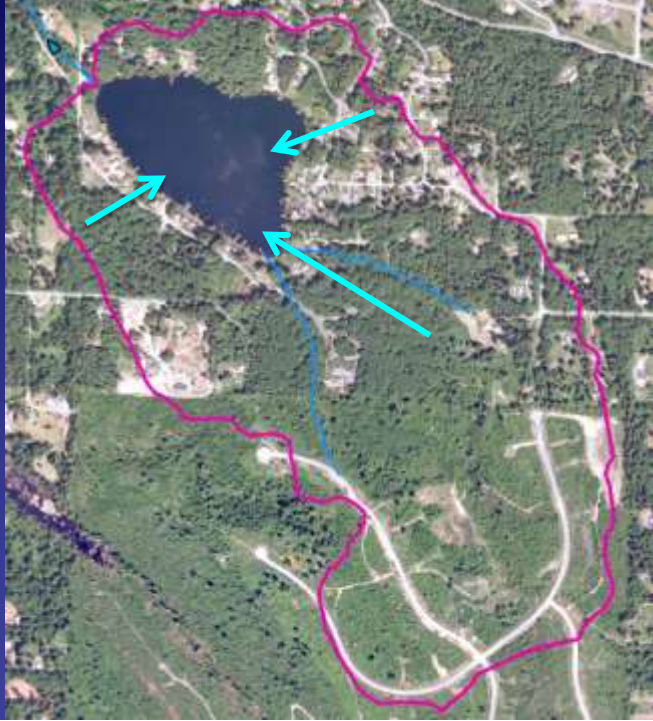


Start with the watershed

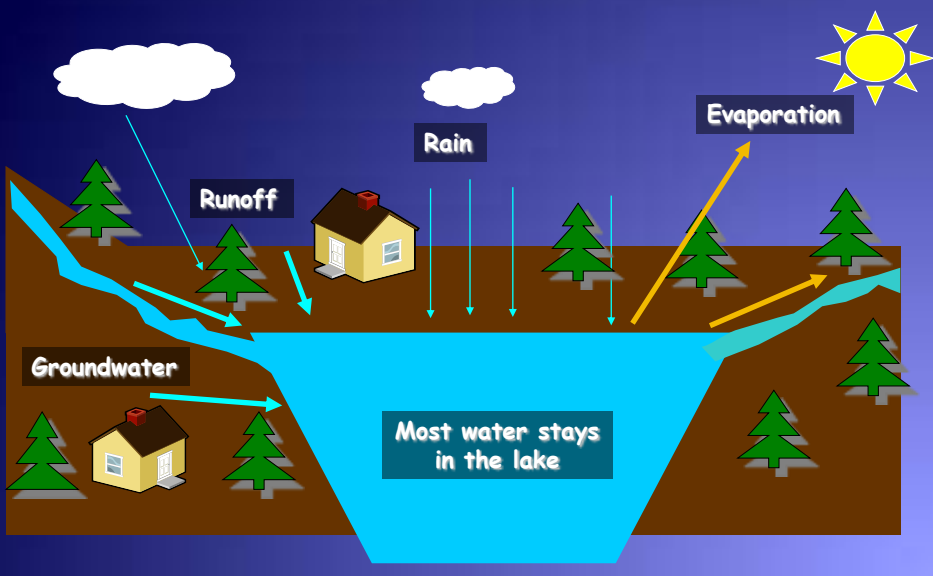
- ◆ All the area that drains to a lake

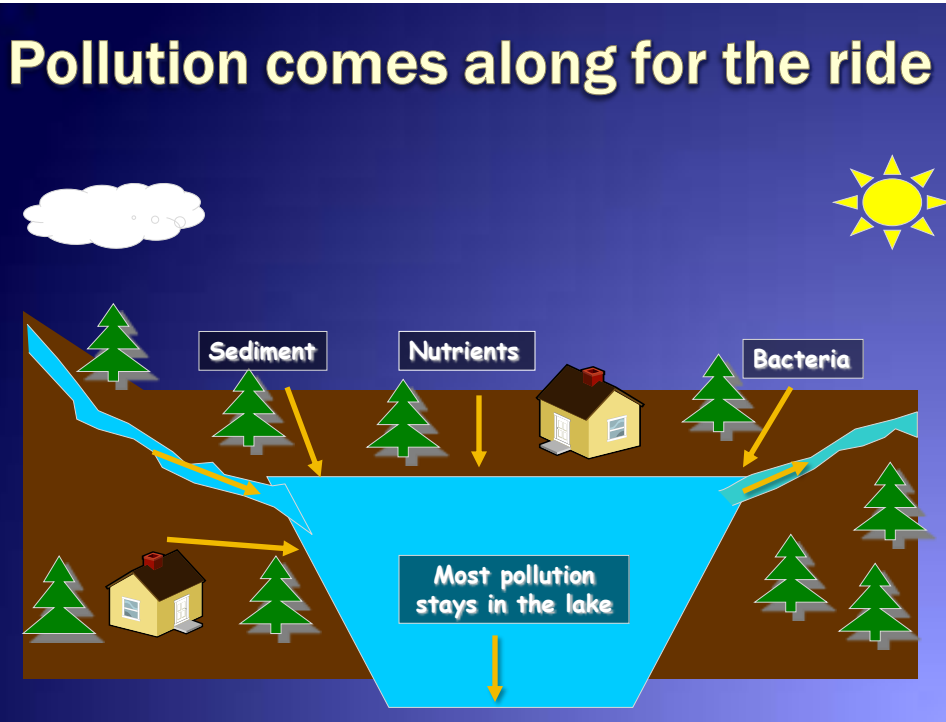


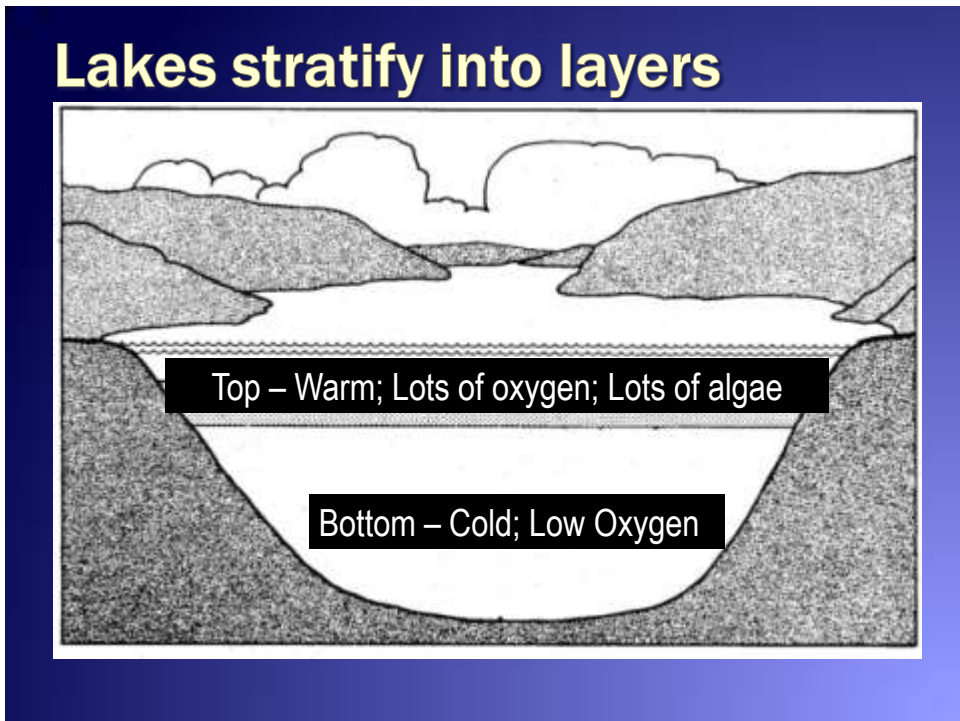
Lake Howard watershed



Water comes from the watershed

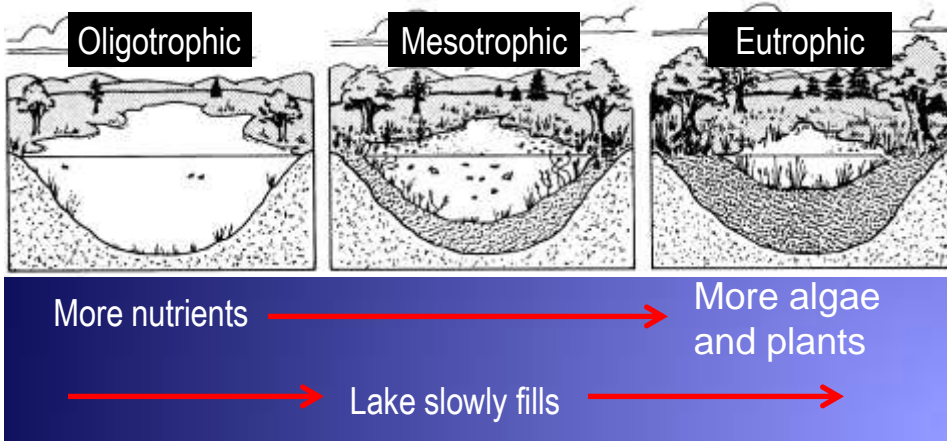






Lakes go through stages

- ◆ A process of enrichment
- ◆ Takes thousands of years
- ◆ **More nutrients can accelerate the process**



Why we monitor Lake Howard:

- ◆ Evaluate current conditions
- ◆ Track long-term trends
- ◆ Identify specific problems



Since 1993, volunteers have monitored Lake Howard:

- ◆ Cherie and Jim Poyner
- ◆ Brad Sebranke
- ◆ Ellen Hiatt
- ◆ Tim Schmidt
- ◆ Suzanne Cannon
- ◆ Others?

Water Clarity – Secchi Disk



Observations



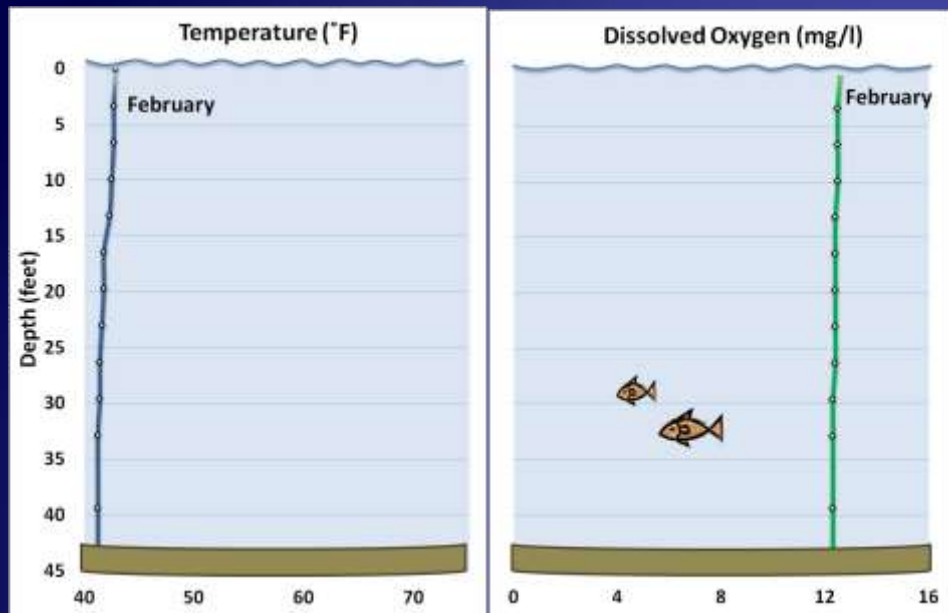
Water Samples for Phosphorus & Chlorophyll a



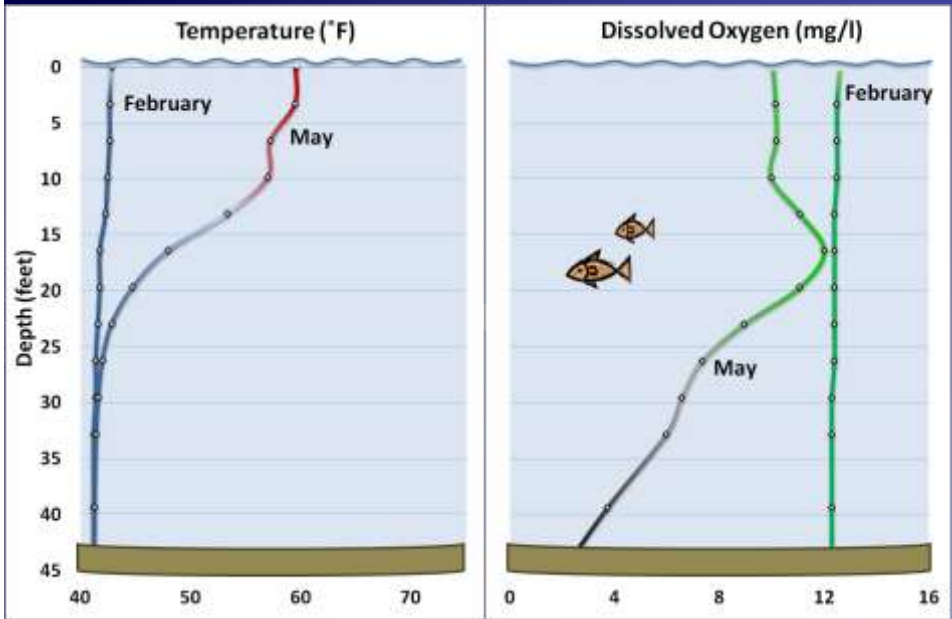
Temperature & Dissolved Oxygen



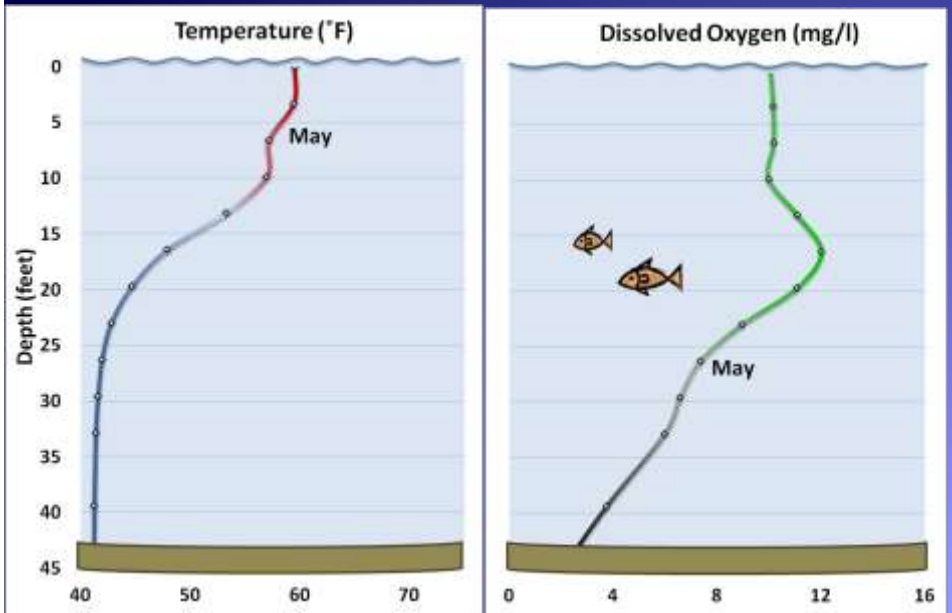
Winter Temperatures & Oxygen



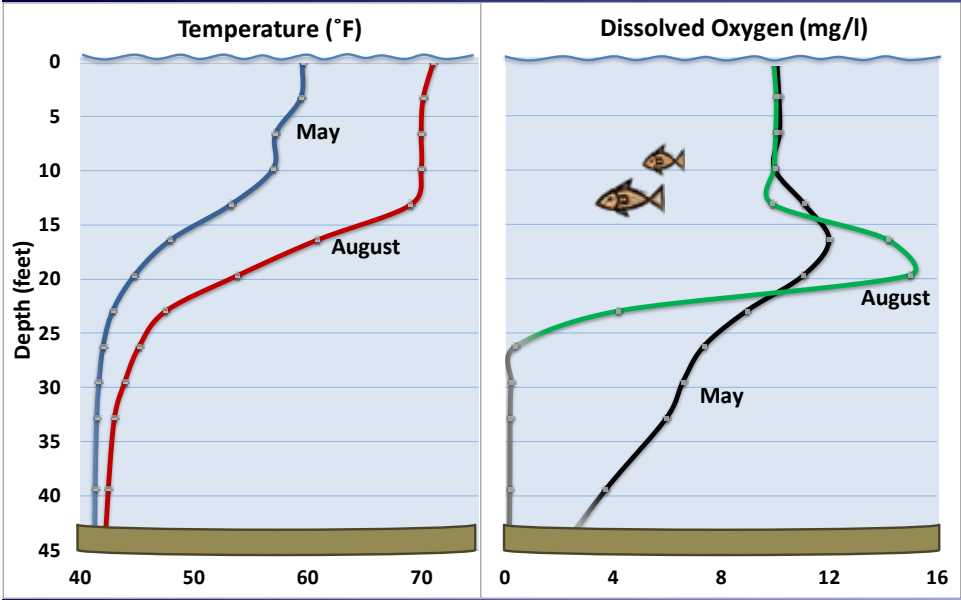
Spring Temperatures & Oxygen



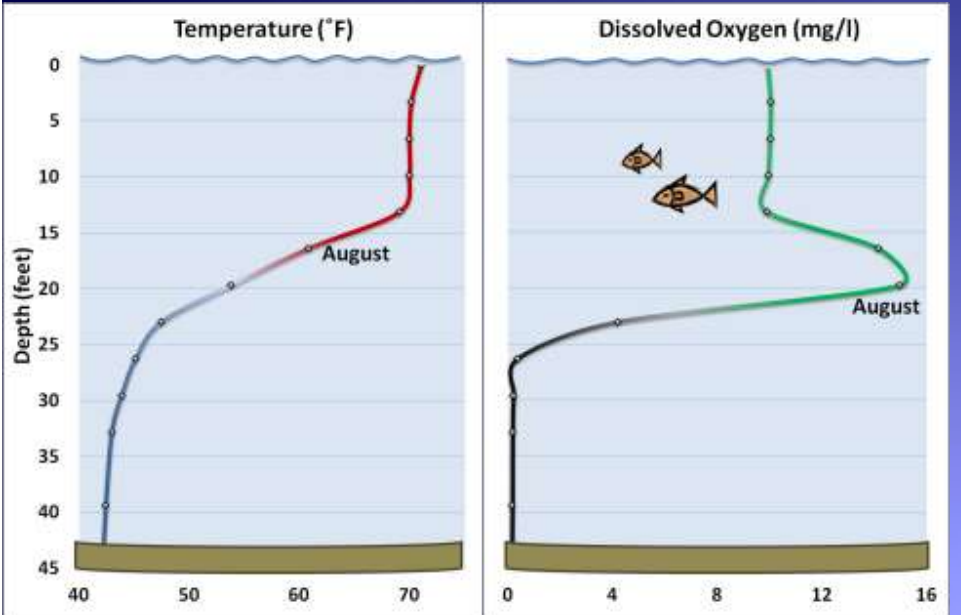
Spring Temperatures & Oxygen



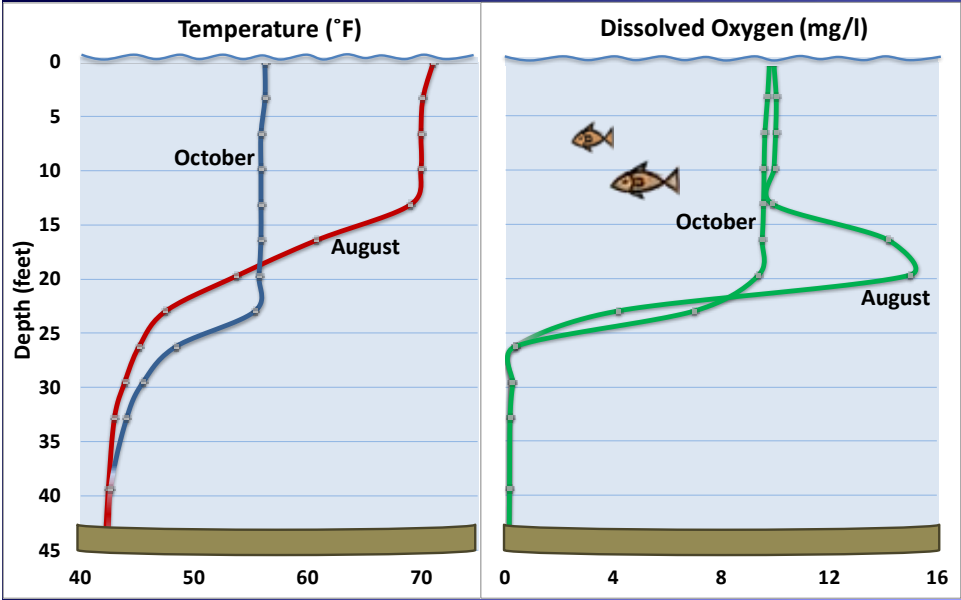
Summer Temperatures & Oxygen



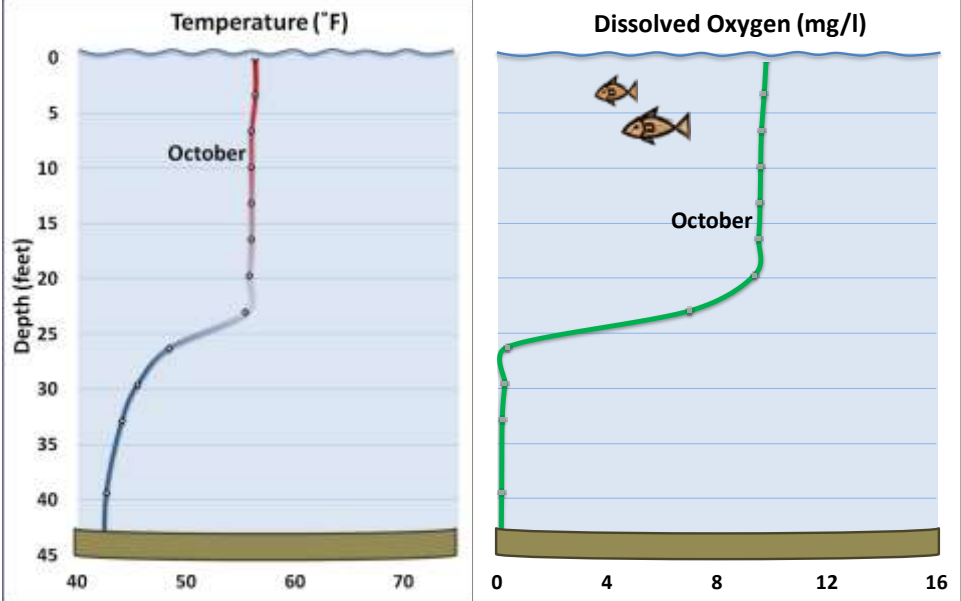
Summer Temperatures & Oxygen

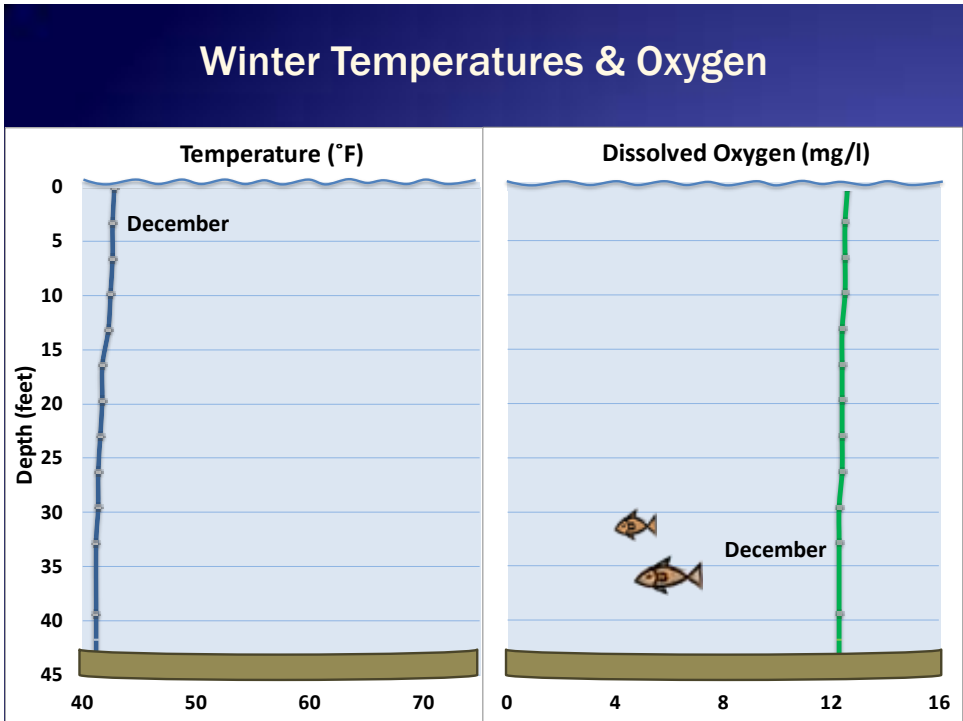
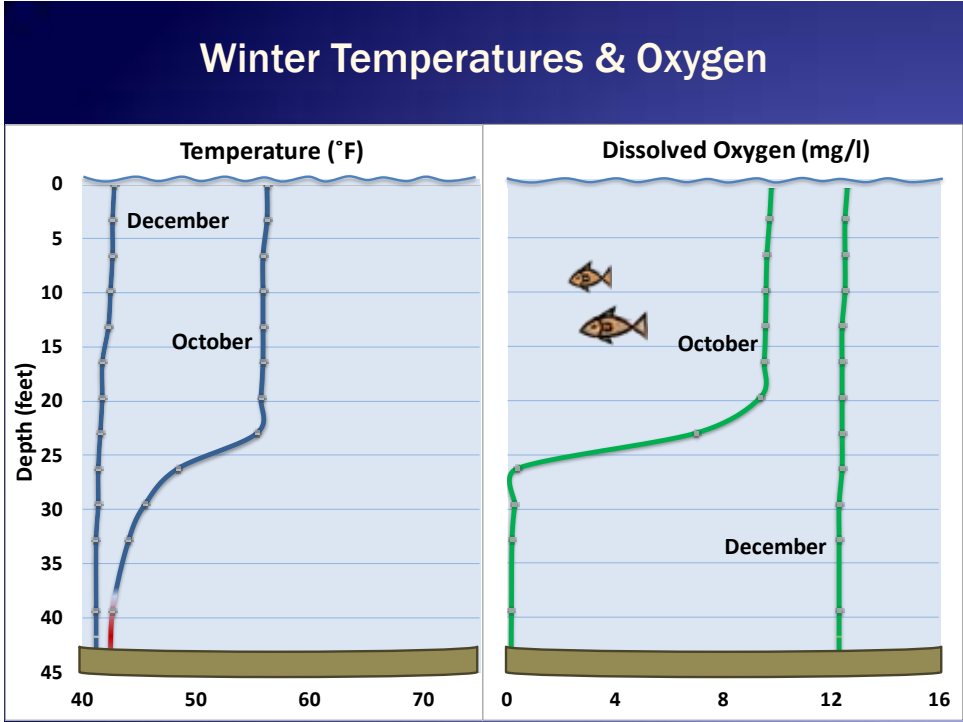


Fall Temperatures & Oxygen



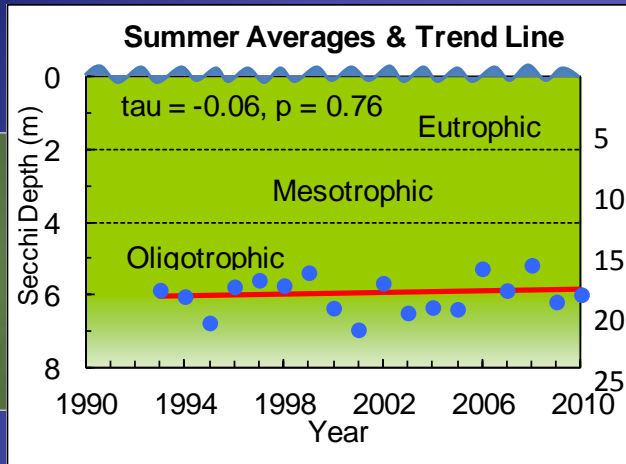
Fall Temperatures & Oxygen





Water Clarity

- ◆ Generally good water clarity
- ◆ Less clarity in years with more algae



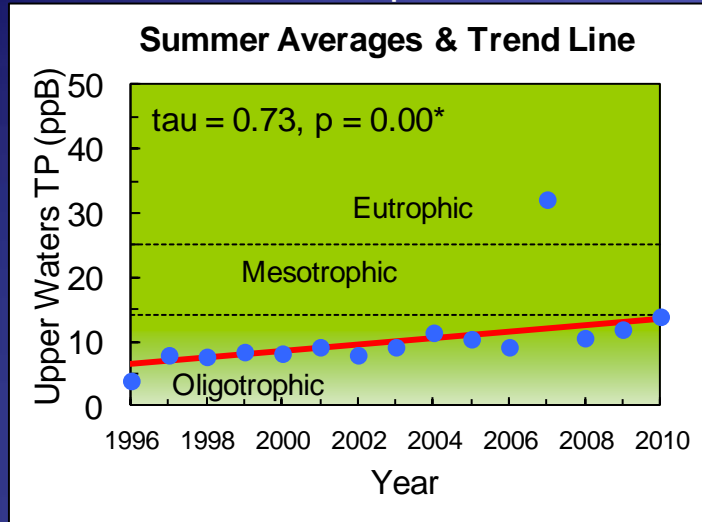
Phosphorus (P)

- ◆ Phosphorus is key nutrient
- ◆ The amount of phosphorus in the lake determines how much algae grows



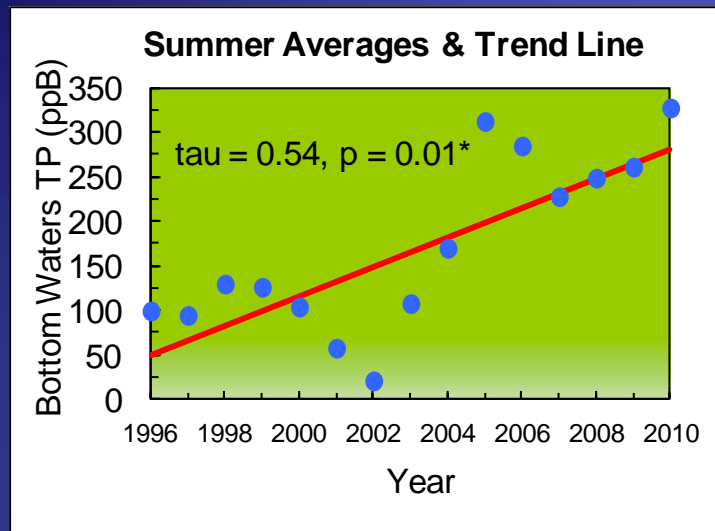
Phosphorus (P)

- ◆ Phosphorus in upper waters indicates watershed sources or recent pollution



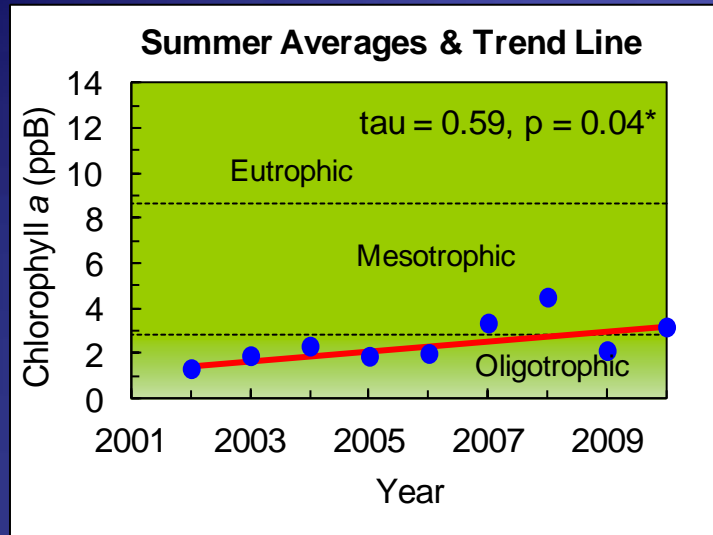
Phosphorus (P)

- ◆ Phosphorus in lower waters indicates past pollution or internal release from the sediments



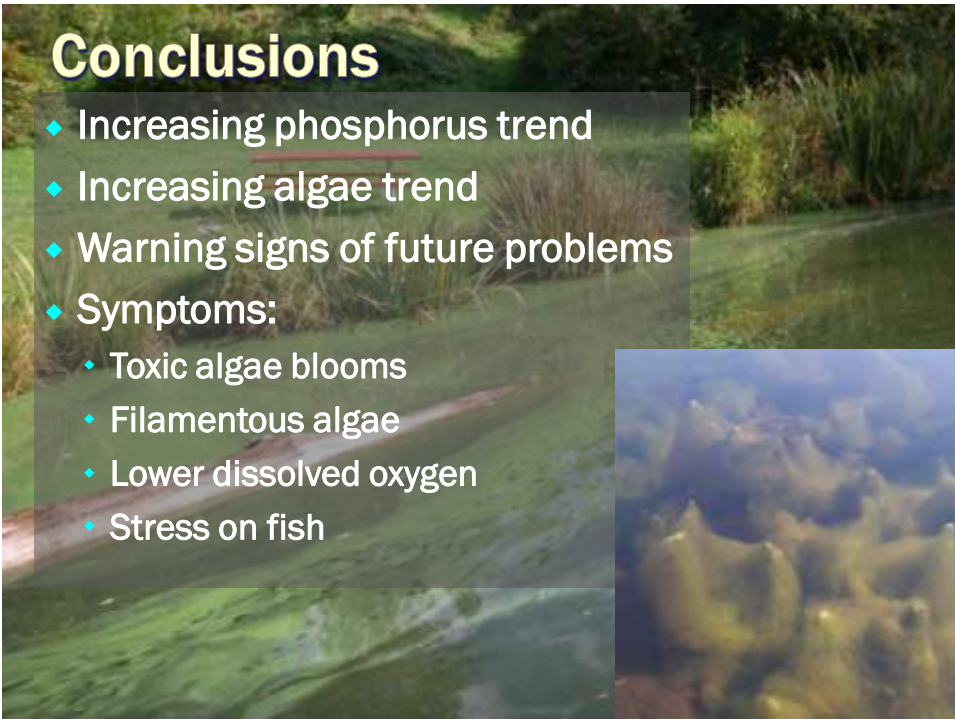
Chlorophyll a

- ◆ A measure of amount of algae



Conclusions

- ◆ Increasing phosphorus trend
- ◆ Increasing algae trend
- ◆ Warning signs of future problems
- ◆ Symptoms:
 - ◆ Toxic algae blooms
 - ◆ Filamentous algae
 - ◆ Lower dissolved oxygen
 - ◆ Stress on fish

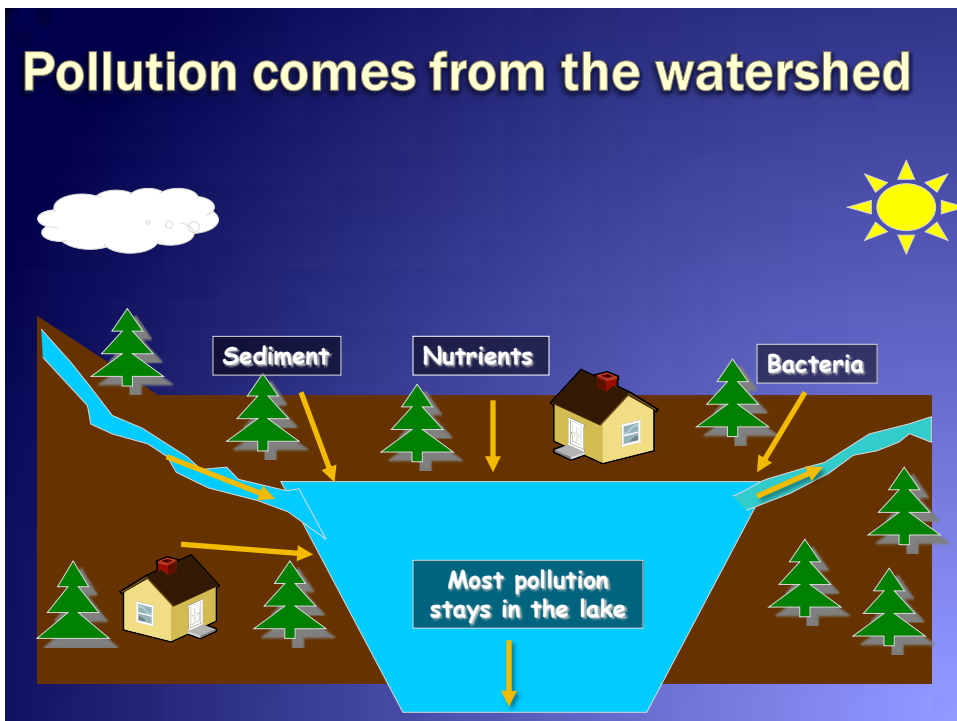


Why are these changes happening?

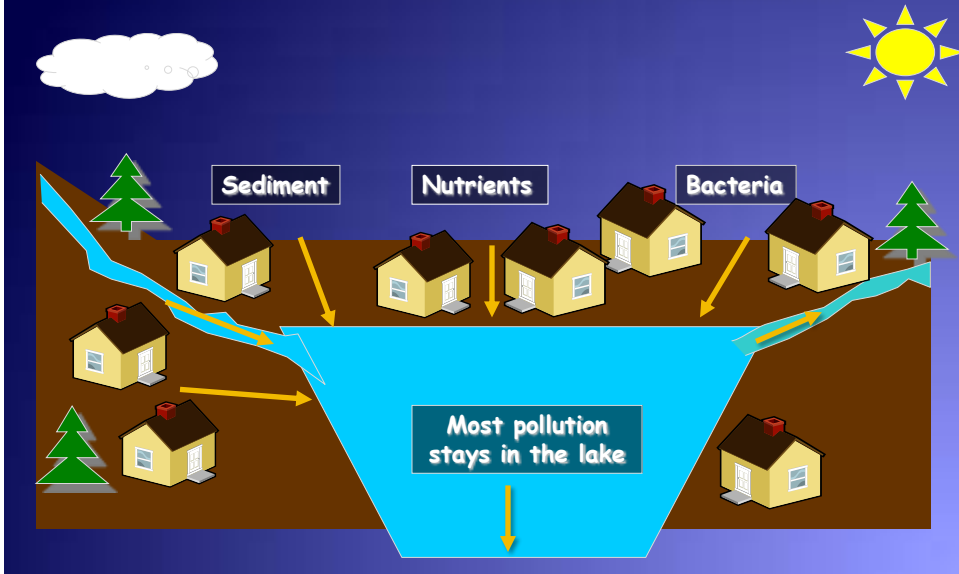
- ◆ Remember the watershed?



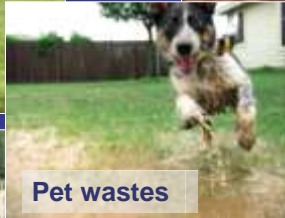
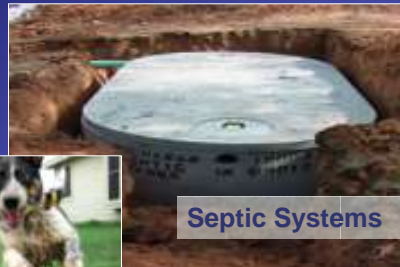
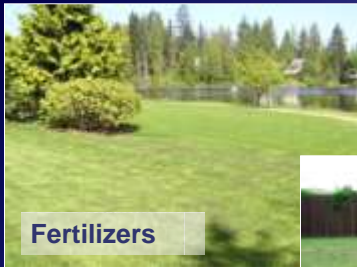
Pollution comes from the watershed



The watershed is changing

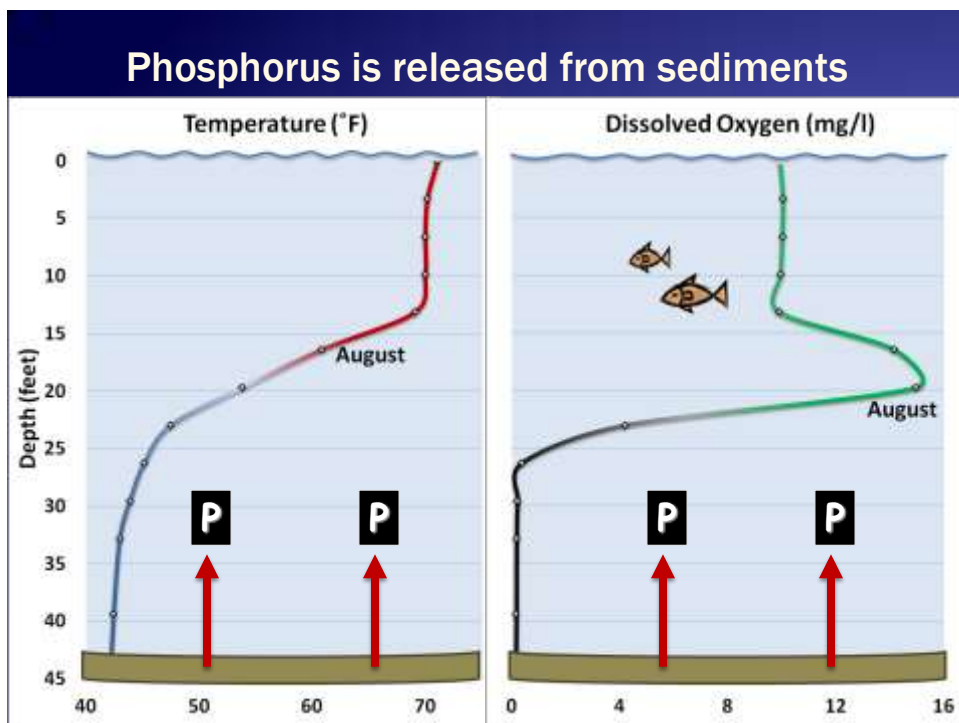


Common Sources of Nutrients



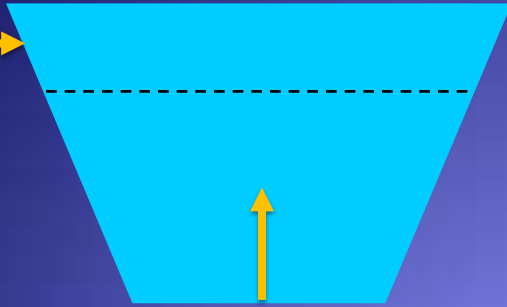
Another reason

- ◆ Remember how the lake stratifies and dissolved oxygen declines in the bottom waters?
- ◆ Very low dissolved oxygen in the lake bottom causes phosphorus to be released from the sediments



Primary focus on watershed sources

Watershed
Nutrient
Sources



Internal
Nutrients