

All you need to know about
Lake Algonquin

August 1, 2021

Friends of Lake Algonquin Annual Meeting





Objectives

Understanding the aquatic chemistry and the watershed surrounding Lake Algonquin can help PROTECT the integrity of the lake

- Discuss watershed characteristics and influences on water quality
- Determine the water quality of Lake Algonquin
- Learn about Lake Algonquin's trophic status and how to prevent nutrient pollution

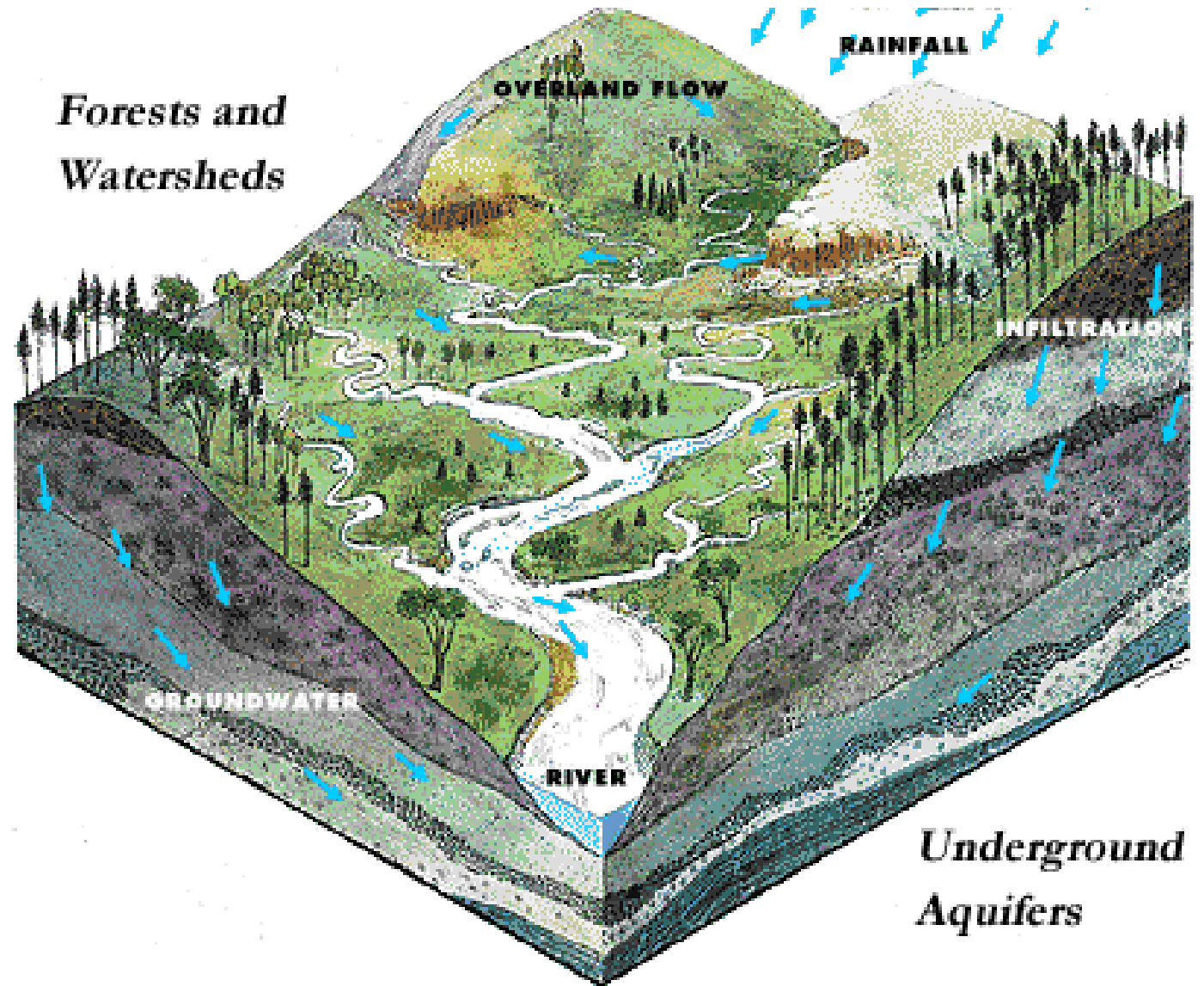


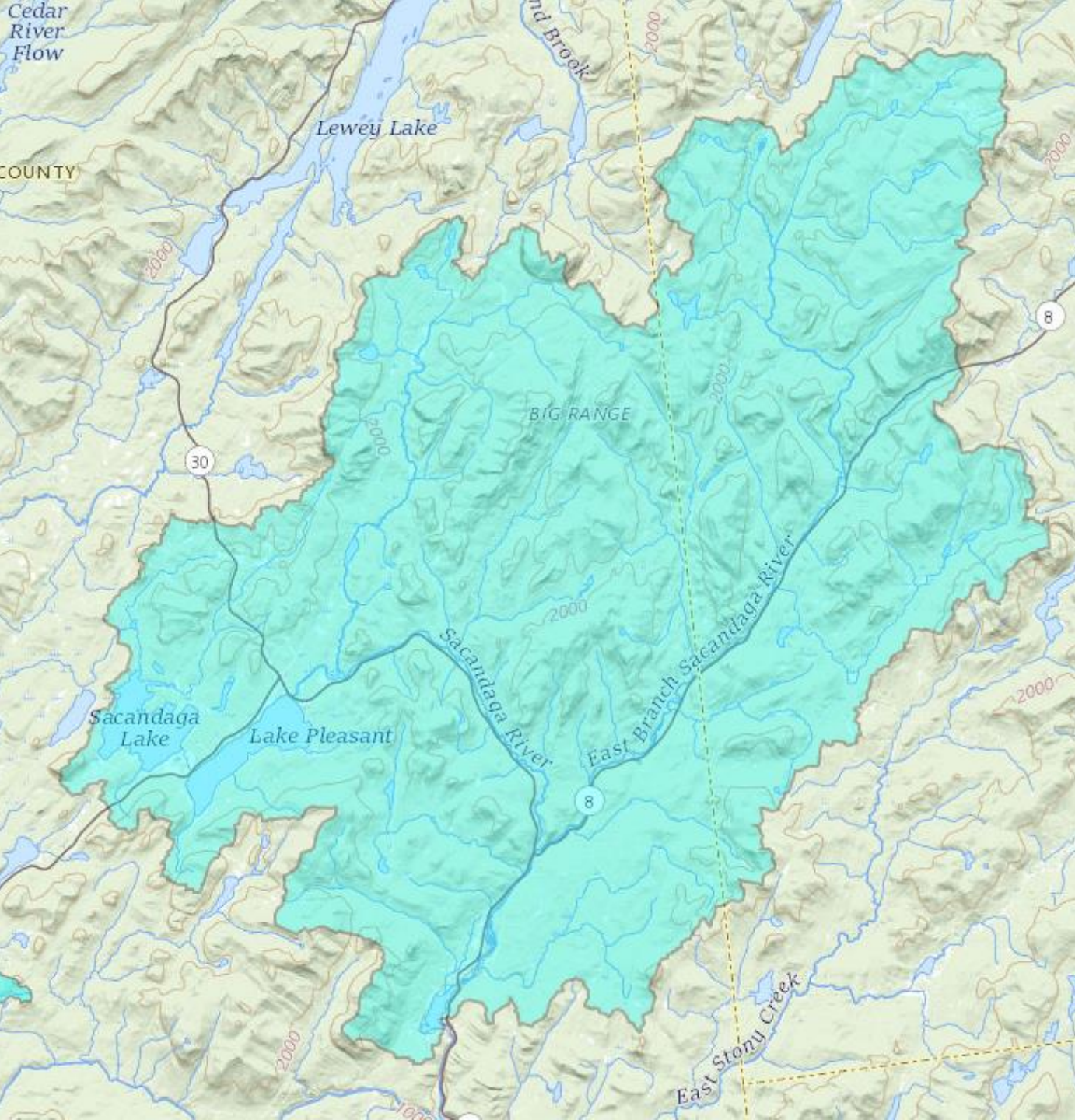
Defining Water Quality

- “the condition of water, including the chemical, physical and biological characteristics, usually in respect to its suitability for a designated use.”
- The ability of water to support all appropriate beneficial uses...
- Many factors influence water quality/ chemistry
 - Watershed
 - Climate
 - Lake Age
 - Biological Organisms – including anthropocentric modifications

The Watershed: The most important factor influencing water quality

- Watershed size greatly influences water chemistry (more land to drain, more sediments received in water body)
- Bedrock geology (limestone vs granite)
- Watershed type: forested, agricultural, wetlands, development/ urban areas





Your Watershed

- Part of the Upper Hudson River
- Heavily forested (89%)
- Massive in size! (2nd largest watershed area from our study lakes)
 - Watershed area: 67,160 hectares
 - Lake area: 105 hectares
 - Lake is 0.15% of the watershed

What does this mean for water quality...?

Watershed influences on Lake Algonquin

- More rainfall captured during storm events = more runoff, more nutrient input, more sediment input
- Decreased transparency, increased DOC
- Human influences: 61.7km of state roads = elevated NaCl concentrations
- Rapid flushing rate
 - Over 25x/year or 2x a month!



Importance of flushing rate

2020 Data Vs. 2021 Data

Month 2020	Sp. Conductivity (us/cm)	Month 2021	Sp. Conductivity (us/cm)
June	-	May	60.5
July	81.9	June	55.7
August	69.2	July	41.7
September	101.3		

- **Conductivity is a measurement of the ability of water to conduct electricity.**
- **Undeveloped lakes = low conductivity (10 – 25 us/cm)**
- **Conductivity increases as concentrations of dissolved ions in the water increase**

HCSWCD Lake Monitoring Program

- Purpose: *“to collect and record data over an extended period and keep a watchful eye out for changes”*
- Water samples collected 1x per month (June – September)
 - May & October data collected on a small subset of lakes, including Algonquin

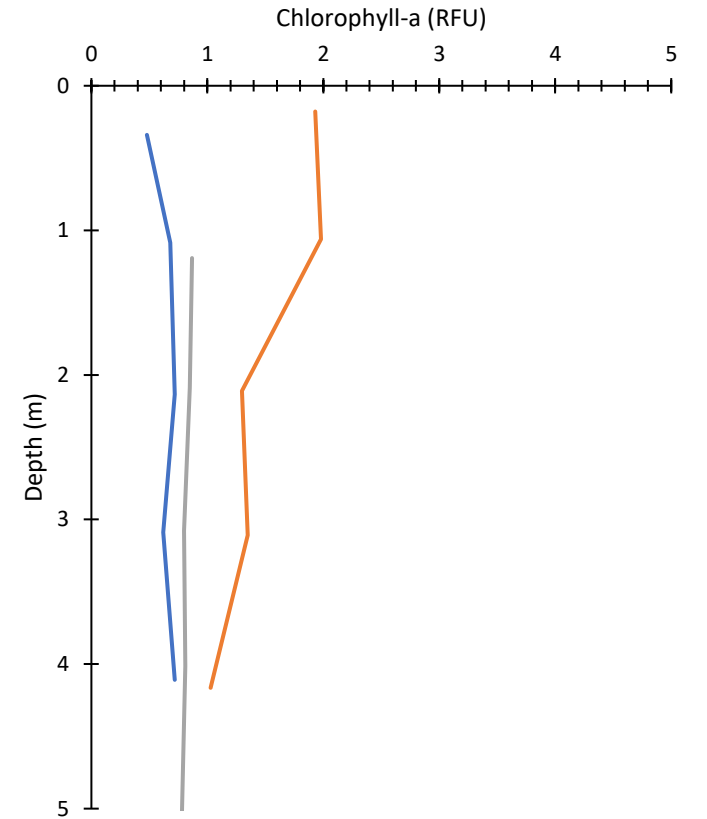
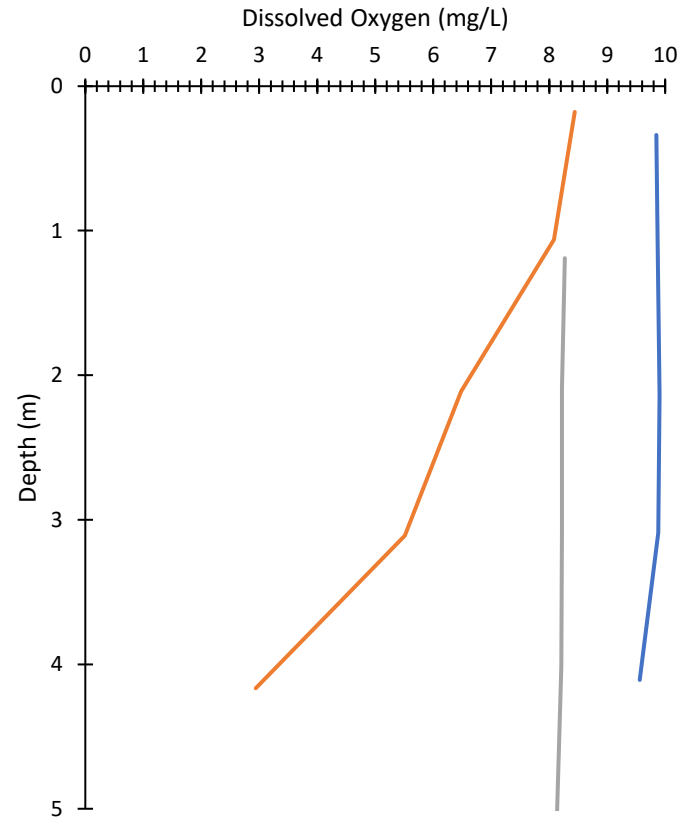
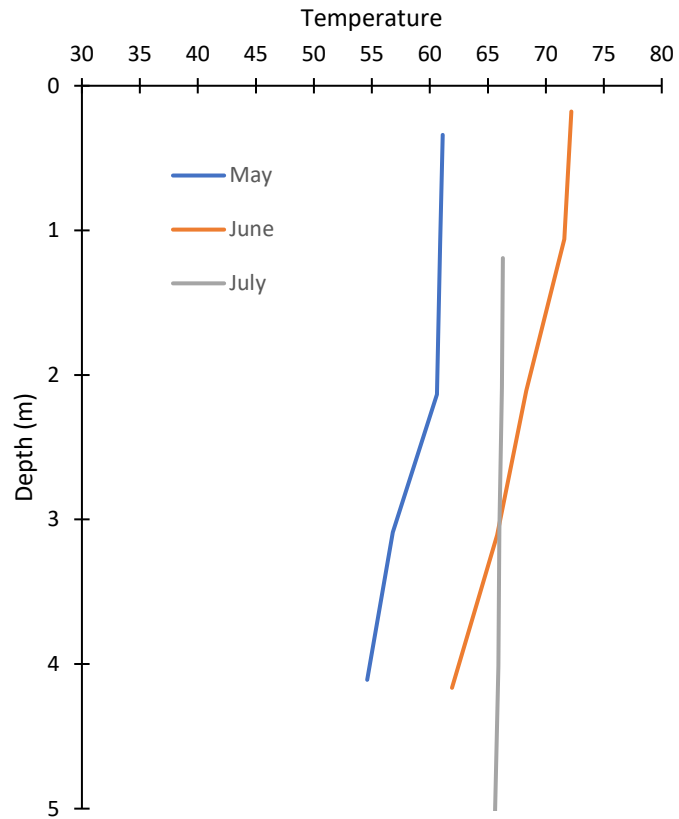




What our data tells us about Lake Algonquin..

- Lake Profiles – thermal and dissolved oxygen distribution
- Trophic Status
- Road Salt Influence
- Acid rain recovery and vulnerability

2021 Profile data



By July, the lake has fully “mixed”, resulting in isothermal conditions

Water Chemistry

- Highly variable across HC study Lakes
- Seasonal variations occur
- HCLMP chemical parameters
 - Nitrogen
 - Phosphorus
 - Sodium & Chloride
 - Alkalinity



Water Quality Parameter	June	July	August	September	Average	Scientific Classification & Trends
Transparency (m)	2.2	2.0	1.5	3.0	2.2	Mesotrophic / TSI = 49 decreasing
Chlorophyll-a (µg/L)	4.1	6.9	9.7	2.9	5.9	Mesotrophic / TSI = 47
Total Phosphorus (µg/L)	9.8	10.6	14.3	7.2	10.5	Oligotrophic / TSI = 38 / decreasing
Nitrate + Nitrite (µg/L)	29.9	7.0	28.0	3.2	17.0	No trend
Alkalinity (mg/L CaCO ₃)	16.0	22.0	16.0	24.8	19.7	Adequate acid neutralizing capacity
Field pH (@ 1m)	-	7.1	7.5	7.2	7.3	Circumneutral
Sp. Conductance (µs/cm)	-	81.9	69.2	101.3	84.1	No trend
Chloride (mg/L)	10.9	11.3	8.7	13.2	11.0	Moderately influenced by road salt / increasing
Sodium (mg/L)	6.7	7.2	6.0	8.2	7.0	Increasing
Calcium (mg/L)	5.8	6.9	5.8	7.9	6.6	Could not support zebra mussel population
Dissolved Organic Carbon (mg/L)	4.2	4.5	6.3	4.0	4.8	No Trend

Trophic Status: The measurement of overall lake productivity

- **Transparency** – measurement of water clarity and light penetration
- **Chlorophyll a** – A photosynthetic pigment found in algae & cyanobacteria.
- **Total Phosphorus** – An essential but limiting nutrient. Extra phosphorus = increased production



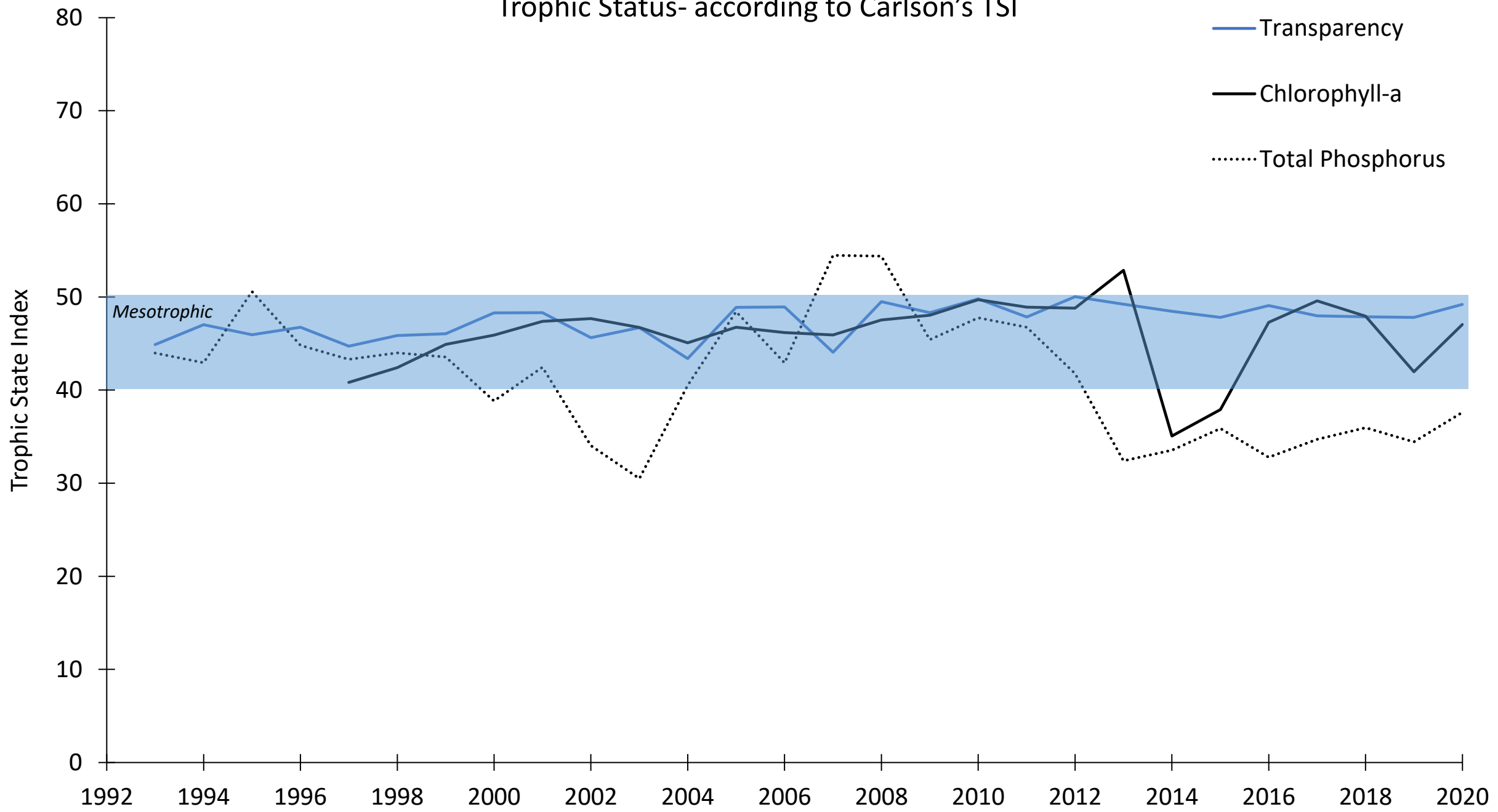
Images: UW-Extension Lakes Program

Parameter	Oligotrophic	Mesotrophic	Eutrophic
Transparency	>5m	2 – 5m	<2m
Total Phosphorus	<10 ug/L	10 – 20 ug/L	>20 ug/L
Chl-a	<2ug/L	2 – 8 ug/L	>8 ug/L

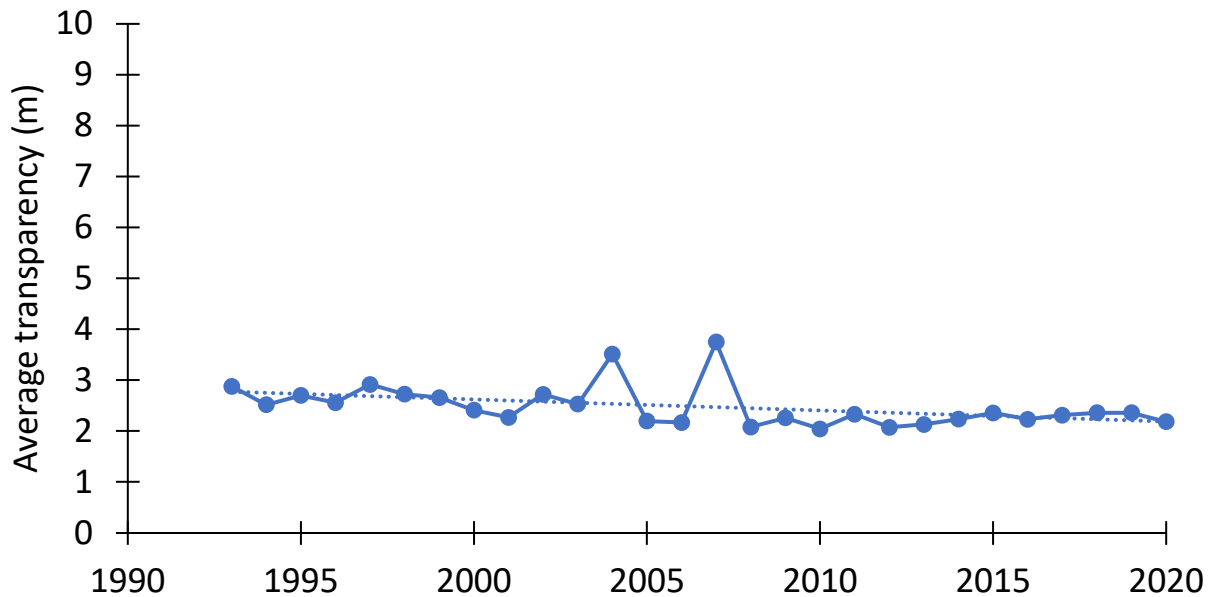
Of the 21 lakes monitored, 15 of the study lakes (70%) are mesotrophic, the remaining 6 lakes are classified as oligotrophic

Average Transparency – 2.2m
 Average Total P – 10.5 ug/l
 Average Chlorophyll-a – 5.9 ug/l

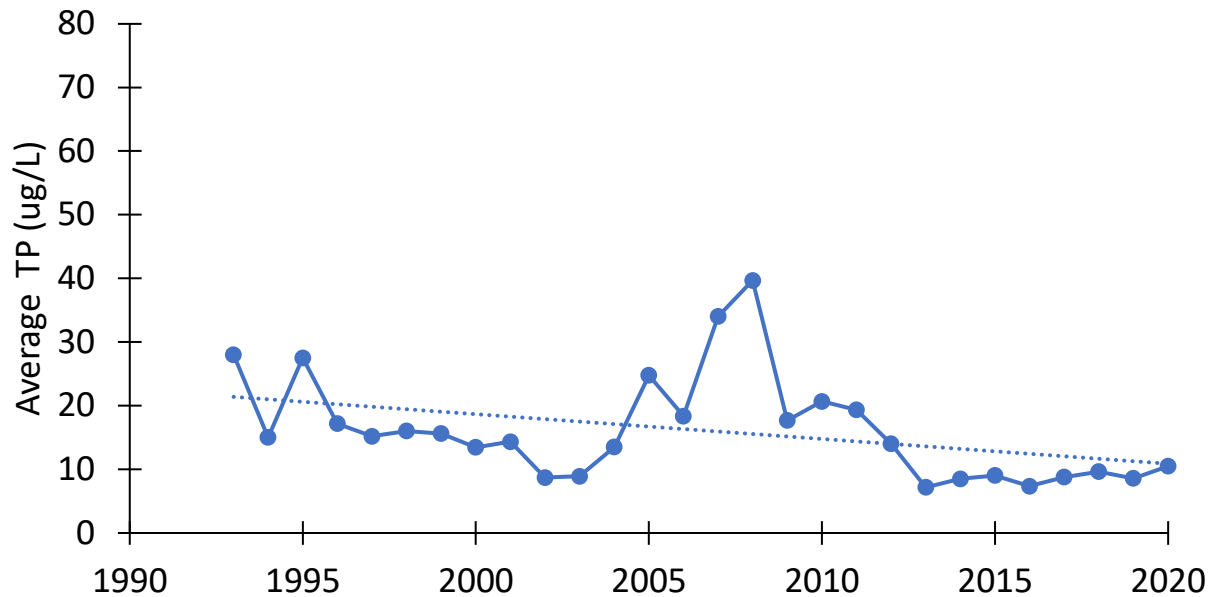
Trophic Status- according to Carlson's TSI



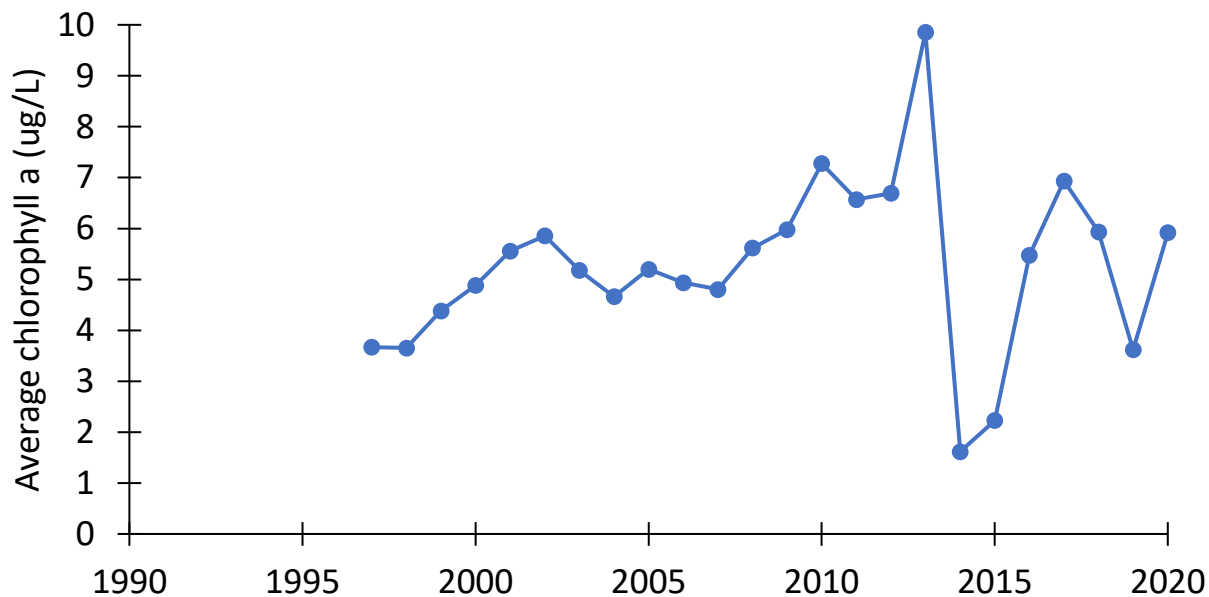
Secchi Depth



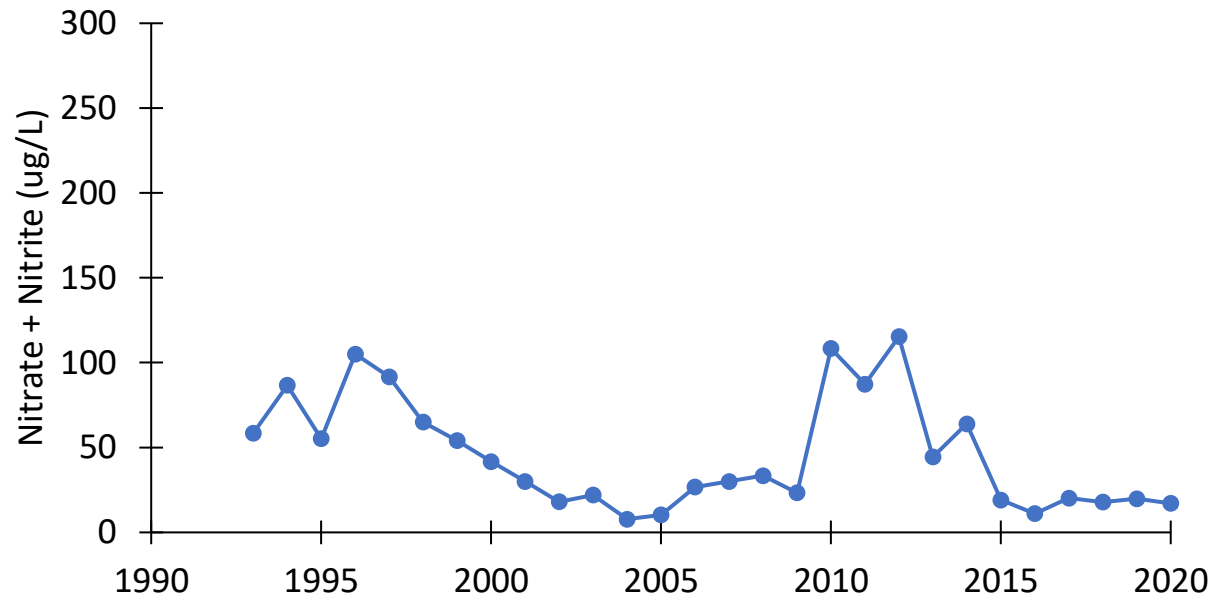
Total Phosphorus



Chlorophyll-a



Nitrate + Nitrite



Trophic Indicators of HC Study Lakes

Lake	Average of Chl-a (ug/L)
Blue Mountain Lake	0.94
Sixth Lake	1.12
Eighth Lake	1.13
Limekiln Lake	1.17
Lake Eaton	1.19
Seventh Lake	1.32
Lake Pleasant	1.73
Raquette Lake	2.31
Fourth Lake	2.35
Sacandaga Lake	2.41
Fawn Lake	2.46
Piseco Lake	2.62
Spy Lake	2.69
Morehouse Lake	2.78
Lake Abanakee	3.01
Indian Lake	3.08
Fifth Lake	3.11
Long Lake	3.14
Oxbow Lake	3.71
Lake Adirondack	5.00
Lake Algonquin	5.92

Lake	Average of Transparency (m)
Lake Algonquin	2.18
Lake Adirondack	2.31
Oxbow Lake	2.68
Lake Abanakee	2.91
Fifth Lake	3.08
Piseco Lake	3.38
Long Lake	3.40
Indian Lake	3.50
Morehouse Lake	3.60
Raquette Lake	3.60
Lake Pleasant	3.70
Sacandaga Lake	4.00
Spy Lake	4.34
Fawn Lake	4.53
Sixth Lake	4.68
Seventh Lake	5.00
Eighth Lake	5.20
Lake Eaton	5.30
Fourth Lake	5.46
Limekiln Lake	6.94
Blue Mountain Lake	8.58

Lake	Average of Total Phosphorus (ug/L)
Seventh Lake	3.78
Lake Eaton	3.90
Eighth Lake	3.90
Blue Mountain Lake	4.00
Sixth Lake	4.08
Limekiln Lake	4.08
Lake Pleasant	4.78
Raquette Lake	5.05
Fawn Lake	5.17
Spy Lake	5.18
Long Lake	5.20
Sacandaga Lake	5.45
Fourth Lake	5.48
Piseco Lake	5.50
Fifth Lake	6.55
Lake Abanakee	6.95
Indian Lake	7.08
Morehouse Lake	7.25
Lake Adirondack	9.20
Oxbow Lake	9.65
Lake Algonquin	10.48

What makes Lake Algonquin so productive...

Phosphorus

- The **least abundant** essential element in water
- Most commonly **limits production**
- Introduction of extra P allows for an **increase in lake productivity**
- **2021 P levels:**
 - May – 6.8 ug/l
 - June – 12.8 ug/l



So where does the extra phosphorus come from?? **THE WATERSHED!**

- Lakeshore development



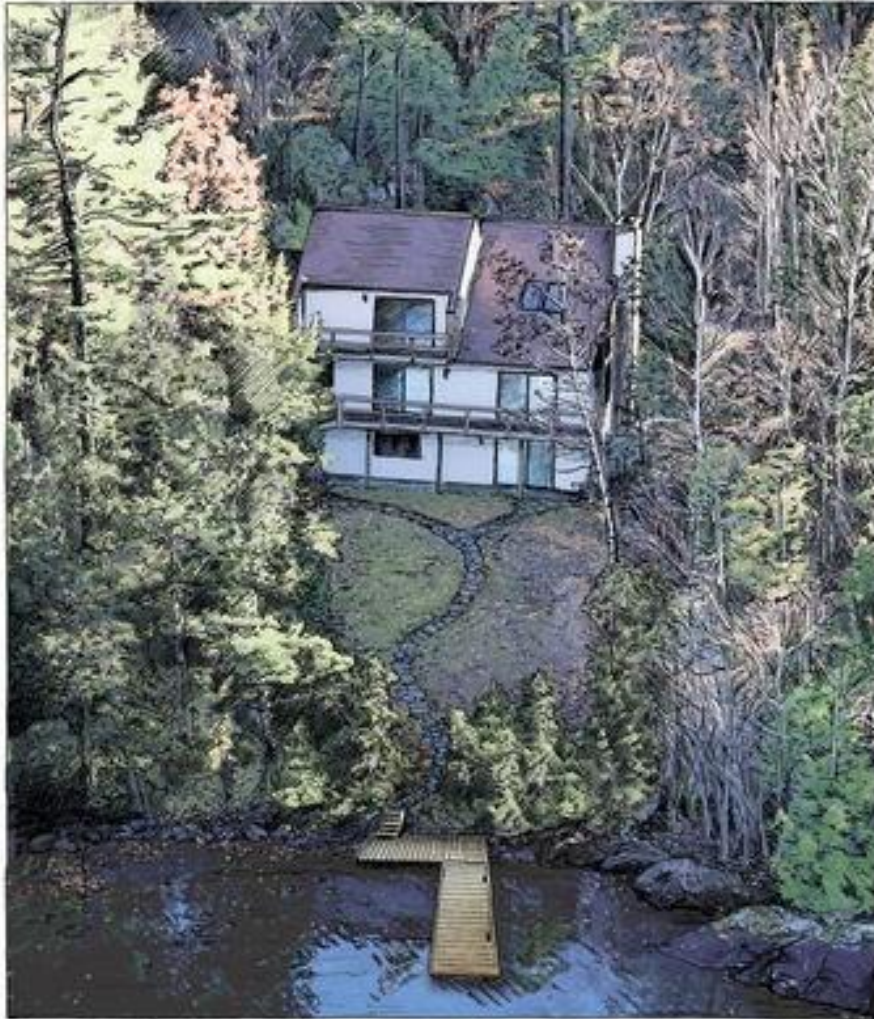
- Storm water runoff



- Faulty septic systems

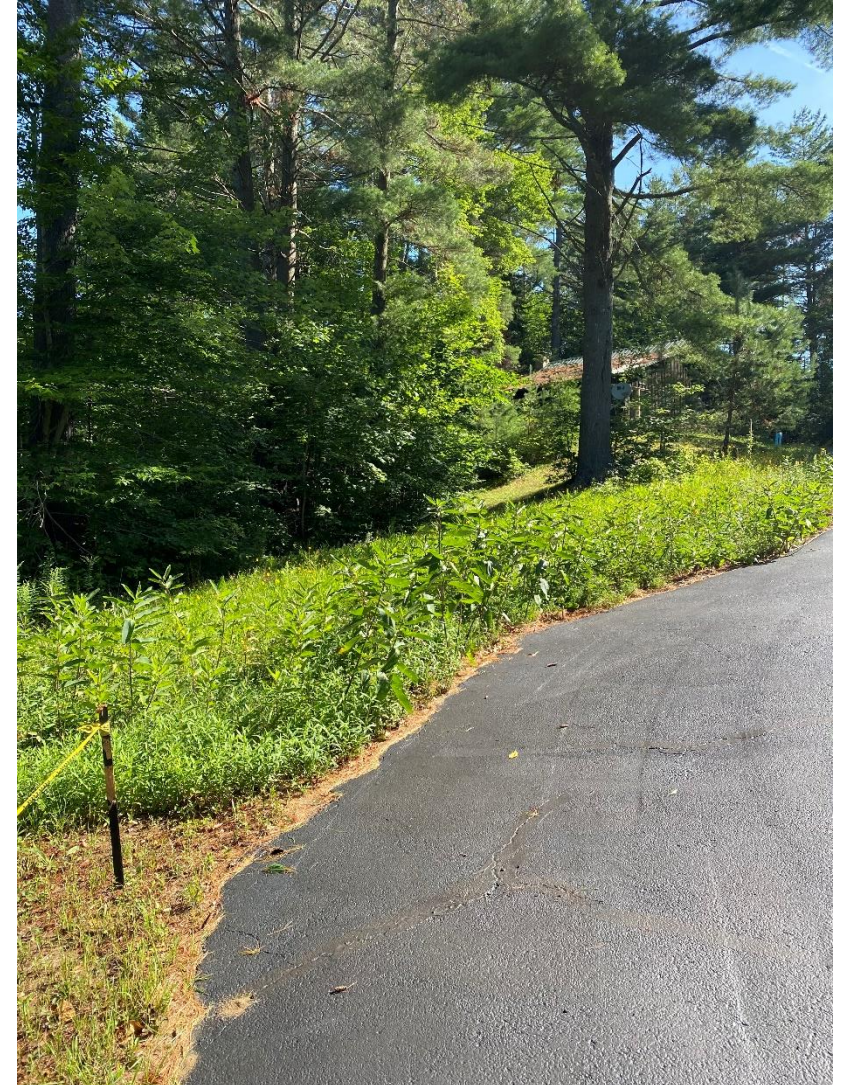


Grass Lawns Can Threaten Surface and Ground Water



Manage Your Landscaping to Reduce Stormwater Runoff

- Lawns should include
 - Trees
 - Rain gardens
 - Buffers
- Mow to 3 inches or more
 - Promote food production
- Limit fertilizers and pesticides
- No mow zones





Water Quality Conclusions

The water quality of Lake Algonquin is
_____?

- Swimming and recreation
- Habitat
- Hydroelectric
- Drinking/cooking?