



# Volunteer Lake Assessment Program Individual Lake Reports

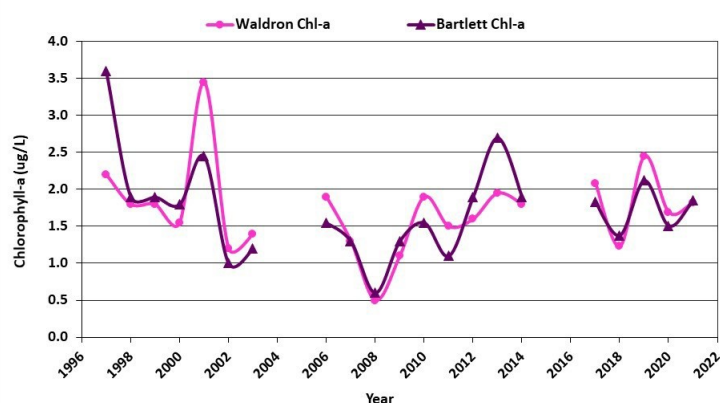
## Lake Winnisquam, Bartlett and Waldron Bays

### 2021 Data Summary

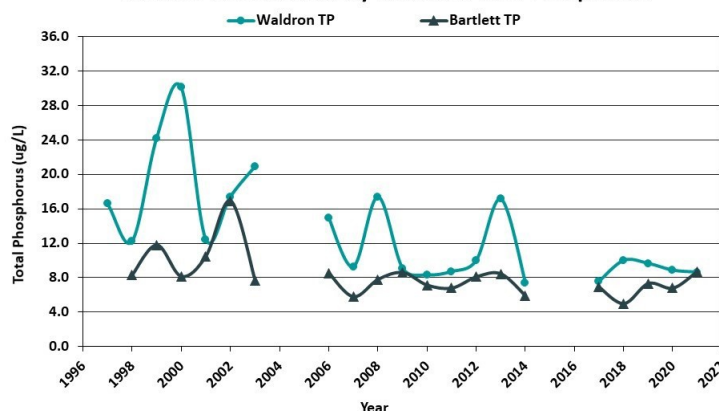
**Recommended Actions:** Phosphorus levels at both Bays have improved since monitoring began, which is encouraging. However, water clarity (transparency) has declined (worsened) since monitoring began, and algal growth (chlorophyll) appears to be increasing since 2006. The declining clarity is likely a result of a combination of increased algal growth and the increased frequency and intensity of storm events resulting in stormwater runoff and flushing of waters rich in dissolved organic matter that impart a brown or tea color to the water. Volunteers noted much reduced clarity in July following record rainfall amounts indicating impacts of stormwater runoff to these nearshore areas. This highlights the importance of managing and reducing stormwater runoff to the lake. Consider partnering with Soak Up the Rain NH to identify areas prone to stormwater runoff and implement projects designed to capture and infiltrate stormwater prior to reaching the lake. Keep an eye on chloride levels which indicate road salt is likely impacting the lake. Encourage road agents and winter maintenance companies that apply de-icing materials to roads, parking lots, walkways, and driveways to obtain Green SnowPro Certification. Evaluate culverts and roadside ditches close to the lake in the spring and identify areas in need of cleanup from application of winter salt/sand mixtures. Encourage clean up of these areas to prevent runoff into the lake. Keep up the great work!

### Historical Water Quality Graphics

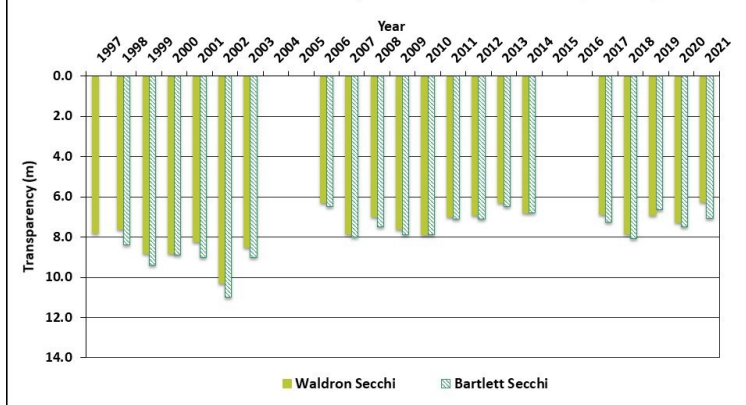
Waldron and Bartlett Bay Historical Chlorophyll-a



Waldron and Bartlett Bay Historical Total Phosphorus



Waldron and Bartlett Bay Historical Water Transparency





## Volunteer Lake Assessment Program Individual Lake Reports Lake Winnisquam, Three Isl., Laconia 2021 Data Summary

### Observations *(Refer to Table 1 and Historical Deep Spot Data Graphics)*

- **Chlorophyll-a:** Chlorophyll level at Bartlett Bay was within a low range in June and decreased gradually through August. Waldron Bay chlorophyll level was very low in June and increased gradually through August but remained within a low range. Average chlorophyll levels at both stations increased from 2020 and were less than the state median and the threshold for oligotrophic lakes. Visual inspection of historical data indicates stable, yet variable, chlorophyll levels since 1997, however levels appear to be increasing since 2006.
- **Conductivity/Chloride:** Bartlett and Waldron Bay conductivity levels were slightly elevated and greater than the state median. Average conductivity levels increased at both stations from 2020. Chloride levels were greater than the state median and higher than expected for undisturbed surface waters, but levels did not exceed the state chronic chloride standard.
- **Color:** Apparent color levels at Bartlett Bay indicated the water was clear with little to no tea coloring. Waldron Bay apparent color levels were borderline clear to lightly tea colored, or light brown, particularly in July and August following record summer rainfall amounts.
- **Total Phosphorus:** Bartlett Bay phosphorus level was elevated in June, decreased to a low level in July, and increased slightly in August. Average Bartlett Bay phosphorus level increased from 2020, was less than the state median, and was slightly greater than the threshold for oligotrophic lakes. Waldron Bay phosphorus level was slightly elevated in June, decreased to a low level in July, and then increased to a slightly elevated level in August. Average Waldron Bay phosphorus level remained stable with 2020, was slightly less than the state median, and was slightly greater than the threshold for oligotrophic lakes. Visual inspection of historical data indicates decreasing phosphorus levels at both stations.
- **Transparency:** Transparency measured at both stations was within an average range in June, decreased (worsened) significantly in July following record rainfall amounts and field data noted cloudy water with visible algal growth, and then increased (improved) to an average range in August. Average transparency at Bartlett and Waldron Bays decreased (worsened) from 2020 but remained much higher (better) than the state median. However, visual inspection of historical data indicates decreasing (worsening) transparency at both stations since monitoring began.
- **Turbidity:** Bartlett and Waldron Bay turbidity levels fluctuated within a low to average range for those stations and increased slightly from 2020.
- **pH:** Bartlett and Waldron Bays pH levels were slightly acidic and less than desirable range 6.5-8.0 units in June and July.

Station Name	Table 1. 2020 Average Water Quality Data for LAKE WINNISQUAM, BARTLETT & WALDRON BAYS								
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Color pcu	Cond. us/cm	Total P ug/l	Trans. m	Turb. ntu	pH
Bartlett-Epilimnion	9.0	1.85	29	20	99.9	9	7.08	0.44	6.34
Waldron-Epilimnion	9.0	1.82	29	23	101.9	9	6.25	0.46	6.26

#### NH Median Values

Median values generated from historic lake monitoring data.

**Alkalinity:** 4.5 mg/L **Chlorophyll-a:** 4.39 ug/L  
**Conductivity:** 42.3 uS/cm **Chloride:** 5 mg/L  
**Total Phosphorus:** 11 ug/L **Transparency:** 3.3 m  
**pH:** 6.6

#### NH Water Quality Standards

Numeric criteria for specific parameters. Water quality violation if thresholds exceeded.

**Chloride:** > 230 mg/L (chronic) **Turbidity:** > 10 NTU above natural  
**E. coli:** > 88 cts/100 mL (beach)  
**E. coli:** > 406 cts/100 mL (surface waters)  
**pH:** between 6.5-8.0 (unless naturally occurring)



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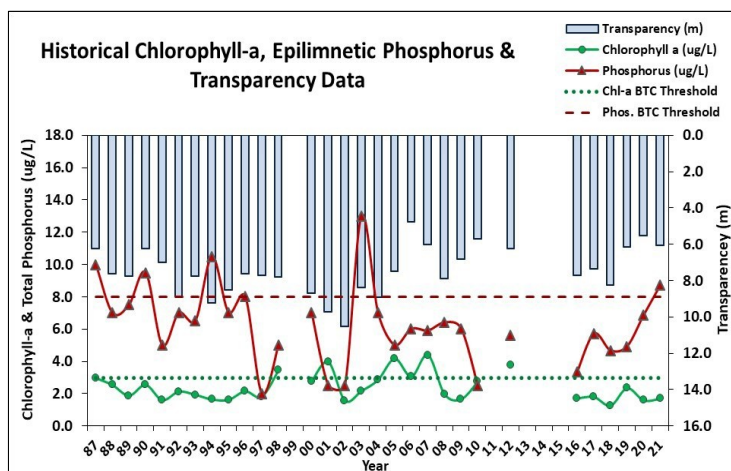
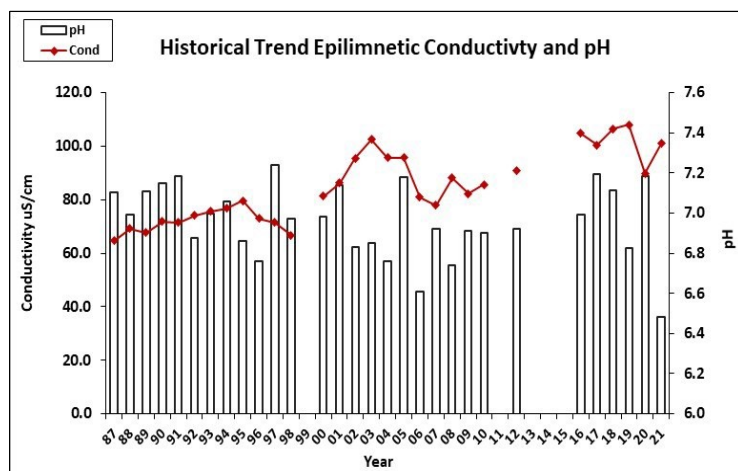
## Lake Winnisquam, Three Isl., Laconia

### 2021 Data Summary

**Recommended Actions:** Great job sampling in 2021! Lake quality remained representative of high quality conditions. However, phosphorus levels were elevated in May, and Epilimnetic phosphorus levels has increased steadily since 2019. Evaluate stormwater runoff and exotic species management activities within this sub-watershed and potential impacts on water quality. Consider partnering with Soak Up the Rain NH to identify areas prone to stormwater runoff and implement projects designed to capture and infiltrate stormwater prior to reaching the lake. Conductivity levels have increased since monitoring began and chloride levels indicate road salt is likely impacting the lake. Encourage local winter maintenance companies that apply de-icing materials to roads, parking lots, walkways, and driveways to obtain Green SnowPro certification. Evaluate culverts and roadside ditches close to the lake in the spring and identify areas in need of cleanup from application of winter salt/sand mixtures. Encourage clean up of these areas to prevent runoff into the lake. Continue efforts to develop and implement a comprehensive watershed management plan. Keep up the great work!

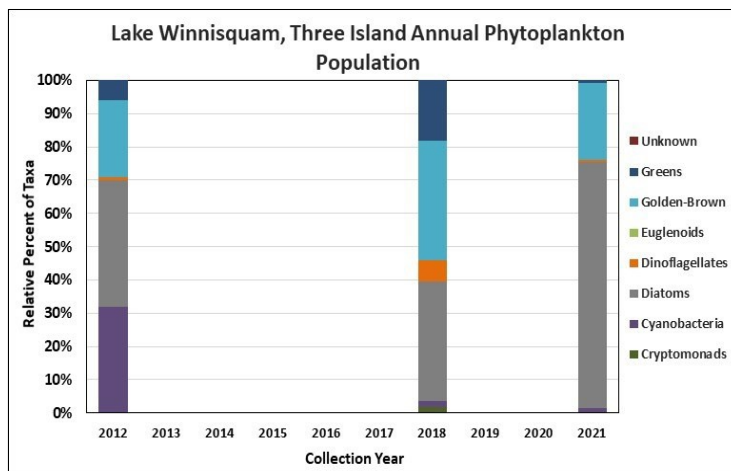
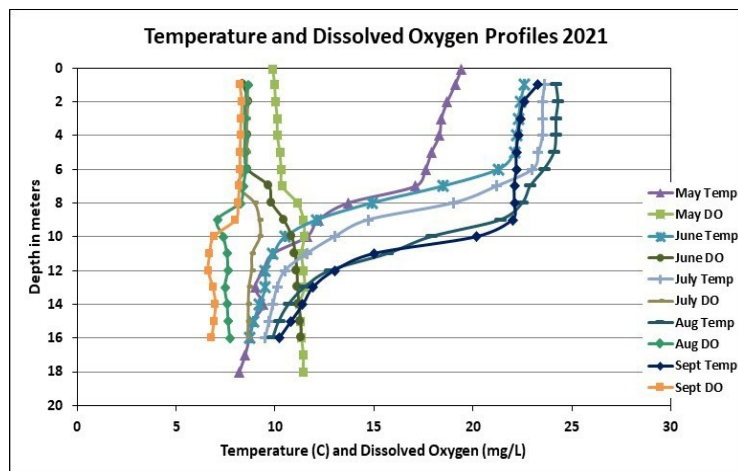
#### Historical Water Quality Trend Analysis

Parameter	Trend	Parameter	Trend
Conductivity	Worsening	Chlorophyll-a	Stable
pH (epilimnion)	Stable	Transparency	Stable
		Phosphorus (epilimnion)	Stable



#### Dissolved Oxygen and Phytoplankton

(Note: Information may not be collected annually)





# Volunteer Lake Assessment Program Individual Lake Reports

## Lake Winnisquam, Pot Isl., Laconia

### 2021 Data Summary

#### Observations (Refer to Table 1 and Historical Deep Spot Data Graphics)

- **Chlorophyll-a:** Chlorophyll level was within a low range in May, decreased through July, and then increased through September but remained within a low range. Average chlorophyll level remained stable with 2020 and was much less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates relatively stable chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) conductivity levels were slightly elevated and greater than the state median. Epilimnetic chloride levels were also greater than the state median, yet less than the state chronic chloride standard. Historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity levels since monitoring began.
- **Color:** Epilimnetic color data indicate the water was clear, with little to no tea coloring, from May through September.
- **Total Phosphorus:** Epilimnetic phosphorus level was elevated in May and field observations noted turbid water, decreased to a moderate level in June, and decreased to low levels through September. Average epilimnetic phosphorus level increased from 2020, was less than the state median, and was slightly greater than the threshold for oligotrophic lakes. Historical trend analysis indicates stable, yet variable, epilimnetic phosphorus levels since monitoring began. Metalimnetic and Hypolimnetic phosphorus levels were also elevated in May and then fluctuated within a low level from June through September.
- **Transparency:** Transparency was within an average range in May, increased (improved) slightly in June, decreased (worsened) to below average level in July and remained stable through September. Average NVS transparency increased slightly from 2020 and was higher (better) than the state median. Historical trend analysis indicates stable, yet variable, NVS transparency since monitoring began. Viewscope (VS) transparency was higher (better) than NVS transparency and a better measure of conditions.
- **Turbidity:** Epilimnetic and Metalimnetic turbidity levels were slightly elevated in May when phosphorus levels were elevated and field data noted turbid waters. Turbidity levels decreased to within a low range from June through September. Hypolimnetic turbidity levels fluctuated within a low range.
- **pH:** Epilimnetic, Metalimnetic and Hypolimnetic pH levels were within the desirable range 6.5-8.0 units in May, and then became more acidic and less than desirable as the summer progressed. Historical trend analysis indicates stable epilimnetic pH levels since monitoring began.

Station Name	Table 1. 2021 Average Water Quality Data for LAKE WINNISQUAM - THREE ISL.									
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
							NVS	VS		
Epilimnion	8.8	1.70	26	20	101.1	9	6.04	7.16	0.55	6.48
Metalimnion					103.9	9			0.64	6.52
Hypolimnion					103.8	9			0.77	6.43

#### NH Median Values

Median values generated from historic lake monitoring data.

**Alkalinity:** 4.5 mg/L **Chlorophyll-a:** 4.39 ug/L  
**Conductivity:** 42.3 uS/cm **Chloride:** 5 mg/L  
**Total Phosphorus:** 11 ug/L **Transparency:** 3.3 m  
**pH:** 6.6

#### NH Water Quality Standards

Numeric criteria for specific parameters. Water quality violation if thresholds exceeded.

**Chloride:** > 230 mg/L (chronic) **Turbidity:** > 10 NTU above natural  
**E. coli:** > 88 cts/100 mL (beach)  
**E. coli:** > 406 cts/100 mL (surface waters)  
**pH:** between 6.5-8.0 (unless naturally occurring)





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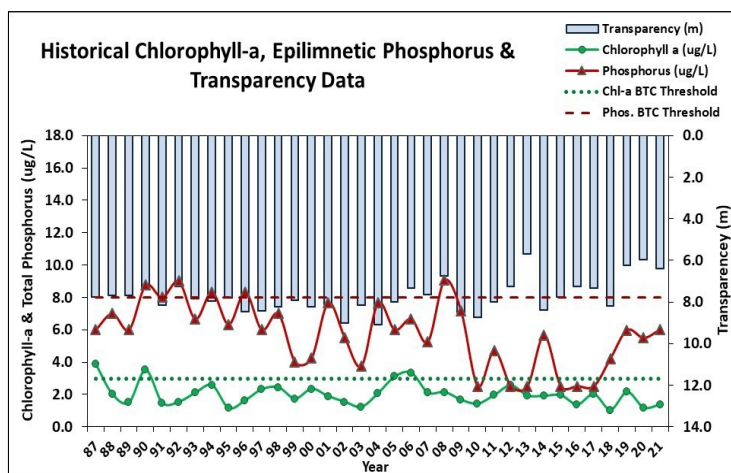
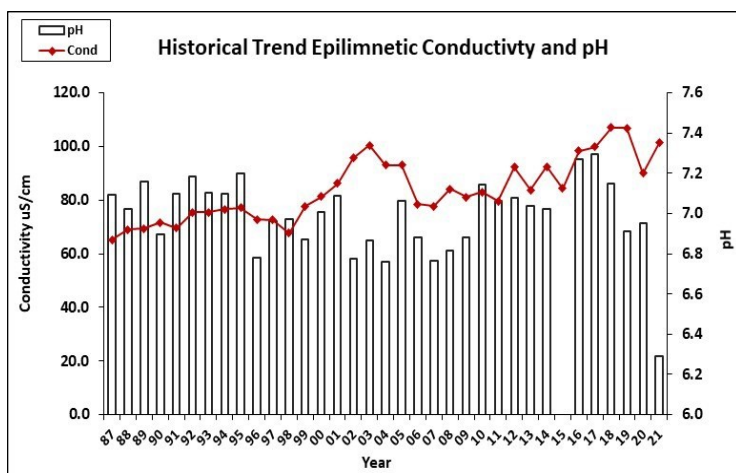
## Lake Winnisquam, Pot Isl., Laconia

### 2021 Data Summary

**Recommended Actions:** Great job sampling in 2021! Lake quality remained representative of high quality conditions. The improving phosphorus levels, particularly since 2010, are encouraging. However Epilimnetic phosphorus levels have remained within a higher range since 2019, water clarity (transparency) has significantly decreased, and turbidity levels have historically increased following storm events. This highlights the importance of managing stormwater runoff throughout the watershed. Consider partnering with *Soak Up the Rain NH* to identify areas prone to stormwater runoff and implement projects designed to capture and infiltrate stormwater prior to reaching the lake. Conductivity levels have increased since monitoring began and chloride levels indicate road salt is likely impacting the lake. Encourage local winter maintenance companies that apply de-icing materials to roads, parking lots, walkways, and driveways to obtain *Green SnowPro* certification. Evaluate culverts and roadside ditches close to the lake in the spring and identify areas in need of cleanup from application of winter salt/sand mixtures. Encourage clean up of these areas to prevent runoff into the lake. Continue efforts to develop and implement a comprehensive watershed management plan. Keep up the great work!

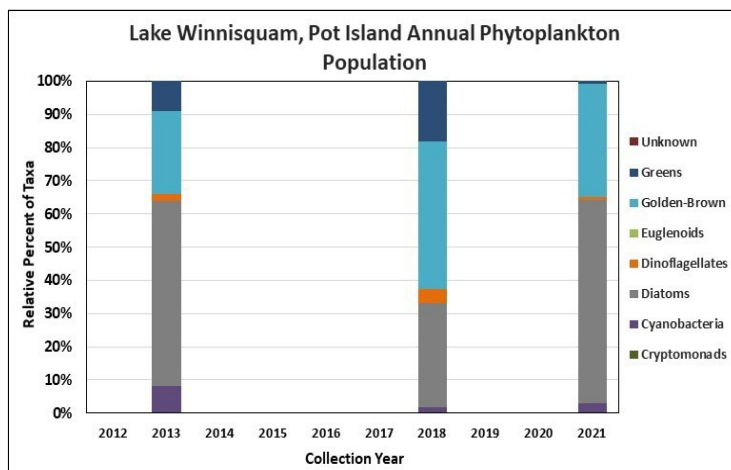
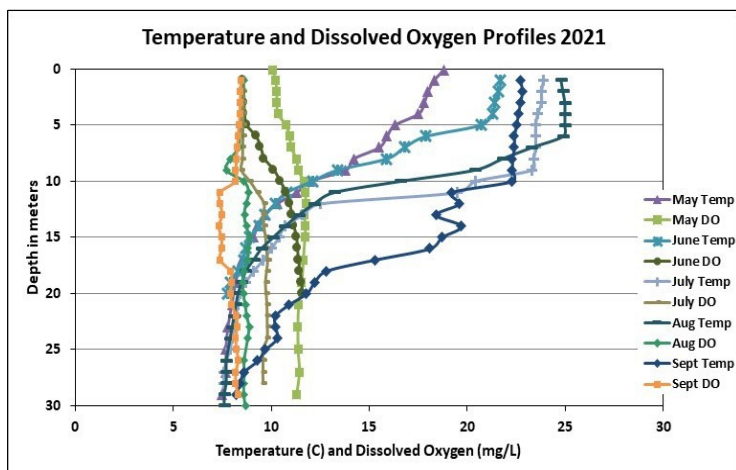
#### Historical Water Quality Trend Analysis

Parameter	Trend	Parameter	Trend
Conductivity	Worsening	Chlorophyll-a	Stable
pH (epilimnion)	Stable	Transparency	Worsening
		Phosphorus (epilimnion)	Improving



#### Dissolved Oxygen and Phytoplankton

(Note: Information may not be collected annually)





# Volunteer Lake Assessment Program Individual Lake Reports

## Lake Winnisquam, Mohawk Isl., Belmont

### 2021 Data Summary

#### Observations (Refer to Table 1 and Historical Deep Spot Data Graphics)

- **Chlorophyll-a:** Chlorophyll level was within a low range in May, decreased in June, remained stable in July, and then increased through September but remained within a low range. Average chlorophyll level remained stable with 2020 and was much less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates relatively stable chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) conductivity levels were slightly elevated and greater than the state median. Epilimnetic chloride levels were greater than the state median, yet less than the state chronic chloride standard. Historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity levels since monitoring began.
- **Color:** Epilimnetic color data indicate the water fluctuated within a clear, with little to no tea coloring, range from May through September.
- **Total Phosphorus:** Epilimnetic phosphorus level was slightly elevated in May and June, and then decreased to low levels from July through September. Average epilimnetic phosphorus level increased slightly from 2020 and was less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates significantly decreasing (improving) epilimnetic phosphorus levels since monitoring began. Metalimnetic phosphorus level was slightly elevated in June. Hypolimnetic phosphorus level fluctuated within a low range.
- **Transparency:** Transparency measured without the viewscope (NVS) was below average (worse) in May due to wave conditions, increased (improved) greatly in June, decreased in July due to wave conditions, increased in August, and decreased again in September due to wave conditions. Average NVS transparency increased slightly from 2020 and was higher (better) than the state median, however historical trend analysis indicates significantly decreasing (worsening) NVS transparency since monitoring began. Viewscope transparency was generally much higher (better) than NVS transparency and likely a better measure of conditions.
- **Turbidity:** Epilimnetic, Metalimnetic and Hypolimnetic turbidity levels fluctuated within a low range.
- **pH:** Epilimnetic and Hypolimnetic pH levels were slightly acidic and less than desirable range 6.5-8.0 units. Historical trend analysis indicates stable epilimnetic pH levels since monitoring began. Metalimnetic pH level fluctuated around the low end of the desirable range.

Station Name	Table 1. 2021 Average Water Quality Data for LAKE WINNISQUAM - POT ISL.									
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
							NVS	VS		
Epilimnion	8.9	1.37	27	14	101.4	6	6.41	7.37	0.37	6.29
Metalimnion					103.5	7			0.51	6.75
Hypolimnion					103.7	7			0.38	6.48

#### NH Median Values

Median values generated from historic lake monitoring data.

**Alkalinity:** 4.5 mg/L **Chlorophyll-a:** 4.39 ug/L  
**Conductivity:** 42.3 uS/cm **Chloride:** 5 mg/L  
**Total Phosphorus:** 11 ug/L **Transparency:** 3.3 m  
**pH:** 6.6

#### NH Water Quality Standards

Numeric criteria for specific parameters. Water quality violation if thresholds exceeded.

**Chloride:** > 230 mg/L (chronic) **Turbidity:** > 10 NTU above natural  
**E. coli:** > 88 cts/100 mL (beach)  
**E. coli:** > 406 cts/100 mL (surface waters)  
**pH:** between 6.5-8.0 (unless naturally occurring)



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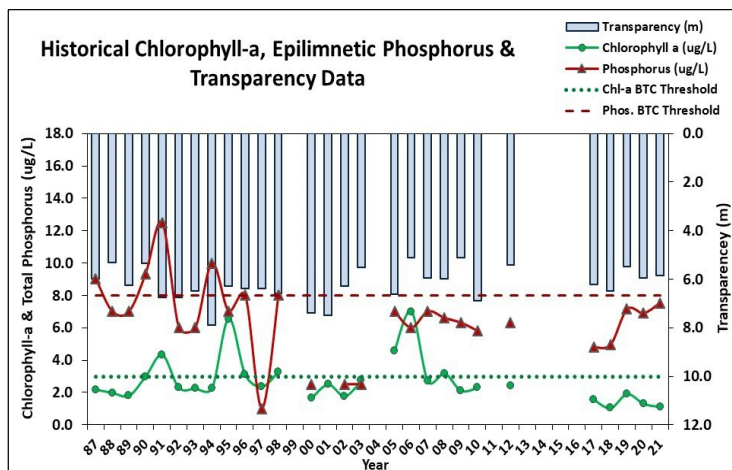
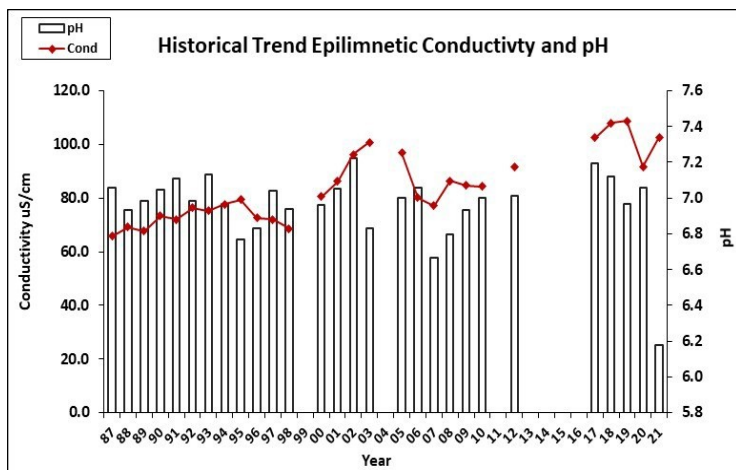
## Lake Winnisquam, Mohawk Isl., Belmont

### 2021 Data Summary

**Recommended Actions:** Great job sampling in 2021! Lake quality remained representative of high quality conditions, however Hypolimnetic phosphorus levels indicate a potential internal load of phosphorus that is released from bottom sediments as the summer progresses. An internal load of phosphorus could potentially fuel algal and cyanobacteria growth which highlights the importance of reducing phosphorus inputs from external sources such as fertilizers, stormwater runoff and agricultural practices. Consider partnering with Soak Up the Rain NH to identify areas prone to stormwater runoff and implement projects designed to capture and infiltrate stormwater prior to reaching the lake. Keep an eye on chloride levels which indicate road salt is likely impacting the lake. Encourage local winter maintenance companies that apply de-icing materials to roads, parking lots, walkways, and driveways to obtain Green SnowPro certification. Evaluate culverts and roadside ditches close to the lake in the spring and identify areas in need of cleanup from application of winter salt/sand mixtures. Encourage clean up of these areas to prevent runoff into the lake. Keep up the great work!

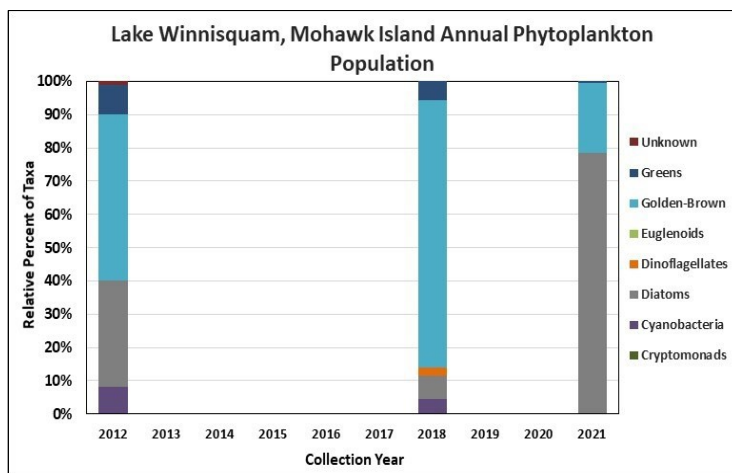
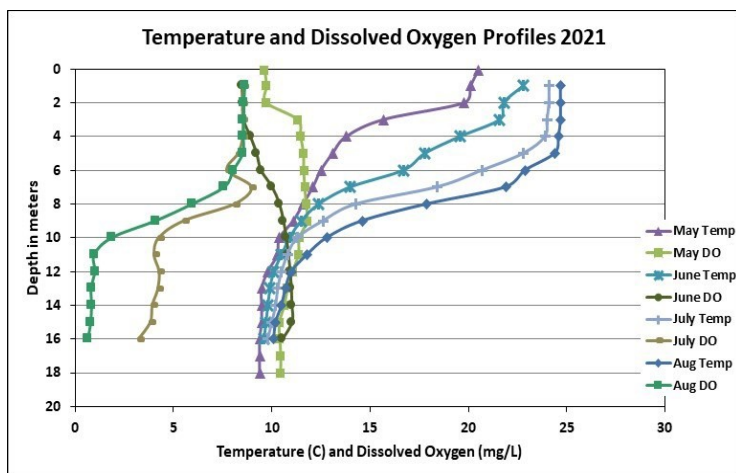
#### Historical Water Quality Trend Analysis

Parameter	Trend	Parameter	Trend
Conductivity	N/A	Chlorophyll-a	N/A
pH (epilimnion)	N/A	Transparency	N/A
		Phosphorus (epilimnion)	N/A



#### Dissolved Oxygen and Phytoplankton

(Note: Information may not be collected annually)





# Volunteer Lake Assessment Program Individual Lake Reports

## Lake Winnisquam, Mohawk Isl., Belmont

### 2021 Data Summary

#### Observations (Refer to Table 1 and Historical Deep Spot Data Graphics)

- **Chlorophyll-a:** Chlorophyll level was within a low range in May, decreased in June, and then increased through August but remained within a low range. Average chlorophyll level decreased slightly from 2020 and was much less than the state median and the threshold for oligotrophic lakes. Visual inspection of historical data indicates variable chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) conductivity levels were slightly elevated and greater than the state median. Epilimnetic chloride levels were greater than the state median, yet less than the state chronic chloride standard. However, visual inspection of historical data indicates increasing (worsening) epilimnetic conductivity levels since monitoring began.
- **Color:** Epilimnetic color data indicates the water fluctuated within a clear to lightly tea colored range and was clearest in June and August, and darkest in May and July.
- **Total Phosphorus:** Epilimnetic phosphorus level was within a low range in May, remained stable in June, decreased in July, and increased slightly in August. Average epilimnetic phosphorus level increased slightly from 2020, was less than the state median, and was approximately equal to the threshold for oligotrophic lakes. Visual inspection of historical data indicates variable epilimnetic phosphorus levels since monitoring began. Metalimnetic phosphorus level was elevated in May and June and decreased to low levels in July and August. Hypolimnetic phosphorus level fluctuated within a moderate to slightly elevated range and was highest in August when dissolved oxygen levels were low indicating likely release of phosphorus from bottom sediments.
- **Transparency:** Transparency measured with (VS) and without (NVS) the viewscope was slightly below average (worse) in May due to wave conditions, and increased (improved) through August. Average NVS transparency remained stable with 2020 and was higher (better) than the state median. Visual inspection of historical data indicates stable NVS transparency since monitoring began. VS transparency was generally higher (better) than NVS transparency except in July following significant rainfall prior to sampling.
- **Turbidity:** Epilimnetic and Metalimnetic turbidity levels fluctuated within a low range. Hypolimnetic turbidity levels were slightly elevated and increased from July through September likely indicating formation and accumulation of organic compounds under anoxic (no dissolved oxygen) conditions.
- **pH:** Epilimnetic and Hypolimnetic pH levels fluctuated below the desirable range 6.5-8.0 units and were slightly acidic. Visual inspection of historical data indicates relatively stable epilimnetic pH levels since monitoring began. Metalimnetic pH level fluctuated around the low end of the desirable range.

Station Name	Table 1. 2021 Average Water Quality Data for LAKE WINNISQUAM - MOHAWK ISL.									
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
							NVS	VS		
Epilimnion	8.6	1.12	26	18	102.7	8	5.85	6.83	0.43	6.18
Metalimnion					102.0	13			0.73	6.51
Hypolimnion					106.5	20			2.29	6.28

#### NH Median Values

Median values generated from historic lake monitoring data.

**Alkalinity:** 4.5 mg/L **Chlorophyll-a:** 4.39 ug/L  
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**pH:** between 6.5-8.0 (unless naturally occurring)