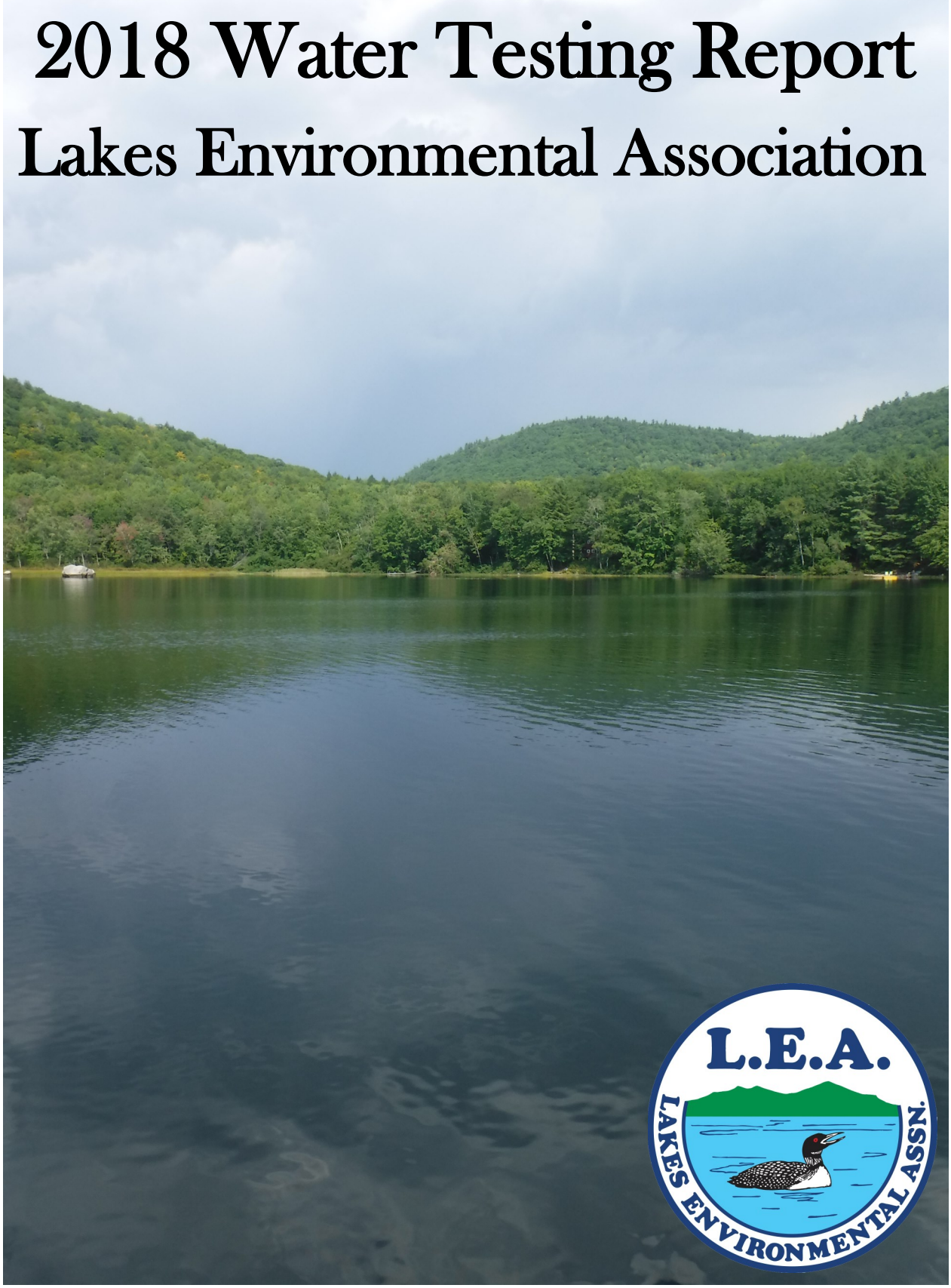
2018 Water Testing Report

Lakes Environmental Association



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About LEA

The Lakes Environmental Association (LEA) is a non-profit organization founded in 1970 with the goal of preserving and restoring the high water quality and the traditional character of Maine's lakes, watersheds and related natural resources. Headquartered in Bridgton, Maine, LEA focuses its efforts on 6 towns in the western Maine Lakes Region, although its reach and influence extends across the whole state.

Invasive Plant Program

LEA's Milfoil Control Team successfully eradicated invasive Variable Leaf Milfoil from Brandy Pond and the Songo River in 2015, after over a decade of hard work. The focus shifted to Sebago Cove in 2016, where a dense infestation threatens nearby waterbodies, and in 2017 they began work on Long Lake after an infestation was found there. LEA's program has been a model for the entire state.

Environmental Education

LEA offers environmental education programs to local elementary, middle, and high schools, reaching over 1,000 students annually. LEA also hosts educational programs for all ages at the Holt Pond Preserve, Highland Lake Preserve and Pondicherry Park, all of which LEA played a key role in establishing.

Lake Water Testing

Water testing on over 40 lakes and ponds in the area occurs every year through traditional and advanced testing initiatives. The results are presented in this report.

Landowner and Municipal Assistance

LEA provides technical assistance to residents interested in preventing erosion on their property. This service helps educate landowners about simple erosion control techniques and existing land use regulations. LEA also works with municipalities on comprehensive planning, natural resources inventories and ordinance development.

Courtesy Boat Inspections

Every summer, LEA hires over 30 courtesy boat inspectors to educate boaters at public boat launches about invasive plants and help them perform inspections on their watercraft. This program, begun by LEA, has been adopted across the state.

Maine Lake Science Center

Opened in 2015, LEA's Maine Lake Science Center is a hub for lake research in the state. The center regularly hosts researcher retreats and other events at its remodeled and renovated energy-efficient headquarters located in Bridgton.

Please Join LEA!

LEA is a primarily member-funded operation. If you swim, boat, fish or simply believe Maine wouldn't be Maine without clear, clean lakes and ponds, please join the Lakes Environmental Association and protect Maine's lakes now and for future generations.

You can become an LEA member with a donation of any amount. Just mail a check to LEA, 230 Main St., Bridgton, ME 04009 or join online at www.mainelakes.org.

Water Quality at a Glance

Please See Key on the Next Page.

Lake	Oxygen Depletion	High P at depth	Clarity Trend	Phos. Trend	Chl-a Trend	Coldwater Fish	Other Issues	Degree of Concern
ADAMS POND	👎	👎	⚪	⚪	👎	🟡	—	HIGH
BACK POND	👎	👎	👍	👍	👎	👎	Low Al:Fe	HIGH
BEAR POND	👎	👎	⚪	⚪	⚪	🟡	—	MOD
BEAVER P. (Bridgton)	👎	👎	👍	⚪	👍	N/A	—	MOD
BEAVER P. (Denmark)	👍	N/A	N/A	⚪	⚪	N/A	—	AVG
BOG POND	👍	N/A	N/A	N/A	N/A	N/A	—	AVG
BRANDY POND	👎	👎	⚪	⚪	⚪	👎	—	MOD/HIGH
COLD RAIN POND	👎	N/A	⚪	⚪	⚪	👎	—	MOD
CRYSTAL LAKE	🟡	👍	👎	⚪	⚪	🟡	Low Al:Fe	MOD
DUCK POND	🟡	N/A	N/A	N/A	N/A	N/A	—	AVG
FOSTER POND	🟡	👍	⚪	⚪	⚪	N/A	—	AVG
GRANGER POND	🟡	N/A	⚪	⚪	⚪	N/A	—	AVG
HANCOCK POND	👎	👍	👍	⚪	👍	🟡	—	AVG
HIGHLAND LAKE	👎	👎	👍	👍	👍	👎	—	MOD/HIGH
HOLT POND	👍	N/A	⚪	⚪	⚪	N/A	—	AVG
ISLAND POND	👎	👎	⚪	⚪	⚪	👎	—	MOD/HIGH
JEWETT POND	👎	👎	⚪	⚪	⚪	N/A	—	MOD
KEOKA LAKE	👎	👎	👍	👍	⚪	👎	Gloeo	HIGH
KEYES POND	👎	👎	👍	⚪	⚪	👎	—	MOD/HIGH
KEZAR POND	👍	N/A	N/A	⚪	⚪	N/A	—	AVG
LITTLE POND	👍	N/A	N/A	👍	⚪	N/A	—	AVG
LITTLE MOOSE POND	👎	👎	⚪	⚪	⚪	N/A	—	MOD
LITTLE MUD POND	👎	N/A	⚪	⚪	⚪	N/A	—	AVG
LONG LAKE (3 BASINS)	👎	👍	⚪	⚪⚪👍	⚪	👎	Gloeo/Al:Fe/ Milfoil	HIGH
LONG POND	👍	N/A	👎	⚪	⚪	N/A	—	AVG
McWAIN POND	👎	👎	⚪	👍	👍	N/A	Gloeo	MOD/HIGH
MIDDLE POND	👎	👎	👍	⚪	👍	👎	—	MOD/HIGH
MOOSE POND (Main)	👎	👍	⚪	⚪	👍	👎	Gloeo/Al:Fe	HIGH
MOOSE POND (North)	👎	N/A	⚪	⚪	⚪	N/A	—	AVG
MOOSE POND (South)	👎	👎	N/A	N/A	N/A	N/A	—	MOD
MUD POND	👎	N/A	⚪	⚪	⚪	N/A	—	AVG
OTTER POND	👎	N/A	👍	⚪	👍	N/A	—	AVG
PAPOOSE POND	🟡	N/A	👍	⚪	⚪	N/A	—	AVG
PEABODY POND	👎	👍	👍	⚪	⚪	🟡	Low Al:Fe	MOD
PERLEY POND	👎	N/A	⚪	👍	👍	N/A	—	AVG
PICKEREL POND	🟡	N/A	⚪	👎	⚪	N/A	—	AVG
PLEASANT POND	👍	N/A	⚪	⚪	⚪	N/A	—	AVG
SAND POND	👎	👍	👎	⚪	⚪	👎	Algae	HIGH
SEBAGO COVE	👍	N/A	N/A	N/A	N/A	N/A	Milfoil	AVG
STEARNS POND	👎	👎	👍	⚪	👍	👎	—	MOD/HIGH
TRICKEY POND	👎	👎	👎	⚪	👎	🟡	—	HIGH
WEBBER POND	👍	N/A	N/A	N/A	N/A	N/A	—	AVG
WOODS POND	👎	👍	⚪	⚪	⚪	N/A	—	AVG

Key to Water Quality at a Glance Table

Oxygen Depletion: Did the lake suffer from low oxygen conditions in 2018?

= severe = slight = none

High P at depth: Were deep-water phosphorus levels above 12 ppb in 2018?

= Yes = No N/A = not tested

Clarity, Phosphorus, and Chlorophyll-a trends: Data from 1996-2018 was analyzed to determine if these parameters are improving or worsening over time. N/A = no trend analysis

=Worsening = Improving = No change

Coldwater Fish: Did coldwater fish have 2 m of suitable habitat at all times of the year in 2018?

= No = Yes N/A = no coldwater fishery

Other Issues: Additional risks that factor into the level of concern. Each issue =

Low Al/Fe: Lake is at a greater risk of phosphorus release from sediments

Algae: An algae bloom has occurred in the past

Gloeo: Lake has a history of elevated *Gloeotrichia echinulata* levels

Milfoil: Invasive milfoil has been found in this lake

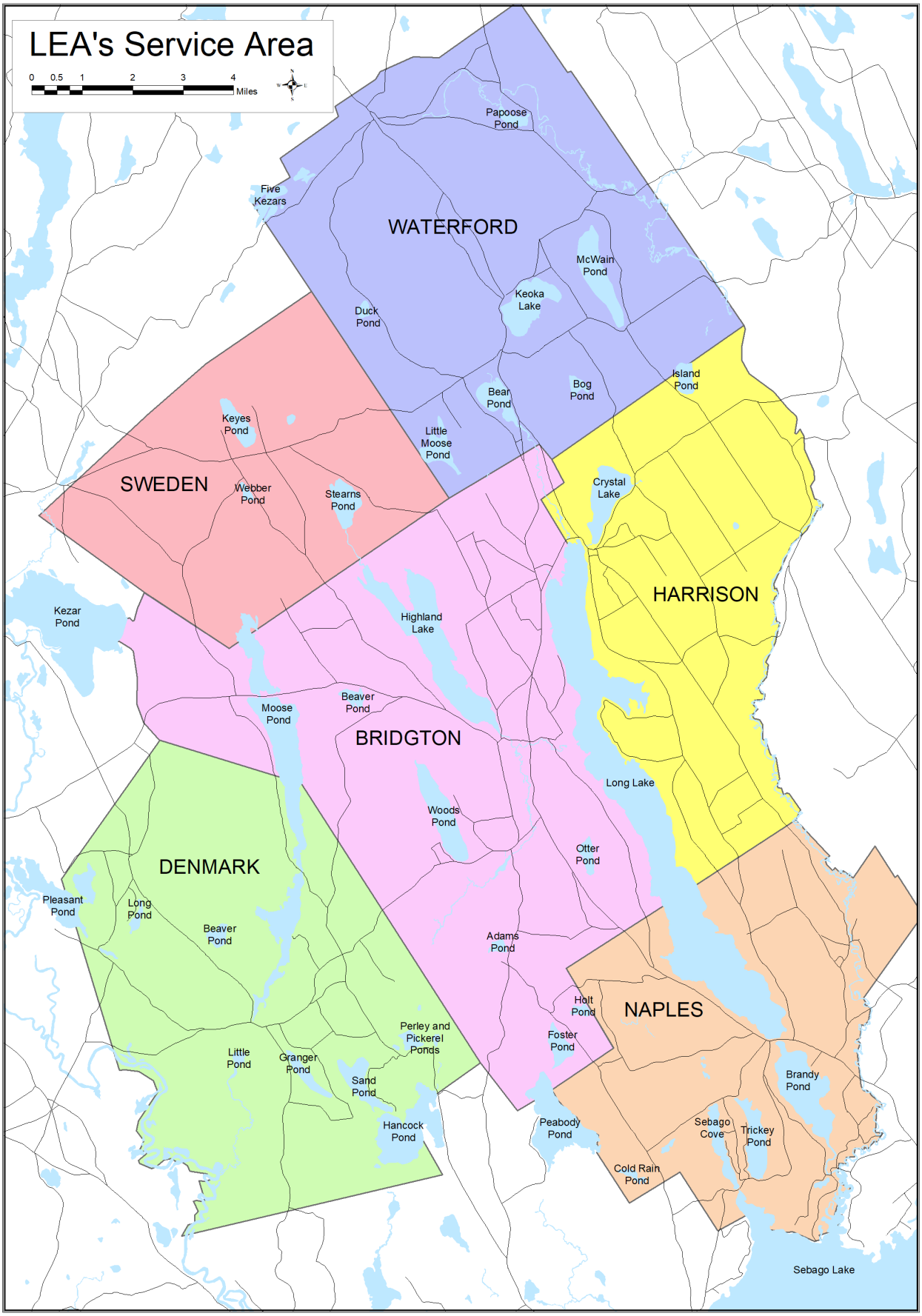
Degree of Concern: LEA's risk assessment for future lake water quality

Average: none or 1

Moderate:

Moderate/High:

High: or a worsening chl-a trend


LEA's Service Area
0 0.5 1 2 3 4 Miles
WATERFORD
SWEDEN
HARRISON
BRIDGTON
DENMARK
NAPLES
Papoose Pond
Five Kezars
McWain Pond
Keoka Lake
Duck Pond
Bog Pond
Bear Pond
Island Pond
Keyes Pond
Little Moose Pond
Webber Pond
Stearns Pond
Crystal Lake
Kezar Pond
Highland Lake
Moose Pond
Beaver Pond
Long Lake
Woods Pond
Otter Pond
Pleasant Pond
Long Pond
Beaver Pond
Adams Pond
Holt Pond
Foster Pond
Perley and Pickerel Ponds
Little Pond
Granger Pond
Sand Pond
Hancock Pond
Peabody Pond
Brandy Pond
Sebago Cove
Trickey Pond
Cold Rain Pond
Sebago Lake

LEA would not be able to test the 41 lakes and ponds of this area without strong support from our surrounding community. Every year, we rely on volunteer monitors, lakefront landowners, summer interns and financial support from Lake Associations and the Towns of Bridgton, Denmark, Harrison, Naples, Sweden, and Waterford to continue to monitor and analyze lake water quality. **Thank you for all your help!**

2018 Volunteer Monitors and Lake Partners

Bill Ames and Paulina Knibbe
Richard and Andy Buck
Steve Cavicchi
Jeff and Susan Chormann
Janet Coulter
Jane Forde
Joe and Carolee Garcia
Lane Gaudet
Carol Gestwicki
Rebecca and Bill Gould
Granger Pond Campground
Shelly Hall
Carl and JoAnne Harbourt
Amy March
Julie and Dan McQueen
Dorothy Mayberry
Bob Mahanor
McWain Shores Association
Bob Mercier
Papoose Pond Campground
Barry and Donna Patrie
Nancy Pike
Alan Pratt
Jean Preis
Arthur and Jean Schilling
Jane Seeds
Linda and Orrin Shane
Foster and Marcella Shibles
Bob Simmons
Tom Straub
Don and Pat Sutherland
Pat and Ed Thomas

2018 Water Testing Crew

Kayla Gray Olivia Mills Kirsten Stemmler Jacob Moulton

Lake Association Partners Who Contribute to Advanced Testing Initiatives

Five Kezar Ponds Watershed Assoc.
Hancock and Sand Ponds Association
Island Pond Association
Keoka Lake Association
Keyes Pond Env. Prot. Assoc.
McWain Pond Association
Moose Pond Association
Peabody Pond Protective Assoc.
Trickey Pond Env. Prot. Assoc.
Woods Pond Water Quality Comm.

Lake Stratification 101

To understand much of LEA's water quality data, you must understand the concept of lake stratification.

Lake stratification is when the water column separates into distinct layers. This is caused by density differences in water at different temperatures. However, wind also plays a key role in maintaining and breaking down stratification. This layering happens in both the summer and winter and breaks down in the spring and fall, allowing for "turnover" – full mixing throughout the water column.

In Maine, three layers often form; the epilimnion, metalimnion (aka thermocline), and the hypolimnion.

The epilimnion is the warm surface layer of the lake and the hypolimnion is the cold bottom layer. The thermocline is a narrow zone in between these layers where temperature and oxygen levels change rapidly. The exact depths of each layer change over the course of the summer and from lake to lake and year to year.

Due to the nature of stratification, which does not allow for exchange between the top and bottom layers, oxygen and nutrient concentrations often differ significantly between the upper and lower portions of a stratified lake. This is especially true in late summer.

This has several consequences for the lake. Light penetration is greatest near the top of the lake, meaning that algae growth primarily occurs in the epilimnion. Algae growth will sometimes peak near the thermocline, often in lakes with deep light penetration and higher hypolimnetic phosphorus levels.

Oxygen levels in the epilimnion are constantly replenished through wind mixing, but the hypolimnion is cut off from the atmosphere, leaving it with a fixed volume of oxygen which is slowly used up over the summer. This can affect coldwater fish species in some lakes.

Phosphorus, the limiting element controlling algae growth in our lakes, is often more abundant in the hypolimnion because it is stored in sediments.

When oxygen levels are low at the bottom of the lake, as often happens later in the summer, a chemical reaction occurs that releases stored phosphorus from sediments. However, due to the density barrier at the metalimnion, these nutrients do not move easily into the epilimnion. This often causes a buildup of phosphorus in the hypolimnion.

Smallmouth Bass

Epilimnion

The warm upper waters are sunlit, wind-mixed and oxygen rich.

Landlocked salmon

Metalimnion

This layer in the water column, also known as the thermocline, acts as a thermal barrier that prevents the interchange of nutrients between the warm upper waters and the cold bottom waters.

Lake trout, also known as togue

Hypolimnion

In the cold water at the bottom of lakes, food for most creatures is in short supply, and the reduced temperatures and light penetration prevent plants from growing.

A year in the life of a lake

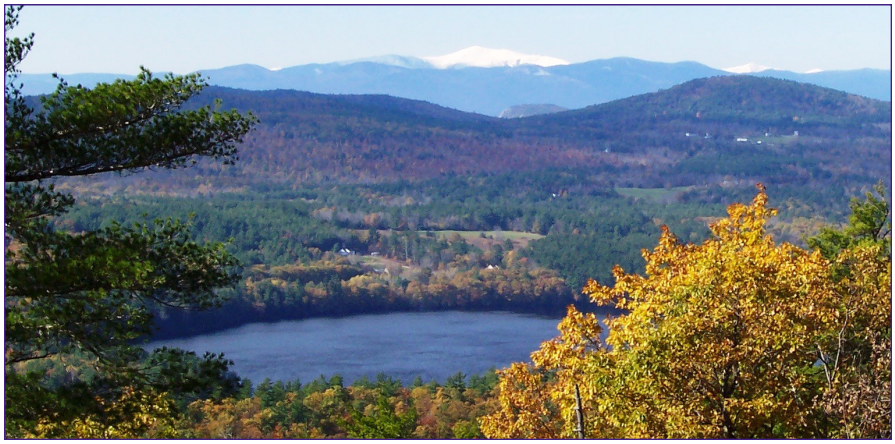
Winter is a quiet time. Ice blocks out the sunlight and also prevents oxygen from being replenished in lake waters because there is no wind mixing. With little light below the ice and gradually diminishing oxygen levels, plants stop growing. Most animals greatly slow their metabolism or go into hibernation.

Spring is a period of rejuvenation for the lake. After the ice melts, all of the water is nearly the same temperature from top to bottom. During this period, strong winds can thoroughly mix the water column allowing for oxygen to be replenished throughout the entire lake.

This period is called spring turnover. Heavy rains, combined with snow melt and saturated soils are a big concern in the spring. Water-logged soils are very prone to erosion and can contribute a significant amount of phosphorus to the lake. Almost all soil particles that reach the lake have attached phosphorus.

Summer arrives and deeper lakes will gradually stratify into a warm top layer and a cold bottom layer, separated by a thermocline zone where temperature and oxygen levels change rapidly. The upper, warm layers are constantly mixed by winds, which "blend in" oxygen. The cold, bottom waters are essentially cut off from oxygen at the onset of stratification. Coldwater fish, such as trout and landlocked salmon, need this thermal layering to survive in the warm summer months and they also need a healthy supply of oxygen in these deep waters to grow and reproduce.

Fall comes and so do the cooler winds that chill the warm upper waters until the temperature differential weakens and stratification breaks down. As in Spring, strong winds cause the lake to turn over, which allows oxygen to be replenished throughout the water column.



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2018 Water Testing Report

Chapter 1—Routine Monitoring Results

Water Quality Testing Parameters

LEA's testing program is based on parameters that provide a comprehensive indication of overall lake health. Tests are done for transparency, temperature, oxygen, phosphorus, chlorophyll-a, color, conductivity, pH, and alkalinity.

Clarity is a measure of water transparency. It is determined with a Secchi disk and measured in meters. Clarity is affected by water color and the presence of algae and suspended particles.

Temperature is measured at one-meter intervals from the surface to the bottom of the lake. This data is used to assess thermal stratification. Lakes deep enough to stratify will divide into three distinct layers: the epilimnion, metalimnion and hypolimnion. The epilimnion (upper layer) is comprised of the warm surface waters. The hypolimnion is made up of the deep, colder waters. The metalimnion, also known as the thermocline, is a thin transition zone of rapidly decreasing temperature between the upper and lower layers. Temperature is recorded in degrees Celsius.

Chlorophyll-a is a pigment found in all algae. Chlorophyll (the –a is dropped for simplicity) sampling in a lake is used to estimate the amount of algae present in the water column. Chlorophyll concentrations are measured in parts per billion (ppb). Samples are collected with a core tube and are made up of water from the top layer (epilimnion) of a lake.

Phosphorus is a nutrient needed by algae to grow. It is measured in order to determine the potential for algae growth in a lake. Like chlorophyll-a, phosphorus is measured in ppb. Surface-layer phosphorus samples are taken in the same manner that chlorophyll samples are collected, while deep-water phosphorus samples are taken at individual depths using a grab sampler. Surface-layer samples tell us how much phosphorus is available for algae in the sunlit portion of a lake, where the algae grow. If deep-water samples show high phosphorus, this is an indication that sediments are releasing phosphorus and that the lake is more susceptible to future algae blooms.

Dissolved oxygen is measured at one-meter intervals from the surface to the bottom of the lake. It is measured in parts per million (ppm). Over the course of the summer, oxygen in the bottom waters is consumed through organic matter decomposition. If dissolved oxygen concentrations reach zero at the bottom of the lake, phosphorus can be released into the water column from bottom sediments, which can cause increased algal growth that fuels further oxygen depletion. Phosphorus release is inhibited in lakes with high sediment aluminum levels. Oxygen depletion can be a natural occurrence in some lakes. It is a special concern in lakes that support coldwater fish, because they are an important part of lake food webs. In this report, "oxygen depletion" refers to dissolved oxygen levels below 4 ppm. During the fall, cooler temperatures and winds cause the lake to de-stratify and oxygen is replenished in the deep waters as the lake mixes.

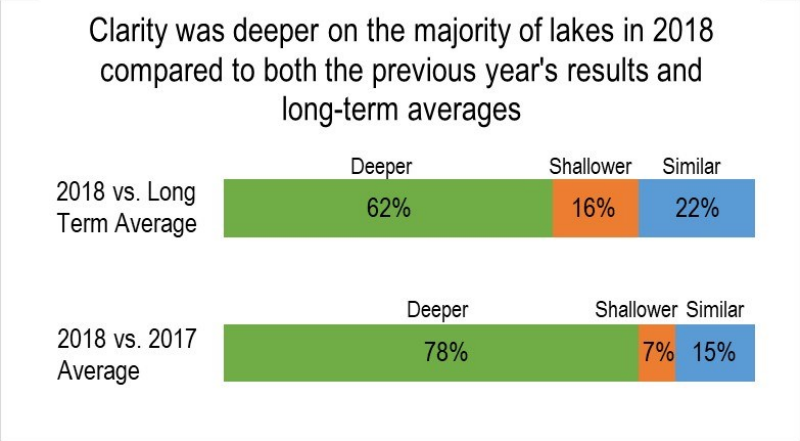
Other Measurements: We collect data on these parameters, but they tend to remain stable over long periods time. They are not reported on unless unusual conditions were observed.

> **Conductivity** measures the ability of water to carry electrical current. Pollutants and minerals in the water will generally increase lake conductivity.
>
> **Color** is a measure of tannic or humic acids in the water.
>
> **pH** is used to measure the level of acidity in lake water, which affects the species makeup and availability of micronutrients in a lake.
>
> **Alkalinity** measures the capacity of lake water to buffer changes in pH.

2018 as a Year

The water testing results for 2018 show a great year for water quality in the Lakes Region. The winter snowpack was substantial for the second year, leading to erosion in the spring that resulted in poor clarity readings to begin the testing season. Ice-out was relatively late in 2018, which meant that the stratified period was shorter, but also contributed to the lower clarity seen at the beginning of the year. However, clarity rebounded greatly for the rest of the summer, helped by the lack of large rainstorms. Despite low spring readings, clarity was better than average on over half of the lakes and ponds in 2018.

Clarity is an important measurement in lakes because it has a huge effect on ecology and water quality. At a basic level, clarity can be an indicator of algae growth. Low clarity readings may indicate high algae growth. Another measurement, chlorophyll, is a more direct measure of algae concentrations. Clarity and chlorophyll, together with phosphorus—a measure of the nutrients available for algae growth—are the key parameters used to determine lake water quality. LEA measures chlorophyll and phosphorus using a sample made up of water from the top layer of the lake. Phosphorus is also measured in the deeper waters of some lakes at individual depths.



On average in 2018, 84% of lakes had deeper (or similar) clarity, 76% of lakes had lower surface-layer phosphorus, and 82% of lakes had lower or similar chlorophyll concentrations when compared to long-term averages. Because of this, many lakes and ponds went from having stable trends in clarity, phosphorus, or chlorophyll to having improving trends, or went from a negative trend to a stable one.

There were a few issues to note this year regarding chlorophyll measurements. LEA sends chlorophyll samples to the Maine State Health and Environmental Testing Laboratory for analysis. Toward the later half of the summer, a piece of key equipment for analyzing chlorophyll broke down. As a result, several of our chlorophyll samples were run outside of the recommended hold period, which means the results were relative and may not be as accurate as if they had been measured within the hold time. Another change this year was in the chlorophyll reporting limit—the lab now gives less precise chlorophyll results, which potentially could slightly change yearly averages. For example, in the past, a typical sample result would be 2.7 ppb chlorophyll. The lab now rounds that result up to 3.0 ppb chlorophyll.

Interpreting the Summaries

Water Quality Classification

Each lake's clarity, chlorophyll, and phosphorus readings will be discussed in the lake summaries. These three measurements are the basis for determining water quality classification. Most lakes in LEA's service area are in the moderate range for all three parameters. The following table shows the range of values in each category (low, moderate, etc.) for each parameter.

Clarity in meters (m)		Phosphorus in parts per billion (ppb)		Chlorophyll-a in parts per billion (ppb)	
10.0 +	excellent	less than 5.0	low	less than 2.0	low
7.1 – 10.0	good	5.1 – 12.0	moderate	2.1 – 7.0	moderate
3.1 – 7.0	moderate	12.1 – 20.0	high	7.1 – 12.0	high
less than 3.0	poor	20.1 +	very high	12.1 +	very high

Trends and Long-Term Averages

The lake summaries start with an explanation of clarity, chlorophyll, and phosphorus trends. These trends are a regression analysis of all the data LEA has collected on that lake or pond since 1996 (or later if data is unavailable for earlier years). If the p-value of the regression is less than 0.05, it is a worsening or improving trend (depending on the direction of the trend). If the p-value is above 0.05, there is no detectable trend. These trends show water quality changes over time.

The long-term average is a simple mean of all the data we have on record for each parameter (clarity, chlorophyll, and phosphorus). The long-term average doesn't tell us specifically how each parameter changes over time like the trend analysis does; it is instead used to see how the current year's data compares to historical values. The long-term average uses all the data available, rather than just data collected in or after 1996.

This means that the trend and the long-term average can be at odds. For example, the overall clarity trend might be improving over time, but if the current year had particularly bad water clarity, the yearly average may be worse than the long-term average. The trend shows how the parameter has changed over time, while the long-term average is used as a benchmark to assess the current year's data.

Coldwater Fish Habitat

Suitable habitat is defined as being below 15.5 °C and above 5 ppm dissolved oxygen. Marginal habitat is between 15.5 and 20 °C and above 5 ppm oxygen. Coldwater fish habitat is considered a water quality issue in lakes with coldwater fisheries that do not have at least 2 meters' worth of suitable habitat at all times during the testing season.

Degree of Concern

Each lake is also given a degree of concern category ranking. The average, moderate, moderate/high, and high degree of concern categories are based on the number of water quality issues a lake faces. An increasing chlorophyll trend automatically puts a lake in the high degree of concern category. Recent algae blooms also raise a lake's degree of concern by one level. You can see more about these rankings in the "Water Quality at a Glance" table and key on pages 2 and 3.

Individual Lake Summaries

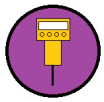
The following pages present 2018 routine monitoring data by lake. Where applicable, graphs or charts have been included in the individual summary information to help show particular conditions or trends. You will also see the following symbols in the top right corner of some pages. These symbols indicate that additional data from that lake is available in chapters 2–5.

This symbol indicates that the lake has a high-resolution monitoring buoy. Further information is available in chapter 2.

This symbol indicates that the lake has high levels of *Gloeotrichia* echinulata algae, which is discussed in more detail in chapter 3.

This symbol indicates that a series of temperature sensors was deployed in the lake in 2018. More information is available in chapter 4.

This symbol indicates that algae samples were taken from the lake in 2018. Algae monitoring results are discussed in chapter 5.



This symbol indicates that fluorometer profiles were taken from the lake in 2018. Fluorometer results are discussed in chapter 5.

Adams Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	7.51	7.26	
Phosphorus (ppb)	6.25	6.82	
Chlorophyll (ppb)	2.88	2.79	

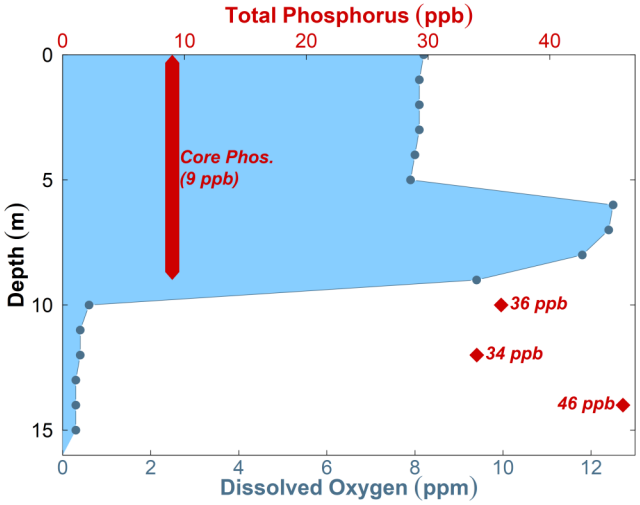
Surface Area:	43 acres
Maximum Depth:	51 feet
Mean Depth:	27 feet
Volume:	955 acre-feet
Watershed Area:	196 acres
Flushing Rate:	0.54 flushes per year
Elevation:	640 feet

Water Quality Summary:

Water clarity, phosphorus, and chlorophyll levels are the main water quality indicators used to assess lakes. Adams Pond has good water clarity that has remained stable over time. Of the 41 lakes and ponds monitored by LEA, Adams Pond has the 6th highest average clarity. Both clarity and phosphorus were better than long-term average levels in 2018. Phosphorus in the upper layer of the pond is moderate and stable. Chlorophyll, however, shows an increasing trend over time and the 2018 average was higher than the long-term average. The chlorophyll average is within the moderate range of values.

Adams Pond has very high deep-water phosphorus levels, which drive algae growth. Algae are especially prevalent at the thermocline (the transition zone between lake layers). We know this because oxygen concentrations in the pond are elevated in this zone each summer due to algae photosynthesis. Because of the high clarity of Adams Pond and the high levels of phosphorus in the deeper waters, the thermocline is an ideal place for algae growth. When the algae die, they sink deeper in the water and consume oxygen as they decompose, leading to rapidly decreasing oxygen levels at depth. Lack of oxygen releases even more phosphorus from the sediments, fueling more algae growth, which starts the process over again in a continuous cycle.

Despite low oxygen conditions, coldwater fish still have suitable habitat in parts of the lake. Due to the increasing chlorophyll trend, as well as oxygen depletion and high deep-water phosphorus, Adams Pond remains in LEA's HIGH degree of concern category.



Adams Pond water column phosphorus (red) and dissolved oxygen (blue) data from 8/16/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Additional Analyses Available

Back Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	7.66	6.49	
Phosphorus (ppb)	5.25	6.00	
Chlorophyll (ppb)	1.60	2.10	

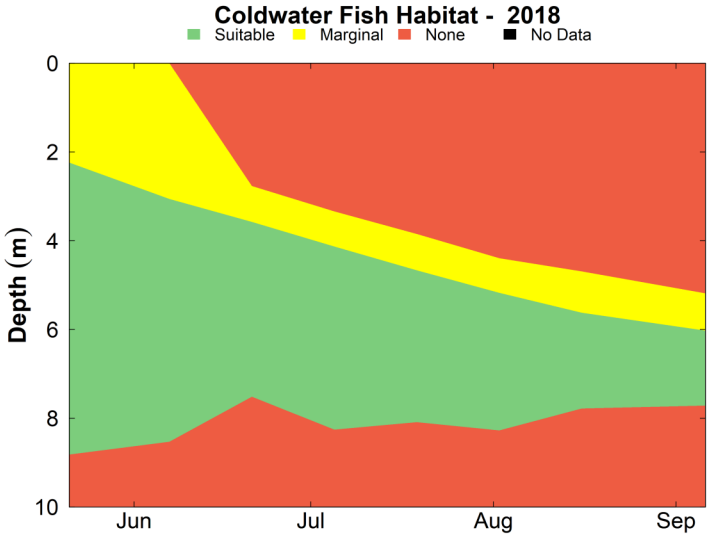
Surface Area: 62 acres
Maximum Depth: 33 feet
Watershed Area: 584 acres
Elevation: 572 feet

Water Quality Summary:

The water quality results from Back Pond for 2018 were among the best of all the lakes sampled. Clarity, surface layer phosphorus, and chlorophyll averages were all improved over the long term average values for these parameters. Trend analysis indicates that clarity and phosphorus are both improving over time on Back Pond. Despite having the lowest average chlorophyll of all lakes in 2018, there is still an increasing trend for this parameter due to some higher readings in past years. The 2018 chlorophyll average was in the low range, phosphorus was moderate, and clarity was good.

Previous sediment chemistry results show Back Pond has a higher potential for internal phosphorus release due to low sediment aluminum levels. Aluminum binds with phosphorus that is released from sediments which have become anoxic (lacking in oxygen), locking it away at the bottom of the lake. The low level of aluminum on Back Pond means that if phosphorus is released from sediments, it is likely to enter the pond and contribute to algae growth. A phosphorus grab sample collected from near the bottom of the pond had a concentration of 18 ppb phosphorus, which is considered high.

In 2018, dissolved oxygen depletion affected the bottom two meters of the pond for much of the summer. This was enough to restrict coldwater fish habitat to less than 2 meters. The increasing chlorophyll trend, low sediment aluminum levels, high deep-water phosphorus, and restricted fish habitat mean that Back Pond is more vulnerable than many other lakes and remains in LEA's HIGH degree of concern category.



Coldwater fish habitat availability in the pond between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Additional Analysis Available

Bear Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.45	5.68	◯
Phosphorus (ppb)	7.25	9.08	◯
Chlorophyll (ppb)	2.25	3.76	◯

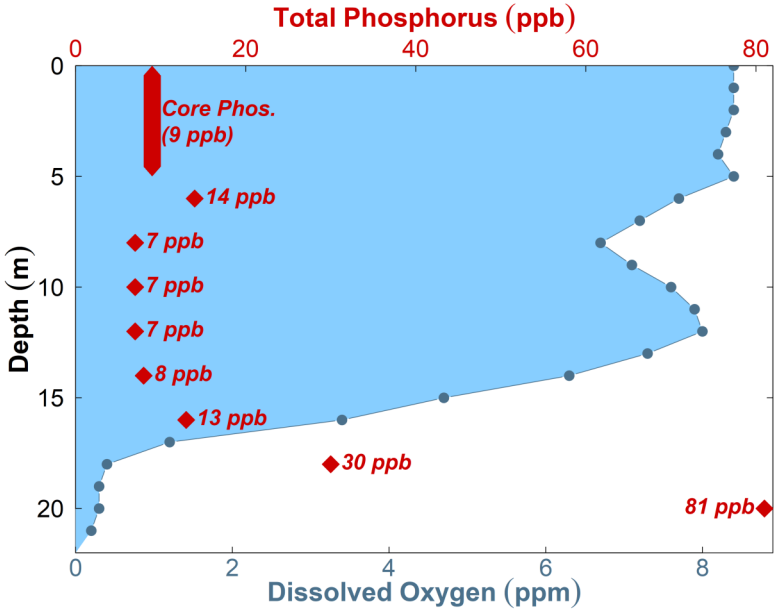
Surface Area:	250 acres
Maximum Depth:	72 feet
Mean Depth:	34 feet
Volume:	7,978 acre-feet
Watershed Area:	5,331 acres
Flushing Rate:	2.3 flushes per year
Elevation:	375 feet

Water Quality Summary:

Trend analysis shows clarity, surface layer phosphorus, and chlorophyll are all stable on Bear Pond. The chlorophyll trend went from increasing in 2017 to stable, which is an improvement. Averages of all three parameters were significantly improved compared to long-term averages. The 2018 averages for each water quality parameter were in the moderate range.

Bear Pond suffers from deep-water oxygen depletion and elevated phosphorus levels at the bottom of the pond. This is illustrated in the graph below, which shows low oxygen at depth (in blue) and high phosphorus grab sample results at 16, 18, and 20 meters. Low oxygen levels often cause high phosphorus in deeper waters by triggering sediments to release stored phosphorus. Despite low oxygen conditions, the fact that Bear Pond is relatively deep means that there is still enough oxygen to support coldwater fish species.

Bear Pond has been lowered from the high degree of concern category because of the improved chlorophyll trend. The remaining issues of oxygen depletion and high phosphorus levels at depth put Bear Pond into LEA's MODERATE degree of concern category.



Bear Pond water column phosphorus (red) and dissolved oxygen (blue) data from 8/27/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Beaver Pond (Bridgton)

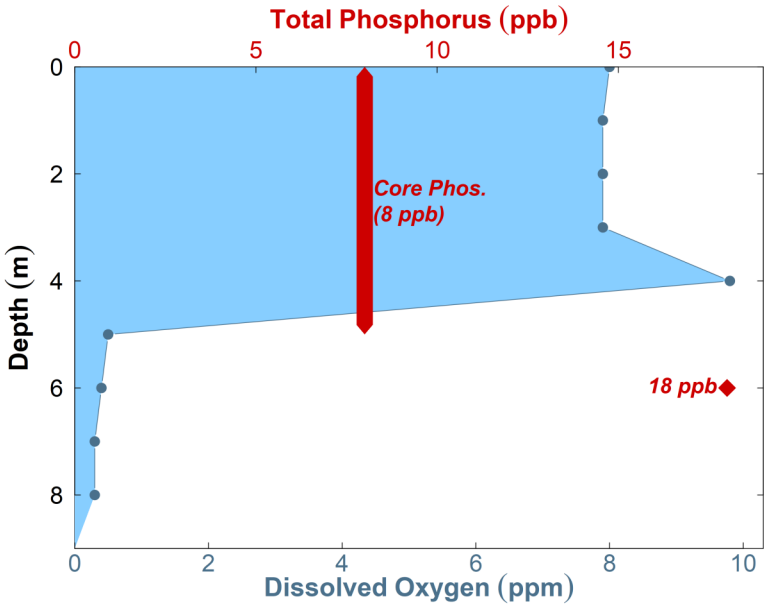
	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.10	5.12	
Phosphorus (ppb)	8.00	9.07	
Chlorophyll (ppb)	6.00	4.63	

Surface Area:	69 acres
Maximum Depth:	35 feet
Watershed Area:	1,648 acres
Flushing Rate:	3.7 flushes per year
Elevation:	473 feet

Water Quality Summary:

Beaver Pond in Bridgton is sampled once a year by LEA. Overall trends show that clarity and chlorophyll have been improving over time while phosphorus levels in the upper layer of the pond have remained stable. Water quality results in 2018 were mixed. Clarity was essentially the same as the long-term average, phosphorus was improved, and chlorophyll was higher than the long-term average. All three measurements were within the moderate range.

Oxygen depletion affected the lower half of the water column when sampling was done in August, as displayed in the graph below. Deep-water phosphorus levels are also consistently high each year on Beaver Pond. One deep-water grab sample was taken in 2018 with a result of 18 ppb, which is in the high range. In many lakes, oxygen depletion causes phosphorus to be released from sediments, leading to high deep-water phosphorus levels. However, previous sediment chemistry studies indicate that Beaver Pond has a low potential for sediment phosphorus release. This suggests that the phosphorus may be coming from external sources within the watershed. Because of the low oxygen and high phosphorus levels present near the bottom of the pond, Beaver Pond remains in LEA's MODERATE degree of concern category.



Beaver Pond water column phosphorus (red) and dissolved oxygen (blue) data on 8/14/2018. Upper layer phosphorus (bar) is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Beaver Pond (Denmark)

	2018 avg.	Long-term avg.	Trend
Clarity (m)	2.36 B	2.60	N/A
Phosphorus (ppb)	11.00	14.56	◯
Chlorophyll (ppb)	2.00	2.92	◯

Surface Area:	80 acres
Maximum Depth:	7 feet
Watershed Area:	1,288 acres
Elevation:	397 feet

Water Quality Summary:

Beaver Pond in Denmark is sampled once per year by LEA. Long-term trend analysis shows that phosphorus and chlorophyll have remained stable over time. Clarity reaches to the bottom of the pond due to the pond's shallow depth, so changes in clarity merely reflect the yearly variation in the depth at which samples were taken. The entire pond was well oxygenated at the time of sampling. The phosphorus concentration of 11 ppb is considered moderate, while chlorophyll was in the low range. Both values showed improvement over their long-term averages. Beaver Pond remains in LEA's AVERAGE degree of concern category due to a lack of significant adverse water quality indicators.

Bog Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	1.50 B	1.47	N/A
Phosphorus (ppb)	13.00	14.44	N/A
Chlorophyll (ppb)	3.00	3.73	N/A

Surface Area:	57 acres
Maximum Depth:	5 feet
Perimeter:	1.4 miles
Elevation:	669 feet

Water Quality Summary:

LEA samples Bog Pond once per year. Clarity routinely reaches to the bottom of the pond because it is very shallow. Trend analysis could not be done for any water quality parameters because LEA has only been taking measurements since 2009. Chlorophyll and phosphorus levels were both lower in 2018 compared to averages of all previous measurements. The chlorophyll level is within the moderate range, while phosphorus is in the high range. The pond is small, shallow and has a large wetland complex associated with it which may cause relatively high phosphorus readings. Due to a lack of significant water quality concerns, Bog Pond remains in LEA's AVERAGE degree of concern category.

Brandy Pond

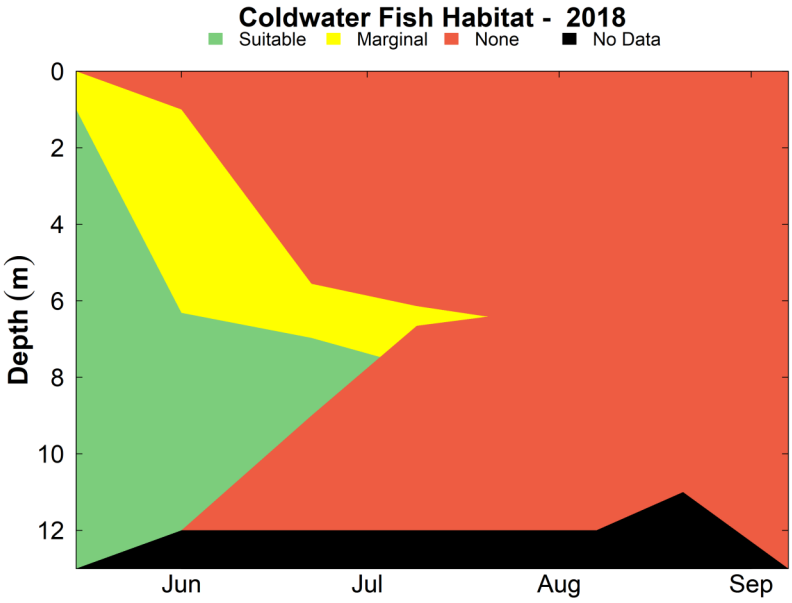
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.64	6.55	◯
Phosphorus (ppb)	7.00	6.46	◯
Chlorophyll (ppb)	2.25	3.00	◯

Surface Area:	733 acres
Maximum Depth:	44 feet
Mean Depth:	16 feet
Volume:	11,789 acre-feet
Watershed Area:	2,300 acres
Flushing Rate:	10 flushes per year
Elevation:	267 feet

Water Quality Summary:

Trend analysis shows that clarity, chlorophyll, and phosphorus are all stable on Brandy Pond. Average clarity in 2018 was slightly better than the long-term average. Surface layer phosphorus was slightly higher than the long-term average, while chlorophyll was lower than the long-term average. All three parameters are within the moderate range.

Water quality concerns on Brandy Pond include oxygen depletion, high deep-water phosphorus levels, and lack of coldwater fish habitat. At its height in late summer, oxygen depletion affects about half of the pond's water column. This lack of oxygen makes the lake inhospitable to coldwater fish, and it may affect fish migration between Long Lake and Sebago Lake. In 2018, deep water phosphorus sampling resulted in a high reading of 13 ppb at 10 meters. High phosphorus in the deeper waters of the pond are often the result of sediment phosphorus release, which is triggered by low oxygen levels. Because of these three issues, Brandy Pond has been elevated to LEA's MODERATE/HIGH degree of concern rating.



Coldwater fish habitat availability in the pond between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Cold Rain Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.10	4.77	◯
Phosphorus (ppb)	13.00	10.58	◯
Chlorophyll (ppb)	6.00	4.14	◯

Surface Area:	36 acres
Maximum Depth:	36 feet
Mean Depth:	13 feet
Volume:	469 acre-feet
Watershed Area:	505 acres
Flushing Rate:	1.9 flushes per year
Elevation:	505 feet

Water Quality Summary:

Water quality testing on Cold Rain Pond occurs once a year in August. Trend analysis shows that clarity, chlorophyll, and surface layer phosphorus have all remained stable over time. Clarity was improved in 2018 over the long-term average, but phosphorus and chlorophyll levels were both higher than long-term averages. Clarity and chlorophyll were in the moderate range, while the phosphorus concentration was in the high range.

The main water quality concerns on Cold Rain Pond are oxygen depletion and a lack of coldwater fish habitat in late summer. In 2018, the bottom four meters of the water column contained little to no dissolved oxygen. The lack of oxygen reduced coldwater fish habitat, which was also constrained by warm surface temperatures. Because of these concerns, the pond is currently in LEA's MODERATE degree of concern category.

Crystal Lake

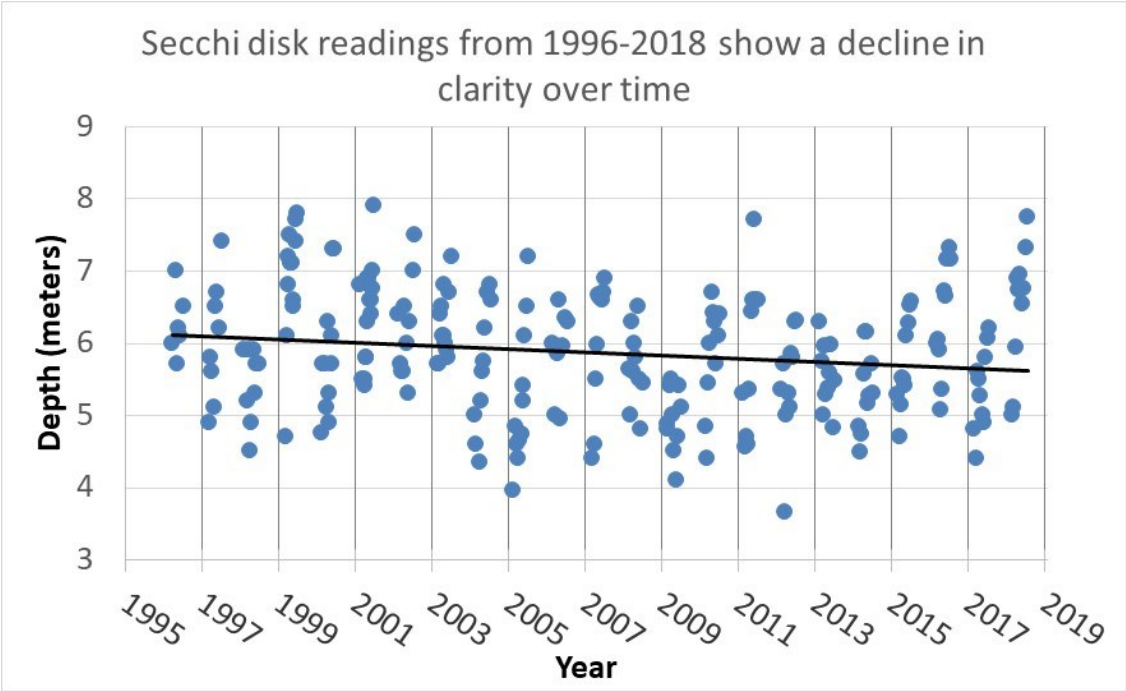
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.50	5.93	↓
Phosphorus (ppb)	5.88	7.41	○
Chlorophyll (ppb)	2.25	2.79	○

Surface Area:	446 acres
Maximum Depth:	65 feet
Mean Depth:	33 feet
Volume:	14,253 acre-feet
Watershed Area:	5,345 acres
Flushing Rate:	0.65 flushes per year
Elevation:	294 feet

Water Quality Summary:

Trend analysis shows that the clarity of Crystal Lake has been declining over time, while phosphorus and chlorophyll are both stable. Despite the negative trend, clarity on Crystal Lake was much improved in 2018. The yearly average exceeded the long-term average and the lake saw its highest clarity readings since 2012. Phosphorus and chlorophyll averages were both improvements over long-term averages. All three parameters are within the moderate range of values.

Previous sediment chemistry results indicate a greater potential for phosphorus to be released from sediments in Crystal Lake due to low aluminum levels. Since phosphorus can only be released under very low oxygen conditions and oxygen depletion in Crystal Lake is minimal, there is little chance of this being a severe problem. Sampling indicated that deep-water phosphorus levels in Crystal Lake were moderate in 2018. Additionally, the lake had adequate habitat for coldwater fish throughout the summer. Crystal Lake remains in LEA's MODERATE degree of concern category because of the worsening clarity trend and the increased risk of sediment phosphorus release.



Duck Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	2.22	2.74	N/A
Phosphorus (ppb)	25.00	20.66	N/A
Chlorophyll (ppb)	12.00	8.50	N/A

Surface Area:	38 acres
Maximum Depth:	10 feet
Mean Depth:	6 feet
Elevation:	1,069 feet

Water Quality Summary:

LEA has conducted water quality sampling on Duck Pond once per year since 2013. While there is not enough data to calculate trends, the clarity of the pond was lower than average in 2018. Chlorophyll and phosphorus concentrations were both higher than average. Clarity was poor, phosphorus was very high, and chlorophyll was in the high range of values. There was slight dissolved oxygen depletion at the bottom of the pond, despite its shallow depth. Duck Pond's water quality is poor in comparison to most of the lakes within LEA's service area. However, Duck Pond is small in area, shallow, and highly colored. There is little development in its watershed. The water quality conditions observed are normal for this type of lake and are not a great concern. Therefore, the pond remains in LEA's in the AVERAGE degree of concern category.

Foster Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.70	6.89	◯
Phosphorus (ppb)	6.75	7.07	◯
Chlorophyll (ppb)	1.88	2.28	◯

Surface Area:	149 acres
Maximum Depth:	28 feet
Mean Depth:	17 feet
Volume:	2,382 acre-feet
Watershed Area:	1,090 acres
Flushing Rate:	0.93 flushes per year
Elevation:	470 feet

Water Quality Summary:

Clarity, chlorophyll, and phosphorus are the key measurements LEA uses to determine water quality. Trend analysis shows clarity, chlorophyll, and phosphorus are all stable over time on Foster Pond. Clarity was slightly worse than the long-term average in 2018, while phosphorus and chlorophyll were both lower than the long-term average. Foster Pond's chlorophyll reading was in the low range, and was the second-lowest of all the lakes tested in 2018. Both clarity and surface-layer phosphorus readings were in the moderate range. The very bottom of the pond experienced slight dissolved oxygen depletion at the end of the summer. Volunteer lake monitor Janet Coulter takes additional clarity readings on Foster Pond. A lack of significant water quality issues puts the pond in LEA's AVERAGE degree of concern category.

Granger Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	7.32	6.72	◯
Phosphorus (ppb)	6.38	7.75	◯
Chlorophyll (ppb)	2.88	3.39	◯

Surface Area:	125 acres
Maximum Depth:	28 feet
Watershed Area:	642 acres
Elevation:	525 feet

Water Quality Summary:

Water quality status is in large part determined by analyzing a lake's clarity, chlorophyll, and phosphorus levels. Trend analysis shows that clarity, phosphorus, and chlorophyll have remained stable over time on Granger Pond. All three parameters showed improvement in 2018 compared to long term averages. Clarity was in the good range, while surface-layer phosphorus and chlorophyll averages were both within the moderate range of values.

Granger Pond experienced algae blooms in 2007 and 2008 and spikes in chlorophyll in the late summer of 2011, 2012, and 2013. Since 2014, chlorophyll levels appear to have returned to more normal levels. The pond experienced minor dissolved oxygen depletion only at the very bottom of the pond in 2018. While the history of algae blooms is a concern, the stable water quality trends and near-decade without another algae bloom means Granger Pond has been downgraded to LEA's AVERAGE degree of concern category.

Additional Analyses Available

Hancock Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	7.53	7.18	
Phosphorus (ppb)	5.63	5.83	
Chlorophyll (ppb)	2.25	2.87	

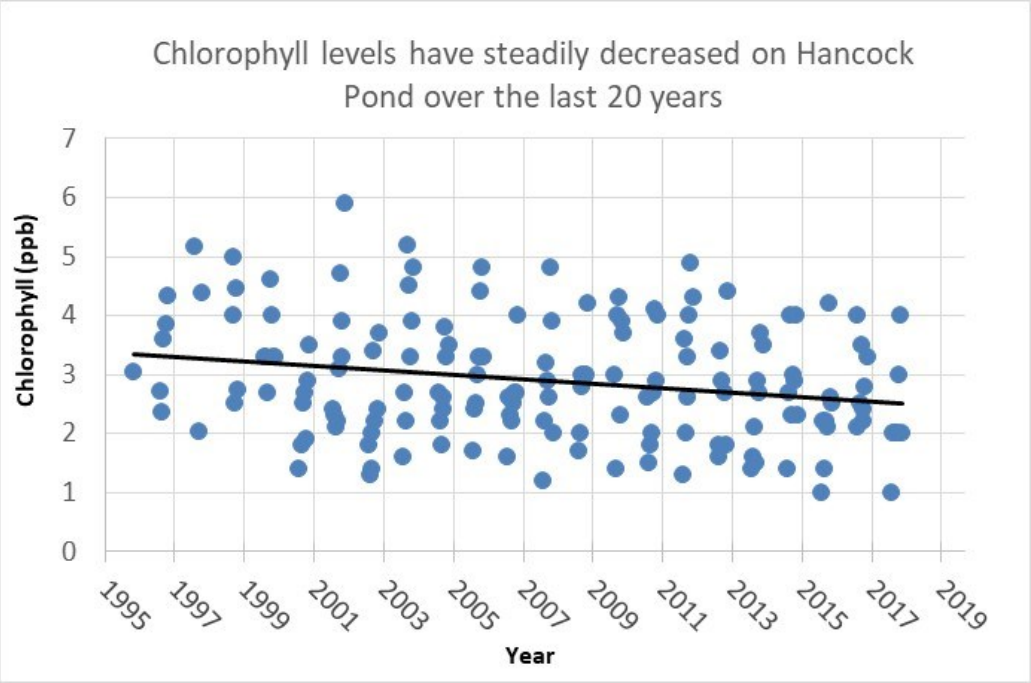
Surface Area: 858 acres
Maximum Depth: 59 feet
Watershed Area: 2,222 acres
Elevation: 502 feet

Water Quality Summary:

Trend analysis shows clarity and chlorophyll are both improving over time on Hancock Pond, while phosphorus remains stable. Hancock Pond is one of the clearest lakes tested by LEA—the fifth most clear of the 41 lakes and ponds tested in 2018— and one of the few with clarity in the "good" range of values. Hancock Pond also had the second-lowest surface-water phosphorus average of all ponds in 2018.

In addition to LEA's water testing crew, volunteer monitor Thomas Straub takes several clarity readings a year on the pond. Clarity, chlorophyll, and phosphorus averages were all improved over long-term averages in 2018. The average chlorophyll and phosphorus values were in the moderate range.

Dissolved oxygen depletion affected the bottom 8 meters of the water column by late summer. This restricts coldwater fish habitat in the pond, although the pond maintained at least 2 meters of suitable habitat throughout 2018. The improving clarity and chlorophyll trends, along with excellent overall water quality results for this year mean that Hancock Pond has been lowered to LEA's AVERAGE degree of concern category.



Additional Analysis Available

Highland Lake

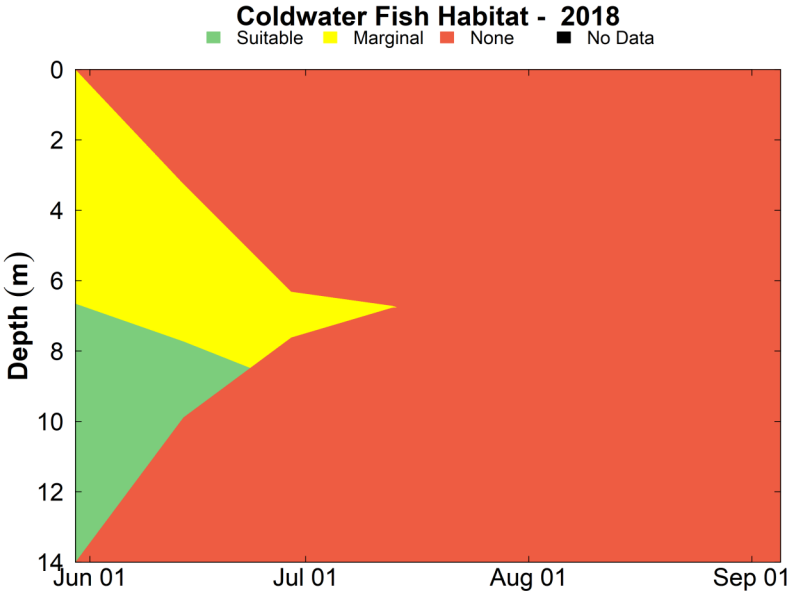
	2018 avg.	Long-term avg.	Trend
Clarity (m)	7.18	6.73	
Phosphorus (ppb)	5.88	6.53	
Chlorophyll (ppb)	2.13	2.81	

Surface Area:	1,334 acres
Maximum Depth:	50 feet
Mean Depth:	20 feet
Volume:	44,030 acre-feet
Watershed Area:	5,178 acres
Flushing Rate:	0.94 flushes per year
Elevation:	426 feet

Water Quality Summary:

Trend analysis shows clarity, surface-layer phosphorus, and chlorophyll are all improving over time on Highland Lake. Highland is the only lake LEA tests where all three parameters show improving trends. These three parameters—clarity, chlorophyll, and phosphorus—are the main factors affecting water quality status. Seasonal averages of all three were better in 2018 compared to long-term averages. Clarity was in the good range in 2018, while chlorophyll and phosphorus were both moderate. Highland Lake had the 4th lowest average chlorophyll levels of the 26 basins sampled bi-weekly in 2018.

Highland Lake's biggest water quality issues are dissolved oxygen depletion, high phosphorus in the deeper waters, and lack of coldwater fish habitat. Dissolved oxygen is rapidly depleted in the deeper waters of the pond after stratification sets in. This quickly reduces the amount of lake habitat suitable for coldwater fish, as seen in the graph below. Low oxygen levels can also lead to higher deep-water phosphorus concentrations by causing phosphorus to be released from sediments, something that only happens when there is a lack of oxygen. Because of these issues, Highland Lake is in LEA's MODERATE/HIGH degree of concern category.



Coldwater fish habitat availability in the lake between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Holt Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	3.10 B	2.94	◯
Phosphorus (ppb)	12.00	13.16	◯
Chlorophyll (ppb)	5.00	4.04	◯

Surface Area:	41 acres
Maximum Depth:	10 feet
Mean Depth:	7 feet
Watershed Area:	2,118 acres
Flushing Rate:	46 flushes per year
Elevation:	455 feet

Water Quality Summary:

Holt Pond is sampled by LEA once per year in August. Trend analysis shows water clarity, chlorophyll, and phosphorus levels have remained stable over time. Clarity reached the bottom of the pond in 2018. The phosphorus concentration was high on the pond, although it was lower than the long-term average, which is also in the high range. This can be attributed to the pond's natural characteristics of being shallow and part of a wetland system. The chlorophyll reading in 2018 was in the moderate range and was higher than the long-term average. No dissolved oxygen depletion was present in the pond during sampling in 2018. Due to a lack of significant water quality issues, Holt Pond remains in the AVERAGE degree of concern category.

Additional Analysis Available

Island Pond

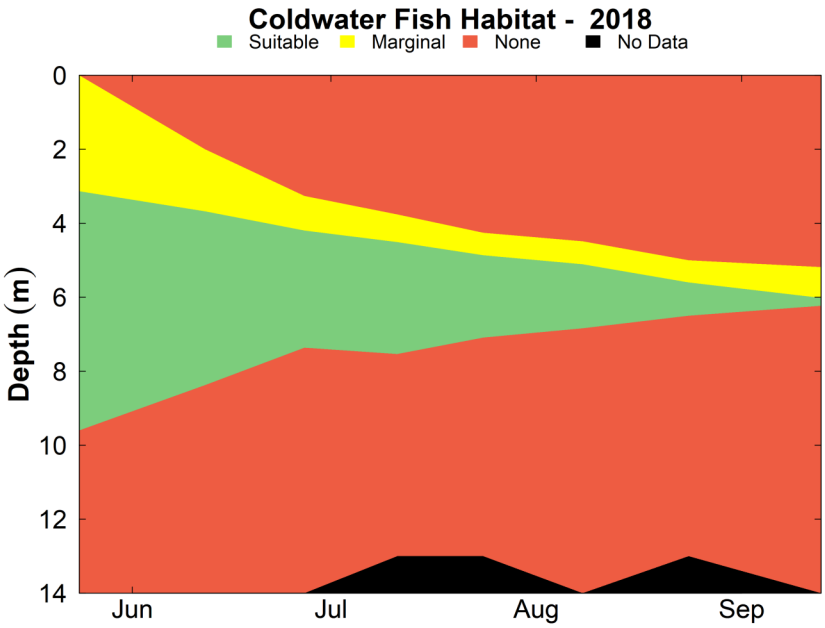
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.14	5.94	◯
Phosphorus (ppb)	6.13	7.26	◯
Chlorophyll (ppb)	3.00	3.40	◯

Surface Area:	115 acres
Maximum Depth:	48 feet
Mean Depth:	16 feet
Volume:	1,626 acre-feet
Watershed Area:	1,128 acres
Flushing Rate:	1.3 flushes per year
Elevation:	448 feet

Water Quality Summary:

Trend analysis shows clarity, chlorophyll, and surface-layer phosphorus have remained stable over time on Island Pond. These three parameters are the most important factors in determining water quality status. In 2018, the average values for each parameter showed improvement compared to long-term averages. All three averages in 2018 were within the moderate range of values.

Island Pond's main water quality concerns are dissolved oxygen depletion, high deep-water phosphorus levels, and severely restricted summer coldwater fish habitat. A lack of dissolved oxygen in the deeper waters of the pond means that coldwater fish are forced into shallower waters. The top layer of the lake is too warm for these fish, so they end up having only a narrow band of habitat available to them in the middle of the pond, which shrinks as water temperatures warm and dissolved oxygen is further depleted. Dissolved oxygen depletion may also be the source of the higher phosphorus readings near the bottom of the pond, as a lack of oxygen causes sediments to release stored phosphorus. Because of these three water quality issues, Island Pond is in LEA's MODERATE/HIGH degree of concern category.



Coldwater fish habitat availability in the pond between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Jewett Pond

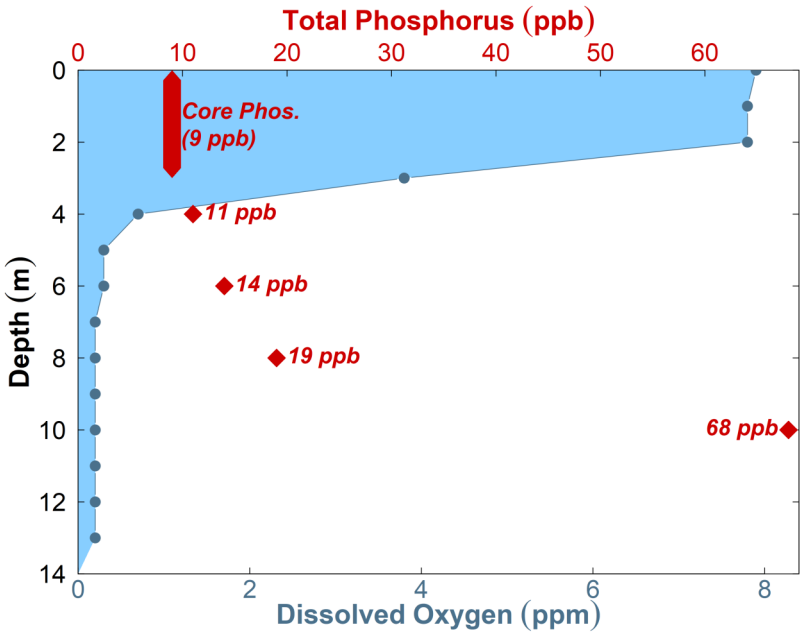
	2018 avg.	Long-term avg.	Trend
Clarity (m)	4.74	4.28	◯
Phosphorus (ppb)	9.00	9.72	◯
Chlorophyll (ppb)	2.00	5.25	◯

Surface Area:	43 acres
Maximum Depth:	41 feet
Watershed Area:	638 acres
Elevation:	580 feet

Water Quality Summary:

Water quality in Jewett Pond is measured once a year in August. Trend analysis indicates that clarity, chlorophyll, and phosphorus are all stable. Compared to long-term averages, 2018 measurements showed improvement over long-term averages. Values for clarity and surface-layer phosphorus were within the moderate range, while chlorophyll was in the low range.

Jewett Pond's main water quality concerns are severe oxygen depletion and very high phosphorus levels in the deeper waters of the pond. Both of these issues are illustrated in the graph below. Because of the shape of the pond, there is a relatively small volume of water in the deeper reaches, which means that oxygen is rapidly used up and not easily replenished. This lack of oxygen can cause sediments to release phosphorus, which accounts for the high phosphorus readings in Jewett Pond, especially near the bottom. These two water quality issues are the basis for Jewett Pond's MODERATE degree of concern rating.



Jewett Pond water column phosphorus (red) and dissolved oxygen (blue) data on 8/31/2018. Upper layer phosphorus (bar) is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Keoka Lake

Additional Analyses Available

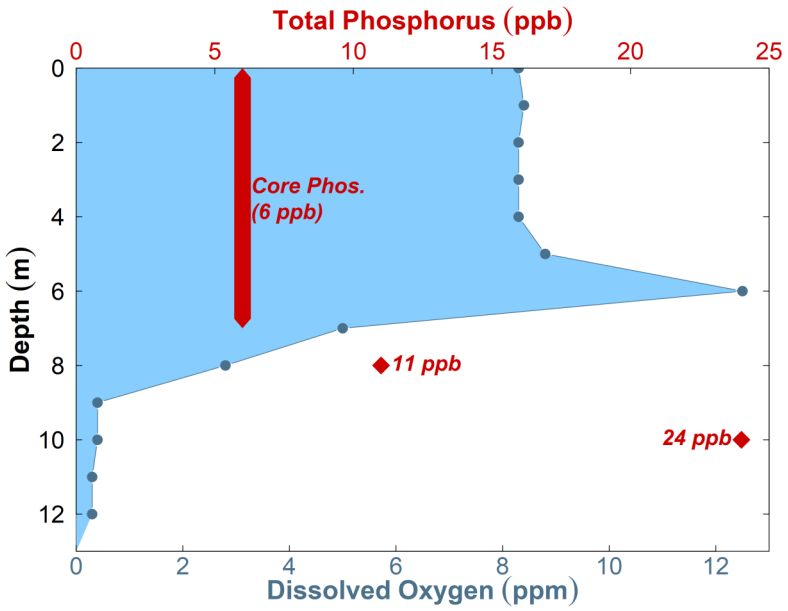
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.58	5.94	
Phosphorus (ppb)	6.00	7.84	
Chlorophyll (ppb)	3.40	3.60	

Surface Area:	460 acres
Maximum Depth:	42 feet
Mean Depth:	25 feet
Volume:	10,569 acre-feet
Watershed Area:	3,808 acres
Flushing Rate:	0.7 flushes per year
Elevation:	492 feet

Water Quality Summary:

The trends in the clarity and surface-layer phosphorus went from stable to improving in 2018. Trend analysis indicates that chlorophyll remains stable. These three parameters are the most important factors in determining water quality status. Average values for all three measurements were within the moderate range and were all improved over long-term averages.

Keoka Lake's main water quality concerns are low oxygen levels, inadequate coldwater fish habitat, high deep-water phosphorus levels, and elevated *Gloeotrichia* levels. A lack of dissolved oxygen in the deeper waters of the pond means that coldwater fish are forced into shallower waters. The top layer of the lake is too warm for these fish, so they end up having only a narrow band of habitat available to them in the middle of the pond, which shrinks as water temperatures warm and dissolved oxygen is further depleted. Dissolved oxygen depletion may also be the source of the higher phosphorus readings near the bottom of the pond, as a lack of oxygen causes sediments to release stored phosphorus. In late summer, Keoka Lake experiences elevated levels of *Gloeotrichia echinulata,* a cyanobacteria that can release toxins and form blooms. Keoka Lake is in LEA's HIGH degree of concern category.



Keoka Lake water column phosphorus (red) and dissolved oxygen (blue) data on 8/28/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Additional Analyses Available

Keyes Pond

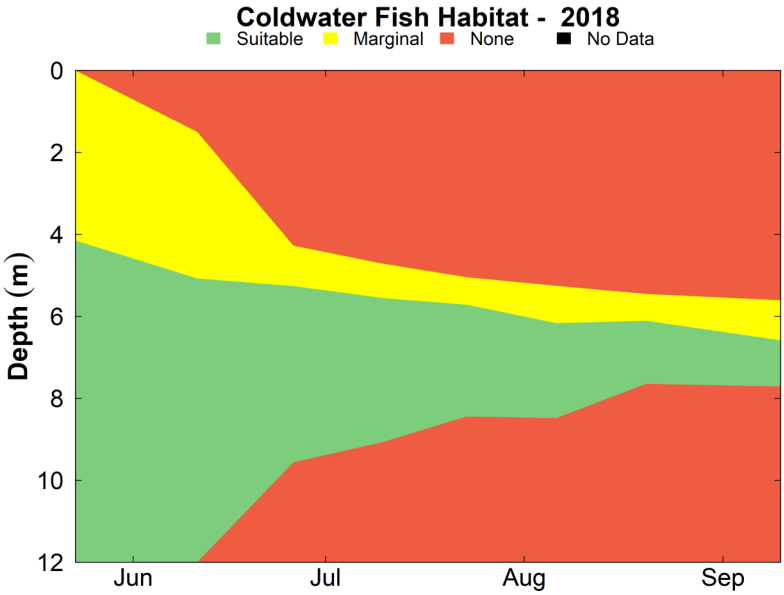
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.48	6.21	
Phosphorus (ppb)	6.25	7.26	
Chlorophyll (ppb)	2.63	3.31	

Surface Area:	191 acres
Maximum Depth:	42 feet
Mean Depth:	17 feet
Volume:	3,333 acre-feet
Watershed Area:	1,213 acres
Flushing Rate:	0.8 flushes per year
Elevation:	508 feet

Water Quality Summary:

Trend analysis shows clarity is improving on Keyes Pond, while chlorophyll and surface-layer phosphorus levels have remained stable over time. These three parameters are the most important factors in determining water quality. In 2018, averages for all three parameters were improved over long-term averages. Clarity, chlorophyll, and phosphorus averages for 2018 were all within the moderate range.

The main water quality concerns in Keyes Pond are low oxygen levels within the deeper waters in the late summer, lack of coldwater fish habitat, and high deep-water phosphorus levels. Low oxygen near the bottom of the pond may be triggering the release of excess phosphorus from the sediments, raising the phosphorus concentration in the deep waters. Oxygen depletion also restricts the amount of habitat available for coldwater fish, as seen in the graph below. By September, a portion of the water column less than 2 meters deep constituted all the suitable habitat available for coldwater fish. Keyes Pond is in LEA's MODERATE/HIGH degree of concern category.



Coldwater fish habitat availability in the pond between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Kezar Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	3.00 B	2.75	N/A
Phosphorus (ppb)	14.00	18.09	◯
Chlorophyll (ppb)	3.00	4.36	◯

Surface Area: 1,851 acres
Maximum Depth: 12 feet
Watershed Area: 10,779 acres
Elevation: 369 feet

Water Quality Summary:

Kezar Pond's water quality is measured once a year in August. Trend analysis shows that chlorophyll and phosphorus levels have remained stable on the pond over time. Because visibility often reaches to the bottom of the pond (as it did in 2018), clarity trend analysis was not done. The results of 2018 sampling showed that the phosphorus concentration was in the high range, although it was still lower than the long-term average. Chlorophyll was in the moderate range and was also lower than the long-term average. No dissolved oxygen depletion was observed during sampling. Kezar Pond is in LEA's AVERAGE degree of concern category due to a lack of significant water quality concerns.

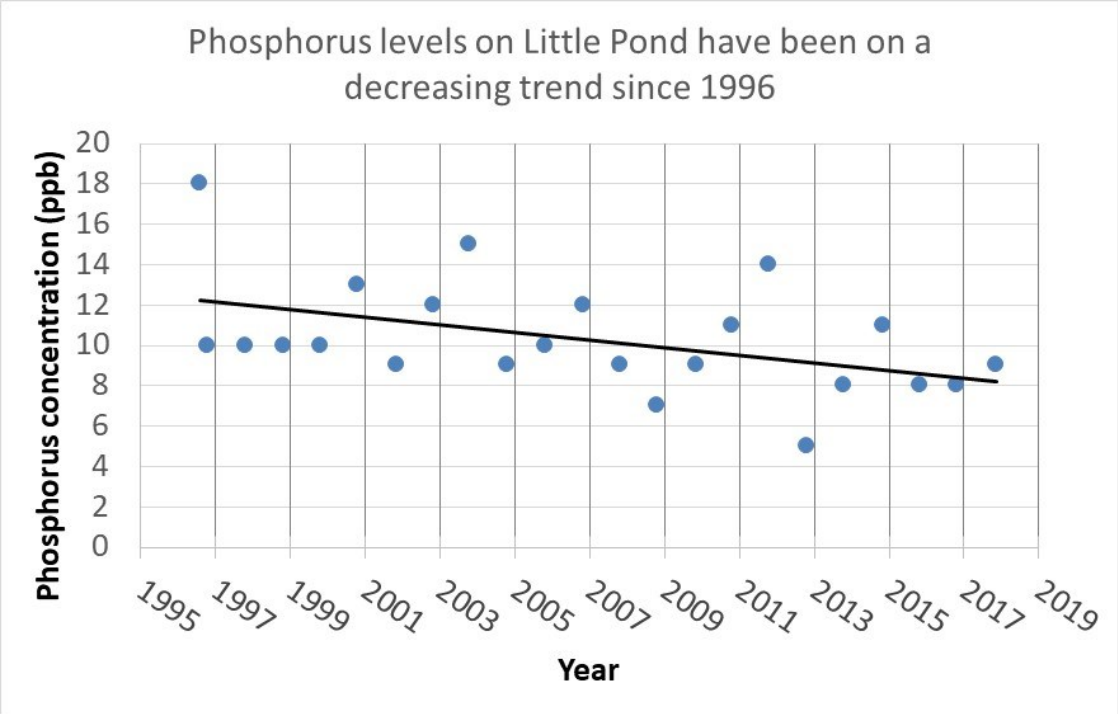
Little Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	3.83 B	4.03	N/A
Phosphorus (ppb)	9.00	10.30	
Chlorophyll (ppb)	5.00	5.09	

Surface Area:	33 acres
Maximum Depth:	13 feet
Watershed Area:	633 acres
Elevation:	360 feet

Water Quality Summary:

Water quality on Little Pond is measured once a year in August. Trend analysis shows that phosphorus is decreasing over time on the Pond. Trend analysis was not done for clarity data because visibility often reaches to the bottom of the pond, as it did in 2018. The overall trend in chlorophyll values over time is stable. Phosphorus and chlorophyll levels were both in the moderate range in 2018 and were both improved compared to the long-term average. No oxygen depletion was observed at the time of sampling. Little Pond is in LEA's AVERAGE degree of concern category because of a lack of significant water quality concerns.



Little Moose Pond

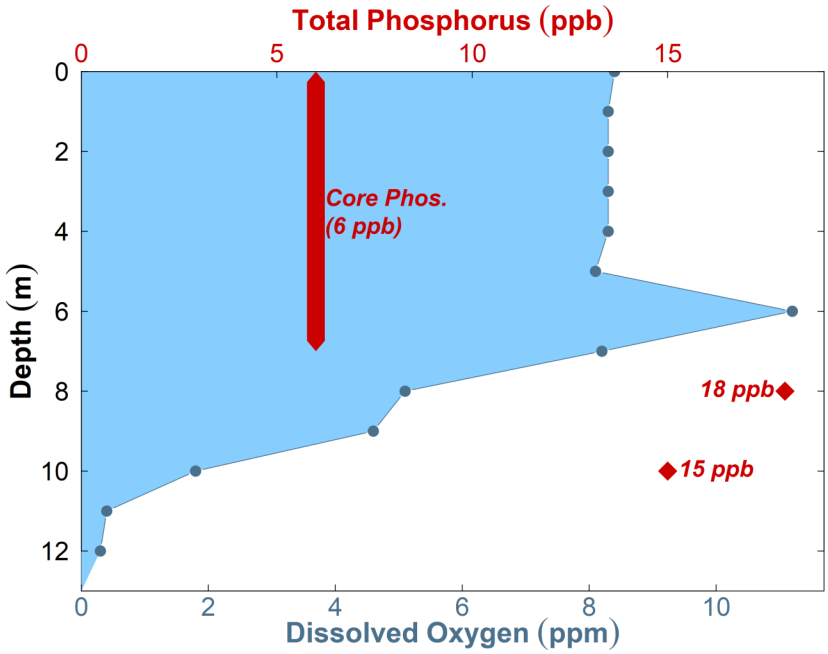
	2018 avg.	Long-term avg.	Trend
Clarity (m)	7.31	7.33	◯
Phosphorus (ppb)	5.63	5.83	◯
Chlorophyll (ppb)	2.00	2.32	◯

Surface Area:	195 acres
Maximum Depth:	43 feet
Mean Depth:	22 feet
Volume:	4,010 acre-feet
Watershed Area:	1,184 acres
Flushing Rate:	0.6 flushes per year
Elevation:	545 feet

Water Quality Summary:

Trend analysis indicates that clarity, chlorophyll, and upper-layer phosphorus are all stable on Little Moose Pond. Average clarity was essentially equal to the long-term average, while phosphorus and chlorophyll averages for the season were both slightly better than long-term averages. Clarity was in the good range of values in 2018 and chlorophyll and phosphorus averages were within the moderate range. Little Moose Pond had the second lowest phosphorus average of all lakes and ponds sampled, and had the third lowest chlorophyll of the 26 basins tested biweekly.

The main water quality concerns on Little Moose Pond are oxygen depletion and high deep-water phosphorus levels. These two issues are illustrated in the graph below. Oxygen depletion affected the bottom four meters of the pond by the end of the testing season. Low oxygen can cause excess phosphorus to be released from the sediments, which may account for some of the high readings near the bottom of the pond. These issues put Little Moose Pond is in LEA's MODERATE degree of concern category.



Little Moose Pond water column phosphorus (red) and dissolved oxygen (blue) data on 8/20/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values(diamonds) are from depth-specific grab samples.

Little Mud Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	2.20	2.86	◯
Phosphorus (ppb)	11.00	22.11	◯
Chlorophyll (ppb)	5.00	7.75	◯

Surface Area:	45 acres
Maximum Depth:	35 feet
Mean Depth:	13 feet
Watershed Area:	1,661 acres
Elevation:	572 feet

Water Quality Summary:

Little Mud Pond is the second basin of Mud Pond, and one of the Five Kezar Ponds. LEA collects water quality data on Little Mud once a year in August. Trend analysis indicates clarity, phosphorus, and chlorophyll are all stable over time. The pond had poor clarity in 2018 which was also worse than the long-term average. Phosphorus and chlorophyll were both improved over their long-term averages and both were in the moderate range of values.

The deeper waters of the pond suffered from dissolved oxygen depletion at the time of testing. Much of the pond's water quality is due to the large wetland complex associated with it, which causes the low clarity and high phosphorus readings. Little Mud Pond is in LEA's AVERAGE degree of concern category.

Additional Analyses Available

Long Lake (North Basin)

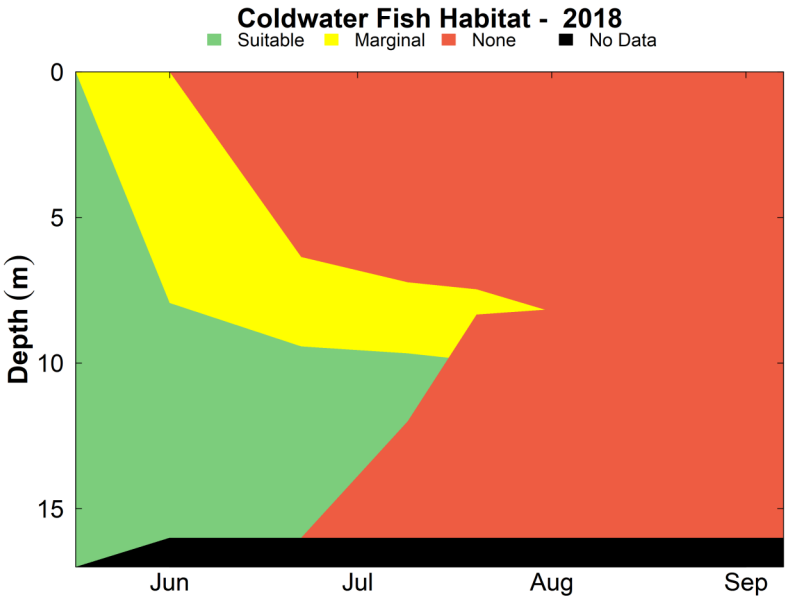
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.37	6.20	◯
Phosphorus (ppb)	6.38	7.46	◯
Chlorophyll (ppb)	2.25	2.96	◯

Surface Area:	4,935 acres
Maximum Depth:	59 feet
Mean Depth:	34 feet
Volume:	165,500 acre-feet
Watershed Area:	33,871 acres
Flushing Rate:	0.94 flushes per year
Elevation:	267 feet

Water Quality Summary:

Trend analysis shows clarity, phosphorus, and chlorophyll levels are stable in the north basin of Long Lake. These measurements are the main water quality indicators within a lake. Average values for all three parameters were in the moderate range in 2018, and all showed improvement over long-term averages.

Although water quality trends are stable, there are a number of issues that threaten Long Lake. Dissolved oxygen depletion affects half of the water column in late summer and makes the basin inhospitable to coldwater fish such as Landlocked Salmon (see graph below). Sediment chemistry testing has revealed that Long Lake has an increased potential for sediment phosphorus release due to low aluminum levels. The north basin in particular also contains elevated concentrations of the cyanobacteria *Gloeotrichia echinulata,* which forms blooms in late summer and is capable of producing toxins. Because of these concerns, Long Lake is in LEA's HIGH degree of concern category.



Coldwater fish habitat availability in the lake between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Additional Analyses Available

Long Lake (Middle Basin)

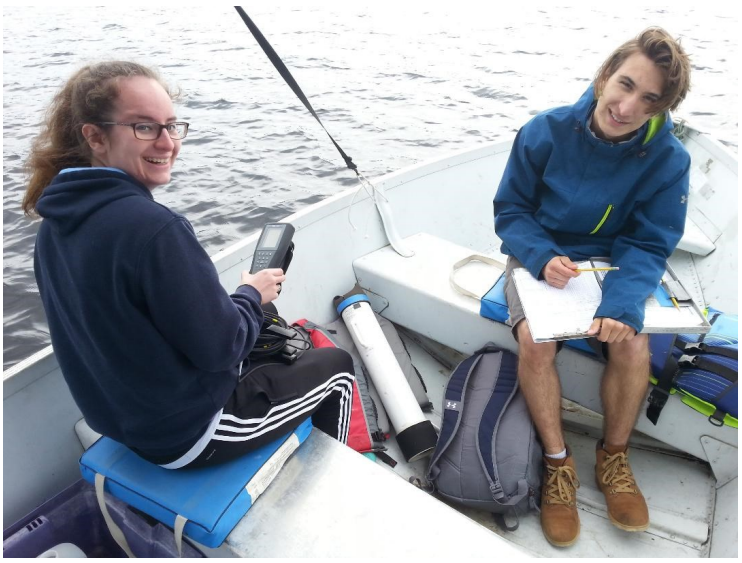
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.70	6.30	
Phosphorus (ppb)	5.88	6.68	
Chlorophyll (ppb)	2.75	2.92	

Surface Area:	4,935 acres
Maximum Depth:	59 feet
Mean Depth:	34 feet
Volume:	165,500 acre-feet
Watershed Area:	33,871 acres
Flushing Rate:	0.94 flushes per year
Elevation:	267 feet

Water Quality Summary:

Trend analysis shows clarity, phosphorus, and chlorophyll levels are stable in the middle basin of Long Lake. These measurements are the main water quality indicators within a lake. Average values for all three parameters were in the moderate range in 2018, and all showed improvement over long-term averages.

Despite stable water quality trends, there are several issues that threaten the lake's water quality. Oxygen depletion affects the middle basin of Long Lake and is a concern because it can cause sediments to release phosphorus. Sediment chemistry testing has revealed that Long Lake has an increased potential for sediment phosphorus release due to low aluminum levels. However, deep-water phosphorus levels were moderate in 2018 and similar to upper-layer water levels. Oxygen depletion can also affect the ecology of the lake by driving out coldwater fish species. The middle basin tends to have naturally warmer deep-water temperatures than a typical lake of its depth, which also provides unfavorable conditions for coldwater fish. Elevated concentrations of the cyanobacteria *Gloeotrichia echinulata,* which forms blooms in late summer and is capable of producing toxins, are also a concern on Long Lake. The invasive aquatic plant milfoil has been found in the shallow waters of the lake, also increasing concerns over the lake's ecosystem. Long Lake is in LEA's HIGH degree of concern category.



Additional Analyses Available

Long Lake (South Basin)

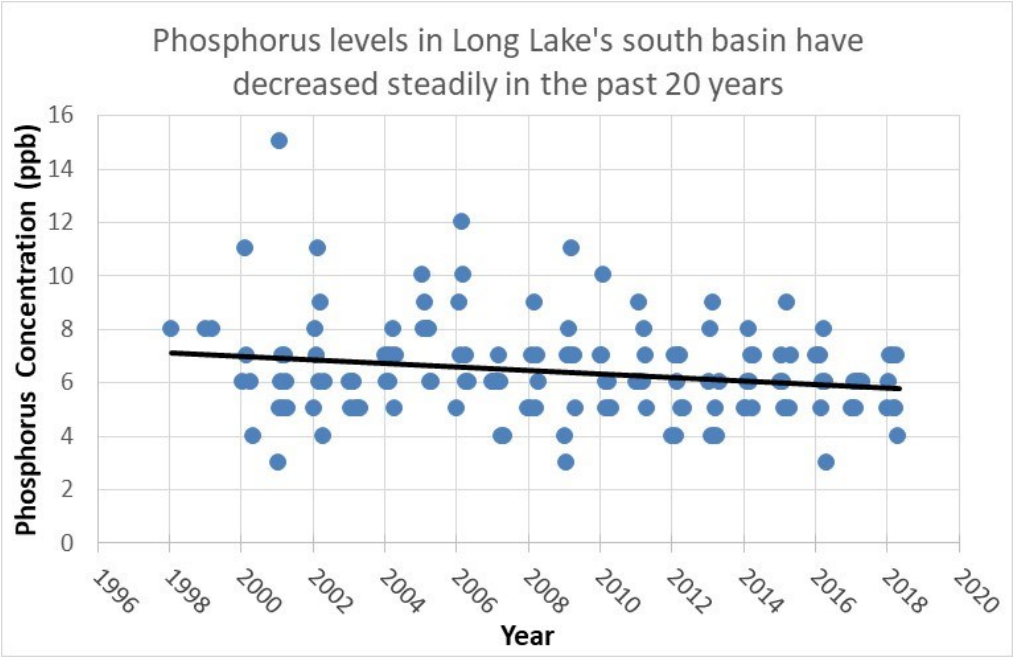
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.73	6.43	
Phosphorus (ppb)	5.75	6.45	
Chlorophyll (ppb)	2.60	2.87	

Surface Area:	4,935 acres
Maximum Depth:	59 feet
Mean Depth:	34 feet
Volume:	165,500 acre-feet
Watershed Area:	33,871 acres
Flushing Rate:	0.94 flushes per year
Elevation:	267 feet

Water Quality Summary:

Trend analysis shows clarity and chlorophyll levels on the south basin of Long Lake are stable. The upper layer phosphorus trend indicates that concentrations are improving over time, as shown in the graph below. Average values for all three parameters were improved over long-term averages and all were in the moderate range in 2018.

The basin suffers from oxygen depletion at depth, which is a concern because it can cause sediments to release phosphorus. Sediment chemistry testing has revealed that Long Lake has an increased potential for sediment phosphorus release due to low aluminum levels. However, deep-water phosphorus levels were moderate in 2018 and similar to upper-layer water levels. Oxygen depletion can also affect the ecology of the lake by driving out coldwater fish species. In 2017, an infestation of invasive variable leaf milfoil was discovered in the south basin of Long Lake, which threatens the rest of the lake as well as other lakes in the area. Elevated concentrations of the cyanobacteria *Gloeotrichia echinulata,* which forms blooms in late summer and is capable of producing toxins, are also a concern on Long Lake. Long Lake is in LEA's HIGH degree of concern category.



Long Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.00	5.28	
Phosphorus (ppb)	9.00	8.13	
Chlorophyll (ppb)	2.00	2.91	

Surface Area:	44 acres
Maximum Depth:	20 feet
Watershed Area:	217 acres
Elevation:	401 feet

Water Quality Summary:

Long Pond is sampled once a year by LEA. Trend analysis indicates declining clarity over time but stable chlorophyll and phosphorus levels. Clarity was slightly worse than the long-term average in 2018. The phosphorus concentration at the time of sampling was higher than average and chlorophyll was lower than the long-term average. Clarity and phosphorus readings were both in the moderate range, while chlorophyll was in the low range. No dissolved oxygen depletion was noted on the pond at the time of sampling. Long Pond is in LEA's AVERAGE degree of concern category.

Additional Analyses Available

McWain Pond

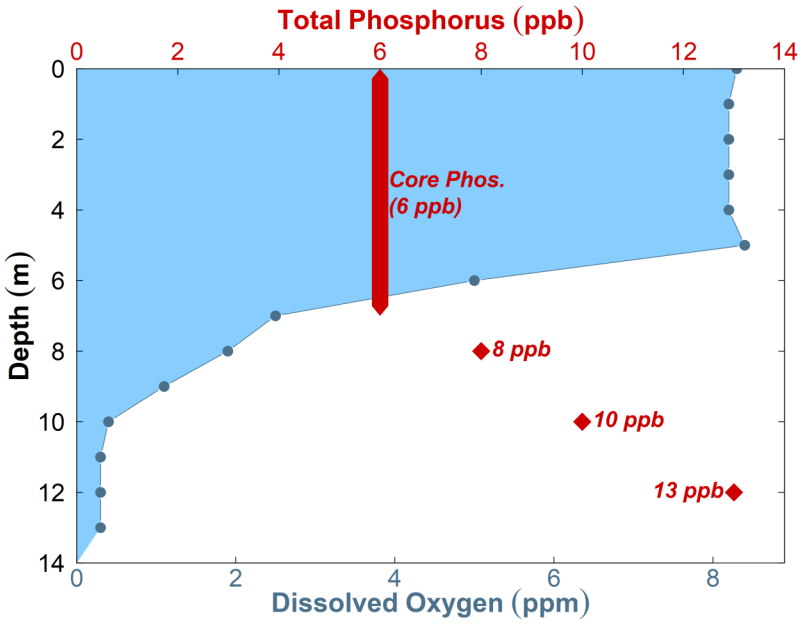
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.91	6.05	
Phosphorus (ppb)	5.75	7.00	
Chlorophyll (ppb)	2.40	3.00	

Surface Area:	445 acres
Maximum Depth:	42 feet
Mean Depth:	23 feet
Volume:	9,756 acre-feet
Watershed Area:	2,505 acres
Flushing Rate:	0.5 flushes per year
Elevation:	533 feet

Water Quality Summary:

Clarity, chlorophyll, and phosphorus are the primary metrics used for water quality assessment on lakes. Trend analysis indicates that clarity is stable over time on McWain Pond. Both surface-layer phosphorus and chlorophyll trends show improvement over time. Average values for all three parameters in 2018 were improved over long-term averages. The surface-layer phosphorus average was one of the lowest of all the lakes sampled in 2018. All three parameters were within the moderate range.

The main water quality concerns on McWain Pond are oxygen depletion, high deep-water phosphorus concentrations, and elevated levels of *Gloeotrichia echinulata*, a cyanobacterial species that causes blooms and can produce toxins. Oxygen depletion at the bottom of the pond can trigger sediments to release phosphorus, which can then be re-suspended in the water column, leading to higher concentrations. Phosphorus and dissolved oxygen data from late August sampling can be seen in the graph below. McWain Pond is currently in LEA's MODERATE/HIGH degree of concern category.



McWain Pond water column phosphorus (red) and dissolved oxygen (blue) data from 8/24/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Additional Analyses Available

Middle Pond

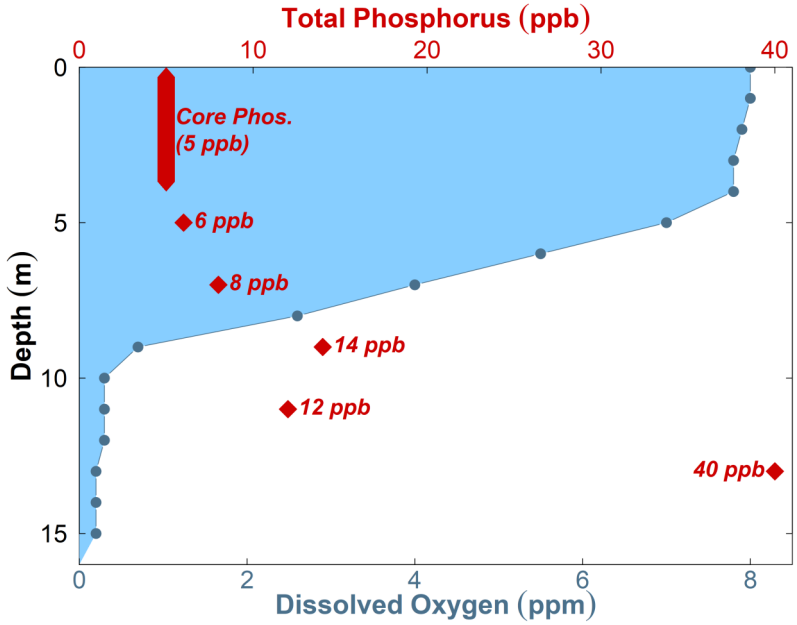
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.94	5.36	
Phosphorus (ppb)	7.13	7.76	
Chlorophyll (ppb)	1.60	3.70	

Surface Area: 72 acres
Maximum Depth: 50 feet
Watershed Area: 231 acres
Elevation: 572 feet

Water Quality Summary:

Trend analysis indicates clarity and chlorophyll are improving over time on Middle Pond. Upper-layer phosphorus concentrations are stable over time on Middle Pond. All three parameters were improved over their long-term averages in 2018. Middle Pond's chlorophyll average was in the low range of values and was the lowest average of all the lakes sampled. Clarity and upper layer phosphorus averages were moderate in 2018.

The main water quality concerns in Middle Pond are oxygen depletion, high deep-water phosphorus levels, and a lack of coldwater fish habitat during a short period in late summer. All of these issues are interconnected: low oxygen levels exclude coldwater fish and can also induce sediments to release phosphorus, which raises levels of this nutrient in the deeper waters. Because of these three issues, Middle Pond is in LEA's MODERATE/HIGH degree of concern category.



Middle Pond water column phosphorus (red) and dissolved oxygen (blue) data from 8/16/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Additional Analyses Available

Moose Pond (Main Basin)

	2018 avg.	Long-term avg.	Trend
Clarity (m)	8.00	7.44	
Phosphorus (ppb)	6.00	5.77	
Chlorophyll (ppb)	2.00	2.81	

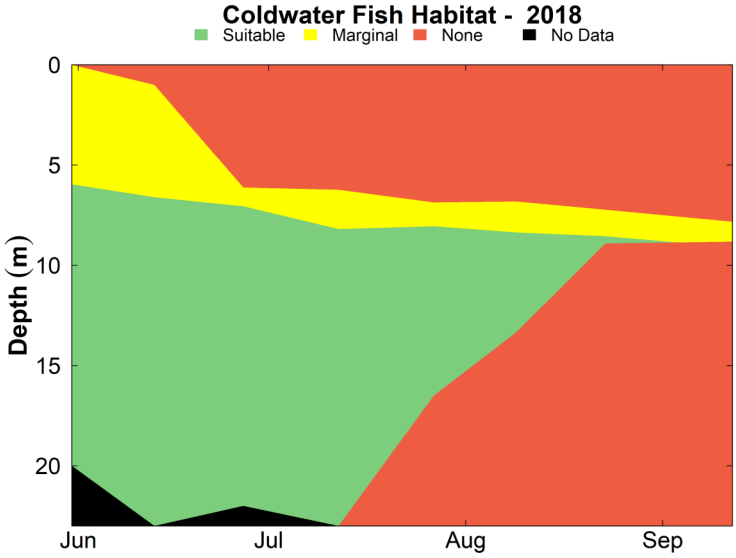
Surface Area:	941 acres
Maximum Depth:	77 feet
Mean Depth:	32.8 feet
Volume:	23,423 acre-feet
Watershed Area:	2,061 acres
Flushing Rate (whole pond):	3.69/year
Elevation:	418 feet

Water Quality Summary:

Trend analysis indicates clarity and surface-layer phosphorus are stable in Moose Pond's main basin. The chlorophyll trend shows levels are decreasing over time. Clarity and chlorophyll averages were improved over long-term averages, and were among the best readings of all the lakes and ponds tested by LEA in 2018. Clarity was in the good range and chlorophyll was in the low range. The phosphorus average was higher than the long-term average and was in the moderate range of values.

Moose Pond's main basin suffers from dissolved oxygen depletion in the late summer. This greatly reduces suitable habitat for coldwater fish and increases the potential for phosphorus release from sediments. As seen in the graph below, there was an abundance of suitable habitat for coldwater fish up until mid-July. Over the course of about a month much of the dissolved oxygen in the bottom half of the lake was used up. Previous sediment chemistry studies indicate that this basin of Moose Pond is susceptible to phosphorus release from the sediments under anoxic (no oxygen) conditions. Luckily, deep-water sampling did not show any high phosphorus readings in 2018. Another issue that affects Moose Pond is the prevalence of *Gloeotrichia echinulata*, a colonial cyanobacteria that blooms in late summer and is capable of releasing toxins.

Oxygen depletion, lack of coldwater fish habitat, potential for phosphorus release, and *Gloeotrichia* blooms put Moose Pond's main basin is in LEA's HIGH degree of concern category.



Coldwater fish habitat availability in the pond between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Additional Analyses Available

Moose Pond (North Basin)

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.22	5.08	◯
Phosphorus (ppb)	9.25	9.47	◯
Chlorophyll (ppb)	3.30	3.97	◯

Surface Area:	365 acres
Maximum Depth:	20 feet
Mean Depth:	8.5 feet
Volume:	3,151 acre-feet
Watershed Area:	1,182 acres
Flushing Rate (whole pond):	3.69/year
Elevation:	418 feet

Water Quality Summary:

Trend analysis indicates that clarity, upper-layer phosphorus, and chlorophyll have all remained stable on Moose Pond's north basin over time. Averages of all three parameters were improved in 2018 compared to long-term averages and all were within the moderate range of values.

The north basin experiences mild oxygen depletion at times during the summer. However, a lack of other water quality issues means that Moose Pond's north basin remains in LEA's AVERAGE degree of concern category.

Additional Analyses Available

Moose Pond (South Basin)

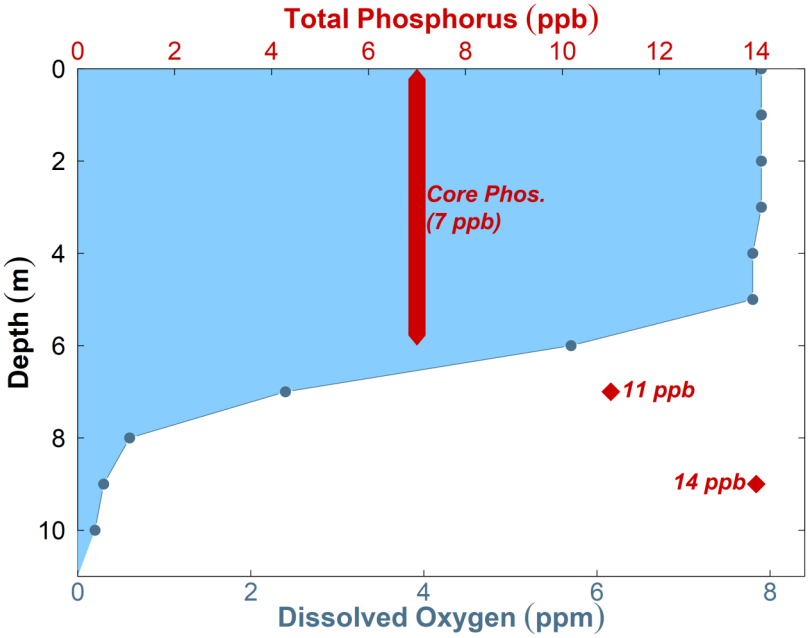
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.70	6.69	N/A
Phosphorus (ppb)	6.25	6.39	N/A
Chlorophyll (ppb)	2.50	2.99	N/A

Surface Area:	388 acres
Maximum Depth:	39 feet
Mean Depth:	15.7 feet
Volume:	6,105 acre-feet
Watershed Area:	1,964 acres
Flushing Rate (whole pond):	3.69/year
Elevation:	418 feet

Water Quality Summary:

The south basin of Moose Pond has only been sampled regularly since 2015, so there is not enough data available to conduct trend analysis for clarity, surface-layer phosphorus, or chlorophyll. Similarly, average values for 2018 are only being compared with three other years of data, not a true long-term average. In 2018 average clarity, upper layer phosphorus, and chlorophyll levels were similar to 2015-2018 averages. All three parameters were within the moderate range.

The south basin of Moose Pond suffers from dissolved oxygen depletion and high deep-water phosphorus concentrations in late summer, which can be seen in the graph below. These conditions mean that Moose Pond's south basin is in LEA's MODERATE degree of concern category.



Moose Pond, south basin water column phosphorus (red) and dissolved oxygen (blue) data on 8/23/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values(diamonds) are from depth-specific grab samples.

Mud Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	4.25	3.44	◯
Phosphorus (ppb)	6.00	11.72	◯
Chlorophyll (ppb)	2.00	5.11	◯

Surface Area:	45 acres
Maximum Depth:	35 feet
Mean Depth:	13 feet
Watershed Area:	1,661 acres
Elevation:	572 feet

Water Quality Summary:

LEA conducts water testing on Mud Pond once per year. Trend analysis indicates that clarity, phosphorus, and chlorophyll are all stable. In 2018, all three readings were in the moderate range and were much improved over long-term averages.

The main water quality issue present on Mud Pond is dissolved oxygen depletion. It was very pronounced at the time of sampling, affecting the bottom 8 meters of the 10-meter-deep pond. This is because most of the pond is shallow and only a small volume of water is contained within the deep part of the pond. This limits the volume of oxygen available and makes it hard for wind to mix air into the deeper waters. Mud Pond is in LEA's AVERAGE degree of concern category.

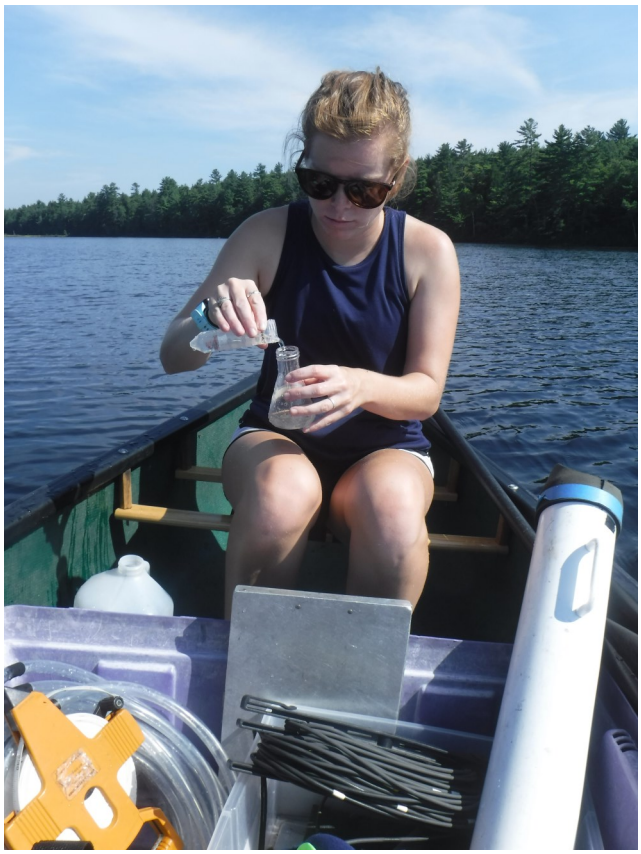
Otter Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.17	3.62	👍
Phosphorus (ppb)	9.00	12.69	⚪
Chlorophyll (ppb)	2.00	4.64	👍

Surface Area:	90 acres
Maximum Depth:	21 feet
Mean Depth:	10 feet
Volume:	814 acre-feet
Watershed Area:	790 acres
Flushing Rate:	0.7 flushes per year
Elevation:	392 feet

Water Quality Summary:

Otter Pond is sampled by LEA once a year in August. Trend analysis shows that clarity and chlorophyll levels have both improved over time in Otter Pond. Phosphorus levels have remained stable. All three parameters were improved over long-term averages in 2018. Clarity and phosphorus were in the moderate range while chlorophyll was in the low range of values. Oxygen depletion was recorded in the bottom 2 meters (6-1/2 feet) of the pond at the time of sampling. Otter Pond is in LEA's AVERAGE degree of concern category.



Papoose Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	3.89	3.53	
Phosphorus (ppb)	13.00	13.85	
Chlorophyll (ppb)	6.00	6.26	

Surface Area: 70 acres
Maximum Depth: 15 feet
Watershed Area: 192 acres
Elevation: 490 feet

Water Quality Summary:

Papoose Pond is sampled by LEA once per year in August. Trend analysis indicates that clarity is improving over time and phosphorus and chlorophyll are stable. All three parameters were slightly better than long-term averages in 2018. Clarity and chlorophyll results are in the moderate range of values while the phosphorus result is considered high. Slight oxygen depletion does occur near the bottom of the pond in most years. A lack of water quality concerns puts Papoose Pond in LEA's AVERAGE degree of concern category.

Additional Analyses Available

Peabody Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	8.38	7.43	
Phosphorus (ppb)	5.88	5.71	
Chlorophyll (ppb)	3.00	2.70	

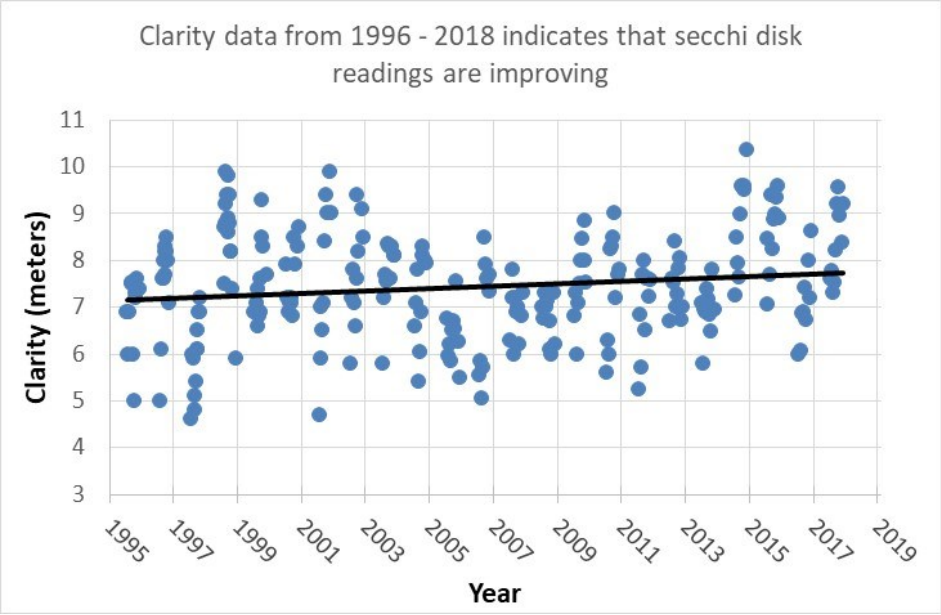
Surface Area:	740 acres
Maximum Depth:	64 feet
Mean Depth:	45 feet
Volume:	24,510 acre-feet
Watershed Area:	2,522 acres
Flushing Rate:	0.3 flushes per year
Elevation:	460 feet

Water Quality Summary:

Trend analysis indicates chlorophyll and surface-layer phosphorus are stable and clarity is improving over time on Peabody Pond. The Pond had the second highest clarity of all lakes sampled in 2018. At 8.38 meters, clarity was almost 1 meter deeper than the long-term average and is within the "good" range of values. Chlorophyll and phosphorus were both slightly higher than long-term averages and both were in the moderate range of values.

The main water quality concerns in Peabody Pond are dissolved oxygen depletion and an increased potential for phosphorus release from sediments. Dissolved oxygen depletion can cause sediments to release phosphorus, and also limits habitat for coldwater fish. Peabody Pond is more susceptible to sediment phosphorus release because the sediments have relatively low aluminum levels. Aluminum binds with the released phosphorus, keeping it out of the water column. Luckily, the extent and duration of oxygen depletion are limited on the Pond. Deep-water phosphorus levels remained moderate and coldwater fish habitat was adequate in 2018.

Peabody Pond is in LEA's MODERATE degree of concern category due to oxygen depletion and increased risk of sediment phosphorus release.



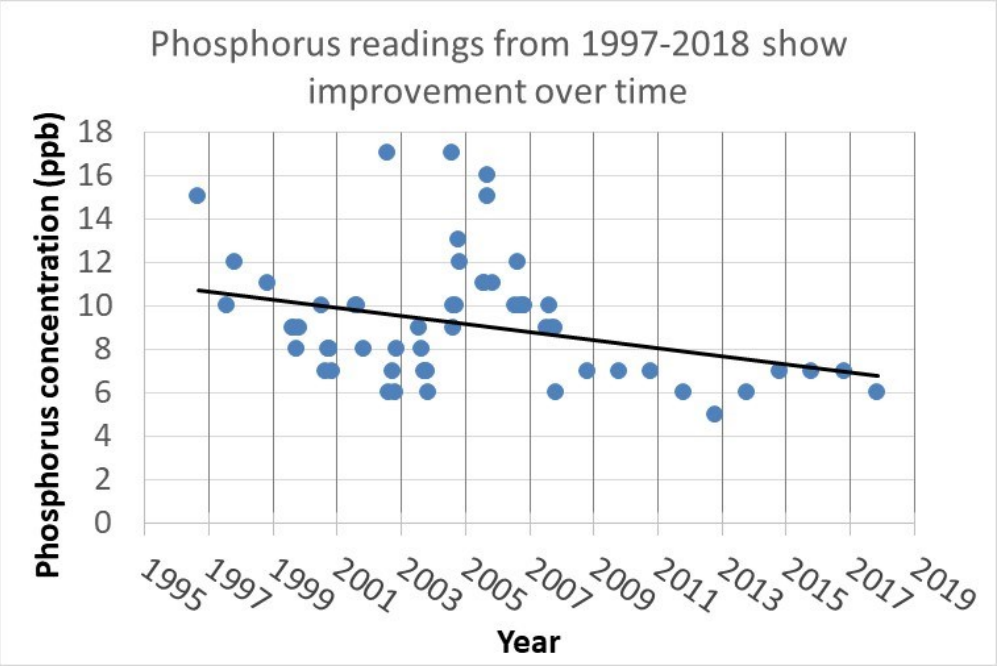
Perley Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.61	4.73	
Phosphorus (ppb)	6.00	9.19	
Chlorophyll (ppb)	2.00	4.73	

Surface Area:	68 acres
Maximum Depth:	27 feet
Watershed Area:	293 acres
Elevation:	521 feet

Water Quality Summary:

Perley Pond is sampled once a year by LEA. Trend analysis indicates clarity is stable while phosphorus and chlorophyll are improving over time. Values for all three parameters were improved over long-term averages in 2018. Clarity and phosphorus were in the moderate range, while chlorophyll was in the low range of values. Dissolved oxygen depletion, which affects half of the water column, is a concern for the pond. A lack of additional water quality issues means the pond is still within LEA's AVERAGE degree of concern category.



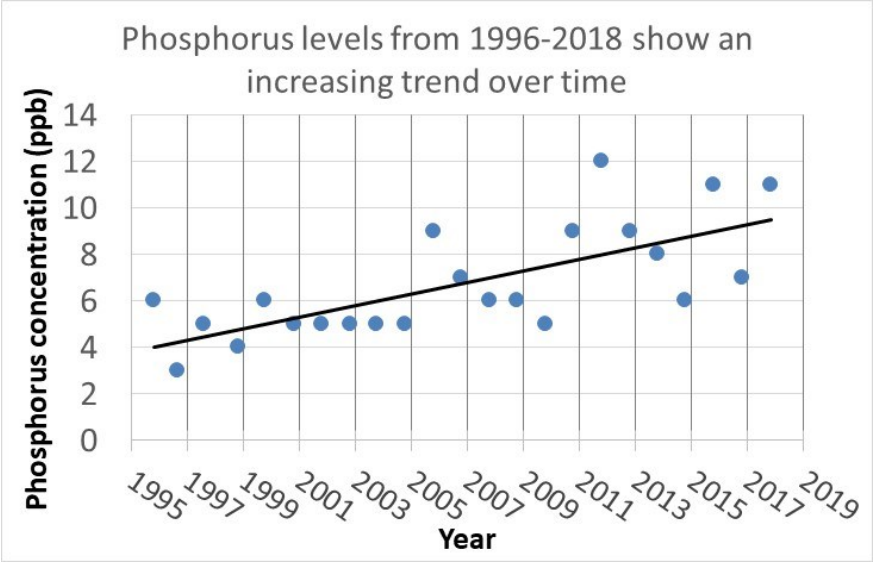
Pickerel Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.63 B	5.21	
Phosphorus (ppb)	11.00	6.74	
Chlorophyll (ppb)	2.00	2.77	

Surface Area:	17 acres
Maximum Depth:	18 feet
Watershed Area:	290 acres
Elevation:	515 feet

Water Quality Summary:

Pickerel Pond is sampled by LEA once per year in August. Trend analysis shows clarity and chlorophyll levels are both stable on the pond, while phosphorus levels are increasing over time. Clarity reached the bottom of the pond in 2018. Phosphorus was higher than the long-term average, but still in the moderate range. Chlorophyll was lower than the long-term average and was in the low range of values. Slight oxygen depletion was observed at the bottom of the pond at the time of sampling. Pickerel Pond is in LEA's AVERAGE degree of concern category.



Pleasant Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	2.60	2.68	◯
Phosphorus (ppb)	13.00	20.32	◯
Chlorophyll (ppb)	4.00	5.13	◯

Surface Area:	604 acres
Maximum Depth:	11 feet
Watershed Area:	4,624 acres
Elevation:	362 feet

Water Quality Summary:

Pleasant Pond is sampled by LEA once a year in August. Trend analysis indicates that clarity, chlorophyll, and phosphorus are all stable over time. Clarity was poor in 2018 and did not reach the bottom despite the shallow depth of the pond. Clarity was similar to the long-term average. The chlorophyll reading was lower than the long-term average and within the moderate range of values in 2018, while phosphorus was in the high range. Despite being high, the phosphorus value was improved over the long-term average. Pleasant Pond is in LEA's AVERAGE degree of concern category due to a lack of significant water quality issues.

Additional Analyses Available

Sand Pond

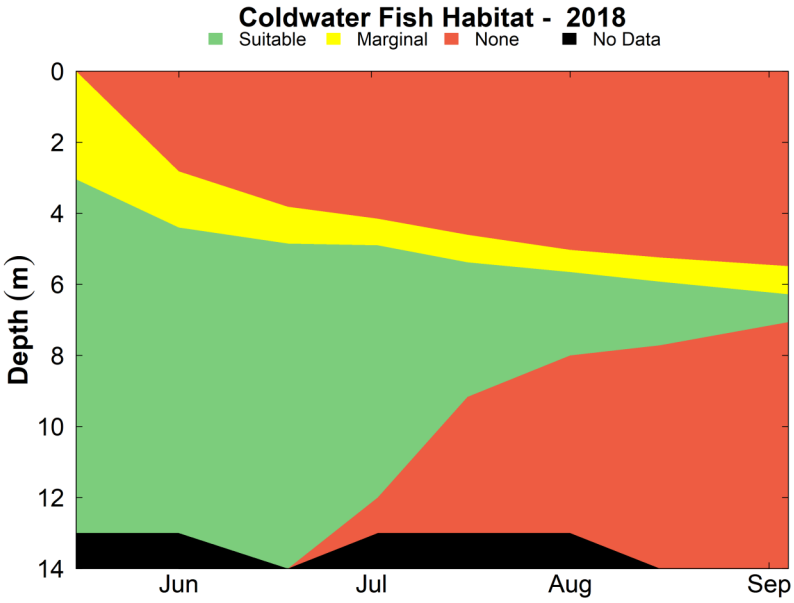
	2018 avg.	Long-term avg.	Trend
Clarity (m)	6.08	6.31	
Phosphorus (ppb)	8.75	8.38	
Chlorophyll (ppb)	2.40	3.45	

Surface Area: 256 acres
Maximum Depth: 49 feet
Watershed Area: 1394 acres
Elevation: 502 feet

Water Quality Summary:

Trend analysis indicates stable phosphorus and chlorophyll trends, but worsening clarity over time in Sand Pond. Average clarity and surface-layer phosphorus readings were worse than long-term averages, while average chlorophyll was improved over the long-term average. Seasonal averages for all three parameters were within the moderate range in 2018.

By mid-June, oxygen depletion began affecting the very bottom of Sand Pond. Over time, as more and more oxygen was used up, the extent of the depletion increased. By September, less than one meter of water column thickness contained adequate oxygen levels for all coldwater fish species. In late May/early June of 2016, Sand Pond had a bloom of *Uroglena*, a golden algae. This particular algae is not a water quality concern in itself, but the proliferation of any type of algae is a sign that there are nutrients available in sufficient quantities to support a bloom. Because of the declining clarity trend, oxygen depletion, lack of coldwater fish habitat, and recent algae bloom, Sand Pond is in LEA's HIGH degree of concern category.



Coldwater fish habitat availability in the pond between late May and early September 2018. Colored areas indicate thickness of water column that is good habitat (green), marginal and stressful for some species (yellow), and inhospitable due to low oxygen and/or warm water temperatures (red).

Sebago Cove

	2018 avg.	Long-term avg.	Trend
Clarity (m)	2.14 B	2.09	N/A
Phosphorus (ppb)	17.00	16.00	N/A
Chlorophyll (ppb)	4.00	4.00	N/A

Water Quality Summary:

Sebago Cove is the most recent water body to be added to LEA's water testing program. The cove has been sampled once a year since 2016. Sebago Cove is a wide, shallow basin which connects the Muddy River to Sebago Lake. Because sampling began so recently, trend analysis and long-term average comparisons cannot be calculated. Clarity reached the bottom of the cove at the time of sampling at 2.14 meters. The phosphorus reading was in the high range of values and the chlorophyll was moderate and matched the 2016-2018 average. LEA is currently working to remove a dense infestation of invasive Variable Leaf Milfoil from the cove. Sebago Cove is in LEA's AVERAGE degree of concern category.

Stearns Pond

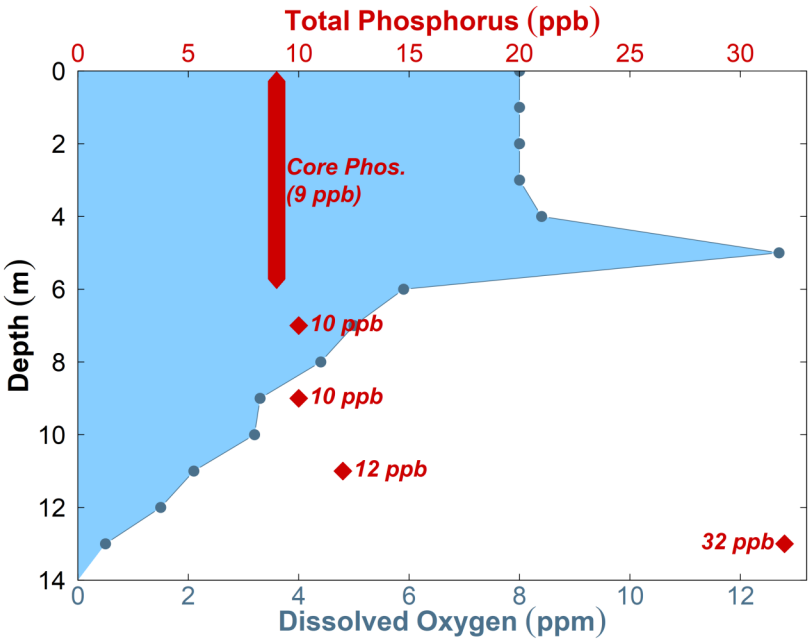
	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.88	5.28	
Phosphorus (ppb)	6.38	8.29	
Chlorophyll (ppb)	3.10	3.09	

Surface Area:	248 acres
Maximum Depth:	48 feet
Mean Depth:	27 feet
Volume:	6,585 acre-feet
Watershed Area:	4,116 acres
Flushing Rate:	1.6 flushes per year
Elevation:	444 feet

Water Quality Summary:

Trend analysis shows clarity and chlorophyll are both improving over time on Stearns Pond, while surface-layer phosphorus remains stable. Clarity and phosphorus were both improved over long-term averages and chlorophyll matched the long-term average. Clarity, chlorophyll, and phosphorus averages were all within the moderate range in 2018.

The main water quality concerns on Stearns Pond are dissolved oxygen depletion, high deep-water phosphorus concentrations, and restricted coldwater fish habitat. Oxygen depletion affects more than half of the Pond's water column in late summer, which restricts habitat for coldwater fish species in the pond and may also contribute to high phosphorus concentrations at the bottom of the pond by triggering sediment phosphorus release. Stearns Pond is in LEA's MODERATE/ HIGH degree of concern category.



Stearns Pond water column phosphorus (red) and dissolved oxygen (blue) data on 8/20/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Additional Analyses Available

Trickey Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	9.43	10.04	
Phosphorus (ppb)	5.63	5.28	
Chlorophyll (ppb)	2.00	1.73	

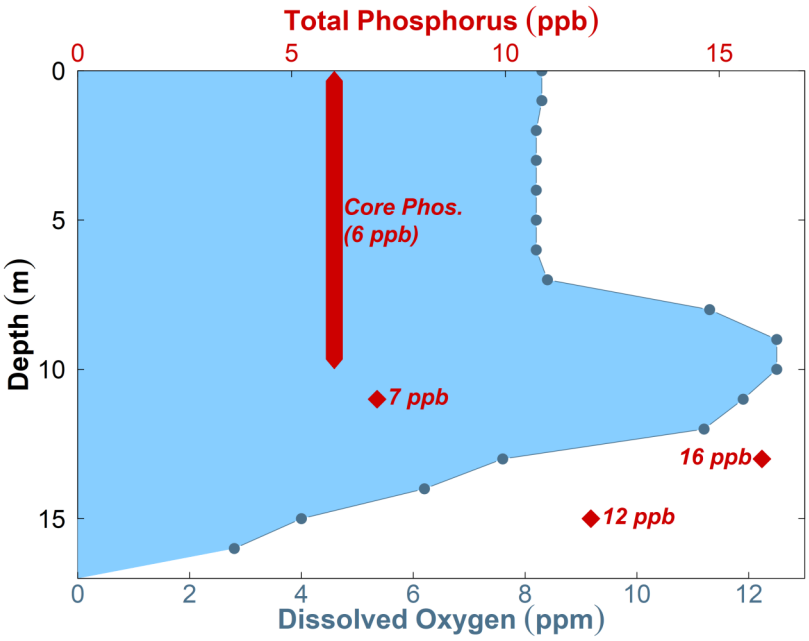
Surface Area:	315 acres
Maximum Depth:	57 feet
Mean Depth:	34 feet
Volume:	10,108 acre-feet
Watershed Area:	555 acres
Flushing Rate:	0.1 flushes per year
Elevation:	360 feet

Water Quality Summary:

Trend analysis indicates worsening clarity and chlorophyll values and stable surface-layer phosphorus levels over time. Despite these trends, Trickey Pond still has the best clarity of the 41 lakes and ponds tested by LEA and one of the lowest levels of chlorophyll and phosphorus. In 2018, average clarity was in the good range, average chlorophyll was in the low range, and average phosphorus was in the moderate range.

Dissolved oxygen concentrations in the deep waters of the pond are high enough to support coldwater fish species throughout the summer, although their habitat is slightly limited by low-oxygen conditions at the bottom of the pond. Additionally, high levels of deep-water phosphorus were revealed by testing in August, as seen in the graph below.

Because of the worsening clarity and chlorophyll trends, as well as high deep-water phosphorus readings, Trickey Pond is in LEA's HIGH degree of concern category.



Trickey Pond water column phosphorus (red) and dissolved oxygen (blue) data on 8/24/2018. Upper layer phosphorus (bar) data is from a composite water sample. Deep water phosphorus values (diamonds) are from depth-specific grab samples.

Webber Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	2.20 B	2.08	N/A
Phosphorus (ppb)	14.00	12.83	N/A
Chlorophyll (ppb)	5.00	3.32	N/A

Surface Area:	34 acres
Maximum Depth:	8 feet
Mean Depth:	5 feet
Perimeter:	1.1 miles
Elevation:	663 feet

Water Quality Summary:

Webber Pond is sampled by LEA once per year in August. Webber Pond is a recent addition to the water testing program, so there is not enough data available to run trend analyses on clarity, phosphorus, and chlorophyll data. The long-term average reflects data from 2013 to 2018. In 2018, clarity reached the bottom of the pond. Webber Pond's chlorophyll reading was in the moderate range, and was higher than average. Phosphorus was in the high range and was higher than average. Webber Pond is in LEA's AVERAGE degree of concern category.

Additional Analyses Available

Woods Pond

	2018 avg.	Long-term avg.	Trend
Clarity (m)	5.50	5.01	◯
Phosphorus (ppb)	7.50	8.12	◯
Chlorophyll (ppb)	3.00	3.10	◯

Surface Area:	462 acres
Maximum Depth:	29 feet
Mean Depth:	17.5 feet
Volume:	7,890 acre-feet
Watershed Area:	3,329 acres
Flushing Rate:	0.77 flushes per year
Elevation:	456 feet

Water Quality Summary:

Trend analysis indicates stable clarity, chlorophyll, and surface-layer phosphorus over time. Previously, phosphorus results showed an increasing trend, but after the 2018 season the trend has stabilized. Averages of all three parameters showed improvement over long-term averages and all were within the moderate range.

The main water quality issue facing Woods Pond is dissolved oxygen depletion, which affects about half of the water column at the height of the summer. For the second year in a row, the degree of concern for Woods Pond has been lowered. The Pond is now in LEA's AVERAGE degree of concern category.