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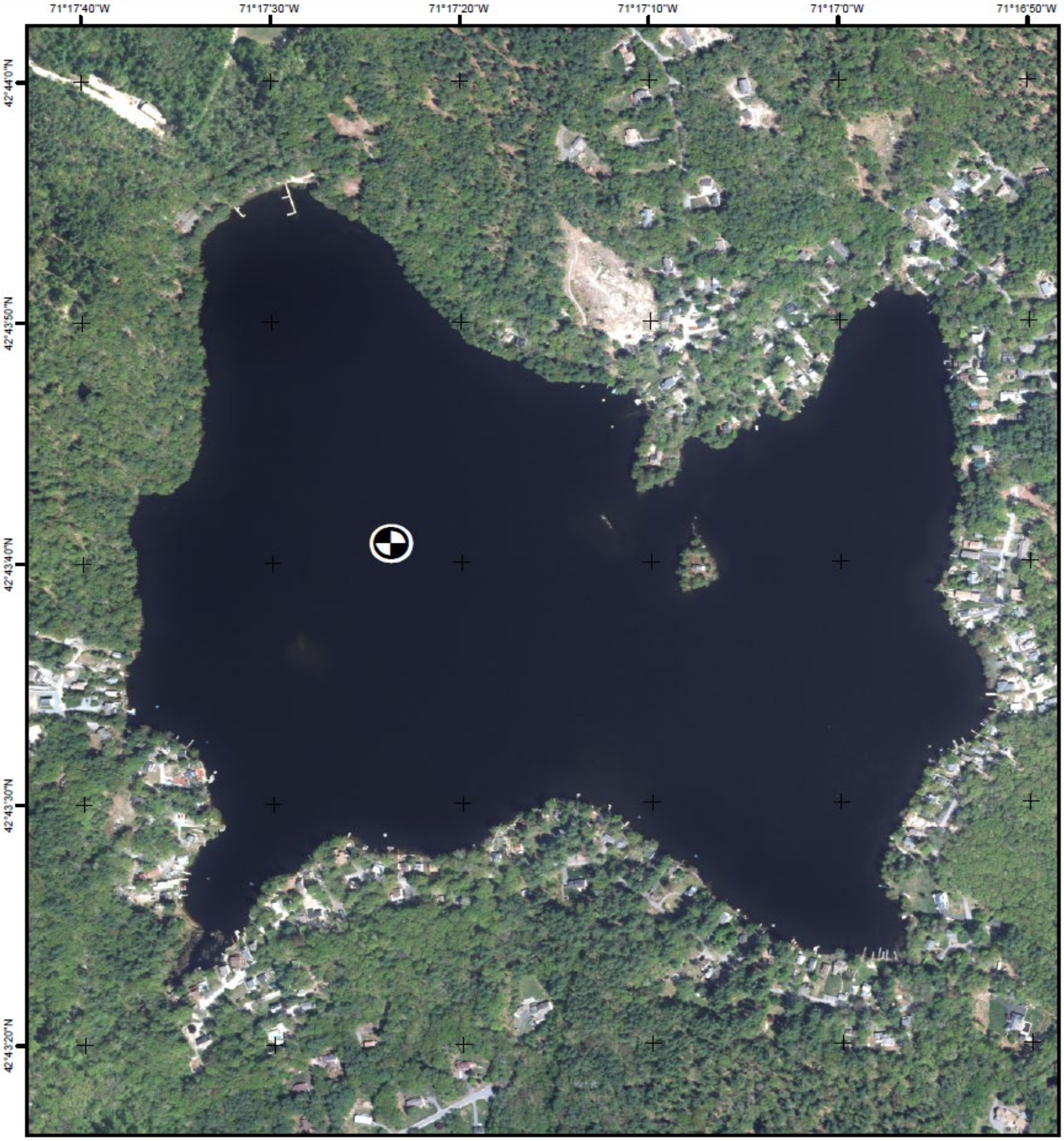
Database	This tab provides all the field and water chemistry data by depth. Future and past data can be added.
Field Data	This tab provides the data collected in the field (e.g. Secchi transparency, profile data). In addition, it provides density values for each depth and RTRM scores calculated for adjoining depths within the water column (See Temperature and Dissolved Oxygen tab).
Temperature and Dissolved Oxygen	This tab provides an explanation and graphical respresentations of temperature, RTRM, and oxygen profiles of the Little Island water column on July 30, 2020.
Specific Conductance ORP, pH	This tab provides an explanation and graphical respresentations of specific conductance, ORP, and pH of the Little Island water column on July 30, 2020.
Algal Communty	This tab contains a list of algal genera, results from analyses of algae concentrations, and a profile of relative Cyanobacteria biomass within the water column of the Little Island water column on July 30, 2020.
Trophic and Nutrient Data	This tab provides an explanation and graphical representation of the trophic and nutrient data determined for water samples collected at Little Island Pond on July 30, 2020. A table with trophic criteria is also provided.
Trophic Assessment	This tab provides an assessment of the trophic status of Little Island Pond based on analysis of data and water samples collected on July 30, 2020.
Ion Data	This tab provides an explanation and graphical representation of the ion data determined for water samples collected at Little Island Pond on July 30, 2020.
Lab Reports	This tab provides the results of analyses performed by HydroTechologies, LLC on water samples collected at Little Island Pond on July 30, 2020.



Little Island Pond Water Quality Sampling Site

◓ Sample Location

Map utilizes NH Orthophotography (2015) as well as data collected by AER. Contains no authoritative data.

AQUATIC ECOSYSTEM RESEARCH
A Freshwater Conservation Company

Date	**Depth**	**Temp. (°C)**	**Oxygen (mg/L)**	**DO (%)**	**Rel. Cyano.**	**Spec Cond. (µS/cm)**	**ORP (mV)**	**pH**	**Chl-*a* (µg/L)**	**Secchi (m)**	**Ammonia (µg/L)**	**Nitrate (µg/L)**	**Nitrite (µg/L)**	**TKN (µg/L)**	**Tot. Nit. (µg/L)**	**Tot. Phos (µg/L)**	**Alkalinity (mg/L)**	**DOC (mg/L)**	**Na^+ (mg/L)**	**K^+ (mg/L)**	**Ca^{2+} (mg/L)**	**Mg^{2+} (mg/L)**	**Cl^- (mg/L)**
30-Jul-20	0.5	29.1	7.7	104	22.4	206	219	8.5															
30-Jul-20	1	29.1	7.7	105	24.6	206	230	8.3	0.59	4.94	0	0	0	288	288	0	18	4.6	28	0	7.1	0	45
30-Jul-20	2	28.9	7.8	105	14.2	206	239	8.2															
30-Jul-20	3	28.4	7.8	104	1.3	205	246	8.0															
30-Jul-20	4	27.0	6.3	82	1.2	204	279	7.4															
30-Jul-20	5	23.0	2.6	31	1.0	197	307	6.9															
30-Jul-20	6	17.7	5.4	58	1.5	192	316	7.0															
30-Jul-20	7	14.9	5.7	59	1.2	192	317	7.0															
30-Jul-20	8	12.5	3.6	35	1.0	192	328	6.9															
30-Jul-20	9	11.6	2.2	21	1.2	191	336	6.7															
30-Jul-20	10	10.8	2.1	20	1.0	191	338	6.7															
30-Jul-20	11	10.1	1.0	9	0.9	192	341	6.7															
30-Jul-20	12	9.7	0.4	4	0.9	194	343	6.7															
30-Jul-20	13	9.5	0.2	1	1.1	196	343	6.7															
30-Jul-20	14	9.4	0.1	1	1.3	197	343	6.7															
30-Jul-20	15	9.4	0.1	1	1.1	198	343	6.7															
30-Jul-20	16	9.3	0.0	0	1.0	199	343	6.7															
30-Jul-20	16.5	9.3	0.0	0	1.1	199	341	6.7			167	64	0	424	488	45	20	3.9					

30-Jul-20

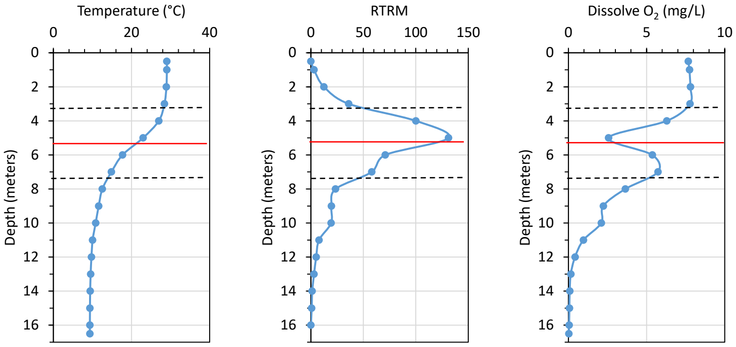
Depth (m)	Temp (°C)	DO (mg/L)	DO (%)	Rel. Cyano.	Spec Cond. (µS/cm)	ORP (mV)	pH	Water Density	RTRM
0.5	29.05	7.66	103.5	22.41	205.7	219.3	8.49	996.3965223	0
1	29.05	7.74	104.5	24.61	205.8	230.1	8.29	996.3965223	2.98386
2	28.93	7.8	105.1	14.21	205.7	239.2	8.15	996.4203932	12.4343
3	28.43	7.77	103.8	1.27	205.2	246.3	8.03	996.5198675	36.0735
4	26.98	6.29	81.9	1.19	203.9	279	7.43	996.8084554	100.12
5	22.96	2.56	30.9	0.97	197.3	306.5	6.87	997.6094152	131.246
6	17.7	5.36	58.3	1.52	192.4	316.1	6.95	998.6593833	70.9778
7	14.86	5.73	58.7	1.16	191.8	317.3	6.99	999.2272056	58.0418
8	12.54	3.64	35.4	0.99	191.5	327.8	6.85	999.6915398	23.5323
9	11.6	2.23	21.2	1.18	191.4	336.4	6.71	999.8797981	19.5335
10	10.82	2.1	19.6	1.03	191.1	337.7	6.7	1000.036066	19.2891
11	10.05	0.96	8.8	0.85	192.1	341.4	6.65	1000.190379	7.76741
12	9.74	0.42	3.8	0.86	194.2	342.6	6.65	1000.252518	5.01175
13	9.54	0.15	1.3	1.12	195.5	342.9	6.66	1000.292612	3.00724
14	9.42	0.08	0.7	1.25	197.3	342.8	6.67	1000.31667	1.25306
15	9.37	0.06	0.5	1.1	198.3	342.8	6.67	1000.326695	0.75185
16	9.34	0.04	0.4	0.96	199.2	342.7	6.68	1000.332709	0
16.5	9.34	0.02	0.2	1.06	199.4	340.5	6.72	1000.332709	

Secchi Disk Transparency	4.94

Temperature profile data allows for the determination of thermal characteristics by affording the ability to calculate where the water column is and is not mixing due to temperature/density differences. In shallow New England lakes or sites in the same lake, stratification can occur but it may be short in duration as energy from wind can mix the water column. In deeper lakes or sites, a middle transitional layer (aka metalimnion) separates the upper warmer layer (aka epilimnion) from lower colder waters below (aka hypolimnion). Within the metalimnion boundaries resides the thermocline, which is the layer between strata where temperature/density changes are greatest with increasing depth. Stratified conditions will often persist in deeper lakes or sites for the entire summer and into the fall until turnover mixes the water column.

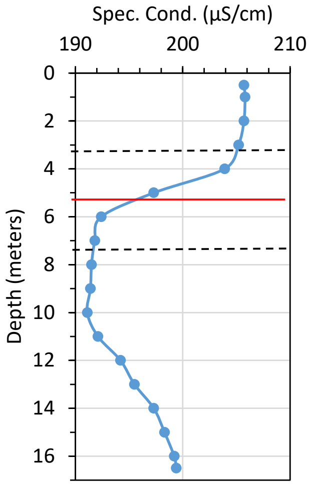
Resistance to mixing, which is an assessment of the ability of two different water volumes – that differ in temperature and density – to mix, was calculated from temperature profile data using the Relative Thermal Resistance to Mixing (RTRM) formula: $(D_1 – D_2)/(D' – D^{o})$, where D_1 is the density of upper water volume, D_2 is the density of the lower water volume, D’ is the density of water at 5° C, and D^{o} is the density of water at 4° C. The thermocline in the water column, where resistance to mix is greatest, is that stratum with the highest RTRM value that is ≥30. RTRM value of ≥80 is indicative of strong resistance to mixing.

An oxygen concentration of 5mg/L is generally thought to be the threshold that delineates favorable conditions for most aerobic organisms in freshwater systems. As concentrations decrease below that threshold, conditions become stressful for different forms of life. Minimum oxygen requirements for fisheries in Connecticut’s lakes and ponds range from 4 to 5mg/L for cold-water fish (e.g. trout), 2mg/L for cool-water fish (e.g. walleye), and 1 to 2mg/L for warm-water fish (e.g. bass and panfish; Jacobs and O’Donnell 2002).



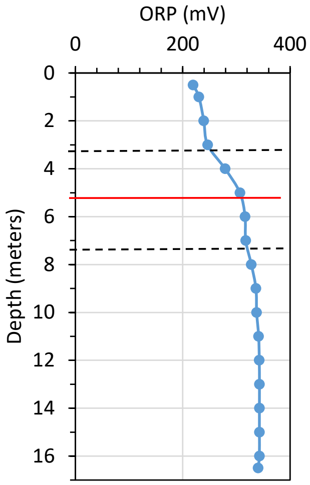
Profiles of temperature (left), Relative Thermal Resistance to Mixing (RTRM, middle) and dissolved oxygen (right) at Little Island Pond on July 30, 2020. The dashed lines represent the upper and lower boundary of

Conductivity is a surrogate measure for the ion concentration in water; simply put, it is a measure of water's ability to transmit an electrical current. Specific conductance is conductivity standardized to a set water temperature (25°C) because, in the field, temperature varies with depths and/or dates. Specific conductance (i.e. conductivity) is an important metric in Limnological studies due to its ability to detect pollutants and/or nutrient loadings. Specific conductance can also have an influence on organisms that inhabit a lake or pond; particularly, algae. The composition of algal communities has been shown to be related, in part, to conductivity levels in lakes (e.g. Siver 1993, McMaster &



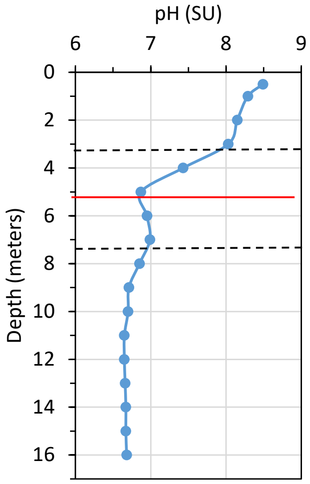
Profile of specific conductance (Spec. Cond.) at Little Island Pond on July 30, 2020. The dashed lines represent the upper and lower boundary of the metalimnion and the solid red line represents the approximate location of the thermocline.

The oxidation-reduction potential (otherwise known as redox potential or ORP) in lakes refers to the oxidative or reductive state in a particular stratum of the water column and can aid in understanding phosphorus dynamics in the lentic system. In general, when OPR is ≥200 millivolts (mV) phosphate remains bound to iron; at ORP values of <200mV, iron starts to becomes reduced and phosphate starts to be released (Søndergaard 2009). Under the latter scenario, a sudden mixing of phosphate-laden waters to the upper reaches of the water column during a storm event could trigger a harmful algal bloom.



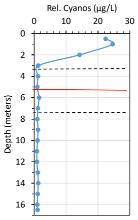
Profile of oxidation-reduction potenial (ORP) at Little Island Pond on July 30, 2020. The dashed lines represent the upper and lower boundary of the metalimnion and the solid red line represents the approximate location of the thermocline.

The pH of lake water is important for several reasons. Firstly, very low (<5) or very high (>9) pH levels will not support diverse lentic flora and fauna. Algal communities are influenced by pH due – in part – to its influence on the form of dissolved carbon in the water column. For example, at pH greater than 8.3, bicarbonate is the dominant form of carbon available to the pelagic algal community. Cyanobacteria (aka blue-green algae) have an adaptive advantage over other algal groups because they can more efficiently utilize that form of carbon. Other algal groups are dependent upon carbon dioxide, which is much less available in water with a pH above 8.3.



Profile of pH at Little Island Pond on July 30, 2020. The dashed lines represent the upper and lower boundary of the metalimnion and the solid red line represents the approximate location of the thermocline.

Relative cyanobacteria (aka blue-green algae) biomass profiles were collected with a fluorimeter incorporated into the sensor array on the AER's field multimeter. Fluorimeters work on the principal that a particular substance fluoresces at a specific wavelength when light of another wavelength is directed on that substance. The fluorimeter in AER's field instrumentation emits a wavelength that interacts with a photosynthetic pigment unique to cyanobacteria (i.e. phycocyanin). This sensor is not calibrated to a known concentrations of phycocyanin; therefore, measurements are not quantitative. Instead the measurements are relative to other measurements in the water column or at other sites.



Profile of relative cyanobacterial biomass (Rel. Cyanos.) at Little Island Pond on July 30, 2020. The dashed lines represent the upper and lower boundary of
the metalimnion and the solid red line represents the approximate location

Algae cell concentrations and relative abundance by genus and taxa at Little Island Pond on July 30, 2020.

Taxa	Genus / species	Cells / mL	%	Taxa cells / mL	Taxa %
Cyanophyta	*Chroococcus sp.*	15	1.8	303	37.4
	Dolichospermum sp.	13	1.6		
	Pseudoanabaena sp.	84	10.4		
	Woronichinia sp.	191	23.6		
Chlorophyta	*Cosmarium sp.*	4	0.5	436	53.8
	Coelastrum sp.	64	7.9		
	Gloeocystis sp.	288	35.6		
	Nephrocytium sp.	41	5.1		
	Oocystis sp.	13	1.6		
	Scenedesumus sp.	19	2.3		
	Sphaerocystis sp.	7	0.9		
Chrysophyta	*Mallomonas sp.*	2	0.2	15	1.8
	Uroglenopsis sp.	13	1.6		
Bacillariophyta	*Tabellaria sp.*	2	0.2	13	1.6
	Epiphytic Diatom	11	1.4		
Pyrrohophyta	*Ceratium sp.*	0	0.0	6	0.7
	Glenodinium sp.	6	0.7		
	Gymnodinium sp.	0	0.0		
	Peridinium sp.	0	0.0		
Cryptophyta	*Cryptomonas sp.*	13	1.6	13	1.6
	Rhodomonas sp.	0	0.0		
Euglenophyta	*Euglena sp.*	0	0.0	4	0.5
	Phacus sp.	0	0.0		
	Trachelomonas sp.	4	0.5		
Ochrophyta	*Stichogloea sp.*	7	0.9	7	0.9
	Unidentified	13	1.6	13	1.6
	Totals	810	100	810	100.0

List of algal genera based on analyses of plankton net and whole

CYANOPHYTA	*Chroococcus sp.*
	Dolichospermum sp.
	Microcystis sp.
	Pseudoanabaena sp.
	Woronichinia sp.
CHLOROPHYTA	*Coelastrum sp.*
	Cosmarium sp.
	Elakatothrix sp.
	Gloeocystis sp.
	Nephrocytium sp.
	Oocystis
	Quadrigula sp.
	Scenedesmus sp.
	Sorastrum sp.
	Sphaerocystis sp.
CHRYSOPHYTA	*Mallomonas sp.*
	Uroglenopsis sp.
BACILLARIOPHYTA	*Tabellaria sp.*
PYRRHOPHYTA	*Glenodinium sp.*
CRYPTOPHYTA	*Cryptomonas sp.*
EUGLENOPHYTA	*Trachelomonas sp.*
OCHROPHYTA	*Stichogloea sp.*

Analyses	Units	Surface	Bottom
Chlorophyll-*a*	µg/L	0.59	N/A
Secch Transparency	meter	4.94	N/A
Ammonia	µg/L	0	167
Nitrate	µg/L	0	64
Nitrite	µg/L	0	0
TKN	µg/L	288	424
TN	µg/L	288	488
TP	µg/L	0	45
Alklalinity	mg/L	18	20
Dissolved Organic Carbon (DOC)	mg/L	4.6	3.9

Chlorophyll-a is a photosynthetic pigment common to all algae, including blue-green algae (aka cyanobacteria); it is used by the algae and plants in the production of sugars and can be used as a proxy for algal biomass.

Secchi disk transparency is a standard Limnological measurement that assesses how much light is transmitted through the water column. How far light penetrates is inversely related to the amount of particulate matter suspended in the water column that absorbs or scatters light. The particulate matter can be inorganic (e.g. silts, clays, etc.) or organic (e.g. phytoplankton) in nature. Since transparency is more often related to the organic particulate matter in the water column, the measurement has historically been used to assess algal productivity and trophic level (Table 1).

Secchi disk transparency is also used to determine the strata in the water column where enough light penetrates to support a condition where more oxygen is produced from algal photosynthesis than is consumed in aerobic cellular respiration. This is referred to as the Compensation Depth and is estimated by doubling the Secchi transparency.

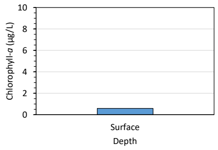
Phosphorus in freshwater systems is commonly the nutrient in the shortest supply and in greatest demand by the algae; therefore, it often the nutrient limiting algal productivity. Sources of phosphorus can be imported from the watershed (i.e. allochthonous) or derived internally from anoxic sediments (i.e. autochthonous). Total phosphorus is the analysis frequently conducted; it represents all forms of phosphorus in a sample, i.e. particulate and soluble forms.

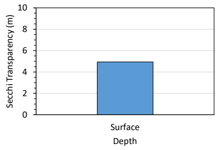
Nitrogen is commonly the second most limiting nutrient for algae in freshwater systems. It can be present in a number of forms in lake water. Ammonia – a reduced form of nitrogen – is important because it can affect the productivity, diversity, and dynamics of the algal and plant communities. Ammonia can be indicative of internal nutrient loading since bacteria will utilize other forms of nitrogen (e.g. nitrite and nitrate) in lieu of oxygen for cellular respiration under anoxic conditions, resulting in ammonia enrichment of the hypolimnion.

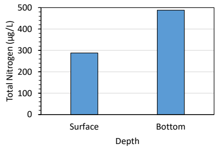
Total Kjeldahl nitrogen (i.e. TKN) is a measure of the reduced forms of nitrogen (including ammonia) and total organic proteins in the water column. Since TKN accounts for biologically derived, nitrogen-rich proteins in the water column, it is useful in assessing the productivity of the lentic system. Nitrate and nitrite are often below detectable levels in natural systems because they are quickly cycled by bacteria and aquatic plants. Total nitrogen is the sum total of TKN, nitrate, and nitrite. Since the latter two are often below detectable limits, TKN levels are often similar or equal to total nitrogen levels.

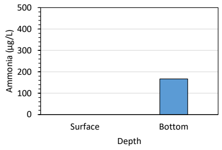
Trophic classification criteria used by the Connecticut Experimental Agricultural Station (Frink and Norvell, 1984) and the CT DEP (1991) to assess the trophic status of Connecticut lakes. The categories range from oligotrophic or least productive to highly eutrophic or most productive.

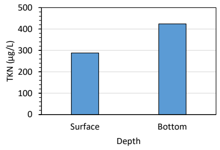
Trophic Category	Total Phosphorus (µg / L)	Total Nitrogen (µg / L)	Summer Chlorophyll-*a* (µg / L)	Summer Secchi Disk Transparency (m)
Oligotrophic	0 - 10	0 - 200	0 - 2	>6
Early Mesotrophic	10 - 15	200 - 300	2 - 5	4 - 6
Mesotrophic	15 - 25	300 - 500	5 - 10	3 - 4
Late Mesotrophic	25 - 30	500 - 600	10 - 15	2 - 3
Eutrophic	30 - 50	600 - 1000	15 - 30	1 - 2
Highly Eutrophic	> 50	> 1000	> 30	0 - 1

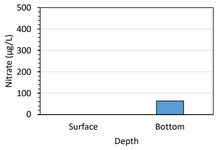


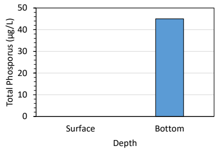


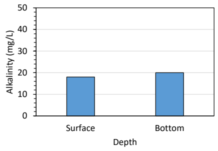












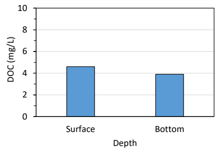


Table 7. Trophic classification criteria used by the Connecticut Experimental Agricultural Station (Frink and Norvell, 1984) and the CT DEP (1991) to assess the trophic status of Connecticut lakes. The categories range from oligotrophic or least productive to highly eutrophic or most productive.

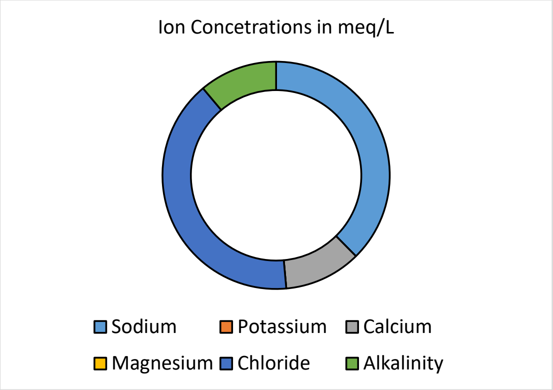
Trophic Category	Total Phosphorus (µg / L)	Total Nitrogen (µg / L)	Summer Chlorophyll-*a* (µg / L)	Summer Secchi Disk Transparency (m)
Oligotrophic	[✓ 0 - 10]	0 - 200	[✓ 0 - 2]	>6
Early Mesotrophic	10 - 15	[✓ 200 - 300]	2 - 5	[✓ 4 - 6]
Mesotrophic	15 - 25	300 - 500	5 - 10	3 - 4
Late Mesotrophic	25 - 30	500 - 600	10 - 15	2 3
Eutrophic	30 - 50	600 - 1000	15 - 30	1 - 2
Highly Eutrophic	> 50	> 1000	> 30	0 - 1

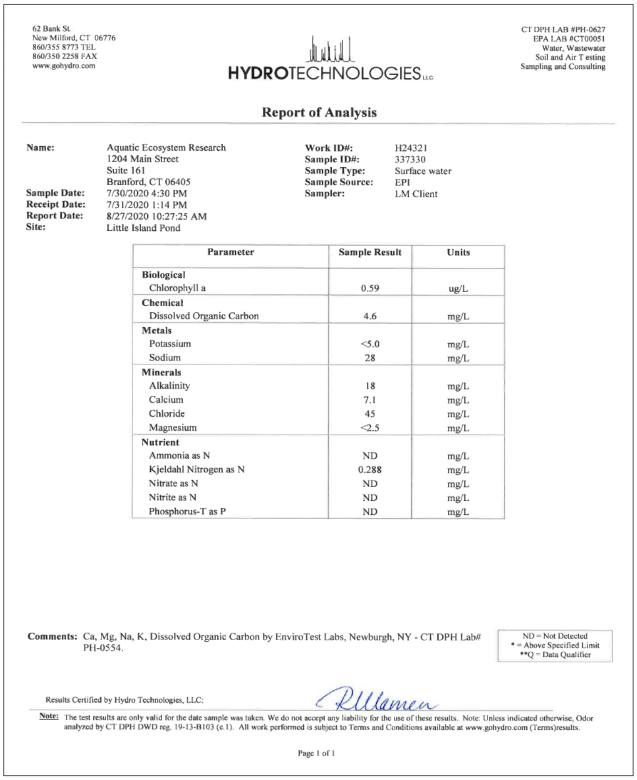
Based on these trophic classification criteria and conditions on July 30, 2020 , Little Island Pond is an oligotrophic - early mesotrophic lake.

◯ **Denotes levels measured at 1 meter of depth at Little Island Pond on July 30, 2020..**

Ions at 1m of Depth	mg/L	meq/L
Sodium	28	1.22
Potassium	0	0
Calcium	7.1	0.36
Magnesium	0	0
Chloride	45	1.31
Alkalinity	18	0.36
Total Cations	35.1	1.57
Total Anions	63	1.67

Base cation and anion concentrations are important in understanding natural influences (e.g. dissolved salts from bedrock geology) as well as anthropogenic influences from the watershed (e.g. road salts). In lakes of the Northeast, the dominant base cations in lake waters are calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}) and potassium (K^{+}). Dominant anions include chloride (Cl-), sulfate (SO_4^{2-}), carbonate ($CO^{2-}{}_3$), and bicarbonate (HCO_3^{-}). In this assessment we examined the base cations, chloride, and alkalinity anions (carbonate and bicarbonate).





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CT DPH LAB #PH-0627
EPA LAB #CT00051
Water, Wastewater
Soil and Air T esting
Sampling and Consulting

Report of Analysis

Name:	Aquatic Ecosystem Research 1204 Main Street Suite 161 Branford, CT 06405	**Work ID#:**	H24321
		Sample ID#:	337330
		Sample Type:	Surface water
		Sample Source:	EPI
Sample Date:	7/30/2020 4:30 PM	**Sampler:**	LM Client
Receipt Date:	7/31/2020 1:14 PM		
Report Date:	8/27/2020 10:27:25 AM		
Site:	Little Island Pond		

Parameter	Sample Result	Units
Biological		
Chlorophyll a	0.59	ug/L
Chemical		
Dissolved Organic Carbon	4.6	mg/L
Metals		
Potassium	<5.0	mg/L
Sodium	28	mg/L
Minerals		
Alkalinity	18	mg/L
Calcium	7.1	mg/L
Chloride	45	mg/L
Magnesium	<2.5	mg/L
Nutrient		
Ammonia as N	ND	mg/L
Kjeldahl Nitrogen as N	0.288	mg/L
Nitrate as N	ND	mg/L
Nitrite as N	ND	mg/L
Phosphorus-T as P	ND	mg/L

Comments: Ca, Mg, Na, K, Dissolved Organic Carbon by EnviroTest Labs, Newburgh, NY - CT DPH Lab# PH-0554.

ND = Not Detected
* = Above Specified Limit
**Q = Data Qualifier

Results Certified by Hydro Technologies, LLC:

Note: The test results are only valid for the date sample was taken. We do not accept any liability for the use of these results. Note: Unless indicated otherwise, Odor analyzed by CT DPH DWD reg. 19-13-B103 (e.1). All work performed is subject to Terms and Conditions available at www.gohydro.com (Terms)results.

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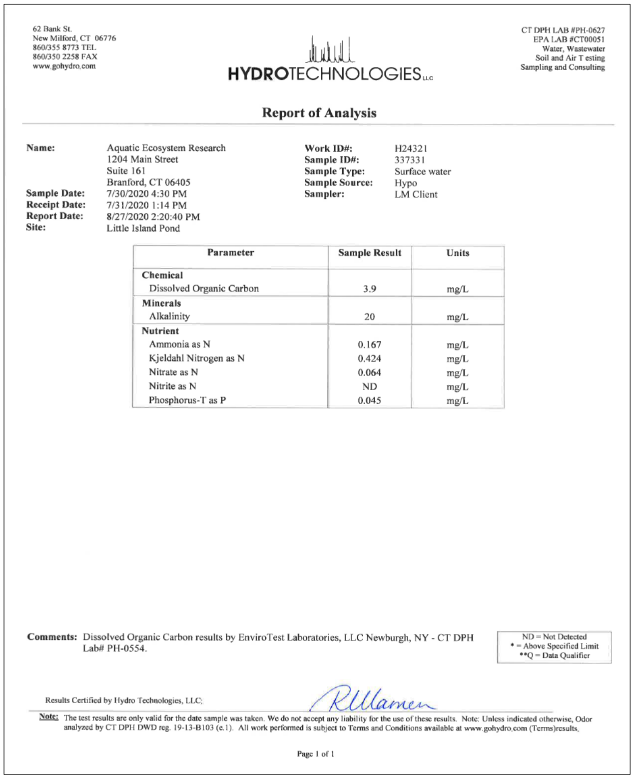

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HYDROTECHNOLOGIES LLC

CT DPH LAB #PH-0627
EPA LAB #CT00051
Water, Wastewater
Soil and Air T esting
Sampling and Consulting

Report of Analysis

Name:	Aquatic Ecosystem Research 1204 Main Street Suite 161 Branford, CT 06405	**Work ID#:**	H24321
		Sample ID#:	337331
		Sample Type:	Surface water
		Sample Source:	Hypo
Sample Date:	7/30/2020 4:30 PM	**Sampler:**	LM Client
Receipt Date:	7/31/2020 1:14 PM		
Report Date:	8/27/2020 2:20:40 PM		
Site:	Little Island Pond		

Parameter	Sample Result	Units
Chemical		
Dissolved Organic Carbon	3.9	mg/L
Minerals		
Alkalinity	20	mg/L
Nutrient		
Ammonia as N	0.167	mg/L
Kjeldahl Nitrogen as N	0.424	mg/L
Nitrate as N	0.064	mg/L
Nitrite as N	ND	mg/L
Phosphorus-T as P	0.045	mg/L

Comments: Dissolved Organic Carbon results by EnviroTest Laboratories, LLC Newburgh, NY - CT DPH Lab# PH-0554.

ND = Not Detected
* = Above Specified Limit
**Q = Data Qualifier

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