AQUATIC ECOSYSTEM RESEARCH
A Freshwater Conservation Company

CANDLEWOOD LAKE AND SQUANTZ POND

2017 Water Quality Monitoring

Prepared for the
Candlewood Lake Authority
Sherman, CT
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EXECUTIVE SUMMARY

As part of its management strategy, the Candlewood Lake Authority (CLA) has supported a water quality monitoring program on Candlewood Lake and Squantz Pond that has run uninterrupted since the mid-1980s. This past season, CLA contracted with Aquatic Ecosystem Research (AER) to complete the 2017 monitoring program field work, compile and assess the field and laboratory data, and report on it. Based on that assessment, AER characterizes Candlewood Lake as a mesotrophic to late mesotrophic lake with chemical characteristics (e.g. conductivity, pH, alkalinity, base cations levels) similar to lakes in the Marble Valley geological region of Connecticut, and Squantz Pond as an early mesotrophic to mesotrophic lake with characteristics similar to lakes in the Western Uplands geological region of Connecticut.

As part of its assessment, AER has provided some historical context to the 2017 findings using recently published research on time series water quality data and AER's own analyses of historical data on Candlewood Lake. AER also performed a preliminary water quality trends analyses for Squantz Pond using the 32-year database the CLA has amassed for that lake.

Both lakes have experience similar trends over the last 32 years, e.g. both have experienced improvements in trophic variables (e.g. lowering of nutrient levels, improving Secchi transparency) but are also both increasing in conductivity levels. The increasing conductivity trend appears due in large part to increasing concentrations of sodium, calcium, magnesium, chloride and possibly, alkalinity. Other variables like pH have also been shown to be increasing at Candlewood Lake. In addition, both lakes are experiencing changes in seasonal patterns of stratification. This is more prevalent for Candlewood Lake than Squantz Pond.

While the traditional indicators of poorer water quality that results in cyanobacteria blooms, i.e. nutrient enrichment, are not reflected in the datasets at Candlewood Lake and Squantz Pond, other changes in water chemistry and changes in thermal stratification patterns do provide adaptive advantages for cyanobacteria (blue-green algae). AER hypothesizes that the recent pattern of more frequent and intense algae blooms in the last five to ten years in Candlewood Lake, and to a lesser degree in Squantz Pond, is due in large part to the kinds of changes described above and in this report.

AER has provided in this report recommendations to aid in the development of a management strategy going forward to improve water quality at Candlewood Lake and Squantz Pond.

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ACKNOWLEDGEMENTS

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INTRODUCTION

Candlewood Lake is a man-made, pumped-storage reservoir created in the late 1920s for the purpose of generating hydroelectricity. After being constructed, the lake became an important State asset due to the environmental and recreational resources it provided in addition to the generation of hydroelectric power. Candlewood Lake continues to be an important economic resource because lake property is in high demand, it generates significant tax revenue, and is a tourist destination in the Greater Danbury – New Milford region; furthermore, the lake also provides substantial ecosystem services, including habitat for Connecticut State listed species (CT DEEP 2017).

Squantz Pond is hydrologically connected to Candlewood Lake (Fig. 1), shares a similar history, and provides similar value to the area despite being five percent of the size of Candlewood Lake. Squantz Pond is situated within the political borders New Fairfield and Sherman; Candlewood Lake also is situated within the aforementioned towns and also spans the towns of Brookfield, Danbury, and New Milford.

The water qualities of Candlewood Lake and Squantz Pond have been assessed annually since the mid-1980s as recommended in the Candlewood Lake Authority Lake Management Plan (CLA 1985). There have also been several studies since the 1930s examining both lakes as part of a multi-lake statewide survey (e.g. Deevey 1940, Frink and Norvell 1984, CT DEEP 1984, Canavan and Siver 1994, 1995, Jacobs and O'Donnell 2002). Other studies have examined trends in the water quality of Candlewood Lake (Marsicano et al. 1996, Kohli et al. 2017) and the influences of the drawdown program established in the 1980s to manage the aquatic invasive plant species, Eurasian watermilfoil (*Myriophyllum spicatum*) (Siver et al. 1986, Lonergan et al. 2014).

The most recent peer-reviewed publication examined historical water quality in conjunction with winter drawdowns from 1985 through 2012 (Kohli et al. 2017). That study detected a statistically significant improvement in trophic water quality conditions (e.g. less phosphorus) over time; the authors' analyses revealed that water quality was statistically better following deep drawdowns (8 to 10 ft.) compared to alternate year shallow drawdowns (4 to 6 ft.). That study also concluded that there is a trend of increasing lake-water conductivity (i.e. total ion concentration). These findings do not support recent assertions that the trophic state of Candlewood Lake has significantly declined in recent decades or that deep winter drawdowns were linked to poor water quality conditions.

Despite the water quality improvements detected from 1985 through 2012, Candlewood Lake, Squantz Pond, and other water bodies in Connecticut have experienced increased frequency and intensity of blue-green algae (also called cyanobacteria) blooms in recent years. Efforts to educate the public about the conditions that result in cyanobacteria blooms have become a priority at the regional, national and global level (e.g. CT DEEP 2017, USEPA 2017).

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Site Descriptions

Candlewood Lake has a surface area of 5,064 acres, a 65-mile shoreline, and a watershed of 25,907 acres (Jacobs and O'Donnell 2002). The lake has a maximum depth of 89 feet (25 meters), and an average depth of 33 feet (10 meters). Analyses of land use was summarized in Kohli et al. (2017, Table 1), indicated that residential land cover has increased significantly since 1970 and likely led to increased phosphorus loading to the lake. The most recent analysis of the watershed (2007) identified the sub-basin immediately around the lake and the centers of New Fairfield and Sherman as some of the most highly developed areas in the watershed thereby exhibiting greater potential to contribute more phosphorus per unit area. Canavan and Siver (1994, 1995) categorized Candlewood Lake as a late mesotrophic, hard-water lake in the Marble Valley geological region of Connecticut.

Table 1. Percent coverage of urban, agricultural, wooded, and water in the immediate Candlewood Lake watershed in 1970 (Norvell et al. 1979), 1977 (CT DEP 1983), 1990 (Marsicano et al. 1995), and 2007 (Candlewood Lake Authority, Sherman, CT, Dec 2012, unpubl. data). Also provided are the lake total phosphorus levels predicted from land cover (Norvell et al. 1979).

Year	Urban	Agriculture	Wooded	Water	Predicted Total Phosphorus*
	(%)	(%)	(%)	(%)	(µg/L)
1970	11.7	8.5	57.0	22.0	20.6
1977	19.5	2.1	57.0	22.2	22.2
1990	28.7	5.6	43.6	21.7	37.1
2007	28.3	1.9	47.1	22.7	34.5

*Predicted values are based on the method of Norvell et al. 1979

Squantz Pond has a surface area of 270 acres, a watershed of 3,662 acres, a maximum depth of 45 feet (14 meters), and an average depth of 27 feet (8 meters, Jacobs and O'Donnell 2002). Canavan and Siver (1994, 1995) categorized Squantz Pond as a mesotrophic lake in Connecticut's Western Upland geological region.

Study Purpose

The purpose of this report is to summarize the findings of the 2017 water quality monitoring programs of Candlewood Lake and Squantz Pond. Furthermore, these study findings were compared to other lakes in the same geological region (i.e. CT Marble Valley). This report will also compare the 2017 findings in Candlewood Lake to studies that summarized historical and contemporary data (i.e. years 1985 – 2012 in Kohli et al. 2017; years 2013 – 2016 CLA's unpublished data). Reporting has not been as intensive for Squantz Pond; therefore, AER will provide an initial data analysis for the large dataset that does exist.

In 2015 and 2017 the Connecticut Department of Energy and Environmental Protection (CT DEEP) issued permits for the import and liberation of triploid grass carp (*Ctenopharyngodon idella*) into Candlewood Lake. A permit was also issued in 2017 for the liberation of triploid grass carp into Squantz Pond. Permit conditions required that specific monitoring of water quality parameters be conducted throughout the duration of this project. Additionally, the State required yearly reporting as a condition of the permit. This report summarizes the 2017 water quality conditions of Candlewood Lake, compares those conditions to historical data, and satisfies the reporting requirements of the State permit. Finally, this report provides recommendations for the continued management of Candlewood Lake and Squantz Pond.

METHODS

Four sites on Candlewood Lake and one site on Squantz Pond (Fig. 1) were visited monthly from May through October. Three of the Candlewood Lake sites are located in the major arms or bays, i.e., the Sherman Arm (SH), New Milford Arm (NM) and Danbury Bay (DB). One site is located in the center of Candlewood Lake (NF). A single sample site was examined monthly in Squantz Pond (SQ); it was located in the center – deepest – portion of the lake. All sites had a maximum depth of 11 to 12 meters with the exception of NM, which was 23 meters deep.

During each visit, Secchi transparency depth was measured with a 22cm Secchi disk. Vertical profiles of six parameters were obtained using a Eureka Manta II Sensor; profile data were collected at the surface and at every meter to the sediment water interface. The following variables were measured as vertical profiles: temperature (°C), dissolved oxygen (mg/L), percent oxygen saturation (% O_2), specific conductance (µmhos/cm), pH, and relative cyanobacteria concentration (cells/mL).

Water samples were collected at each site visit; those samples were analyzed for the variables outlined in Table 2 by a State-certified laboratory. Those samples were captured at 1m below the surface (epilimnion), less than 0.5m above the sediment water interface (hypolimnion), and the thermocline, which was determined based on the sample date's vertical temperature profiles. Analyses conducted on collected samples including each analysis' frequency are outlined in Table 2.

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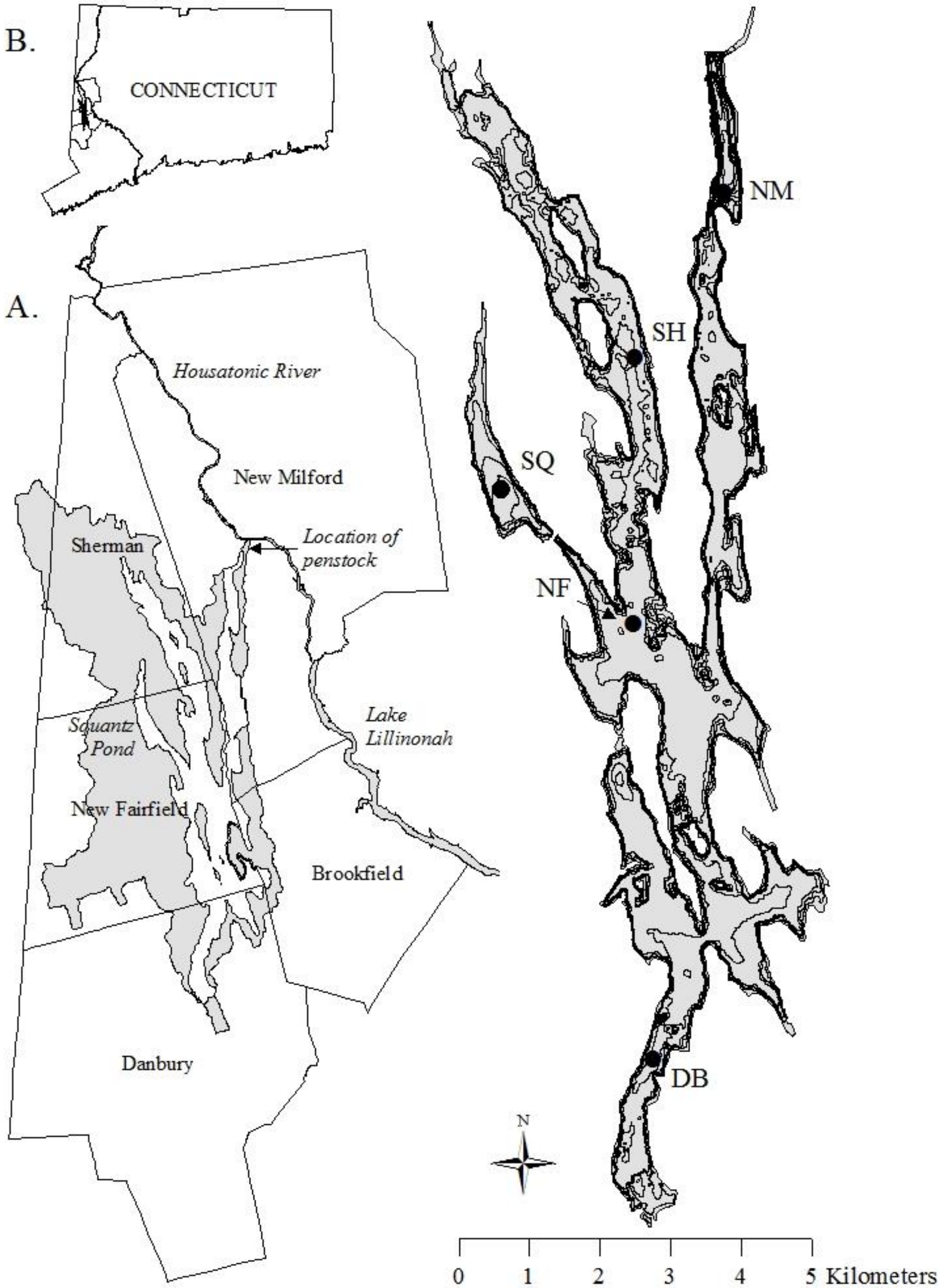

Figure 1. Location of sampling sites on Candlewood Lake (DB, NF, NM, SH) and Squantz Pond (SQ). Inset A shows the location of the watershed and municipalities in relation to the lakes. Inset B shows the location of the lake and municipalities within the State of Connecticut.

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Table 2. Chemical analyses and schedule for Candlewood Lake and Squantz Pond during the 2017 season.

Variable	Units	Collection Depth	Collection Frequency
Total Phosphorus	µg/L	Epilimnion, Metalimnion Hypolimnion	Monthly
Total Nitrogen	mg/L		
Total Kjeldahl Nitrogen	mg/L		
Nitrate	mg/L		
Nitrite	mg/L		
Ammonia	mg/L		
Alkalinity	mg/L		
Chlorophyll-a	µg/L	Epilimnion	Monthly
Calcium	mg/L	Epilimnion	Every other month (May, July, September)
Magnesium	mg/L		
Sodium	mg/L		
Potassium	mg/L		
Chloride	mg/L		

2017 WATER QUALITY MONITORING SUMMARY: CANDLEWOOD LAKE

Thermal and Oxygen Profiles

The variables evaluated and data collected in the vertical profiles are provided in Appendix 1. Temperature, dissolved oxygen, and Relative Thermal Resistance to Mixing (RTRM) profiles for the NF and NM sites are graphically presented in this report (Figs. 2 and 3); graphic representations of the DB and SH profiles are omitted from this report because they are similar to the NF site.

Water temperature was nearly homogeneous to a depth of 7 – 8 meters (m) in May at all four sites. Water temperatures below the 7 – 8m stratum were cooler, which is indicative of the early stages of stratification. Dissolved oxygen levels were above the biologically critical limit of 5.0mg/L throughout the entire water column at the time of the May sampling event at all sites and all depths.

By June 2017, the water column was well stratified; the metalimnion occurred from 4 to 7 or 8m depending on site. The greatest RTRM value (i.e. least mixing of layers) was between 5 and 6m at all sites. Oxygen concentration was less than 5.0mg/L below 6m; anoxic conditions were found below 8m at the SH site and below 9m at the DB and NF sites. At the NM site, oxygen concentrations fell below critical levels from 7 to 16m ranging from 2.2 to 4.5mg/L, increased above 5.0mg/L between 17 to 19m, and gradually declined with depth where anoxic conditions were found below 22m.

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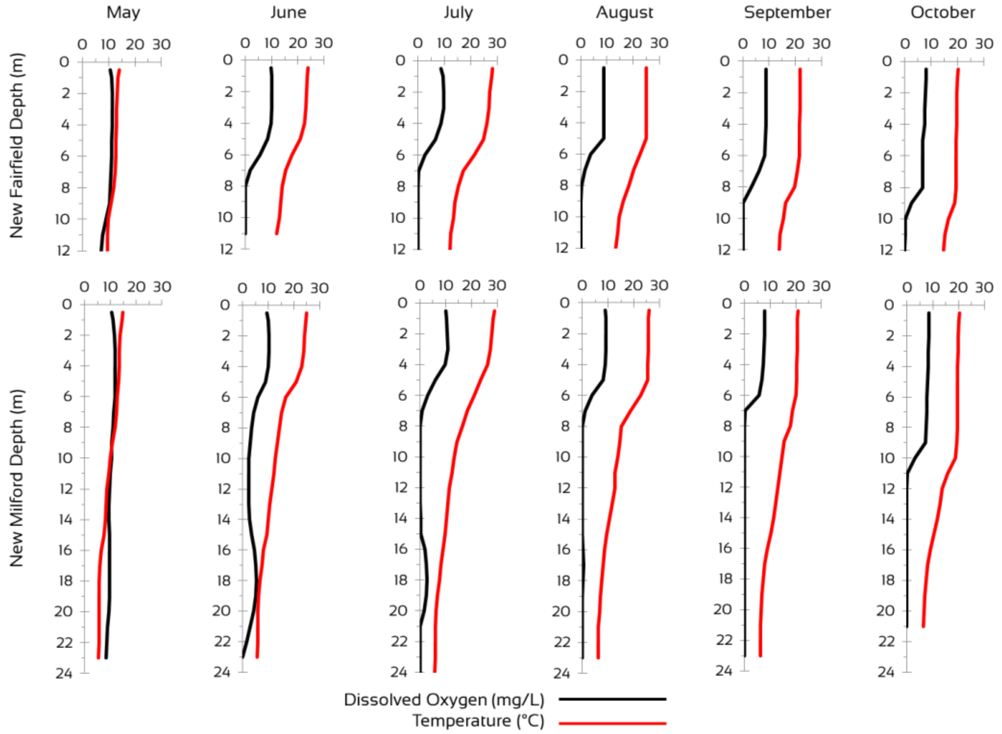

Figure 2. Temperature and oxygen profiles for NF and NM sites during the 2017 monitoring season.

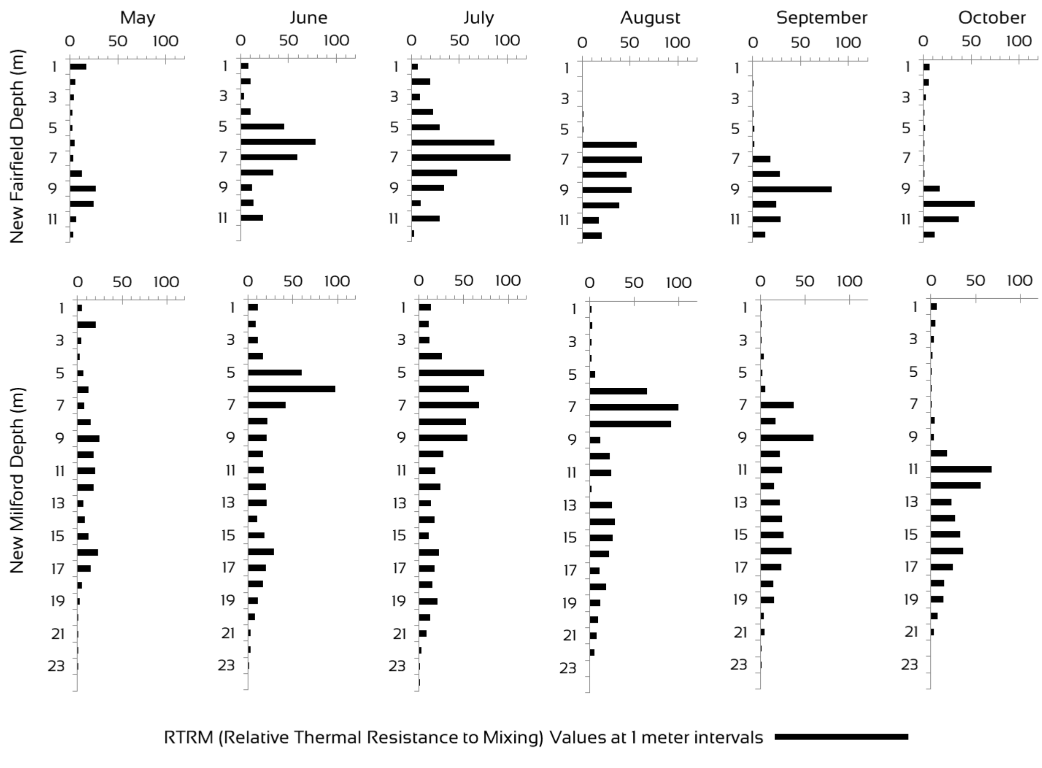

Figure 3. Profiles of RTRM values between meters at NF and NM sites during the 2017 monitoring season.

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Temperature and oxygen profiles at all sites were similar in July and August; however, there were some important differences. The lower boundary of the epilimnion was between 3 and 5m in July, depending on site. The top of the hypolimnion was found between 8 and 9m depending on site. In August, the top of the metalimnion was deeper by about one meter at all sites. Oxygen concentrations were less than 5mg/L below 5m and anoxia was encountered at all sites; the stratum where anoxia was encountered varied by site.

The first important difference observed between July and August profiles was the surface temperature. Surface water temperatures exceeded 28°C (82°F) in July but only 25 to 26°C (approximately 77 to 79°F) in August. Secondly, there was little resistance to mixing in the epilimnion at all sites in August; there were measurable RTRM values in July that diminished by August (see Fig. 3). The highest total resistance to mixing in the water column at all sites was observed in July 9 (Appendix 1). Therefore, the epilimnetic regions of the water column were mixed to a lesser degree in July compared to August. That condition of an epilimnion with minimal resistance to mixing persisted through October.

September and October profiles exhibited distinct and concordant stratification characteristics among all sites except SH. The Sherman site was nearly homogenous from top to bottom in October (Appendix 1). The proportion of the water column at or above critical oxygen levels increased as the thermocline became less prominent; however, oxygen was still below critical limits below the thermocline; anoxia was found near the sediment-water interface. The exception to that finding, which was true of most sites, was the NM site where oxygen concentrations below 1.0mg/L were found throughout much of the water column into October.

State of Nitrogen

All nutrient data, including nitrogen, can be found in Appendix 2. Nitrogen can be present in a number of forms in water. Ammonia – a reduced form of nitrogen – is important because it can affect the productivity, diversity, and community 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 under anoxic conditions, resulting in ammonia enrichment of the hypolimnion. Other forms of nitrogen in lake waters are nitrite and nitrite. Furthermore, Total Kjeldahl Nitrogen (i.e. TKN) is a measure of the reduced forms of nitrogen (i.e. ammonia) and total organic proteins in the water column. The former two are generally found to be below detectable levels in natural systems because they are quickly cycled by bacteria and aquatic plants. TKN is a nitrogen variable used to assess the productivity of the lentic system because it accounts for biologically derived proteins in the water column. Total nitrogen (see Table 2) is the sum of TKN, nitrate and nitrite. Since the latter two are often below detectable limits, TKN levels are often the same as total nitrogen levels.

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Ammonia levels in epilimnetic waters of all four sites were below detectable levels throughout the entire season. The metalimnion of Candlewood Lake was found to contain 0.1 to 0.2mg/L of ammonia at all sites in July. Furthermore, the metalimnetic waters contained 0.42mg/L at the Sherman site in September, and 0.14mg/L at Danbury in October. This suggests that ammonia is likely cycled quickly by the algal and plant communities of Candlewood Lake. The metalimnetic ammonia detected in September and October could be reflective of a layer of cyanobacteria (blue-green algae) residing at that specific layer of the water column.

Detectable ammonia levels were common in the hypolimnion; that variable ranged from 0.19 to 1.12mg/L when it was present above detectable levels. Higher values were more prevalent in the latter half of the season, which is suggestive of internal nitrogen loading when oxygen is limited. The Sherman site had the highest count of ammonia detections (4) in the hypolimnion; the concentrations at that site ranged from 0.19 to 0.71mg/L, all of which occurred between July and October. The New Milford site was found to have a detectable hypolimnetic ammonia concentration in May.

Nitrate was not detected in any epilimnetic or metalimnetic samples during the 2017 season at any sites. Nitrate was detectable in hypolimnion of all sites in May; values ranged from 0.05 to 0.19mg/L. Only the New Milford site contained a detectable concentration after May. The values detected at the New Milford site exhibited a diminishing trend between June and August; the monthly values for June, July, and August were 0.42 to 0.29 to 0.06mg/L, respectively.

Epilimnetic TKN levels ranged from 0.20 to 0.97mg/L among all sites; the 2017 season average for Candlewood Lake for all sites was 0.44mg/L. Danbury and Sherman sites had modestly higher season average concentrations (0.48 and 0.46mg/L, respectively) compared to the New Fairfield and New Milford sites (0.43 and 0.40mg/L, respectively). May and June concentrations were modestly higher at all sites, which suggests that the watershed had an early season influence on the productivity of the Candlewood system. A similar pattern was observed in the metalimnetic samples.

Hypolimnetic TKN levels ranged from 0.26 to 1.35mg/L; the seasonal average was 0.67mg/L. Higher concentrations were observed in August, September and October. This suggests that there is a very productive benthic bacteria community that is contributing to the frequent deoxygenation detected in Candlewood Lake.

State of Phosphorus

Phosphorus is often the nutrient limiting the algal community productivity. Using the available data (October samples were unreliable based on laboratory error), the season's lake-wide average epilimnetic phosphorus concentration was 15µg/L; monthly assessments ranged from 7 to 27µg/L. The highest lake-wide average was found in June (24ug/L); monthly epilimnetic averages of lake-wide phosphorus declined to 9µg/L by September.

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The phosphorus concentrations observed in the metalimnion ranged between 9 and 29µg/L with a mean of 19ug/L (Appendix 2). The average metalimnetic phosphorus concentration was significantly higher than that of the epilimnion ($p<0.05$) and there were no significant differences in the metalimnetic phosphorus concentration among sites. May phosphorus concentrations (range 12-16ug/L) increased to the highest level by July (range 24-29ug/L). By September, the phosphorus concentration of Candlewood Lake diminished to levels nearly equal to those found in May.

Hypolimnetic phosphorus concentrations from May through September ranged from 9 to 104 µg/L with an average of 37 µg/L for the season. The monthly lake-wide average increased from 14 µg/L (May) to 57 µg/L (August and September). The range of phosphorus concentrations observed in the later months were greater than those observed in the early parts of the season. In May total hypolimnetic phosphorus concentrations ranged 9 to 16µg/L; in August and September the hypolimnetic phosphorus concentration ranges were 13 to 104 µg/L and 9 to 88µg/L, respectively.

Phosphorus or Nitrogen Limitation

In freshwater systems phosphorus, followed in importance by nitrogen, limit algal productivity since they are the most important nutrients for all plants. Limnologists often use the Redfield ratio 16:1 of total nitrogen to total phosphorus to determine whether nitrogen or phosphorus is limiting (Redfield 1958). Ratios below 16 indicate nitrogen limitation while ratios above 16 indicate phosphorus limitations.

The Redfield ratios were calculated for both epilimnetic and metalimnetic samples where both total nitrogen and total phosphorus data was available (all months except October). In the epilimnion ratios ranged from 15 to 53 and averaged 33. In a single instance, the epilimnetic ratio was below 16. It occurred at the NM site in June when the ratio was 15. The average for the DB site for the season was 41 while at the other sites it ranged from 30 to 32.

In the metalimnion ratios ranged from 14 to 82 and averaged 31. The ratio of 82 was the only finding above 50; it occurred in September at the NF site when the highest metalimnetic ammonia level (0.39 mg/L) was measured. Redfield ratio averages for the season ranged from a low of 22 (at NM) to high of 38 (at NF).

These data clearly support that Candlewood Lake is almost always phosphorus limited.

Phosphorus Mass

An estimation of the mass of phosphorus in the epilimnion, metalimnion and hypolimnion over the 2017 season was performed to better understand nutrient dynamics, e.g.

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where is the phosphorus coming from and how much. This was done by using the total phosphorus concentration measured at each layer during each site visit, extrapolating mass by applying that concentration to the volume of the entire layer within the water column, and averaging mass for each layer for the lake over the season. This analysis makes some assumptions which may require further study, e.g. it assumes that the concentration of phosphorus 0.5m from the bottom is the same throughout the hypolimnion that may occupy many meters of the water column. Nonetheless, the analysis is useful to understand the general dynamics of the system.

In May the average mass of phosphorus in the epilimnion was approximately 2,000kg while only approximately 700kg in the hypolimnion (Fig 4). By July and for the remainder of the season the average epilimnetic mass ranged from 1,100 to 1,200kg. The mass in the hypolimnion increased to 1,400 and 1,500kg by June and July, respectively, and peaked in September at approximately 3,200kg. Average phosphorus mass in the metalimnion was calculated for June through August when stratification was most pronounced; was on average less than the mass in the layers above and below in June; greater than that estimated in the epilimnion and hypolimnion in July; and about same as the average mass of the epilimnion in August.

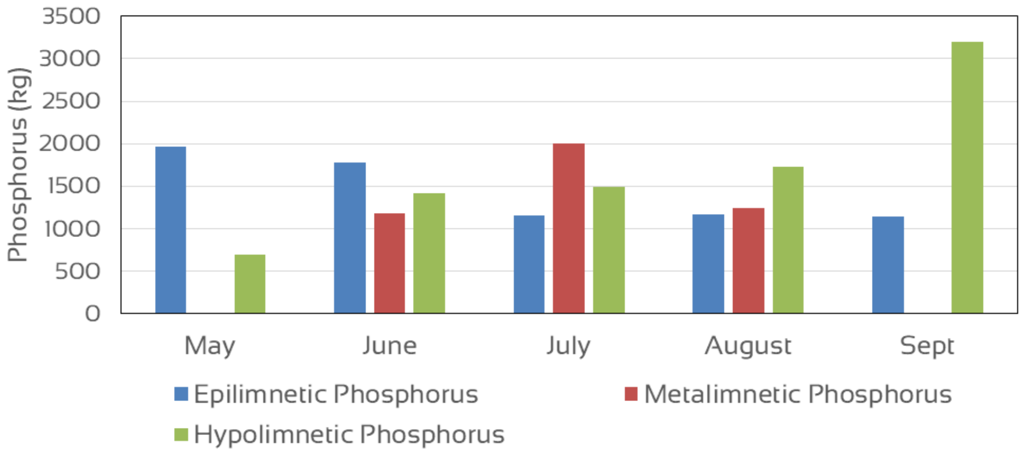

Figure 4. Estimations of mass of phosphorus in the epilimnion, metalimnion and hypolimnion at Candlewood Lake during the 2107 season.

It is important in these types of analyses to be aware of the changing volumes of layers, e.g. the volume of the metalimnion from June through August was greatest in July. Nonetheless, the analysis implies that nutrient levels, and by association productivity, in the early to mid-portion of the season is dependent upon watershed exports of nutrients. As the season progresses, the mass in the hypolimnion more than quadruples and indicative of internal nutrient loading. However, the average epilimnetic mass does not concurrently increase probably due to the strong separation of the water masses via stratification. Depending on how stratification breaks down, the water column may experience a sudden increase of phosphorus late in the fall season and potentially create algae bloom conditions.

Secchi Transparency, Chlorophyll-a and Blue-Green Algae Profiles

Secchi transparency and chlorophyll-*a* data can be found in Appendix 2. While phosphorus and nitrogen are important to the understanding of algal productivity, Secchi transparency and chlorophyll-*a* concentration are direct indicators of algal influence on water clarity and algae community size, respectively. Secchi transparency is a measure of the penetration of light down into the water column, which is reduced as particulate matter – including algae – increases. Chlorophyll-*a* concentrations reflect the number or volume of photosynthetic organisms, e.g. algae, in the water. The aforementioned variables have an inverse relationship; meaning that as Secchi transparencies increase, chlorophyll-*a* concentrations decrease. Conversely, when Secchi transparency decreases, chlorophyll-*a* concentrations increase. In concordance with phosphorus and nitrogen, these variables are used to assess the trophic status of the lentic system (Table 3).

Table 3. 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

Secchi transparencies of Candlewood Lake during 2017 ranged from 1.18 to 3.37m with a 2017 average of 2.53m. The lowest Secchi measurements were recorded in May when the lake average was 1.43m; the sites ranged from 1.18 to 1.59m. The greatest Secchi transparencies occurred in June and July when lake averages were 3.15 and 3.07m, respectively, and the sites ranged from 2.85 to 3.37m. Secchi transparencies

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were similar in August and September. The transparency ranged from 2.30 to 2.68m and averaged 2.49 and 2.47m in August and September, respectively.

In October, Secchi transparencies were similar among the DB, NF, and SH sites with measurements of 2.29, 2.19, and 2.36m, respectively; water clarity was measured at 3.09m at the NM site. Despite that and other small differences among sites over the season, there were no statistical differences in transparency among sites (P>0.05).

Chlorophyll-*a* concentrations in 2017 ranged from 3.9 to 11.9µg/L, with a yearly average of 6.1µg/L. A lake-wide average of 5.8µg/L was observed in May; the next month (June) the lowest average of 4.6µg/L was encountered. Aqueous chlorophyll-*a* concentrations gradually increased as the season progressed and reached a maximum in October when concentrations at DB, NF, and SH sites were 11.9, 8.8 and 9.2µg/L, respectively. October chlorophyll-a concentration at NM was 4.7µg/L. Seasonal site averages were not found to be statistically different (P>0.05).

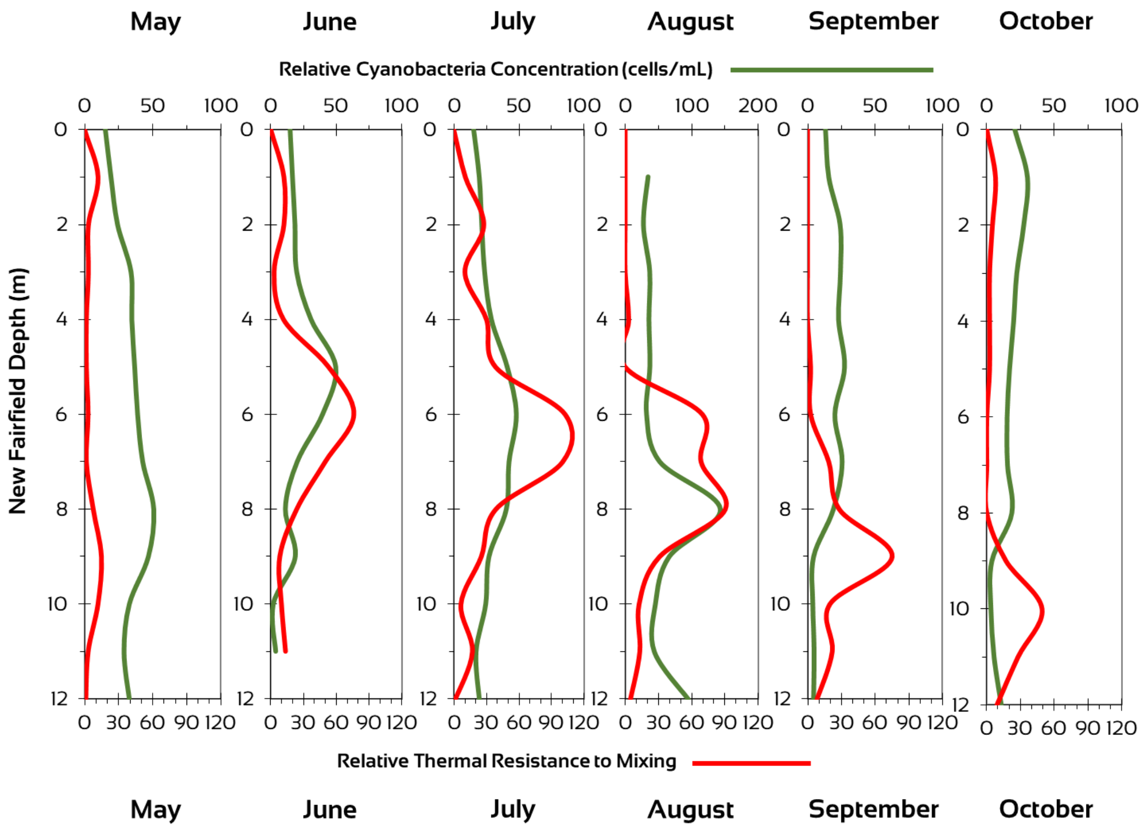

Figure 5. Relative thermal resistance to mixing (RTRM) and relative cyanobacteria cell concentrations (cells / mL) at the NF site during the 2017 monitoring season.

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Behaviors of blue-green algae (or cyanobacteria) within the water column varied greatly as a function of site and month. The greatest relative cell concentrations found in the water column were observed at or below the thermocline (i.e. depth of greatest RTRM). This phenomenon was particularly evident at all sites in the month of August (Fig. 5; Appendix 1). However, there were several occasions at the SH site when the highest relative cell concentration was found at the surface (see Appendix 1).

Alkalinity and pH

The pH of lake water is important for several reasons. Firstly, very low or very high pH levels will not support aquatic animal life. Algal communities are also influenced by pH due in part to the identity of dissolved carbon in the water column at various pH levels. For example, at a pH greater than 8.3, bicarbonate is the dominant form of carbon available to the pelagic algal community; the blue-green algae have adaptive advantages over other algal groups in that they are better equipped to utilize this form of carbon. Other algal groups are dependent upon carbon dioxide, which is not very present in water above pH of 8.3. Therefore, pH greater than 8.3 provides an adaptive advantage to the blue-green algae and will promote their dominance.

The pH measured in the epilimnion of Candlewood Lake during the 2017 season (Appendix 1) ranged from 7.9 to 8.9 standard units (SU) and averaged 8.4SU; seasonal averages among the four sites were within 0.2SU of each other. Lower pH values were found in May (7.9 to 8.4SU) and peak values were found in July and August with a range between 8.7 to 8.9SU; pH then dropped to values between 7.9 and 8.2SU during the months of September and October.

Alkalinity is a measure of calcium carbonate, and reflects the buffering capacity or acid neutralizing capacity of water. Alkalinity of surface waters is largely influenced by the geology and other influences of the watershed. Calcium carbonate concentration at the bottom of a lake can be generated internally from the dissimilatory reduction reactions of sulfate by bacteria found in the anoxic lake sediments (Siver et al. 2003).

Alkalinity in the epilimnion ranged from 64 to 76mg/L with a seasonal average of 70mg/L. Alkalinity assessments all fell between 70 to 76mg/L with the exception of DB and NF during the month of May and all sites in August when levels ranged between 64 to 69mg/L. There were no differences in seasonal means among sites ($P>0.05$).

Alkalinity of the hypolimnion ranged between 66 to 100mg/L during the season with a seasonal average of 81mg/L. Average alkalinity in the hypolimnion was found to be significantly different at the NM site compared to all other sites ($P<0.05$). The DB, NF, and SH sites alkalinity measurements were below 80mg/L during all sampling events with the following exceptions: DB in October; NF in September and October; and SH in September. At the NM site all monthly concentrations were 91 to 100mg/L with the

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exception of May when the concentration was 80mg/L. All alkalinity data is found in Appendix 2.

Conductivity and Ionic Concentrations

Base cation and anion concentrations are important in understanding natural influences from the watershed (e.g. dissolved salts from bedrock geology) and anthropogenic pollutants from the watershed (e.g. road salts). In the Northeast, the dominant base cations in lake water are calcium (Ca^{2+}), magnesium (Mg^{2+}), sodium (Na^{+}) and potassium (K^{+}). Dominant anions include chloride (Cl-), sulfate (SO_4^{2-}), carbonate, and bicarbonate.

Conductivity is a surrogate assessment of total dissolved solids and cations/anions in the water. Since temperature can affect conductivity, measurements are standardized to temperature, which is then termed specific conductivity. Higher conductivity measurements have been shown to coincide with cyanobacteria dominance in the algal community. Vertical changes in specific conductivity profiles of the water column, specifically higher conductivity at the lake bottom, is a result of the release of ions from the lake sediment under anoxic conditions.

Specific conductivity (hereafter conductivity) measurements at 1m depth in Candlewood Lake during the 2017 season (Table 4; Appendix 1) ranged from 231 to 249 µmhos/cm and average 242 µmhos/cm. The month of May exhibited the greatest variability among sites with averages at the SH site of 231 µmhos/cm, at the NM site of 249 µmhos/cm, and at the DB and NF sites of 242 and 240 µmhos/cm, respectively. As the season progressed, NM levels dropped and SH levels increased. Statistical differences did exist ($P<0.05$) among the seasonal site averages; the DB site average was marginally lower than the NF average (241 µmhos/cm); the DB site average was statistically higher than the NF and SH site averages; the NM site average was statistically higher than the SH site average and almost statistically higher from the NF average ($P=0.055$).

Concentrations of base cations and chloride are provided in Table 4. In summary, potassium levels ranged from 0.8 to 1.7mg/L and averaged 1.3mg/L. Sodium levels ranged from 14 to 18.5mg/L and averaged 15.9mg/L. Highest sodium levels were measured in May and ranged from 16.8 to 18.5mg/L. Magnesium levels ranged from 6.1 to 7.9mg/L and averaged 7mg/L.

The magnesium level measured at NM in May (7.87mg/L) was the highest of the season. Calcium levels ranged from 19 to 22mg/L and averaged 20.4mg/L for the season. Chloride levels ranged from 30 to 36mg/L and averaged 31.9mg/L for the season. Monthly chloride averages gradually diminished from 33.5mg/L in May to 32 mg/L in July to 30.3mg/L by September.

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Table 4. Base cation, chloride and conductivity at 1 meter depth at Candlewood Lake in 2017.

Danbury	Potassium (mg/L)	Sodium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)	Cond (µmhos/cm)
May	1.72	18.5	21.1	7.33	36	242
June						245
July	1.5	15	20	6.4	32	244
Aug						243
Sep	0.8	16	21	7.3	31	244
Oct						244
New Fairfield	**Potassium (mg/L)**	**Sodium (mg/L)**	**Calcium (mg/L)**	**Magnesium (mg/L)**	**Chloride (mg/L)**	**Cond (µmhos/cm)**
May	1.56	17.2	21.2	7.4	33	240
June						239
July	1.7	14	19	6.1	32	242
Aug						242
Sep	0.8	16	21	7.3	30	241
Oct						242
New Milford	**Potassium (mg/L)**	**Sodium (mg/L)**	**Calcium (mg/L)**	**Magnesium (mg/L)**	**Chloride (mg/L)**	**Cond (µmhos/cm)**
May	1.6	17.2	21.2	7.87	33	249
June						245
July	1.5	15	19	6.3	32	244
Aug						243
Sep	0.8	14	19	6.8	30	241
Oct						242
Sherman	**Potassium (mg/L)**	**Sodium (mg/L)**	**Calcium (mg/L)**	**Magnesium (mg/L)**	**Chloride (mg/L)**	**Cond (µmhos/cm)**
May	1.5	16.8	20.6	7.15	32	231
June						237
July	1.5	14	20	6.5	32	241
Aug						241
Sep	0.9	17	22	7.7	30	238
Oct						242
Lake Avg.	**Potassium (mg/L)**	**Sodium (mg/L)**	**Calcium (mg/L)**	**Magnesium (mg/L)**	**Chloride (mg/L)**	**Cond (µmhos/cm)**
May	1.6	17.4	21.0	7.4	33.5	241
June						242
July	1.6	14.5	19.5	6.3	32.0	243
Aug						242
Sep	0.8	15.8	20.8	7.3	30.3	241
Oct						243
Season Avg.	1.3	15.9	20.4	7.0	31.9	242

Thermal and Oxygen Profiles

As with the Candlewood Lake, the data collected at one-meter intervals at Squantz Pond is provided in Appendix 1. A graphic representation of monthly temperature, dissolved oxygen and RTRM values by depth are provided below (Fig. 6).

The water column at Squantz Pond was clearly stratified on May 24th, which differed from Candlewood Lake that was sampled twelve days earlier when stratification was in early stages. Highest RTRM values were observed at 3 to 5m as well as at 9m. This suggests, that following the development of the deeper thermocline, a rapid warming created another thermocline at shallower depths. Oxygen concentrations were above critical levels down to 9m then gradually decreased from 5.8 to 3.2mg/L at 11m. In June, a well-mixed epilimnion extended down to 4m with temperatures ranging from 24.3 to 23.7°C and oxygen levels above 9mg/L. A thermocline was observed between 4 and 5m as temperatures decreased to 19.7°C. RTRM was greatest between 4 and 5m.

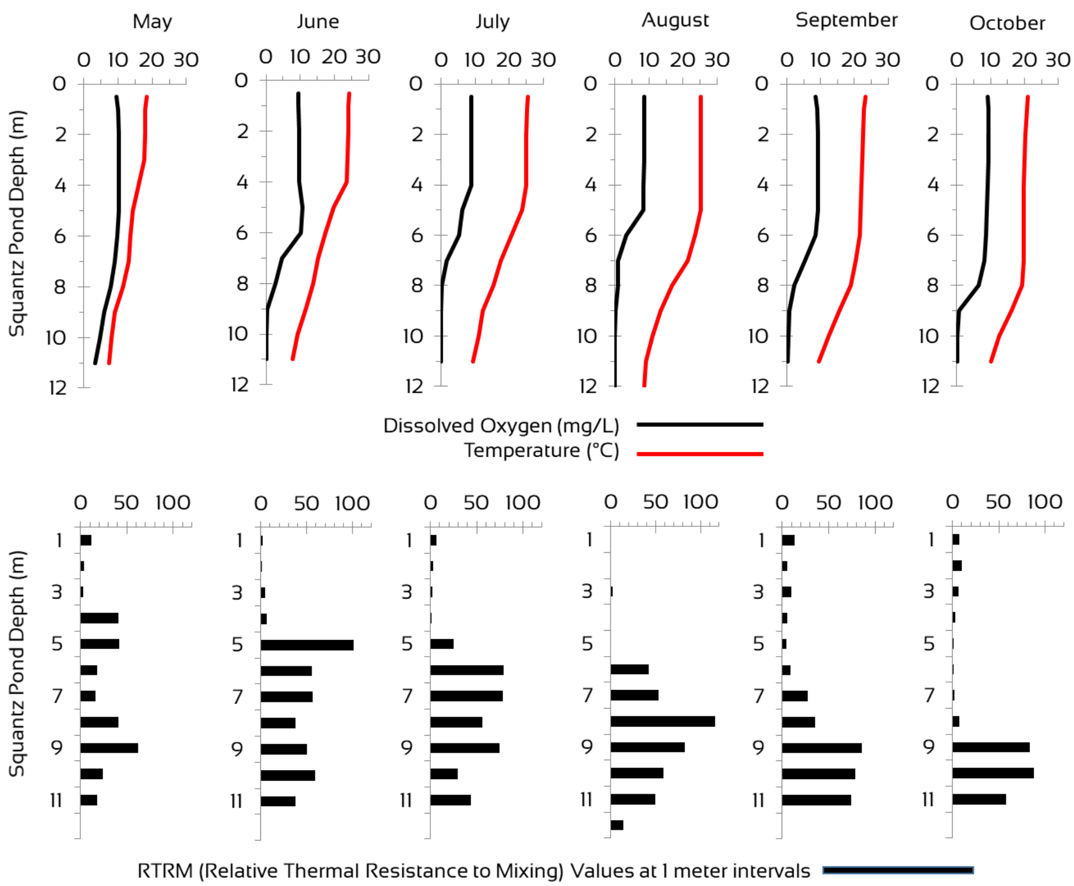

Figure 6. Temperature and conductivity profiles (top) and RTRM profiles (bottom) at Squantz Pond in 2017.

Highest oxygen levels were observed between 5 and 6m with values of 10.5 and 10.3mg/L, respectively, then diminished to <0.3mg/L from 9 meters to the bottom.

A similar pattern was observed in July with oxygen under critical levels by 7m. As the season progressed (August, September and October), the thermocline was pushed downward by mixing and critical oxygen levels were over 5mg/L above 9m. It is noteworthy that Squantz Pond water column was not completely mixed by October 5th.

Nitrogen and Phosphorus States

Squantz Pond nutrient data is found in Appendix 2. Epilimnetic ammonia, nitrate and nitrite levels were below detectable levels throughout the 2017 season. TKN (and TN since all nitrogen was in the form TKN) ranged from a low of 0.15mg/L in October, to a high of 0.38mg/L in June, and averaged 0.28mg/L for the season.

No detectable levels of ammonia, nitrate and nitrite were found at the metalimnion throughout the season. TKN levels at this depth ranged from a low of 0.17mg/L in September, to high of 0.87mg/L in June and averaged 0.41mg/L for the season.

Ammonia was detected in the hypolimnion in July through October, gradually increasing from 0.28 to 1.2mg/L. Small amounts (<0.1mg/L) of nitrate and nitrite were only observed in the hypolimnion in August. Hypolimnetic TKN levels ranged from 0.4 to 0.7mg/L for the first three months of the season and 0.88 to 1.2mg/L in the last three months with the highest levels observed in October.

Total phosphorus levels in the epilimnion ranged from 12 to 14µg/L and average 12.7µg/L for the season based on levels measured in May, July, August and September. Metalimnetic levels were only modestly higher with a maximum and a mean level of 20 and 14.8µg/L, respectively. Hypolimnetic levels ranged from 8 to 43µg/L and averaged 28.8µg/L for the season.

Phosphorus or Nitrogen Limitation

In the four instances where total nitrogen and total phosphorus data were available, the TN:TP ratios were very consistent, ranged from 21 to 24 with an average of 23, which was indicative of a phosphorus limited system. Similar conditions were observed in the metalimnion where a range of 11 to 32 and average of 23 was observed. The only time the ratio was below 16 in either the epilimnion or metalimnion was in September in the metalimnion when a ratio of 11 was observed.

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Secchi Transparency, Chlorophyll-a and Blue-Green Algae Profiles

Squantz Pond Secchi transparency and chlorophyll-*a* data are found in Appendix 2. Secchi transparency at Squantz Pond was on average 3.18m; 65cm greater than that at Candlewood Lake. Measurements at Squantz Pond in May were the lowest of the season at 1.93 m, but more than doubled by the June with a measurement of 4.11m. In July, Secchi transparency had declined modestly to 2.77m. In August through October measurements ranged from 3.21 to 3.71m with the reading in September the highest of those months.

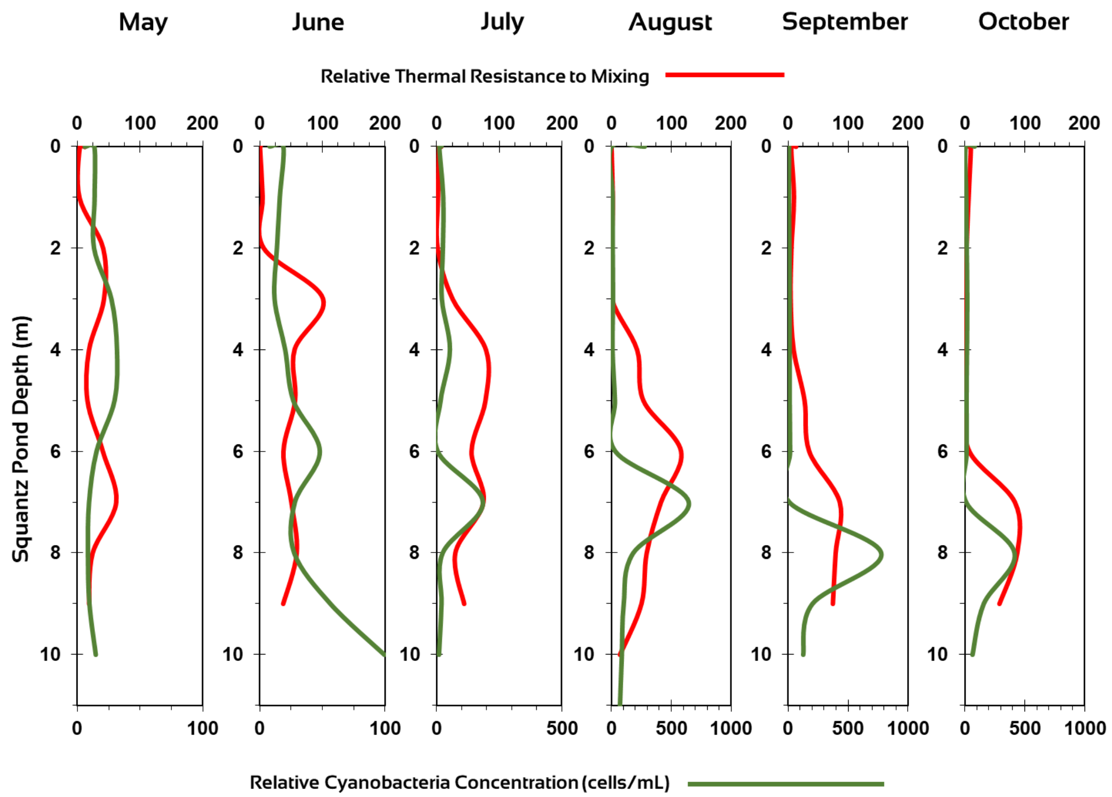

Figure 7. Relative thermal resistance to mixing (RTRM) and relative cyanobacteria cell concentrations (cells / mL) at the Squantz Pond site during the 2017 monitoring season.

Chlorophyll-*a* levels at Squantz Pond ranged from 0.8 to 4.2µg/L and averaged 2.9µg/L for the season. Concentrations from 3.4 to 3.6µg/L were observed in May through July. As seasonal low of 0.8µg/L was measured in August, followed by 1.7µg/L in September, and the seasonal high of 4.2µg/L in October.

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Relative cyanobacteria cell concentration profiles are provided in Fig. 7 and Appendix 1. In May and June, more equal distributions in the water column of modest concentrations were observed. In July, a greater and fairly consistent concentration was observed from the surface down to 6m, where levels appeared quite low. At 7m, however, a layer approximately 37 times more concentrated than at 6m and 7 times more concentrated than at 8m was observed. That spike of cyanobacteria cell concentration at 7m more than tripled by August. In September the greatest relative concentration was observed at 8m and was slightly greater than observed in August at 7m. The highest relative cell concentration in October was again observed at 8m but was slightly lower than that observed in September.

Alkalinity and pH

All pH data for Squantz Pond can be found in Appendix 1. The epilimnetic pH at Squantz Pond was measured in May at a low of 8.0SU, increased to 8.5SU by June, and then to a high of 8.7SU in July. The epilimnetic pH from August through October ranged from 8.2 to 8.3SU. The lake seasonal average was 8.3 SU.

Alkalinity data for Squantz Pond is located in Appendix 2. Epilimnetic and metalimnetic alkalinity exhibited very similar characteristics. Alkalinity at both levels ranged from 36 to 42mg/L and averaged 38.3 and 38.6mg/L at the epilimnion and hypolimnion, respectively. Hypolimnetic alkalinity was significantly higher ($P<0.05$) than observed above, ranged from 40 to 54mg/L and averaged 46.2mg/L for the season.

Conductivity and Ionic Concentrations

Epilimnetic conductivity at Squantz Pond ranged from 164 to 170µmhos/cm and averaged 168µmhos/cm for the season. The seasonal low was measured in May and highest levels in July and August (Table 5 and Appendix 1).

Base cations and chloride levels measured in 2017 are provided in Table 5. Season averages for potassium, sodium, calcium, magnesium and chloride were 1.2, 11.8, 11.7, 4.4 and 25.7mg/L, respectively.

CANDLEWOOD LAKE TRENDS

Regional Comparisons

Characteristics of Candlewood Lake are consistent with lakes in the Marble Valley region of Connecticut. All 2017 base cation, anion and conductivity averages were within the range from Marble Valley lakes observed by Canavan and Siver in their 1995 study (Table 6). All 2017 trophic and productivity parameters for Candlewood Lake were in

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line with historical findings for the Marble Valley lakes. Based on the standard parameters used to assess trophic state, Candlewood Lake in 2017 was a mesotrophic to late mesotrophic lake (Table 3).

Table 5. Base cation, chloride and conductivity at 1 meter depth at Squantz Pond in 2017.

Squantz	Potassium (mg/L)	Sodium (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)	Cond. (μmhos/com)
May	1.39	12.5	12.1	4.24	27	164
June						168
July	1.6	12	11	4.5	26	169
August						170
Sept	0.74	11	12	4.6	24	168
October						168
Season Avg.	1.2	11.8	11.7	4.4	25.7	168

Historical Dissolved Salt Trends

The conductivity of Candlewood Lake continues to increase at a consistent rate (Fig. 8) (NEE 2014, Kohli et al. 2017). During the first five years of the monitoring program specific conductance measurements ranged from 100 to 175μmhos/cm. From 1991 to 2000, measurements ranged from 150 to 200μmhos/cm. From 2001 to 2012 measures generally ranged from 175 to 225μmhos/cm with higher conductivity observed at the NM site and occasionally at the SH site. This year, conductivity ranged from 231 to 249μmhos/cm and averaged 242μmhos/cm.

In Connecticut, changing conductivity is typically driven by changes in calcium concentration. Calcium levels at Candlewood Lake are increasing over time (Fig. 9). Calcium is an important variable to monitor because it can regulate the risk of colonization by zebra mussels, which do threaten Candlewood Lake since they are in nearby lakes. In 2017 Candlewood's calcium levels average 20.4mg/L, which is in the "moderate risk of colonization" range as determined by scientists studying zebra mussels.

At Candlewood Lake increasing conductivity may be related to other ionic sources including those rich in sodium and chloride (Fig. 11). Both sodium and chloride concentrations have doubled in the last ten years. Regression analyses were performed plotting sodium, calcium and magnesium against chloride (Fig. 12). Correlations between the three cations and chloride were moderately strong and trends were statistically significant.

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Table 6. Comparisons of the 2017 season averaged water quality variables from Candlewood Lake (CWL) and Squantz Pond (SP) to ranges observed in lakes located in the Marble Valley, Western Upland and in all geological regions in Connecticut from a Statewide survey of 60 lakes (Canavan and Siver 1995) conducted in the early 1990s. All measures with the exception of Secchi transparency were from samples collected at 1 meter depth.

Parameter	**Units**	**CWL** 2017 Season Means	**SQP** 2017 Season Means	**Marble Valley** Min	Max	Mean	**Western Uplands** Min	Max	Mean	**60 Lake Set** Min	Max	Mean
Total Nitrogen	µg/L	440	282	343	547	449	208	714	364	119	3831	439
Total Phosphorus	µg/L	15.0	12.8	27	42	31	10	57	33	9	334	33
Chlorophyll-*a*	µg/L	6.2	2.9	1.2	7.1	4.3	0.7	19.7	5.1	0.2	71.6	6.5
Secchi Disk	meters	2.53	3.18	2.0	4.9	3.3	1.7	7.6	3.5	0.9	7.6	3.3
pH	pH units	8.4	8.3	7.8	8.3	8.2	4.6	8.1	7.2	4.6	8.8	7.1
Sp. Conductivity	µS/mhos	242	168	180	317	258	25	188	96	24	317	102
Alkalinity	mg/L	70.3	38.3	54.5	120.5	90	23.7	44	21	0	120.5	14.5
Chloride (Cl^-)	mg/L	31.9	25.7	3.2	42.2	21.3	0.7	24.1	9.2	0.7	42.2	10.3
Calcium (Ca^{2+})	mg/L	20.4	11.7	16.6	28.8	22.8	2.8	11.4	6.8	1.2	28.8	7.6
Magnesium (Mg^{2+})	mg/L	7.0	4.4	5.9	15.2	9.8	1	5.2	4.1	0.2	15.2	2.5
Sodium (Na^+)	mg/L	15.9	11.8	2.5	24.6	13.1	1.4	10.4	5.3	1.4	24.6	6.9
Potassium (K^+)	mg/L	1.3	1.2	1.2	2.7	1.9	0.2	0.9	0.5	0.4	2.7	1.2

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While this trend is not currently a threat to recreational use or human health, it is indicative of significant watershed runoff containing considerable dissolved salts potentially from deicing agents (NEE 2014, Kohli et al. 2017). Changing conductivity and ionic concentrations can impact the composition of the phytoplankton and other organisms. Increasing dissolved salts, in conjunction with increasing pH and warming temperatures, provided an advantage to cyanobacteria (Kohli et al. 2017 and references therein).

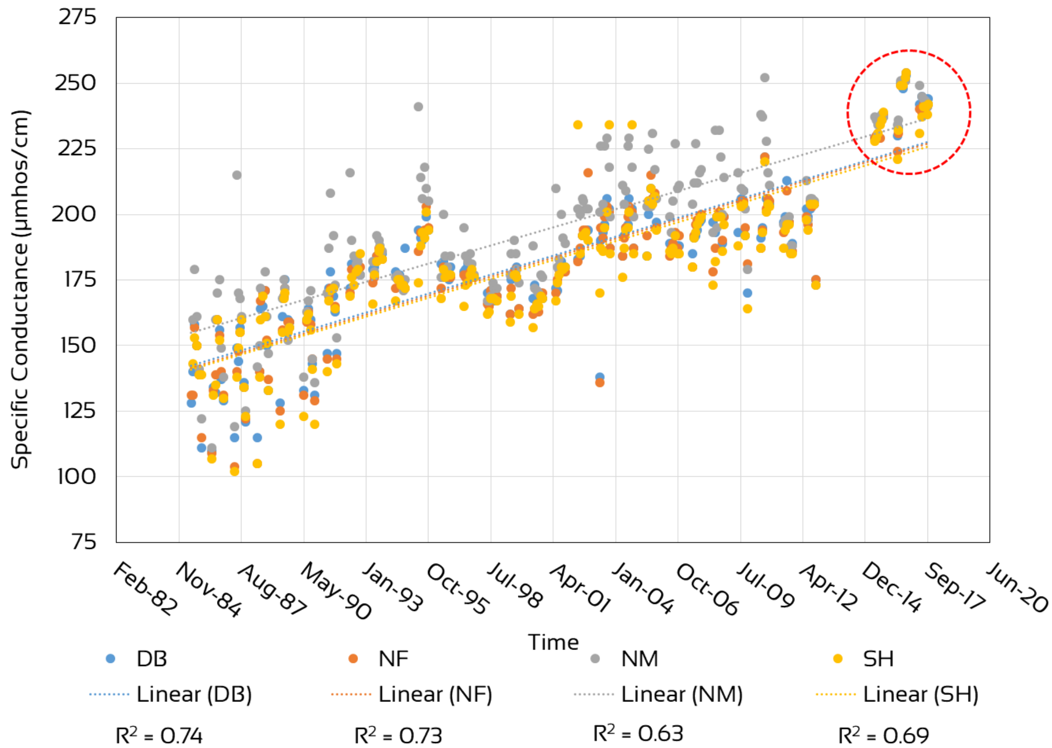

Figure 8. Conductivity trends at the four Candlewood Lake sites from 1985 to 2012 and from 2015 to 2017 (circled).

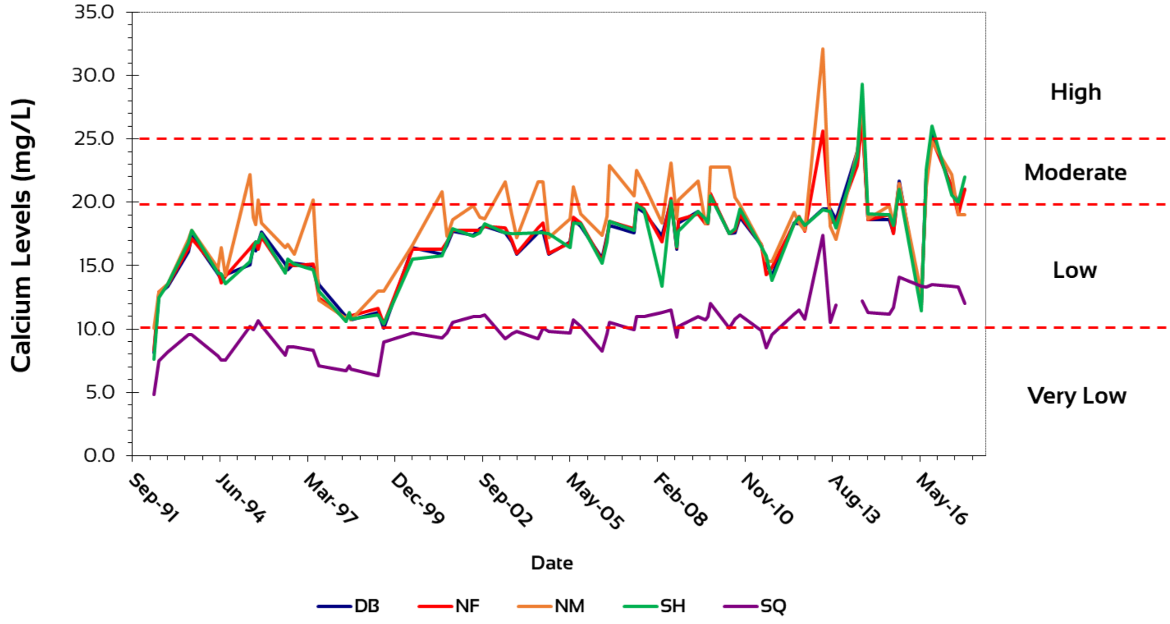

Figure 9. Calcium trends over time at the four sites on Candlewood Lake and one site on Squantz Pond. Measures are compared to standards used to assess colonization potential for zebra mussels based on calcium.

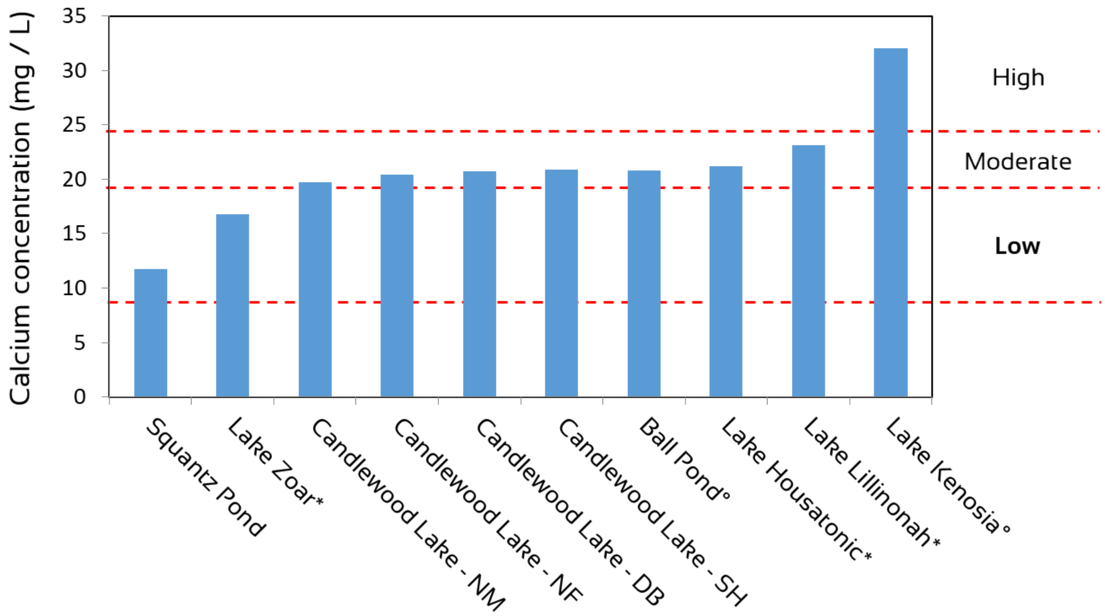

Figure 10. Colonization potential at Candlewood Lake, Squantz Pond and other regional lakes based on calcium concentrations. Candlewood and Squantz levels are averages from 2017. Data from Murray et al. (1993) and Canavan and Siver (1995) are identified with an asterisk (*) and degree sign (°), respectively.

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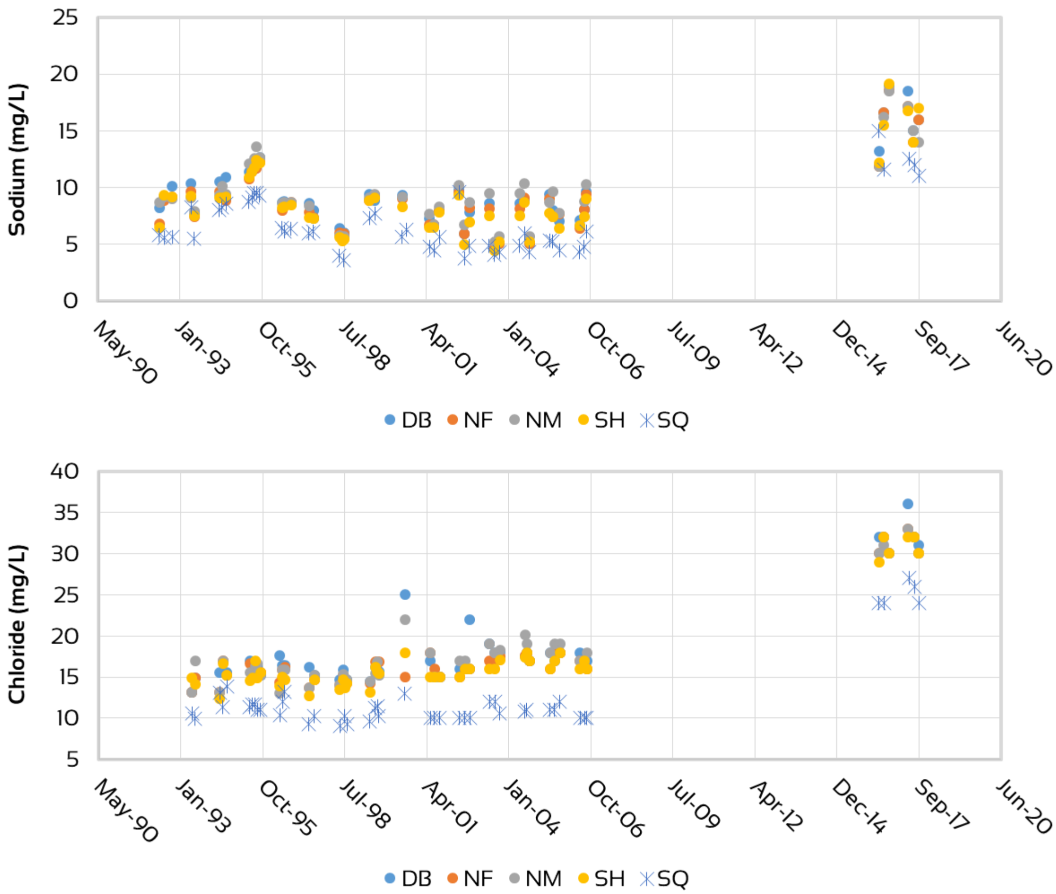

Figure 11. Historical sodium and chloride levels at all sites on Candlewood Lake and one site on Squantz Pond from 1992 to 2006, 2016, and 2017.

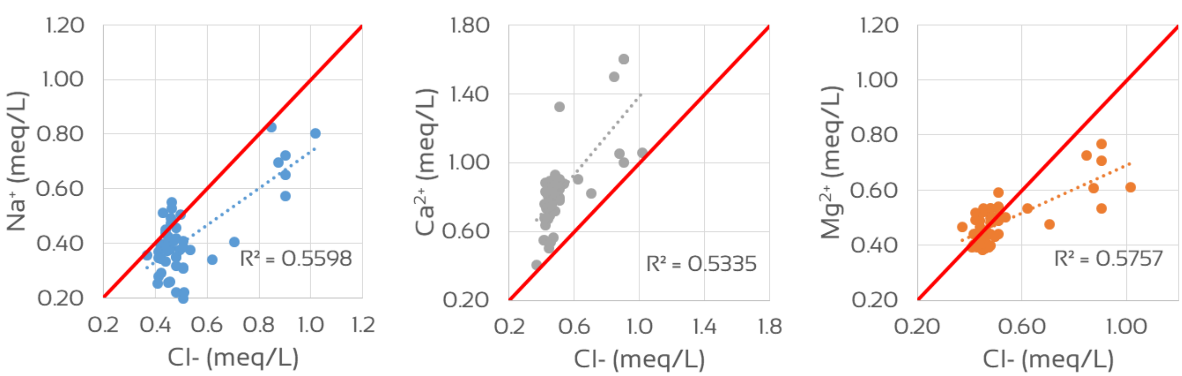

Figure 12. Biplots of base cations sodium (Na^+), calcium (Ca^{2+}) and magnesium (Mg^{2+}) against chloride (Cl^-) concentrations measured in mEq/L from 1992 to 2006, 2016, and 2017. Linear regressions (dotted lines) and coefficients of determination values (R^2) are indicated. For all three correlations P=0.00. A red 1:1 line is also depicted.

Trophic Trends

As noted earlier, standard trophic indicators (Table 3) put Candlewood Lake as a mesotrophic to late-mesotrophic lake. Based on chlorophyll-*a* and Secchi data, the years 2017 and 2016 were typical when compared to years from 1985 to 2015 when data for both variables were collected.[1] A biplot of yearly averaged chlorophyll-*a* concentration vs Secchi transparency (Fig. 13), shows the years 2016 and 2017 falling within the middle portion of the curve best representing all years. A statistic that describes how well the points fit along a line or curve in a biplot is the coefficient of determination or R^2. The R^2 value indicates the percentage of variation in the response variable, in this case Secchi transparency, that is related to the predictive variable, in this case chlorophyll-*a* (i.e. correlation). Here the R^2 value is 0.67 which indicates a strong relationship between the two variables despite other factors that might affect Secchi transparency measurements (e.g. cloud cover, inorganic matter in the water, etc.).

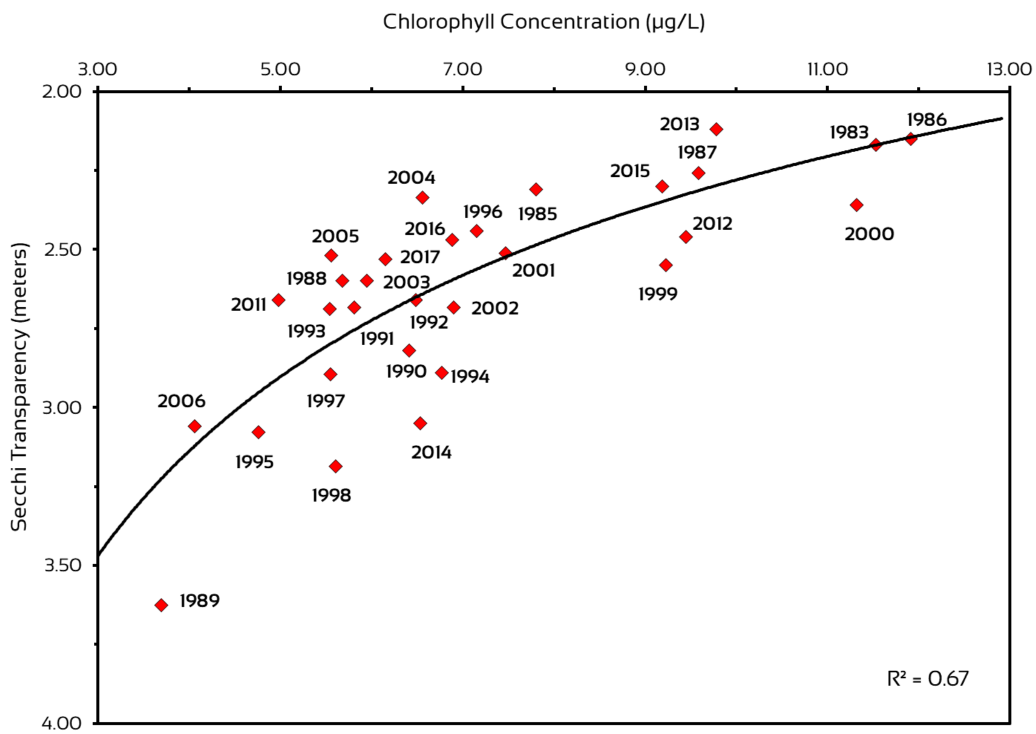

Figure 13. Model of Candlewood Lake based on seasonal mean Secchi transparencies and chlorophyll-*a* concentrations. Annual means for both variables are from 1983, 1985 – 2006, and 2011 – 2017.

The curve in Fig. 13 reflects a range of conditions since 1985. More eutrophic seasons (more algae) are those with lower average Secchi transparencies and higher average chlorophyll-*a*

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[1] Chlorophyll-*a* concentrations were not measured at Candlewood Lake or Squantz Pond from 2007 to 2010.

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concentrations (e.g. 1986, 1983, and 2000). Less eutrophic seasons (less algae) are those at the other end of the curve (e.g. 1989, 2006, and 1995). Most points are centered in the middle of the curve, including 2016 and 2017. This is representative of typical conditions over the last 32 years. Mean seasonal Secchi transparency and chlorophyll-*a* concentration for all data shown here are 2.62m and 7.14µg/L, respectively. The mean 2017 conditions are very similar at 2.53m and 6.15µg/L, respectively.

One objective of this report was to compare trophic conditions from 2013 to 2017 to those from data collected from 1985 to 2012 (NEE 2004, Kohli et al. 2017). In Fig. 14 actual data and 95% confidence intervals (CI) for 2013 to 2017 Secchi transparency, chlorophyll-*a*, and epilimnetic phosphorus data are plotted. The 1985 to 2012 mean and 95% CI for each trophic parameter are also indicated. Confidence intervals for the three variables from 2013 to 2017 fall just below, just above, and over the 28-year mean depending on the year. In general, there does not appear to be any shifts or trends in these trophic variables in recent years other than some yearly variability.

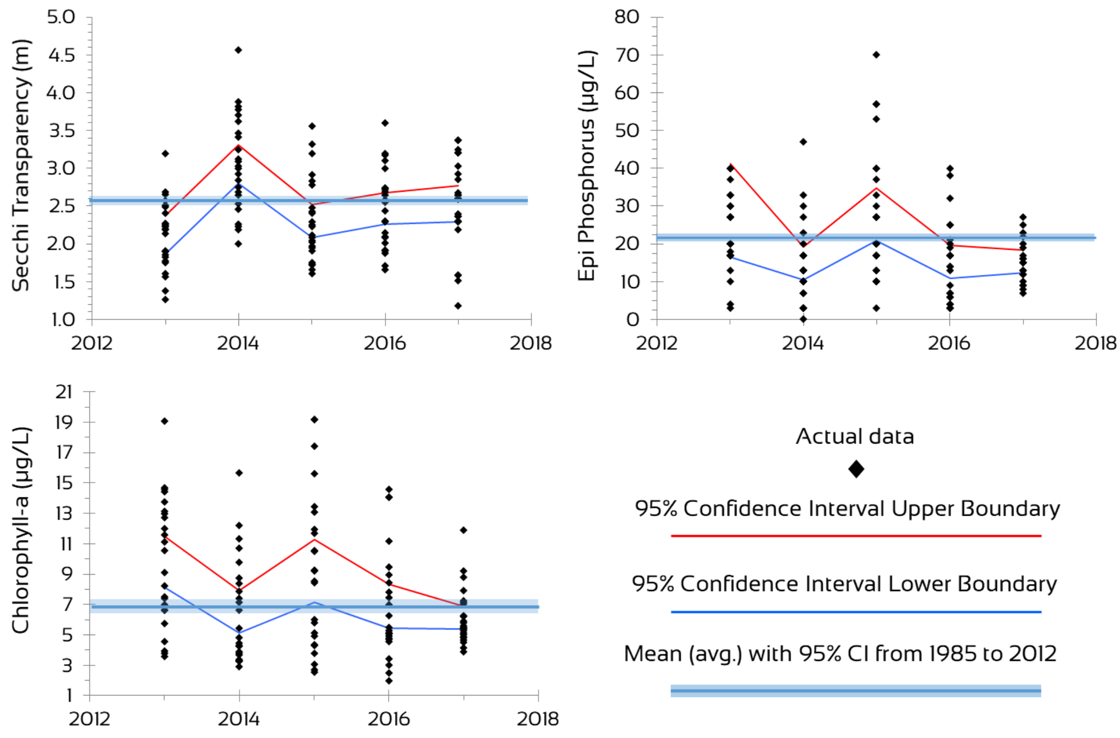

Figure 14. Comparison of recent Secchi transparency, chlorophyll-a concentrations, and epilimnetic phosphorus concentrations from 2013 to 2017 to averages for each variable from data collected from 1985 to 2012 (Kohli et al. 2017).

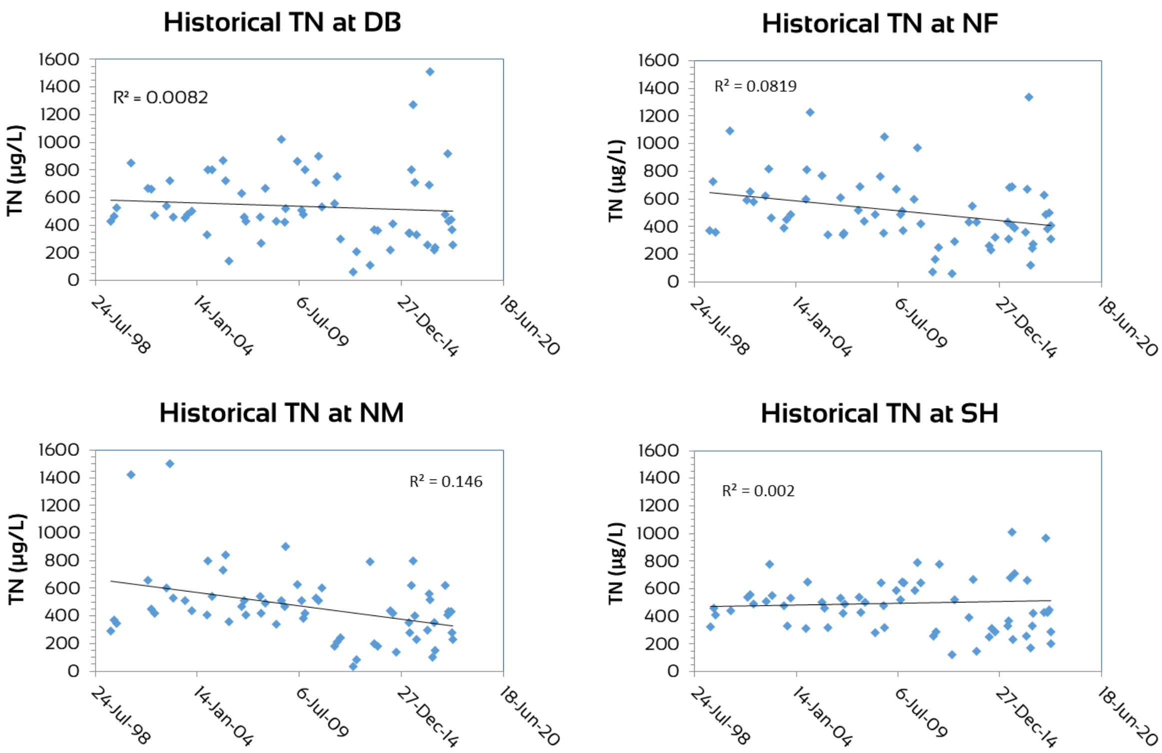

Figure 15. Epilimnetic total nitrogen concentrations at the four sites in Candlewood Lake from 1999 to 2017.

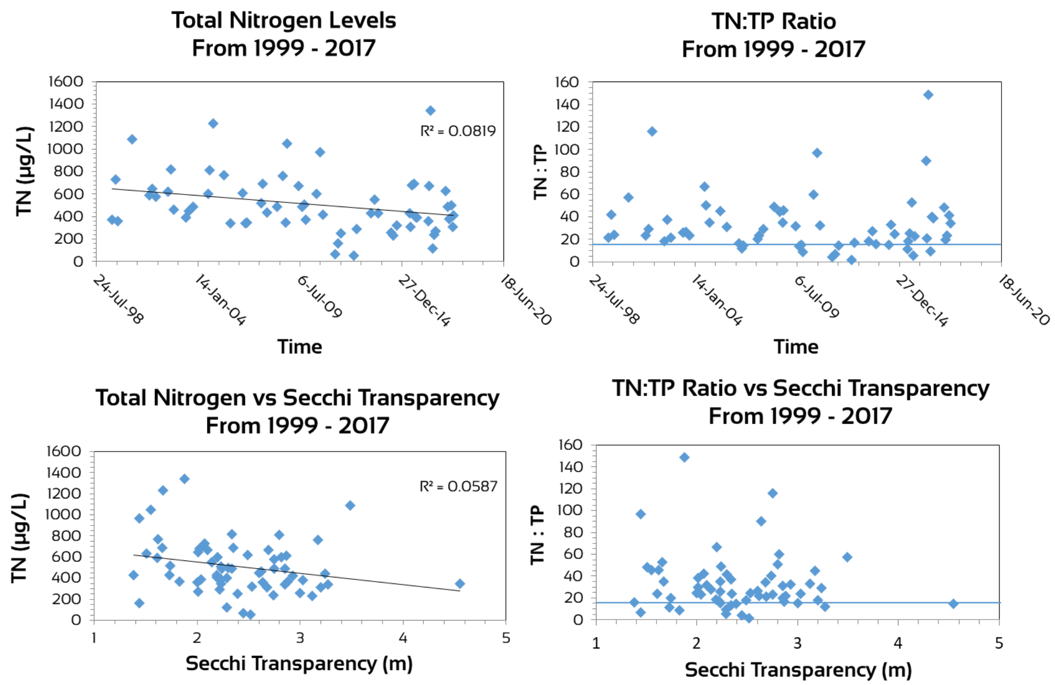

Figure 16. Analyses of total nitrogen and ratio of total nitrogen to total phosphorus (TN:TP) over time; total nitrogen vs Secchi transparency; and TN:TP vs Secchi from data collected at the NF site from 1999 through 2017.

Nitrogen levels do not appear to be trending upward either (Fig. 15). In fact, decreases over time at NM and NF are statistically significant ($P=0.002$ and $P=0.022$, respectively). There is no significant correlation between total nitrogen and Secchi transparency or the ratio of total nitrogen to total phosphorus (TN:TP) and Secchi transparency. Nor is there any TN:TP trend over time since 1999 (Fig. 16).

Cyanobacteria Bloom Frequency/Intensity

The 2017 season did not see the kinds of cyanobacteria blooms as observed in recent past seasons (e.g. 2013 and 2015) although some blooms were reported. Conditions in 2016 were similar to those observed in 2017. However, there has been an increase in approximately the last five to seven years in bloom frequency and intensity. But since nutrient enrichment does not appear to the driving these increases, an important question to ask is, "What is driving it?" The answer is most likely a combination of other variables.

Kohli et al. (2017) showed that water quality at Candlewood Lake was significantly better following deep winter drawdowns and suggested that the reduction of plants following deep drawdowns may be reducing the "pumping" of nutrients from the lake sediments into the water. Fewer plants can also mean a reduction of photosynthesis in the water. In photosynthesis, plants and phytoplankton, including cyanobacteria, use carbon dioxide (CO_2) and produce oxygen. As CO_2 is used up, pH increases. After pH increases past 8.3SU, CO_2 is replaced by bicarbonate (HCO_2^-) which algae other than cyanobacteria cannot use.

In a report on managing pH for purposes of aquaculture, Tucker and D'Abramo (2008) stated that the long-term solution to high pH problems in ponds is to alter pond biology so that the net daily carbon dioxide uptake is near zero and that this can be achieved by reducing photosynthesis or increasing respiration. Unsuccessful management of Eurasian watermilfoil at Candlewood Lake then could also be keeping pH levels high and CO_2 levels low, creating advantages for cyanobacteria. In addition, the steady increase in conductivity and ionic concentrations also tend to favor cyanobacteria (Kohli et al. 2017).

Changing Patterns of Stratification

Another condition that favors cyanobacteria is reduced vertical mixing (Paerl and Huisman 2009). A number of genus of cyanobacteria found in Candlewood Lake produce aerotopes (gas vesicles), a highly effective adaptation used to regulate buoyancy. This adaptation provides an advantage over other groups of algae (green algae, diatoms, etc.) that rely on less effective mechanisms to remain the water column, and are more prone to sinking when vertical mixing is reduced, thus outcompeted for light resources necessary for photosynthesis.

Resistance to mixing is measured by calculating the RTRM values between strata in the water column (i.e. between 1 and 2m, between 2 and 3m, etc.). The depth in the water column where

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the maximum RTRM is located is the thermocline and is the plain where the greatest resistance to mixing occurs. The sum of RTRM values between all layers from the surface to the bottom is the total RTRM value for the site.

There is conclusive evidence that the maximum RTRM and total RTRM values are trending upwards at Candlewood Lake and thus mixing in the water column is being reduced. At the DB site since 1985, maximum RTRM values in May, June and July have significantly ($P<0.05$) increased (Fig. 17). Total RTRM values in May and August have also significantly increased at the same site (Fig 18). This clearly provides an advantage for the blue-green algae over other taxonomic groups.

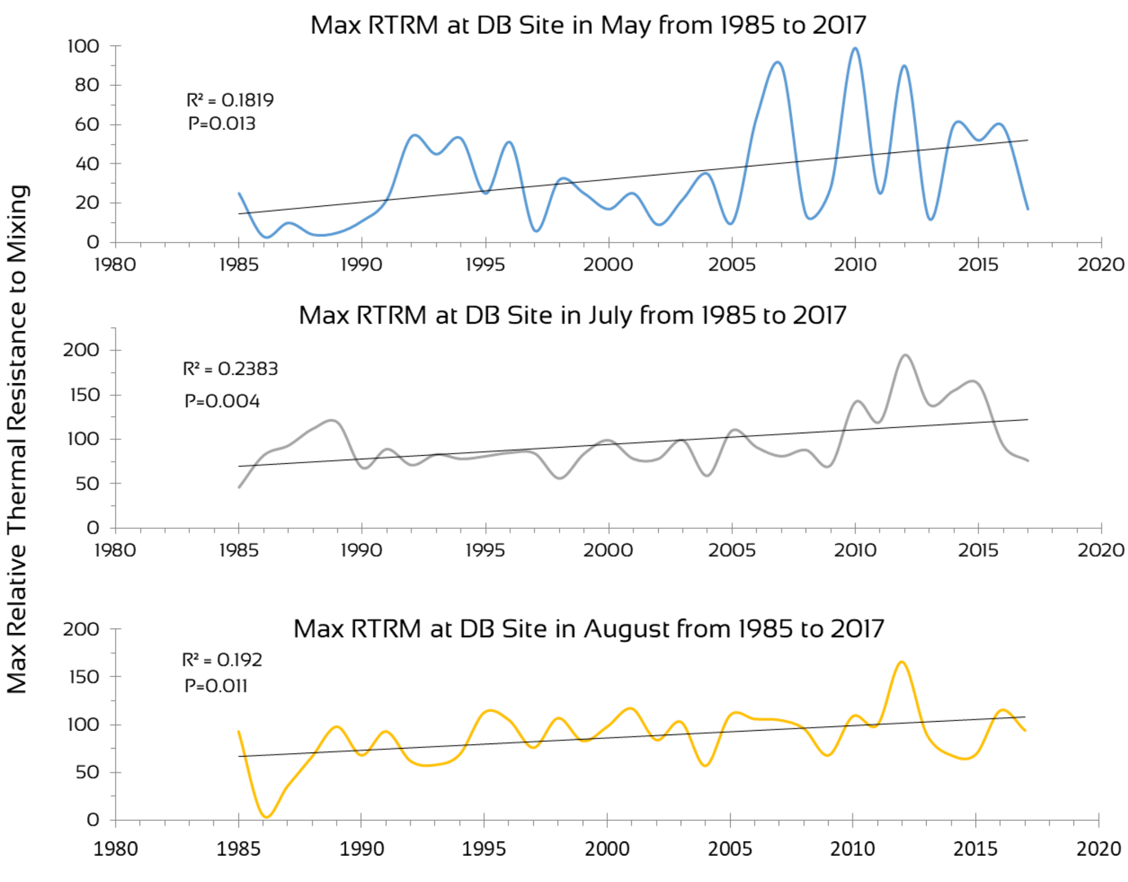

Figure 17. Maximum RTRM value in the water column at the DB site in May (top), July (middle), and August (bottom) from 1985 through 2017.

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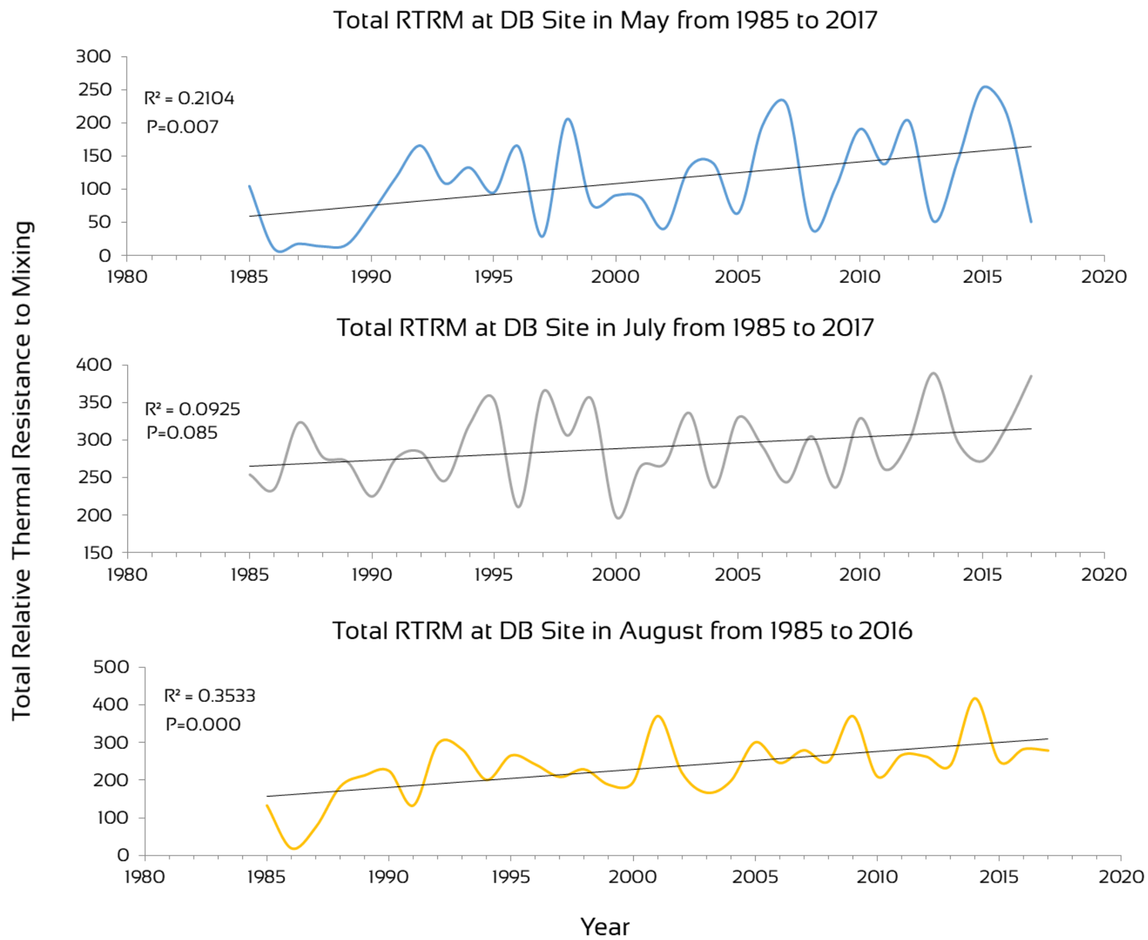

Figure 18. Total RTRM value for the water column at the DB site in May (top), July (middle), and August (bottom) from 1985 through 2017.

SQUANTZ POND TRENDS

Regional Comparisons

Many of the water quality characteristics of Squantz Pond are consistent with those of lakes in the Western Uplands of Connecticut (Table 6). Exceptions were pH, sodium, calcium and chloride that were on average slightly higher in 2017 than the ranges of those variables observed in Western Upland lakes in Canavan and Siver (1995). It is important to note that the water quality characteristics of lakes grouped by geological zones of Connecticut were from surveys conducted in the early to mid-1990s, but also those surveys included Squantz Pond.

Historical Dissolved Salt Trends

Based on a preliminary examination of trends (Fig. 19), conductivity at Squantz Pond has been increasing since 1985. Initial epilimnetic measures from the mid to late 1980s ranged from 70 to 123μmhos/cm; in the 1990s it ranged from 80 to 159μmhos/cm; and since 2000 epilimnetic conductivity has ranged from 105 to 203μmhos/cm. Squantz Pond has also experienced increases in base cations and anions, particularly sodium, calcium and chloride (Figs. 8 & 10). The increased calcium levels have upgraded the zebra mussel colonization potential from very low to low (Fig. 9).

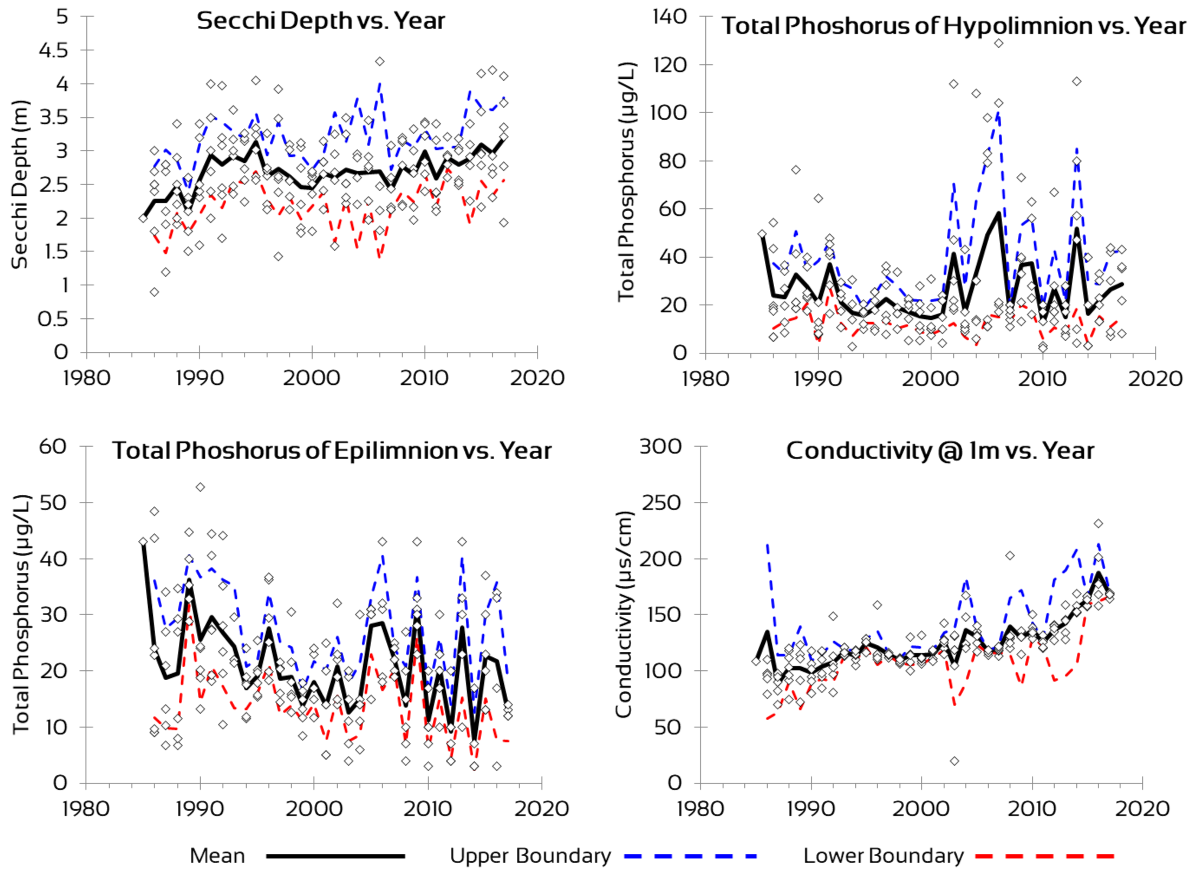

Figure 19. Secchi transparency, epilimnetic and hypolimnetic total phosphorus concentrations, and conductivity trends at Squantz Pond from 1985 to 2017. Represented in each panel are the average (mean), the upper and lower boundary of the 95% confidence interval.

Trophic Trends

The 2017 trophic data puts Squantz Pond in the early mesotrophic-mesotrophic category (Table 3). Based on a preliminary examination of trophic trends, Squantz Pond has not become more eutrophic over the last 32 years, and in fact is experiencing improved conditions. Secchi transparency is trending up; and epilimnetic total phosphorus and total nitrogen are trending down (Figs. 19 & 20). Although not observed at the frequency or intensity as at Candlewood Lake, Squantz Pond has seen some increase in cyanobacteria bloom events.

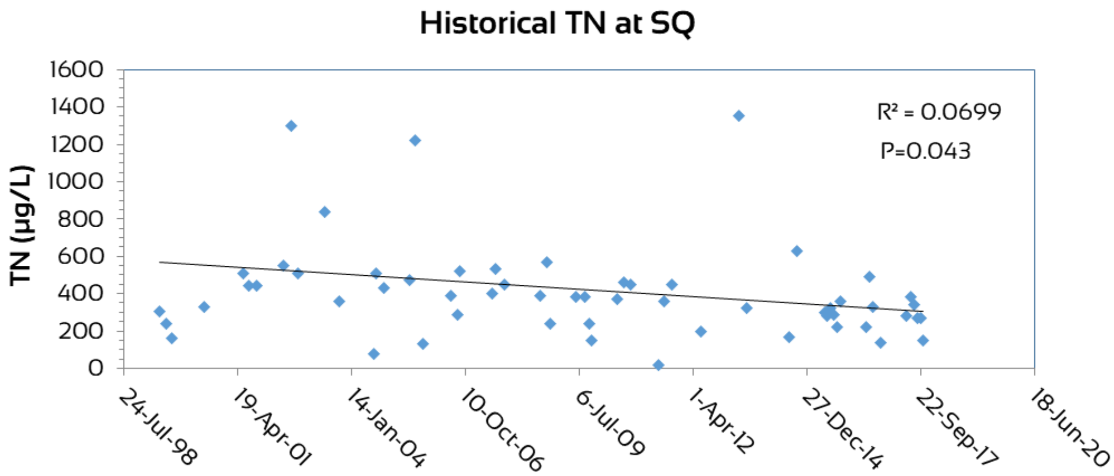

Figure 20. Epilimnetic total nitrogen levels at Squantz Pond from 1999 to 2017.

Changing Patterns of Stratification

Analyses of thermal stratification patterns at Squantz Pond is preliminary. There is some evidence that stratification patterns at Squantz Pond are changing with time, but the data is not as conclusive as it is at Candlewood Lake. Regression analyses were conducted for maximum and total RTRM values in May, July and August between the years of 1986 through 2017. Of the six analyses, only maximum RTRM in July over the 31-year period had a statistically significant correlation (Fig. 21).

We hypothesize that trends in stratification patterns are different at Squantz Pond from Candlewood Lake because of the lake morphology. Candlewood Lake is largely oriented in a north to south direction and generally wider, while Squantz Pond is oriented in a northwest to southeast direction and narrower. Winds tend to be more noticeable on Squantz Pond (e.g. discernable whitecaps), even when Candlewood Lake appears calm.

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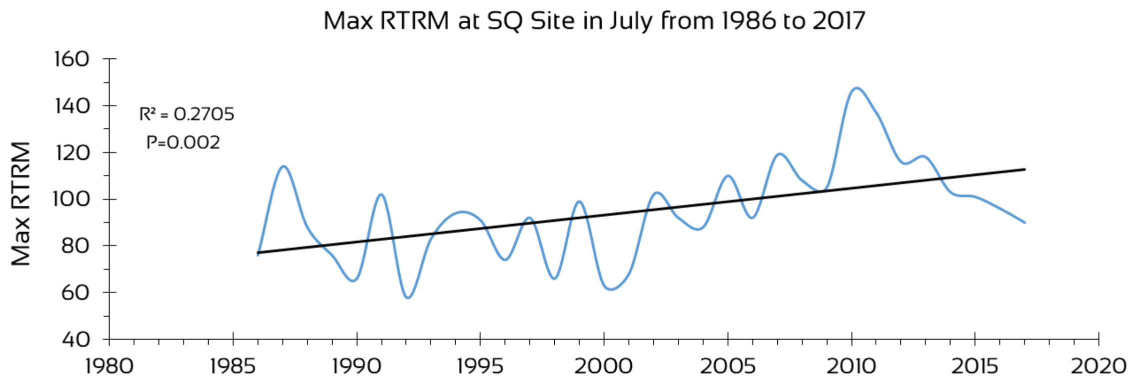

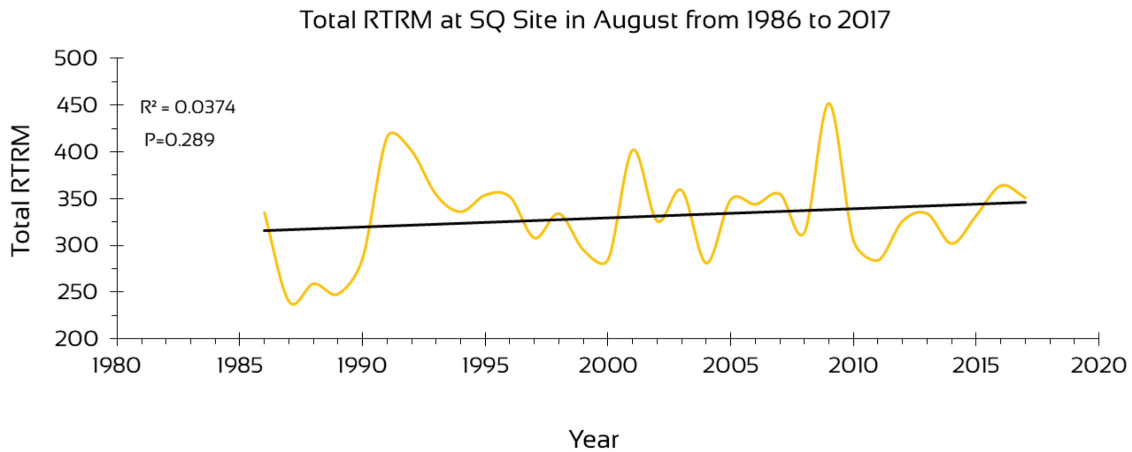

Figure 21. Significant trend of the maximum RTRM in July (top) and not significant trend of total RTRM in August (bottom) at Squantz Pond from 1986 to 2017.

DISCUSSION AND RECOMMENDATIONS

Over the last decade the frequency and intensity of cyanobacteria blooms has increased at Candlewood Lake, at other lakes across the State and at many lakes across the country. Fewer bloom incidents have been reported at Squantz Pond than at Candlewood Lake. Historically, nutrient enrichment was considered the primary cause of algae blooms and the focal point for management local efforts.

The Kohli et al. (2017) study revealed that phosphorus levels were not increasing at Candlewood Lake, and in fact decreased from 1985 to 2012 due, in part, to local and state management efforts and the drawdowns used to manage Eurasian watermilfoil. Epilimnetic phosphorus data since 2012 and nitrogen data since 1999 also do not support the idea of recent blooms resulting from increased nutrient levels. Similar trends in total phosphorus and total nitrogen levels were observed at Squantz Pond. It is important to note that although nutrient levels are not increasing, the relative concentrations of nutrients can result in blooms when other conditions (i.e. water temperature, pH, etc.) are suitable.

Nutrient levels are not the only variables that increase or decrease the competitiveness of algal groups. As noted throughout this report, a number of other variables observed at Candlewood Lake favor cyanobacteria productivity over that of other algal taxa including high pH levels, increasing conductivity (i.e. dissolved salts), and reduced mixing of the water column.

Watershed-based efforts to reduce nutrient loading to both Candlewood Lake and Squantz Pond have had positive results. However, these efforts have not yet resulted in stabilizing conductivity, cation, and anion levels. Changes in conductivity and dissolved salts may be related to changes in watershed practices, e.g. changes in types of deicing salts and applications of those.

The 2017 season saw a reduction of acres of Eurasian watermilfoil at both Candlewood Lake and Squantz Pond, despite only a shallow drawdown done in the prior winter. The triploid grass carp program appears to be providing positive results at Candlewood Lake and Squantz Pond. It is important to note that the timing of the 2016/2017 shallow drawdown (vs the timing of shallow drawdowns from 2000 to 2016) may have played a role in better control of milfoil (Lonergan et al. 2014). Continued success in reducing acres of invasive aquatic plant growth may result in a lowering of pH and could increase the competitiveness of phytoplankton groups other than cyanobacteria. It could also reduce transport of nutrients from the lake sediments to lake water via aquatic plants if this is an important contributor to increases in cyanobacteria blooms.

AER recommends the following measures to address water quality issues at Candlewood Lake and Squantz Pond gleaned from this study:

In-lake Phosphorus Dynamics Study

Since phosphorus availability ultimately regulates algal productivity, then a more aggressive approach to reduce levels should be considered. Internal loading is clearly an important contributor to the phosphorus budget of Candlewood Lake (Simpkins 1994) and no effort to date has been attempted to mitigate it. An in-lake phosphorus dynamics study would provide up to date documentation of the various forms and abundance of phosphorus in the water body throughout the summer season along a depth gradient (i.e. each meter). It would require a single season study of the system where phosphorus and related variables (oxygen, iron, manganese, etc.) are evaluated over short time-frames (i.e. daily). It would not be necessary to do this at all of the current sample points; the deepest two points would be sufficient for this analysis.

In-lake Sediment Mass/Nutrient Study

If it is determined that phosphorus levels in regions of the water column that support algal growth are largely influenced by internal loading, then an in-lake sediment mass/nutrient study would be a next logical step in determining the feasibility of sequestering nutrients in the sediments from the waters above. This study would document the chemical and physical composition of in-lake sediment throughout the lake. It would result in an understanding of total nutrient load available in the sediments and lead to the development of in-lake phosphorus control protocols. (Note: It is necessary to undertake a watershed study before developing in-lake phosphorus management protocols).

Watershed study

A watershed study would document the specific watershed inputs of nutrients and other pollutants (e.g. sodium, calcium, chloride) into the lake; it would also document seasonal dynamics of watershed inputs; and identify specific areas within the watershed that may be contributing higher proportions of those pollutants. The watershed study would lead to the development of additional watershed management strategies that would be part of a comprehensive lake and watershed management plan.

AER recommends the US Environmental Protection Agency's Nine Minimum Element Watershed Plan (USEPA 2017) as a template plan for achieving improvements in water quality and addressing the increasing concentrations of ionic pollutants. Elements of this type of plan include:

1. An identification of the causes and sources of pollution
2. An estimate of the load reductions expected
3. A description of the nonpoint source (NPS) management measures implemented
4. An estimate of the amounts of technical and financial assistance needed
5. An outreach component that will be used to enhance public understanding
6. An expedited schedule for implementing NPS management measures
7. A description of milestones for determining whether NPS management measures are being implemented
8. Criteria to determine whether loading reductions are being achieved over time
9. A monitoring component to evaluate the effectiveness of the implementation efforts

Consolidation and Review of Candlewood Lake Management Plans

The CLA has developed a number of management plans or guidance documents since the early 1980s when the agency expanded its mission to include management of the environmental values of the Lake. In addition, the CLA worked closely with several municipalities in the past and contributed to their Plans of Conservation and Development to ensure that local lake resources were adequately protected. Furthermore, CLA was very instrumental in the development of several of the management plans that were required of the hydropower company, currently FirstLight Power Resources, by the Federal Energy Regulatory Commission. A sample of all these documents are listed in Table 7.

Currently there is no one cohesive plan for Candlewood Lake and Squantz Pond linking or referencing the various management plans, guidance documents and other documents that may have a bearing on the management of Candlewood Lake and Squantz Pond. AER recommends that a thorough review of these documents be undertaken. The review should discern management topics and recommendations that have and have not been adequately addressed. From that review, one over-arching lake and watershed management plan should be crafted that includes references to historical management documents. The management plan should also address issues that may not have been adequately addressed in prior plans and documents.

Table 7. Selected CLA management plans or guidance documents, municipal Plans of Conservation and Development, and FERC approved management plans written by the hydroelectric company.

Document (Authoring Entity)	Year
Candlewood Lake Water Quality Program Management Plan (CLA)	1985
Action Plan for Preserving Candlewood Lake. Recommendations Prepared for the Candlewood Lake Authority for Brookfield, Danbury, New Fairfield, New Milford, and Sherman, Connecticut (CLA) (Also see specific recommendations to each town)	2002
New Fairfield Plan of Conservation and Development (Planimetrics)	2003
Candlewood Lake Buffer Guidelines in Candlewood Lake News (Special Edition), Vol. 21, No. 1. (CLA)	2005
A Blueprint for Candlewood Lake: A Management Planning Guide for Candlewood Lake, FERC Project No. 2576 (CLA)	2005
Nuisance Plant Monitoring Plan: Candlewood Lake, and Lakes Lillinonah and Zoar. FERC License Article 409. Housatonic River Project FERC Project No. 2576 (Northeast Generation Company)	2005
Housatonic Hydroelectric Project, FERC No. 2576. Recreation Plan (Northeast Generation Company)	2005
Investigations into Eurasian Watermilfoil Management by Deep Drawdown at Candlewood Lake (CLA)	2009
An Examination of Recreational Pressures On Candlewood Lake, CT (CLA)	2009
Shoreline Management Plan, Housatonic River Project No. 2576 (FirstLight Power Resources)	2009
Interim Report on the Findings & Recommendations of the Candlewood Lake Authority Zebra Mussel Task Force (CLA)	2011
Options for Eurasian Watermilfoil Management in Candlewood Lake (CLA)	2013

AER is well-suited to implement or oversee implementation of these recommendations and would be available for further consultation. Last year the CLA met with Dr. Robert Kortmann to discuss other types of mitigation that would focus on the mixing and resistance to mixing in the water column. The CLA should consider an additional consultation with Dr. Kortmann to discuss the feasibility of this type of measure at Candlewood Lake.

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APPENDIX 1. PROFILE DATA

This appendix contains all date collected at one meter intervals throughout the water column at the four sites on Candlewood Lake and one site on Squantz Pond. The following abbreviations are used in this appendix.

Temp (°C)	Temperature in degrees Celsius
DO (mg/L)	Dissolved oxygen in milligrams per liter
DO (%Sat)	Dissolved oxygen percent saturation
Rel. BG (cells/mL)	Relative blue-green algae in cells per milliliter
Sp Cond (μmhos/cm)	Specific Conductivity in micro mhos per centimeter
SU	Standard unit
m	meter
Surf.	Surface

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Danbury Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/L)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
05/12/17	12:08:31	Surf.	13.68	10.83	103.1	22.8	242.3	8.27
05/12/17	12:09:25	1	13.64	11.37	108.2	24.5	242.4	8.24
05/12/17	12:09:53	2	13.19	11.63	109.6	42.8	241.8	8.24
05/12/17	12:10:13	3	12.71	11.74	109.5	48.6	241.9	8.18
05/12/17	12:10:37	4	12.66	11.54	107.5	45.5	241.7	8.1
05/12/17	12:11:01	5	12.6	11.45	106.5	46.7	241.9	8.05
05/12/17	12:11:23	6	12.56	11.32	105.2	49	241.8	8
05/12/17	12:11:33	7	12.23	11.29	104.2	65.4	241.6	7.95
05/12/17	12:11:51	8	10.98	11.28	101.1	70.4	242.2	7.79
05/12/17	12:12:23	9	10.42	10.04	88.8	61.1	242.6	7.55
05/12/17	12:13:42	10	9.9	8.1	70.8	56.3	242.9	7.36
05/12/17	12:14:18	11	9.76	7.39	64.4	58.4	243.4	7.29
06/22/17	13:15:36	Surf.	24.33	9.65	114	19.9	244.6	8.47
06/22/17	13:16:36	1	24.17	10.04	118.3	12.3	244.7	8.49
06/22/17	13:17:47	2	23.49	10.24	119.1	18	243.8	8.54
06/22/17	13:18:47	3	22.76	10.22	117.3	25.5	244.5	8.47
06/22/17	13:19:31	4	22.04	10.08	114.1	36.9	242.7	8.37
06/22/17	3:20:25	5	20.93	9.23	102.2	38.9	242.9	8.02
06/22/17	13:23:15	6	18.12	6.19	64.8	34.4	243.2	7.36
06/22/17	13:26:47	7	15.88	2.66	26.6	22.4	242.9	7.09
06/22/17	3:29:45	8	14.52	0.81	7.9	7.7	243.3	7.01
06/22/17	13:32:51	9	13.32	0	0	6.6	244.2	6.99
06/22/17	13:33:13	10	12.86	0	0	5.4	247	6.97
06/22/17	13:33:41	11	12.74	0	0	8.9	248.7	6.98

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Danbury Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
07/20/17	2:26:09	Surf.	28.07	9.6	122.6	10.6	244.9	8.91
07/20/17	12:27:35	1	27.89	10.1	128.5	26.3	244.8	8.93
07/20/17	2:28:53	2	27.27	10.35	130.2	19.7	244	8.95
07/20/17	2:29:45	3	26.92	10.35	129.4	29.9	243.5	8.92
07/20/17	2:46:06	4	25.39	8.61	104.8	40.8	243.2	8.5
07/20/17	2:53:59	5	23.84	5.54	65.5	46.8	243.5	7.7
07/20/17	2:56:37	6	21.5	2.7	30.5	56	243	7.36
07/20/17	3:00:25	7	18.51	0.31	3.3	44.8	241.8	7.19
07/20/17	13:02:21	8	15.98	0.07	0.7	113.3	242	7.18
07/20/17	13:03:13	9	14.23	0.01	0.1	30.5	247.1	7.2
07/20/17	3:04:07	10	13.33	0	0	20.3	253.6	7.23
07/20/17	13:04:41	11	13.29	0	0	21.5	254	7.26
08/24/17	12:16:16	Surf.	25.3	8.91	108.2	14.5	243.9	8.77
08/24/17	12:17:28	1	25.27	9	109.3	24.4	243.9	8.8
08/24/17	12:18:08	2	25.24	9.02	109.4	26	244	8.78
08/24/17	12:19:02	3	25.17	9.05	109.7	33	243.8	8.78
08/24/17	12:19:56	4	25.12	9.09	110.1	32.6	243.7	8.76
08/24/17	2:20:44	5	25.04	9.09	109.8	30.6	243.8	8.72
08/24/17	2:22:39	6	24.83	8.61	103.6	30.4	244.4	8.6
08/24/17	12:27:37	7	21.62	2.45	27.7	34.2	242.5	7.41
08/24/17	2:30:10	8	18.53	1.18	12.5	185.4	238.8	7.25
08/24/17	12:33:57	9	15.18	0	0	102.8	255.7	7.34
08/24/17	2:34:43	10	14.18	0	0	79.4	262.4	7.34
08/24/17	12:35:17	11	14.1	0	0	78.9	262.9	7.34

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Danbury Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
09/21/17	11:41:09	Surf.	22	8.89	101.5	13.1	243.9	8.34
09/21/17	11:41:59	1	22	9.02	103	18.8	243.8	8.36
09/21/17	11:42:45	2	21.99	9.05	103.3	23.1	243.9	8.36
09/21/17	11:43:23	3	21.97	9.05	103.2	42.7	243.6	8.35
09/21/17	11:44:13	4	21.93	9.04	103	28	243.7	8.35
09/21/17	11:44:59	5	21.89	9.01	102.6	29.1	243.7	8.33
09/21/17	11:45:41	6	21.83	8.98	102.2	27.1	243.5	8.31
09/21/17	11:46:49	7	21.82	8.85	100.6	25.7	243.3	8.3
09/21/17	11:48:35	8	21.8	8.49	96.6	31.2	243.4	8.27
09/21/17	11:51:53	9	20.51	3.71	41.2	19.1	241.5	7.47
09/21/17	11:55:07	10	16.02	0.03	0.3	7.9	276.2	7.42
09/21/17	11:55:47	11	15.17	0	0	10.7	281.4	7.41
10/05/17	11:26:00	Surf.	20.32	8.67	95.8	38.1	244.1	8.06
10/05/17	11:26:38	1	20.12	8.63	94.9	25.2	244.1	7.99
10/05/17	11:27:30	2	19.78	8.5	92.8	30.3	244	7.94
10/05/17	11:28:40	3	19.74	8.19	89.4	32.6	244.1	7.89
10/05/17	11:29:34	4	19.72	8.01	87.4	28.8	244.4	7.87
10/05/17	11:30:22	5	19.69	7.89	86.1	29	244.2	7.85
10/05/17	11:32:44	6	19.69	7.41	80.9	26.4	243.9	7.81
10/05/17	11:33:32	7	19.62	7.28	79.3	21.2	243.9	7.79
10/05/17	11:36:16	8	19.47	4.79	52	11.8	244	7.52
10/05/17	11:41:23	9	18.76	0.14	1.5	15	243.2	7.27
10/05/17	11:42:19	10	16.9	0.08	0.8	9.6	281.8	7.33
10/05/17	11:42:55	11	16.26	0.05	0.5	12.3	286	7.38

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New Fairfield Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
05/12/17	11:23:05	Surf.	14.13	10.66	102.6	14.9	241.2	8.17
05/12/17	11:24:03	1	13.46	11.27	106.9	19.1	239.5	8.2
05/12/17	11:24:29	2	13.23	11.42	107.7	24	236.8	8.18
05/12/17	11:25:13	3	13.06	11.48	107.9	34	236.2	8.08
05/12/17	11:26:14	4	12.95	11.32	106.1	34.6	235.6	8.03
05/12/17	11:27:18	5	12.85	11.21	104.9	36.7	235.5	7.96
05/12/17	11:28:12	6	12.65	11.05	102.9	38.9	236.1	7.91
05/12/17	11:28:36	7	12.51	10.96	101.7	42.7	235.8	7.87
05/12/17	11:29:14	8	12.02	10.65	97.8	50.9	237.2	7.71
05/12/17	11:29:38	9	10.95	10.44	93.5	46.9	238	7.61
05/12/17	11:30:12	10	9.96	9.14	80	32.7	244.5	7.44
05/12/17	11:30:58	11	9.69	7.75	67.4	28.8	246.9	7.33
05/12/17	11:31:30	12	9.56	7.17	62.2	32.7	248.2	7.29
06/22/17	12:06:09	Surf.	24.01	9.83	115.5	14.6	239.1	8.48
06/22/17	12:06:39	1	23.67	10.02	116.9	16.4	238.9	8.49
06/22/17	12:07:27	2	23.26	10.17	117.8	18.3	239.8	8.49
06/22/17	12:07:47	3	23.12	10.18	117.5	19.6	240.6	8.5
06/22/17	12:08:55	4	22.7	9.93	113.8	30.5	241.2	8.42
06/22/17	12:11:13	5	20.87	8.38	92.7	49.3	239.2	7.86
06/22/17	12:16:48	6	17.73	5.62	58.4	39.3	241.1	7.3
06/22/17	12:20:18	7	15.37	1.95	19.2	20	239.6	7.06
06/22/17	12:28:48	8	14	0.05	0.5	11	240.6	6.98
06/22/17	12:31:18	9	13.51	0	0	18.5	240.9	6.97
06/22/17	12:31:55	10	12.96	0	0	1.8	242	6.97
06/22/17	12:32:11	11	12.04	0	0	3.6	249.2	6.94

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New Fairfield Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
07/20/17	11:27:06	Surf.	28.31	8.79	112.7	14.9	242.2	8.8
07/20/17	11:28:38	1	28.05	9.67	123.3	19.2	242	8.84
07/20/17	11:29:30	2	27.28	9.91	124.8	21.1	242.1	8.88
07/20/17	11:30:24	3	26.93	9.95	124.5	23.3	241.2	8.85
07/20/17	11:32:16	4	26.03	8.67	106.7	28.5	240.6	8.53
07/20/17	11:33:50	5	24.86	6.73	81	40.6	240.5	7.9
07/20/17	11:36:24	6	21.37	2.68	30.3	47.6	239.9	7.35
07/20/17	11:39:07	7	17.22	0.31	3.3	42	239.3	7.19
07/20/17	11:40:41	8	15.32	0.06	0.6	39.9	241.7	7.2
07/20/17	11:42:11	9	13.97	0	0	26.6	244	7.23
07/20/17	11:43:23	10	13.59	0	0	24.1	244.8	7.24
07/20/17	11:45:41	11	12.4	0	0	16.7	254.7	7.33
07/20/17	11:47:01	12	12.3	0	0	19.2	257.1	7.35
08/24/17	11:15:34	Surf.	25.17	8.85	107.2	-56.2	242	8.71
08/24/17	11:16:08	1	25.16	8.88	107.6	34.6	242	8.72
08/24/17	11:17:18	2	25.15	8.92	108.1	27.6	242.2	8.7
08/24/17	11:17:56	3	25.12	8.92	108	37.1	242.2	8.69
08/24/17	11:18:38	4	25.08	8.9	107.7	35.9	242	8.68
08/24/17	11:19:16	5	25.04	8.87	107.3	37.3	242.2	8.66
08/24/17	11:23:08	6	22.75	3.92	45.4	32.3	242.1	7.54
08/24/17	11:25:51	7	20.25	1.71	18.8	52.1	240.5	7.33
08/24/17	11:28:30	8	18.4	0.36	3.9	602.9	237.3	7.22
08/24/17	11:29:53	9	16.34	0.05	0.5	143	246.1	7.27
08/24/17	11:30:48	10	14.78	0	0	66.3	254.8	7.31
08/24/17	11:31:32	11	14.09	0	0	45.6	256.8	7.35
08/24/17	11:32:08	12	13.28	0	0	43.9	261.2	7.35

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New Fairfield Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
09/21/17	10:49:33	Surf.	21.79	8.74	99.3	13	241.3	8.26
09/21/17	10:50:13	1	21.79	8.77	99.7	15.4	241.2	8.19
09/21/17	10:50:53	2	21.75	8.8	99.9	23.7	241.1	8.18
09/21/17	10:51:39	3	21.75	8.79	99.9	24	240.7	8.18
09/21/17	10:52:25	4	21.71	8.79	99.8	22.6	241.1	8.16
09/21/17	10:54:25	5	21.64	8.58	97.3	27	240.8	8.12
09/21/17	10:55:37	6	21.58	8.43	95.5	19.9	240.9	8.07
09/21/17	10:58:43	7	20.83	6.33	70.6	25.2	241.4	7.7
09/21/17	11:01:57	8	19.71	3.18	34.7	18.8	241.5	7.42
09/21/17	11:05:07	9	16.41	0.19	1.9	4.3	263.8	7.37
09/21/17	11:06:32	10	15.44	0.04	0.4	3.7	270	7.39
09/21/17	11:07:16	11	14.29	0	0	4.7	272.3	7.39
09/21/17	11:07:46	12	13.77	0	0	4.3	274.2	7.38
10/05/17	10:35:59	Surf.	20.21	8.05	88.7	21	242.6	7.91
10/05/17	10:36:47	1	19.94	7.96	87.3	30.3	242.1	7.91
10/05/17	10:38:09	2	19.71	7.67	83.7	27.5	242.2	7.86
10/05/17	10:39:09	3	19.61	7.53	82	22.4	242.1	7.84
10/05/17	10:39:46	4	19.56	7.43	80.8	20.1	241.6	7.83
10/05/17	10:42:10	5	19.49	6.81	73.9	17.1	241.6	7.75
10/05/17	10:42:40	6	19.48	6.77	73.5	15.3	241.9	7.75
10/05/17	10:43:06	7	19.43	6.75	73.3	15.6	242	7.74
10/05/17	10:43:40	8	19.42	6.71	72.8	18.8	241.9	7.73
10/05/17	10:47:50	9	18.73	2.63	28.1	4.1	245.1	7.43
10/05/17	10:50:30	10	16.57	0.14	1.4	3.4	271.2	7.42
10/05/17	10:51:16	11	15.1	0.04	0.4	5.7	278.8	7.41
10/05/17	10:52:04	12	14.63	0	0	11	283.4	7.41

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New Milford Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
05/12/17	12:57:34	Surf.	14.78	10.35	101	24.6	248.8	8.42
05/12/17	12:58:12	1	14.57	11.08	107.7	19.4	248.7	8.41
05/12/17	12:58:38	2	13.74	11.56	110.2	32.5	247.9	8.46
05/12/17	12:59:08	3	13.56	11.77	111.9	39.4	247.7	8.44
05/12/17	12:59:42	4	13.45	11.82	112.1	39.1	248.5	8.42
05/12/17	13:00:12	5	13.17	11.8	111.2	51.5	247.9	8.34
05/12/17	13:00:34	6	12.66	11.77	109.6	72.8	247.2	8.12
05/12/17	13:01:04	7	12.35	11.26	104.1	74.3	247.1	7.9
05/12/17	13:01:20	8	11.76	11.05	100.9	68.1	248.2	7.83
05/12/17	13:01:50	9	10.78	10.57	94.3	51.3	252.2	7.71
05/12/17	13:02:10	10	10.05	10.34	90.7	38.6	258.1	7.65
05/12/17	13:02:42	11	9.26	9.96	85.7	29.7	261.8	7.58
05/12/17	13:03:12	12	8.54	9.73	82.3	22.5	265.1	7.55
05/12/17	13:03:58	13	8.26	9.48	79.7	22.2	266.3	7.54
05/12/17	13:04:26	14	7.94	9.46	78.9	21.7	267.6	7.54
05/12/17	13:04:52	15	7.43	9.53	78.5	13.5	270.4	7.55
05/12/17	13:05:12	16	6.52	9.72	78.3	10.6	275	7.57
05/12/17	13:05:34	17	5.92	9.72	77.1	9.3	278.1	7.57
05/12/17	13:05:48	18	5.72	9.74	76.8	5.5	279.2	7.56
05/12/17	13:06:12	19	5.61	9.61	75.5	5.8	280.3	7.54
05/12/17	13:06:36	20	5.56	9.33	73.3	5.4	280.9	7.52
05/12/17	13:07:20	21	5.52	8.82	69.2	4.2	280.9	7.5
05/12/17	13:07:40	22	5.49	8.7	68.2	1.8	281.4	7.49
05/12/17	13:08:10	23	5.46	8.33	65.3	4.1	282.8	7.45
05/12/17	13:08:54	24	5.46	7.53	59	77.2	291.9	7.4

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New Milford Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
06/22/17	14:07:10	Surf.	24.97	9.55	114.2	13.6	245	8.46
06/22/17	14:08:16	1	24.53	10.04	119.1	12.5	244.5	8.5
06/22/17	14:08:58	2	24.2	10.15	119.7	12.3	244.1	8.54
06/22/17	14:09:18	3	23.77	10.27	120.1	16.6	243.9	8.53
06/22/17	14:10:02	4	23.11	10.04	115.9	25.2	243.8	8.36
06/22/17	14:12:30	5	20.71	8.89	98.1	43	244.8	7.9
06/22/17	14:14:30	6	16.82	5.94	60.5	49	244.4	7.35
06/22/17	14:17:33	7	15.16	4.16	40.9	35.6	245.3	7.2
06/22/17	14:19:15	8	14.31	3.4	32.8	29.7	245.7	7.15
06/22/17	14:21:17	9	13.48	2.79	26.4	12.4	246.8	7.12
06/22/17	14:23:41	10	12.8	2.24	20.9	7.1	247.3	7.1
06/22/17	14:24:37	11	12.1	2.26	20.8	0.7	249.7	7.11
06/22/17	14:25:51	12	11.29	2.28	20.6	0.9	252.7	7.11
06/22/17	14:26:23	13	10.46	2.34	20.7	-1.3	256.4	7.13
06/22/17	14:27:31	14	10.07	2.67	23.5	-1.3	257.9	7.14
06/22/17	14:29:33	15	9.34	3.46	29.8	-0.4	261.2	7.19
06/22/17	14:31:47	16	8.19	4.44	37.2	-0.1	267.3	7.24
06/22/17	14:33:45	17	7.41	5.12	42.2	-4	271.3	7.29
06/22/17	14:34:26	18	6.75	5.23	42.3	-3.2	275	7.3
06/22/17	14:35:20	19	6.3	5.06	40.5	-3.4	277.2	7.3
06/22/17	14:37:16	20	5.99	4.25	33.7	-5.9	278.7	7.27
06/22/17	14:39:28	21	5.88	2.98	23.6	-6.4	279.3	7.23
06/22/17	14:43:48	22	5.78	1.63	12.9	-8.3	281	7.18
06/22/17	14:48:02	23	5.73	0	0	1.7	283.7	7.14

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New Milford Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
07/20/17	13:39:05	Surf.	28.88	9.98	129.2	16.4	244.8	8.92
07/20/17	13:40:31	1	28.34	10.45	134.1	15.5	244.2	8.93
07/20/17	13:41:17	2	27.89	10.69	136	12.2	243.8	8.94
07/20/17	13:41:53	3	27.41	10.8	136.2	30	242.9	8.98
07/20/17	13:44:25	4	26.38	9.7	120.2	37.4	242.8	8.76
07/20/17	13:48:44	5	23.45	6.12	71.8	58.4	244.2	7.73
07/20/17	13:51:42	6	21.21	2.96	33.3	74.3	243.3	7.37
07/20/17	13:54:24	7	18.53	0.79	8.5	37.4	244.1	7.24
07/20/17	13:56:46	8	16.43	0.06	0.6	33.2	244.8	7.21
07/20/17	13:57:30	9	14.28	0	0	11	246.3	7.23
07/20/17	13:58:18	10	13.18	0	0	2.4	247.6	7.24
07/20/17	13:58:58	11	12.44	0	0	-3	249.1	7.26
07/20/17	14:00:04	12	11.49	0.03	0.3	-4.5	252.1	7.28
07/20/17	14:01:14	13	10.95	0.08	0.7	-4.1	254.8	7.29
07/20/17	14:02:32	14	10.25	0.29	2.5	-5.9	257.4	7.31
07/20/17	14:03:42	15	9.81	0.48	4.2	-1.1	260.1	7.32
07/20/17	14:06:39	16	8.93	1.96	16.9	-3.3	262.5	7.38
07/20/17	14:08:31	17	8.25	2.49	21.1	-3.5	266	7.41
07/20/17	14:09:53	18	7.67	2.81	23.4	-4.2	269.3	7.44
07/20/17	14:12:19	19	6.86	2.38	19.5	-4.8	274.6	7.44
07/20/17	14:14:17	20	6.37	1.61	13	-4.2	276.7	7.42
07/20/17	14:17:11	21	6.04	0.08	0.7	1.8	280.2	7.39
07/20/17	14:18:07	22	5.94	0.02	0.2	5.3	283.2	7.39
07/20/17	14:19:29	23	5.89	0	0	8.5	287.7	7.41
07/20/17	14:19:55	24	5.87	0	0	179.1	292.3	7.41

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New Milford Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
08/24/17	13:16:40	Surf.	25.95	8.89	109.2	18.9	243.8	8.7
08/24/17	13:17:38	1	25.85	9.02	110.6	19.5	243.8	8.7
08/24/17	13:18:18	2	25.72	9.02	110.4	24.1	243.4	8.71
08/24/17	13:19:06	3	25.65	9.03	110.3	28	243.2	8.7
08/24/17	13:19:52	4	25.58	9	109.9	31.4	243.5	8.67
08/24/17	13:21:57	5	25.32	7.96	96.7	40.1	243.3	8.46
08/24/17	13:25:01	6	22.73	3.78	43.7	46.4	244.4	7.52
08/24/17	13:28:16	7	18.76	0.93	9.9	55.4	243.5	7.3
08/24/17	13:30:40	8	15.11	0.05	0.5	142.4	245.3	7.28
08/24/17	13:31:58	9	14.62	0	0	98.6	247.5	7.29
08/24/17	13:32:38	10	13.71	0	0	59.2	250.7	7.31
08/24/17	13:33:09	11	12.73	0	0	31.9	252.6	7.33
08/24/17	13:33:27	12	12.64	0	0	29	253.6	7.33
08/24/17	13:35:05	13	11.64	0	0	10	257.7	7.38
08/24/17	13:35:31	14	10.5	0	0	9.4	259.6	7.41
08/24/17	13:36:19	15	9.48	0	0	2.1	261.7	7.43
08/24/17	13:38:11	16	8.61	0.27	2.3	6.1	265.2	7.43
08/24/17	13:38:51	17	8.17	0.34	2.9	3.6	267.7	7.43
08/24/17	13:39:49	18	7.44	0.27	2.3	5.7	272.4	7.44
08/24/17	13:41:14	19	6.98	0.04	0.3	8.5	275.3	7.45
08/24/17	13:41:48	20	6.6	0	0	0.6	279	7.45
08/24/17	13:42:26	21	6.3	0	0	14.8	286.4	7.45
08/24/17	13:43:20	22	6.09	0	0	8.4	289.9	7.48
08/24/17	13:44:14	23	6.06	0	0	20.6	294.9	7.49

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New Milford Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
09/21/17	12:34:48	Surf.	20.82	7.82	87.2	20.7	241	7.9
09/21/17	12:35:10	1	20.75	7.8	86.9	25.8	240.8	7.89
09/21/17	12:35:54	2	20.68	7.73	85.9	35.4	240.9	7.87
09/21/17	12:36:36	3	20.63	7.68	85.3	43	240.8	7.87
09/21/17	12:38:42	4	20.48	7.25	80.3	43.4	240.6	7.8
09/21/17	12:40:18	5	20.39	6.81	75.4	41.6	240.3	7.74
09/21/17	12:42:54	6	20.15	5.76	63.4	37.3	239.6	7.61
09/21/17	12:46:53	7	18.64	0.13	1.4	10.8	233.8	7.18
09/21/17	12:48:21	8	17.96	0	0	7	242.2	7.24
09/21/17	12:49:07	9	15.58	0	0	3.9	258.4	7.29
09/21/17	12:49:53	10	14.71	0	0	4.9	259.6	7.33
09/21/17	12:50:45	11	13.74	0	0	9.7	259	7.36
09/21/17	12:51:21	12	13.11	0	0	3.2	258.7	7.37
09/21/17	12:51:57	13	12.25	0	0	1.7	260.1	7.38
09/21/17	12:52:51	14	11.28	0	0	2.3	260.4	7.4
09/21/17	12:53:51	15	10.23	0	0	1.6	262.2	7.42
09/21/17	12:54:53	16	8.84	0	0	0.4	265.8	7.44
09/21/17	12:55:45	17	7.89	0	0	12.7	273	7.44
09/21/17	12:57:11	18	7.3	0	0	7.4	276.9	7.46
09/21/17	12:57:51	19	6.69	0	0	12.7	283	7.46
09/21/17	12:58:45	20	6.52	0	0	18.9	286.9	7.47
09/21/17	12:59:49	21	6.32	0	0	13.1	297.7	7.49
09/21/17	13:00:13	22	6.26	0	0	10.7	301.9	7.51
09/21/17	13:00:55	23	6.21	0	0	15.8	308.5	7.55

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New Milford Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
10/05/17	12:14:08	Surf.	20.42	8.6	95.2	11.3	242.2	7.96
10/05/17	12:14:38	1	20.15	8.62	94.9	13.4	241.9	7.91
10/05/17	12:15:30	2	19.94	8.52	93.4	20.7	241.7	7.9
10/05/17	12:17:00	3	19.79	8.31	90.9	16	241.6	7.88
10/05/17	12:17:34	4	19.71	8.19	89.3	18.7	241.7	7.86
10/05/17	12:18:56	5	19.69	7.92	86.4	19	241.4	7.82
10/05/17	12:19:46	6	19.67	7.83	85.4	18.6	241.4	7.82
10/05/17	12:20:42	7	19.66	7.73	84.3	16.2	241.3	7.81
10/05/17	12:22:16	8	19.5	7.51	81.6	16.5	241.1	7.77
10/05/17	12:23:32	9	19.37	7.28	78.9	13.2	240.9	7.73
10/05/17	12:28:40	10	18.64	3.07	32.8	14.5	241.3	7.38
10/05/17	12:32:29	11	15.91	0.07	0.7	7.8	260.6	7.36
10/05/17	12:33:25	12	13.69	0	0	7.7	262.8	7.36
10/05/17	12:33:51	13	12.78	0	0	0.8	263.4	7.36
10/05/17	12:34:37	14	11.69	0	0	-0.2	262.7	7.37
10/05/17	12:35:13	15	10.39	0	0	-3.1	262.5	7.39
10/05/17	12:35:55	16	8.94	0	0	-2.9	267	7.41
10/05/17	12:36:35	17	7.96	0	0	1.2	273.4	7.41
10/05/17	12:37:21	18	7.36	0	0	4.4	278	7.42
10/05/17	12:38:08	19	6.8	0	0	5.8	287.8	7.41
10/05/17	12:38:50	20	6.49	0	0	7.8	297.4	7.44
10/05/17	12:39:54	21	6.36	0	0	6.4	305.5	7.53

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Sherman Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
05/12/17	10:42:04	Surf.	13.65	10.69	101.8	14	231.4	7.94
05/12/17	10:42:56	1	13.28	11.1	104.8	28.9	230.7	7.93
05/12/17	10:43:46	2	12.97	11.13	104.4	37.5	230.1	7.9
05/12/17	10:44:44	3	12.73	10.95	102.1	34.4	229.9	7.85
05/12/17	10:45:26	4	12.69	10.82	100.8	32.8	229.6	7.82
05/12/17	10:46:06	5	12.64	10.72	99.8	34	229.5	7.81
05/12/17	10:46:44	6	12.53	10.61	98.5	36.1	229.5	7.76
05/12/17	10:47:10	7	12.26	10.53	97.2	45.8	231.2	7.7
05/12/17	10:47:48	8	11.85	10	91.5	53.7	234.5	7.55
05/12/17	10:48:22	9	11.02	9.16	82.2	39.8	237.8	7.42
05/12/17	10:48:52	10	10.65	8.19	72.8	34.9	239.7	7.33
05/12/17	10:49:30	11	10.23	7.22	63.6	33.9	243.3	7.25
05/12/17	10:49:56	12	10.22	6.51	57.3	35.5	243.4	7.21
06/22/17	11:24:40	Surf.	24.28	9.72	114.8	105.5	237.9	8.5
06/22/17	11:25:08	1	23.52	9.95	115.8	6.6	237.1	8.56
06/22/17	11:26:20	2	23.2	10.29	119	19.8	237	8.53
06/22/17	11:27:10	3	23	10.19	117.4	22.9	236.9	8.5
06/22/17	11:27:54	4	22.43	9.94	113.3	32.2	238.2	8.3
06/22/17	11:28:58	5	20.47	8.65	94.9	41.4	239.7	7.76
06/22/17	11:30:16	6	16.81	5.75	58.6	26.6	237.7	7.28
06/22/17	11:31:14	7	14.8	2.01	19.6	9.1	238	7.08
06/22/17	11:34:56	8	13.98	0	0	19.1	239.4	6.99
06/22/17	11:35:34	9	13.4	0	0	4.9	241.5	6.98
06/22/17	11:36:36	10	12.87	0	0	3.5	244.2	6.99
06/22/17	11:37:14	11	12.61	0	0	4.4	248.6	6.99

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Sherman Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
07/20/17	10:32:04	Surf.	28.19	9.17	117.3	17.3	241.3	8.82
07/20/17	10:33:34	1	27.72	9.6	121.7	16	241	8.83
07/20/17	10:35:34	2	27.43	9.62	121.5	23	240.5	8.81
07/20/17	10:36:46	3	26.9	9.63	120.3	21.1	240	8.74
07/20/17	10:37:58	4	26.04	9.08	111.8	31.2	239.7	8.46
07/20/17	10:41:24	5	24.16	5.14	61.1	39.7	239.7	7.62
07/20/17	10:43:02	6	20.5	1.63	18.1	43	239.5	7.26
07/20/17	10:44:07	7	17.66	0.61	6.4	54.1	238.3	7.21
07/20/17	10:44:57	8	15.23	0.24	2.4	25.8	245.4	7.19
07/20/17	10:45:32	9	14.75	0.11	1.1	18.4	247.5	7.24
07/20/17	10:46:25	10	13.43	0.02	0.2	12.4	249.8	7.26
07/20/17	10:47:29	11	13.17	0	0	16.3	255.6	7.32
08/24/17	10:27:14	Surf.	25.33	9.02	109.6	-2.9	241.4	8.72
08/24/17	10:28:24	1	25.33	9.11	110.7	30.3	241.5	8.71
08/24/17	10:29:06	2	25.33	9.5	115.5	31.7	241.4	8.7
08/24/17	10:30:02	3	25.27	9.74	118.3	42	241.5	8.68
08/24/17	10:30:43	4	25.16	9.77	118.4	38.3	241.7	8.62
08/24/17	10:32:59	5	25.05	8.95	108.2	37.5	241.8	8.54
08/24/17	10:40:35	6	22.74	4.68	54.2	42.2	241.6	7.59
08/24/17	10:44:01	7	19.54	0.52	5.6	235.7	240.3	7.26
08/24/17	10:45:58	8	16.61	0.17	1.7	136.3	253.3	7.33
08/24/17	10:47:16	9	15.02	0.09	0.8	72.2	260.6	7.38
08/24/17	10:48:06	10	14.4	0.06	0.6	61.2	263	7.4
08/24/17	10:49:18	11	14.16	0.04	0.4	90	266.7	7.43

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Sherman Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
09/21/17	10:10:48	Surf.	21.4	8.37	94.4	63.7	238.5	8.03
09/21/17	10:11:44	1	21.39	8.11	91.5	29.2	238.5	7.97
09/21/17	10:13:02	2	21.38	8.11	91.5	22.7	240.9	7.98
09/21/17	10:13:52	3	21.3	8.13	91.5	21.6	241	7.97
09/21/17	10:14:32	4	21.25	8.13	91.4	25.7	240.9	7.96
09/21/17	10:16:31	5	21.12	7.58	85	20.1	240.5	7.88
09/21/17	10:19:39	6	20.13	3.2	35.2	20.3	240.7	7.45
09/21/17	10:22:57	7	18.86	0.39	4.1	7.4	239.3	7.29
09/21/17	10:24:41	8	18.4	0.07	0.8	7.8	245	7.31
09/21/17	10:25:33	9	16.36	0	0	5.5	274.2	7.37
09/21/17	10:26:13	10	14.75	0	0	7.7	279.2	7.41
10/05/17	09:55:23	Surf.	19.72	7.64	83.4	19.6	241.9	7.89
10/05/17	09:56:19	1	19.61	7.46	81.2	26.7	241.9	7.87
10/05/17	09:57:23	2	19.58	7.3	79.5	25.3	241.9	7.83
10/05/17	09:58:01	3	19.55	7.22	78.5	26.6	241.9	7.81
10/05/17	09:59:11	4	19.45	7.05	76.5	22.9	242	7.78
10/05/17	09:59:55	5	19.39	6.96	75.5	23.3	241.9	7.78
10/05/17	10:00:37	6	19.37	6.92	75	19.1	241.9	7.76
10/05/17	10:02:16	7	19.35	6.64	71.9	18	242	7.74
10/05/17	10:07:00	8	18.91	4.73	50.8	10.1	243.2	7.54
10/05/17	10:10:54	9	18.72	3.14	33.6	6.5	244.3	7.46
10/05/17	10:16:04	10	18.32	0.33	3.5	9.4	248.4	7.36

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Squantz Pond Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (μmhos/cm)	pH (SU)
05/24/17	12:02:59	Surf.	18.41	9.58	100.9	5.9	164.5	8.17
05/24/17	12:03:47	1	17.94	10.03	104.6	13.5	164.6	8.01
05/24/17	12:04:19	2	17.8	10.11	105.2	13.8	164.6	7.95
05/24/17	12:04:57	3	17.68	10.14	105.1	13.3	164.6	7.94
05/24/17	12:05:35	4	16.04	10.22	102.5	27.3	164.1	7.85
05/24/17	12:06:27	5	14.35	10.14	98	31.8	163	7.66
05/24/17	12:07:19	6	13.62	9.82	93.4	29.8	163	7.53
05/24/17	12:08:11	7	12.99	9.06	85	15.3	163.7	7.39
05/24/17	12:09:51	8	11.37	7.69	69.5	9.3	165.5	7.22
05/24/17	12:15:10	9	9.02	6.31	53.9	7.7	168.1	7.07
05/24/17	12:17:32	10	7.94	4.59	38.3	9.6	168.6	6.93
05/24/17	12:24:32	11	7.21	3.2	26.2	14.7	170.6	6.86
06/28/17	11:28:08	Surf.	24.27	9.34	110.2	7.7	167.5	8.47
06/28/17	11:28:56	1	24.2	9.53	112.3	18.6	167.5	8.48
06/28/17	11:29:28	2	24.17	9.58	112.9	15.8	167.5	8.48
06/28/17	11:30:15	3	23.97	9.63	113	13.5	167.5	8.46
06/28/17	11:30:51	4	23.71	9.66	112.8	11.6	167.4	8.42
06/28/17	11:31:57	5	19.67	10.54	113.9	20.1	165.7	8.37
06/28/17	11:33:31	6	17.44	10.28	106.1	26.6	165.2	7.74
06/28/17	11:37:17	7	15.18	4.76	46.8	47.7	165.5	7.02
06/28/17	11:40:05	8	13.66	2.61	24.8	27.8	165.4	6.86
06/28/17	11:43:37	9	11.64	0.26	2.3	27.3	168.5	6.74
06/28/17	11:44:43	10	9.28	0.12	1	56.3	172.7	6.74
06/28/17	11:45:53	11	7.78	0.03	0.2	99.3	179.5	6.75

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Squantz Pond Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
07/26/17	10:40:09	Surf.	25.41	8.77	106.7	20.2	168.9	8.64
07/26/17	10:41:09	1	25.14	8.8	106.5	11.1	168.6	8.68
07/26/17	10:41:49	2	25	8.82	106.5	26.9	168.6	8.7
07/26/17	10:42:13	3	24.93	8.83	106.5	25.7	168.4	8.68
07/26/17	10:42:57	4	24.88	8.84	106.5	21.4	168.3	8.7
07/26/17	10:46:29	5	23.86	6.24	73.8	53.5	168.2	7.42
07/26/17	10:49:00	6	20.69	5.31	59.1	16.6	166.9	7.23
07/26/17	10:52:59	7	17.56	1.66	17.3	4.9	165.9	6.99
07/26/17	10:55:59	8	15.33	0.26	2.5	184.7	162.6	6.91
07/26/17	10:56:51	9	12.34	0.11	1	24.6	171.2	6.94
07/26/17	10:57:55	10	11.16	0.04	0.3	20.2	174.2	6.96
07/26/17	10:58:39	11	9.41	0	0	10.1	180	7
08/25/17	11:04:31	Surf.	25.3	8.54	103.7	277.2	169.6	8.26
08/25/17	11:05:11	1	25.3	8.54	103.7	2.6	169.6	8.23
08/25/17	11:05:39	2	25.3	8.57	104	10.9	169.6	8.2
08/25/17	11:05:59	3	25.22	8.57	103.9	10.7	169.5	8.17
08/25/17	11:06:51	4	25.19	8.48	102.7	13.6	169.5	8.1
08/25/17	11:07:23	5	25.16	8.43	102.1	9.2	169.6	8.11
08/25/17	11:11:00	6	23.45	3.43	40.2	29.3	167.5	7.18
08/25/17	11:14:26	7	21.32	0.96	10.9	33.7	167.7	6.97
08/25/17	11:15:04	8	16.68	0.81	8.3	644.4	164.6	7
08/25/17	11:17:37	9	13.39	0.13	1.2	180.8	170.4	6.95
08/25/17	11:18:25	10	11.05	0.03	0.2	102.4	182	6.97
08/25/17	11:18:55	11	9.06	0	0	87.1	187.6	7.05

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Squantz Pond Site Profile Data

DATE	TIME	Depth (m)	Temp (°C)	DO (mg/l)	DO (%Sat)	Rel. BG (cells/mL)	Sp Cond (µmhos/cm)	pH (SU)
09/25/17	10:48:50	Surf.	23.34	8.62	101	3.4	167.8	8.5
09/25/17	10:49:38	1	22.82	8.98	104.1	8.4	167.7	8.33
09/25/17	10:50:18	2	22.62	9.12	105.4	7.3	167.6	8.31
09/25/17	10:51:08	3	22.24	9.23	105.8	11.1	167.3	8.32
09/25/17	10:51:40	4	22.03	9.27	105.8	12.8	167.2	8.28
09/25/17	10:52:20	5	21.87	9.24	105.2	13.6	167.2	8.23
09/25/17	10:55:00	6	21.51	8.44	95.5	13.1	166.9	7.91
09/25/17	11:01:14	7	20.42	5.34	59.1	17.1	165.7	7.36
09/25/17	11:10:26	8	19.02	2.25	24.2	10.1	166.1	7.12
09/25/17	11:15:09	9	15.58	0.74	7.4	778.4	166.3	6.98
09/25/17	11:15:43	10	12.42	0.49	4.6	203.1	183.5	6.99
09/25/17	11:17:03	11	9.45	0.23	2	126.7	199.5	7.18
10/05/17	15:01:21	Surf.	20.96	9.09	101.7	81.5	168.2	8.27
10/05/17	15:02:15	1	20.67	9.3	103.4	6	168	8.23
10/05/17	15:02:43	2	20.26	9.37	103.3	11	167.6	8.24
10/05/17	15:03:17	3	20	9.38	102.9	14.7	167.6	8.2
10/05/17	15:04:45	4	19.88	9.11	99.7	19.1	167.6	8.1
10/05/17	15:05:55	5	19.83	8.9	97.3	16.6	167.6	8
10/05/17	15:07:14	6	19.79	8.7	95.1	13.2	167.5	7.94
10/05/17	15:09:16	7	19.69	8.12	88.5	14.6	167.5	7.76
10/05/17	15:12:06	8	19.38	6.56	71.1	9.8	167.8	7.48
10/05/17	15:17:18	9	16.02	0.52	5.2	417.5	167.4	6.95
10/05/17	15:18:45	10	12.51	0.16	1.5	157.2	186	7.02
10/05/17	15:19:37	11	10.19	0.07	0.6	63.1	199.1	7.13

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APPENDIX 2: SECCHI TRANSPARENCY, CHLOROPHYLL-*A*, ALKALINITY AND NUTRIENT DATA

The following abbreviation are used within Appendix 2.

DB	Danbury Site	Epi	Epilimnion
NF	New Fairfield Site	Meta	Metalimnion
NM	New Milford Site	Hypo	Hypolimnion
SH	Sherman Site	TKN	Total Kjeldahl Nitrogen
SQ	Squantz Pond Site	TN	Total Nitrogen
		Total P	Total Phosphorus

Chlorophyll *a* (µg/L)

Month	Date	DB	NF	NM	SH	Avg.	Date	SQ
May	12-May-17	7.25	5.8	4.86	5.29	5.79	24-May-07	3.59
Jun	22-Jun-17	3.89	4.8	4.15	5.43	4.56	28-Jun-17	3.46
Jul	20-Jul-17	5.58	4.5	5.37	5.02	5.13	26-Jul-17	3.57
Aug	24-Aug-17	5.89	6.2	5.13	7.02	6.06	25-Aug-17	0.84
Sep	21-Sep-17	7.13	7.9	6.27	5.49	6.70	25-Sep-17	1.68
Oct	5-Oct-17	11.91	8.8	4.66	9.19	8.65	5-Oct-17	4.19
	Avg.	6.94	6.33	5.07	6.24	6.15	Avg.	2.89
	Min.	3.89	4.54	4.15	5.02	3.89	Min.	0.84
	Max.	11.91	8.82	6.27	9.19	11.91	Max.	4.19

Secchi Disk Depth (m)

Month	Date	DB	NF	NM	SH	Avg.	Date	SQ
May	12-May-17	1.18	1.51	1.45	1.59	1.43	24-May-07	1.93
Jun	22-Jun-17	3.25	2.85	3.3	3.21	3.15	28-Jun-17	4.11
Jul	20-Jul-17	2.93	3.03	2.95	3.37	3.07	26-Jul-17	2.77
Aug	24-Aug-17	2.60	2.30	2.48	2.59	2.49	25-Aug-17	3.35
Sep	21-Sep-17	2.40	2.68	2.56	2.65	2.57	25-Sep-17	3.71
Oct	5-Oct-17	2.29	2.19	3.09	2.36	2.48	5-Oct-17	3.21
	Avg.	2.44	2.43	2.64	2.63	2.53	Avg.	3.18
	Min.	1.18	1.51	1.45	1.59	1.18	Min.	1.93
	Max.	3.25	3.03	3.30	3.37	3.37	Max.	4.11

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Danbury Bay Site 2017 Nutrient And Alkalinity Data

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
May	Epi	64	0	0	0	0.48	0.48	13
	Meta	74	0	0	0	0.55	0.55	12
	Hypo	70	0	0.05	0	0.74	0.74	15
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
June	Epi	76	0	0	0	0.92	0.92	22
	Meta	74	0	0	0	0.44	0.44	21
	Hypo	76	0	0	0	0.33	0.33	28
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
July	Epi	70.4	0	0	0	0.43	0.43	17
	Meta	70.2	0.14	0	0	0.5	0.64	29
	Hypo	78.2	0	0	0	0.26	0.26	72
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Aug.	Epi	68	0	0	0	0.44	0.44	7
	Meta	68	0	0	0	0.36	0.36	19
	Hypo	79.4	0.6	0	0	0.86	1.46	82
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Sept.	Epi	72	0	0	0	0.37	0.37	10
	Meta	69	0	0	0	0.29	0.29	9
	Hypo	66	0	0	0	0.42	0.42	9
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Oct.	Epi	71	0	0	0	0.26	0.26	0
	Meta	72.2	0.14	0	0	0.45	0.59	0
	Hypo	92.4	0.79	0	0	1.19	1.98	67

New Fairfield Site 2017 Nutrient And Alkalinity Data

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
May	Epi	64	0	0	0	0.48	0.48	13
	Meta	74	0	0	0	0.55	0.55	12
	Hypo	70	0	0.05	0	0.74	0.74	15
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
June	Epi	72	0	0	0	0.49	0.49	25
	Meta	74	0	0	0	0.4	0.4	27
	Hypo	74	0	0	0	0.71	0.71	22
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
July	Epi	72.2	0	0	0	0.38	0.38	16
	Meta	72.8	0.1	0	0	0.4	0.5	24
	Hypo	78	0	0	0	0.31	0.31	31
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Aug.	Epi	67	0	0	0	0.5	0.5	12
	Meta	67	0	0	0	0.31	0.31	11
	Hypo	68.8	0	0	0	0.47	0.47	13
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Sept.	Epi	72	0	0	0	0.31	0.31	9
	Meta	80	0.39	0	0	0.6	0.99	12
	Hypo	88	0.86	0	0	1.09	1.95	88
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Oct.	Epi	71.8	0	0	0	0.41	0.41	
	Meta	75	0.16	0	0	0.36	0.52	
	Hypo	90	0.91	0	0	1.3	2.21	

New Milford 2017 Nutrient And Alkalinity Data

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
May	Epi	70	0	0	0	0.62	0.62	15
	Meta	70	0	0	0	0.43	0.43	16
	Hypo	80	0.19	0.21	0	0.6	0.79	9

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
June	Epi	70	0	0	0	0.41	0.41	27
	Meta	76	0	0	0	0.44	0.44	25
	Hypo	92	0	0.42	0	0.36	0.36	14

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
July	Epi	72.2	0	0	0	0.43	0.43	15
	Meta	73.2	0.13	0	0	0.48	0.61	25
	Hypo	99.6	0	0.29	0.11	0.33	0.33	17

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Aug.	Epi	67.8	0	0	0	0.43	0.43	12
	Meta	69	0	0	0	0.53	0.53	22
	Hypo	91.8	0.58	0.06	0	0.73	1.31	30

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Sept.	Epi	70.4	0	0	0	0.28	0.28	8
	Meta	68.2	0	0	0	0.36	0.36	20
	Hypo	100	1.12	0	0	1.35	2.47	73

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Oct.	Epi	70	0	0	0	0.23	0.23	
	Meta	75.6	0	0	0	0.18	0.18	
	Hypo	93.4	0	0	0	0.4	0.4	55

Sherman Site 2017 Nutrient And Alkalinity Data

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
May	Epi	72	0	0	0	0.43	0.43	16
	Meta	74	0	0	0	0.37	0.37	14
	Hypo	72	0	0.05	0	0.35	0.35	16
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
June	Epi	72	0	0	0	0.97	0.97	19
	Meta	72	0	0	0	1.08	1.08	22
	Hypo	74	0	0	0	0.78	0.78	29
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
July	Epi	71.6	0	0	0	0.43	0.43	20
	Meta	69.8	0.12	0	0	0.44	0.56	24
	Hypo	71.6	0	0	0	0.39	0.39	20
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Aug.	Epi	68.2	0	0	0	0.45	0.45	15
	Meta	69	0	0	0	0.46	0.46	24
	Hypo	78.2	0.64	0	0	0.93	1.57	104
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Sept.	Epi	72	0	0	0	0.2	0.2	9
	Meta	73	0.42	0	0	0.48	0.9	12
	Hypo	86	0.71	0	0	0.96	1.67	57
Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (mg/L)	Total P (ug/L)
Oct.	Epi	71.4	0	0	0	0.29	0.29	
	Meta	71.6	0	0	0	0.29	0.29	
	Hypo	74.4	0.19	0	0	0.47	0.66	

Squantz Pond 2017 Nutrient And Alkalinity Data

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (µg/L)	Total P (ug/L)
May	Epi	38	0	0	0	0.28	280	13
	Meta	38	0	0	0	0.32	320	10
	Hypo	40	0	0	0	0.4	400	8

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (µg/L)	Total P (ug/L)
June	Epi	42	0	0	0	0.38	380	
	Meta	42	0	0	0	0.87	870	
	Hypo	42	0	0	0	0.71	710	

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (µg/L)	Total P (ug/L)
July	Epi	36	0	0	0	0.34	340	14
	Meta	36	0	0	0	0.26	260	20
	Hypo	44	0.28	0	0	0.47	750	35

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (µg/L)	Total P (ug/L)
Aug.	Epi	37.7	0	0	0	0.27	270	12
	Meta	37	0	0	0	0.42	420	16
	Hypo	46.4	0.6	0.08	0.06	0.93	1530	36

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (µg/L)	Total P (ug/L)
Sept.	Epi	38	0	0	0	0.27	270	12
	Meta	38	0	0	0	0.17	170	15
	Hypo	54	0.55	0	0	0.88	1430	43

Month	Depth	Alkalinity (mg/L)	Ammonia (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	TKN (mg/L)	TN (µg/L)	Total P (ug/L)
Oct.	Epi	38	0	0	0	0.15	150	
	Meta	40.4	0	0	0	0.4	400	13
	Hypo	50.8	1.2	0	0	1.2	2400	22

APPENDIX 3. COMPARISON OF LAST FIVE YEARS OF TROPHIC DATA TO THE PRIOR 28 YEARS IN THE EPILIMNION AT CANDLEWOOD LAKE

Danbury Site.

Variable (units)	Month	1985-2012 Mean ± SD	2013	2014	2015	2016	2017
Secchi	May	2.43±0.47	2.26	3.62	2.12	2.55	1.18
(meters)	June	2.93±0.57	3.20	2.93	3.56	3.00	3.25
	July	2.31±0.54	1.77	3.09	2.08	1.91	2.93
	August	2.83±0.69	1.83	2.75	1.75	2.72	2.60
	September	2.59±0.62	1.90	2.46	2.43	3.17	2.40
	October	2.10±0.28	1.75	2.26	1.97	1.92	2.29
	All months	2.53±0.61	2.12	2.85	2.32	2.55	2.44
Chl-*a*	May	4.07±1.64	7.39	4.26	2.71	4.55	7.25
(µg/L)	June	4.38±2.12	3.95	8.74	6.00	4.75	3.89
	July	7.77±4.02	11.13	6.64	11.67	14.09	5.58
	August	6.26±3.25	13.14	7.14	17.40	5.50	5.89
	September	8.36±4.22	11.58	7.89	8.55	6.98	7.13
	October	12.49±3.79	12.01	9.79	11.94	11.19	11.91
	All months	7.21±4.32	9.87	7.41	9.71	7.84	6.94
Epi-TP	May	24.65±9.33	18	33	20	17	13
	June	24.40±11.00	27	17	27	38	22
	July	23.911±0.68	20	10	17	14	17
	August	25.06±9.25	27	20	20	19	7
	September	22.41±9.88	3	3	40	3	10
	October	22.19±9.13	30	7	10	7	NA
	All months	23.77±9.82	20	15	22	16	14

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New Fairfield Site.

Variable (units)	Month	1985-2012 Mean ± SD	2013	2014	2015	2016	2017
Secchi	May	2.45±0.44	2.19	3.00	1.73	2.64	1.51
(meters)	June	3.15±0.61	2.69	3.46	3.20	2.69	2.85
	July	2.40±0.56	2.14	3.12	2.02	1.88	3.03
	August	2.86±0.59	1.86	3.70	1.66	2.29	2.30
	September	2.58±0.67	1.38	2.53	2.29	2.74	2.68
	October	2.03±0.29	2.20	2.19	2.04	2.01	2.19
	All months	2.58±0.64	2.08	3.00	2.16	2.38	2.43
Chl-a	May	4.29±1.95	9.1	4.8	3.8	2.5	5.8
(µg/L)	June	4.34±2.46	3.8	3.9	4.9	3.4	4.8
	July	6.95±3.49	7.5	7.4	13.1	5.1	4.5
	August	6.52±2.90	14.6	3.8	19.2	4.7	6.2
	September	7.51±4.91	12.7	10.7	10.5	5.1	7.9
	October	12.16±4.80	13.0	12.2	9.2	14.6	8.8
	All months	6.84±4.42	10.1	7.1	10.1	5.9	6.3
Epi-TP	May	21.66±8.86	23	17	37	4	13
(µg/L)	June	21.59±7.89	17	10	17	32	25
	July	23.33±12.41	20	7	27	9	16
	August	21.88±10.15	17	17	13	13	12
	September	21.21±12.20	27	13	70	6	9
	October	22.08±9.17	37	13	17	7	NA
	All months	21.96±10.13	24	13	30	12	16

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New Milford Site.

Variable (units)	Month	1985-2012 Mean ± SD	2013	2014	2015	2016	2017
Secchi	May	2.52±0.56	2.49	3.03	2.23	3.10	1.59
(meters)	June	3.21±0.65	2.57	4.57	3.32	3.60	3.21
	July	2.36±0.55	2.27	3.82	2.48	2.15	3.37
	August	2.96±0.56	2.24	3.88	1.95	2.58	2.59
	September	3.07±0.72	2.66	3.25	2.78	3.19	2.65
	October	2.65±0.42	2.41	2.64	2.83	2.30	2.36
	All months	2.80±0.65	2.44	3.53	2.60	2.82	2.63
Chl-a	May	4.28±2.33	5.74	3.25	2.56	3.01	4.86
(µg/L)	June	4.02±2.52	3.57	2.91	3.05	4.91	4.15
	July	7.15±3.19	6.64	4.28	9.28	6.27	5.37
	August	5.27±2.27	10.54	3.33	15.60	7.43	5.13
	September	6.19±4.61	6.98	4.46	5.11	5.28	6.27
	October	8.35±4.37	14.45	8.36	5.79	8.95	4.66
	All months	5.89±3.64	7.99	4.43	6.90	5.68	5.07
Epi-TP	May	20.94±8.44	40	47	53	17	15
(µg/L)	June	21.47±8.09	17	13	3	25	27
	July	23.37±13.22	33	3	57	3	15
	August	21.02±11.87	163	0	13	14	12
	September	18.45±8.58	33	3	10	6	8
	October	18.77±8.73	17	27	57	3	NA
	All months	20.68±10.03	53	19	32	11	14

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Sherman Site.

Variable (units)	Month	1985-2012 Mean ± SD	2013	2014	2015	2016	2017
Secchi	May	2.46±0.43	1.61	2.69	1.72	2.44	1.59
(meters)	June	3.18±0.63	2.51	3.41	2.92	2.74	3.21
	July	2.51±.055	1.91	2.84	2.25	1.71	3.37
	August	2.64±0.52	2.23	3.78	1.61	2.08	2.59
	September	2.31±0.61	1.26	2.23	2.41	2.09	2.65
	October	2.00±0.27	1.57	2.00	1.91	1.66	2.36
	All months	2.52±0.62	1.85	2.83	2.14	2.12	2.63
Chl-a	May	4.61±2.32	6.63	3.67	4.35	5.15	5.29
(µg/L)	June	4.10±2.44	4.55	3.29	4.31	9.48	5.43
	July	6.72±3.57	8.23	5.46	8.42	7.81	5.02
	August	5.88±2.92	13.78	3.38	19.20	8.42	7.02
	September	8.94±4.39	14.69	11.31	13.47	1.97	5.49
	October	14.08±5.51	19.07	15.65	10.55	14.07	9.19
	All months	7.30±4.93	11.16	7.13	10.05	7.82	6.24
Epi-TP	May	22.92±10.82	4	10	33	40	16
(µg/L)	June	21.85±11.66	13	23	10	25	19
	July	21.13±9.25	20	30	20	17	20
	August	22.17±10.37	10	10	27	21	15
	September	22.31±11.16	30	13	30	4	9
	October	25.26±10.45	40	10	40	20	NA
	All months	22.59±10.56	23	16	27	21	16

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