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Media Center

Lake Reports

FOR IMMEDIATE RELEASE

DATE: May 10, 2017

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2016 New Hampshire Lake Status Reports Are Now Available

Concord, NH – The Volunteer Lake Assessment Program (VLAP) and the Lake Trophic Survey Program (LTSP) at the New Hampshire Department of Environmental Services (NHDES) have released their 2016 water quality reports. Based on data collected by volunteer citizen scientists on 170 lakes and ponds, VLAP created reports for each water body which analyze long-term trends in water quality. Additionally, 11 new trophic reports are available, which are in-depth studies over a three year period on the current status of the selected lakes. Together, these reports summarize chemical, biological, and physical water quality information of individual lakes and ponds around New Hampshire, and join the growing archive of state-wide data in the Lake Information Mapper.

To access the 2016 VLAP reports, please visit: www.des.nh.gov/organization/divisions/water/wmb/vlap/annual_reports/2016/lake-reports.htm

To access the 2016 LTSP reports, please visit:

www.des.nh.gov/organization/commissioner/pip/publications/documents/r-wd-17-07.pdf

All of the reports are also available on the New Hampshire Lake Information Mapper. To access the Mapper, please visit: tinyurl.com/NH-LakeMapper

 Adobe Acrobat Reader format. Download a free reader from [Adobe](#).

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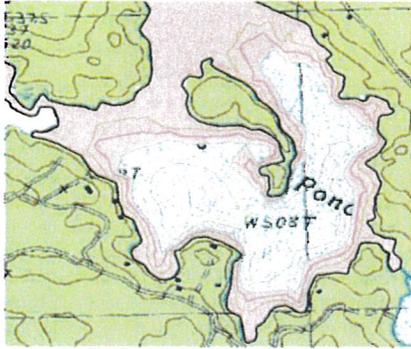
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HOW TO READ YOUR VLAP REPORT

MORPHOMETRIC DATA¹

Watershed Area (Ac.):	17,664	Max. Depth (m):	11.3	Flushing Rate (yr ⁻¹):	12.9	Year	Trophic Class	KNOWN EXOTIC SPECIES ⁵
Surface Area (Ac.):	179	Mean Depth (m):	3.7	P Retention Coef ³ :	0.37	1992	MESOTROPHIC	Variable Milfoil
Shore Length (m):	4,000	Volume (m ³):	2,675,000	Elevation(ft):	508	2009	EUTROPHIC	

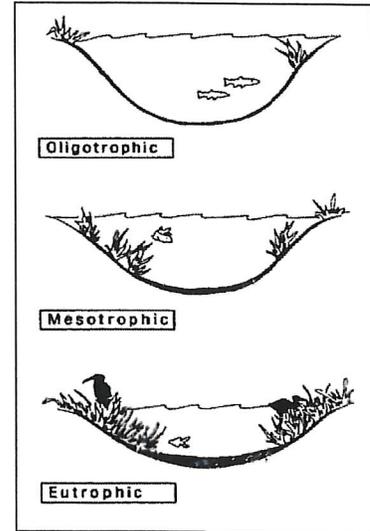
1. LAKE MORPHOMETRY: refers to the size and shape of the lake basin, and can affect the physical, chemical and biological processes of the lake. A lake's morphometry can be best described by a bathymetric map.



2. FLUSHING RATE: refers to the number of times a lake flushes (volume of water equal to the lake's volume passes through the lake) in one year, expressed to the nearest 0.1 times/year. Lakes have low flushing rates compared to rivers and streams, which are constantly replenishing their water volume, which leaves lakes more vulnerable to the accumulation of pollutants and nutrients.

3. PHOSPHORUS RETENTION COEFFICIENT: The phosphorus retention coefficient can be defined as the fraction of inflowing phosphorus that is not lost through outflow and retained within the water body.

4. TROPHIC CLASSIFICATION: generally refers to the biological production, or how aged a lake is. NH uses four indicators to determine a lake's trophic status. Those are dissolved oxygen, chlorophyll-a, transparency, and vascular aquatic plant growth. Oligotrophic lakes tend to be deeper, larger lakes with clear water, rocky or sandy shorelines, low phosphorus enrichment, limited rooted plant growth, low algal growth and adequate dissolved oxygen throughout. Mesotrophic waters are an intermediate category with characteristics between oligotrophic and eutrophic water bodies. Eutrophic waters are smaller, shallower ponds with mucky bottoms, extensive rooted plant growth, and depleted dissolved oxygen in bottom waters; often tea-colored and sometimes murky from planktonic algal growth.



5. EXOTIC SPECIES: plants and/or animals that are not native to a specific region and once introduced, typically have no natural enemies to keep populations in check. In lakes, exotic aquatic plants, such as Variable milfoil, can quickly out-compete native plants for resources and have detrimental affects on the lake ecosystem. Currently, 72 lakes/ponds in NH are infested with an exotic species. For more information on Exotic Species in NH's lakes visit <http://des.nh.gov/organization/divisions/water/wmb/exoticspecies/index.htm>

Variable milfoil (*Myriophyllum heterophyllum*)



WATERBODY REPORT CARD TABLES

Water Quality Assessment Outcomes

Since the *Clean Water Act* took effect in 1987, it requires that every state submit two surface water quality assessment documents to the EPA every two years. Included in these reports is a list of waters (Section 303d list) that do not meet water quality standards thus, they are impaired or not supporting their designated uses.

Designated Use	Impaired	Parameter	Category
This represents the uses a waterbody (lake, river, estuary) should support. There are seven designated uses: aquatic life, fish consumption, shellfish consumption, drinking water, primary contact recreation, secondary contact recreation, and wildlife.	If data collected for a specific parameter routinely do not meet accepted criteria, then a waterbody is considered to be impaired for that designated use. Alternately, if data meet accepted criteria, the waterbody fully supports the designated use.	The physical, chemical or biological parameter used to assess whether a waterbody supports a specific designated use.	Depicts how well the designated use is supported based on thresholds assigned to the parameter. There are several categories from fully supported to severely impaired. Category ratings of Bad and Slightly Bad indicate the use is impaired. A category rating of Encouraging indicates additional data are needed. Category ratings of Good or Very Good mean data support the use.

Parameter	Thresholds
pH	6.5 – 8.0
Phosphorus (total)	< 8 ug/L Oligotrophic ≤ 12 ug/L Mesotrophic ≤ 28 ug/L Eutrophic
Chlorophyll-a	< 3.3 ug/L Oligotrophic ≤ 5.0 ug/L Mesotrophic ≤ 11.0 ug/L Eutrophic
Dissolved Oxygen	> 6.0 mg/L Class A waters > 5.0 mg/L Class B waters > 75% Sat. Class A & B waters
<i>E. coli</i>	Single sample < 88 cts/100 mL Public beaches Geometric mean < 47 cts/100 mL Public beaches Single sample < 153 cts/100 mL Class A waters Single sample < 406 cts/100 mL Class B waters Geometric mean < 47 cts/100 mL Class A waters Geometric mean < 126 cts/100 mL Class B waters

HOW TO READ YOUR VLAP REPORT

OBSERVATIONS AND RECOMMENDATIONS SECTION

Chlorophyll-a: A photosynthetic pigment found in plants, including algae, and measured to estimate amount of algal growth in a lake system. Elevated chl-a levels indicate excessive algal growth typically caused by too many nutrients (phosphorus).

Conductivity/Chloride: Conductivity measures the ability of water to carry an electrical current. It is determined by the number of ions and minerals present. Chloride ion is naturally occurring in seawater, but less so in freshwaters. NH's soft water has naturally low conductivity and chloride values. Elevated conductivity and chloride may indicate pollution from such sources as road salting, septic systems, wastewater treatment plants, or agriculture runoff.

E. coli: *E. coli* is a natural component of the large intestines of humans and other warm-blooded animals. *E. coli* is used as an indicator organism for bacteriological monitoring because it is easily cultured and its presence in the water in defined amounts indicates that fecal matter MAY be present.

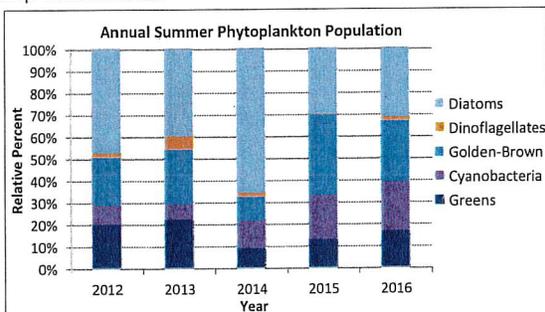
Total Phosphorus: Total phosphorus is a measure of all the phosphorus forms present in the water, including both inorganic and organic forms. In freshwater, it is the limiting nutrient that determines the amount of algal growth that can occur. Too much phosphorus can lead to excessive algal and cyanobacteria populations.

Transparency: Transparency, a measure of water clarity, is affected by the amount of algae, color, and particulate matter within a lake. It is measured using a 20 cm black and white Secchi disk.

Turbidity: Turbidity in the water is caused by suspended matter (such as clay, silt, and algae) that cause light to be scattered and absorbed, not transmitted in straight lines through water.

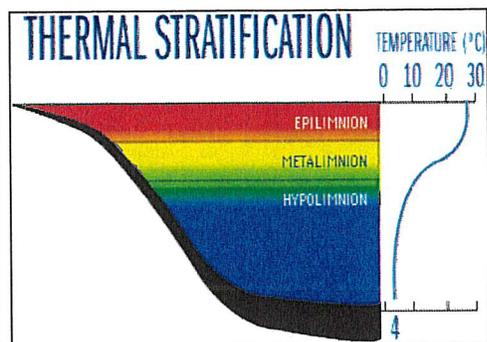
pH: pH is a measure of the hydrogen ions in the water or, in general terms, the acidity. New Hampshire lakes historically have slightly acidic pH levels due to acid rain and granite bedrock lacking in minerals that counteract inputs of the acid rain. Lake pH is important to the survival and reproduction of fish and other aquatic life.

PHYTOPLANKTON: Microscopic plants, or algae, form the basis of the lake's food chain. They need sunlight and nutrients to grow and are typically found in the warmer epilimnetic and metalimnetic waters. The type of phytoplankton present in a lake can be used as an indicator of general lake quality and shifts in the dominant algal population over time can be an early warning to shifts in the aquatic ecosystem. Diatoms and golden-brown algae are typically found in the spring and fall, while green algae and cyanobacteria are more common in mid to late summer. An abundance or shift to cyanobacteria dominance over time may indicate excessive phosphorus or that the lake ecology is out of balance. Diatoms and golden-brown algae are typical of NH's less productive lakes.



Note: Phytoplankton graphics are not included in all lake reports.

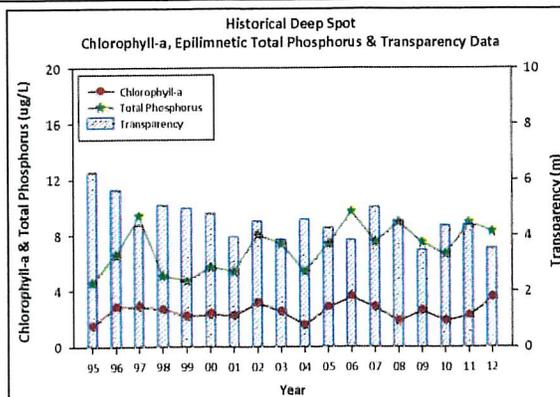
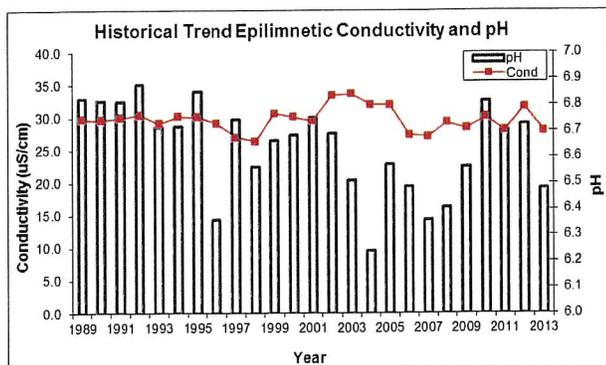
DISSOLVED OXYGEN AND TEMPERATURE PROFILE



Depicts the amount of oxygen dissolved in water at various temperatures from the lake's surface to bottom. Dissolved oxygen (DO) in lake water is used by all forms of aquatic life and can help to assess the "health" of the lake ecosystem. NH's lakes typically mix twice annually; spring and fall. Spring turnover of lake water occurs after ice out as warmer air temperatures heat up surface waters. Eventually, the lake becomes thermally stratified with a layer of warm surface water overlying layers of dense cold water. Eventually three distinct layers form called the epilimnion, metalimnion, and hypolimnion, and waters in these layers do not mix freely during summer months. Layers can be determined by looking at the DO/Temperature profile and graphic. Typically, DO is greater in the epilimnion due to wind and wave action mixing atmospheric oxygen into surface waters, as well as algal growth producing oxygen as a by-product of photosynthesis. As you move into the metalimnion and hypolimnion, DO can decrease to low levels as these layers do not get re-oxygenated and microbial activity utilizes DO to break down organic matter in bottom sediments. When fall arrives and colder air temperatures cool surface waters, fall turnover occurs, mixing the thermal layers until they are a uniform temperature and DO levels recover at deeper depths. Understanding DO and temperature patterns is important to lake management. These patterns reflect and influence lake productivity, physical properties, phosphorus cycling, and fish and aquatic animal populations.

Note: Dissolved oxygen and temperature profiles are not included in all lake reports.

WATER QUALITY TREND ANALYSIS: Understanding how lake water quality has changed over time can identify potential problems and help guide watershed management activities. Statistical analyses are conducted on various parameters where ten or more consecutive years of data are available. Specifically, linear regression analyses are utilized to determine if the annual mean value of a parameter has changed, significantly increased or decreased, or not over time. A parameter has significantly changed if the significance value is less than 0.05, meaning there is 95% confidence that the values have increased or decreased. If there is not a significant change, then we look at the coefficient of variation to determine how stable or variable are the data. The graphics depict the average annual value for chlorophyll-a, transparency, and epilimnetic total phosphorus, pH and conductivity. A significant increase in chlorophyll-a, total phosphorus and conductivity means that data are degrading or worsening over time; while a significant decrease means the data are improving over time. The opposite holds true for pH and transparency; a significant increase means the data are improving, while a significant decrease means the data are degrading or worsening.





Volunteer Lake Assessment Program Individual Lake Reports

PLEASANT LAKE, NEW LONDON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	7,488	Max. Depth (m):	28.6	Flushing Rate (yr ¹):	0.7	Year	Trophic class	KNOWN EXOTIC SPECIES
Surface Area (Ac.):	606	Mean Depth (m):	10.5	P Retention Coef:	0.6	1979	OLIGOTROPHIC	
Shore Length (m):	7,200	Volume (m ³):	25,761,000	Elevation (ft):	805	1993	OLIGOTROPHIC	

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

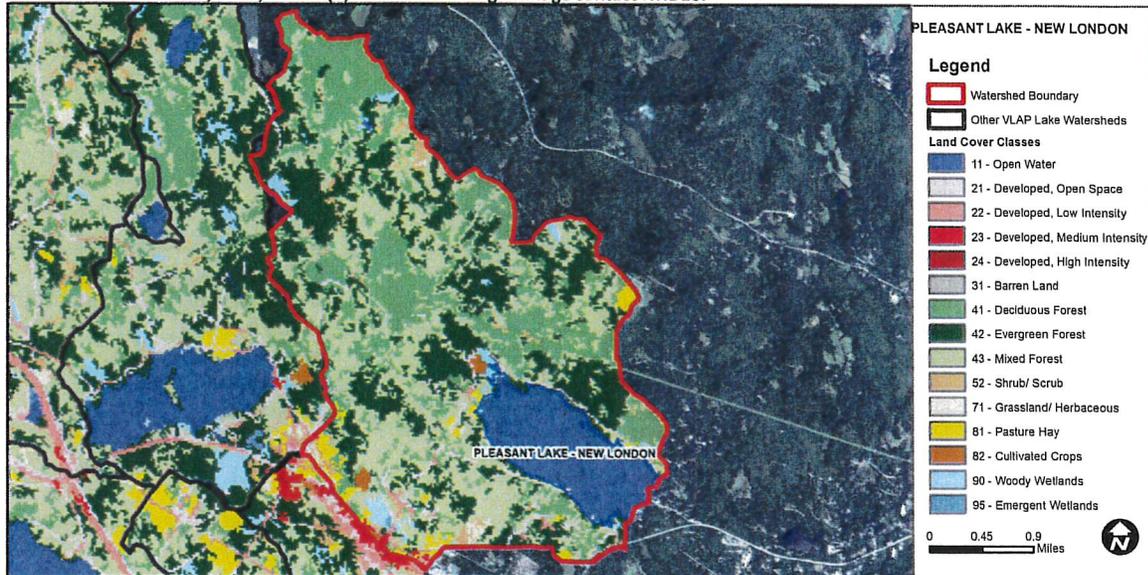
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for this parameter by a small margin.
	Oxygen, Dissolved	Bad	Data periodically exceed water quality standards or thresholds for this parameter by a large margin.
	Dissolved oxygen satura	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin.
	Chlorophyll-a	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
Primary Contact Recreation	Escherichia coli	No Data	No data for this parameter.
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

PLEASANT LAKE - ELKINS BEACH	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
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WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	9.6	Barren Land	0.02	Grassland/Herbaceous	0.29
Developed-Open Space	1.79	Deciduous Forest	22.5	Pasture Hay	1.91
Developed-Low Intensity	0.76	Evergreen Forest	26.98	Cultivated Crops	0.42
Developed-Medium Intensity	0.34	Mixed Forest	32.34	Woody Wetlands	1.49
Developed-High Intensity	0	Shrub-Scrub	1.5	Emergent Wetlands	0.09

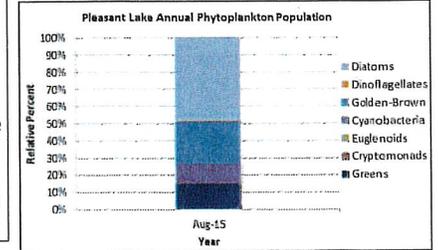
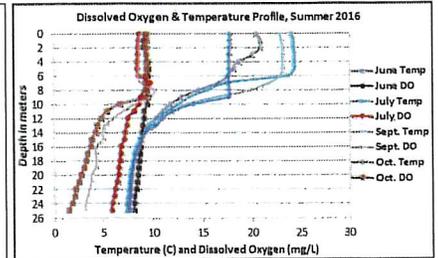


VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS PLEASANT LAKE, NEW LONDON 2016 DATA SUMMARY

RECOMMENDED ACTIONS: Lake clarity (transparency) improved in 2016 during drought conditions suggesting the lack of stormwater runoff may have helped to improve clarity by reducing nutrient and sediment loading to the lake. This highlights the importance of managing stormwater runoff from paved, dirt and gravel roads, driveways, rooftops, steep slopes, agricultural, and timber harvesting sites. DES has several resources available as well as the new Soak Up the Rain NH Program (www.soaknh.org). Work with local road agents to identify and manage stormwater runoff from roads and roadside ditches. Maine DEP's "Camp Road Maintenance Manual" is a great resource. Keep up the great work!

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

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels fluctuated within a low range from June through October and were highest in October. The 2016 average chlorophyll level remained stable with 2015 and was much less than the state median. Historical trend analysis indicates stable chlorophyll levels with high variability between years.
- ◆ **CONDUCTIVITY/CHLORIDE:** Deep spot and tributary conductivity levels fluctuated within an average range from June through October and were approximately equal to the state median. Historical trend analysis indicates stable epilimnetic (upper water layer) conductivity levels since monitoring began.
- ◆ **E. COLI:** Slope Shore Pond Outlet and Turtle Cove E. coli levels were very low and much less than the state standards of 88 cts/100 mL for public beaches and 406 cts/100 mL for surface waters.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic, Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) phosphorus levels remained stable and low from June through August. Average epilimnetic phosphorus decreased slightly from 2015 and was much less than the state median. Historical trend analysis indicates stable epilimnetic phosphorus levels with moderate variability between years. Turtle Cove tributary phosphorus levels were elevated in June and the turbidity was also slightly elevated suggesting low flow conditions. All other tributary phosphorus levels remained low.
- ◆ **TRANSPARENCY:** Transparency measured with (VS) and without (NVS) the viewscope was lower than normal in June and then increased (improved) significantly from July through September. Average NVS transparency increased (improved) from 2015 and was much higher (better) than the state median. However, historical trend analysis indicates significantly decreasing (worsening) transparency since monitoring began.
- ◆ **TURBIDITY:** Deep spot turbidity levels fluctuated within a low to average range. Chandler Brook, Outlet, Slope Shore Pond Outlet, and White Brook turbidity levels fluctuated within a low range. PL 7, PL 8 and Turtle Cove turbidity levels were elevated in June suggesting low flow conditions.
- ◆ **pH:** Epilimnetic, Metalimnetic, Outlet, Chandler Brook, White Brook, PL 7, PL 8, and Slope Shore Pond Outlet pH levels were within the desirable range 6.5-8.0 units. However, epilimnetic pH has historically fluctuated below the desirable range. Historical trend analysis indicates stable epilimnetic pH with moderate variability between years. Hypolimnetic pH fluctuated below the desirable range and Turtle Cove pH was slightly less than desirable in June.



Station Name	Table 1. 2016 Average Water Quality Data for PLEASANT LAKE-NEW LONDON								
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	5.6	1.98	49.9		5	7.44	7.53	0.56	7.06
Metalimnion			49.4		5			0.66	7.05
Hypolimnion			49.3		5			1.00	6.33
Chandler Brook (PL 2)			50.1		5			0.52	7.03
Outlet (PL 1)			50.0		5			0.57	7.08
PL 7			49.5		6			0.91	7.05
PL 8			49.5		5			1.00	7.04
Slope Shore Pond Outlet			49.9	8	5			0.59	7.05
Turtle Cove (PL 5)			51.2	1	9			0.87	6.82
White Brook (PL 4)			50.6		5			0.61	7.05

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

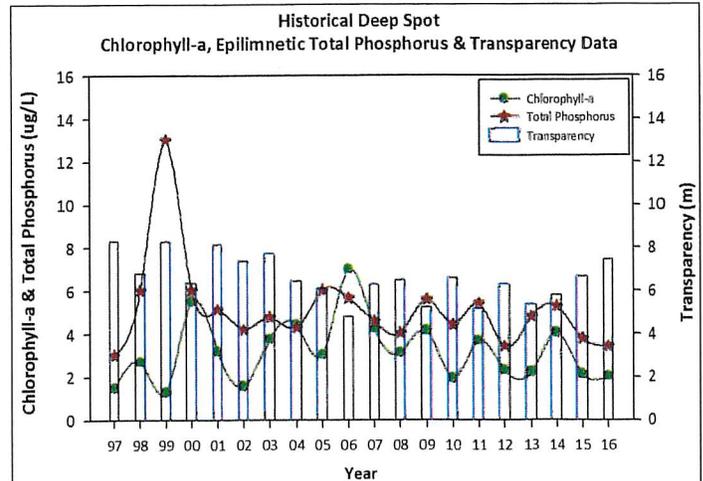
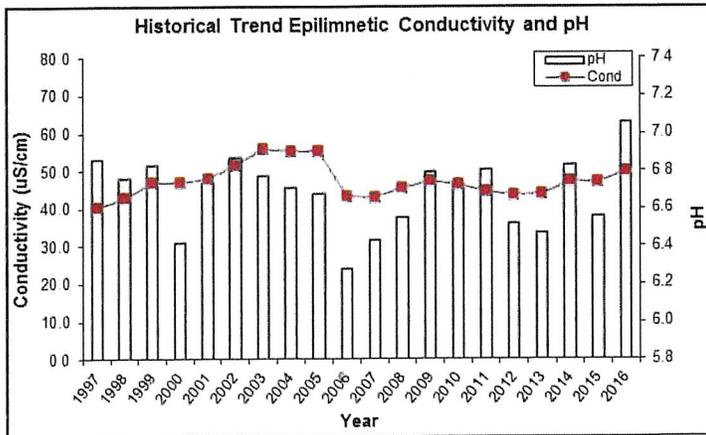
- Chloride:** > 230 mg/L (chronic)
- E. coli:** > 88 cts/100 mL – public beach
- E. coli:** > 406 cts/100 mL – surface waters
- Turbidity:** > 10 NTU above natural level
- pH:** between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.

- Alkalinity:** 4.9 mg/L
- Chlorophyll-a:** 4.58 mg/m³
- Conductivity:** 40.0 uS/cm
- Chloride:** 4 mg/L
- Total Phosphorus:** 12 ug/L
- Transparency:** 3.2 m
- pH:** 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data show low variability.	Chlorophyll-a	Stable	Trend not significant; data highly variable.
pH (epilimnion)	Stable	Trend not significant; data moderately variable.	Transparency	Worsening	Data significantly decreasing.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.





Volunteer Lake Assessment Program Individual Lake Reports
SUNAPEE LAKE, LITTLE, NEW LONDON, NH

MORPHOMETRIC DATA					TROPIC CLASSIFICATION		KNOWN EXOTIC SPECIES	
Watershed Area (Ac.):	3,968	Max. Depth (m):	13.1	Flushing Rate (yr ⁻¹)	1.1	Year	Trophic class	
Surface Area (Ac.):	472	Mean Depth (m):	4.4	P Retention Coef:	0.66	1994	MESOTROPHIC	
Shore Length (m):	9,500	Volume (m ³):	8,449,500	Elevation (ft):	1220	2008	OLIGOTROPHIC	

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

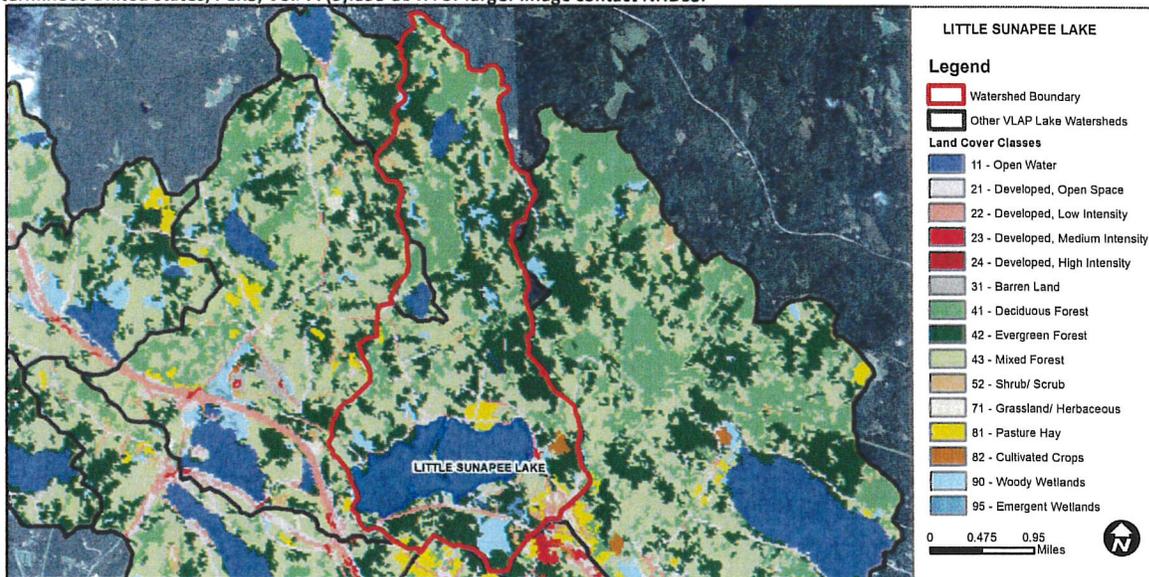
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for this parameter by a small margin.
	Oxygen, Dissolved	Bad	Data periodically exceed water quality standards or thresholds for this parameter by a large margin.
	Dissolved oxygen satura	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin.
	Chlorophyll-a	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
Primary Contact Recreation	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

LITTLE LAKE SUNAPEE - COLBY LODGE BEACH	Escherichia coli	No Data	No data for this parameter.
LITTLE SUNAPEE LAKE - BUCKLIN TOWN BEACH	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	14.6	Barren Land	0	Grassland/Herbaceous	0.15
Developed-Open Space	2.93	Deciduous Forest	12.95	Pasture Hay	1.4
Developed-Low Intensity	1.5	Evergreen Forest	32.03	Cultivated Crops	0.36
Developed-Medium Intensity	0.1	Mixed Forest	27.97	Woody Wetlands	3.86
Developed-High Intensity	0	Shrub-Scrub	1.83	Emergent Wetlands	0.22

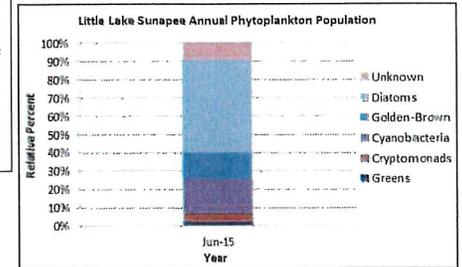
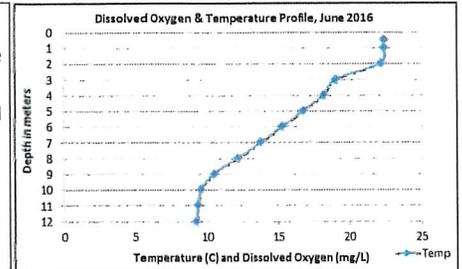


VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS LITTLE LAKE SUNAPEE, NEW LONDON 2016 DATA SUMMARY

RECOMMENDED ACTIONS: Lake water quality is generally representative of Oligotrophic, or high quality conditions. Epilimnetic phosphorus levels have stabilized within a low range since 2013 and we hope to see this continue. Water clarity (transparency) has decreased (worsened) since monitoring began. This may be explained by the increased frequency and intensity of storm events and flushing of wetland systems rich in dissolved organic matter which impart a "tea" color to water. Analyze deep spot samples for Apparent Color in 2017 when the biologist visits. Continue to educate lake and watershed residents on ways to reduce stormwater runoff from their properties using DES' "NH Homeowner's Guide to Stormwater Management". Keep up the great work!

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

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels remained stable and low from June to September. The 2016 average chlorophyll level increased slightly from 2015 and was slightly less than the state median. Historical trend analysis indicates relatively stable chlorophyll levels since monitoring began.
- ◆ **CONDUCTIVITY/CHLORIDE:** Epilimnetic (upper water layer), Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) conductivity and chloride levels were greater than the state median but less than a level of concern. Historical trend analysis indicates relatively stable epilimnetic conductivity levels since monitoring began.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic and Metalimnetic phosphorus levels were stable from June to September and within a low range. Average epilimnetic phosphorus decreased slightly from 2015 and was much less than the state median. Historical trend analysis indicates relatively stable epilimnetic phosphorus levels since monitoring began.
- ◆ **TRANSPARENCY:** Transparency measured with (VS) and without (NVS) the viewscope was low in June likely due to pollen in the water and then increased (improved) greatly in September. Average NVS transparency remained stable with 2015 and was higher (better) than the state median. Historical trend analysis indicates significantly decreasing (worsening) NVS transparency since monitoring began. VS transparency was higher (better) than NVS transparency and likely a better representation of actual conditions.
- ◆ **TURBIDITY:** Epilimnetic turbidity level was higher in June likely due to pollen and then decreased in September and remained within a low range. Metalimnetic turbidity level was stable and low. Hypolimnetic turbidity level was low in June and increased to a slightly elevated range in September potentially due to the accumulation of dissolved organic compounds in hypolimnetic waters as the summer progressed.
- ◆ **pH:** Epilimnetic pH level was within the desirable range 6.5-8.0 units, however has historically fluctuated below the desirable range. Metalimnetic and Hypolimnetic pH levels fluctuated below the desirable range in 2016. Historical trend analysis indicates relatively stable epilimnetic pH levels since monitoring began.



Station Name	Table 1. 2016 Average Water Quality Data for LITTLE LAKE SUNAPEE, NEW LONDON								
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Cond. uS/cm	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	5.2	3.63	15	84.6	6	4.13	5.03	0.92	7.00
Metalimnion				83.8	5			1.04	6.42
Hypolimnion			15	90.5	14			3.33	6.34

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.

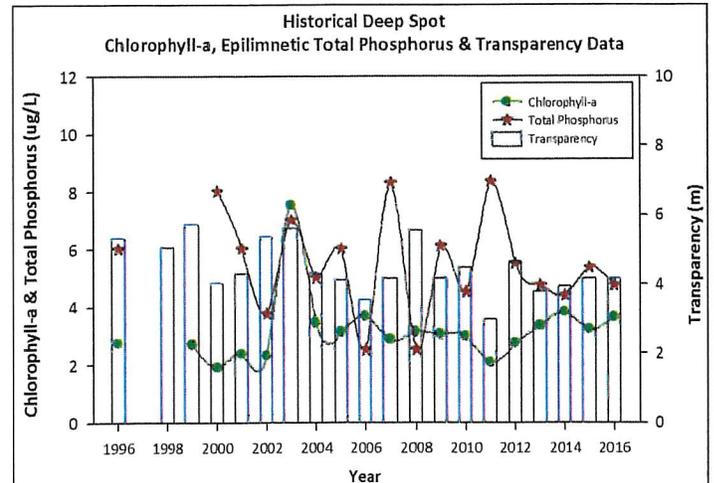
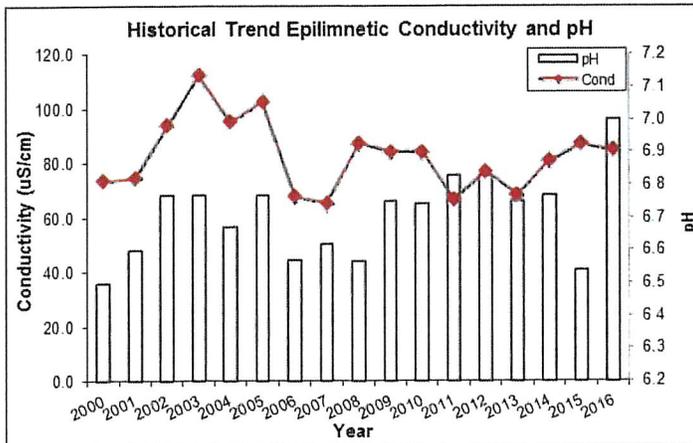
- Alkalinity:** 4.9 mg/L
- Chlorophyll-a:** 4.58 mg/m³
- Conductivity:** 40.0 uS/cm
- Chloride:** 4 mg/L
- Total Phosphorus:** 12 ug/L
- Transparency:** 3.2 m
- pH:** 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

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

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
pH (epilimnion)	Stable	Trend not significant; data moderately variable.	Transparency	Worsening	Data significantly decreasing.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.





Volunteer Lake Assessment Program Individual Lake Reports

SUNAPEE LAKE, SUNAPEE, NH

MORPHOMETRIC DATA

TROPHIC CLASSIFICATION

KNOWN EXOTIC SPECIES

Watershed Area (Ac.):	28,863	Max. Depth (m):	31.9	Flushing Rate (yr ⁻¹):	0.3	Year	Trophic class	Variable Milfoil
Surface Area (Ac.):	4090	Mean Depth (m):	11.4	P Retention Coef:	0.7	1995	OLIGOTROPIC	
Shore Length (m):	47,600	Volume (m ³):	188,150,000	Elevation (ft):	1092	2006	OLIGOTROPIC	

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

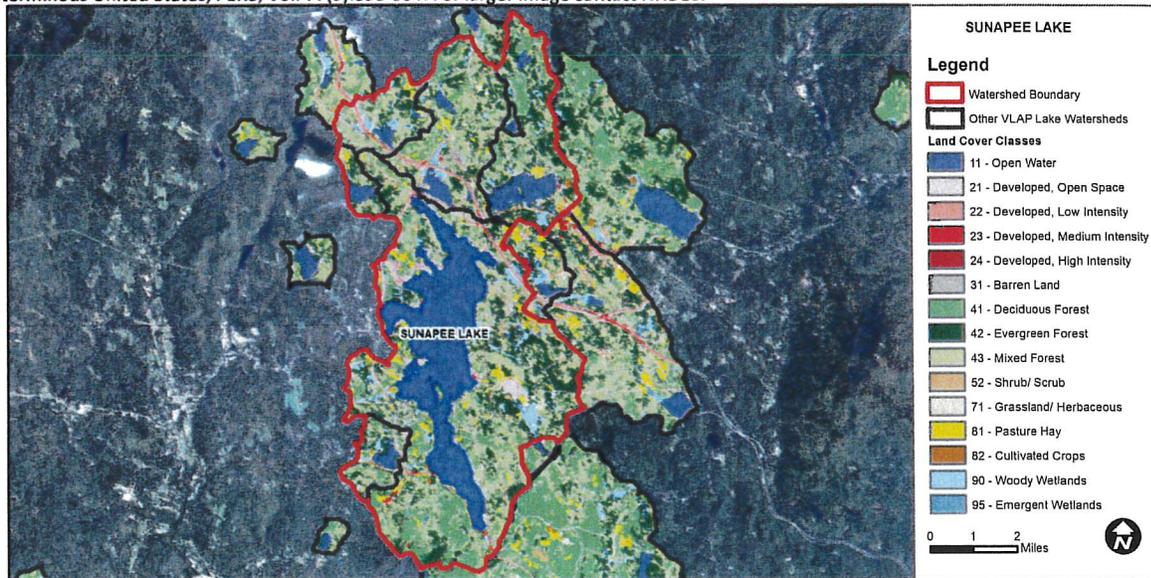
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for this parameter by a small margin.
	Oxygen, Dissolved	Bad	Data periodically exceed water quality standards or thresholds for this parameter by a large margin.
	Dissolved oxygen saturation	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin.
	Chlorophyll-a	Very Good	Sampling data is 50 percent better than the water quality standards or thresholds for this parameter.
Primary Contact Recreation	Escherichia coli	Encouraging	Limited data for this parameter predicts water quality standards or thresholds are being met; however more data are necessary to fully assess the parameter.
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

Location	Parameter	Category	Comments
SUNAPEE LAKE - DEWEY (TOWN) BEACH	Escherichia coli	Slightly Bad	Data periodically exceed water quality standards or thresholds for this parameter by a small margin.
SUNAPEE LAKE - SUNAPEE STATE PARK BEACH	Escherichia coli	Bad	Data periodically exceed water quality standards or thresholds for this parameter by a large margin.
SUNAPEE LAKE - BLODGETT'S LANDING BEACH	Escherichia coli	Bad	Data periodically exceed water quality standards or thresholds for this parameter by a large margin.
SUNAPEE LAKE - DEPOT BEACH	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
SUNAPEE LAKE - GEORGES MILL TOWN BEACH	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	17.9	Barren Land	0.18	Grassland/Herbaceous	0.44
Developed-Open Space	4.66	Deciduous Forest	12.49	Pasture Hay	2.59
Developed-Low Intensity	2.83	Evergreen Forest	21.94	Cultivated Crops	0.15
Developed-Medium Intensity	0.24	Mixed Forest	31.84	Woody Wetlands	3.2
Developed-High Intensity	0.01	Shrub-Scrub	1.14	Emergent Wetlands	0.3

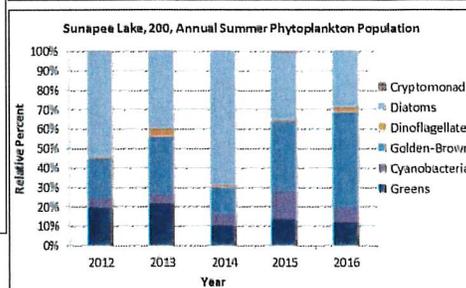
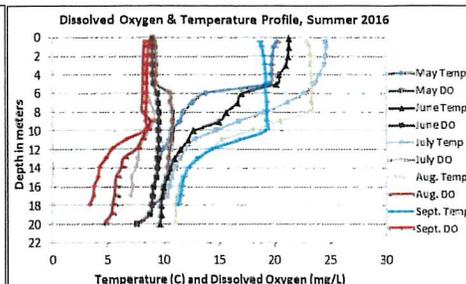


VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS LAKE SUNAPEE 200, SUNAPEE 2016 DATA SUMMARY

RECOMMENDED ACTIONS: Lake conductivity has increased and in 2016 approached the levels measured between 2002 and 2005. Continue to encourage local and state road agents and winter maintenance companies to obtain NH Voluntary Salt Applicator licenses through UNH Technology Transfer Center's Green SnowPro Certification. Add chloride monitoring to the regular sampling program to establish a baseline data set and help determine how much of the conductivity is influence by chloride. Drought conditions likely contributed to the lower algal growth and improved water clarity (transparency). This indicates that storm events may influence turbidity either through stormwater runoff transporting suspended particles or from flushing of wetland systems high is dissolved organic matter that give the water a dark or tea color. Consider adding apparent color analyses to deep and near shore stations to help track monthly and annual variations in water color as it relates to water clarity. Keep up the great work!

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

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels were stable and very low from May to June and then increased as the summer progressed but remained within a low range. The 2016 average chlorophyll level decreased slightly from 2015 and was much less than the state median. Historical trend analysis indicates stable chlorophyll levels with moderate variability between years.
- ◆ **CONDUCTIVITY/CHLORIDE:** Conductivity remained slightly elevated and Epilimnetic (upper water layer) conductivity levels increased slightly as the summer progressed. Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) conductivity levels remained fairly stable from May through September. Average epilimnetic conductivity levels increased from 2015 and was greater than the state median. Historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity level since monitoring began.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic (upper water layer) phosphorus levels increased slightly from May to June and then decreased and remained stable through September. Average epilimnetic phosphorus remained stable with 2015 and was much less than the state median. Historical trend analysis indicates stable epilimnetic phosphorus levels with low variability since 1993. Metalimnetic phosphorus levels were also stable and low. Hypolimnetic phosphorus levels were slightly higher from June through August but remained within a low range.
- ◆ **TRANSPARENCY:** Transparency was below average in May during white cap conditions on the water's surface, increased (improved) steadily through August and then decreased slightly in September. Average transparency improved from 2015 and was much higher (better) than the state median, and was the highest (best) measured since 2004. Historical trend analysis indicates stable transparency since monitoring began.
- ◆ **TURBIDITY:** Epilimnetic turbidity remained low on each sampling event but was slightly higher in June. Metalimnetic turbidity was low from May through July and then increased slightly in August and September when algal growth was higher. Hypolimnetic turbidity also remained within a low range but was slightly higher in May and September when during turnover periods.
- ◆ **pH:** Epilimnetic and metalimnetic pH levels was within the desirable range 6.5-8.0 units on each sampling event. Historical trend analysis indicates stable epilimnetic pH levels with low variability between years. Hypolimnetic pH levels fluctuated below the desirable range from June through September.



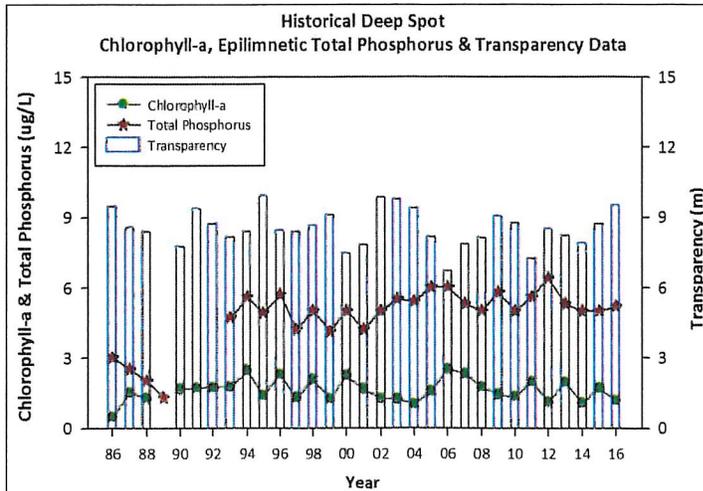
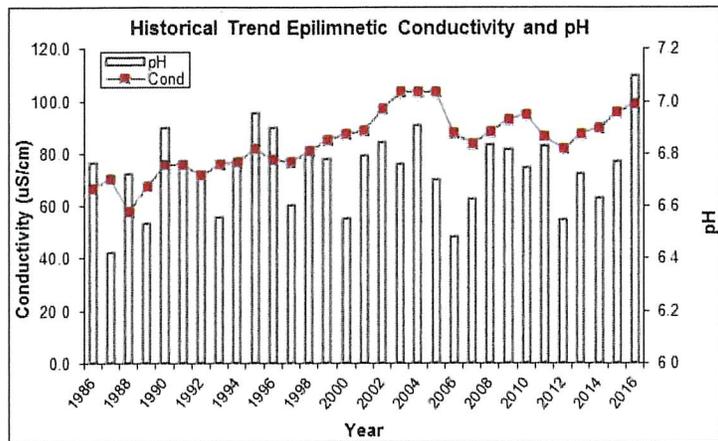
Station Name	Table 1. 2016 Average Water Quality Data for SUNAPEE LAKE, STN. 200						
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	Total P ug/l	Trans. m VS	Turb. ntu	pH
Epilimnion	5.9	1.16	98.9	5	9.50	0.50	7.10
Metalimnion			98.7	5		0.67	6.97
Hypolimnion			98.1	6		0.80	6.57

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.9 mg/L
Chlorophyll-a: 4.58 mg/m³
Conductivity: 40.0 uS/cm
Chloride: 4 mg/L
Total Phosphorus: 12 ug/L
Transparency: 3.2 m
pH: 6.6

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 6.5-8.0 (unless naturally occurring)

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Worsening	Data significantly increasing.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
pH (epilimnion)	Stable	Trend not significant; data show low variability.	Transparency	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Stable	Trend not significant; data show low variability.





Volunteer Lake Assessment Program Individual Lake Reports

MESSER POND, NEW LONDON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	1,408	Max. Depth (m):	7.6	Flushing Rate (yr ⁻¹):	4.7
Surface Area (Ac.):	67	Mean Depth (m):	2.6	P Retention Coef.:	0.53
Shore Length (m):	3,200	Volume (m ³):	704,000	Elevation (ft):	1105

TROPIC CLASSIFICATION

Year	Trophic class
1981	MESOTROPHIC
1996	MESOTROPHIC

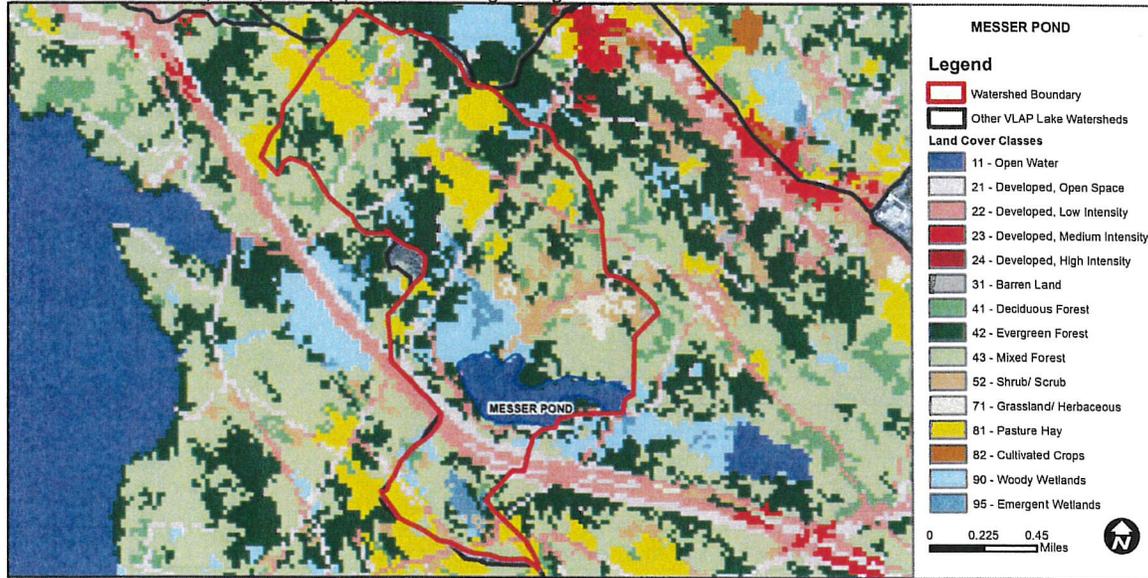
KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	Data exceed water quality standards or thresholds for a given parameter by a small margin.
	pH	Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a large margin.
	Oxygen, Dissolved	Encouraging	Limited data for this parameter predicts water quality standards or thresholds are being met; however more data are necessary to fully assess the parameter.
	Dissolved oxygen saturation	Cautionary	Limited data for this parameter predicts exceedance of water quality standards or thresholds; however more data are necessary to fully assess the parameter.
	Chlorophyll-a	Slightly Bad	Data exceed water quality standards or thresholds for a given parameter by a small margin.
Primary Contact Recreation	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	6.45	Barren Land	0.1	Grassland/Herbaceous	1.45
Developed-Open Space	6.29	Deciduous Forest	5.19	Pasture Hay	13.19
Developed-Low Intensity	5.96	Evergreen Forest	23.27	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	23.73	Woody Wetlands	6.57
Developed-High Intensity	0	Shrub-Scrub	5.23	Emergent Wetlands	2.16



VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS

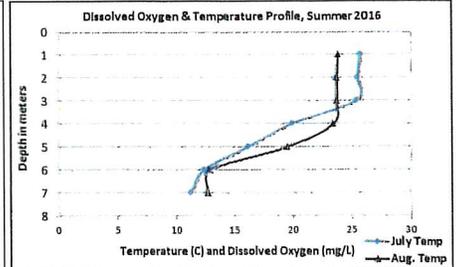
MESSER POND, NEW LONDON

2016 DATA SUMMARY

RECOMMENDED ACTIONS: Great job collecting water temperature profile data at the deep spot! Once you record the information, review the profile and adjust deep spot sample depths to collect a sample from the middle of each thermal layer when possible. Based on the July and August profiles, samples should be collected at 2, 4.5 and 6 meters. This will better represent nutrient levels and conditions of the different layers. These layers may shift slightly based on month of collection, air temperatures and water clarity. Refer to the VLAP field manual for instructions on how to determine the thermal layers. Pond phosphorus levels and algal growth remained within a low to average range in 2016 and pond clarity (transparency) was higher than average. The drought conditions and lack of stormwater runoff and flushing of wetland and tributary systems high in dissolved organic content likely helped pond quality in 2016. This highlights the importance of minimizing stormwater runoff from impervious areas and areas prone to erosion. Manage beaver activity in the Outlet channel to maintain a good flushing rate in the pond. If necessary, install a beaver pipe or flow through device through the beaver dam, or block culvert openings. Keep up the great work!

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

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels were slightly elevated in July and then decreased to a low range in August and September. The 2016 average chlorophyll level increased slightly from 2015 and was slightly less than the state median. Historical trend analysis indicates relatively stable chlorophyll levels since monitoring began.
- ◆ **CONDUCTIVITY/CHLORIDE:** Deep spot, County Rd. Inlet, Fieldstone and County, and Outlet conductivity levels remained slightly elevated and greater than the state median. Historical trend analysis indicates stable epilimnetic (upper water layer) conductivity levels with high variability between years.
- ◆ **E. COLI:** Little Cove E. coli levels were very low and much less than the state standards of 88 cts/100 mL for public beaches and 406 cts/100 mL for surface waters.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic phosphorus was within an average range in July, increased to a slightly elevated level in August when the turbidity was also elevated suggesting algal growth at the water's surface, and then decreased in September. Average epilimnetic phosphorus increased slightly from 2015 and was slightly less than the state median. Historical trend analysis indicates stable epilimnetic phosphorus levels since monitoring began. Metalimnetic (middle water layer) phosphorus level remained within a low to average range. Hypolimnetic (lower water layer) phosphorus levels decreased from July to September and remained within an average range, however the sample was collected at 5 meters and temperature profile data indicates the sample should be collected at 6 meters to accurately represent the hypolimnion. County Rd. Inlet phosphorus levels were slightly elevated in July and September and lab data note high levels of organic matter in the July sample and sediment in the September sample. County Rd. 2 phosphorus was elevated in July and lab data note organic matter in the sample. Outlet phosphorus levels were elevated in August and September and volunteers noted low flows and beaver activity.
- ◆ **TRANSPARENCY:** Transparency measured without the viewscope (NVS) was low and stable from July to August and then increased (improved) to an average range in September. Average NVS transparency increased (improved) from 2015 but remained less (worse) than the state median. Historical trend analysis indicates significantly decreasing (worsening) transparency since monitoring began. Transparency measured with the viewscope (VS) was generally higher (better) than NVS transparency and likely a better measure of actual conditions.
- ◆ **TURBIDITY:** Epilimnetic and Metalimnetic turbidity levels were slightly elevated in August indicating potential algal growth from 1 to 3 meters in the water column. Hypolimnetic turbidity levels fluctuated within an average range for that station. County Rd. Inlet turbidity levels were slightly elevated in July and September and low flow conditions, colored water and organic matter affected the turbidity. County Rd. 2 turbidity level were elevated on each sampling event and low flows, colored water and organic matter affected turbidity. Outlet turbidity levels were elevated in August and September and low flows and beaver activity could have affected the samples.
- ◆ **pH:** Epilimnetic, Metalimnetic and County Rd. 2 pH levels were within the desirable range 6.5-8.0 and historical trend analysis indicates significantly increasing (improving) epilimnetic pH levels since monitoring began. We hope to see this continue! Hypolimnetic, County Rd. Inlet and Outlet pH levels fluctuated below the desirable range on one or more sampling events.



NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

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

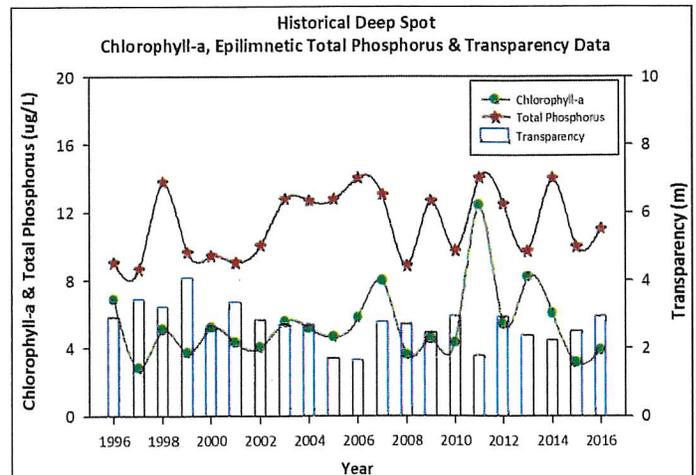
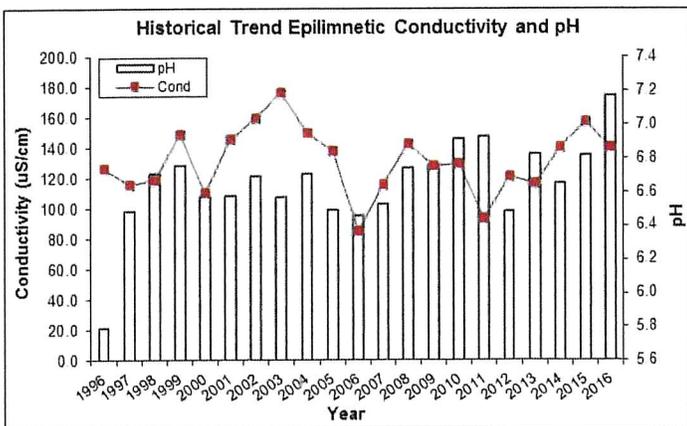
NH Median Values: Median values for specific parameters generated from historic lake monitoring data.

- Alkalinity: 4.9 mg/L
- Chlorophyll-a: 4.58 mg/m³
- Conductivity: 40.0 uS/cm
- Chloride: 4 mg/L
- Total Phosphorus: 12 ug/L
- Transparency: 3.2 m
- pH: 6.6

Station Name	Table 1. 2016 Average Water Quality Data for MESSER POND-NEW LONDON								
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	8.9	3.85	140.5		11	2.93	3.33	1.23	7.17
Metalimnion			140.3		8			1.05	7.13
Hypolimnion			139.2		12			1.60	6.55
County Rd. Inlet			131.7		23			2.65	6.24
County Rd. 2			147.2		26			6.31	6.71
Little Cove				2					
Outlet at Bog Rd.			146.9		21			2.65	6.68

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Stable	Trend not significant; data highly variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
pH (epilimnion)	Improving	Data significantly increasing.	Transparency	Worsening	Data significantly decreasing.
			Phosphorus (epilimnion)	Stable	Trend not significant; data show low variability.





Volunteer Lake Assessment Program Individual Lake Reports
OTTER POND, SUNAPEE, NH

MORPHOMETRIC DATA

TROPIC CLASSIFICATION

KNOWN EXOTIC SPECIES

Watershed Area (Ac.):	11,098	Max. Depth (m):	7.6	Flushing Rate (yr ¹):	7.6	Year	Trophic class	
Surface Area (Ac.):	185	Mean Depth (m):	4	P Retention Coef:	0.43	2005	MESOTROPHIC	
Shore Length (m):	4,800	Volume (m ³):	3,000,500	Elevation (ft):	1125	2008	MESOTROPHIC	

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

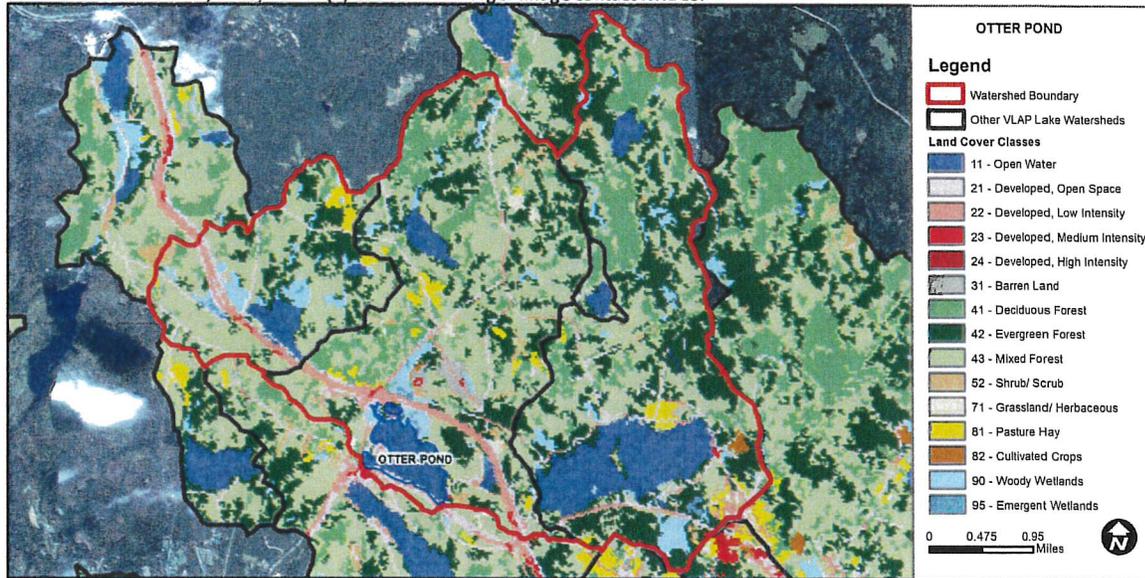
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for this parameter by a small margin.
	Oxygen, Dissolved	Encouraging	Limited data for this parameter predicts water quality standards or thresholds are being met; however more data are necessary to fully assess the parameter.
	Dissolved oxygen satura	Encouraging	Limited data for this parameter predicts water quality standards or thresholds are being met; however more data are necessary to fully assess the parameter.
	Chlorophyll-a	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
Primary Contact Recreation	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

OTTER POND - MORGAN BEACH	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
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WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	9.34	Barren Land	0.52	Grassland/Herbaceous	0.45
Developed-Open Space	3.87	Deciduous Forest	11.3	Pasture Hay	1.84
Developed-Low Intensity	3.36	Evergreen Forest	25.39	Cultivated Crops	0.18
Developed-Medium Intensity	0.2	Mixed Forest	35.78	Woody Wetlands	4.18
Developed-High Intensity	0.01	Shrub-Scrub	2.01	Emergent Wetlands	0.31



VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS

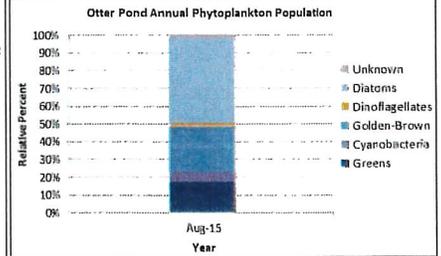
OTTER POND, SUNAPEE

2016 DATA SUMMARY

RECOMMENDED ACTIONS: Pond phosphorus levels were the best measured since monitoring began and the drought conditions, lack of stormwater runoff and flow of tributary systems rich in dissolved organic matter into the pond may have helped keep nutrient levels low. Sampling generally occurred following storm events after periods of dry conditions. Tributary sampling indicated higher turbidities in Baptist Bk. and Star Lk. Inlet systems, however Baptist Bk. phosphorus levels remained low while Star Lake phosphorus levels were slightly elevated. This highlights the importance of managing stormwater runoff in the watershed. Focus on the areas closest to the lake front and tributaries to prevent direct runoff into the water. The declining transparency is likely the result of increased algal growth and tea color of the water. Analyze deep spot samples for Apparent Color in 2017 through the DES Jody Connor Limnology Center to evaluate changes in water color and dissolved organic matter. DES' "NH Homeowner's Guide to Stormwater Management" and UNH's "Landscaping at the Water's Edge" are great resources. Keep up the great work!

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

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels were very low in May, increased to average levels in June, and then decreased slightly and remained stable from July to September. The 2016 average chlorophyll level decreased from 2015 and was less than the state median. Historical trend analysis indicates significantly increasing (worsening) chlorophyll levels since monitoring began.
- ◆ **CONDUCTIVITY/CHLORIDE:** Deep spot, Outlet and Star Lake 2 conductivity levels were slightly elevated and greater than the state median. Historical trend analysis indicates significantly increasing (worsening) epilimnetic (upper water layer) conductivity levels since monitoring began. Baptist Bk. conductivity was slightly elevated in May and increased to greatly elevated levels by September. Little Sunapee Brook conductivity levels were slightly elevated from May through early August and then increased greatly in late August and September. Star Lake Inlet conductivity levels were slightly elevated from May through July and then increased greatly in August and September.
- ◆ **E. COLI:** Beach E. coli levels were low and much less than the state standard of 88 cts/100 mL for public beaches.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels decreased as the summer progressed and remained within a low range. Average epilimnetic phosphorus decreased from 2015, was much less than the state median, and was the lowest measured since monitoring began. Hypolimnetic (lower water layer) phosphorus fluctuated within a low range and was also the lowest measured since monitoring began. Historical trend analysis indicates stable epilimnetic phosphorus levels since monitoring began. Baptist Brook phosphorus levels were slightly elevated in late August during low flows and lab data note light sediment in the sample. Little Sunapee Brook phosphorus levels were higher in late August and September but remained within an average range. Outlet phosphorus levels remained low. Star Lk. Inlet phosphorus levels were slightly elevated from August through September during low flows, turbid conditions, and following storm events. Star Lake 2 phosphorus levels were slightly elevated in May and early August and lab data note colored water with light turbidity.
- ◆ **TRANSPARENCY:** Transparency measured with (VS) and without (NVS) the viewscope fluctuated within a low to average range and was highest (best) in July and early August. Wind and wave conditions seemed to impact transparency in June and late August. Average NVS transparency was stable with 2015 and was approximately equal to the state median. Historical trend analysis indicates significantly decreasing (worsening) transparency since monitoring began.
- ◆ **TURBIDITY:** Epilimnetic, Hypolimnetic and Outlet turbidity levels fluctuated within a low to average range. Baptist Brook and Star Lake 2 turbidity levels were generally elevated from May through September. Little Sunapee Bk. turbidity levels were slightly elevated in May and June. Star Lake Inlet turbidity levels were elevated from July through September. Tributary sampling generally occurred following storm events during drought conditions. Low flows, wetland impacts, sediment and organics were noted in varying degrees particularly in the Star Lake tributary system.
- ◆ **pH:** Deep spot, Baptist Bk., Little Sunapee Bk., and Outlet pH levels were within the desirable range 6.5-8.0 units, however epilimnetic pH has historically fluctuated below the desirable range. Historical trend analysis indicates significantly decreasing (worsening) epilimnetic pH levels since monitoring began. Star Lk. Inlet and Star Lake 2 pH levels fluctuated below the desirable range.



NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

Chloride: > 230 mg/L (chronic)

E. coli: > 88 cts/100 mL – public beach

E. coli: > 406 cts/100 mL – surface waters

Turbidity: > 10 NTU above natural level

pH: between 6.5-8.0 (unless naturally occurring)

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.

Alkalinity: 4.9 mg/L

Chlorophyll-a: 4.58 mg/m³

Conductivity: 40.0 uS/cm

Chloride: 4 mg/L

Total Phosphorus: 12 ug/L

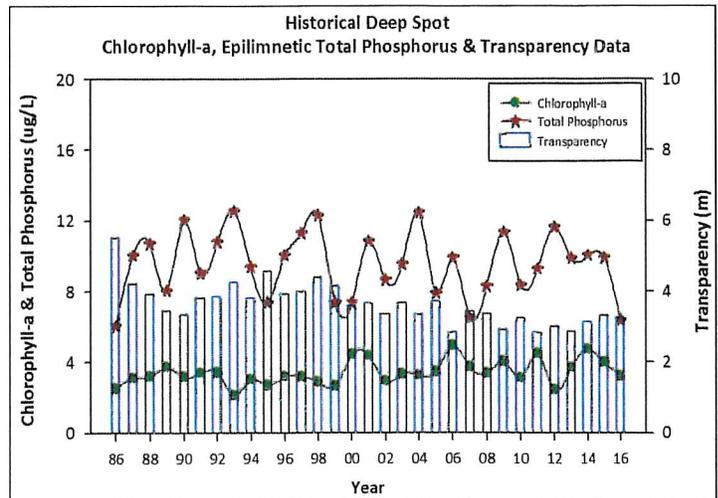
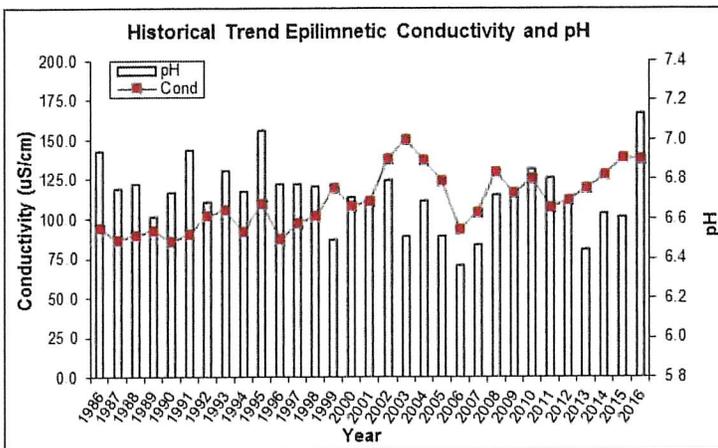
Transparency: 3.2 m

pH: 6.6

Station Name	Table 1. 2016 Average Water Quality Data for OTTER POND-SUNAPEE								
	Alk. mg/l	Chl-a. ug/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	7.1	3.18	137.6		6	3.24	3.00	1.07	7.13
Hypolimnion			136.0		6			1.20	6.77
Baptist Brook			395.6		9			3.46	6.75
Beach				6					
Little Sunapee Brook			234.4		9			1.28	6.91
Outlet			138.2		6			1.08	7.07
Star Lake 2			186.9		18			3.74	6.44
Star Lk. Inlet			554.5		19			4.44	6.54

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Worsening	Data significantly increasing.	Chlorophyll-a	Worsening	Data significantly increasing.
pH (epilimnion)	Worsening	Data significantly decreasing.	Transparency	Worsening	Data significantly decreasing.
			Phosphorus (epilimnion)	Stable	Trend not significant; data show low variability.





Volunteer Lake Assessment Program Individual Lake Reports
KEZAR LAKE, SUTTON, NH

MORPHOMETRIC DATA

TROPIC CLASSIFICATION

KNOWN EXOTIC SPECIES

Watershed Area (Ac.):	6,848	Max. Depth (m):	8.2	Flushing Rate (yr ⁻¹):	8.2	Year	Trophic class	
Surface Area (Ac.):	182	Mean Depth (m):	2.7	P Retention Coef:		1984	MESOTROPHIC	
Shore Length (m):	3,400	Volume (m ³):	1,975,500	Elevation (ft):	906	2003	MESOTROPHIC	

The Waterbody Report Card tables are generated from the DRAFT 2014 305(b) report on the status of N.H. waters, and are based on data collected from 2004-2013. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organizations/divisions/water/wmb/swqa/index.htm

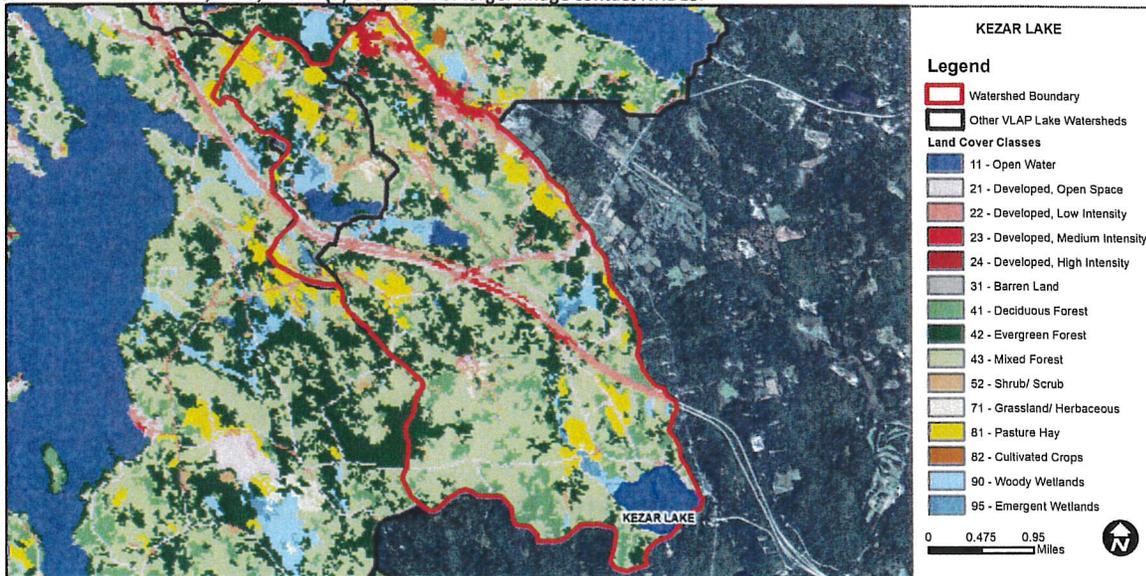
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin
	Oxygen, Dissolved	Good	Sampling data commonly meet water quality standards or thresholds for this parameter.
	Dissolved oxygen satura	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin
	Chlorophyll-a	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
Primary Contact Recreation	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

KEZAR LAKE - WADLEIGH STATE PARK BEACH	Escherichia coli	Good	Sampling data commonly meet water quality standards or thresholds for this parameter.
KEZAR LAKE - WADLEIGH STATE PARK BEACH	Cyanobacteria	Slightly Bad	Cyanobacteria bloom(s).

WATERSHED LAND USE SUMMARY

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, PERS, Vol. 77(9):858-864. For larger image contact NHDES.



Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	4.46	Barren Land	0.14	Grassland/Herbaceous	0.73
Developed-Open Space	5.86	Deciduous Forest	8.25	Pasture Hay	6.39
Developed-Low Intensity	6.24	Evergreen Forest	22.37	Cultivated Crops	0.07
Developed-Medium Intensity	1.39	Mixed Forest	36.49	Woody Wetlands	3.22
Developed-High Intensity	0.07	Shrub-Scrub	3.27	Emergent Wetlands	1.11



VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS

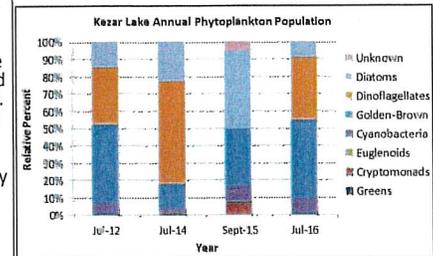
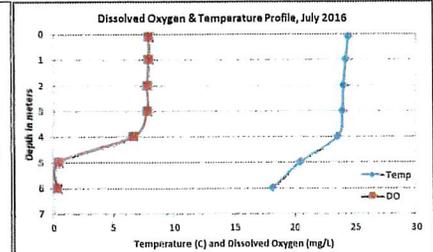
KEZAR LAKE, NORTH SUTTON

2016 DATA SUMMARY

RECOMMENDED ACTIONS: Lake water quality remained good in 2016 with low phosphorus levels, average algal growth and good clarity (transparency). The drought conditions in 2016 likely helped to reduce phosphorus loading through stormwater runoff and flushing of wetland systems. This highlights the importance of managing stormwater runoff from dirt/gravel roads, sandy beaches, steep slopes, and impervious surfaces such as paved roads and driveways. DES' "NH Homeowner's Guide to Stormwater Management" is a great resource. Conductivity and chloride levels in Lyon Brook are elevated and chloride levels approach the state standard for chronic chloride exposure. Winter road salt application on state and local roads, parking lots, driveways, and walkways is likely impacting the brook. Conduct spring runoff sampling for chloride in the Inlet and Lyon Brook to assess spring concentrations during snowmelt. Encourage local road agents and winter maintenance companies to obtain NH Voluntary Salt Applicator License through UNH Technology Transfer Center's Green SnowPro Certification. Keep up the great work!

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

- ◆ **CHLOROPHYLL-A:** Chlorophyll levels were average in July and then decreased to low levels in August. The 2016 average chlorophyll level increased slightly from 2015 yet remained less than the state median. Historical trend analysis indicates significantly decreasing (improving) chlorophyll levels since monitoring began. We hope to see this continue!
- ◆ **CONDUCTIVITY/CHLORIDE:** Deep spot and Outlet conductivity and chloride levels remained slightly elevated and greater than the state medians, however chloride levels did not approach the state chronic chloride standard of 230 mg/L. Historical trend analysis indicates significantly increasing (worsening) epilimnetic (upper water layer) conductivity levels since monitoring began. Inlet conductivity and chloride levels were elevated. Lyon Brook at Trussel Ridge conductivity and chloride levels were greatly elevated.
- ◆ **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels were within an average range in July and then decreased to a low level in August. Average epilimnetic phosphorus remained stable with 2015 and was slightly less than the state median. Historical trend analysis indicates stable epilimnetic phosphorus levels with moderate variability between years. Hypolimnetic (lower water layer) phosphorus was slightly elevated in July and decreased to a low level in August. Inlet and Lyon Bk. phosphorus levels were higher in July and then decreased in August, however levels remained within an average range for those stations. Outlet phosphorus levels were low.
- ◆ **TRANSPARENCY:** Transparency measured without the viewscope (NVS) was good and was slightly above average for the lake, and remained stable from July to August. Average NVS transparency remained stable with 2015 and was slightly less than the state median. Historical trend analysis indicates highly variable transparency since monitoring began. Transparency measured with the viewscope (VS) was generally higher (better) than NVS transparency and likely a better measure of actual conditions.
- ◆ **TURBIDITY:** Epilimnetic turbidity was slightly elevated in July when algal growth was higher, and then decreased to a low level in August. Hypolimnetic turbidity was elevated in July and August potentially due to the accumulation of dissolved organic compounds as the summer progresses and dissolved oxygen levels decrease below 1.0 mg/L. Inlet turbidity was slightly elevated in July and August and field data note low flow conditions. Lyon Brook turbidity was low. Outlet turbidity was slightly elevated in July and low in August.
- ◆ **pH:** Epilimnetic, Lyon Brook and Outlet pH levels were within the desirable range 6.5-8.0 units, however epilimnetic pH has historically fluctuated below the desirable range. Hypolimnetic and Inlet pH levels fluctuated below the desirable range in 2016. Historical trend analysis indicates significantly decreasing (worsening) epilimnetic pH levels since monitoring began.



Station Name	Table 1. 2016 Average Water Quality Data for KEZAR LAKE-NORTH SUTTON								
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Cond. uS/cm	Total P ug/l	Trans. m		Turb. ntu	pH
						NVS	VS		
Epilimnion	9.4	3.78	36	175.2	10	3.05	3.74	1.19	6.95
Hypolimnion				177.0	14			5.63	6.54
Inlet			70	311.0	17			2.10	6.46
Lyon Brook At Trussel Ridge			120	518.0	12			0.51	7.14
Outlet			36	176.4	8			1.29	7.12

NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

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

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.

- Alkalinity: 4.9 mg/L
- Chlorophyll-a: 4.58 mg/m³
- Conductivity: 40.0 uS/cm
- Chloride: 4 mg/L
- Total Phosphorus: 12 ug/L
- Transparency: 3.2 m
- pH: 6.6

HISTORICAL WATER QUALITY TREND ANALYSIS

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	Worsening	Data significantly increasing.	Chlorophyll-a	Improving	Data significantly decreasing.
pH (epilimnion)	Worsening	Data significantly decreasing.	Transparency	Stable	Trend not significant; data highly variable.
			Phosphorus (epilimnion)	Stable	Trend not significant; data moderately variable.

