Volunteer Lake Assessment Program Individual Lake Reports
LOON LAKE, PLYMOUTH, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	2,240	Max. Depth (m):	8.8	Flushing Rate (yr¹)	2.6		
Surface Area (Ac.):	112	Mean Depth (m):	3.9	P Retention Coef:	0.55		
Shore Length (m):	2,600	Volume (m³):	1,784,500	Elevation (ft):	489		

TROPHIC CLASSIFICATION

Year	Trophic class
1983	MESOTROPHIC
1999	MESOTROPHIC

KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2016 305(b) report on the status of N.H. waters, and are based on data collected from 2006-2015. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organization/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	Bad	Data periodically exceed water quality standards or thresholds for this 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 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	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.

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.
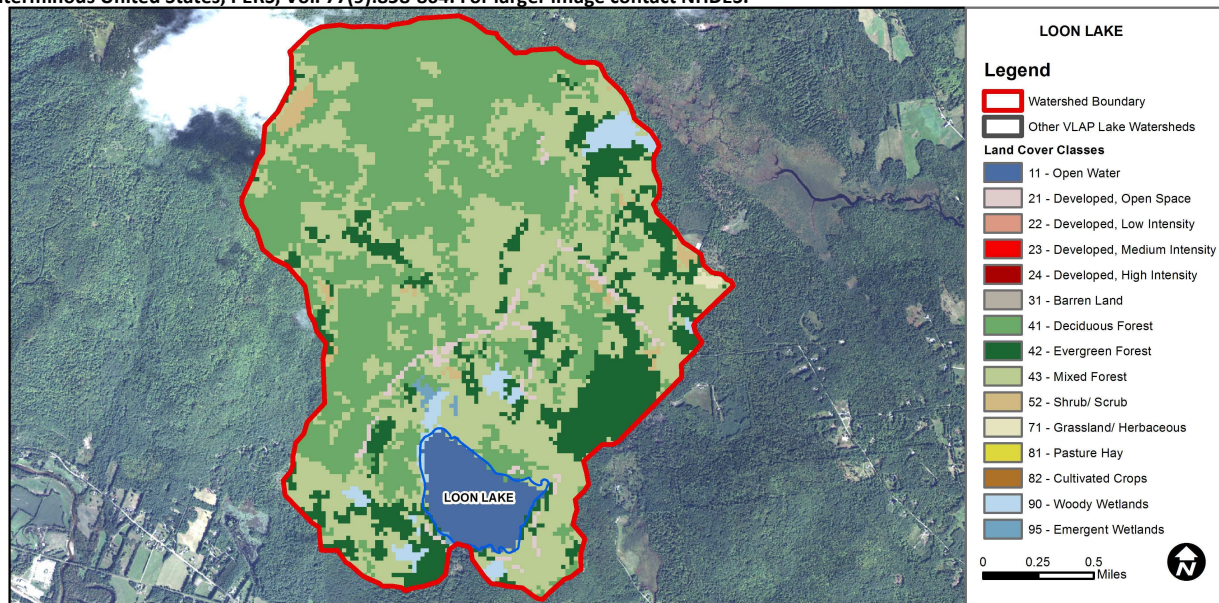
Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	4.62	Barren Land	0	Grassland/Herbaceous	0.17
Developed-Open Space	1.61	Deciduous Forest	39.28	Pasture Hay	0
Developed-Low Intensity	0	Evergreen Forest	13.92	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	36.44	Woody Wetlands	2.4
Developed-High Intensity	0	Shrub-Scrub	1.26	Emergent Wetlands	0.29

RECOMMENDED ACTIONS: Lake quality was good in 2017 with in-lake phosphorus and algal growth remaining within acceptable levels. The improving epilimnetic phosphorus levels are encouraging, and epilimnetic pH levels appear to be recovering from a period of decline between 1996 and 2006. We hope to see this continue! However, above average spring and early summer rainfall likely contributed to decreased clarity and higher turbidity levels in early summer. Apparent color was measured to estimate levels of dissolved organic matter that imparts a tea or brown color to the water and how it may relate to the increased frequency and intensity of storm events flushing highly colored water from wetland systems in to the lake. This can alter lake clarity as well as turbidity and phosphorus levels. Data in 2017 suggest that the water is twice as dark as it was in 1999 when measured by the DES Lake Trophic Survey Program. Continue measuring color to establish a baseline data set and to better understand how it relates to storm events and water clarity. Gargaz Inlet phosphorus and turbidity levels were slightly elevated in June following a storm event. Keep an eye on stormwater runoff from dirt/gravel roads and driveways in this area and work to prevent erosion of sediments into the stream and lake. Maine DEP's "Camp Road Maintenance Manual" is a good resource. Keep up the great work!

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

- **CHLOROPHYLL-A:** Chlorophyll levels increased as the summer progressed and remained within a moderate range. Average chlorophyll level increased slightly from 2016, was slightly greater than the state median, and was slightly less than the threshold for mesotrophic lakes. Historical trend analysis indicates relatively stable chlorophyll levels with moderate variability between years.
- **CONDUCTIVITY/CHLORIDE:** Epilimnetic (upper water layer), Metalimnetic (middle water layer), Hypolimnetic (lower water layer), Mill Brook Inlet, and Outlet conductivity and/or chloride levels were within a low range and less than the state median. Historical trend analysis indicates stable epilimnetic conductivity levels since monitoring began. Gargaz Inlet conductivity levels were slightly higher than the other stations, however remained much less than a level of concern.
- **COLOR:** Apparent color was measured in the epilimnion and indicates the lake water is moderately tea colored, or brown.
- **E. COLI:** Gargaz Inlet E. coli levels were higher in June following a significant storm event and then decreased to low levels as the summer progressed. Mill Brook E. coli levels increased from July to September. Outlet E. coli levels were low on each sampling event. E. coli levels at all stations were well below the state standard of 406 cts/100 mL for surface waters.
- **TOTAL PHOSPHORUS:** Epilimnetic phosphorus levels were within a moderate range and remained stable from June to July and then decreased to low levels in September. Average epilimnetic phosphorus remained stable with 2016 and was slightly less than the state median and the threshold for mesotrophic lakes. Historical trend analysis indicates significantly decreasing (improving) epilimnetic phosphorus levels since monitoring began. Metalimnetic phosphorus levels decreased from moderate to low as the summer progressed. Hypolimnetic phosphorus levels were slightly elevated in June and then decreased to moderate levels in July and September. Gargaz Inlet phosphorus levels were within a moderate range in June and July and slightly elevated in September and the turbidity of the sample was also slightly elevated. Mill Brook Inlet phosphorus levels were greatly elevated in June and July following storm events, and then decreased to slightly elevated levels in September. Outlet phosphorus levels were moderate in June and July and decreased to low levels in September.
- **TRANSPARENCY:** Transparency measured with (VS) and without (NVS) the viewscope was below average (worse) in June and July and then increased (improved) in September. Average NVS transparency decreased from 2016 and was slightly higher (better) than the state median. Historical trend analysis indicates relatively stable transparency since monitoring began.
- **TURBIDITY:** Epilimnetic, Metalimnetic and Outlet turbidity levels fluctuated within a low range however Epilimnetic and Outlet levels were higher in June and July potentially due to significant storm events and/or pollen. Hypolimnetic turbidity fluctuated within moderate levels and were below average for that station. Gargaz and Mill Brook Inlet turbidity fluctuated within moderate levels and were within average ranges for those stations.
- **PH:** Epilimnetic, Gargaz Inlet, Mill Brook Inlet, 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 relatively stable epilimnetic pH levels with moderate variability between years. Metalimnetic and Hypolimnetic pH levels were slightly less than desirable.

Dissolved Oxygen and Temperature Profile June 2017

Loon Lake Annual Phytoplankton Population
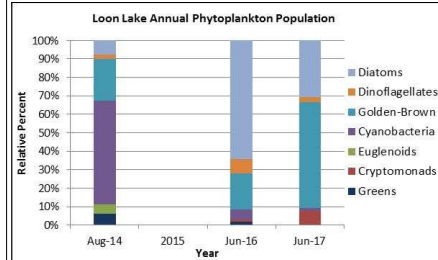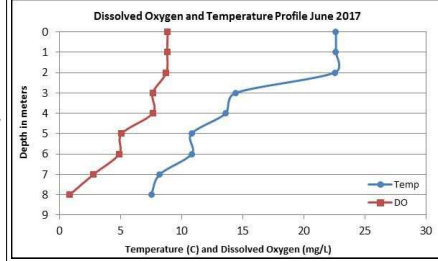
NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.

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/m^3

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. 2017 Average Water Quality Data for LOON LAKE-PLYMOUTH										
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Color PCU	Cond. uS/cm	E. Coli MPN/100ML	Total P ug/l	Trans. m NVS	Trans. m VS	Turb. ntu	pH
Epilimnion	5.1	4.79	3	53	24.3		8	3.35	3.79	0.72	6.70
Metalimnion					23.8		9			0.94	6.34
Hypolimnion					27.1		15			1.79	6.09
Gargaz Inlet			3		49.7	64	18			1.68	6.78
Mill Brook Inlet			3		33.6	75	39			2.79	6.48
Outlet In Stream					25.2	8	10			0.95	6.74

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 moderately variable.
pH (epilimnion)	Stable	Trend not significant; data moderately variable.	Transparency	Stable	Trend not significant; data moderately variable.
			Phosphorus (epilimnion)	Improving	Data significantly decreasing.

Historical Trend Epilimnetic Conductivty and pH

Historical Chlorophyll-a, Epilimnetic Phosphorus & Transparency Data