Volunteer Lake Assessment Program Individual Lake Reports

CLOUGH POND, LOUDON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	230	**Max. Depth (m):**	18.2	**Flushing Rate (yr^{1})**	0.4
Surface Area (Ac.):	46	**Mean Depth (m):**	5.9	**P Retention Coef:**	0.78
Shore Length (m):	1,600	**Volume (m^{3}):**	1,045,000	**Elevation (ft):**	466

TROPHIC CLASSIFICATION

Year	Trophic class
1983	MESOTROPHIC
2002	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

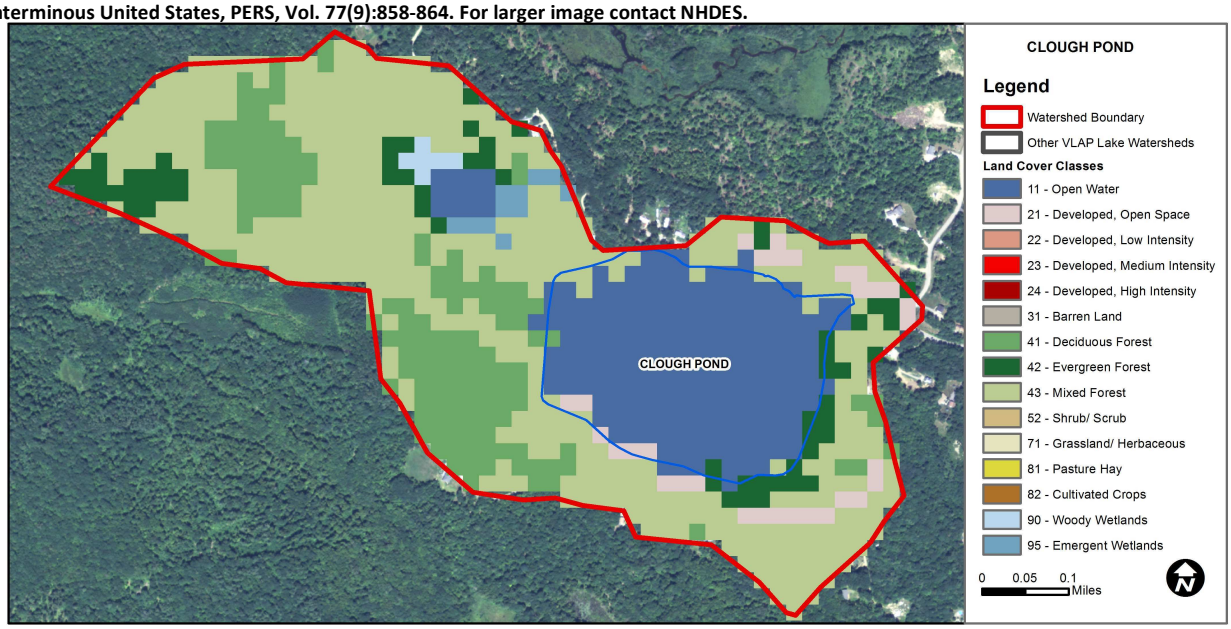
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	The calculated median is from 5 or more samples and is > indicator and the chlorophyll a indicator is exceeded.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	Cautionary	There are < 10 samples with 1 exceedance of criteria. More data needed.
	Dissolved oxygen satura	Cautionary	There are < 10 samples with 1 exceedance of criteria. More data needed.
	Chlorophyll-a	Slightly Bad	The calculated median is from 5 or more samples and is > indicator.
Primary Contact Recreation	Escherichia coli	Encouraging	There are no geometric means or there are > 2 single samples but those samples are within 75% of the geometric means criteria. More data needed.
	Chlorophyll-a	Good	There are at least 10 samples with one, but < 10% of samples, exceeding indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

CLOUGH POND - TOWN BEACH	Escherichia coli	Encouraging	There are no geometric means or there are > 2 single samples but those samples are within 75% of the geometric means criteria. More data needed.

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	22.7	Barren Land	0	Grassland/Herbaceous	0
Developed-Open Space	3.52	Deciduous Forest	16.13	Pasture Hay	0
Developed-Low Intensity	0	Evergreen Forest	7.04	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	48.4	Woody Wetlands	0.68
Developed-High Intensity	0	Shrub-Scrub	0	Emergent Wetlands	1.25

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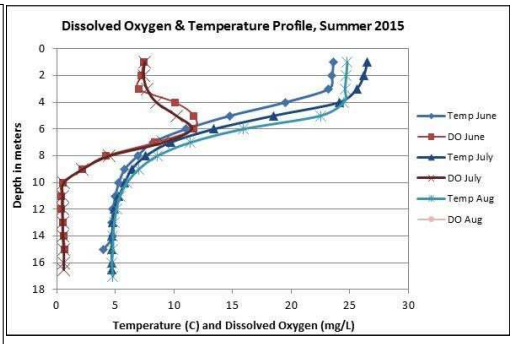
2015 Data Summary

Recommended Actions: The low chlorophyll, phosphorus and high transparency values measured this summer are a positive sign and we hope to see this continue. The installation of stormwater management systems on several sites in the watershed have likely helped to improved lake water quality and future monitoring will help to assess project effectiveness. The worsening conductivity trends is concerning and likely the result of winter de-icing applications, particularly road salt, on roads, parking lots, driveways and walkways in the watershed. Educate and local residents on best management practices associated with salt application, and encourage local road agents and winter maintenance companies to obtain a Voluntary N.H. Salt Applicator License through UNH's Technology Transfer Center's Green SnowPro Certification. Educational materials can be found at http://www.t2.unh.edu/salt-reduction-bmps. Keep up the great work!

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

- **Chlorophyll-a:** Chlorophyll levels decreased from June to July, remained stable into August, and were less than the state median. Average chlorophyll levels were the lowest measured since 1990, and we hope to see this continue! Historical trend analysis indicates highly variable chlorophyll levels since 2002.
- **Conductivity/Chloride:** Deep spot (Epilimnion, Metalimnion and Hypolimnion), Inlet and Outlet conductivity levels were elevated in June and decreased to lower, yet still slightly elevated levels as the summer progressed. The dry weather in June may have contributed to the elevated conductivity throughout the water column. Historical trend analysis indicates significantly increasing (worsening) Epilimnetic (upper water layer) conductivity since 2002.
- **Total Phosphorus:** Epilimnetic phosphorus levels were slightly higher in June and then decreased to low levels in July and August, and were well below the state median. Historical trend analysis indicates highly variable epilimnetic phosphorus from 2002-2009, however since 2010 phosphorus levels have remained relatively stable and low. Metalimnetic (middle water layer) phosphorus levels were average and remained stable throughout the summer. Hypolimnetic (upper water layer) phosphorus levels were elevated throughout the summer due to the release of phosphorus from bottom sediments when dissolved oxygen levels decrease below 1.0 mg/L, a process called internal loading. Inlet phosphorus levels were slightly elevated in June and then decreased to average levels in July and August. Outlet phosphorus levels remained low throughout the summer.
- **Transparency:** Transparency increased (improved) greatly from 2014, was stable from June to July and then improved in August and was much better than the state median. The dry weather conditions and lack of stormwater runoff may have contributed to the improved summer transparency. Transparency measured with the viewscope (VS) was much better than that measured without and likely a better representation of actual conditions. Historical trend analysis indicates relatively stable transparency with moderate variability since 2002.
- **Turbidity:** Epilimnetic and Metalimnetic turbidities remained relatively stable throughout the summer and were within an average range for those stations. Hypolimnetic turbidity was slightly elevated in June and then increased greatly in July and August due to the accumulation of organic compounds under anoxic conditions. Inlet turbidity was slightly elevated throughout the summer and it was noted that the July sample contained a small amount of sediment and was moderately colored. Outlet turbidity remained low throughout the summer.
- **pH:** Epilimnetic, Metalimnetic, Inlet, and Outlet pH levels were within the desirable range and historical trend analysis indicates stable Epilimnetic pH since 2002. Hypolimnetic pH was less than desirable and could be critical to aquatic life.
- **Dissolved Oxygen/Temp:** Dissolved oxygen levels were generally in a good range from the epilimnion through the metalimnion and then decreased to less than 1.0 mg/L in the hypolimnion in June and July. In August, hypolimnetic oxygen levels improved to almost 5.0 mg/L and suspect there was a problem with the dissolved oxygen probe, therefore the data were not valid. The low hypolimnetic levels caused phosphorus typically bound in bottom sediments to be released into the water column where it could potentially cause an increase in algal growth. This can be seen with the spike in dissolved oxygen levels in the metalimnion between 4 and 6 meters on each sampling event indicating a layer of algae.



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. 2015 Average Water Quality Data for CLOUGH POND								
	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	7.9	2.56	19	104.0	8	5.05	5.48	1.04	6.69
Metalimnion				104.8	13			1.72	6.63
Hypolimnion				121.2	37			8.09	6.08
Inlet			19	107.0	13			3.69	6.72
Outlet			18	104.1	7			0.98	6.88

Historical Water Quality Trend Analysis

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