Volunteer Lake Assessment Program Individual Lake Reports

PAWTUCKAWAY LAKE, NOTTINGHAM, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	13,248	**Max. Depth (m):**	15.2	**Flushing Rate (yr^1)**	2.3
Surface Area (Ac.):	900	**Mean Depth (m):**	2.9	**P Retention Coef:**	0.61
Shore Length (m):	27,700	**Volume (m^3):**	10,740,000	**Elevation (ft):**	250

TROPHIC CLASSIFICATION

Year	Trophic class
1989	MESOTROPHIC
1998	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

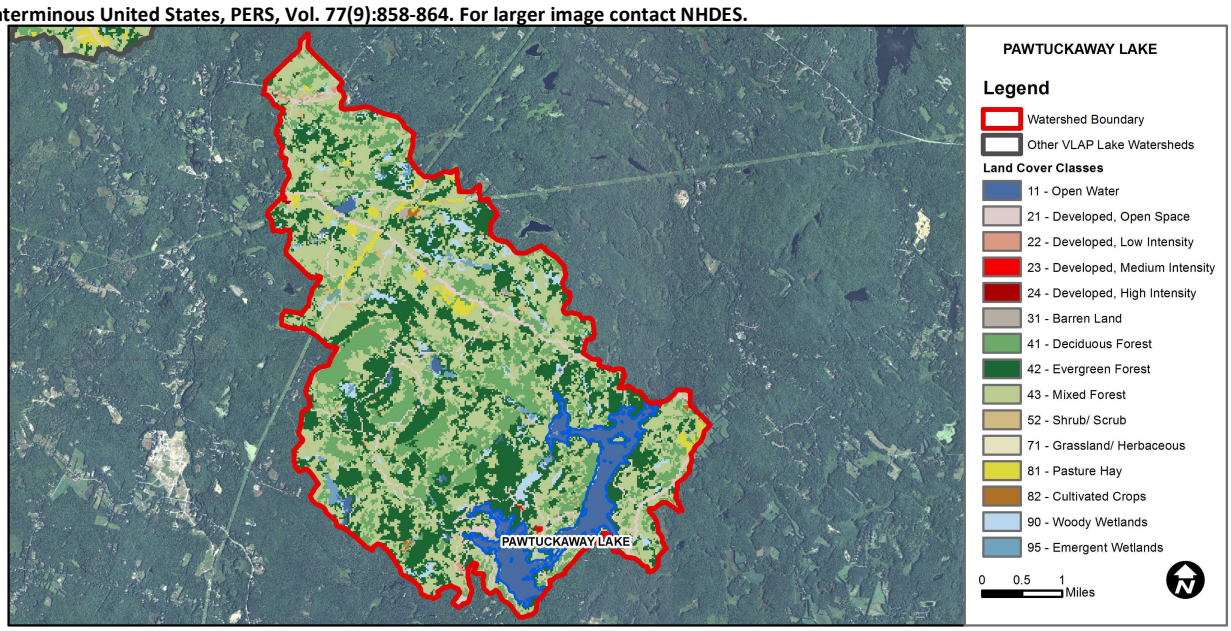
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	The calculated median is from 5 or more samples and is > indicator and the chlorophyll a indicator is exceeded.
	pH	Bad	>10%, with a minimum of 2, samples exceed criteria, with 1 or more by a large margin.
	Oxygen, Dissolved	Very Good	There are a total of at least 10 samples with 0 exceedances of criteria.
	Dissolved oxygen satura	Slightly Bad	There are >10% of samples (minimum of 2), exceeding criteria.
	Chlorophyll-a	Slightly Bad	The calculated median is from 5 or more samples and is > indicator.
Primary Contact Recreation	Escherichia coli	No Data	No data for this parameter.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Good	There are at least 10 samples with one, but < 10% of samples, exceeding indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

PAWTUCKAWAY LAKE - TOWN BEACH	Escherichia coli	Very Good	Where there are no geometric means, all bacteria samples are < 75% of the geometric mean. Where there are geometric means all single bacteria samples are < the SSMC and all geometric means are < geometric mean criteria.
PAWTUCKAWAY LAKE - PAWTUCKAWAY STATE PARK BEACH	Escherichia coli	Bad	There are >=1 exceedance(s) of the geometric mean and/or >=2 single sample criterion exceedances. One or more exceedance is >2X criteria.
PAWTUCKAWAY LAKE - PAWTUCKAWAY 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.



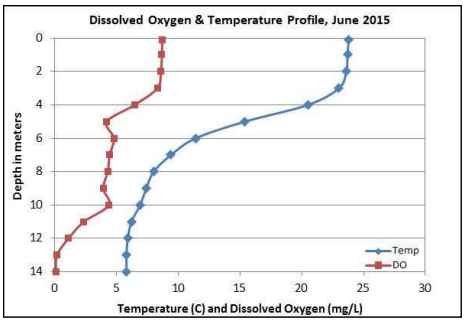
Land Cover Category	% Cover	Land Cover Category	% Cover	Land Cover Category	% Cover
Open Water	6.52	Barren Land	0.09	Grassland/Herbaceous	0.06
Developed-Open Space	4.12	Deciduous Forest	16.26	Pasture Hay	1.5
Developed-Low Intensity	0.19	Evergreen Forest	26.59	Cultivated Crops	0.16
Developed-Medium Intensity	0.05	Mixed Forest	38.87	Woody Wetlands	3.15
Developed-High Intensity	0.02	Shrub-Scrub	1.49	Emergent Wetlands	0.92

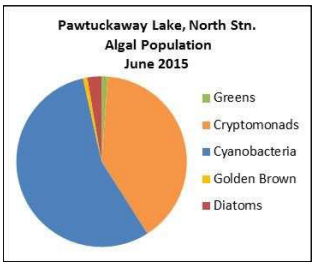
Volunteer Lake Assessment Program Individual Lake reports
Pawtuckaway Lake, North Stn., Nottingham
2015 Data Summary

Recommended Actions: Epilimnetic and White Grove Bk. phosphorus levels have increased (worsened) since monitoring began and Fernalds Bk. phosphorus levels remain greatly elevated. Educate lake and watershed residents on best practices to reduce nutrient loads such as properly maintaining septic systems, eliminating or minimizing fertilizer use, establishing vegetative buffers along shorelines, and reducing stormwater runoff and erosion from unstable sediments. DES' "N.H. Homeowner's Guide to Stormwater Management" and UNH Cooperative Extension's "Landscaping at the Water's Edge" are good resources. Keep up the great work!

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

- **Chlorophyll-a:** Chlorophyll levels were stable and low from May through August and then increased to moderate levels in September. The 2015 average chlorophyll level was less than the state median, decreased from 2014, and was the lowest measured since 1993! Historical trend analysis indicates relatively stable chlorophyll with moderate variability between years.
- **Conductivity/Chloride:** Deep spot, Back Creek B, Drowns Dam, Fundy Bk., and Round Pond Bk. conductivity and chloride levels were generally slightly greater than the state medians however not above a level of concern. Historical trend analysis indicates relatively stable epilimnetic (upper water layer) conductivity since monitoring began. White Grove Bk. conductivity levels were slightly elevated and chloride levels were above average for NH lakes. Fernalds A and Fernalds B conductivity levels were much greater than the state median and chloride levels were elevated although not above the state chronic chloride standard.
- **E. coli:** White Grove E. coli levels were very low and much less than state standards for public beaches and surface waters.
- **Total Phosphorus:** Epilimnetic and Metalimnetic (middle water layer) phosphorus levels were elevated in May potentially due to spring turnover. Epilimnetic phosphorus continued to be slightly elevated through July and then decreased to average levels. Hypolimnetic (lower water layer) phosphorus levels increased greatly as the summer progressed and dissolved oxygen levels were depleted, a process called internal phosphorus loading. Historical trend analysis indicates significantly increasing (worsening) epilimnetic phosphorus since monitoring began. Back Creek B and Fundy Bk. phosphorus levels remained fairly stable from May through Sept. and were within an average range for those stations. Round Pond Bk. phosphorus levels were elevated from July through September and low flow conditions likely concentrated nutrients. Drowns Dam and White Grove Bk. phosphorus was elevated in May and sediment was noted in the samples. Fernalds A and B have a history of elevated phosphorus levels due to historical and current agricultural activities in the sub-watershed.
- **Transparency:** Transparency measured with the viewscope (VS) remained stable from May through September and was much better than the state median. Historical trend analysis of VS data ('07-'15) indicates stable transparency. Transparency measured without the viewscope (NVS) was generally much lower (worse) than the VS transparency.
- **Turbidity:** Epilimnetic turbidity was low from June through Sept., however Metalimnetic turbidity was slightly elevated in August and Sept. and Hypolimnetic turbidity was elevated and increased as the summer progress and organic compounds accumulated in hypolimnetic waters. Back Creek B turbidity was slightly elevated in July. Fundy Bk. turbidity was slightly elevated in July and August. Drowns Dam, Fernalds A and White Grove Bk. turbidities were elevated in May. Round Pond Bk. turbidity was elevated from July through September. Low flow conditions likely contributed to the elevated turbidities.
- **pH:** Epilimnetic pH fluctuated below the desirable range 6.5-8.0 units in May and September, however pH recovered between June and August. Spring snow melt and fall turnover may have contributed to the lower pH. Historical trend analysis indicates relatively stable epilimnetic pH with moderate variability between years. Metalimnetic, Hypolimnetic, Drowns Dam, Fundy Bk., Round Pond Bk., and White Grove Bk., pH levels were generally less than the desirable range 6.5-8.0 units and slightly acidic.





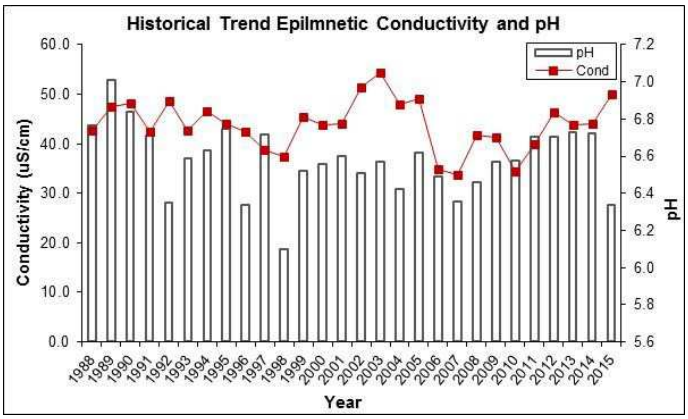
Station Name	Table 1. 2015 Average Water Quality Data for PAWTUCKAWAY LAKE, NORTH STN.									
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu	pH
							NVS	VS		
Epilimnion	6.2	2.94	6	50.0		13	3.38	4.51	0.95	6.34
Metalimnion				53.0		14			1.43	5.97
Hypolimnion				66.0		66			6.54	5.97
Fernalds A			45	392.0		5220			17.30	6.89
#09 Fernalds B			36	211.0		806			3.66	7.01
18 White Grove					4					
Back Creek B			10	63.4		33			1.84	6.44
Drowns Dam			7	52.1		34			1.95	6.20
Fundy Brook			11	49.3		32			2.36	5.19
Round Pd. Brook			3	35.1		44			3.99	6.07
White Grove Brook			22	140.3		28			1.27	6.15

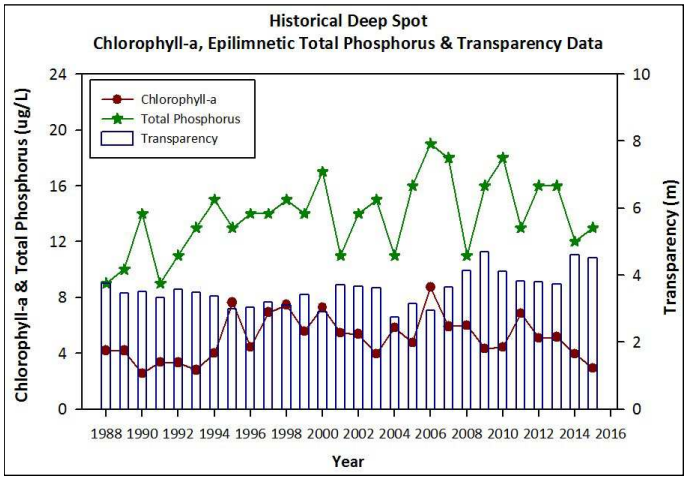
NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between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

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	Stable	Trend not significant; data show low variability.
			Phosphorus (epilimnion)	Worsening	Data significantly increasing.





This report was generated by the NH DES Volunteer Lake Assessment Program (VLAP). For more information contact VLAP at (603) 271-2658 or sara.steiner@des.nh.gov