Volunteer Lake Assessment Program Individual Lake Reports

HIGHLAND LAKE, STODDARD, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	19,008	**Max. Depth (m):**	9.6	**Flushing Rate (yr^{-1}):**	10.3
Surface Area (Ac.):	712	**Mean Depth (m):**	1.6	**P Retention Coef:**	0.49
Shore Length (m):	25,300	**Volume (m^3):**	4,721,000	**Elevation (ft):**	1294

TROPHIC CLASSIFICATION

Year	Trophic class
1993	MESOTROPHIC
2004	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

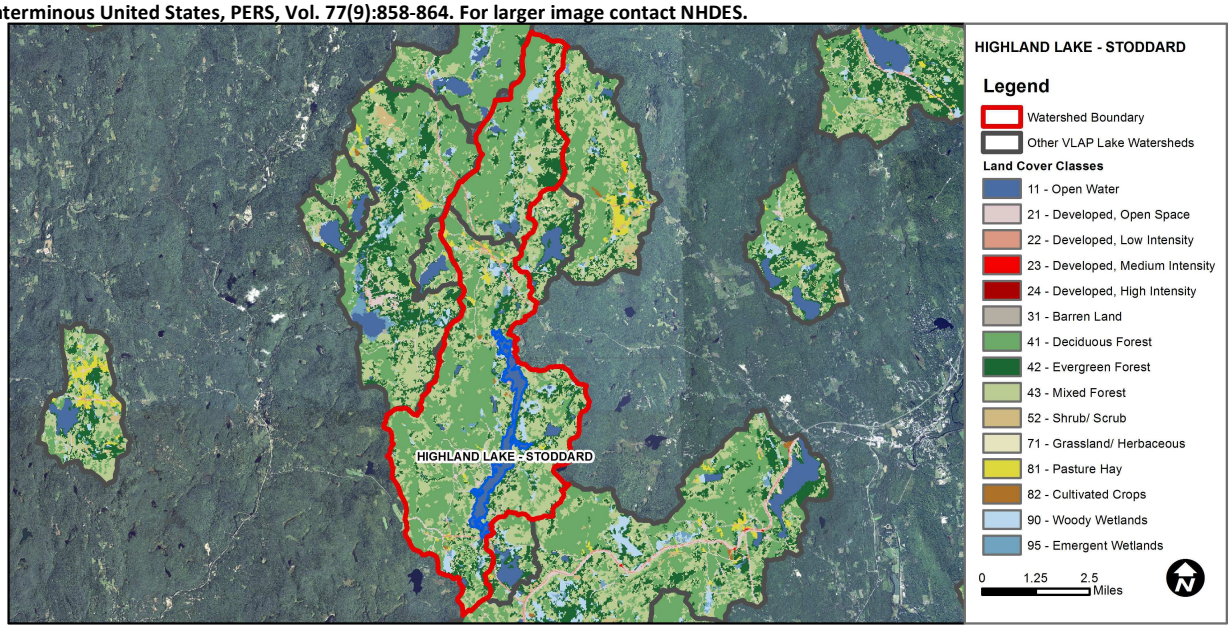
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator and the chlorophyll a indicator is okay.
	pH	Bad	>10%, with a minimum of 2, samples exceed criteria, with 1 or more by a large margin.
	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	Good	The calculated median is from 5 or more samples and is < indicator and > 1/2 indicator.
Primary Contact Recreation	Escherichia coli	Good	There are geometric means and all geometric means are < geometric mean criteria; and there has been a single sample exceedance.
	Chlorophyll-a	Very Good	There are a total of at least 10 samples with 0 exceedances of indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

HIGHLAND LAKE-HIGHLAND LAKE BOAT LAUNCH	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.

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	5.2	Barren Land	0	Grassland/Herbaceous	0.05
Developed-Open Space	2.58	Deciduous Forest	39.23	Pasture Hay	0.92
Developed-Low Intensity	0.59	Evergreen Forest	15.01	Cultivated Crops	0.1
Developed-Medium Intensity	0.01	Mixed Forest	31.25	Woody Wetlands	3.49
Developed-High Intensity	0	Shrub-Scrub	0.58	Emergent Wetlands	0.91

Volunteer Lake Assessment Program Individual Lake Reports

Highland Lake, North Stn., Stoddard

2015 Data Summary

Recommended Actions: The improving water quality trends are a great sign! Water quality is generally representative of Mesotrophic conditions. A significant storm event in June resulted in slightly elevated phosphorus in Barden Pond Bk. and Pickerel Cove 2 as well as slightly elevated turbidity in North Inlet and Pickerel Cove 2. The elevated levels may be naturally occurring from the flushing of wetland systems during significant storm events. Since these are sources of phosphorus to the lake, efforts should made to reduce phosphorus pollution from shorefront and watershed properties, particularly during storm events. DES' "N.H. Homeowner's Guide to Stormwater Management" and UNH Cooperative Extension's "Landscaping at the Water's Edge are great references for property owners. Keep up the great work!

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

- **Chlorophyll-a:** Chlorophyll levels were slightly elevated in June and then decreased to low levels in July and August. The 2015 average chlorophyll level decreased from 2014 and was slightly 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, Barden Pond Bk., and Pickerel Cove 2 conductivity and chloride levels were low and less than the state medians. Historical trend analysis indicates significantly decreasing (improving) epilimnetic (upper water layer) conductivity since monitoring began. We hope to see this continue! North Inlet conductivity and chloride levels were slightly greater than the state medians but not above a level of concern.
- **Total Phosphorus:** Epilimnetic phosphorus was slightly higher in June following a significant storm event, and phosphorus levels decreased to low levels in July and August. Average epilimnetic phosphorus decreased slightly from 2014 and was less than the state median. Historical trend analysis indicates significantly decreasing (improving) epilimnetic phosphorus since monitoring began. We hope to see this continue! Metalimnetic (middle water layer) phosphorus was also slightly elevated in June and then decreased to lower levels by August, and the elevated June phosphorus also likely contributed to the algal growth. Hypolimnetic (lower water layer) phosphorus levels were within an average range for that station in June and July and then increased to slightly elevated levels in August. Barden Pond Bk. and Pickerel Cove 2 phosphorus levels were slightly elevated in June following a significant storm event, and phosphorus levels decreased to within low to average ranges in July and August. North Inlet phosphorus levels remained low and were within an average range for that station.
- **Transparency:** Transparency measured without the viewscope (NVS) was low in June due to wave conditions and then improved to a good range in July and August. Average NVS transparency increased (improved) from 2014 and was slightly better than the state median. Historical trend analysis indicates highly variable transparency since monitoring began. Transparency measured with the viewscope (VS) was average in June and July and then increased to high (good) levels in August and is likely a better representation of actual conditions.
- **Turbidity:** Epilimnetic turbidity was slightly elevated in June likely due to algal growth and a significant storm event prior to sampling, and then decreased to low levels in July and August. Metalimnetic turbidity was within an average range and stable from June to August. Hypolimnetic turbidity increased to elevated levels as the summer progressed likely due to the formation and accumulation of organic compounds in hypolimnetic water as dissolved oxygen levels decrease below 1.0 mg/L. Pickerel Cove 2 and North Inlet experienced slightly elevated turbidities in June following the significant storm event. Barden Pond Bk. turbidity was slightly elevated in July and August due to low flow conditions.
- **pH:** Deep spot and tributary pH levels were less than the desirable range 6.5-8.0 units and slightly acidic. Historical trend analysis indicates significantly decreasing (worsening) epilimnetic pH since monitoring began.

Station Name	Table 1. 2015 Average Water Quality Data for HIGHLAND LAKE, NORTH STN.								
	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	3.3	4.04	4	28.0	9	3.49	3.88	0.91	6.04
Metalimnion				30.1	12			0.89	5.94
Hypolimnion				33.4	18			5.28	5.61
Barden Pond Brook			3	19.6	17			1.26	6.28
North Inlet			11	57.4	10			0.98	6.23
Pickerel Cove 2			3	21.6	14			1.04	5.93

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

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