Volunteer Lake Assessment Program Individual Lake Reports

HUNKINS POND, SANBORNTON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	250	**Max. Depth (m):**	7.9	**Flushing Rate (yr^1)**	1.9
Surface Area (Ac.):	15	**Mean Depth (m):**	4.2	**P Retention Coef:**	0.58
Shore Length (m):	1,000	**Volume (m^3):**	253,500	**Elevation (ft):**	785

TROPHIC CLASSIFICATION

Year	Trophic class
1989	EUTROPHIC
2006	EUTROPHIC

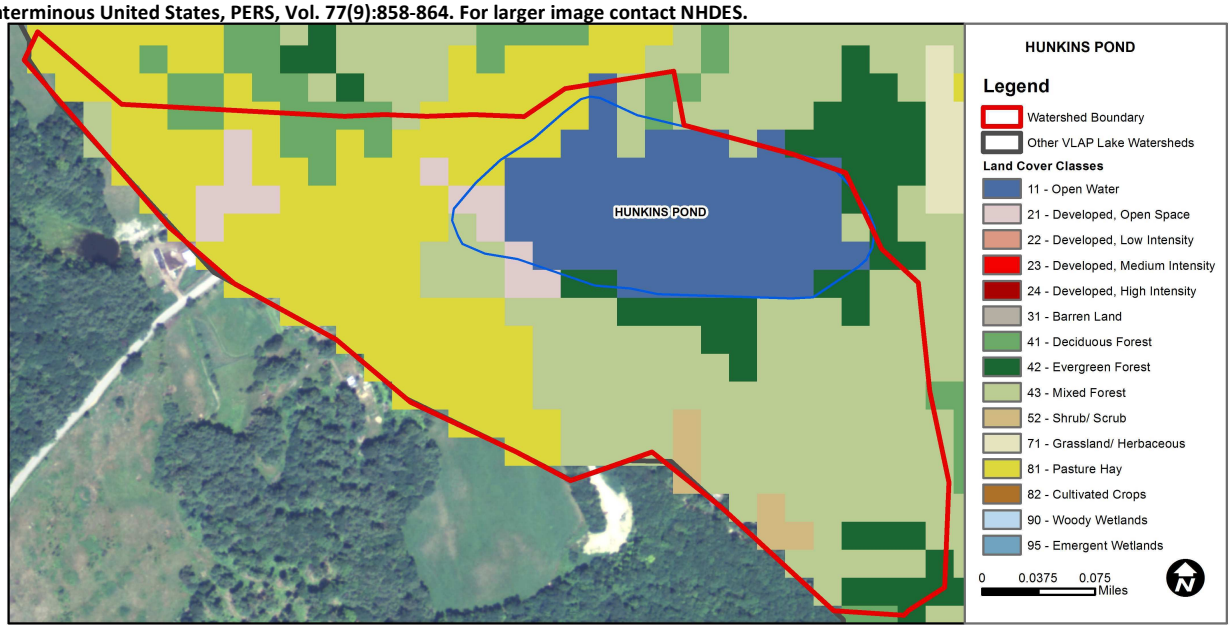
KNOWN EXOTIC SPECIES

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)	Bad	The calculated median is from 5 or more samples and is > 2X 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	Encouraging	There are < 10 samples with 0 exceedances of criteria. More data needed.
	Dissolved oxygen satura	Slightly Bad	There are >10% of samples (minimum of 2), exceeding criteria.
	Chlorophyll-a	Bad	The calculated median is from 5 or more samples and is > 2X indicator.
Primary Contact Recreation	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.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Bad	There are >10% of samples (minimum of 2), exceeding indicator with one or more samples considered large exceedance.

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	19.4	Barren Land	0	Grassland/Herbaceous	0
Developed-Open Space	4.06	Deciduous Forest	3.43	Pasture Hay	31.21
Developed-Low Intensity	0	Evergreen Forest	6.87	Cultivated Crops	0
Developed-Medium Intensity	0	Mixed Forest	35.58	Woody Wetlands	0
Developed-High Intensity	0	Shrub-Scrub	1.87	Emergent Wetlands	0

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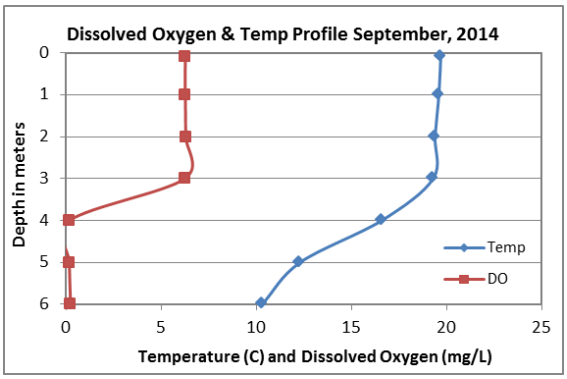
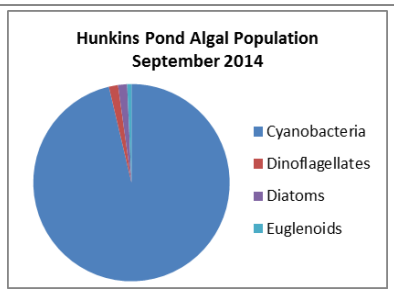
2014 Data Summary

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

- **Chlorophyll-a:** Chlorophyll levels were greatly elevated, much greater than the state median, and a cyanobacteria bloom was occurring at the time of sampling. The pond has historically experienced cyanobacteria blooms in late summer as depicted by the historical graphic.
- **Conductivity/Chloride:** Conductivity levels were elevated and much greater than the state median. Visual inspection of historical data indicates epilimnetic (upper water layer) conductivity has remained relatively stable since 2006.
- **Total Phosphorus:** Epilimnetic and North End phosphorus levels were elevated and greater than the state median. Visual inspection of historical data indicates elevated and variable epilimnetic phosphorus since monitoring began. Hypolimnetic (lower water layer) phosphorus levels were greatly elevated and indicative of internal phosphorus loading. Bacteria contained in the pond sediment use dissolved oxygen to decompose the thick layer of organic matter. When dissolved oxygen levels decrease to less than 1.0 mg/L, phosphorus typically bound in the sediments is released into the water column. This phosphorus is then utilized by algae and cyanobacteria to grow to bloom proportions.
- **Transparency:** Transparency was bad and less than 1.0 meter due to the cyanobacteria bloom that was occurring.
- **Turbidity:** Turbidity was elevated throughout the pond due to the cyanobacteria bloom.
- **pH:** Epilimnetic and North End pH levels were within the desirable range of 6.5—8.0 units, however this was likely a result of the cyanobacteria bloom and the by-products of photosynthesis which tend to increase pH levels as depicted in the historical graphic. Hypolimnetic pH was lower and likely more representative of the natural conditions in the pond.
- **Recommended Actions:** Historical and current agricultural practices in the watershed, along with annual fish stocking has contributed to a thick layer of organic material on the pond's bottom. This in turn has contributed to the lack of dissolved oxygen in the hypolimnion which has led to the severe internal phosphorus loading in the pond. The internal phosphorus load combined with the external phosphorus load from agricultural practices causes the annual cyanobacteria blooms. These blooms have the potential to produce toxins that could be harmful to pets, livestock, wildlife and humans. The Belknap County Conservation District has and continues to work with the agricultural land owners to try and reduce phosphorus loading to the pond. However, there continues to be direct access to the pond by livestock, as was witnessed while sampling occurred. It is recommended to restrict access to the pond by all livestock. This will protect livestock from drinking waters contaminated with potentially toxic cyanobacteria, as well as eliminate direct deposits of fecal material along the pond's shoreline that can wash into the pond during rain events. It is also recommended to communicate the water quality conditions of the pond to the N.H. Fish and Game Department. The pond should not be stocked with fish on an annual basis. The dissolved oxygen levels cannot support cold-water fish for an extended period. Fish then die and fall to the bottom of the pond adding to the thick organic layer which further depletes dissolved oxygen and causes the release of phosphorus that promotes cyanobacteria blooms.

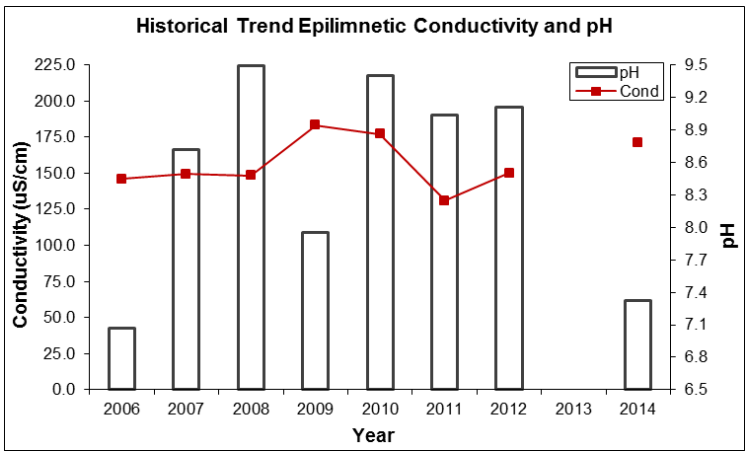
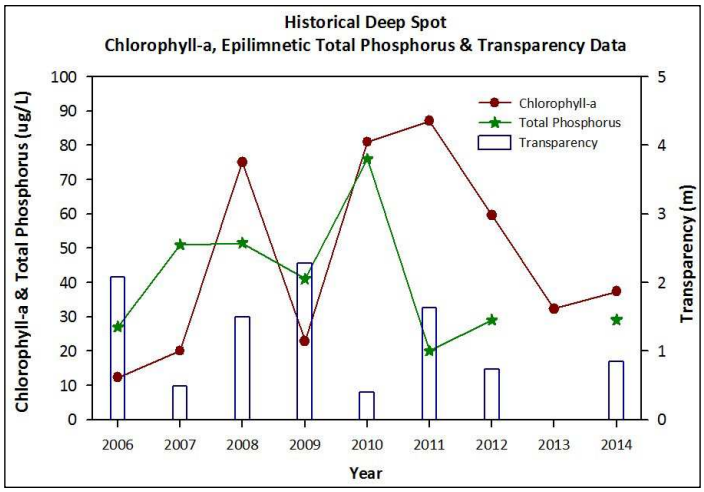




NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 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. 2014 Average Water Quality Data for HUNKINS POND							
	Alk. mg/l	Chlor-a ug/l	Cond. uS/cm	Total P ug/l	Trans. m		Turb. ntu	pH
					NVS	VS		
Epilimnion	22.4	28.4	171.1	29	0.85	0.90	16.6	7.32
Hypolimnion			237.0	394			19.95	6.47
North End		46.4	170.4	30			18.5	7.54

Historical Water Quality Trend Analysis

Parameter	Trend	Explanation	Parameter	Trend	Explanation
Conductivity	N/A	Ten consecutive years of data necessary for analysis.	Chlorophyll-a	N/A	Ten consecutive years of data necessary for analysis.
pH (epilimnion)	N/A	Ten consecutive years of data necessary for analysis.	Transparency	N/A	Ten consecutive years of data necessary for analysis.
			Phosphorus (epilimnion)	N/A	Ten consecutive years of data necessary for analysis.