Volunteer Lake Assessment Program Individual Lake Reports

BEAVER LAKE, DERRY, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	5,760	**Max. Depth (m):**	14	**Flushing Rate (yr^{1})**	4.1
Surface Area (Ac.):	134	**Mean Depth (m):**	5	**P Retention Coef:**	0.47
Shore Length (m):	5,800	**Volume (m^3):**	2,707,500	**Elevation (ft):**	287

TROPHIC CLASSIFICATION

Year	Trophic class
1985	EUTROPHIC
1999	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

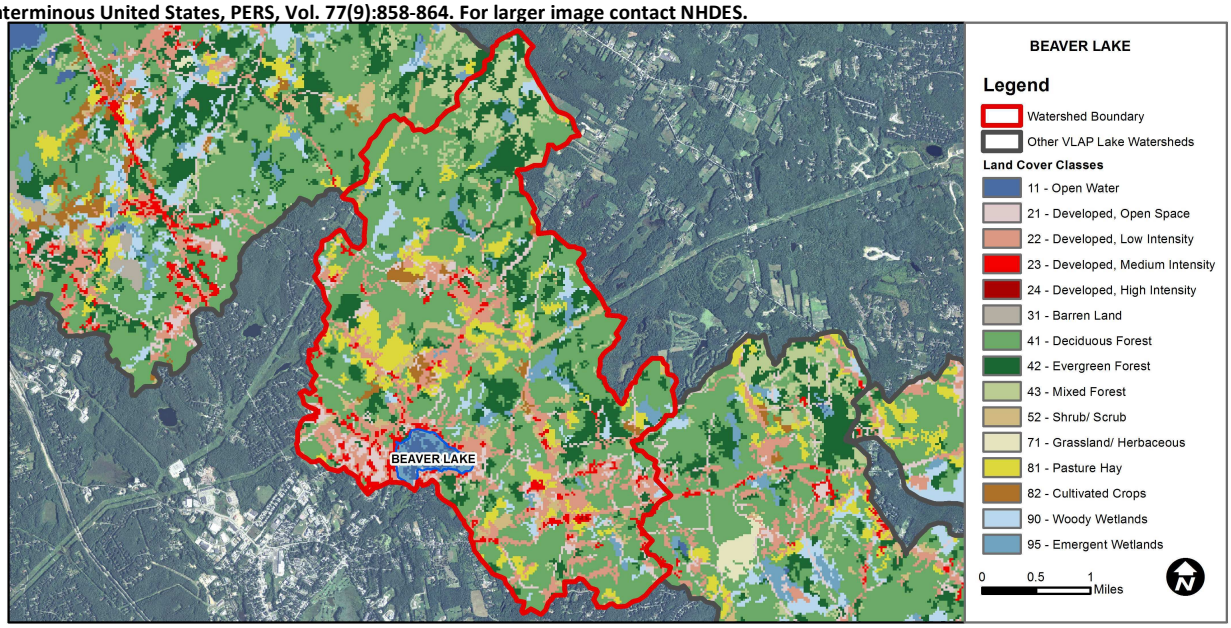
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Slightly Bad	The calculated median is from 5 or more samples and is > indicator and the chlorophyll a indicator is exceeded.
	pH	Slightly Bad	>10% of samples exceed criteria by a small margin (minimum of 2 exceedances).
	Oxygen, Dissolved	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	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.
	Chlorophyll-a	Very Good	There are a total of at least 10 samples with 0 exceedances of indicator.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

BEAVER LAKE - PARK 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.
BEAVER LAKE - GALLIEN'S 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.
BEAVER LAKE - COMEAU'S BEACH	Escherichia coli	No Data	No data 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	1.13	Barren Land	0.05	Grassland/Herbaceous	0.01
Developed-Open Space	5.16	Deciduous Forest	44.15	Pasture Hay	7.07
Developed-Low Intensity	12.7	Evergreen Forest	12.38	Cultivated Crops	1.1
Developed-Medium Intensity	2.67	Mixed Forest	3.84	Woody Wetlands	2.83
Developed-High Intensity	0.03	Shrub-Scrub	3.77	Emergent Wetlands	3

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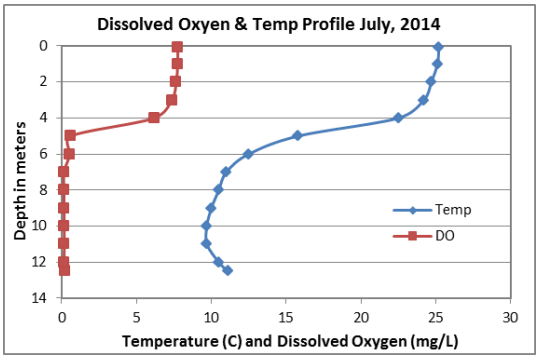
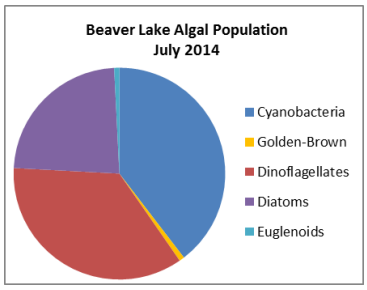
Beaver Lake, Derry

2014 Data Summary

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

- **Chlorophyll-a:** Chlorophyll levels were elevated in June and July (> 11.0 ug/L) and were approaching levels indicative of an algal bloom (15 ug/L). Chlorophyll levels had decreased to < 5.0 ug/L by September. Historical trend analysis indicates relatively stable chlorophyll levels since monitoring began, however average levels increased in 2013 and 2014.
- **Conductivity/Chloride:** Deep spot and tributary conductivity and chloride levels were elevated and much greater than the state medians. Conductivity and chloride continue to be greatest at Cat-o-Brook, particularly at Beaver Rd. Historical trend analysis indicates relatively stable epilimnetic (upper water layer) conductivity with moderate variability between years.
- **Total Phosphorus:** Epilimnetic phosphorus levels decreased from June to September and the 2014 average was less than the state median. Historical trend analysis indicates stable epilimnetic phosphorus levels with moderate variability between years. Metalimnetic (middle water layer) phosphorus levels were slightly above average, but stable throughout the summer. Hypolimnetic (lower water layer) phosphorus levels were elevated in September likely due to the release of phosphorus and organic compounds from bottom sediments under anoxic conditions. Manter Brook phosphorus levels were average for that station, and Cat-o-Brook phosphorus levels were elevated likely due to wetland influences.
- **Transparency:** Transparency was much less than normal in June due to elevated algal growth, however improved and remained stable in July and September. Transparency has continually improved since 2005, which is a good sign. Historical trend analysis indicates stable transparency with high variability between years.
- **Turbidity:** Epilimnetic turbidity was relatively low, metalimnetic turbidity was slightly greater in July and September likely due to algal growth, and hypolimnetic turbidity was elevated in September likely due to the release and formation of organic compounds during anoxic conditions. Cat-o-Brook phosphorus levels increased as the summer progressed likely due to low flow or stagnant conditions.
- **pH:** pH levels were sufficient to support aquatic life, however hypolimnetic pH levels have historically been less than desirable range 6.5-8.0 units. Historical trend analysis indicates stable epilimnetic pH levels since monitoring began.
- **Dissolved Oxygen/Temp:** Dissolved oxygen levels were zero from the metalimnion through the hypolimnion in July. This indicates a rich organic layer at the lake's bottom where biological activity uses up oxygen throughout the summer. This could lead to phosphorus release from sediments that could supply algae and cyanobacteria with nutrients necessary for growth.
- **Recommended Actions:** Algal growth was elevated in June and July potentially due to phosphorus loading from spring snow melt and stormwater runoff. Identifying and reducing phosphorus loads from the watershed should continue to be a priority. Limit fertilizer use and use phosphate free fertilizer if necessary. Identify areas of stormwater runoff into the lake and implement best management practices to capture and infiltrate stormwater before entering the lake. Conductivity and chloride continue to be elevated. Educate watershed residents on the proper use of de-icing materials on their driveways and walkways to help reduce salt loading. Cyanobacteria were dominant in the July algal sample. Watch for cyanobacteria blooms or surface scums and notify DES immediately if noticed. Cyanobacteria have the ability to produce toxins that could be harmful to pets and humans. Keep up the great work!

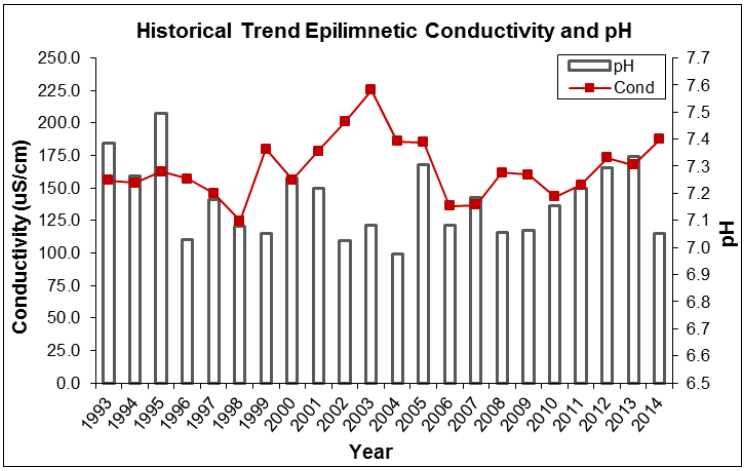
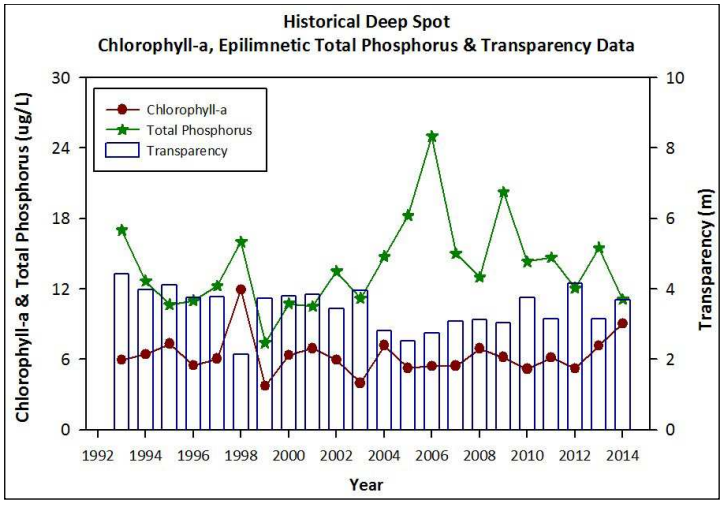




NH Water Quality Standards: Numeric criteria for specific parameters. Results exceeding criteria are considered a water quality violation.
Chloride: > 230 mg/L (chronic)
E. coli: > 88 cts/100 mL – public beach
E. coli: > 406 cts/100 mL – surface waters
Turbidity: > 10 NTU above natural level
pH: between 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 BEAVER LAKE								
	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	18.4	9.02	41	187.3	11	3.68	4.53	1.09	7.05
Metalimnion				181.3	16			1.99	6.79
Hypolimnion				188.4	34			3.92	6.65
Cat O Brook			57	335.3	47			6.51	7.02
Cat-O-Bk. at Beaver Rd			150	735.0	15			1.13	7.66
Manter Brook			41	217.0	19			1.58	7.04

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 show low variability.
pH (epilimnion)	Stable	Trend not significant, data show low variability.	Transparency	Stable	Trend not significant; data highly variable.
			Phosphorus (epilimnion)	Stable	Trend not significant, data moderately variable.