Volunteer Lake Assessment Program Individual Lake Reports

TODD LAKE, NEWBURY, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	12,212	**Max. Depth (m):**	6.1	**Flushing Rate (yr^{-1}):**	0.5
Surface Area (Ac.):	168	**Mean Depth (m):**	2.2	**P Retention Coef:**	0.88
Shore Length (m):	5,100	**Volume (m^3):**	1,466,500	**Elevation (ft):**	670

TROPHIC CLASSIFICATION

Year	Trophic class
1991	MESOTROPHIC
2009	MESOTROPHIC

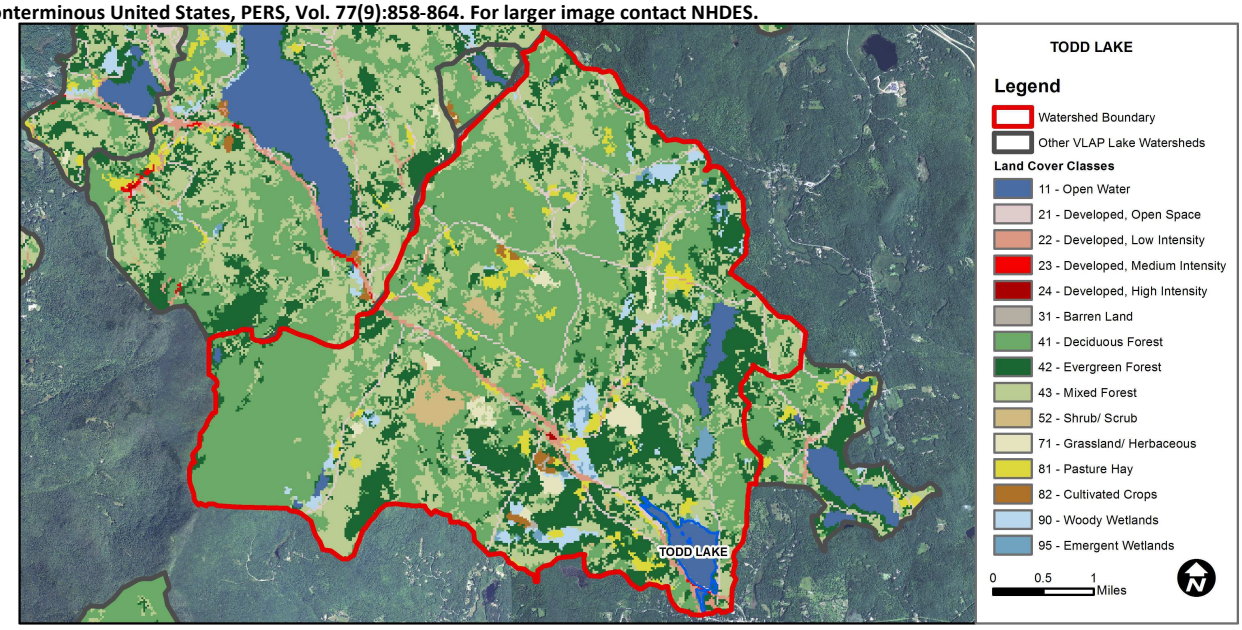
KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2016 305(b) report on the status of N.H. waters, and are based on data collected from 2006-2015. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organization/divisions/water/wmb/swqa/index.htm

Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin.
	Oxygen, Dissolved	Cautionary	Limited data for this parameter predicts exceedance of water quality standards or thresholds; however more data are necessary to fully assess the parameter.
	Dissolved oxygen satura	Cautionary	Limited data for this parameter predicts exceedance of water quality standards or thresholds; however more data are necessary to fully assess the parameter.
	Chlorophyll-a	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
Primary Contact Recreation	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
	Chlorophyll-a	Good	Sampling data commonly meet water quality standards or thresholds 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	2.52	Barren Land	0.05	Grassland/Herbaceous	1.44
Developed-Open Space	2.83	Deciduous Forest	41.51	Pasture Hay	2.92
Developed-Low Intensity	1.03	Evergreen Forest	18.9	Cultivated Crops	0.31
Developed-Medium Intensity	0.04	Mixed Forest	23.99	Woody Wetlands	2.36
Developed-High Intensity	0.02	Shrub-Scrub	1.5	Emergent Wetlands	0.6

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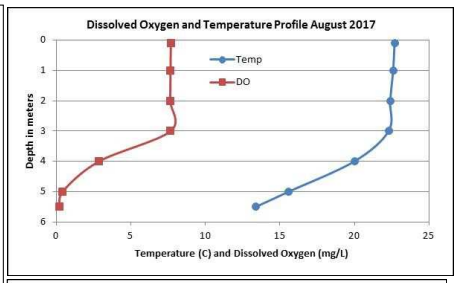
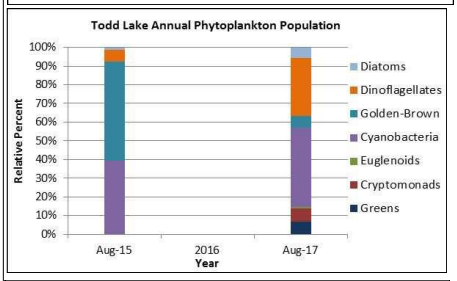
2017 Data Summary

Recommended Actions: Lake quality was generally representative of mesotrophic conditions in 2017, however chlorophyll levels spiked to almost bloom conditions in July, and have increased gradually since 2007. The increased frequency and intensity of storm events and associated stormwater runoff to the lake and tributaries is likely contributing nutrients that feed algal growth. Consider development of a watershed management plan to identify and quantify nutrient sources in the watershed, and make recommendations on where to focus management activities to reduce nutrient loads. For more information visit the DES Watershed Assistance section page at www.des.nh.gov/organization/divisions/water/wmb/was/categories/grants.htm. Continue education and outreach efforts aimed at reducing stormwater runoff and maintaining vegetative buffers utilizing DES' "NH Homeowner's Guide to Stormwater Management" and UNH Cooperative Extension's "Landscaping at the Water's Edge". Keep up the great work!

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

- **Chlorophyll-a:** Chlorophyll levels were within a moderate range in June, increased to elevated levels in July and then decreased to low levels in August. Average chlorophyll level increased from 2016, was slightly greater than the state median and the threshold for mesotrophic lakes. Historical trend analysis indicates relatively stable chlorophyll levels with moderate variability between years.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Hypolimnetic (lower water layer), Gillingham Dr. Inlet, Outlet, and Reservoir Brook conductivity and/or chloride levels were within a moderate range and approximately equal to the state medians. Historical trend analysis indicates relatively stable epilimnetic conductivity levels with moderate variability between years. Andrew Brook conductivity and chloride levels were slightly higher than the other stations and indicates impacts of road salting, however were not above a level of concern.
- **Color:** Apparent color was measured in the epilimnion and indicates the lake water is moderately tea colored, or brown.
- **E. coli:** No E. coli bacteria were present in the epilimnion in July.
- **Total Phosphorus:** Epilimnetic phosphorus was moderate in June, decreased to a low level in July, and then increased to a moderate level in August. Average epilimnetic phosphorus level remained stable with 2016 and was approximately equal to the state median and threshold for mesotrophic lakes. Historical trend analysis indicates stable epilimnetic phosphorus levels since monitoring began. Hypolimnetic phosphorus levels increased from moderate to slightly elevated as the summer progressed. Andrew Brook phosphorus levels were slightly elevated in July and lab data note low amounts of organic matter in the sample. Gillingham Dr. Inlet phosphorus levels were elevated in July and August during low flows and July lab data note moderate amounts of organic matter in the sample. Outlet phosphorus levels were slightly elevated in June. Reservoir Brook phosphorus levels remained low from June through August.
- **Transparency:** Transparency measured with (VS) and without (NVS) the viewscope was low (worse) in June due to wave conditions then increased (improved) as the summer progressed and was higher (best) in August. Average NVS transparency increased (improved) slightly from 2016 and was lower than the state median. Historical trend analysis indicates highly variable transparency since monitoring began. VS transparency was higher (better) than NVS transparency on each sampling event and likely a better measure of actual conditions.
- **Turbidity:** Epilimnetic and Hypolimnetic turbidity levels fluctuated within a low to moderate level and were within normal ranges for those stations. Andrew Brook turbidity was higher in July when organic matter was in the sample. Gillingham Dr. Inlet turbidity levels were elevated in July due to organic matter and in August during very low flow conditions. Outlet and Reservoir Brook turbidity levels fluctuated within a low level.
- **pH:** Epilimnetic, Andrew Brook, Outlet, and Reservoir Brook pH levels were within the desirable range 6.5-8.0 units, however epilimnetic pH has historically fluctuated below the desirable range. Historical trend analysis indicates significantly decreasing (worsening) epilimnetic pH levels since monitoring began. Hypolimnetic and Gillingham Dr. Inlet pH levels were slightly less than desirable.





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)

Table 1. 2017 Average Water Quality Data for TODD LAKE-NEWBURY

Station Name	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Color PCU	Cond. uS/cm	E. Coli #/100ml	Total P ug/l	Trans. m		Turb. ntu	pH
								NVS	VS		
Epilimnion	6.3	5.95	9	60	48.6	0	12	2.89	3.59	0.89	6.69
Hypolimnion					47.2		16			1.78	6.13
Andrew Brook			15		82.1		16			1.31	6.89
Gillingham Dr. Inlet			3		35.3		30			2.14	6.35
Outlet					51.0		11			0.84	6.68
Reservoir Brook					33.3		11			0.41	6.86

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)	Worsening	Data significantly decreasing.	Transparency	Stable	Trend not significant; data highly variable.
			Phosphorus (epilimnion)	Stable	Trend not significant; data show low variability.