Volunteer Lake Assessment Program Individual Lake Reports
WINONA, LAKE, NEW HAMPTON, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	3,328	Max. Depth (m):	14.6	Flushing Rate (yr^1)	1.6
Surface Area (Ac.):	154	Mean Depth (m):	6.6	P Retention Coef:	0.54
Shore Length (m):	5,000	Volume (m³):	4,149,000	Elevation (ft):	540

TROPHIC CLASSIFICATION

| Year	Trophic class
1987	MESOTROPHIC
2005	MESOTROPHIC

KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2020 305(b) report on the status of N.H. waters, and are based on data collected from 2010-2019. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/water/rivers-and-lakes/water-quality-assessment

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 this parameter by a small margin.
	Oxygen, Dissolved	Bad	Data periodically exceed water quality standards or thresholds for this parameter by a large margin.
	Dissolved oxygen satura	Slightly Bad	Data periodically exceed water quality standards or thresholds for a given parameter by a small margin.
	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.
	Cyanobacteria hepatoto	Slightly Bad	Cyanobacteria bloom(s).
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

LAKE WAUKEWAN - TOWN BEACH	Escherichia coli	Good	Sampling data commonly meet water quality standards or thresholds for this parameter.

VLAP SAMPLE STATION MAP: This map depicts the location of routine sampling stations discussed on page two of the report.
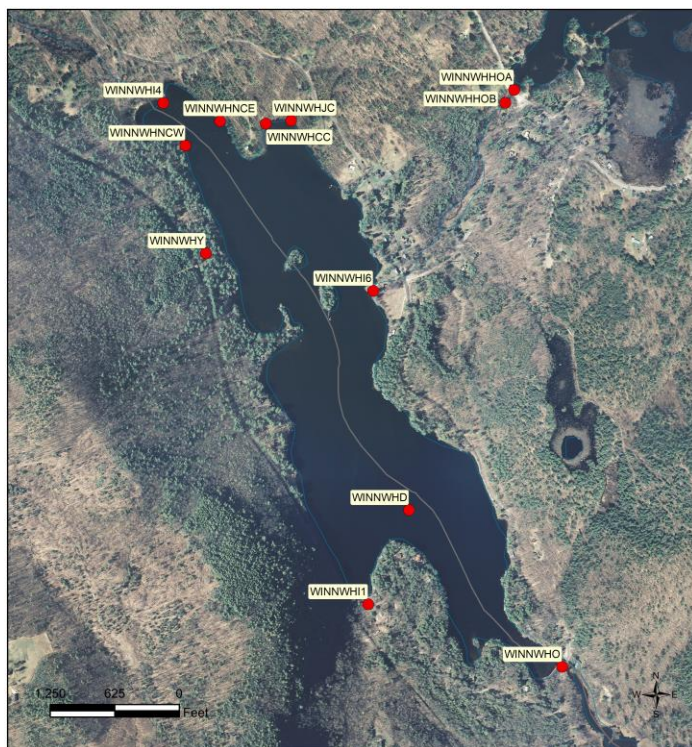
LAKE WINONA
NEW HAMPTON
VOLUNTEER LAKE ASSESSMENT PROGRAM

STATIONID	STATION NAME
WINNWHI4	NORTH INLET
WINNWHI6	HAWKINS POND INLET
WINNWHD	DEEP SPOT
WINNWHI1	HEIGHTS BROOK INLET
WINNWHO	OUTLET
WINNWHHOA	HAWKINS OUTLET ABOVE
WINNWHHOB	HAWKINS OUTLET BELOW
WINNWHCC	CHUTES COVE
WINNWHNCW	NORTH COVE WEST SIDE
WINNWHNCE	NORTH COVE EAST SIDE
WINNWHY	YORK BROOK
WINNWHJC	JEAN CHUTES

Source: The data layers are derived from NHDES data and are under constant revision. NHDES is not responsible for the use or interpretation of this information. Not intended for legal use NHDES Watershed Management Bureau   Date: 2/17/2021

RECOMMENDED ACTIONS: Great job sampling in 2020! Algal growth (chlorophyll-a) has significantly increased in the lake, particularly since 2012 when levels have generally remained above the threshold for mesotrophic lakes. The lake experienced a cyanobacteria bloom again in 2020 and historical data suggest more frequent occurrence of summer algal/cyanobacteria blooms. Phosphorus levels have significantly increased in the Hypolimnion suggesting a thick organic layer on the lake bottom that depletes dissolved oxygen resulting in release of phosphorus bound in the sediments into the water column. This phosphorus is readily available for uptake by algae and cyanobacteria. This highlights the importance of minimizing stormwater runoff, erosion, and sedimentation and deposition of organic material to the lake. Encourage shoreline property owners to maintain a good vegetative buffer to help reduce stormwater runoff to the lake and shoreline erosion from wave action. DES' "NH 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 level was elevated in August and indicative an algal bloom or a thick layer of algal growth deeper in the water column. Average chlorophyll level increased from 2019 and was much greater than the state median and the threshold for mesotrophic lakes. Historical trend analysis indicates significantly increasing (worsening) chlorophyll levels since monitoring began.
- **CONDUCTIVITY/CHLORIDE:** Epilimnetic (upper water layer), Metalimnetic (middle water layer), Hypolimnetic (lower water layer), North Cove East, and Outlet conductivity levels and/or chloride levels were greater than the state median, yet not above a level of concern. However, historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity levels since monitoring began. Heights Brook conductivity and chloride levels were within a low range. Hawkins Pond Outlet and Hawkins Pond Inlet conductivity levels were elevated and chloride levels were also slightly elevated.
- **COLOR:** Apparent color measured in the epilimnion indicates the water was clear with little to no tea, or brown, coloring.
- **TOTAL PHOSPHORUS:** Epilimnetic, Metalimnetic, North Cove East, and Outlet phosphorus levels were within a low range. Average epilimnetic phosphorus level remained stable with 2019 and was less than the state median and the threshold for mesotrophic lakes. Historical trend analysis indicates stable, yet variable, epilimnetic phosphorus levels since monitoring began. Hypolimnetic phosphorus level was elevated potentially due to the release of phosphorus from bottom sediments under anoxic (low dissolved oxygen) conditions, a process called internal loading. Historical trend analysis indicates significantly increasing (worsening) hypolimnetic phosphorus levels since monitoring began. Hawkins Outlet, Hawkins Pond Inlet and Heights Brook phosphorus levels fluctuated within a moderate range.
- **TRANSPARENCY:** Transparency measured with (VS) and without (NVS) the viewscope was above average (good) and increased (improved) from 2019 potentially due to lighter water color conditions compared with previous years. Historical trend analysis indicates relatively stable NVS transparency since monitoring began.
- **TURBIDITY:** Epilimnetic, Metalimnetic, Hawkins Outlet, Hawkins Pond Inlet, Heights Brook, North Cove East, and Outlet turbidity levels were within a low range. Hypolimnetic turbidity level was slightly elevated potentially due to the formation and accumulation of organic compounds under anoxic conditions.
- **PH:** Deep spot and tributary pH levels were within the desirable range 6.5-8.0 units. Historical trend analysis indicates stable, yet variable, epilimnetic pH levels since monitoring began.

Station Name	Table 1. 2020 Average Water Quality Data for LAKE WINONA - CENTER HARBOR									
	Alk. (mg/L)	Chlor-a (ug/L)	Chloride (mg/L)	Color (pcu)	Cond. (us/cm)	Total P (ug/L)	Trans. (m)		Turb. (ntu)	pH
							NVS	VS		
Epilimnion	6.4	13.17	22	10	70.8	8	7.00	8.50	0.29	7.00
Metalimnion					68.8	11			0.42	6.97
Hypolimnion					81.1	32			2.61	6.54
Hawkins Outlet Above					182.1	19			1.02	6.74
Hawkins Pond Inlet			56		177.5	17			1.06	6.94
Heights Brook Inlet			7		43.7	19			0.88	6.60
North Cove East			23		73.4	10			0.29	7.07
Outlet			23		71.5	7			0.18	6.81

NH Median Values: Median values for specific parameters generated from historic lake monitoring data.
Alkalinity: 4.5 mg/L
Chlorophyll-a: 4.39 ug/L
Conductivity: 42.3 uS/cm
Chloride: 5 mg/L
Total Phosphorus: 11 ug/L
Transparency: 3.3 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	Worsening	Data significantly increasing.	Chlorophyll-a	Worsening	Data significantly increasing.
pH (epilimnion)	Stable	Trend not significant; data highly variable.	Transparency	Stable	Trend not significant; data moderately variable.
			Phosphorus (epilimnion)	Stable	Trend not significant; data highly variable.

Historical Trend Epilimnetic Conductivty and pH

Historical Chlorophyll-a, Epilimnetic Phosphorus & Transparency Data