Volunteer Lake Assessment Program Individual Lake Reports

BERRY BAY, FREEDOM, NH

MORPHOMETRIC DATA

Watershed Area (Ac.):	230,326	**Max. Depth (m):**	11.6	**Flushing Rate (yr^{1})**	254
Surface Area (Ac.):	145	**Mean Depth (m):**	3.7	**P Retention Coef:**	-0.01
Shore Length (m):	5,800	**Volume (m^3):**	2,147,000	**Elevation (ft):**	406

TROPHIC CLASSIFICATION

Year	Trophic class
1987	OLIGOTROPHIC
2003	MESOTROPHIC

KNOWN EXOTIC SPECIES

The Waterbody Report Card tables are generated from the DRAFT 2018 305(b) report on the status of N.H. waters, and are based on data collected from 2008-2017. Detailed waterbody assessment and report card information can be found at www.des.nh.gov/organization/divisions/water/wmb/swqa/index.htm

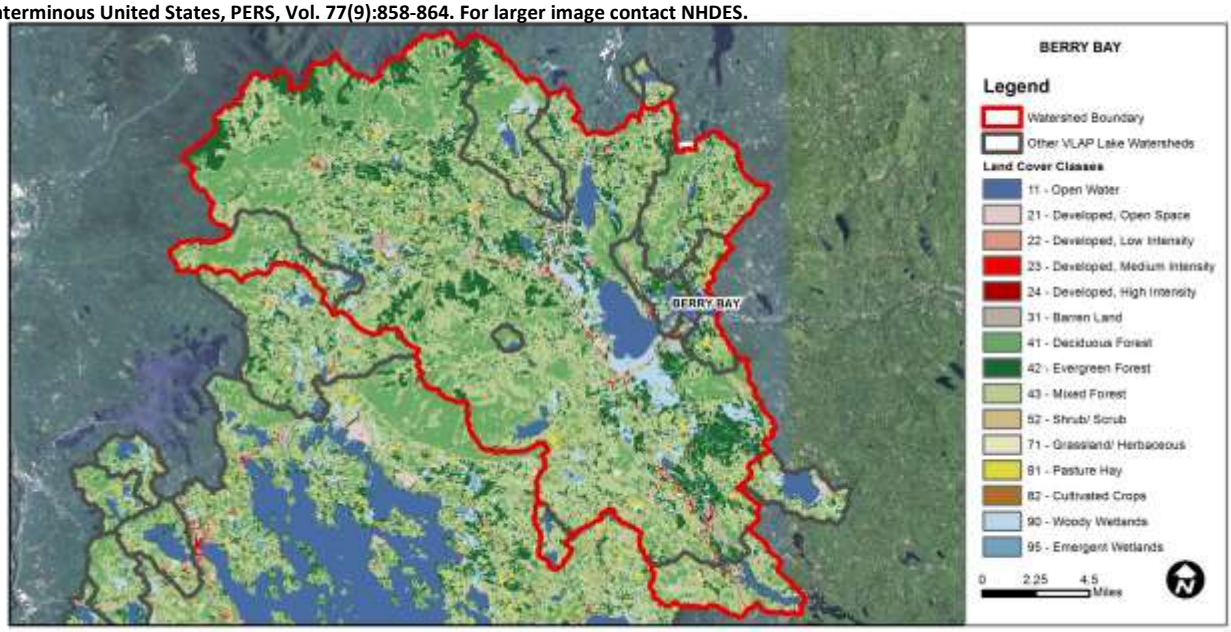
Designated Use	Parameter	Category	Comments
Aquatic Life	Phosphorus (Total)	Good	Sampling data is better than the water quality standards or thresholds for this parameter.
	pH	Slightly Bad	Data periodically exceed water quality standards or thresholds for this parameter by a small margin.
	Oxygen, Dissolved	Very Good	All sampling data meet water quality standards or thresholds for this 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	No Data	No data for this parameter.
	Chlorophyll-a	Very Good	All sampling data meet water quality standards or thresholds for this parameter.

BEACH PRIMARY CONTACT ASSESSMENT STATUS

BROAD BAY - CAMP HUCKINS BEACH	Escherichia coli	Cautionary	Limited data for this parameter predicts exceedance of water quality standards or thresholds; however more data are necessary to fully assess the parameter.
BROAD BAY - CAMP ROBIN HOOD BEACH	Escherichia coli	Very Good	All sampling data meet water quality standards or thresholds for this parameter.
LEAVITT BAY - CAMP MARIST BEACH	Escherichia coli	Very Good	All sampling data 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	3.63	Barren Land	0.63	Grassland/Herbaceous	0.36
Developed-Open Space	3.02	Deciduous Forest	23.03	Pasture Hay	0.93
Developed-Low Intensity	0.78	Evergreen Forest	20.56	Cultivated Crops	0.49
Developed-Medium Intensity	0.25	Mixed Forest	38.3	Woody Wetlands	4.62
Developed-High Intensity	0.04	Shrub-Scrub	2.7	Emergent Wetlands	0.6

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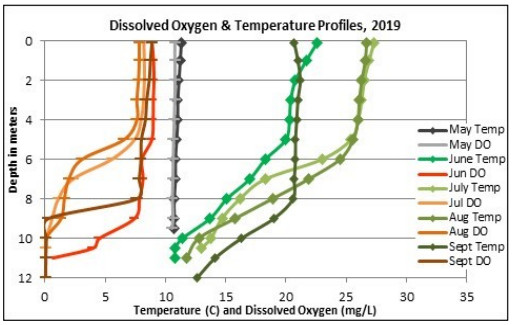
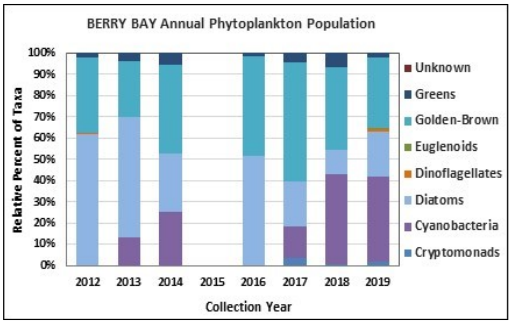
Berry Bay, Freedom
2019 Data Summary

Recommended Actions: Chlorophyll and epilimnetic phosphorus levels have stabilized below the oligotrophic thresholds for New Hampshire lakes which is a great sign. Berry Bay conductivity and chloride values, while low, have increased steadily since 2012. This indicates that human influences such as road salt are likely impacting water quality. Managing stormwater run-off from roadways and reducing road salt usage where feasible is recommended. UNH Technology Transfer Center's Green SnowPro Certification program is recommended for winter maintenance companies that manage private roads, developments and parking lots. Continue efforts to implement a watershed management plan. DES' "NH Homeowner's Guide to Stormwater Management" and UNH Cooperative Extension's "Landscaping at the Water's Edge" are useful resources. A significant storm event in May resulted in darker water color and decreased clarity. Continue to measure the relationship between water color and clarity as the increased frequency and intensity of storm events flushes waters rich in dissolved organic matter that impart a tea color to the water . Keep up the great work!

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

- **Chlorophyll-a:** Chlorophyll levels fluctuated within a low range from May through August and increased slightly in September. Average chlorophyll level remained stable with 2018 and was much less than the state median and the threshold for oligotrophic lakes. Historical trend analysis indicates relatively stable chlorophyll levels since monitoring began.
- **Conductivity/Chloride:** Epilimnetic (upper water layer), Metalimnetic (middle water layer) and Hypolimnetic (lower water layer) conductivity levels remained slightly greater than the state median but much less than a level of concern. Epilimnetic chloride levels were also slightly greater than the state median yet much less than the state chronic chloride standard. Historical trend analysis indicates relatively stable epilimnetic conductivity levels since monitoring began.
- **Color:** Apparent color measured in the epilimnion indicates the lake water was lightly to moderately tea colored, or brown, and was darkest in May following significant rainfall.
- **Total Phosphorus:** Epilimnetic phosphorus levels fluctuated within a low range from May through July, increased slightly in August, and then decreased in September. Average epilimnetic phosphorus level increased slightly from 2018 and was slightly less than the state median and threshold for oligotrophic lakes. Historical trend analysis indicates stable epilimnetic phosphorus level since monitoring began. Metalimnetic phosphorus levels were stable and low from May through July and then increased to moderate level in August. Hypolimnetic phosphorus levels were low in May and July, and within a moderate range in June, August and September.
- **Transparency:** Transparency measured with (VS) and without (NVS) was below average (worse) in May, increased (improved) in June, decreased in July and August, and then increased (improved) to within a normal range in September. Average NVS transparency decreased (worsened) from 2018 and was approximately equal to the state median. Historical trend analysis indicates highly variable transparency since monitoring began.
- **Turbidity:** Epilimnetic and Metalimnetic turbidity levels fluctuated within a low range. Hypolimnetic turbidity levels were low from May through July and increased to slightly elevated levels in August and September.
- **pH:** Epilimnetic pH level was within the desirable range 6.5-8.0 units and historical trend analysis indicates stable epilimnetic pH levels since monitoring began. Metalimnetic and Hypolimnetic pH levels were slightly less than desirable.





Station Name	Table 1. 2019 Average Water Quality Data for BERRY BAY - FREEDOM									
	Alk. mg/l	Chlor-a ug/l	Chloride mg/l	Color pcu	Cond. us/cm	Total P mg/l	Trans. m		Turb. ntu	pH
							NVS	VS		
Epilimnion	5.3	1.63	10	48	51.4	7	3.38	3.81	0.51	6.58
Metalimnion					56.2	8			0.68	6.31
Hypolimnion					62.3	9			1.82	6.27

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	Stable	Trend not significant; data moderately variable.	Chlorophyll-a	Stable	Trend not significant; data moderately variable.
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 show low variability.