



## Volunteer Lake Assessment Program Individual Lake Reports

### WINONA, LAKE, NEW HAMPTON, NH

#### MORPHOMETRIC DATA

#### TROPIC CLASSIFICATION

#### KNOWN EXOTIC SPECIES

|                       |       |                           |           |                                   |      |      |               |  |
|-----------------------|-------|---------------------------|-----------|-----------------------------------|------|------|---------------|--|
| Watershed Area (Ac.): | 3,328 | Max. Depth (m):           | 14.6      | Flushing Rate (yr <sup>-1</sup> ) | 2.1  | Year | Trophic class |  |
| Surface Area (Ac.):   | 154   | Mean Depth (m):           | 5.2       | P Retention Coef:                 | 0.54 | 1987 | MESOTROPHIC   |  |
| Shore Length (m):     | 5,000 | Volume (m <sup>3</sup> ): | 3,161,000 | Elevation (ft):                   | 540  | 2005 | MESOTROPHIC   |  |

The Waterbody Report Card tables are generated from the 2012 305(b) report on the status of N.H. waters, and are based on data collected from 2001-2011.

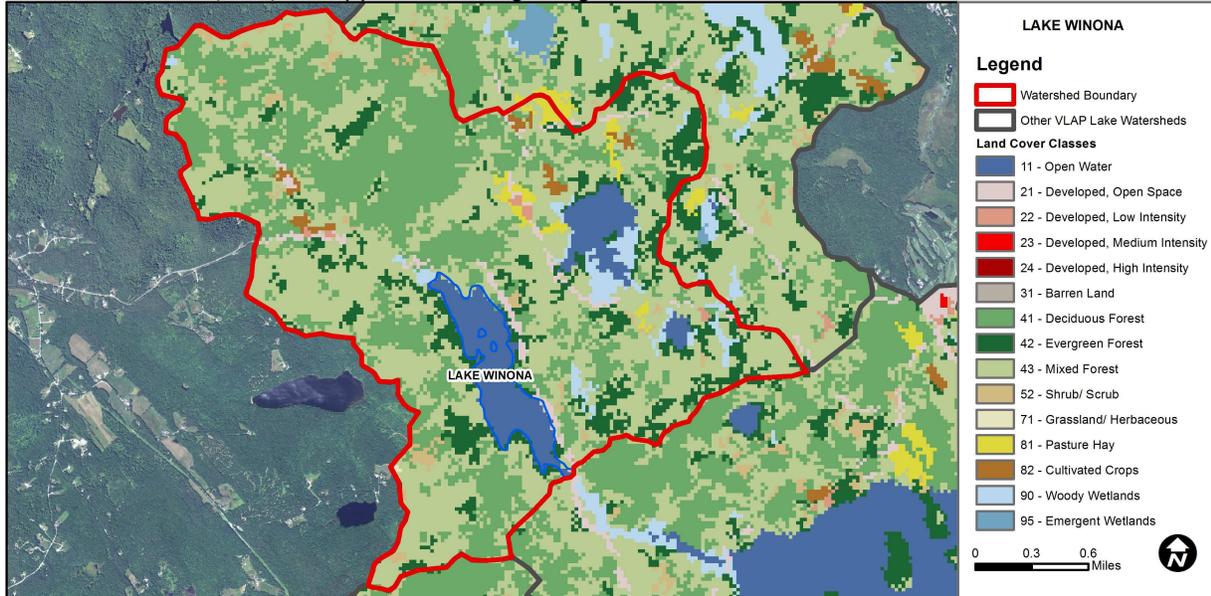
| Designated Use             | Parameter          | Category     | Comments                                                                                          |
|----------------------------|--------------------|--------------|---------------------------------------------------------------------------------------------------|
| Aquatic Life               | Phosphorus (Total) | Good         | >/=5 samples and median is < threshold but > 1/2 threshold value.                                 |
|                            | pH                 | Slightly Bad | >10% of samples exceed criteria by a small margin (minimum of 2 exceedances).                     |
|                            | D.O. (mg/L)        | Bad          | >10%, with a minimum of 2, samples exceed criteria, with 1 or more by a large margin.             |
|                            | D.O. (% sat)       | Slightly Bad | >10% of samples exceed criteria by a small margin (minimum of 2 exceedances).                     |
|                            | Chlorophyll-a      | Good         | >/=5 samples and median is < threshold but > 1/2 threshold value.                                 |
| Primary Contact Recreation | E. coli            | Good         | Geometric means < criteria; however at least 1 exceedance of the single sample criteria occurred. |
|                            | Chlorophyll-a      | Very Good    | At least 10 samples with 0 exceedances of criteria.                                               |

#### BEACH PRIMARY CONTACT ASSESSMENT STATUS

|                            |         |           |                                                                                                                                                                                                                               |
|----------------------------|---------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LAKE WAUKEWAN - TOWN BEACH | E. coli | Very Good | All bacteria samples <75% of geometric mean criteria, but not enough to calculate geometric mean. Or, all bacteria samples are < single sample criteria and calculated Geometric means are less than geometric mean criteria. |
|----------------------------|---------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### 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                 | 7.09    | Barren Land         | 0       | Grassland/Herbaceous | 0.04    |
| Developed-Open Space       | 1.83    | Deciduous Forest    | 30.07   | Pasture Hay          | 1.16    |
| Developed-Low Intensity    | 0.27    | Evergreen Forest    | 10.89   | Cultivated Crops     | 0.79    |
| Developed-Medium Intensity | 0       | Mixed Forest        | 43.84   | Woody Wetlands       | 2.3     |
| Developed-High Intensity   | 0       | Shrub-Scrub         | 1.58    | Emergent Wetlands    | 0       |



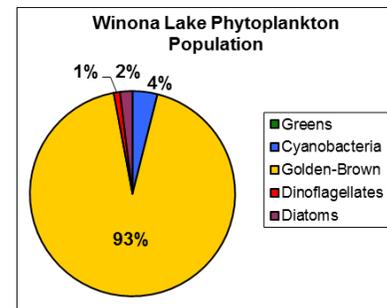
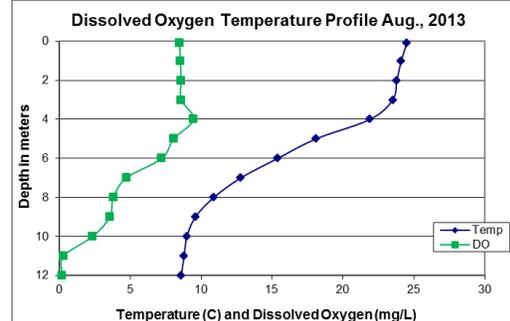
# VOLUNTEER LAKE ASSESSMENT PROGRAM INDIVIDUAL LAKE REPORTS

## WINONA LAKE, NEW HAMPTON, NH

### 2013 DATA SUMMARY

#### OBSERVATIONS AND RECOMMENDATIONS (Refer to Table 1 and Historical Deep Spot Data Graphics)

- 🔥 **CHLOROPHYLL-A:** Chlorophyll levels were low in June, elevated in August, and low in September. Phytoplankton data indicated Golden-Brown algae were dominant during August. The 2013 average chlorophyll was the highest measured since monitoring began and was greater than the state median. Historical trend analysis indicates relatively stable chlorophyll levels with moderate variability between years.
- 🔥 **CONDUCTIVITY/CHLORIDE:** Deep spot and tributary conductivity and chloride were slightly greater than the state median, except for York Brook which was low. Historical trend analysis indicates significantly increasing (worsening) epilimnetic conductivity since monitoring began.
- 🔥 **E. COLI:** E. coli levels were much less than the state standard for surface waters at all stations.
- 🔥 **TOTAL PHOSPHORUS:** Epilimnetic and metalimnetic phosphorus decreased from June to August and 2013 average epilimnetic levels have increased gradually since 2010, although still remain less than the state median. Significant early summer storm events and stormwater runoff may have contributed to the higher phosphorus level. Historical trend analysis indicates relatively stable epilimnetic phosphorus with high variability between years. Hypolimnetic phosphorus levels were slightly elevated on each sampling event potentially due to the release of phosphorus from bottom sediments when dissolved oxygen levels decrease below 1.0 mg/L in the hypolimnion. Hawkins Pond Inlet phosphorus was elevated in June following significant storm event of 1.5 inches prior to sampling. All other tributary phosphorus levels were low.
- 🔥 **TRANSPARENCY:** Transparency was lower in 2013, but still better than the state median, as it was measured in August when algal levels were elevated. Historical trend analysis indicates relatively stable transparency with moderate variability between years.
- 🔥 **TURBIDITY:** Metalimnetic turbidity was slightly elevated in June potentially due to a layer of algae or settling of suspended sediments from significant storm events. Hypolimnetic turbidity was elevated in August potentially due to the release of organic compounds from bottom sediments when dissolved oxygen levels decrease below 1.0 mg/L. Hawkins Pond Inlet and Outlet turbidity were elevated in June following significant storm event.
- 🔥 **pH:** Metalimnetic and hypolimnetic pH were less than desirable range 6.5 - 8.0 units. Historical trend analysis indicates relatively stable epilimnetic pH with high variability between years.
- 🔥 **RECOMMENDED ACTIONS:** Hawkins Pond Inlet turbidity and phosphorus were elevated following a significant storm event of 1.5 inches in June and a sediment plume into the lake is clearly visible from historical erosion upstream. Conduct a tributary walk to identify sources of sediment and phosphorus loading. Contact the VLAP Coordinator for assistance if necessary. The increased frequency and intensity of storm events highlights the importance of managing stormwater runoff from lake and watershed properties, dirt/gravel roads, agriculture, and steep slopes. Above average rainfall caused lake water levels to be elevated for most of the summer and that can contribute to elevated phosphorus and algal growth. The increasing conductivity is likely a result of winter road maintenance and road salting. Encourage local road agents to obtain a NH Voluntary Salt Applicator License through the UNH Technology Transfer Center's Green SnowPro Certification.



**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:** 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<sup>3</sup>
- Conductivity:** 40.0 uS/cm
- Chloride:** 4 mg/L
- Total Phosphorus:** 12 ug/L
- Transparency:** 3.2 m
- pH:** 6.6

| Station             | Alk. | Chlor-a | Chloride | Cond. | E. Coli | Total P | Trans. |      | Turb. | pH   |
|---------------------|------|---------|----------|-------|---------|---------|--------|------|-------|------|
|                     | mg/l | ug/l    | mg/l     | uS/cm | #/100ml | ug/l    | NVS    | VS   | ntu   |      |
| Epilimnion          | 7.15 | 7.68    | 9        | 54.0  |         | 7       | 4.10   | 5.13 | 0.69  | 7.04 |
| Metalimnion         |      |         |          | 53.8  |         | 10      |        |      | 1.04  | 6.35 |
| Hypolimnion         |      |         |          | 57.5  |         | 21      |        |      | 2.40  | 6.38 |
| Hawkins Pond Inlet  |      |         | 16       | 77.8  | 25      | 14      |        |      | 3.62  | 6.79 |
| Heights Brook Inlet |      |         | 6        | 53.2  | 25      | 7       |        |      | 0.49  | 6.33 |
| North Inlet         |      |         | 10       | 53.7  | 10      | 7       |        |      | 0.61  | 6.80 |
| Outlet              |      |         | 10       | 55.3  | 10      | 7       |        |      | 1.07  | 6.84 |
| York Brook          |      |         |          | 21.0  | 20      | 5       |        |      | 0.36  | 6.63 |

#### HISTORICAL WATER QUALITY TREND ANALYSIS

| Parameter    | Trend     | Explanation                                  | Parameter               | Trend  | Explanation                                      |
|--------------|-----------|----------------------------------------------|-------------------------|--------|--------------------------------------------------|
| pH           | Stable    | Trend not significant; data highly variable. | Chlorophyll-a           | Stable | Trend not significant; data moderately variable. |
| Conductivity | Degrading | Data significantly increasing.               | Transparency            | Stable | Trend not significant; data moderately variable. |
|              |           |                                              | Phosphorus (epilimnion) | Stable | Trend not significant; data highly variable.     |

