OBSERVATIONS & RECOMMENDATIONS

We would like to recognize the Manchester Urban Ponds Restoration Project volunteers for their second year of participation in the New Hampshire Volunteer Lake Assessment Program. Manchester's volunteers collected a large number of samples this summer and we applaud them for their efforts! Although the data collected this past summer continue to reflect poorer water quality, we hope this program continues to encourage citizens to be proactive in sampling efforts and pond cleanup activities. Through sampling, education, and various water quality improvement projects initiated by the City of Manchester, we ultimately expect that the ponds will be improved!

After reviewing data collected from **PINE ISLAND POND,** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- **Figure 1:** These graphs show the historical and current year concentration of chlorophyll-a in the water column. Chlorophyll-a, a pigment naturally found in plants, is an indicator of the algal abundance. Because algae is a microscopic plant that contains chlorophyll-a and is naturally found in lake ecosystems, the concentration of chlorophyll-a found in the water gives an estimation of the concentration of algae or lake productivity.

  The summer of 2001 was filled with many warm and sunny days and there was a lack of significant rain events during the latter-half of the summer. The combination of these factors resulted in relatively warm surface waters throughout the state. The lack of fresh water to the lakes/ponds reduced the rate of flushing which may have resulted in water stagnation. Due to these conditions, many lakes and ponds experienced increased algae growth, including filamentous green algae (the billowy clouds of green algae typically seen floating near shore) and nuisance blue-green algae (Cyanobacteria) blooms.

  The current year data (the top graph) show that the chlorophyll-a concentration *increased by a large amount* from May to August, and *decreased by a large amount* from August to September, and

increased from September to October. The chlorophyll-a concentration on each sampling event this season was *greater than* the state mean. The concentration in August was *well above* the state mean and is classified a "*nuisance amount*" that is indicative of an algal bloom.

The dominant phytoplankton species observed this season were as follows: *Dinobryon* (a golden-brown alga) in May; *Anabaena* (a blue-green alga in August; *Anabaena* in September; and *Melosira* (a diatom) in October. Phytoplankton populations undergo a natural succession during the growing season (Please refer to the "Introduction" section of this report for a more detailed explanation regarding seasonal plankton succession). It is natural for diatoms to be the dominant species in the spring, green algae in the summer, and blue-green algae in mid to late summer. In addition, diatoms and golden-brown alga are typical in New Hampshire's less productive lakes and ponds. An overabundance of blue-green alga indicates that there may be an excessive total phosphorus concentration in the lake, or that the lake ecology is out of balance.

The historical data (the bottom graph) show that the 2001 chlorophyll-a mean is *much greater than* the 2000 mean and state mean. As additional sampling season are conducted, we will be able to generate long-term trends for chlorophyll-a concentration.

While algae is naturally present in all lakes, an excessive or increasing amount of any type is not welcomed. In freshwater lakes, phosphorus is the nutrient that algae depend upon for growth. Therefore, algal concentrations may increase when there is an increase in nonpoint sources of nutrient loading from the watershed, or in-lake sources of phosphorus loading (such as phosphorus releases from the lake sediments). It is important to continually educate residents about how activities within your lake's watershed can affect phosphorus loading and lake quality.

- **Figure 2:** The graphs on this page show historical and current year data for lake transparency. Volunteer monitors use the Secchi-disk, a 20 cm disk with alternating black and white quadrants, to measure water clarity (how far a person can see into the water). Transparency, a measure of water clarity, can be affected by the amount of algae and sediment from erosion, as well as the natural colors of the water.

The numerous big snowstorms during the late spring of 2001 contributed a large amount of snowmelt runoff to most of the lakes and ponds throughout the state, which may have increased phosphorus loading and the amount of soil particles washed into the waterbodies. Many lakes and ponds experienced lower than typical transparency readings during late May and June. However, the lower than average rainfall and the warmer temperatures resulted in some lakes reporting their best-ever Secchi-disk readings in July and August, a time when we often observe reduced clarity due to increased algal growth!

The current year data (the top graph) show that the in-lake transparency *increased slightly* from May to August, *increased by a large amount* from August to September, and then *decreased by a large amount* from September to October. The transparency in May, August, and October, was *well below* the state mean, while the clarity in September was *greater than* the state mean.

The historical data (the bottom graph) show that the 2001 mean transparency is *greater than* the 2000 mean and *less than* the state mean. Again, as additional sampling season are conducted, we will be able to generate long-term trends for in-lake transparency.

Typically, high intensity rainfall causes erosion of sediments into the lake and streams, thus decreasing clarity. Efforts should be made to stabilize stream banks, lake shorelines, and disturbed soils within the watershed and especially dirt roads located immediately adjacent to the edge of the waterbody. Guides to Best Management Practices are available from NHDES upon request.

- **Figure 3:** These graphs show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plant and algae growth in New Hampshire freshwater lakes and ponds. Too much phosphorus in a lake can lead to increases in plant and algal growth over time.

The current year data for the upper layer (the top inset graph) show that the total phosphorus concentration *increased slightly* from May to August, *increased slightly* from August to September, and was stable in September and October. The total phosphorus concentration on each sampling event was *greater than* the state median.

The current year data for the lower layer (the bottom inset graph) show that the total phosphorus concentration *increased by a large amount* from May to August, and then *decreased* from August to September. The total phosphorus concentration in May *equaled* the state median, while the concentration in August and September was *well above* the state median.

The historical data for the upper layer show that the 2001 total phosphorus mean is *less than* the 2000 mean and *greater than* the state median.

The historical data for the lower layer show that the 2001 total phosphorus mean is *slightly greater than* the 2000 mean and *much greater than* the state median.

One of the most important approaches to reducing phosphorus loading to a waterbody is to educate the public. Phosphorus sources within a lake's watershed typically include septic systems, animal waste, lawn fertilizer, road and construction erosion, and natural wetlands. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Sediment core sampling was conducted at **PINE ISLAND POND** in September of 2001. Sediment cores were analyzed for pesticides, PCB's, PAH's and metals. No significant levels of metals were found. A fish survey was also conducted with the help of the NH Fish & Game Department. A healthy warm-water fish population was present. Five largemouth bass were collected for tissue analysis. These will be analyzed for pesticides, PCB's and metals content.

- The pond was not sampled in June or July this season. Please try to sample the pond at least once per month during the summer (June, July, and August) so that we can observe trends as the summer progresses.

- The mean conductivity was even higher than last year at all sampling stations this season (Table 6). Typically, sources of elevated conductivity are due to human activity. These activities include septic systems that fail and leak leachate into the groundwater (and eventually into the tributaries and the lake), agricultural runoff, and stormwater runoff from urbanized areas (which typically contains road salt during the spring snow melt). In addition, natural sources, such as iron deposits in bedrock, can influence conductivity. We recommend that wet weather sampling be conducted next season. This may help to identify the sources of pollution to the pond. Please contact the VLAP Coordinator for proper sampling instructions.

- The total phosphorus concentration in the Inlet was very high (132 ug/L) in August (Table 8). We recommend that the monitors conduct sampling along this inlet using the bracketing technique during at least one rain event next season. This will help us to pinpoint any sources of elevated total phosphorus. Please contact the VLAP Coordinator for proper sampling instructions.

- The dissolved oxygen concentration in the hypolimnion (the lower layer) was again depleted in the bottom meter this season (Table 9 and 10). As lakes age, oxygen becomes ***depleted*** in the hypolimnion by the process of decomposition. The ***low*** oxygen level in the hypolimnion is a sign of the lake's ***aging*** and ***declining*** health.

- The *E. coli* results were low on the August and September sampling events (Table 12). Specifically, results were 17 counts or less, which is well below the state standard of 406 counts per 100 mL for surface waters, and 88 counts per 100 mL for designated public beaches.

NOTES

- Monitor's Note (5/10/01): Jet ski and canoeists observed on pond.

- Monitor's Note (8/14/01): Purple loosestrife starting to become established by Dartmouth building.

- Monitor's Note (10/19/01): Isothermic.

USEFUL RESOURCES

Combined Sewer Overflows (CSO's), WD-WEB-9, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/wwt/web-9.htm

Impacts of Development Upon Stormwater Runoff, WD-WQE-7, NHDES Fact Sheet, (603) 271-3503, or www.des.state.nh.us/factsheets/wqe/wqe-7.htm

Stormwater Management and Erosion and Sediment Control Handbook. NHDES, Rockingham County Conservation District, USDA Natural Resource Conservation Service, 1992. (603) 679-2790.

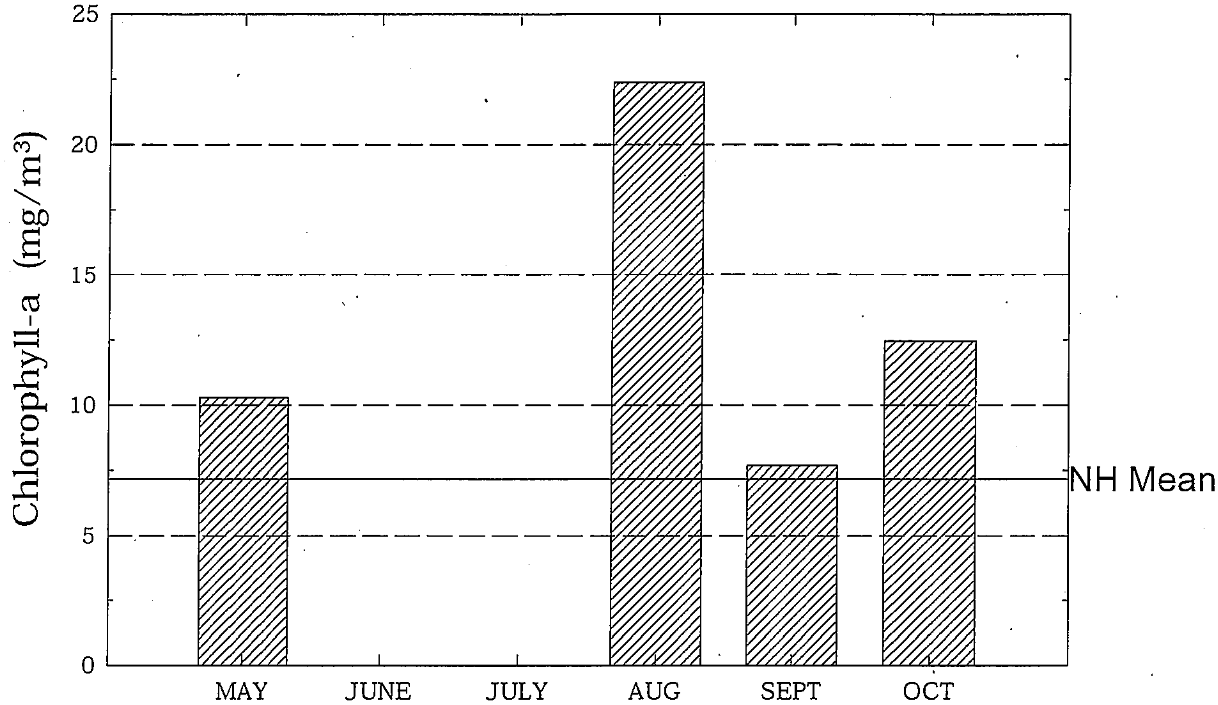
Snow Disposal Guidelines, WD-WMB-3, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/wmb/wmb-3.htm

Road Salt and Water Quality, WD-WMB-4, NHDES Fact Sheet, (603) 271-3503 or www.des.state.nh.us/factsheets/wmb/wmb-4.htm

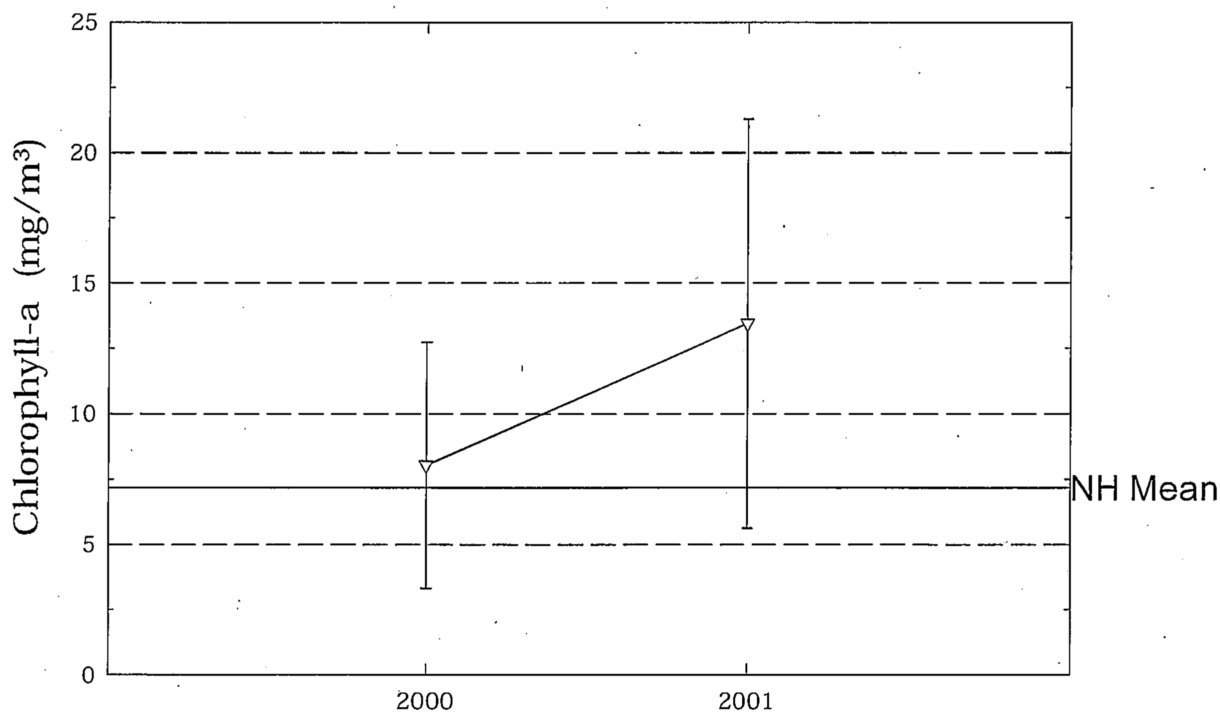
Cleaning Up Winter Storm Damage in Shoreland Areas, WD-BB-39, (603) 271-3503, www.des.state.nh.us/factsheets/bb/bb-39.htm

Pine Island Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



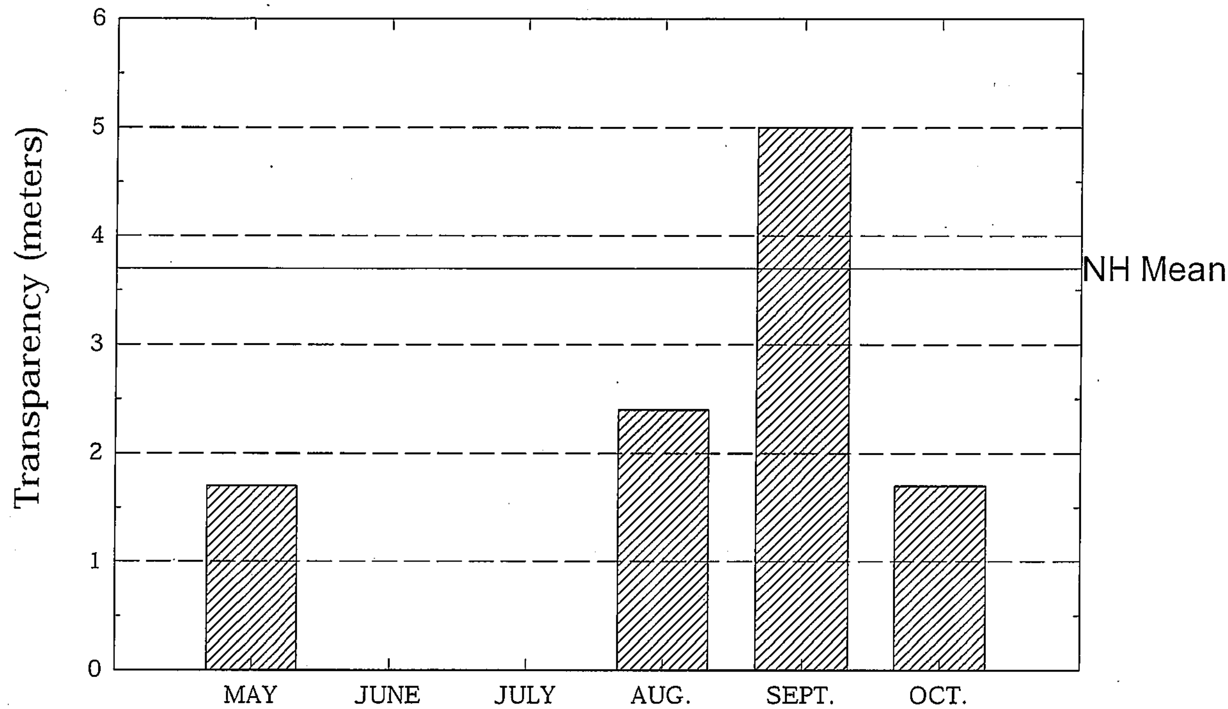
2001 Chlorophyll-a Results



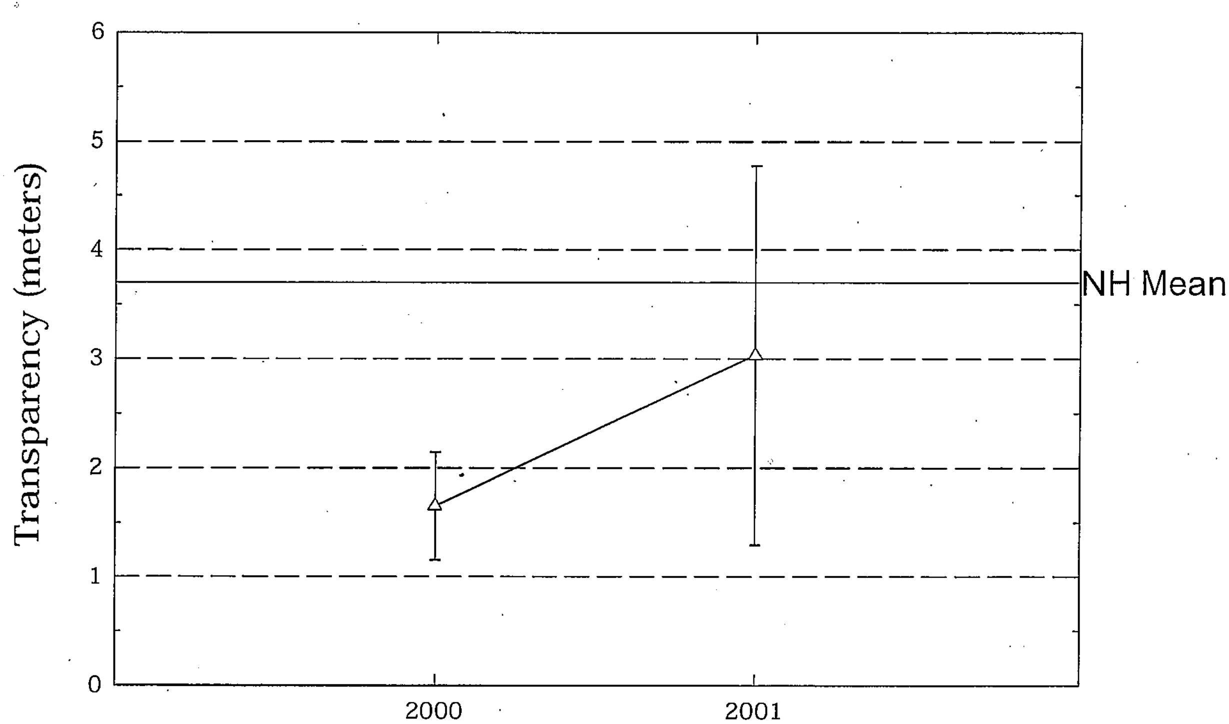
Historical Chlorophyll-a Results

Pine Island Pond

Figure 2. Monthly and Historical Transparency Results



2001 Transparency Results



Historical Transparency Results

Pine Island Pond

Figure 3. Monthly and Historical Total Phosphorus Data.