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! While many of the results again this year indicate that the Manchester ponds are degraded, we hope that this project will continue to encourage the citizens of the city to participate in water quality sampling. Through sampling, education, and various water quality improvement projects initiated by the City of Manchester, we ultimately expect that the degraded conditions of the ponds will be improved!

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

FIGURE INTERPRETATION

- **Figure 1:** These graphs show the historical and current year chlorophyll-a concentration in the water column. Chlorophyll-a, a pigment naturally found in plants, is an indicator of the algal abundance. Because algae are microscopic plants that contain chlorophyll-a and are naturally found in lake ecosystems, the chlorophyll-a concentration 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 there was a *large amount of variability* associated with the chlorophyll-a concentration during the 2001 season. Specifically, the June

chlorophyll-a concentration was *greater than* 30 mg/m^3, which DES considers to be a "nuisance" amount that is indicative of an algal bloom. The concentration in May and June was *slightly greater* than the state mean, while the September chlorophyll-a concentration was the only concentration that was *less than* the state mean during the 2001 sampling season.

The dominant phytoplankton species observed this year were as follows: *Syndera* (a golden-brown alga), *Asterionella* (a diatom), and *Pinnularia* (a diatom) in May; *Dinobryon* (a golden-brown alga), *Ceratium* (a dinoflagellate), and *Trachelomonas* (a green alga) in June; *Ceratium, Dinobryon, and Microcystis* (a blue-green alga) in July; and *Ceratium* and *Dinbryon* in September. Diatoms and golden-brown alga are typically found in New Hampshire's less productive lakes and ponds. A dominance of blue-green alga or dinoflagellates indicates that the total phosphorus concentration in the lake or pond may be excessive or that the lake ecology is out of balance.

The historical data (the bottom graph) show that the 2001 chlorophyll-a mean is much *less than* the high 2000 mean and still *greater than* the state mean. The 2001 mean is approximately twice that of the state mean.

Overall, the historical data (the bottom graph) show a *variable* in-lake chlorophyll-a trend, meaning that the concentration has *varied greatly* during individual sampling seasons, and between sampling seasons. Please keep in mind that we have only three years of data to analyze historical trends. As more are data collected during the upcoming years, we will better be able to determine in-lake chlorophyll-a trends.

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. With increased stormwater management activities within the watershed, we hope to see an increase in transparency in the pond.

- **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 transparency was between approximately 1.0 and 1.7 meters this season, with the September transparency being the greatest. It is likely that the transparency in September was greater than the transparency earlier in the season due to the lack of rain during the latter-half of the summer washing silt and sediment from erosion within the watershed into the pond, and also the low chlorophyll-a concentration in September.

The historical data (the bottom graph) show that the 2001 mean transparency is *slightly greater than* the 2000 mean and still *well below* state mean.

Overall, the historical data (the bottom graph) show an overall *slightly decreasing* trend since 1996, meaning that the transparency has *slightly worsened* since monitoring originally began. However, please keep in mind that this trend is based on a total of only three years of data with three missing years of data between the 1996 and 2000 sampling seasons.

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. Streets should be swept and culverts and catch basins should be cleaned-out. 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 pond. Too much phosphorus in a lake can lead to increases in plant and algal growth over time.

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

The current year data (the inset graph) for the lower layer show that the total phosphorus concentration *increased by a large amount* from May to June, and then *decreased very slightly* from June to July. There was no lower layer total phosphorus concentration sample collected in September. On each sampling event this season, the total phosphorus concentration was *greater than* the state median, with the concentration in June and July being *well above* the state median.

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

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

Overall, the historical data for the lower layer and upper layer show a *variable* total phosphorus trend, with the annual total phosphorus concentration generally being *well above* 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 depth mapping and sediment core sampling was conducted at **DORRS POND** during 2002. Sediment depth mapping was done during ice cover and sediment core sample collection was conducted in June. Sediment cores were analyzed for pesticides, PCB's, PAH's and metals. High levels of copper, lead, manganese, mercury, zinc, and the pesticide constituent DDE were recorded. Average sediment depth in **DORRS POND** is 2.24 feet. 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.

- Conductivity levels throughout the watershed and in the pond continued to be very high this season (Table 6). Specifically, the conductivity levels at nearly every sampling station were approximately twice as high as was observed during the 2000 season! Typically, sources of increased 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 road runoff (which typically contains road salt during the spring snow melt). In addition, natural sources, such as iron deposits in bedrock, can influence conductivity. As we recommended last season, it would be useful to determine the sources of elevated conductivity using the bracketing sampling technique along the inlets. If you are interested in determining the sources of elevated conductivity levels in the watershed, please contact the VLAP Coordinator for guidance on the proper sampling technique.

- Lessard Inlet and the Juniper Street Inlet continued to have elevated total phosphorus concentrations (Table 8) and turbidity levels (Table 11) this season. It would be useful to determine the sources of the elevated total phosphorus concentration and turbidity levels using the bracketing sampling technique along these inlets. If you are interested in investigating these inlets, please contact the VLAP Coordinator for guidance on the proper sampling technique.

- In May, the dissolved oxygen was relatively high throughout the water column, likely due to the fact that spring turnover (lake-mixing) had recently occurred (Table 9). As the summer progressed into June and July, the lower layer dissolved oxygen was depleted at the deep spot. The loss of oxygen in the lower layer as the sampling season progresses is primarily due to the process of biological breakdown of organic matter (i.e.; biological organisms use oxygen to break down organic matter), both in the water column and particularly at the bottom of the lake where the water meets the sediment. In September, the dissolved oxygen was relatively high throughout the water column again, likely due to the fact that fall turnover (lake-mixing) had recently occurred (Table 9).

- The *E. coli* result for the surface grab sample that was collected in early May was very low (Table 12). Specifically, the result of 4 counts per 100 mL was well below the state standard of 406 counts per 100 mL for surface waters, and 88 counts per 100 mL for swimming areas.

NOTES

- Monitor's Note (5/11/01): No rain for at least 2 weeks
- Monitor's Note (6/15/01): Flow at Juniper inlet; duck observed; Supersaturation of dissolved oxygen at 1meter depth; trail-walkers and bus full of school children observed; chemical odor at 2 meter sample observed (possibly metallic smelling odor)
- Monitor's Note (7/26/01): 30+ ducks observed; Rained stopped approximately 3 hours before sampling.
- Monitor's Note (9/26/01): Children observed feeding ducks at the dam; Significant rain event occurred during the night prior to sampling.

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

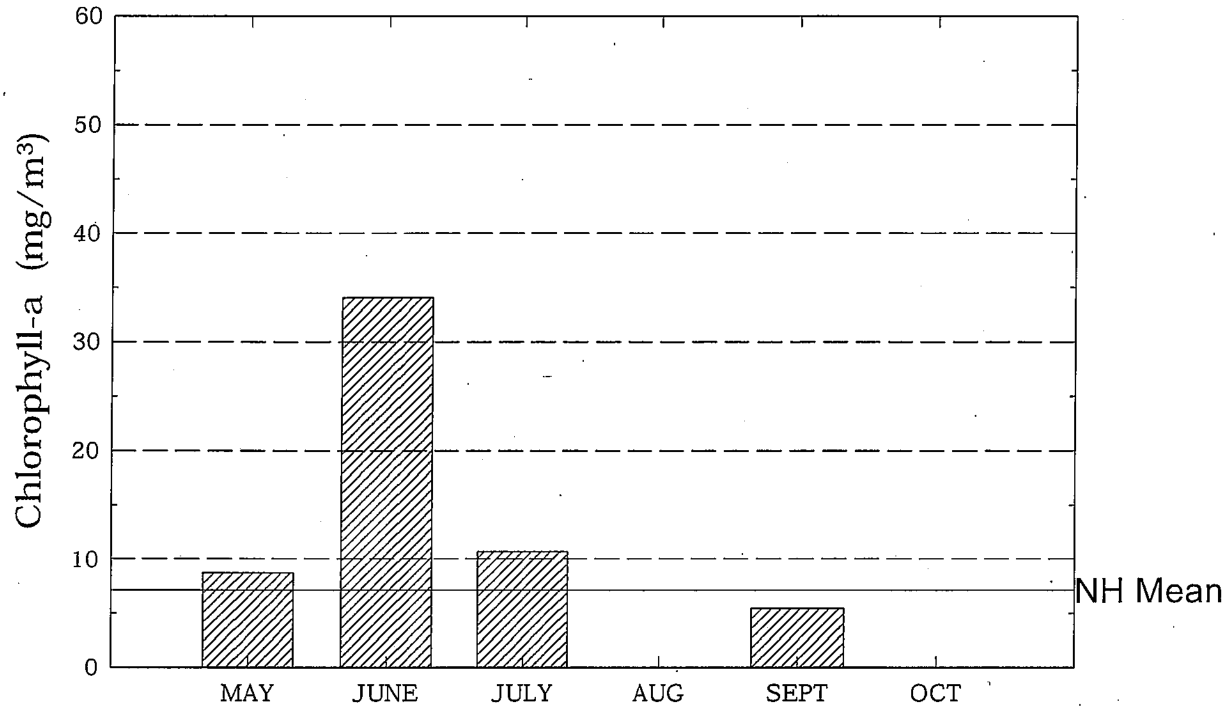
Cleaning Up Winter Storm Damage in Shoreland Areas, WD-BB-39, (603) 271-3503, www.des.state.nh.us/factsheets/bb/bb-39.htm

The Canada Goose: A Beautiful Pest, NHDES VLAP Annual Newsletter The Sampler, Spring 2001, Article written by Alicia Carlson, (603) 271-2658 or www.des.state.nh.us/wmb/vlap/samplr01.pdf

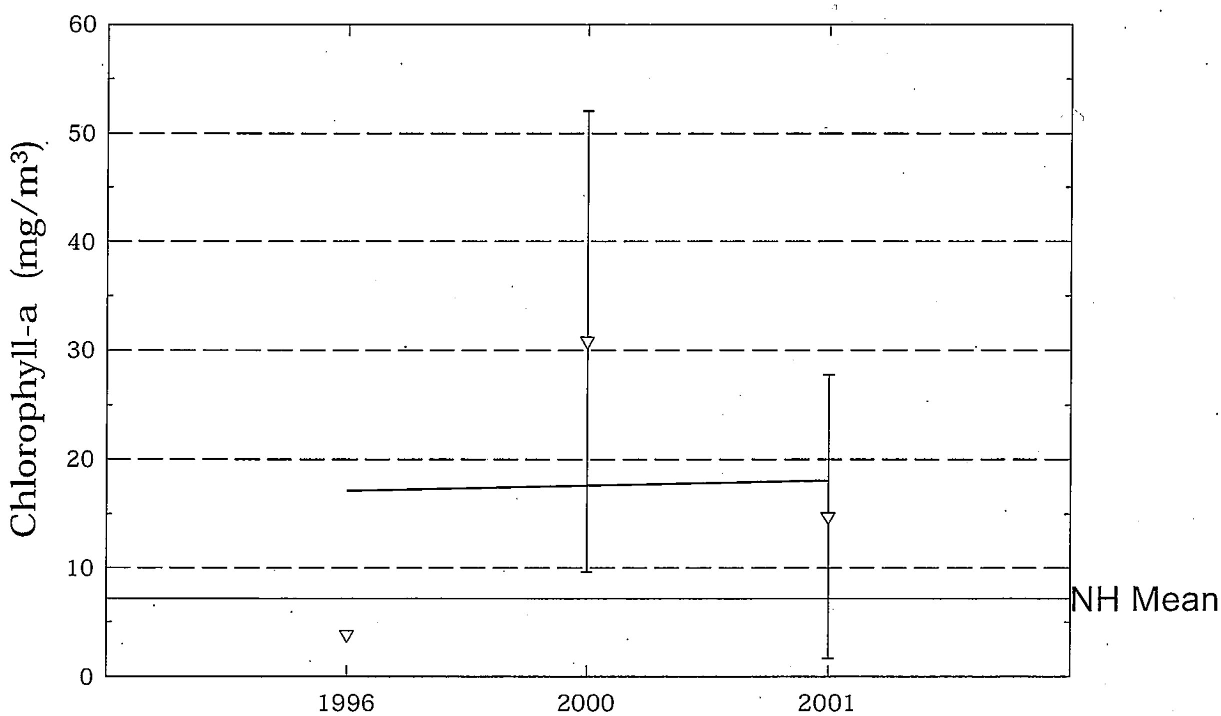
Management of Canada Geese in Suburban Areas: A Guide to the Basics, Draft Report, NJ Department of Environmental Protection Division of Watershed Management, March 2001, www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/Goosedraft.pdf

Dorrs Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



2001 Chlorophyll-a Results



Historical Chlorophyll-a Results

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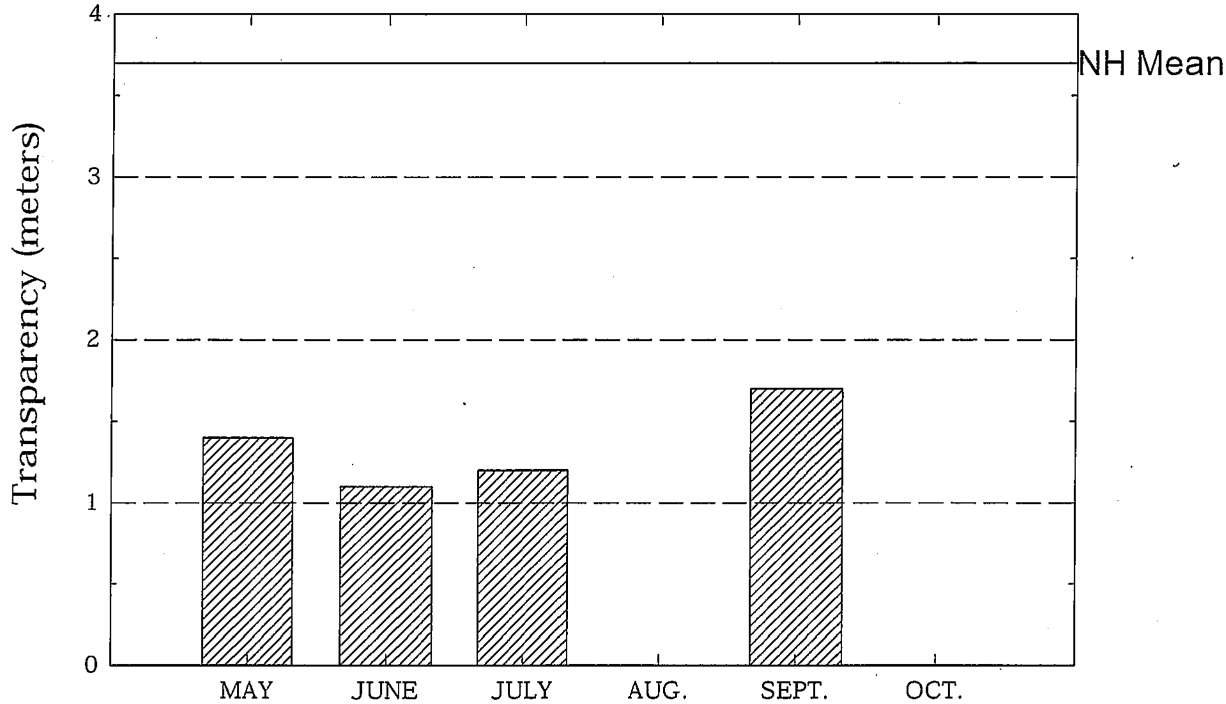
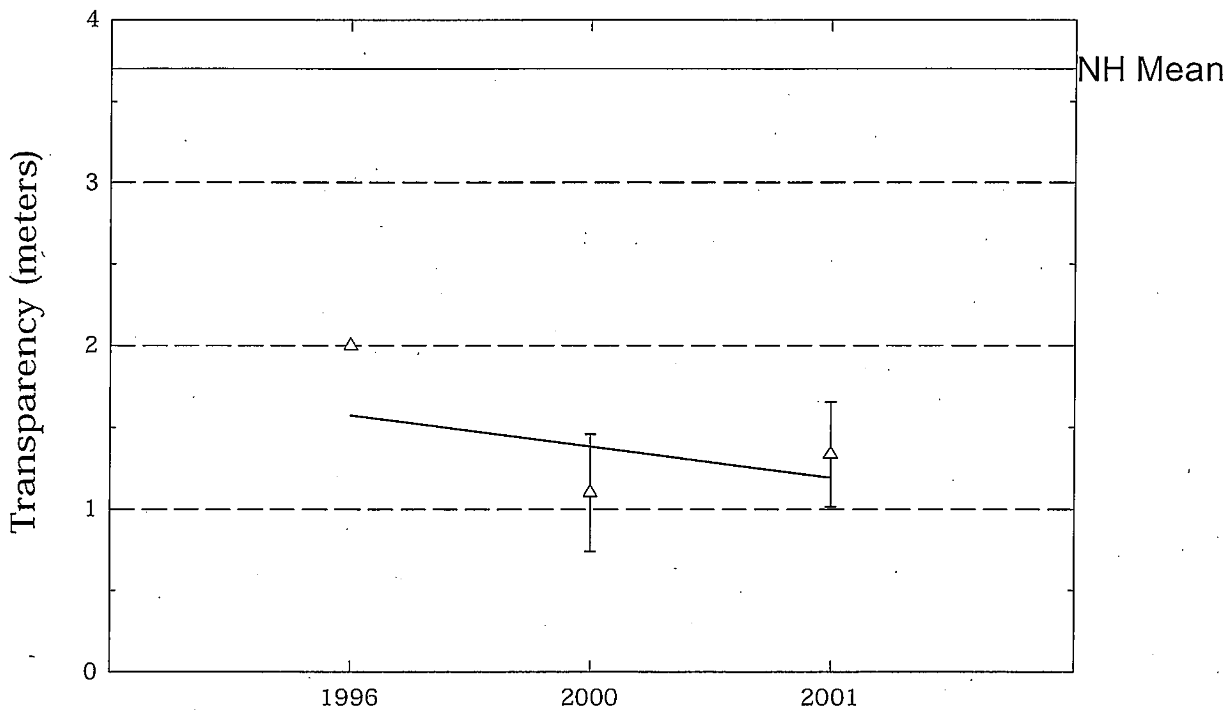
Figure 2. Monthly and Historical Transparency Results



2001 Transparency Results



Historical Transparency Results

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Figure 3. Monthly and Historical Total Phosphorus Data.