2001

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 **MAXWELL 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 the chlorophyll-a concentration *increased very slightly* from May to July,

increased by a large amount **from July to August, and then** ***decreased*** **from September to October. The chlorophyll-a concentration in May, June, July, August, and October was well below the state mean. The concentration in September was** ***slightly less*** **than state mean.**

The dominant phytoplankton species observed in the plankton samples this season were as follows: ***Asterionella*** **(a diatom),** ***Tabellaria*** **(a diatom), and** ***Syndera*** **(a diatom) in May;** ***Asterionella, Ceratium*** **(a dinoflagellate), and** ***Coelosphaerium*** **(a blue-green alga) in June; an unidentified filamentous blue-green alga,** ***Oedogonium*** **(a green alga), and an unidentified diatom in July;** ***Nitzchia*** **(a diatom),** ***Dinobryon*** **(a golden-brown alga), and** ***Mougeotia*** **(a green alga) in August;** ***Dinobryon*** **(a golden-brown alga), and an unidentified filamentous blue-green alga in September; and** ***Melosira*** **(a diatom),** ***Dinobryon, Mougeotia, and Tabellaria*** **in October. Diatoms and golden-brown algae are typical in New Hampshire's less productive lakes and ponds. However, an overabundance of blue-green algae indicates that there may be an excessive total phosphorus concentration in the lake, or that the lake ecology is out of balance. (Please refer to the "Other Comments" section for a more detailed explanation regarding blue-green algae.)**

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

As your association continues to sample over the years, we will be able to use the data to assess the historical in-lake chlorophyll-a trend.

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 *decreased slightly* from May to June. The transparency in September was *slightly less* than the transparency in June. There were no Secchi-disk readings taken in July, August, or October this season. The transparency in May, June, and September was *slightly less* than the maximum depth of the pond. (Note: The maximum depth of the pond is approximately 1 meter which is much less than the state mean Secchi-disk depth of 3.7 meters.)

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

Again, as your association continues to sample over the years, we will be able to use the data to assess historical trends.

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. In addition, catch basins should be cleaned out and street-sweeping measures should be implemented on a regular basis throughout the watershed. 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.

(Note: Due to the shallow depth of the pond, it is only necessary to sample one layer at the deep spot.)

The current year data for the upper layer (the top graph) show that the total phosphorus concentration *increased by a large amount* from May to June, and then *decreased slightly* from June to October this season. While the concentration in May and October was *slightly greater* than the state mean, the concentration in June, July, August, and September was *well above* the state mean. The *decrease* in total phosphorus concentration as the season progressed may have been due to the lack of rain in the latter-half of the summer and the consequent lack of silt and sediment (which typically contains attached phosphorus) being washed into the pond.

The historical data for the upper layer (the lower graph) show that the 2001 total phosphorus mean is *greater than* the 2000 mean and *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 **MAXWELL POND** in July of 2001. Sediment cores were analyzed for pesticides, PCB's, PAH's and metals. High levels of the pesticide constituent DDE (a breakdown component of DDT) were recorded. No significant amounts of metals, PCBs, or PAHs were found.

- Staff from NHDES and Manchester's Urban Pond Restoration Coordinator conducted an exhaustive sediment survey at Maxwell Pond in February of 2002. The survey entailed collecting sediment depth data from over 300 points on the pond. This included laying out 25 transects with data collection points (a hole drilled in the ice) every 10 feet, and probing the sediment to determine ice to sediment and ice to refusal depths.

  This survey will be used to generate predictive models that will determine how the pond and stream morphometry will react if the Maxwell Pond Dam is removed. The information collected this past February will be transformed into a CAD system (a computerized survey and mapping software program) that will eventually be linked up with 1-foot aerial contour maps (which will be generated this spring) in order to create a seamless digital terrain map for this portion of the Black Brook stream corridor.

- Small amounts of blue-green algae were observed in the plankton sample throughout the sampling season. Specifically, *Oscillatoria* was observed in May, *Coelosphaerium* in June, *Aphanizomenon* and an unidentified species of filamentous blue-green alga in July, and *Anabaena, Aphanizomenon, Oscillatoria,* and *Aphanizomenon* were observed in September (Table 2). Blue-green algae can reach nuisance levels when excessive nutrients and favorable environmental conditions occur. This summer, we observed that many lakes throughout the state experienced small to moderate blue-green algae blooms, likely due to the many warm sunny days that occurred this summer which helped to accelerate algae growth. In addition, the lack of rain in the latter half of the summer, observed by the fact that numerous tributaries dried up earlier than usual this summer, meant that the lake flushing rates were slowed. The presence of these blue-green indicator species serves as a reminder of the lake's delicate balance. Watershed residents should continue to act proactively to reduce nutrient loading into the lake by limiting or eliminating fertilizer use on lawns, keeping the lake shoreline natural, re-vegetating cleared areas within the watershed, and properly maintaining septic systems and roads.

- The mean conductivity was higher than last year at all sampling stations this season (Table 6). However, the conductivity levels in **MAXWELL POND** still remain the lowest of all the Manchester Urban Ponds! 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. As recommended for many of the Manchester Ponds this season, wet weather sampling will be valuable in finding the sources of elevated conductivity in the watershed and in the pond.

- Dissolved oxygen was again ***relatively high*** at all depths sampled at the deep spot of the pond, Table 9). Typically, shallow lakes and ponds that are not deep enough to stratify into more than one or two layers will have relatively high amounts of oxygen at all depths. This is due to continual lake mixing and diffusion of oxygen into the bottom waters induced by wind and wave action. However, the dissolved oxygen concentration in the pond decreased as the season progressed. The depletion of dissolved oxygen in the water column of lakes and ponds as the summer progresses results primarily from 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.

- The *E. coli* concentration at the ***Inlet*** was elevated in ***September*** (Table 12). Specifically, the concentration was 110 counts per 100 mL. However, the concentration ***was not above*** the state standard of 406 counts per 100 mL designated for Class B waters. If you are concerned about *E. coli* levels at this station, you may want to conduct a more intensive sampling regime in this area using the bracketing technique to determine the source(s) of the high readings. Please contact the VLAP Coordinator for instructions on sampling protocol and methods.

NOTES

- Monitor's Note (5/3/01): Female cardinal and large snapping turtle observed; picked up trash!
- Monitor's Note (6/26/01): Dozens of small fish observed; turbidity suspect and may be skewed due to activity located upstream
- Monitor's Note (9/24/01): Pollen, bacteria or algae located on the surface?
- Monitor's Note (10/23/01): Water level very low.
- Biologist's Note (10/23/01): No pH data for the Outlet due to laboratory error. No Secchi-disk depth was taken.

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

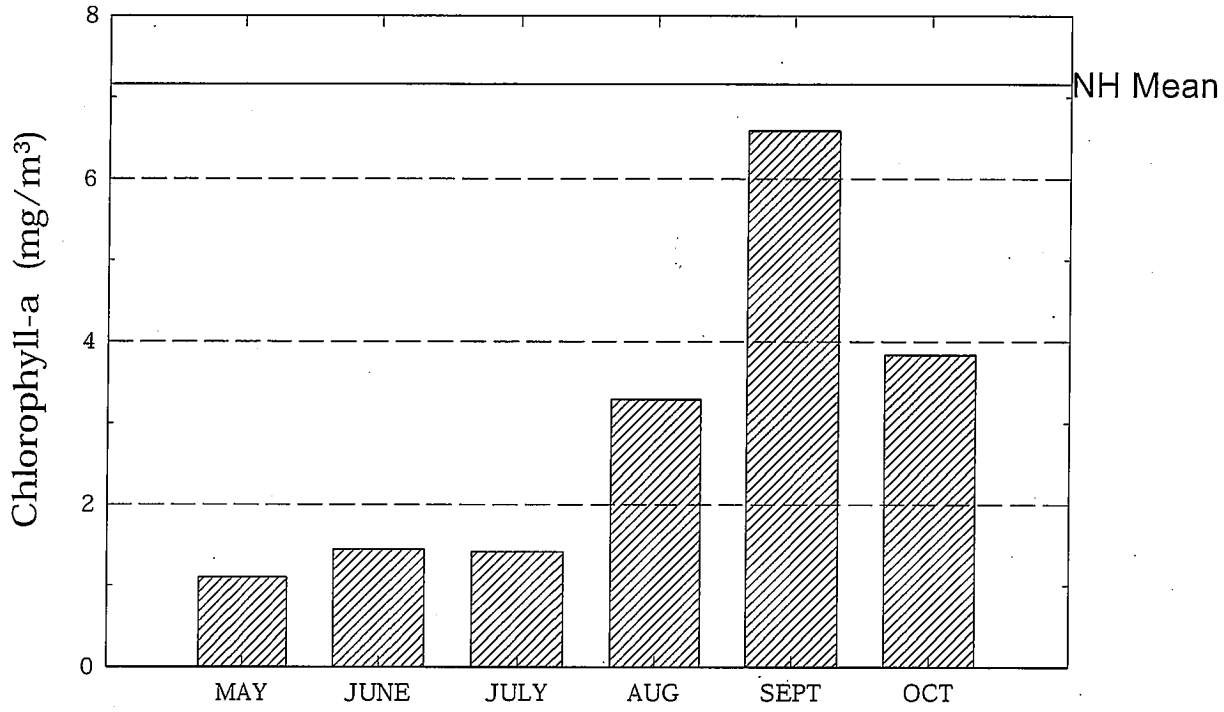
Stormwater Management and Erosion and Sediment Control Handbook. NHDES, Rockingham County Conservation District, USDA Natural Resource Conservation Service, 1992. (603) 679-2790.

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

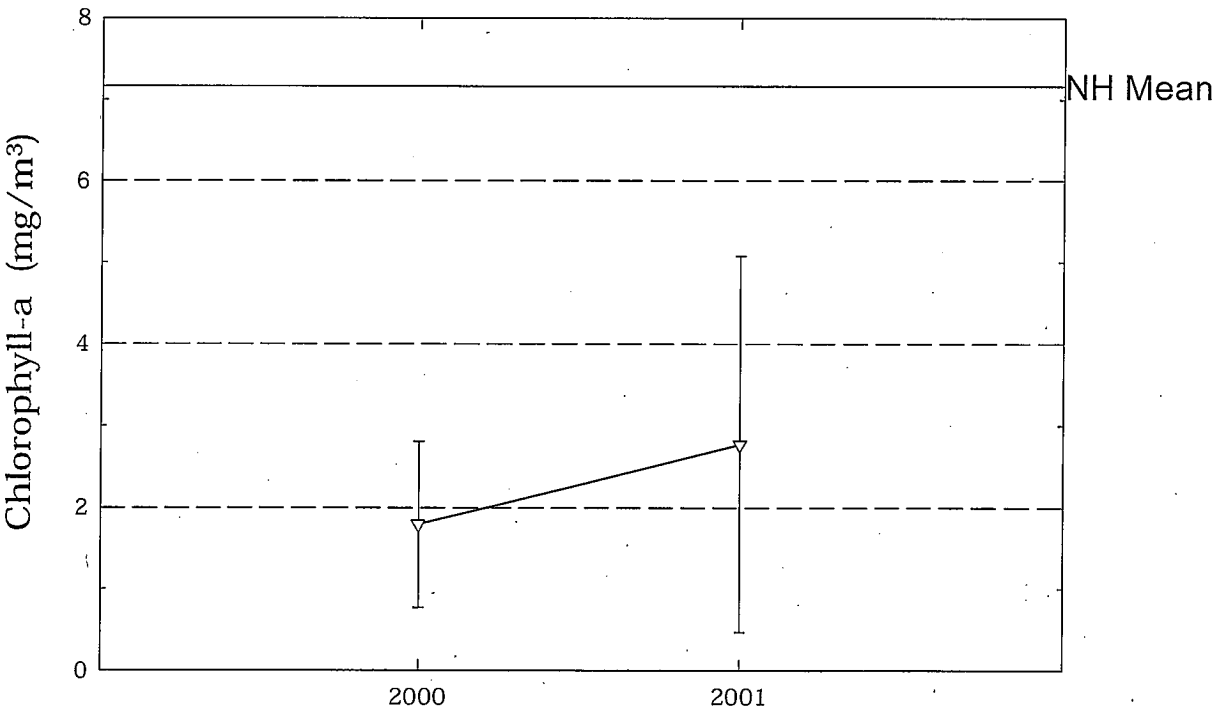
Management of Canada Geese in Suburban Areas: A Guide to the Basics, Draft Report, NJ Department of Environmental Protection Division of Watershed Management, March 2001, www.state.nj.us/dep/watershedmgt/DOCS/BMP_DOCS/Goosedraft.pdf

Maxwell Pond

Figure 1. Monthly and Historical Chlorophyll-a Results



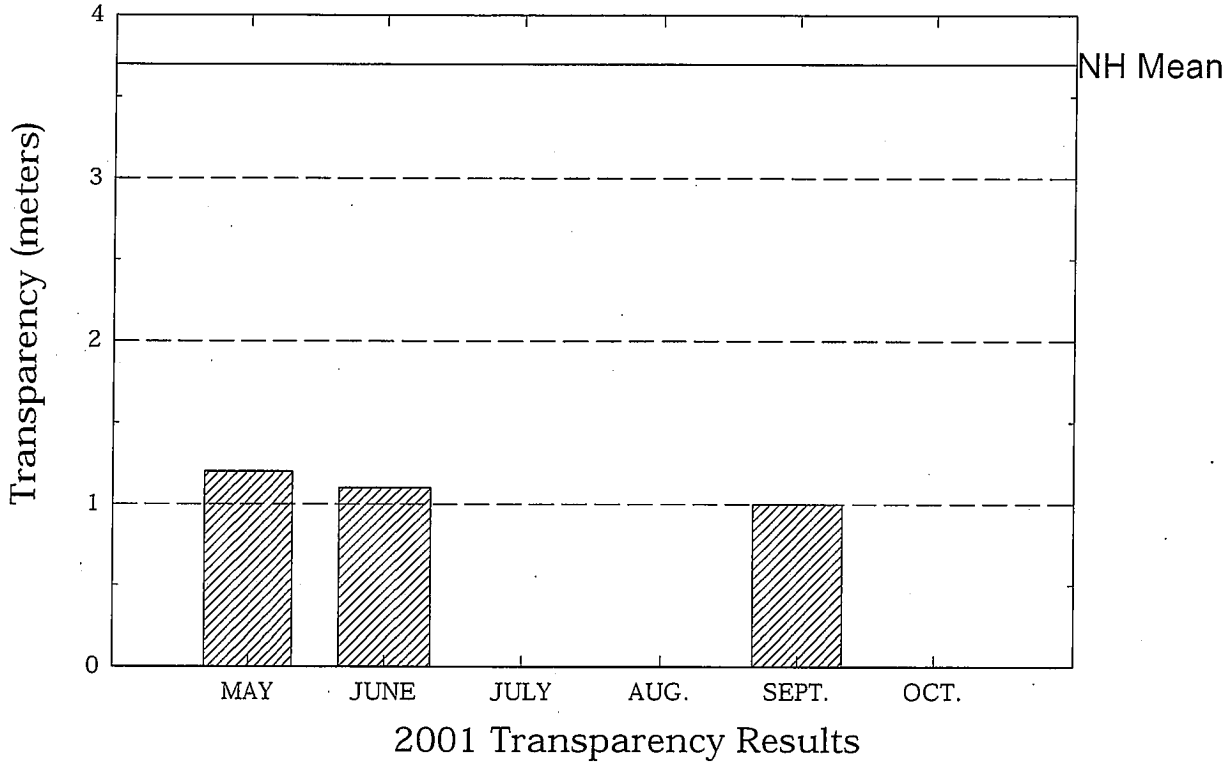
2001 Chlorophyll-a Results

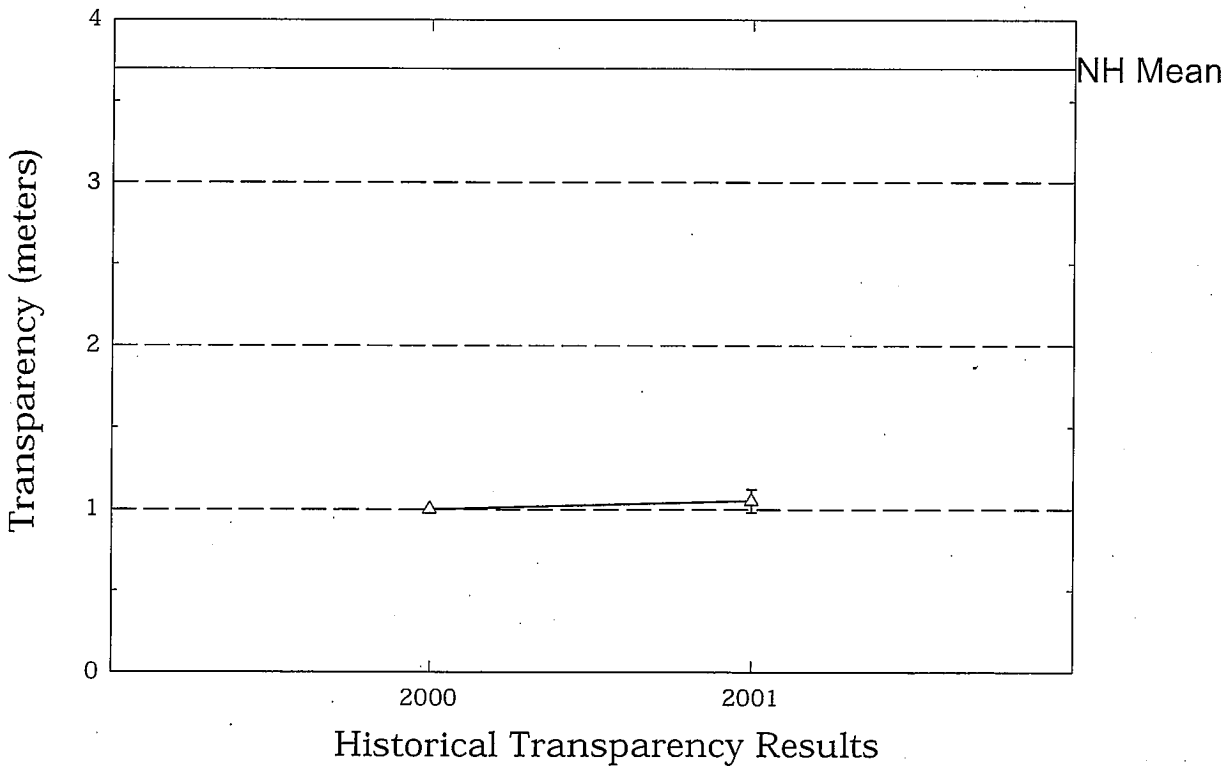


Historical Chlorophyll-a Results

Maxwell Pond

Figure 2. Monthly and Historical Transparency Results





Maxwell Pond

Figure 3. Monthly and Historical Total Phosphorus Data.