NEWTON CONSERVATORS

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NEWSLETTER

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Results of Crystal Lake Conservancy's 2012 Water Analysis

Janice Bourque, Co-President, Crystal Lake Conservancy

The Crystal Lake Conservancy's continuing activities, carried out by our many dedicated volunteers, include two major efforts:

- Monitoring water visibility and temperature
- Water sampling and laboratory analysis.

The Conservancy held its third Annual Forum in October and presented the results of the water analysis it conducted from May 2012 to October 2012. Those results indicated that the health of Crystal Lake deteriorated over the past year. This article will summarize those results and present some solutions to the problems.

In full contrast to the situation in the summer of 2011, Crystal Lake was under a great deal of stress in 2012 and has entered a eutrophic phase, as indicated by higher-than-average water temperatures, increasingly low visibility, low dissolved oxygen, increased presence of nuisance aquatic plants (coontail appearing abundantly in Cronin's Cove) with higher bacteria, phosphorus and algae levels. Normal lake aging and eutrophication occurs over centuries and results from natural sources of nutrients and sediments. Crystal Lake, however, is undergoing a "cultural eutrophication," whereby this natural process is accelerated by the increased levels of bacteria and nutrients that flow off a more densely developed watershed area.

For the third year, volunteers recorded weekly temperature and visibility readings at three different depths (1 foot, 10 feet and 20-30 feet, which is the bottom of the lake) at six specific sites around Crystal Lake between May 2012 and October 2012. Water temperatures rose rapidly from 40-50 degrees in the spring to 70-80 degrees in the summer and remained fairly high and constant at all depths due to unusually high ambient temperatures during the summer. Water visibility was at 10 feet in late May but rapidly declined to 0-2 feet by the end of July; it then improved to 10 feet at the end of August but had another rapid decline to 0-2 feet visibility during the first

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2012 Water Analysis continued from page 1:

week in September due to two large algae blooms. The State Department of Public Health closed the lake to public swimming when water visibility was less than 4 feet: lifeguards could not easily see swimmers in the water, and algae counts were high, which could expose residents to potential toxins.

Trained volunteers also collected water samples to identify factors affecting the overall health of the lake. Water samples were taken during an actual heavy rainstorm and within several hours of a rainfall or on the next day from six different locations on eight different dates from April 26 until October 4, 2012, and were analyzed by a state-certified lab. The CLC sampling methodology for water quality was consistent with state protocol for swimming water quality. The testing focused on Cronin's Cove, Levingston Cove, Lake Terrace, the center of the lake, the public swimming area and the outflow into Paul's Brook by the railroad tracks. The comprehensive tests included bacterial analysis (E. coli and Enterococcus), herbicides, pesticides and fertilizer components such as nitrate, ammonia, and phosphorus. Beals Associates conducted deep-water temperature, phosphorus and dissolved oxygen testing in August during the algae bloom. (Dissolved oxygen indicates the amount of oxygen in the water to sustain animal life.)

The results of CLC's sampling were as follows:

- Bacterial test results were variable depending on location and date. Five dates revealed bacteria levels well below the Maximum Contaminant Limits (MCL). However, three testing dates showed E.coli and Enterococci levels well above the MCL in Levingston Cove, Cronin's Cove, and Lake Terrace.
- No herbicides or pesticides were detected.
- Nitrate results were low and typically below detection limits
- Phosphorus was detected early in the season in the deep water and at Cronin's Cove. The deep-water detection was of particular concern given the opportunity for normal dilution as the water flows from the outfalls to the center of the Lake. Beals Associates' additional test results also showed increased phosphorus elevations in deep water.
- Average phosphorus levels are 10 parts per billion (ppb). Crystal Lake had phosphorus levels of 50-110 ppb.
- Dissolved oxygen levels began to drop when measured at a depth of 10 feet, with rapid decline to zero oxygen at 25 feet. Animal life would have a difficult time surviving at zero to no oxygen at these lower levels. Oddly, there was no indication of a fish kill during the testing period.

So what have we learned?

1. **Crystal Lake is high in phosphorus.**
   Data on phosphorus levels indicates high levels are present with a rapid increase over last year. High phosphorus is related to algae blooms, and the real source is unknown. We do know from the City of Newton's testing that there are high levels of phosphorus present at street-level prior to entering storm drains. Phosphorus is also distributed differently than bacteria and settles to deeper levels, where it easily can be stirred up again when the lake is disturbed or when it naturally turns over in the spring and fall.
2. **Bacteria are present and high in some areas.**
   Bacteria data has been consistent now for several years, with increased occurrences of higher levels in areas that have less current movement, such as in Cronin's Cove, Levingston Cove, and Lake Terrace. It is unpredictable when higher levels occur, and the direct source is unknown. Testing performed by the City of Newton has revealed that very high levels of bacteria are known to exist in street runoff PRIOR to its entering storm drains. This suggests the issue is in the watershed area, and the main source may not be any material found in the storm drains. Despite some high bacteria levels, there is rapid dilution of the bacteria to low levels as the flush from the streets moves toward the center of the lake.

What can the watershed residents do to help decrease the amount of pollution flowing into Crystal Lake?

- Decrease the amount of nutrients (fertilizer, pesticides, compost) used in our yards that then flow onto adjacent streets and into the lake.
- Reduce the amount of bacterial flow occurring on street level in yards, driveways and streets. Do not dump waste into drains!
- Reduce stormwater and gutter runoff by allowing it to infiltrate into soil; manage waterfowl; and reduce any construction debris.
- Voluntary compliance is very important. If the situation does not improve, concerned residents might decide to explore creating new City regulations as a last resort.

What can the City of Newton do?

1. **Continue to investigate the storm drains and sewer lines and do regular cleaning out.**
   Leakage from sewer systems can cause sludge and detergents to leak into groundwater supplies, increasing phosphorus load. The City has done substantial work to investigate and insure the patency of lines.
2. **Investigate methods of draining street water into natural filtration areas before it runs into storm drains: create sustainable drainage.**
   Redirect storm drains to catch basins, retention basins, and detention tanks that won't drain directly to lake. The City could also explore improved drainage systems—swales, bioswales, and permeable paving.
3. **Explore alternative in-lake restoration techniques**
   The following measures involve more cost and time, can have negative side effects, and can be avoided if resources were put into finding and addressing the real source of pollution.

Through **hypolimnetic aeration**, oxygen could be pumped into the lowest level in the lake and could provide more dissolved oxygen to animal life. **Artificial circulation** (fountains, paddlewheels, air diffusers) such as used in the bathhouse area could provide aeration to expose the lake water to more oxygen and could be added to the various Coves. Through **hypolimnetic withdrawal**, siphons could be used to remove nutrient rich water, which then would be replaced by neutral water.

Dilution methods could flush the lake to reduce algae but would require lots of water. **Nutrient diversion techniques** could utilize expensive engineering to divert drains. **Dredging** could use heavy hydraulic equipment to increase the depth of the lake and could remove sediment; it was used for Bullough's Pond.

Nutrient inactivation could also be performed utilizing aluminum, iron, or calcium salts to inactivate phosphorus. Alum treatment (aluminum sulfate) can last eight or more years but also can have deleterious effects on the living creatures in the lake.

It is incumbent upon all of us to slow the accelerated eutrophication of Crystal Lake in order to keep it healthy for years to come. For more information on Crystal Lake and the work of the Conservancy, visit www.crystallakeconservancy.org.

Editor's Note

For a second issue of the newsletter, the focus of our first two articles is on storm water: the problems it is creating in our watersheds and the ways that residents and city government can help to alleviate those problems, which are expected to worsen as global warming increases.

Crystal Lake Conservancy co-president Janice Bourque presents evidence that the water quality in Crystal Lake is likely to be of greater concern in the future. She also presents suggestions that residents can follow to prevent pollution from their property from entering the storm drains. As you sit in your armchairs over the winter, scheming about what to do in your garden next spring, consider a rain garden. In our next issue, Ed Himlan, Executive Director of the Massachusetts Watershed Coalition, will present surprising statistics about the large amount of pollution that can be removed from stormwater runoff by the installation of simple rain gardens.

Marcie Scudder's beautiful photograph taken at Crystal Lake reminds us of the wildlife that is dependent on healthy water at Crystal Lake and all the city's bodies of water.

Alderman Deborah Crossley and Alderman Ruthanne Fuller give us a basic understanding of Newton's complicated sewer and stormwater system. We'll be waiting to hear more as the plan to update the stormwater system develops.

Beth Wilkinson

City Storm Water Management

Alderman Deb Crossley with Alderman Ruthanne Fuller

What's in a (storm) drain?

Which by any other name ("catch basin") should smell as sweet—as clean rain water. Ideally, it should contain nothing more.

The storm drains in our roads, however, also collect whatever the rains wash off the roads: dirt, leaves, trash, chemicals from car exhaust, pet waste, fertilizers and other garden chemicals. In places where there still are old connections to the sewer system and/or if the pipes are damaged and leaking, the storm drains also may be picking up sewage.

The previous article by Janice Bourque contains suggestions about what you as property owners can do to keep contaminants out of the city storm system. The city's responsibility is to provide and to maintain the public infrastructure in good working order, well functioning and reliable.

It is important to consider the city's stormwater system within the context of the vast underground plumbing system that Newton maintains to serve its citizens. We must provide residents with **clean** water, remove **waste** water (sewage), and drain rain water from properties and streets. These systems are the extensions of the plumbing systems that our homes and businesses require to sustain our lives and work. Beneath Newton's approximately 300 miles of streets, we have an almost equal length each of water, sewer and storm water pipes, as well as associated pump stations, manholes, catch basins, culverts, outflows, etc., that complete the public infrastructure that the city must steward. Much of these systems are now very old, leaking and in need of repair, which usually means cleaning and relining but in some cases requires replacement.

So, how are we doing with our stormwater system?

Keep in mind that it is a huge system. We have 320 miles of stormwater drain pipes, 12,750 catch basins, two pump stations, 155 major outfalls (the places where the drain