- Six Ponds Improvement Association

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Re-exam Little Long Pond

Little Long Pond

WATERSHED MANAGEMENT FOR LITTLE LONG POND PLYMOUTH, MASSACHUSETTS

A Discussion and Recommendations Based on a
Critical Review of a 1980 Study and the Analysis of More Recent Data

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Introduction: Little Long Pond in Plymouth, Massachusetts is a 45 acre kettle pond located in the south-central part of the town. It is a shallow pond with an average depth of 5 feet, a maximum depth of 8 feet, and with steep sides on the west, north and east. The pond is situated in a rural residential zone, where it is bordered by dense woodland to the west and by dense residential development to the north and the east. To the south is the parking lot for the state boat ramp at Long Pond, and a scout camp borders the south-west shore. The relatively dense residential development, which presently contains over 100 homes within a 1,000 foot radius of the center of the pond, has substantially fragmented the vegetated buffer zone around the pond and is certainly contributing nutrients to the pond.

Lyons and Skwarto Study: In 1979 and 1980, the firm of Lyons and Skwarto conducted studies of water quality in this and 40 other ponds in Plymouth. Their year-long in-depth study of Little Long Pond showed that nitrate levels were almost always above the permissible limit of 0.10 mg/l and were frequently above a critical threshold of 0.25. Likewise, the large majority of the values for Kjeidahl nitrogen, organic nitrogen, were well above a critical value of 0.40. The phosphorus levels ranged from 0.02 mg/l, only slightly below

the eutrophic level, to 0.08 mg/l, with the average level falling around a critical threshold of 0.04. While additional parameters were measured, these two were the focus of the study. The 41 pond study mentioned above showed that Little Long Pond was the ranked 31st on a eutrophic index (with 1 being best and 41 being worst).The pond was described as phosphorus limited and ultra-eutrophic.

Six Ponds Improvement Association Studies: The Six Ponds Improvement Association, on its own as well as with assistance from the Town of Plymouth, has been conducting water quality studies of Little Long Pond and other regional ponds for several years. The data show that nitrate and phosphate levels continue to frequently exceed permissible as well as critical levels just as they did in 1980. These nutrient levels continue to make the pond ultra-eutrophic and suggest that, while conditions vary from year to year, the situation is worse than in 1980.

Nitrate levels were 0.08 mg/l in 1997, 0.02 mg/l in 1998, 0.5 mg/l in 1999, 0.145 mg/l in 2000, and 0.159 mg/l in 2001. Levels in several samples ranged from non-detectable to 0.17 in 2002. Levels in several samples ranged from non-detectable to 0.23 mg/l in 2003, with the average being much closer to the critical threshold of 0.25 than it was in 2002. On the whole, the numbers appear to be rising, and they often approach a critical level.

Phosphorus levels for this same period were 0.02 mg/l in 1997, 0.06 mg/l in 1998, 0.01 mg/l in 1999, 0.003 mg/l in 2000, and 0.047 mg/l in 2001. In 2002, levels in several samples ranged from 0.067 to 0.223 mg/l with the average around 0.11 (ultra-eutrophic). In 2003, levels in several samples ranged from 0.022 to 0.077 mg/l, with an average around 0.05 (highly eutrophic). The majority of the 2002 and 2003 levels were well above the critical level for a pond to be considered eutrophic.

Apparent Errors in the Lyons and Skwarto Report: Several nitrate and phosphate figures in the Little Long Pond study are obviously in error and others must be questioned due to inconsistencies between what was recorded in tables and what was plotted. Some of the numbers gathered at three different stations seem unrealistically high when compared with other data in the report and with more recent data. On the other hand, discounting the high numbers and taking a conservative look at the data, the results still indicate that Little Long Pond was experiencing problems in 1980.

It appears that nitrate levels at station 1 near the north end of the pond were erroneously recorded at 10 times their actual levels from August of 1979 through April of 1980. Levels of 1.2 mg/l to 1.7 mg/l were recorded in the table, but they were plotted at only 0.12 to 0.17 mg/l, which appears to be more consistent with the data for the subsequent months. But even these lower figures are above permissible levels. Similarly, figures for nitrates recorded at station 3, the pondâ€™s outlet, do not entirely match the graphical data for the same period. Although the September and October 1979 figures match the plot (0.70/mg/l), the August 1979 levels of 0.80 to 0.90 mg/l are approximately twice the levels that were plotted. The March 1980 level of 1.13 mg/l is also about twice the level that was plotted. After June of 1980, nitrate levels were also plotted at twice their recorded levels of 0.06 to 0.20 mg/l. Regardless of how accurately they were recorded or plotted, the figures of 0.70 mg/l and higher do not appear credible when compared with other data for the pond. Only at station 2 do the data seem fully credible. These data appear to be accurately recorded and plotted, with figures range from 0.15 mg/l in August in 1979 to 0.40 mg/l in October 1980. The nitrate data collected in the lower half of the pond also match more closely with the more recent data collected by the Six Ponds Improvement Association.

Assessment of the Lyons and Skwarto Recommendations: Lyons and Skwarto recognized in 1980 that Little Long Pond needed rehabilitation in order to restore its water quality to a healthy level. They discussed actions that taken individually or together could reduce nutrient and sediment influx into the pond. However, the actions were presented as a set of boiler plate recommendations applicable to almost any pond, rather

than as specific recommendations for specific problems. The study did not clearly identify any precise sources of nutrient influxes, but, instead, it implied that nutrients were coming from the whole watershed, and that the whole watershed is what must be managed.

Several of the control techniques mentioned are designed to physically reduce the influxes of nutrients from wastewater and leachate released in the sewer water systems. Such techniques are known as structural controls, and they include actions such as installing low flow devices on showerheads and faucets, hooking homes up to town water and sewage services, locating faulty septic systems, installing soil erosion control barriers, installing retention basins, and disposing of sanitary landfill leachate. These techniques either reduce wastewater and nutrient flows, or else they redirect it to other discharge points.

Other control techniques mentioned are non-structural, and they are designed to limit the number of point and nonpoint sources of pollution. These controls include zoning regulations that minimize buildout potential by imposing minimum lot sizes and building setbacks, development controls that limit subdivisions of land and limit development in sensitive areas, and area bans on detergents and fertilizers containing phosphorus. These methods are designed to treat the whole landscape within the watershed, with the realization that a healthy watershed will likely produce a healthy pond.

The study also discussed some in-pond management techniques that may be employed to reverse the degradation of the pond and upgrade its water quality to some degree. Such techniques include dredging, draw-down, chemical treatments, water mixing and aeration, dilution, pond bottom sealing, biological controls, reduction of motor boat use, and harvesting of macrophytes and microphytes (large plants and planktons).

Interpretation and Recommendations Based on This Review of the Lyons and Skwarto Study: It must be recognized that the residential development, which has occurred since this report was completed, has already substantially altered the buffer zone around part of this pond, and this zone cannot be restored to an earlier state. Moreover, the residential development on the east side of the pond is extensive, and is probably near buildout conditions. Therefore, several of Lyons and Skwartoâ€™s earlier watershed recommendations would not work since there are many houses quite close to the pond. For a watershed based approach, the following ideas should now be considered.

In regards to structural controls, public outreach should be used to educate homeowners about action they can take individually or collectively to reduce their impacts on this pond. They should be encouraged to install low flow devices if feasible, and to maintain some kinds of sediment barriers in their yards. They should be encouraged to plant some shrubs and herbs in the buffer zones, so that additional vegetation may absorb some additional runoff and nutrients-and they donâ€™t have to ruin their scenic vistas in the process. They should actively maintain and upgrade their septic systems (at least pump them), and find and fix any faulty ones as soon as possible, for many of the older homes here probably do not have fully compliant Title 5 systems that would actively minimize impacts on groundwater. Because all these actions are voluntary, it must be stressed that the homeowners may hold the future water quality of the pond in their hands.

Another type of structural control which should be systematically implemented is Town as well as State control of road runoff, driveway runoff and parking lot runoff through the use of BMPs. For example, runoff is fed directly into the pond from drains along Oar and Line Road, Independence Way, Tower Hill Farm Road, and Unity Circle. In some instances, this runoff comes from structures along the heavily traveled Long Pond Road.

For non-structural controls, all that can really be done now is to strictly enforce current zoning ordinances and building setbacks in order to limit future development along the northern and western buffer zones of the pond. The current rural residential ordinance should be used to require larger lot sizes than those employed in the older (30 years) development to the east, and it should require longer building setbacks. New septic

systems must comply with Title 5. Because new construction is already occurring on the western side, a wide vegetated buffer zone should be maintained to help limit erosion on the steep slopes there, even if houses are constructed on the very tops of the hills. Residents should make efforts to keep runoff from driveways, lawns and roofs from feeding into the pond. There is too much potential for extensive runoff into the pond if such actions are not taken.

If flora and sediments begin to seriously choke the pond, it may become necessary to consider such techniques as dredging, draw-down, chemical treatments, water mixing and aeration, dilution, pond bottom sealing, biological controls, reduction of motor boat use, and harvesting
of macrophytes and microphytes (large plants and planktons). However, extensive permitting would be required for suchh activities. Moreover, if chemical or biological treatments are employed, they may pose some physical risks to residents. All due precautions must be taken. The biggest problem with these methods is that they substantially alter the natural environment, and if they are employed, they may prove to be more detrimental to the native flora and fauna than the current situation is.

Final Comments: Little Long Pond continues to be ultra-eutrophic, and no apparent corrective actions have been taken since Lyons and Skwarto identified the water quality problems back in 1980. The water quality appears to be getting worse today, as nutrient levels frequently exceed those of 1979 and 1980.

The largest area of altered landscape is residential development, and it is here where most efforts must be made. All stakeholders must do their parts to minimize their impacts on this pond, for it continues to feel the effects of high nutrient loading even though it has a moderately rapid flush rate of 18 days. The state must also do its part to maintain the parking lot for the Long Pond boat ramp so that it doesnâ€™t contribute additional influxes of nutrients from parking lot runoff. But, as the need to rehabilitate the pond gets more acute, it will be up to everybody to reduce their personal impacts on the pond.

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Sources

A Study of Little Long Pond With Guidelines for Rehabilitation. Lyons
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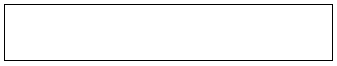
Six Ponds Improvement Association web site (www.sixponds.org)

Plymouth Water Quality Task Force web site (www.plymouthwaterquality.org)



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