

## Lake Management Services Recommendations

April 18, 2018

### Introduction:

Per our site meeting of 4-1-18, below are the recommendations we discussed. One of the topics discussed was establishing buffer zones around the lake system. Buffer zones are needed to minimize storm water and landscape runoff from developed areas as this point source tends to contain substantial amounts of significant water pollutants – dominantly nutrients, oil and grease, and trace metals. Failure to adequately manage this nutrient load in the water bodies has resulted in several undesirable consequences, including algae bloom, nuisance weeds, odor problems, mosquito and other vector problems, and other potentially negative environmental effects.

It was common to treat the symptoms of these problems through applications of herbicides, insecticides, etc., without addressing the underlying root causes for poor water quality. Current state-of-the-art management techniques, however, have begun to address the sources of water quality problems, through reduction of nutrient loading and through bioremediation techniques for extracting nutrients and other pollutants from the water column. These methods are already being utilized within the water bodies of Swansboro and we (DBi) will continue to promote and implement these management practices.

### LAKE MANAGEMENT GOALS

The overall management goals of the lakes are:

- 1.) Excess nutrients and other constituents will be reduced through bioremediation and aeration. **Bacteria products are currently applied at the lakes and aeration is utilized at Dyer Lake. Perimeter Cattails provide excellent erosion control and absorb nutrients efficiently.**
- 2.) Turbidity shall be maintained below a level which would limit growth of aquatic vegetation. **Turbidity refers to clarity of water. Example of sources that will cause Turbid waters are runoff (landscape & roadsides), reflux of bottom muck into the water column, submerged vegetation (weeds fragmenting & algae build-up on weeds), etc.**
- 3.) The lakes shall be maintained in an aesthetically pleasing condition, i.e., algae blooms, trash accumulation, etc., shall be avoided.
- 4.) Use by wildlife will be encouraged, consistent with the lakes serve as open space, landscape buffer and open water habitat.
- 5.) Establishment of domestic waterfowl populations will be discouraged, as their presence can be detrimental to wild birds, and excessive resident duck and goose populations can significantly contribute to water quality degradation.
- 6.) Appropriate mosquito abatement and other vector control issues will be addressed as appropriate. **Vector Control will provide “mosquito fish” for mosquito & midge abatement.**

- 7.) Maintenance activities should be minimally intrusive, in addition to being simple and economic.
- Turf grass is not a wetlands plant and does not grow well at the water's edge. It also does very little to filter runoff and protect water quality. Mow clippings into water will contribute to nutrients to the water and exacerbate algae growth.
  - Trailing plants, such as primrose (Dyer), bottlebrush (Twin) and lilies (catfish), all grow laterally over the water forming mats that extend from shoreline.
- Trailing plants control: At Dyer, we do not want the perimeter treated to bare ground. We will control growth in the water and control limitedly along the bank. We want the sedges to develop in these areas and become dominate plant.
- At Twin, the parrotfeather will be controlled but allow the sedges to grow along the bank.
- Buffer zone: maintaining dense beneficial vegetation around the lakes perimeter is extremely important for improving water quality. Establishing buffer zones takes minimal effort and requires little maintenance in the long run. The lakes all have native sedges growing along the perimeter. Mowing and chemical treatment must stop so that they can re-establish.
- 8.) Maintenance activities should be minimally disruptive to fish and wildlife in the water bodies.

### **Water Chemistry Parameters**

Regular analysis of various water chemistry parameters provided an efficient and effective method for gauging the overall health of the aquatic environment, and for guiding management actions to prevent or correct problems before they become significant. The various constituents of greatest importance for water quality management can be generally divided into two major categories - - those which are primarily influenced by external factors, such as nutrient and trace metal concentrations in source waters, and those primarily influenced by internal factors, such as a buildup of undecomposed organic material in the lakebeds.

### **Turbidity**

This will be a measurement of water clarity. A Secchi Disk will be utilized to measure the depth of the transparency of the water. The Secchi Disk is an 8 inch disk with alternating black and white quadrants. It is lowered into the water until it can no longer be seen by the observer. At this point we can verify transparency of water based on point the secchi is no longer visible. Transparency is an indicator of the impact of human activity on the land surrounding the lake. If transparency is measured through the season and from year to year, trends can be observed. Transparency can serve as an early warning that activities on the land are having an effect on a lake.

**Objective level: secchi > 5ft.;**

**Action level: secchi < 3ft.;**

**-Activity that can be done by Swansboro staffing to assist lake contractor (DBI) is to take a transparency reading, 1x/week at each lake site and record. DBI will assist in marking a target location for activity as well as provide Secchi and training.**

## **Temperature**

Water temperature is the dominant driving force behind seasonal changes in the aquatic environment. The rate of plant growth (including algae) tends to increase in the spring once the water has warmed to at least 60°F, and is in “high gear” above 68°F. Plant senescence begins to occur in the fall when the temperature drops back below 60°F. Temperature monitoring is therefore used to establish recommended vegetation harvest dates, and to predict the likelihood of an algae bloom in the event of an increase in nutrient levels.

In the event that the water temperature becomes excessively high (above 80°F), dissolved oxygen levels should be closely monitored.

**Objective level: seasonal action level: < 60°F; > 80°F**

**-Activity that can be done by Swansboro staffing to assist lake contractor (DBI) is to take a temperature reading, 1x/week at each lake site and record. DBI will assist in marking a target location for activity as well as provide Secchi and training.**

### **Preventative Measures for Water Quality Maintenance**

The greatest single cause of water quality degradation in urban lakes is the influx of excessive nutrients, primarily nitrates and phosphates. Bioremediation and beneficial vegetation in lakes will eliminate these excess nutrients from the water column, as well as to assimilate other undesirable constituents from the incoming waters.

The following are some of the most common and preventative sources of water quality problems:

- 1.) Landscape Maintenance
- 2.) Landscape Design
- 3.) Excessive Waterfowl Populations
- 4.) Erosion and Sedimentation

### **Other Recommendations:**

#### **Erosion & Sedimentation:**

There are significant areas of bare ground surrounding most of the systems and readily visible sediment deposits within the shorelines. Any nearby landscaping or construction projects can also become a major source of siltation problems. Heavy siltation has several undesirable affects. First, it can completely block light penetration through the water, killing any beneficial plants growing below the surface. Second, it carries substantial amounts of nutrients with it, which will then sponsor algae growth after the water clears. Furthermore, in the long run, the lakes will become more and more shallow, which will contribute to warming, additional algae growth and other eutrophication problems.

### **Landscape Maintenance:**

The most frequent cause of excessive nutrients reaching these lakes is over fertilization of landscape areas that drain into lake waters. Landscape maintenance personnel typically utilize a calcium-based, slow-release fertilizer in order to reduce the labor of application. These fertilizers are spread about liberally, followed by heavy watering to prevent burning. Nutrient-laden irrigation water is then likely to run off landscaping and into lake waters. A sudden “spike” of nutrient-rich water can overwhelm the uptake abilities of any beneficial plants and/or supplemental bacteria and result in an algae bloom.

- Fertilizer applications should be tailored to soil needs
- Phosphorus based fertilizers are generally not essential
- Fertilizer application methods used should not allow fertilizer to enter lake waters
- Excessive irrigation runoff should be avoided
- lake waters should not be used as disposal site for organic debris
- All organic debris created by vegetation should be promptly removed from areas adjacent to the lakes
- All deciduous trees or shrubs must be planted at sufficient distance from the basin shoreline so that at mature size the full canopy will be at least 10 feet from the water

### **Excessive Waterfowl Populations:**

Migratory bird populations can be encouraged to utilize the open water habitat of the lakes. Birds which are temporary visitors to the lakes, and which eat food items naturally occurring in the lakes, add to the biological diversity of the lakes and make use of an important resource. However, a resident waterfowl population, maintained by an artificial source of food, represents a prolific nutrient source. A single duck can excrete 2.1 pounds of nitrogen and 1.3 pounds of soluble phosphorus in a year. A population of several hundred resident ducks, which could easily develop on the lakes, could be responsible for a doubling of the total nitrate and phosphate load in the water bodies. Uneaten feed will decompose in the water, further adding nutrients and creating conditions conducive to the spread of avian botulism and fowl cholera.

It is recommended that an informal education program be included as a part of the overall lakes management plan, which might include such features as;

- interpretive signs near the water, briefly describing the negative consequences of duck feeding
- newsletter articles or general memos describing the management system being used in the lakes, including references to the potential impact of excess waterfowl
- Introduce more beneficial vegetation around the ponds to reduce erosion and increasing buffers that allow natural water filtration.

