Lake Summerset Association (LSA) Invasive Aquatic Plant Control and Management Guide

Created by the LSA Lake Planning Committee (LPC) together with volunteer Association Members.

1.0 Purpose

This guide is intended to serve as a resource for managing non-native and native invasive aquatic plant species present in the lake, together with water quality initiatives, watershed issues and ecosystem preservation. Cost-benefit objectives relating to budgeting constraints are considered as well. It intends to present knowledge and options available for strategy management based on the yearly dynamic lake conditions.

2.0 Introduction

Lake Summerset is a 285 acre man-made lake with a shoreline of 5 miles. Its greatest length is 1 3/4 miles and lies within a 1,550 acre recreational community located across the Winnebago and Stephenson County line in Illinois. It was completed in 1969 by Boise Cascade Recreation Communities, a Division of Boise Cascade Home and Land Corporation and subsequently turned over to the Lake Summerset Association, Inc. (a non-profit corporation representing the owners of residential lots). Its function includes ongoing property management including the lake, streets, common real estate areas and amenities. Water and sewer utility service is provided by the Otter Creek Lake Utility District (OCLUD) of Winnebago County. The lake reached full pool in 1972 having a maximum depth of 35 feet with water breaching the dam spillway as designed.

The lake is located in an agriculturally dominated watershed where nutrient loading will always be a challenge to control.

3.0 Lake Protection and Management

3.0.1 Program Goals

- Provide water quality that allows for many diverse forms of recreation that the lake supports, including; Swimming, boating, fishing.
- Maintain a healthy ecosystem within the lake, which includes aquatic plants and the microorganisms that support the extended food chain.
- Minimize the introduction of invasive plant and animal species to the lake while working to control the invasive species already present.
- When conditions require corrective action to improve water quality, they shall be completed by appropriate professionals.
- Both established and emerging technologies will be considered for managing the ecosystem.

3.0.2 Aquatic Plants

Aquatic plants are an important component of a healthy lake. They provide habitat and food for fish, along with oxygenating the water. However, the natural density and distribution of aquatic plants can become disrupted when either excess nutrients cause native plants to have abnormally high growth rates or invasive plants are introduced and out-compete native plants. In these situations aquatic plants can grow excessively, disrupting both ecological and recreational values. When this occurs, management options and strategies for controlling the weeds are required. For this to be successful, an assessment is done that includes the following:

1. Correctly identify the invasive and nuisance plants.

2. Identify the desired vegetation to achieve fish and wildlife habitat goals.

3. Use cost-benefit perspectives to determine long-term management strategies.

4. Establish a water quality program (water clarity, chemical measurements, biological measurements).

5. Develop an ongoing program that includes control methods such as mechanical, chemical and cultural (education of property owners).

3.0.3 Aquatic Plant Management Plan

For Lake Summerset specifically, the following plant species have been identified and are currently growing aggressively:

Non-native invasive: Curlyleaf Pondweed - very dense in late spring/early summer and is present in the West End, Birch Bay, North end of Tamarack Bay, along the North shore between Juniper Park and South Gate Marina and around the Main Dam Marina. The estimated lake infestation area is approximately 60 acres. See Attachment 1 and 2 for early summer (May/June) 2020 drone pictures and spring 2020 aquatic vegetation bio-volume sonar survey data.

Native: Elodea, Sago Pondweed, Coontail - present mid-summer through early fall. Very dense in the West End and Birch Bay. Also present along the north shore. The estimated lake infestation area is approximately 40 acres.

3.0.3.1 Control Methods

For the primary lake area, the decided strategy to date is to use chemical treatment for non-native invasive plants (species selective) and mechanical methods for the removal of native plants. Chemical treatment is only done by a licensed biologist using herbicides that have been approved by the U.S. Environmental Protection Agency and would be applied in early spring before water temperatures reaching above 55 degrees to be most effective. Mechanical harvesting and skimming operations would run continuously throughout the spring/summer/early fall growing season. One of the drawbacks of mechanical harvesting/cutting is that it leaves plant fragments in the water which can result in floating bio-masses of decaying vegetation that collect along the shorelines, creating nuisance to members and potentially feeding large algae blooms. As such, mechanical skimming is also required (together with) the cutting operation to be fully successful. Unfortunately, mechanical harvesting can impact the fishery after late spring/early summer fish spawns, as certain species use the weeds for cover. Operators of the mechanical harvesters must be sensitive to this situation and monitor whether significant numbers of fish are being extracted from the lake while cutting in certain areas. Corrective measures including minimizing depth penetration of cutting heads below the surface and keeping harvester speeds at a minimum when plowing through weeds during cutting and extraction operations. In addition, temporarily suspending cutting operations in certain areas of the lake is also suggested where small fry density is noticeably high during weed extraction, as fish will move throughout the day allowing for cutting operations to resume at different times in those locations.

Lake Summerset will also provide lakefront property owners the option of participating in a volunteer weed control program (at the property owners expense) that would chemically treat their specific lakefront areas around boat docks and piers twice a year (spring and early summer months). This program is again administered by a licensed biologist (only) using U.S. EPA-approved herbicides and provides the lakefront property owners relief of the dense shoreline weed growth during the summer months, inhibiting recreational use of their property. This program will be evaluated seasonally to ensure it is not reducing too much of the lakes needed native plant biomass.

3.0.4 Water Quality Strategies

Monitoring lake water quality is an essential part of understanding and diagnosing issues that are present in the lake. Data from three parameters or categories are considered when determining what goals and objectives are to be used to help guide water quality management decisions. These parameters are:

1. Physical Measurements - water clarity, dissolved oxygen and temperature.

2. Chemical Measurements - nutrients (Nitrates, Ammonia, Phosphorus), suspended solids, pH.

3. Biological Measurements - chlorophyll and bacteria.

For Lake Summerset, a Level 2 monitoring scenario (as recommended by the Illinois EPA) applies. This scenario is defined as follows:

Level 2: Basic

Purpose: Generally characterize lake water quality and identify potential problems.

Parameters:

- Secchi disk transparency
- Dissolved oxygen/temperature
- Total phosphorus
- Nitrate + Nitrate nitrogen
- Ammonia Nitrogen
- Total suspended solids
- Volatile suspended solids
- Chlorophyll
- Aquatic plants (types and locations)
- Bacteria (swimming beaches minimally)
- lake level

Frequency:

- Twice/month, May-Oct,; every year

Depth:

- profiles (readings at 1 foot below the water surface and at 1 or 2 foot intervals thereafter to 2 feet above the lake bottom)

3.0.4.1 Physical Measurements

Water clarity (or transparency) is commonly measured by using a Secchi disk. The disk is lowered into the water and to the depth in which it is no longer visible is recorded. This data identifies how deep sunlight can reach into the water and is considered an indirect measurement of how much algae and sediment is in the water. In addition, oxygen will only be produced from green plant photosynthesis as deep as the sunlight penetrates.

In Illinois, there are currently no water quality standards for Secchi transparency. There have been six location areas identified where Secchi disk and other water quality measurements are made on Lake Summerset. These locations are:

1. Dam

2. Entrance to Tamarack, main section of the lake

3. No wake buoy line towards the west end.

4. Birch Bay

5. West End

6. Tamarack Bay (lots 1412,1413).

Dissolved oxygen measurements determine the amount of oxygen in the water available for fish and other aquatic life. Temperature measurements are used to characterize the presence or absence of thermal stratification. A lake's temperature variations will influence what types and how many fish will live and reproduce in the lake. For the protection of aquatic life, IEPA water quality standards specify that dissolved oxygen not be less than 5.0 mg/L at any time.

Sampling data will be correlated, plotted and maintained by the LSA LPC.

3.0.4.2 Chemical Measurements

Elevated nutrient levels can stimulate nuisance plant growth and lead to an out-of-balance ecosystem and impaired recreation. As such, understanding the chemical composition of the lake water is an important component when determining what corrective strategies should be used when problems occur. Below are the nutrient parameters and their acceptable ranges per IEPA guidelines:

- **Total Phosphorus (TP)** - concentrations above .030 mg/L are enough to stimulate nuisance plant and algae growth. IEPA standard is .050 mg/L.
- **Nitrate+Nitrate Nitrogen** - concentrations above .30 mg/L stimulate algae growth.
- **Ammonia Nitrogen** - can vary depending on water temperature, pH and time of year. However, at any time of year no sample should exceed 15 mg/L total ammonia.
- **Suspended Solids** - includes both organic (algae) and inorganic (soil particles). No set standard exists, but recommendations suggest anything above 15 mg/L could highly impair recreational activities, while levels at 3 to 7 mg/L might cause slight impairment.

Chemical Measurement sampling locations for Lake Summerset will be identical to where the bi-weekly 12 point bacteria sampling locations are (per OCLUD specifications) and will be analyzed by the OCLUD laboratory.

Sampling data will be correlated, plotted and maintained by the LSA LPC.

3.0.4.3 Biological and Lake Level Measurements

Analysis of bacteria levels at swimming beaches are performed weekly by the Otter Creek Lake Utility District (OCLUD) and bi-weekly per Winnebago and Stephenson county requirements beginning mid-May until the end of the Labor Day Holiday weekend. OCLUD also samples bi-weekly for bacteria levels at various locations around the lake (15 total samples) which include

two outside locations along the Otter Creek inlet (at the west end of the lake) during this same timeframe. Illinois Department of Health sets the standards for acceptable E.coli density levels and Lake Summerset is required to follow those standards by law.

Lake level changes are not something currently used in Lake Summerset as a means for water quality initiatives. However, hypolimnetic withdrawal treatments are invoked periodically as a method for nutrient mitigation. While this doesn't affect the lake level in any noticeable form, the process does involve the release of lake bottom water to enhance the removal of excessive nutrients. The process used is described below.

3.0.4.3.1 Hypolimnetic Withdrawal

Hypolimnetic withdrawal of nutrient-rich water is possible after the lake water warms and a thermocline forms that stratifies the lake water column into three different layers. The top layer is the Epilimnion Layer, the middle layer is known as the Metalimnion Layer and contains the thermocline. The bottom layer is called the Hypolimnion Layer. The Metalimnion Layer acts as a buffer preventing oxygen from the atmosphere from reaching the Hypolimnion Layer and concentrates nutrients phosphorous and ammonia nitrogen in the Hypolimnion Later. Water sample testing in August 2019 on Lake Summerset confirmed much higher levels of dissolved oxygen exist at the surface than at the lake bottom (35 feet below) by a factor of about 6. This testing also confirmed higher ammonia nitrogen by a factor of about 50 and total phosphorous by a factor of about 5.5 at the bottom versus the lake surface.

Lake Summerset can be lowered by a valved 18-inch diameter drain pipe that extends from an intake box located in the deepest part of the lake through the valve tower and discharge through the sidewall of the spillway chute. By law, the valve needs to be opened at least once a year. The original valve became very difficult to operate after 40 years of use and because of fear of valve failure in the open position, the governing authorities granted LSA's request to leave it closed until a replacement could be engineered, procured, and installed. As a result, the valve remained closed for several years until the new valve was installed at the end of 2014.

The new valve has been operated three or four times a year since the spring of 2015. Typically the valve is left open for one to four hours, but has been left open for several days when the lake is high and a lot of water was flowing over the spillway crest. Approximately 2.5 acre-feet of water is removed (from the nearly 5,000 acre-foot lake) every hour the valve is opened. When the valve is opened during thermocline conditions, typically mid-summer to early fall, nutrient-rich water is discharged and very effective hypolimnetic withdrawal is achieved.

The current method of achieving hypolimnetic withdrawal won't be nearly as effective during dry years when little or no water is flowing over the spillway and valve open time needs to be minimized. Therefore, LPC is currently working on plans to restore an inoperable 4" diameter flow augmentation drain line in the valve tower and to extend the line via a hose to the intake

box in the deepest part of the lake. When complete, these modifications will allow continuous discharge of nutrient-rich water during thermocline conditions at a much slower rate. Sampling data will be correlated, plotted and maintained by the LSA LPC.

3.0.5 Watershed Management

Critical to any lake ecosystem is its watershed which includes the surrounding land area that drains into the lake. For Lake Summerset, this encompasses runoff from land areas within the development as well as from external agricultural areas surrounding the lake and directly from the Otter Creek inlet. This agriculturally dominant watershed will always be a source for nutrient loading in the lake.

Management of the watershed includes items such as shoreline stabilization as well as the use of pesticides and fertilizers on resident's lawns and on farm fields. The impact of excess nitrogen and phosphorus based fertilizers directly affects the water quality of Lake Summerset through the watershed, contributing to excessive aquatic weed growth. Nutrients can come from many sources, but for Lake Summerset the primary contributors are fertilizers from agricultural fields and residential lawns. Residents can minimize impacts to the lake by ensuring only low nitrogen and zero-based phosphorus lawn fertilizes are applied, or use fertilizers that contain natural components as substitutes for nitrogen and phosphorous (seaweed, bone meal and feather meal are examples).

In addition, the LPC has been working with the Illinois Department of Natural Resources (IDNR) to establish a permanent sediment basin and silt settling pond along the Otter Creek inlet at the west end of Lake Summerset, utilizing the external Hagemann Property. This effort requires not only outside engineering services, but also approvals and permits from the State of Illinois based on the design and holding characteristics of the basin and silt containment pond. Costs clearly play a factor here as well. The need for this type of structure is recognized for the health of the lake and it's now a matter of working through the logistics and managing the costs before implementation can occur.

3.0.6 Lake Dredging Program

Dredging was developed as a method of creating and maintaining navigable waterways and as means to support some mining processes. Dredging is now part of the process for extending the life cycle of lakes.

All lakes regardless of how they are fed are subject to siltation. Materials are transported into the lake from runoff from watersheds, shoreline erosion through wave action, biomass that falls or washes into the lake, and even the wind carries material that is deposited. The rates at which material is deposited into lakes vary greatly based on the condition and composition of the terrain in the watershed. Much can be done to minimize and control the amount of silt entering the lake. The list of control measures includes; soil conservation measures for farming, stabilizing shorelines of waterways & lakefront , trapping soil & debris before it can reach the lake. While these measures are vitality important in the process of extending the useful life of a lake, ultimately silt and debris is deposited into the lake which compromises its use for recreational purposes. Dredging is then required to remove the materials and

reset the life cycle of the lake. Without periodic dredging lakes would become choked with silt and debris rendering them useless for recreation or water storage for municipalities. The habitat for aquatic plants and wildlife in the lake would also change dramatically.

Dredging can also play a key role in controlling aquatic plant growth in the lake. The dredging process can be used to remove nutrients that are attached to silt particles that enter the lake from farm and lawn runoff. The nutrients cause excessive aquatic plant growth and algae blooms. Dredging can be utilized to remove aquatic plant root structure, seed pods and nutrients that are on the lake bottom.

Dredging can be divided into two major categories; hydraulic dredging and mechanical dredging. The process of hydraulic dredging requires that the silt & debris are stirred into a slurry with a large impeller and then pumped from the lake to a disposal site for dewatering. In mechanical dredging, excavators are used to scoop up the silt and debris from the lake and deposit it into trucks or barges, where it can be transported and dumped into a disposal site for dewatering. Both dredging processes are costly to complete. In general, mechanical dredging is more cost effective for smaller projects and hydraulic dredging is better suited to larger scale projects. Lake Summerset Association utilizes both methods of dredging as part of our lake management program. Hydraulic dredging is currently on a 25-plus year budget cycle. Areas where this technology is utilized include; Tamarack Bay, Birch Bay and the West End of the lake. Mechanical dredging is completed more frequently (typically 5-to-10-year cycles) to clean out silt deposited at the entrance of bays. This technology is typically utilized along the waterways leading up to the entrance of Tamarack Bay, Birch Bay and the West End. The hydraulic excavator will also typically reach out into the bay from the waterway to the limit of its reach. The goal is to remove as much silt as possible while it can still be reached with mechanical extended reach excavators. When silt is washed out in the deeper water of the bays it becomes cost-prohibitive to remove it with mechanical excavators and must then be removed as part of a large hydraulic dredging program.

Much of the costs associated with a hydraulic dredging program take place before and after the actual dredging activity. One of the earliest activities in a dredging program is the permitting process. Over the years the permitting process has become increasingly more complex. Engineering firms that have specialists in the permitting process are engaged to collect data, complete testing of silt samples (ensure that the silt does not contain any toxic materials) and prepare the necessary documentation for state and federal agencies. Other key elements of the hydraulic dredging process include; site preparation for the disposal/dewatering of the silt, equipment mobilization to Lake Summerset and demobilization. All of which take place outside of the actual dredging activity.

To ensure that LSA is prepared for a dredging program and has sufficient funds on hand requires that the silt levels be monitored in the lake periodically. Members of the Lake Planning Committee complete a comprehensive silt mapping of the key areas of the lake where silt is deposited (typically every 3 to 5 years). This information is then compared to previous silt studies to determine the rate at which the silt is collecting on the lake bottom and make an estimate as to when the next dredging (mechanical or hydraulic) program needs to take place. This long-term planning activity is essential to make sure that the process for initiating a hydraulic dredging program commences 3 to 4 years in advance of when it is needed.

4.0 Long Term Benefits

The Lake Summerset Community is built around its primary asset, which is the lake itself. The visual quality of the community is highly dependent on the condition of that water body. Its natural beauty is part of the quality of life for lakeshore property owners and the entire community. When properly managed, it provides recreational and sporting activities across a large spectrum. Multiple studies exist identifying how water quality directly affects property values as well. Strategies identified and used in this document provide the foundation necessary for creating an on-going system of integrated control methods/practices required to manage invasive and aggressive aquatic weed growth long term.

Attachment 1

Attachment 2