SŌLITUDE
LAKE MANAGEMENT

October 20, 2016

Ms. Susan Chapman, First Selectman
Town of New Fairfield
4 Brush Hill Road
New Fairfield, CT 06812

Re: 2017 Proposal for an Aquatic Management Program in New Fairfield Portions of Candlewood Lake

Dear First Selectman Chapman:

Solitude Lake Management ("Solitiude") is pleased to submit this Proposal for an Aquatic Management Program in New Fairfield Portions of Candlewood Lake during the 2017 season. As discussed during our October 5th meeting, the program proposed at Candlewood Lake for next year will focus on:

1. Eurasian Watermilfoil Control - use aquatic herbicides to control Eurasian watermilfoil and evaluate if the triploid grass carp will then preferentially graze on milfoil regrowth, as compared to the more mature old growth milfoil plants found in untreated sections of the lake.

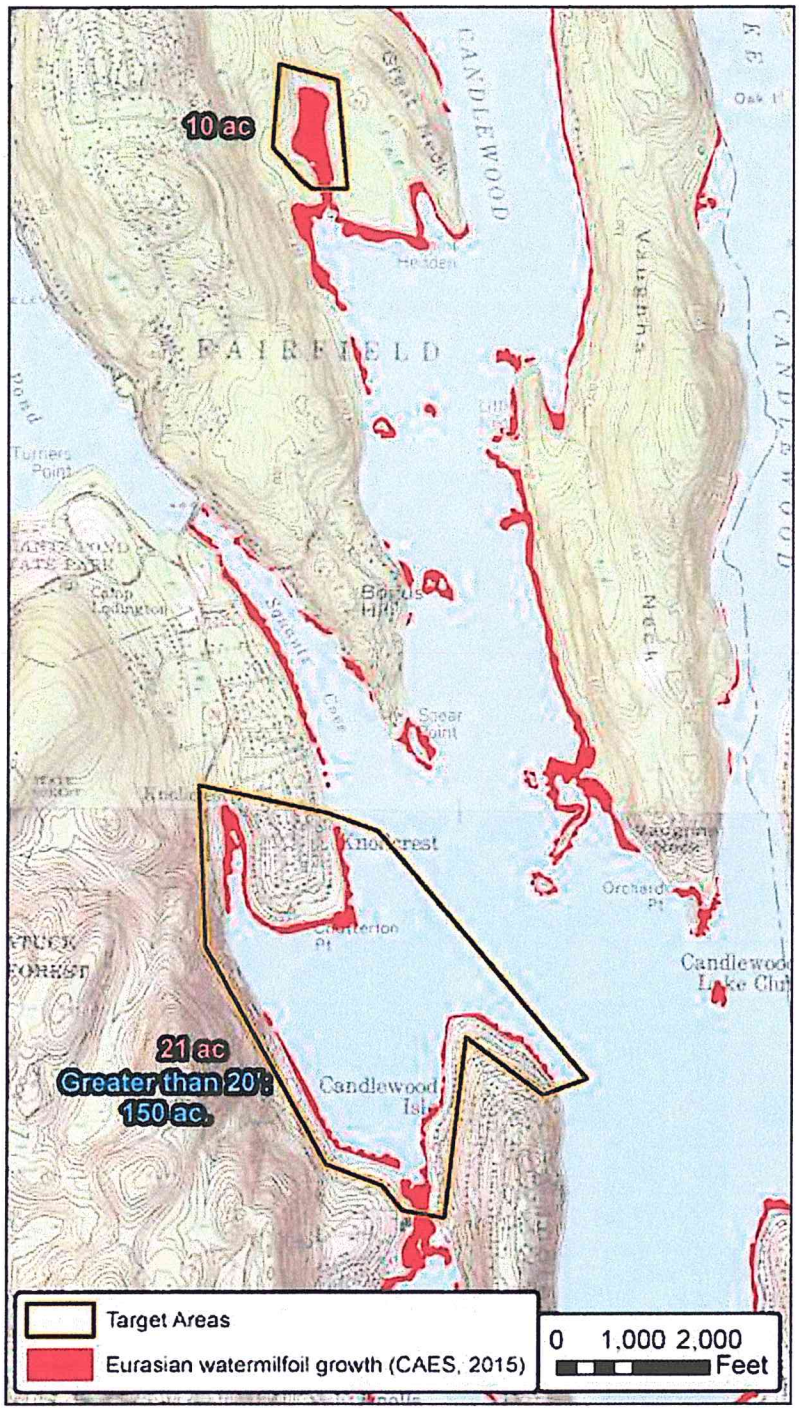
2. Cyanobacteria Control – perform a series of limited area treatments around the New Fairfield Town Beach to control cyanobacteria when it is present at low densities to try and prevent bloom conditions from developing that result in beach closures.

3. Monitoring and Assessment – work with the Connecticut Agricultural Experiment Station (CAES), Northeast Aquatic Research (NEAR), CT FirstLight and other project partners to design and implement monitoring programs to assess the effectiveness of the demonstration herbicide and algaecide treatments and to evaluate future management strategies.

We understand that the suggestion of using herbicides and algaecides in Candlewood Lake will draw concern and criticism from some groups and individuals, but the area-selective treatments that we are proposing are proven strategies that have been effectively permitted and used in some of Connecticut's largest lakes, some of which include: Bantam Lake, Twin Lakes Lake Lillinonah and Lake Zoar. The use of EPA/State registered aquatic herbicides and algaecides is often the most cost-effective means of controlling nuisance growth on large lake systems. We believe that incorporating carefully designed treatments as part of an integrated management plan at Candlewood Lake will be the most effective way to achieve the desired level of control of invasive Eurasian watermilfoil and preventing blooms of potentially toxic cyanobacteria.

PROPOSED MANAGEMENT AREAS

The areas shown in the map below are recommended for the 2017 treatment program:



Two management areas are proposed. The larger area is found in proximity to the New Fairfield Town Park and will extend from Knollcrest Road around Chatterton Point, past the Town Park and then around the northern end of Candlewood Isle. This area supported an estimated 21 acres of milfoil growth based on the 2015 mapping performed by CAES, but reportedly more milfoil growth was present in 2016. An estimated 40-50 acres will likely require treatment in this area to target all of the milfoil growth and overcome the effects of dilution. The whole area found within the polygon shown on the map represents about 150 acres where the water depth is greater than 20 feet deep. This is the area where we are proposing maintenance algaecide treatments to prevent cyanobacteria from forming.

The second management area is the Shelter Harbor cove which is approximately 10 acres in size. This whole cove would be targeted for milfoil treatment and the maintenance algaecide applications.

EURASIAN WATERMILFOIL TREATMENT

The objective of the milfoil treatment program will be to reduce the standing plant biomass and then evaluate whether or not the Triploid Grass Carp will graze more favorably on the milfoil regrowth. We believe that the Grass Carp will preferentially feed on the new growth of milfoil that will begin actively re-growing several weeks following treatment with a contact herbicide. A study effort to evaluate Grass Carp feeding within the treated areas is described in a subsequent section.

Eurasian watermilfoil is susceptible to several aquatic herbicides that are currently registered for aquatic use by the EPA and the CT DEEP. Reward® Herbicide (active ingredient diquat) is recommended for this treatment program at Candlewood Lake. Diquat is a fast-acting, contact herbicide that is effective for partial lake or shoreline treatments. Diquat has been effectively used for milfoil control at dozens of lake systems in Connecticut including Bantam Lake, Twin Lakes, Lake Lillinonah and Lake Zoar. Some of the advantages of using diquat for this treatment program are its rapid mode of action, the fact that it only targets the actively growing stem and foliage tissue and that the milfoil plants will begin to regrow after several weeks from the remaining root crowns, and its relatively low cost compared to other available herbicides.

Treatment would be scheduled and performed on a weekday in mid-May. There should be sufficient active milfoil growth by that time, and lake usage should still be low as this will precede the Memorial Day opening of the Town Park. In accordance with herbicide label, water use restrictions that will be imposed following treatment will include no use of treated lake water for drinking for 3 days, for domestic animal and livestock watering 1 day and for irrigation 5 days. While there are no swimming restrictions listed on the herbicide label, we believe that it is prudent practice to close treated areas to swimming on the day of treatment. The shorelines of treated areas will need to be posted with signs warning of the treatment program. Additional public notification will need to occur in the local newspapers and on the Town and other appropriate websites.

The herbicide application will be completed in one day by State certified aquatic applicators. Diquat is a liquid formulation that is diluted in mixing tanks onboard the treatment boats and the diluted solution is then evenly injected subsurface throughout the designated treatment areas using a calibrated spray system. At the label approved application rates, diquat does not have adverse impacts or pose unreasonable risk to non-target organisms, including Grass Carp. Diquat has actually been used to control bacterial gill disease in fish hatcheries at rates more than ten times higher than the maximum label rate used to aquatic weed control.

We recommend seeking permit approval to treat up to 50 acres along the shoreline from Knollcrest to Candlewood Isle and another 10 acres in Shelter Harbor Cove. Complete control of actively growing milfoil is expected within two-three weeks following treatment.

CYANOBACTERIA TREATMENT

Reportedly there were multiple occasions during the 2016 season when then New Fairfield Town Beach was closed due to elevated cyanobacteria densities. While longer-term nutrient control strategies continue to be evaluated, lake-wide solutions are still likely several years away. There are several approved algaecides that can be used to effectively reduce cyanobacteria densities. Treatments are usually most effective when initiated early, before the cyanobacteria densities are approaching bloom densities. A "trigger" for treatment can be established using cyanobacteria densities if sampling is done frequently enough, or possibly even by just using water clarity (i.e. Secchi disk) readings.

Most of the algaecide products that are currently registered for aquatic use are copper-based products. Copper sulfate is one of the oldest aquatic products and it had a long track-record of use as an algaecide. Most large lake and reservoir algaecide treatments performed in the Northeast still utilize copper sulfate. Several other copper complexes in liquid and granular formulations are available. Most

of these products are usually designed to stay in solution longer than copper sulfate or to improve penetration into some of the heartier and more difficult to control algal species. In addition to copper-based products, there are several hydrogen peroxide based algaecide products that claim to better toxicology profile's than copper, but they carry a premium price. Products that we recommend for consideration at Candlewood Lake include:

Algaecide	***Active Ingredient***	***Description***
Copper Sulfate	Elemental copper 25.2%	• Low cost • Registered for aquatic use since 1950s • Most direct large lake and reservoir treatment experience • Extensive use in potable water reservoirs • 0.06 – 0.08 ppm a.i. is typical application rate for cyanobacteria
SeClear G Algaecide and Water Quality Enhancer	Elemental copper 15%	• Proprietary formulation that acts as water quality enhancer by reducing phosphorus • 0.1 ppm a.i. - lowest labeled application rate • 5X cost of copper sulfate
EarthTec Algaecide/Bactericide	Elemental copper 5%	• Propriety formulation that provides for improved dissipation and cell penetration • Lower recommended copper use rates • Labeled as bactericide in addition to algaecide • 0.06 ppm a.i. - lowest labeled application rate • 3-4X cost of copper sulfate
GreenClean Liquid 5.0 Algaecide/Bactericide	Hydrogen dioxide 23.0% Peroxyacetic acid 5.3%	• Non-copper algaecide and bactericide • Less concern about toxicity from copper accumulation • No toxicity concerns for Grass Carp or other sensitive aquatic fauna • Claims to selectively target cyanobacteria at low application rates • 50x cost of copper sulfate • Possible solution for shoreline spot-treatment

Considering that only a small portion of the lake will be treated with algaecides and there will be considerable untreated water to reintroduce cyanobacteria or replace the phosphorus to fuel cyanobacteria growth, we feel that it would more advantageous to treat larger areas more frequently. We recommend planning for a series of four (4) separate copper sulfate applications to the two areas (160 acres total). Treatments will likely be scheduled and performed once algal densities begin to build in the water column. We recommend treating before the in-lake cyanobacteria levels exceed 20,000 cells/ml. Treatments would likely be performed every 3-4 weeks between June and September, with the actual timing linked to algal count data (if they are being performed regularly enough) or possibly to water clarity readings as measured with a Secchi disk. Treatments would be performed from a conventional sprayboat and a surface or sub-surface application would be conducted and guided by GPS.

In order to avoid potential impacts to Grass Carp, we would recommend using the lowest recommended label rate of copper sulfate 0.25 ppm (0.06 ppm a.i.) and only performing treatment outside of the littoral

zone, where water depth exceeds 20 feet. We identified approximately 150 acres extending from Knollcrest to the northwest shore of Candlewood Isle. The only exception to this would be the 10-acre Shelter Harbor Cove treatment area, which could serve as a test area to see how Grass Carp respond to the algaecide treatments.

There are no temporary water use restrictions associated with copper sulfate treatments, but we would recommend posting the shorelines and recommend closure of the Town Beach for the balance of the day of each application. We could work with the Town to schedule treatment of the areas closest to the beach for late in the day to minimize disruption.

MONITORING PROGRAM

In order to assess the effectiveness of the proposed herbicide and algaecide treatments and how they influence the Grass Carp program, we recommend performing some comparison monitoring in treated and untreated areas. Vic DiCenzo, Ph.D. in our Fisheries Department designed a monitoring program and would work with CAES and/or NEAR to gather the data during their regularly scheduled visits to the lake. A brief synopsis of the recommended monitoring program is detailed below:

Efficacy of Grass Carp Herbivory in Candlewood Lake

Background

The ideal aquatic plant management tool should provide cost-effective control with long-term impact, a high level of selectivity, and if possible have minimal or no negative side effects. The most widely used biological control in North America is the Grass Carp *Ctenopharyngodon idella, which* is native to East Asian Rivers. Grass Carp are able to consume large quantities of aquatic macrophytes. Under suitable conditions, adult Grass Carp will eat more than its own weight of plant material on a daily basis. However, Grass Carp introductions are not without risk. Most of the controversy with grass carp introductions was related to its possible natural reproduction. Additionally, Grass Carp are selective feeders and may feed on preferred native vegetation rather than noxious vegetation such as Eurasian Watermilfoil *Myriophyllum spicatum*. Additional research is needed on the efficacy of Grass Carp on Eurasian Watermilfoil.

Objective

SOLitude will work with the Town, CAES, NEAR and CT FirstLight and other assess Grass Carp herbivory on Eurasian Watermilfoil in areas treated with herbicides as well as areas not treated with herbicides.

Approach

We propose to evaluate Grass Carp herbivory using three exclosures in each of the two areas (total of six exclosures). Exclosures will be 4'x4' and the maximum depth of each exclosure will be 3'. We will measure percent coverage of Eurasian Watermilfoil as well as the ratio of plant height to water depth. We will compare these two measures to a similar-sized control area adjacent to each exclosure to assure that our comparisons have similar substrate and water quality. Assessments will be conducted once monthly in June, July, and August. We will analyze these data to compare Grass carp herbivory within both the treated and untreated areas as well as between the treated and untreated areas.

Scope of Services

- Study design
- Procurement of supplies
- Installation of exclosures
- Monthly assessments in June, July, and August 2017 (by CAES and/or NEAR)
- Data analysis
- Report preparation
- Presentation of results

PERMITTING

All elements of the Aquatic Management Program described in the preceding sections will require permitting with CT DEEP. The herbicide and algaecide treatments will require a permit from the DEEP Pesticides Program. The fish exlosures proposed for the monitoring program will require a permit from DEEP Boating Department.

Considering the potential complexity of public input that may be received on these two permit applications, we recommend requesting a pre-permit filing meeting with the appropriate Departments of DEEP, CT FirstLight, the Town and other project partners. Permit applications should be filed as soon as possible with the appropriate Departments to avoid any delays in permit issuance.

SUMMARY OF PROGRAM COSTS

Full description of the tasks and associated costs are provided in the preceding pages. Lump sum estimates are provided for the permitting and monitoring phases of the project. The treatment program costs are broken down by the Town Park area and the Shelter Harbor Cove area.

- Permitting with CT DEEP Pesticides Program and Boating Safety $2,500
- Monitoring Program – consulting services.....$9,000
- Treatment Programs

Treatment	**Town Park Cove**	**Shelter Harbor Cove**
Reward (Diquat) Herbicide for Eurasian watermilfoil control	Assumes treatment of 50 acres One application in mid-May $14,500	Assumes treatment of 10 acres One application in mid-May $3,250*
Copper Sulfate Algaecide Treatment for Cyanobacteria Control	Assumes treatment of 150 acres Four applications between June and September $19,920	Assumes treatment of 10 acres Four applications between June and September $3,240*

** Assumes Shelter Harbor Cove is treated on the same day as the Town Park Cove*

The total program estimate for all tasks listed above is $52,410.

Naturally, we are willing to modify the program in the best interest of the project and in order to meet the Town's available budget for this work. If you decide to proceed with this project we can prepare a contract for the agreed upon services or use the Town's standard contract if that is preferred.

SOLitude appreciates the opportunity to provide the Town of New Fairfield with a proposal for an Aquatic Management Program during the 2017 season. We are confident that the treatment and monitoring that we are recommending will provide some immediate relief to the nuisance Eurasian watermilfoil growth and cyanobacteria blooms and will provide valuable information on how herbicide and algaecide treatments can be safely utilized as part of an integrated management program on Candlewood Lake. Please do not hesitate to contact us if you have any questions or require any additional information at this time.

Sincerely,

/S/

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