



CANDLEWOOD LAKE AUTHORITY

Member Municipalities: Brookfield • Danbury • New Fairfield • New Milford • Sherman

PO BOX 37 • SHERMAN, CT 06784 • P (860) 354-6928 • F (860) 350-5611

Minutes of Regular Meeting

June 10, 2020, 7:30PM

via ZOOM due to COVID-19

Attending:

P. Schaer Sherman
D. Cushnie Sherman (*joined 7:42*)

J. Main New Fairfield
J. Archer New Fairfield
B. Licht New Fairfield

M. Gaffey Brookfield
J. Murphy Brookfield
W. Lohan Brookfield

C. Robinson Danbury
D. Rosemark Danbury

M. Toussaint New Milford
S. Kluge New Milford (*joined 8:49*)
J. Wodarski New Milford

M. Howarth, Executive Director
J. Neil Stalter, Director of Ecology and Environmental Education
J. Usher, CLA Administrative Coordinator
R. Barnard, Chief, CLAMP

Recorder: J. Usher

Guests: There were 2 guests

Chairman, Phyllis Schaer called the regular meeting of the Candlewood Lake Authority to order at 7:36pm. This meeting took place via Zoom video conference due to the COVID-19 pandemic.

Public Comment:

Greg Bugbee of CAES presented his 2018/2019 weed mapping results via phone.

Consent Agenda

Jeff Main made a motion to approve the consent agenda, seconded by Dan Rosemark with all voting in favor.

Absent:

E. Siergiej Danbury

CANDLEWOOD LAKE AUTHORITY MARINE PATROL

Chief Ron Barnard reported one jet ski injury last Sunday. The patrol officers are using the COVID supplies provided. Training for new hires by DEEP is still on hold due to COVID. There has been 1 rainout, so far.

Chairman's Report

Ms. Schaer thanked all the delegates for participating in the Zoom meetings during this time. She advised the board of recent Equipment & Facilities position resignation during probationary period. This position will be re-evaluated .

Vice-Chairman's Report: Vice Chairman, Mark Toussaint
Will report in Watershed.

Treasurer's Report:

Bill Lohan gave an overview of the Budget vs Actual Year to Date for May 2020. We received several large donations: We received the \$10,000 check for the anonymous grant towards the used patrol boat purchase.

Admin 91%

E/F 54%

PA 7%

PS 81%

WM 71%

Overall expense 75.9% of budget

Mr. Lohan made a motion to approve the budget fund transfers dated June 10, 2020 totaling \$4,669.03, seconded by Ms. Schaer with all voting in favor.

Mr. Lohan plans to discuss our expenses being done on an accrual basis with the auditor. Ms. Schaer will confirm with the Town of Sherman. Mr. Main will check with the Town of New Fairfield. Mr. Rosemark will check with the City of Danbury.

COMMITTEE REPORTS

Public Safety Committee:

Joe Wodarski said that Chief Ron Barnard covered everything.

Equipment/Facilities Committee:

Doug Cushnie provided an update on the Equipment and Facilities season. He noted that the Sherman base is in good shape and it is relatively quiet now.

Public Awareness Committee:

Marianne Gaffey discussed the zebra mussel press release. Stencils on ramps will be repainted if any delegates are interested, signs will be checked. The Not Wanted Campaign is nearly done which will be used on social media and possibly a mobile billboard. A Zebra Mussel monitoring station demonstration will be filmed tomorrow. Sponsorships are coming in. A small exclusive

group committee is being formed for sponsorships and another small subcommittee is being formed to work on a new website. Magnets for 2020 are in production.

Watershed Management Committee:

At the last Watershed Management meeting, Larry Marsicano gave a 1– hour presentation regarding the 2019 water quality annual report. The comparison of two invasive weed monitoring plans was reviewed. WM will reconvene and address at the June 17th meeting. Neil Stalter provided an update on the Lake Management Plan. Steve Kluge has been assisting Mr. Stalter with water quality testing and doing additional testing himself. Mr. Kluge also discussed an app that you can use on your phone which queried local weather and other pertinent data to record Secchi measurements. Mr. Stalter will re-send the link that Mr. Kluge provided to the delegates.

NEW BUSINESS

Neighborhood Grant Program – we might apply for this grant to benefit the Sherman base. Ms. Schaer will work on the grant application and offered delegates to email her with any suggested improvements for the Sherman facility.

ADJOURN

Mr. Main made a motion to adjourn, seconded by Ms. Gaffey with all voting in favor.

The meeting ended at 9:00pm.

Respectfully submitted,



Marianne Gaffey, Secretary
Jeannine Usher, Administrative Coordinator
r/b/mh/ps

These minutes are not considered official until they have been approved at the next regularly scheduled meeting of the Candlewood Lake Authority.



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June 10, 2020
Executive Director
Mark Howarth

Monthly Report

COVID-19

I continue to work remotely, primarily, spending some time at the Sherman Base/on the water.

2020 Season: The boating season is under way on the lake. Typically lake activity ramps up on Memorial Day weekend, though this year many noted that activity on the lake started earlier because of changes in outdoor recreation due to COVID-19. We are continuing to monitor the boating activity and recreational use of the lake this year, as we understand this year may be different than past summers.

- **New Patrol Boat:** The used Aquasport we purchased is in service, fully equipped with lights and sirens and lettered for identification of the Marine Patrol. I have been told of very positive reviews from those who have driven the boat and we are happy to have it in our Patrol fleet for 2020.
- **CLA Boats In:** All of the CLA boats are in the water and functioning well. The Patrol has been using four vessels on the water this season in order to help implement COVID health safety measures.
- **PPE:** We have been able to source the necessary Personal Protective Equipment for our Marine Patrol and staff, including KN95 masks, surgical masks, hand sanitizer, disinfecting wipes and gloves. We appreciate everyone who helped secure those essential items for our Marine Patrol Officers. The CT DEEP, Town of New Milford, State Reps Harding and Allie-Brennan and the New Milford Big-Y, as well as our staff, all pitched in to pull this together.

- **New PFDs:** We have purchased 4 new self inflating PFDs for the CLA Marine Patrol officers to use while on Patrol this season. This allows each officer to have their own vest to use this season.

IT Upgrades

- We are in the process of upgrading some of our IT capabilities at the New Milford office. We had researched and looked into options to provide us with the best functionality and ease of use. The storage and remote access solution we are implementing will allow us to take advantage of some additional features of our current software license, and at the same time provide some cost savings for us through the elimination of two other monthly services we have been using. With our staff working primarily remotely due to COVID-19, this upgrade should provide our staff with a better, faster and more reliable remote access solution.

Not Wanted Campaign

- We have provided our designers with the final edits for the Not Wanted campaign to help educate boaters about Aquatic Invasive Species and look forward to rolling this program out shortly to the public.

Zebra Mussel in Candlewood

- FirstLight notified the CLA and CT DEEP that a single juvenile zebra mussel was located in Candlewood Lake on May 22nd during their annual contracted search of 10 dive site locations.
- The mussel was reported to have been in 13 feet of water, off the tip of Vaughn's Neck, and not believed to have been of reproductive age and the mussel was removed.
- No other zebra mussels were found at that dive site or any of the other 9 search sites on the lake
- We are working to better understand this finding and address possible new monitoring, education and aquatic invasive species prevention strategies.



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J. Neil Stalter

Director of Ecology and Environmental Education

Candlewood Lake Authority

Re: June Meeting: Monthly Report

Date: 6/10/2020

- I am still working almost entirely remotely due to the Covid-19 Pandemic, and am focusing on tasks that I can accomplish from home.
- We have received the second version of the “not wanted campaign” from KatArt and it’s really turning out fabulously!
 - We sent back a number of updates, but we feel it’s very close to being in a great spot. Once the hydrilla poster is finished, it should be pretty easy to make posters for other invasive species with information tailored to them.
- Work on the Lake Management Plan is continuing! I’ve attached to this report the initial history and existing management plan history sections to this report for the board to take a look at! These sections are definitely subject to change and additions, and will be made nicer with pictures, formatting, edited language, references, etc. but this is the current draft version!
 - The thorough review of all the management plan and research history on the lake has taken a while, because there are a TON of past documents and publications about the lake and its management, and I’m certain we will be adding more as we go.
 - Work on the Candlewood hydrology and nutrient budget is underway, and we will be reaching out to our stakeholders to begin work on component sections of the LMP in the coming days.
- We have created a pre-summer newsletter that is ready to go out, but we are awaiting the right time to send it.
 - The theme of the newsletter is “what are we working on while remote.”

- The first month of water quality monitoring went off great! Thank you to Steve for driving the ARK and helping with aspects of the monitoring while we kept our social distance.
 - We are still awaiting the lab results from hydrotech, at which point I will finish the monthly WQ summary I have begun and we will give that to the board and post it on our website.
 - Anecdotally, the results look unsurprising. The lake hasn't stratified yet, but you can see a thermocline beginning to form. Secchi clarity was general in the mid 2m range, which isn't out of the ordinary for May, as the plankton community is usually dominated by diatoms and golden algae, which can make the water appear darker and brownish.
 - Larry Marsicano gave a presentation at watershed on his findings for the water quality monitoring for the 2019 season at the watershed meeting last month. We're hoping to schedule another presentation for the full board at a later date.



- I sent out an email to the historic Zebra Mussel hotel volunteers to begin that program again this year. If you are interested in joining the program, we can get you all kitted up very easily to help monitor for Zebra Mussels in the lake!
- We emailed a Eutrophication educational article to our email list to give people an idea of what the term means and how they can help prevent it in the lake.
- I am preparing to go out next week to conduct our invasive plant monitoring at the boat launches.

**Candlewood Lake &
Squantz Pond
Lake Management Plan**

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Candlewood Lake History
Existing Management Plan History
Candlewood Lake Hydrology
Areas of Critical Need
 Watershed Inputs.....
 Erosion
 Stormwater
 Hydrologic Inputs (Streams)
 Salt Pollution
 Septic Systems
 Ongoing Shoreline Development (e.i. Vaughn’s Neck)
 Internal Lake Ecology
 Fishery
 Plant Community
 Littoral Zone Community
 Planktonic Community
 Invasive Species
 Sustainability
 Internal Loading
 Education and Outreach
 Climate Change Resiliency
 Recreation and Public Safety
 Overcrowding
 Public Safety
 Boating Courtesy
Goal Setting and Improvement Strategies
 3 - Year Goals
 5 - Year Goals.....
 10 - Year Goals
 Lake Overlay Zone
LMP as a “Living Document”
Conclusion

Candlewood Lake History

The story of Candlewood Lake begins more than a quarter of a century before its creation in 1926-1928. At the dawn of the 20th century Connecticut lawyer, entrepreneur, and political boss John Henry Roraback was busy developing railways, lime quarries, and hydroelectric projects throughout western Connecticut. By 1905 he had combined several small hydroelectric companies into the Berkshire Power Company. Recognizing the power generating potential of the Rocky River (a tributary of the Housatonic that flowed in the valley that is today occupied by the northeast arm of Candlewood Lake), Roraback successfully lobbied the state legislature to create a special charter granting him power rights to the Rocky River. In 1905, Roraback created the Rocky River Power Company, and in 1909 he received permission to build dams along the northern reaches of the Housatonic. No development was done on the Rocky River itself until 1917 when Roraback gained the financial backing of the large Philadelphia-based utility holding company, the United Gas and Improvement Co. (UGI). UGI acquired and combined several power companies along the Housatonic, including the Rocky River Power Company, into the Connecticut Light and Power Company (CL&P) with Roraback as director and vice-president. In 1919 CL&P completed the Stevenson Dam on the Housatonic (impounding Lake Zoar behind it), and that same year, the Connecticut legislature gave CL&P the right to dam the Rocky River and to divert water from the Housatonic up into the Rocky River valley.

On July 15, 1926, with Roraback now company president, CL&P's Board of Directors approved a plan to dam the Rocky River, pump water up from the Housatonic to create a storage reservoir behind it, and to release that water back down the Housatonic to generate electric power during periods of high electric energy demand. This would become the first "pumped storage" hydroelectric project in the United States (the first being built in 1907, in Switzerland).

Before being flooded, the Rocky River was a meandering Housatonic tributary, draining ponds and smaller tributaries as it wound in and out of rocky ridges on its way north to join the Housatonic just north of the center of New Milford. Forests and farmland covered the valley floor, and the little town of Jerusalem was nestled in what is today the southern end of New Milford Bay. Even in colonial days the steep gradient of the Rocky River's northern end was recognized as an important resource, and it was harnessed to furnish power for several small mills. With the water ponded behind the dam there would be 200 feet of vertical drop through the penstock to the generators.

The plans moved forward quickly and the company bought the valley land and built several dams to contain the water. The largest, at the north end, measured 100 feet high and 952 feet wide. On February 25, 1928, the fill-up began and in a mere seven months, Candlewood Lake was born.

All the valley land below the 440 foot elevation contour was targeted as lake land. The company contracted with the 35 families living in the area to be flooded. Though the company had the power of eminent domain they bargained with the families and paid fair pre-lake prices. Only a few individuals refused to sell, so some property inundated by the lake is still privately owned.

A total of 5,520 acres of basin had to be prepared for flooding, including four ponds: Squantz, Barse, and Creek in New Fairfield, and Neversink overlapping the Danbury-New Fairfield line. In the clearing operation about 100 buildings, including homes, barns, schools, and churches, were demolished or moved. Workers were paid \$1 per body to remove gravestones and remains from small cemeteries for reburial.

Large crews of Maine and Canadian woodsmen temporarily lived in four work camps throughout the basin, and together with local men they chopped down timber and brush below the 440 elevation contour line with only muscle power. The wood was free for the carting, but most of it was burned with fires often blazing day and night. There was a rumor that the most unwieldy trees were chained to the bottom and left to let nature take its course.

Construction of the plant, dam and smaller dikes to build up the low points was carried out by the U.G.I. Contracting Company of Philadelphia, the same UGI that still owned CL&P. A construction camp with quarters for 400 men was set up near the proposed dam. This temporary village had four bunkhouses, a bath house, store, bank, bakery, and barbershop, all placed along facetiously named streets. Locally the camp was known as UGI-ville. In about 17 months some 920 men completed the entire job at a cost of \$5,000,000, a bargain even in 1920s currency.

Pumping Housatonic water up through the 13 ft. diameter penstock started on February 25, 1928. By the end of the year the lake surface had reached 429 feet above sea level and the plant went into operation. This new body of water, now the largest lake in Connecticut, was nestled among rolling hills and boasted 61 miles of shoreline rife with numerous coves and islands. The lake was called Candlewood Lake.

CL&P became an independent company in 1941 when UGI was forced by federal legislators to divest itself of its holdings outside Pennsylvania. In 1966 Northeast Utilities was created to serve as a utility holding company consisting of Western Massachusetts Co., Connecticut Light and Power, and Hartford Electric Light Co. This consolidation was the latest step in a history of cooperation between these companies dating back to 1925, when the three utilities first engaged in joint power-pooling and long-range planning. CL&P's chairman and chief executive officer became president and chief executive officer of Northeast Utilities.

In July 2006, Northeast Utilities sold its five hydroelectric power plants on the Housatonic River and the three big lakes that are part of the system -- Candlewood, Lillinonah and Zoar --to the New Jersey-based private equity firm Energy Capital Partners. Energy Capital Partners then set up a new subsidiary company - FirstLight Power Resources - to own and manage those plants. FirstLight Power remains the owner and manager of Candlewood, as well as the entire Housatonic River system, to this day.

History of Public Safety, Management, and Environmental Protection of Candlewood Lake

After the lake's formation in 1928, the lake quickly became a popular tourist destination and summer location. The land that surrounded the area now submerged by the waters of Candlewood Lake was comprised of mostly farmland with very sparse development and very little forested area. The true value of this land wouldn't be discovered until later though, with early real estate developers selling small plots for a few hundred dollars -- while many farmers in the area held onto their plots which had just become "lake-front property." This would lead to the Candlewood Lake community we know today -- thousands of homes, many of which large family homes supporting year round residents, flanking the shore of our beautiful lake. This development also comes with on-site sewage in the form of septic systems and private wells. As development hastened, and the lake became a more popular destination for tourism and recreation, it became clear that there would need to be a dedicated organization to manage safety and protection of the lake and the people who use it.

Thus, in 1972, the five towns surrounding the lake (Brookfield, Danbury, New Fairfield, New Milford, and Sherman) decided that there was a need for a lake patrol on the water to keep boaters safe and enforce boating law. Out of this need was born the Candlewood Lake Authority, an organization made up of patrol officers who function under the authority of the Connecticut Department of Energy and Environmental Protection to enforce boating law on the lake and assist boaters on the water. It wasn't until a number of years later, that the CLA was also tasked with environmental protection as water quality began to degrade more rapidly due to increasing development and usage.

Once tasked with environmental monitoring and protection of the lake, the CLA began a long term monitoring program in 1985 which continues today. This program involved taking profiles and water samples from 4 locations on the lake, and 1 location on Squantz Pond. The metrics measured as a part of this monitoring include: Temperature, pH, Dissolved Oxygen, Secchi Depth, Conductivity, Chlorophyll-a, Phosphorus, Nitrogen, and important base cations, among other items we will discuss later in this document. The CLA also began educating the community on best practices for lake protection, and became the experts on protecting Candlewood Lake through thorough research and education. In an effort to organize the CLA efforts to protect the lake, the "Candlewood Lake Water Quality Management Program Plan"

was written in 1985 and covers many plans in specific areas of lake protection and management. It is this 1985 document that we are “officially” updating with this lake management plan, however there are a great number of other management documents and research that are being incorporated in this plan. For a list of those, refer to the “Existing Management Plan History” section of this plan.

The Candlewood Lake Authority is not the only organization with an interest in management of the lake – as the owners of the Lake have a clear financial interest in preserving the usefulness of the lake as a hydropower resource, but are also federally regulated to protect certain aspects of lake and ecosystem health. These regulations come from the agency FERC (The Federal Energy Regulatory Commission). This agency grew out of the Federal Power Commission which was formed in 1920, and eventually became the FERC in 1977. The Federal Power Commission oversaw all hydropower projects in the United States, which included Candlewood Lake during its creation and upon its completion. A license for ownership and use of the lake, containing many requirements that the owners of the hydropower project must follow, was submitted and approved by FERC in 1980. In 1999, Northeast Generation Services Company, the owners of the lake at that time, applied for a new license, which was granted to them in 2004. FirstLight is now the owner of the lake, and thus are the holders of that same license. This license outlines a number of requirements for managing the lake as a hydropower resource, but also outlines a great number of required management documents that drill down on specific requirements for environmental protection of the lake that the owners of the hydropower project must undertake. These documents include a Shoreline Management Plan, a Recreation Management Plan, and a Nuisance Plant Monitoring Plan, among others. For a compendium of these and other management documents, please refer to the “Existing Management Plan History” section of this LMP. These documents undergo their own update schedule as prescribed by the FERC. The License undergoes an update every 40 years, and thus the next is scheduled for 2044.

We will not get into specific management actions in this section, as the current landscape of each area of need will be contained within its subsequent section within the lake management plan. Through extensive research around the world, it has become clear to lake managers everywhere that lakes and their ecosystems are incredibly complicated systems. It can be difficult to change certain aspects of a lake’s fragile balance without altering another (for a relevant example, see how increasing water clarity can lead to an increase in aquatic plant growth). This Lake Management Plan, while meant to be a synthesis of both the current state of Candlewood & Squantz Lake management, as well as a plan for the future, this information will necessarily change based on the state of the lake moving into the future. For more information on how we will keep this plan relevant and up to date, please refer to the “LMP as a ‘Living Document’” section.

Existing Management Plan History

Below is a compendium of existing management plans, research, and other documents that are relevant to the creation of this lake management plan, and have been researched and synthesized for their inclusion in different aspects of the plan. Each will be referenced when necessary in relevant sections of the plan to give context and information regarding the current state and strategies for protecting Candlewood Lake and Squantz Pond.

This section can be thought of as an annotated bibliography, organized by the date of publication of each document. For the purpose of this plan, only relevant documents that have not been replaced by more recent versions of the same document have been included below (For example, the Shoreline Management Plan that was completed in 2013 was not included below, and instead the more recent 2019 Shoreline Management Plan was included. However, information from the 2013 plan was used both in the update of the 2019 plan, as well as to inform the creation of this LMP and some of its strategies). For the original copies of these documents, please contact the Candlewood Lake Authority and we can supply a copy that we have on file.

- I. Candlewood Lake Water Quality Management Program Plan, Jonathan T. Simpson, Candlewood Lake Authority, January 1985.
 - a. This is the original “Lake Management Plan” created by the Candlewood Lake Authority to function as a guiding document for specific projects and ideas for protection of Candlewood Lake. Some projects included in the plan include a CLA information Center, a CLA hotline, a lake monitoring framework, an aquatic invasive weed survey, a septic leachate detection survey, lake-bottom barriers, waterfowl management, and many more. Many of these projects have been applied and are currently in place in some form today, some were unfeasible and thus were not pursued, and some were replaced by other more relevant issues and strategies. This document also goes into potential budgetary issues for the CLA and certain projects. Due to the age of this plan (35 years old) and the lack of updates made directly to the document, we are replacing this document with the more relevant Candlewood Lake and Squantz Pond Lake Management Plan.

- II. An Historical Account of Water Quality Changes in Candlewood Lake, Connecticut, Over a Sixty Year Period Using Paleolimnology and Ten Years of Monitoring Data, Laurence J. Marsicano et al., Candlewood Lake Authority, Connecticut College, Western Connecticut State University, 1995.
 - a. This is a peer- reviewed research paper that was subsequently published in the Journal Lake and Reservoir Management in 2009. The paper reviewed a sediment

core sample taken from Danbury Bay, in lake monitoring results from 1985-1995, and 1990 aerial photographs establishing different land use categories. The sediment cores were analyzed to decipher nutrient and conductivity levels, as well as phytoplankton community composition from 1930-1985, at which point analysis of the in-lake monitoring is used to compare how these metrics changed from the lake's creation in 1928. The paper establishes a modest improvement in nutrient and trophic levels in the lake from 1985-1995 while noting an increase in conductivity levels in the water during the same time period. The paper also establishes a notable degradation in water quality from a high in 1950 until monitoring began in 1985 when we began to see modest improvements due to advocacy and policy work. Paper also establishes increased development and land use/clearing within the Candlewood/Squantz Watershed.

- III. Economic Evaluation of Candlewood Lake, Sara T. DeLoughy PhD, Laurence J. Marsicano, Candlewood Lake Authority, Western Connecticut State University, 2001.
 - a. This document uses a method of valuation used for environmental resources to make estimates of the economic value of certain aspects of Candlewood Lake, and what those values would be following environmental degradation. Based on different levels of degradation, values of homes could be reduced substantially which would have the knock on effect of reducing property tax values for the municipalities surrounding the lake. Surveys were also employed to establish the values of certain activities (boating, swimming, fishing, etc.). While the dollar values are no longer accurate due to inflation and changing economics in the area, the principle and percent changes in value are still relevant to managers' assessment of the value of Candlewood Lake and the services it provides the local community. Note that this does not include an economic valuation of the power generation capacity of the lake and how that might change due to environmental degradation.

- IV. Action Plan for Preserving Candlewood Lake, Larry Marsicano, Harold Mayer, Candlewood Lake Authority, 2002.
 - a. This document involved the participation of a number of members of a "special advisory committee" representing those organizations with a direct interest in the protection of Candlewood Lake. The action plan presented a review of current zoning and land use standards of the five towns within the Candlewood and Squantz watershed in an effort to develop strategies to help mitigate nonpoint source nutrient runoff that was polluting the lake. This review of current standards and regulations in each municipality was sent, along with recommendations for improvements each town could make to improve nutrient pollution into the lake, to each of the five municipalities. The comprehensive nature of this review, as

well as the recommendations developed and the participation of concerned stakeholders make this a natural stepping stone between the 1985 Water Quality management plan, and this lake management plan. Thus, this document will be utilized heavily in this LMP's discussion of nonpoint source pollution in each subsection of the "Watershed Inputs" section of the LMP.

- V. Order Issuing New License Projects: p-2576 and p-2597, Federal Energy Regulatory Commission, June 2004.
 - a. This document contains the license held by the owners of the lake (FirstLight Power at the time of this writing) and contains many of the rules and regulations governing how the utility company manages and monitors the hydropower resource. This document also contains the descriptions of a number of other required documents relevant to the management of Candlewood Lake, and which are included in this Lake Management Plan as resources. This license will be up for renewal in the year 2044.

- VI. A Blueprint for Candlewood Lake: Management Planning Guide for Candlewood Lake FERC Project Number 2576, Candlewood Lake Focus Group, Candlewood Lake Authority, March 2005.
 - a. This was a substantial submittal to Northeast Generation Company and the FERC in preparation for the Recreation Management Plan creation by the owners of the lake. In it is contained substantial information about the position of critical lake stakeholders on recreational issues on Candlewood. This document also includes language from the 2004 license to justify management actions on Candlewood Lake, and language that, in particular, should be included in the management plan that would eventually be approved in September of 2006. While some of these suggestions would be taken into account, and some would not, this document lays out clear priorities held by critical stakeholders regarding Candlewood Lake recreation and land management. Some of these areas include buffer requirements, boating "user conflict", recreation carrying capacity, land use, Candlewood Lake education center, and permitting shoreline property land use, among many others. This also provides a useful resource for this LMP as it incorporates the input of many stakeholders representing different engaged organizations.

- VII. Housatonic River Hydroelectric Project FERC No. 2576 Recreation Plan & Order Modifying and Approving Recreation Plan Under Article 408, Northeast Generation Company & FERC Respectively, June 2005 & September 2006 Respectively.
 - a. Note that for all FERC approved documents, the "Order modifying and approving" the document will necessarily be included, as this document contains

changes and amendments made to the original submittal, while still approving that original document for use. The Recreation Plan is required of the owner of the lake as outlined in the 2004 license (article 408). These two documents contain the plan for upgrading and maintaining recreational facilities for public use on Candlewood Lake, as well as on the rest of the FERC regulated hydropower project. The recreation plan discusses overcrowding and “user conflict” on Candlewood Lake without laying out any mitigation strategies. FERC suggests exploring this further in the Shoreline Management Plan development, which will eventually lead to the creation of the “Overcrowding Plan” which has been included as a reference in this LMP.

VIII. Nuisance Plant Monitoring Plan Candlewood Lake, and Lakes Lillinonah and Zoar & Order Modifying and Approving Nuisance Plant Monitoring Plan Pursuant to Article 409, Northeast Generation Company & FERC Respectively, June 2005 & February 2006 Respectively.

- a. Note that for all FERC approved documents, the “Order modifying and approving” the document will necessarily be included, as this document contains changes and amendments made to the original submittal, while still approving that original document for use. The Nuisance Plant Monitoring plan lays out the methodology the owners of the lake must use during their required annual monitoring of Candlewood Lake for invasive aquatic weeds. This document was a requirement of the 2004 License (Article 409). Among specific requirements for the monitoring, this document and the order modifying and approving it describe the annual meeting of a technical committee comprised of the lake owner, CT DEEP, and the lake authorities to discuss the annual results and oversee the monitoring. The annual reports from this monitoring will also be referenced in the lake management plan to illustrate how the plant community is changing over time.

IX. Investigations into Eurasian Watermilfoil Management by Deep Drawdown at Candlewood Lake, Larry Marsicano, Candlewood Lake Authority, February 2009.

- a. This report from the Candlewood Lake Authority observes the drawdowns conducted from 1985 through 2007 and measures their efficacy with both quantitative and anecdotal data. Starting in 1985, for roughly a decade, a deep drawdown occurred biennially to help manage the aquatic weed problem on Candlewood Lake. This began to occur less consistently in the late 90’s through the 2000’s and the paper observes that in years where a deep drawdown did not occur as substantially as possible, or did not occur at all, there were clear indications of an overabundance of aquatic plants in the lake. This leads into a discussion of the characteristics of what makes a drawdown effective.

- X. An Examination of Recreational Pressures on Candlewood Lake CT, Larry Marsicano, Candlewood Lake Authority, July 2009.
- a. Using the 2009 flyover data, as well as survey data, fishing tournament frequency, accident frequency, and more, this report drills down on the boating density and recreational pressures on the lake in order to decipher the lake's true carrying capacity. Calculating a lake's carrying capacity and boating density has been difficult for lake managers around the world, but using all of the information at the CLA's disposal, this report is able to determine that the lake often exceeds a safe level for boating. This conclusion is backed up by the responses to surveys of the local community regarding their usage of the lake. This report was eventually submitted to FERC, and would be cited in the development of the Shoreline Management Plan, as well as in the development of the Overcrowding Plan, both of which are included as references in this LMP.
- XI. Candlewood Lake Water Quality Protection Issues, King's Mark Environmental Review Team, August 2009.
- a. The King's Mark Environmental Review team studied Candlewood Lake's watershed and land use, as well as the action plan created by the Candlewood Lake Authority to assess whether the action plan sufficiently discussed possible land use changes and zoning regulations to protect the lake, and if there was any missing info. This report went to the CLA and to the town of New Fairfield, as it was New Fairfield's desire to assess how the zoning changes would actually improve nonpoint source pollution into the lake. The review largely corroborated the CLA's assessment made in the 2002 Action Plan, while adding a number of possible recommendations for further development of land use categorization and zoning regulations. These recommendations will be referenced and included in this LMP.
- XII. Interim Report on the Findings and Recommendations of the Candlewood Lake Authority Zebra Mussel Task Force for the Prevention of Introduction and Control of Zebra Mussels in Lakes Candlewood, Lillinonah, and Zoar, Candlewood Lake Authority, October 2011.
- a. Following the discovery of Zebra Mussels in the Housatonic River, the CLA and other stakeholders formed the Zebra Mussel task force to discuss the best methods to prevent the invasion of Zebra Mussels in Housatonic River system lakes. This report outlines a number of actions to be taken to help prevent and monitor for potential zebra mussel invasions. Some of those actions include: increasing monitoring capabilities in lake and at boat launches, increasing educational

materials and signage, researching the development of a boat launch inspection program, SCUBA surveys, coordinated media releases, and more. The report also discusses how hospitable the ecosystem in these lakes are for Zebra Mussels based on dissolved Ca²⁺ levels, substrates for growth, and drawdown frequency and depth.

- XIII. Evaluation of the Effects of Winter Water Level Drawdown on the Ecology of Candlewood Lake, CT, George Knoecklein, Northeast Aquatic Research LLC, May 2012.
- a. This report was completed by Northeast Aquatic Research for the Town of New Fairfield to evaluate the winter deep drawdowns on Candlewood Lake and how they are affecting the plant community, water quality, and how effective they are at eliminating nuisance plants in the lake. The report also examines how water quality metrics have changed over time in the lake, and discusses the fish community, their nesting requirements, and how that has changed over time as well. This report discusses some possible causes of water quality degradation seen in the lake over time, while also assessing the factors necessary to create a successful deep drawdown that eliminates milfoil from the mid-depth directly affected by deeper dewatering. Although the report finds that years following a deep drawdown generally have higher nutrient measurements, the cause of those higher measurements is unclear and could be attributed to a number of factors.
- XIV. Continued Monitoring of Zebra Mussel Introductions from the Housatonic River in Lakes Candlewood, Lillinonah and Zoar: A Pilot Program – 2012, Stephen M. Wagener, Edwin Wong, et al., Western Connecticut State University, Candlewood Lake Authority, January 2013.
- a. There were two similar documents, both describing the monitoring completed in lakes Candlewood, Lillinonah, and Zoar to monitor for zebra mussel veligers in-lake. The methodology used is cross-polar microscopy, which allows easy identification of zebra mussel veligers which show a “Maltese-cross” pattern when viewed under cross-polar light. This monitoring showed an increasing number of veligers discovered in Lillinonah and Zoar, but none in Candlewood Lake. The monitoring of veligers using cross-polar microscopy continues to this day on Candlewood Lake.
- XV. Options for Eurasian Watermilfoil Management in Candlewood Lake, Candlewood Lake Authority, October 2013.
- a. This report discussed a number of alternative options to controlling Eurasian Watermilfoil on Candlewood Lake in an effort to decipher which would be the most effective while also being the most cost effective. Options evaluated include:

herbicide treatments, mechanical harvesting, and biological controls including milfoil weevil and triploid grass carp. This report was sent to the municipalities surrounding Candlewood Lake, and it was this review that provided the initial evidence that Triploid Grass Carp would likely be the best option for Candlewood Lake. Those carp would eventually be deployed in the lake, and the program is still ongoing as of this writing.

- XVI. Candlewood Lake Overcrowding Plan & Order Approving Boat Overcrowding Plan, FirstLight Power & FERC respectively, March 2014 & November 2014 Respectively.
- a. Note that for all FERC approved documents, the “Order modifying and approving” the document will necessarily be included, as this document contains changes and amendments made to the original submittal, while still approving that original document for use. The overcrowding plan was required of the owners of Candlewood Lake following the approval of the 2013 Shoreline Management Plan. The Overcrowding Plan outlines required actions of the owners of the lake to help mitigate overcrowding on Candlewood. The critical action to achieve this goal is limiting private, marina, and community dock expansion. The plan also outlines how the carrying capacity and current crowding levels on the lake using flyover photographs and boat counts. The order approving the plan makes virtually no modifications to the original plan.

- XVII. A Laboratory Examination of the Effectiveness of a Winter Seasonal Lake Drawdown to Control Invasive Eurasian Watermilfoil, Thomas Lonergan, Laurence Marsicano, Mitch Wagener, et al. Davenport University, Candlewood Lake Authority, Western Connecticut State University, September 2014.

- a. This was a laboratory experiment conducted to examine the conditions necessary to kill the root systems of Eurasian Watermilfoil during a deep drawdown (dewatering) of the soil. The study found that are extremely cold temperatures, only a short period of dewatering is necessary, however in more mild temperatures, or while covered in a layer of snow pack, more consistent and long term dewatering might be necessary. However, it goes on to say that in-lake conditions require these conditions naturally, and thus are subject to climactic variations.

- XVIII. Assessment of Long Term Trends for Management of Candlewood Lake, Connecticut, USA, P. Kohli, P. A. Siver, L. J. Marsicano, et al., Connecticut College, Western Connecticut State University, Candlewood Lake Authority, July 2017.

- a. This study uses the Candlewood Lake Authority monitoring database from 1985-2012 to establish long term trends statistically and examine how the lake has changed over time in response to continued watershed development and increased

usage. This study establishes a modest improvement in trophic condition over this time, attributing the improvement to increased management and advocacy work, as well as annual winter drawdowns. The study also points out a steady increase in the level of dissolved salts and conductivity in the water, likely as a response to increased deicing treatments and road salt applications in the watershed.

XIX. Wind induced impacts on hypolimnetic temperature and thermal structure of Candlewood Lake (Connecticut, U.S.A.) from 1985-2015, Peter A. Siver, Laurence J. Marsicano, et al. Connecticut College, Aquatic Ecosystem Research, May 2018.

- a. This paper explores the hypothesis that climate change caused decreases in wind speed could be affecting Candlewood Lake's ability to mix. Namely, that the lower average wind speed in recent years is increasing the strength of the thermocline in the lake and preventing mixing of the epilimnion and hypolimnion. The relationship of this stronger thermocline and the planktonic community and trophic status is explored, including as a possible explanation for increased algal bloom frequencies in lakes around the country.

XX. Shoreline Management Plan & Order Modifying and Approving Updated Shoreline Management Plan Pursuant to Article 407, FirstLight Power Resources & Federal Energy Regulatory Commission Respectively, March 2019 & August 2019 Respectively.

- a. The Shoreline Management Plan (SMP) is a requirement of the 2004 License (article 407) that requires the owners of the lake to create a document outlining their management of the lake's shoreline including preservation, management of development, and land use classification. The first Shoreline Management Plan was approved in 2013, and required a 6 year update. This 2019 SMP represents the update to that plan, and was approved later that same year by the FERC. The SMP outlines a number of requirements the power company can leverage onto homeowners' whose property abuts the FirstLight owned shoreline property, and who regularly use that property for lake access. These requirements include applications and fees for development, limits and regulations of that development, revegetation and natural preservation requirements of the shoreline, and management of recreational development (docks, moorings, etc.). The order modifying and approving the SMP outlines a number of points and clarifies the meaning and intent of the FERC's oversight of the SMP as a document. There will be an annual report of all "Significant activities" (i.e. substantial development) on the shoreline that year. The information contained in the SMP is critical for this Lake Management Plan to reference in regards to shoreline preservation and erosion prevention.

XXI. Candlewood Lake Brookfield Study Area Wastewater Management Plan, Lombardo Associates, Inc., Brookfield Water Pollution Control Authority, April 2020.

- a. This is the final report of a 3 part septic leachate, groundwater, and well water study conducted in the town of Brookfield, primarily on the peninsula bordering Candlewood Lake. The study generally found that soil is able to attenuate 90% of the dissolve phosphorus leaving septic systems and 50% of the dissolved nitrogen leaving septic systems. This means that there is still a measurable amount of both of these pollutants entering the lake from septic systems, which represent the vast majority of the sewage control on houses on the shore of Candlewood in all 5 towns. The study goes onto suggest a number of solutions to attenuate this pollution, including a sewer system installation. Note that soil attenuation of dissolved nutrients depends heavily on soil type and distance between the septic field and the lake.