TOWN COUNCIL – AGENDA REQUEST FORM

THIS FORM WILL BECOME PART OF THE BACKGROUND INFORMATION USED BY THE COUNCIL AND PUBLIC

Please submit Agenda Request Form, **including back up information**, 8 days prior to the requested meeting date. **Public Hearing requests must be submitted 20 days prior to requested meeting date to meet publication deadlines** (exceptions may be authorized by the Town Manager, Chairman/Vice Chair).

MEETING INFORMATION

Date Submitted: June 3, 2016
Submitted by: Lake Naticook Conservation Association
Department:
Speakers: Lake Naticook Conservation Association Members

Date of Meeting: August 18, 2016

Time Required: 25 minutes
Background Info. Supplied: Yes: _☒_ No: _☐_

CATEGORY OF BUSINESS (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Appointment:	☐	Recognition/Resignation/ Retirement:	☐
Public Hearing:	☐	Old Business:	☐
New Business:	☒	Consent Agenda:	☐
Nonpublic:	☐	Other:	☐

TITLE OF ITEM

1st Annual Update on Lake Naticook [Tabled at the July 21, 2016, Town Council meeting]

DESCRIPTION OF ITEM

To update the Town Council on Lake Naticook water quality, including milfoil mitigation efforts.

REFERENCE (IF KNOWN)

RSA:	Warrant Article:
Charter Article:	Town Meeting:
Other:	N/A

EQUIPMENT REQUIRED (PLEASE PLACE AN "X" IN THE APPROPRIATE BOX)

Projector:	☐	Grant Requirements:	☐
Easel:	☐	Joint Meeting:	☐
Special Seating:	☐	Other:	☐
Laptop:	☐	None:	☐

CONTACT INFORMATION

Name:	**Murray Collette**	Address	**15 Sunset Drive**
Phone Number		Email Address	murraycollette@gmail.com

APPROVAL

Town Manager: Yes _☐_ No: _☐_ Chair/Vice Chair: Yes _☒_ No: _☐_

Hold for Meeting Date: _____

Lake Naticook Update (1st Annual) June 2016

Lake Naticook Conservation Association

Presenters:

Murray Collette – President

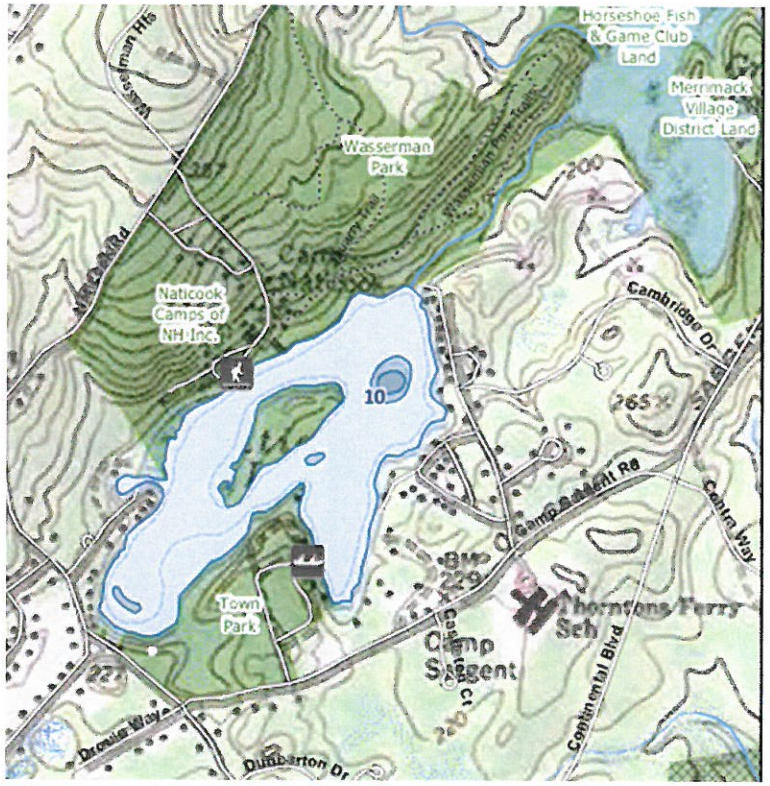
Roger Gettel – Vice President

David Quimby –Liaison to Veteran's Park

Lake Naticook Summary

- Key regional recreational resource
  - Wasserman Park recreational area and conservation land
  - Veteran's Park fields and boat access
  - YMCA Camp Sargent
- Size
  - 62 Acres, Deepest 20 feet, average 11 feet
- Water Quality Pressures (today's update)
  - Milfoil
  - Runoff

Largest Owners	Acreage	Water Frontage (Ft)
Town of Merrimack	165	4140 + Island
YMCA Camp Sargent	22.5	1600
40 Waterfront Landowners	17	3676



Milfoil in Naticook Lake: Status & Control Efforts

- Milfoil is still a major issue for the health of Naticook Lake however progress has been made with control over the last 3 years.
- Milfoil growths located by LNCA volunteer "weed watchers" typically are now relatively small/less mature plants in dispersed locations rather than large areas of growth unlike many NH Lakes are seeing runaway multiple acre growths. The nature of the current control work can be characterized as "whack-a-mole" or "search and destroy", however plants have been found in all areas of the Lake.
- Volunteer weed watchers locate plants ahead of periodic dives and on dive days help divers with locating plants and assist with buoy removal after plants are cleared. These efforts help utilize costly diver time efficiently to maximize value for the town and state taxpayers that fund the dive operations. LNCA volunteers are contributing hundreds of hours per season to the remediation effort.

Naticook Milfoil: Status and Control Efforts;
Continued

- Special effort was made to initiate weed watcher activities early this season to facilitate a May dive to remove plants and associated marking buoys ahead of Memorial Day weekend and the Camp Sargent triathlon. This included clearing growths proximate to the boat ramp, where milfoil was originally introduced to the Lake, and Wasserman Park waterfront. These areas are at particular risk for propagation from disturbance/fragmentation.
- On Thursday May 26 two divers assisted by three volunteers worked all day to successfully clear all marked locations. The next dive is planned for late June.
- Favorable early conditions helped volunteers scour the Lake for plants, and we are hopeful the extra early season efforts will pay off in reduced mid season impacts.

Naticook Milfoil: Looking Forward

- Our understanding is the current season budget is for up to 10 dive days. Two dive days have been used to date with the next dive pending scheduling for late June. Intervals between dives depend on plant findings by volunteers with expectation for one dive every 3-4 weeks through end of season (as late as divers will dive).
- Continued effective control efforts are critical as the explosive growth rate of milfoil will quickly erase gains during any lull in efforts.
- Early season dives are extremely important to remediation efforts and to maximize the aesthetic and recreational value of the Lake. The goal is for two May dives or better next year. 10 dives per season is a good working estimate with hope that with effective management and favorable conditions fewer may actually be used.
- New volunteers are welcome. Critical skill is reliable identification which can be taught. A volunteer diver willing to achieve milfoil certification as a supplement to the DASH contract would be extremely valuable to the effort.

Naticook Lake: LLMP Water Quality Report

- For many years (since 1982?) Naticook Lake has been part of a study of NH Lakes under the UNH Co-Operative Extension Lakes Lay Monitor program tracking the biological health of the Lake. Each yearly report provides a "snapshot" subject to variation from naturally occurring variables each year.
- Parameters tracked include Phosphorus, Chlorophyll a, water clarity, color, alkalinity, ph and specific conductivity plus dissolved oxygen (when there are appropriate temperature profiles present).
- While Naticook is blessed with a higher percentage of shoreline in a natural state than many NH lakes, evidence of human impacts on the water quality are seen in elevated phosphorus samples and specific conductivity readings. Both have trended upwards since 1982 along with resultant Chlorophyll a readings.

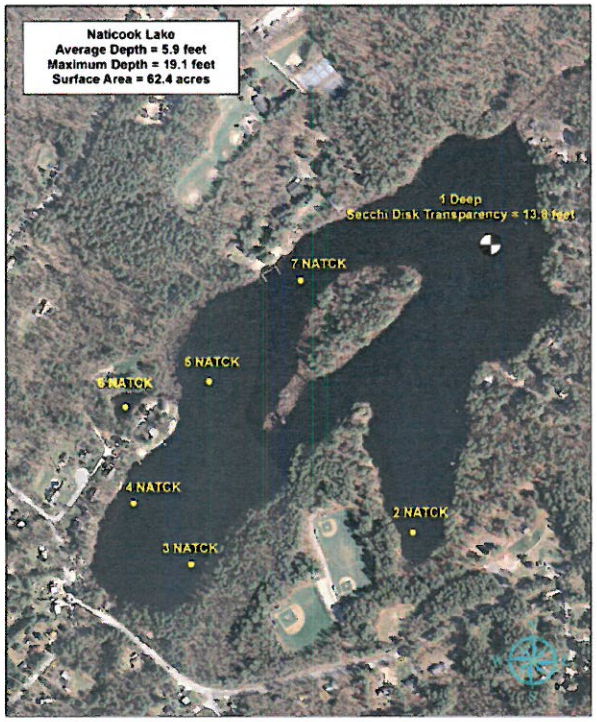
LLMP Water Report: continued

- Primary threat to Lake is inputs of sediment and nutrients (nitrogen & phosphorus) from runoff.
- Traditionally the highest phosphorus readings are found at site 6, the "lagoon" at end of Dirt Road where the stream from uphill drains to the lake bringing nutrients from its watershed. The second primary concern is Site 2 (near where the point for the Veterans Park ballfield watering system is, down shore modestly from the boat ramp) has at times shown elevated readings registering in the Eutrophic "poor" category. This suggests that nutrients from the Park ballfields could be finding their way into the Lake during runoff events.
- With the planned work on the boat ramp, best practice would dictate steps to prevent or divert runoff from the road and fields from entering directly into the Lake.

2015 LLMP Report

Adobe Acrobat Document

Figure 8. Naticook Lake
Merrimack, NH
2015 Deep and near-shore sampling sites.



0 0.06 0.12 0.18 0.24 Miles

University of New Hampshire Cooperative Extension

Aerial Orthophoto Source: NH DRAFT
Site locations GPS coordinates collected by the UNH Center for Freshwater Biology

NATICOOK LAKE

2015 SAMPLING HIGHLIGHTS

Station – 1 Deep

Merrimack, NH

University of New Hampshire Cooperative Extension

Station 1 Deep (Figure 8) was used as a reference point to represent the overall Naticook Lake water quality. Water quality data displayed in Tables 1 and 2 are surface water measurements with the exception of the Dissolved Oxygen data.

Blue = Oligotrophic

Yellow = Mesotrophic

Red = Eutrophic

Gray = Not Assessed

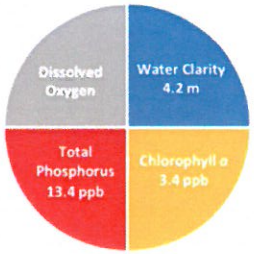


Figure 1. Naticook Lake Water Quality (2015)

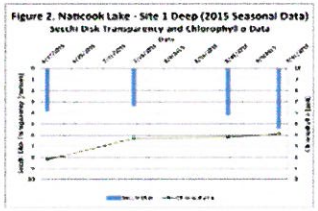
Table 1. 2015 Naticook Lake Seasonal Averages and NH DES Aquatic Life Nutrient Criteria

Parameter	Oligotrophic	Mesotrophic	Eutrophic	Naticook Lake Average (range)	Naticook Lake Classification
Water Clarity (meters)	4.0 – 7.0	2.5 – 4.0	< 2.5	4.2 meters (3.4 – 5.4)	Oligotrophic
Chlorophyll a (ppb)	< 3.3	> 3.3 – 5.0	> 5.0 – 11.0	3.4 ppb (1.8 – 4.1)	Mesotrophic
Total Phosphorus (ppb)	< 8.0	> 8.0 – 12.0	> 12.0 – 28.0	13.4 (single sample)	Eutrophic
Dissolved Oxygen (mg/L)	5.0 – 7.0	2.0 – 5.0	<2.0	Not Assessed	Not Assessed

* Naticook Lake did not develop a deep water layer that is the basis for the dissolved oxygen classification criteria

Table 2. 2015 Naticook Lake Seasonal Average Accessory Water Quality Measurements

Parameter	Assessment Criteria					Naticook Lake Average (range)	Naticook Lake Classification
Color (color units)	< 10 uncolored	10 – 20 slightly colored	20 – 40 lightly tea colored	40 – 80 tea colored	> 80 highly colored	26.8 color units (20.2 – 31.8)	Lightly tea colored
Alkalinity (mg/L)	< 0.0 acidified	0.1 – 2.0 extremely vulnerable	2.1 – 10 moderately vulnerable	10.1 – 25.0 low vulnerability	> 25.0 not vulnerable	19.1 mg/L (18.6 – 19.7)	Low Vulnerability
pH (std units)	< 5.5 suboptimal for successful growth and reproduction		6.5 – 9.0 optimal range for fish growth and reproduction			7.0 standard units (range 6.5 – 7.1)	Optimal range for fish growth and reproduction
Specific Conductivity (uS/cm)	< 50 uS/cm Characteristic of minimally impacted NH lakes		50-100 uS/cm Lakes with some human influence	> 100 uS/cm Characteristic of lakes experiencing human disturbances		238.4 uS/cm (range 237.1 – 245.0)	Characteristic of lakes experiencing human disturbances



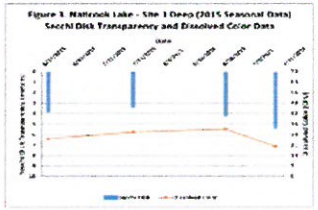


Figure 2 and 3. Seasonal Secchi Disk transparency, chlorophyll a changes, and dissolved color concentrations. Figures 2 and 3 illustrate the interplay among Secchi Disk transparency, chlorophyll a, and dissolved color. Shallower water transparency measurements oftentimes correspond to increases in chlorophyll a and/or color concentrations.

2015 LLMP Report

LONG-TERM TRENDS

WATER CLARITY: The Naticook Lake water clarity measurements, measured as Secchi Disk transparency, display a trend of relatively stable long term Secchi Disk transparency (Figure 4). However, annual variations are evident.

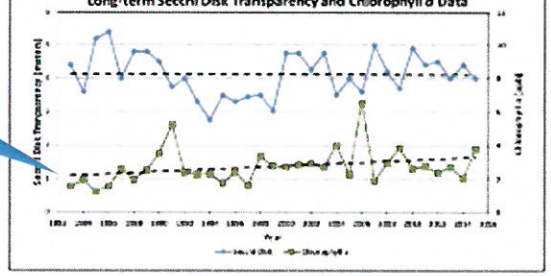
CHLOROPHYLL: The Naticook Lake chlorophyll *a* concentrations, a measure of microscopic plant life within the lake, display a trend of increasing concentrations (Figure 4).

TOTAL PHOSPHORUS: Phosphorus is the nutrient most responsible for microscopic plant growth. The Naticook Lake total phosphorus concentrations display a trend of increasing concentrations (Figure 5).

COLOR: The Naticook Lake color data, the result of naturally occurring "tea" color substances from the breakdown of soils and plant materials, display a trend of increasing concentrations (Figure 5).

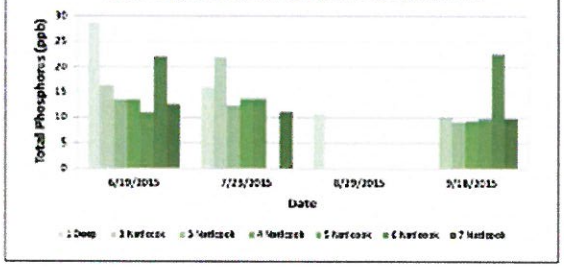
Chlorophyll trend increasing

Figure 4. Naticook Lake - Site 1 Deep (1983-2015)
Long-term Secchi Disk Transparency and Chlorophyll *a* Data



Figures 4 and 5 Changes in the Naticook Lake water clarity (Secchi Disk depth), chlorophyll *a*, dissolved color, and total phosphorus concentrations measured between 1983 and 2015. **These data illustrate the relationship among plant growth, water color, and water clarity. Total phosphorus data are also displayed and are oftentimes correlated with the amount of plant growth.**

Figure 6. Naticook Lake
Total Phosphorus Surface Water Inter-site Comparison



Phosphorus trend increasing

Figure 5. Naticook Lake - Site 1 Deep (1983-2015)
Long-term Total Phosphorus and Dissolved Color Data

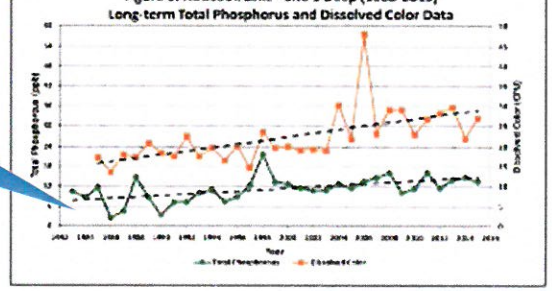
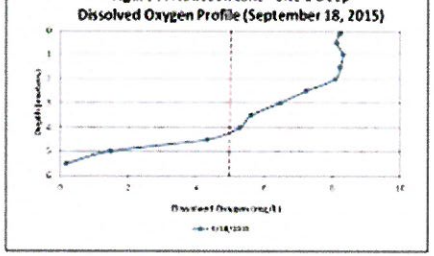


Figure 6. Naticook Lake surface water total phosphorus inter site comparison. *Notice the difference in total phosphorus concentrations among sampling locations.*

Figure 7 Naticook Lake dissolved oxygen profile collected on September 18, 2015. The vertical red line indicates the dissolved oxygen concentration commonly considered the threshold for successful growth and reproduction of warm water fish such as bass and perch. *Notice the decreasing dissolved oxygen concentrations near the lakebottom.*

Figure 7. Naticook Lake - Site 1 Deep
Dissolved Oxygen Profile (September 18, 2015)

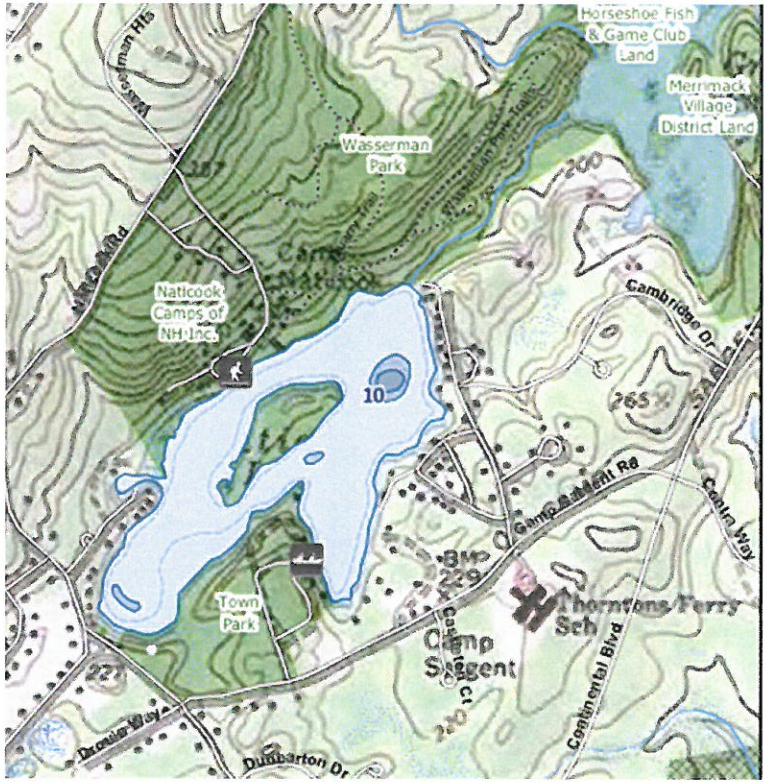


Recommendation: Minimize polluted runoff & erosion

Reccomendations

Implement Best Management Practices within the Naticook Lake watershed to minimize the adverse impacts of polluted runoff and erosion into Naticook Lake. Refer to "Landscaping at the Water's Edge: An Ecological Approach" and "New Hampshire Homeowner's Guide to Stormwater Management: Do-It Yourself Stormwater Solutions for Your Home" for more information on how to reduce nutrient loading caused by overland run-off.

- http://extension.unh.edu/resources/files/Resource004159_Rep5940.pdf
- http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-11-11.pdf

Summary Recommendations

- Continue LNCA, Town & DES partnership on Milfoil treatment
  - LNCA members volunteered 440+ hours
  - Town & DES funded state certified divers
- Closer coordination with Conservation Commission
- Continue to work together to identify and address Polluted and Erosion Runoff
  - Veteran's Park boat ramp & fields (Next Discussion)
  - Wasserman Park Runoff from Naticook Road (future discussion)