

**TOWN OF WOLFEBORO
CONSERVATION COMMISSION
January 14, 2019
MINUTES**

Members Present: Dan Coons, Chairman, Lenore Clark, Vice-Chairman, Art Slocum, Ed Roundy, Brian Gifford, Jeff Marchand, Members, Warren Muir, Alternate.

Members Absent: Dave Senecal, Selectmen's Representative, Sarah Silk, Robert Pierpont, Alternates.

Staff Present: Lee Ann Hendrickson, Administrative Secretary.

Chairman Coons opened the meeting at 6:36 PM at the Wolfeboro Town Hall Annex Conference Room.

**I. Consideration of Minutes
December 10, 2018 Minutes**

It was moved by Lenore Clark and seconded by Jeff Marchand to approve the December 10, 2018 Wolfeboro Conservation Commission minutes as submitted. All members voted in favor. The motion passed.

**Dredge & Fill Minutes
December 29, 2018**

It was moved by Ed Roundy and seconded Lenore Clark to approve the December 29, 2018 Wolfeboro Conservation Commission Dredge & Fill minutes as submitted. Lenore Clark, Dan Coons, Ed Roundy voted in favor. Jeff Marchand, Brian Gifford, Art Slocum abstained. The motion passed.

II. Discussion Items

a. Bill Rae Conservation Area

Jeff Marchand stated he went to the property and stated the aluminum boat that was submerged is now on shore. He stated the canoe still remains on the land; noting he took photographs of the boats. He stated he contacted Marine Patrol regarding locating the owner of the boat (from the bow numbers) and noted there is no new litter on site. He stated Scott Champagne has done a job good snowplowing and noted there are signs of recreational use on the property.

b. McBride Easement Monitoring

Dan Coons stated he walked the property with Lenore Clark and Brian Gifford on 12/16/18; noting there were no signs of any issues or trespassing. He recommended the boundaries of the easement be blazed next summer.

c. Cyanobacteria Task Force

Lenore Clark stated the Committee has met twice thus far. She stated Warren Muir provided a comprehensive overview and briefing, see attached. She noted the Committee is working on the Mission Statement.

d. Willey Brook

Trails

Dan Coons stated the trails are walkable but, icy. He stated Wolfeboro Single Track may be interested in constructing the last mile of trail.

Parking Area

Dan Coons stated he has not received an estimate for the construction of a parking area from Rich Baldwin.

e. Trask Mountain Trail Construction

No report.

f. Whiteface Mountain

Dan Coons stated the conservation easement is expected to be finalized and ready for acceptance in February.

Lenore Clark asked if the eight unknown acres has been resolved.

Dan Coons stated a survey needs to be done; noting such would cost approximately \$10,000. He stated information as far back as 1847 regarding the acreage was found.

g. Brewster Heath Easement

Dan Coons stated a public hearing is required for the execution of the easement.

Jeff Marchand asked who would review the easement on behalf of the Town.

Dan Coons replied Attorney Mark Puffer.

h. Maintenance Planning for Conservation Properties; Status Updates

Bill Rae Conservation Area

Jeff Marchand volunteered to refinish the sign.

Ellie's Woodland Walk/Ryefield Marsh

Dan Coons stated the boardwalk is in need of repair/rebuild, the entrance needs to be changed, parking lot re-graveled, property logged and possible acquisition of abutting property.

Jeff Marchand asked if the proceeds from logging would go to the Conservation Commission.

Dan Coons replied yes.

The Committee agreed to table such until April.

i. Conservation Commission Counsel

Dan Coons stated he contacted Attorney Jim Cowles from Walker & Varney; noting Attorney Cowles is willing to represent the Commission.

III. Other Business

N/A

IV. Informational Items

The Commission received the following informational item; NHDES correspondence.

V. Non-Public Session

N/A

It was moved by Lenore Clark and seconded by Art Slocum to adjourn the January 14, 2019 Conservation Commission meeting. All members voted in favor. The motion passed.

There being no further business before the Commission, the meeting adjourned at 7:15 PM.

Respectfully Submitted,

Lee Ann Hendrickson

Lee Ann Hendrickson

Cyanobacteria Task Force Briefing – Jan 2019
Warren Muir

Eutrophication

the process by which a body of water becomes enriched in dissolved nutrients (such as phosphates) that stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen.

Stages of eutrophication

Oligotrophic = good water quality – all of our lakes, except Mirror Lake and Sargents Pond

Mesotrophic = moderate water quality - Mirror Lake and Sargents Pond

Eutrophic = poor water quality - None

Key concerns relating to eutrophication

- Plants
- Algae
- Biofilms
- Cyanobacteria

Cyanobacteria are present everywhere and of particular concern in high concentrations (blooms)

There are many different types of cyanobacteria.

Most cyanobacteria cause rashes and other dermal effects.

Most cyanobacteria can (but do not always) produce and release one or more types of toxic chemicals (toxins):

- Microcystins – liver toxins
- Anatoxins - Neurotoxins
- Saxitoxins - Neurotoxins
- BMAA – Neurotoxin (the toxin postulated to be associated with ALS and/or Parkinson's)

These biological concerns are all driven by four factors that we have little control over:

- Light
- Warm water temperatures
- Calm waters
- Iron and other mineral nutrients

And two over which we have more control:

- Nitrogen
- Phosphorous

Phosphorous is the factor over which we have the most control

Typical sources of phosphorous:

- Wildlife (ducks, etc.) small
- Groundwater sources, including septic system failures 5-7%
- Atmospheric deposition 15-20%
- Tributaries
- In-lake (legacy)
- Storm water runoff

Lakes have three important zones that influence water quality in different ways

- Surface water column
- Deeper waters that don't mix with surface waters when lakes become stratified in the summer as the surface waters warm significantly and in the winter when they cool significantly relative to the more constant temperature of the deeper waters
- Lake bottom

Surface waters

Most of the focus is upon the surface waters, as that is the zone which we see and drink and in which we swim, fish, and boat. Thus, it is the zone that has been the focus of most water quality monitoring. This is also the zone that has been the focus of most watershed assessments, such as the one ongoing for Lake Winnepesaukee in Tufonboro and Winter Harbor.

Typically surface-water-column-total-P concentrations at

- 8 ug/l or less are considered good,
- 10 ug/l or above are considered at risk for algal and cyanobacteria growth, and
- 20 ug/l or above are considered impaired

Typical mid-summer surface water total phosphorous concentrations for our lakes are

- | | |
|-----------------------------------|------------------|
| • Lake Wentworth | 5-9 ug/l (2017) |
| • Crescent Lake | ~7 ug/l (2017) |
| • Rust Pond P | ~9 ug/l (2018) |
| • Mirror Lake P | 8-16 ug/l (2017) |
| • Winnepesaukee, The Broads, | 5-9 ug/l (2017) |
| • Wolfeboro Bay | ~ 6 ug/l (2017) |
| • Winter Harbor (Carry Beach end) | 4-5 ug/l (2018) |

Deeper waters

- Algae, plants, and other organic material that sink into the deeper waters, where there is no mixing with the surface waters, can die, and use up the oxygen in the water, setting off anaerobic chemical and biological processes.
- Fish and other forms of life can die under these conditions from lack of oxygen.
- Also among the anaerobic processes are reactions that convert insoluble forms of phosphorous on the bottom to soluble forms.
- The phosphorous released in anaerobic deeper waters can enter surface waters during turnover in the autumn and spring (when the surface and the deeper water temperatures are similar).

Mirror Lake has a significant-sized deeper water zone that in most years becomes anaerobic. In 2017, during turnover total phosphorous levels in its surface waters reached 112 ug/L. So, the lake has a significant in-lake (legacy) source of phosphorous.

Winter Harbor has a deep (~80ft) hole in the center of the bay about 30-50 yards in diameter, which was shown in September 2018 to be anaerobic in its bottom 20 feet. The rest of the harbor is 40 feet deep or less and is presumed to have no other anaerobic areas. One measurement has been made of the total phosphorous levels in the surface waters at the Wolfeboro/Whitegate Rd. end of Winter Harbor during turnover (Oct 2018) showed a four-fold increase above typical levels during the summer (17 ug/L vs. 4 ug/L). Subsequent samples are being collected this winter to determine how quickly the phosphorous levels go back down at this site to those observed during the summer months. If they do go down quickly, it will be an indication that the deeper water in the harbor is currently only a modest contributor to the level of total phosphorous in to the nearby surface water.

Lake Bottoms

The bottoms of freshwater lakes consist of sand, gravel, and rocks. They are habitats and sources of nutrients for a wide variety of animal, plant, and other forms of life. However, fewer chemical and biological measurements are available on the bottoms of our lakes than of the waters above.

In the case of Winter Harbor, the bottom of the lake is important because of the significant increase in biofilms and algae in recent decades. It is also important because of a *Gloeotrichia* cyanobacteria bloom in late August and early September 2018 that resulted in a nearly monthlong NHDES Advisory for people to avoid contact with the lake water.

Gloeotrichia (Gloeo)

- *Gloeotrichia* are not a common cyanobacteria but have been found in recent years in several New England lakes. Less is certain about *Gloeotrichia* than other, more common, cyanobacteria.
- Unlike other cyanobacteria, *Gloeotrichia* are believed to get their phosphorous and most other nutrients from the sediments at the lake bottom, instead of from soluble phosphorous in the surface waters.
- Gloeo rest over the winter in the sediment and come to life in the spring, living in conjunction with (benthic) algae growing on the lake bottom and slowly reproducing. They are reported to be associated with fresh (recent) sediments in water 15 feet deep or less.
- When the water is warm and calm, Gloeo have the ability to float to the surface in colonies of cells as often as three times a day, where they are able (like peas and clover) to convert nitrogen in the air to a form that it and the algae can use to grow faster (doubling 3-4 times per day). *Gloeotrichia* colonies in blooms typically grow to about 5,000 cells and are visible to the eye.
- Gloeo blooms can build over a week or two and often end over a day or two, with the Gloeo falling back down to the sediment as akinetes (seeds).

- Gloeo blooms in NH have been reported to produce and release microcystins, often as its blooms end.
- Microcystins are relatively stable compounds, which can remain in the water for weeks.
- NHDES Beach advisories are issued when Gloeo concentrations are at or above 15,000 cells/ml
- Guidance on microcystin (toxin associated with Gloeo) limits:
 - drinking water 0.3 ug/l,
 - recreation 4-10 ug/l .
- The 2018 Gloeo bloom in Winter Harbor released cyanotoxins below 0.1 ug/l. It may have released anatoxins, BMAA, and microcystins, with BMAA in the highest concentration.

Surveying cyanobacteria in the water by Whitegate Road in the Spring and Fall (after the Gloeo bloom) finds Anabaena and other cyanobacteria in modest concentrations. Gloeotrichia are not seen in the water column until they start blooming and rising to the surface. None of the other types of cyanobacteria have been observed to have bloomed, as yet. Addition of more phosphorous and other nutrients to Winter Harbor would increase the risks that some of these other types of cyanobacteria would bloom.

When the 2018 Gloeotrichia bloom in Winter Harbor occurred the surface water total phosphorous levels were low (~4 ug/l). No other water column parameters were high. However, the soluble reactive phosphorous levels in the sediment at Whitegate Road are manifold the levels in the water column. The total phosphorous levels of the storm water runoff stream (40 Whitegate Road) are as high as 7,850 ug/l. There are three of these storm water streams along Whitegate Road and presumably there are several more along the shoreline.

The addition of more nutrients to our lakes risks not only more Gloeotrichia blooms, but also of other types of cyanobacteria, algae and other organisms in the surface water that could significantly diminish water quality. Also, the addition of more nutrients in our lakes would add to the in-lake (legacy) sources and make it harder to improve water quality and prevent future cyanobacteria blooms.

Algae and biofilms on the bottom of our lakes are likely living symbiotically with cyanobacteria and should not be ignored. Measurements have not been made of the concentrations and types of cyanobacteria that may be present in the benthic algae or in the biofilms in Winter Harbor. In some lakes, algae-cyanobacteria biofilms on the bottom become thick and float to the surface.

There have been watershed assessments done for Lake Wentworth, Crescent Lake, Rust Pond, and Mirror Lake that have identified major sources of nutrients to be addressed. There is an ongoing assessment of Lake Winnepesaukee in Tuftonboro and Winter Harbor. These assessments and the sources that they identify are prerequisites for state and federal matching funds for mitigation of the sources. There has been no watershed assessment of the rest of the Winnepesaukee shoreline in Wolfeboro and it is rumored that there will be no further state funds available to do more assessments.

As yet, I have not been able to review in detail all the data available on Wolfeboro's waterbodies, aside from Winter Harbor. However, while clearly Winter Harbor is a problem and has some unique attributes. I am sure that there are other current or potential water quality problems on our other shorelines that would be important to address. Some of these have been identified in the watershed assessments and others are yet to be identified. It is not hard to do so.

Note: a Gloeotrichia bloom was reported near in the Broads near the mouth of Winter Harbor in 2009. Gloeotrichia also have been previously observed elsewhere in recent years in Lake Winnepesaukee in Wolfeboro and in Lake Wentworth in concentrations below bloom-levels.

The only other cyanobacteria blooms reported in Wolfeboro waters that I'm aware of have been several ones in Mirror Lake. These blooms have been primarily *Oscillatoria* and *Microcystis*, not *Gloeotrichia*. While fewer cyanobacteria blooms have been observed in the surface water of Mirror Lake in recent years, some reoccurring *Oscillatoria* blooms have been observed in late summer sitting on the top of the deeper water anaerobic zone.

There have been several other cyanobacteria blooms reported elsewhere in Lake Winnepesaukee in recent years.

The waterbodies in New Durham feeding into Lake Winnepesaukee at the bottom of Alton Bay regularly have blooms of *Oscillatoria*, *Microcystis*, and *Anabaena*.