TOWN OF BARRINGTON ZONING BOARD OF ADJUSTMENT

Statement of opposition to the Application for Variance from Multiple Set Back Requirements, specifically from Article 4, Section 4.1.1, Table 2 to allow setbacks of 12.16' *vs* the required 30' and a front setback of 35.76' *vs* the required 40', on a Flower Drive property located at Map 111, Lot 6 by Lynda Brushett and James Corcoran personally as abutters and by Lynda Brushett as President of the Nippo Lake Association,

Summary:

The applicant's submission on its face fails to satisfy the legally required showing for the granting of a variance. The applicant's suggestions e.g., that houses today are bigger etc. is (a) little more than unsupported cultural commentary or opinion, (b) factually inconsistent with the largely cottage character of Nippo Lake specifically, and (c) in any event insufficient to meet the strict legal standard for variance from the known zoning conditions that attached when the property was purchased.

Background

Until 2010, Nippo Lake enjoyed a long history as a clear, pristine body of water. In 2010 Nippo Lake turned pea green, virtually overnight due to the first of a troubling series of major cyanobacterial blooms. The blooms persisted at various times for weeks in spring, summer and fall posed significant health threats as cyanobacteria is capable of producing two dangerous toxins, one affecting the central nervous system and one affecting the liver. Both toxins are harmful to humans, particularly children and can cause significant respiratory illness since the toxins are known to volatilize. The toxins are capable of causing the death of animals that drink from the lake during a bloom.

During blooms people had to avoid contact with the water until it cleared. A bloom in 2014 lasted from early August to ice-in. Several times the cyanobacteria level was so high that the State of New Hampshire Department of Environmental Services officially noticed quarantine of the lake due to health concerns.

When the first bloom occurred in 2010, the Nippo Lake Association was advised by water quality experts at UNH that phosphate is often the critical determining factor that, if low enough, keeps cyanobacteria (which is present at low levels in most freshwater bodies of water) in check. When concentrations of phosphate reach around 7 to 8 ppb or above, however, cyanobacteria have the nutrients needed to explode in the dangerous blooms Nippo Lake experienced. The most common source of phosphate infiltration is unbuffered run-off from human development in the watershed.

In 2003 DES measured lake phosphate at 4 ppb, a normal and desirable level of phosphate. After 2010 testing for lake phosphate concentrations were noted at or above 8

ppb (twice normal levels), and remained high for much of the summer and fall months. Concentrations above 20 ppb at times were recorded in some locations.

In 2015 studies commissioned by the Nippo Lake Association with assistance from UNH pointed to phosphates as the principal nutrient factor precipitating cyanobacterial blooms. Following confirmation by NH DES in 2016, a partnership evolved over the next 7 years in which the Nippo Lake Association raised over $425,000 to hire engineers and fresh water lake scientists to develop and implement a watershed restoration plan which has returned water quality to the lake.

The significance of this history to the current application for a zoning variance is that Nippo Lake and its immediate watershed continue to be fragile. Without careful stewardship and undertaking land use actions to prevent pollutants from entering the water, the lake remains risk of becoming a eutrophic, essentially dead, body of water, with disastrous health and financial consequences. Actions taken by Nippo residents ensure that the development and maintenance of roads, driveways, shorefronts, and homes follow best practices that preserve the ability of the watershed to handle stormwater and winter thaws and filter out pollutants and that prevent pollutants from entering the lake in the first place.

Building on private and public investment that has restored water quality, the Nippo Lake Association is currently working with the Southeast Land Trust, to raise over $1,000,000 protect a significant 164 acre portion, about a quarter, of the lake's watershed from development. The commitment by the Town Conservation Commission and the Board of Selectmen to participate in the funding of the conservation easement for this property set to close later this year underscores the importance of lake water quality issues to our community.

All this effort goes to the point that area setbacks for new development are an important land use tool that helps make sure that new homes and related infrastructure safeguard natural resources, promote public safety and preserve community character. In this case the setbacks should be applied as the Zoning Ordinance prescribes: 75' setback from the lake; 30' side setbacks and the front setback at 40'. These setbacks provide needed permeable surfaces in an ecologically sensitive area that allow water to percolate into the soil to filter out pollutants and prevent water from running off into the lake. Maintenance of required side and front setbacks provide for fire safety buffers and fire and emergency service access to residents located in a remote woodland at the end of a mile long, narrow private road. The setbacks provide noise, glare, odor and visual buffers, as well as building scale appropriate to the neighborhood. All setbacks should be required as per the Ordinance to provide those benefits. As the owner's narrative states, there is sufficient space to build a house on this lot that meets setback requirements.

Of special concern with this Application is that the proposed plan and narrative indicate a 50' buffer from Nippo Lake *vs* the 75 feet required by the Shoreland Protection District Overlay in the Zoning Ordinance. We submit that the 75' setback should also be included in the development plan.

Variance Criteria

The applicant bears the burden of presenting evidence sufficient to allow the Zoning Board of Adjustment to reach reasonable conclusions and fact finding sufficient to satisfy the following legal criteria for the grant of a zoning variance. Here, the applicant has not, and cannot, make the required showing and therefore, the application must be declined.

1) Special conditions do not exist such that literal enforcement of the Ordinance will result in unnecessary hardship to the applicant as defined under applicable law.

The owner's narrative acknowledges that a house with a footprint of 35'in width would fit on the lot. The only hardship here is that a larger house is desired by the owner. One that faces Flower Drive rather than the lake. One that requires significant variances. The special conditions that prompt the request for a variance are not because of hardship but rather because of a preference for a large house, more appropriate to a 2 acre subdivision than the actual lot of record. In this case, strict conformity to dimensional requirements does in fact allow the owner to reasonably develop the property–just not the design currently proposed.

Resizing the house, would allow the owner to meet the Zoning Ordinance's 30' side setbacks and 40' front setback. Options exist to both enforce the ordinance and build a dwelling. By denying this variance the ZBA is not denying the owner a necessary use of the property, but is requiring the use be redesigned so as to conform to the requirements for area setbacks and to protect the interests of the public, abutters and the endangered watershed. Resizing also allows the owner to meet SPDO requirement that no structure be built within 75' of a lake,

2) Granting the variance would not be consistent with the spirit of the Ordinance.

Barrington permits structures to be built on non-conforming lots that have frontage or area that is less than required **if three provisions are met**: "1) The lot was a legal lot of record and duly recorded at the Strafford County Registry of Deeds prior to adoption of this Ordinance; 2) The lot is capable of supporting a well and septic system designed and installed in compliance with all applicable town and state regulations **and** 3) All proposed uses, buildings, and structures, shall comply with the setback requirements in the Table of Dimensional Regulation" This non-conforming lot, at best, meets only provision 1 and 2. It does not meet provision # 3 and as such is not consistent with the 'spirit' of 5.1.1.

Further, the owner's narrative states that a "50' buffer protects the abutting water resource". Not the case. The location and size of the structure proposed to be built on the lot does not conform to Barrington's Shoreland Protection District Overlay (SPDO) requirement that "no structure of any type, including by way of example and not by way

of limitation, all buildings, garages, sheds, parking lots and driveways, may be constructed within seventy-five (75) feet of the shoreline of any year-round stream, or any lake or pond over two (2) acres." (11.2.1) The SPDO goes on at 11.3.1: "Lots of record that existed prior to July 28,1988...are exempt from these shoreland setback provision **to the extent that it can be demonstrated that conformance is impossible,** however any structure on such lots must conform as fully as possible." It has not been demonstrated that conformance is impossible. The lot is sufficiently large enough to meet this standard and accommodate a dwelling through a redesign and siting of the structure. A 50'setback consistent with the purpose of this requirement "to preserve the overall quality of surface waters, and their adjacent environs, in the Town of Barrington in order to protect the public health and maintain the ecological integrity associated with these resources." (11.1).

As noted, Nippo Lake is at severe, well-documented risk of eutrophication which occurs when infiltration, in Nippo Lake's case phosphorous loaded erosion, runs into the lake resulting in the recurrent growth of toxic blue-green cyanobacteria. It cannot be reasonably disputed that a minimum of 30 feet on either side of the structure, 40 feet on the front side of the structure and 75 foot structure-free buffer from the lake is critical to conserving water quality, habitat, and aesthetic values the Zoning Ordinance is designed to protect, along with fire safety, emergency services access and noise, odor and visual buffers between adjacent properties.

3) Granting the variance will result in diminution of surrounding property values.

The immediately adjacent properties consist of conserved land, small seasonal summer camps and one small year round house. The size of the proposed house with side setbacks of 12.16' vs. 30' and resulting lot coverage does not comport with the character of the area nor conservation goals. In 2022 abutters purchased from the town a couple of small lots on the opposite side of Flower Drive from this property, to protect the wetland and small stream located there. This land is conserved and cannot be developed. Granting a variance to severely reduce side setbacks is adverse to the goal of conserving permeable watershed land that protects Nippo Lake and ensuring the protection of people with safety buffers.

The property values of the approximately 40 homes which abut the applicant's development by virtue of their location on Nippo Lake are also adversely impacted if the Zoning setbacks in such an environmentally sensitive area are reduced. The 30 foot buffer on either side of the building maintains important watershed permeable land. The purpose of the 75' shoreland structure-free buffer, for example, along with DES requirements for vegetation maintenance, is "a key component in preserving the integrity of public waters" because "well vegetated shorelands that include a variety of native trees, saplings and natural ground cover are much more apt to naturally manage the harmful effects of stormwater run-off." (DES WD-SP-5) Vigilant maintenance of this protective scope is necessary to prevent further economic loss from these known effects.

4) Granting of the variance would not do substantial justice.

All those whose property abuts the lot and the lake will be adversely impacted by reduction in the standard of compliance with the town's Zoning Ordinance.

Not approving a variance does not do an unnecessary or unavoidable injustice to the owner because the applicant has options to build a structure that meet town requirements. His claim of hardship is fundamentally one of his own making because the applicant can redesign the house to meet town requirements.

By contrast, substantial injustice to the lake, abutters, other lake property owners and the public will result if the variances are granted.

5) Granting of the variance would plainly be contrary to the public interest.

Purposes of the Barrington Zoning Ordinance
1.3(1) To promote the health, safety, welfare and prosperity of the community;
1.3(2) To safeguard natural resources such as ponds, lakes, rivers, streams, wetlands, forests and
aquifers;
1.3(3) To preserve the essential character and quality of life in the community

Granting the requested variance would be manifestly contrary to the public interest and undermine important statutory and regulatory land use controls the primary purpose of which is protection of the public interest. Granting the variance would be contrary to the purposes of the Zoning Ordinance. Granting the variance would undermine public safety, the safeguarding of natural resources and the character of the neighborhood. To say as the narrative does that the proposed development plan will have a positive impact on the lake just plain wrong. The impact is precisely the opposite. Any reduction in the buffering capacity of the Nippo Lake watershed is contrary to the public interest and can be avoided by the owner by redesigning the structure to achieve maximum conformance with the Zoning Ordinance.

Conclusion

For all the reasons stated above, and as summarized at the beginning of this statement, the applicant has not and cannot satisfy the requirements for the granting of a variance from the ordinance as requested, and accordingly the application must be denied.

Lynda Burkett James C. Corcoran
106 Harlan Drive
Barrington NH June 13, 2023

A Lesson in Patience, New Hampshire's First Aluminum Treatment in 37 Years

Sally Soule, David Neils, and Don Kretchmer

Background

For many years, Nippo Lake, a 35-hectare mesotrophic lake in Barrington, New Hampshire, was noted for its high water quality, abundant recreational opportunities, and plentiful wildlife. Generations of families returned to the lake each summer to swim in the clear water and relax in the cool shade of its forested shoreline. Over the years, a strong, committed coalition of residents formed to sustain the lake's many benefits. However, starting in 2010, the lake began to experience annual, persistent cyanobacteria blooms (Figure 1). The blooms frequently lasted several weeks, often spanning the entire surface area of the lake interfering with recreational uses and threatening public health. An analysis of lake water quality data conducted in response to local concerns about the blooms showed an increasing trend in total phosphorus, the nutrient that typically limits growth of algae and cyanobacteria. Additionally, lake water quality data indicated that a lack of oxygen in the lake's bottom depths promoted release of phosphorus from benthic sediments, resulting in peak hypolimnetic total phosphorus concentrations of 180 micrograms per liter as measured in fall 2016.

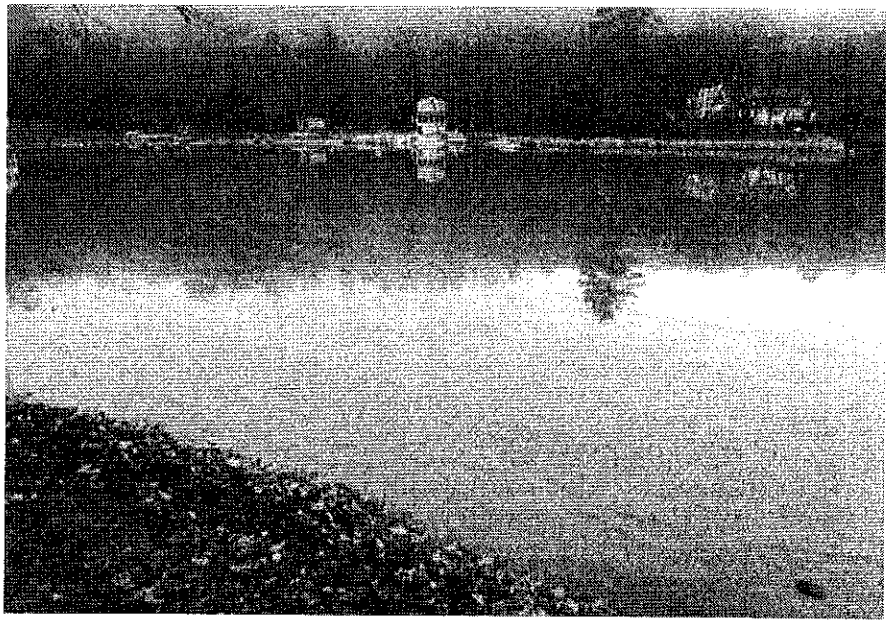

Figure 1. Nippo Lake cyanobacteria bloom, fall 2015. (Photo: Nippo Lake Association)

Building a road map for restoration

This unsettling shift in lake water quality served as an urgent call to action for watershed residents who launched a sustained, locally-led restoration effort to address rising levels of phosphorus with the goal of reducing the frequency and intensity of cyanobacteria blooms. In 2016, the Nippo Lake Association (NLA), an all-volunteer group dedicated to protecting the lake, established a partnership with the New Hampshire Department of Environmental Services (NHDES) to develop a watershed restoration plan that provided guidance for implementation of activities that reduced phosphorus loading to the lake.

Watershed modeling and data analysis conducted for the watershed plan estimated that the total phosphorus nutrient load to Nippo Lake was approximately 38 kilograms per year. Of that, 34 percent of the load was identified as coming from internal sources, namely bottom sediments. The remainder of the phosphorus load was identified as coming from watershed sources (44 percent), waterfowl (five percent), and atmospheric deposition (10 percent). To reach the restoration goal of fewer cyanobacteria blooms, the watershed planning analysis clearly indicated that phosphorus load reductions would need to come from manageable anthropogenic watershed sources as well as the internal load.

Although tackling both sources within the aggressive restoration timeline desired by residents seemed daunting, the NLA strengthened its commitment to the lake, assembled a multi-disciplinary project team consisting of lake managers, stormwater engineers, and water quality experts, and launched restoration activities in 2017.

To maximize the effectiveness and longevity of internal phosphorus load reduction, the NLA's first step was to prioritize management of external sources of phosphorus by implementing stormwater management practices that reduced erosion from residential properties and several problematic gravel roads. These efforts reduced phosphorus loading to the lake by approximately 5 kilograms per year. The NLA also conducted targeted outreach to watershed residents on the importance of lake-

friendly living practices including septic system maintenance, proper fertilizer use, stormwater management, and establishment of vegetated shoreline buffers. Additionally, NLA continued to identify and prioritize external sources of phosphorus loading for future prevention measures including additional stormwater management, outreach to residents, and land conservation. The goal of the ongoing watershed work is to permanently reduce watershed loads as well as prolong the effectiveness of the internal load treatment.

Going deep: Treating internal sediment sources

Once efforts to control external sources of phosphorus loading were underway, the NLA coordinated with NHDES to tackle internal sources of phosphorus loading from Nippo Lake sediments. After conducting a rigorous alternatives analysis in 2019 to evaluate control methods, the use of aluminum compounds to bind phosphorus in the bottom sediments was chosen to achieve the necessary reduction of internally recycled phosphorus. Aluminum compound treatments target the release of nutrients from bottom sediments, are specific in dosing and target area of application, and require a short-term application phase to achieve long-term benefits.

Almost immediately, a barrier arose when the project team realized the state did not have a formal process for approving treatment. Although other states routinely permit use of aluminum compounds to control cyanobacteria blooms, New Hampshire had only allowed the approach to be used once, in 1984. As such, NHDES did not have an approval process to enable the proposed treatment to move forward. Once this pressing need was identified, NHDES began the challenging work of creating a process to grant permission for lake treatment using aluminum compounds - while at the same time trying to meet ambitious deadlines for full-lake restoration.

Following a lengthy internal review of water quality data, state water quality standards, regulatory policies, and with input from the public, NHDES permitted the use of aluminum compounds as a "demonstration project" through the issuance of a state surface water discharge permit. The permit carried limits on the types and amounts of chemicals allowed for use, set exceedance thresholds for certain water quality parameters, included conditions for safety measures, and required rigorous water quality monitoring before, during and after treatment. Once approved, aluminum compound treatment for Nippo Lake was executed in summer of 2021.

Treatment application

Treatment of Nippo Lake with aluminum compounds for the purpose of phosphorus inactivation included three primary components: identification of the treatment area, calculation of the dose or amount of aluminum needed to successfully bind chemically available phosphorus in the bottom sediment, and a determination of the ratio of aluminum compounds to be added. For Nippo Lake, the treatment area, dose rate, and ratio were based on a review of information including water quality data, bottom sediment sample collection and analysis, and effective aluminum compound ratios used in other treatments of surface waters in New England.

The total area targeted for treatment was 22.7 hectares or 65 percent of the total lake area (Figure 2). This included areas where the lake depth was greater than 8 meters and regularly experienced anoxia during summer and fall. To maximize treatment effectiveness, the treatment area also included shallower mid-depth areas where temporary anoxia in the sediments might release loosely bound and labile sediment phosphorus. Determination of the dose rate was a key step in the planning process for the aluminum compound treatment. In addition to review of relevant data, dose rate development for Nippo Lake required consultation with lake management professionals experienced in the use of aluminum compounds to control internal phosphorus loads. The dose was calculated based largely on sediment core samples collected by the project team in 2018. Ultimately, a total dose rate of 54 grams of aluminum per square meter was recommended for treatment based on the sum of the mass of all forms of sediment phosphorus including loosely bound, iron-bound, and labile organic phosphorus, per dry weight of sediment. A target sediment treatment depth of 10 centimeters was set with a ratio of 10-parts aluminum treatment to one-part phosphorus sediment. For comparison, typical lake treatment application rates for inactivation of sediment phosphorus range from 10-150 grams of aluminum per square meter

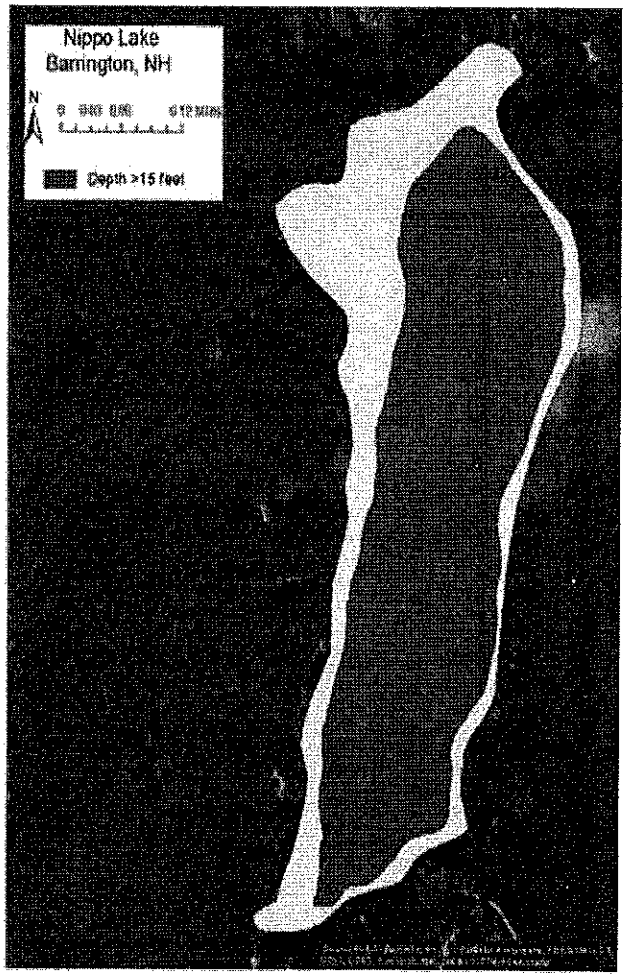

Figure 2. Nippo Lake target aluminum compound treatment area. (Map: DK Water Resources, LLC)

(Wagner 2004). As treatment rolled out, actual dosing (52 grams per square meter) was very close to the target dose (54 grams per square meter).

Treatment was completed over nine separate days from May 25 through June 17, 2021, and included adding 85,353 liters of aluminum sulfate and 45,092 liters of sodium aluminate to Nippo Lake in all areas deeper than 4.6 meters. The final ratio of aluminum sulfate to sodium aluminate was 1.9:1 and the total dose of aluminum was 52 grams per square meter. The treatment resulted in a white flocculant that settled on the bottom of the lake and served as the binder for phosphorus released from the sediment (Figure 3).

Figure 3. Underwater photo showing accumulation of aluminum hydroxide floc on bottom of Nippo Lake following the addition of aluminum compounds. (Photo: Don Kretchmer)

Monitoring results

During treatment, continuous mean pH readings ranged from 6.76 to 7.08 within the treatment zone. Acid soluble aluminum concentrations during treatment were above chronic water quality criteria but below acute water quality criteria. Turbidity remained at or below background levels (<1 NTU) during treatments. After treatment was completed, pH continued to decline at deep water sites, but significant rainfall amounts (36 centimeters) that fell in the local area in July through August may have influenced this result. Acid soluble aluminum concentrations were approximately five times lower the week after treatment ended and continued to decline to background levels.

Total phosphorus was monitored to assess lake response during the first four months following treatment. Total phosphorus concentrations decreased from approximately 20 micrograms per liter to five micrograms per liter in the surface waters. More importantly, in the hypolimnion, total phosphorus concentrations remained relatively constant at around 20 micrograms per liter, but this was significantly lower than peak concentrations observed in 2016. Overall, it was estimated that the treatment resulted in a 70 to 90 percent reduction from the hypolimnetic phosphorus load due to inactivation of nutrient release from bottom sediments (Figure 4 and Figure 5).

While a substantially lower total phosphorus load was documented in the hypolimnion in the months following treatment, challenges associated with use of these chemicals emerged in meeting aluminum water quality thresholds as the chronic criteria for aluminum were exceeded during treatment. However, strict adherence to the permitted chemical ratio, creation of multiple treatment zones, employing an extended treatment period, and careful real-time monitoring of pH minimized noticeable impacts to aquatic life. Additional monitoring in 2022 will provide a full season assessment of lake conditions one year after treatment and will likely offer a better understanding of what can be expected in future years.

In summary, the in-lake treatment goal of reducing the hypolimnetic phosphorus load to the lake by 80 to 90 percent was achieved. By reducing the phosphorus load from internal sources, the risk of cyanobacteria blooms in Nippo Lake is expected to be minimized for a period of 10-20 years, providing additional external nutrient sources continue to be controlled. The treatment serves as a demonstration project designed to improve the overall condition of Nippo Lake by minimizing the frequency and extent of cyanobacteria blooms and reducing the length of time the waterbody is a potential risk to human, pet, and livestock health while increasing the length of time the lake is suitable for recreation.

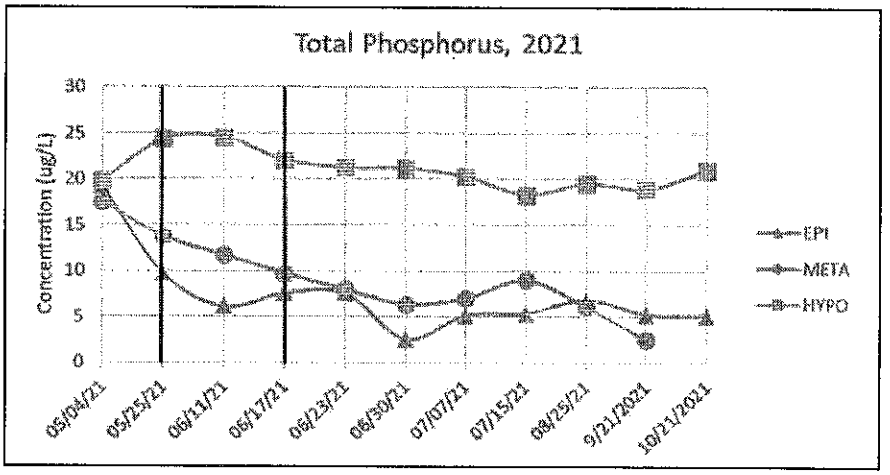

Figure 4. Total phosphorus concentrations for deep spot sites from May – October 2021 before, during, and after aluminum compound additions. Vertical bars indicate start and end of treatment.

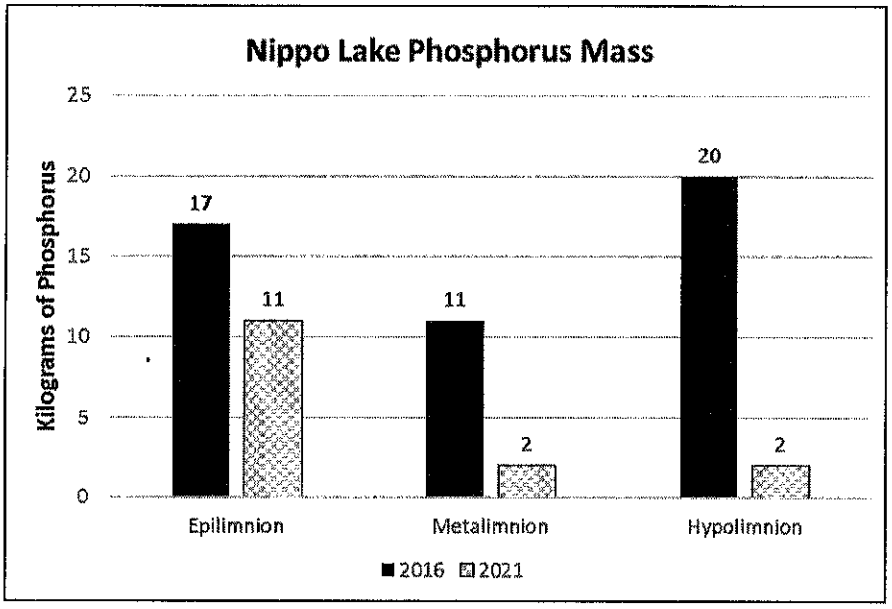

Figure 5. Mass of phosphorus in Nippo Lake in August – October of 2016 and 2021.

Lessons learned: Strong partnerships – key to success

As with many complex restoration efforts, strong local partnerships played a critical role in the success of this project. The NLA served as the entity responsible for managing all aspects of the project including fundraising, outreach, and providing oversight for the project's technical team. DK Water Resource Consulting, LLC (Don Kretchmer, Principal) served as the lead consultant to the NLA with assistance from Water Resource Services, LLC (Kenneth Wagner, Principal). SOLitude Lake Management was hired to complete the aluminum treatment. The NHDES served as the lead for several key project elements including permitting, assistance with identification and remediation of watershed phosphorus sources, and conducting water quality monitoring throughout the duration of the project. Funding for the project came from private sources as well as through grants from NHDES's nonpoint source pollution program. Without this team effort, it would have been extremely difficult to meet the project's ambitious restoration goals and timeline.

Looking ahead

The application of aluminum compounds to Nippo Lake provided a unique opportunity to make much needed improvements to water quality while simultaneously addressing the need by NHDES to consider allowable use of a well-known and researched in-lake management technique for other projects in New Hampshire. Short-term results indicate treatment was successful, in large part, because of partnerships between the NLA, technical consultants, and NHDES. However, several other lakes in New Hampshire regularly experience cyanobacteria blooms and are known to have high levels of internal phosphorus loading. Therefore, it is highly likely additional projects recommending the use of aluminum compounds as a restoration tool will be proposed in coming years. Thus, the experience gained from Nippo Lake will be useful in making future projects successful (Figure 6).

Figure 6. Aerial view of treatment activities, Nippo Lake. (Photo: Nippo Lake Association)

References

Wagner, K.J. 2004. *The practical guide to lake management in Massachusetts.* Prepared for the Massachusetts Executive Office of Environmental Affairs. 160 pages.

Sally Soule is the Coastal Watershed Supervisor for NHDES' Nonpoint Source Pollution Management Program. Sally provides technical assistance to municipalities, non-profit organizations, and other local partners to develop, implement, and measure the success of watershed restoration and protection projects in New Hampshire's coastal watershed.

Dave Nells is an aquatic biologist with the NHDES, where he has worked for 21 years. He has a Bachelor of Science degree from Cornell University and a Master of Science from Virginia Tech.

Don Kretchmer, CLM, is the principal at DK Water Resource Consulting LLC. He has over 35 years of experience conducting water quality and ecological studies on lakes, rivers, and watersheds throughout New England and across the country. He is a Certified Lake Manager (CLM).