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Mr. Michael Riordan
Lake Onota Preservation Association
Via email at michaelhriordan@icloud.com

Dear Mr. Riordan:

It has come to my attention that the City of Pittsfield and the MA DEP are negotiating a Consent Order relating to problems with the drawdown of Lake Onota, and possibly with consideration of overall lake management of Lake Onota, including herbicide use and monitoring programs. I am not involved with or party to those proceedings, but as I recently prepared documents that supplement the existing Generic Environmental Impact Report for lake management in Massachusetts with specific regard to drawdown and herbicide use, and have been involved in management planning for Lake Onota in the past, I wanted to bring to your attention some key points that have bearing on any consideration of the management of Lake Onota.

Lake Onota is a substantial resource within the City of Pittsfield, providing habitat, recreational opportunity, and an appreciable tax base. The value of the resource to the City cannot be overemphasized and like any asset, management for optimal value is warranted. As the watershed, shoreline and even the lake area have been modified by human action, management is in fact necessary to maintain desired lake features. While natural processes and human regulatory constraints apply, Lake Onota is more like a public building or park than a natural preserve and requires maintenance to sustain its functions.

As a Great Pond under statute of the Commonwealth of Massachusetts, much of Lake Onota is technically the property of the Commonwealth, but its actual management has fallen almost entirely to the City of Pittsfield, which does own part of the lake by virtue of having acquired the dam and flowage area created by that dam. A variety of user groups have input to the management process, some more vocal than others and some without adequate scientific support, and the City does the best it can to accommodate multiple uses while meeting the environmental mandates of the Commonwealth as embodied in its regulatory structure. This is not an easy task or simple situation and maintaining flexibility in the management of Lake Onota is important. Conditions vary over time and space and there is no one size fits all solution to any lake problem. Hard and fast rules or thresholds for action are rarely appropriate, even for a specific lake. I sincerely hope that the best interests of the lake and all its users are kept in mind as negotiations proceed.

Concerns for Lake Onota are typical for Berkshire County lakes: excessive rooted plant growth with a focus on invasive species and elevated algae concentrations with a focus on cyanobacteria. The algae issue has not been severe, and ongoing monitoring by LOPA and the City has indicated acceptable clarity and levels of algae on a consistent basis. Vigilance is needed, and the participation in the USEPA cyanobacteria monitoring program was a good idea. While algae problems cannot be ruled out as a future issue, they are not currently a dominant thrust of lake management at Lake Onota.

The focus has been on rooted plants, with particular attention to Eurasian watermilfoil, curly-leaf pondweed, and spiny naiad, all invasive species, although some native plants can also achieve nuisance potential in Lake Onota.

The primary means to control milfoil have been drawdown and herbicide applications. Some hand pulling has also been recently employed and other methods have been applied in the past (e.g., mechanical harvesting), but drawdown and herbicides have been the mainstays of rooted plant control in Lake Onota for many years. The management plan has been adjusted over time and might need to be revised again to reflect insights from ongoing monitoring, but it has generally served the City well. Drawdown also provides benefits with regard to flood control and prevention of ice damage to banks, both interests of the Wetlands Protection Act, so this technique has been essential for more than just rooted plant control. Erosion of banks by flood and ice damage adds sediment and nutrients to Lake Onota, so drawdown relates to plant control both directly and indirectly.

With regard to drawdown, please note the following:

1. The GEIR was considerably flawed in its treatment of drawdown. I was the final editor of that document, but was not the sole author, and many of the recommended practices for implementing drawdown were not sufficiently supported by science. Monitoring programs since that time have provided considerable insight and my supplement to this section of the GEIR should be read by anyone considering use or regulation of drawdown as a lake management technique. Many of the key points pertain to Lake Onota.
2. The general threshold of 3 feet as the maximum level of drawdown acceptable under regulation without additional justification was generally upheld by review. While each lake has to be considered on a case by case basis, and the portion of the lake bottom exposed is a better indicator of potential impact than water level decrease, no evidence was found of significant negative impacts on any interest of the Wetlands Protection Act from drawdowns of 3 feet or less. This general assessment is applicable to Lake Onota; there is nothing about Lake Onota that suggests that a drawdown of 3 feet will cause impacts unacceptable under current regulations.
3. The thesis work of J. Carmignani at UMASS found remarkably few impacts to MA lakes from drawdown. The main impact documented by the thesis was that individual freshwater mussels were killed in the drawdown zone. Yet this work did not document impacts to freshwater mussel populations. That is, while mussels can be killed in the drawdown zone, the impact on the overall mussel population was uncertain. Lake Onota was one of the study lakes. Analysis of MA lakes, including many that were part of the thesis and Lake Onota specifically, suggests that no significant population level impacts occur. There could be an issue where a mussel species listed by NHESP was present, as any loss could be considered a taking, but Lake Onota contains no listed mussel species. There are many more mussels in water 5 to 30 feet deep in Lake Onota than in the 0-3 ft zone exposed by drawdown. Only a small fraction of the mussel population is impacted, and recolonization occurs readily.
4. Flood control is aided by drawdown. A 3-foot drawdown of Lake Onota provides enough capacity to handle at least a storm with a once in ten year frequency and allows capture of much of the spring snowmelt in a manner that limits downstream threats. In its capacity as a flood control

facility, Lake Onota should not be subject to arbitrary calendar dates for completion of refill. The April 1st deadline often imposed in Orders of Conditions is inappropriate, as the spring thaw can occur anytime between about the second week of March and the third week of April. An average is of no valid use; impacts are day to day and year to year, not based on any average. There is no need and in fact considerable risk in refilling the lake before the spring thaw. Aside from flood control, lake ecology is keyed to temperature, not calendar data. Fish spawning, plant productivity, and many related lake processes occur mainly after ice out, which is tied to temperature, not date, and can vary considerably from year to year. Drawdown for flood control must be performed annually and refill should be completed by the time the water reaches a temperature to suit the earliest spawning fish, which can be soon after ice out, but covers a range and can allow for later refill in a lake like Onota.

5. Another key function of drawdown is prevention of damage to banks. Lakes without drawdown have been documented to suffer such damage on a highly variable basis, both spatially and temporally. The lack of a drawdown over the winter of 2019-2020 for Lake Onota resulted in considerable shoreline damage as documented by LOPA. Damage is scattered and relates to shoreline slope, armoring, and other features, but did occur and is not unusual. The need for some degree of annual drawdown to protect sensitive shoreline areas should be upheld in any regulatory proceeding.
6. With regard to its plant control function, drawdown is very effective at limiting the density of perennial plant species in the drawdown zone. Eurasian watermilfoil is such a perennial species and is an invasive species with considerable negative impact on Lake Onota. While drawdown rarely eliminates any plant species, it does favor annual seed, turion or winter bud producers over perennial species and will allow sediment coarsening over time where the slope is great enough, which tends to lower plant density in the drawdown zone. The effectiveness for milfoil control has been well documented for other area lakes, including Goose Pond in Lee, Lake Garfield in Monterey, and Laurel Lake in Lee and Lenox. Additionally, the lack of drawdown in Laurel Lake in one recent winter and in Lake Onota just this past winter resulted in major expansion of milfoil and severe problems in much shallower water than usual. Drawdown is a valuable tool for control of milfoil in both the short- and long-term but needs to be implemented annually. Every other year or less frequent application has been attempted in multiple Berkshire County lakes with unacceptable results. Drawdown is a weather dependent plant control technique; application for plant control will not be as effective during mild winters. Yet without knowing the weather well ahead of time we have no way to predict in which years to perform or forego drawdown, and a regimented schedule of drawdown with off years decreases effectiveness.
7. Start and end dates for active water level lowering should not be tightly tied to calendar dates. Where multiple lakes drain into the same river system, such as Onota and Pontoosuc in Pittsfield, staggering the drawdowns over time may be advisable to minimize flood potential. The exact start and end dates recommended by state agencies have varied over my 35 years of work in MA, and no one set of dates is perfect. The intention of the currently recommended November timeframe has been stated variously at different times, but includes the desire to let hibernating organisms operate in a full lake as long as possible and to minimize the temperature of lake water released downstream into what may be a colder water habitat. Historically, later drawdown was preferred to facilitate boat launching and shoreline fishing as late into the season as possible. For many years, drawdown of Lake Onota has commenced on October 1st with a very slow drawdown that

has sometimes taken until mid-December to complete and has minimized interference with boating and other access considerations and avoided downstream flood impacts. This practice was the result of a process that involved all interested stakeholders and reached a mutually agreeable conclusion. I am not aware of any aspect of the Lake Onota drawdown that requires strict adherence to the preferred November timeframe and the only documented impact has been a minor loss of mussels, addressed previously.

8. The preferred average rate of drawdown of <3 inches per day, which has been upheld as desirable from experience of the last 15 years, may preclude drawdown to the target level within the month of November, which has higher than average precipitation and runoff. The average drawdown rate for Lake Onota is well under 1 inch per day, so it takes more than a month to achieve a 3-foot drawdown. While some acceleration of drawdown is possible, a large storm in late November could overrun the capacity of the Lake Onota pipe outlet to pass water, reversing the drawdown and leaving the water level too high to meet flood control, ice damage, and plant management functions going into December. Calendar dates are convenient for compliance checks but not flexible enough to allow optimal management and not protective in a way consistent with regulations.
9. Rates of drawdown and refill are not controllable at a fine scale in most cases, including Lake Onota. Pulling a spillway board or turning the crank on a valve that controls the opening of a subsurface pipe to release more water increases the outflow, but as the water level declines the head pressure also declines and outflow is reduced. The rate of outflow is also impacted by storms that alter inflow and can actually reverse the drawdown unless extremely high flows are allowed and are even possible with the outlet structure available. Replacing a board or closing the pipe opening for refill has similar limitation. Having a constant rate of drawdown or refill is very unlikely, but the variation should not be so extreme as to suggest ecological impact. For Lake Onota, the average rate of drawdown and refill has been less than one inch per day. The maximum and minimum values reported in the Carmignani thesis can be very large on an instantaneous basis, but do not last long. True daily averages show much less variation.
10. The recommended maximum outflow rate of 4 cfs per square mile of watershed from the GEIR is not appropriate. The recommendation comes from the aquatic baseflow policy which stipulates that value as a minimum for a spring flushing flow, not a maximum of any kind. The size of the watershed relative to the area of the lake and the capacity of the downstream channel to handle water during drawdown should be considered. For Lake Onota, with a watershed of just under 10 square miles, the outflow recommended under the 4 cfs/mi^2 rule would be only 40 cfs, not much more than the average (36 cfs) at the time of year drawdown is conducted and making drawdown almost impossible. The City operates the outlet at an average of 52 to 75 cfs to achieve the 3-foot drawdown over less than 2 months in most years at an average water level decline of 0.65 to 1.0 inches per day. Compressing the drawdown into just the month of November would require almost twice as much average outflow, more than the outlet pipes can convey and potentially causing downstream flooding.
11. The recommended minimum downstream flow of 0.5 cfs per square mile during the refill period is reasonable, although a slightly lower flow (0.3 cfs/mi^2) is supported for Berkshire lakes like Onota based on area hydrology. It is true that high flows are expected in the river during spring and refill from a drawdown will decrease those flows. This provides a flood control benefit, but in terms of river ecology there could be some detriment to downstream biological resources if

Lake Onota contributed a large portion of the downstream flow in the Housatonic River. An analysis of the contribution of Lake Onota to Housatonic flows in the spring would be worthwhile, to determine if the Onota contribution has any significant effect on river flows and if reduction in that flow has any negative impacts that could outweigh the flood control benefits. I am not aware of any such negative impacts, but Lake Onota can be refilled in under a month in all but the most extremely dry spring at the GEIR-recommended 5 cfs outflow requirement, so there is room for adjustment if needed.

With regard to herbicide applications, please note the following:

1. The number of active ingredients available for use as herbicides approved in MA has doubled since the GEIR was finished. There are also more formulations of herbicides with any one active ingredient, including liquid and pellet forms and with different additives to improve effectiveness. Blanket statements about herbicides are close to useless; one has to discuss specific ingredients and formulations to make any generalizations beyond the intent to kill target plants.
2. Despite highly publicized actions against a few ingredients (e.g., glyphosate, the main ingredient in a suite of agricultural and lawn herbicides), the risk to human health from approved aquatic herbicides has been minimal when used in accordance with the legal label (which dictates dosage and other aspects of application). Used properly, herbicides can address plant problems that themselves constitute a human health threat without compromising human health by their use.
3. Current thinking with regard to herbicide use is to vary the herbicide used against any one target species over a period of years to avoid any impetus for resistance to be developed. Having multiple herbicides approved for use in a lake, even with just one target species, is desirable. A common combination has been fluridone and diquat for Eurasian watermilfoil control, with fluridone used on a lakewide basis (although a recent formulation allows lesser areas to be addressed) and diquat used as a follow up for more localized growths. Experience over the last 15 years has revealed that diquat, long thought to kill only the parts of the plant it contacts, has some systemic properties and can kill root systems. Fluridone, while highly regarded as a systemic treatment for Eurasian watermilfoil, requires extended contact time (>1 month) and rarely kills all the milfoil in the system, so some follow up is needed. Triclopyr was added as an alternative herbicide over a decade ago when it was approved for use in MA. Now we have florpyrauxifen-benzyl as a new ingredient that seems to target milfoil even better than other herbicides but is more expensive and has less of a track record to date since it is new. All of these ingredients are applicable to Lake Onota and remaining flexible on choice of herbicide over time and space is advised; such flexibility should be incorporated into permits.
4. Lake Onota has at least two listed plant species, although one (*Potamogeton ogdenii*) is really in a ponded area that flows into Lake Onota and is actually a hybrid of two common species, so its inclusion on the protected plant list seems dubious. The other listed plant is an indigenous species of milfoil, so some consideration of how to avoid impacting it when controlling Eurasian watermilfoil is needed. But the impact of any herbicide on different species of milfoil is not identical and no assumption of impact should be made.
5. Experience over the last 15 years has suggested that it is rare to eliminate any plant species by herbicide treatment. Species richness has increased after treatment in most cases where richness has been suppressed by invasive species. Where species richness is high and the target species is not dominant, any loss of species has been temporary in the vast majority of cases, with a return

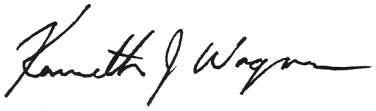
to pre-treatment richness within 2 years, which is the regulatory threshold for recovery in MA. Unfortunately, the same trend holds for the target species, which will be reduced in relative abundance and may even be absent for a time, but almost always return at some level within 2 years and requires additional control on an ongoing basis. Therefore, restricting herbicide use to once every few years is counterproductive. It is better to undertake a major effort to reduce target plant abundance in a single year, then to follow up with additional management (which may or may not involve herbicides) over smaller areas each year thereafter to keep the target plant abundance as low as possible.

6. Treatments in Lake Onota in recent years have involved up to 160 acres of the 653-acre lake, or up to 25% of the total. Considering only the plant growth zone (<20 feet of water depth), the treated area is about 41% of the plant growth zone. This is high enough to warrant monitoring for plant community features in response to treatment, and monitoring sponsored by LOPA suggests that no significant negative impacts are occurring. The focus of treatment has not been to eliminate plants overall, but to minimize invasive species and promote a native assemblage. This is an ongoing effort that, if ceased, would allow a resurgence of invasive species and negatively impact the lake and its users, human and non-human.
7. Despite no demonstration of negative impacts, changes in the plant community will result in some change to habitat, with some species benefitting and others being disadvantaged. This is the fundamental problem with the 8th interest of the Wetlands Protection Act, added after the initial passage of the Act, that addresses fish and wildlife habitat. Consideration must be given to the range of species present and any documented goals for the management of the lake. Lack of regular fishery surveys has hampered this analysis for the last 2-3 decades and assumptions about impacts of herbicide treatments with no reliable fish data are inappropriate.

With regard to plant control in Lake Onota, having a complete but flexible plan in place is highly desirable. Lake Onota has held permits for drawdown and herbicide treatment but has not had a recent review of the best combination of herbicides and other techniques to maintain desirable conditions in the lake with regard to rooted plants. There is nothing inherently wrong with the program as currently implemented, but there may be better options or fine tuning that could produce better results. Economics is a factor, as are regulatory constraints, but the science behind plant control options has become better understood since the GEIR was produced and needs to be transmitted to all interested parties. All interested parties should be involved in any review and questions should be addressed with real data, not opinion or assumption, in light of the information provided above.

Contact me with any questions, and feel free to pass this on to any parties interested in the management of Lake Onota.

Sincerely yours,



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