

Ecological Issues of Glenmere Lake, Town of Warwick, Orange County, New York

Introduction

Glenmere Lake is a circumneutral bog lake, a rare ecological community in New York (Kiviat and Stevens 2001). Glenmere Lake is mostly undisturbed and contains a greater variety of aquatic and palustrine plant species, Glenmere also has the largest known population of northern cricket frog (S1 Endangered) in New York, and the largest contiguous area of prime cricket frog habitat as well.

Apparently the ecological significance of Glenmere Lake is not understood or appreciated by many people in the local community. Plans by the village of Florida associated with the management of the lake as its water supply raise serious ecological concerns. As an ecologist who has worked extensively in the field of rare-threatened and endangered species I feel compelled to report these concerns to NYSDEC and the NYNHP.

A plan to control invasive plants in Glenmere Lake and a proposed housing development adjacent to the lake are of great concern to local environmentalists, but are not receiving adequate scrutiny from local officials. There is a danger that these actions will be approved without adequate environmental review. This could lead to unexamined and premature approval of these projects to the detriment of Glenmere Lake and its natural surroundings.

Two people familiar with Glenmere Lake brought this water body and its biological richness to my attention. Jay Westerveldt is a local naturalist who has been investigating Glenmere Lake for a number of years, and has become concerned for its ecological integrity based upon proposed management and development plans. Peter Warny is a herpetologist from Long Island and a longtime friend who became interested in Glenmere Lake after meeting Westerveldt. On June 18 Westerveldt gave me a tour of the lake by canoe with a couple of land stops. Warny was unable to attend due to a commitment in New Jersey.

Glenmere Lake habitat survey and assessment

Glenmere Lake is also similar in hydrology, landscape and vegetation to the Great Vly, another circumneutral bog lake in a DEC Wildlife Management Area in Catskill and Saugerties, NY. Glenmere Lake is exemplary compared to the Great Vly. The Great Vly has a history of disturbance reminiscent of the Harriman Park bog lakes. A former owner attempted to convert the mile-long, spring-fed calcareous wetland into a cranberry farm, a hopeless quest due to the water being near the opposite (alkaline) end of the pH scale for cranberries. Additionally there has been for many decades an active limestone quarry along the wetland's east margin. Looking down at the Vly from the quarry cliff one can see a gridwork of channels remaining from the cranberry episode.

The Great Vly has largely recovered from past disturbance. Although some shoreline areas of Glenmere Lake were lightly developed, the lake itself showed less evidence of past disturbance than the Great Vly. Along the west side of the wetland next to deep open water there is a water works plant and a modest public park, and along the southwest shore a number of houses set back in the wooded hills. The lack of development near the north, east and southeast margins of Glenmere Lake no doubt contributes to its high ecological quality.

The first thing that impressed me was the exceptional diversity of aquatic plant species at Glenmere. The shallower portions of the lake south, east and northeast of the deep portion were the richest, including aquatic herbs and palustrine herbs, shrubs and trees. Deeper waters had pondweeds (*Potamogeton spp.*), including *P. epiphydrus*, *P. illinoensis*, *P. pusillus* and *P. zosteriformis*. Other submergent plants included grassleaf mudplaine (*Heteranthera dubia*), common coontail (*Ceratophyllum demersum*) and nodding water-nymph

(*Najas flexilis*). Shallows near shore had Engelman's quillwort (*Isoetes engelmani*) and small waterwort (*Elatine minima*).

Notable occurrences on palustrine islands and shores were roundleaf sundew (*Drosera rotundifolia*), northern pitcher plant (*Saracenia purpurascens*), Calypso (*Calypso bulbosa*), water willow (*Decadon vericillata*). Shrubs included hazel alder (*Alnus serrulata*), poison sumac (*Toxicodendron vernix*), silky dogwood (*Cornus amomum*) and buttonbush (*Cephalanthus occidentalis*). Floating-leaved aquatics included white water lily (*Nymphaea odorata*), yellow pond lily (*Nuphar variegata*), water shield (*Brassenia schreberi*), duckweed (*Lemna minor*) and watermeal (*Wolffia spp.*). Tall emergent herbs included cattails (*Typha spp.*), arrow arum (*Peltandra virginica*), pickerelweed (*Pontederia cordata*), bur-reeds (*Sparganium spp.*), rushes (*Juncus spp.*) and smartweeds (*Polygonum robustius*, *P. amphibium*, others). This is only a partial list of aquatic and palustrine plants; a more intensive survey would no doubt reveal more.

Northern cricket frog

On our reconnaissance of June 18 2010 we heard large choruses of cricket frogs in a number of locations in the shallow shrub-bog habitats in the southern and eastern portions of Glenmere Lake.

In regard to northern cricket frog habitat, the vegetation and flora of Glenmere Lake reminded me of the less disturbed lakes in Harriman State Park. There all but two of the original large wetlands were dammed and flooded by the Civilian Conservation Corps in the mid 1930s, an unfortunate action that would not be permitted under today's state wetland regulations.

In 1988 I surveyed Harriman Park for northern cricket frog and found the species in six locations, only three of which had more than one to three calling males at any visit. To my understanding no cricket frogs have been heard in Harriman in over a decade, not even at Island Pond, the only high-elevation bog lake that escaped the CCC "improvements." This piece of cautionary history is sobering when considering the situation at Glenmere Lake.

Proposed control of Eurasian water milfoil

The control plan for water milfoil reported to me is to have a New Jersey pest control firm, Allied Biological, apply the general herbicide fluridone ("Sonar") to the deep center of the lake, and eliminate all aquatic plants there to make sure the water milfoil is entirely wiped out. This strikes me as the proverbial cure that's worse than the disease, if indeed there is a disease. There was at the time of my visit no problem with water milfoil or any other plant species in any part of Glenmere Lake. This was well into the growing season with plants at near maximum coverage. There is certainly no current or pending threat or emergency from any invasive plant species. It is possible that observed levels of water milfoil represent maximum or near maximum potential abundance at Glenmere Lake, and will not increase significantly.

The greater threat to both the ecosystem and the water supply is the milfoil control plan itself, or any activity involving chemical applications to the waters of Glenmere Lake. People drink this water. I see no reason for additional cautionary comments in that regard.

The ecosystem is another matter. Paradoxically, an aquatic ecosystem as complex and diverse as that of Glenmere Lake is both strong and fragile. Both its strength and its fragility lie in its diversity – diversity of physical structure and conditions, and also diversity of vegetation structure and species composition. A variety of water depths, temperatures and even chemistries can be reasonably assumed. There are various sediments, natural debris in varying states of decay, and other material resources that provide food and a spatial matrix for an assortment and abundance of plants and animals. Thus species diversity – and diversity of size, forms and living strategies – arises from the physical conditions. All these elements work together to support each other in a living network of great vitality and resilience.

The Pesticide Management Education Program (PMEP) of the USDA Cornell Cooperative extension gives a list of 16 plant genera or species susceptible to fluridone. The list is admitted not to be exhaustive. It could not be; Sonar has not been tested on every plant genus or species. Every aquatic genus on the list except two (*Cabomba* and *Hydrilla*) I observed at Glenmere Lake.

At the same time a change in the system could cause great stress, especially a change at a fundamental level such as water conditions. Induced changes in water chemistry are likely to result in ecological damage unless some organisms can respond and rebalance the ecosystem chemistry. Toxic chemicals that weaken or kill living organisms undermine the system's capacity to recover its balance and integrity.

To target a species or group of species for elimination can have unpredictable, unfortunate and lasting system-wide consequences. If an invasive species is clearly demonstrated to be a threat then it is important to be very careful not to harm other species. The better solution is to choose a means of control that does not affect other species. Biological controls or multiple measures directed at the target species (Integrated Pest Management) are recommended, including by NYSDEC, because they are both safer for the environment and often more effective than chemical eradication.

In the case of water milfoil I believe eradication, even of only water milfoil, would not be effective long-term because water-milfoils are common and easily spread. Once eradicated from a body of water they would soon be back. A better long-term solution might be to introduce an herbivore that prefers *Miriophyllum*. The native milfoil weevil (*Euhrychiopsis lecontei*) is a specialist herbivore that prefers Eurasian water milfoil over native species (Solarz and Newman 1996). This weevil has proven an effective control in some locations. It should be tried before any chemical controls are considered.

Potential conflicts of interest and political influence

There are apparent conflicts of interest involving the New Jersey pest control firm Allied Biological, the pesticide manufacturer Sepro Corp, and a NYSDEC official. I believe this could result in a grave error in resource management that could result in significant and lasting damage to the Glenmere lake ecosystem.

I was informed of the conflict of interest situation by Westerveldt. In a letter to the editor of The Chronicle, a local newspaper (Feb12, 2010), Westeveldt "Connects the dots" in this conflict of interest:

"The private, New Jersey-based company that performs [the village of] Florida's biological surveys is Allied Biological, whose president, Glenn Sullivan, is a board officer of the Northeast Aquatic Plant Management Society. NYS Department of Environmental Conservation environmental engineer Scott Kishbaugh, the DEC's decision-maker on eradicating "invasive plants," serves on this same board as internal auditor."

Westeveldt continues:

"This 'non-profit' cites, as their largest monetary contributor, the Sepro corporation [which] developed, manufactures, and markets "Sonar," the herbicide that Allied, and NYS Department of Environmental Conservation environmental engineer Kishbaugh is pushing for use at Glenmere Lake."

This I have on Westerveldt's word, and as far as I can determine [web sources?] it is factually accurate. It is not my purpose to comment on the political issues but rather to offer my assessment of the ecological situation. I am confident of my conclusions in this regard, which hold regardless of the politics. I mention the political context to emphasize the urgency for an objective, scientifically sound approach to the perceived or possibly "oversold" problem of invasive plants at Glenmere Lake.

A greater threat than invasive plants themselves could be the establishment within DEC of a pre-emptive policy of early intervention and quick action based on a “make sure it’s all gone” attitude, leading to overkill and significant damage to healthy ecosystems. It is important to prevent such a lethal juggernaut from driving the control of invasive plants. Such control is important and at times necessary, but the overall goal is ecosystem health, including the preservation of biodiversity.

Creamery Pond

I offer the example of Creamery Pond, a small wetland near Glenmere Lake that was treated with herbicide by Allied Biological in 2008 and 2009, as an example of Allied Biological’s pre-emptive, aggressive approach to invasive plant management and control. Creamery Pond may provide a preview of what could happen to Glenmere Lake. Below is Jay Westerveldt’s commentary on the firm’s “discovery” in Creamery Pond of Esthwaite waterweed (*Hydrilla verticillata*), an invasive plant that has escaped from aquarium supply outlets to many points of introduction in North America (Allied Biological 2008, see Addendum, items A and B).

“My grandfather built Creamery pond in 1950; I have fished and surveyed it for decade. A homeowner on the lake asked me to see what can be done about ‘all the weeds,’ as he heard that invasive plants would get them a free ‘lake cleaning’ if found to be present there. I performed a two-day survey and found no invasives.”

”Within one year, Allied Biological was hired to survey the pond (allied provides a link to the NYSDEC grant program on their website!). Miraculously they found NY's first occurrence of Esthwaite waterweed. The Sepro Corp. donated the chemicals and the NYSDEC covered the eradication by Allied. Dr. Jonathan Micancin spoke against this protocol at a town meeting set up by the DEC. Both Bog Turtles and Cricket frogs are well-known to occur very near the pond. Since the eradication Creamery Pond has become an absolute, weed-infested mess.”

I have not visited Creamery Pond, but I have no reason to doubt Westerveldt’s description of its post-treatment condition. Glenmere Lake must not be permitted to suffer a similar fate.

Assessment of threats from invasive plants

The aquatic plant species behind all the controversy and concern at Glenmere Lake is Eurasian water milfoil (*Miriophyllum spicatum*). Allied Biological has made an effort to convince town officials and residents that Eurasian water milfoil presents a serious threat to the local water supply, that this plant is about to explode in abundance and clog the waters of the lake. What I saw at Glenmere Lake suggests otherwise.

I observed Eurasian water milfoil only in the deeper central area of the lake, along with native water milfoil (*Miriophyllum heterophyllum*), white water lily (*Nymphaea odorata*), water shield (*Brassenia schreberi*) and Illinois pondweed (*Potamogeton illinoisensis*). There were relatively few plants of these species, and all seemed to be stressed by the depth of the water, a great deal of energy apparently expended to grow up to the available sunlight and the water surface. The condition of milfoils here was especially poor. Many plants were coated with what appeared to be decaying algae or decayed material of the plants themselves. New growth was minimal or absent, and few plants had grown sufficiently to reach the water surface, which they would need to do to bear flowers and fruit. The growing tips of about 90% of the milfoils were apparently dead or dying. Westerveldt suggested that this was from application of copper sulfate used to control “problem” plants.

In the shallower remote areas of the lake, including the boggy areas, plants appeared healthier and more robust. Additionally, in the shallower areas of the lake there was a greater density and diversity of aquatic plants. This may be partly due to absence or low levels of copper sulfate, and the fact that shallower water is less stressful on bottom-rooted plants. The water was much clearer here as well, with sunlight reaching greater depths.

In these areas away from the deep center of the lake I did not find Eurasian water milfoil, but instead the similar-looking native coontail (*Ceratophyllum demersum*) and other plants that might be mistaken for Eurasian water milfoil. Nowhere in the lake did I see any indication of a current or potential problem with dominance or density of water milfoil. I consider it unlikely that a problem will develop with Eurasian water milfoil or any other invasive plant any time soon unless more invasives are introduced or other factors degrade water quality.

Threats to Northern cricket frog (*Acris crepitans*)

Northern cricket frog, listed as Endangered in New York, is the rarest species known to be present at Glenmere Lake. Westerveldt reports that cricket frogs recently stopped calling from locations where they were heard regularly, and in good numbers. He suspects this may be due to application of chemicals such as an excess of copper sulfate.

I am informed that Allied Biological has proposed experimental exposure of cricket frogs to “Sonar” (fluridone) to test susceptibility to this known toxin.

Fluridone has not been tested on amphibians, only on mammals, whose physiology is very different and unreliable for comparison. I also understand that the firm plans to perform this test not under controlled laboratory conditions but on frogs in Glenmere Lake. This approach strikes me as unscientific and dangerous. How can any useful information or valid conclusions be derived from such an unstructured, uncontrolled experiment? As described to me it is astoundingly lacking in basic scientific rigor and caution, as well as open to the influence of countless unidentifiable, immeasurable conditions. Additionally it poses a threat to what appears to be the largest cricket frog population in New York State.

Another issue is that herbicides and other chemicals may reduce or eliminate invertebrate food sources for cricket frogs. An example of a potential important (and possibly vulnerable) food source is the water lily planthopper, which occurs abundantly at Glenmere Lake (see Addendum, item C).

Additionally there is a large residential development (Glenmere Preserve) planned for the upland adjacent to the west end of Glenmere Lake, the part of the lake with the greatest concentration of cricket frogs. As I understand it, this project is being rushed through with only a cursory review. Any project updrainage of Glenmere Lake should receive the most thorough review possible and be held to the strictest standards of environmental quality. Dr. Jonathan Micancin, Visiting Assistant Professor of Biology at The College of William and Mary has visited Glenmere Lake and commented on threats to cricket frogs there (see Addendum, item D).

Recommendations

Glenmere Lake is a sufficiently important natural resource to warrant a careful, collective interdepartmental review. Moreover the issues raised by Glenmere Lake are very serious and likely to arise again, perhaps with increasing frequency. Hence it is a good test case for the Department to begin to develop policy to better deal with the array of issues raised here. This may be part of what the future looks like. Here is a chance for rational, informed citizens and science-minded planners and regulators to get a jump on what may be in store on the coming wave of commercial interests competing in the potentially lucrative field of invasive plant control.

This is not the only case in my experience that suggests to me that the growing campaign against invasive plants, though largely well-meaning and validated by good evidence, is becoming a movement fraught with hazards and rife with potential threats of environmental abuse. I also offer the opinion, based on my experience as a biological consultant, that current widespread corruption encouraged by government/business ties poses a staggering threat to the application of good science to solving genuine environmental problems. The Glenmere Lake situation is a perfect example of this.

Considering the and sensitivity of the Glenmere Lake ecosystem I recommend that NYSDEC engage a full spectrum of agency personnel with specialized expertise in multiple disciplines relevant to the many issues involved in this decision. Any discussions and ecisions affecting the Glenmere Lake ecosystems need a multiple disciplinary approach, and should not be left to one or a few individuals with limited expertise. It seems that the DEC invasives staffers tend to oversell the threat of invasives infestations, and prefer herbicides as the best possible means of control. Important and essential broader fields of expertise are ecology and water quality. More specialized fields include aquatic and palustrine ecosystems; invasive plant ecology, particularly aquatic invasives including water milfoils; water and soil chemistry and pesticide toxicology; integrated pest management including biological controls. These fields may not be exhaustive of what is relevant to achieving a well-informed and scientifically valid perspective.

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ADDENDUM: SUPPORTING MATERIAL

Item A

New Invasive Species Finding in NY- The first infestation of hydrilla (*Hydrilla verticillata*) in New York was confirmed in Creamery Pond in Orange County late this summer. More than 50% of the 5-acre pond is occupied by this exotic species. Shortly after its documentation in Creamery Pond, *Hydrilla* was discovered in 2 of the 11 ponds within the Sans Souci Lake Nature Preserve in Suffolk County, NY. NYSDEC is requesting immediate action be taken at Creamery Pond by conducting a fall 2008 herbicide treatment followed by an additional treatment in the spring of 2009 with subsequent grass carp stocking. Similar priority is being given to the Nature Preserve with management methodologies to be implemented in 2009 now being discussed.

- from Allied Biological's website (www.alliedbiological.com/newsandnotes.htm).

Item B

Aggressive Weed Puts DEC in a Bind

By Matt King

Times Herald-Record, 10/09/08

SUGAR LOAF — Residents and environmentalists are divided over spraying chemicals in Creamery Pond, but they likely will be used to prevent an invasive plant from spreading to the rest of the state.

The plant, hydrilla, is an aggressive invader with the potential to turn Creamery Pond into a swamp and choke waterways throughout the region.

"It's a bad plant, and it's something we don't want introduced into other water bodies," Scott Kishbaugh, an environmental engineer with the state Department of Environmental Conservation, told 20 concerned residents who live near the pond on Tuesday.

Kishbaugh said the chemicals, along with a carp that likes to eat hydrilla, will have the best chance of killing the plant. Other options, like dredging and harvesting, won't work as well, he said, because hydrilla is too resilient and will thrive in almost any environment.

No one is sure how hydrilla sprouted in Creamery Pond, but the likeliest explanation is it was carried in by a water fowl from a body of water in New Jersey.

The 9-acre pond is behind the Lycian Centre. It's owned by about 15 residents with homes on its shores. They have appealed to the DEC to use "any means necessary" to eradicate the plant because it will crowd out other plants and make it impossible to boat or fish.

"I think it needs to be attacked aggressively and attacked quickly," said Joe Ranni, who lives on the pond. "I'm not for anything that causes cancer, but if the (chemicals) dissipate quickly, I think it's a necessary first step."

Turtles near Creamery Pond

DEC officials have not made a final decision but are leaning toward fall and spring treatments with a copper compound called Komeen and fluridone.

But not every resident is happy about the plan. They worry about the effects the chemicals could have on bog turtles and northern cricket frogs, two endangered species with habitats near the pond.

The DEC has not approved fluridone for use in nearby Glenmere Lake because it could harm the frogs living there.

"If there's any other alternative, that would be my preference," said Shary Denes, who lives near, but not on, the pond.

And some residents are suspicious of a North Carolina company called SePro that will donate the chemicals.

"I'm all for getting the weeds out, whatever it takes, except using synthetic chemicals," said Jay Westerveld, president of the Sugar Loaf Historical Society. "I don't see a reason to use chemicals unless someone who is donating them is going to use Creamery Pond as a testing ground."

The DEC will make a final decision next week.

Item C

"I helped the New York Natural History Council identify a true bug species, *Megamelus davisii*, or the Water Lily Planthopper. This arthropod appears to be an important source of food for the Northern Cricket Frog (*Acris crepitans*) in the Glenmere reservoir." – Louis N. Sorkin, Senior Scientific Assistant, Department of Entomology at the American Museum of Natural History.

Item D

The Fight to Save Glenmere Lake's Endangered Cricket Frogs - The Great Stakes at Glenmere Lake
By Dr. Jonathan Micancin.

What to do about the Northern Cricket Frog and Glenmere Lake? An endangered frog has jumped in the way of real estate projects and manipulation of a public water supply in Orange County. To eliminate this obstacle, a bill has recently been drafted to remove the Northern Cricket Frog from New York State's list of endangered species, despite the fact that cricket frogs, like many other amphibians around the world, are in decline.

We should consider what is at stake for every person that is affected by this issue. A vocal few have money, pride, reputation, ethical convictions, and/or preferred lifestyle on the line. Many more drink the water from Glenmere Lake and will be affected by any economic development that occurs nearby. A far greater number of people have a stake in what happens to cricket frogs and Glenmere Lake in the next few years: every person on earth. This is no exaggeration, but it requires an explanation.

It was only about 25 years ago that scientists began to recognize a pattern of amphibian decline in supposedly pristine areas like cloud forests in Central America and mountain lakes in California. It is only recently that we have realized that amphibians are dying out everywhere, whether they live in national parks or in backyards. Of the more than 6000 known amphibian species, at least 42% are in decline and at least 32% are threatened with extinction or are already gone forever. Amphibians are especially sensitive to human disturbance and most receive a double-dose of it by living in water and on land. These factors make it difficult to point to a single cause for the decline or extinction of even one species. Habitat loss and a fungal disease called chytridiomycosis ("kit-trid" for short) are major killers. Climate change is also implicated in amphibian declines, as is a long list of other manmade problems.

A major concern for people that study amphibians is that some probable causes of amphibian declines can also affect humans. Perhaps the most insidious among these is pollution. Banned chemicals like DDT and PCBs and wildly popular herbicides like Roundup and atrazine can be toxic, but even if they do not kill, they persist in the environment and their effects may be terrible. One reason is that, like the substance BPA that was recently removed from plastic bottles, they are endocrine disruptors. Endocrine disruptors emulate hormones found in

frogs and people and they have been linked to such human health problems as cancer, brain disorders, miscarriages, and other reproductive maladies. Children appear to be particularly vulnerable to endocrine disruption.

The precautionary principle holds that in the absence of information showing that some action will not harm the environment or human health, it is better to act with caution than to assume that no ill effects will occur. With connections between amphibian and human well-being becoming clear, opportunities to study amphibian declines in areas where many people live are increasingly important. Because cricket frogs have declined over large and diverse areas (the upper Midwest, the Southeast, and New York), multiple causes are probably responsible. By comparing Glenmere Lake and the area around it with places in New York where the Northern Cricket Frog no longer occurs, we could begin to determine the causes of the decline of the species, which in turn could indicate potential threats to human health. Such work would inform amphibian biology and public health far beyond Orange County. Because the Northern Cricket Frog is already endangered in New York, it is safe to expect that any substantial changes to the habitat of cricket frogs around Glenmere Lake will reduce their numbers and diminish the opportunity to learn from them. This is why every person on earth has a stake in Glenmere Lake.

I was born in the Hudson Valley and as a boy I explored its rivers, lakes, and ponds. Catching amphibians became one of my favorite pastimes, but I never saw or heard a cricket frog. I have since earned a Ph.D in Biology by studying two species of cricket frogs in North Carolina. Safely removed from the controversy that surrounds them back home in New York, I see that it is good news for the people that depend on Glenmere Lake for water that cricket frogs can thrive there. The presence of the Northern Cricket Frog suggests that Glenmere Lake is relatively clean and protected. To our peril, few things in nature stay that way for long.