# Management Plan
# for Moody Pond
# (Saranac Lake, NY)

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Prepared for

**Friends of Moody Pond**

*https://friendsofmoodypond.org*

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## 1.0 INTRODUCTION

In *Walden*, Henry David Thoreau wrote that a lake is "a landscape's most beautiful and expressive feature. It is Earth's eye, looking into which the beholder measures the depths of his own nature." Anyone who has seen Moody Pond lying still as a mirror and reflecting the sky, the surrounding forests, and the slopes of Mount Baker knows that Thoreau's description is as fitting here today as it was at Walden. The pond is well loved by local residents and visitors alike, a beautiful point of pride for Saranac Lake village, the focus of a close-knit community that most people can only dream of living in, and a place that embodies core principles of the Adirondack Park itself by blending humans and the wild in a mutually complementary mosaic.

But Thoreau's observation is also a warning that Moody Pond reflects more than just the sky, forest, and mountain; it reflects us, too. A lake is tightly connected with its watershed, and for the last two centuries humans have become an increasingly influential component of Moody Pond's watershed. Unfortunately, some of those influences are changing the pond in undesirable ways. Whether such changes persist, intensity, or reverse in future will depend upon how the people who live, work, and recreate here think and act. In that sense, Moody Pond truly is a mirror in which we can see the depths of our own nature.

The citizen action group Friends of Moody Pond (FMP) was first organized in 2019 to address concerns among local residents and visitors about the growth of invasive Eurasian Water Milfoil (EWM) in the pond. This preliminary management plan is intended to support efforts by FMP to address the EWM issue as well as other environmental challenges facing the pond.

## 2.0 SETTING AND HISTORY OF MOODY POND

### 2.1 Setting

According to the Adirondack Lakes Survey Corporation (ALSC) and the Adirondack Park Invasive Plant Program (APIPP), Moody Pond has a surface area of 23-25 acres (9-10 ha), mean depth of 8-9 feet (2.6 m), maximum depth of 17 feet (5.2 m), and a surface elevation of 1542 feet (470 m). The watershed covers ca. 137 acres (55-56 ha), including the wooded southern flank of Mount Baker. Most of its water inputs come from groundwater and direct precipitation on the pond surface, but relatively small amounts of surface runoff also enter from several locations around the shoreline including an intermittent brook that drains Mount Baker into an alder swamp at the north end of the pond. Outflow is through a stream that exits a shallow bay on the southwestern end of the pond and drains into the Saranac River. The ALSC estimated that the flushing rate of the pond is approximately 1.5 times per year. Forest Hill Avenue, formerly known as Moody Pond Road and East Pine Street, parallels most of the 1.4 km shoreline, which is privately owned except for a small, possibly state-owned parcel at the Mount Baker trailhead and public boat launch. With most Adirondack lakes, the state and/or shore owners share property rights to the bottom of the water body, but in the case of Moody Pond the entire lake bed is said to have been deeded to the Cantwell family, who have been long-time residents of the neighborhood.

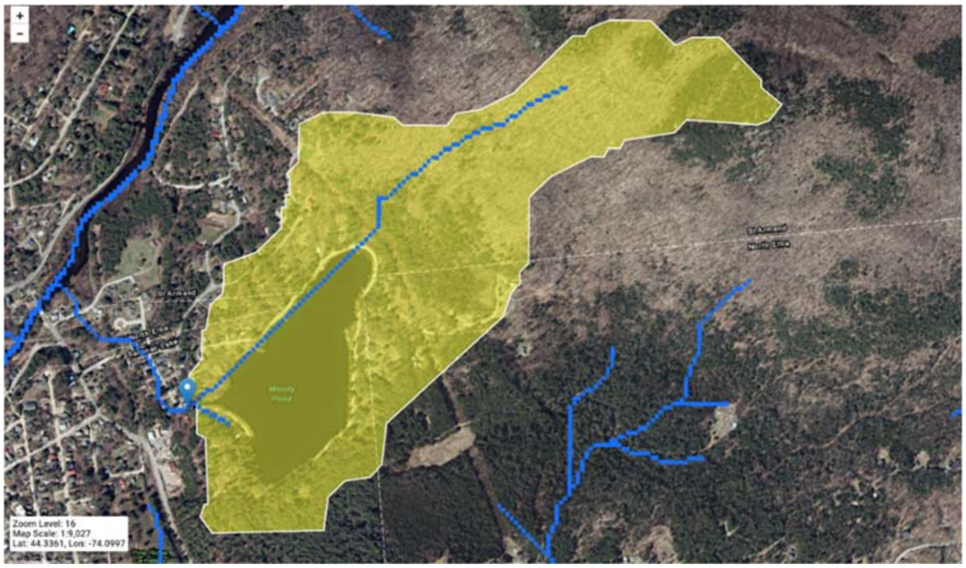



*Fig. 1. Map of the Moody Pond watershed, courtesy of Brendan Wiltse.*

### 2.2. Geological History

The anorthosite and related granitic rocks that underlie the Moody Pond watershed are roughly 1 billion years old, or about one quarter of the age of Earth itself. Remnants of even older calcite deposits that were left behind by a former tropical sea may also be present here as they are elsewhere in the High Peaks area. The gritty bases of several dozen ice sheets planed and sanded the bedrock during the last 2-3 million years, each time pushing slowly forward from Canada in a southerly direction, then stopping and melting down in place. The narrowest part of the sandy ridge along the southern rim of the watershed is an esker, the bed of a former meltwater river that once lay beneath or within the ice sheet (Buddington 1953). Most of the ridge is unusually broad and discontinuous in comparison to the more classic eskers at Rainbow Lake and Paul Smiths, but in any case it is clearly some sort of deglacial landform.

Sediment coring studies by faculty and students at Paul Smith's College have shown that Moody Pond formed 13,000 years ago at the close of the last Ice Age. At the base of the longest core, brown organic mud atop dense grey glacial sediment represented the transition from a silt-choked meltwater lake on a barren landscape to a clear-water pond surrounded by the region's first forests. The microscopic remains of diatoms (microscopic algae with glassy shells) in the roughly 7 feet of overlying layers of lake mud showed that the algal community had remained much the same for thousands of years until the last century or two (see Section 2.4).

*Fig. 2. Paul Smith's College students collecting sediment cores from Moody Pond in 2019.*

**2.3 Settlement and Recreational History**

People have been part of the landscape around Moody Pond for most of its history (Stager 2017). A distinctive fluted projectile point discovered on the shores of Tupper Lake demonstrates that "Paleo-Indian" hunters were present in the region at least 10,000 years ago, not long after the last ice sheet melted away. According to Mary MacKenzie (2005), the adjacent Saranac River was a major trail for indigenous peoples traveling into the uplands from Lake Champlain. It is also likely that some of the region's earliest roads, such as the Northwest Bay Road that once included what is now Pine Street, followed pre-existing indigenous footpaths.

In an interview during the late 19$^{th}$ century, Abenaki guide Mitchell Sabattis reported that the English names of many local lakes, including Lake Clear and Blue Mountain Lake, were translations of older indigenous names. According to the Historic Saranac Lake wiki (HSLW 2020), Moody Pond was formerly known as Pine Pond, and it is tempting to speculate that it bore that more descriptive name for many centuries before Jacob Moody named it after himself.

Jacob Smith Moody (1787-1863), a former resident of New Hampshire and veteran of the War of 1812, was the first Euro-American settler in Saranac Lake. In 1819, he purchased a large plot that included part of Moody Pond and cleared a homestead at the base of the sandy ridge near the intersection of what is now Pine Street and Brandy Brook Avenue (Donaldson, 1921). According to an article by Thomas Cantwell, however, Moody cleared farmland on the east side of the pond and built a temporary residence there, although these accounts might not be mutually exclusive. In 1836 he is said to have deeded the northern third of his property to his son, Harvey (1808-1890), who built a cabin and smithy on it. Judging from the location of Jacob Moody's residence on Brandy Brook Avenue as shown on an early map (Fig. 3), it seems likely that the Moody family used the trail through The Pines to access the pond. Judging from the deeply eroded nature of that path, it also seems possible that it began as an older indigenous footpath.

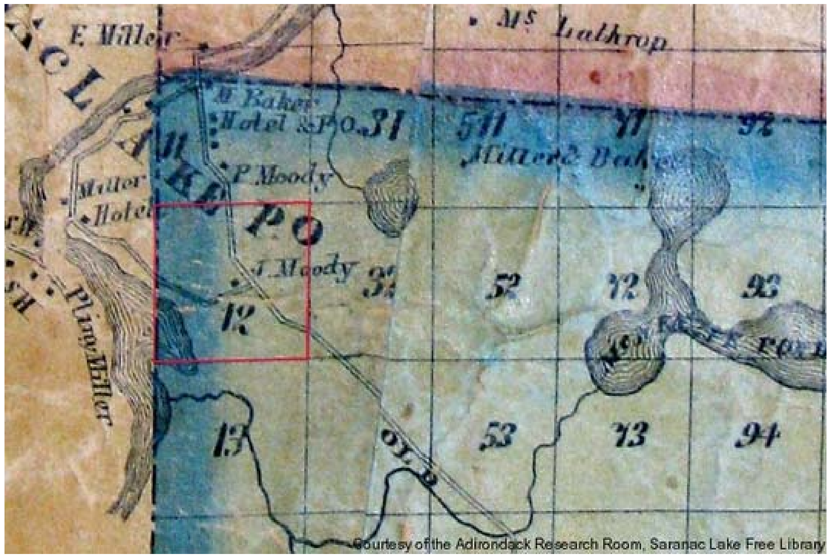



*Fig. 3. Map from 1858, placing Jacob Moody's residence on Brandy Brook Avenue. The red square outlines Moody's property: Township 11, Lot 12. No residences or roads are indicated around Moody Pond at that time. https://localwiki.org/hsl/150_River_Street*

Much more of the history of Moody Pond, Mount Baker, and the Saranac Lake community in general is well documented on the HSLW, but selected aspects that are potentially relevant to the ecological condition of the pond are mentioned here.

Forest fires burned the slopes of Mount Baker in 1903 and 1908, and many of the non-native scots pines that now cover much of the summit were planted in 1914. The mountain burned again in 1915. The lack of forest cover due to fires and land clearance in the northeastern sector of the watershed was a likely source of soil erosion and associated nutrient inputs to the pond from topsoil and wood ash. Forest cover within the watershed is now more extensive than it has been since the early 20th century, but the debris that washed into the lake previously might still represent a source of algae-stimulating nutrients today.


*Fig. 4. Moody Pond from Mount Baker ca. 1901-1906, showing extensive cleared lands on the eastern side of the watershed. https://localwiki.org/hsl/Mount_Baker*

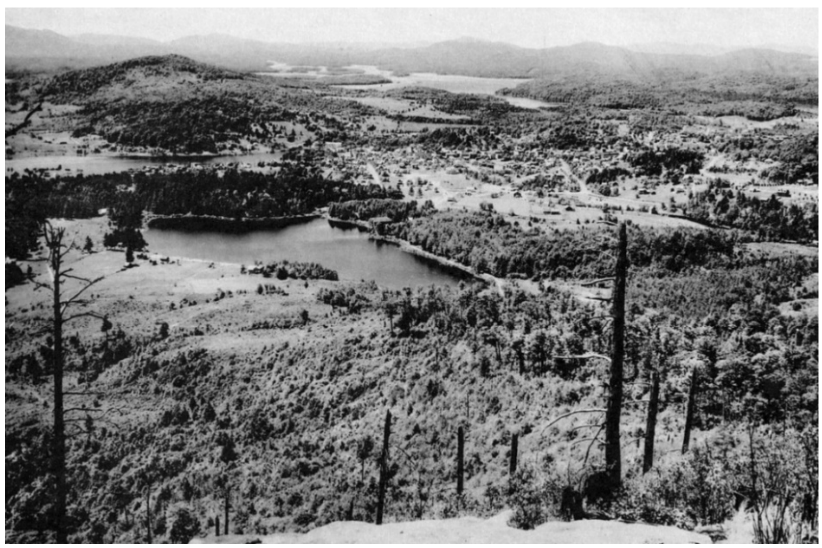


*Fig. 5 Moody Pond from Mount Baker, ca. 1920. Signs of the recent fires are visible.*

It is not certain when the first road was established along the shoreline, but USGS maps published in 1902 and 1904 show that a road and several residences were present along the eastern and southern sides of the pond then (Fig. 6). The road reached only as far as a buidling on the northern end that appears to be what is now Shamim Allen and Craig Bailey's home site overlooking the alder wetland at the foot of Mount Baker. It also allowed access to a quarry on the mountainside that provided building materials for the village during the 1930s. Another map from 1955 shows that the road fully encircled the pond by then. Sewage, fertilizers, and soil erosion associated with residences within the watershed would have been increasingly significant sources of nutrients during the last century, as were animal wastes deposited on the road prior to the automobile age. Mount Baker Road, which appears on a USGS map from 1979, also became a possible new source of nutrient-rich runoff.

Thorough studies of septic systems, ground water hydrology, and watershed-scale nutrient budgets are not yet available for Moody Pond. Most of the more than two dozen residences adjacent to the pond's shoreline are now connected to the village's sewer system, but residential wastes have probably been a chronic source of nutrient enrichment since the 19th century. Local porous, sandy soils would permit rapid seepage from former leach fields and septic tanks as well as lawn fertilizers, herbicides, and insecticides. Adjacent roads also contribute dust and runoff that contains traces of petroleum, asbestos, salt, dog waste, and other pollutants. Fortunately, the water of Moody Pond remains surprisingly clear despite the heavy settlement, fires, and multiple uses of the watershed during the last two centuries, although it is not always so and is probably less clear than in the pre-settlement past.

The beauty and accessibility of the pond have long drawn Saranac Lake residents and visitors for year-round recreation. It is popular among anglers, boaters, and swimmers, and since the days of Robert Louis Stevenson and early Olympic hopefuls it drew ice skaters and bobsledders. But the main attraction is the walking loop provided by Forest Hill Avenue with its flat terrain, proximity to town, Mount Baker, and The Pines trail system, attractive views of Moose and MacKenzie Mountains, and the pond itself. The Town promotes the walking loop with signs downtown and online, and those who jog, walk their dogs, push strollers, watch wildlife, or simply saunter on any given day can number in the hundreds.

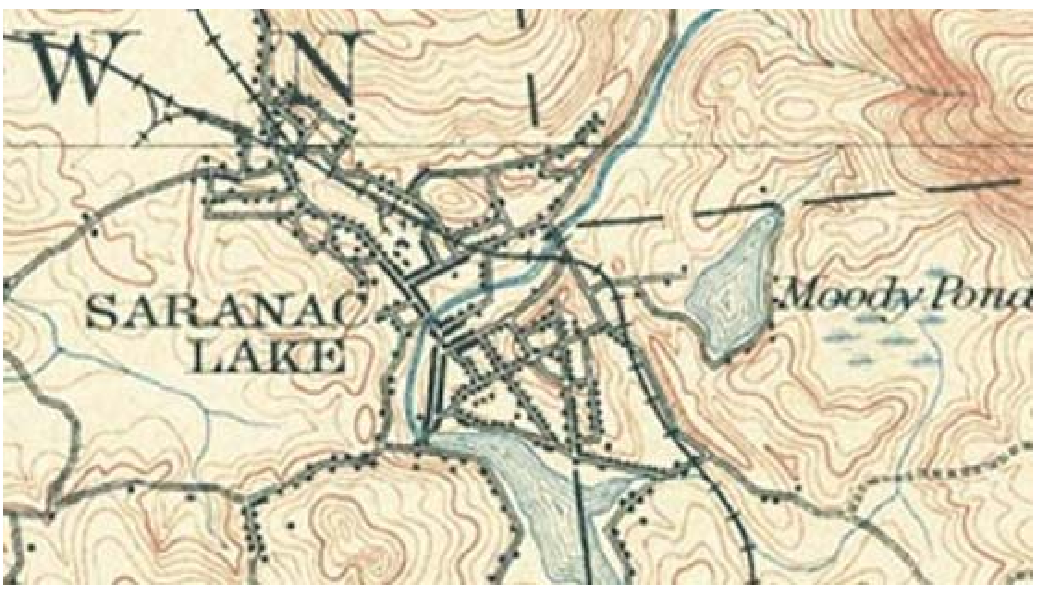



*Fig. 6. USGS map, ca. 1904, showing road access only on the southern and eastern shores of Moody Pond.* [https://www.etsy.com/listing/385229402/saranac-lakes-1904-usgs-old-topographic](https://www.etsy.com/listing/385229402/saranac-lakes-1904-usgs-old-topographic)

**2.4 History of Lake Studies at Moody Pond**

Moody Pond was one of hundreds of Adirondack lakes that the ALSC studied during the mid-1980s in response to concerns about the impacts of acid rain and invasive species in the Park. Their chemical analyses of the pond revealed no evidence of acidification then, and acidic emissions from coal-fired power plants and other sources upwind of the Adirondacks have declined due to amendments of the Clean Air Act in 1990. Acid rain is therefore unlikely to represent a serious threat to Moody Pond now or in the foreseeable future. At the time, invasive fish species were also present in most of the lakes studied, and like many of them Moody Pond contained non-native northern pike and "possibly-invasive" yellow perch (Stager et al. 2015).

A contour map of the pond produced by the ALSC contains major errors (Fig. 7a), and differs from one produced by APIPP in 2019 (Fig. 7b).

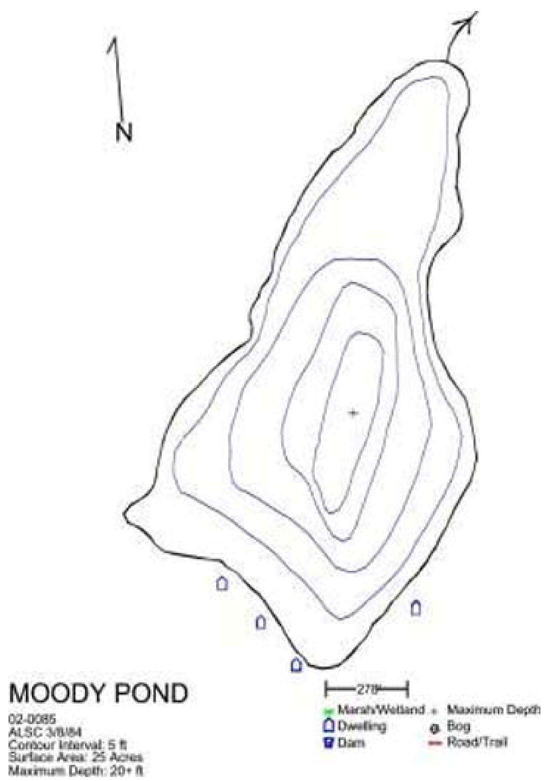
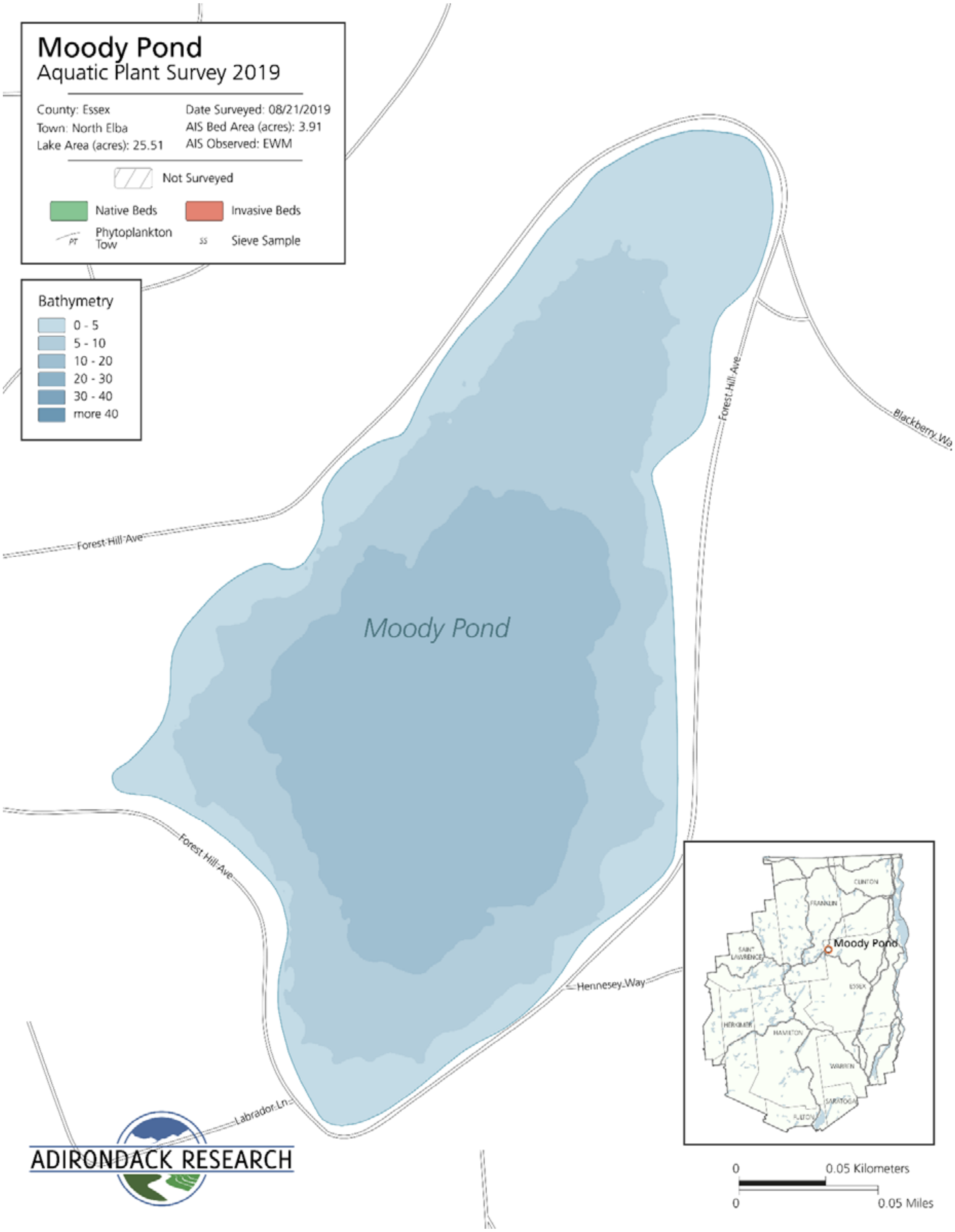



*Fig. 7a. Contour map of Moody Pond produced by the ALSC. It provides a general sense of the internal layout of the pond but includes several errors including the incorrect inclusion of an outlet at the northern end (it actually flows into the pond, not out), the lack of an outlet in the southwestern cove, far too few residences, and excessive depth in the center (actual max depth is less than 20 feet).*




*Fig*

*Fig. 7b. Contour map of Moody Pond produced by Adirondack Research and APIPP (Appendix A). This map, in contrast to the ALSC map, shows no outlet.*

In 2019, a preliminary survey of the extent of EWM conducted by APIPP yielded a map that identified extensive beds of EWM at intermediate depths within the central sector of the pond and smaller beds in the northern shallows (Fig. 8). The artificially linear margins of the mapped beds suggest that the extent of the larger, deeper growth offshore was underestimated, and smaller concentrations of EWM that were observed by FMP members along the entire southern littoral zone in late summer, 2020, were not included on the APIPP map. ***Because EWM in the pond is more extensive than the preliminary survey was able to document, more complete vegetation maps should be obtained to support planning and management efforts***.

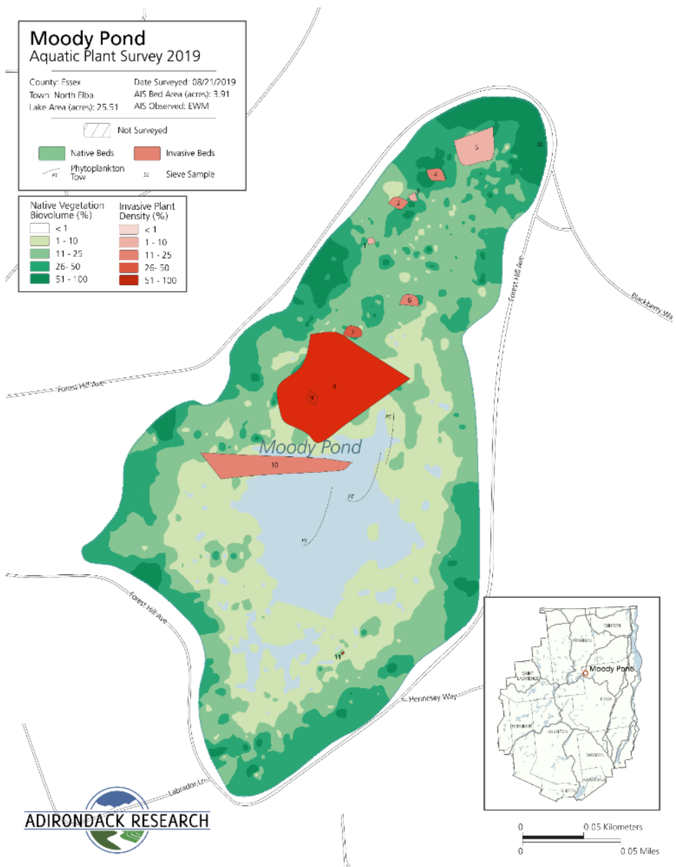



*Fig. 8. Map of EWM extent in Moody Pond in 2019 produced by Adirondack Research and APIPP (Appendix A), showing EWM beds in red and native plants in green.*

Since 2018, Curt Stager has conducted informal investigations of the pond's history and ecology including sediment coring, plankton sampling, clarity (Secchi disk depth), temperature, and dissolved oxygen profiles. These investigations are expected to continue in coming years.

Analysis of the ancient diatoms preserved in one sediment core by PSC student Dakota Weinman (Fig. 9) offers potentially useful insights into the environmental history of the pond. The core was 45 cm long, and carbon-14 dating showed that it represented the last 1000 years. Figure 9 illustrates shifts in the percent abundances of various diatom species that represented ecological transitions in the pond around A.D. 1400 and 1700, respectively, due to past climatic changes. Two horizontal dotted lines on the figure mark more recent transitions that probably reflect human activity in the watershed. Above 10 cm depth in the core (roughly A.D. 1820) the percentages of small bottom-dwelling species of diatom (*Fragilaria* and Pennales) increased, particularly above 2 cm depth (roughly A.D. 1980). The two most likely explanations of the change are:

(1) Because some of those taxa grow well on aquatic plants, the changes might reflect growth of plants on the lake bed due to nutrient enrichment. If so, then a recent increase of vegetation has been removing nutrients from the water that might otherwise be used by algae in the plankton, thereby masking the degree of nutrient enrichment from recent human activity.

(2) The percentages of bottom-dwelling diatom species might have increased because free-floating planktonic diatoms have recently been outcompeted by other forms of algae or cyanobacteria.

In both cases, nutrient enrichment ("cultural eutrophication") of Moody Pond might be more of a problem than has been recognized thus far. If more abundant plankton begins to shade out the vegetation in the deeper portions of the pond, it might trigger a snowball effect of reduced water clarity, odor problems, and potentially toxic blooms of algae or cyanobacteria. Similar interactions among plankton and plants have also been documented in clear-water lakes elsewhere, including Walden Pond, MA (Stager et al. 2018).

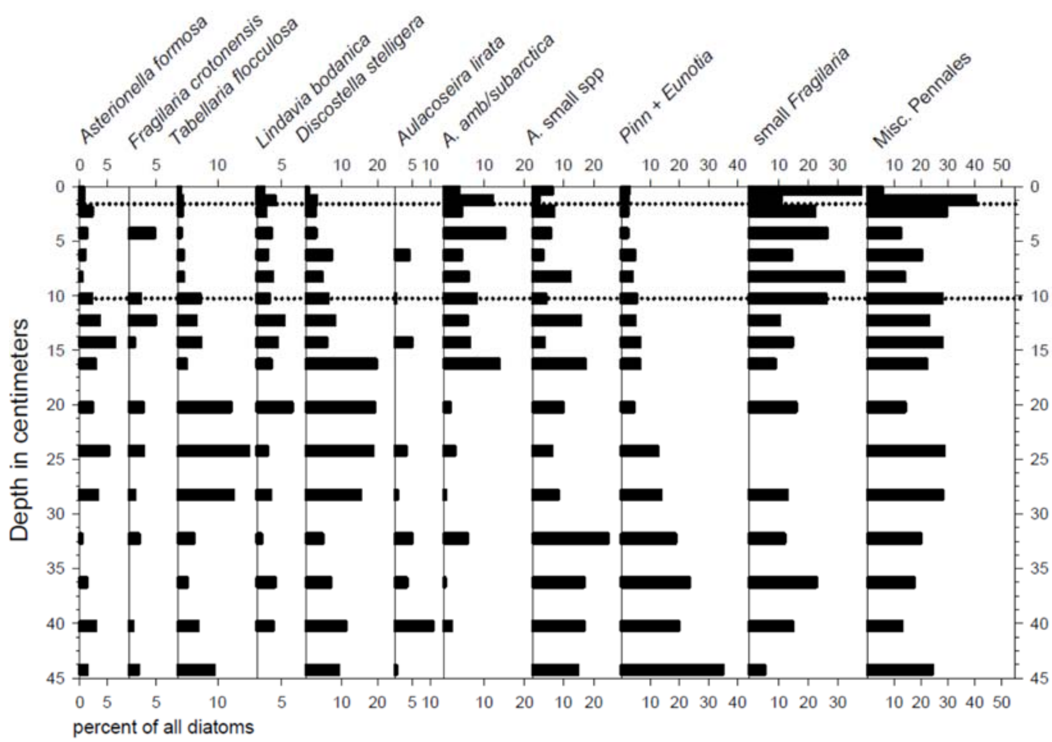



*Fig. 9. Diatom taxa versus depth in a sediment core from Moody Pond. Each column represents the percent abundance of a diatom species. The upper dotted lines mark recent transitions to higher percentages of bottom-dwelling diatoms (small Fragiliaria and Pennales).*

### 2.5 Water Quality

Analyses by the ALSC in July, 1985, showed that Moody Pond had an approximately neutral pH (7.2), meaning that it was not strongly influenced by acid rain as many other small Adirondack lakes were. In contrast, the pH of Bear Pond near Paul Smiths was 5 at that time, indicating 100 times the acidity of Moody Pond.

Chloride concentrations in 1985 were 13.2 mg/L, indicating road salt contamination. By comparison, chloride concentrations in heavily salted Lake Colby and the Upper and Lower Cascade Lakes were 25.6, 27.5 and 21.4 mg/L, respectively, while concentrations in isolated Bear and Black Ponds near Paul Smiths were <1 mg/L. Recent browning and deaths of white pines along the narrow strip of land between Forest Hill Avenue and the pond also suggests that road salt continues to contaminate Moody Pond.

A simple but informative method of measuring water clarity is to lower a black and white "Secchi disk" into the water on a rope until it vanishes from sight, then record the depth at which it first reappears upon being hauled back upwards. In recent years a Secchi disk has often been visible on the bottom at 16-17 feet (5.2 m) in the center of the pond, but in June, 2020, a heavy growth of the chrysophyte alga *Dinobryon* turned the water brown and reduced clarity to 6 feet (1.9 m) for more than a week.

Surface scums of various sorts also form along the pond margins on occasion in the ice-free months, especially after prevailing winds pile surface debris against the shore. Some of them were simply seasonal buildups of pine pollen (yellow color), but others were composed of the toxic cyanobacterium *Anabaena* (bright green), most recently in June-July, 2020.

Such observations have not yet been made for long enough to determine whether the recent *Dinobryon* and *Anabaena* growths in Moody Pond are normal or if they warn of a potentially irreversible loss of water quality in the near future. ***Monitoring of the plankton community should be continued in order to document possible trends in water clarity.***

### 2.6 Biological Overview

A complete biological survey of the pond has not yet been conducted, but animals known to inhabit it include largemouth bass, yellow perch, brown bullheads, painted and snapping turtles, and many insects including dragonflies, whirligigs, and water striders.

The biodiversity of the surrounding watershed is remarkably rich for a suburban landscape. Swallowtail butterflies "puddle" for minerals in the damp sand near the boat launch, American toads, bullfrogs, and green frogs call and breed along the shore, otters occasionally cruise the shallows, and white-tailed deer, fishers, grey foxes, and black bears share the adjacent woods and backyards with their human neighbors. The shoreline is too heavily developed and trafficked for most waterfowl to nest safely, but frequent visitors include loons, mergansers, buffleheads, blue herons, and Canada geese. Birds known to nest in the adjacent woods include merlins and crows, and kingfishers, bald eagles, hermit thrushes, pileated woodpeckers, and various migrant warblers are often seen and/or heard near the pond.

Pickerel weed and water lilies are common along the pond margins, especially in sheltered coves along the southern shore, and cattails grow along the northern and southern shores. Large beds of EWM are present in the central sector of the pond (Fig. 8), and individual plants and floating fragments are widespread around the shallow margins. Measurements of dissolved oxygen concentrations on June 2, 2020, are perhaps relevant to the EWM issue. Slightly elevated concentrations (10 mg/L) at 16 feet (5 m) depth might have reflected photosynthesis of plants on the bottom despite clouding of the water by a *Dinobryon* bloom. Because the sampling site was at the deepest part of the pond, this provides further evidence that EWM could potentially receive enough sunlight to thrive across the entire lake bed.

More detailed lists of organisms known to inhabit Moody Pond are provided in Appendices A and B.

## 3.0 MANAGEMENT CONCERNS AND GOALS

### 3.1 Management Concerns

***Newly Invasive species***

Large non-native Banded Mystery Snails are common in the shallows of Moody Pond, a species that has been known to outcompete native snails, eat bass eggs, and carry parasites that can harm other aquatic life. However, invasive plants are currently of more widespread concern.

The discovery of EWM in Moody Pond was a primary reason for the formation of FMP and for the preparation of this document. Among the abundant submerged plants in many Adirondack lakes is a native species (Northern Water Milfoil) that looks much like EWM, but it has less than 10 leaflets per leaf while EWM has 11-20, and is not considered problematic. In contrast, EWM sometimes grows prolifically enough to pose serious ecological problems for lakes and the people who use them. Each plant can grow up to 20 feet long and aggregates of it become dense enough to interfere with boating, angling, and swimming while also crowding out the native aquatic flora. Although EWM is a perennial, the main body of the plant dies back and decomposes in late Fall, and the seasonal decay of large amounts of it can reduce dissolved oxygen that fish depend upon and foul shorelines with rotting vegetation.

***The severity of EWM impacts varies from lake to lake, but because Moody Pond is relatively shallow and clear it is likely to allow enough sunlight to reach the bottom to potentially allow heavy EWM growth across most or all of the lake bed. Nutrient enrichment (see below) may also enhance EWM growth in the pond.***

***Water Quality***

In general, people prefer clear lakes to murky ones. Many Adirondack lakes are tea-stained with organic matter from the surrounding forest soils or wetlands, and some are cloudy with algae or cyanobacteria. Cyanobacteria such as *Anabaena* produce floating scums under certain circumstances and can produce nerve and/or liver toxins that can harm humans, pets, and wildlife. Toxic cyanobacteria tend to bloom when a lake is warmest, usually in late summer and early Fall but, like algae, they also depend on nutrients such as nitrogen and phosphorus that leak upwards from the bottom sediments or wash in from the surroundings. The more nutrients are available to act as fertilizer the more abundant such plankton can become. In Moody Pond, it is likely that human activity during the last two centuries has enriched the water and bottom sediments with nutrients that, in concert with recent warming, have favored more growth of cyanobacteria. ***Long-term monitoring is needed to determine whether recent brief periods of clouding by algae and cyanobaceria represent a trend in declining water quality.***

***Other Issues***

Analyses by the ALSC in 1985 demonstrated that chloride concentrations in Moody Pond were unusually high. To our knowledge, no such measurements have been made since, but much or all of the salt that is mixed with sand that the town applies to Forest Hill Avenue in winter eventually ends up in the pond. ***Chloride concentrations in Moody Pond should be measured in order to test for road salt contamination of the water and surrounding soils.***

Other issues that have been raised among FMP members include management of dog waste (water quality and health concerns), reducing the 30 mph speed limit on Forest Hill Avenue (currently 30 mph), reducing the use of herbicides, insecticides, and fertilizers within the watershed (toxicity to wildlife and plants, water quality), and possible impacts of future residential development within the watershed.

**3.2 Management Goals**

At present, the primary management goal of FMP is to address the spread of EWM in Moody Pond. Permanent eradication may not be feasible at this point due to the widespread distribution of the plant in the pond. ***Slowing, stopping, or reversing the growth of the largest beds offshore is a more reasonable goal, as is resisting the establishment of new EWM beds in the shallows where it is not already abundant and reducing further EWM inputs from boaters.***

An additional goal that should be considered is reducing inputs of nutrients into the pond that could further stimulate EWM growth, reduce water clarity, and/or cause algae or cyanobacteria to become more numerous. ***To help address that goal, baseline information on groundwater flow and nutrient budgets would also be helpful***.

## 4.0 RECOMMENDED MANAGEMENT PROGRAM

### 4.1 Control EWM

Several techniques are available for controlling EWM, including the application of herbicides, introduction of non-native herbivorous insects, mechanical or hand-harvesting, and placement of benthic mats to smother the plants. None are likely to attain total eradication once EWM is well established, as is now the case in Moody Pond.

The first two approaches are controversial due to the high risk of harming non-target species. Moody Pond is an ecosystem rich in species and diverse recreational and aesthetic values that could be damaged by adding toxins or additional non-native species to it. Chemical companies do not adequately test the effects of the herbicides they sell or the potentially toxic, long-lived breakdown compounds they become on the many species who live in our pond, leaving it to concerned citizens to discover those effects after the fact, if at all. Consulting organizations that promote such ways of dealing with invasive species lack that information, too.

The other options require permits from the NYSDEC and significant commitments of money and/or time, and they must be repeated indefinitely as EWM beds grow back. Large-scale harvesting has minimal impact on non-target species, but it involves the considerable expense of hiring the harvesting-equipment and/or divers as well as disposal of the plants, and if not performed properly by trained professionals it can scatter EWM fragments that are capable of sprouting elsewhere. Small-scale hand harvesting is also permissible in privately owned waters in order to maintain open access for recreational or aeasthetic purposes, but only within a limited area as specified by the NYSDEC.

Placing mats on the bottom can smother the densest beds with less effort and cost, and the plants under the mats do not require disposal because they decay in place. However, it leaves smaller, more dispersed patches untouched and the mats must be moved to different locations each year. In that scenario, the mats become part of the ecosystem much like wildlife on land who graze down the vegetation on a prairie, keeping its growth in check but not eradicating it. Concerns that the mats could harm turtles who overwinter in the mud could be addressed by removing the mats in the Fall.

***Long-term commitment to localized hand-harvesting with a commercial dive team is probably the most practical and least costly measure to implement in conjunction with volunteers removing surface fragments. This approach will have the fewest harmful side effects on the pond ecosystem. Accurate and up-to-date mapping of the latest extent of EWM is essential to effective control. For a 3-year rapid management approach, we recommend hand-harvesting two weeks each year (on an as needed basis in years 2 and 3) combined with surface fragment collection and daily monitoring of the outlet. Preventing further introductions of EWM by posting and/or monitoring the public boat launch is advisable, which could also help to increase public awareness of environmental challenges facing the pond and slow or prevent the introduction of other invasive species yet to arrive. Signage will be placed at or near the trailhead to Mt. Baker at the ingress/egress to the pond and also at the trash can which is a popular fishing access point.***

### 4.2 Reduce Nutrient Inputs

Moody Pond is highly vulnerable to nutrient inputs from human influences on the watershed that can reduce water quality and stimulate the growth of EWM. Numerous potential sources of such nutrients include yard and garden fertilizers, road dust and runoff, and perhaps seepage from old septic systems. Furthermore, warmer, wetter climates are likely to amplify such nutrient inputs through greater runoff, groundwater flow, soil decay, and release of nutrients from pond sediments by low-oxygen conditions due to warming and/or eutrophication. ***Because nutrient enrichment of the pond can degrade aesthetic qualities and property values while also contributing to the growth of EWM, it is advisable to reduce nutrient inputs Moody Pond as much as possible. Nutrient monitoring can be obtained through a relatively inexpensive program partnership with the Adirondack Watershed Institute. Once an understanding of pond nutrients is obtained, specific management actions can be considered.***

### 4.3 Long-Term Monitoring

In order to plan and assess effective management efforts, long-term monitoring of ecological conditions in Moody Pond is vital. To support EWM control, accurate and up-to-date mapping of the distribution of the plants in the pond should also be carried out annually to determine the success of any control methods. Spot-sampling of EWM with an inexpensive dredge or simple observation from the surface could be conducted on a regular basis. Counts of people using the pond and road could help to determine the degree of use and demonstrate the importance of Moody Pond to the community.

To better inform efforts to protect water quality, baseline information on the plankton, temperature, chemistry, and clarity of the pond are also needed. Informal monitoring of that nature is currently under way and will be continued for the foreseeable future by Curt Stager. Other lakeshore residents should also be encouraged to record and archive personal observations of animals, plants, ice cover, algae blooms, and other ecological goings-on in and around the pond, which can serve as points of reference for future changes. Information on the nutrient budget of the watershed and the chemistry, volume, and direction of flow of groundwater would help identify sources and abundance of nutrients and other pollutants in the pond.

**Long-term monitoring will be carried out in 3 primary ways:**

1) **Annual mapping of EWM, likely carried out by the dive team to start and later by AWI or APIPP**
2) **Partnership with AWI on monitoring of nutrients and potential contaminants in the pond.**
3) **Shoreowner commitments to observing and reporting informal trends in and around the pond including, but not limited to**
    a. **Observations of EWM**
    b. **Use of boats on the pond**

c. **Fishing access in and around the pond**

### 4.4 Public Education and Engagement

People have become increasingly influential members of the local ecosystem and are now among the most powerful environmental factors affecting the pond. Therefore, informing and engaging the public as well as watershed residents is vital for effective stewardship of the pond. To that end, FMP members hold regular meetings, prepare grant proposals and articles for local media, and maintain a website as a platform for outreach. Signs and/or in-person engagement of the public at the boat launch would also encourage responsible use of the pond and help to reduce future inputs of EWM or other invasive species. ***Such activities by FMP should be continued in order to help spread awareness of current environmental issues and the roles people play in them. More information on the numbers and kinds of people who use the pond and its the watershed in various ways would be useful in supporting those efforts.***

## 5.0 POTENTIAL IMPACTS OF NO ACTION

### 5*.1 EWM*

The effects of ignoring the arrival of EWM varies from lake to lake. In some cases, it merely adds to the diversity of vegetation and provides additional habitat for fish and invertebrates. In others, the EWM grows large and thick enough to crowd out native vegetation, reduce fish habitat, and impede the movement of swimmers, fishing lures, and boats. In such cases, the annual dieback of the plants also sends heaps of odiferous, rotting debris onto shorelines and can release nutrients that help to trigger unpleasant algae blooms.

It is difficult to be certain how such a scenario would play out in Moody Pond. In some cases, non-native species experience a population boom upon arrival but eventually reach a new equilibrium in much lower numbers. In others, they completely replace the previous biotic community in ways that most people would find undesirable. For the latter situation to occur with EWM, the plants must have a suitable habitat to grow on with plenty of sunlight reaching the bottom and enough nutrients to sustain abundant growth. Unfortunately, Moody Pond seems to be fully capable of filling those needs. Preventing such a situation would more effective and far less costly than dealing with it after it occurs.

### *5.2 Eutrophication*

Without baseline information on nutrient dynamics in the watershed, it is not possible to know how much nutrient enrichment is occurring in Moody Pond. Without long-term monitoring, it is also not possible to know if water quality is decreasing, holding steady, or improving. The sediment core data do show that ecological changes have occurred in the pond during the last century or so, but they do not confirm their nature or intensity.

Nonetheless, nutrient inputs to Moody Pond are certainly greater now than they were before the watershed was so heavily developed and used. Furthermore, local climate has become warmer and wetter (Stager and Thill, 2010), and that trend is expected to continue. Warming increases decay rates in local soils and can reduce concentrations of dissolved oxygen at the bottom of a lake, and wetter conditions increase soil erosion and runoff, all of which further boost nutrient inputs. Jeppeson, *et al*. (2017), have warned lake managers worldwide that nutrient inputs will need to be reduced even further in order to keep many lakes in the same ecological state they are in today as the climatic setting changes around them.

If water quality in Moody Pond declines further as today's multiple human impacts are amplified by climate change, several undersirable outcomes could result depending on which species obtain the most nutrients in such a scenario. If EWM gets most of the nutrients, then clogging of the lake may result, as well as buildups of decaying plant matter on shore and fouling of the water during the annual die-back. If planktonic algae get most of them instead, then the water will become murkier, possibly smellier, and less pleasant to recreate on. And if cyanobacteria win out, then toxic blooms could prevent swimming for weeks or months at a time. In the latter cases, submerged plants could also be increasingly shaded out, thereby decreasing habitat for fish and other aquatic animals.

**6.0 CONCLUSIONS**

People have been integral parts of the ecosystem around Moody Pond for thousands of years, perhaps for as long as the pond itself has existed. Today, people are not only still part of the watershed but an increasingly influential one as well. Becoming more aware of that ecosystem and our place in it are important steps toward becoming responsible and effective stewards during our own brief chapter in the pond's history. As biologist Thomas Henry Huxley once said, "we must learn what is true in order to do what is right."

During the last two centuries people have paved, logged, planted, burned, and built upon much of the watershed, introduced species from elsewhere, and boosted the flow of nutrients and pollutants into Moody Pond. Thus far, the pond remains desirable for homes or recreation, but that could change if EWM, algal or cyanobacterial booms, and/or climate change alter the pond in ways that we find undesirable.

The establishment of Friends of Moody Pond is a hopeful sign that those of us who care about the pond are willing to address such challenges. Hopefully, this preliminary report will serve ongoing efforts to "learn what is true" as we seek to do what is right for the pond we love, knowing that the outcomes of our efforts today will, as always, be reflected in the pond itself.

## 7.0 SUMMARY OF RECOMMENDATIONS

1. Accurate, up-to-date vegetation mapping should be continued annually to support planning and management efforts.

2. Long-term monitoring of the pond's temperature, chemistry, animal community, and plankton community is needed in order to document possible trends in water quality.

3. Chloride concentrations in Moody Pond should be measured in order to test for road salt contamination of the water and surrounding soils.

4. Baseline information on groundwater flow and nutrient budgets would be helpful.

5. Reducing the extent of the largest EWM beds offshore is a more realistic goal than total eradication. Localized hand-harvesting with a commercial dive team is the most practical and least costly with the fewest harmful side effects on the pond ecosystem.

6. Signs and/or in-person engagement of the public at the ingress/egress near Mt. Baker trailhead and at the trash can as a popular fishing access site would help encourage responsible use of the pond and reduce future inputs of EWM and other invasive species.

7. Because nutrient enrichment of the pond can degrade aesthetic qualities and property values while also contributing to the growth of EWM, it is advisable to reduce nutrient inputs Moody Pond as much as possible.

8. Outreach and education efforts by FMP should be continued in order to help spread awareness of current environmental issues and the roles people play in them. More information on the numbers and kinds of people who use the pond and its the watershed in various ways would be useful in supporting those efforts.

9. Lakeshore residents should be encouraged to record and archive personal observations of animals, plants, ice cover, algae blooms, and other ecological goings-on in and around the pond, which can serve as baseline points of reference for future changes.

## 8.0 RAPID 3-YEAR MANAGEMENT PLAN FOR EWM

1) Hire dive team for at least 2 weeks in 2021, 2022, and 2023. Weeks dedicated to harvesting may vary depending on success.

2) Couple hand-harvesting with monitoring and removal of surface fragments to be done by volunteers.

3) Secure outlet during the hand-harvesting operation to prevent downstream contamination.

4) Post signs at Mt. Baker pond ingress/egress and the trash can fishing access site.

5) Volunteer monitoring of pond usage including boats and shoreline fishing to gauge need for public outreach.

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**APPENDIX A**

*Taken from Draft 2019 Adirondack Aquatic Invasive Species Surveys Early Detection Team Report for use by Friends of Moody Pond - written by Adirondack Research for the Adirondack Park Invasive Plant Program*

# Moody Pond

**Survey Date:** August 21, 2019
**Last Surveyed:** 2018

## Lake Description

Moody Pond is 24.9-acres and has 0.90-miles of shoreline. It is located in the town of North Elba, Essex County and lies in the Saranac River watershed. The team launched two canoes off Forest Hill Avenue, across from the Baker Mountain Trailhead.

## Aquatic Invasive Plant Presence

*Myriophyllum spicatum* (Eurasian watermilfoil) was first detected in Moody Pond in 2018. A total of 11 plant beds were mapped.

## Native Plant Biota

Comprehensive surveys of all native plants found within the pond were not prioritized in 2019. Native plants detected were: *Brasenia schreberi* (watershield), *Vallisneria americana* (eelgrass), *Potamogeton amplifolius* (large leaf pondweed), *Nitella spp.*, *Utricularia purpurea* (large purple bladderwort), *Nuphar variegata* (yellow pond lily), *Pontederia spp.* (pickerel weed), *Eleocharis spp.* (hairgrass) and *Nymphoides cordata* (little floating heart).

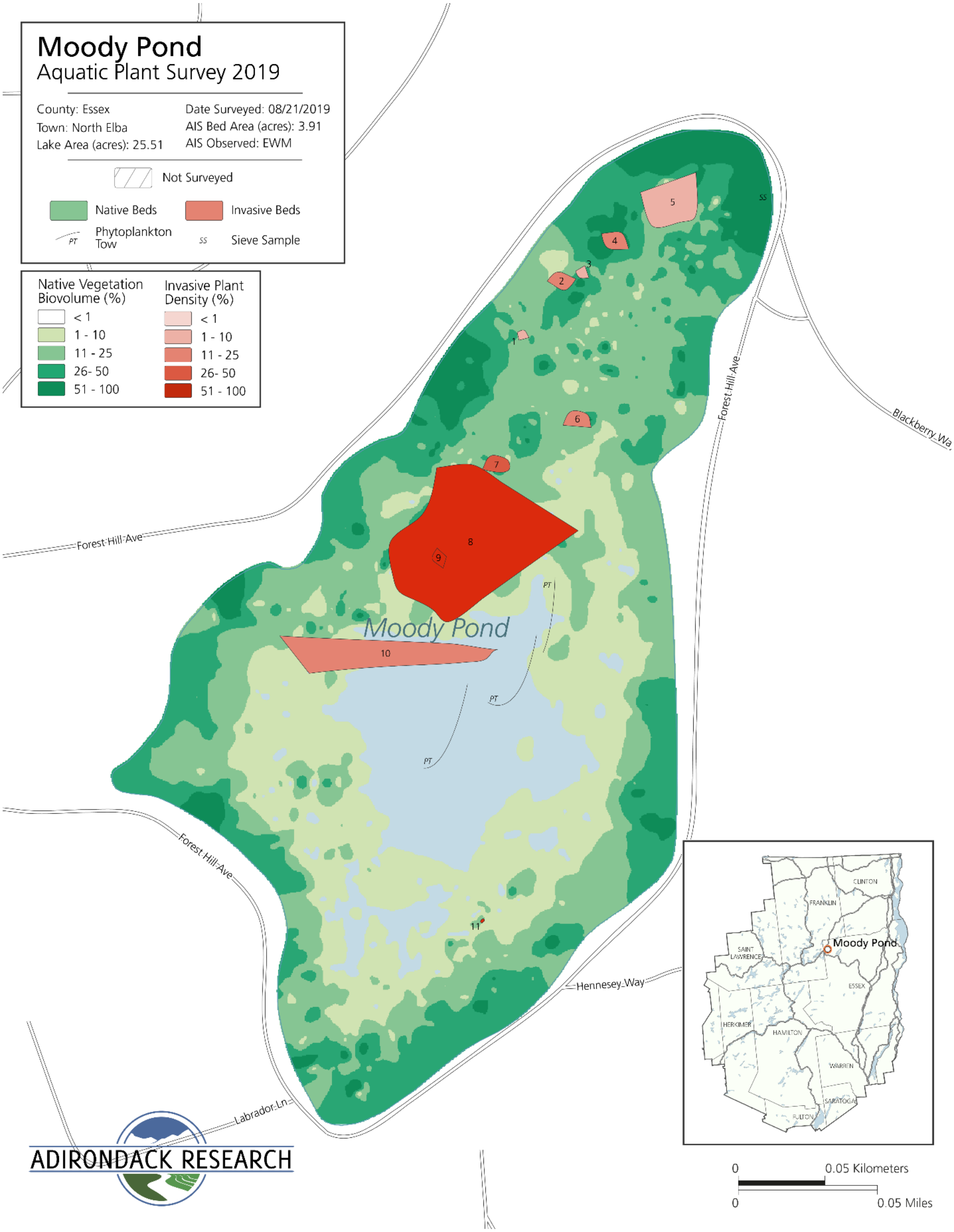
## Aquatic Invasive Animal Presence

Sediment sieves were taken to determine the presence of *Corbicula fluminea* (Asian clams). None were found. Three plankton tows were also conducted with no invasive plankton detected.

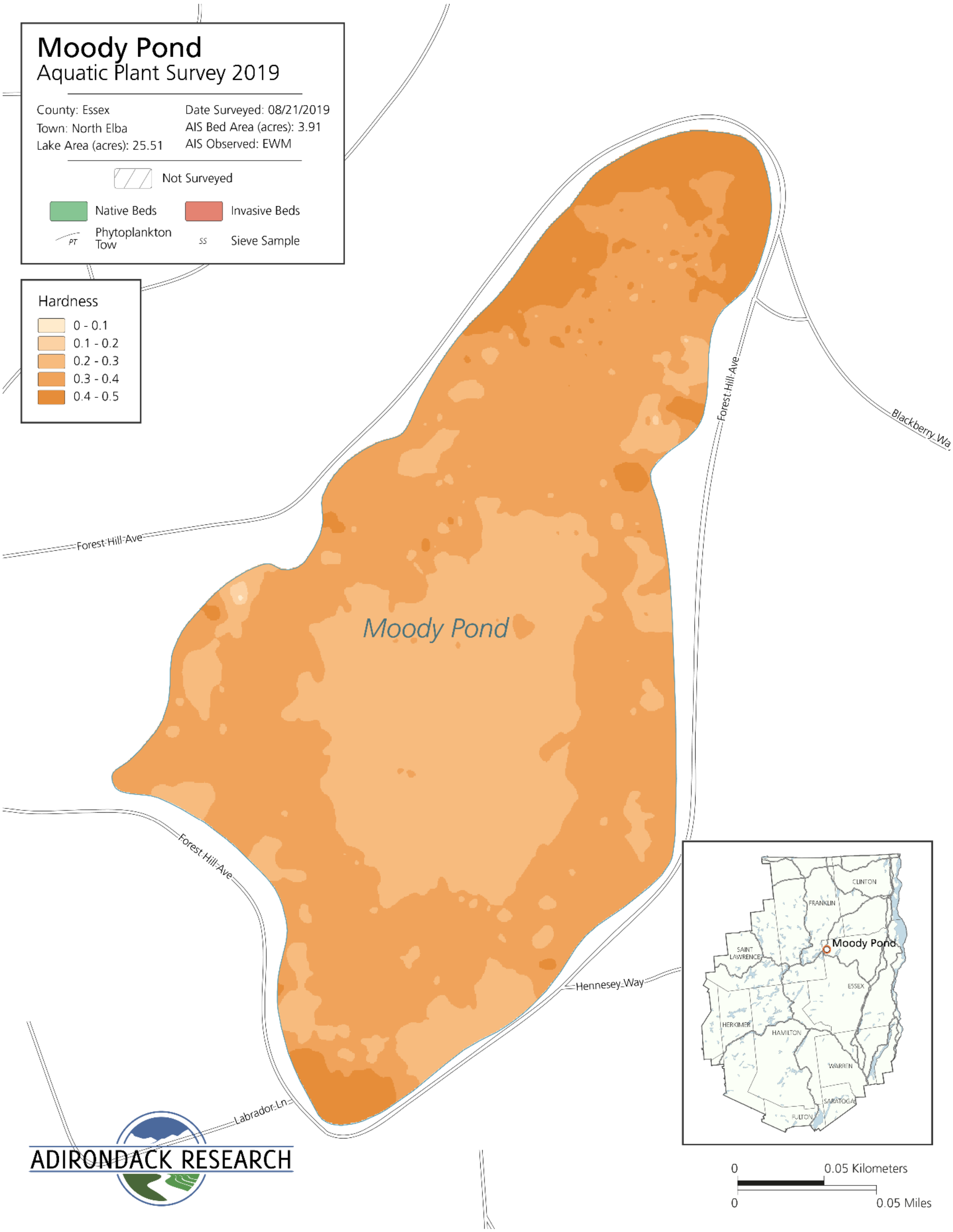
## Invasive Species Percent Cover (See map on adjacent page)

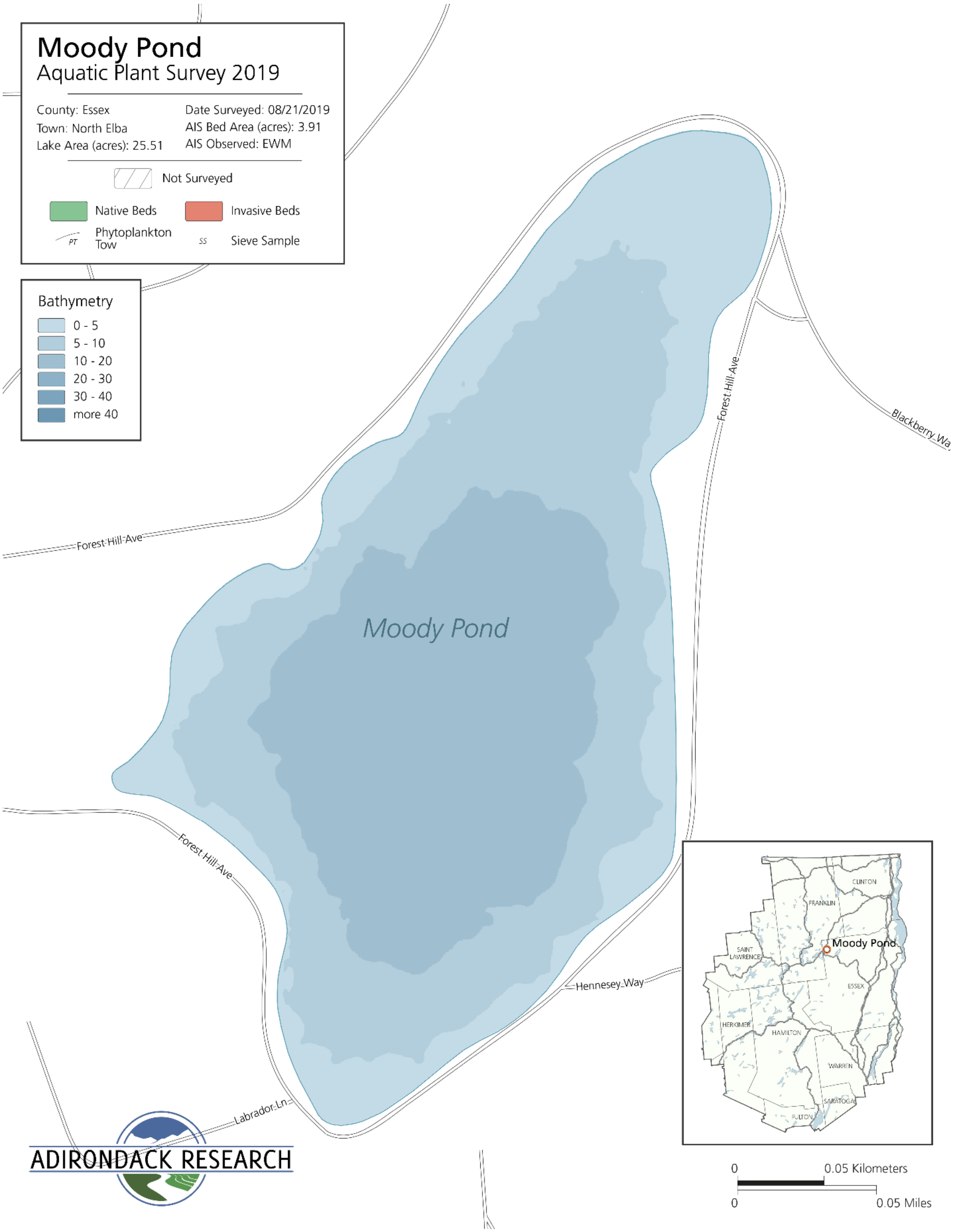
| **Eurasian Watermilfoil** | | | | **Eurasian Watermilfoil** | | | |
|---|---|---|---|---|---|---|---|
| Bed | Size (Ac.) | Size (Sq. Ft.) | % Cover | Bed | Size (Ac.) | Size (Sq. Ft.) | % Cover |
| 1 | .01 | 561.55 | 1-10 | 9 | .03 | 1168.21 | 51-100 |
| 2 | .05 | 2387.88 | 11-25 | 10 | .63 | 27393.70 | 11-25 |
| 3 | .02 | 799.46 | 1-10 | 11 | .0005 | 20.35 | 51-10 |
| 4 | .06 | 2756.79 | 11-25 | | | | |
| 5 | .34 | 14955.80 | 1-10 | | | | |
| 6 | .06 | 2470.38 | 11-25 | | | | |
| 7 | .05 | 2175.78 | 26-50 | | | | |
| 8 | 2.64 | 115046.00 | 51-100 | | | | |

| **Asian Clam** | **Spiny Waterflea** |
|---|---|
| Present (Y/N) | Present (Y/N) |
| No | No |



Moody Pond
Aquatic Plant Survey 2019
County: Essex
Town: North Elba
Lake Area (acres): 25.51
Date Surveyed: 08/21/2019
AIS Bed Area (acres): 3.91
AIS Observed: EWM
Not Surveyed
Native Beds
Invasive Beds
Phytoplankton Tow
Sieve Sample
Native Vegetation Biovolume (%)
< 1
1 - 10
11 - 25
26- 50
51 - 100
Invasive Plant Density (%)
< 1
1 - 10
11 - 25
26- 50
51 - 100
Moody Pond
Forest Hill Ave
Blackberry Wa
Hennesey Way
Labrador Ln
CLINTON
FRANKLIN
SAINT LAWRENCE
ESSEX
HERKIMER
HAMILTON
WARREN
SARATOGA
FULTON
0
0.05 Kilometers
0
0.05 Miles
ADIRONDACK RESEARCH


Moody Pond
Aquatic Plant Survey 2019
County: Essex
Town: North Elba
Lake Area (acres): 25.51
Date Surveyed: 08/21/2019
AIS Bed Area (acres): 3.91
AIS Observed: EWM
Not Surveyed
Native Beds
Invasive Beds
Phytoplankton Tow
Sieve Sample
Hardness
0 - 0.1
0.1 - 0.2
0.2 - 0.3
0.3 - 0.4
0.4 - 0.5
Moody Pond
Forest Hill Ave
Forest Hill Ave
Forest Hill Ave
Blackberry Wa
Hennesey Way
Labrador Ln
CLINTON
FRANKLIN
Moody Pond
SAINT LAWRENCE
ESSEX
HERKIMER
HAMILTON
WARREN
SARATOGA
FULTON
0
0.05 Kilometers
0
0.05 Miles
ADIRONDACK RESEARCH


Moody Pond
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County: Essex
Town: North Elba
Lake Area (acres): 25.51
Date Surveyed: 08/21/2019
AIS Bed Area (acres): 3.91
AIS Observed: EWM
Not Surveyed
Native Beds
Invasive Beds
PT Phytoplankton Tow
SS Sieve Sample
Bathymetry
0 - 5
5 - 10
10 - 20
20 - 30
30 - 40
more 40
Moody Pond
Forest Hill Ave
Forest Hill Ave
Forest Hill Ave
Blackberry Wa
Hennesey Way
Labrador Ln
ADIRONDACK RESEARCH
CLINTON
FRANKLIN
SAINT LAWRENCE
Moody Pond
ESSEX
HERKIMER
HAMILTON
WARREN
SARATOGA
FULTON
0
0.05 Kilometers
0
0.05 Miles

**APPENDIX B: Organisms known to inhabit or visit Moody Pond as of summer, 2020. (For plants, see Appendix A).**

**ANIMALS**

***Fish***

Yellow Perch (*Perca flavescens*)

Largemouth Bass (*Micropterus salmoides*)

Bullhead (*Ameiurus sp.*)

Pumpinkseed (*Lepomis gibbosus*)

***Mammals***

Otter (*Lontra canadensis*)

Mink (*Neovison vison*)

Muskrat (*Ondatra zibethicus*)

White-tailed Deer (*Odocoileus virginianus*)

***Birds***

Belted Kingfisher (*Megaceryle alcyon*)

Common Loon (*Gavia immer*)

Canada Goose (*Branta canadensis*)

Mallard Duck (*Anas platyrhynchos*)

Bufflehead (*Bucephala albeola*)

Common Merganser (*Mergus merganser*)

Great Blue Heron (*Ardea herodias*)

Common Crow (*Corvus brachyrhynchos*)

Osprey (*Pandion haliaetus*)

Bald Eagle (*Haliaeetus leucocephalus*)

***Reptiles***

Painted Turtle (*Chrysemys picta*)

Snapping Turtle (*Chelydra serpentina*)

***Amphibians***

Green Frog (*Rana clamitans*)

American Bullfrog (*Lithobates catesbeianus*)

***Molluscs***

Banded Mystery Snail (*Viviparus georgianus*)

***Insects***

Giant Water Bug (*Lethocerus americanus*)

Water striders (at least 2 species)

Whirligig Beetles (species unknown)

Dragonflies and damselflies (species unknown)

***Crustaceans***

Crayfish (species unknown)

Cladocera and Copepods (species unknown)

**ALGAE**

Chrysophytes (*Dinobryon* sp.)

Diatoms (incl. small benthic Fragilaroid spp., *Discostella*, *Asterionella*, and *Aulacoseira* spp.)

**BACTERIA**

Cyanobacteria (*Anabaena* sp.)