Final Report
NYS DEC Invasives Species Eradication Grant
State Assistance Contract # C303601
Eagle Lake Eurasian Water Milfoil Eradication Project
Town of Crown Point
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The following report provides some highlights from and lessons learned regarding the invasive species eradication project for Eurasian Water Milfoil on Eagle Lake. This project can be considered a success as significant milfoil was removed by both hand harvesting and matting. More than 7 acres of milfoil was addressed as originally stipulated in the grant. Despite good efforts, permits for use of an herbicide were not obtainable (further explanation to follow) and as a result, major milfoil patches remain. General details for the project follow with more specific information being presented in later paragraphs.

Eagle Lake is a 420 acre lake located in southern Essex County, New York State; split between the boundaries of both the Town of Crown Point (the Grant recipient) and the Town of Ticonderoga. Volunteer members of the Eagle Lake Property Owners, Inc. (ELPOI) first identified milfoil in the lake in the late 1970's.They asked for and received assistance from both towns over the ensuing years to try to seek solutions to control the spread of milfoil. Several attempts at study and control were made by various parties (ELPOI members, DEC staff, etc.) in the early years. All attempts were stymied either by lack of the projected significant funds that would be required or negative connotations and lack of agreement regarding control methods. Even from the earliest days, experts from the DEC and environmental management firms, after surveying the lake, indicated that the spread and densities were such that hand harvesting and matting would only be effective in the smallest of patches and that consideration towards an herbicide treatment should be pursued. Due to differences in opinion as to which control methods should be developed, utilized and regulated by the various State agencies and Adirondack Park environmental groups, milfoil control in Eagle Lake, and other lakes within the Park, has been limited to very localized volunteer hand harvesting and education of local lake residents as to how to prevent its spread. At the same time, a small group of Eagle Lake volunteers assisted the Towns in pursuing methods to obtain the projected funding that would be necessary to complete an integrated control approach with the inclusion of an herbicide. They also initiated contact with the various "interested parties" that would be involved in the herbicide permitting process to seek their input and support. State Assistance Contract C303601 was written with the goals of pursuing this integrated control methodology. The goal of the project was to start eradication with targeted hand harvesting and benthic barrier placement, working from the smallest patches up to the larger patches, as identified in a 2003 GPS milfoil survey. During the initial phases of hand removal, dialog and efforts would continue to secure appropriate DEC and APA permits for the selective use of the herbicide Renovate. The 2003 GPS survey reported that milfoil had colonized about 50 locations around the littoral zone of the lake, for a combined area of about 8 acres, and scattered/isolated plants stretched along most of the shoreline. It was anticipated that if permits for the use of the herbicide Renovate could be secured a much greater impact on the milfoil could be made than hand harvesting/matting alone. The project coordinator/grant author and other involved parties anticipated that by using an integrated approach that approximately 7 acres of this milfoil could be eradicated and then proceeded accordingly. With commitments for matching funding/donations (as required by the grant), the appropriate permits for hand harvesting (non-jurisdictional determinations for hand harvesting and matting in waters both under and over 2

meters) and a contract to hire divers and the project coordinator all secured, the eradication project started. (Figure 1 shows a map of the areas worked as part of the project)

An interested third party asked for a short synopsis of this project this past fall as it applied to cost for milfoil control/eradication and project successes in general. What was provided to that third party covered the highlights of this project. It is copied here.

Here are some rough numbers for Eagle Lake in Essex County. To date (2007-2010), approximately $112,000 in cash and donated labor/supplies/materials have been expended over the past 3 years with the majority of work taking place over a 2 year period (2008-2009). Significant volunteer labor was expended planning for the project over a prior 10+ year period, which was done before the tracking of costs started. Costs have been related to removal labor as well as matting supplies, major dive equipment, boat rental and work float construction, plant surveys, fees related to permit applications, and education. Funding sources for this project came from private contributions, NYS State "special project" grants, a NYS Invasive Species Eradication Grant, and extensive donations of labor and supplies/materials/equipment.

Actual milfoil kill has been accomplished by placement, removal and redeployment of ~1.5 acres of benthic mat, hand picking an equal or greater area around the perimeter of these patches (approximately 18 of the smallest patches in the lake) and swimming and hand picking about 4.5 miles of the 7.8 mile shoreline. The remaining shoreline was surveyed by boat and found to be clear of milfoil or contained patches that were either too big/dense for hand picking/matting to be deemed cost effective or were deemed unsafe for divers to work in.

Several patches are approaching an acre plus of dense solid milfoil with plant heights of 22 plus feet (bottom to surface), or span across several thousand feet of rock, boulder and downed tree littered shoreline. A rough follow-up 2009 GPS mapping survey of these remaining patches was completed to document the area that would need to be treated as part of an herbicide treatment, and encompassed the perimeters of the dense patch centers and the medium to light density milfoil perimeters, totals around 50-75 acres. This milfoil remains untouched. Planning for its removal methodology is ongoing.

Included here are some statistics gathered from the work log;

Number of patches identified in 2003 GPS survey	49
Approximate total area of milfoil identified in a 2003 GPS survey	8 acres *
Lake area surveyed by both surface and in water observation	420 acres
Approximate area of lake needing herbicide treatment	50-75 acres *
Cumulative diver hours, approximately 90% of time was spent in the water	667 hrs
Top side surface support person cumulative hours	245.75 hrs
Weight of steel ballast used for benthic mats	12,000lb
Benthic mat construction time (2- 3 people working several hours per day)	4 weeks
Rough finished size of benthic mats	10’ X 25’
Approximate square footage of mat constructed	48,740 sq ft.
Approximate square feet of matted area during the project	72,940 sq ft.
Mat material used #1 (International Paper- Beneficial Use Determination approved)	Mill wire
Mat material used #2 (DEC approved)	Lumber tarp
Number of patches covered using mats	18
Approximate weight of milfoil handpicked and removed from lake ‘08-‘09	15,270 lbs

Shoreline swam and picked	4.5 miles
Maximum depth of plant growth	23 feet

* see item 9 on page 7

Note: Observation of the milfoil during the spring and summer of 2010 showed a significant crash to many of the milfoil beds located around the lake. In the preceding years, tall dense beds of plants that topped out now looked like mush. As summer progressed the plants got more distressed looking. A late fall follow-up observation showed that much of the milfoil in these areas was again a more lush green with short, approximately 1 foot tall, plants scattered across the bottom. A few of the patches in the lake did produce plant stalks that topped out, but this was more the exception than the norm.

There were many lessons learned as the project got started and progressed. These are highlighted below. They are in no specific order but tend to follow the order they were encountered and subsequently solved. Many of these learning opportunities looked major at the time but looking back on them at project completion; they were really not that bad. None of them stopped the project. One factor that contributed to the smooth work flow and to their solution(s) was the extensive network of contacts gathered by the project coordinator in the many years of prior planning and leg work related to getting ready for this project. Thank you to those that are reading this and who helped!

One decision related to this project was to complete as much of it as possible with volunteer and/or local labor to keep costs low and allow maximum benefits towards milfoil control, as well as allowing monetary expenditures to benefit the local community. This, in itself, presented many challenges as the pool of volunteers is limited. Finding individuals that were available locally to dive are also extremely limited as well. Other challenges were related to;

- Insurance and liability for volunteers
- Paid help
- Property owners whose property was being accessed
- Local staging for supplies and equipment (due to very limited access to the lake caused by rugged inaccessible terrain and private shoreline property ownership)
- Limited amounts of information available as to best methods for hand picking
- Limited amounts of information available as to appropriate diver equipment needs and diver/tender support equipment
- Materials for benthic mat use/construction and deployment/ retrieval and the end of use disposal/ recycling etc.
- Politics and differences within and between agencies for methods for milfoil control and requirements for various permits
- Lake resident and transient lake user dynamics/opinions as to needs, methods, materials and direction related to removal, the controversial nature of the subject of herbicide use, and getting all stakeholders (including environmental groups) to be able to agree on the best method for its use. This still has not happened for Eagle Lake.

Even though this portion of the removal project is coming to a close, the efforts to control milfoil on Eagle Lake will continue. Education and fundraising are ongoing. Dialog and planning for an herbicide application are still in progress. Below is an expansion of some of the hurdles and their solutions. Included at the end are several select maps of the work area and milfoil distribution as well as select pictures related to the project. Additionally, permit documents, maps, photos, videos and significant additional information related to the Eagle Lake milfoil control effort are located on the Eagle Lake website http://eaglelake1.org/index.shtml

1. Eagle Lake is bisected into two basins by NYS Route 74. The “causeway” that forms this division and allows the road to cross the lake has a narrow (20’ foot wide) and low (4 foot height above the water line) bridge on it. Milfoil currently grows in both basins of the lake. The only public boat launch is on the smaller 76 acre (western) basin. The majority of the milfoil and the planned base for project operations are in the larger 340 acre (eastern) basin. There are a couple of private launch access points on the larger basin but none readily appropriate to support the launch of the large 20-22 foot plus work/pontoon boat. Several different boat/float options were considered for providing safe diver access/support and material transport to the milfoil sites. In the end, the project used several different boat/float combinations. The first was an “in house” purpose-built work float. The second was two privately owned 14’ aluminum run-about boats donated for use on the project and the third was a 24’ stripped down pontoon boat donated for use on the project by a lake resident that owns a boat sales and service business. The work float was built to be used as the main staging area and could be moved to both sides of the lake. It was just big enough to support 2 of the 4 divers, a top side support person and some gear. It was designed with no sides and a low water profile, to provide easy access to hand off and retrieve mats. The float was just big enough to support work in the small basin with its more limited milfoil areas and the smaller crew needed to tackle it The aluminum boats were used to get people and materials to and from the float, provide additional work/storage space and to assist in pushing/moving the float around. The pontoon boat was used as the equipment barge, along with the work float, when working in the larger basin. These provided adequate space to safely support the divers, their equipment, the air supply system and hoses, and significant quantities of benthic barrier mats for the day. Launching of the two larger boats was only possible as a result of the generosity of two private property owners (one was also a part time diver) on the larger basin with private launches. Overnight and off time dockage of all of the boats required several lake residents’ permission to tie up at their private docks.

   Lesson learned: Options for boats is important. Involving lake residents to get permission to use their property for tie up was critical to saving time moving everything around the lake each night. Having the boat docked where someone was present to monitor it also made the equipment a little more secure from theft. Having sufficient square footage to support the divers, their gear (approximately 75 lbs of dive weights and wet suit gear etc. each), other equipment (surface air compressor, 4 -150’ air hoses, air distribution manifolds etc.) and supplies (mats, empty and full milfoil bags, gas cans, lunches, dry/warm clothes, rain gear, etc) made for a comfortable and safe work area on the lake. The long lengths of air supply hoses needed a large area just to lay them out without tangling. It was not uncommon to load 15 to 20 mats, at 45 lbs each, onto the boat for half a days’ work of placing them in and removing them from the lake.

   The same conditions described above (limited access for work boat launching) will also impact the ultimate plan to use an herbicide. Special provisions will need to be made to provide access to the lake for the applicator and the specialized application boat.

2. Steep rock cliffs and rugged lake shore terrain, dense with native vegetation consisting mostly of mature pines and mixed hardwoods, made access to the waters difficult. Locating flat surface areas large enough to stage materials and assemble benthic mats was a considerable challenge. There is a “boat access only” public beach at one end of the lake which is relatively flat. Since it is boat access only and a great distance from most of the milfoil patches, it was not of practical use. The limited development for housing/cottages along the south shore did not prove useful. Most of this development left the rugged terrain in place and was on private property. Only one site on the lake was found to be sufficiently suitable, having both road and boat access for staging/storing mat materials. It had a relatively flat surface for mat construction, coupled with a homeowner that was willing to allow volunteers access for mat construction work. This home/property owner ultimately became the primary mat assembly person, logging several hundred hours towards the process. Assembly of mats off site with transport to the lake would have added considerable bulk/handling, time and an additional monetary cost to the benthic barrier creation process.

Lesson learned: Access to the lake is critical. Even though a major road runs within a few hundred feet of the lake along the entire south side, it could not provide easy lake access. Commitments for access from property owner(s) need to be made to provide lake access. If any kind of work area is necessary, the task of finding a suitable location becomes even more challenging. Several property owners expressed concern for "liability" with regard to allowing people to access/use their property as related to this project. This is an important and delicate aspect of any project. Research/dialog is still ongoing as to how this will affect any future work.

The same conditions described above, if they cannot be addressed, (limited shoreline access) will also impact the logistics/costs of the APA additional requirements associated with the staging and deployment and use of herbicide containment curtains. The owner of Lycott Environmental, while out on the lake in 2010, made the comment "just how and where does anyone expect you to be able to stage curtains from". See additional comments about curtains below.

3. Finding and working with volunteers was challenging. Most of the property around Eagle Lake is owned by seasonal residents, many of whom are only at the lake for short week/weekend stays. These owners, while very supportive and interested, are often unwilling to give up too many or any of their already limited days at the lake. Additionally, many of the volunteers are senior citizens and understandably often have physical limitations. This meant that the small work team had to be mostly self-sufficient. Volunteers were able to, and did, help on a couple of parts of the project. They helped with mat assembly, fragment chasing, completion of the education newsletter and fund raising.

   Lesson learned: Volunteer labor cannot solely be expected or utilized to complete major or possibly even minor parts of this type of project. While the volunteer pool may appear large, there are very few that can/will commit the necessary time or meet the physical demands. Volunteers can do some of the background work and monitoring but for a project of this complexity and scale to be successful it requires people with full time commitments. It should not be expected that someone would quit their "real job" to take on a multiple summer project of this magnitude. This holds true for divers too.

4. Finding divers in the local area almost proved to be impossible. Many suggestions were made by lake and community residents as to who to contact for divers (fire department, local dive shop, etc.) for the project. Many were contacted but only 3 people could make time in their schedules to work on the project on more than a hit or miss weekend or evening basis. One additional diver was found and able to help on a part time base. Three of the five people directly involved in the project were part time summer residents on the lake, one was a community resident and the last was a weekend lake resident. It was important to the project that the people getting paid for dive and support services be hired/paid consistently as they needed to be insured for liability and workman's comp., etc.. The only way this could happen was to have them hired by an outside vendor who could contract their services to the Town.

   Lesson learned: Finding divers in a small town or on a small lake, that have the time to commit to a long term project, even for pay, is difficult. Finding ones willing to dive into milfoil and place mats in a low visibility environment is even more of a challenge. Getting them properly hired and paid requires a lot of effort, and probably would not work for the average lake. The divers who worked on this project are to be commended for the effort they put forth. Working in cool 65-70 degree, murky water with a wet suit, placing (unrolling) 10' X 25' mats weighing 45 lb each while surrounded by 22 feet tall milfoil plants that pushed the divers back/around for 4- 5 hours straight is a considerable job.

5. Eagle Lake is located within the Adirondack Park, and as a result of this there are many "agencies" that have interests in what happens in, on and around it. This situation sets up some dynamics in

the politics of control. Working with the DEC and APA with regards to general permits was reasonably straight forward. However issues of permits, their requirements, and specific agency additional requirements related to the use of herbicides are still ongoing and anything but straight forward.

Lesson learned: Working with all agencies and environmental groups to build community support and compliance takes time and patience. Since there are few, if any, prior cases for agencies to base decisions on, specific guide lines and permit documents are not readily available. Several of the permit documents for hand harvesting and matting were developed specially for this project. Development of plans for an herbicide treatment is still ongoing, including the APA additional requirement for a containment curtain around any potential treatment site. This is despite this project coordinators involvement with the NYS Governors Task Force for Invasives and the committee's recommendation, "that rules governing the control of invasives should be streamlined and consistent across NYS". As it currently stands curtains are not required outside the Adirondack Park.

6. Community and lake resident education is paramount to success. While many people "get it" as far as what negative impacts invasives have, and problems with their control and the methods used for this, there are a few people who have personal biases against one method of control or another. Some even venture to indicate that a "doing nothing" and/or "wait and see approach" might be appropriate.

   Lesson learned: Continual education, presented by a number of different mediums, is important to build consensus and understanding. There is no way to completely satisfy all concerned parties. The decision has to be made to remove this invasive by the best method for the particular patch/site in question accounting for the fact that some of these removal processes will create a temporary impairment to lake use, but the removal will ultimately provide a longer term improvement to the lakes' quality. Input for this decision needs to be gathered from lake residents as a whole but needs to be implemented by a "lead agent". Probably the best lead agent for this position is the Town(s) that have jurisdiction over the lake.

7. Details for mat construction based on others experience were limited and the details that were available varied widely. Final mat construction for this project was based on experimentation and changes to details provided by others. The original mat material, provided under a DEC agreement of "beneficial use determination" for mill wire, was a discarded material used as part of the paper making process. This material was free to the project and was available in large 20' X 250' pieces, depending on the specifics of its use in the paper process. Mill wire ranges from a light weight nylon material to a very heavy felt type material. It was found for this project that the light weight material was more than robust enough to kill the milfoil and was light enough to allow for easy of handling. The felt was exceptional heavy when dry and proved to be impossible to move when wet in the water. The lighter weight material did however require ballast to keep it on the bottom while smothering the milfoil. To address this, surplus steel bars were zip tied to it at 3-4 foot intervals. Spacing was based more on ease of deployment than weight distribution. It was determined that a total mat weight of between 40 and 50 pounds for a 250 sq ft mat would be sufficient to keep it on the bottom and provide enough weight to crush the covered milfoil. Approximately 15,000 sq ft of donated mill wire and 3,000 lbs of purchased ballast steel were used for the project in the first phase of mat construction. The initial 15,000 sq ft of mill wire wound up being all that was available. Approximately 60 mats, constructed using these methods in the first year of the project, were placed much more quickly and with less work effort than originally expected.

   Once the mill wire supply was exhausted, an alternative mat material was searched for which required and received DEC approval for its use. This material was a lightweight poly plastic "lumber tarp", a material that is used to cover lumber when it is shipped from the mill to end

consumers. It was economical and available in a 10' by 6,000' roll, was trucked in from another state, and allowed the mat construction process to move forward once again. An additional 7,500 lbs of ballast steel was purchased and as a result an additional 38,500 sq ft of mat was assembled. Construction of mats was done predominantly by 2 dedicated seasonal lake residents. Even though they worked tirelessly on the process and a few additional volunteers pitched in, mats were placed faster than they could be produced. To relieve them of some of the work, it was necessary to hire a couple of part-time local students.

Lesson learned: Mat construction, while looking simple requires extensive amounts of construction time, has significant amounts of materials of both size and weight, requires a reasonable amount of work area to assemble/store them, and requires a significant amount of time/space/and effort to get rid of/recycle them at the end of the project. The steel and lumber tarp (polyethylene) is recyclable while the mill wire is not. The project was fortunate to have the dedication of those people that assembled mats and also those that donated the use of their property for mat construction.

8. Dive equipment needed for the project was divided in two parts; equipment provided to the divers and equipment the divers supplied themselves. Breathing air for the divers was provided by a gas driven "hooka" surface air compressor and was supplied to each diver by a single 150' long hose. Several hoses could be hooked together to provide an even wider work circle proving very beneficial at times, however, divers preferred staying closer to the float as moving materials the extended distance through the water was a challenge. This surface air was also used to supply air to the diver-supplied buoyancy compensators (BC). The hooka set up was a perfect fit for this project. It allowed up to 4 divers to work for extended periods of time without the hassle and expense of filling/refilling dive tanks and the bulk handling that goes along with them. The hooka air also contains a level of moisture that affords the divers the ability to work all day without the mouth-drying discomfort associated with using bottled air. Divers were expected to supply their own wet suits, BC, snorkel, face mask, dive boots, fins, gloves, weights and weight belt. Disposable items such as mask antifogging drops, ear drops, and custom fit mouth pieces, were provided for the divers. An emergency air bottle and regulator was available on the work float should the hooka quit. This was in addition to the fact that the hooka had several minutes of air storage as a part of its design. Communications with divers indicating low air or other emergencies was by banging on the metal of the work float and/or by gentle tugs on their air lines. Both methods worked very well. The divers did, on occasion, have problems with "bottom bouncing" where their ears kept trying to equalize as they repeatedly surfaced and descended picking up and placing mats particularly at the deeper plant depths of 24 feet.

   Lesson learned: A hooka surface air compressor, despite the over $5,000 in upfront costs, is the way to provide dive air. The cost of its operation is minimal. Service intervals are reasonable and can be performed by a relatively mechanically competent person (the project coordinator to this project was that person). Diver body temperature regulation was at times problematic. The temperature regulation was dependent on weather sunny day vs. overcast or cool/drizzly/windy days and whether divers were at the surface receiving materials or working at depth pushing mats around. Divers were often cool on the surface during breaks on over cast days and looked for a towel to wrap up in. When pushing the mats around on the bottom, they were often warm and opened their suits to regulate temperature. Even though there was some diver temperature regulation discomfort, this part of the project presented some of the least amount of problems.

9. The 2003 GPS mapping survey was initially undertaken to map the size and location of several of the largest beds. It was completed by surface observation in order to provide definitive measures of location and size of milfoil distribution within the lake and to provide "critical mass" data by showing the extent and size of distribution of milfoil. As survey data was being collected, it was found that the smaller patches (approximately 100 square feet in size) could also be surveyed. This collected data documented the initial 49 patches and using the area calculator function in the

program MapInfo, calculated an approximate collective size of 8 acres of milfoil. When divers surveyed the first test patch for hand harvesting, prior to receipt of this grant, they reported several things that were not revealed or taken into consideration in the initial 2003 survey. The first item was that milfoil was found to be growing significantly deeper than surface observation, even under the best conditions, would allow seeing. This made not only this first test patch larger, it also made many of the other large patches significantly larger as their edges died away into deep or deeper waters. The second observation was the significant extent of scattered milfoil plants around the perimeter of the patches as well as around the shoreline, not even considered as part of the 2003 survey. As part of the curtain planning and the amount of lake surface area that would need to be treated with an herbicide, new boundaries were drawn around the largest patches of milfoil. The area calculated with regards to this was estimated to be about 50-75 acres. This area would include the area of 2 bays and groupings of several patches that are located in close proximity to one another. (Figure 2 shows a map of these patches.)

Lesson learned: In the time from gathering the data for the initial 2003 report until work on the project began sizes of the milfoil beds changed. A few declined in size but most increased in area and density. (Figure 3 details this growth expansion in just one of the locations.) A re-evaluation of patches, with a better look at size for herbicide application, including a buffer zone around the patch perimeter along with selective grouping of closely spaced patches, provides a more accurate and realistic treatment size. A look at the perimeters associated with these “grouped patches”, for the purpose of determining amount of containment curtains, shows that each has a distance around it that extends into the thousands of feet. (Figure 4 provides details of these distances for a few select patches.) Also, a depth profile of these perimeters indicates a need to contain water to a depth of 25 feet (plus or minus) as milfoil was determined to be growing to this depth. (Figure 5 shows a depth transect map for one of the proposed site specific treatment locations.)

10. Lake Luzerne was granted an herbicide use permit in spring of 2010. This permit was for a curtain contained treatment of an 11 acre bay. The requirement to use a curtain was an additional stipulation by the APA and is not part of the NYS DEC product registration and use requirements. The bay that herbicide use was permitted for had a distance across the opening of approximately 300’ with a maximum depth of less than 10 feet. There was an adjacent accessible public beach and public boat ramp for ease of staging. These conditions made this additional stipulation for Renovate use a small burden on Lake Luzerne’s entire project. The 2010 follow up plant survey for Lake Luzern indicates a positive outcome with no residual milfoil in the treatment zone and negligible impacts to native aquatic vegetation both inside and outside the treatment zone.

    Dialog with APA representatives regarding the interest in use of an herbicide in Eagle Lake have been ongoing for many years. The first dialog centered on using the herbicide Sonar. When Renovate received final registration in NY, dialog switched to this herbicide as it was perceived to be a more effective and environmentally friendly product. It was stated by state agency representatives that it was a better product and in general had “less baggage” associated with its use. The “less baggage” claim was in part made with regards to Renovates’ selectivity, fast action on and absorption by milfoil, its short half-life in the water column and the fact that water does not need to be contained for extended periods of time when compared to Sonar’s application/use.

    Lesson learned: It takes time and patience for keeping current with technology changes, product availability, preferred usage changes, new rules for herbicide use/governance, and the required continued education/re-education of all involved parties. Simply adjusting to employee retirements/transfers, political party changes and appointments is ever challenging and time consuming, in addition to the need to keep up on the changing budget processes, late budgets, spending/allocation deadlines, etc.

11. Neither the Federal nor the NYS supplemental product label for the use of Renovate indicate or recommend the need for product containment curtains. The APA has however included this as part of their requirement for Renovates use in the Adirondacks. This additional stipulation was added, post completion of the DEC registration process, by the APA. The APA was involved in and had opportunity to include comments to this effect at the time of original registration process, and they did not, instead deferring to the DEC. This additional requirement, as per discussion with APA staff scientist's, is to "prevent product drift" and to further protect the native vegetation that is "outside the treatment zone". Renovate was developed and subsequently accepted for registered use in NYS because it is a very selective (milfoil specific) herbicide when used according to label directions. Lake Luzerne was granted a permit to use Renovate in April of 2010 however with the additional stipulation of using a curtain to create a lake with-in a lake. Renovate to date, has been successfully used in several NYS lakes outside of the Adirondack Park, as well as many lakes in Vermont and other New England states without curtains. All of the treated lakes had some type of pre and post treatment aquatic vegetation survey completed to determine impacts and effectiveness of the treatment. In the interest in gathering scientific and informative data, copies of several of these lake's plant surveys were obtained by the Eagle Lake Milfoil Project Coordinator These were reviewed and posted to the Eagle Lake website for use in providing education to Eagle Lake residents as well as those that are or might be involved in the decisions related to milfoil control in this or other lakes. (See http://eaglelake1.org/html/other_lakes/other_plant_surveys.shtml) In reviewing these "other lake's" plant surveys, all indicated great reductions in the amount and distribution of milfoil post treatment. In some cases "eradication" was even claimed. With the milfoil removed, the distribution and in some cases the assemblage of native plants increased. Some unofficial reports in the hours and days post treatment indicated that some of the natives in the treatment zone showed signs of stress but the post treatment plant surveys indicated that these plants had recovered by the time the official surveys were completed in early Fall. This observation holds true for lakes treated without curtains as well as for Lake Luzerne. Lake Luzerne was a perfect place to try a curtain containment test, due to the conditions mentioned above. In my opinion, based on the preliminary observations of the Lake Luzerne treatment results, there are 3 important observations of note. First, the plant survey results show no significant differences to those observed when compared to non-curtain contained herbicide treatments. Second, Renovate can be used at lower concentrations successfully with a curtain. Third, significant additional costs and logistical challenges are present with the added use of curtains.

    As mentioned elsewhere in this report, Eagle Lake has several environmental as well as milfoil growth conditions that make using the APA additional stipulation of curtains a burden that is beyond the financial and physical reality of this grant/project. These are condensed and highlighted here;

    - Milfoil plants in Eagle Lake grow to 25' depths.
    - Typical curtains are produced for use to depths of approximately 10 feet. Deeper ones are available by special order at a significant cost per linear foot of length. Thirty feet deep curtains are estimated to weigh about 5 lbs per foot with an estimated cost in excess of $50.00 per linear foot. For curtaining one side of one bay, the curtain length was measured at 400 feet. The opposite side was similar in length. Each 400 foot section of curtain would weigh 2,000 lbs. Deployment would need to be done by hand, an almost impossible task, because there is such limited access to the lake for bigger machinery to help with this and cost $20,000 (not including anchorage supplies, delivery, set-up, removal and storage/disposal after use). Specific costs associated for this were never explored as the project would never be able to afford the purchase price alone.
    - A check with several herbicide applicators and construction companies that do shoreline work all indicated that there were no curtains for loan or rent in this size. It was suggested by an APA representative that this could be a solution. Using rented curtains carries a risk of introducing new species and organisms into the lake if they are not cleaned properly. This

cleaning task presents its own challenges based on construction and the availability of an area to complete this in.

- Several of Eagle Lakes patches exceed 1 acre in size and as such have extensive perimeters, or have a distance across two points of a bay that extend into the thousands of feet.
- Several of the patches are located on pinnacles or sunken islands surrounded by open water with surrounding depths to 30 plus feet. Anchoring a curtain in this depth of water for several days or possibly weeks would be very difficult, if not impossible. The slopes of these pinnacles are often very steep as was found out when trying to anchor the work float. It was often necessary to have the divers locate a large rock, if one could be conveniently found, to wrap the anchor rope around as there was often nothing on these slopes to get a bite into. (Figure 5 shows a depth transect map for one of the proposed site-specific treatment locations.)
- Stretching and anchoring curtains in the lake will present safety concerns for recreational boating/lake use.
- Logistics for assembling and deploying a curtain, of any size within the lake, are a challenge given the rugged tree lined shoreline and the limited public lake access.
- The APA, even in making this additional stipulation, was unable/unwilling to help offset the additional burden of cost that this mandate carried with it.

Several licensed Renovate product applicators representing different companies, as well as several NYS DEC staff involved with the use of Renovate, have commented that based on the densities and distribution of milfoil in Eagle Lake, that a treatment with Renovate would be appropriate. They also state that the additional burden of curtains, as it would apply to an Eagle Lake herbicide treatment, does not provide gains sufficient to warrant the burden.

Lesson learned #1: Often times, people/agencies charged with the decision/rule making process are not looking at all of the ramifications related to that decision (costs, logistics, availability of funds, acceptance of some short term impairment for a longer term gain). Milfoil is one of a select few invasives that can be “controlled” and even “eliminated”. Most others spread by vectors that are not easy to identify/control and/or at rates that make them impossible to manage. Why are we missing this opportunity?

Lesson learned #2: Politics and horsepower behind the people making the decision, not necessarily “good science”, will ultimately determine if an un-curtained Renovate treatment will be allowed in Eagle Lake. This project, after reimbursement along with some additional private funding, would have sufficient funds to treat (with Renovate without curtains) most of the acreage of the lake identified as containing milfoil. This is based on the average cost per square acre for several other lakes that have been treated with Renovate without curtains. The cost associated with the curtain material alone would exceed any currently remaining funds. If a decision to treat by this method cannot be reached, these funds will be used to continue matting and harvesting until exhausted, and based on previous costs for these methods, there will be a significant amounts of milfoil remaining. This remaining milfoil will in a short time repopulate Eagle Lake and provide prime root/fragment stock for human or animal transport to other lakes.

12. Matting means a total kill of any and all vegetation contained under the mat, along with an implied impact to those invertebrates, amphibians, fish eggs, macrophytes, etc. that may inevitably be trapped underneath as well. At times, with a 50% mixed native/milfoil vegetation plant population, it was hard to justify a total kill but the makeup of the native vegetation made any assured successful milfoil removal by hand harvesting realistically impossible. Additionally, 8 weeks of mat placement/deployment as has been suggested as “adequate kill time” was not sufficient to completely kill mature plants. With adequate milfoil kill times being in excess of 8 weeks and divers available for only a 10 week seasonal period, it made mat placement/removal and subsequent redeployment unrealistic. Hence mats were either placed and left over winter or removed and redeployed, but again left over winter.

Lesson learned: Decisions made for mat placements and their total kill nature often result in not placing them at certain locations in order preserve the native plants and cover they provide for fish etc.. This decision leaves significantly more milfoil behind for time consuming and less effective hand picking, along with the opportunity to leave roots, etc. behind to re-grow. Even after a 1 year recovery time, areas that were previously matted still show the scars of this control method with only a few widely dispersed natives returning. Eagle Lake has a rich and robust mix of native vegetation. Even in those areas that are heavily covered with milfoil, some of this diversity remains. To kill it all with mats or to let milfoil further suppress it is not appropriate.

13. Coordination between the two towns, Ticonderoga and Crown Point, that Eagle Lake has boundaries in, has presented some unique challenges and many great opportunities. From the challenge point, it doubles the time spent with each supervisor and their respective Board providing them with current information and making plans for moving forward. For the benefits however both town supervisors (current and past) have extended and placed a significant amount of trust and faith in the project coordinator's ability and interest in seeing this project from inception to completion. They have been willing to submit permits, seek grant funding, and both have worked together to suggest and seek solutions. They have even taken the matter before the Essex County Board of Supervisors and who, by resolution, supported the project with the inclusion of the herbicide Renovate.

    Lesson learned: There are lots of people willing to help, including the local government, but despite the great concern on everyone's part, no one has the ability to step up and provide the needed control, funding or the specific ability to say "Do It".

14. Some years the milfoil grows very well with lush long stalks that reach the surface. In other years, the milfoil seems to retreat with the stalks not reaching their full height potential. One constant however is the size (bottom area) of most patches continue to grow over time. Eagle Lake has resident herbivore (acentria moth and weevil) populations. Some of the changes in the lushness of the milfoil can probably be attributed to the cyclical year to year nature of the herbivore populations. In the 10 plus years since herbivores were first detected, there has been little change to overall patch size. Some have shrunk. Most have expanded some significantly so. The number of patches and distribution has increased. The only thing that has really changed over the past 10 years, compared to time prior to this, is the significance of the amount of "topped out" biomass has declined.

    Lesson learned: Some years the milfoil wins and other years it appears that the bugs gain an advantage but in the end, the milfoil continues to grow and spread. It presents problems with regards to recreational use of the lake (safety of swimmers, water skiers, and boaters), the continued damage to native aquatic plant species as it out competes them, displacement of fish through lost habitat and breeding beds, reduced scenic value, negative impacts on property values along with lost tax revenue, and provides a perfect breeding ground for the unsuspecting transient lake user to pick up a hitch hiking fragment and transport it to another lake.

The longer the invasive control/eradication process takes/drags on, the more disinterested and disillusioned previous supporters/volunteers become. Apathy, anger and frustration can set in that inhibits forward momentum to the finish line. Discussion along the line of "taking matters into one's own hands" sometimes can arise and if followed out, could produce a disastrous environmental impact. Add the presence or potential presence of an additional invasive or multiple invasives (terrestrial and or aquatic) into this mix and very quickly individuals and groups alike (paid or volunteer) become overwhelmed with responsibilities, financing needs and directions for navigating the permitting process. If those people walk away disillusioned before there is a solution, their environment will be

compromised and sacrificed because there is no state level support to carry this task forward, (with or without personnel or funding) as a result, all may be lost. This whole process should be about eradication, not simply (or with great difficulty) getting to a state of control (or not)….

Herbicide control is not right for every situation, but if its integration into the "control toolbox" is appropriate for the size and conditions of a specific milfoil project, it should be used as the first method for milfoil "knock down". This was not the case for Eagle Lake, as an herbicide use permit was not available. As a result, the overall costs associated with milfoil control will be much higher and the effectiveness of control will be lower.

If the "powers that be" consider the Adirondack Park to be so much more "special" than other areas of the State, then why have they allowed this invasive to become the problem that it is in the 80 lakes within the Park that now support milfoil? As a final reflection, throughout this project and grant no one with the "horsepower" or position to "get it done" has come forward and said "let me guide you, pave the way and get the solutions done that can correct this".

Special thanks are given to Tim Sinnott for all the guidance, support, interest and patience he has provided to this project.

Figures related to the Eagle Lake Milfoil removal project.

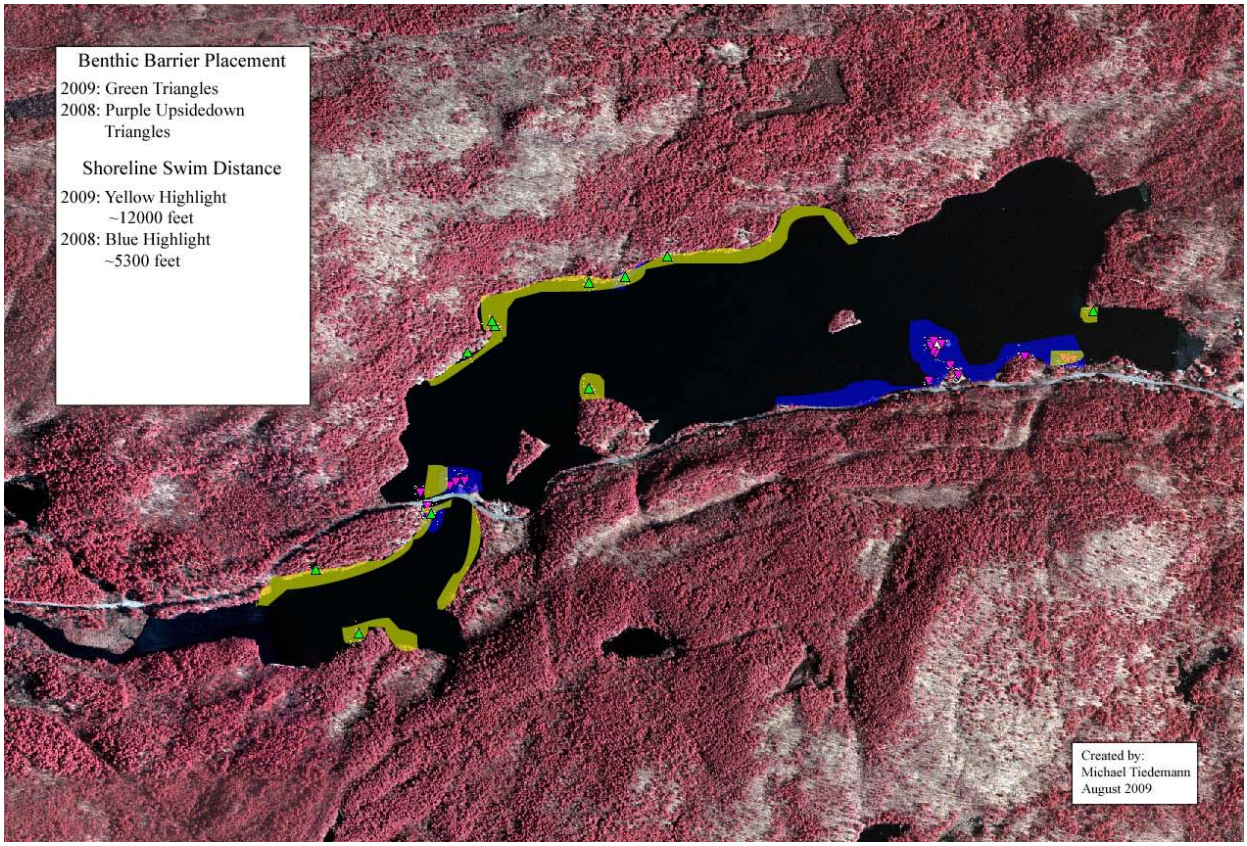


Figure 1 Overlay map of work locations 2008-2010

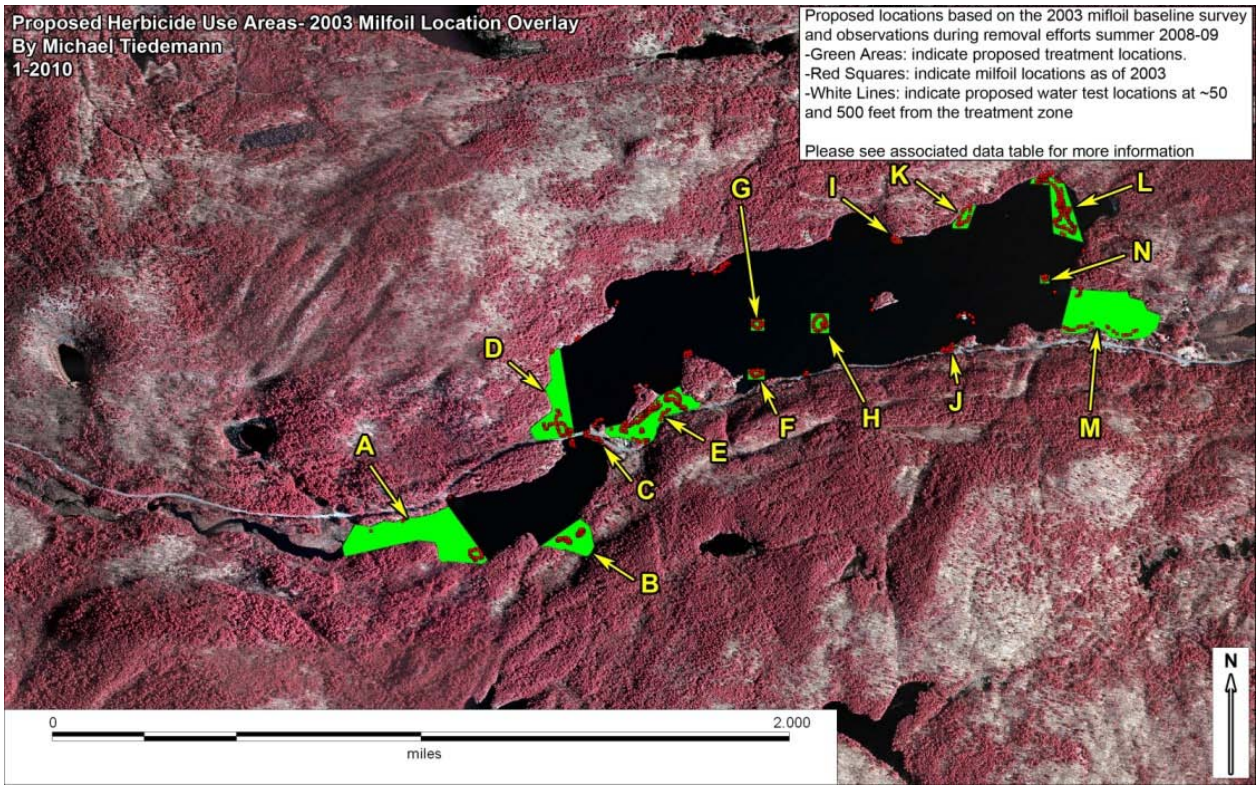


Figure 2 Milfoil, site specific, proposed herbicide treatment locations. Several of the non-green highlighted patches have been handpicked or matted) Location I and G are the two specific locations that discussions are currently focusing on. Location H is the site of the "poster child" patch. Location M is the area highlighted in figure 3 (next page) for milfoil expansion. Detailed depth transects for proposed curtain locations were completed at location E.

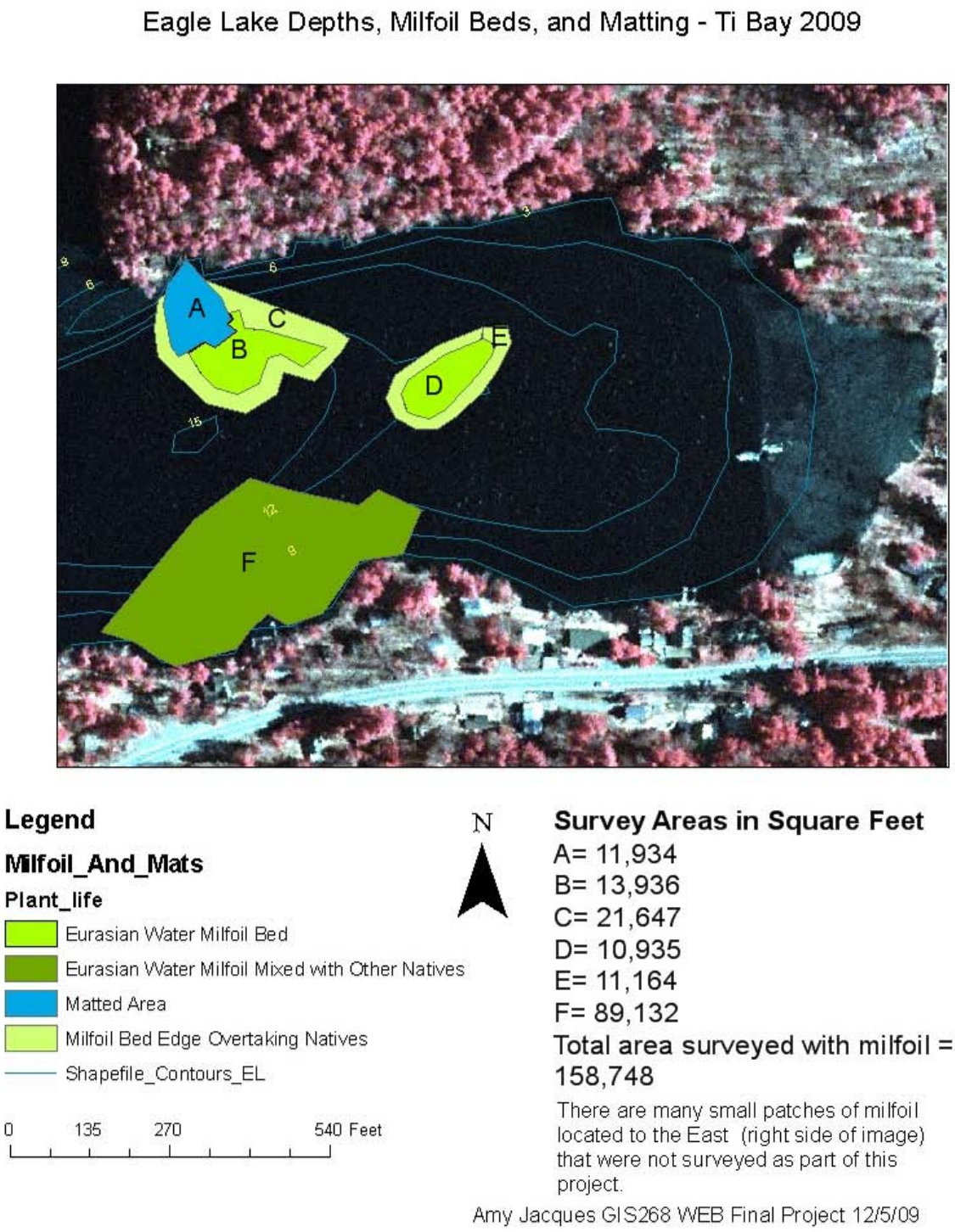


Figure 3 Visual enlargements of milfoil bed "M" shown in Figure 2

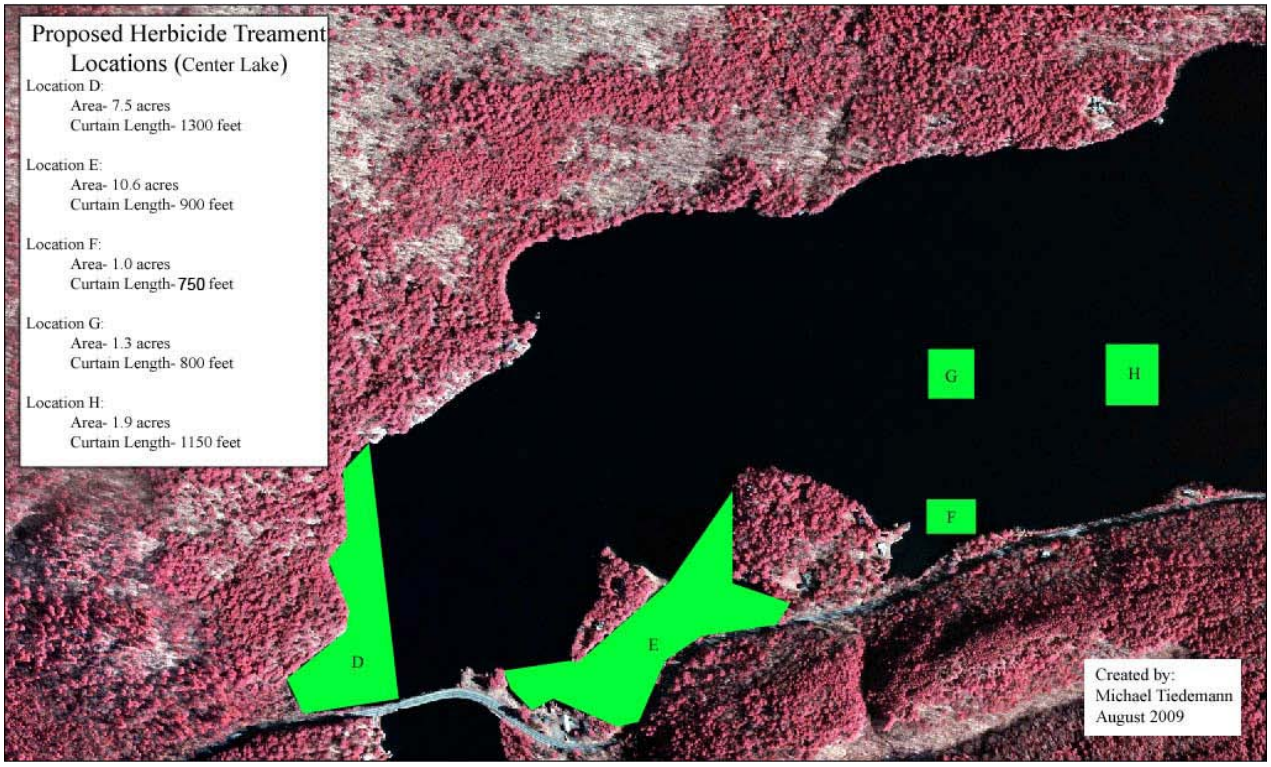


Figure 4 Estimated curtain lengths and circumference around select milfoil patches considered as part of proposed site-specific herbicide treatment.

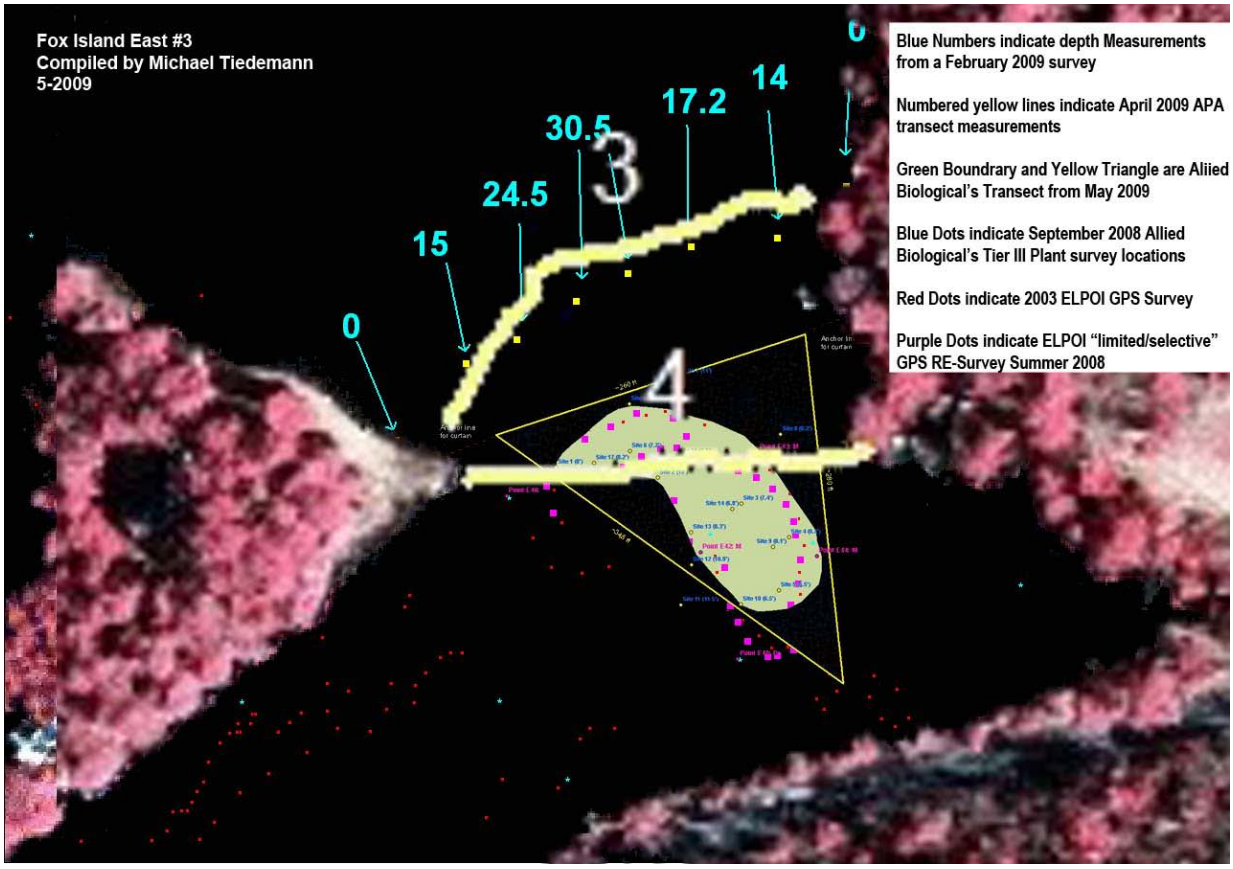


Figure 5 Depth transect map, for one side of the bay, for the proposed site specific herbicide treatment locations. Location E, from figure 4 has been enlarged here to show depth transects from the island (west/left) to the peninsula (east/right).

Select milfoil removal project pictures 2008-2010

1. Constructing the work float.

4. The launch crew lifted the float off the trailer and set it on saw horses. The trailer was removed and the float was then set down in the water.

2. Work float construction almost complete.

5. The work float was towed to the staging area. It worked real well for a first time boat designer/builder.

3. Work float completed and trailered 13 miles around the lake to the only private launch that could be used to put it in the water.

6. The project pontoon boat (donated for project use only), the work float and 2 small aluminum run-about boats provided safe and ample room for the milfoil work team and their gear. The only problem was it did not fit under the “causeway”.

7. The hooka air compressor, expensive, but well worth it. It could safely support 4 divers and operate all day on a tank full of gas.

8. Steel bars and more steel bars. Pictured here, 3500lbs of 10 foot ballast hand carried from the road approximately 200 feet to the mat assembly area. In all, more than 11,000 lbs were used.

9. The 2500 lb roll of polyethylene plastic lumber tarp, 10 feet wide by 6,000 ft long, located in the only area where a tractor and trailer could unload material. Location is about 500' from the mat assembly area.

10. The mat assembly crew finishing installation of zip ties used to hold ballast to the plastic tarp (mat). Next step is to roll them up. Not a lot of extra room on this sloped work area, but better than no site.

11. Master mat construction technician Jim with a pile of mats. Diver Mike is here to pick up a load.

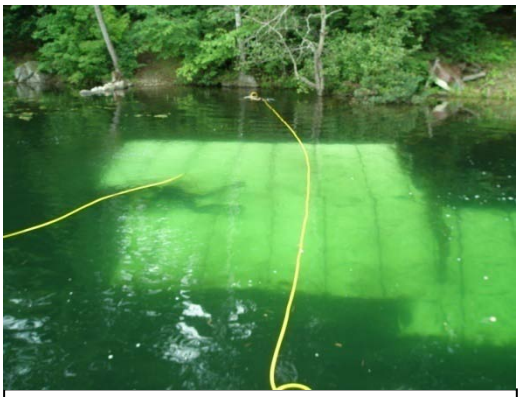
12. Diver Mike arriving with a boat load of mats. Enough for the mornings' work.

13. Working on the western (smaller) basin of the lake without the benefit of the pontoon boat. This is the first patch mats were laid on.

14. Divers confer on the best approach for laying the next mat. Collecting fragments with a long skimmer pole.

15. Looks like a lot of space until the divers climb on board and there is a pile of mats and bags of removed milfoil on board as well.

16. Setting anchor and getting ready to deploy more mats. One of the 4-150' air lines coiled up. Keeping them untangled as divers swam around was a continuous and daily chore.



17. A diver finishing placement of the last of 3 - 10' X 25' mats. Water depth is about 12' - 18' here. The diver's partner is starting work on hand picking the surrounding area.

18. Dianne, Amy, Steve and Mike, the dive team.

19. Ariel view of the lake Rt. 74 is on the south (left). The lack of development and ruggedness of the shoreline can be seen. A close look at the picture, just behind the trailing edge of the wing, will reveal the "poster child" milfoil patch visible from 2,500 feet.

20. Milfoil "topped out" at this patch in mid Aug 2009 and remained at the surface long into the fall. It is pictured here, still visible even in late October, long after most of the natives have died back and decomposed. 2009 was a banner year for growth.

21. Diver swimming through a thick patch of milfoil, goodie bag in hand, ready to do their hand picking.

22. Underwater compass targets (shown here on land), placed in various locations in the lake, allow photos taken over time to be compared for milfoil and native spread. A Vermont DEC idea for simplifying plant surveys.

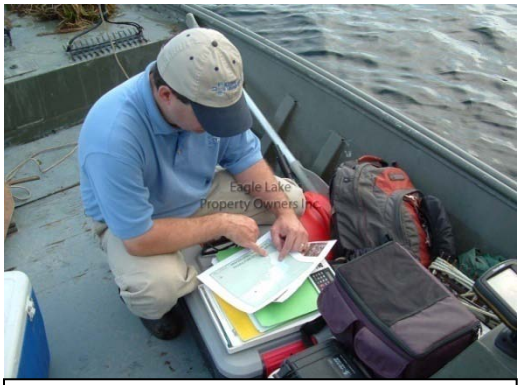
23. An in-water view of the compass target, looking west with some natives in the foreground and milfoil in the background.

24. Making depth measurements through the ice, February 2009

26. Providing educational information to members of the Eagle Lake Property Owners, Inc (ELPOI) at their annual July meeting.

Eagle Lake Newsletter – November 2010

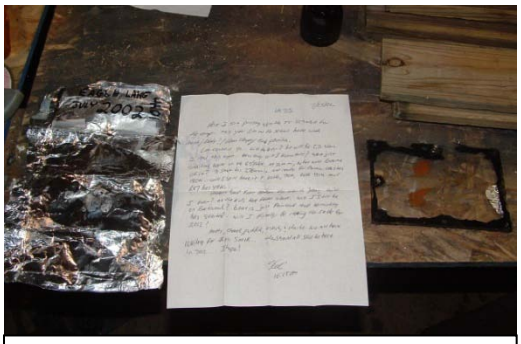
27. Copy of the cover of the November 2010 Eagle Lake newsletter, one of many published communications that were sent to all lake residents over the course of the project to highlight current aspects of what was going on.



25. Technician Chris, from Allied Biological, checking a map as part of completing a Tier III aquatic vegetation survey.

28. ELPOI Board Members meet with Senator Little, the Adirondack Council Chairman, and several DEC staff to discuss planning directions for grant submission, with inclusion of herbicide use.

29. "Key Players" meeting is convened to establish a path for both the use of an herbicide, as well as the application process for the 2006 grant.



30. A surprise find! A time capsule was found when removing one of the first mats placed. Conversation with the person who placed it, indicated that when it was place 8 yrs prior there was no milfoil in sight.

31. Injured Northern Pike has a growth about the size of a softball on its side.

32. Diver Amy models a hat she found on the bottom.

33. A long hot day makes the project coordinator do some goofy things.

Notes: