Beaver Lake
2013 Aquatic Plant Control Program

Prepared By
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Project Overview

This was Northwest Aquatic Eco-Systems (NWAE) second year of providing aquatic weed control services for the Beaver Lake LMD #4. During our first contract year (2012) no applications were performed as concerns related to the proposed treatments were researched. Concerns raised addressed potential impacts to grazing livestock that may consume the lake water following treatment. Beaver Lake has been actively involved with a program to eradicate noxious aquatic macrophytes from the system. Targeted species include Eurasian watermilfoil and Nymphaea odorata. Native plant growth extends outward beyond the 15 foot contour line and consumes all of the lake shoreline. There are no immediate shoreline residential homes. A vast majority of the shoreline is used commercially as pasture for grazing livestock. The lake supports limited swimming and recreational boating but does support a very healthy recreational fishery. Most all of the lake use is associated with fishing activities. Dense shoreline native macrophyte growth appears not to hinder current lake use.

Some of the information provided in the 2013 report was included in our 2012 report. Current and past information is provided to provide the reader with the ability to understand the history of the program without requiring the review of all prior years report.

Beaver Lake is approximately 73 acres in size and is located outside of Mount Vernon just south of Clear Lake one mile east of highway SR-9. The lake is opened year round for fishing, supporting a largemouth bass, black crappie, yellow perch, coho and cutthroat species fisheries.

Survey Protocol

Survey techniques were typical of those considered as “standard protocol” throughout the industry. This year however NWAE incorporated new state of the art surveying equipment in an effort to produce a survey that could easily be understood by all reviewers Typically, past sampling consists of manually retrieving weed samples from numerous locations lake-wide while observing growth through the water column. Although effective, individual bottom sampling can only identify plants within the immediate area sampled. Visual observations when water clarity permits is a far superior method for plant inventory since it allows for inspection of the entire lake bottom wherever the survey boat operates. This avoids the possibility of missing plants between bottom surveying data points. The procedure employed encompasses a surface vehicle shadowing the weed bed borders and collecting data points corresponding to small or large occurrences of plants. To ensure the efficacy of the survey, a bottom sampling rake is thrown from the boat at various locations lake-wide. The rake is then drawn across the lake bottom, brought to the surface and into the boat. Plants attached to the rake are identified and confirmed as being the same species as noted visually through the water

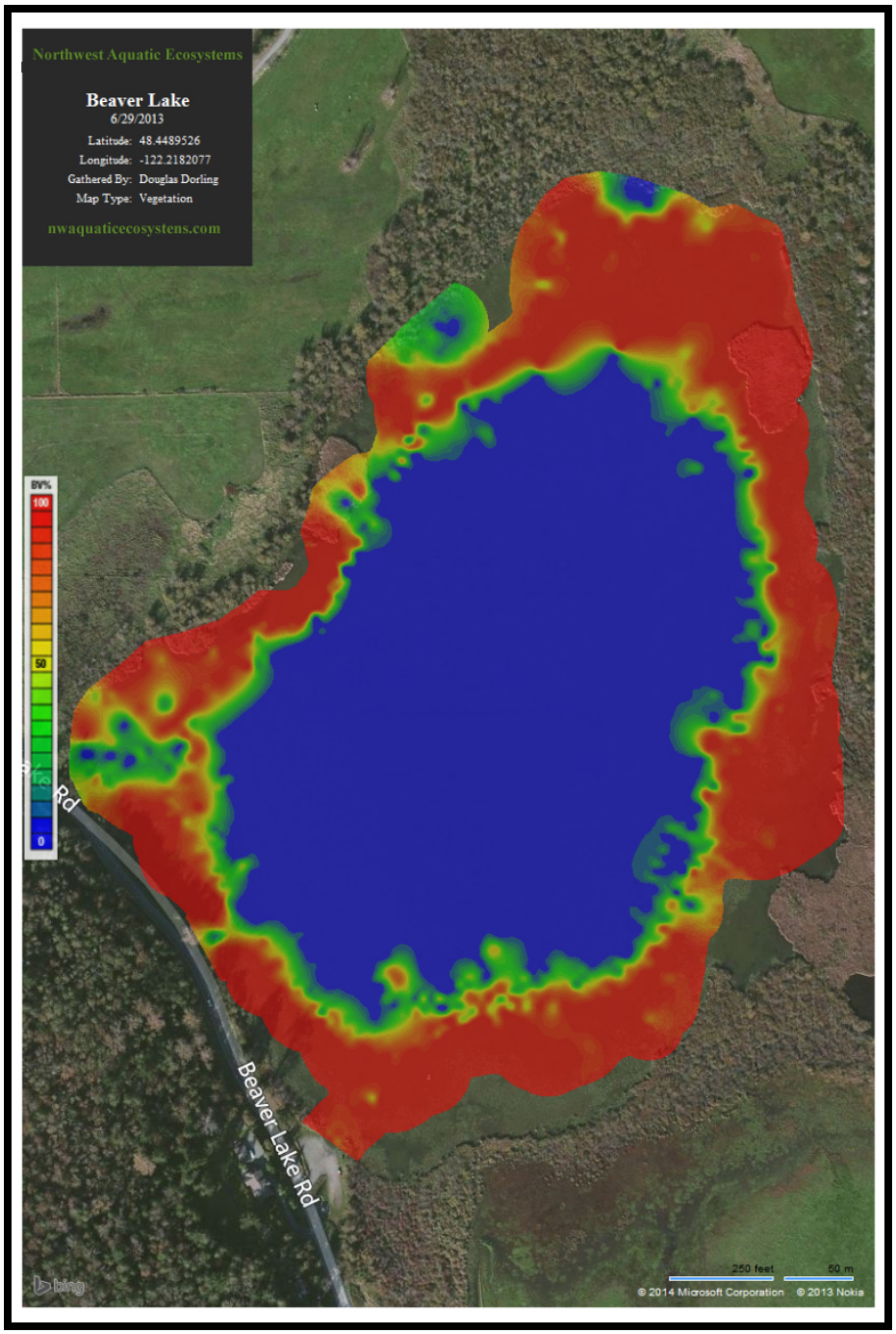
column. If the lake bottom is void of plants, no data is stored. The survey boat typically spends the entire survey within the lakes littoral zone while completing the task. The system produces sub meter and automatically calculates and stores the position of every data point enabling the mapping of thousands of data points on a daily basis. Either single data points can be entered or features such as line boundaries can be recorded. Data points are then assembled as a map layer, which are then incorporated, into the project file.

During 2013 sonar data was collected utilizing specific transducers and bottom scanning equipment. Once collected the SD card was uploaded via. cloud based technology and the processing of the data was finalized. The resulting product is a color coded map of the lake bottom identifying weed growth areas and plant densities. Not only is a well-defined map produced but a sonar log of the survey is saved allowing a complete review and evaluation of the survey to occur in house. The sonar log allows you the ability to view all plant growth along the boats survey track. When nonnative milfoil species were identified a milfoil specific data point was added to the transect line.

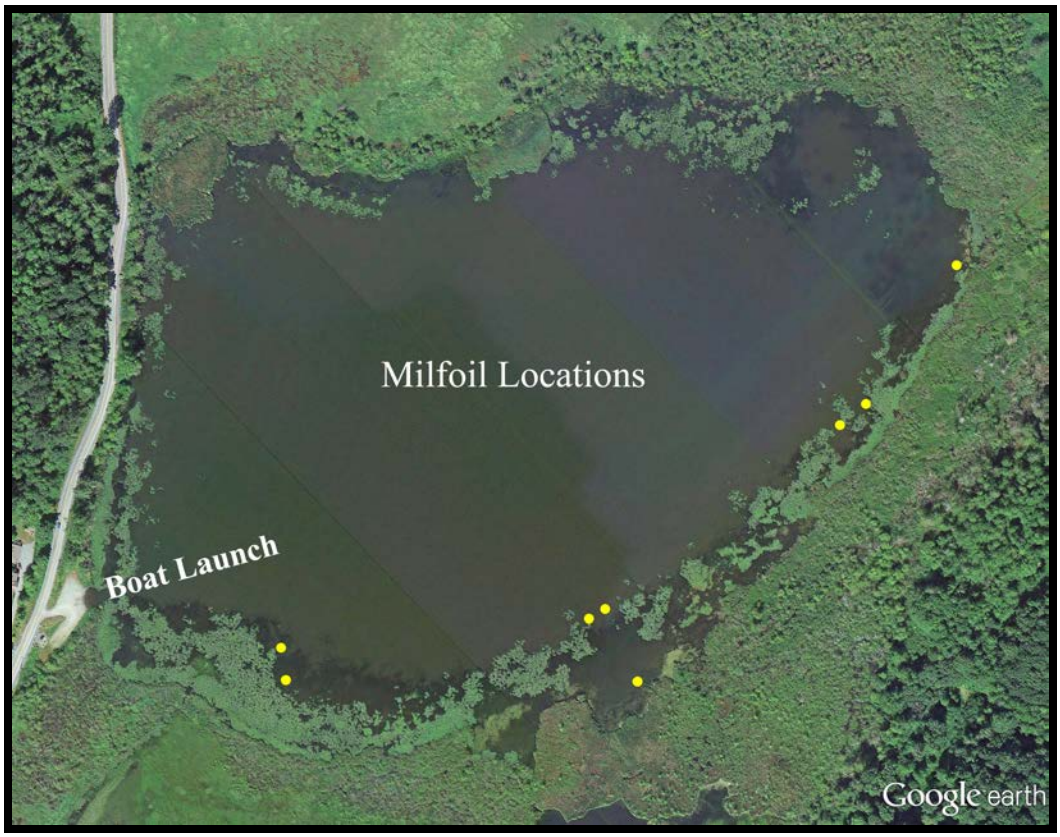
The survey boat started collecting data circling the immediate shore. Once the initial shoreline pass was completed, the boat moved outward approximately 50 to 100 feet for each successive pass. The survey was completed once the entire 73 acre lake basin was transected. Before leaving the site, boat survey "tracks" were reviewed to ensure that the entire lake basin was surveyed and the integrity of the survey was recorded.

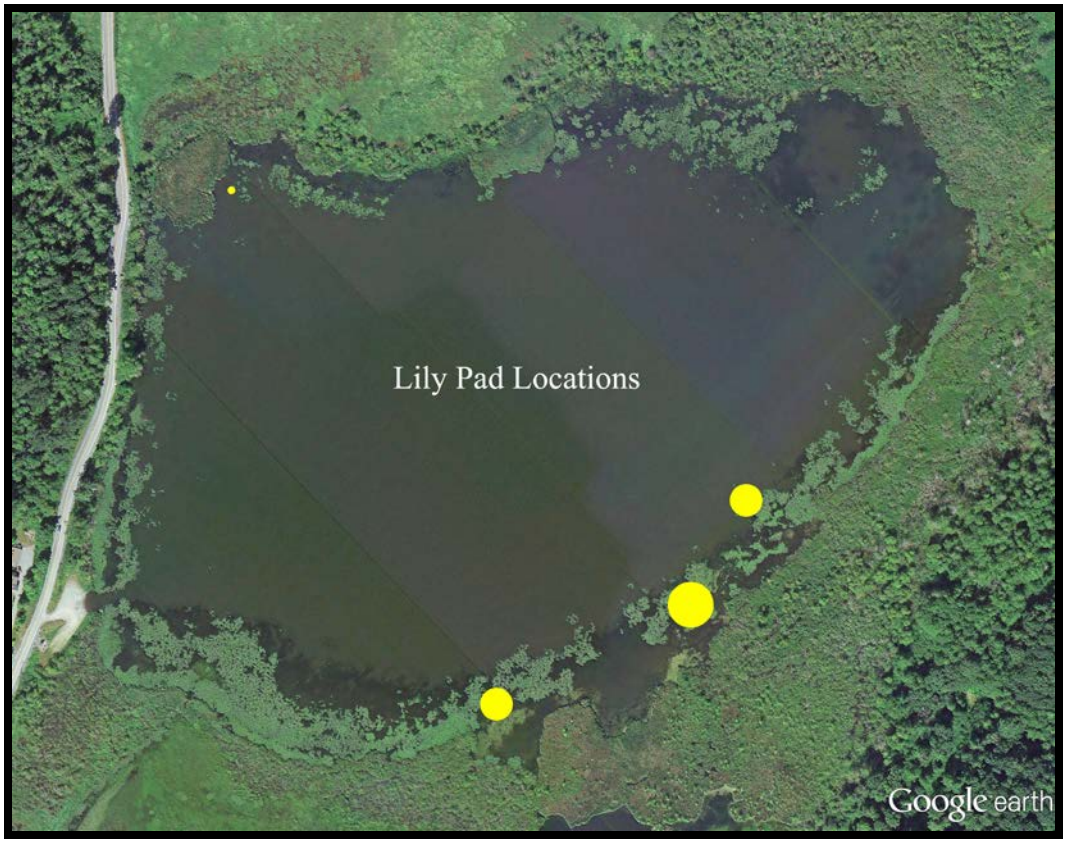
Beaver Lake Pre Treatment Survey Results

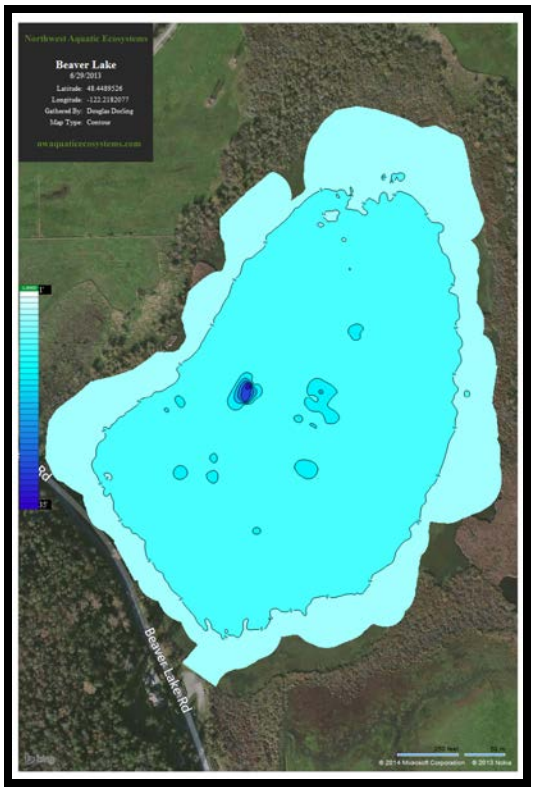
Beaver Lake was surveyed on June 29, 2013. Water clarity was excellent with visibility down to the bottom throughout most of the lake's littoral zone. Only 13 single stemmed milfoil plants were identified during the survey. Plants were sporadic, all of the surveyed milfoil plants were located along the eastern shoreline of the lake. Three small areas of fragrant water lily were identified during the 2012 season, these infestations had expanded considerably; with one infestation approximately 5,000 square feet in size. This site was not composed of a total dense surface mat but a number of large patches throughout the specific area. Typically lily pads that have been previously treated are normally smaller than untreated plants. Many of these plants appeared as large leaved pads. Native pondweeds dominated the survey throughout the littoral zone with both elodea and ceratophyllum species exhibiting dominance in isolated locations throughout the northeastern section of Beaver Lake.



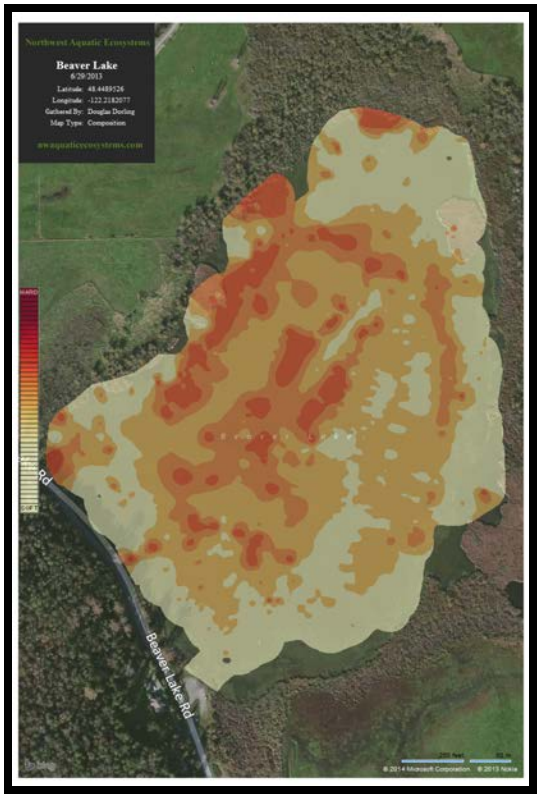
Red areas 100% plant density
Blue areas 0% plant density


Milfoil Locations
Boat Launch
Google earth

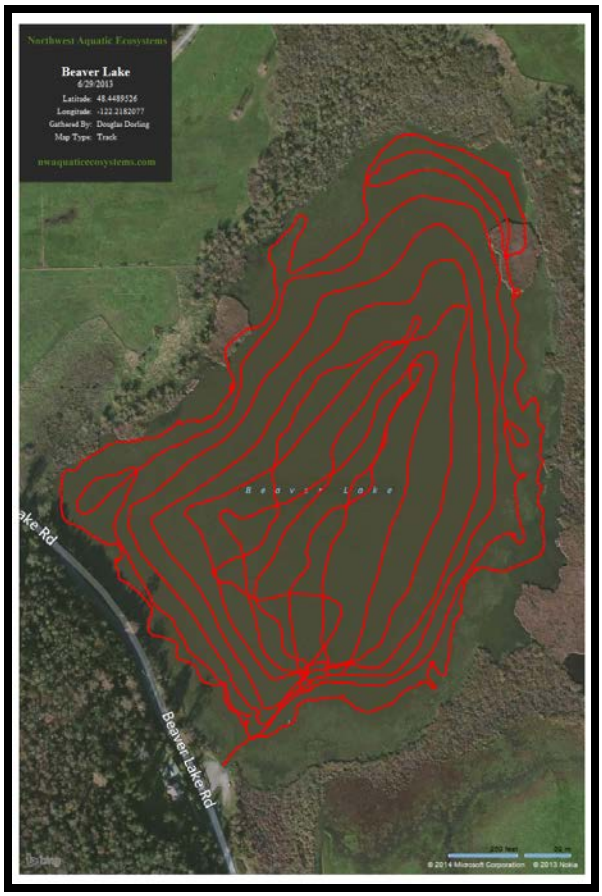

Lily Pad Locations
Google earth



Beaver Lake five foot contour



Red - hard sediment type
Gray - muck sediment type



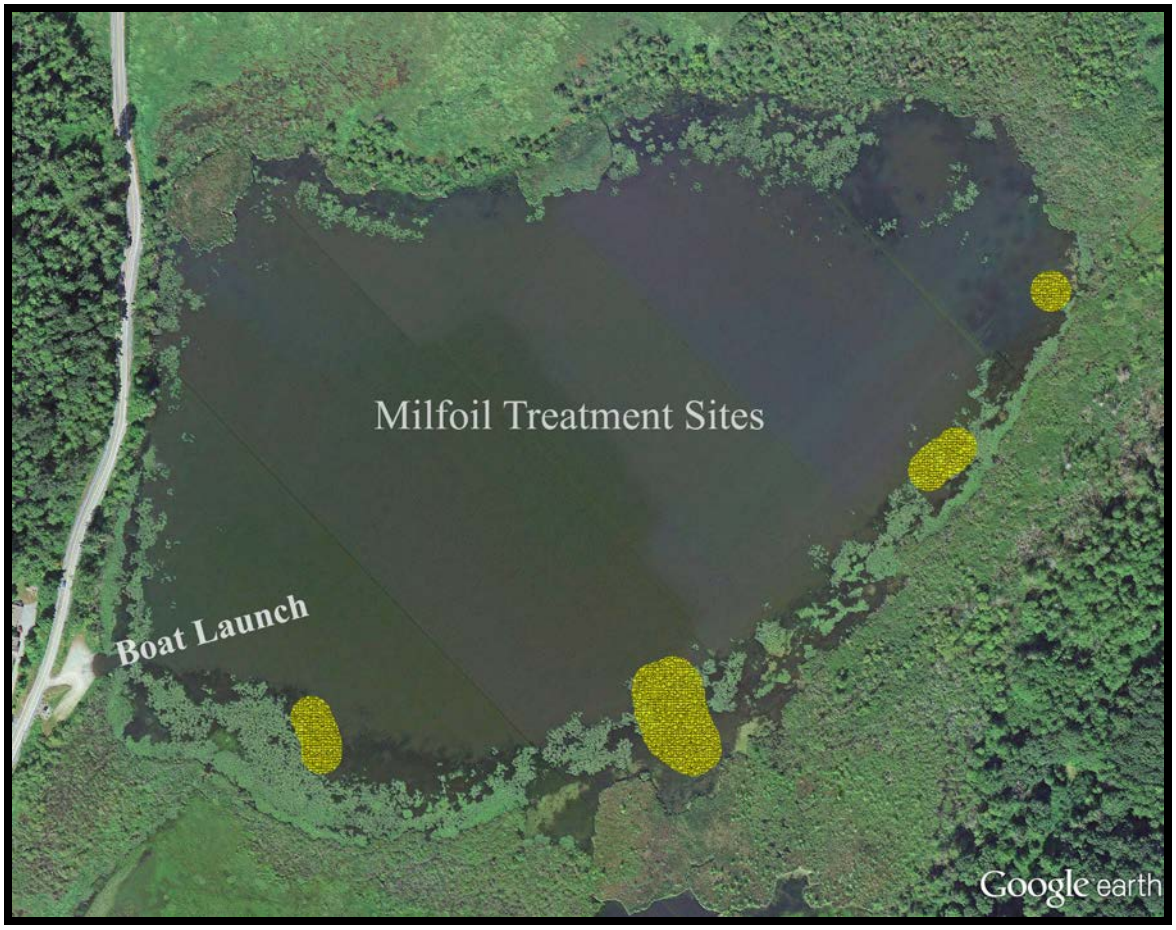
Survey Tracks

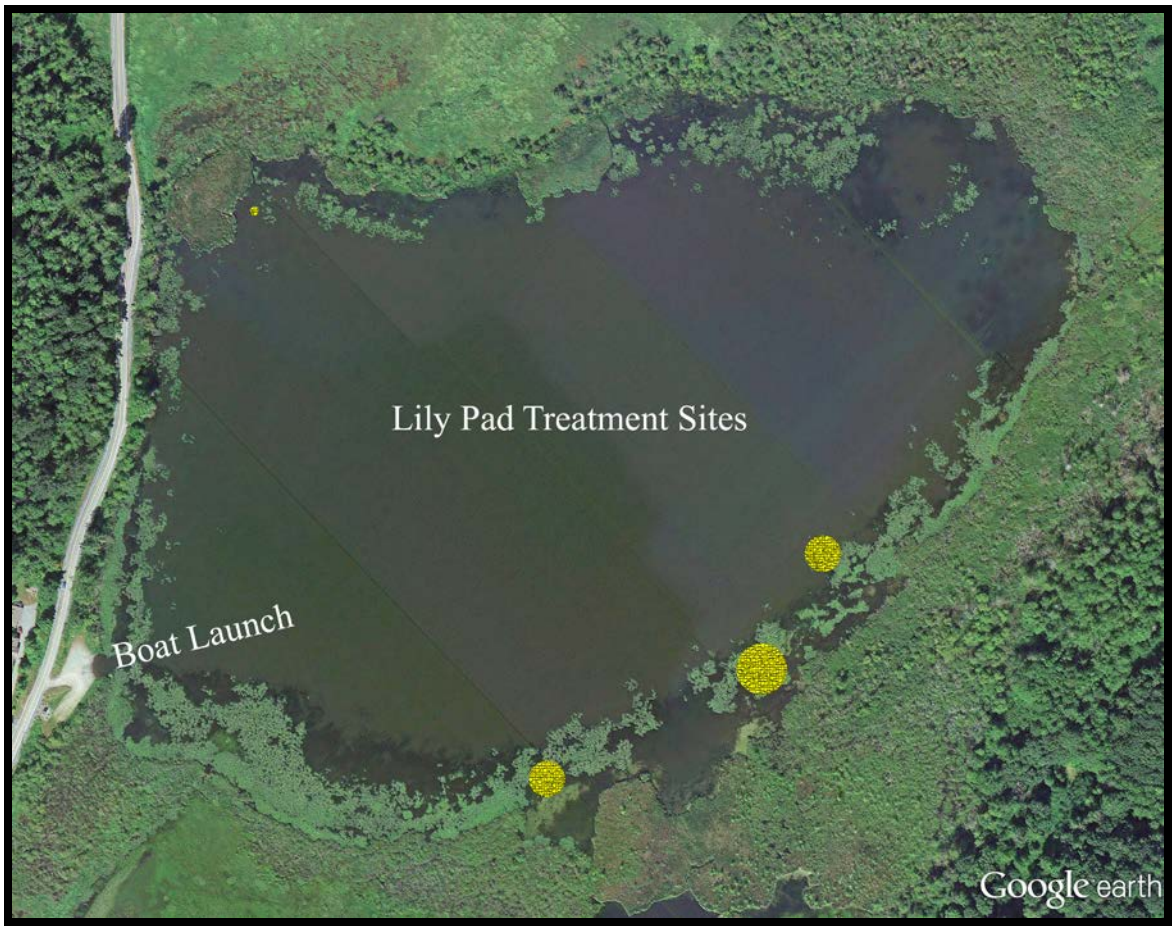
Treatment

Beaver Lake received treatment on July 21, 2013. Having researched materials available for use it was determined that glyphosate, Renovate and 2,4-D based products would be available for use. None of these products prohibit grazing cattle from drinking the lake water following treatment. The distance the proposed treatment sites are from potential lake treatment sites were livestock may be grazing likely will result in no material drifting into those lake shoreline locations.

Shoreline posting was conducted on the day of treatment. A two person crew initiated posting of the lake upon arrival in the morning and treatment began shortly after arriving at the site. Material was offloaded from a locked truck container and transferred into two 25 gallon spray tanks mounted on the application boat. Containers were triple rinsed on site and returned empty back into the truck. Material was applied utilizing an 18 foot Airgator airboat. Lake water was drawn into the boat through intake ports located in the hull of the boat. Herbicide was then metered into the lake water via an injection manifold.

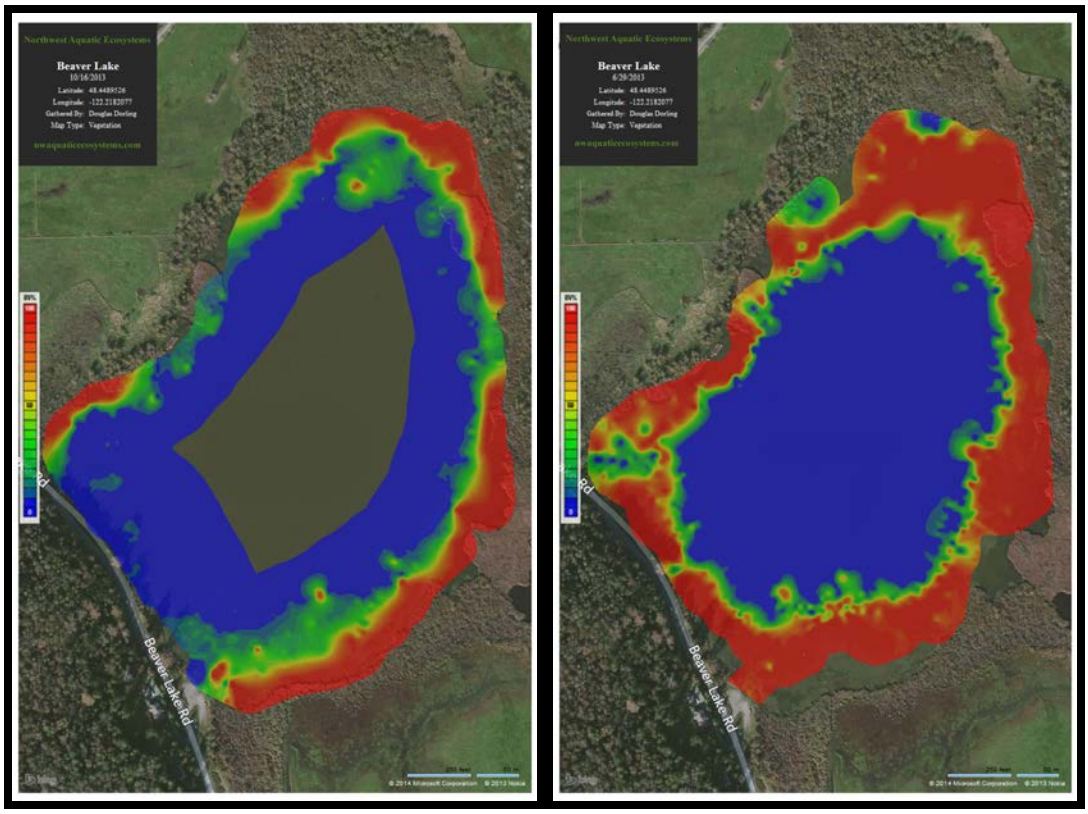
Once the herbicide was injected, the water was then discharged back into the lake. Weighted hoses were then used to place the material at the appropriate depth in the water column. Prior to treatment a lake treatment map, identifying treatment plots, was downloaded into the onboard GPS system. The boat utilized the onboard GPS to identify treatment site boundaries. All of the targeted submersed and floating plant sites were treated on July 21. When floating plants were sprayed one 25 gallon tanks was filled with lake water; herbicide and adjuvant which were then added directly to the tank. Once mixed, the application boat drove along the shoreline identifying targeted sites and the spray mixture was then discharged using a spray gun. Milfoil was treated with DMA4ivm at a rate of five gallons per surface acre. Lily pads received a 1.5% solution of glyphosate sprayed directly onto the floating plant surfaces.





Fall Survey

The fall survey was performed on October 16, 2013. At the time of the survey Beaver Lake was experiencing a severe algae bloom. Water clarity was poor with a dense green algae surface scum lake wide. Water clarity along the shoreline extending outward throughout most of the prior treatment areas was below six inches. The survey resulted in no documentation of any milfoil plants lake wide. Poor water clarity at the time of the survey may have hidden potential plants. Previous sprayed lily pad infestations had responded well. Lily pad treatment sites consisted of stems and small floating leaves. Many of the remaining floating leaves were severely damaged, yellow and brown in color. Most native species had started to enter their dormant stages. Plant densities were declining from previously noted June levels.



October 2013 June 2013

Recommendations

1. Permit guidelines that mandate leaving 50% of the shoreline untreated for native vegetation control should never pose a problem simply because no residential homes exist on the lake and the lake is mainly used for fishing purposes. Good fisheries often consist of lake waters that maintain a wide distribution and variety of macrophytes. All of the noxious species present in Beaver Lake can be targeted with materials that are specific only to those species. Reducing native plant growth may prove to be an unpopular approach to the avid local fishermen. At some point in time, native weed control may be necessary due to the shallow nature of the water-body. The local fisherman and the Department of Fish and Wildlife could probably best evaluate when such an action may be warranted. Until native weed concerns are raised by lake users the LMD should avoid control alternatives targeting these species.
2. LMD officials or the consultant need to determine if the pasture lands abutting Beaver Lake are properly fenced off thereby preventing livestock access to the lake waters during normal years of rainfall. Abutting property owners adjacent to the lake need to ensure that established fence lines perform as designed during normal rainfall years. Typically early established fence lines may not presently prevent livestock from entering waters as they may once have. Some fence maintenance may be in order.

3. There remains a need to continue the efforts to eradicate noxious species from the lake. Current milfoil plants are extremely light in concentration and noted in only a few locations. Left untreated these isolated occurrences will eventually spread lake-wide. The shallow nature of the lake provides excellent habitat for this to occur rapidly. If high water levels prevent early season treatment then a late season application would appear to be in order. The amounts of material required to control the current infestations are extremely small. Materials selected for use do not restrict grazing livestock from utilizing the lake water as a water supply during treatment.
4. Property owners and the LMD need to work together in an effort to ensure treatments occur and livestock is protected. Property owners need not simply adopt a "no treatment" philosophy without first considering the long term health of the lake. Property owners should coordinate pasture use with potential treatment schedules. At the very least those shoreline areas where no livestock access is possible should be available for treatment.
5. Most importantly as noted above, the grazing pasture use and treatment issues need to be resolved on an amicable basis. Documentation currently exists that supports both positions. However, it is clear that lake pollution associated with potential livestock excrement entering the lake is prohibited under both state and federal law.
6. Continue to evaluate property owners concerns and provide information that supports the position and the program format of the LMD., If research suggests that the LMD needs to reevaluate the program format then such data should be reviewed.
7. Continue utilizing the new mapping technology. This technology provides an easily defined map that can be used as baseline data as lake conditions change.