Beaver Lake
2014 Aquatic Plant Control Program

Prepared By
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Project Overview

This was Northwest Aquatic Eco-Systems (NWAE) third 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. 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 2014 report was included in our 2013 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

This year NWAE again incorporated the new state of the art surveying equipment in an effort to produce a survey that could easily be understood by all reviewers Prior to 2013 sampling consisted of manually retrieving weed samples from numerous locations lake-wide while observing growth through the water column. Although effective this method only identifies the 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. The past procedures employed 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 accuracy 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.

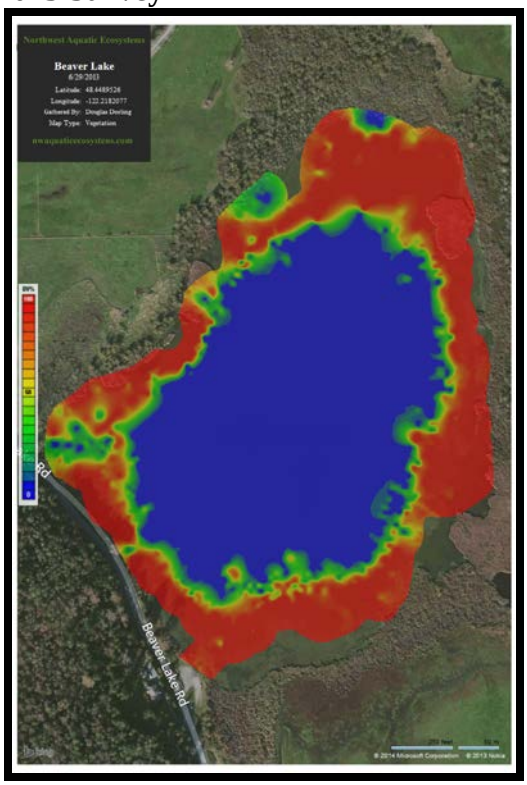
During 2013 and 2014 sonar data was collected utilizing specific transducers and bottom scanning equipment. Once collected the SD card was uploaded via. cloud based technology and the processing of the data was finalized. The resulting product is a color coded map of the lake bottom identifying weed 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 the consultant4the 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.

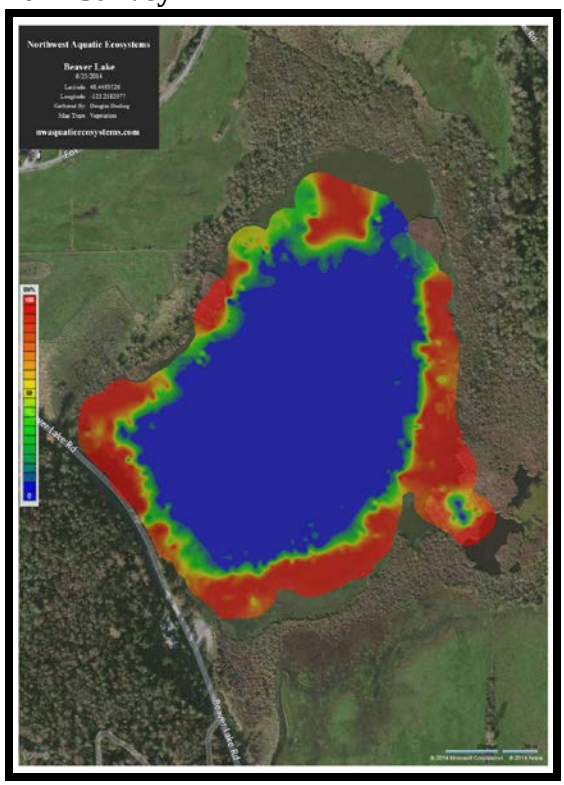
The survey boat started collecting data circling the immediate shore. Once the initial shoreline pass was completed, the boat moved outward approximately 50 to 100 feet for each successive pass. The survey was completed once the entire 73 acre lake basin was transected. Before leaving the site, boat 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

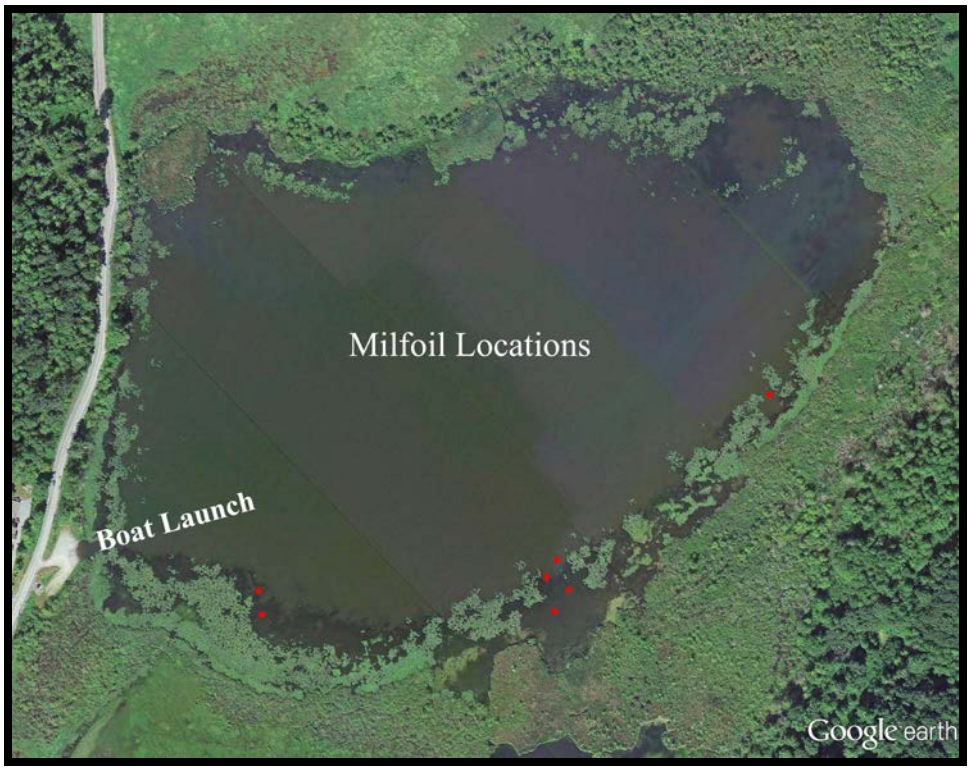
Beaver Lake was surveyed on June 29, 2014. Only a few small patches of single stemmed milfoil plants were identified during the survey. Plants were sporadic, all of the surveyed milfoil plants were located along the eastern shoreline of the lake similar to surveys performed in the past. Fragrant water lily infestations were reduced from those noted during the non-treatment 2012 season. Once again infestations were all identified within areas that had been historically treated. Plants exhibited anticipated growth patterns typically associated lily pads that have been previously treated, smaller pad surfaces than untreated plants. 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. 2014 plant densities were less than those noted during 2013.

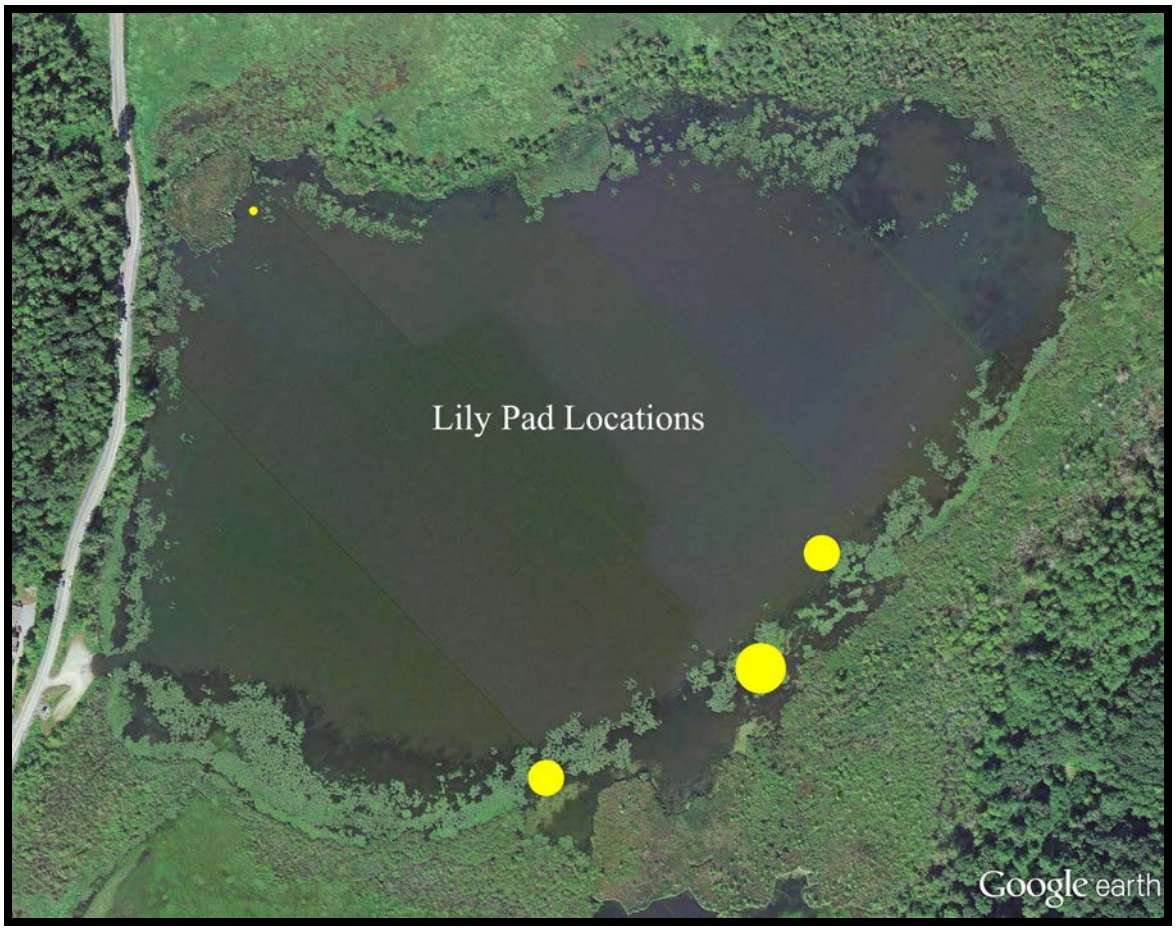
2013 Survey **2014 Survey**





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





Treatment

Beaver Lake received treatment on July 21, 2014. Products selected for use did not prohibit grazing cattle from drinking lake water during or following treatment. Distances of the proposed treatment sites from potential lake access points after considering dilution would likely result in no material drifting into those potential grazing access shoreline locations. Both glyphosate and 2,4-D were selected as the control agents.

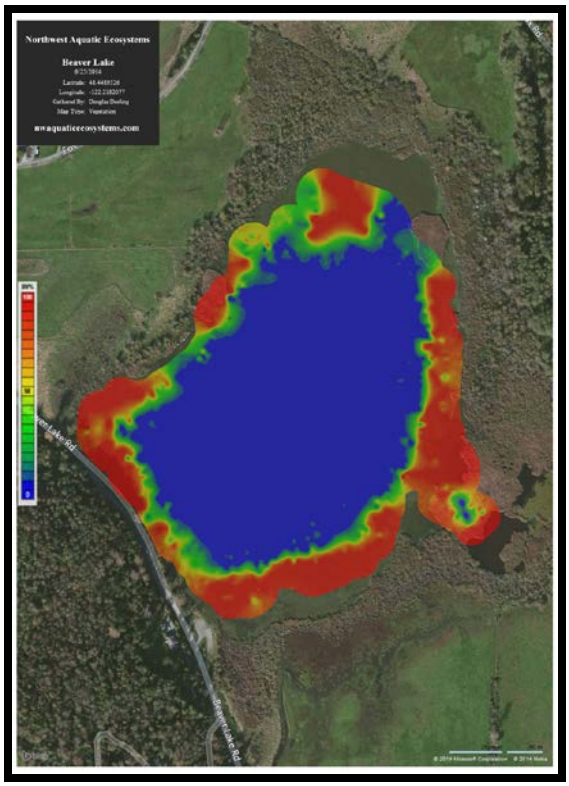
Shoreline posting was conducted on the day of treatment. Such posting consisted of two large signs secured at the boat launch. Material was offloaded from a locked truck container and transferred into a single 25 gallon spray tank mounted on the application boat. Containers were triple rinsed on site and returned empty back into the truck.

For submersed weed control once the appropriate amount of material was added to the 25 gallon tank lake water was used to fill the tank up to the twenty five gallon level. The resulting mixture was then metered into the lake water via an injection manifold Weighted hoses were used to place the material at the appropriate depth in the water column. Prior to treatment a lake treatment map, identifying treatment plots, was

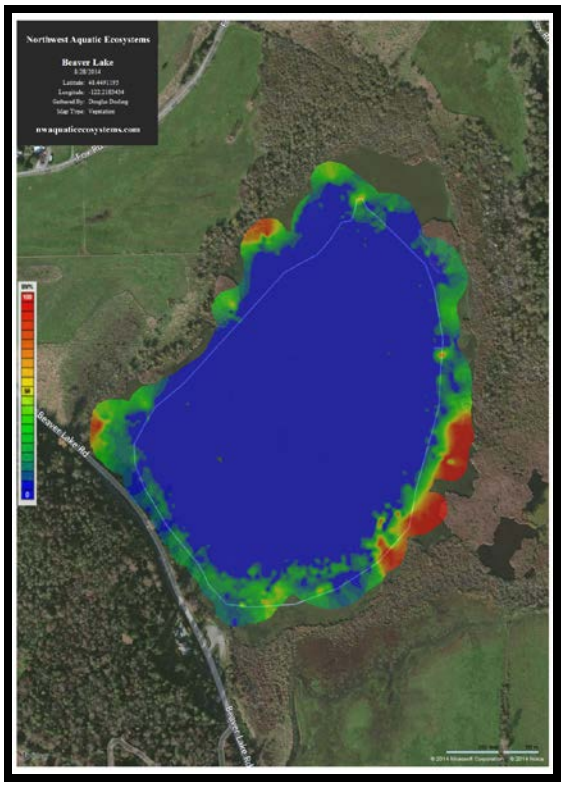
downloaded into the onboard GPS system. The boat utilized the onboard GPS to identify treatment site boundaries. When floating plants were sprayed the 25 gallon tank was filled with lake water; herbicide and adjuvant were then added directly into the tank. Once mixed, the application boat drove along the shoreline identifying targeted sites and the spray mixture was then discharged using a spray gun. Milfoil plants were treated with DMA 4 IVM at a rate of five gallons per surface acre. Lily pads received a 1% solution of glyphosate sprayed directly onto the floating plant surfaces.

Fall Survey

The fall survey was performed on August 24, 2014. At the time of the survey Beaver Lake appeared to have experienced an algae bloom die off that resulted in murky water and poor water visibility. Much of the noted earlier aquatic vegetation was extremely unhealthy with many species decomposing. The reason for the macrophytes die off is unclear but may have been associated with the earlier algae bloom restricting light penetration. The survey resulted in no documentation of any milfoil plants lake wide and severely damaged lily pads. No new lily pad locations were identified. Plant densities were far less than ever noted before within the lake. A comparison of the 6-24-2014 survey with the 8-24-2014 survey clearly supports our evaluation.



June 24, 2014



August 24 2014

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. 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.
3. 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.
4. 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 then such data should be reviewed.
5. Continue utilizing the new mapping technology. This technology provides an easily defined map that can be used as baseline data as lake conditions change.