2015 Beaver Lake
Aquatic Weed Control Program

Prepared for

Beaver Lake LMD #4
Skagit County Public Works
Mount Vernon, Washington

Prepared by

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Project Overview

This was Northwest Aquatic Eco-Systems (NWAE) fourth 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 with a vast majority of the shoreline comprised of commercial use 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. During the 2014 season an elevated reduction in macrophyte growth was noted by both the Washington State Department of Ecology and Northwest Aquatic Ecosystems. No apparent reason for the decline was identified but the reduction was generally thought to have resulted from the decomposition of a severe algae bloom.

Some of the information provided in the 2015 report was included in our 2014 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, 2014 and 2015 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 July 06, 2015. Macrophyte growth again was reduced from prior year surveys as a result of the 2014 plant die off. Past surveys often resulted in the inability of the survey boat to travel through these dense weed beds. Boat access was remarkably improved with only minor surface mats present providing difficult access. Milfoil growth appeared to not be impacted by the prior year's plant die off. Milfoil plants were sporadic, but denser than in years past. Perhaps the lack of dense native plant growth encouraged milfoil expansion. Fragrant water lily infestations were similar to those noted in the past with infestations identified within areas that had been historically treated. Plants appeared to exhibit denser infestations within lake areas that had been previously treated. Native pondweeds dominated the survey throughout the littoral zone with both elodea and ceratophyllum species exhibiting dominance in isolated locations within the northeastern section of the lake. 2015 plant densities were similar to those noted at the close of 2014, reduced.

Electronic data acquisition at times can be frustrating as data perceived collected and stored within the system upon downloading and processing renders data that is corrupt. During the early portion of the survey the boats transducers were moved out of position as the result of an encounter with a submerged log. The movement of the transducers upward produced data that proved to be unreliable after processing. Typically when such encounters occur transducer settings are inspected to ensure that the correct positioning has not been compromised. No electronic files for this survey are available.

Treatment

Beaver Lake received treatment on July 27, 2015. Approximately one acre of the lake was treated for milfoil control while lily pad treatments were less than ¼ acre. 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 potential grazing shoreline locations. Both glyphosate and 2,4-D were selected as the control agents.

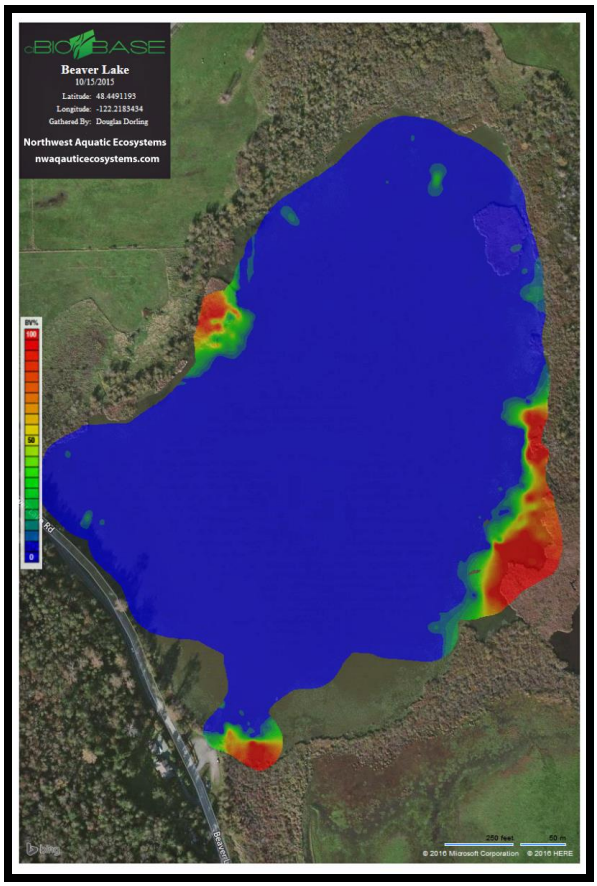
Shoreline posting was conducted on the day of treatment. Posting consisted of two large signs secured at the boat launch. There are no residential homes on the immediate shoreline. Material was offloaded from a locked truck container and transferred into a single 25 gallon spray tank mounted on the application 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 added to fill the tank 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 areas was downloaded into the onboard GPS system. The boat utilized the onboard GPS to identify treatment targeted sites.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 throughout the littoral zone identifying targeted plants and the spray mixture was then discharged using a spray gun.

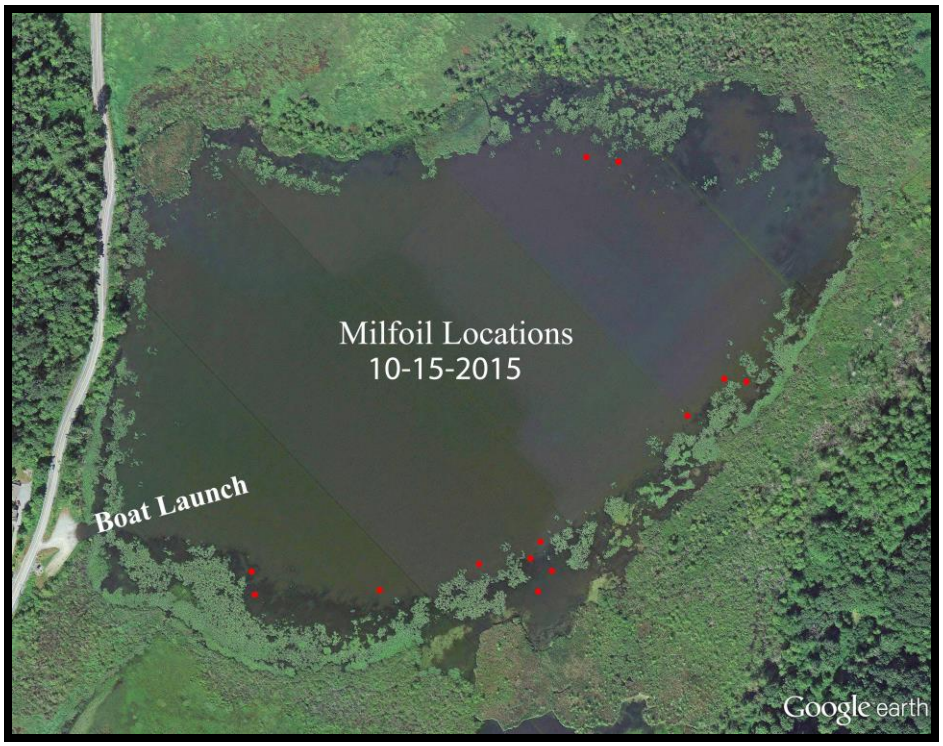
Milfoil plants were treated with DMA 4 IVM at a rate of five gallons per surface acre. Lily pads received a 1% solution of glyphosate sprayed directly onto the floating plant surfaces.

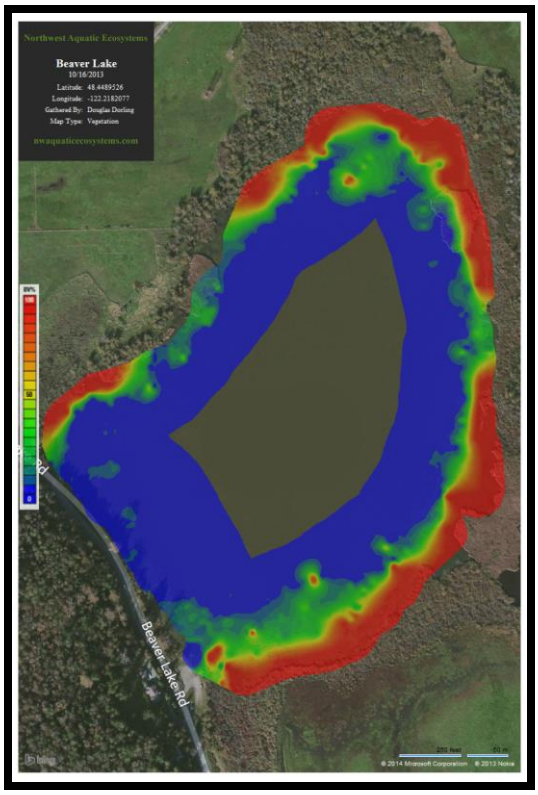
Fall Survey

The fall survey was performed on October 15, 2015. Weed growth as noted in 2015 once again experienced a considerable reduction in plant densities throughout the lake. The environmental factors associated with the decrease observed during 2014 apparently were still influencing the system once again during 2105. Lily pad growth was present in conjunction with an increase in the milfoil population.

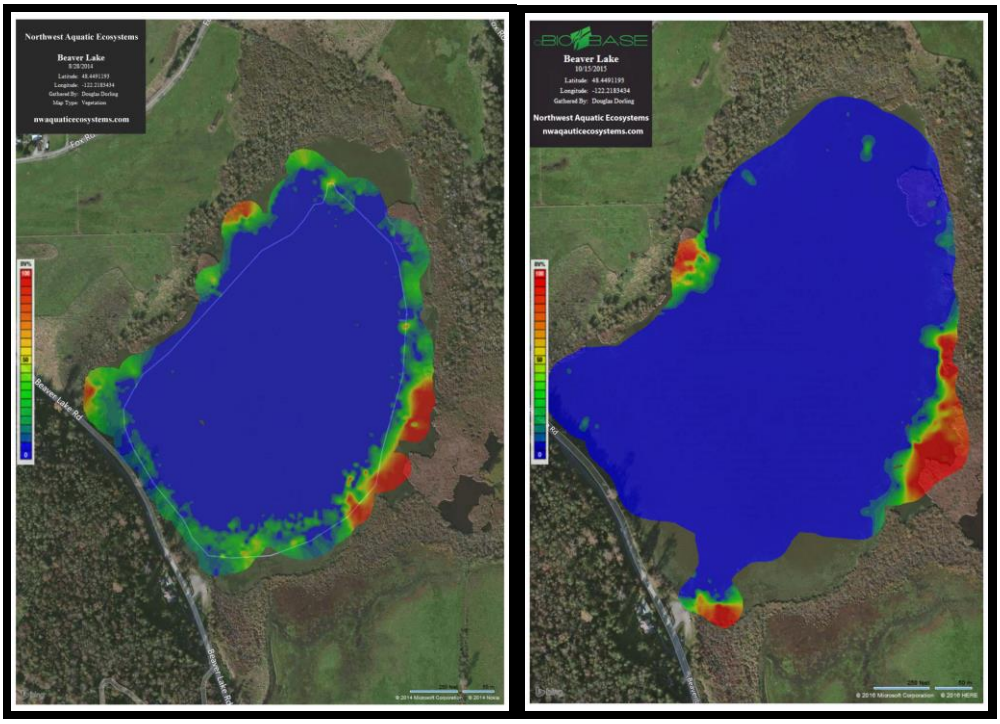


October 2015





Fall 2013



Fall 2014 Fall 2015

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. Any concern directed at dense native weed growth noted in prior years should no longer be a concern since natural occurrences over the past two years has substantially reduced such growth. The local fisherman and the Department of Fish and Wildlife could probably best evaluate native weed growth concerns as they may be 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 have increased in density but still inhabit the same lake areas as noted in the past. Left untreated these isolated occurrences will eventually spread lake-wide. With the reduction of native leant growth lakewide areas once inhabited with native plants may soon become infested with milfioil. 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 still remains relatively 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. Past mapping was successful in documenting native weed population decline since 2014.