2015 Clear Lake
Aquatic Weed Control Program

Prepared for

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

Prepared by

Northwest Aquatic Eco-Systems, Inc.
855 Trosper Road SW #108-313
Tumwater, Washington 98512
Pondweeds@comcast.net
Telephone: (360) 357-3285

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Project Overview

This was Northwest Aquatic Eco-Systems (NWAE) fourth year of providing aquatic weed control services for the Clear Lake LMD #4 district. Clear Lake has been actively involved with an intense program to eradicate noxious aquatic macrophytes from the system for a number of years. The Local Management District was formed to specifically address these issues. Targeted species include Eurasian watermilfoil and Nymphaea odorata. Densities of Eurasian water-milfoil plants have been reduced considerably and are now contained mainly to an area located by the public swimming area. Lily pad sites are responding positively to years of prior treatment and this slow process will continue. Some residents living along the shoreline have requested that no herbicides be applied to their lakefront. The entire lakes littoral zone currently supports a wide range of native plant species. This growth extends outward beyond the 15 foot contour line and consumes much of the entire lake shoreline. These native plant stands also support sporadic single plant milfoil growth.

Resident native species now pose the same recreational problems often associated with the milfoil noxious species. Management practices of the lake have evolved over the past few years to incorporate the control of native species at acceptable levels while also monitoring and controlling single milfoil plants that may always remain within the system. The 2015 effort expanded Aquathol K use along troublesome shoreline areas that previously had not responded well to diquat. The change in approach resulted in far superior control during the 2015 campaign. Lily pad control was also elevated above the control efforts of 2014. *In review the control achieved during 2015 was superior to any of our prior treatment years.*

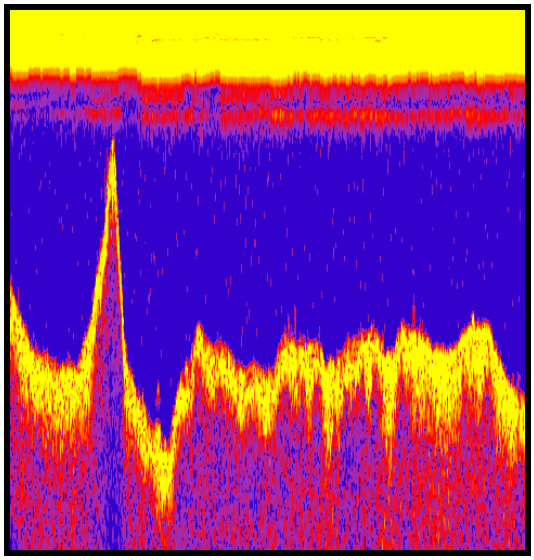
This 2015 report contains information identified in earlier reports in an effort for reviewers to understand most all the activities undertaken at Clear Lake without requiring the review of each yearly report. Similar to 2014 during the 2015 submersed weed control component of the project, the public swimming beach was closed down during and for 24 hours proceeding the application.

Survey Protocol

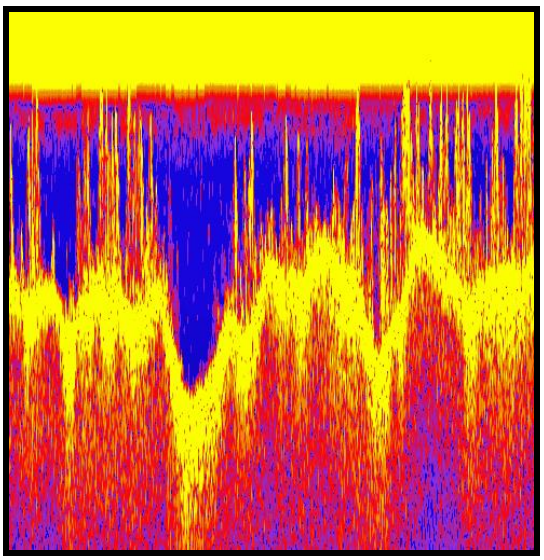
This year, NWAE continued to incorporate new state of the art surveying equipment in an effort to produce a survey that could easily be understood by all reviewers. Typically, past sampling consisted of manually retrieving weed samples from numerous locations lake-wide while observing growth through 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 old survey protocol 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 was 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. This older system produced sub meter accuracy and automatically calculates and stores the position of every sampling data point. Data points are then assembled as a map layer, which are then incorporated into the project file.

During 2015, sonar data was collected utilizing specific transducers and bottom scanning equipment. The survey boat proceeds along predetermined transect lines spaced approximately 100 feet apart. Once the entire lakes littoral zone has been traveled and no vegetation appears on the chart recorder, the survey is terminated. Data collected on the SD card is then uploaded via cloud based technology and the processing of the data is finalized. The resulting work 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 tracks. When nonnative milfoil species were identified, a milfoil specific data point was added to the transect line to ensure the integrity of the survey bottom sampling was conducted at various locations along the transect lines.



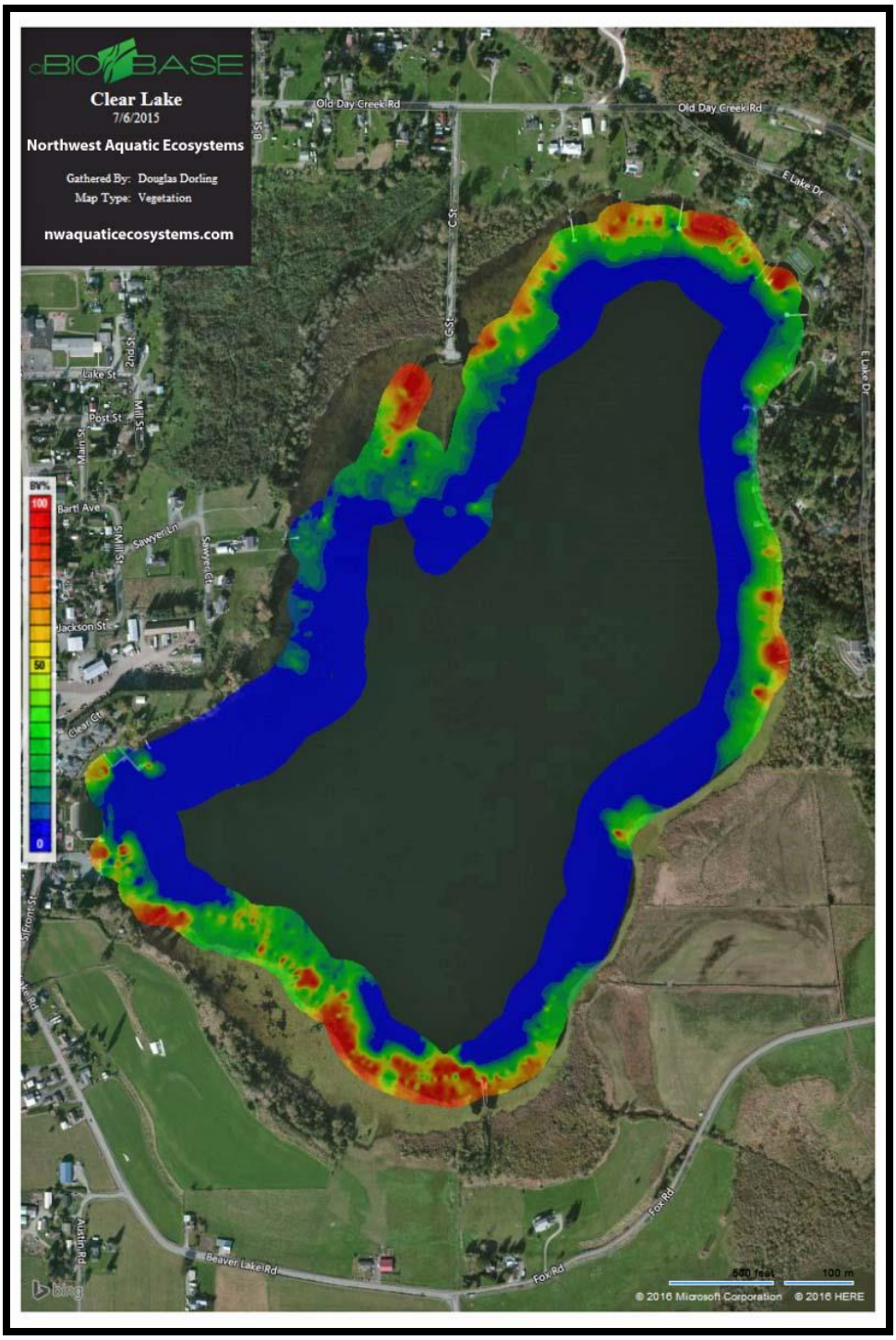
Weed Free Lake Bottom



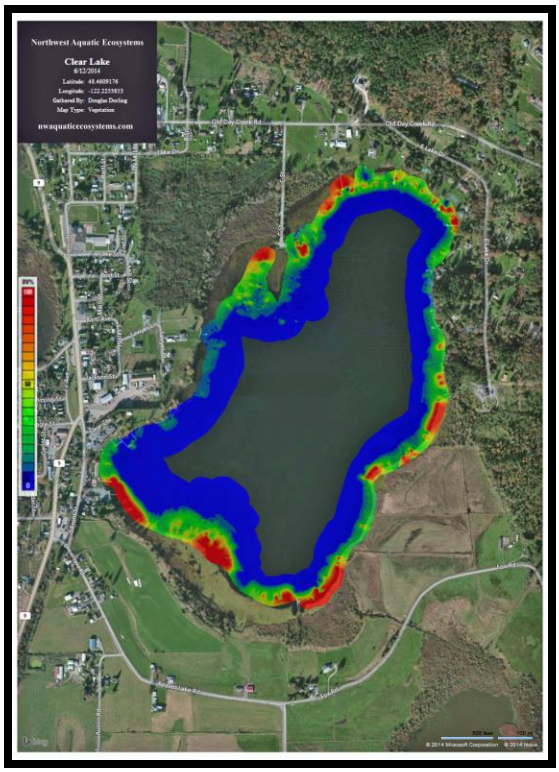
Weed Infested Lake Bottom

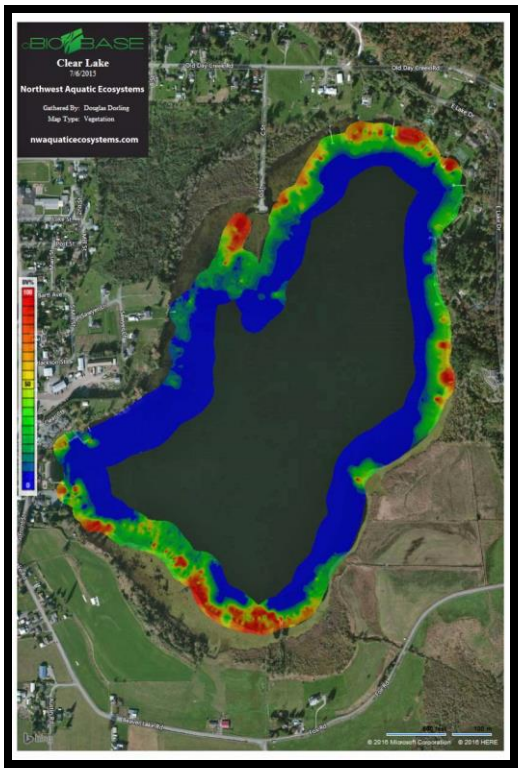
Clear Lake Pre Treatment Survey Results

Clear Lake was surveyed on July 06, 2015. Water clarity was good with visibility reaching nearly to the bottom throughout most of the lake's littoral zone. Milfoil was present but was only noted as very sporadic single plants within the same areas of the lake identified during 2014. Much of the shoreline was experiencing various degrees of native plant growth. There were no extended lake shoreline areas that were not experiencing some form of native plant growth. The NWAE survey identified the same native species present that have historically been observed. Weed densities appeared similar to those noted during 2014. Although some lake shoreline areas were experiencing decreased weed growth other regions exhibited accelerated growth. Species identified would include Potamogeton amplifolius, P. robbinsii, P. natans, P. gramineus, Vallisineria americana, Elodea canadensis and Utricularia vulgaris. The most prolific pondweed was P. zosteriformis while there were other thin leafed pondweeds that could not be identified in the field. Similar to other lakes in the area different shoreline sections of the lake were dominated by dissimilar submersed species.



Red areas indicate 100 percent coverage
Blue areas indicate 0 percent coverage





6-12-2014 7-06-2015

Red areas indicate maximum plant biomass occupying the entire water column.
Blue areas indicate no plant biomass, green 50% coverage

July 27 Treatment

Under current NPDES guidelines, native macrophyte control is limited to no more than 50% of the shoreline or approximately 6,300 feet. The permit also mandates that "the geographic area where the Permittee intentionally applies chemicals must remain the same for the entire length of the permit coverage up to the maximum percentage of the littoral zone allowed by the water body". In essence, once native plant treatment sites within Clear Lake reach the 50% threshold level, no further expansion of the treatment areas are permitted. The new cycle period for the next permit begins during 2016. With the establishment of the new permit cycle changes in the treatment areas can be evaluated and altered if necessary to conform to the fluctuating environmental conditions lake wide.

Our approach during 2015 was similar to 2013 and 2014. Provide lake property owners with an acceptable degree of control while continuing the compliant treatment model utilized during 2013.

Shoreline posting was conducted on the day of treatment. A two person crew initiated posting and treatment of the lake upon arrival in the early morning. Early site arrival was necessary in order to ensure that no public beach participants had arrived for daily site use. One small boat posted the lake and swim area while the treatment boat proceeded to treat those areas already posted. Signage posted on the swim beach indicated that lake water use was closed during the treatment and for 24 hours post application. 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 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. Tanks were refilled and dispensed as needed. Submersed weeds were treated with Diquat at a rate of two gallons per surface acre in waters over three feet deep and one gallon per acre in waters less than 3 feet in depth. All of the targeted submersed weeds were treated on July 27.

NWAE expanded Aquathol K use into the northern shoreline areas of the lake. Diquat was first applied to these areas and then Aquathol K under a separate application was also applied.

An 18 foot aluminum boat equipped with one 25 gallon spray tank was utilized during the spraying of the lily pads. The 25 gallon tank was filled with lake water, herbicide and surfactant was then added directly into the tank. Once mixed the application boat drove along the shoreline identifying targeted floating plants and the spray mixture was then

discharged using a spray gun. When emptied, the tank was refilled and dispensed as needed. Lily pads received a 1.0% solution of glyphosate sprayed directly onto the floating leaves. Similar areas treated during 2014 received treatment again during 2015.

September 21 Lily Pad Treatment

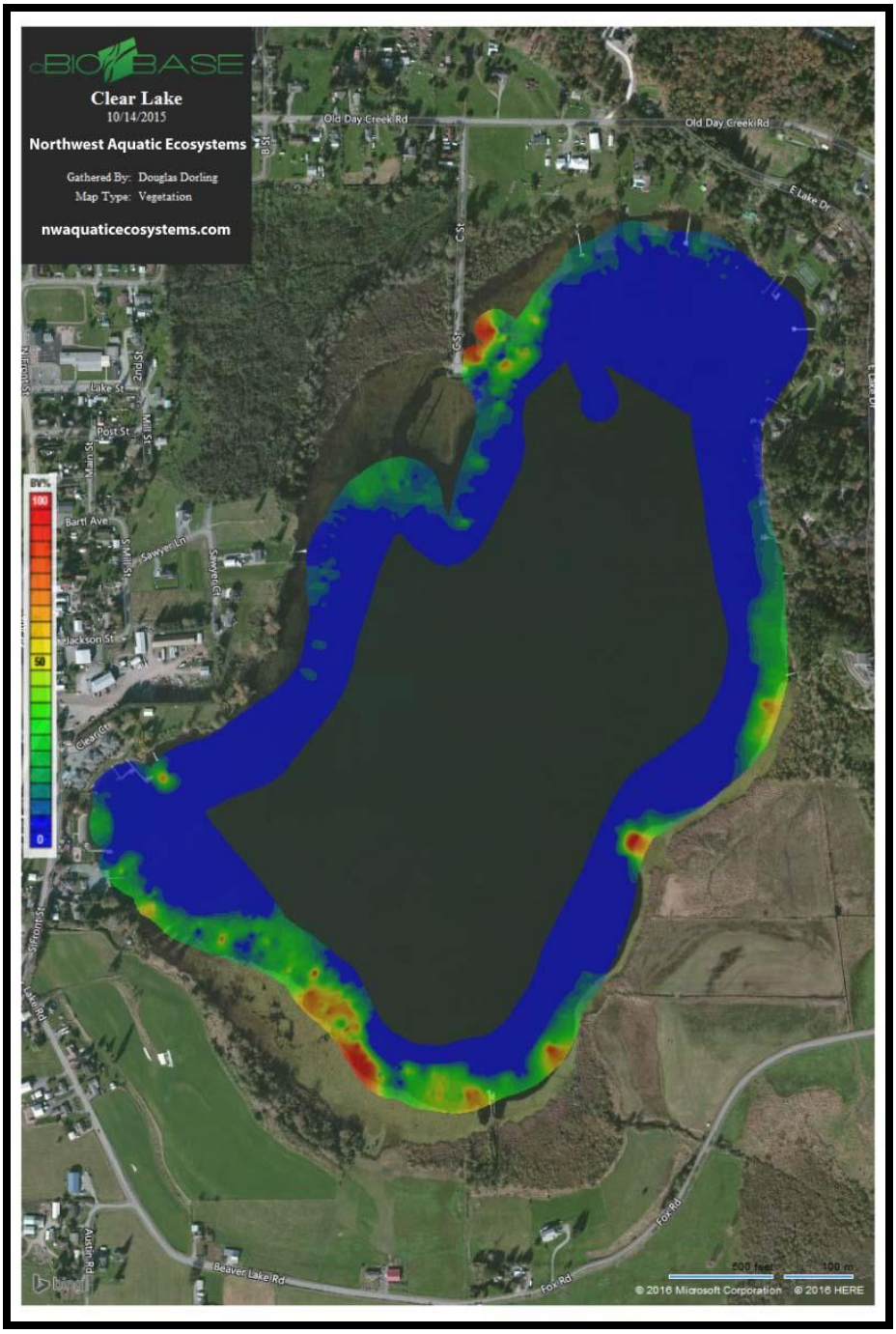
Lily pads within the residential shoreline areas of the lake were once again treated. Previously sprayed shoreline areas had responded well to the earlier summer spraying activities. Pads within the targeted sites had been decomposing with limited new growth on the surface. Surface floating pads were small and sporadic. Preceding treatment, shoreline posting was completed. No closure of the public swim beach occurred during this event. Throughout this spray event an 18 foot aluminum gas powered vehicle was utilized. Once mixed, the application boat drove along the shoreline identifying targeted sites and the spray mixture was then discharged using a spray gun. Spray holding tank was refilled and dispensed as needed. The spray component was blended on board in a 25 gallon tank and then discharged through a hand held spray nozzle directly onto the lily pads floating leaf surfaces. Pads were sprayed with a 1.0 % solution of glyphosate. The same sites targeted during 2014 were again targeted during 2015.

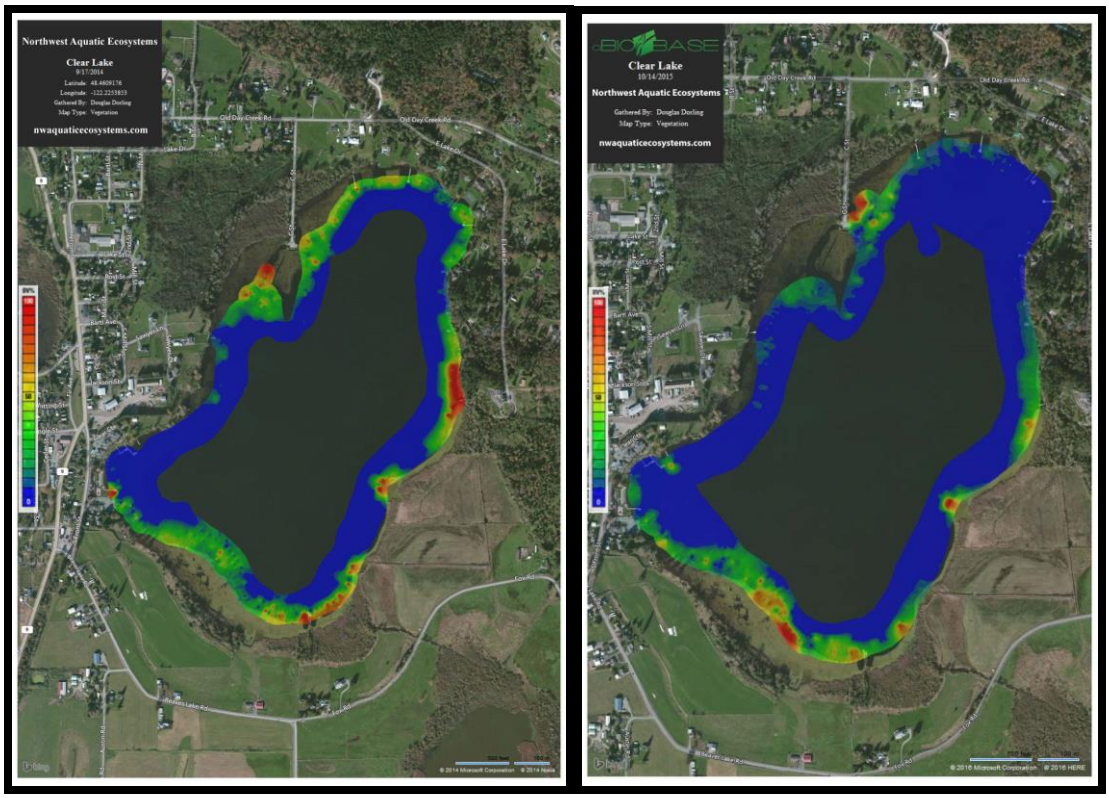
Fall Survey

The fall survey was performed on October 14, 2015. No milfoil plants were identified throughout the littoral zone of the lake. Many of the pondweeds had already decomposed. However, the larger thick stemmed species were still evident but decomposing. Species such as Potamogeton amplifolius and Potamogeton robbinsii often degrade at a much slower rate than the thin leaved pondweeds. There was less reoccurring weed growth noted then in earlier treatment years. This was particularly true along northern shoreline section of the lake. Perhaps this decreased growth can be attributed to the elevated use of Aquathol K. Results noted at Clear Lake were similar to the successful Aquathol K approach developed on Big Lake.

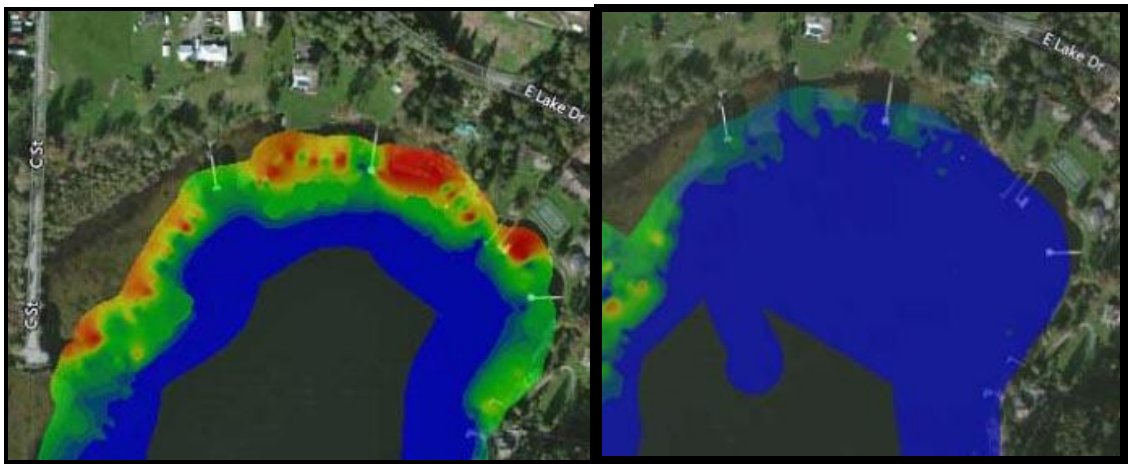
Clear Lake appears to be more of a fishing and swimming resource than one used heavily for water skiing and boating. At times such boating activities may impact treatment results.

Fall 2015 Survey





Fall 2014 Fall 2015



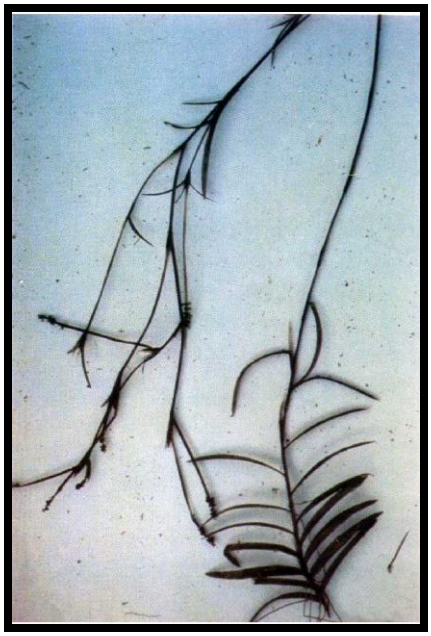
Spring 2015 Fall 2015

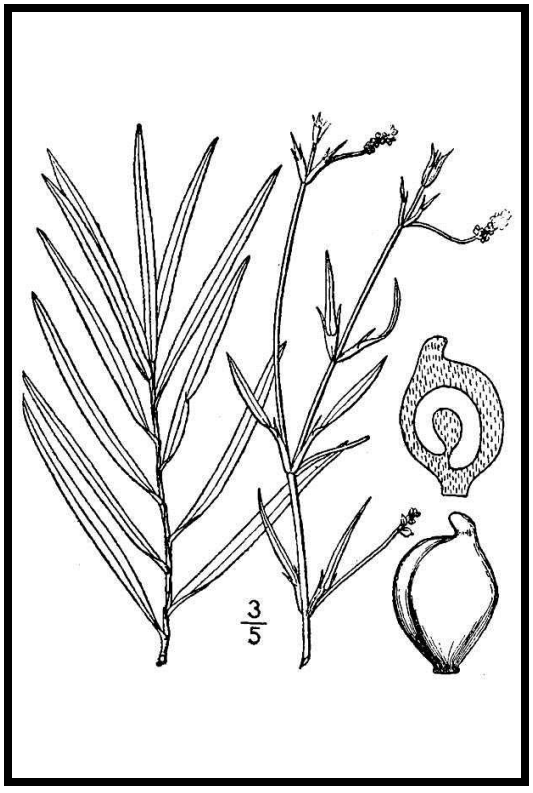
Recommendations

1. The 2015 treatment format still allows for additional native shoreline treatment if necessary. Clear Lake supports ample nonresidential shoreline areas that will adequately provide the required buffer without impacting residential recreational use.
2. There is only one native weed species that will prove to be difficult to control when necessary. Vallisneria americana (tape grass). Presently this species is not one of the dominant weeds lake-wide but is noted sporadically throughout the lake.
3. Use of Aquathol K and diquat should be extended to other shoreline areas. The expanded use of Aquathol K during the 2015 season has produced results similar to those noted in Big Lake. Although Aquathol K is a more expensive product it's use with diquat will result in better control to those areas susceptible to soft, lite organic soils. If the current budget cannot support increased use then measures should be considered by the board to provide additional funding for the 2016 season.
4. Continued communication between residents and the consultant in an effort to keep property owners informed of the current weed growth conditions, what species are native and noxious species, what plants are targeted for control and what plants cannot be controlled. More dialogue between the consultant and the homeowners may result in a better understanding as to the homeowners concerns. This approach would probably result in a more effective treatment format.
5. Noxious species appear to no longer represent the problematic species lake-wide. The range and location of milfoil plants have stabilized and not much expansion has been detected over the years. Plants currently coexist in mixed stands of native species. Low density milfoil growth can now seasonally be controlled with either contact herbicides or specifically targeted with systemic materials. How these species are controlled and what materials should be applied requires evaluation preceding the spring survey. Actions that may or may not be implemented will probably change on a year to year basis. One year native and noxious weeds may be targeted with a contact herbicide while during other years only milfoil may be targeted with systemic products.
6. The spring survey should be considered the more important of the two scheduled surveys. This survey will determine what plants are targeted and what materials will be used during any treatment year. The late summer survey is performed too late in the season to direct any further native weed control operations. In general this survey will identify where successful control operations occurred and the need for any additional late season milfoil treatments.

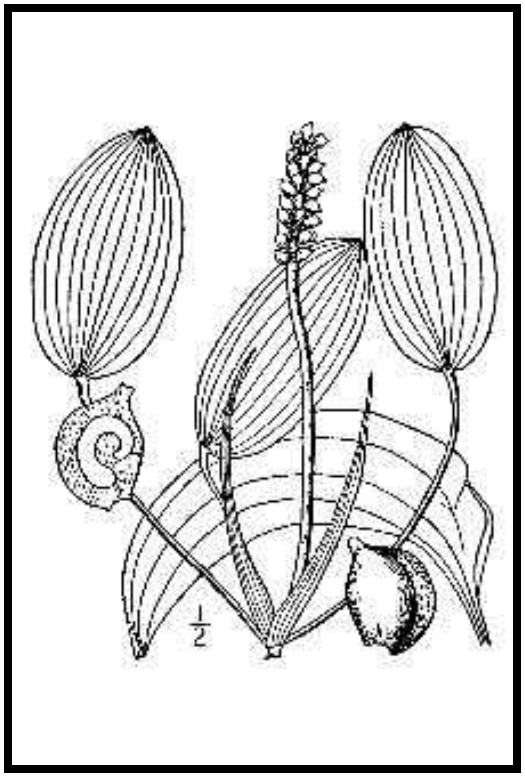
Dominant Submersed Macrophyte Species

Potamogeton robbinsii

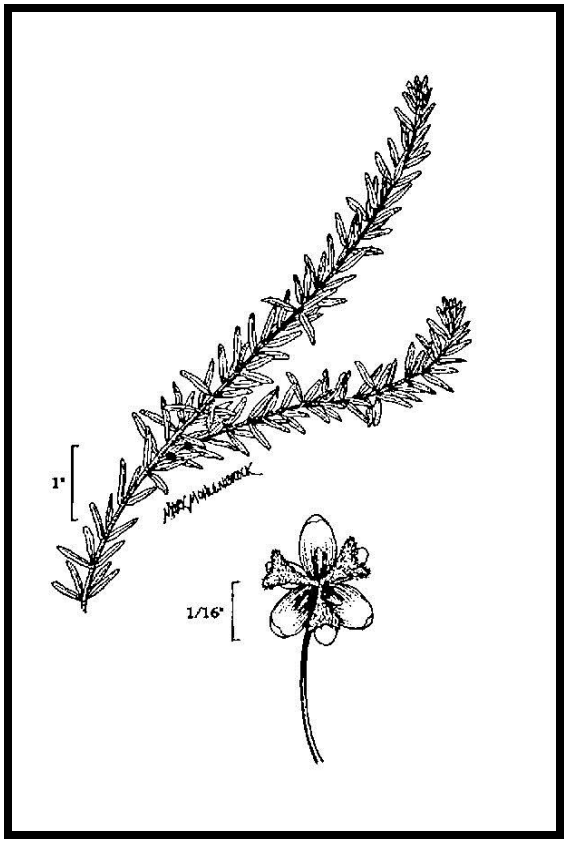




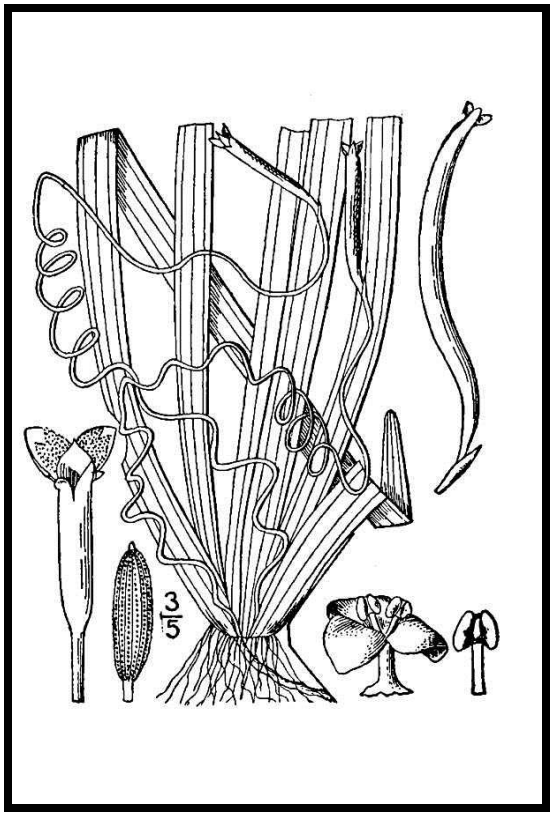
Potamogeton amplifolius



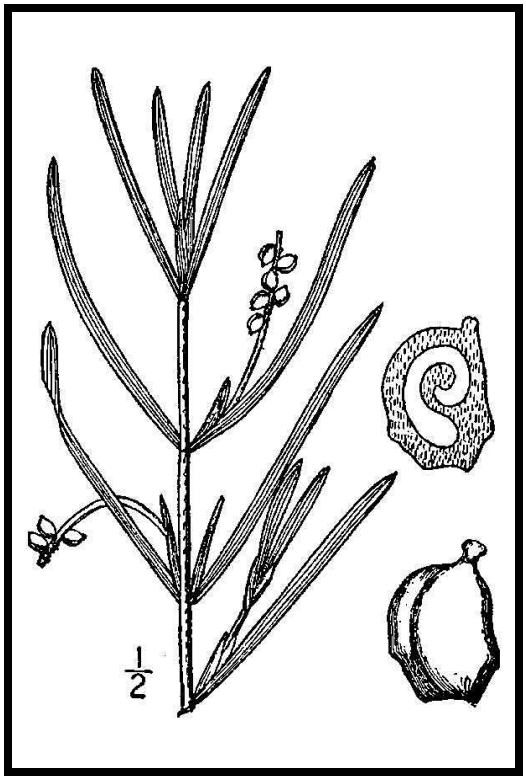
Elodea canadensis



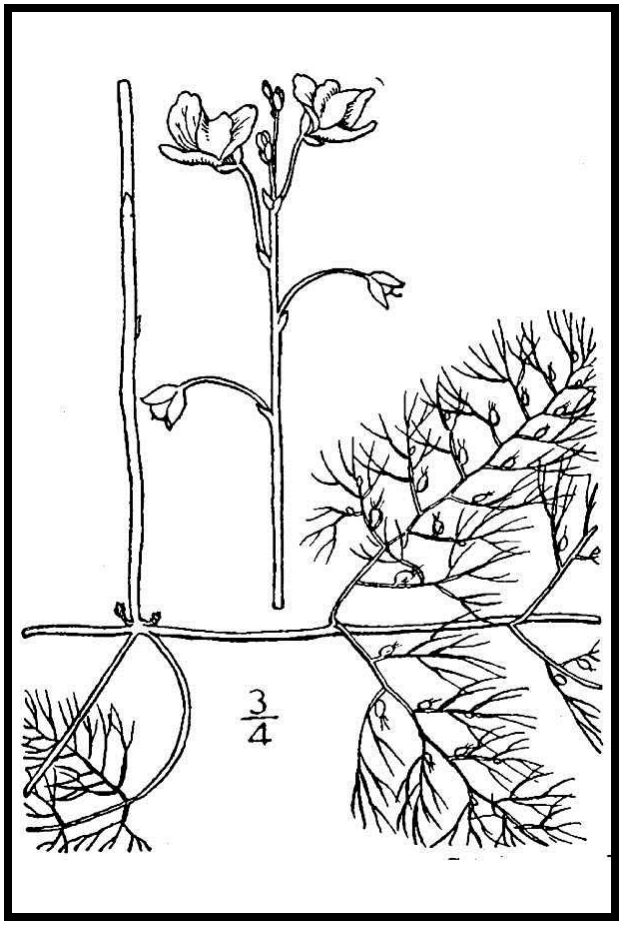
Vallisneria americana



Potamogeton zosteriformis



Utricularia vulgaris



Potamogeton gramineus