Clear Lake
2012 Aquatic Plant Control Program

Prepared By
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Project Overview

This was Northwest Aquatic Eco-Systems (NWAE) first year of providing aquatic weed control services for the Clear Lake LMD #4 district. Prior to any project work commencing, NWAE reviewed application records on file with the Department of Ecology and year end reports supplied to Skagit County from the previous 2010 and 2011 contract years. This information provided the baseline for our 2012 Clear Lake weed control operations. Clear Lake has been actively involved with an intense program to eradicate noxious aquatic macrophytes from the system. Targeted species include Eurasian watermilfoil and Nymphaea odorata. Densities of Eurasian water-milfoil have been reduced considerably while it is apparent that targeted lily pad sites have been responding positively to years of prior treatment. All of these sites currently support a wide range of control however none of these past targeted lily pad sites exhibit a degree of control that would curtail further treatment. Past milfoil populations that have been eradicated from the system are now colonized with native plant growth. 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 now need to evolve and incorporate control efforts necessary to maintain native species at acceptable levels while also monitoring and controlling single milfoil plants that may always remain within the system. Our efforts this year realized the restricted recreational opportunities created by

excessive native plant growth while also providing for the control of the milfoil species. This report reviews all activities undertaken at Clear Lake during the year 2012 and also reviews NPDES permit guidelines that determine treatment protocol.

2010 -2011 Data Review

Section S8 of the NPDES permit requires that each permit holder submit a pesticide/product application report to the Washington State Department of Ecology at the close of each treatment season. This report must identify the dates that treatments occurred, products/amounts used and the acreage treated. The following data as submitted was reviewed for Clear Lake.

	DATE	MATERIAL APPLIED	AMOUNT APPLIED	ACREAGE TREATED
2010	**8-04**	**Glyphosate**	**.75 gallons**	**2 acres**
	No submersed weed control undertaken this year.			
2011	**7-22**	**Glyphosate**	**.38 gallons**	**2 acres**
	8-17	**Triclopyr**	**235 lbs.**	**14 acres**
	9-02	**Glyphosate**	**.5 gals.**	**2 acres**

In conjunction with the application records, NWAE also reviewed the year end reports submitted to Skagit County by the consultant for the years 2010 & 2011. The 2010 report suggests that treatments took place but no maps identifying where the treatments occurred are identified. Ecology treatment records indicate that no applications for noxious weeds occurred during 2010. Testament maps and treatment records are present for the year 2010. Both surveys identify the presence of milfoil. The 2011 survey shows a noticeable increase in both the range and density of the species possibly due to the non-treatment event during 2010.

Survey Protocol

Survey techniques were typical of those considered as “standard protocol” throughout the industry. A late start in performing the survey occurred as a result of communication problems experienced between NWAE and Skagit County. Survey protocol during the initial summer survey was modified to take into account the favorable water clarity present during the time of the survey along with the need to expedite the survey as a result of the late start. Typically, 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

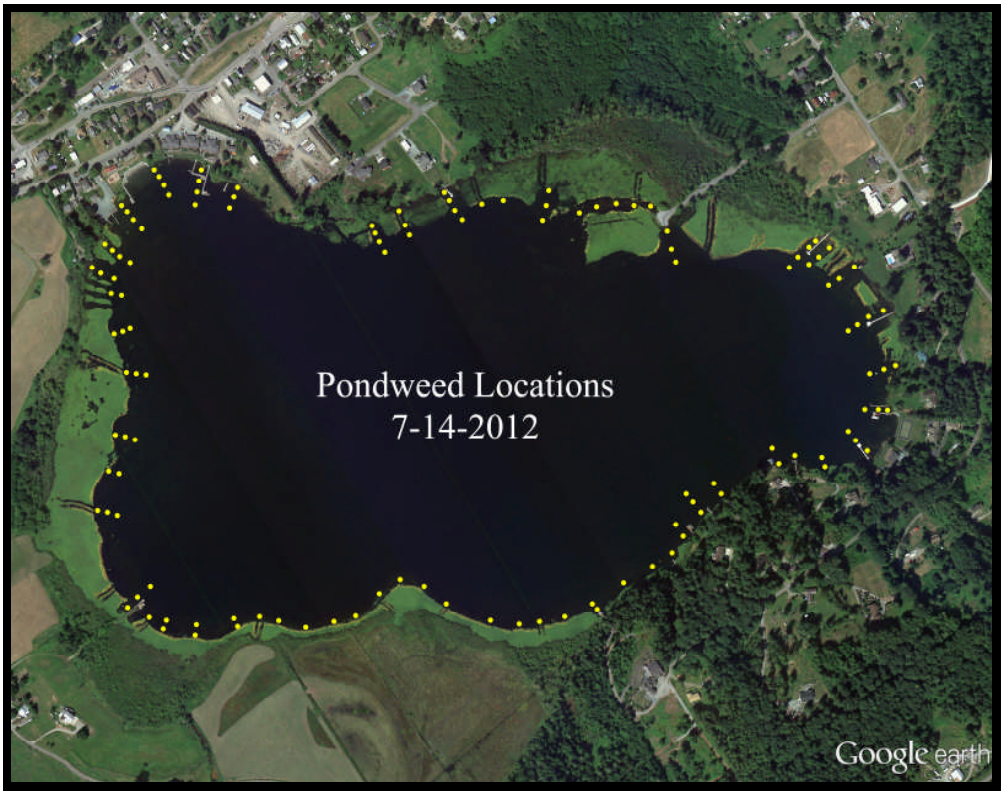
immediate area sampled. Visual observations when water clarity permits is a far superior method for plant inventory since it allows for inspection of the entire lake bottom wherever the survey boat operates. This avoids the possibility of missing plants between bottom surveying data points. The procedure 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 was thrown from the boat at various locations lake-wide. The rake was then drawn across the lake bottom, brought to the surface and into the boat. Plants attached to the rake were identified and confirmed as being the same species as noted visually through the water column. If the lake bottom was void of plants, no data was stored. The survey boat spent most of the day within 300 feet of the shoreline. The system produces sub meter accuracy and combined with the powerful Pathfinder Office and Terra Sync software, provides clear processing of data in a Windows compatible format. The system 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.

When submersed non-native species were identified, data was collected and stored on a Trimble Geo XT GPS system. The data dictionary consisted of species previously identified as being present in the lake, Eurasian watermilfoil and Brazilian elodea. Nymphaea odorata (Fragrant water lily) was not plotted. This particular species had been previously treated on a yearly basis so range expansion was not expected. Location of this species was accomplished using satellite imagery. 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 boat obtained a 300 foot distance from the shoreline.

Clear Lake Pre Treatment Survey Results

Clear Lake was surveyed on July 14, 2012. Water clarity was excellent with visibility down to the bottom throughout most of the lake's littoral zone. Milfoil was present but was only noted as very sporadic single plants throughout those areas treated during 2011. Approximately one dozen data points noting milfoil were collected. The success of the 2011 effort was evident when comparing the 2011 pretreatment milfoil densities with those noted during 2012. Much of the shoreline was experiencing various degrees of native plant growth. There were no noted extended lake shoreline areas that were not experiencing some form of native plant growth. Nearly all of the residential shoreline areas were already experiencing problematic weed growth that resulted in some degree of restricted use. To a large extent, most of the dense growth extended just beyond the dock areas. Patches of native weeds had already surfaced. Past surveys identified the presence of native species but no references or discussion was included in the yearly reports. The NWAE survey identified a number of native species present 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.


Pondweed Locations
7-14-2012
Google earth

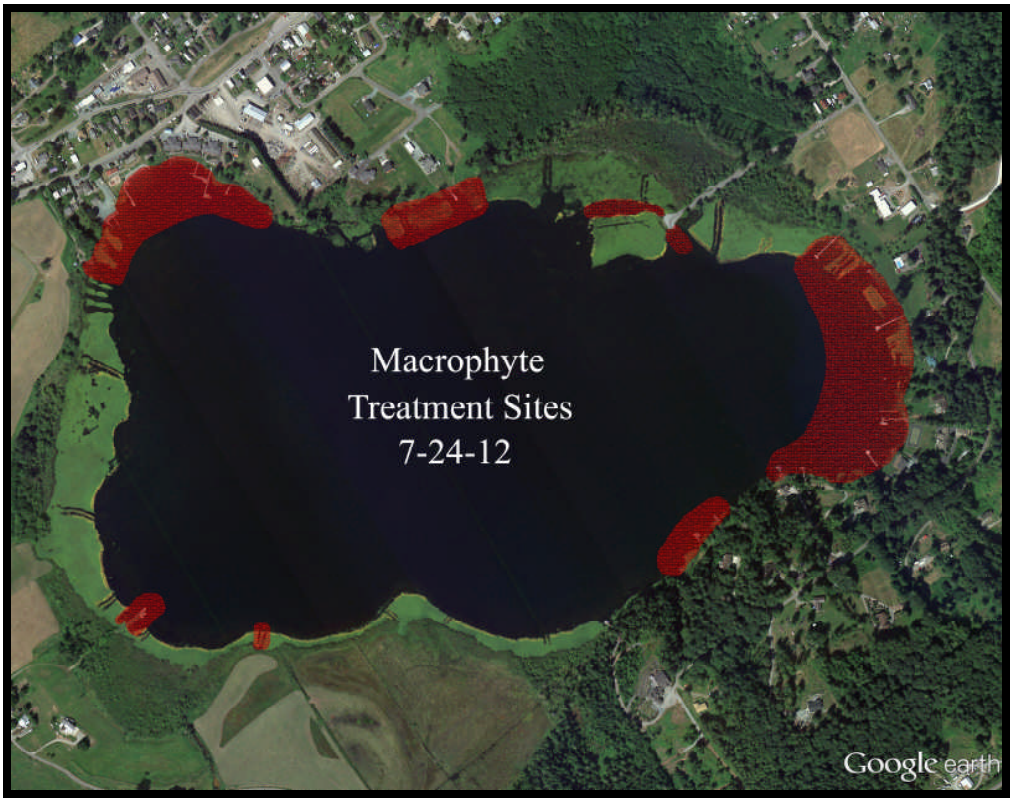

Elodea Locations
7-14-2012
Google earth

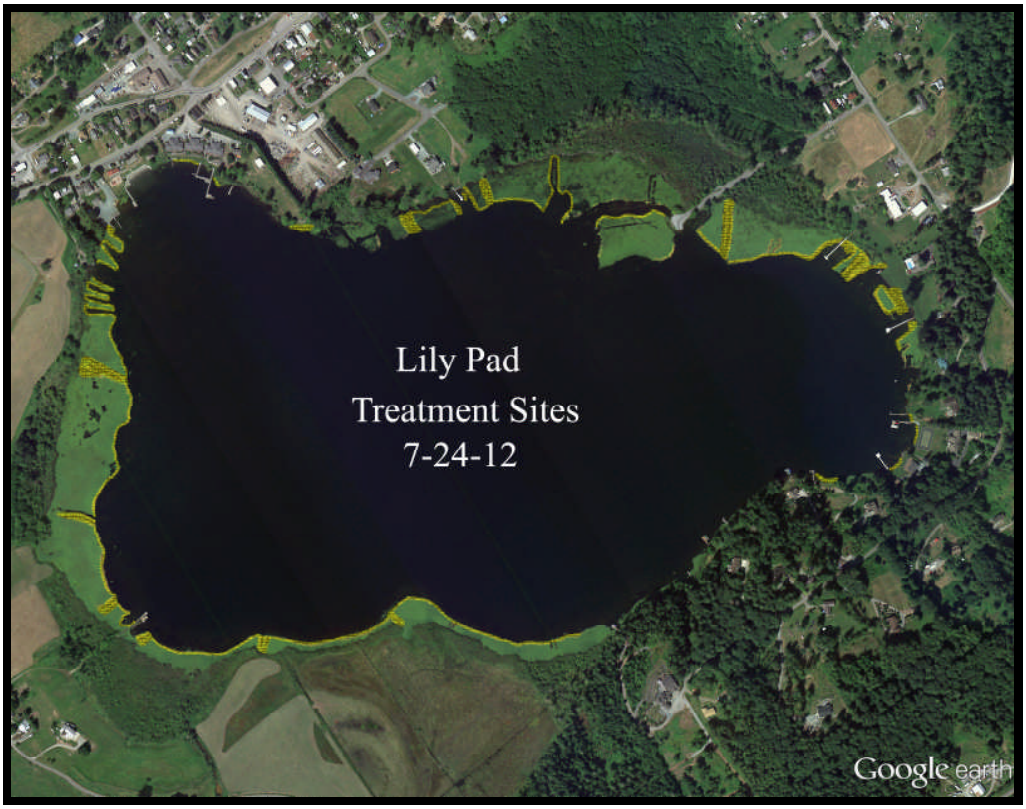
July 24 Treatment

Clear Lake is 200 acres with a shoreline length of 2.4 miles. Under current NPDES guidelines, native macrophyte control is limited to no more than 50% of the shoreline or approximately 6,336 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 and the areas treated cannot be changed until 2016.

Our approach during 2012 was to initiate native plant control operations and to ensure compliance with current permit regulations while also affording lake property owners an acceptable degree of control. Since most of the residential areas are located along three basic shoreline areas, development of a compliant treatment model proved to not be an issue. The treatment model was designed to adhere to the 50% rule.

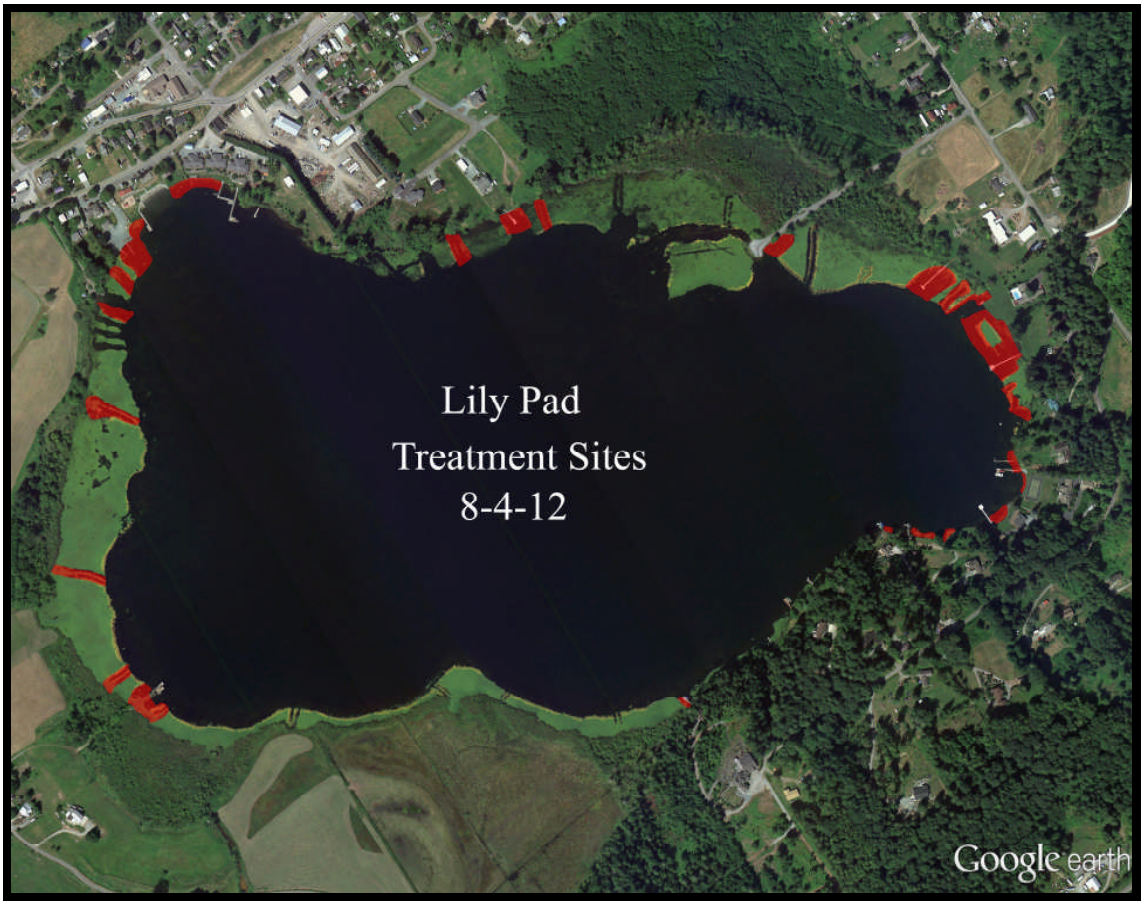
Shoreline posting was conducted on the day of treatment. A two person crew initiated posting of the lake upon arrival in the morning and treatment began approximately one hour later as the application vehicle shadowed the posting vessel. Material was offloaded from a locked truck container and transferred 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 24. When floating plants were sprayed both 25 gallon tanks were filled with lake water; herbicide and adjuvant which were then added directly to the tanks. Once mixed, the application boat drove along the shoreline identifying targeted sites and the spray mixture was then discharged using a spray gun. Tanks were refilled and dispensed as needed. One boat driver and two sprayers were used during this phase of the project. 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. Lily pads received a 1.5% solution of glyphosate sprayed directly onto the floating plant surfaces.


Macrophyte
Treatment Sites
7-24-12
Google earth


Lily Pad
Treatment Sites
7-24-12
Google earth

August 8 Treatment

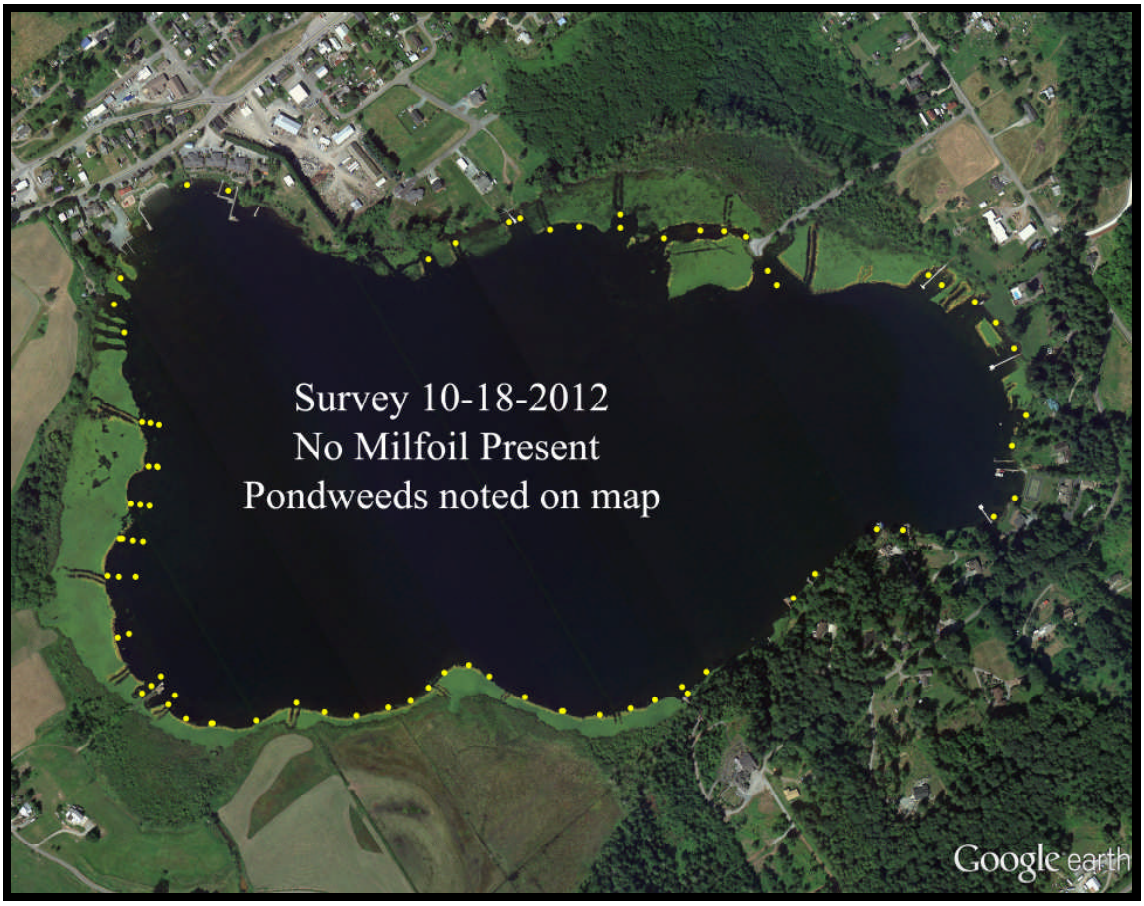
Lily pads within the residential shoreline areas of the lake were once again treated. Prior to treatment, shoreline posting was completed. During this spray event a 16 foot aluminum gas powered vehicle was utilized. Once again the spray mix was blended on board in a 25 gallon tank and then discharged through a hand held spray nozzle directly onto the lily pad floating leaf surfaces. In the course of this spray event it was noted that some of the previous areas targeted during past treatment seasons had created floating lily pad root mats. This occurrence is not unusual when large lily pad infestations are targeted for eradication. Future treatments will need to recognize this developing concern. Mats dislodged from the bottom typically drift throughout the lake with some mats eventually coming to rest residing along residential shorelines.



Fall Survey

The fall survey was performed on October 18, 2012. No milfoil was identified throughout the littoral zone of the lake. Many of the pondweeds had already decomposed however patches of Potamogeton robbinsii were evident. All of the targeted native sites remained virtually weed free and were exhibiting safe recreational lake waters from the shallow immediate shorelines extending outward to the 15 foot contour line.

It was apparent that native plant biomass had been reduced considerably and that there were no diquat problems associated with wave or wind action. Clear Lake appears to be more of fishing and swimming resource then one used heavily for water skiing and boating. Targeted lily pads throughout the lake responded well to treatments. Obvious visual discrepancies existed between those sites targeted for control and those left untreated.

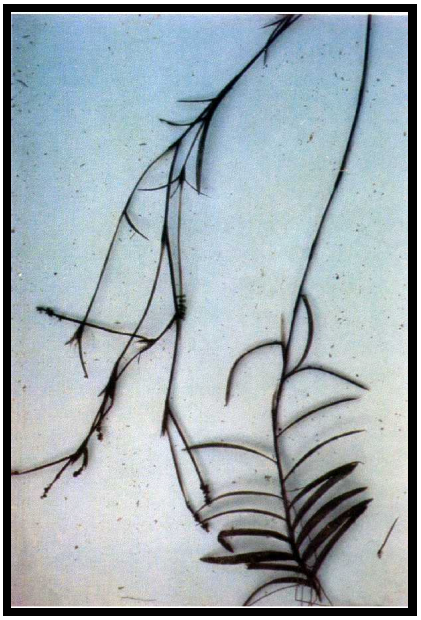


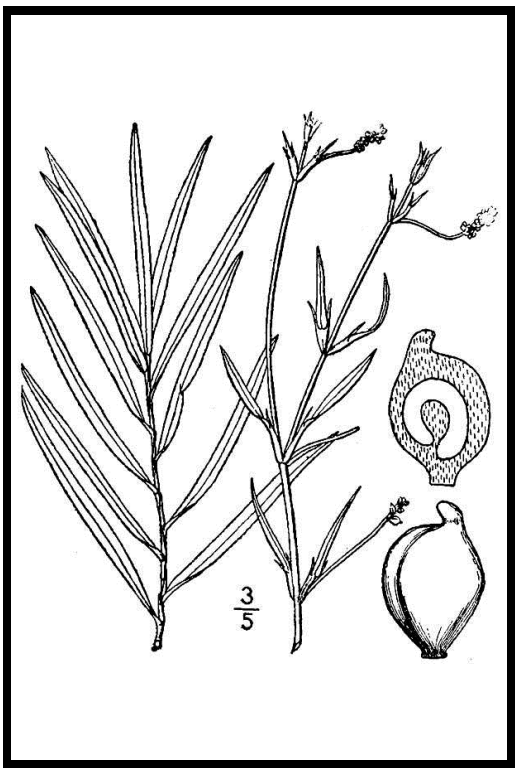
Recommendations

1. Permit guidelines that mandate leaving 50% of the shoreline untreated for native vegetation control has been achieved. The 2012 treatment format still allows for approximately an additional 1,000 feet of shoreline to be incorporated into the program if necessary before achieving the 50% threshold. 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. During all of our appearances on the lake, problems associated with wave and/or wind action did not influence or impact treatments.
4. Contract terms should be limited to no less than two years. A one year contract does not afford the consultant the ability to implement changes to a treatment scenario or revisit the site during the season in an effort to improve the efficacy of the treatment. One year contracts discourage consultants from seeking alternatives that might improve on past years practices.
5. Residents need to be informed of the current weed growth conditions and what species are native and noxious species, what plants are targeted for control and what plants cannot be controlled. The NWAE team had contact and correspondence with approximately twelve homeowners many exhibited an eagerness to learn more about the process. 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.
6. 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. 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. The apparent growth of the milfoil during the non-treatment year of 2010 to 2011 supports this approach.
7. 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.

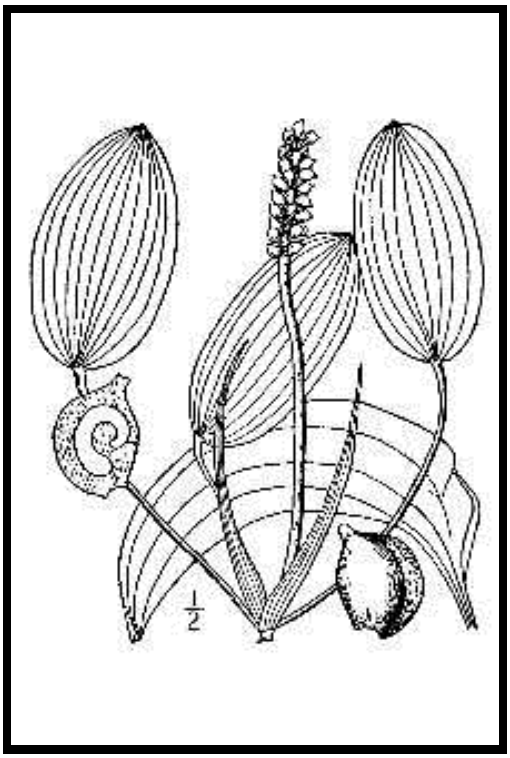
Dominant Submersed Macrophyte Species

Potamogeton robbinsii

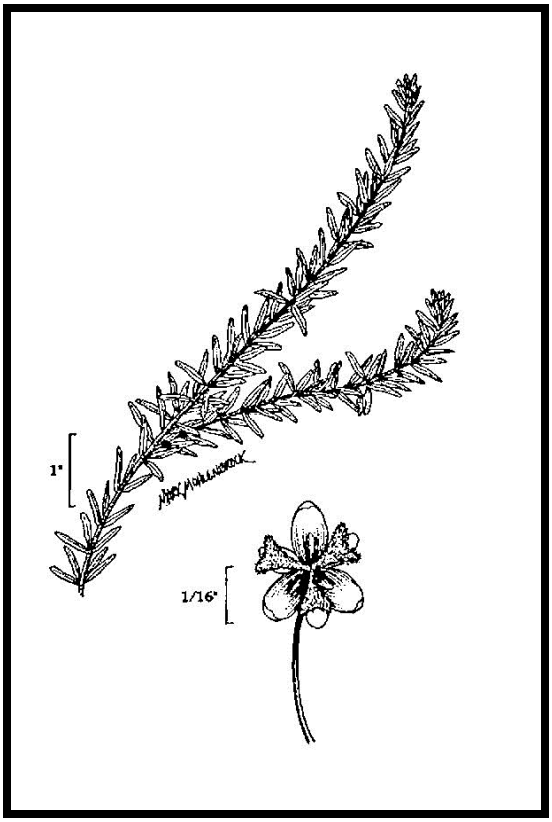




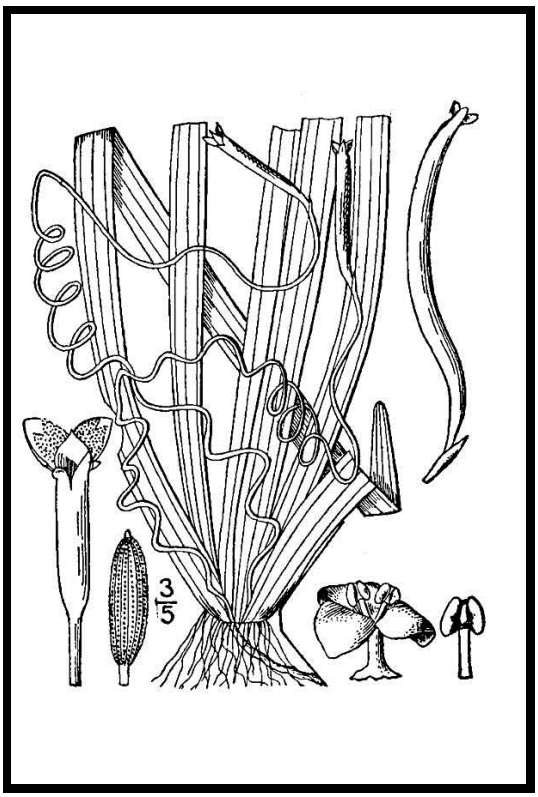
Potamogeton amplifolius



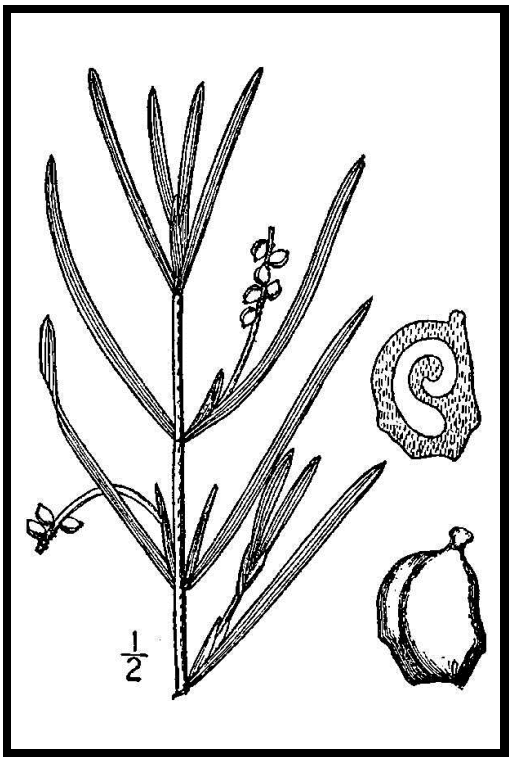
Elodea canadensis



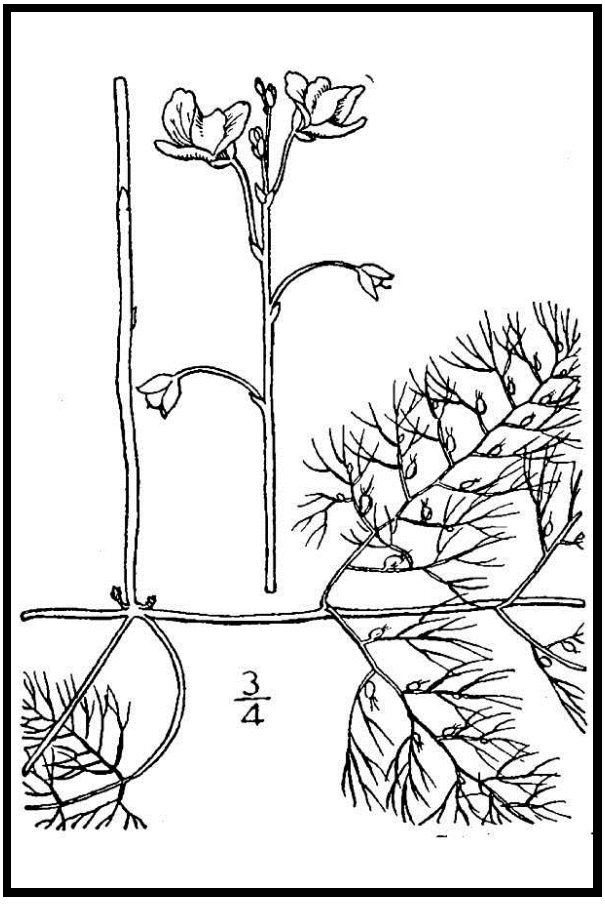
Vallisneria americana



Potamogeton zosteriformis



Utricularia vulgaris



Potamogeton gramineus