

# 2020 Big Lake Aquatic Weed Control Program

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Prepared for

Big Lake LMD #1  
Skagit County Public Works  
Mount Vernon, Washington



Prepared by

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## **Project Overview**

Water levels at Big Lake appeared higher than normal during 2020, similar to other lakes in the area. This was the first time Brazilian elodea was noted in the lake and required treatment. Big Lake has been actively involved for at least eleven years with an intense program to eradicate noxious aquatic macrophytes from the system. Targeted species include Eurasian watermilfoil, *Egeria densa* (Brazilian elodea), *Nymphaea odorata* and yellow flag iris. Densities of Eurasian watermilfoil are currently limited to a few small infestations located along the southwest shoreline of the lake. This area of infestation has traditionally occurred but has not increased in range and remains sporadic throughout the southwest area. Nearly 100% of the lake's residential shoreline area is experiencing native plant growth that impacts lake access and use. Weed growth appears reduced from 2019 as noted by the reduced red infestation levels noted on the 2020 map.

Prior to the 2016 treatment season, weed control activities had been limited to commence after July 15<sup>th</sup> based on the established fish timing window at that time. The shallow nature of the immediate shoreline area historically produced weed growth that typically reached the waters' surface prior to July 15<sup>th</sup>. This growth rendered some of those shoreline areas unacceptable during the early summer months of recreational lake use. In an effort to treat earlier, NWAE in conjunction with the LMD, petitioned the state to approve weed control activities to commence prior to July 15<sup>th</sup>. As a result of this effort the Department of Ecology granted a treatment window modification authorizing treatment after June 15<sup>th</sup>. This earlier treatment window does provide for a more seasonal friendly treatment schedule resulting in reduced weed associated problems during the early summer months.

Similar to the fish treatment timing window issue, NWAE requested Ecology to increase the allotted shoreline treatment percentage as mandated in the statewide general permit. Ecology denied the request stating that the requested change was specific to Big Lake and that lake specific changes could not be considered until the current statewide permit expired and a new one was issued. The new five year permit will be issued for the 2021 season. During the public comment period for the new permit NWAE requested Ecology to include in the new permit a mode of action that would allow lakes to petition the state so that a modification to the current littoral zone treatment percentage can be considered. If the NWAE request is not included in the new permit, an avenue would still be available for the Big Lake LMD to challenge this requirement. Such a challenge would need to be made within 30 days of the issuance of the new permit.

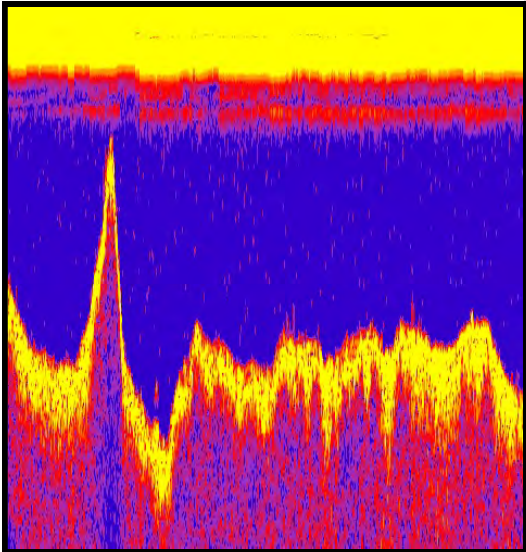
Algae related problems continue to occur seasonally. Some years the blooms produce thick surface scums that are windblown lake-wide. Other years the blooms are short and barely noticeable.

## **Survey Protocol**

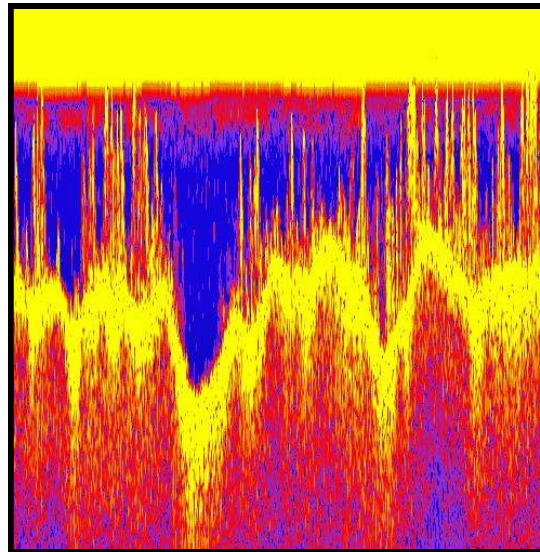
Survey techniques for 2020 once again utilized the sonar mapping technology initiated during the 2013 treatment season. The current mapping protocol is now an industry

standard utilized worldwide. Current mapping technology incorporates sonar technology with on board chart recording. Sonar data is collected on board and processed to produce an on-screen map of the lake bottom as the boat transects the lake. When weeds are no longer observed along the lake bottom, the collection of sonar data is terminated. Once collected, the SD card is uploaded via cloud based technology and the processing of the data is 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. This updated protocol encompasses a surface vehicle transecting the lake along the littoral zone. Boat tracks are designed to be approximately 100 feet apart. 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 through the structure scan or visually through the water column. The system automatically calculates and stores the position of every transect data point enabling the mapping of thousands of data points on a daily basis.

When individual milfoil plants were identified from the surface, waypoints were added to the transect line.



Weed Free Lake Bottom



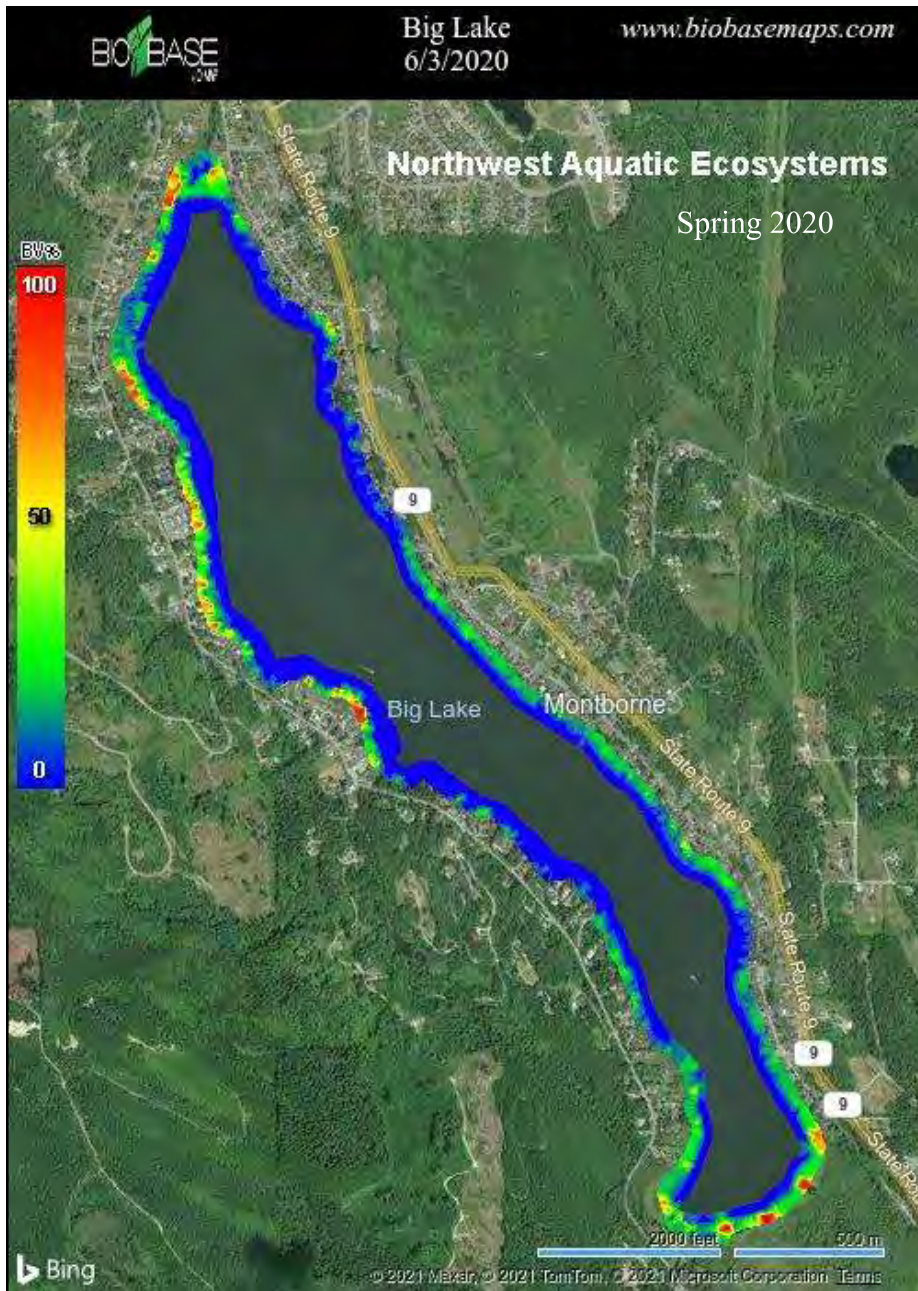
Dense Weed Growth Lake Bottom

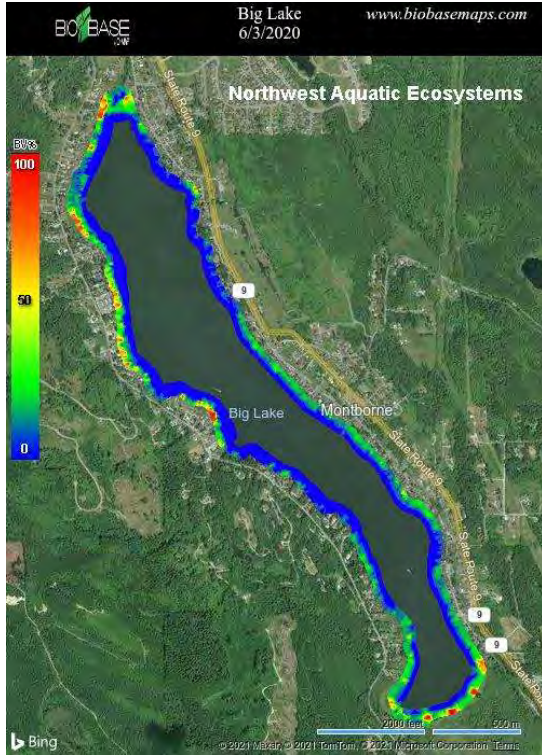
## Big Lake Pre-Treatment Survey Results

Big Lake was surveyed on June 03, 2020, within the same timeline as the 2017, 2018 & 2019 surveys. Macrophyte growth had decreased to what was noted in the past as shown by the reduced red thermal imaging within the map file for 2020. Water temperature fluctuations, lake levels and water clarity all have an impact as to when seed germination occurs and the rate of weed growth. Cooler early seasonal water temperatures impede

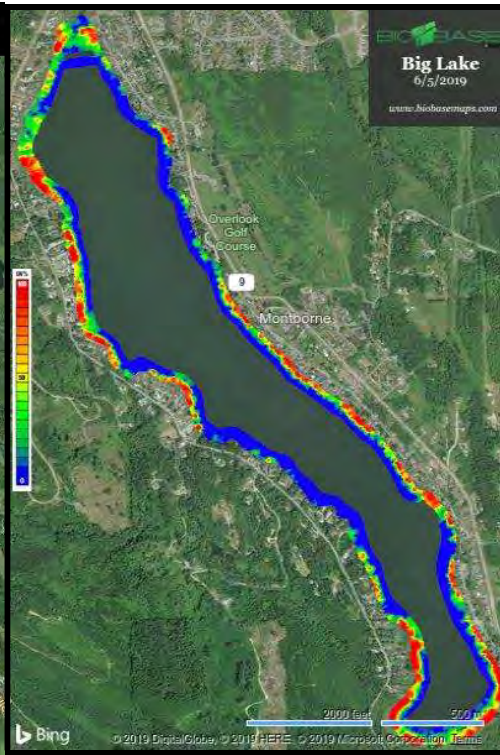
timely lake-wide seed germination often producing inconsistent weed growth. Reduced water clarity impacts the depth to which seeds will germinate. Favorable water clarity increases the depth in which seeds have the ability to germinate.

Weed species noted during the 2020 survey were similar to those identified in prior surveys. The only noted change was the occurrence of a few *B. elodea* plants identified within the southeast quadrant of the lake. No new native species were recognized. The lake's littoral zone is dominated by *P. robbinsii*, *P. zosteriformis*, *P. epihydrus*, *P. richardsoni*, *vallisneri* and *elodea*. Different weed species were dominant depending on the shoreline area sampled. In general *P. robbinsii* is dominant lake-wide.





Spring 2020



Spring 2019

**Non Native Macrophyte Locations 2020**



## **July 13, 2020 Treatment**

Our approach during 2020 was to continue to provide maximum coverage under the current NPDES guidelines. The 2020 treatment model was designed similar to the prior models expanding treatment outward from the shoreline with continued use of Aquathol K liquid, Diquat and Aquathol K/Diquat tank mixes. Glyphosate has been replaced with imazapyr for lily pad and iris control. Aquathol K has been found to exhibit systemic herbicide properties related to the ability of the active ingredient to be translocated into the root systems of targeted species. Past use of Aquathol K has increased the efficacy of treatments in those lake areas plagued with shallow rich organic muck bottoms. The use of Diquat/Aquathol K mixtures is now an industry standard supported by the recent manufacturing of this same herbicide composition under the trade name Strike.

Due to the reduced plant growth noted in the spring survey the initial application was delayed in an effort to ensure all of the macrophytes lake-wide had germinated. Only plants present during the application will be impacted by the treatment. There is no residual effect associated with plants that germinate following the application.

Shoreline posting was conducted on July 12. A two person crew comprised of one watercraft completed the posting task within a 10 hour timeframe. One crew member posted the docks as the boat circumnavigated the shoreline. If dock access was not available then the crew member was off loaded and signage was placed within the water's edge. Similar to years past, the local newspaper was contacted addressing the upcoming treatment and notice was published in the newspaper. The public boat launch was posted with a large sign requesting that no boating occur during the treatment. The boat launch signage was in place no less than 24 hours prior to treatment. On the day of treatment new signage was posted at the boat launch displaying the areas of the lake that were targeted for treatment and the water restrictions associated with the treatment.

Material was offloaded from a locked container truck and transferred into two 25 gallon spray tanks mounted on the application boat. Containers were triple rinsed on site and returned back into the truck empty. Herbicides, diquat and Aquathol K, were 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 into the on-board lake water, the lake water/herbicide mixture 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 treatment boat utilized the onboard GPS to identify treatment site boundaries. All of the targeted sites were treated on July 13<sup>th</sup>. Native submersed weeds were treated with both a Diquat/Aquathol K mixture and also a conventional diquat mix. Diquat was applied at a rate of one to two gallons per surface acre while Aquathol K was applied at a five gallon per acre rate in a tank mix consisting of five gallons of Aquathol K and one/two gallons of diquat.

The southern shoreline area of the lake is designated as a No Spray Zone. Limited native plant and floating plant control occurs at three or four private docks. Since our presence on the lake in 2011, no *Egeria densa* had been observed lake wide. This particular area of the lake is heavily infested with native plant growth. Surveying within a close proximity to the shoreline is nearly impossible and problematic. Boat prop entanglement within weed beds in conjunction with associated clogged water intakes renders in depth surveys of this area challenging. *Egeria densa* was treated with a diquat mixture of 2 gallons per surface acre. Diquat is the only permitted product in Washington State for use on small scale control of this species.



Lily pad control was performed later in the day with a 1% solution of imazapyr and surfactant. The 25 gallon spray tanks were filled with lake water, herbicide and surfactant. Once mixed, the application boat drove along the shoreline identifying

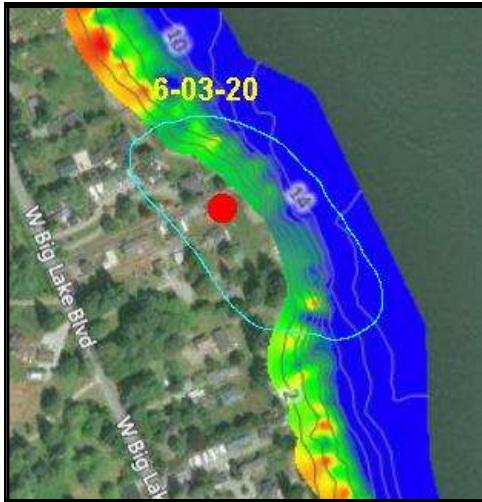
targeted floating plants. The spray mixture was then discharged using a spray gun. When emptied, the tank was refilled and the process was repeated until the entire lake shoreline was traversed. Plant densities at most of the prior treatment sites have now been eliminated or reduced to considerably smaller patches consisting of only a few floating leaves. Three residents historically have requested no treatment. These same sites continued to receive no treatment.



## July 23, 2020 Treatment

Drift related control is an important component of the Big Lake treatment script. Some areas of the lake depend on the drift from treatment sites to control plants that do not receive a direct application of herbicide. Many factors contribute into the drift component. On a yearly basis, how treatments respond to drift is unpredictable. However, if the proper conditions exist, drift can prove to be a very reliable and important tool in weed management. At times, expected drift zones do not materialize, resulting in some lake areas remaining untreated or exhibit varying degrees of control. Our July 23 lake appearance and treatment was a result of limited drift occurring at the adjacent sites and a spring survey identified low density growth present at the site. Shoreline areas north and south of the identified site were treated during the initial application.





Spring survey that identifies limited weed growth in comparison to shoreline areas north and south of the site.

Blue – No growth  
 Green - Less than 40 % growth  
 Red – 100% growth

Area in question - blue polygon

Since the area in question was not treated earlier and that the projected drift from the adjacent targeted sites did not develop, a minor spot application was performed.

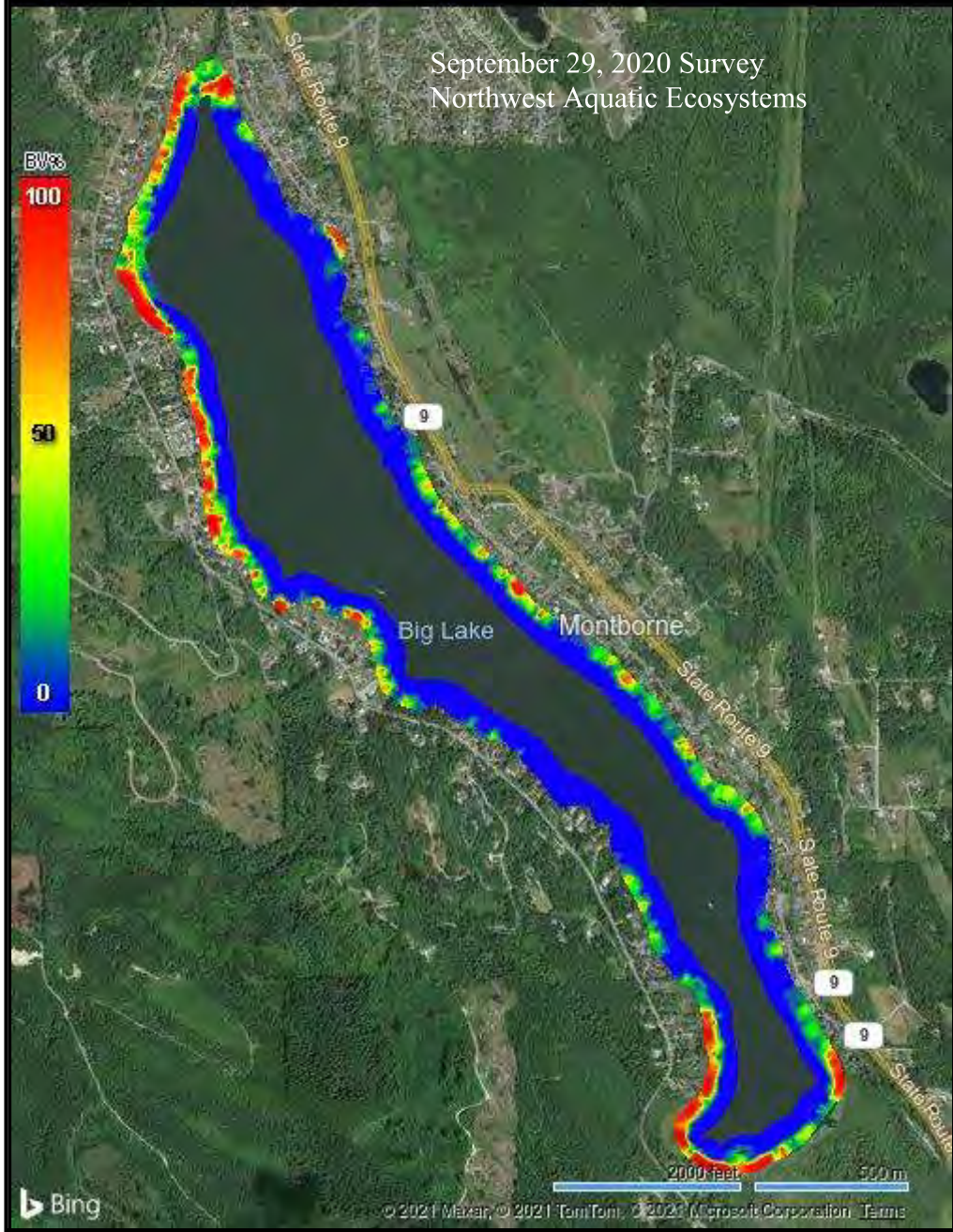
**Fall Survey 9-29-2020**

Our fall survey was performed on September 29, 2020. What was noted was that the eastern shoreline responded better to treatment than the western shoreline. Probably the major factor influencing these results was likely the wind pattern following treatment. A westerly wind would have directed material away from the western shoreline while containing material along the eastern shoreline. Material applied along the western shoreline would likely have experienced a quicker dilution rate.

Water levels decline seasonally at Big Lake. Shallow growth zones would exhibit different density characteristics from similar, deeper water environments experienced earlier in the season.

The southern shoreline wetland area is designated as a conservancy no spray zone. This area typically receives no native plant control except for three or four private docks. Noxious floating plants and submersed nonnative species are targeted when identified. Since our presence on the lake in 2011, no *Egeria densa* had been recognized lake wide. This particular area of the lake is heavily infested with native plant growth. At times, during surveys, boat passage through the area has proven to be problematic. Boat prop entanglement within weed beds in conjunction with associated clogged water intakes, renders some areas within this designated portion of the lake inaccessible.

September 29, 2020 Survey  
Northwest Aquatic Ecosystems



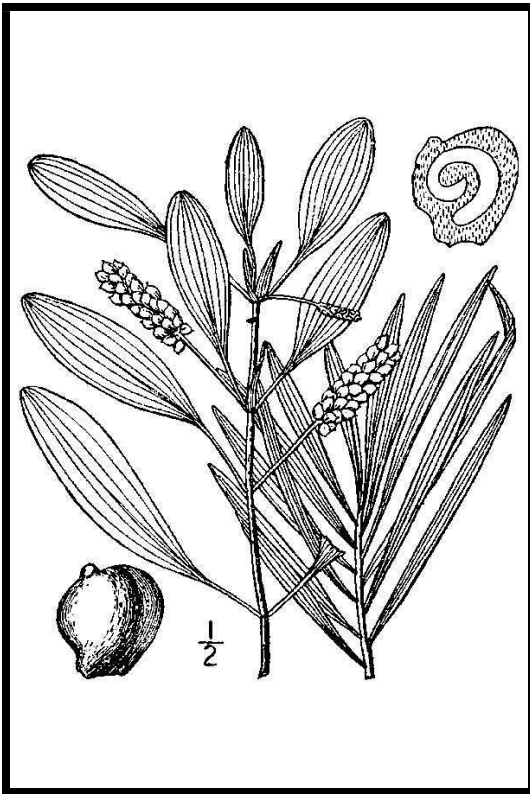
## 2021 BUDGET

Surveys (pre)	1	@	\$1,800.00	\$ 1,800.00
Surveys (post)	2	@	\$1,500.00	\$ 3,000.00
NPDES Permit	1	@	\$ 750.00	\$ 750.00
Noxious Weed Control	15	@	\$ 250.00	\$ 3,750.00
Native Weed Control (Diquat)	80	@	\$ 300.00	\$ 24,000.00
Native Weed Control Aquathol K	40	@	\$ 700.00	\$ 28,000.00
Purple Loosestrife Lily Pad Control	4	@	\$ 400.00	\$ 1,600.00
Communication				\$ 450.00
Mailings				\$ 600.00
Newspaper Notice Signs Boat Launch				\$ 550.00
Total				\$ 64,500.00

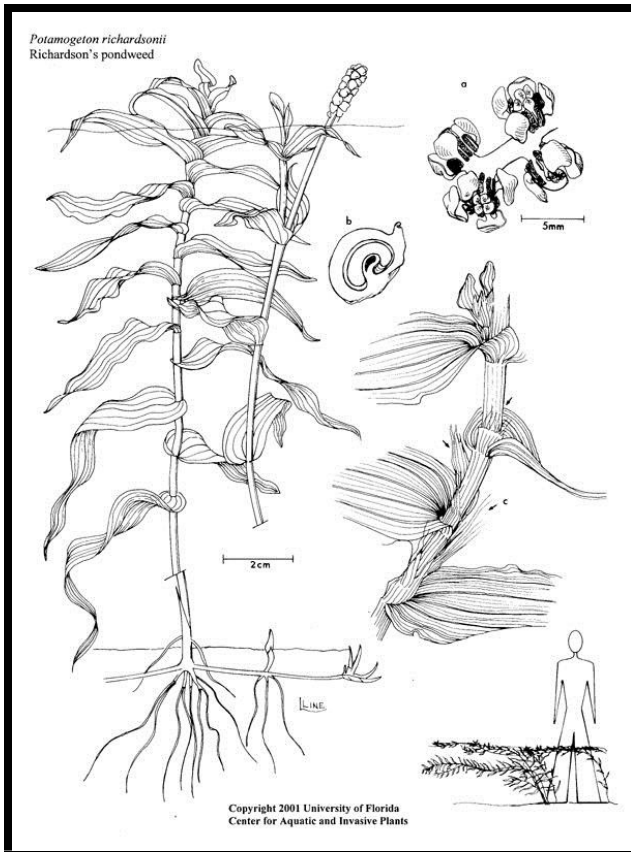
## Recommendations

1. Continue the expanded notification to the property owners and local residents through newspaper articles, radio and LMD notifications. Emphasis again needs to be directed at no lake use during treatment.
2. Lily pad control operations should only be conducted during those hours when wind conditions are minimal. Patches consisting of only a few plants should be cut and removed by the property owners.
3. Noxious species appear to no longer represent the problematic species lake-wide. The range and location of milfoil plants have stabilized; not much expansion has been detected. Plants currently coexist in mixed stands of native species. Milfoil can now seasonally be controlled with either contact herbicides or specifically targeted with systemic materials. Actions that may or may not be implemented will probably change on a year to year basis.
4. 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. A mid-season brief survey should be conducted to determine lake areas that may require a secondary treatment.
5. Continue use of the contact herbicide Aquathol K, utilizing both the liquid and granular formulations. Use of the material has proved to be successful in controlling some pondweeds not susceptible to diquat. Use should also include tank mixes of both diquat and Aquathol K.
6. Continued use of the new mapping technology. This technology provides an excellent visual evaluation of weed conditions lake-wide. The resulting map can be understood by all users of the lake and requires no in-depth technical background for review. The technology also provides an excellent reference to visually show a property owner if problematic weeds are present at their parcel.
7. Discuss submitting a possible formal request to the Department of Ecology to increase the allotted shoreline treatment as specified in the NPDES permit. This request would need to be submitted within 30 days of the issuance of the new statewide NPDES permit currently scheduled for release during March 2021. If the NWAE requests are not included in the new permit.
8. Continued to work with the LMD and County personnel on nutrient related issues and assist in providing information when requested.

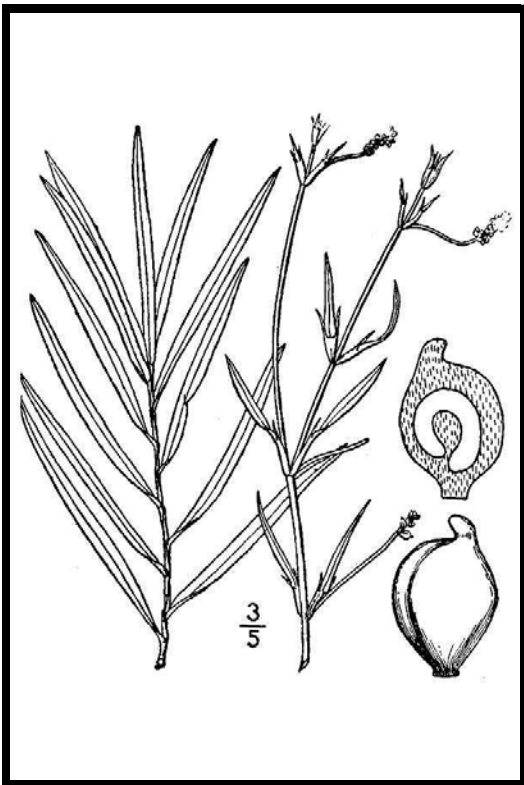
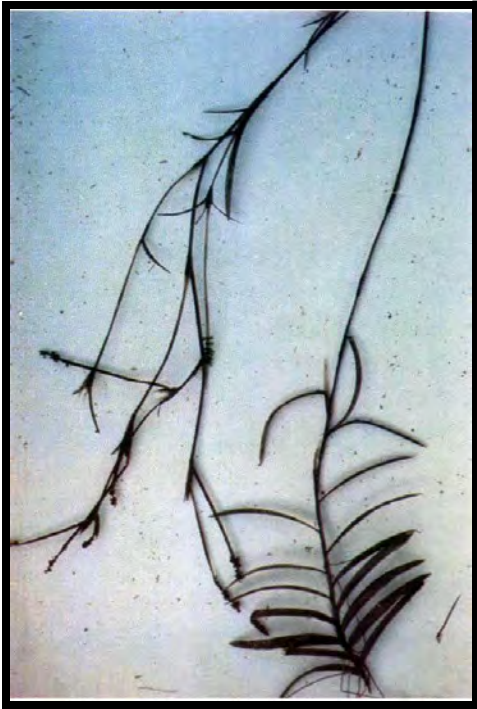
Dominant Submersed Macrophyte Species  
*Potamogeton epihydrus*



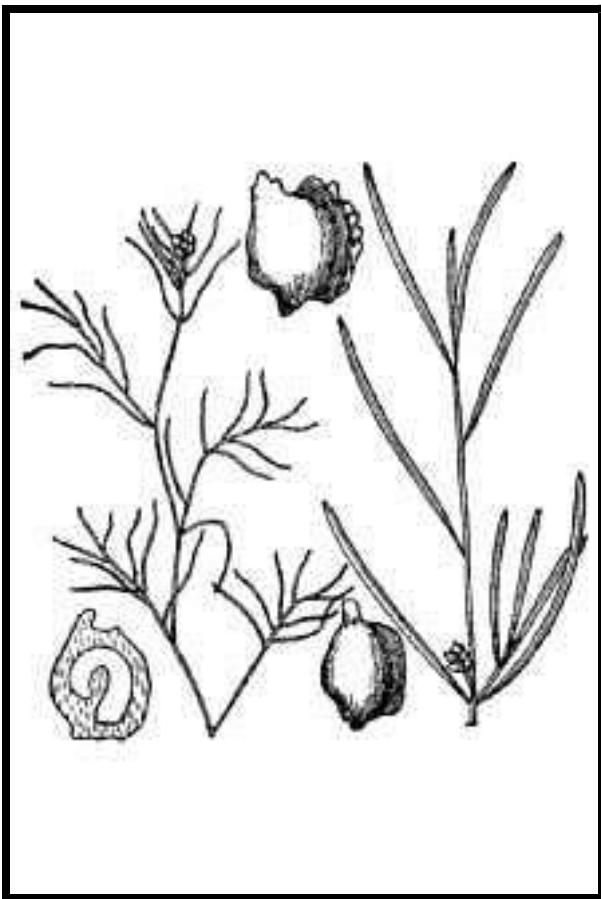
Potamogeton richardsonii



*Potamogeton robbinsii*

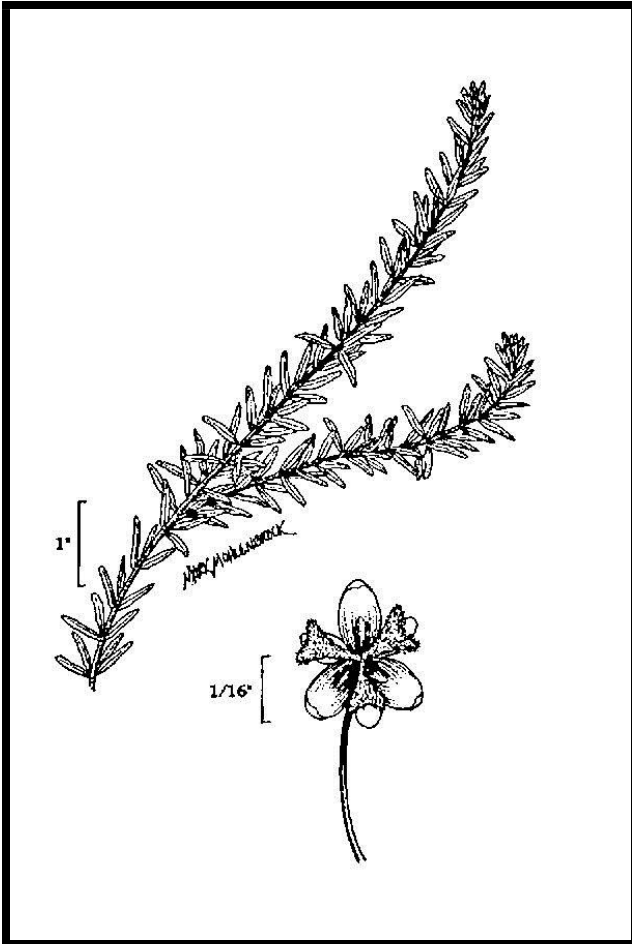


Potamogeton foliosus





Elodea canadensis



*Vallisneria americana*

