Lake Campbell and Lake Erie
2016 Aquatic Plant
Control Program

Prepared for:

Lake Erie & Campbell LMD #3
Skagit County Public Works
Mount Vernon, Washington

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Project Overview

This will be Northwest Aquatic Ecosystems' seventh consecutive year providing services to the Lake Erie and Campbell waterways. Components of the prior year reports have been incorporated into the 2016 report. Some of the past historical data is necessary in providing the reviewer adequate project baseline references. Our 2016 contract encompassed many of the same objectives and components as the earlier agreements. Management objectives have always focused on noxious weed activities as such species have been managed to reduce their appearance lake-wide. Native plants have recently begun to pose similar recreational hazards as the noxious macrophytes. Although not prevalent yet within Lake Campbell, native species have expanded throughout Lake Erie and have required management in order to provide a safe recreational environment to abutting property owners and the local community. Lake Campbell, during the past few years, has shown an increase in the native plant community component of the lake's ecosystem. As both lakes continue to reestablish native plant growth, management objectives will be required to consider the benefit of such species while also recognizing the potential danger unchecked growth may pose to lake users. Prior to the onset of 2015, Lake Erie retained only small problematic patches of milfoil that historically have been identified to reside within specific lake areas. Lake Campbell however, during 2014 & 2015, has shown a marked increase in milfoil occurrences in both the eastern and western shoreline areas. Some of this milfoil increase is likely attributed to two shoreline parcels that contain milfoil infested ponds that have direct access to the main lake. As a result of the increased milfoil noted within Lake Campbell and limited presence within Lake Erie past funding of Lake Erie native species was reduced during the 2016 season. Lake Erie did not receive a second native weed treatment during 2016.

Survey Protocol

Survey techniques for 2016 were similar to those utilized during 2014 & 2015. Macrophyte data was collected utilizing wavelength 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. During the survey when milfoil plants were identified, their locations were noted along the transect line and their GPS coordinates were recorded. Each milfoil data point was identified by a red dot. The resulting processed map produced is a color coded map of the lake bottom identifying weed growth areas, plant densities and milfoil locations. 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 affords you the ability to view all plant growth along the boats survey track. This new protocol avoids the possibility of missing plants between bottom survey data points.

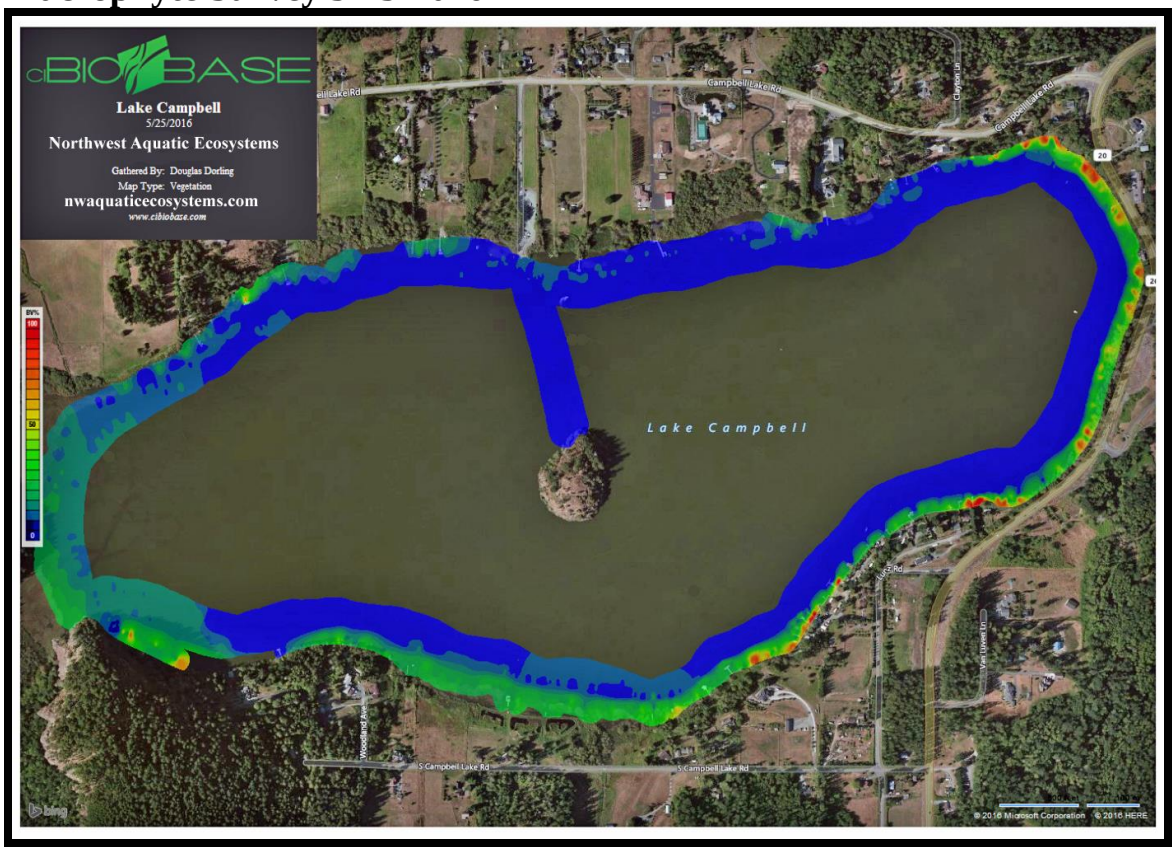
Data is collected by a survey vehicle transecting the lake along the littoral zone. Boat tracks are designed to be approximately 100 feet apart. To ensure the efficacy of the survey, a bottom sampling rake was thrown from the boat at various locations lake-wide. The rake was then drawn across the lake 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 through the structure scan or visually through the water column. The system automatically calculates, maps and stores the position of every data point.

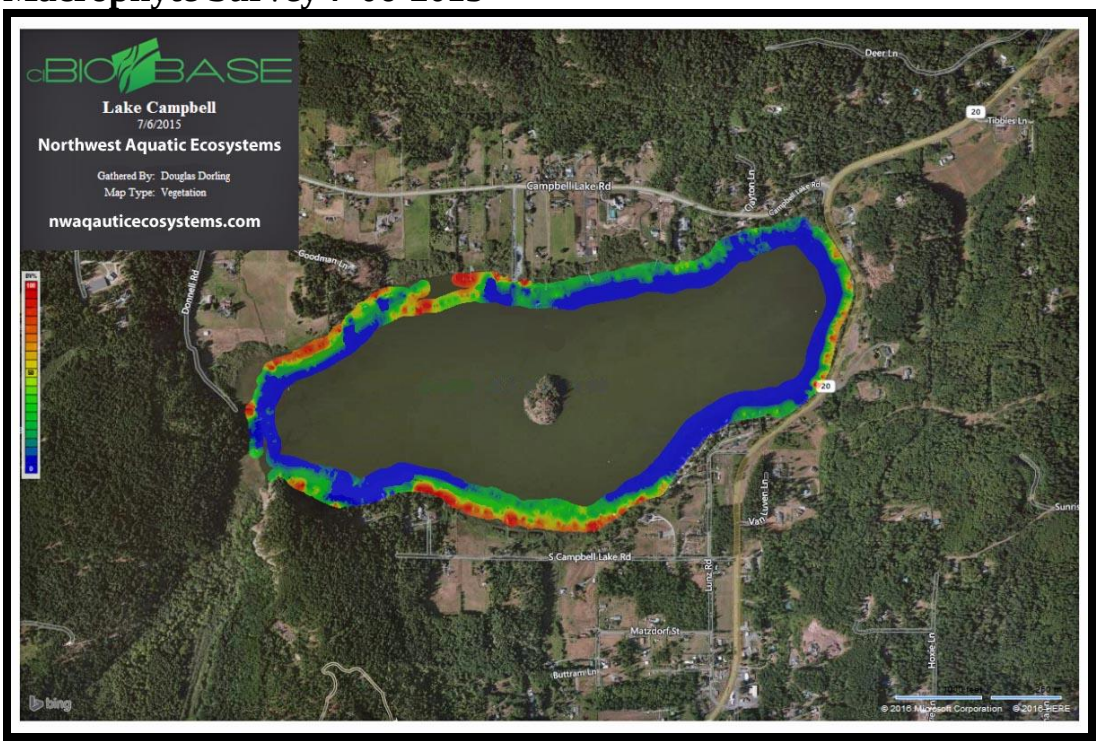
Lake Campbell Pre Treatment Survey Results

Lake Campbell was surveyed on May 25, 2016. At the time of the survey water clarity was decreased as the result of a minor algae bloom. Shoreline scum was not evident. Results of the spring survey identified an increase in native plant species lake-wide. Milfoil growth experienced during 2015 within much of the spadderdock perimeter along the western, northwest and southwest shorelines was reduced considerably as a result of the 2015 herbicide application. The lake area infested with native spadderdock is a difficult one to survey because of the dense spadderdock growth. Milfoil plants and/or fragments can remain undetected beneath the pads and then surface later in the season as the pads begin to die back.

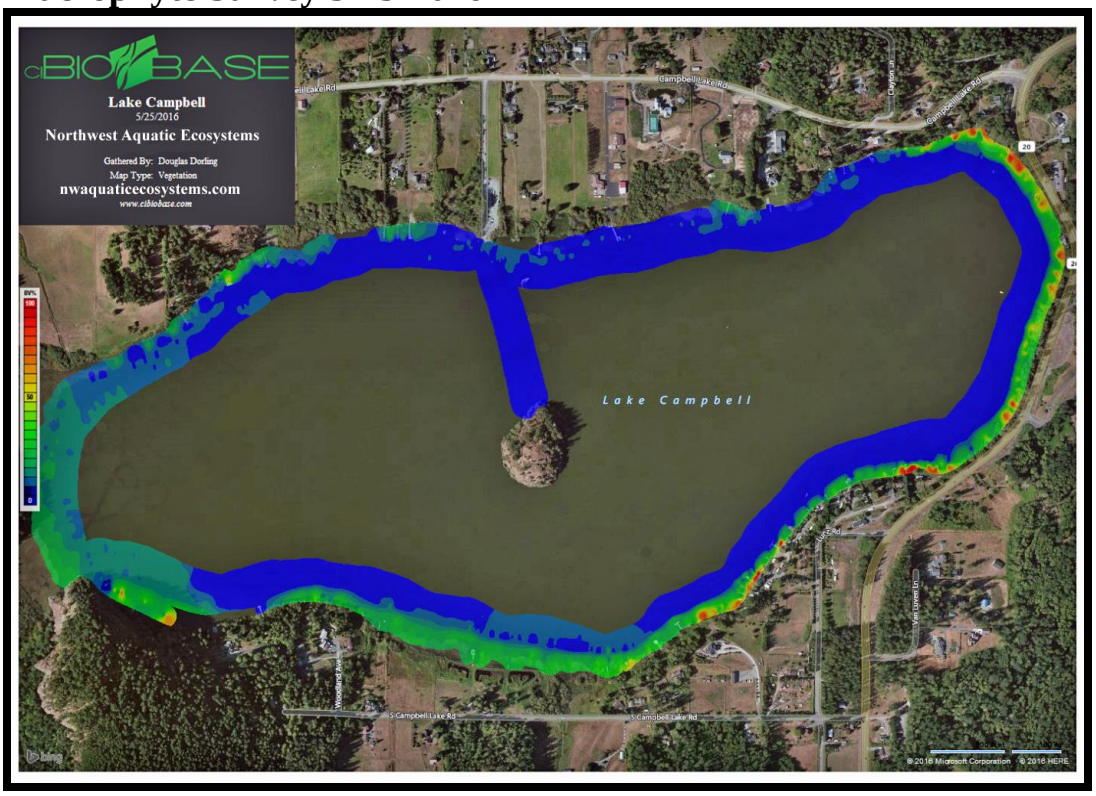
Macrophyte Survey 5-25-2016



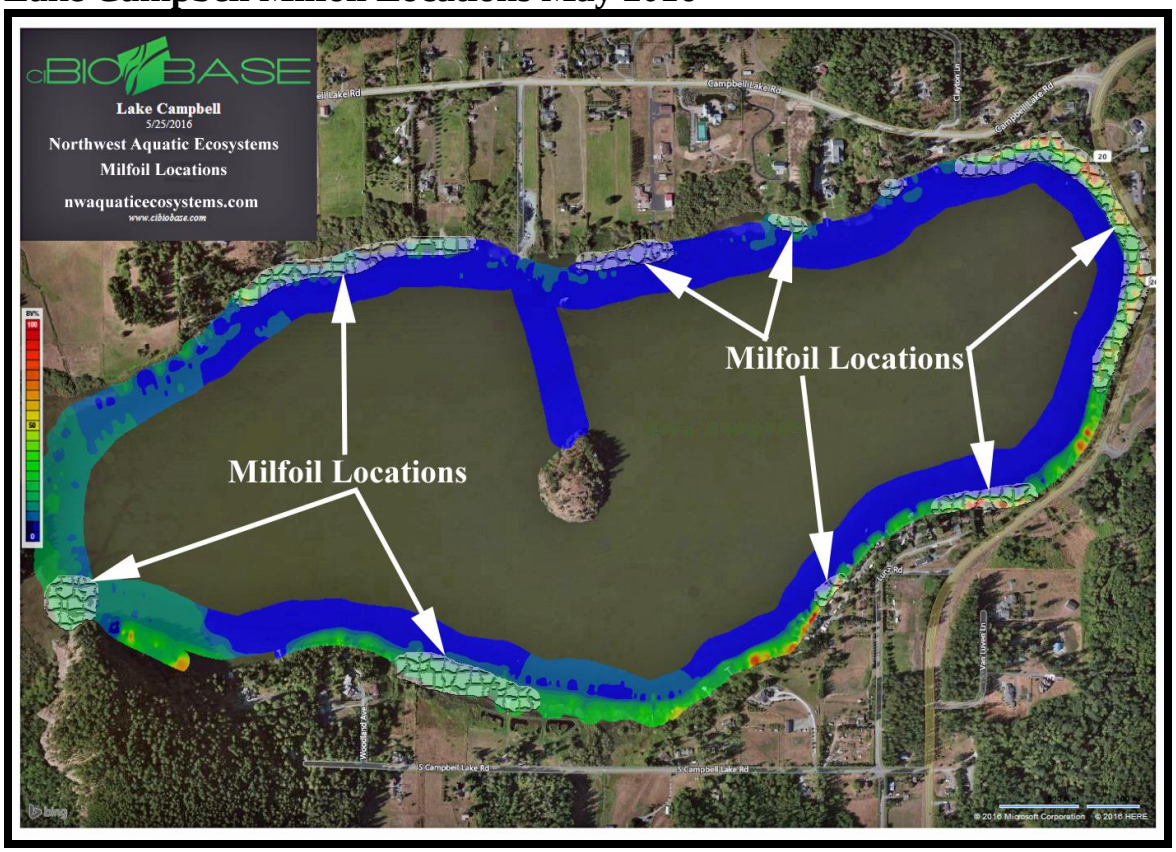
Macrophyte Survey 7-06-2015



Macrophyte Survey 5-25-2016



Lake Campbell Milfoil Locations May 2016



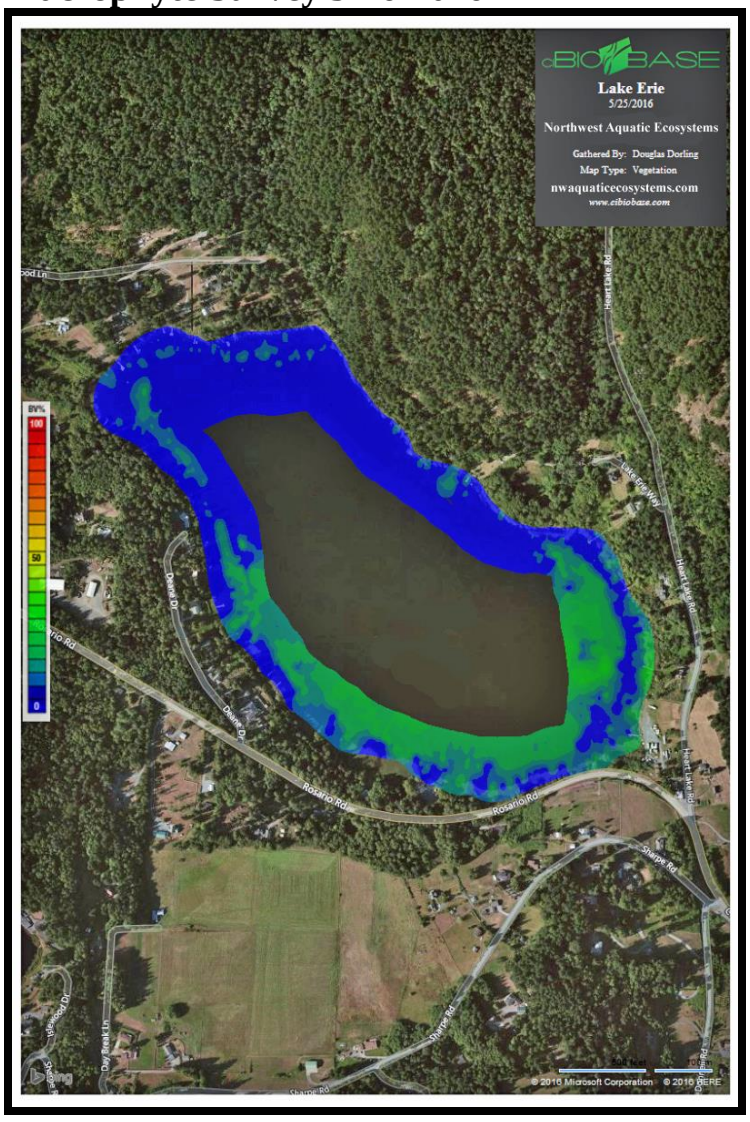
Residential Lake Campbell Milfoil Pond Inspection

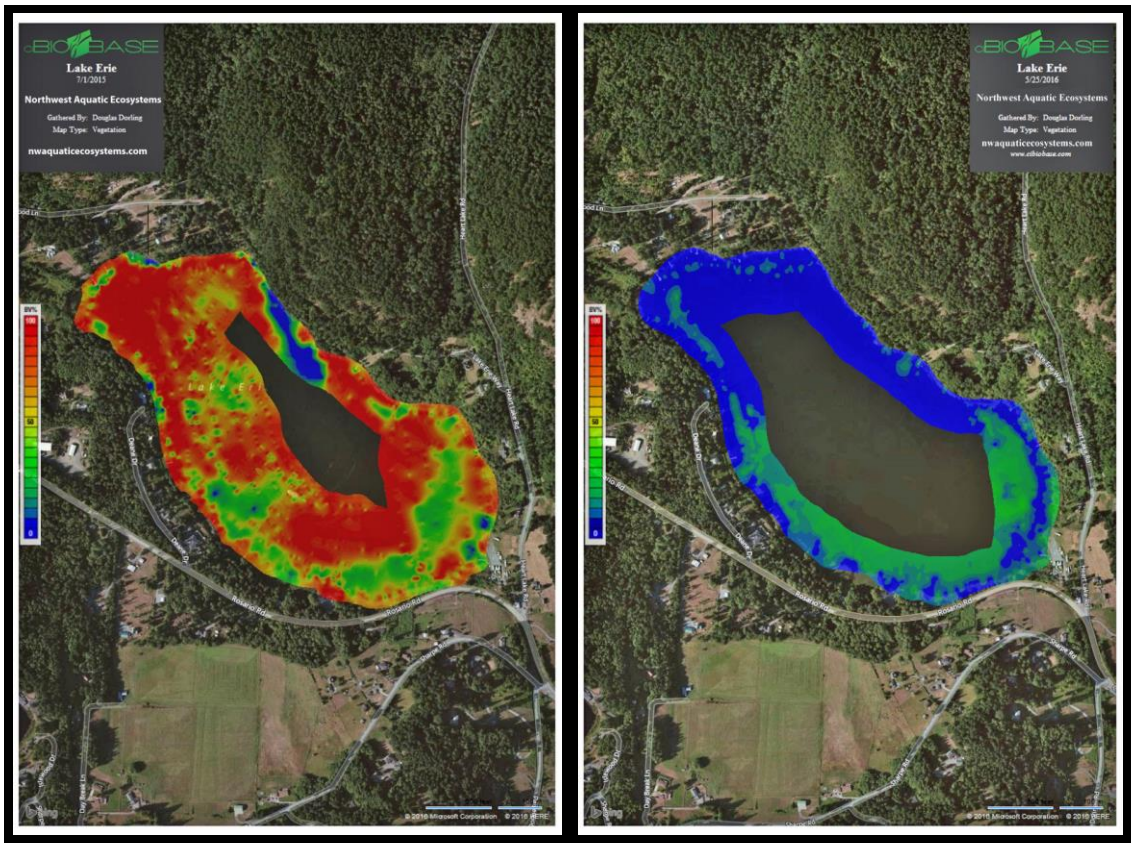
During the main lake survey, the two private properties that were treated for milfoil during 2015 were also inspected. Both parcels had only a few milfoil plants actively growing throughout the ponds. Densities of plants had been reduced by over 95%.

Lake Erie Pre Treatment Survey Results

Lake Erie was surveyed on the morning of May 25, 2016, water clarity was good. Very limited milfoil plants were identified and as has been historically noted in the past, all plants were located along the southeastern shoreline. Native weed growth density had decreased considerably lake wide in comparison to 2015 densities. Growth reduction was probably a result of residual effect of the secondary treatment performed during 2015 and the earlier survey timeline. Najas is still the dominant weed species lake-wide. However, the thin leaf pondweed population is becoming more prevalent throughout the lake basin.

Macrophyte Survey 5-26-2016





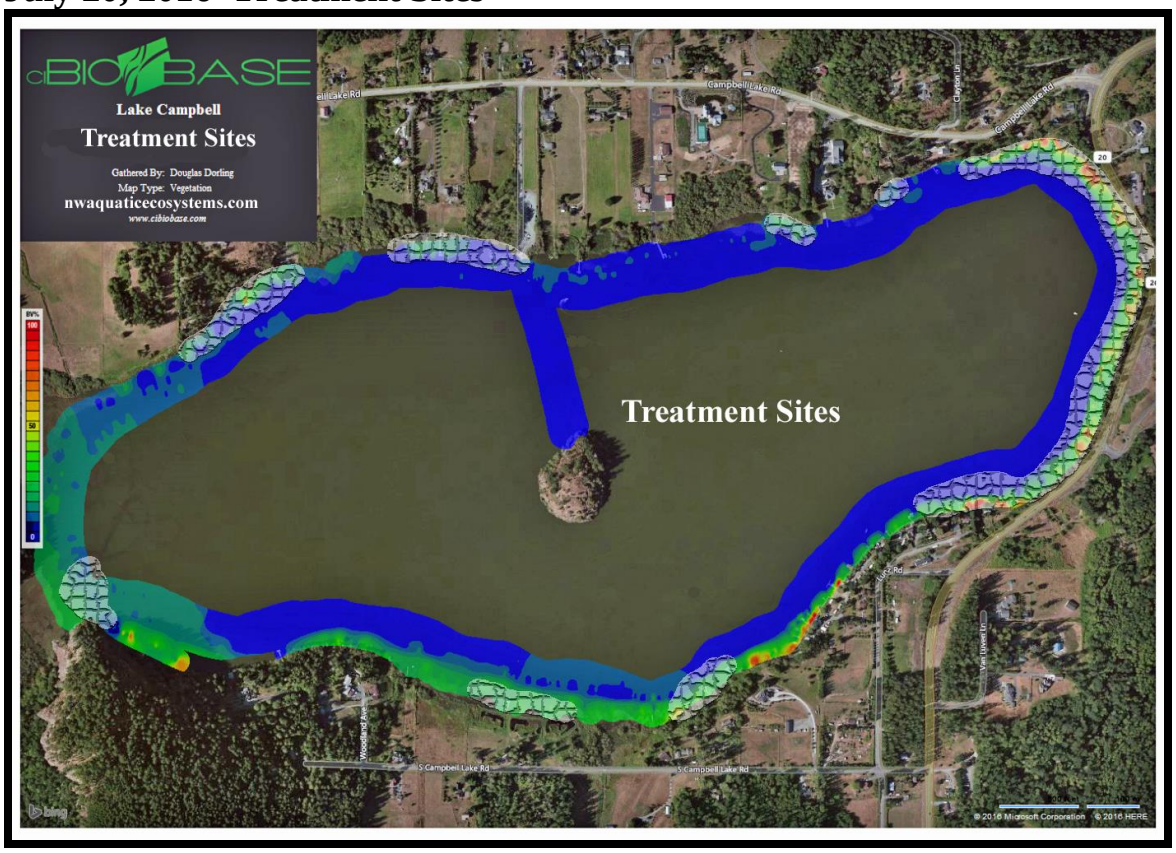
Spring 2015 Survey **Spring 2016 Survey**

Milfoil Locations Spring 2016

Lake Campbell Treatment

Lake Campbell was treated on July 20, 2016, one week earlier than our 2015 treatment date. Prior to treatment the area was posted. The public boat launch was posted with two large signs and the residential shorelines received smaller signs. Postings noted the materials used and water use restrictions. A private staging area just north of the public boat launch was employed during treatment. Two materials were applied during the application phase of the project. Lake shoreline treatments consisted of either the use of 2,4-D or a diquat/2,4-D mixture.

July 20, 2016 Treatment Sites



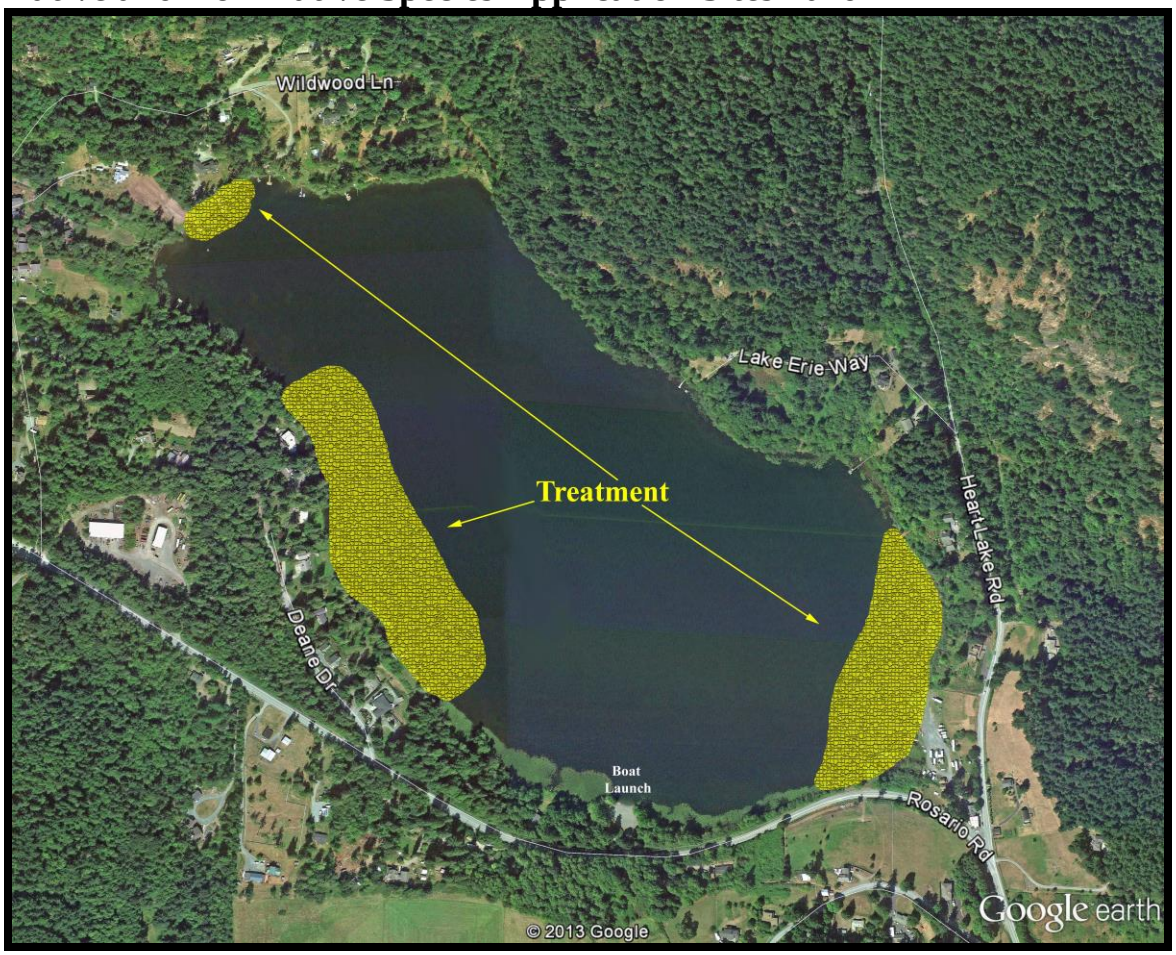
Lake Erie Treatment June 21, 2016

Lake Erie shoreline was posted prior to the spraying event on June 21, 2016. Shoreline postings were placed on the immediate docks or near shore trees. Two large two foot by three foot signs were also positioned along the access road leading to the launch site and one sign was placed adjacent to the boat launch. These larger signs identified where the materials were applied and what materials were used.

Treatment acreage and locations were identical to those noted during 2015; 20 acres. This was a reduction from those acreages treated during 2014. Tribune (diquat) once again

was applied to complete the task. No shoreline, emergent or floating plants were targeted. A staging area was located at the public boat launch. Materials were stored in a locked truck and transferred from the truck to the application boat as needed. Once material transfer occurred and the boats tanks were full, the licensed applicator proceeded to the targeted treatment sites and dispersed the material. Materials were injected directly over the targeted weed beds via a boom system designed to disperse the mixture vertically throughout the macrophyte column. The treatment boat was equipped with a GPS system that ensured the application vehicle remained within the boundaries of the treatment zone.

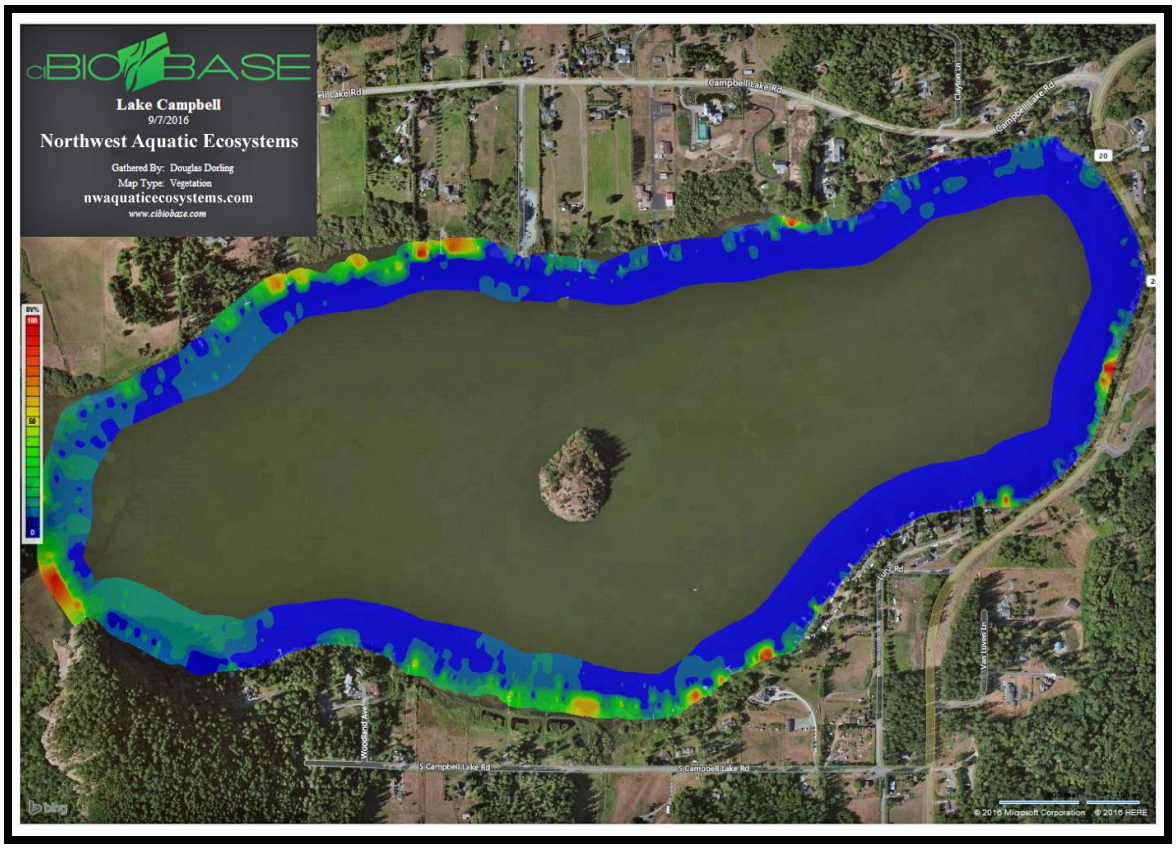
Native and Non-Native Species Application Sites 2016

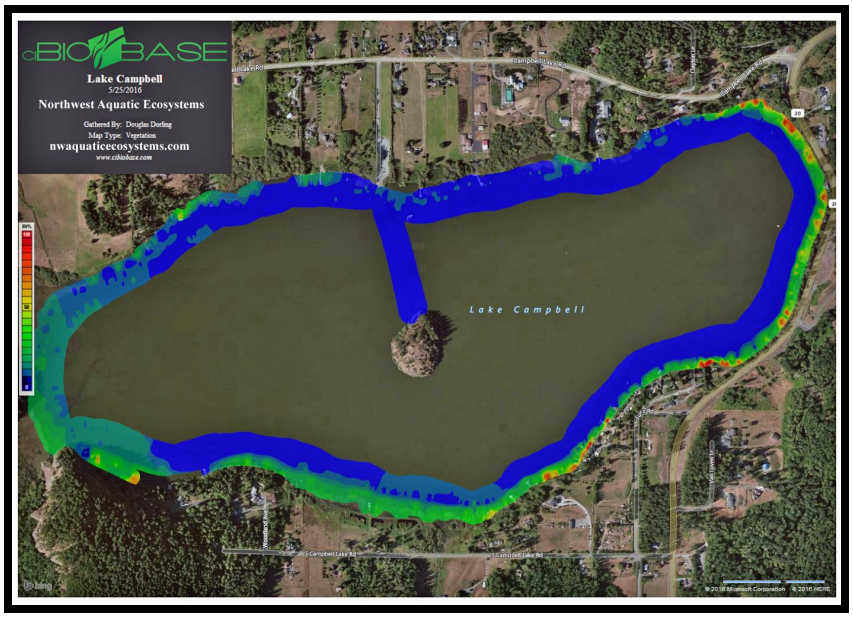


Lake Erie & Campbell Surveys September 7, 2016

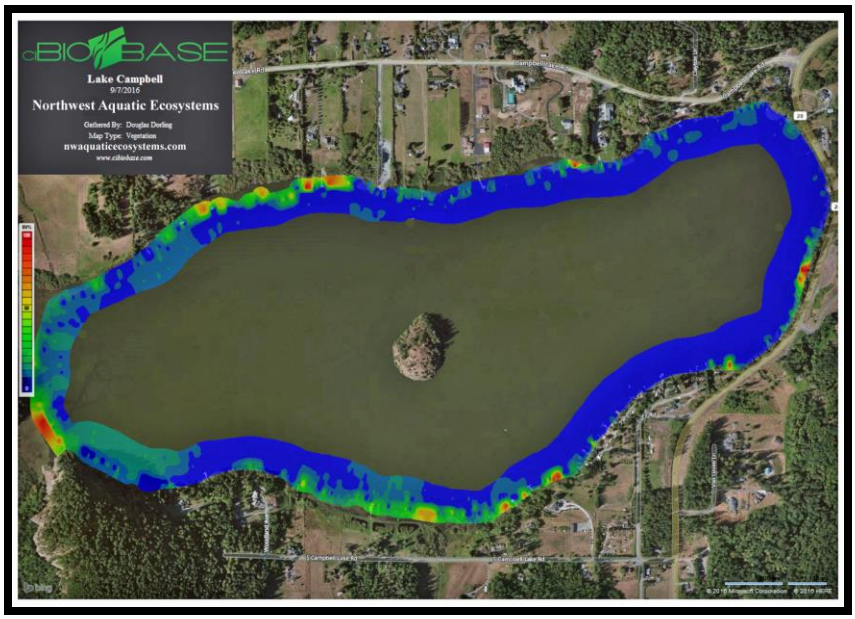
Lake Erie and Campbell were both surveyed on September 7, 2016. No milfoil plants were identified during the Lake Erie survey. However, milfoil patches were once again identified along the eastern closed portion of Lake Campbell. Densities and plant locations had been reduced considerably but were still present. A Lake Campbell survey performed by the Department of Ecology during the same timeframe resulted in similar results.

Lake Erie native plant growth had surprisingly increased considerably to levels that would have normally resulted in a secondary treatment. This unexpected Lake Erie growth was identified too late in the growing season to initiate a treatment scenario that would have resulted in a positive cost benefit ratio for the property owners. An earlier seasonal, brief, site visit or comments generated from the property owners probably would have resulted in an early August treatment.

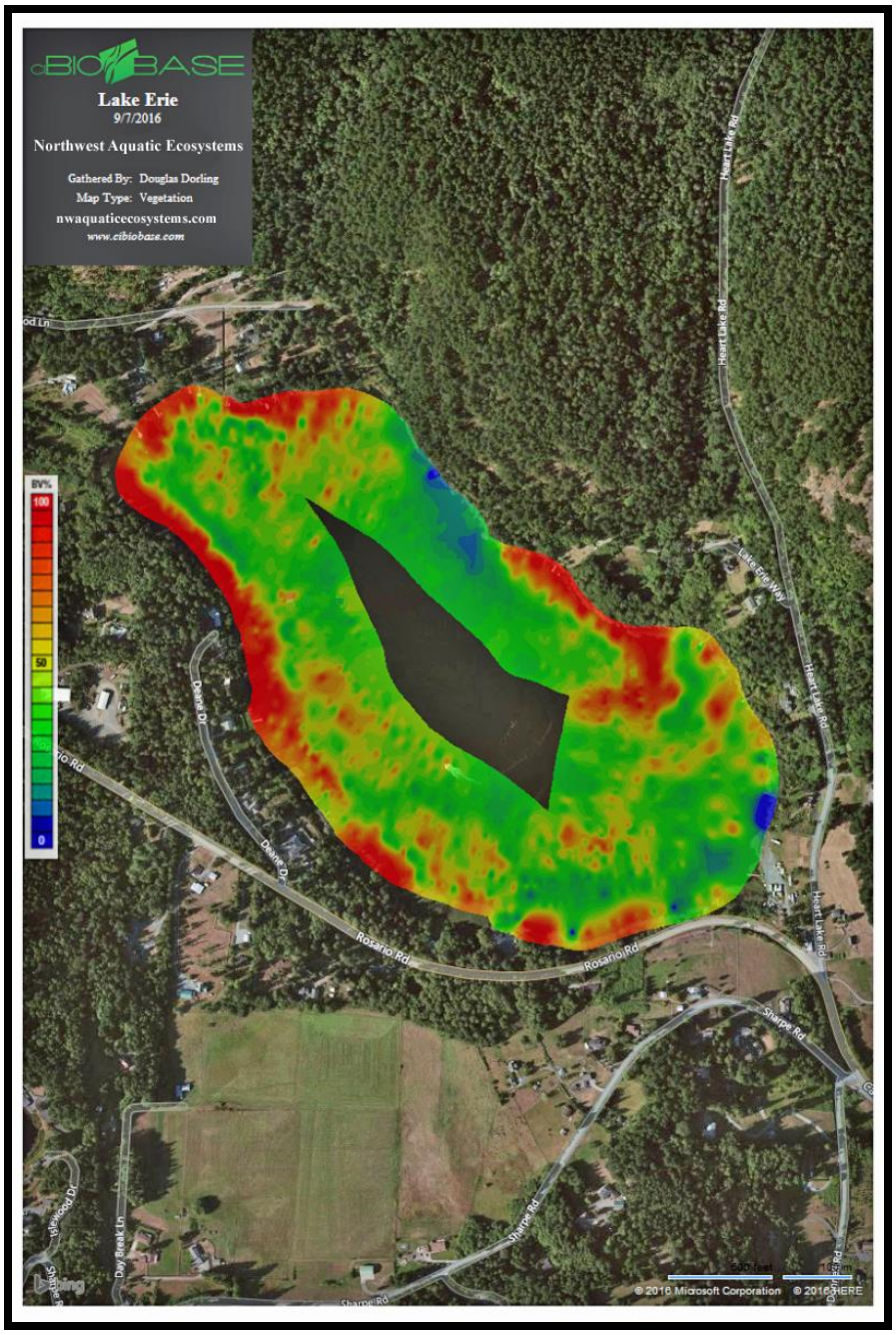




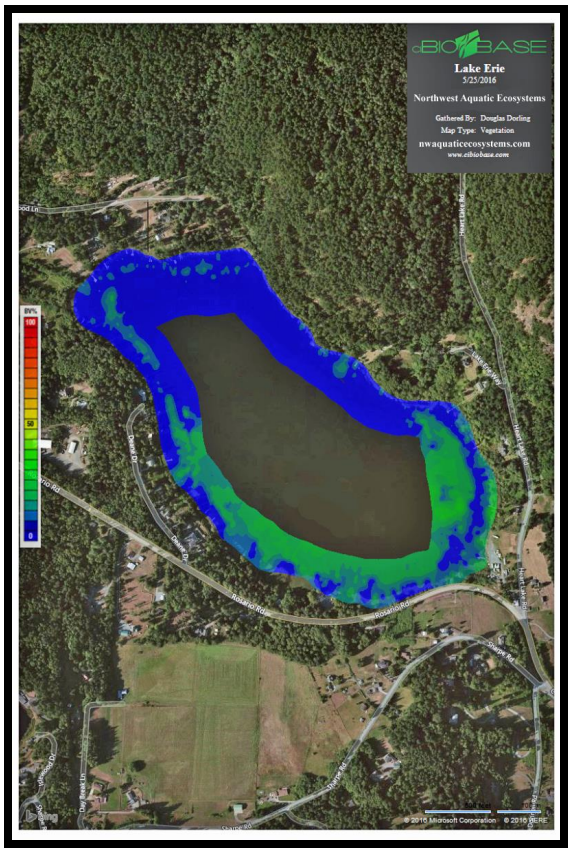
Spring Survey 2016



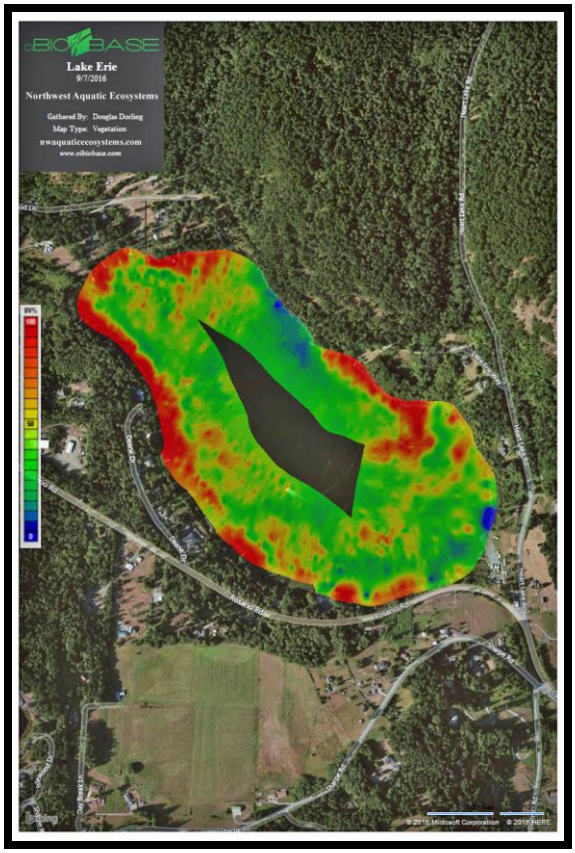
Fall Survey 2016



Fall Survey 2016



Spring Survey 2016



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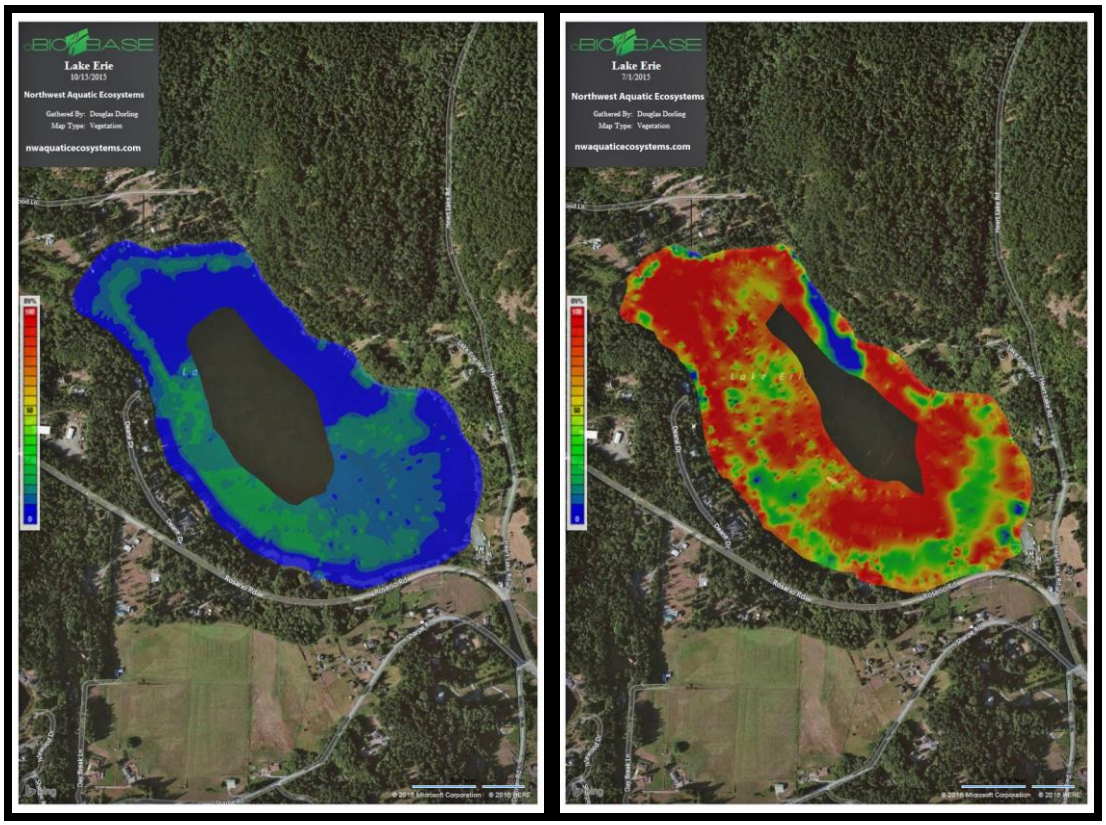
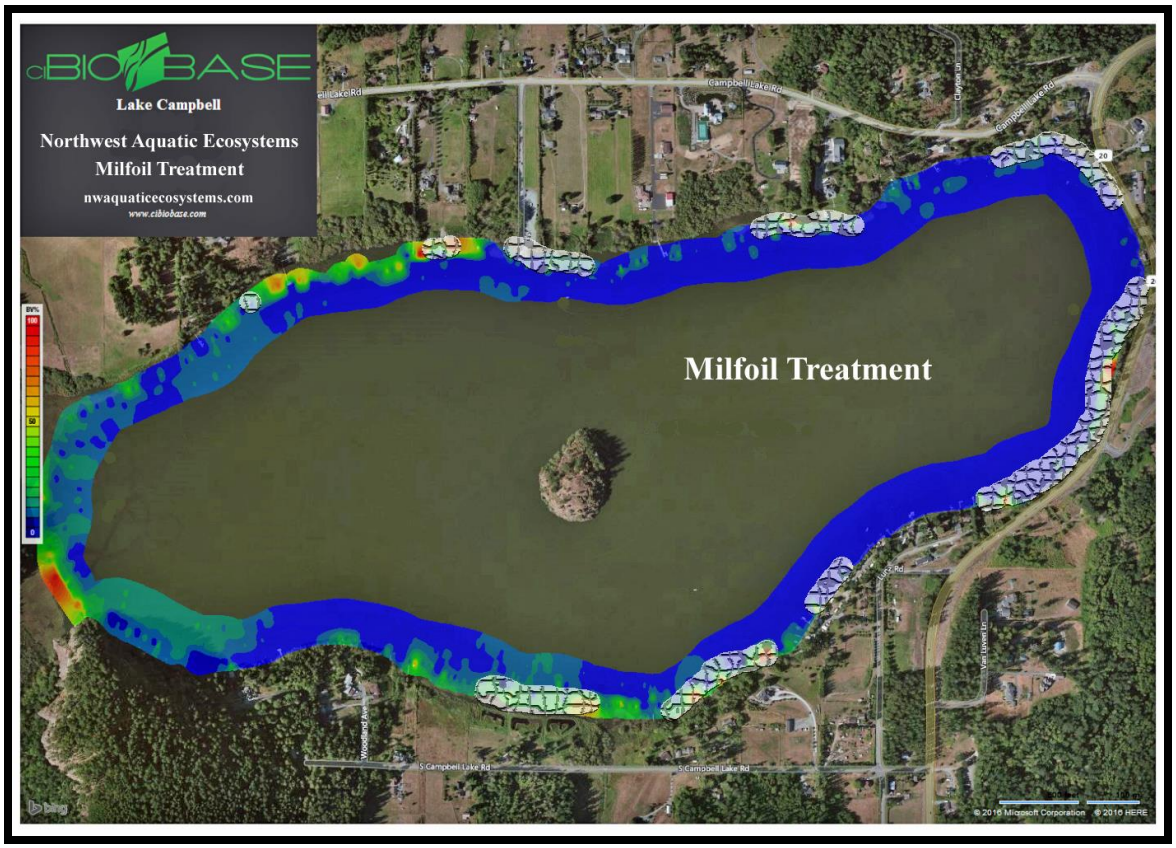


Fall Survey Lake Erie 2015 Spring Survey Lake Erie 2015

Lake Campbell Milfoil Treatment September 13 & 14, 2016

A late season milfoil treatment was conducted in response to the fall survey and discussion held during the earlier LMD board meeting. The application consisted of a liquid formulation of 2,4-D. The goal of this treatment was to eliminate the remaining milfoil infestation in a cost effective fashion and reduce the production of viable fragments. The unexpected appearance of increased milfoil growth over the past two seasons had the possible potential for increased expansion lake-wide. Approximately 16 acres of the main lake were treated. Posting of the public boat launch and impacted shoreline areas were completed prior to treatment. Once the milfoil treatment was completed, shoreline areas were sprayed for lily pad, yellow flag iris and loosestrife control. A 1% mixture of glyphosate was used.



Recommendations For 2016

Milfoil growth within Lake Campbell was noticeable during 2016, with late season growth similar to 2015. Much of the late season growth was contained to the eastern shoreline areas of the lake. Similar to 2015, the increased growth native weed control activities were reduced within Lake Erie in order to address the milfoil growth occurring at Lake Campbell. Late season native plant growth within Lake Erie had reached the surface in spot locations lake-wide. Native weed species are still problematic at Lake Erie and currently pose the greatest threat to recreational users of the lake. Native species continue to increase their range on Lake Campbell. Lake Erie native weed growth will probably follow cycles where one year growth may require two treatments and others only one. It is safe to assume that Lake Erie will require some degree of native weed control on a year to year basis. The areas treated for problem milfoil growth at Lake Campbell will require increased monitoring during 2017 in an effort to reduce further plant expansion and will likely require addition applications in the upcoming years. The unexpected milfoil infestations that have had direct access to the main lake have now been identified and treated. This should reduce the possibility of future infestations from non-lake sources.

Northwest Aquatic Eco-Systems recommendations for the 2016 season are as follows:

1. Control of approximately 25 acres of lake shoreline that currently experiences sporadic milfoil growth of single stemmed milfoil plants within lake Campbell. The Lake Campbell infestation has not increased in range along the perimeter of the shoreline as was noted during 2015. Current infestation will again need to be addressed again during 2017 in order to halt further expansion lake-wide.
2. Continued surveys of the two individual private shoreline residential parcels for milfoil within small ponds on the parcels.
3. Targeted control of spadderdock at both lake sites to manage the encroachment of this species into the main basin and along residential shorelines. Control of the noxious species fragrant waterlily, purple loosestrife and yellow iris should continue lake wide as the budget permits.
4. Treatment of problematic Lake Erie native weed species when such species are hindering lake use. These treatments are typically cyclical in nature when only one treatment may be required one year and others two. The need for either one or two treatments will probably be weather dependent.
5. Lake Campbell management continues to focus solely on milfoil growth while Lake Erie requires the ability to manage both noxious and troublesome species in an effort at keeping the best interest of the property owners and the lake system's health in perspective. Milfoil treatments should be designed to control the targeted species while resulting in the least negative effect to the Nuphar.
6. Continued use of the new survey technology. This technology and mapping has proven to provide a broad based evaluation of the macrophyte communities. Yearly surveys are now capable of providing simple color coded maps reflecting yearly changes in plant densities.
7. Maintain established budgets for 2017 in an effort to account for the increased milfoil problems associated with Lake Campbell and potential secondary treatments on Lake Erie.
8. The shallow nature of Lake Erie and the growth characteristics of najas tend to favor surface weeds late in the season. These plant features encourage a secondary treatment.