

Lake Campbell and Lake Erie 2021 Aquatic Plant Control Program LMD #3



Prepared for:

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

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Project Overview

This will be Northwest Aquatic Ecosystems twelfth consecutive year providing services to the Lake Erie and Campbell waterways. Some components of the prior year reports have been incorporated into the 2021 report as we have done in the past. Management objectives have always focused on noxious weed activities as such species typically receive priority consideration. Native plants (pondweeds & naiad) pose similar recreational hazards as the noxious macrophytes within Lake Erie and severely impact lake use during summer months. Native species are not yet prevalent within Lake Campbell. However, recent surveys of Lake Campbell have shown an increase in native species and exhibit encouraging signs of expansion lake-wide. Northwest Aquatic Ecosystems (NWAE) has learned over the years that at times Lake Erie requires only one early submersed weed treatment and during some years an additional late season application is required.

2021 proved to be an interesting year for macrophyte growth throughout many Washington State Lakes. Some lakes exhibited early seasonal growth while others displayed tremendous late summer growth. Lake Erie displayed aggressive early summer native plant growth with moderate late seasonal milfoil expansion. Lake Campbell exhibited minor early seasonal growth but generated late seasonal milfoil expansion.

During the spring survey, Lake Campbell milfoil colonies were sporadic and almost completely absent from the system while Lake Erie was experiencing intense problematic native plant growth lake-wide. The absence of milfoil within Lake Campbell, in harmony with the elevated native growth noted at Erie, directed the weed control operations for both lakes during this 2021 season. One observation during 2021 noted that in future years it may be difficult to maintain native and noxious weeds at safe recreational levels within the current budget guidelines.

Survey Protocol

Survey techniques for 2021 were identical to those utilized during prior surveys. Our methodology is an industry standard. Macrophyte data was collected utilizing wavelength specific transducers and in conjunction with scanning equipment. Once collected, the data was uploaded via cloud-based technology and the processing of the information 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 result 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 boat's 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 away from each other. To ensure the

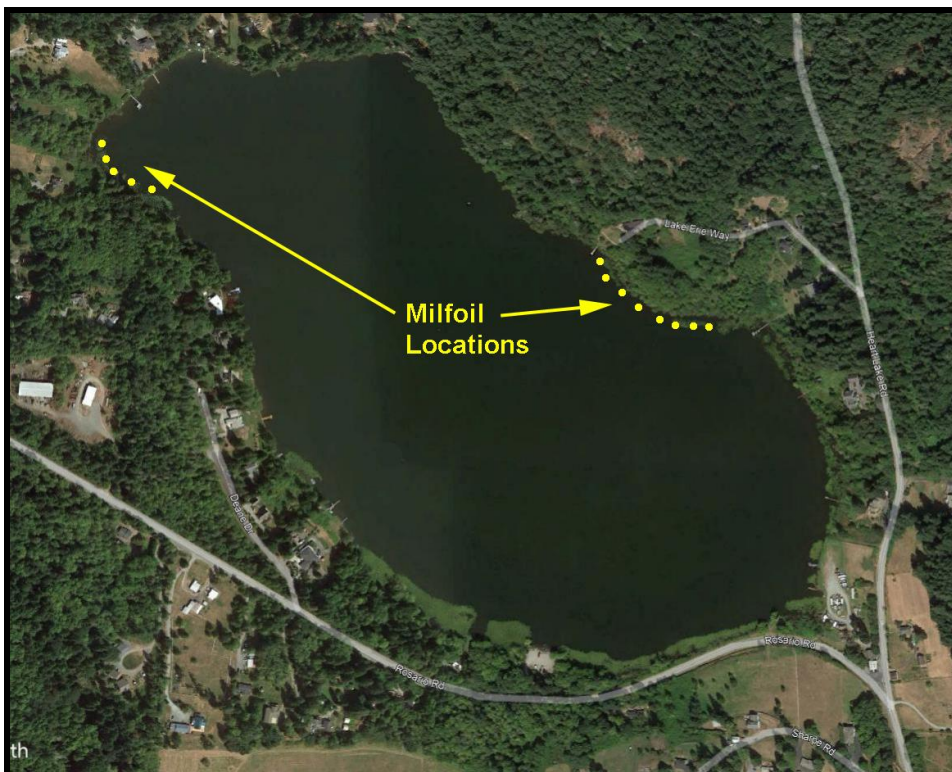
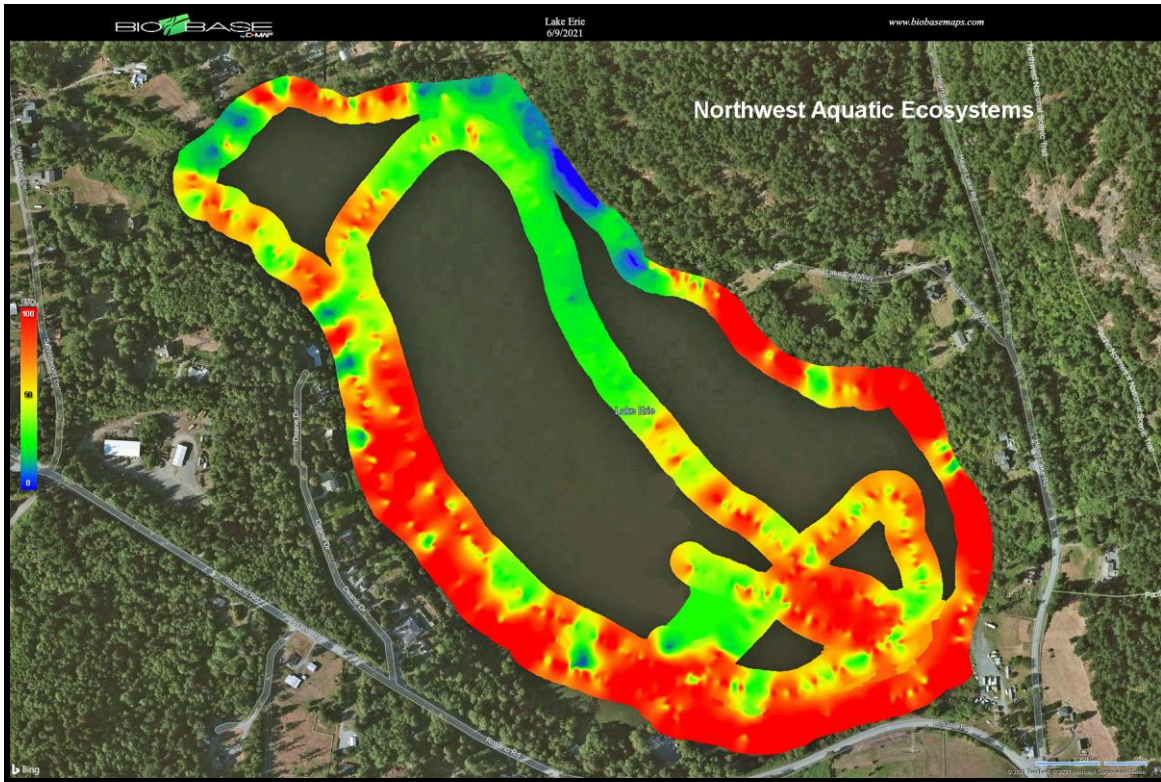
efficacy of the survey, a bottom sampling rake was thrown from the boat at various locations lake-wide. The rake was then drawn across the lake bottom, brought to the surface and into the boat. Plants attached to the rake were identified and confirmed as being the same species as noted through the structure scan or visually through the water column. The system automatically calculates depths and stores the position of every data point collected.

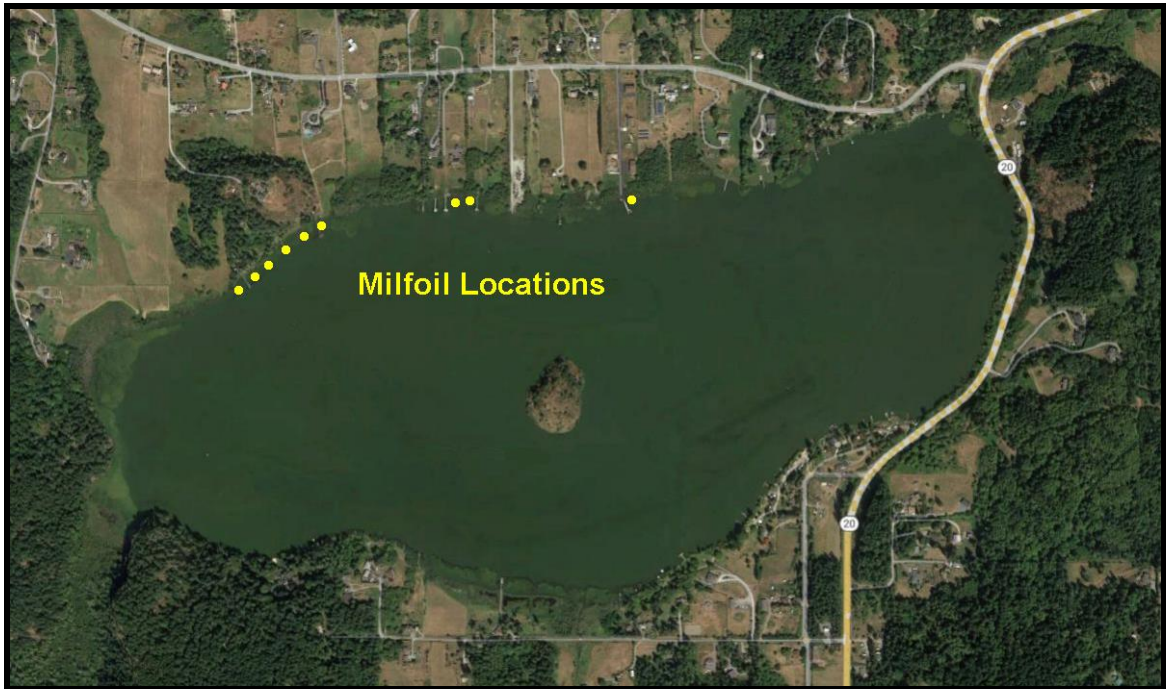
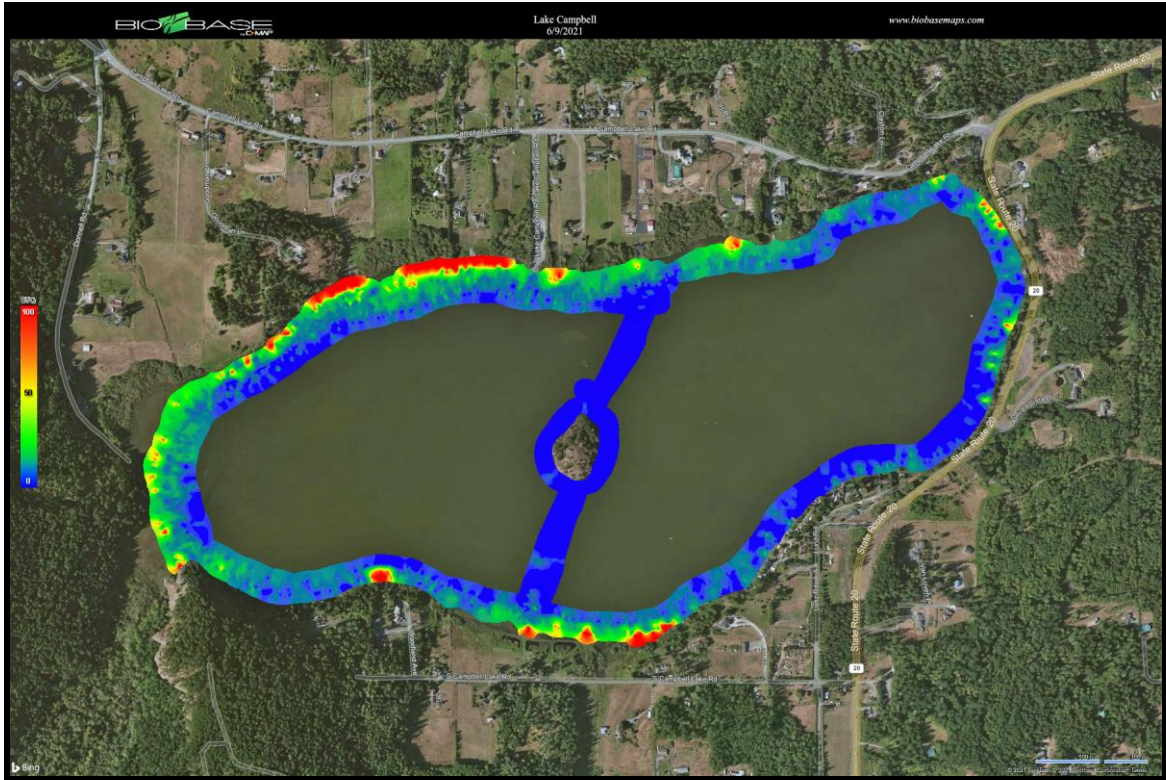
Lake Campbell Pre-Treatment Survey Results

Lake Campbell and Erie were both surveyed on June 09, 2021, within 7 days of last year's 2020 survey (06-02-20). Historically, all surveys have been conducted within the early June survey window. Lake Campbell exhibited limited milfoil growth within the lake's shoreline perimeter lake-wide. Plant growth historically has only been identified within approximately 250 feet of the shoreline and the 7 foot contour line. Much of the vegetation noted was bottom growing filamentous algae and thin leaf pondweeds. The extensive milfoil growth noted during the fall of 2019, and treated during 2020, appeared to have successfully reduced milfoil growth to only a few sporadic patches lake-wide.

Four survey data files were collected during the Lake Erie survey. During the processing of two of the Lake Erie files they were corrupted and no data from these two files was processed. The remaining two files did produce enough data to generate a macrophyte map that was representative of the lake conditions at the time of the survey. Native plant growth consisting of thin stemmed pondweeds and naiad (najas). Najas has always been historically the dominant low growing species while thin leaf pondweed continued to occupy the upper regions of the water column. Pondweed growth had already pierced the water's surface forming sparse surface mats lake-wide. The density of the growth created problems during the survey requiring the prop to be cleared. The 2021 survey did identify the establishment of new sporadic milfoil growth.

Macrophyte Survey 6-09-2021







Residential Lake Campbell Milfoil Pond Inspection

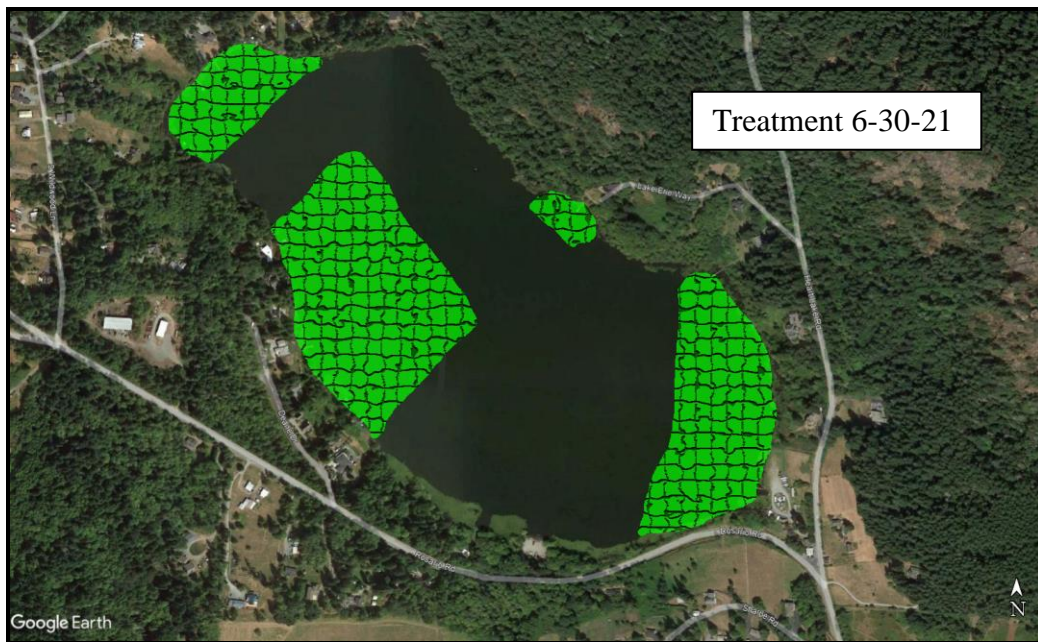
These pond sites are inspected every year for milfoil growth. If milfoil is identified, treatments are scheduled to coincide with the main lake body treatment. No milfoil was identified at either location. Numerous native species were identified.



Lake Erie Treatment June 30, 2021

Lake Erie was treated on June 30, 2021. Approximately 55 acres were treated with a two gallon per acre application rate of diquat. Plants were dense and already forming surface mats lake-wide. The herbicide mixture was injected approximately two feet below the water's surface with the assistance of weighted drop hoses. All the residential and trailer park sites received treatment. Residential and the trailer park native weed treatment sites were increased from last year's campaign as a result of a greater budget allotment for Lake Erie. During 2020 only 15 acres of weeds were targeted at Lake Erie. The public boat launch was posted with two large signs and the residential shorelines received smaller signs on the day of treatment. Postings noted the materials used and water use restrictions. The larger public access signs identified where the material was applied and what material was utilized. NWAEE staged the treatment from the public boat launch. Materials were injected into the water column 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.

At the time of application, it was decided to return to Lake Erie within two weeks to evaluate the degree of control achieved following the primary application. NWAEE had concerns directed at control issues associated with potential treatment outcome resulting from the dense growth noted at the time of treatment. Typically, dense weed growth restricts the movement of the herbicide mixture through the water columns experiencing dense weed growth. As noted during the survey, the treatment boat also experienced difficulties with prop clogging issues.



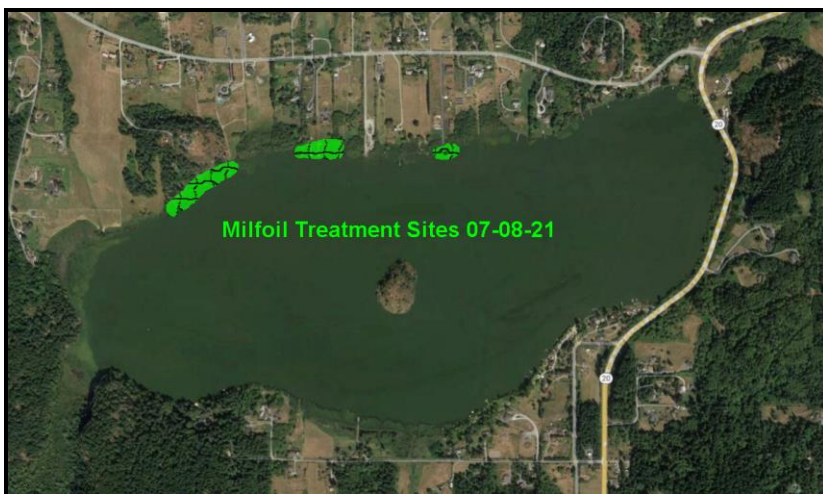
Lake Erie Treatment July 07, 2021

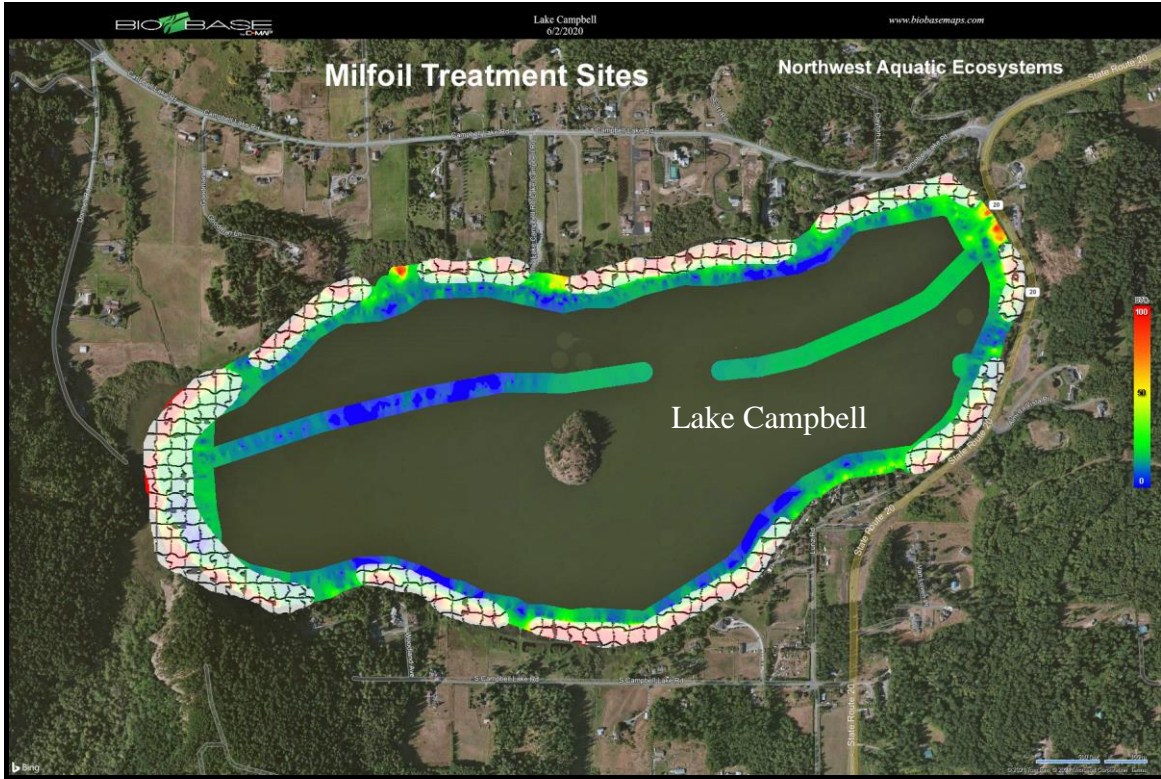
Lake Erie was inspected on 07-07-21, to evaluate the progress of the control obtained following the June 30 application. Examination of the site determined that many of the plants were impacted by the initial treatment exhibiting brown/gray leaf structures typical of macrophyte response to diquat. Some of the very dense weed growth areas still contained sporadic green growth characteristics typical of healthy plants. These areas received a secondary application of diquat. The inspection also noted that the drift from outside the targeted treatment sites was not as extensive as noted during prior application years.

Lake Campbell Treatment July 08, 2021

Lake Campbell was treated on 7-08-21. Only approximately 5 acres of the lake received treatment with forty gallons of Triclopyr for milfoil control. This was a considerable reduction from the 2020 treatment that noted a treatment area of 81 acres. Our initial spring survey and site inspection on the day of treatment supported our results from the 2020 milfoil treatment indicating nearly all the milfoil identified in 2020 was now under control. Correspondence with residents during our lake appearance also supported those claims. This absence of milfoil permitted the increased treatment for native weed growth at Lake Erie. The site was posted on the day of treatment. In conjunction with the shoreline posting, the public boat launch was posted with two large signs. Posting at the boat launch was not necessary since the launch was under repair and closed. All postings stated what materials were planned for use and their water use restrictions. A private staging area just east of the public boat launch was employed during treatment. This is the same staging area NWAE has utilized since our involvement with the project several years ago. The site provides easy, safe, unobstructed access to the lake.

Material was off loaded from a locked cargo truck and emptied into two 25-gallon spray tanks secured within the application boat. As the boat discharged the material, it was refilled at the staging area. The process continued until the targeted milfoil was treated.

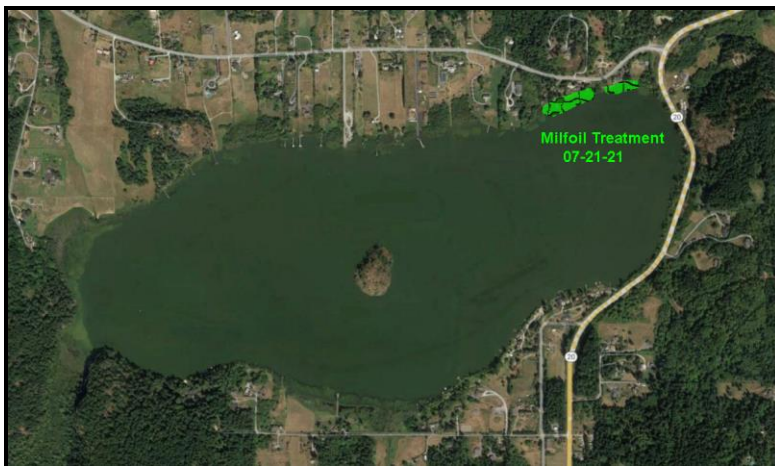




Lake Campbell Milfoil Treatment Sites 2020

Lake Campbell Treatment July 21, 2021

NWAE received an email from Skagit County that a resident noticed weed growth (milfoil) in and around her dock. Our crew visited the site and talked with the property owner on 07-21-21. Milfoil was identified present at the location. In response to our findings the immediate area and abutting properties received treatment. We were limited on the course of treatment resulting from our efforts at Lake Erie earlier in the year.



Lake Erie & Campbell Surveys October 11, 2021

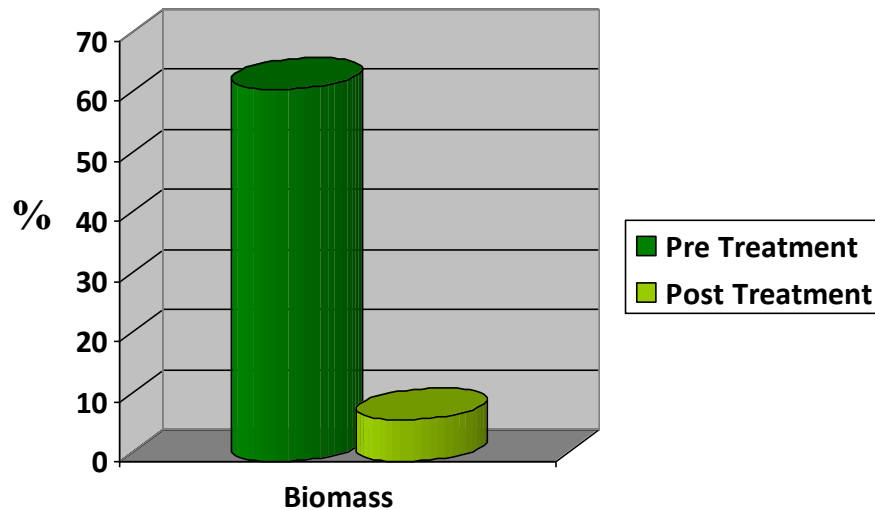
Lake Erie and Campbell were both surveyed on October 11, 2021. Both systems were noted observing plant growth. Milfoil was noted at both lake locations.

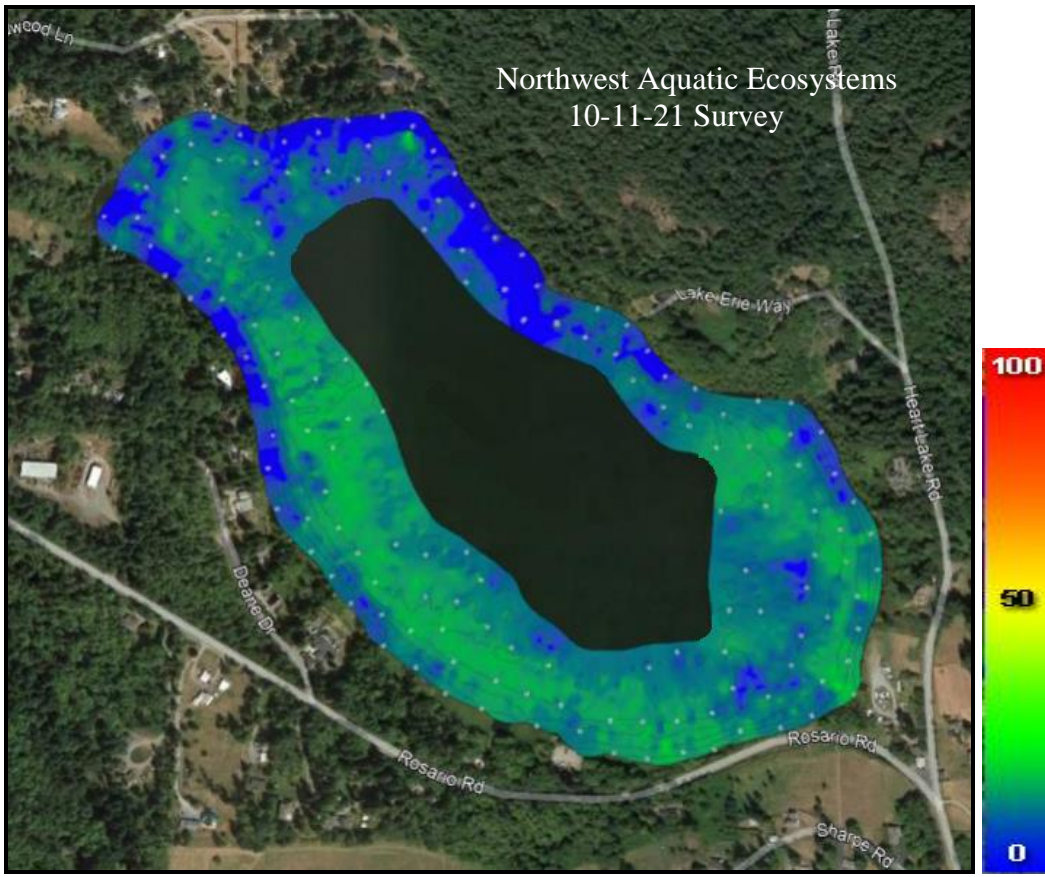
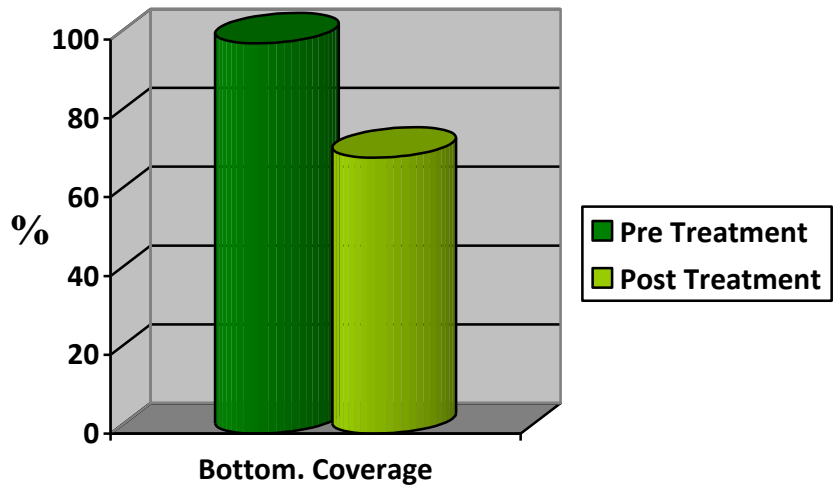
Lake Erie

A dramatic reduction in plant biomass was noted pre and post treatment. Pretreatment water column plant biomass volume was determined to be 62%. While post treatment water column biomass was reduced to 7.1%. Lake bottom sediments covered with aquatic plants pretreatment was 98.6%. While post treatment coverage was reduced to 70%. This small reduction in bottom coverage is misleading because most of the plants noted growing along the sediments were low growing filamentous algae and not native weeds that were noted during the spring survey.

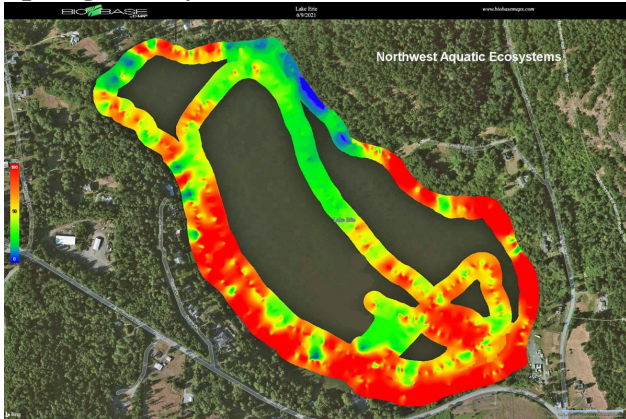


Nitella

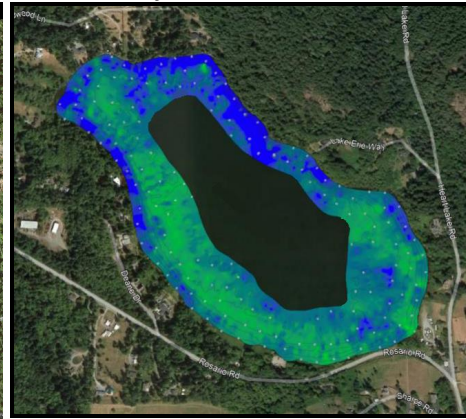




Spring Survey 2021



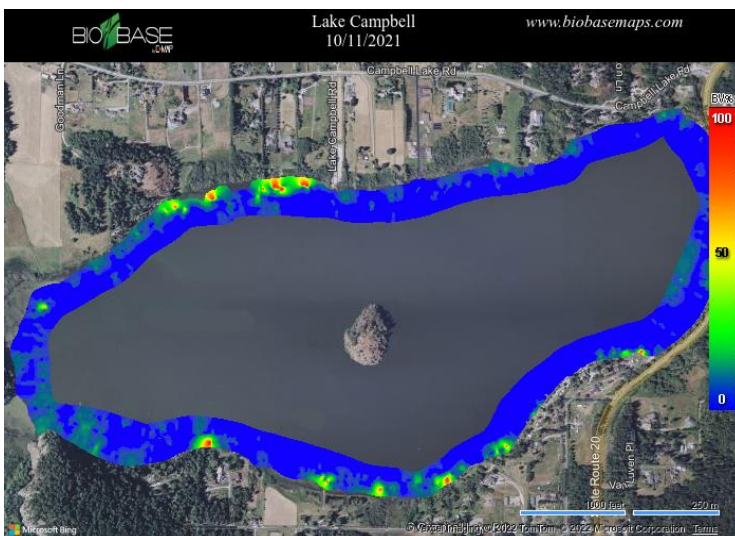
Fall Survey 2021



Lake Campbell

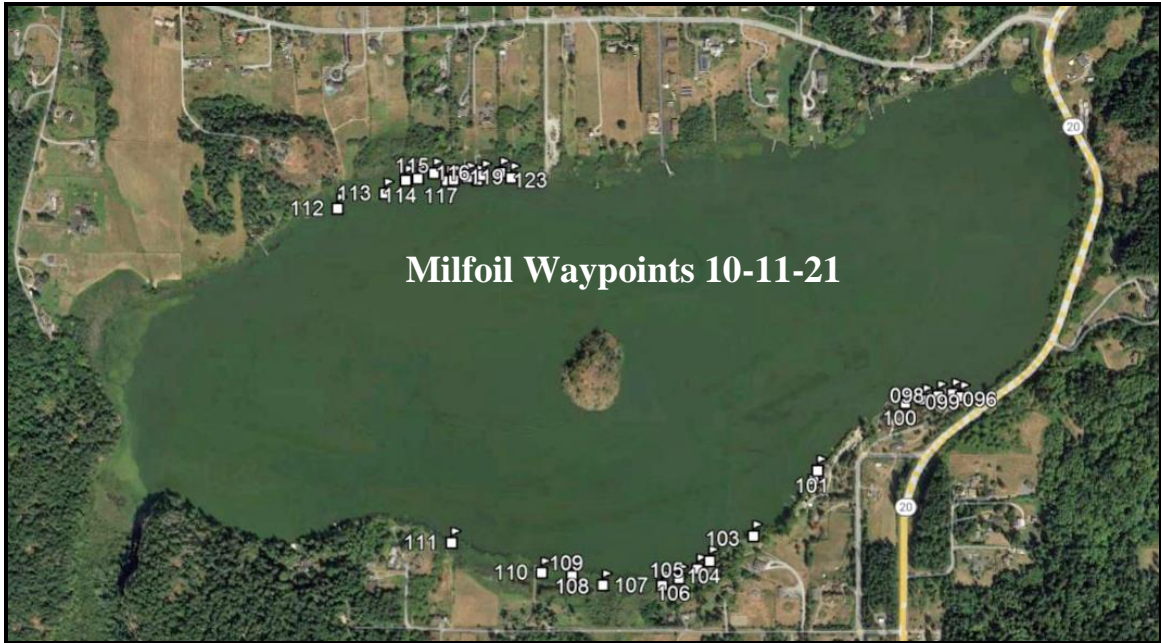
The fall Lake Campbell survey identified a decline in vegetation even though only two small areas of the lake received treatment. This decline is likely associated with the lake wide decrease in bottom dwelling filamentous algae as a result of poor water clarity. A late seasonal increase in Milfoil was also noted. This late milfoil surge appears to be similar to past late seasonal growth patterns. Having already exhausted budget revenue for the LMD, no fall milfoil applications were administered. Shoreline areas that had been sprayed earlier for lily pad, iris and loosestrife control were all exhibiting severe damage.

2021 was an unusual year for lake weed growth. Low lake levels associated with drought conditions and sunny days will typically promote weed growth in new areas of the lake that typically does not receive enough sunlight to support growth or seed germination. One explanation may be that other environmental conditions were present that assisted in the control effort because native plants lake-wide were also reduced.

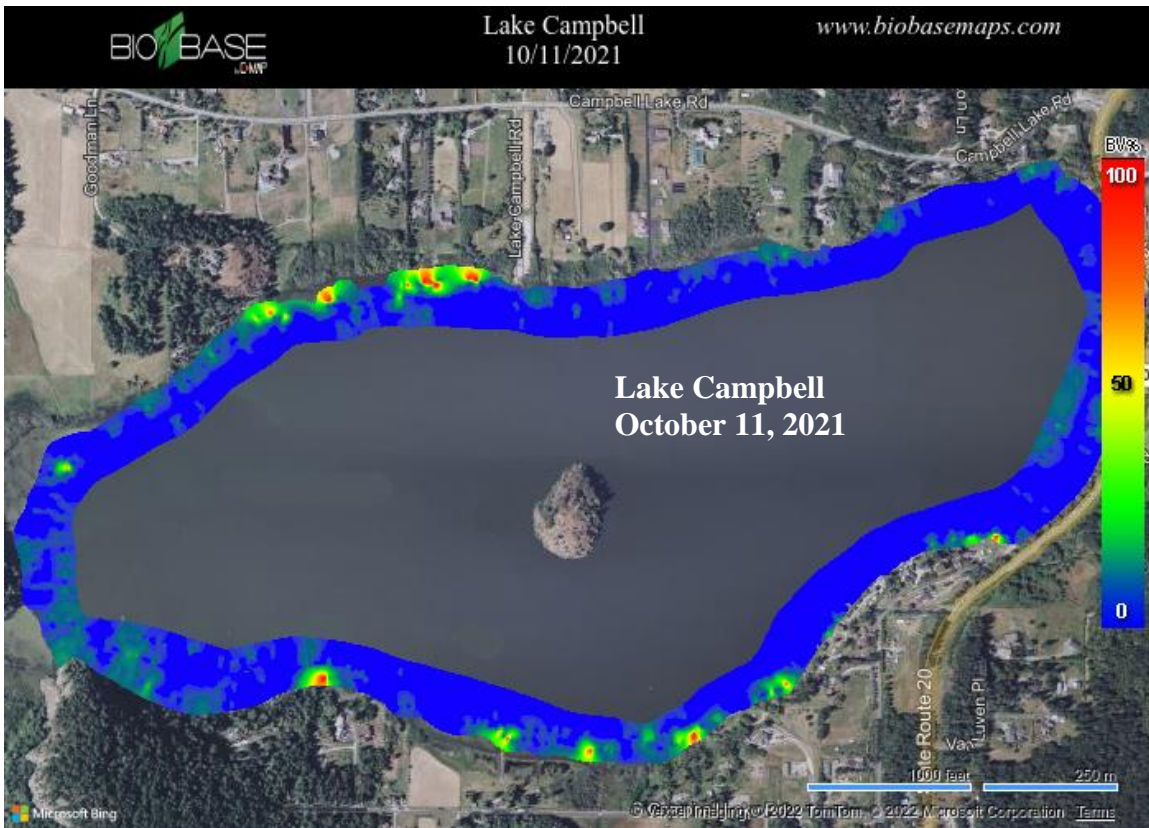
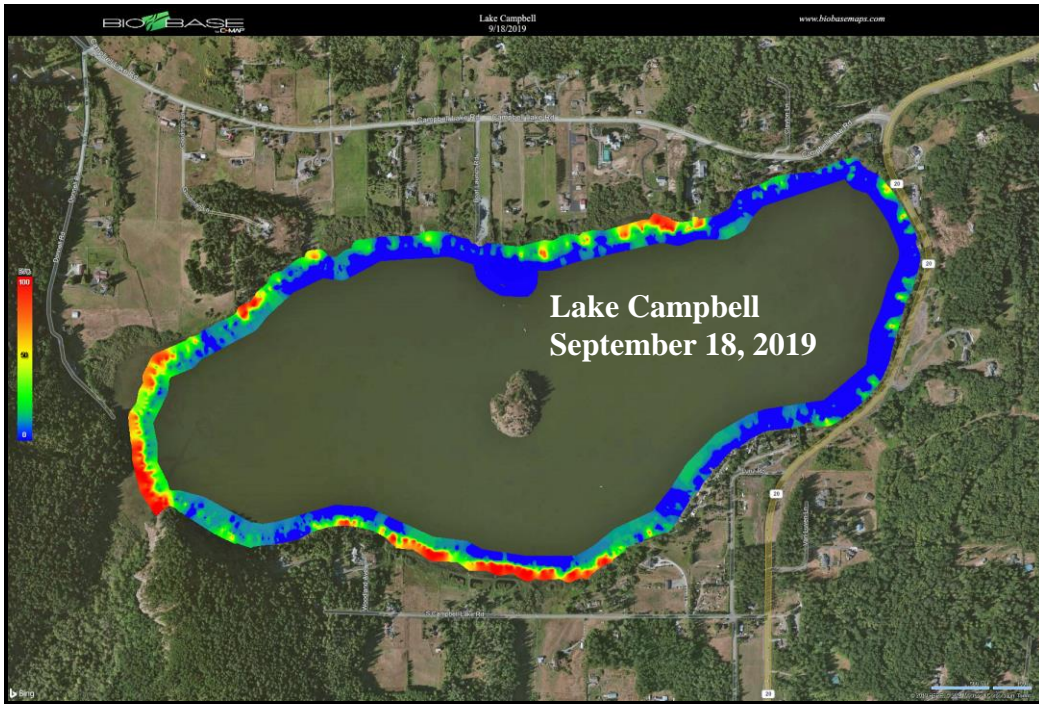


10-11-21 Survey

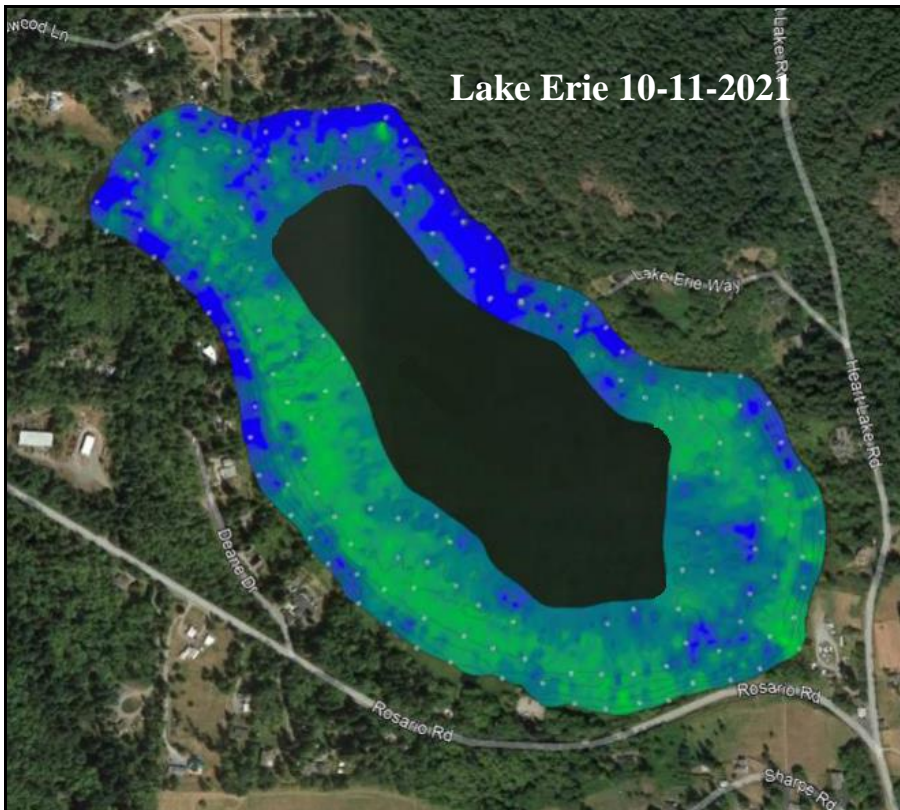
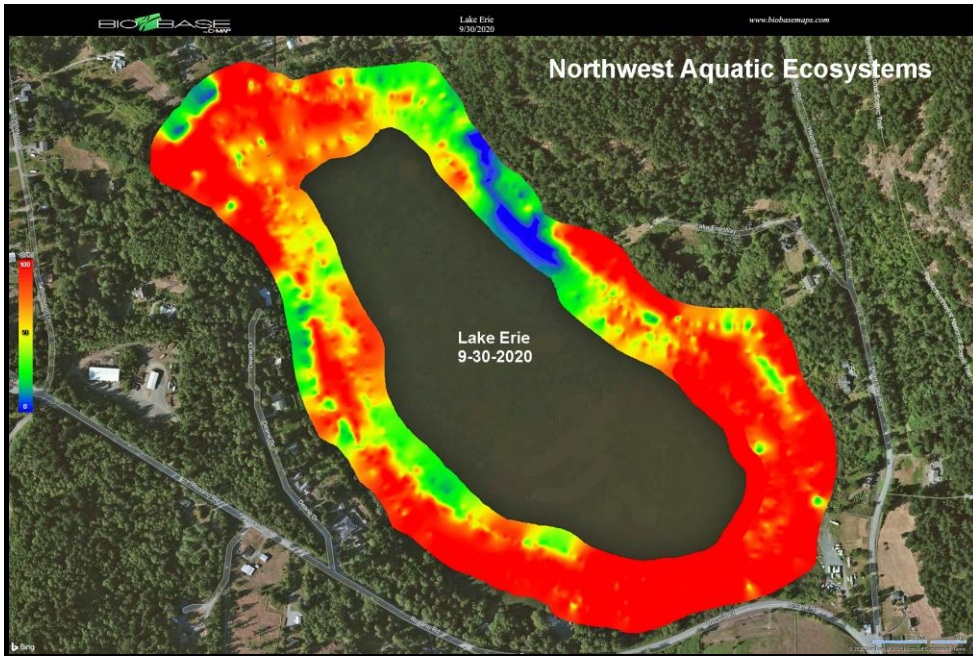
Blue - 0% Growth
Yellow - 50% Growth
Red - 100% Growth



Yearly Observed Density Changes - Lake Campbell



Yearly Observed Density Changes - Lake Erie



Recommendations For 2022

Both Lake Campbell and Erie have experienced past milfoil outbreaks after years of no substantial growth. Lake Erie also has exhibited dense native plant growth on a yearly basis. Native plant growth throughout Lake Erie, if left untreated, would likely result in reduced or no recreational opportunities to lakefront and local residents. The need to control both native and noxious species poses a difficult management issue. Should the LMD funding model once again prioritize noxious weeds as the targeted species and native weeds as a secondary target when funds are available? This approach would delay early treatment of nuisance species at Lake Erie until after early seasonal and late milfoil growth is addressed. Currently, the spring survey dictates where funding is directed.

During 2021 the spring surveys identified little early seasonal milfoil at Lake Campbell and dense native plant growth on Lake Erie. Funding was allocated to address the dangerous Lake Erie problem under the assumption that only limited treatment would be necessary at Lake Campbell. As the season came to a close it was identified that new milfoil colonies had emerged within Lake Campbell that should have been addressed. Funding, however, had already been exhausted.

The shallow nature of Lake Erie and the permit requirements of allowing only 50% (55 acres) of the same lake areas to be treated over the five-year permit cycle, provides a yearly seed bank to produce dense weed growth on a yearly basis. As non-treated areas mature, seeds are consumed by waterfowl, dislodged through boat traffic and are deposited back within the entire lake. The cycle is never ending and provides only seasonal control. Some years Lake Erie has required two applications.

We also anticipate a need within the next few years to start addressing native plant growth within some of the residential shoreline areas of Lake Campbell. Native plant growth has slowly developed within some of the shoreline areas of the lake that are residential. The emergence of these native plants benefits the biology of the lake but unfortunately will eventually restrict lakeshore access and recreational use. Native plant issues have never been an issue or planned for at Lake Campbell. Future management plans and the funding of such plans focusing on native plant growth needs to be discussed.

Northwest Aquatic Eco-Systems recommendations for the 2022 season:

1. Late may early June survey of both Lake Erie and Campbell. In the past, this survey date and results directed where and how much funding would be allocated to the different components of the program. The spring survey does provide a very good baseline for Lake Erie but at times has been misleading when directed at Lake Campbell. In an effort to avoid the milfoil shortfalls noted for Lake Campbell the approach for 2022 budgeting should use the late summer fall survey of Lake Campbell as the baseline. Milfoil plants noted during the fall of 2021 will likely again reside within those same lake areas for the 2022 season.

2. Examine LMD budget excess and determine how much if any additional funding could be allocated for the 2022 treatment for native species.
3. Treatment at Lake Campbell should be delayed until all anticipated milfoil colonies have emerged from their root crowns. Milfoil typically germinates early in the season. This does not appear to be the growth pattern in recent years for Lake Campbell.
4. Have minor targeted control of spatterdock 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. Spatterdock and lily pad growth now appear to be in a maintenance mode. Loosestrife and iris will continue to be addressed as funding becomes available.
5. Treatment of the problematic Lake Erie native weeds will need to be assessed after the spring surveys in an effort to ensure that adequate budget resources are available to address any potential unexpected milfoil issues.
6. Continue use of the new survey technology. This technology and mapping have 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. Current mapping technology is the industry standard.
7. Discuss LMD assessment level and possible increase.
8. Material costs have increased considerably from 2021 pricing. Some materials have experienced over a 100% increase in cost from 2020. Some materials likely will not be available until the second quarter of 2022.
9. All price related increases associated with other industries noted during 2021, have also impacted the aquatic industry. Expect less treated acreage under the same budget.