

American Lake Eurasian Milfoil Program 2019 Year End Report



Prepared for
City of Lakewood

AquaTechnex,
LLC

www.aquatechnex.com

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Introduction

American Lake in Lakewood, Washington has a history of being impacted by invasive aquatic species. *Myriophyllum spicatum* or Eurasian Watermilfoil has been a major problem in lakes along the I 5 Corridor in Western Washington for several decades. At some point in the past, this plant was introduced to American Lake. Eurasian Milfoil spreads via fragmentation. Generally, the plant will move into a lake transported on a boat trailer. Once there, it will grow root hairs and sink to the bottom and establish. As the plants mature each year, they spread within the lake by fragmentation. Milfoils can grow up to a foot per week and rapidly replace native aquatic vegetation in the system. By the summer of 2017 the problem in American Lake was widespread.

The City of Lakewood and the American Lake community, including private property owners and representatives from Camp Murray and JBLM, banded together to develop an Integrated Aquatic Vegetation Management Plan. The first year of this plan focused on significantly reducing the population of Eurasian Milfoil in the lake to the point that small maintenance treatments in future years could hold the problem in check.

An RFP was issued by the City and awarded to our firm. The objective of the work for 2019 under this agreement was to perform a pretreatment survey to determine if there had been a change in the populations, to develop and implement a treatment program using ProcellaCOR herbicide and monitor the results. This report will summarize this work and findings.

Summary of operations

The American Lake survey occurred shortly after award of contract. At the end of 2018, the Integrated Aquatic Vegetation Management Plan and survey work that supported it had mapped approximately 120 acres of Eurasian Milfoil. The survey conducted in the summer of 2019 found that closer to 166 acres were now infested in the littoral area of the lake. This had the potential to exceed the budget and pricing quoted in the winning RFP.

Based on the City's desire to have a significant impact on the plants present, our team revisited the pricing. We had used an average depth from the shoreline to outside edge of the treatment zones to calculate the amount of herbicide necessary to treat the acres present at the end of 2018.

We broke the acres found in 2019 into three zones based on average water depths. This allowed us to use less material in the acres that were shallow, a bit more as per label in a second zone marked medium depth, and the most in the area mapped as deeper. So instead of treating 166 acres with one average depth, we treated 48.3 acres mapped as shallow, 111.52 acres mapped as medium and 6.7 acres mapped as deep. In this fashion we were able to treat at label rates and expand the number of acres treated with the same chemical budget that was assumed in the proposal that was submitted.

ProcellaCOR herbicide was not allowed for use in Washington State until July 5th of this year when the revised NPDES permit for application of aquatic herbicide became active. The vote on a Lake Management District and contracting also took place in June and early July. On completion of contracting, the survey work and communication with the City, the first application was planned for August 1st. A 10 day prior notice was delivered to all shoreline residents informing them of treatment and water use restriction. In this case ProcellaCOR restricted use of water from the treatment area for 24 hours.

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The Tacoma Country and Golf Club has a water right and withdraws water to irrigate the golf course from American Lake. During the summer months, a golf course requires from 500,000 to 1,000,000 gallons per night to maintain turf health. As the lake was the only water supply for this purpose, we worked with the Superintendent to come back later in the summer when rain supplied relief from the need to irrigate and target the areas around the Club's intake.

On July 31st, our team mobilized a posting crew to the lake and performed shoreline signage posting as required by the permit. On August 1st, we mobilized three application vessels to the lake, assigned them treatment zones and began making the application of ProcellaCOR herbicide. The work began at approximately 7 am and was completed at approximately 3 pm.

In late August the City notified us that a competitor has provided a picture of milfoil along the shoreline and comments about the treatment not working. There was a green dock located in the picture, but no address was provided for that location. We surveyed the shoreline and located the dock in the imagery. This location was not part of the treatment area. At the time of the survey in early summer, milfoil was not observed at this location and not included in the treatment area. As we were coming back to treat the County Club zone in September, we added this location to that treatment plan and targeted that growth.

We performed two surveys, one in September about 6 weeks post treatment and a second one on October 9th.

Summary of results

We performed two surveys.

The first trip to the lake was approximately six weeks post treatment on September 12th. All areas of the lake showed signs of severe herbicide injury. Some of the zones in the western portion of the lake has plant still standing however and it was decided to do a second review in a few more weeks to allow the plants to move through the process.

The second review and survey of the lake took place on October 9th. We mobilized a survey team equipped with an underwater video drone system to the lake so that observations of our team could be recorded for display to the City in this report.

The results of this survey are shown on the attached maps and video links. It should be noted that at the time of treatment the water levels in the lake were approximately three feet higher than during the October survey, and on August 1, the milfoil was either topped out or within a few inches of the lake surface at this higher water level.

The first map is of the treatment areas that were subject to herbicide application. The second map provides an overview of conditions in the lake at approximately two months post treatment.

There are two zones mapped with respect to control. We experienced two different situations on the lake.

Zone one is labeled Milfoil Dead. The milfoil beds in this zone are dead and gone from the water column. There are however significant levels of native aquatic plant growth present. Potamogeton species and Vallisneria were the dominant species present. These plants while present are not the

dense mat forming beds that milfoil presented prior to treatment. It is probable that removing the milfoil allows this growth to recover into this zone.



Aquatechnex biologist deploying 4k video drone system. This system has 4K resolution camera, is controlled by handheld system and is steered to locations to video or runs programed transects.

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Two representative underwater videos are presented here:

- North shore east of beach. <https://vimeo.com/365405388> Naiad, vallisneria, pondweeds present.
- South shore west of Tacoma Country Club <https://vimeo.com/365407452> dense milfoil monoculture present pre treatment. Pondweeds, vallisneria, naiad and elodea present.

Zone two is labeled severely injured. Plants in this zone all showed herbicide symptomology, all stems 6-8 feet below the water line level on day of treatment, more than half of the stems laying over and defoliated. There was also green growth remaining on the stems in perhaps 50% of the plants present in this zone (all stems however showed herbicide impacts). Two representative underwater videos are presented here:

- Beach area in front of VA Facilities. <https://vimeo.com/365396110> Note all stems injured, significant numbers laying over, some green growth remaining on declining stems.
- Area on south shore at start of severe injury zone <https://vimeo.com/365409197> same as above.

We have discussed this development with both the manufacturer, SePRO, and federal research scientists that have been following ProcellaCOR treatments for a couple years in the field nationally. There have been occasions where control takes longer than a few months to complete, so there is some possibility that these plants will still die out. A survey this coming spring should be performed to confirm or map any surviving plants.



Boom jet system designed to apply ProcellaCOR at water surface used on American Lake Project

The second point is the only variable that seems different is that all of the areas where milfoil is injured and not completely gone was treated with a new application set up. SePRO indicated that the herbicide moves into plants so fast that later in the season the herbicide should be applied where the apical tips of

the plant are in the water column. We built a boat spray system to make surface applications where the majority of the apical tips of the plant were in the mid to late summer, at the water surface.

Two of our application boats worked on the areas where we obtained excellent control. They used our standard drop hose system that injects the herbicide and mixes it in the upper four feet of the water column.

The one new system used a surface spray boom-jet system that applied the herbicide right on the water surface. This boat did all of the work in the western portion of the lake where control is not as rapid. There is a distinct line where the one boat stopped, and the new boat started.

This is a new herbicide and people are still learning about it in the field. One theory might be that the herbicide that was surface applied absorbed very high in the plants, at the lake surface and damage causes may have limited translocation. The boom systems that injected may have more rapidly exposed more of the plant vertically in the water column and absorption occurred at more points on the plant stem vertically in the water column.

In any event, the results in a portion of the lake are not complete.

Lessons Learned and suggested steps forward

As mentioned, this is a new herbicide and people will be learning about how it behaves under different field conditions as time goes on. The biology and plant conditions vary from lake to lake and region to region. There have been similar cases where control was thought to be less than optimal a few months after treatment, but plants did not reappear the following year.

The fact that the permit did not allow us to use this product earlier in the year could have some impact on this as well. While this and most other auxin herbicides perform well all summer long, they can work better at lower rates in the early summer when the plant is more actively emerging from the winter and growing rapidly. Starting earlier in future treatments could optimize results.

In retrospect, our attempt to treat more acres for your budget may have been a mistake. We might have treated fewer acres at a higher rate and that may have changed things.

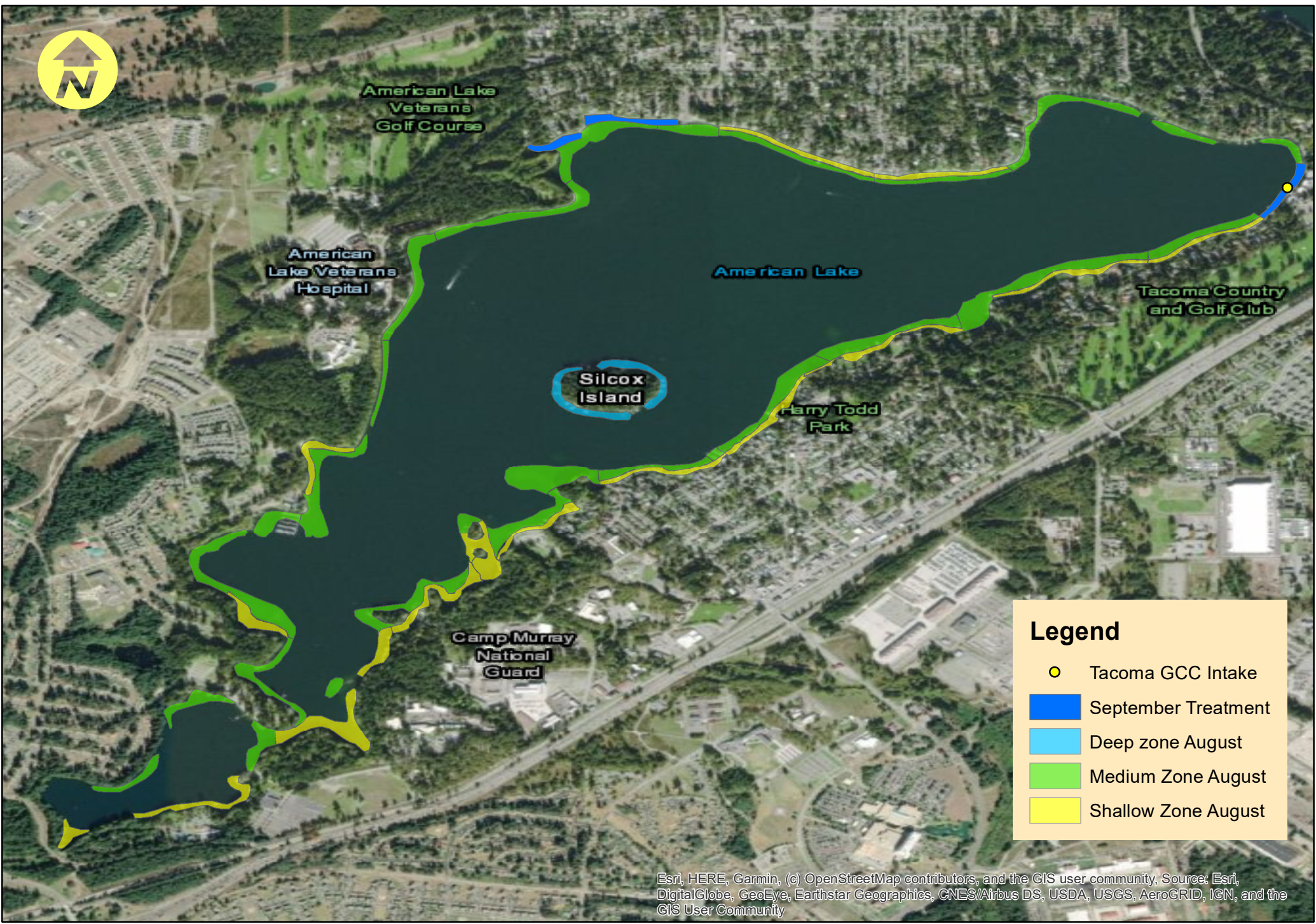
But the primary factor that differentiates control is the boats that worked on the lake. This boat was built specifically to address where the manufacturer wanted to put the herbicide in mid to late summer, and it may be that it doesn't work as well as the drop hose system in terms of exposing the plant in the water column to the herbicide. While this is an opinion, it seems well founded.

We would suggest the following steps:

In the spring of 2020, starting in mid-May, the lake should be inspected to determine if there is regrowth in the areas mapped as injured.

Our contract expires at the end of this year. If it is renewed, and there is significant regrowth in the areas mapped as severely injured, we would offer to perform a second application to these zones providing the herbicide and the application equipment and team to finish this off at no additional cost.

Please address questions to Terry McNabb, 360-201-2612 or tmcnabb@aquatechnex.com.

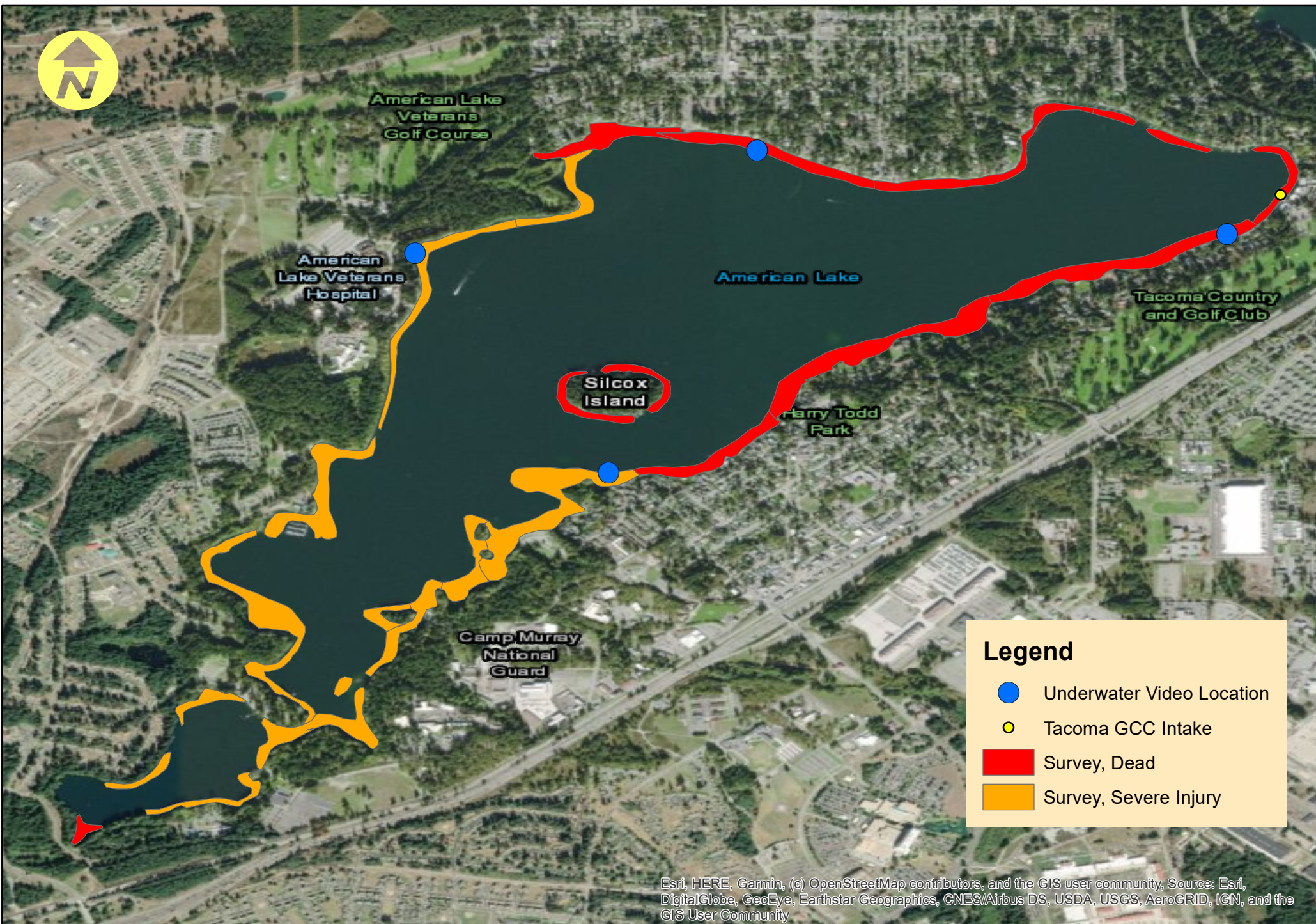


Legend

- Tacoma GCC Intake
- September Treatment
- Deep zone August
- Medium Zone August
- Shallow Zone August

Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

American Lake Eurasian Milfoil Treatments, Summary of Control



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

American Lake Eurasian Milfoil Treatments, Summary of Control