



2012 Lake Tapps Eurasian Milfoil Diver Removal Project Summary

Prepared for Cascade Water Alliance

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Summary of Diver Operations at Lake Tapps, Summer 2012

Overview

Lake Tapps is located in northern Pierce County, Washington near the Village of Bonney Lake. This system was developed by Puget Power as a hydro-electric generation facility some 50 years ago and impounds approximately 2,750 surface acres. The lake shoreline is well developed and the lake heavily used for recreation and fishing. There are two public accesses to the lake and a number of private community access sites. Cascade Water Alliance took control of this reservoir in recent years and is developing the system as a future potable water supply for its customers.

For a number of years, this lake has had an expanding population of the invasive aquatic weed Eurasian Milfoil. This aquatic plant is listed by Washington State as a Class B Noxious Weed and causes considerable problems in infested waters. The dense mats formed by the plant impact boating and presents an unsafe condition in heavily used swimming areas. They also degrade water quality and aquatic habitat.

Cascade began a program to combat this invasive weed three summers ago. A treatment program designed by Tetra Tech and implemented by Aquatechnex utilized Sonar Aquatic Herbicide in 2010 to target approximately 400 acres in locations where the plant colonies were considered to be the most problematic. A second smaller treatment in 2011 focused on moving out from the core treatment area and targeting additional acres. The primary herbicide utilized in that process was Renovate OTF granular. By the early summer of 2012, Tetra Tech Survey work showed that there had been a very major reduction in the populations in the lake to the point where they wanted to utilize diver teams to target and remove remaining plant communities.

Aquatechnex was requested to provide diver teams to perform this work. This report will provide a summary of the work performed and our thoughts on the results and remaining efforts required.

Cascade provided a not to exceed budget of \$40,000.00 for this work effort for the late summer of 2012 efforts. Aquatechnex provided a quote of \$2,300.00 per day to supply two divers, tenders, a diver support vessel, fuel, compressed air fills and travel to and from Lake Tapps. With sales taxes, this budget allowed for approximately 15.5 days of operation.

Operations

Aquatechnex team met with Cascade staff at the lake on August 29th to begin operations and develop a pattern for survey. The group decided that the team should perform a towed diver survey of those portions of the reservoir not mapped as having heavy growth, to locate and remove by hand those plants that could be collected without slowing the survey effort too much, and mapping spots where plant removal would consume time. After completing this circuit, the team could focus time on those areas that could be cleared easily. Areas that would be very time consuming to clear would be weighed against the cost of herbicide treatment.

Diver Operations were conducted on the following dates:

August 29	August 30
August 31	September 4
September 5	September 6
September 20	September 21
September 24	September 25
September 26	September 27
September 28	October 1
October 2	October 3
October 4	October 5
October 15	October 16
October 17	October 30
October 31	

As we progressed around the lake, we found a considerable number of pioneering or small communities of Eurasian Milfoil well dispersed through the littoral area of the lake. Most of these were younger plants and located in deeper water where they would generally not be visible to a boat survey. While we were budgeted to work for 15.5 days, the initial 4-5 days were spent in primarily reconnaissance and the team focused more on getting a clear picture of conditions so that the time spent clearing vegetation could be maximized. While we did remove plants during this portion of the mission where we could do so fairly rapidly, we found scattered Eurasian Milfoil plants at varying densities throughout most of the areas we covered. We then began to focus our efforts on clearing these zones where we could be the most effective with this type of effort and the budget allowed. Our diver team worked on the lake for 23 days on both of these efforts with 16 days focused directly on manual Eurasian Milfoil removal. We did not bill in excess of the authorized amount. We felt that the few days spent in primarily reconnaissance mode allowed us to focus the time spend with focused removal with better information and we absorbed those days ourselves.

Comments for Consideration

Manual removal diving projects have fixed costs per day, largely driven by labor. This work has been determined not to be a public work where prevailing wages are required, but having quality divers that can work underwater for an extended period of time commands wages close to or beyond the prevailing wage rate.

The production a diver team can deliver per day is a function of a number of factors. The density and distribution of Eurasian Milfoil plants is a primary driver. Small areas with dense colonies can consume multiple days to clear, while stretches with scattered plants where the divers can remove them and move along can be cleared fairly rapidly. Lake bottom substrate also has a significant impact. The objective is to remove the plants and the root crowns where ever possible. In very soft sediments, this process is relatively easy as the roots can be felt by the divers and come out very easily. Much of Lake Tapps has a very hard and in many cases rocky substrate. This both slows removal and the divers are

less sure they are removing the entire root crown. It's often not clear in these hard sediments if you have captured the entire root crown. Water clarity is the last primary driver. Lake Tapps water clarity was generally good and the lack of soft substrates generally limited suspension of sediment into the water column. Divers can cloud the water as they operate when sediments are soft and easily disturbed. When this happens the diver team can have an obscured view and may miss plants present unless they repeat the process in the same area after sediment settles out. Repeating the process however also means you have to double the search through one area or zone.

Attached is a map showing those areas that the divers cleared of Eurasian Milfoil plants that were emerged from the lake bottom within the littoral area. The areas that were covered in this process of 18 days of diver operation were approximately 102 acres.

It should be noted that this production was focused on areas where the team could make progress. There are other areas of Lake Tapps where Eurasian Milfoil densities are such that 15 days of diver operations may not have cleared 1-2 acres of infestation. Many of the gaps between these cleared areas have Eurasian Milfoil present at densities that would have dramatically reduced the shoreline coverage because of the time necessary to target them.

At some point the economics of diver removal vs. herbicide treatment needs to be considered. Using a granular product such as Renovate OTF aquatic herbicide, treating shoreline strips is very effective. The benefits of utilizing a herbicide when plant densities are higher are:

1. Cost per area covered can drop dramatically
2. Herbicides in the water will impact all of the plants in the treatment area, visibility is not an issue. Divers can miss plants if visibility is poor, herbicides will not.
3. A systemic herbicide like Renovate will translocate and kill the root crowns. In very hard substrates such as this, in some cases divers may not be able to find or remove the entire root crown woven into the rocks and clay.

The cost to treat one surface acre with Renovate OTF under these circumstances would be approximately \$750.00 for materials and application. The Eurasian Milfoil encountered in most of these areas is located in shoreline bands that average from 25 to 75 feet wide. Using a strip treatment band of 100 foot in width, one surface acre will extend approximately 435 feet parallel to the shoreline. As such, the cost of one day of diver operations at \$2,300.00 would equal herbicide coverage to a 1,300 foot by 100 foot area parallel to a shoreline or about 3 surface acres.

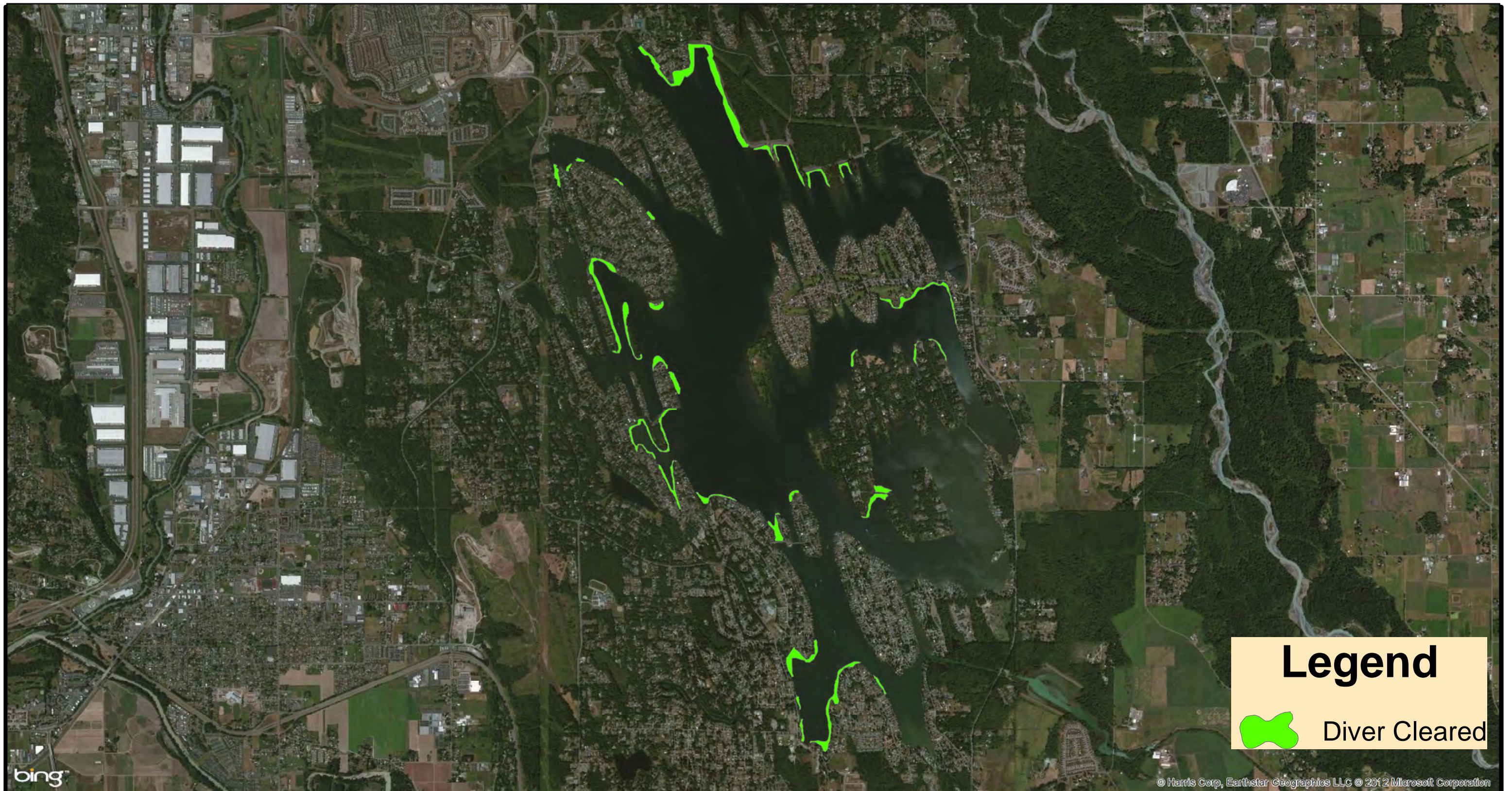
Using an alternative systemic herbicide such as Renovate MAX G (combination of Triclopyr and 2,4-D) could reduce the cost per acre to approximately \$650.00 and the cost of one day diver operations would cover 1,550 feet parallel to the shoreline. A second option would be Sculpin Aquatic Herbicide (2,4-D amine granular) at a cost of about \$475.00 per acre and that would treat an one day diving equivalent of 2,100 feet of shoreline.

The areas covered in this summer's operations totaled approximately 102 acres and this means divers were able to view and clear about 3-4 acres per day. This is only possible in areas where densities are low. Many of the areas bypassed would have consumed much more that would have been economically feasible.

It is our recommendation that we meet with Harry Gibbons and combine our GIS files with the Tetra Tech project they are maintain for you. I think a discussion with them over the winter on what we observed and what we would recommend for treatment in addition to those areas they are considering would be beneficial. Our overall feeling is that while earlier in the summer Eurasian Milfoil growth was relatively low in the lake system, by summer's end many of the areas not targeted by this removal mission hold populations that are probably very much more economically dealt with using a systemic herbicide.

Alternatively we may also want to try some drawdown treatment plots this winter if the lake bed is exposed where milfoil colonies exist. This technology has worked very well on Lake Pend Oreille and a number of other sites where we can access and treat the soil in a pre-emergent fashion. Where this is applicable, it can cut the cost of herbicides on a per acre basis substantially.

Questions should be addressed to Terry McNabb, 360-201-2612 or tmcnabb@aquatechnex.com. Thank you for your consideration.



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Legend

 Diver Cleared

Lake Tapps Eurasian Milfoil Control 2012
Areas Cleared by Divers



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