Lake McMurray
2017 Aquatic Plant Control Program

Prepared By
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December 2017

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Project Overview

This was Northwest Aquatic Eco-Systems (NWAE) fifth year of providing aquatic weed control services for the Lake McMurray LMD#2. Our 2017 efforts were similar to those noted during prior treatment years. Lily pad and yellow flag iris chemical weed control was performed outside of a ¼ mile radius of the McHaven potable water intake. This distance once again provided for water analysis results exhibiting no herbicide residue near the McHaven potable water intake. 2016 was the first year manual lily pad removal was provided to approximately twelve lakeshore residents and the McHaven development. This group had not participated in any of the past spraying events nor had they been part of any LMD sponsored platform supporting lily pad control alternatives. This manual weed control was continued into 2017. During 2017 the manual component portion of the project consisted of two cutting events accomplished at approximately a 30 day interval.

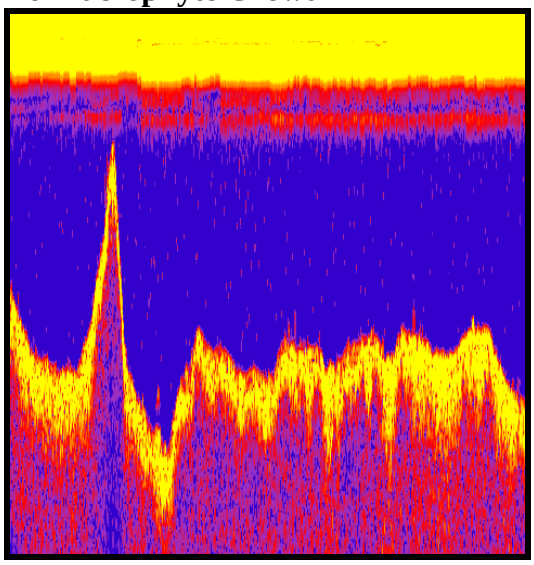
No nuisance submersed weed control was undertaken during 2017 as a result of the plant species present and materials available to control that particular plant. Use of diquat (material with the ability to control this problem) during 2014 produced residual drift that reached the McHaven intake. With the unfavorable drift results obtained during 2014 no further use of diquat is permitted. McHaven is the only registered potable water intake lake wide. This intake supplies potable water to a small community located just north of the boat launch. The McHaven system has the ability to store water on site for a few days, depending on water usage.

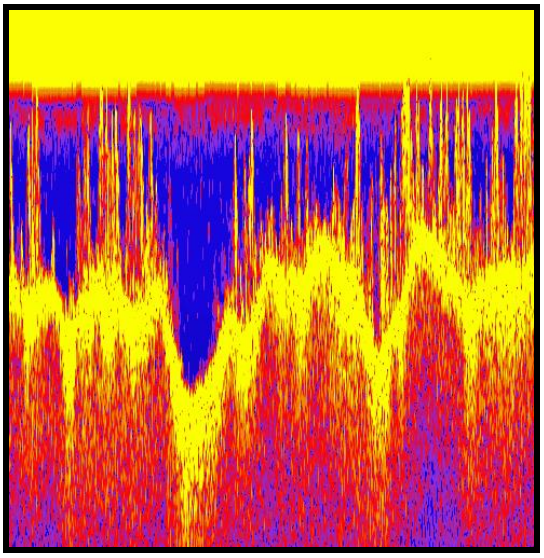
Lake McMurray is 160 acres and is approximately 9 miles to the Southeast of Mount Vernon. The lake is the headwaters of the Nookachamps Creek, tributary of the Skagit River. Nearly 50% of the shoreline is developed with over 90% of the development occurring along the western and southern shorelines. Water skiing and high speed motor boat use are prohibited. Currently the Lake McMurray program format still emphasizes milfoil control but also includes fragrant waterlily and yellow flag iris control. Native plant communities have increased in densities throughout various shoreline areas of the lake, reducing recreational opportunities. Lake McMurray supports shoreline swimming, a healthy recreational fishery and small boat use.

Survey Protocol

2017 sonar data was collected similar to those noted during 2014, 2015 & 2016. Electronic data was collected on a chart recorder utilizing sonar and structure scan transducers. Milfoil, when identified, was recorded as a waypoint during the survey. Surveying was terminated once plants were no longer detected on the chart graph recorder's monitor.

No Macrophyte Growth **Macrophyte Growth**



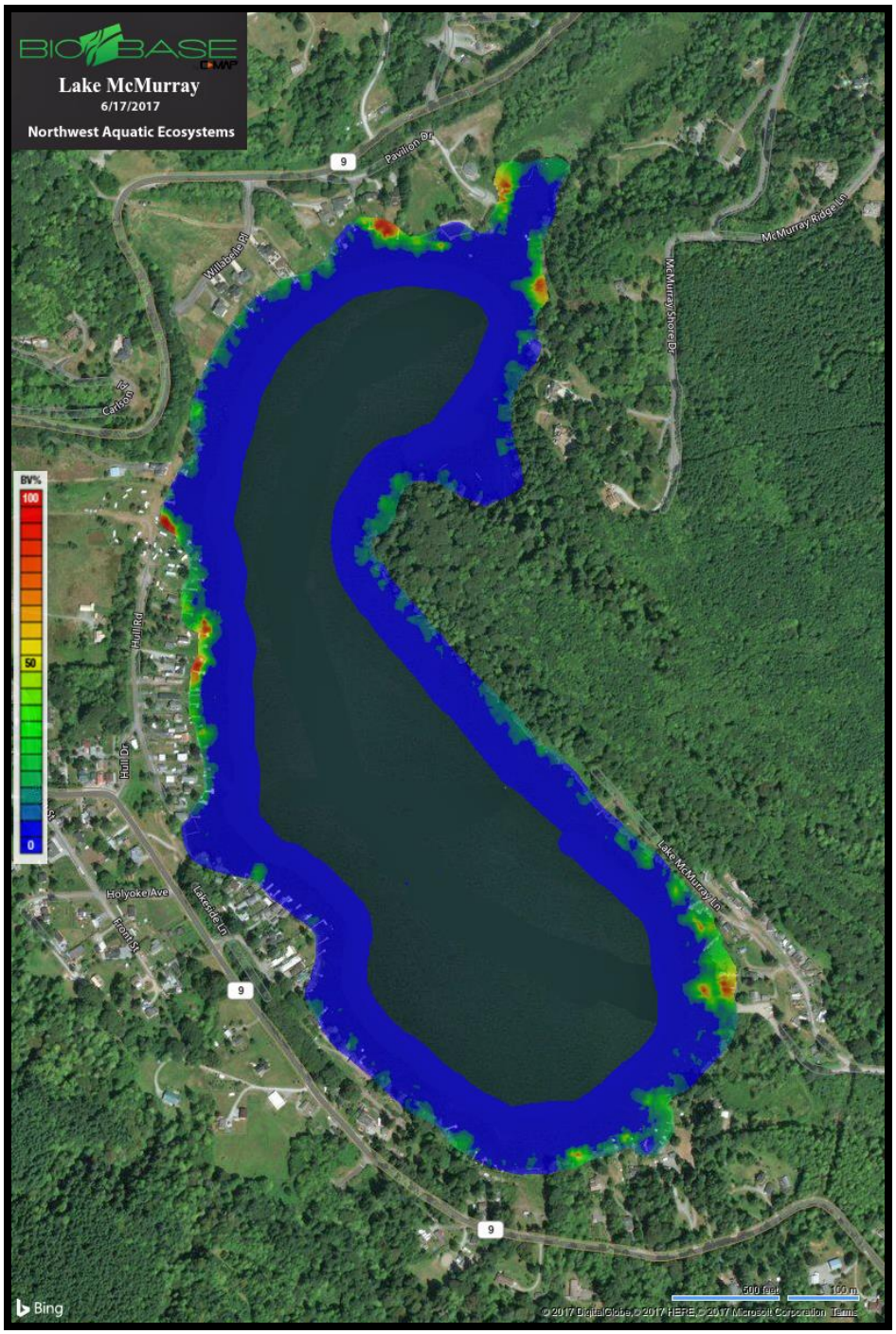


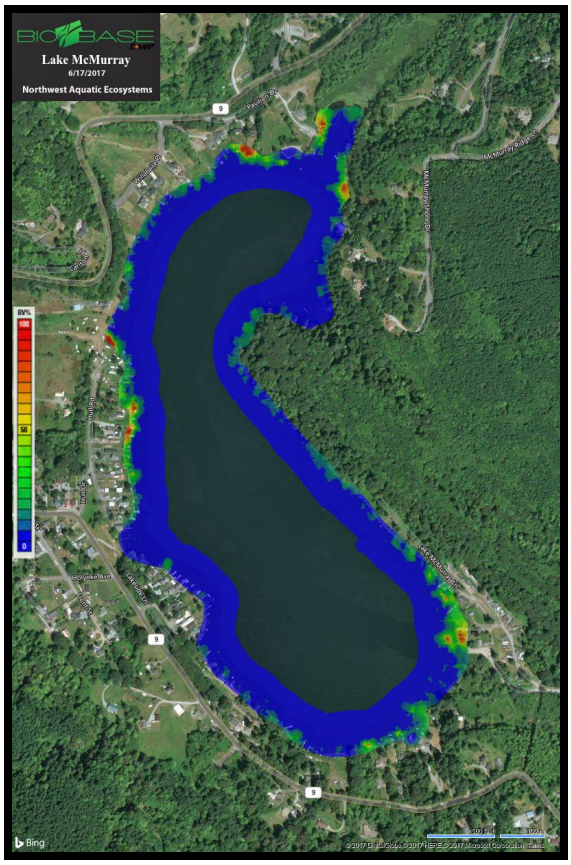
Once collected, the SD card was uploaded via cloud based technology and the processing of the data was finalized. Not only is a well defined map produced but a sonar log of the survey is saved allowing a complete review and evaluation of the survey to occur in-house. The survey entails a surface vehicle 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 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 stores the position of every transect data point enabling the mapping of thousands of data points on a daily basis.

Lake McMurray Spring Survey Results

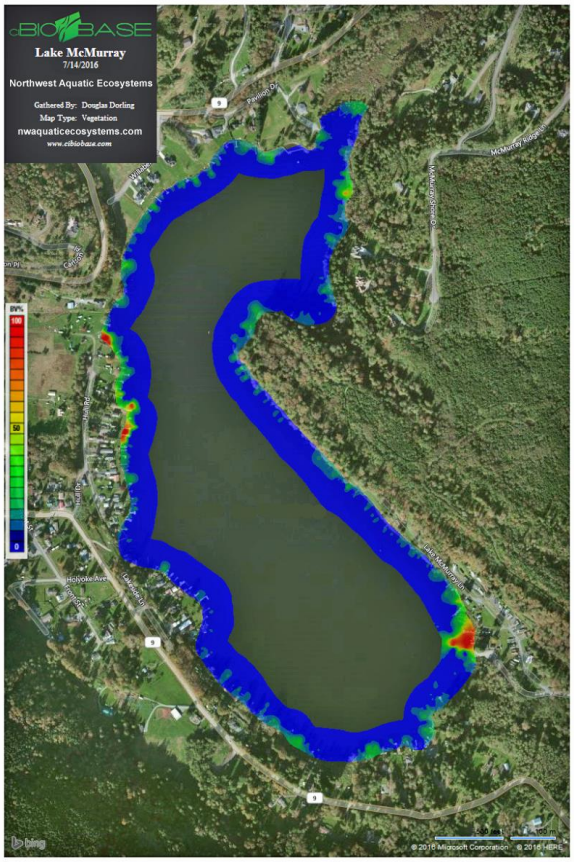
Lake McMurray was surveyed on June 17, 2017. Water clarity, as expected, was excellent. Bottom sediments were visible throughout most of the lake's littoral zone. No milfoil plants were identified as was similar to years past. Results of the spring 2017 survey resulted in growth of the submersed species elodea and pondweeds along residential shoreline areas like those that have been historically identified. No pattern existed related to plant densities lake wide. Some areas appeared less dense while others exhibited thicker growth. The area associated with the McHaven development exhibited lighter growth than in prior years. This may have been the result of an early survey performed during 2017. Yellow flag iris plants appear not to have increased in range and were identified sporadically along the shoreline at approximately 50 locations. Most infestations were small, less than 15 square feet in area. Fragrant water lily plants were noted lake wide with the largest infestations occurring at the outlet portion of the lake and in the southeast corner just north of the public boat launch. This species is no longer

increasing in range as past glyphosate applications have been successful. Pondweeds and elodea species dominated the lake's macrophyte composition. Pondweeds have established themselves as problematic in some shoreline areas of the lake and discussions associated with potential treatment may be appropriate. These pondweed infestations can be controlled with Aquathol K a product that decomposes to simply hydrogen carbon and oxygen. Aquathol K's half-life is hours. Cost associated with monitoring must be considered.





2017 Macrophyte Survey



2016 Macrophyte Survey

Blue areas indicate no submersed macrophyte growth.
Green areas indicate moderate growth.
Red areas indicate 100 % coverage

Major Lily Pad Locations

Treatment

Lake McMurray received treatment for lily pads and yellow flag iris on August 15 & 28, 2017. Only infestations more than 1/4 mile from the McHaven potable water intake were targeted. An 18 foot aluminum boat equipped with one 25 gallon spray tank was utilized during this spray event. The 25 gallon tank was filled with lake water; Glyphosate and surfactant were then added directly to the tank. Once mixed, the application boat drove along the shoreline identifying targeted species. The spray mixture was then discharged directly onto the plants' leaf structures using a spray gun. When emptied, the tank was refilled and discharged as needed. Spray mixture consisted of a 1% solution of glyphosate.

The pads sprayed during these events were noted as being smaller and less dense than those in the untreated lake areas. Plant density in treated areas was decreased and some prior existing patches had been eradicated.

Monitoring

Samples were collected on August 15, August 19, August 28 and, September 5 2017. Samples were stored in ice and delivered to Water Management Laboratories in Tacoma. Water Management then shipped the samples to a secondary lab for analysis. Samples were analyzed for glyphosate. During each sampling event one sample was collected at the treatment site just below the surface and one sample was collected just below the surface at the McHaven potable water intake. Currently there are no plans to reduce the no spray zone to within ¼ mile of the McHaven intake. Our August 15 and 19 sampling

results are currently trying to be located by WMA. All of the samples collected on August 28 and September 5 returned glyphosate levels below the detectable limits of the equipment. The treatment site samples on both occasions detected no glyphosate present probably because of the small amount of material now being utilized at the sites.

Sample Stations

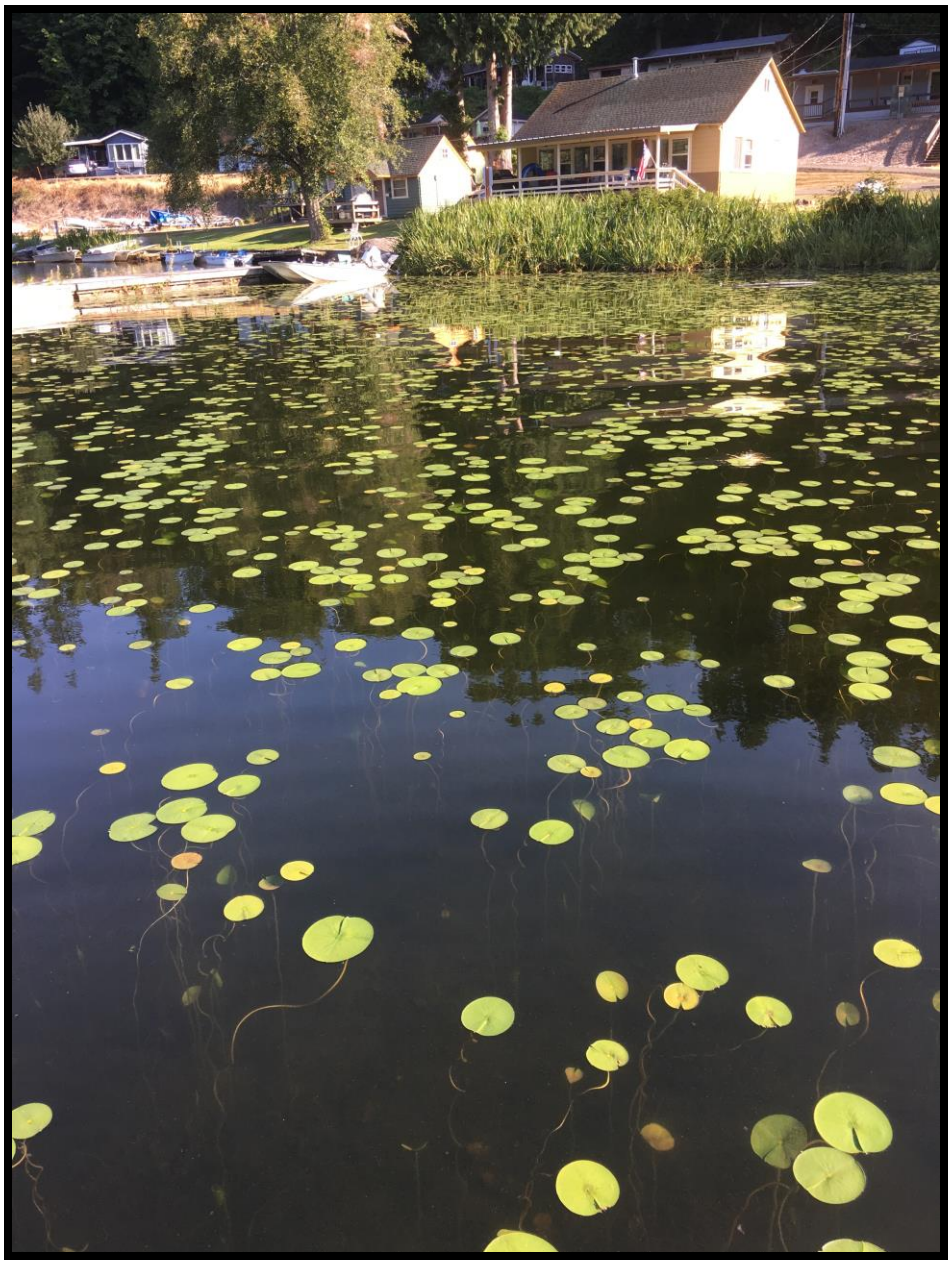
Lily Pad Manual Removal

Lily pad manual removal occurred twice during 2017 on July 2 & 3 and August 6 & 7. During each lily pad event one day was utilized to service the individual properties within the no treatment zone and the other day was spent at the McHaven site. Removal efforts at all sites consisted of a three person crew cutting and loading pads into a small boat and offloading or cutting and raking the plants to a shoreline staging area where the plants were then loaded into a pickup truck and delivered to a dump site provided by the McHaven development. Utilizing the McHaven dump site reduced the cost of the removal project considerably. Bruce, from the McHaven community assisted. The cutting and removal process was slow and labor intense.

Northwest utilized two types of hand held throwing cutters, a gas powered cutter and a set of bush trimming loppers. Each piece of equipment generated both positive and negative reviews dependent on the environment each tool was working within. One hand held throwing cutter was utilized in conjunction with a boat tethered along a pull line stretched from dock to dock in the deeper waters. All the other equipment was operated in areas under six feet in depth.

Collecting pads for disposal

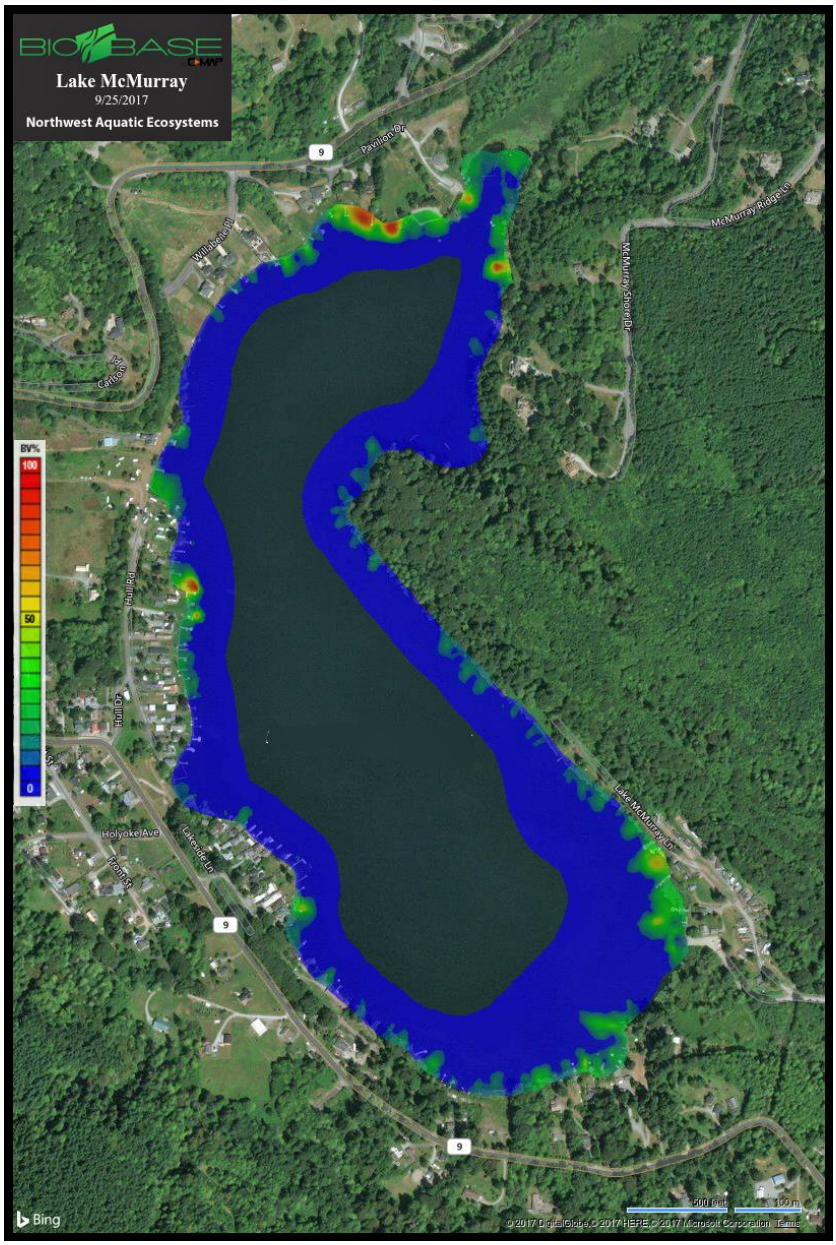
Task Completed



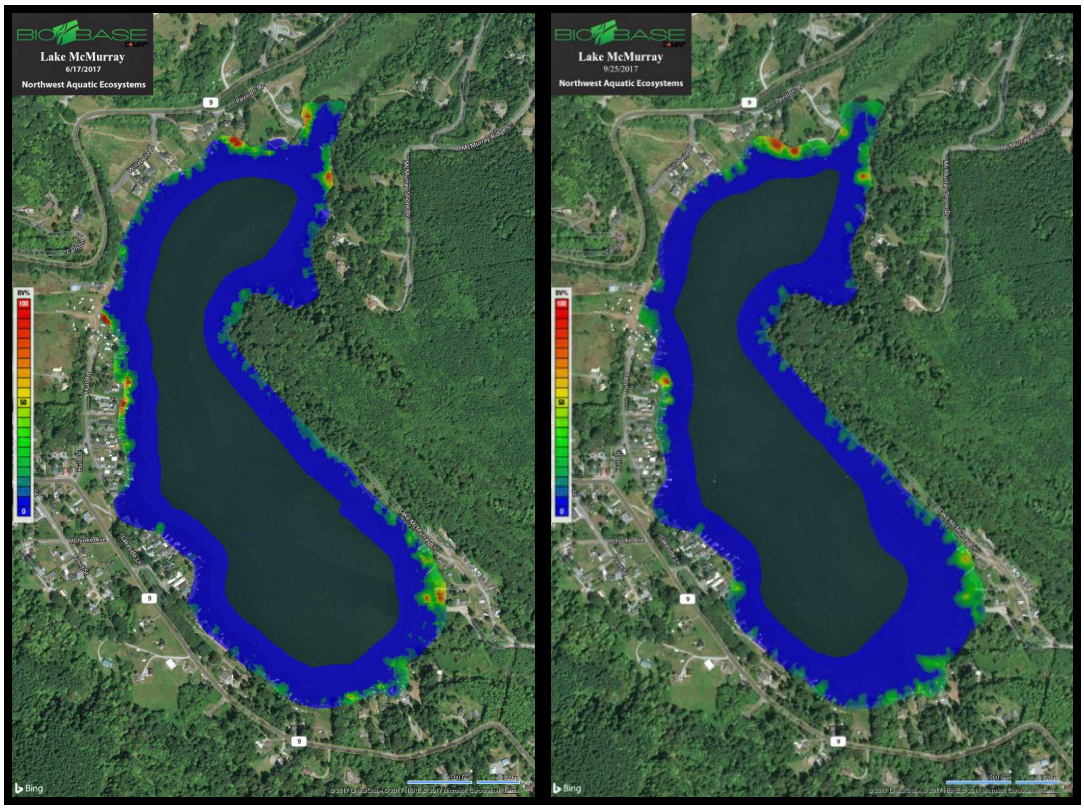
Lily pads 21 days post initial harvesting

Fall Survey

The fall survey was performed on September 25, 2017. The survey resulted again in no milfoil plants identified lake wide. Results were not surprising and conformed with prior fall surveys. Once again there was a noted decline in weed densities. However, the general areas where weeds were present at the beginning of the year also supported weeds at the close of the year. As noted in prior reports, there were no means to identify why this decrease occurred but possible scenarios could include bacterial, viral or insect associated damage. All targeted lily pad sites were clearly showing signs of herbicide damage. Lily pads had died back and new growth was small and limited in nature.



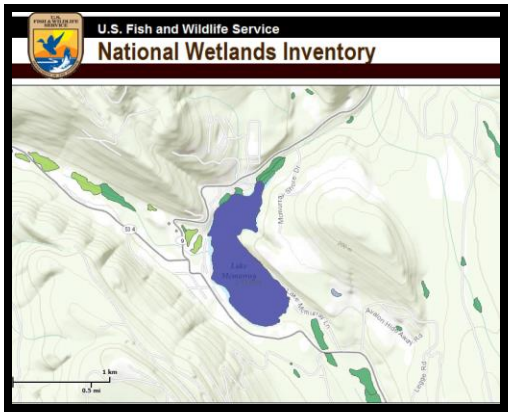
Fall Survey 2017



Spring 2017 **Fall 2017**

Outlet Concerns

The outlet area has been identified by the US Fish and Wildlife Service as a registered wetland. Conversation has been directed at the potential means to remove debris and clear the outlet area to provide a more efficient lake outflow pattern. Removal or alterations made to any native species or fallen debris within the outlet area would require extensive permitting, mitigation and financial resources.



Green areas
are registered wetlands

Recommendations

1. LMD officials, the consultant and the McHaven Inc. (potable water right holder) need to continue to work in harmony in developing treatment protocol that will provide the greatest degree of control lake-wide while ensuring the integrity of the McHaven water supply. During 2016 & 2017 the no spray zone for lily pads and yellow iris was reduced to be ¼ mile from the McHaven water intake. Sampling conducted during 2013, 2014, 2015, 2016 and 2017 has documented that the use of the herbicide glyphosate resulted in no active ingredient detected at the community's potable water intake.
2. Diquat is the only material registered in Washington State that will control elodea, the dominant species identified in the lake. Diquat residues were detected at the McHaven potable water intake during 2014. Levels were below the EPA guidelines for potable systems, .02 mg/L. Such levels were not expected even with the ½ mile imposed no treatment zone. The established criterion for the use of any herbicide within the waters of Lake McMurray is to ensure the McHaven population that ***NO*** herbicide is detected at the community's water intake. Diquat was eliminated from further use on Lake McMurray during 2015.
3. Aquathol K can be used to control only the pondweed species found in the lake. In the past, the pondweeds were a component of the elodea population. Control of the pondweeds in these portions of the lake would not bring about relief to property owners because the elodea species would still be problematic. It is for this reason that Aquathol K was not utilized during 2015, 2016 or 2017. There are now some shoreline areas of the lake where the only species present are pondweeds and Aquathol K could be a potential control agent. The same approach related to water testing following treatment would be required. The Aquathol K label requires a minimum 600 foot setback from potable water intakes. Aquathol K degrades faster in the water than diquat with byproducts consisting of only carbon, hydrogen and oxygen.
4. Continue use of glyphosate in the control of lily pads, yellow flag iris and loosestrife.
5. Re-evaluate the use of manual control for lily pads within the no spray zone. Pads that resurfaced were smaller in diameter after each cut. The length of time between cuts should not exceed three weeks. A single seasonal cutting would not be worthwhile although it would provide short term relief.
6. Continue use of the new mapping technology. Such technology will provide an easily understood macrophyte map. Mapping can then be used as baseline data in evaluating the success of future weed control activities.

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 547
WA DOH TEST PANEL: GLYPH

System ID No.: N/A	System Name: N/A		
Lab/Sample No.: 08985840	Date Collected: 08/28/17		DOH Source No.: N/A
Multiple Source Nos.: N/A		Sample Type: N/A	Sample Purpose: I
Date Received: 08/29/17	Date Analyzed: 09/08/17		Analyst: ALI
	Date Reported: 09/19/17		Supervisor:
County: N/A		Group: N/A	
Sample Location: McMurray Treat Site			
Send To: Northwest Aquatics Eco 855 Trosper Rd SW # 108-313 Olympia, WA 98512		Remarks:	

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
	EPA REGULATED						Trigger?	MCL?
152	Glyphosate	**301**	ug/L	NA	NA	NA		

NOTES:

SRL (State Reporting Level): Indicates the minimum reporting level required by the Washington Department of Health (DOH).

Trigger Level: DOH Drinking Water response level. Systems with compounds detected at concentrations in excess of this level are required to take additional samples. Contact your regional DOH office for further information.

MCL (Maximum Contaminant Level): If the contaminant amount exceeds the MCL, immediately contact your regional DOH office.

NA (Not Analyzed): In the RESULTS column indicates this compound was not included in the current analysis.

ND (Not Detected): In the RESULTS column indicates this compound was analyzed and not detected at a level greater than or equal to the SRL.

< : Indicates less than.

Comments :

ALI Lab No.: 170831007-001
Method EPA 547: Glyphosate

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EPA TEST METHOD - EPA 547
WA DOH TEST PANEL: GLYPH

System ID No.: N/A	System Name: N/A		
Lab/Sample No.: 08985841	Date Collected: 08/28/17		DOH Source No.: N/A
Multiple Source Nos.: N/A		Sample Type: N/A	Sample Purpose: I
Date Received: 08/29/17	Date Analyzed: 09/08/17		Analyst: ALI
	Date Reported: 09/19/17		Supervisor:
County: N/A		Group: N/A	
Sample Location: McMurray P. Intake			
Send To: Northwest Aquatics Eco 855 Trosper Rd SW # 108-313 Olympia, WA 98512			Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
	EPA REGULATED						Trigger?	MCL?
152	Glyphosate	ND	ug/L	NA	NA	NA		

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Comments :

ALI Lab No.: 170831007-002
Method EPA 547: Glyphosate

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 547
WA DOH TEST PANEL: GLYPH

System ID No.: N/A	System Name: N/A		
Lab/Sample No.: 08985867	Date Collected: 09/05/17		DOH Source No.: N/A
Multiple Source Nos.: N/A		Sample Type: N/A	Sample Purpose: I
Date Received: 09/06/17	Date Analyzed: 09/18/17		Analyst: ALI
	Date Reported: 09/21/17		Supervisor:
County: N/A		Group: N/A	
Sample Location: McMurray Treat Site			
Send To: Northwest Aquatics EcoSystem 855 Trosper Rd SW # 108-313 Olympia, WA 98512		Remarks:	

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
	EPA REGULATED						Trigger?	MCL?
152	Glyphosate	ND	ug/L	NA	NA	NA		

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Comments :

ALI Lab No.: 125 96068
Method EPA 547: Glyphosate

WATER MANAGEMENT LABORATORIES INC.

1515 80th St. E.
Tacoma, WA 98404
(253) 531-3121

SYNTHETIC ORGANIC CHEMICALS (SOC's) ANALYSIS REPORT
EPA TEST METHOD - EPA 547
WA DOH TEST PANEL: GLYPH

System ID No.: N/A	System Name: N/A		
Lab/Sample No.: 08985868	Date Collected: 09/05/17		DOH Source No.: N/A
Multiple Source Nos.: N/A		Sample Type: N/A	Sample Purpose: I
Date Received: 09/06/17	Date Analyzed: 09/18/17		Analyst: ALI
	Date Reported: 09/21/17		Supervisor:
County: N/A		Group: N/A	
Sample Location: McMurray Well			
Send To: Northwest Aquatics EcoSystem 855 Trosper Rd SW # 108-313 Olympia, WA 98512			Remarks:

DOH #	ANALYTES	RESULTS	UNITS	SRL	TRIGGER	MCL	EXCEEDS	
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Comments :

ALI Lab No.: 125 96069
Method EPA 547: Glyphosate