

## ***2007 Liberty Lake Eurasian Watermilfoil Management Report***

### **DESCRIPTION OF SITE**

Liberty Lake is a 708-acre (1.1 square mile) soft-water mesotrophic lake situated 2.5 miles east of the City of Spokane Valley and 3 miles west of the Idaho border. The City of Liberty Lake rests ¼ mile north-northwest of the lake. Liberty Lake has a mean depth of 23 feet (7 meters) and a maximum depth of 30 feet (9 meters). The lake and incorporated area of Liberty Lake are known for their real estate and recreational value; they are heavily utilized by 80,000 to 100,000 visits per season (Funk *et. al.*, 1982). Recreational activities on the lake include fishing, swimming, boating, water-skiing, and jet skiing. A large percentage of the lake is privately owned with two public access points for recreation. These include a County Park swimming beach (situated in the southeast) and a Washington State Department of Fish and Wildlife boat launch (situated in the north).

### **MANAGEMENT HISTORY**

A small infestation of Eurasian watermilfoil (*Myriophyllum spicatum*) was discovered in Liberty Lake in the fall of 1995 and was effectively controlled by hand harvesting until 1997. A private diving company utilized divers to pull the plants by hand, collect, and dispose of them. They were successful until the spring and early summer of 1997. After 1997, application of granular 2,4-D then became the primary milfoil management method in Liberty Lake, although hand harvesting also continued. Since that time, 2,4-D treatments have occurred in various sections of the lake. Each spring, diving and surface surveys are conducted by the Liberty Lake Sewer and Water District (LLSWD) to locate milfoil populations and determine treatment areas. The areas with numerous milfoil plants are treated with aquatic herbicide and the areas with smaller numbers of milfoil plants are hand harvested (Liberty Lake Aquatic Weed Management Plan, 2003).

### **2007 TREATMENT**

#### **Background**

Previously, the milfoil infestation in Liberty Lake has been managed by the use of granular 2,4-D herbicide and diver hand harvests. Due to the past few years of the relatively ineffectiveness of the herbicide, the LLSWD decided to conduct a test in 2005 on the efficacy of three different aquatic herbicide products approved by the WA Department of Ecology. The three products selected were DMA\*4IVM (2,4-D liquid), AquaKleen (2,4-D granular) and Renovate (Triclopyr). Given the results of the 2005 efficacy surveys, the LLSWD was pleased with the results of the DMA\*4IVM product and favors its use for future management (Milfoil Management Report, 2005).

#### **Herbicide Application and Sampling**

Liberty Lake was treated by a licensed applicator using DMA\*4IVM on July 25, 2007. 2,4-D was applied via boat at 10 gallons per acre via sub-surface injection. Depths varied and plant density could not be determined, so the applicator decided this to be the best rate for the project. In total, 130 gallons of 2,4-D was applied to a total of 13.5 acres. The largest treatment area was 4.1 acres. See Figure 1 for 2007 treatment areas and milfoil locations.

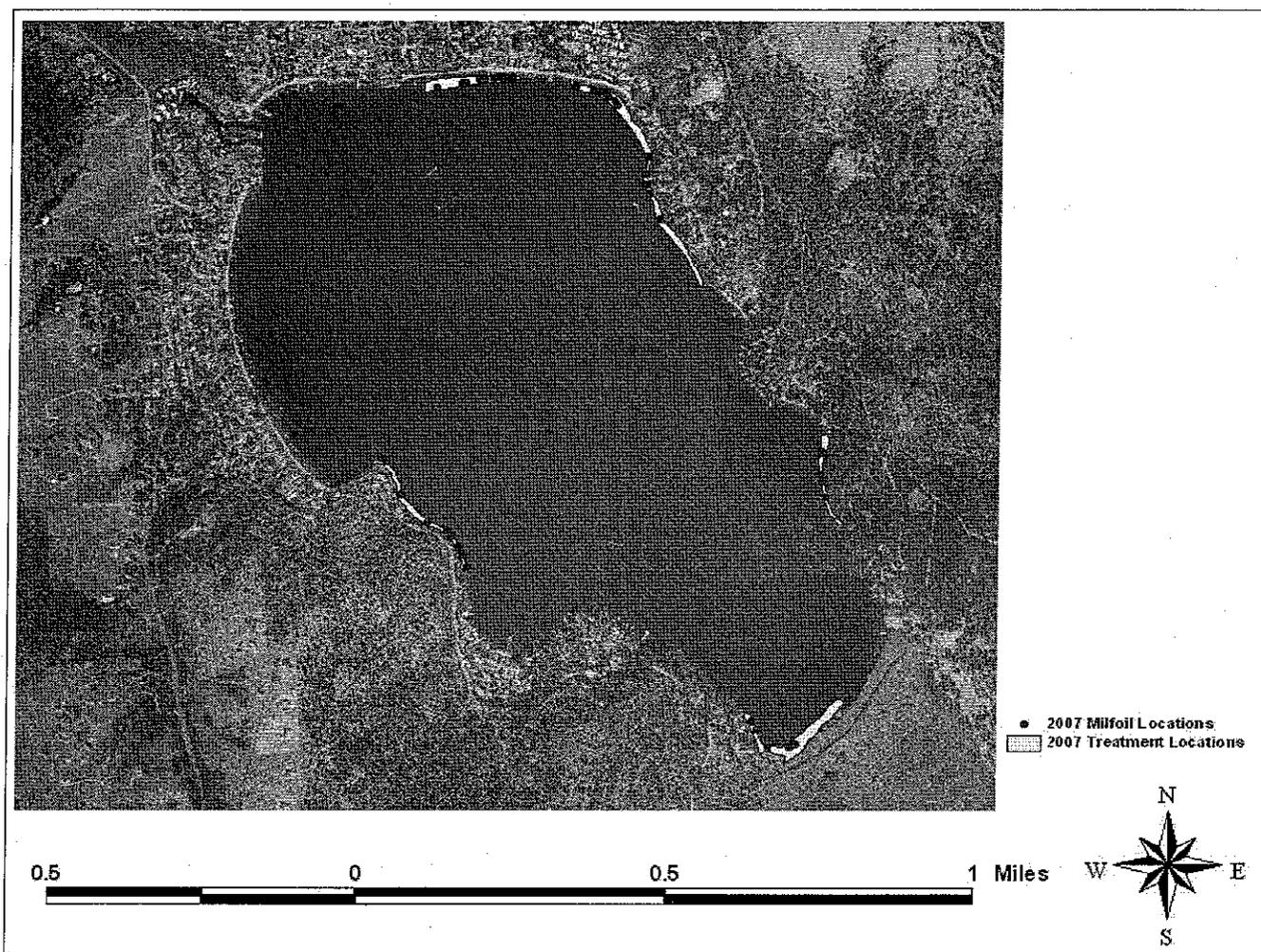


Figure 1: 2007 Treatment areas and milfoil locations

Two locations were selected for the residual herbicide sampling and water quality analysis. The sample locations were identified as TA-IN and IA-OUT (Figure 2). Under the grant agreement between the WDOE and the LLSWD, residual sampling had to be conducted on the largest treatment area before the treatment, at 1-Day, 3-Day, and 7-Day intervals for inside and outside the treatment area. Surface water grab samples for 2,4-D residue analysis were collected by the Lake Manager. All samples collected were stored on ice until delivery to the laboratory, and were analyzed by an Ecology accredited laboratory using method number EPA 8321A. The herbicide residual sampling results are displayed in Table 1. In addition to the residual sampling, water quality parameters for temperature, dissolved oxygen, pH, total dissolved solids, and conductivity were collected for the background, 1-Day, 3-Day, and 7-Day intervals (Tables 2 and 3).

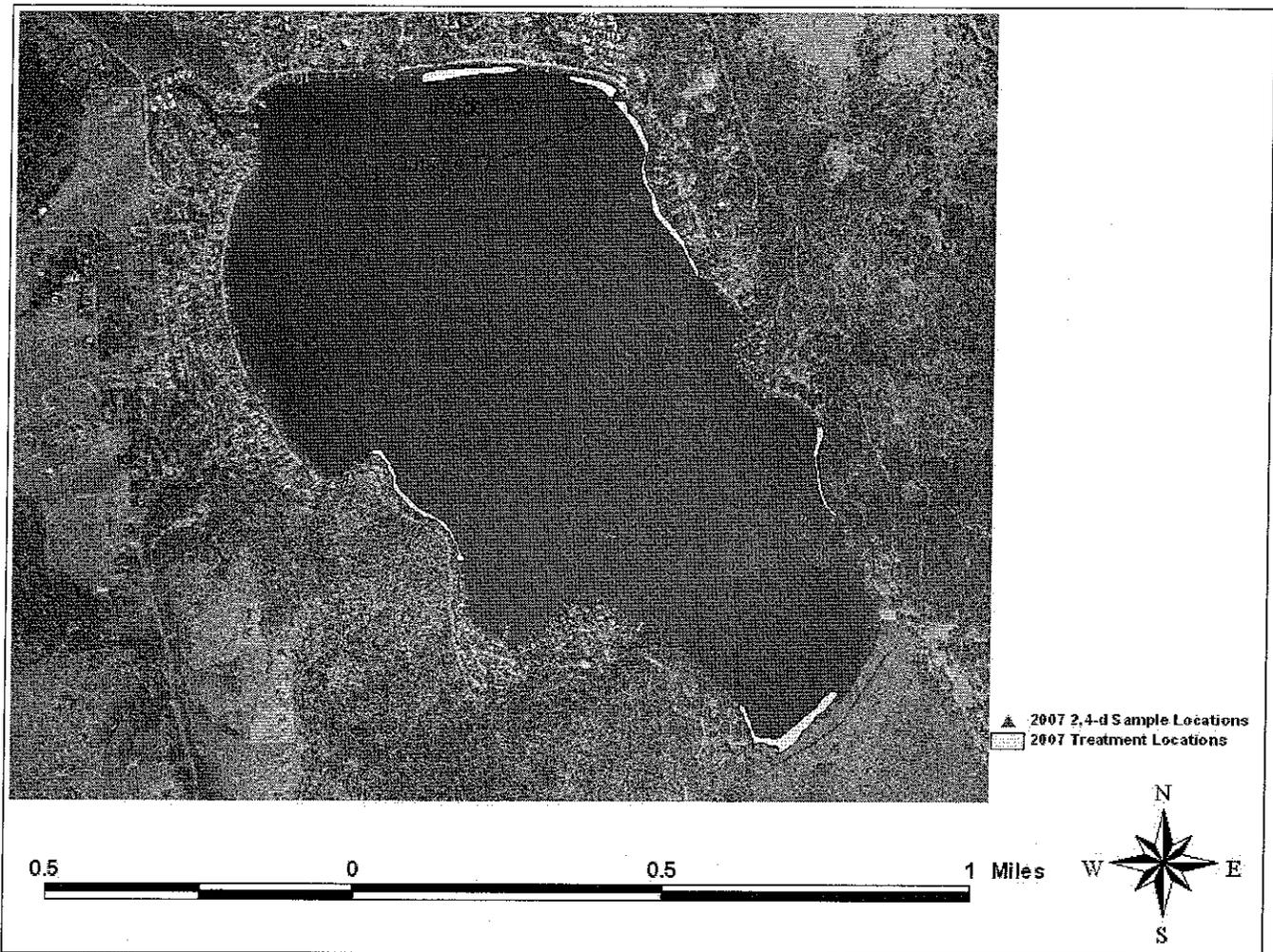


Figure 2: 2007 Treatment areas and herbicide residual sampling locations

Treatment Area	Sample Description	Sample Date	Analysis	Result (µg/l)(ppb)
TA-IN-PT	Test area #1 Pre-Treatment; Inside treatment area	7/25/2007	2,4D Liquid	ND
TA-OUT-PT	Test area #1 Pre-Treatment; 225' outside treatment area	7/25/2007	2,4D Liquid	ND
TA-IN-24	Test area #1 1-Day; Inside treatment area	7/26/2007	2,4D Liquid	1.75
TA-OUT-24	Test area #1 1-Day; 225' outside treatment area	7/26/2007	2,4D Liquid	4.12
TA-IN-3D	Test area #1 3-Day; Inside treatment area	7/28/2007	2,4D Liquid	12
TA-OUT-3D	Test area #1 3-Day; 225' outside treatment area	7/28/2007	2,4D Liquid	13.7
TA-IN-7D	Test area #1 7-Day; Inside treatment area	8/1/2007	2,4D Liquid	10.4
TA-OUT-7D	Test area #1 7-Day; 225' outside treatment area	8/1/2007	2,4D Liquid	11.6

Table 1: 2007 Herbicide residual sampling results

### Inside Treatment Area (TA-IN)

Date MMDDYY	Time HHMMSS	Depth meters	Temp C	DO mg/l	DO% Sat	pH Units	SpCond µs/cm	TDS g/l
7/25/2007	8:19:03	0.6	24.53	7.94	95	7.71	49.4	0.0316
7/25/2007	8:20:09	1	24.62	7.69	92.2	7.76	49.3	0.0315
7/25/2007	8:21:24	2	24.37	7.53	90	7.69	49.2	0.0315
7/25/2007	8:21:58	2.71	24.34	6.5	77.6	7.4	49.2	0.0315
7/26/2007	8:18:47	0.62	24.77	8.32	100.1	7.71	48.8	0.0312
7/26/2007	8:19:26	1.02	24.83	8.07	97.1	7.76	48.8	0.0313
7/26/2007	8:20:20	2.01	24.49	7.51	89.9	7.97	48.7	0.0312
7/28/2007	8:41:02	0.64	25.48	8.05	98.1	7.76	49.6	0.0317
7/28/2007	8:41:40	1.01	25.48	8.03	97.8	7.76	49.7	0.0318
7/28/2007	8:42:22	2.01	25.11	8.39	100.7	8.06	49.6	0.0317
8/1/2007	8:51:22	0.66	24.45	8.69	103.5	7.81	49.5	0.0317
8/1/2007	8:51:57	1	24.5	8.51	101.4	7.84	49.4	0.0316
8/1/2007	8:52:41	2	24.21	8.71	103.3	8.06	49.4	0.0316

Table 2: 2007 Water quality sampling results for inside treatment area

### Outside Treatment Area (TA-OUT)

Date MMDDYY	Time HHMMSS	Depth meters	Temp C	DO mg/l	DO% Sat	pH Units	SpCond µs/cm	TDS g/l
7/25/2007	7:59:38	0.63	24.69	8.07	96.9	7.79	49.2	0.0315
7/25/2007	8:00:40	0.98	24.71	7.84	94.2	7.82	48.8	0.0312
7/25/2007	8:02:11	2	24.72	7.49	90	7.83	48.9	0.0313
7/25/2007	8:03:30	3	24.72	7.66	92.1	7.81	48.8	0.0312
7/25/2007	8:04:43	4	24.69	7.24	86.9	7.85	48.9	0.0313
7/25/2007	8:06:13	5	24.64	7.55	90.6	7.85	49.2	0.0315
7/25/2007	8:07:22	6	22.64	5.68	65.7	6.79	49.6	0.0318
7/25/2007	8:08:32	7	21.15	2.88	32.3	6.43	51.7	0.0331
7/25/2007	8:10:02	8	19.45	0.37	4	6.23	58.4	0.0374
7/26/2007	7:59:39	0.64	24.87	8.57	103.3	7.73	48.7	0.0312
7/26/2007	8:00:24	1.02	24.87	8.35	100.6	7.76	48.7	0.0313
7/26/2007	8:01:19	2.01	24.88	8.23	99.2	7.77	48.7	0.0312
7/26/2007	8:02:24	3	24.88	8	96.5	7.75	48.4	0.031
7/26/2007	8:03:24	3.99	24.86	8	96.4	7.77	48.4	0.031
7/26/2007	8:04:10	5	24.81	7.82	94.1	7.76	48.6	0.0311
7/26/2007	8:05:05	6.01	23.49	8.07	94.8	7.24	48.3	0.0309
7/26/2007	8:05:53	7.01	20.86	3.02	33.7	6.3	53.1	0.034

7/28/2007	8:25:39	0.61	25.53	7.92	96.6	7.82	48.7	0.0311
7/28/2007	8:26:44	1	25.59	7.61	92.9	7.84	48.5	0.0311
7/28/2007	8:27:51	2.02	25.59	7.14	87.2	7.85	48.6	0.0311
7/28/2007	8:28:55	3.02	25.55	7.32	89.3	7.83	48.7	0.0312
7/28/2007	8:30:05	3.98	25.46	7.44	90.6	7.67	48.6	0.0311
7/28/2007	8:31:52	5.01	24.93	6.56	79.1	7.04	48.7	0.0312
7/28/2007	8:33:14	6.01	23.19	6.13	71.6	6.72	49.5	0.0317
7/28/2007	8:35:06	7.01	22.1	4.49	51.3	6.33	52.3	0.0334
8/1/2007	8:38:03	0.68	24.57	8.89	106.1	7.88	49.4	0.0316
8/1/2007	8:38:31	1.02	24.6	8.65	104	7.89	49.3	0.0315
8/1/2007	8:39:25	2.02	24.61	8.65	103.3	7.91	49.3	0.0315
8/1/2007	8:39:59	3.01	24.61	8.61	102.9	7.9	49.3	0.0315
8/1/2007	8:40:25	4	24.61	8.52	101.7	7.9	49.6	0.0317
8/1/2007	8:41:01	5.01	24.6	8.4	100.3	7.89	49.3	0.0315
8/1/2007	8:41:39	5.98	24.56	8.51	101.6	7.87	49.4	0.0316
8/1/2007	8:42:32	7.02	21.28	2.05	22.7	6.26	57.2	0.0366

Table 3: 2007 Water quality sampling results for outside treatment area

### Summary of 2,4-D Residuals from Liberty Lake

All of the residual herbicide samples collected were well below the EPA standard of 70 ppb following the treatment. It is not clearly understood why the sampling results display abnormally low values following the treatment. At the affirmed labeled rate of ~10 gallons/acre, it would be expected to observe values of 30+ times greater than the values reported. Contact was made with the laboratory and the applicator to clarify the results. Representatives from each party were confident in their responsibilities, and the low concentration values were never explained. Similar sampling results were also observed in 2006 and the samples were taken from the same locations both years. Table 1 outlines the sampling results of the herbicides applied to Liberty Lake in 2007. In addition to Table 1, refer to Figure 2 for the treatment area residual sample locations.

### Herbicide Application Efficacy

Liberty Lake was visually surveyed after the treatment by the Lake Manager. No adverse impacts such as unintentional macrophyte damage or fish kills were observed following the treatment. However, significant Spirogyra and periphyton growth was observed in the lake two weeks post treatment and the milfoil plants observed did not display actively growing green growth. Secchi disk readings in Liberty Lake during the application period was very good at 5 meters and the water quality parameters collected did not show any anomalies to report (Tables 2 and 3).

Efficacy surveys were conducted at weekly intervals up to 1 month following the treatment. Plant observations were recorded in a field book. Below is a summary of the weekly efficacy surveys:

- Week 1 (8/1/07): Plants observed in the treatment areas displayed green tips, but no curling of the tips were observed. An herbicide residual sample was taken. Many plants, both inside and outside the treatment areas, were covered in periphyton growth and Spirogyra. Minor Gleotricia cyanobacteria were observed in the water column at the time of the survey. Secchi disk was recorded at 4.5 meters.

- Week 2 (8/9/07): All the observed milfoil plants in the treatment areas appeared to be slightly toppled. Green tips were still observed, but all plants are becoming increasingly covered with periphyton and Spirogyra growth. The efficacy survey was difficult to conduct with abundant periphyton and Spirogyra growth surrounding all macrophytes in the lake. Secchi disk was recorded at 3.25 meters.
- Week 3 (8/16/07): No apparent differences were observed between Week 2 and Week 3.
- Week 4 (8/22/07): All the plants observed in the lake (native and non-native) are completely covered with periphyton and Spirogyra growth. The efficacy survey was unsuccessful because plant species could not be identified from the surface. A dive survey/harvest was conducted within the treatment areas and was unsuccessful to properly determine the ultimate efficacy of the treatment. Secchi disk was recorded at 3.0 meters. No further efficacy surveys will be planned due to the periphyton and Spirogyra growth patterns throughout the entire lake.

### **Conclusion**

Overall, the efficacy of the 2006 herbicide application in Liberty Lake was meager. It is not clearly understood the reasoning for the relatively poor efficacy of the treatment and the low residual sampling results, but it is certain that the abundant growth of Spirogyra influenced the normal growth rate of the milfoil plants in the lake and may have attributed to the shortcomings of the herbicide efficacy. However, given the relatively ineffectiveness of the 2007 herbicide treatment, the LLSWD is considering using a different herbicide product for the 2008 season, perhaps switching back to granular 2,4-D is an option. In addition to the herbicide treatment, 67 pounds of wet milfoil was removed from the lake outside the treatment areas.