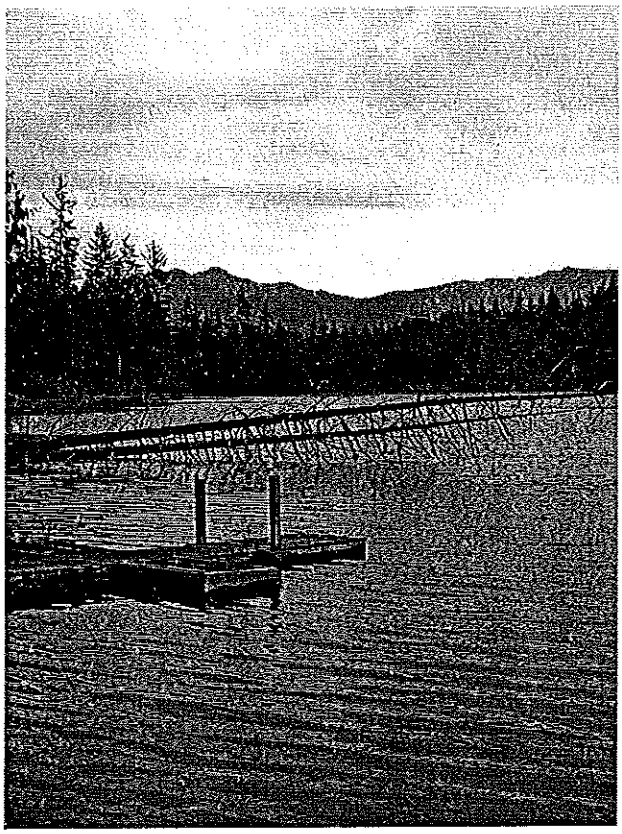
Lake Twelve

Integrated Aquatic Plant Management Plan

F i n a l R e p o r t



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King County
Department of Natural Resources and Parks

1 INTRODUCTION

Lake Twelve is a small, shallow lake located northeast of the city of Black Diamond, Washington, which is surrounded by single family residences and which has a public access boat ramp owned by the Washington Department of Fish and Wildlife. The non-native aquatic plant species Eurasian water milfoil (*Myriophyllum spicatum*) and fragrant water lilies (*Nymphaea odorata, Nymphaea spp.*) were identified in the early 1990s as major aquatic nuisances that interfered with the beneficial uses of the lake, such as native aquatic plant growth, water quality, and recreational pursuits. In 1994 the Lake Twelve Association, in conjunction with King County, developed an Integrated Aquatic Plant Management Plan, which devised a methodology to control and manage the weeds. The following year, the Lake Twelve Association partnered with King County and decided to combat the problem through a combination of diver surveys, herbicides, and hand pulling. King County applied for and received the Washington Department of Ecology's Aquatic Weeds Management grant in 1996 to help fund this project. Success was noted in the first few years of treatment, but work ceased in 1999, and both lilies and milfoil have since returned to the lake.

Since the project's conception, several staff within King County have managed it. The merger Between King County and the Municipality of Metropolitan Seattle, as well as changes in the organization of groups within King County necessitated changes at the program level as well. While some files and records of the project exist, they are incomplete, probably due in part to several changes in project managers over the years. The aquatic weed control component of the project on Lake Twelve was completed in 1999, with limited success. The purpose of this document is to summarize the work that was done on Lake Twelve and to officially close the project.

2 DATA AND METHODS

2.1 1995-1996

Resource Management, Inc. (RMI) was contracted by King County in 1995 to control the aquatic weeds in Lake Twelve using the tactics outlined in the 1994 Lake Twelve Management Plan. Milfoil was the first weed targeted; control activites included surveying, mapping, and herbicide applications.

Sonar® application was scheduled to begin in 1995; however, the first survey revealed existing aquatic plant damage from an unidentified cause. RMI contacted King County, the Washington Department of Agriculture, and the Washington Department of Ecology. The Department of Agriculture took water samples, but no definitive conclusions could be made about the damage based on the results of the water testing. Unauthorized herbicides were the suspected cause, but evidence could not be produced to back up the suspicion. The authorized aquatic weed control measures were postponed until the following year.

Work began on the lake in June of 1996 with a diver survey that utilized aerial photos, transect surveys, and GPS equipment to locate and map milfoil infestations present at the

time. Maps were produced using ArcInfo and delivered to Bob Storer, the project manager as of July 2, 1996.

Sonar®, with the active ingredient fluridone, was the herbicide applied in liquid form to the lake to eradicate the milfoil present. King County secured the appropriate permits (Department of Ecology Modification of Surface Water Quality Standards and the King County Shoreline Exemption) prior to starting Sonar® treatment in the lake. The public was notified about the herbicide and the application process before the first treatment date.

The goal was to maintain Sonar® concentrations of 20 ppb for six to eight weeks. Two sites in the lake were sampled after each application, and if concentrations dropped below 20 ppb another treatment occurred (Table 1). The first 20 ppb application was done on July 9th and sampling on July 22nd showed that concentrations dropped to approximately 11 ppb. More

Sonar was applied on July 23rd to boost levels up to 20 ppb. On August 2nd, concentrations dropped to 6.6 ppb and 10.5 ppb, subsequently another application was performed on August 6th. The final application was done on August 27th. A follow up survey was performed on October 17th and no standing milfoil plants were found.

Table 1. Sonar concentrations post treatment

Date	Site 1	Site 2	Average
July 22nd	10.9	10.5	10.7
August 2nd	6.6	10.5	8.6
August 19th	20.5	19.1	19.8
Average	12.7	13.4	13.0

RMI 1996

2.2 1997

The second year tasks were to have included milfoil surveys and glyphosate (Rodeo®) application to water lilies. No Eurasian water milfoil was observed in the diver survey. Permits for the Rodeo® application were not obtained in time for treatment, so water lily treatment was rescheduled for the summer of 1998.

2.3 1998

The 1998 season tasks included surveying the lake for milfoil, as well as mapping and treating the water lilies. A RMI diver survey was conducted on June 30th to determine the presence of Eurasian milfoil. Transect surveys were conducted using the towed sled method, and no milfoil was found in the littoral zone. Native aquatic plant communities were documented in areas previously infested with milfoil.

Water lilies were mapped using a combination of GPS and field mapping techniques. The map produced a coverage of water lilies that was used to help determine treatment areas. The level of human use determined the areas of treatment. In areas heavily used for recreational purposes, the plants were treated, if little activity existed, plants were left untreated.

Prior to Rodeo® treatment, the necessary permits were obtained from Washington State Department of Ecology and King County Water and Land Resources. The Department of Ecology permit required an extensive public notice program, which was completed through informational flyers given to lakeside residents a week before the application, as well as posting signs around the lake on the day of the application.

Rodeo was applied on two occasions, once in mid-July and once in early August. Rodeo was sprayed directly onto the plant, effecting only the floating leaf and emergent vegetation. No treatment was done on the east side of the lake due to the sensitivity of the wetland area.

2.4 1999

In July of 1999, RMI and King County staff performed an aquatic weed inspection to assess the previous treatments. The boat survey began on the south shoreline at the public assess point and moved west. Milfoil was discovered in the littoral zones of the southern, western, and northern shoreline. The total number of milfoil plants in the lake was small, and the action plan to take care of them included an underwater survey and diver hand pulling.

The survey included identifying areas with milfoil and using GPS to map them. The milfoil plant and root crowns were removed by hand; most of the plants were one stem plants, indicating they were new. The weeds were bagged and removed from the lake and were disposed of by RMI in their Olympia offices. No follow up reporting was done on the water lily treatment. This was the last documented year that noxious aquatic weed control work was performed on Lake Twelve.

3 FLURIDONE ANALYSIS RESULTS

The only year that fluridone, the active ingredient in Sonar®, was applied to Lake Twelve was in 1996. There is minimal information existing on the effects of fluridone on lake health. Surveys have demonstrated that the herbicide hinders milfoil growth, but little is known about effects elsewhere in the lake ecosystem, e.g. sediment and benthic macroinvertebrates.

The grant contract between King County and Department of Ecology requested that a pre and post survey of sediments and benthic macroinvertebrates be performed. There are no supporting documents in the Lake Twelve file that this task was ever attempted or completed. A memo in 1996 from Terry McNabb, owner of RMI, to Joanne Davis states that aquatic vegetation damage was observed in the lake in the summer of 1995. The first attempted plant survey by RMI in 1995 uncovered the problem and the firm contacted King County, the Washington Department of Agriculture, and the Washington Department of Ecology. Attempts were made to contact all current and former King County staff who had been involved with the project, as well as the contractor, to see if any more information could be gotten about the fate of the invertebrate surveys, but very little information was obtained from this effort. It is possible that this component of the contract regarding the effects of fluridone on benthos was never undertaken because of the many changes in project management.

However, if any documents regarding the completion of this task are recovered in the future, they will immediately be forwarded to the Department of Ecology.

4 PLANT SURVEYS

Plant surveys were executed by RMI starting in 1996 and for the following three years. Maps are attached in the appendices of this report.

5 BUDGET

The Aquatic Weed Control grant from the Department of Ecology was awarded to King County in 1996. The total amount was $45,686 and King County was reimbursed for project expenditures through the authority of the grant contract. The table below summarizes the grant disbursement to King County and contractors for labor.

Lake Twelve Grant Use

Date	Consultant	King Co Staff	Total Eligible Costs	75% Reimbursement	Remaining Funds
				$45,686.00	**$45,686.00**
11/5/1996	$6,048.61	$27,546.23	$33,594.84	$25,196.13	**$20,489.87**
3/17/1997		$357.89	$357.89	$268.42	**$20,221.45**
Missing Invoice Voucher but est. to be for this amount				$2,515.65	**$17,705.80**
8/7/1997		$574.43	$574.43	$430.82	**$17,274.98**
1/5/1998		$273.55	$273.55	$205.16	**$17,069.82**
4/8/1998		$54.71	$54.71	$41.03	**$17,028.79**
10/22/1998	$1,411.80	$436.16	$1,847.96	$1,385.97	**$15,642.82**
7/12/1999	$4,669.80	$218.08	$4,887.88	$3,665.91	**$11,976.91**
9/22/1999	$3,081.40	$593.12	$3,674.52	$2,755.89	**$9,221.02**
12/1/1999		$362.53	$362.53	$271.90	**$8,949.12**
4/20/2000	$2,129.00	$47.45	$2,176.45	$1,632.34	**$7,316.78**

6 CONCLUSIONS

Since no activity occurred on Lake Twelve after April 2000, King County closed the account during the Water and Land Resources Division re-organization at the end of 2001. The reasoning was that it seemed very unlikely that the work would be revived under the extended contract between the state and the county. A quick overview of what the project proposed and what actually happened is provided below.

The Lake Twelve IAVMP picked a specific treatment plan for milfoil and fragrant water lilies that included diver surveys and herbicide treatments. It was estimated that aggressive in-lake treatment would occur for a minimum of five years to fully control the problem. The goal of the IAVMP was to remove all known Eurasian water milfoil populations and control selected areas of water lilies.

A schedule of activities listed by year was included in the IAVMP. The first year was dedicated to a Sonar® treatment of the whole lake. The tasks in year two included a Rodeo®

treatment of the water lilies and minor applications of Sonar® to persistent milfoil areas if necessary. There were no scheduled tasks for year three of the action plan and year four included minor Rodeo® treatments if necessary. All years included minor hand pulling and bottom barriers as means of weed control. A continued monitoring program was to be put in place to insure that a milfoil reinfestation did not occur. Other elements of the plan included establishing an action team that would be able to make critical program decisions. Public outreach and education was a major element of the plan using newsletters, meetings, and posting as a way to inform the general public. Other components of the plan addressed recreational use restrictions and mitigation to reduce harm to native aquatic vegetation from herbicides.

The Washington State Department of Ecology approved the goals and chosen weed control method of the IAVMP. King County Surface Water Management (SWM) applied for and received the Aquatic Weeds Management Fund Grant to implement the action plan. The Department of Ecology added conditions within the grant that King County agreed to include in the project scope.

The first task addressed project management, which King County SWM implemented and adhered to. RMI was the lead on the herbicide application, monitoring, and evaluation tasks; tasks two, three, and four respectively. Task two responsibilities mirrored those in the IAVMP with a few additional items. Samples of benthic invertebrate and sediment were requested to be taken pre and post Sonar® treatment. This survey did not occur; possibly due to the mysterious plant die off in 1995, but no records state the official outcome of this assignment. In year one, volunteers were to be recruited to remove the dead milfoil in the fall. Task three was public involvement and education, requiring public outreach and education efforts, volunteer milfoil boat monitoring, and volunteer help with monitoring activities. Efforts in public outreach and education included meetings, newsletters, and postings but there is no documentation of volunteers pulling dead milfoil out in the fall or implementing milfoil monitoring at the boat launch. Evaluation reports were addressed in task four, requiring a summary of first year evaluation report and a final summary report. Evaluation documents were written by RMI at the end of each year that detailed the work completed. The last document was written in 1999, only 3 years after the first treatment. Milfoil and water lilies have reinfested the lake in subsequent years.

The Lake Twelve noxious weed management plan lasted for three summers, not for the stated five years. Public education and outreach was done, but citizen volunteers were not included to any great degree in the monitoring of the project. Overall, most of the tasks set forward by the IAVMP and the Department of Aquatic Weeds Management Fund were met. A few unknowns exist due to limited documentation, but is assumed the work was not done. No work has been done on Lake Twelve in three years and this document is submitted as the final evaluation of the aquatic weed management project.