Picture is Copyright Property of the
Conservation Commission of the State of Missouri

Lone Lake
Brazilian elodea Project

An

Integrated Aquatic Vegetation Management Plan

- Final –

Developed in Cooperation With

Lone Lake
Homeowners Association

Island County
Noxious Weed Control Board

Washington State Department of Ecology

AWMF Grant Number G0400338 March 2005

ACKNOWLEDGEMENTS

A community comes together to make a project of this nature successful. Many people have put their time, thought and energy into the success of the Lone Lake Brazilian elodea Project. This is to acknowledge their efforts and dedication to the restoration of Lone Lake.

Lone Lake Steering Committee

Pat Clark, Jan Clark, Steve Ford
Kathy Hamel, John Lees, Mark Miller
Bonnie Murdock, Ron Murdock, Ellen Nelson
Gil Nyerges, Dick Robbins, Bill Russell
Scott Strodel, Larry Tsunoda

The Fishing Clubs – Gil Nyerges

Alpine Fly Fishers ▪ Clark-Skamania Fly Fishing Club ▪ Clearwater Fly Casters Columbia Basin Flycasters ▪ Dryside Fly Club ▪ Evergreen Fly Fishing Club Fidalgo Fly Fishing Club ▪ Foufth Corner Fly Fishers ▪ Greywolf Fly Fishing Club Inland Empire Fly Fishing Club ▪ Lower Columbia Fly Fishers ▪ Methow Valley Fly Fishers ▪ Northwest Fly Anglers ▪ Northwest Fly Fishers ▪ Olympic Fly Fishers of Edmonds ▪ Overlake Fly Fishing Club ▪ Puget Sound Anglers – Oak Harbor ▪ Puget Sound Anglers – South ▪ Puget Sound Fly Fishers ▪ Seattle Police Department Fly Fishing Club ▪ South Sound Fly Fishers ▪ Spokane Fly Fishers The Fishin' Club ▪ Washington Council – FFF ▪ Washington Fly Fishing Club Wenatchee Valley Fly Fishers ▪ Yakima River Fly Fishers

The Audubon Society

Steve Ellis

South Whidbey Parks and Recreation District

Lee McFarland and Linda Kast

Whidbey Island Conservation District

Carol Osterman

State Agency Staff

Kathy Hamel, Department of Ecology
Larry Tsunoda and Doug Thompson, Department of Fish and Wildlife

Board of Island County Commissioners

William J. Byrd, Chair, William L. McDowell, Mike Shelton

Island County Noxious Weed Control Board

Sheila Case-Smith, Chair, Tom Eisenberg
Ron Muzzal, Bill Stipe, Fred VanBenshoten

Island County Staff

Washington State University Cooperative Extension, Island County

Debbie Thompson, Prosecutors Office, Joshua Choate, Prosecutors Office
Kathleen Parvin, Environmental Health, Doug Kelley, Environmental Health
Sandy Sandritter, Public Works, Phil Cohen, Surface Water Manager

Consultants

Doug Henderson, ReMetrix, Ryan Moore, ReMetrix
Scott Ruch, ReMetrix, Terry McNabb, ReMetrix

EXECUTIVE SUMMARY

This project was initially undertaken to reduce the abundance and density of aquatic vegetation in Lone Lake. *Egeria densa* was identified and soon the primary goal focused on the eradication of the noxious weed infestation. Eradicating *Egeria densa* will continue to be the primary focus of this project, but the participants now see the wisdom in taking a holistic approach to lake health. The implementation project will work to eradicate both *Egeria* and *Lythrum salicaria* also found along the shore of Lone Lake. A lake stewardship program will be developed to monitor water quality and reduction in noxious weed infestations. These eradication efforts will be coupled by an on-going commitment to public outreach and education concerning the water quality issues associated with Lone Lake.

The Lone Lake Brazilian elodea Project Steering Committee, for purposes of IAVMP development, reviewed all methods currently available for noxious weed control. They carefully considered whether or not these methods can be applied effectively against the infestations in Lone Lake. They believe it is necessary to use an integrated approach toward control in order to eradicate the *Egeria*. The lake will be treated with herbicide followed by the introduction of Triploid Grass Carp as a biocontrol agent. These control methods will be implemented in conjunction with lake monitoring, surveying and an educational outreach component to ensure long-range health of the lake. In subsequent years, control efforts will focus on the remaining localized infestations. Hand pulling and bottom barriers will be employed to eliminate the remaining plants.

The one known *Lythrum salicaria* site is currently being managed with biocontrol agents and mechanical removal. Additional biocontrols will be released, if necessary, and mechanical control will continue. In the future, this site will be monitored by the Lone Lake Stewardship program and the Bioagent Enhancement Program.

Table of Contents

INTRODUCTION

Lone Lake is located on the south end of Whidbey Island in rural Island County, Washington. The lake is located 2.5 miles southwest of the city of Langley and one mile southeast of Goss Lake. It is approximately 101 acres in size having a maximum depth of thirteen feet and a mean depth of seven feet. The lake is fed by two small inlets and drains into Useless Bay on Puget Sound. Lone Lake has 1.6 miles of shoreline with 44 waterfront homes and a residential community of over 100 homes having access to the lake. It is designated a Trophy Lake by the Washington State Department of Fish and Wildlife providing some of the best trout fishing in the state. Washington State Department of Ecology surveyed Lone Lake in 1996. At that time, the lake was determined to be macrophytic and nutrient enriched (eutrophic). The predominant species was identified as *Potamogeton praelongus* (white stemmed pondweed). Ecology found high levels of total phosphorus with heavy epiphytic algal growth associated with the *Potamogeton praelongus*. Surface water monitoring (swim beach surveillance) takes place yearly and only on a few occasions have those limits exceeded the normal range for fecal coliform bacteria or *E. coli*. In the summer of 2003, it was brought to the attention of the Island County Noxious Weed Control Board (ICNWCB) and Ecology that plant growth in the lake had reached unacceptable levels. Historical uses of the lake were now in jeopardy due to the very high levels of one plant species in particular *Egeria densa*. Swimming, boating and fishing had become increasingly more difficult and far less enjoyable. Concerns with safety on the lake are increasing. Another fear is that property values will decline. Concerned homeowners took samples of the weed species to a workshop held by Ecology in 2003. There, Ecology staff identified the sample as *Egeria densa* (Brazilian elodea). The Washington State Noxious Weed Control Board has listed *Egeria* as a Class B Noxious Weed Species designated for control in Island County.

PROBLEM STATEMENT

The introduction of exotic invasive plant species is changing Lone Lake. People are finding it increasingly difficult to use the lake for fishing, boating, swimming and other traditional activities. Lone Lake has been identified as a macrophytic lake (Ecology, 2004). There has always been an abundant plant population in this lake environment. However, over the past several years the over abundance of Brazilian elodea (*Egeria*) has severely impacted beneficial uses of Lone Lake.

Swimming safety is an issue and can no longer be enjoyed in Lone Lake. Some shoreline property owners no longer allow their children to swim in the lake fearing entanglement. The children willing comply (Steering Committee, 2004). The South Whidbey Parks and Recreation District sponsors an annual triathlon. The swimming portion of the Whidbey Island Triathlon is held in

Lone Lake. Vegetation, now, reaches the water surface along the course. Becoming entangled in the weeds makes the swim more difficult and far less enjoyable for the participants. Triathletes have approached the Island County Noxious Weed Control Board wanting to know what can be done about the abundance of vegetation in Lone Lake and when they will see some relief (Hall, 2004). For practical purposes, Lone Lake is the only lake that can be used for this triathlon. The other lakes in the area are Goss and Deer Lakes. The staging area at Goss Lake is not large enough for this event. If Deer Lake were to be used, the triathlon would have to cross a state highway. This is a high quality event, in its ninth year, that draws approximately 250 participants. Many participants train year-round in anticipation of this triathlon. Some participants come from off island and remain over night. The local area would be negatively impacted if the Whidbey Island Triathlon were no longer held (Lone Lake Brazilian elodea Project Proposal, 2003).

Boating has already been impacted. Homeowners are pulling their boats out of the water because enjoyment has declined and there is an increase in safety concerns. Kayakers and canoeist are now unable to paddle the lake as they once could. The potential for boating and/or swimming accidents to occur is increasing. Competition for the decreasing open space available in the lake is bringing motorized boats closer to swimmers and fishermen.

Water skiing is increasingly more difficult. One well accomplished water skier is convinced that a fall, resulting in an injury, was caused by the water ski becoming entwined in the vegetation. This caused the motion of the ski to rapidly decelerate bending the skier's leg backward resulting in hamstring damage.

Fishermen, more than most recreational lake users, understand the importance of aquatic vegetation. Over the past several years they, too, have become concerned with the abundance of vegetation in Lone Lake. The fishermen often use float tubes while fly-fishing. They particularly enjoy fishing the northwest and east side of the lake in the mid-range of depth. The macrophytes have always been in abundance in these areas, but are now filling the water column. This makes it increasingly more difficult to navigate. The vegetation is reaching the surface making it impossible to use rod and reel and largely undesirable for the fly fishermen. The fishermen are being forced into deeper water to find relief from the abundant vegetation causing them to fish in closer proximity to the open water more normally used by water-skiers. Lone Lake has a Washington Department of Fish and Wildlife Trophy Lake designation. The fishing clubs were instrumental in having Lone Lake designated as such, because they have enjoyed consistently catching large trout when fishing this lake. The fishermen are concerned that monotypic stands of Egeria will cause an overall reduction in the size of trout. These dense mats and entangled stems cause mature fish to lose foraging space. They become less efficient at obtaining prey and the quality of foraging material declines. Egeria

does not support the abundance of invertebrate species that a macrophytic lake with native species would (Aquatic Ecosystem Restoration Foundation (AERF), 2004). This, along with the reduction in open space could lead to a population of small fish.

The Lakefront homeowners fully understand the potential for property values to decline if this noxious weed is left uncontrolled. Over time, the impenetrable mats of Egeria can decrease water flow and trap sediments. Water depth has decreased since the 1996 Ecology survey. This may very well cause an increase in flooding (AERF, 2004). If lake sedimentation increases and the abundance of invasive plant species increase then the Lone Lake environment may very well shift toward characteristics more normally associated with bogs. This will reduce the aesthetics of the lake resulting in lower property values.

Purple loosestrife or *Lythrum salicaria* is an emergent noxious weed species that can be found along the margins of Lone Lake. If left uncontrolled this infestation will expand, continuing to replace native vegetation. It is difficult to mow and maintain. *Lythrum salicaria* infestations can alter wetland ecosystems. Coupled with the Egeria infestation, these noxious weed infestations pose a real threat to shoreline property owners' investments.

Lone Lake has been designated Priority Habitat by Washington Department of Fish and Wildlife. This means it is habitat considered to be a priority for conservation and management. It has been given this designation because of the wetlands adjacent to the lake and because it supports regular concentrations and regular large concentrations of waterfowl. The federally threatened bald eagle is found in the Lone Lake area as well (WDFW, 2004). Vegetation type and diversity is critical to preserving the food web that supports the waterfowl concentrations seen in Lone Lake. When *Egeria densa* and *Lythrum salicaria* are present in an environment a reduction in diversity of plant species is often seen. This in turn reduces the diversity of invertebrates supported by that vegetation. This will impact the diversity of reptiles and amphibians reducing the quality of food source for bird populations.

MANAGEMENT GOALS

The ultimate goal for implementing this Integrated Aquatic Vegetation Management Plan is to eradicate Egeria from Lone Lake while protecting habitat for fish and wildlife. The first three years of implementation, will consist of intense control efforts put forth to achieve eradication. The key people in this project are well aware of how difficult it is to eradicate Egeria. They are dedicated to tracking the reduction of infestation and if necessary, maintaining the Egeria population at very low levels in the lake. The hope is that these control efforts will restore the lake to a more natural state and that beneficial uses will return.

In the course of developing the Lone Lake IAVMP, the Steering Committee has carefully considered the health of not only Lone Lake, but the wetlands adjacent to the lake. Because of the Priority Habitat status given to Lone Lake and the adjacent wetlands, it is critical that control methods used to eradicate *Egeria* and *Lythrum* do not harm the ecosystem or the species it supports. Implementation of this plan will make it possible for native vegetation to reestablish in the lake environment and along the shoreline. Native vegetation is known to provide better habitat for fish and wildlife by supporting a more diverse food supply than monotypic stands of invasive plant species. Implementing this IAVMP will help to ensure the preservation of this unique waterfowl habitat and fishery as well as restore beneficial uses of the lake.

Eradication of *Egeria* will make it possible and more desirable to continue the tradition of the Whidbey Island Triathlon. It will be safer and more enjoyable because of it. Local merchants will continue to enjoy the benefits of business generated as a result of the triathlon event.

With a decrease in BioVolume (percent of the water column filled with plants), open water surface area will be increased. This increase in usable water surface area will make it safer for swimmers. Their safety will be enhanced by decreasing the competition from other recreational users of this same space. Swimmers will also be in less contact with the vegetation, reducing the possibility of entanglement.

Paddling boats through the lake closer to shore will, again, be possible and pleasurable. The area of the lake where vegetation reaches the surface will be pushed back to the margins. The water column will be free of vegetation from the surface down several feet, in an increased percentage of the lake. The frequency of a paddle coming in contact with vegetation will decrease. This will enhance the freedom of motion desired by participants in this sport at this site.

Water-skiers will once again be able to enjoy their sport without fear of injury. The larger surface area devoid of vegetation will benefit the skiers, in that it will create a safer environment. Water-skis will no longer become entangled in the vegetation and the greater open space will give them more room to maneuver.

The implementation of this IAVMP will work to return native species as the dominant submersed vegetative cover in Lone Lake. The goal is for native vegetative cover to fall in the range of 25-80%, in support of fish habitat (AERF, 2004) (Ecology, 2004), and help preserve this unique fishery. A reduction in BioCover (percentage of lake-bottom covered with plants) and BioVolume will make the use of fishing lures in Lone Lake once again possible. It will also increase the depth of water column usable in fly-fishing. Those using float tubes will have enhanced freedom of movement.

Eradication of Egeria from this environment will help eliminate the concerns due to abundant vegetation and the esthetic value of shoreline

property. This will help to protect Lone Lake shoreline property owners' investment.

CHARACTERISTICS OF THE WATERSHED AND WATERBODY

GENERAL INFORMATION

Lone Lake is located 2.5 miles southwest of the city of Langley and one mile southeast of Goss Lake on Whidbey Island. This portion of Island County is unincorporated and has tripled in population over the last 30 years (Island County Planning Department, 2004). Lone Lake has 1.6 miles of shoreline. The shoreline parcels are zoned rural, rural residential, rural agriculture and rural forest. There are 44 waterfront homes and a residential community of over 100 homes adjacent to the lake. This long-plat, known as Lone Lake Terrace, owns a lake-front parcel as a community, allowing them access to the lake (Figure 1).

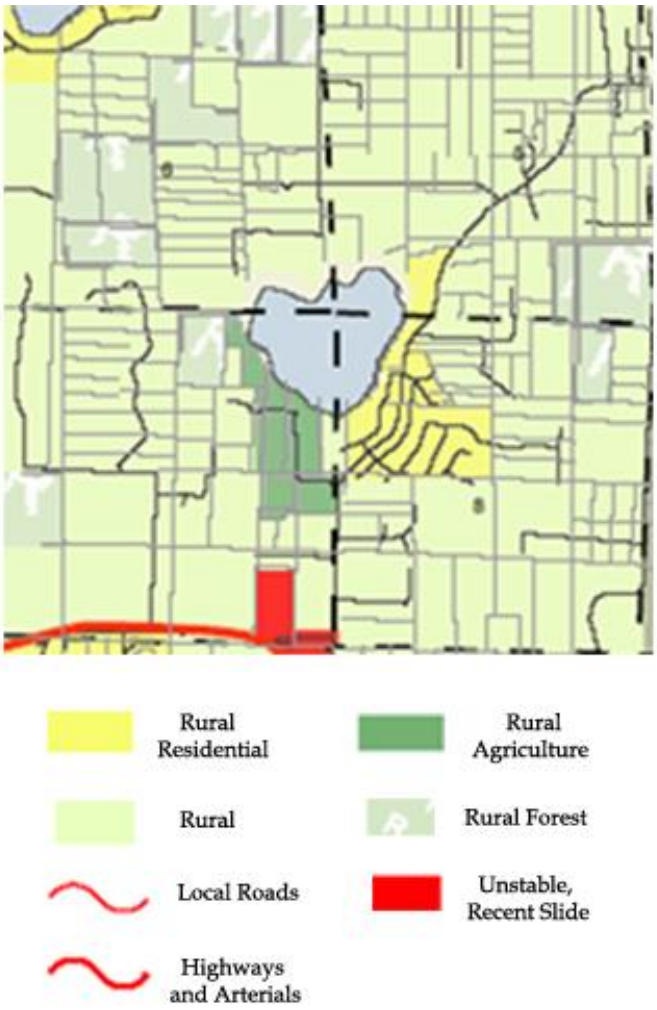


Figure 1. Land Use Map, Lone Lake and Vicinity

Island County Planning Department

Along with growth in population there has been road construction, parcel development and timber harvesting in the vicinity of Lone Lake. (Island County Public Works, archived permits) (Lone Lake Brazilian elodea Project Steering Committee (LLBePSC), October 10, 2004). Timber has been harvested on the west side of the lake (Strodel, 2004) where slopes are 40% and greater. There is at least one large shoreline parcel in agricultural use near the critical areas associated with Lone Lake (Figure 2).

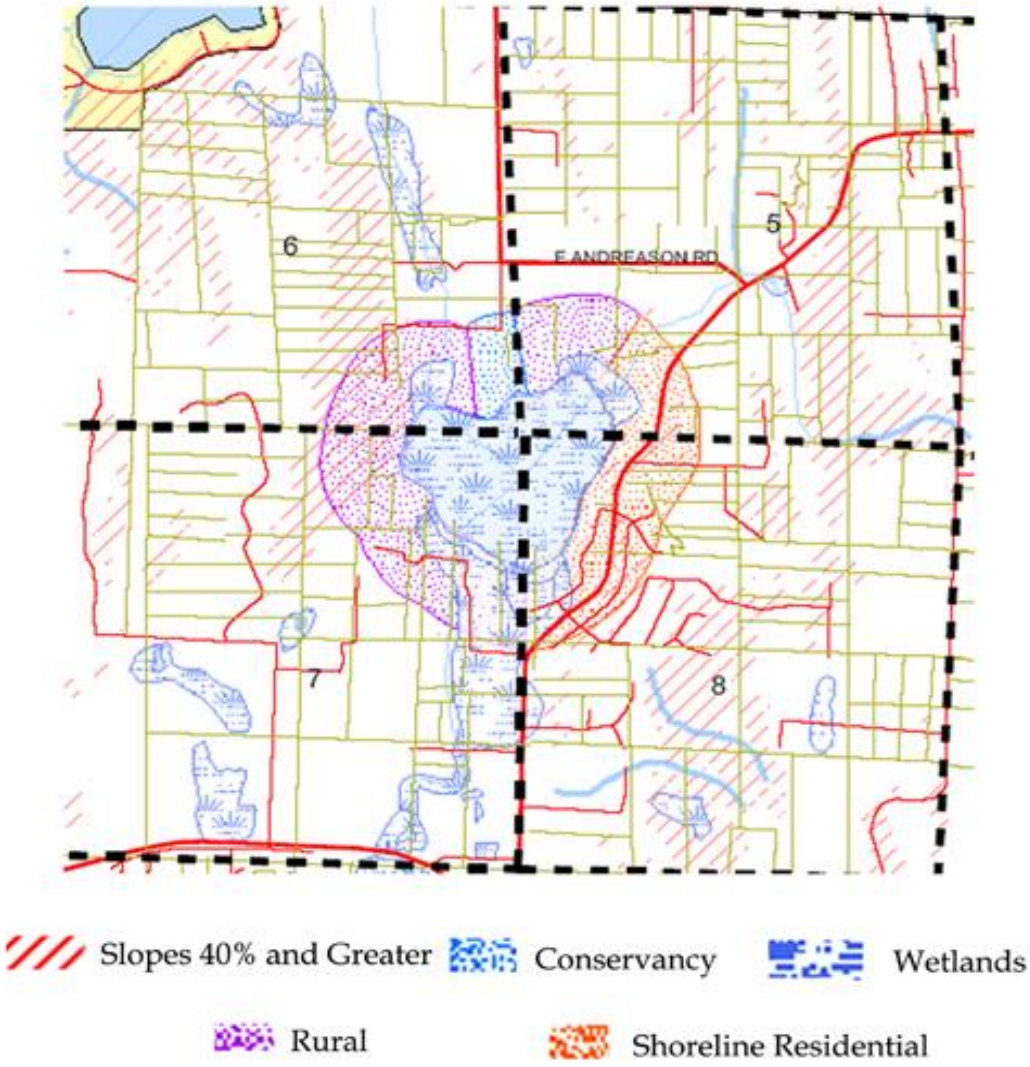


Figure 2. Critical Areas Map, Lone Lake Vicinity Island County Planning Department

"Lone Lake is part of the Deer Lagoon drainage area (Figure 3). This drainage area totals 5,400 acres. According to the LiDAR delineation the portion of this basin that actually drains to Lone Lake is approximately 1,900 acres." (Nash, 2005). Ecology's 1996 survey reports the drainage area as being 2.80 square miles. This same survey determined the lake volume to be 909 acre-feet. (Ecology, 1996).

Figure 3. Topographic Map of Lone Lake and Vicinity Map by TopoZone

In the September 2004 survey, ReMetrix determined the maximum depth of Lone Lake to be 13 feet. (Fig. 4).

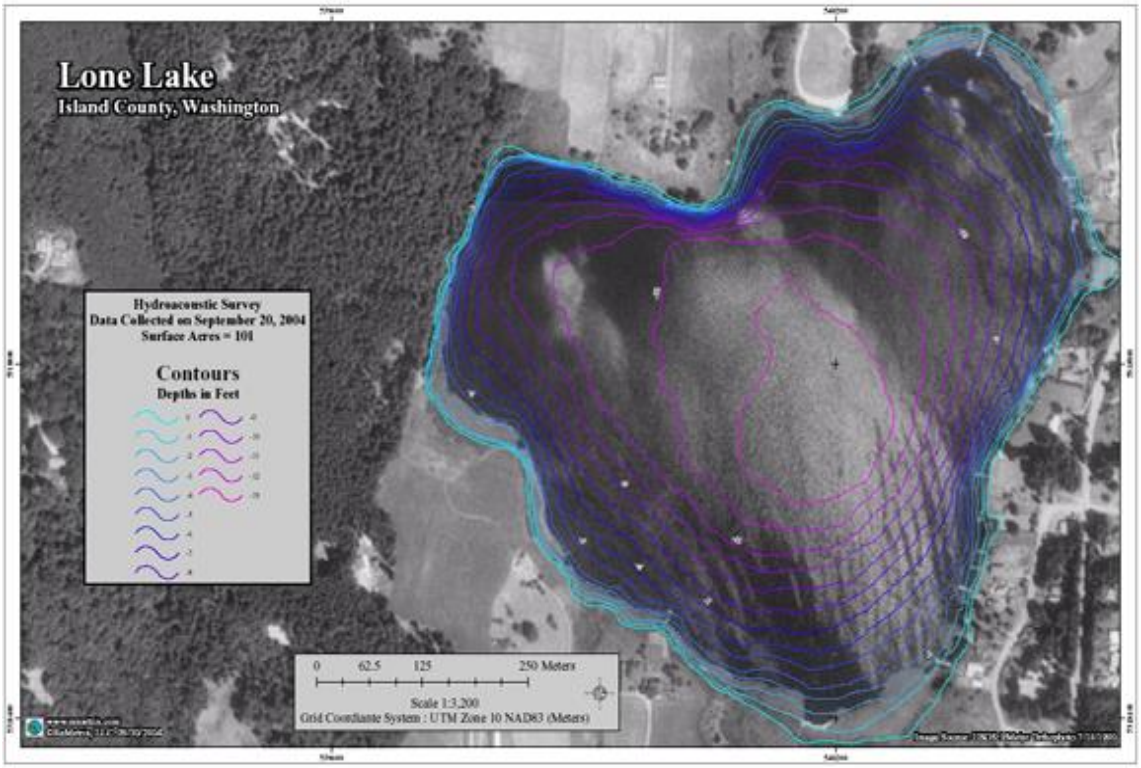


Figure 4. Water Depth in Lone Lake (map by ReMetrix)

This is four feet less than that recorded in the Ecology survey of 1996. (Ecology, 1996). This discrepancy may be due to methodology. Ecology used a Jacob's staff for physical depth sampling. ReMetrix used a "digital scientific echosounder linked to a differential Global Positioning System beacon" to gather depth readings. ReMetrix also used a Jacob's staff to ground truth the echosounder data. They found a "varying amount of differential between the acoustic measurements and the Jacob's staff measurements. ReMetrix determined the differential to be caused by the extremely soft sediment of the lake bottom. The hydroacoustic signal is significantly more sensitive than a Jacob's staff at detecting the density difference that marks the transition between the water column and the soft sediment layer. In Lone Lake, gradually increasing soft-sediment to water ratios eventually reach a threshold of sediment concentration that begins to reflect the relatively short-wavelength acoustic signals, yet still do not provide noticeable resistance to the Jacob's staff until much greater sediment to water ratios are reached. Alternatively, the Jacob's staff does not register the soft-sediment layer until it reaches sediment densities great enough to resist the downward force of the Jacob's staff. Based on the consistency of the acoustic depth data from transect to transect and the inconsistency of the point depth data, ReMetrix decided that the acoustic data

are the most reliable measurements from which to calculate water depths and bathymetric contours." (ReMetrix, Lone Lake Survey Attachment). Perhaps there is an additional contributor to the differentials in depths between the Ecology and ReMetrix surveys. It could be that Egeria is trapping sediments in the lake system contributing to the reduction in depth.

Lone Lake is fed by two small inlets and one outlet. The outlet drains into Useless Bay (Ecology, 1996). The inlets and outlet are not named and the flow rates are unknown. (Cohen, 2004). The lake outlet structure is in a state of disrepair. From all accounts the outlet has been dry for the last ten years. The topography is such that it would, likely, take a catastrophic flood event for surface water to flow from Lone Lake into Useless Bay (Lone Lake Brazilian elodea Project Proposal, 2003). The residence time for water in the lake is also unknown. (Cohen, 2004). It is thought that the lake is in contact with the aquifer. It is likely that the water moves from the lake into the aquifer during the wet season and from the aquifer to the lake during the dry season. To verify this seasonal water level data would need to be collected from both the wells and from the lake (Kelley, 2004).

SOILS (This section is taken directly from the "Soil Survey Report of Island County, Washington", August 1958)

The climate is fairly uniform throughout Island County and, except for the prairie areas, the vegetation is fairly uniform. Therefore, though climate and vegetation were the most important factors that affected the formation of the soils, they do not account for the pronounced differences among the soils. These differences were caused largely by differences in parent materials, relief, and age of the soils.

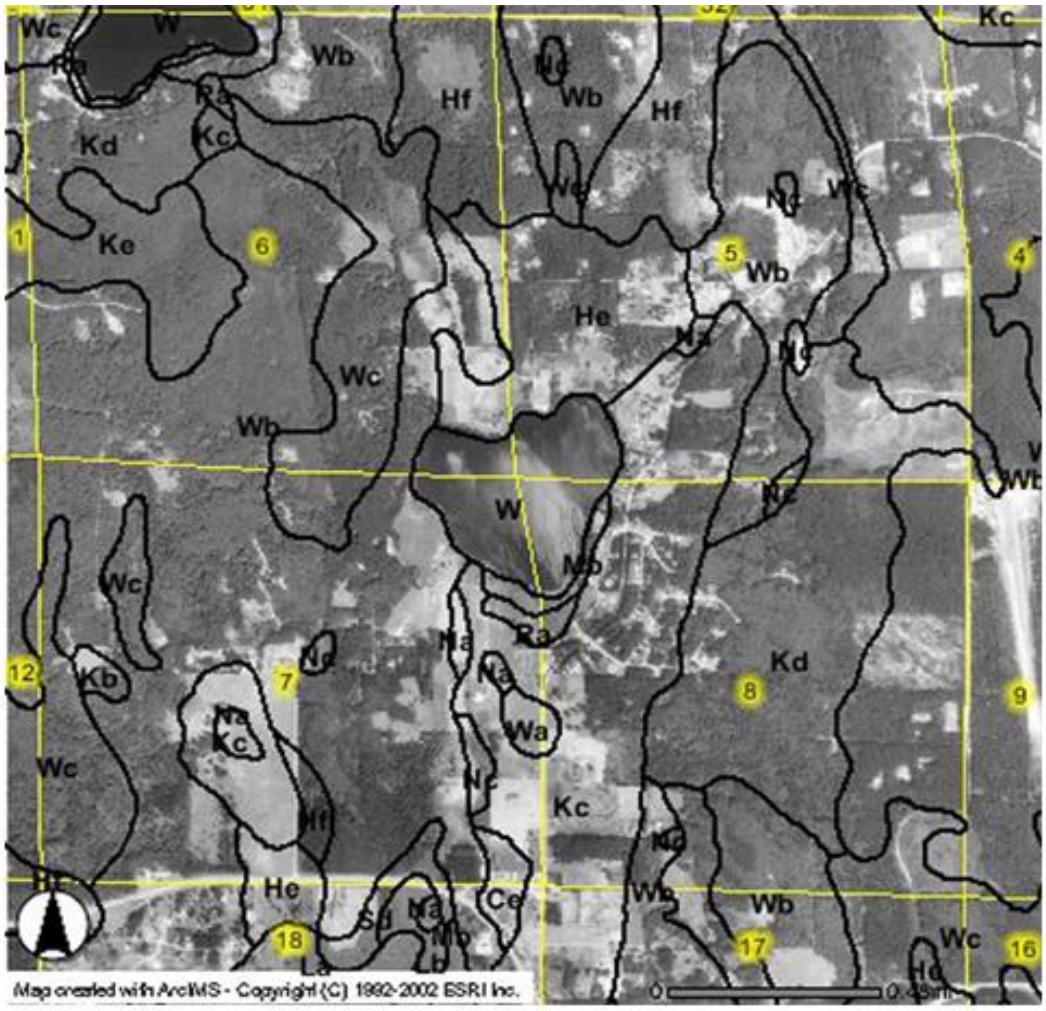
Island County has a maritime or somewhat modified continental climate, influenced by winds from the Pacific Ocean. The winters are mild and wet. The summers are cool and dry. Temperatures rarely go as low as zero or as high as 90°F. The average temperature is about 50°F. Most of the precipitation falls between December and March, and there is a distinct dry season during the summer. The annual rainfall at Coupeville averages between 18 and 19 inches, but the rainfall is apparently somewhat heavier south and east of Coupeville. The southern part of Whidbey Island is believed to receive approximately 35 inches of rainfall annually. The precipitation falls as gentle rains. During the winter many of the days are overcast and foggy. The relative humidity is high during most of the year, but occasionally drops to 50 percent or less during the summer. Little snow falls, and ground freezes only occasionally below a surface crust.

The predominant vegetation consists of a dense growth of conifers-largely Douglas-fir and hemlock and a ground cover of ferns, mosses, and vines. A few shrubs grow in the more open areas, and maple trees, shrubs, and vines grow in the depressions. The marshy areas are covered by sedges, reeds, and other water plants.

The soils of Island County were derived mainly from materials deposited by glaciers. Granite, gneiss, and schist were the principal rocks from which these materials originated, but considerable amounts also came from parent material that was derived from marine deposits or from glacial lake sediments. The glacial ice that came from the north was a lobe, or tongue, of the Cordilleran icecap. The Vashon glacier, the most recent of the glaciers, left the extensive deposits from which most of the soils were formed. Older Pleistocene deposits are exposed in the sea cliffs at various places on the islands. These older deposits, however, did not contribute to the parent materials of any of the soils because they were later covered by deposits left by the Vashon glacier. During the interglacial periods the land rose to higher elevations, became eroded, and than sank. Apparently, all these processes contributed to the formation of the principal land features and regional drainage systems. Though the glacial till deposits vary considerably, they are partially or strongly cemented, which suggests that the parent materials may have been submerged by glacial waters for long periods. The gray glacial till that covers most of the county is of a sandy texture. Many rounded pebbles and cobblestones are embedded in it. In many places boulders occur, especially in the surface materials. The glacial outwash is loose in consistence. In some places it is very gravelly, but in other places it is sandy. A small part of the parent materials consisted of marine and glacial lake sediments.

The topography of the county has been affected by glacial action. It is predominantly morainic. The relief is generally undulating to rolling, but a few slopes are steeper than 15 percent. Most of the soils occur at elevations of 100 to 300 feet. Except for the depressional areas, which are not extensive, the soils have enough slope so that natural drainage is adequate. The soils of Island County have been developing since the retreat of the Vashon glacier, the last glacier that covered the Puget Sound area. The glacial materials from which the soils were formed were deposited near the close of the Pleistocene epoch.

Of the six great soil groups represented in Island County, most of the soils found in the vicinity of Lone Lake are members of a single group known as Podzols. The Podzols found adjacent to the lake are Whidbey Gravelly Sandy Loam, 5 to 15 Percent Slopes, Hoypus Gravelly Loamy Sand, 0 to 5 Percent Slopes, and Keystone Loamy Sand, 5 to 15 Percent Slopes. Mukilteo Peat, 0 to 2 Percent Slopes is an organic soil that is found adjacent to the lake as well (Figure 5).



He Houpus Gravelly Loamy Sand, 0 to 5 Percent Slopes
Kc Keystone Loamy Sand, 5 to 15 Percent Slopes
Mb Mukilteo Peat, 0 to 2 Percent Slopes
Wb Whidbey Gravelly Sandy Loam, 5 to 15 Percent Slopes
W Water

Figure 5. Soils Adjacent to Lone Lake

The Whidbey soils, developed from cemented gravelly till, occupy about 36% of the county. The present vegetation on these soils consists largely of second-growth Douglas-fir and hemlock with a scattering of deciduous trees, shrubs, and ferns. The Hoypus and Keystone soils have developed from loose, permeable, coarse-textured glacial drift. The Hoypus soils have developed from somewhat modified gravelly and stony drift. They occur on uplands. The Keystone soils originated from sandy drift. Compared to the Hoypus soils, they occupy uplands such as hummocks and kettleholes. The Organic soils have a muck or peat surface layer that is underlain by peat. These soils occur in low

basins or depressions where the water table is high. They have developed under a swamp or marsh type of vegetation, generally in a humid or subhumid climate. These soils were derived from the remains of plants in various stages of decomposition. Mukilteo peat has developed from sedges and reeds that grew in open marshes. The sediments found in Lone Lake are deep, flocculent and easily disturbed. (LLBeSC Meeting, September, 2004). Where the flocculent soils lie is anecdotal. It is thought that "the flocculent soils are where there is significant vegetation around the perimeter of the lake such as the south and southeast area where you find lily pads and cattails. The annual die off associated with these species gives it that peat bog feeling. If you compare this area with some of the areas with little shoreline vegetation like the boat launch and some homes with just grass to water, you will see less of that flocculent and more solid sediments" (Strodel, 2004).

VEGETATION

The aquatic plant species present in Lone Lake were documented in the 1996 Ecology survey. That list was updated in 2003 to include *Egeria*. Table 1. represents the aquatic plant species found in Lone Lake by the Department of Ecology. The state-listed noxious weeds have been bolded. The Table includes both submersed and emergent species. In 1996 the dominant species was *Potamogeton praelongus.* Included in the 1996 Ecology survey were comments "that the lake was difficult to survey because there were so many plants in a wide littoral zone" (Ecology, 1996).

Table 1. AQUATIC PLANTS IN LONE LAKE **(Ecology, 2003)**

Ceratophyllum spp..	*Chara spp.*	***Egeria densa***
Elodea canadensis	***Lythrum salicaria***	*Nuphar polysepala*
Phalaris arundinacea	*Potamogeton praelongus*	*Potamogeton zosteriformis*
Schoenoplectus tabernaemontani		*Typha spp.*

ReMetrix performed a survey of submersed plants in 2004. Table 2 represents the species identified in that survey. Vegetation was sampled at 74 sites using a weighted double-sided thatch rake. At each sample point vegetation species, relative density, relative abundance, and species habit was recorded.

Table 2. SUBMERSED PLANTS IDENTIFIED IN 2004
(ReMetrix, Lake Survey Appendix)

Ceratophyllum denersum	*Chara spp.*	***Egeria densa***
Potamogeton crispus	*Potamogeton nodosus*	*Potamogeton praelongus*
	Potamogeton zosteriformis	

"A total of seven submersed species were identified by ReMetrix in the 2004 survey (Fig. 6).

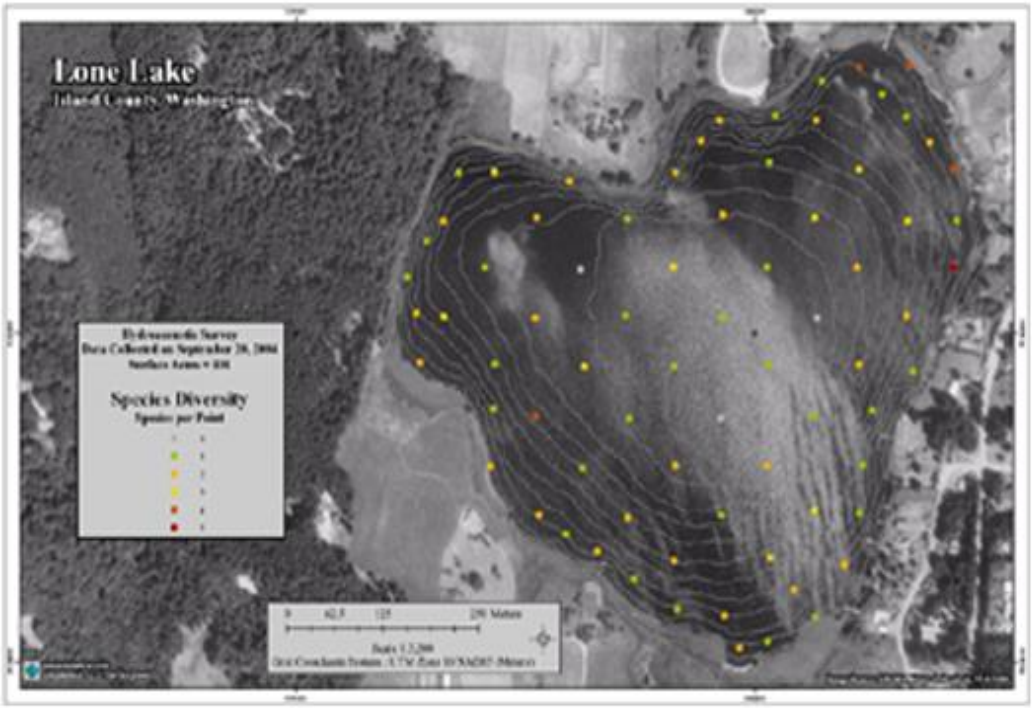


Figure 6. Aquatic Vegetation Species Diversity in Lone Lake (map courtesy of ReMetrix)

Waters shallower than 11-feet generally have increased species diversity, though no distinct pattern of species diversity is visible in the -11 to 0 foot depth range.

1. *Egeria densa* dominates the submerged plant assemblage and was found at 70 of the 74 sample sites (95%). This coverage percentage likely applies throughout the entire lake." Plant densities of samples taken of this

species was common (20%-60%) to dense (>60%) from the depth of -11 to 0 feet. From the depth of -13 to -11 the density was categorized as sparse (3%-20%). Since *Egeria* was not detected in the 1996 survey of Lone Lake, this represents a very rapid colonization of the entire lake by this aggressive invasive species.

2. *Chara* was identified at nine sites; one sparse in density. It was found at low levels of density (<3%) at all other sites. These sites were located in the north and west portions of the lake and as deep as -12 feet.
3. *Ceratophyllum demersum* was found at 13 of the 74 sites. Densities were sparse. This species was found as deep as -12-feet.
4. *Potamogeton praelongus* was found at 25 of the 74 sites. The densities were sparse with two sites in the common density range of 20-60%. Samples of this species were found no deeper than -7-feet.
5. *Potamogeton zosteriformis* was found at 10 sites and sparse in density. Six sites were in the far northeast portion of the lake and three were in close proximity to one another in the extreme southern portion of the lake.
6. *Potamogeton nodosus* was found at three sites, sparse in density at each site.
7. *Potamogeton crispus* was found at one site with a sparse density. (ReMetrix, Lake Survey Appendix

"Overall vegetation biocover and vegetation biovolume was analyzed using hydroacoustic data. Biocover (Fig. 7) is a measure of the percentage of the sediment layer covered with plants in any defined area.

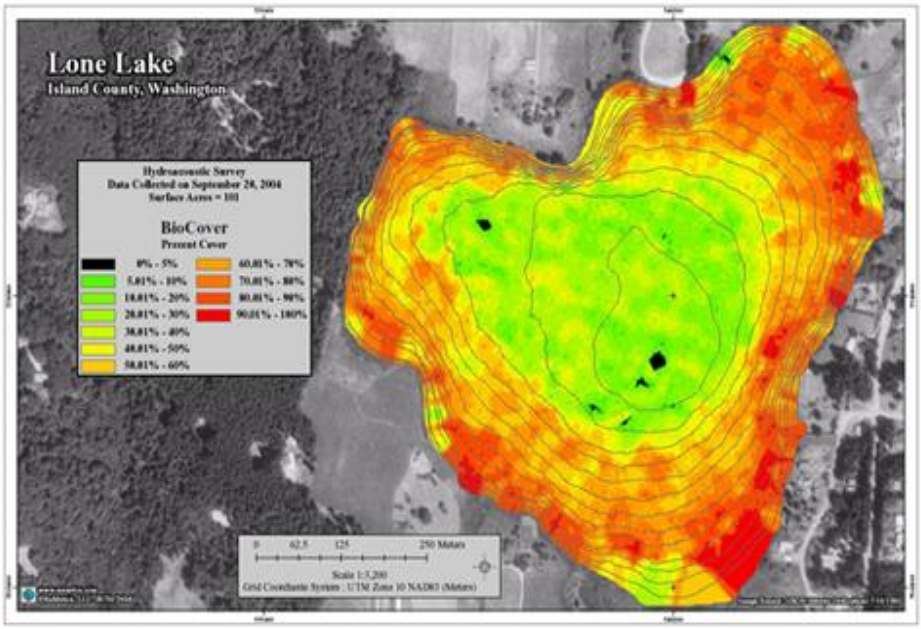


Figure 7. BioCover in Lone Lake Map by ReMetrix

This relates to plant density on the bottom of the lake. Nearly the entire lake bottom is vegetated. Coverage in areas shallower than 11-feet is commonly greater than 50%, while coverage in areas shallower than 7-feet is commonly greater than 70%. The percent of coverage in areas deeper than 11-feet is generally within the 5-30% range. A few small gaps in biocover exist in the deepest areas of the lake. Biovolume (Fig. 8) is a measure of how much of the water column is occupied by plants. This helps indicate where plants may be reaching nuisance levels in the water column.

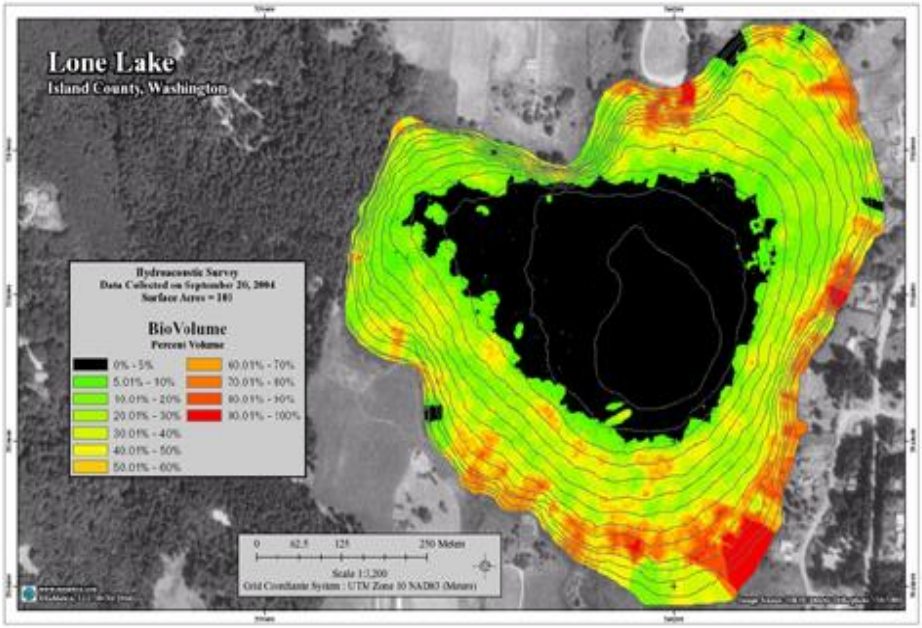


Figure 8. BioVolume in Lone Lake

Biovolume is definitely concentrated in areas shallower than 11-feet. Between 5-feet of depth and 11-feet of depth, the biovolume commonly ranges between 5-40%, with a few small areas climbing into the 70% range. The greatest concentration of biovolume is found in waters less than 5-feet deep, extending in an arc from the central southwestern shore counterclockwise to parts of the northeastern shores. A few small pockets of very low (<5%) biovolume do exist near the shoreline. Waters deeper than 11-feet have biovolume less than 5%, which makes sense given the greatly reduced plant bottom coverage of these areas." (ReMetrix, Lake Survey Appendix). *Elodea canadensis* was not found. This may be due to the time of year the survey was performed. This species may have died off for the season or there may be significant reduction in the populations currently found in the lake due to displacement by *Egeria*.

Of the aquatic plant species identified in Lone Lake, three are noxious weeds. They are *Egeria densa*, *Lythrum salicaria* and *Phalaris arundinacia*. *Egeria densa* and *L. salicaria* are Class B noxious weed species designated for control in

Island County. This project will concentrate on the eradication of these two species. *Phalaris arundinacia* is a Class C noxious weed. It is cosmopolitan in this region therefore eradication is not likely, but control is strongly encouraged.

Egeria densa

Egeria densa is a freshwater, submersed, perennial herb. The leaves are in whorls of 4 to 8 around the stem. They can be found drifting or rooted to the bottom sediments in water up to twenty feet deep. It is a popular aquarium plant known as *Anacharis* and dumping of aquaria in lakes is often the cause of initial infestation (Fish and Wildlife). This species is prohibited for sale in Washington, but it can be readily obtained from internet sites or purchased in other nearby states. *E. densa* can reproduce sexually or from fragmentation. They form a small white flower (18-25mm) with petals. However, all *Egeria* plants introduced into the United States are male and therefore no sexual reproduction occurs outside of its native range. When fragmentation occurs roots are produced from double-nodes on the stem (Washington State Noxious Weed Control Board (NWCB, 2004). Another means by which *Egeria* spreads is through underground branching known as rhizomes. These rhizomes are known to persist several feet down into a flocculent sediment layer (Hamel, 2004).

The highly aggressive *Egeria* displaces and replaces native vegetation. It forms impenetrable mats that decrease water flow. The tangled stems provide habitat for mosquitoes and reduces insect diversity. The decline in diversity is caused by the formation of a dense canopy and a reduction in light penetration. A less diverse animal community lowers the value as a food source for waterfowl (AERF, 2004).

Egeria densa foliage supports a lower abundance and diversity of invertebrates which serve as fish food. Dense stands of *Egeria* are poor spawning beds. The tangled stems allow less space for larger fish to prey. This often results in a less efficient predator. These impacts, combined, may lead to populations of smaller fish (AERF, 2004).

Lythrum salicaria

According to the "Written Findings" of the Washington State Noxious Weed Control Board, "*Lythrum salicaria* is a perennial, emergent aquatic plant. As many as 30 to 50 herbaceous, erect annual stems rise to about nine feet tall from a persistent perennial tap root and spreading rootstock. There is a somewhat squarish stem. Upper leaves are alternant, 1.5 to 4 inches long with shape varying from lanceolate to narrowly oblong. The showy, magenta flowering stems end in a 4-16 inch flowering spike. Flowers appear from July to early October. Each flower is complete, containing five to seven petals, with the same number of sepals as petals, and twice as many stamens as petals. The ovary is superior, with two fused carpels. The fruit is a two-valved capsule

enclosed in the pubescent calyx. Purple loosestrife is invasive and competitive and unavailable to native wildlife. It replaces native plants used for ground cover, food, or nesting material. Loosestrife stands are dense at the top and open at the base. Structures of root masses create a three foot opening, in the water, between plants. This provides, virtually, no cover for nesting ducks." (NWCB, 2004).

Pharlaris arundinacia

"This rhizomatous perennial grass, also known as reed canarygrass, can reach three to six feet in height. Stems can be up to 0.5 inches in diameter with some reddish coloration near the top. Leaf blades are flat and hairless 0.25 to 0.75 inches wide. Flowers are borne in panicles on culms high above the leaves. Panicles are 3-6 inches in length and it flowers in June and July. *Pharlaris* forms dense highly productive single species stands that pose a major threat to many wetland ecosystems. The species grows so vigorously that it is able to inhabit and eliminate competing species. This species typically occurs in soils that are saturated or nearly saturate for most of the growing season. Established stands can tolerate extended periods of inundation. Unlike native wetland vegetation dense stands of reed canarygrass have little value for wildlife. Few species eat the grass and the stems grow too densely to provide adequate cover for small mammals and waterfowl" (NWCB, 2004).

WETLANDS AND PRIORITY HABITAT

The National Heritage Information System was searched for information on significant natural features in the vicinity of the Lone Lake project area (T29N R3E, S5-8). No records for rare plants or high quality native ecosystems in the vicinity of this project were found. (Moody, 2004).

A report written by Linda M. Kunze, published by Washington State Department of Natural Resources entitled Preliminary Classification of Native, Low Elevation, Freshwater Wetland Vegetation in Western Washington describes two types of wetlands found in the same geographic region as Lone Lake. Kunze's report identifies this region as the Northern Puget Trough Lowlands. Sphagnum bogs and impounded minerotrophic wetlands are found here. The wetlands associated with Lone Lake are believed to be partially impounded minerotrophic wetlands. They have "no marine-derived salts and are fed by water which has been in contact with mineral soils. They have very little sphagnum, either living or in the rooting zone, and include wetlands with either organic or mineral soils. The pH is generally greater than 5.5. They may be high or low nutrient systems. They include the range from impounded systems with no through-flow to partially impounded systems which have either seasonal flow or slow-moving water year-round" (Kunze, 1994). Lone Lake likely has both organic and mineral soils having peat adjacent to the south end of

the lake and sandy loam/loamy sand soils adjacent to the north end of the lake. The lake is a high nutrient system that either flows seasonally or the water slowly moves year round.

Lone Lake and the surrounding wetlands have been designated Priority Habitat by the Washington Department of Fish and Wildlife (Fig. 9).

Figure 9. Lone Lake Priority Habitat Use Map (Information Courtesy WDFW)

Priority Habitats as defined by Washington Department of Fish and Wildlife (WDFW) are "areas that support diverse, unique and/or abundant communities of fish and wildlife. Information is collected by WDFW biologists using the best information available from research efforts, surveys, or field observations. This information represents known occurrences of priority habitats not potential or theoretical" (WDFW, 2005). Virtually all the scrub-shrub, forested and emergent

wetlands along the shoreline of Lone Lake have this priority designation. The wetlands associated with Lone Lake have been prioritized as such because they support an abundance of regularly occurring waterfowl. It is an important food resources and refugia for waterfowl, shorebirds and marine birds. The lake, and its vegetation, also support regularly occurring waterfowl and have the same Priority Habitat designation (Washington Department of Fish and Wildlife, 2004).

WATER QUALITY

Surveys

There is very little water quality data available on Lone Lake. In September of 1988 an Island County Assistant Planner began laying the ground work for restoring Lone Lake. Provisions for funding this type of project were made available through passage of the Centennial Clean Water Act. The approach would be to perform a lake survey and develop a restoration plan as Phase I of the project. Phase II would be the implementation of that plan. In October of that same year, Deborah Howe of Ott Engineering, Incorporated prepared a "Proposal for Restoration of Lone Lake." In that report the author noted "the rich biological production of the lake resulting in exceptional growth rates of trout and of aquatic weeds." She went on to speculate that the "high density of algal blooms may cause fish kills." Algal blooms do occur in Lone Lake, but no fish kills have been reported. Lake residents report high levels of algae in two of the past four years. What causes the increase in algae some years and not others is unclear. A one year old female Australian shepherd drank water from Lone Lake and began to display symptoms of poisoning. A veterinarian attributed the death of the dog to ingesting blue-green algae that was thought to be present in the lake at the time. The algae itself was not positively identified. (LLBeSC Meeting, 2004).

Howe refers to a water sample collected in May 1974 that "strongly indicates eutrophic conditions." "The surface water was super-saturated with Dissolved Oxygen (DO), while bottom waters contained hydrogen sulfide, indicating no oxygen present. Ammonia-nitrogen was high throughout the water column with correspondingly low values of nitrate-nitrogen. Phosphorous levels were high on the surface and on the bottom. The nutrient levels in association with observed DO are characteristic of eutrophic conditions." (Ott Engineering, 1988). This analysis is in agreement with what Ecology found in their 1996 survey of Lone Lake. Comments included with that survey stated that "all Trophic State Indices were indicative of a eutrophic lake. The large plant populations and considerable algal growth are additional indicators of a eutrophic lake." (Ecology, 1996)

Later in the process, a memo was sent to the Assistant Planner by a County Commissioner. In that memo he addressed the lack of in-kind match funding for the proposed project. He then suggested that the Lone Lake community begin monitoring the lake voluntarily as part of an Ecology-trained

lake stewardship program. There is no documentation or verbal record indicating the lake stewardship program was pursued.

Water Monitoring

The Island County Health Department performs surface Water Monitoring (Swim Beach Surveillance) of Lone Lake twice each year. The samples are collected at the boat ramp and are checked for either E. Coli or Fecal Coliform. According to protocol "E. Coli organism levels must not exceed a geometric mean value of 126 per 100 ml, with not more than 10 percent of all samples (or any single sample when less than ten sample points exist) obtained for calculating the geometric mean value exceeding 406 per 100ml (the estimated upper 90th percentile for a population of bacterial samples with a geometric mean of 126 and a log10 standard deviation of 0.4)" The protocol for Fecal Coliform is "five consecutive samples shall not exceed 200 per 100ml. Failure to meet these standards will result in closure of the beach. Any single sample over 1,000 per 100ml will result in closure."

Since 1990, there has only been three times where contaminants have reached unacceptable levels. June 29, 1992 a water sample tested for E. coli reported having levels of 400 E. coli bacteria per 100ml. The sample taken was associated with a high rainfall event. On August 31, 1992 a sample tested came back reporting 114 fecal Coliform in 100 ml of water. June 12, 1995 was the last time a sample has come back with adverse results. The sample was tested for E. coli and there were 145 E. coli bacteria in 100ml of water.

Hydrologic Information

A large geographical portion of Island County draws its drinking water from a sole-source aquifer. Because of that, the County has allocated a great deal of time and revenue to understanding and protecting this crucial natural resource. Drinking water wells are sampled for oxygen, chlorine and NO3 levels. The average nitrogen level in the Lone Lake Basin ranges from 0 to 912 with nitrogen levels in the County, in general, on the rise. (Kelley, 2004)(Salmon TAG, 2004).

According to the Island County Hydrologist, "it appears that the vast majorities of the drinking water wells in the Lone Lake area are completed in sand and gravel layer that occurs between ~30′ above sea level and ~60′ below sea level." (Fig. 10).

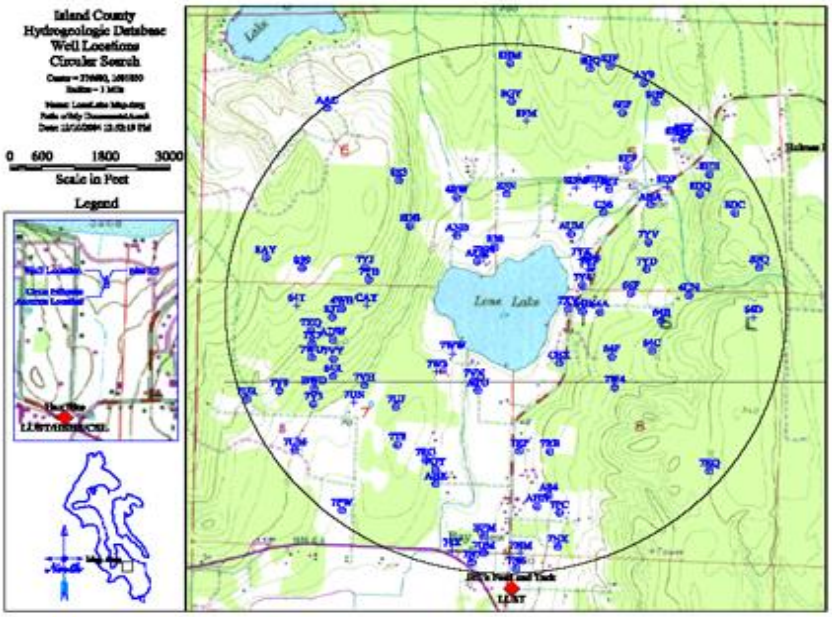


Figure 10. Well Locations In a One Mile Radius of Lone Lake

Two individuals have a legal right to water that comes from the lake for irrigation purposes. It is believed that neither one of these individuals exercises this right. (Clark, 2004). Based on a very preliminary assessment the lake probably reflects the water level in this aquifer. Water levels in the lake would have to be monitored to evaluate how much seasonal fluctuation there is to prove or disprove this. Based on the topographic map, the water level elevation of the lake is at 17 feet, looking at the map of 2,514 participants, water level elevations in wells in the area is on the order of the same, slightly higher to the east, and lower to the north and west. This also points to the idea that the lake is reflecting aquifer water levels. It is likely that water moves from the lake into the aquifer during the wet season and from the aquifer to the lake during the dry season." (Kelley, 2004).

Water Rights

There are several water districts located around Lone Lake. They include, Lone Lake Shores, Lone Lake Terrace, Quigley Water Association, Murdock Water Association, Richardson Water Association and several individual wells. It is believed that no one takes water from the lake for household use. Two individuals are known to have water rights to take water from the lake during the irrigation season. Both parties are aware of irrigation use restrictions if fluridone is used in control of *Egeria* in Lone Lake.

Possible Sources of Non-Point Pollution

All structures in this part of the county requiring sewage disposal have septic systems. This is thought to be, by and large, the greatest contributor to

non-point pollution in this area of Island County. There are several large parcels, designated for agricultural use, adjacent to Lone Lake. These parcels support many head of cattle and adhere to the Island County Ordinance C-151-99 which outlines permissible uses of agricultural lands near Critical Areas. Section VIII, A, 1 of that ordinance calls for a 50-foot agricultural buffer from lakes (Clark, 2004).

REPTILES and AMPHIBIANS

According to Washington Department of Fish and Wildlife there are only 45 herpetological records in their database for Whidbey Island. Most of these are pre-1940. (Salzer, 2004). There is no known reptile and amphibian species list for the Lone Lake area specifically.

Table 3. Recorded Reptiles and Amphibians on Whidbey Island
Species List Provided by of Lori Salzer, WDFW

Northern Alligator Lizard	Red-legged Frog	Bullfrog
Northwestern Garter Snake	Common Garter Snake	Ensatina
Pacific Tree Frog	Western Toad	Rubber Boa

Table 4. Undocumented Reptiles and Amphibians
(Depending on the habitat these herpetological species could be found on Whidbey Island)
Species List Provided by Lori Salzer, WDFW

Rough-skinned Newt	Long-toed Salamander	Western Terrestrial Garter Snake
Northwestern Salamander	Western Fence Lizard	

MAMMALS

The Department of Fish and Wildlife has documentation of mammal species on Whidbey Island. There is no information specific to mammals in the vicinity of Lone Lake nor is there documentation of mammal species that are rare, threatened or endangered in the project area.

Table 5. Documented Mammals on Whidbey Island

Species List Provided by Ruth Milner and Russell Link, WDFW

Shrew *Sorex* spp.	Shrew Mole
Little Brown Myotis *Myotis lucifugus*	Big Brown Bat *Eptesicus fuscus*
Racoon *Procyon lotor*	Weasel *Mustela* spp.
River Otter Lutra cancdensis	Coyote *Canus latrans*
Townsend Chipmunk *Eutamias towndendi*	Douglas squirrel (chickaree) *Tamiasciurur douglasi*
Northern Flying Squirrel *Glaucomys sabrinus*	Norway rat *Rattus norvegicus*
Deer Mouse *Peromyscus maniculatus*	Townsend Vole *Microtus townsendi*
Red-backed Vole	Field Vole
Muskrat *Ondatara* zibethica	Black-tail Deer *Odocoileus hemionus*

BIRDS

Lone Lake is host to quite a diverse bird population and serves as habitat for regularly occurring and migratory birds. All of Lone Lake and much of the surrounding area was identified as an "active and productive Bald Eagle territory in 1992" (WDFW, 2004). The Bald Eagle is a listed state (and federally) threatened species. Great –blue heron use Lone Lake and is a "Species of Local Concern" in Island County. This species is being monitored by the state as well. The pied-billed grebe is known to nest here and that is unusual in western Washington. This is by and large the best place to see yellow warblers on Whidbey Island and it is only one of a few places that willow flycatchers have been found breeding in Island County. (Ellis, 2004)

Table 6. BIRDS OF LONE LAKE Species list provided by Steve Ellis, Audubon Society

M = Migrant	**B = Breeding**	**B? = Possible Breeding**
ST = State Threatened	**SM = State Monitor**	
Species Using Deep Water		
Common Loon (M)	Double-crested Cormorant	Ring-necked Duck (M)
Common Merganser (M)	Osprey	
Bald Eagle (ST)	Kingfisher (B?)	
Species Using Shallows/Emergent Vegetation		
Pied-billed Grebe (B)	Great-blue Heron (SM)	Canada Goose (B)
Mallard (B)	Blue-winged Teal (M)	Cinnamon Teal (B?)
Gadwall (B?)	American Wigeon (M)	Hooded Merganser (B)
American Coot	Glaucous-winged Gull	
Species Using Shoreline		
Killdeer (B?)	Spotted Sandpiper (M)	Least Sandpiper (M)
Species Using Riparian		
Rufous hummingbird (B)	Downy Woodpecker (B)	Northern Flicker
Willow Flycatcher (B?)	Tree Swallow (B)	Violet-green swallow (B)
Black-capped Chickadee(B)	Bushtit (B)	Winter Wren (B)
Marsh Wren (B)	Cedar Waxwing (M)	Orange-crowned Warbler (B?)
Yellow Warbler (B)	Yellow-rumped Warbler (M)	Wilson's Warbler (B)
Song Sparrow (B)	Lincoln's Sparrow (M)	White-crowned Sparrow (B)
Golden-crowned Sparrow (M)	Red-winged Blackbird (B)	Brewer's Blackbird (B?)
House Finch (B)	Pine Siskin (M)	

FISH

The Washington Department of Fish and Wildlife (WDFW) has a long history of managing the Lone Lake fishery. What follows is a brief history of stocking of Lone Lake with fish and of rehabilitation efforts. This information comes from a draft report, prepared by Bob Pfeifer, an Area Biologist with WDFW that evaluated the trout fishery of this lake.

Stocking History

- 1918 - 65,000 Kokanee were introduced
- 1922 - 9,000 bass and 15,000 catfish fry were released
- 1923 - 36,000 bass fry
- By 1946 – yellow perch and black crappie had been stocked
- 1956 through 1987 – managed as 'Trout Only' water by the former Washington Department of Game
- 1988 to Present – managed as 'Quality Trout Water'. This means it is a productive lake ecosystem contributing to fast growth rates and larger fish per acre than other Whidbey Island lakes.
- 2003 – 4,250 trout stocked. This is a rate of 46 trout/acre.
- 2004 – 4,240 trout stocked. This rate is 45.9 trout/acre.
- 1980 and 1982 – illegal re-introduction of largemouth bass.

Lake Rehabilitation History

- 1956 – first rehabilitation event to remove brown bullhead catfish, yellow perch, and unidentified freshwater cottids. This event initiated a nearly 30-year program of trout monoculture, with periodic re-treatments to control competitive species. The lake was probably treated with rotenone.
- 1959 – treatment with rotenone
- 1962 – treatment with toxophene
- 1969 – treatment with rotenone
- 1974 – treatment with rotenone
- 1982 – treatment with rotenone. Brown bullhead catfish believed to be eradicated.

(Pfiefer, 1998) (Tsunoda, 2004)

Table 7. Fish in Lone Lake Species List Provided by Larry Tsunoda, WDFW

Rainbow Trout - *Oncorhynchhus mykiss* (some are triploid rainbow trout)		Cutthroat Trout (suspected)
Eastern Brook Trout (suspected)		Largemouth Bass
Yellow Perch	Pumpkinseed Sunfish	Brown Bullhead Catfish

Currently, WDFW manages Lone Lake as "Quality Fishing Water". The agency stocks the lake with trout in the spring. There are no known naturally reproducing trout in the lake. In addition to the stocked trout, there are largemouth bass, yellow perch, pumpkinseed sunfish, and brown bullhead catfish, all illegally introduced. The illegally introduced fish species are likely naturally reproducing. (Tsunoda, 2004).

BENEFICIAL USE

Lone Lake has one public access for fishermen, recreational boaters, water-skiers and swimmers. It is a boat ramp located on a 7.95 acre parcel owned by the Washington Department of Fish and Wildlife. This parcel is found on the north side of the lake having 528 feet of shoreline. There is quite a large area on the WDFW parcel, opposite the boat ramp, that serves as the staging area for the swimming portion of the Whidbey Triathlon, among other things. The lake is used daily for both power and paddle boating as well as fishing. Historically, the fishermen have enjoyed good fishing throughout the lake, especially on the northwest and east side of the lake in the mid-range of depth found in the lake. Fishermen can be found on the lake daily. Many clubs plan annual group fishing trips to Lone Lake. (Whidbey Fly Fishing Club, 2004). In the warmer months, you can find swimmers, water-skiers and an occasional SCUBA diver enjoying Lone Lake (Fig. 11).

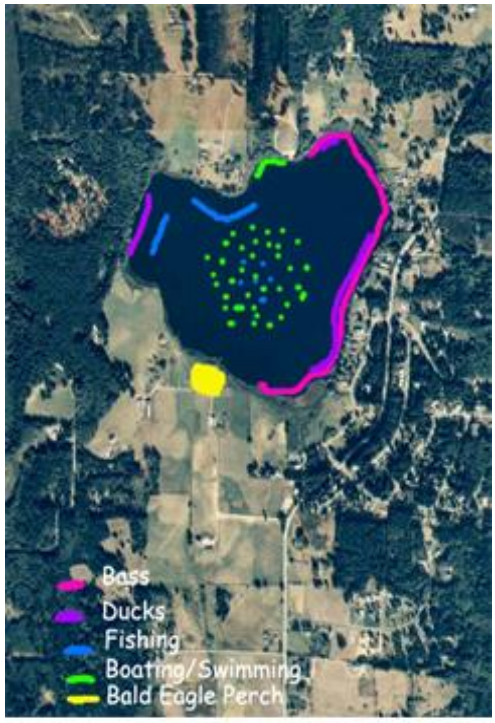


Figure 11. Lone Lake Beneficial Use Map

AQUATIC PLANT CONTROL METHODOLOGY

The contents of this section were borrowed, heavily from Ecology's Aquatic Plant Management methodologies, AERF's Aquatic Plant Management handbook and John Madsen's article on Aquatic Plant Management Techniques. The format is similar to those found in the Spring Lake, Big Lake and Long Lake aquatic vegetation projects and integrated for use here. The Steering Committee considered effective methods for the control of the Egeria infestation, only. Integrated methods to control the *Lythrum salicaria* infestation at Lone Lake are currently in place.

Once it had been decided that action must be taken in response to this aquatic weed infestation, it became apparent that all available methods and technologies for control should to be investigated and considered for use. In researching the various methodologies, efficacy of control and potential long and short term impacts were be identified. Knowing the control methods available and what it takes to implement each of them will make it possible to develop a well balanced and workable plan. It will also make the critical component of educating the local community and general public achievable. It is easier to present and defend a well thought-out plan.

What follows are the various methods available for controlling aquatic noxious weeds. There will be a description of each method, a discussion of efficacy of use and feasibility of application in Lone Lake against *Egeria*.

NO CONTROL

What would happen to Lone Lake as a result of inaction? "Nonnative plants are a biological pollutant with the potential to biomagnify in lakes (Madsen, 2000). From 1996 to 2004 Lone Lake went from a lake with no Egeria to a lake that is dominated by this species. In 2004 a survey showed that Egeria occurs in about 95 percent of the lake.

Advantage

There is no bureaucratic punishment if a plan fails (Madsen, 2000). No time or resources are spent. This allows time and money to be used for other purposes.

Disadvantage

The disadvantage to doing nothing is that in most cases the problem eventually requires a solution. The period of inaction amounts to time lost in the battle against the infestation. This often results in a more challenging problem requiring a far greater amount of resources.

Discussion

The option of 'no control' is shortsighted and an example of poor stewardship of a valuable resource. The short term impacts of no control can already be seen in Lone Lake. Beneficial uses are declining and the investment required to get the infestation under control is increasing. Inaction is no longer an option at Lone Lake. Comparing the 1996 Ecology survey with the survey in this project, dramatic changes to the Lone Lake environment can be seen. Water

depth has decreased by four feet and the dominant species has shifted from *P. praelongus* to *Egeria densa*. If *Egeria* is left uncontrolled, sediments may continue to accumulate, further reducing the water volume of the lake. *Egeria*, as the dominant species in Lone Lake, will have lasting effects on the entire food web in this Priority Habitat. The monotypic stands of *Egeria* do not support the abundance and diversity of invertebrates which serve as fish food. It may also cause a decline in value as a food source for waterfowl. Mosquito populations are likely to increase with a potential to impact public health.

Costs

Immeasurable

AQUATIC HERBICIDES

The passage of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) in 1972 imposed more stringent and costly standards for the testing and registration of pesticides. The United States Environmental Protection Agency (EPA) has approved a number of herbicides for aquatic use. They have been reviewed and are considered compatible with the aquatic environment when used according to label directions. The state of Washington imposes additional constraints on herbicide use. Aquatic herbicides are restricted use and may only be legally applied by a state-certified applicator. Coverage must be obtained under a National Pollutant Discharge Elimination System (NPDES) permit. All permit provisions must be followed to be in compliance with this permit. The Washington State Department of Ecology currently issues permits for seven aquatic herbicides (AERF, 2004).

Herbicides that can be used in aquatic environments in Washington can be placed into two categories. These are contact or systemic herbicides. Contact herbicides act immediately on the tissues contacted, typically causing extensive cellular damage at the point of uptake but generally not affecting areas untouched by the herbicide. Typically, these herbicides are faster acting, but they do not have a sustained effect. Results of contact herbicides are often described as chemical mowing. In many cases it does not kill root crowns, roots, or rhizomes. If repeated, over time, this may cause enough disruption in normal plant metabolism that it will inhibit plant growth. Systemic herbicides are translocated throughout the plant. The chemical is introduced into the plant and drawn down into the root mass. These herbicides are slower acting but often result in mortality of the entire plant (AERF, 2004).

Another way to categorize herbicides is to identify their selectivity. Herbicides are generally placed into two categories; non-selective and selective. Non-selective herbicides are broad spectrum herbicides that generally affect all plants that they come in contact with. Selective herbicides will affect only some plants. Often the adverse effects of these herbicides are targeted at dicots. Monocots are often unaffected. That is, broad leafed plants like *Myriophyllum spicatum* will die back or show some ill effect as a result of a selective herbicide

application, whereas, monocots like *Egeria densa* may not show any adverse effects at all. Unfortunately since Egeria is a monocot, there are no selective herbicides that are effective in controlling this species.

There are many regulatory requirements that must be met once it is decided that herbicide will be applied to an aquatic environment. In March 2001, the 9th Circuit District Court passed a decision that has been interpreted to mean that NPDES permits must be obtained before aquatic pesticides can be applied to the waters of Washington State. Coverage is made under a federal discharge permit called a **National Pollutant Elimination System Discharge (NPDES) permit**. This general permit was issued by the Department of Ecology (who is delegated authority by EPA to write and administer NPDES permits) to the Washington State Department of Agriculture. This permit covers aquatic herbicide application to manage state-listed noxious weeds such as Egeria. Coverage maybe obtained by licensed aquatic herbicide applicators from the Department of Agriculture. Once coverage is secured then notification of the local citizens and posting public access is required. If an herbicide is used for more than two growing seasons then development of an Integrated Aquatic Vegetation Management Plant (IAVMP) is required. In developing an IAVMP investigating and accumulating information on the watershed is obligatory. If in that process, it is discovered that threatened and endangered species are present or there is a need to protect rare plants then additional mitigation measures maybe proposed.

There are seven herbicides available for use in Washington waters. Two are effective in the control of Egeria (Hamel, 2004).

Fluridone

Fluridone is a slow-acting systemic herbicide that disrupts carotenoid synthesis. This causes bleaching of chlorophyll. It can show good control of submersed plants where there is little water movement and extended time for the treatment.

Advantage

- Applied at very low doses
- Safety factor of greater than 20
- Broad-spectrum, effecting most submersed species
- Can sometimes be used selectively at low concentrations
- Most applicable to whole-lake treatments
- Die-off is more gradual
- Few label restrictions
- Not found to cause genetic mutations or cancer in tested lab animals

Disadvantage

- Slow acting
- Long contact time required
- Broad-spectrum, effecting most submersed species

- Half-life of 21 days
- Expensive

Discussion

It is critical that there is no long lasting negative impact as a result of noxious weed control work in Lone Lake. The Priority Habitat and selective fishery must be preserved. There are citizens in the local area that have voiced their concerns about applying herbicides to an aquatic environment. Fluridone, because of its effectiveness in controlling Egeria and very low level of assessed risk, is the best choice of herbicide in this environment.

Fluridone Impacts to Submersed Vegetation

Based on the PlanTest™ results from the Egeria in Loomis Lake in Pacific County, a minimum concentration of 12-15 ppb of fluridone should be maintained for 10-12 weeds in Lone Lake. During the PlanTest™ samples of Egeria from Loomis Lake were grown in various concentrations of fluridone and the concentration that was determined to result in 90+ percent control was selected for use in Loomis Lake. No additional efficacy of control was seen during the PlanTest™ when Egeria was grown in a fluridone concentration of 24ppb. The PlanTest™ results should be applicable to the Egeria in Lone Lake.

At a fluridone concentration of 12-15 ppb, generally most submersed plants will be killed. Although fluridone is systemic and kills the roots, native plants have seeds, tubers, and over-wintering structures called turions that allow native species to return the year following treatment. Egeria doesn't have any of these other reproductive propagules like native plants do. However, it has been noted that in lakes with deep organic sediments, some survival of Egeria rhizomes occurs after herbicide treatment. Because Lone Lake has organic sediments, some survival of Egeria should be expected. In Lake Limerick which also has organic sediments, their consultant reported a 95 percent reduction in the surface biomass of Egeria one year after treatment verified through biomass sampling. It is anticipated that a similar reduction in Egeria biomass should occur in Lone Lake.

Fluridone is very slow-acting. The die back of the plants will occur slowly over a two-week or longer period. The slow die back is desirable because this does not cause extremely low oxygen conditions to develop in the lake (other than those that normally occur). Plants will remain standing in the water column and will slowly drop out to the lake bottom over a period of time. Often macroalgae such as *Chara* (muskgrass) or *Nitella* (Brittlewort) will fill in the areas where the plants have died back. These macroalgae are low-growing and provide good food and habitat. It is possible that phytoplankton blooms may occur following treatment and for at least a year afterward. Removing plants releases nutrients to the water and this in turn can provide fuel for algae. Lake residents need to expect this to occur.

A whole lake treatment of fluridone will have significant environmental impacts to Lone Lake by removing most submersed vegetation in the year of treatment. However looking long-term, submersed species recover within about two to three years of treatment. Often there is more species diversity after treatment with the removal of an aggressive invasive species. Not removing the invasive species is more detrimental to the lake long-term than removing the species.

Fluridone Impacts to Emergent Vegetation (Wetlands)

Fluridone has been used in a number of lakes in Washington to control both Brazilian elodea and Eurasian watermilfoil. Impacts to wetland from fluridone were studied during the 1991 treatment of Long Lake in Thurston County and during the 1996 treatment of the Little Pend Oreille Lakes in Stevens County. Emergent species appear to be very resistant to the effects of fluridone at the concentrations used for the control of submersed species. Shoreline species like cattails often will take up fluridone and look variegated for up to a year after treatment. However, the damage is visual and not permanent; emergent vegetation recovers after fluridone treatment. Pre- and post-treatment surveys were taken in wetlands in the Pend Oreille Chain of Lakes. "Aerial photographs which were taken were stated to present a good representation of the emergent wetland vegetation present at the time of the surveys. The only difference that was noted between the two surveys was the virtual elimination of the yellow pond lilies from the open lake and downstream of Coffin Lake…This effect was expected as Nuphar is somewhat susceptible to fluridone." (Winterowd). Based on this information and from reports after treatment in other Washington lakes, little permanent impact is expected to any of the emergent wetlands surrounding Lone Lake at the concentrations proposed to treat Egeria. Some vegetation growing at the lake's edge and at the edge of the wetlands around Lone Lake may show some bleaching, but these plants will not die.

Fluridone Impacts to Waterfowl

Fluridone is not toxic to animals. Any impacts to waterfowl would occur by reduction in food sources or habitat as the submersed vegetation dies back. The impacts of the whole lake fluridone treatment on Long Lake were studied by the Coot Company. "Waterfowl were monitored before and after the 1991 Sonar™ treatment for milfoil, to track the impact on the anticipated drastic change in aquatic vegetation on waterfowl. An increase in diving ducks (fish eaters) was observed compared to a control site at Hicks Lake, with a corresponding decreased in dabbling ducks at Long Lake (insect and other bottom organism eaters). While changes were observed in broods, it appeared that variables other than aquatic vegetation may have produced these results, including feeding, low boat activity during the 1991 treatment compared to

normal years, extreme low water at the Hicks Lake control site, etc." (Thurston County Department of Water and Waste Management, 1995). Basically fish eating birds congregated at Long Lake for about two months, the populations returned to pre-treatment levels at both lakes. Waterfowl at Lone Lake should be relatively unaffected by the treatment since emergent plants and wetlands will be relatively undisturbed. The fish-eating birds like herons and eagles will enjoy increased fishing success for a short time as the vegetation dies back. Dabbling ducks may move to nearby water bodies for a while. Based on the Long Lake study no long-term adverse impacts are expected to waterfowl or other bird populations.

Fluridone Impacts to Fish

Fluridone is relatively non-toxic to fish. Any impacts to fish in Lone Lake will be indirect and due to vegetation loss. Fish and Wildlife collected electro-shocking studies on Long Lake from 1990 (pre-herbicide treatment) to 1993. Long Lake was treated with fluridone in 1991. The intent of the study was to track to impact of the changes in aquatic vegetation form the fluridone treatment on lake fish populations. Largemouth bass and yellow perch were the principal species tracked (Long Lake is a warm water fishery with stocked trout). Post-treatment surveys showed a distinct pattern of reduction in perch and crappie numbers, with an increase in bass numbers. This was anticipated as the cover for the prey fish was reduced allowing increased predation by fish and diving birds. Sometimes year classes of fish are lost during the year of treatment due to cover loss. Similar impacts would be anticipated in Lone Lake. Loss of cover would allow prey fish to become more vulnerable to predation from larger fish and birds.

Rare Plants and Endangered Species

The Natural Heritage Program found no record of rare plants in the vicinity of Lone Lake in their data base. The Washington Department of Fish and Wildlife found no record of rare or endangered mammals, reptiles or amphibians in the Lone Lake area in their data base. Lone Lake is Bald Eagle habitat.

Treatment Scenarios

A liquid formulation of fluridone or Sonar Q™, a quick release pellet, can be used to control the *Egeria* in Lone Lake. The liquid is very effective. If a liquid formulation is used the entire water volume for the lake needs to be taken into account because the material will find equilibrium. Sonar Q™ is a pellet formula that releases the herbicide over a period of a week or more. The pellet swells at once when it hits the water and will not penetrate soft sediments. It remains on the surface allowing the herbicide to travel through the water column, coming in contact with vegetation. Where there are plants in the water column, the pellets

tend to sit on the plant material and keeping it from coming in contact with the sediments on the lake bottom. The liquid would be applied using an airboat with weighted drop hoses, the pellets, using a granular blower.

Monitoring

In order to maintain the correct concentration of fluridone in the water column, monitoring is required. Fluridone is applied in a liquid formulation by sub-surface infection from trailing hosed by a state-licensed applicator. About a day or two after treatment, water samples should be collected to determine fluridone concentrations. The number of samples required depends upon the size and shape of the lake. In a long, narrow lake, three samples may be enough to determine lake concentration. In a small, round lake such as Lone Lake, one sample taken in the middle may be sufficient. Testing, the water ensures that the target concentration of fluridone has been met. The SePRO Company has fluridone analysis test kits. Test results can be available within 48 hours and each sample costs about $100.00. Other laboratories can also perform fluridone analysis, but turn around times for results may be longer.

Fluridone concentrations are maintained in the lake over time by the application of additional herbicide at about bi-weekly intervals or as needed. To determine how much herbicide to add, water samples are collected about 10 to 14 days after the initial treatment and analyzed for fluridone. Generally during this two-week period, fluridone concentrations decrease by about half, due to plant uptake and exposure to sunlight. Fluridone is also more persistent in cooler water. After fluridone concentrations are determined, the applicator applies enough herbicide to the lake to bring the whole lake concentration back up to the 12-15 ppb range.

This scenario continues until fluridone concentrations have been held at 12-15 ppb in the lake for ten weeks. During a typical treatment, the applicator may apply fluridone to the lake four times.

Toxicity

See Fluridone Appendix

Costs

Based on the water volume and the application rates that can impact Egeria, the cost of a whole lake treatment would be approximately **$52,000** plus monitoring costs of **$2,000-3,000.**

Diquat

Diquat is a rapid-acting, contact herbicide that disrupts plant cell membrane integrity. There is limited drift associated with diquat and is suitable for spot treatments. It is typically used for short term control of a variety of submersed aquatic plants.

Advantage

- Broad spectrum herbicide

- Controls some filamentous algae
- Die-off within 7 days
- Not harmful to most fish

Disadvantage

- Broad spectrum herbicide
- Die-off within 7 days
- Does not kill the roots
- Binds with suspended solids
- Potential to decrease oxygen if not applied properly

Discussion

Turbid water or dense algal blooms can interfere with the effectiveness of diquat. Lone Lake has flocculent soils and yearly algal blooms, though the algae, generally, blooms later in the growing season. Herbicides would be applied earlier in the growing season at the most effective time and while avoiding the algal bloom. Diquat binds to suspended particles, and when bound, it is not considered bioavailable. Rapid-acting herbicides like diquat may cause low oxygen conditions to develop as plants decompose. Low oxygen can cause fish kills. Diquat carries a bit of a higher risk then fluridone. It has a safety factor of 5. Due to the concerns of adverse environmental impact, as expressed by the local citizenry, this herbicide is a less desirable choice than fluridone (Public Meeting, 2004).

Costs

To reduce the negative impacts of the plant die-off, the lake would be treated in phases over the course of several weeks. This will allow the lake environment to recover somewhat between the applications of herbicide. Treatment of infested acres would cost approximately $30,000 with monitoring costs of $2,000-3,000.

BIOCONTROL

Triploid Grass Carp

Currently, there is one biocontrol agent with proven efficacy against *Egeria* permitted for use in Washington. The species is *Ctenopharyngodon idella*, also known as Grass Carp or White Amur.

Advantage

- Inexpensive in the long term
- Effective in isolated water bodies
- Feed on *Egeria*
- Herbivorous fish won't feed on other fish or eggs

Disadvantage

- Cannot control feeding sits
- Difficult to contain in water body if there are inlets or outlets
- Longer response time than other control methods

- If overstocked they are difficult to remove
- May lead to algal blooms

Discussion

Pauley and Bonar performed experiments to evaluate the importance of 20 Pacific Northwest aquatic plant species as food items for grass carp. Grass carp did not remove plants in a preferred species-by-species sequence in multi-species plant communities. Instead they grazed simultaneously on palatable plants of similar preference before gradually switching to less preferred groups of plants. The relative preference of many plants was dependent upon what other plants were associated with them. The relative preference rank for the 20 aquatic plants tested was as follows:

> *Potamogeton* crispus (surly leaf pondweed) = *P. pectinatus* (sago pondweed) > *P. zosteriformes* (flat-stemmed pondweed) > *Chara* sp. (muskgrasses) = *Elodea canadensis* (American waterweed) = thin-leaved pondweeds *Potamogeton* spp. > *Egeria densa* (Brazilian elodea) (large fish only) > *P. praelongus* (white-stemmed pondweed)= *Vallisneria americana* (water celery) > *Myriophyllum spicatum* (Eurasian watermilfiol) > *Ceratophyllum demersum* (coontail) > *Utricularia vulgaris* (bladderwort) > *Polygonium amphibium* (water smartweed) > *P. natans* (floating leaved pondweed) > *P. amplifolius* (big leaf pondweed) > *Brasenia schreberi* (watershield) = *Juncus* sp. (rush) > *Egeria densa* (Brazilian elodea) (fingerling fish only) > *Nyphaea* sp. (fragrant waterlily) > *Typha* sp. (cattail) > *Nuphar* sp. (spatterdock).

Given the species list for Lone Lake, grass carp prefer *P. zosteriformes*, *Chara*, and *Elodea canadensis* over *Egeria*. They like *P. praelongus* only slightly less than *Egeria* and will likely graze it too. They don't particularly care for *Ceratophyllum demersum* and they won't eat the *Nuphar polysepala* or the *Scirpus* spp.

Grass carp are discouraged from use in **public lakes** and **permitting requires approval from the Director of WDFW** (Tsunoda, 2004). If the lake is over stocked they can denude a lake leaving it devoid of vegetation causing harm to other species. Grass Carp exacerbate nutrient cycles in the lake. They use approximately 33% of what they eat excreting the balance into the water. Approximately 66% of the nutrients (nitrogen and phosphorous) tied up in the vegetation is again made available for plant growth. The nutrients released from the vegetation can lead to accelerated aquatic vegetation growth, including explosive blue-green algae blooms which can be poisonous to pets and children. When all of the aquatic vegetation is removed they will feed on vegetative parts and other organic materials in the sediments. This adds to nutrient loads by releasing nutrients from the sediments and it negatively affects water clarity by increasing turbidity (Tsunoda, 2004). There is a concept called Alternate Stable

States. It says in part that many shallow lakes can be found in one of two states depending on which community dominates. Macrophytic dominated lakes (Lone Lake) have a significant part of the lake occupied by aquatic plants and tend to have clear waters. The alternative state is one where there are few aquatic plants and the lake is dominated by phytoplankton. Lakes in this state tend to be turbid with phytoplankton and suspended sediments. These are called stable states because a lake in one of these states tends to stay that way and resists change to the other state. It takes some major event to cause a lake to make a switch as a whole lake herbicide treatment or addition of grass carp. (Bachmann, Hoyer and Canfield, 2004). By following this action plan the lake residents and interested parties need to be aware that there is a chance the lake could be altered from a macrophytic-dominated lake to a phytoplankton-dominated lake.

Impacts of Grass Carp on Wetlands

Generally in Washington, grass carp do not consume emergent wetland vegetation or water lilies even when the water body is heavily stocked or over stocked. A heavy stocking rate of triploid grass carp in Chambers Lake, Thurston County resulted in the loss of most submersed species, whereas the fragrant water lilies, bog bean, and spatterdock remained at pre-stocking levels. A stocking of 83,000 triploid grass carp into Silver Lake Washington resulted in the total eradication of all submersed species, including Eurasian watermilfiol, Brazilian elodea, and swollen bladderwort. However, the extensive wetlands surrounding Silver Lake have generally remained intact. In southern states, grass carp have been shown to consume some emergent vegetation. In Lone Lake, impacts to emergent plants by stocking grass carp should be minimal, even if the lake were to be overstocked with fish.

Impacts of Grass Carp Stocking

There can be significant impacts to the water body following grass carp stocking. Since native plants provide habitat, sediment stabilization, and many other important functions, removal of all submersed plants can have a severe impact on the water body. Most of the impacts due to grass carp stocking are attributed to the removal of the plants rather than direct impacts of the fish. WDFW investigated the effects of grass carp on the water quality of 98 Washington lakes and ponds. (Bonar, et. al., 1996). The average turbidity of sites where all submersed aquatic plants were eradicated was higher (11 nephelometric turbidity units [NTU's]) than sites where aquatic plants were controlled to intermediate levels (4 NTU's) or at sites where the vegetation was not affected by grass carp grazing (5 NTU's. In Silver Lake, NTU's of 50 were observed after all submersed plants were removed (Gibbons, 1997). Although there have been some reports that grass carp stocking can increase algal blooms, this does not appear to be the case in Washington. The increase in turbidity was all abiotic (probably suspended sediments). In other words, once the submersed species are removed or partially removed the lake becomes more turbid or

muddy. Never the less, the satisfaction rate of the pond owners or lake residents with the results from stocking grass carp was high.

Frodge et. al. (1995) observed positive water quality changes in Bull Lake, Washington and Keevies Lake, Washington after they were stocked with grass carp. Grass carp stocking and the resultant plant removal reduced some of the deleterious problems caused by excessive plant growth, such as low dissolved oxygen and high pH. The lake bottom in Silver Lake went from being anoxic and devoid of bottom dwelling invertebrates to oxidized and supportive of benthic organisms after grass car had removed all submersed vegetation (Gibbons, 1997).

Pauley et. al. (1995) studied fish communities for a six year period in three lakes before and after grass carp stocking. They concluded that while changes in fish populations did occur in the lakes, no consistent trend occurred after the introduction of grass carp. It should be noted that in two of the lakes, aquatic plants were not totally eliminated.

Waterfowl that feed on submersed plants are affected when these plants disappear. A report from Silver Lake (Gibbons, 1997) showed that although there were no clear indications that the number of water fowl in the lake had declined after grass carp introduction in May 1992, there was a sharp decrease in American coots in 1994, 1995, and 1996. These data suggest that the loss of submersed plants from the lake resulted in fewer birds that depended on these plants fro food from Silver Lake.

Lake groups are strongly advised to monitor plant species and area of coverage, before and for several years after stocking grass carp. If the plants have not reduced in area or biomass after three years (Fish and Wildlife is reviewing their policy and might suggest five years instead of three years), more grass carp should be added. Since Fish and Wildlife issues the permit for extra fish, having monitoring data will provide them with the information to evaluate the request for extra fish.

Costs

Stocking rates depend on biomass. "Planting rates for aquatic plant eradication objectives may range from 15-25 grass carp per surface acre of targeted vegetation. Planting rates for aquatic vegetation control objectives may range from 5-10 grass carp per surface acre of targeted vegetation (Tsunoda, 2004)

Initial stocking rates will be modest to help prevent problems associated with too many grass carp in the system. The fish will be stocked sequentially. A small number of fish will be introduced and the biomass will be monitored over a three to five year period. If the *Egeria* population continues to increase in Lone Lake and it is determined that additional fish are needed to keep the infestation at very low levels, more grass carp will be added. The biomass will be monitored for a three to five year period reevaluating the macrophytic condition of the lake at that time. Subsequent plantings of modest amounts of grass carp

followed by monitoring of biomass will continue until it is determined that the infestation is being controlled at an acceptable level without impacting other water quality concerns at an unacceptable level.

To make cost estimates for planning purposes, grass carp planting rates recommended for aquatic vegetation control rather than the far greater rate recommended for eradication will be used. A conservative prediction of moderate success with herbicide treatment (50% reduction in infested acres) and the high end market value for grass carp will be used to calculate the cost. That is, 10 fish per infested acre assuming 35 infested acres post herbicide treatment with fish costing $20.00/ fish. The cost of the initial grass carp planting will total **$7,000**.

The **outlet from Lone Lake will need to be repaired, before stocking** with Grass Carp is **permitted** (Thompson, 2004). This repair, if cost allowable, will be made with in-kind contributions provided by the homeowners and fishing club members.

PHYSICAL METHODS

Water Level Drawdown

Water is taken down to a level that exposes the weed infestation to desiccation and freezing. This will stress the plant enough to effectively control problem plant populations. *Egeria* is considered susceptible to water level drawdown.

Advantage

- Cost effective if water control structure is in place
- Provides opportunity to improve or repair docks, etc.
- May encourage growth of some aquatic plant species

Disadvantage

- Milder climates such as seen in Island County may not experience the freezing or dewatering conditions needed for *Egeria* control
- May be followed by algal blooms
- Can impact fish and wildlife
- May encourage growth of some aquatic plant species

Discussion

There is no water control structure in Lone Lake. The winters generally do not get cold enough for this method to be effective. In order to expose the entire Egeria infestation to desiccation or dewatering, virtually all of the lake would have to be drained. This would have adverse affects on fish, their food source and the food source for the regularly occurring waterfowl. Recreational use of the lake would be eliminated. This is not a viable or suitable control option for Lone Lake.

Costs

A high capacity pump must be used.

Benthic Barriers

Plants are covered over with a layer of a growth-inhibiting substance such as landscape fabrics or other materials that are specifically designed as sediment covers. Benthic barriers will typically kill plants under them within 2 months. They are effective for limited areas and well suited to high-intensity use areas. Installation of these barriers requires **Hydraulic Project Approval (HPA).** However Fish and Wildlife has a pamphlet called Aquatic Plants and Fish that serves as the HPA if all the pamphlet provisions are followed. You can get copies of the HPA pamphlet from the Mill Creek Office of Fish and Wildlife.

Advantage

- Creates immediate open water
- Easily installed
- Can get 100% control
- Material are readily available

Disadvantage

- Reduces habitat
- Must be regularly inspected
- Easily damaged
- May create safety hazard
- Can be difficult to anchor
- Nonselective

Discussion

Due to the size of the infestation in Lone Lake this is not an option for the whole lake. It will work well in localized areas, such as at the boat launch and around private docks. If an individual installs a benthic barrier, it can be used as an in-kind contribution, but only if bottom barriers are installed for Egeria control. Bottom barriers could be an option to help clean up larger patches of *Egeria* returning after herbicide treatment.

Costs

$0.22 - $1.25/square foot of material. There are labor and maintenance costs associated with the barriers. Ecology has a website that provides instructions for installing bottom barriers.
http://www.ecy.wa.gov/programs/wq/management/aqua021.html

MECHANICAL METHODS

Hand Pulling

This involves removing leaves, stems and roots of aquatic plants by hand. It is very similar to pulling weeds from the garden except that these plants are growing in water. In shallow water hand removal requires no special equipment, except that in gravel of sandy sediments, sometimes using a hand tool is helpful to ensure removal of all the roots. In water deeper than three feet SCUBA equipment and a mesh bag are needed. An **HPA** is required before work is initiated. However Fish and Wildlife has a pamphlet called Aquatic Plants and

Fish that serves as the HPA if all the pamphlet provisions are followed. You can get copies of the HPA pamphlet from the Mill Creek Office of Fish and Wildlife.

Advantage

- Selective for targeted species
- Suitable for early infestations
- Suitable to remove remaining invasive plants after herbicide treatment

Disadvantage

- Expensive if the labor is contracted out, but inexpensive if trained volunteers perform the work
- Time and labor intensive
- Can cause fragmentation
- Can cause sediments to become stirred up which will limit visibility

Discussion

The *Egeria* infestation in Lone Lake is far too large making it far too expensive to apply this method as a major component of eradication. It will, however, be a useful tool once the infestation levels are reduced as a result of herbicide and biocontrol. This method can be utilized by individual property owners and be regarded as an in-kind contribution. One limiting factor is the flocculent soils and turbidity. If the soils are determined to be suitable, then the goal is to have at least one community hand-pulling event each year. Participants will be trained in proper technique and disposal of the plant. Issues concerning fragmentation will be emphasized. Based on results seen in other lakes, areas with deep sediment may allow Egeria rhizomes to survive. It would be good to have these areas mapped out and concentrate hand pulling efforts here after treatment.

Costs

Time. If volunteer divers are used, costs may include insurance and air for the divers. If this is contracted out, costs can be about $1,000 per day.

Cutting

There are several tools made to accomplish this control method, all of which cut the plant and leave the root mass. They can be manually operated or powered by either batteries or motors. HPA required. However Fish and Wildlife has a pamphlet called Aquatic Plants and Fish that serves as the HPA if all the pamphlet provisions are followed.

Advantage

- Immediate clearing of water column
- Uncomplicated
- Lake residents can perform this activity

Disadvantage

- Roots remain

- Fragmentation occurs and it is difficult to ensure that all fragments are removed from the water
- Time consuming because cutting may need to be repeated several times during the growing season
- Proper disposal is needed to ensure that plants don't reenter the water
- Sharp blades can be dangerous

Discussion

This technique is not advisable when controlling Egeria. The fragmentation caused by cutting spreads the infestation and it is very difficult to remove all the fragments.

Costs

These tools range from $57.00 to 2,000 plus time spent cutting.

Raking

Raking tears the plant from the sediment, breaking some plants off and removing some roots. Using a back and forth motion like a vacuum cleaner works best. HPA is required. However Fish and Wildlife has a pamphlet called Aquatic Plants and Fish that serves as the HPA if all the pamphlet provisions are followed.

Advantage

- Clears the water column immediately
- Not complicated and can be easily performed by the average lake resident
- Weed rakes can be made or inexpensively purchased

Disadvantage

- Some plant parts remain to regrow
- Fragments are produced and it is difficult to remove all of them from the water
- Suitable only for small areas
- Time consuming and will need to be repeated several times during the growing season
- Proper disposal is needed to ensure that the plants do not reenter the water and create new infestations

Discussion

Plant parts remain and fragmentation is likely, therefore, this in not a viable option for control of Egeria.

Costs

$87.00 or more for the cost of a plant rake plus time spent raking. Read more about manual methods at:
http://www.ecy.wa.gov/programs/wq/plants/management/aqua022.html

Diver dredging

SCUBA divers use hoses attached to small dredges to suck plant material, including roots, from the sediment. Water and sediments are returned while

plant material is retained. HPA is required. However Fish and Wildlife has a pamphlet called Aquatic Plants and Fish that serves as the HPA if all the pamphlet provisions are followed. Section 404 permit from Army Corp of Engineers may be required. Many contractors are using a modified method for diver dredging. They use the hoses and the dredges as a way of transferring hand pulled plants to the surface. If no sediment is removed by the dredge, there is no need to get a Section 404 permit.

Advantage

- Can be selective to targeted species
- May create deeper water, however true diver dredging is designed for the removal of plants only. The sieved sediment is returned to the water body
- Long lasting effects.

Disadvantage

- Time consuming (0.25 – 1 acre/day)
- Expensive
- Plants break off in hard soils
- Increased turbidity
- May release nutrients or toxic material

Discussion

The size of the Egeria infestation in Lone Lake makes this method cost prohibitive for the initial removal of biomass. However, depending on the removal pattern of Egeria by the fluridone treatment, diver dredging may be very suitable to remove "pockets" or dense patches of Egeria that may return after fluridone treatment. If Egeria returns evenly throughout the lake after herbicide treatment, this method will be less suitable. The Thurston County Noxious Weed Control Board recently hired a contractor to remove Egeria from the Chehalis River. The contractor worked for ten day and removed over three tons of Egeria for about $10,000.

Cost

$1,500 to 2,500 per day. Doug Freeland of A.C.E. Diving charges $1,000 per day. Read more about diver dredging at:
http://www.ecy.wa.gov/programs/wq/plants/management/dredging.html

Rotovation

Rotovation is underwater rototilling. Rotovation is generally only used for the removal of Eurasian watermilfoil because the flesh root crowns of milfoil float. Rotovation has also been used to remove water lily rhizomes. It is unsure whether the Egeria rhizomes could be effectively removed. The machine churns seven to nine inches deep; some species have plant parts that float and the plants and roots are subsequently removed using a weed rake. Because the long strands of plants tend to wrap around the rototiller head, this method is most effective when the plant has died back for the winter. Sunken logs and other underwater obstacles impede rotovation. Underground utilities need to be

located. Hydraulic Project Approval is required. A local shoreline permit may be needed. Section 404 permit from Army Corp of Engineers may be required.

Advantage

- Native aquatics may be stimulated and grow profusely after rotovation occurs
- Control work is best performed in winter and spring

Disadvantage

- Only about 2- 3 acres/day can be rotovated
- Fragmentation occurs and it is impossible to remove all the fragments from the water. Rotovation should only be considered in systems where the invasive species is extremely widespread and there are no alternative methods
- High cost and large specialized equipment is needed. These machines are very expensive to purchase. They cost about $200,000. This method of control is expensive to contract for if contractors that offer this service are even available in this area.
- Disrupts sediments and stirs nutrients and potentially toxic material up into the water column
- Labor intensive

Discussion

This is not a good option for the control of Egeria. Large numbers of fragments will be spread and this method does not meet the plan goal of eradication or maintenance of very low numbers of *Egeria* plants in Lone Lake.

Cost

Rotovation is cost prohibitive, but mostly it does not allow Egeria to be eradicated. It would take 20 to 30 days to do the control work due to the size of the infestation in Lone Lake and this work would need to be repeated at least every other year, if not more often. The equipment is expensive and labor costs would be high. Read more about rotovation at:
http://www.ecy.wa.gov/programs/wq/plants/management/aqua027.html

Harvesting

Mechanical harvesters are large machines which both cut and collect aquatic plants. Cut plants are removed from the water by a conveyor belt system and stored on the harvester until disposal. A barge may be stationed near the harvesting site for temporary plant storage or the harvester carries the cut weeds to shore. The shore station equipment is usually a shore conveyor that mates to the harvester and lifts the cut plants into a dump truck. Harvested weeds are disposed of in landfills, used as compost, or in reclaiming spent gravel pits or similar sites.

Harvesting is usually performed in late spring, summer, and early fall when aquatic plants have reached or are close to the water's surface. Harvesters can cut and collect several acres per day depending on weed type, plant density,

and storage capacity of the equipment. Harvesting speeds for typical machines range from 0.5 to 1.5 acres per hour. Depending on the equipment used, the plants are cut from five to ten feet below the water's surface in a swath 6 to 20 feet wide. Some modern harvesters can cut plants in a range of water depths. Because of machine size and high costs, harvesting is most efficient in lakes larger than a few acres. Harvesting can be an excellent way to create open areas of water for recreation and fishing access.

Advantage

- Creates immediate areas of open water
- Habitat is not entirely eliminated since cut plants remain below the water surface and regrow
- Can target specific areas by removing plants growing in navigation or recreational areas
- Removing plants and disposing of them off-site also removes the plant nutrients and plant organic material
- A fall harvest may help slow the sedimentation rate by removing plants before they die back and fall to the sediment

Disadvantage

- Harvesting contributes to the spread of invasive species like Egeria since not all fragments can be removed from the water
- Non-selective in the area of harvest since all plants are cut and removed
- Harvesting is short-term and plants grow back. Generally it needs to be done at least twice during the growing season
- Fragments are produced and are not effectively removed from the water.

Discussion

Harvesting at Lone Lake has occurred for the past several years. The homeowners bought a harvester to seek relief from the weed infestation. Unfortunately it is likely that the Lone Lake Homeowners Association harvesting operation performed led to the very rapid colonization of the lake by *Egeria*. They provided a service to the Whidbey Island Triathlon by clearing the course prior to the event. Harvesting is known to cause fragmentation and is one of the reasons for the rapid acceleration of infestation in Lone Lake. The harvester will be retired at least until the Egeria infestation is under control. Harvesting can be a good way to control native plants in high use areas.

Costs

$35,000 to 110,000 for equipment plus labor. Read more about harvesting here:
http://www.ecy.wa.gov/programs/wq/plants/management/aqua026.html

NUTRIENT REDUCTION

Some nutrient reduction to Lone Lake is possible through reduction in non-point pollution sources. Educating the local citizenry on possible non-point sources of pollution and the means to reduce these pollutants is the best way to

address this issue. Water quality monitoring through the Lake Stewardship Program will help define nutrient issues in the lake. Currently, it is not understood.

Nutrient levels and algal blooms may become a serious issue once the *Egeria* is eradicated especially if the lake becomes phytoplankton dominated rather than macrophytic dominated. If nutrients reach undesirable levels, reduction treatments will be considered. The first course of action, after education and investigation of the sources of pollution, would be to apply an alternative method of algae control such as introduction of barley straw to the system. Grass carp may increase nutrient levels in the lake system. If algae are to be a problem, that problem would be expected to manifest itself some time after grass carp planting. If it appears that algae is becoming problematic, introduction of barley straw into the Lone Lake system would take place in the early spring of 2007 or sometime thereafter. This method of algae control will only be acceptable for one maybe two applications. It would take approximately 500 – 25 pound bales of barley straw to treat the entire lake. The straw would have to be placed in sacks or wire nets with floats attached. This would impact beneficial use and could only be tolerated under exceptional conditions for a finite period of time. This type of method can be labor intensive but is usually less expensive and less harmful to the environment. It is also a means by which the community can make in-kind contributions to the project in the form of labor. At this time alum treatments have not being considered.

INTEGRATED MANAGEMENT PLAN

The Lone Lake Integrated Aquatic Vegetation Management Plan will take a holistic approach to vegetation management. The goal is to eradicate Egeria. Along with this goal of eradication the project will work to eradicate *Lythrum salicaria* along the shoreline. It will also educate the property owners on the aggressive and destructive nature of *Phalaris* and encourage them to remove this species as well. A lake stewardship program will be formed. This program will collect water quality data as well as, survey and monitor vegetation. The water quality data collected will be used to understand how control methods are affecting certain water quality parameters. Surveying and monitoring the vegetation will provide information on the efficacy of control methods that have already been implemented. This understanding will help guide future vegetation control decisions.

The first three years of implementation will be aggressive. The subsequent years will be used to further reduce plant infestations using more localized methods and to ensure water quality standards remain high.

VEGETATION CONTROL

Egeria densa

A comprehensive and coordinated management approach to eradicate Egeria will be made in Lone Lake (Table 8). The initial control work will begin early in the 2005 growing season with an application of the low risk and systemic herbicide fluridone. Fluridone will be used to greatly reduce the biomass of the infestation and kill as many Egeria plants as possible. Fluridone was selected by the steering committee because of its efficacy of Egeria control in other lakes in Washington and to address the concerns of the local citizens about herbicide use. One of the leading causes of concern is depletion of oxygen when the plants die-off. The risk of this occurring with fluridone is less of a concern because the die off is more gradual than with other herbicides such as diquat.

Fluridone is not always systemic in flocculent soils such as those present in Lone Lake. Areas of survival in Loomis Lake after the whole lake treatment with fluridone have occurred in the north end of the lake in an area where there are deep sediments. Divers report finding viable rhizomes for as far as their arm reaches into these deep sediments in Loomis Lake. In other areas of the lake, harder sediments do not allow these rhizomes to grow at depth. Ecology staff speculates that the herbicides do not translocate effectively throughout the entire rhizome in these deeply rooted plants, leaving them able to produce new shoots the year following treatment. (Hamel, 2004). An experienced aquatic herbicide applicator was contacted and it is his belief that there are formulations of fluridone available to deliver the herbicide effectively, resulting in a high kill rate. A liquid formulation of fluridone or Sonar Q™, a quick release pellet, can be used to control the *Egeria* in Lone Lake in McNabb's opinion. The liquid would be applied using an airboat with weighted drop hoses, the pellets, using a

granular blower. (McNabb, 2005). A fluridone application will affect, but not cause permanent harm to emergent wetland vegetation.

The following year, biomass will be determined and stocking rates for Grass Carp will be calculated. "The introduction of conservative numbers of grass carp in multiple stocking events spaced far enough apart to assess the impact of the grass carp presence on the vegetation might be best" (Tsunoda, 2004). The Project will go through the permitting process and seek approval for stocking Grass Carp. Upon approval, fish will be purchased and planted in the lake. Once the infestation is reduced to a far lower level, localized physical and mechanical control methods can be implemented. Benthic barriers and hand pulling will be employed to ensure eradication.

Table 8. *Egeria* Eradication Timeline

1st Year	**Spring 2005**	**Summer 2005**	**Fall 2005**
	Herbicide application	Stand-up Lake Stewardship Program	Survey and Monitor
	Bayview/Tilth Markets (edu.)	Island County Fair (edu.)	Bayview/Tilth Markets (edu.)
	- Community Outreach -		
2nd Year	**Spring 2006**	**Summer 2006**	**Fall 2006**
	Survey and Monitor	Determine Biomass	Permitting /Stocking Triploid Grass Carp
	Bayview/Tilth Markets (edu.)	Island County Fair (edu.)	Bayview/Tilth Markets (edu.)
	- Community Outreach -		
3rd Year	**Spring 2007**	**Summer 2007**	**Fall 2007**
	Survey and Monitor		Survey and Monitor
	Possible Implementation of Algae Control (Barley Straw)		
	Bayview/Tilth Markets (edu.)	Island County Fair (edu.)	Bayview/Tilth Markets (edu.)
	Evaluate Need for Sustained Funding (outside of LLHA)		
	- Community Outreach -		
4th through 8th Year	**Spring 2008 - 2012**	**Summer 2008 - 2012**	**Fall 2008 - 2012**
	Survey and Monitor		Survey and Monitor
	Bayview/Tilth Markets (edu.)	Island County Fair (edu.)	Bayview/Tilth Markets (edu.)
	- Community Outreach -		

Lythrum salicaria

With heightened awareness of noxious weed issues, brought on by the IAVMP process, efforts to reduce the *Lythrum* infestation in the Lone Lake ecosystem are currently, underway. There is one known *Lythrum salicaria* site along the shores of Lone Lake. The Island County Noxious Weed Control Board coordinated with the Washington State Invasive Weed Species Bioagent Enhancement Program to release beetles at that site. In August 2004, the Program Coordinator for the Bioagent Enhancement Program collected beetles at the Winchester wasteway and released one thousand *Galerucella pusilla* for the purposes of reducing the Lythrum infestation in the Lone Lake area. The site was surveyed in mid-September and leaf destruction, caused by the beetles, was evident. Flowers were removed prior to seed set, bagged and disposed of properly. Additional biocontrols will be released in the future, if necessary, and mechanical control will continue. In the future, this site will be monitored by the Lone Lake Stewardship program and the Bioagent Enhancement Program.

LAKE STEWARDSHIP

A lake stewardship program will be started for the purposes of monitoring and surveying Lone Lake. It is critical that integrity of water quality in Lone Lake be maintained while implementing the Integrated Aquatic Vegetation Management Plan. Aspirations are to improve water quality as a result of the education and outreach component of the project (discussed in the next section). Nutrient levels will be tracked. In doing so, unsafe water conditions may be avoided, by modifying control work in the lake. Through the duration of this project, as funding allows, a "water quality assessment" regimen of sampling will be followed that will include analysis of phosphorous and nitrogen. The guidelines outlined in "A Citizen's Guide to Understanding and Monitoring Lakes and Streams" will be followed (Ecology, 2004).

Surveying the lake, regularly, will provide information on BioCover and BioVolume. This will be used to plan, localized, physical and mechanical control projects. The results of these surveys will also point toward necessity to form a Lake Management District. If additional control treatments are required the survey information will provide evidence of necessity to fund these expensive treatments.

EDUCATION AND OUTREACH

The education and outreach component will ensure success of the Lone Lake IAVMP. Workshops will be held for purposes of native and noxious weed identification. These workshops will include proper removal methods pertaining to *Egeria* and *Lythrum* in particular. The fishing clubs have already shown interest in participating in a workshop of this nature. Meetings will be called to keep the general public informed on the progress of the eradication project. Press releases and mass mailings will be disseminated with news of the

progress being made in Lone Lake. Educational materials concerning nutrient effects on lake systems and nutrient reduction will be a large part of the community education. The local citizens will be informed on how they can reduce nutrient loading in Lone Lake through responsible landscaping practices, feeding geese and use of lawn fertilizers among other things. Members of the Steering Committee and the Island County Noxious Weed Control Board will make themselves available for presentations to individual organizations or public events such as the county fair and farmer's markets.

BOAT WASHING STATION

The Lone Lake *Egeria* Eradication Project will look into the feasibility of building a boat washing station. There is real concern that *Egeria densa* will be transported from Lone Lake and introduced into neighboring lakes by boat trailers. This risk will be reduced if boats have access to water in which to remove vegetation after pulling out of Lone Lake. Steve Ford, a member of the Lone Lake Brazilian elodea Project has formulated the following ideas with respect to constructing a boat washing facility in the vicinity of the Lone Lake boat launch. "There is an existing irrigation system on a parcel adjacent to the boat launch. This irrigation system is shared between two owners. Washington State Department of Ecology has issued a water right for this irrigation system that allows water to be taken from the lake for irrigation use only. It prohibits using the water on any other property and it restricts the volume of water that can be taken. Use is restricted to the 'irrigation season'. In order to use this system for the purposes of a boat washing facility, Ecology would have to amend use restrictions to allow for more volume, use for the boat washing station, and year round use. It is thought that the owners of this irrigation system would cooperate and participate in developing this facility. A fund would need to be established to maintain the system. This would cover power consumption as well as other minor, but perpetual costs. A pipeline would have to be constructed from the irrigation existing system to the boat launch area. Cost estimate for the pipeline is well under $1,000.00. Provisions would have to be made to keep the system active all year without incurring broken pipes during a freeze. This particular irrigation system only works so long as the lake level is sufficiently high.

The alternative solution to the existing irrigation system would be to drill a well for ground water which would require standard county health department approval. This would be more expensive, but provide potable water to the boat launch users."

COSTS

A whole lake herbicide application will be made, followed by introduction of the biocontrol agent to control the *Egeria*. Mechanical control to further reduce the *Lythrum* site will continue. Additional biocontrol agents will be procured to

supplement those already on the *Lythrum* plants if needed. Concurrently, monitoring and surveying will be employed. This will provide applicable information concerning efficacy of control and progress toward eradication of both the *Egeria* and *Lythrum*. Grant administration, oversight of the project, monitoring/surveying protocol development and training as well as education and outreach will be provided (Table 9).

Table 9. Budget Summary **(by task)**

Herbicide Application	**$52,000**
Triploid Grass Carp	**7,000**
Outlet Repair	**2,500**
Boat Washing Station	**5,000**
***Lythrum* Control**	**1,000**
Algae Control – Barley Straw (and associated costs)	**5,000**
Monitoring, Survey and Education	**6,000**
Grant Administration, Salary/Wage/Final Report	**21,500**
Total	**$100,000**

SOURCES OF FUNDING

Grants

This plan was developed to meet the standards of the Aquatic Weed Management Fund and qualify for funding in the 2004-2005 funding cycle. It is the beliefs of participants in this project that awards from this fund will make implementation of the Lone Lake IAVMP most expeditiously. It is important on many different levels that control of Egeria be initiated as soon as possible.

Matching Funds

There is widespread interest in this project. Both volunteer labor and monetary means of support have been pledged by interested parties. As is apparent in the Lone Lake Brazilian elodea Project, the Steering Committee members and local supporters have worked tirelessly and enthusiastically to make this project successful. The will continue this level of support and participation through the completion of the Lone Lake Egeria Eradication Project. The fishing clubs will help build the boat washing station. They will consider contributing funds to offset costs concerning Grass Carp introduction. Once the Egeria infestation is reduced, community 'dig day' events will be scheduled. Labor for the monitoring/surveying component of this plan and all of the education and outreach will be in-kind contributions. This will total the AWMF required 25% match of the total project.

Formation of a Lake District

The Lone Lake Egeria Eradication Project will investigate the feasibility of forming of a lake district to maintain Egeria at very low levels, assure a high standard of water quality and beneficial uses.

COMMUNITY INVOLVEMENT

There is a long established commitment to preserving and protecting Lone Lake. The Lone Lake Community was eager to support the Assistant Planner with the lake restoration project in 1988. Because this met with unfavorable reaction from the Island County Commissioners at that time, funding was not pursued. In June of 1990, the County proposed road improvements to Andreason Road, a county road that runs between Goss Lake and Lone Lake. The County received $250,000 through the Rural Arterial Program to do the necessary improvements to Andreason Road to gain Scenic Back Road designation. The project met local community opposition because of the potential negative impacts to the water quality of Lone Lake. The project was dropped and the money was returned.

Shoreline property owners began noticing an abundance of aquatic vegetation in Lone Lake and the adverse affects associated with it. In 1990, the Lone Lake homeowners Association purchased a weed harvester. Any property owner who contributed toward the purchase price was allowed to use the harvester. During the past five years only four or five people have used the harvester to clear weeds near their docks. Just prior to the Whidbey Triathlon the harvester has been used to clear vegetation from the swimming course. No formal or consistent control schedule was set up. (Clark, 2004).

In the summer of 2004 the weed infestation in Lone Lake became intolerable. The homeowners brought this to the attention of the Island County Noxious Weed Control Board. The Program Coordinator identified the nuisance species as *Elodea canadensis* informing the homeowners that it is a species native to Washington and reducing infestations through government funding is a low priority. They were seeking relief from the overabundance of aquatic vegetation. It was important to them to restore the lake to the historic level of beneficial use they had enjoyed in the past. They were willing to accomplish this goal using their own resources.

The homeowners began investigating ways to control the vegetation in Lone Lake. In their investigation of control methods it was discovered that virtually all vegetation control methods in lake systems in Washington require a permit. In some instances the development of an Integrated Aquatic Vegetation Management Plan was prerequisite to issuance of the permit. In September 2003, several homeowners took plant samples to an Aquatic Weed Management Fund workshop for species identification and to investigate potential sources of funding to pursue permits and control work. There, Ecology staff positively

identified Egeria as one the species the Lone Lake Homeowners brought to the workshop for identification. Eradication of Egeria is a priority and funding eradication efforts at Lone Lake was now much more likely. Once it became apparent to the property owners that effective and responsible control of the aquatic vegetation in Lone Lake would require far more time than they were able to dedicate to the problem a partnership was initiated by the homeowners with the Island County Noxious Weed Control Board.

The Whidbey Island Fly Fishing Club was approached by the Lone Lake Homeowners Association. The homeowners wanted to inform the fishermen of the *Egeria* infestation in Lone Lake and to gain their support for eradication efforts. In November of 2003, the Whidbey Island Fly Fishing Club held a meeting addressing weed infestations and *Egeria* in Lone Lake. Gil Nyerges of the Whidbey Island Fly Fishing Club invited representatives from the Lone Lake Homeowners Association, the ICNWCB Program Coordinator, an aquatic botanist that manages a 10 acre private lake in central Washington and two other fishing clubs to attend the meeting. Dr. Richard Thompson spoke on the noxious weed infestation in the lake he manages and presented the history of control work to reduce the infestation there. Susan Horton (ICNWCB) and Bill Russell (LLHA) talked about the weed infestation in Lone Lake. Once the presentations were complete the floor was open for questions.

This meeting launched a dialogue and integral partnership between the Lone Lake Brazilian elodea Steering Committee and the growing number of fishing clubs interested in the weed infestation in Lone Lake. This dialogue is on-going benefiting the planning process with descriptions of degradation in beneficial uses of the lake concerning fish habitat and fishing conditions through first hand knowledge. The participation of the fishing clubs is essential to this project. They have provided required information for the Integrated Aquatic Vegetation Management Plan and have pledged monetary and volunteer support for eradication of *Egeria* from Lone Lake. There are now twenty seven fishing clubs with well over 1,000 members in support of the eradication plan. Gil Nyerges sits on the Lone Lake Brazilian elodea Steering Committee and represents the interests of the fishermen. The fishermen held another meeting dedicated solely to the Lone Lake issue in September 2004. Members of the fishing clubs attended the public meetings called by the LLBeSC in the effort to keep the general public abreast of developments with the Lone Lake project. The fishermen have become quite knowledgeable about the problems *Egeria* poses to the sustained health of Lone Lake. Many of them now know how to identify *Egeria* and better understand its growth habits. They have been educated on the various control options for eradication of *Egeria*, along with their advantages and disadvantages. The fishermen understand the potential for temporary adverse affects to fish habitat associated with the control of *Egeria*. The overwhelming majority of the club-members present at these meetings support the recommendations made in the Lone Lake IAVMP. They believe it is important to

implement the plan and eradicate *Egeria* to restore the incredible Lone Lake fishery upon which its reputation is based. Many members have written letters in support of this project (Attachment B).

The fishing clubs believe funds are available from individual fishing clubs' conservation committees to use in implementation of certain components of the Lone Lake IAVMP. Currently they are researching the feasibility of funding the design and installation of a boat washing facility at the Lone Lake boat ramp. This important component will help reduce the possibility of cross contamination of neighboring lakes. The fishing clubs may also help offset costs associated with implementing biocontrol.

The homeowners and surrounding community are dedicated to the Lone Lake Brazilian elodea Project. Bill Russell, a shoreline property owner took it upon himself to write the first draft of the grant proposal to fund IAVMP development. A steering Committee was formed even before monies were awarded for plan development. Members were anxious to begin the process. The Lone Lake Brazilian elodea Project Steering Committee (LLBePSC) includes volunteer members from the Lone Lake Homeowners Association. They are Pat and Jan Clark, Bill Russell, Dick Robbins, Ellen Nelson, Steve Ford, Bonnie and Ron Murdock as well as Mark Miller. John Lees represents the Lone Lake Shores subdivision; Terry Arnold represents the Lone Lake Terrace subdivision and Gil Nyerges represents the interest of the 27 fishing clubs made up of several hundred members. Kathy Hamel from Ecology, Larry Tsunoda with WDFW and Susan Horton of the ICNWCB represent government agencies and are members of the Steering Committee.

The contract between Ecology and Island County was not executed until June 14, 2004. To qualify for a 2004-2005 AWMF award, a survey of the lake needed to be performed and Integrated Aquatic Vegetation Management Plan developed by November 1, 2004. Members of the Lone Lake Brazilian elodea Steering Committee commute daily to the Seattle area. Some of them are part-time residents of Lone Lake. Nevertheless, the Steering Committee was able to meet three times, hold two public meetings to inform the surrounding community and participate in the hiring of an aquatic plant surveyor.

- On May 25, 2004 a meeting of the Steering Committee was held. This was the initial planning meeting that included introductions by the attending members. The guidelines to fulfill the grant requirements were discussed. A general time line for plan development was established. Twelve of the fifteen members were present.
- July 25, 2004, the Lone Lake Brazilian elodea Steering Committee held a Community Meeting to initiate dialogue and understating between Lone Lake project members and the local community. Noxious weeds and the weed laws were discussed as well as Egeria

specifically and why it is a problem. How developing an Integrated Aquatic Vegetation Management Plan fits into reduction of biomass in Lone Lake was also presented.

- Pat Clark, Jan Clark, Steve Ford and Dick Robbins participated in interviewing prospective aquatic plant surveyors and IAVMP developers. Interviews were held on July 20, 28 and 30. There was a great deal of discussion over the conflict of interest in having people that perform aquatic vegetation control work develop an IAVMP. In the end ReMetrix was chosen to perform the lake survey and the ICNWCB Program Coordinator was chosen to assist the Steering Committee through IAVMP development process.
- On August 25, 2004 a steering committee meeting was held to develop a problem statement and management goals for the IAVMP. Eleven members were present.
- The September 12, 2004 Steering Committee Meeting was called to go through the control options (mailed out control methodology prior to meeting). All aquatic vegetation control methods were discussed. The committee agreed to pursue an integrated management plan applying herbicide as a first step followed by introduction of grass carp and monitoring. In the future benthic barriers and hand pulling will be incorporated when appropriate.
- Members of the Steering Committee met with the lake surveyor, the area habitat biologist and a representative BioSonic the company that makes the hydroacoustic equipment used in data collection for the lake survey on September 15, 2004.
- October 10, 2004 the LLBePSC held a public meeting to inform the local community about and discuss the problems facing Lone Lake. It included grant information, development of the IAVMP and findings from the recent aquatic vegetation survey. Forty members of the local community (some were from the fishing clubs) and nine steering committee members were present along with Terry McNabb who represents ReMetrix and a reporter from the South Whidbey Record. Questions and concerns posed by members of WEAN and the No Spray Coalition, environmental watchdog groups, were addressed. Other topics touched upon were algae, oxygen depletion associated with plant die-off and lake stewardship.
- The Steering Committee fulfilled the requirements of plan development in a very short time using only approximately 66% of the money awarded. Though they operated within an abbreviated time frame they accomplished the tasks set forth in front of them in a thoughtful and responsible manner. They worked diligently to provide the in-kind contribution to this project. Through hard

work and dedication they met this objective in only four months. (Attachment A)

The Lone Lake Homeowners Association and the Lone Lake Brazilian elodea Project Steering Committee are not being led through this process. They are leaders. Without prompting from the ICNWCB or Ecology they formed the Steering Committee, compiled contact information to distribute news and materials about the weed infestation in Lone Lake. They have called all meetings, drafted the agendas and invited guest speakers. The Steering Committee has reached out to the local community by supplying them information at meetings they called or by attending meetings put on by local organizations. Representatives from the LLBePSC have been asked to speak at meetings of the Lions Club of South Whidbey (Attachment A), Holmes Harbor Rod and Gun Club and the fishing clubs. From such meetings, crucial partnerships have been developed. The community now has a better understanding of Egeria and why it is a problem in Lone Lake. They also understand, though they may not agree with, why certain control methods have been proposed to combat the infestation.

Though this has been an expedited process, the Steering Committee members are dedicated to producing a quality plan. For them the driving force is the health of Lone Lake. It is imperative that Lone Lake be relieved of the weed infestation that now degrades the quality of the lake. It is important to implement a well though out plan that will eradicate Egeria and make the local citizens better stewards of Lone Lake.

Island County Noxious Weed Control Board (ICNWCB) is also committed to this project. Outside of grant administration, the ICNWCB will partner with the LLHA and local citizens to make the monitoring and survey component of the IAVMP successful. It will train participants on the tasks required and methods used in monitoring and surveying. The ICNWCB will also make itself available for outreach and education and will visit neighboring lakes to survey and address local concerns about cross contamination.

RFERENCES

1. Aquatic Ecosystem Restoration Foundation. 2004. *Best Management Practices Handbook in Support of Fish and Wildlife*. Available on-line. www.aquatics.org/aquatic_bmp.pdf

2. Bachmann, Roger W., Hoyer, Mark V. and Canfield, Daniel E., Jr. 2004. *Aquatic Plants and Nutrients in Florida Lakes*. Aquatics, Fall 2004 Edition.

3. Bonar, S. A., Bolding, B., and Divens, M. 1996. *Management of aquatic plants in Washington State using grass carp: effects on aquatic plants, water quality, and public satisfaction 1990-1995.* Washington Department of Fish and Wildlife Research Report No. 1F96-05.

4. Clark, Pat. December, 2004. LLBePSC Member. Personal Communication. Small farm best management practices on property adjacent to Lone Lake.

5. Clark, Pat. November, 2004. LLBePSC Member. Personal Communication. IAVMP Development Questions.

6. Cohen, Phil. December 2004. Island County Surface Water Manager. Personal Communication. Residence Time and Flow Rates of Water into and out of Lone Lake.

7. Department of Ecology. 2004. *A Citizen's Guide to Understanding and Monitoring Lakes and Streams*. Available on-line. www.ecy.wa.gov/programs/wq/plants/management/joysmanual/lakemonitoring.html

8. Department of Ecology. 2004. *Aquatic Plant Identification Manual for Washington's Freshwater Plants*. Available on-line. www.ecy.wa.gov/programs/wq/plants/plantid2/index.html

9. Department of Ecology. 2004. *Aquatic Plant Management/Control Methods*. Available on-line. www.ecy.wa.gov/programs/wq/plants/management/index.html

10. Ellis, Steve. October 2004. Audubon Society. Personal Communication. Species List.

11. Envirovision. 1997. *Big Lake Aquatic Plant Management Plan*.

12. Ford, Steve. February 2005. LLBePSC Member. Personal Communication. Boat Washing Station.

13. Frodge, J. D., Thomas, G. L., and Pauley, G. B. 1995. Chapter 6 – *Water quality effects of stocking sterile triploid grass carp in Keevies Lake and Bull Lake.* In: The Biology Management and Stocking Rates of Triploid Grass Carp *Ctenophyaryngodon idella*, and Their Effects on the Plant Community, Fish Assemblage, and Water Quality of Several Pacific Northwest Lakes. Final Report to the Washington Department of Ecology.

14. Gibbons, H. L. 1997. *Silver Lake Phase II Study, 1996 Annual Report* prepared for Cowlitz County by KCM, Inc.

15. Hall, Janet. June, 2003. Triathlete. Personal Communication. Whidbey Island Triathlon.

16. Hamel, Kathy. September 28, 2004.Department of Ecology. Aquatic Weed Management Fund Workshop.

17. Hamel, Kathy. September, 2004. Department of Ecology. Personal Communication. Herbicide Efficacy.

18. Howe, Deborah. 1988. Ott Engineering. Proposal for Initial Environmental Studies for Restoration of Lone Lake.

19. Island County Health Department. 2000. Surface Water Monitoring (Swim Beach Surveillance) Protocol.

20. Island County Planning and Community Development. 2003. Agricultural Best Management Practices Program for Island County.

21. Island County Salmon TAG Meeting. July, 2004.

22. Kelley, Doug. December 2004. Personal Communication. Lone Lake and ground water. Island County Environmental Health Department.

23. Kelley, Doug. July 2004. Lone Lake Basin Hydrologic Data. Island County Environmental Health Department.

24. King County Department of Natural Resources and Parks Water and Land Resources Division. 2003. *Spring Lake Integrated Aquatic Vegetation Management Plan*. Available on-line.
www.ecy.wa.gov/programs/wq/plants/Spring%20Lk%20IAVMP.pdf

25. Kunze, L.M. 1994. *Preliminary classification of native, low elevation, freshwater wetland vegetation in western Washington*. Washington Natural Heritage Program, Department of Natural Resources, Olympia, WA, 120pp.

26. Lone Lake Brazilian elodea Project Steering Committee (LLBePSC). September 2004. Minutes from Steering Committee Meeting.

27. Lone Lake Brazilian elodea Project Steering Committee. October 10, 2004. Public Meeting Minutes.

28. Madsen, John. Spring 2000. North American Lake Management Society; LakeLine, v.20,no.1,pp.22-34.

29. McNabb, Terry. October, 2004. ReMetrix. Personal Communication. Egeria Abundance and Herbicide Efficacy.

30. Moody, Sandy Swope. December 6, 2004. Washington Natural Heritage Program. Information on Significant Natural Features in the Lone Lake Project Area (T29N R3E S5-8).

31. Nash, Matt. January, 2005. Island County Public Works. Personal Communication. Lone Lake Drainage Area.

32. Ness, A. O. 1958. *Soil Survey of Island County, Washington.* United States Department of Agriculture in Cooperation with Washington Agricultural Experiment Station, Institute of Agricultural Sciences, State College of Washington Scanned version available on-line. www.or.nrcs.usda.gov/pwn_soil/washington/wa029.html

33. Parvin, Kathleen. July, 2004. Island County Environmental Health. Personal Communication. Swim Beach Surveillance.

34. Pauley, G. B., Marino, D. A., Thiesfeld, S. L., Vecht, S. A., Thomas, G. L., Beauchamp, D. A., and Bonar, S. A. 1995. Chapter 9 – *Impacts of triploid grass carp grazing on the game fish assemblages of Pacific Northwest Lakes.* In: The Biology Management and Stocking Rates of Triploid Grass Carp *Ctenophyaryngodon idella*, and Their Effects on the Plant Community, Fish Assemblage, and Water Quality of Several Pacific Northwest Lakes. Final Report to the Washington Department of Ecology.

35. Pfeifer, Bob. 1998. *Trout Fishery Evaluation of Lone Lake, Whidbey Island, Island County, Washington, Spring-Fall 1998*. Washington Department of Fish and Wildlife.

36. Russell, Bill. March 2004. LLBePSC Member. Personal Communication. Nutrient loading in Lone Lake.

37. Salzer, Lori. December, 2004. WDFW. Personal Communication. Herpetological Records for the Lone Lake Area.

38. Smith, A. Kirk and Julie Rector. 1997. *Water Quality Assessments of Selected Lakes within Washington State.* Department of Ecology, 1994. Washington State Department of Ecology Environmental Investigations and Laboratory Services Program. Pp.205-207.

39. Strodel, Scott. December 2004. LLBePSC Member. Personal Communication. Soils in Lone Lake.

40. Thompson, Doug. October 2004. WDFW, Habitat Biologist. Personal Communication. Stocking Grass Carp.

41. Thurston County Department of Water and Waste Management. 1995. *Long Lake Eurasian Watermilfoil Eradication Project*. Final Report

42. Tsunoda, Larry. October 2004. WDFW, Biologist. Personal Communication. Draft Grass Carp Stocking Policy.

43. Tsunoda, Larry. November, 2004. WDFW, Biologist. Personal Communication. Fish species in Lone Lake.

44. Washington Department of Fish and Wildlife. 2005. Fish and Wildlife Map Products. Available on line. http://wdfw.wa.gov/hab/mapprods.pdf

45. Washington Department of Fish and Wildlife. October 12, 2004. Habitats and Species Report in the Vicinity of T29R03E Section 6.

46. Washington State Noxious Weed Control Board. Written Findings. 2004. Information About Brazilian elodea – Egeria densa. Available on-line. www.nwcb.wa.gov/weed_info/egeria.html

47. Washington State Noxious Weed Control Board. Written Findings. 2004. Information About Purple Loosestrife – Lythrum salicaria. Available on-line. www.nwcb.wa.gov/weed_info/ploosestrife.html

48. Washington State Noxious Weed Control Board. Written Findings. 2004. Information About Reed Canarygrass – Phalaris arundinacia. Available on-line. www.nwcb.wa.gov/weed_info/reedcanary.html

49. Whidbey Fly Fishing Club. September 2004. Personal Communication. Lone Lake Informational Meeting.

50. Winterowd, Sue and David S. Lamb. Little Pend Oreille Lakes-Eurasian watermilfoil Eradication Project, Final Report.

ATTACHMENT A

Lone Lake Brazilian elodea Project

- Steering Committee -

Serving all of South Whidbey Island

THE SOUTH WHIDBEY RECORD

Vol. 80, No. 79 Saturday, October 2, 2004 50 cents

INSIDE

Mammoth A7

Lone Lake resident Pat Clark holds Brazilian elodea in his right hand and a native weed typical to the lake in his left. The invasive plant's growth it could destroy the lake within 10 years, turning it into a 101-acre marsh.

Jennifer Conway staff photo

Community ready to fight weeds

By JENNIFER CONWAY
Staff reporter

Fearing for the survival of all of South Whidbey's lakes, the Lone Lake Homeowners Association is doing what they can to prevent an aquarium weed in their waters from spreading further.

For homeowner and association member Pat Clark, the lake is more than his home — it's his family history. His grandfather homesteaded the area around 1905, and the Clark family has called it home ever since.

Around 1996, Lone Lake took a turn for the worse when the invasive aquarium weed Brazilian elodea was discovered growing in the lake, Clark said. The weed is thought to have been introduced into the lake from someone dumping a household aquarium with the plant into the water, or from a boat trailer carrying the same plant.

"The Brazilian elodea is just choking and killing it," he said Thursday.

With a $30,000 grant from the state's Department of Ecology, which was awarded earlier this year to the county, the homeowners association was finally able to investigate the weedy condition of Lone Lake. The grant pai for a survey of the 101-acre lake by ReMetrix a vegetation and aquatic mapping compan based out of Indiana.

On Sept. 15 and 16, ReMetrix came to Whic

SEE WEED, PAGE A3

Attend the meeting

Learn more about the problems facing Lone Lake at 2 p.m. Oct. 10 at Deer Lagoon Grange Hall, 5140 Bayview Road.

WEED

▼ *Elodea could spread to other island lakes*

CONTINUED FROM A1

bey Island to map Lone Lake. Clark said they crisscrossed the shallow lake every 50 feet with sonar equipment to determine the depth of the lake, it's temperatures, the aquatic vegetation and the extent of the invasive weed's infestation. The evaluation came in under-budget, costing about $12,000.

On Oct. 10, Clark said, a presentation from ReMetrix will share the conditions of the Brazilian elodea and their suggestions on how to manage the lake.

"We don't have those answers yet," he said.

Clark said there are approximately 44 waterfront owners on Lone Lake, and a total of 90 Lone Lake property owners who live in the area, including Lone Lake Shores and Lone Lake Terrace. In addition to inviting property owners to the presentation, Clark said local fishing clubs and Whidbey Island triathlon organizers are also extremely concerned about the lake's healthy future.

"We just felt we needed to educate all of the people," Clark said.

One of Clark's biggest concerns is the strong possibility that the invasive weed will be carried to nearby Goss Lake — less than a mile away — or Deer Lake by a boat trailer or angler's equipment. He said for the health of all Whidbey Island lakes, residents are invited to learn about the weed to prevent spread to other lakes. In Lone Lake the weed has eliminated many of the native plants in the lake, which is about 20 feet deep.

He also said South Whidbey Parks and Recreation District received many complaints this year from participants of the Whidbey Island Triathlon, who said swimming through the weeds was worse this summer than ever before.

"There's just fewer and fewer people using it because of the weeds," Clark said.

He's been told by a state biologist the lake's status as a fly fishing trophy lake and recreational area would be threatened if the invasive weed's continued to spread.

"I'm hoping that that would never happen here," Clark said.

In addition to the presentation from ReMetrix on Oct. 10, Clark said the Island County Noxious Weed Coordinator will present the lake's vegetation management plan which she is developing for the Department of Ecology. The county will prepare the implementation grant proposal for how to control the weeds — which is due by Nov. 1 — that would pay for removal of the weeds.

Clark said depending on the nature of the presentation and public support will determine what measures are taken to prevent and remove Brazilian elodea from Lone Lake, including weed-eating carp, bottom barriers or hand pulling the weeds.

ideas. For more information, call the port office at 331-5494.

Lone Lake weeds to be addressed

Learn more about the problems facing Lone Lake at 2 p.m. Sunday at Deer Lagoon Grange Hall, 5140 Bayview Road. Presentations from an aquatic vegetation management specialist and Island County's Noxious Weed Coordinator Susan Horton will be held at the educational community meeting. Results from a September aquatic survey of Lone Lake will reveal the extent of the invasive weed Brazilian elodea.

OPINION

EDITORIALS

Lake's weedy problem needs careful attention

If Lone Lake residents get the chance next year, they will start fighting a battle against an invader in their lake.

This battle — against a non-native aquarium plant that has clogged Lone Lake and threatened the continued survival of its fish population — will not start without controversy, but it is one that must be fought.

Stocked every year with hatchery-raised trout, Lone Lake is hardly a poster child for pristine, untouched fresh water aquatic environments. Barely 23 feet deep at its deepest point, it is already displaying some of the characteristics of a lake on its way to becoming a swamp. Weed growth in the lake is hastening this.

The lake's damaged ecology has been well known for years, but until this summer, it was something that both the lake's human users and finned residents could live with. But between the choking weed growth and potentially deadly algae blooms accelerated by the extreme heat of the past summer, Lone Lake appears to be headed toward becoming a dead lake — something that is not good for the animals and people who call the lake home.

If the state comes up with grant money to fund a cleanup in the lake, South Whidbey residents can expect to see the lake stocked with non-native carp — a scavenger fish that will eat its way through the lake's weed population — and possibly to find professionals applying aquatic weed killer in the lake. Both solutions to the weed problem will likely rub at least a few people the wrong way, given South Whidbey's recent environmental record. But in this case, humans need to take drastic measures to correct a drastic problem created by humans in the first place.

Had we taken better care of Lone Lake, none of this would be necessary. Maybe we've finally learned something. If done properly, the battle to save Lone Lake will only need to be fought once. After that, nature should be able to take its course.

Lone Lake

Leader needed for rehabilitation

To the editor:

We have lived on South Whidbey for over 30 years and in that time, we have been amazed to watch the stewardship of our natural resources and environment by the concerted actions of our citizens. We have saved the virgin timber at U2, the Saratoga woods, the Greenbank farm lands and buildings, the Ebey Prairie, the wild grasses and vegetation at the pheasant farm, the Sears catalog home and the Bayview Cash Store.

There is now a jewel in our midst that needs our community's collective attention, Lone Lake. As was detailed in a recent front page story and editorial in *The South Whidbey Record*, this 100 body of water that most of us take for granted is slowly dying because of a serious but correctable weed infestation that was introduced by us. This weed is choking the lake and eventually will turn it into a swamp. We should care greatly about the condition of this lake not only from an aesthetic viewpoint, but also from a scientific and recreational point of view.

What a wonderful gift it would be, for our region, if an organization that is presently functioning and has the wherewithall to mount a campaign to save Lone Lake would come forward and get people like me moving to get a plan of action in place, along with our county and state officials, to expeditiously Save Lone Lake.

I'm ready to step up to the plate, to do some leg work, put some money in the pot and place that "Save Lone Lake" sign and bumper sticker on my car. Where is my leader?

JIM MILLER
Langley

Send us your letters

Letters to the editor may be mailed to P.O. Box 359, Langley, WA 98260, faxed to 360-221-6474 or e-mailed to editor@southwhidbeyrecord.com. Include your address and a telephone number where you can be reached in the day in order to confirm. Letters of 300 words or less are the best chance of being published. All letters are subject to editing. If you have a question, call the editor at 221-5300.

Lone Lake

Residents search for weed solution

To the editor:

The Lone Lake Homeowners Association would like to thank *The South Whidbey Record* for the excellent coverage and editorial regarding the noxious weed Brazilian elodea and the algae bloom Cyanobacteria. Cyanobacteria can be very harmful to animals.

Warning signs have been posted at the popular state boat ramp and park. We are hopeful this information will assist pet owners, inform the public and prevent weeds from spreading to other nearby lakes.

The Lone Lake Homeowners clearly admit that we do not have the solutions to our Lone Lake problems. However, we are spearheading an effort to obtain the necessary funds to develop a plan to study the lake.

With the assistance for the Department of Ecology, Department of Fish and Wildlife, local fishing clubs and Island County, we are hopeful a grant will be obtained to start the process for improving the lake for all concerned.

Comments and support can be sent to *lonelakeweeds@yahoo.com.*

PAT CLARK
Langley

Fly fishers talk Lone Lake

The Whidbey Island Fly Fishing Club will meet at 7 p.m. on Nov. 12 at the Holmes Harbor Golf Club clubhouse. The subject of the program for the evening will be Lone Lake and its weed problem. In attendance will be Dr. Richard B. Thompson, a fisheries biologist who manages a 12-acre private lake in Kittitas County. The meeting is open to all those who have an interest in saving this resource. A light dinner will be served 6-7 p.m. for $10. RSVP Gil Nyerges at 341-5313 or at *nyerges11@hotmail.com.*

Weed removal for Lone Lake gets funding

County receives $30,000 for effort

By **GAYLE SARAN**
Staff reporter

Homeowners on Lone Lake are a bit closer to cleaning up their weed-choked lake thanks to a grant from the state Department of Ecology.

Island County was awarded $30,000 this week to develop a plan to control Brazilian elodea in Lone Lake. Brazilian elodea is an invasive aquarium plant that is no longer being sold in Washington due to the damage it does to natural bodies of water.

Pat Clark, president of the Lone Lake Homeowners Association, said the grant was something he and other lake homeowners had been hoping for over the past few months.

"We are very excited and grateful for this grant," he said.

The grant will be administered by Island County.

Clark said this year, the money will be used to hire a biologist to help "determine our options." Those options include using weed-eating fish and aquatic herbicides. Because the weeds are so well established in the lake, the homeowners will need more grant money in future years to finish the job.

"It will take several years to eradicate the weed," Clark said.

Clark said the lake deteriorated more than usual last summer due to the dry, hot weather. The weeds grew while the water level dropped.

Fearing that the lake's status as a fly fishing trophy lake — as well as lakefront property values — could be affected by the infestation, the homeowners association applied for the grant last fall. Options available to solve the problem include stocking the lake with weed-eating carp or, if the infestation is found to be bad enough, the association may use a water-borne herbicide to kill off the Brazilian elodea.

The weed, which appeared in the lake in the mid-1990s, is commonly used in aquariums, said Susan Horton, coordinator for the Island County Weed Control Board. It likely got in the lake when someone dumped an aquarium into the water.

Horton said she is pleased with Ecology's decision to award a grant for the weed eradication project.

SEE WEEDS, PAGE A3

WEEDS

CONTINUED FROM A1

The Washington Department of Ecology awarded grants of more than $440,000 to help control the spread of non-native aquatic weeds in Northwest Lakes. Without the money, residents and property owners would have borne the costs of controlling these plants. However, in 1991, the Legislature established the Freshwater Aquatic Weeds Account to provide financial and technical support to help communities tackle the problem.

Whidbey Island Triathlon

Triathletes take to the water, roads and trails August 7 at 9 a.m. in the "Race the Rock" Whidbey Island Triathlon. The race consists of a half-mile swim in Lone Lake, a 19.6-mile bike ride and a 3.8-mile run. For information or entry forms, go to the South Whidbey Parks & Recreation Web site at www.swparks.org or call 221-5484.

Talk about fly fishing issues

The Whidbey Island Fly Fishing Club will meet Sept. 29 at the Race Road Fire house in Coupeville to talk about the Brazilian elodea infestation of Lone Lake.

Dinner starts at 6 p.m., while the meeting starts at 7 p.m. For more information, call 221-8174

THE SOUTH WHIDBEY RECORD

Lake's ecosystem may soon start to collapse

By JENNIFER CONWAY

The future of Lone Lake is grim, with little or no chance of it ever making a complete turnaround.

At a Lone Lake Homeowners Association meeting Oct. 10 at the Deer Lagoon Grange Hall, about 50 area residents, anglers, environmentalists and recreational users all learned the same thing: the condition of the invasive weed Brazilian elodea in the lake is bad and it will only get worse.

Within the next 12 days, Island County and a Lone Lake steering committee composed of residents and others concerned will decide how to kill as many of the weeds as possible, then send their plan to the Washington Department of Ecology.

According to Pat Clark, the president of the Lone Lake Homeowners Association, the presence of Brazilian elodea was discovered sometime around 1996. The weed was likely introduced into the 101-acre lake by someone dumping household aquarium water and the plant into the lake, or from a boat trailer carrying the same plant.

In January, Island County received a $30,000 grant from the department of Ecology to bring in an outside company to investigate the weedy condition of Lone Lake. ReMetrix, an aquatic plan assessment mapping business headquartered in Indiana, completed the aquatic survey on Sept. 15 and 16.

Terry McNabb, a co-owner ReMetrix, gave talked about the results of the survey at the Oct. 10 meeting. The company surveyed the lake by crisscrossing the lake every 50 feet with sonar equipment. The survey determined the depth of the lake, temperatures, the aquatic vegetation and the extent of the Brazilian elodea's infestation. The lake is shallow — about 20-feet at its deepest — and a majority of it was found to be infested with elodea. McNabb said 60 to 65 percent of the lake is choked with the weeds. .

"You tend to have more of a weed problem in the shallow parts of the lake," McNabb said.

McNabb, who is also an aquatic biologist and president of the Bellingham-based company AquaTechnex, gave the group several suggestions about how to kill off the weeds. He also noted that if the weeds are not controlled, they could easily spread to other area lakes on boats and boat trailers. Currently, only 19 of the approximately 7,800 lakes in Washington are known to host the Brazilian elodea.

"These plants spread primarily by fragments on boat trailers," McNabb said.

Susan Horton, program coordinator for Island County Noxious Weed Control Board, followed McNabb's presentation by talking about the threat elodea poses. In addition to being a non-native plant, she said Brazilian elodea displaces native plants and weeds by totally eliminating them. It also creates impenetrable mats that are difficult for swimmers and boaters to penetrate. Eventually, she said, the weeds will decrease water flow and shrink the lake's fish population.

She said with the eradication of fish, area waterfowl will also be left without food.

McNabb and Horton said a combination of methods will need to be used to reduce the amount of Brazilian elodea. A combination of herbicides and weed-eating fish called carp were suggested, as was the possible use of bottom barriers to reduce the amount of weeds near public and private docks and private property.

Laurie Keith, president of the Whidbey Island No-Spray Network, urged those at the meeting to consider the effects of using an herbicide in Lone Lake. She said a thorough investigation of herbicides proposed for use is needed, as the chemicals could have an unknown lasting effect on area residents and recreational users.

McNabb said an herbicide is essential in getting rid of the weeds.

"You can't really lump all pesticides together," he said. "Nothing we're really finding goes after Brazilian elodea yet."

In 1996, McNabb said, the use of a controlled pesticide eradicated the invasive weed milfoil in Goss Lake.

Horton said it will take just a few more years of uncontrolled growth for Brazilian elodea to turn Lone Lake into a bog.

"We want to strive for eradication, but that probably won't be the case," she said. "This lake's probability is already out of control."

What was agreed at the meeting was an immediate plan is needed. Lone Lake resident Jean Schick Jacobowitz said she was surprised how fast the weed spread.

"I don't think anyone realized it could get this bad this quickly," she said.

Another resident, Donna Richardson, said after years of living and swimming in the lake, recreational activities in it are currently out of the question for her.

"I wouldn't go near the lake now with a 10-foot pole," she said.

Drew Dickson, an avid Lone Lake kayaker, agreed the weeds have made boating more difficult over the past few years. He said the weeds have become so thick his children don't even want to swim in the lake.

"The algae blooms have got a lot more regular and more severe," he said.

Angler Gil Nyerges said the Whidbey Island Fly Fishing Club is interested in raising funds to help control the weeds. He suggested a boat washing station as a possible project. That, at least, could stop the spread of elodea.

"You're not alone," he said. "It's an important thing."

ReMetrix will present a written report about the lake weeds to Island County by Oct. 25. Horton will prepare a weed eradication plan for the Department of Ecology by Nov. 1.

rving
ll of
outh
idbey
sland

THE SOUTH WHIDBEY
RECORD

78, No. 85 Wednesday, October 22, 2003

What's it going to take to clean up Lone Lake?

Matt Johnson / staff photo

ake homeowners Bill Russell and Pat Clark look over the accumulation of elodea weeds on Russell's beach Thursday. The invasive weed ing the lake, which has prompted homeowners to look for grant money to stock the lake with weed-eating fish.

Homeowners seek funds to stop weeds

Carp may do the trick, but herbicides might be needed in addition

By NATHAN WHALEN
Staff reporter

Residents living near a Whidbey Island lake known for trout fishing are looking to a plant-eating fish for help in eliminating weeds choking the water.

This summer, Lone Lake became almost unfishable, unswimmable and unboatable as a non-native, invasive aquarium weed present in the lake for years almost grew to the surface in almost every area. At the same time, a late-summer bloom of what appeared to be a toxic algae bloom may have made the lake an outright hazard for human and animal lake users.

For the past several years, the residents around Lone Lake have been dealing with an infestation of Brazilian elodea, a submerged broadleaf that has spread throughout the lake. It gets into lakes when people dump their aquariums. Once in a lake, it can be spread between bodies of water by boaters or on fishing gear.

"The weeds are taking over the lake," said Bill Russell, a homeowner near the lake who is also a member of the Lone Lake Homeowners Association.

Russell said the South American plant has eliminated most of the native plants in the shallow lake, which has a maximum depth of just over 20 feet. He believes fish in the lake are also threatened because the plant depletes the oxygen content of the water.

Fearing that the lakes status as a fly fishing trophy lake, as well as lakefront property values, could be affected by the infestation, the homeowners association is applying for up to $47,000 in state grant funding to pay to stock the lake with weed-eating carp. In addition, if the infestation is found to be bad enough, the association — with approval from the state — may use a water-bourne herbicide to kill off the Brazilian elodea.

The weed, which appeared in the lake in the mid 1990s, is commonly used in aquariums, said Susan Horton, coordinator for the Island County Weed Control Board. She said that the plant is highly aggressive and can change the dynamic of the lake.

After meeting with officials from the state's Department of Ecology last month, the homeowners association learned that it could qualify for state grant funding to stock the lake with sterile carp and, if necessary, to pay for herbicides.

Pat Clark, president of the Lone Lake Homeowners Association, said while he is aware that either measure could upset some South Whidbey residents, the association cannot do nothing.

"We're afraid if we don't do anything, the lake is dying," he said.

The carp are the preferred solution. Island County's Horton said carp have a voracious appetite for elodea. Living up to 10 years, the sterilized fish will have some time to put a dent in the weed problem, though that may not be enough. Russell, who is writing the grant for the homeowners association, said if the elodea population is found to be too dense, it may need to be poisoned prior to the introduction of carp.

Hello elodea

To learn more about Brazilian elodea, visit *www.ecy.wa.gov/programs/wq/plants/weeds/egeria.html.*

Before doing anything, the association needs permits from Washington State Department of Fish and Wildlife, the same agency that stocks the lake annually with trout. Russell said that state agency hasn't made a decision on whether the homeowners can use the carp.

The state may require the homeowners association to develop a plan to manage the weed removal. That would mean that 2005 would be the first opportunity for treating the lake with carp or chemicals.

Because state grant money can only be distributed by a government agency, Horton asked the Board of Island County Commissioners this week to sponsor the grant. At their Monday meeting, the commissioners said they would consider the request.

Kathy Hamel, an aquatic plant specialist for the Washington Department of Ecology, said even if the homeowners group pulls together the money to stock the lake with carp, it will take constant work to keep the weeds at bay.

"Once a noxious weed gets into a lake, it is very difficult to eradicate it," Hamel said in an e-mail this week.

In past years, the association has used an underwater weed mower to cut the top three feet of weeds off. This has been successful in opening the

SEE LAKE, PAGE A3

LAKE

CONTINUED FROM A1

water for boaters and swimmers. Even so, there are plenty of weeds left. Russell said he [illegible] broken weeds off the beach almost daily, even during the fall.

As for the algae bloom, Ecology's Hamel said the microscopic plant is nearly impossible to remove from the lake. Fortunately, as the sun shines less during the winter, algae blooms typically break up and fade, along with the toxins they can carry.

Any weed eradication work would have to be done by a private contractor, as Ecology is not in the weed-killing business. Funding granted to the homeowners association would have to be matched at the rate of 25 percent.

Record editor Matt Johnson contributed to this article.

100 Copies distributed to area residents plus emailed to about 20 more

MARK YOUR CALENDAR

IMPORTANT EDUCATIONAL COMMUNITY MEETING

SUNDAY, OCTOBER 10TH AT 2:00PM

DEER LAGOON GRANGE HALL, 5140 Bayview Rd.

The purpose of this meeting is to communicate information regarding the problems facing Lone Lake. As many of you know, Island County and Lone Lake Home Owners Association have received a Department of Ecology grant to begin the process of eradicating Brazilian Elodea, an invasive weed that is choking the lake.

At this meeting the following points will be discussed:

- Results of the Lone Lake survey completed by ReMetrix on September 15th and 16th. Presentation by Terry McNabb, aquatic vegetation management specialist, will cover present conditions and possible solutions for managing Brazilian Elodea.
- Island County Noxious Weed Coordinator, Susan Horton, will present the progress in writing the Integrated Aquatic Vegetation Management Plan.
- Larry Tsunoda, Department of Fish and Wildlife representative, and Gil Nyerges of the Whidbey Island Fly Fishing Club will share support and concerns for the Lone Lake project.

Time for your questions and comments will be included.

If you need further information please contact Pat Clark, LLHOA President at 360-321-4548 or email pjclark@whidbeyisland.com.

Your participation is important! Please attend!

Lone Lake Homeowner's Association

Community Meeting 10-10-2004
Location: Deer Lagoon Grange
Present: Susan Horton, Terry McNabb, Larry Tsunoda LLHOA Board members: Pat Clark, Ellen Nelson, Steve Ford, Bill Russell, Jan Clark, Mark Miller, John Lees and 40 community members.

1. Pat Clark opened the community meeting with an introduction of the LLHOA Steering Committee and a description of the purpose of this meeting.
2. Susan Horton, Island County Noxious Weed Control Board, presented a slide show summarizing the history of Lone Lake and the current situation with Brazilian elodea.
3. Terry McNabb of ReMetrix gave a slide presentation describing the results of the Lone Lake survey recently completed. He explained the options available for managing the elodea and talked about how those options related to the particulars of Lone Lake.
4. Terry McNabb answered questions from the community. Below is a summary of most of the questions including the names and affiliations of the people participating.

Steve Erickson of WEAN Asked about whether tracking had been done on the nutrient loading. He wondered if it had been done since the 1996 survey. Susan H. explained that a prior county planner had attempted to propose a study of the nutrient load but it had been turned down by the county commissioners. Susan H. said that we intend to follow the Lake Stewardship guidelines.

William Smith – Freeland resident who kayaks on Lone Lake- reported that he did Internet search on Reward and that it had been approved by the EPA. He is interested in additional information about Reward.

Laurie Keith of the No Spray Coalition expressed concerned about the health consequences of using herbicides. She also expressed concern about herbicide companies doing the research on their own products. She expressed concern that the studies don't look at the chemicals as endocrine disrupters and felt that these are responsible for current unexplained d health issues such as ADHD and autism.

Frank Dost of Freeland and a fishing club member as well as a retired toxicologist explained that endocrine studies are done on herbicides. He also explained the importance of understanding the use of the term "safe" in regard to herbicides.

Midge Pearson, Goss Lake resident, expressed concern that the elodea would be transported to Goss Lake. It was indicated that the elodea can be viable for 1-2 weeks even when carried on someone's boat.

Drew Dickson, Lone Lake resident and kayaker, expressed concern about the density of the weeds and the difficulty of using the lake for recreational purposes. He also expressed concern about the frequency and intensity of the algae blooms and wondered about how to control the algae.

Steve Ford, Lone Lake homeowner, discussed the relationship between the algae and other plants in the lake and how the lowering of phosphorus reduced the amount of algae.

Linda Griesbach, Lone Lake homeowner, had questions about the lifecycle of elodea and how it reproduces, She also had questions about the impact on other species in the lake.

Terry McNabb explained that Reward is abroad spectrum herbicide and it is a maintenance took and does not kill the roots of the plant. Sonar has more ability to be selective.

Larry Tsunoda of DFW discussed the permitting process through DFW for use of grass carp. He mentioned that it has to go through a SEPA process, and be open for public review for 3 weeks. He reported that 6-10 fish per acre are recommended and that the fish live for about 5-6 years.

Gil Nyeres spoke as the representative of numerous fishing clubs in the area. He reported that there are approximately 30 clubs in the state and that we have their backing to go forward with this project.

Terry McQuellon of Lone Lake Shores is interested in the Lake Stewardship program and how it can be used in this process.

Midge Pearson of Goss Lake wants to know how we keep up on the survey and if it is up to the homeowners at Goss Lake to watch out for elodea. It was recommended that checking near the boat launches is the best place to look for it.

Pat Clark asked if there will be a fish kill if we use an herbicide and whether or not we have to shut down the boat launch. This is all part of the permitting process. There was some discussion about the possibility of a "quarantine" of Lone Lake.

Teresa Pate, Lone Lake homeowner, discussed the water quality issue from one year ago and the death of their young dog from drinking the lake water when there was an algae bloom.

Pat Clark discussed the fact that the next phase of grant applications is going to be highly competitive and we will be facing other grant applicants like the University of Washington.

Drew Dickson, Lone Lake homeowner, asked if eradication is possible. We will strive for it but it has never been done in this state, according to Susan Horton.

Donna Richardson, Lone Lake homeowner since 1940, discussed the many years she spent swimming all over the lake and that she will not get in the lake now. She wonders if we can close the lake to stop the elodea from spreading.

Steve Erickson of WEAN asks about the mortality rate of carp; whether we can install a boat washing facility at the boat launch; is there a way to close the lake; and states his belief that the worst problem is really the nutrient loading because of the increased population in the watershed.

Jeannie Jacobowitz, Lone Lake homeowner, expresses her concern that we do something quickly and that she wants to work for long term solutions.

Laurie Keith, No Spray Coalition, asks what other lakes have done to solve this problem. She wonders what the next step in the process is and how we will decide. She also asks about using bottom barriers at the boat launch.

Brad Thompson, Lone Lake homeowner, asks questions about what time of year the herbicide would be used.

Scott Strodel, Lone Lake homeowner, asks what the biggest source of nutrients is and if we have to do a study to determine this. According to Susan and Terry there is very little data on Lone Lake nutrients.

Laurie Keith, No Spray Coalition, asks what is being done for integrated management. She expresses that it looks like we are doing mostly toxics first. She also offers to provide information on impacts of herbicides.

Teresa Pate, Lone Lake homeowner, asks questions about how many carp are needed to get rid of the elodea. She expresses high concern about the use of chemicals because of her personal history of cancer treatment.

Jim Miller who has lived in this area for 32 years wants to assume a positive picture that we will be able to manage the elodea.

Jan Clark, Lone Lake homeowner, discusses the information she gathered from other lake homeowners in Washington State.

Other concerns noted: how to harvest weeds that are killed by the herbicide. Apparently this will be done through the normal biomass yearly process. Herbicides don't impact the insect life.

5. The Deer Lake Grange has once again donated the $100 hall rental fee to our project for today's meeting.

Lone Lake Homeowner's Association
Steering Committee Meeting 9-12-2004

Present: Susan Horton(Island County), Larry Sunodo(Wa St DFW),Pat Clark, Dick Robbins, Ellen Nelson, Steve Ford, Jan Clark, Bonnie Murdock, Ron Murdock, Mark Miller, Jesse Scott, John Lees.

1. Pat Clark introduced Jesse Scott who represents the Evergreen Fly Fishing Club and is here to be updated on our plans.
2. Ryan Moore of ReMetrix will conduct the lake survey on Sept 15th & 16th.
3. Susan Horton and Larry Sunodo led the group through a discussion of all the possible methods of eradicating Brazilian elodea.

Physical methods –

Water level drawdown is not possible on LL because there is no control structure.

Benthic barriers are best used for isolated areas such as docks. We would need to do the entire lake. It's also only a temporary treatment and has to be removed.

Mechanical methods-

Hand pulling requires removing all the plant parts and is usually incorporated with other control methods. It has high possibility of fragmentation of the plant.

Raking and cutting both are not as effective with elodea because they easily break the plant. Could possible exacerbate the problem.

Harvesting – causes fragmentation.

Diver harvesting – extremely expensive for the size of the LL problem.

Retovation – involves tilling and causes fragmentation- also is quite expensive.

Bio Control-

Triploid grass carp are effective for a light to moderate infestation. Costly but they could be used in combination with other methods once the elodea is at a manageable level. Used as a suppression method not as sole eradication method. Don't appear to be any inflow or outflow issues with LL. There have been mixed results because it can be difficult to determine how many carp to use. If there are too many they can remove all the vegetation and the goal is to have 20-40% of surface level with vegetation.

Chemical controls-

Only 2 effective on elodea: Diquat and Fluridone

Diquat – a contact, non-selective herbicide; low levels of residuals for 5 days. Will result in die back of elodea and natives will come back in its place. One day application.

Fluridone – slow acting systemic herbicide; requires more than one application over 60 days. Less toxic than Diquat.

4. Discussion of how to disseminate information about planning process and date of next LLHOA meeting.

5. Discussion of plan process. Committee agreed that we want to pursue an integrated management plan with an initial application of herbicide, followed by mechanical and barrier methods in order to eradicate Brazilian elodea and to restore Lone Lake to a more natural state. More specific information for the plan will be generated by the lake survey and the community meeting.

6. Pat Clark reported that we may observe the survey in process this week but will not actually be participating. The ReMetrix team will give a briefing at 9AM at the Lone Lake Boat Launch. They will give a demonstration of what they will be doing and go over their methodology. It's possible to shadow their boat but not to be on their boat.

7. The DOE meeting regarding planning will beheld 9-28 in Lacey. Susan, Jan, Pat and Bill will represent LLHOA.

8. The Fly Fishing clubs are having a BBQ and meeting on Wed 9-29-04 at the Race Road Fire House. They have invited anyone from the Steering committee to join them. Pat, Jan and Bill will attend. The meeting will discuss the Lone Lake situation.

9. Susan explained the grant in-kind process. Currently we have over $5000 accumulated in this fund for this grant. We need $6000 and hope to have it by 11/1/04.

10. A tentative date for an educational public meeting was set for 10-10-04 with a back up date of 10-17-04. Pat will discuss this with ReMetrix and encourage someone on their staff to attend.

Lone Lake Homeowner's Association

Steering Committee Meeting 8-25-2004

Present: Susan Horton(Island County), Pat Clark, Dick Robbins, Ellen Nelson, Steve Ford, Jan Clark, Bonnie Murdock, Ron Murdock, Mark Miller, Gil Nyerges, John Lees.

1. Susan Horton reported that ReMetrix will be under contract and begin the Lone Lake survey on Sept.13, 2004. They will have 30 days to provide their preliminary report. Their final report is due 10-31-2004.

2. Volunteers will be notified when they are needed to assist with the survey.
3. Discussion about the timeline for the next grant process was held. A final draft is due 11-1-2004 and the final plan by 1-31-2005.

4. Gil Nyrerges reported that 11 fly fishing clubs are interested in the Lone Lake project. Each has about 90 members.

5. Discussion was held about the problem statement and the management goals of the plan.

6. Next Steering Committee meeting will be held Sunday Sept. 12th at 2PM at the Clark's. Susan will e-mail documents about control options. Members will read these before the meeting in order to begin an informed discussion of the options.

Lone Lake Homeowner's Association
Steering Committee Meeting 5-25-2004

Present: Susan Horton (Is County), Larry Sunoda (DFW), Gil Nyerges (Fly Fishing Clubs), Pat Clark, Dick Robbins, Ellen Nelson, John Lees, Scott Strodel, Steve Ford, Bill Russell, Jan Clark, Mark Miller.
Not present: Ron Murdock, Bonnie Murdock, Kathy Hamel

1. Meeting began with introductions of Susan Horton, Island County Noxious Weed Control, and Larry Sunoda, Wa St Dept of Fish & Wildlife and other members of the committee.

2. DOE Grant Update
Grant to develop a plan for weed eradication is in Susan's office ready to be signed. Grant is for $30,000 with a matching $10,000 for in-kind contributions.
Susan came to the meeting to seek our input about how to develop the plan for weed eradication. Discussion was a held about the process involved in producing the plan. It includes obtaining data about the lake, from a professional consultant, and then developing and writing the plan to present to DOE by November. This plan document needs to be ready in order to submit it for the next grant cycle in November. Kathy Hamel at DOE is fully aware of our needs and of the work our group is doing.
Kathy Hamel at DOE is strongly encouraging Susan to write the plan and to use a consultant to survey the lake. Discussion was held about the pros and cons of having Susan do it versus another professional consultant.
Discussion also held about the process of obtaining a professional (write a RFP-request for proposal) to do the survey. Clarification was given about the fact that the person who writes the plan cannot implement the plan.
Susan reported that if she is involved in writing our plan she will do this outside of her Noxious Weed job and we would have to pay her with our grant money.
It was also noted that "in-kind" contributions will not be counted until the contract is fully executed.
A proposal was made to divide the RFP into two parts – surveying the lake and writing the plan. The Committee agreed to this plan and Susan will begin writing the RFP.
It is anticipated that the lake survey could be done in July.
Information about how to develop a plan is available online at:
www.ecy.wa.gov/programs/wq/plants/management/manual/Chapter4.html

3. Discussion about communications with all Lone Lake property owners was held. It was decided that this should wait until the grant contract is signed and matching is available.

4. Use of weed harvester: harvester is on the lake but not ready to use yet. Discussion held about when to mow and rake out weeds as a group.

5. Pat Clark reported he had been reminded by Island Cty Sheriff about regulations for speed boats and water skiers on all Island County Lakes. Four water ski boats are allowed on the lake at one time and they must stay 200ft from shore. No jet skis are allowed.

ATTACHMENT B

Lone Lake Brazilian elodea Project

- Letters of Support -

LIONS CLUB OF SOUTH WHIDBEY
COMMUNITY INVOLVEMENT, SERVICE AND PRESTIGE
P.O. BOX 164, CLINTON, WA 98236-0164
MESSAGE CENTER
(360) 331-3151
WEB SITE-WWW.LIONWHP.COM

IT'S GREAT TO BE A LION WE SERVE

"OUR SLOGAN"
Liberty, Intelligence, Our Nations Safety

November 30, 2004

Pat Clark, President
Lone Lake Homeowner's Association
5170 Bayview Road
Langley, WA 98260

Dear Pat:

Thank you for your presentation on November 11, 2004 to the South Whidbey Lions regarding the problem with Brazilian elodea in Lone Lake. After your presentation, the South Whidbey Lions passed a resolution to support your efforts in eradicating this noxious weed. Due to your visual and factual presentation surrounding the history of Lone Lake, our Club believes the Lone Lake steering committee has thoroughly evaluated a variety of methods to be used and we support the committee if an herbicide appears to be the best method. We understand that weed eating carp may be introduced as a part of the control method.

Our Club has strong concerns that if the problem in Lone Lake is not addressed, this noxious weed will not only destroy Lone Lake but could easily be carried to both Goss Lake, Deer Lake and other lakes within our region.

Our Club is hopeful that Island County and the Lone Lake Homeowner's Association will be successful in obtaining the grant applied for through the Department of Ecology.

Very truly yours,

Chuck Brengle
South Whidbey Lions Club,
By Chuck Brengle, Secretary

From: B. Richard Levinthal [dicklevmd@yahoo.com]
Sent: Friday, October 22, 2004 10:31 AM
To: susanh@co.island.wa.us
Cc: Gil Nyerges
Subject: Lone Lake
Through a fellow member of the Washington Fly-Fishing Club I recently learned of the Elodea problem at Lone Lake. I hope you will do everything possible to eradicate this

noxious weed, not only to restore Lone Lake, but especially to help prevent the spread of the weed to other lakes in our state. As it is said that Elodea is currently present in only a relative few lakes, our best chance of preventing the ruin of many of our beautiful lakes, is to aggressively eradicate it where it exists, before further spread occurs.

B. Richard Levinthal, M.D.
Issaquah, WA

October 21, 2004

Dear WVFF Members and Supporters:

I received a phone call last night (10/20/04) from Gil Nyerges and he requested our help with a problem fly fishers on the Westside are facing with the invasion of Brazilian Elodea. This non-native is more aggressive than milfoil and is threatening quality lakes *over there*. We all know that in this connected biosphere that over *there* means here.

What they (we!) need is a lot of folks indicating their support for eradicating this weed so the project coordinator can use those numbers in a grant proposal to get funding for the clean up. This is not a controversial issue and is simply a way that we can help the right folks get funding to attack this problem.

If you want more information about this problem go to www.island.wsu.edu/weeds/indexweeds.htm.

Please send your personal email in support of this clean up effort to susanh@co.island.wa.us before November 1, 2004.

Program Coordinator
Island County Noxious Weed Control Board
PO Box 5000
Coupeville, WA 98239
susanh@co.island.wa.us

Thank you for making this effort to protect our waters.

Walt

From: KlonyJoe@aol.com
Sent: Wednesday, October 13, 2004 8:03 PM
To: susanh@co.island.wa.us
Subject: Lone Lake
Susan, I am a member of the Northwest fly Fishermen and the FFF. I undersatnd that you are a major influence in the future of Lone Lake as a catch and release fishery. I have come up to the Island often in the past come to fish Lone Lake but not now that it is plugged with weeds, it is unfishable. I have been told that If the lake is treated with Floridone or Diquat and then planted

with grass carp it would solve the problem. Do whatever youcan to correct the problem. Thanks.
Carl Schmidt, Bothell, Wash.

From: PNicklas@aol.com
Sent: Sunday, October 24, 2004 9:26 AM
To: susanh@co.island.wa.us
Cc: wtribley@wvc.edu
Subject: Lone Lake
Susan,
We have recently become aware of the serious damage to Lone Lake created by an infestation of Brazilian Elodea, and of your organization's efforts to implement a mitigation strategy. We would like to express our support of the weed eradication plan, not only as a proper corrective action for Long, but as an important preventive step for the rest of Washington's lakes. Please keep us informed of your progress.

Dick Nicklas, Secretary
Wenatchee Valley Fly Fishers

From: Pat & Jan clark [pjclark@whidbeyisland.com]
Sent: Monday, October 11, 2004 11:33 AM
To: Susan Horton
Subject: Fw: Lake meeting
Hi Susan, Thought this email we received today might be helpful to you.
----- Original Message -----
From: Drew Dixon
To: Pat & Jan Clark
Sent: Monday, October 11, 2004 10:21 AM
Subject: Lake meeting

Thank you for holding the meeting yesterday to disseminate the information regarding the weed problem in Lone lake.
As a resident living on the lake and an avid sea kayaker I normally take full advantage of the proximity of the water for training, classes, clinics and demonstrations of kayak paddling strokes, rolls and rescue techniques. However, with the exponential growth of the weed in the past two years has become such a concern to most of the kayaking group that meets on Wednesdays that we have been forced to move our practice sessions to Deer lake. Furthermore, most kayakers who paddle on lakes are preferring a tranquil calm paddling experience often because they don't have the experience to deal with the cold water and currents that are a part of the challenge of open water paddling in Puget sound. These paddlers most often want to paddle close to shore for security. With the weed problem as it is it is impossible to paddle the shore of the lake without becoming entwined with weed. The lake has sadly become an undesirable destination to kayak, which is a sad situation given its natural beauty.

I am hopeful that a successful management program will be developed such that the lake will be restored to its former glory.
Yours sincerely,
Drew Dixon
(360) 321-4070
adixon@whidbey.com

From: Gil Nyerges [nyerges11@hotmail.com]
Sent: Thursday, October 28, 2004 10:12 PM
To: EricSauerN@netscape.net
Cc: susanh@co.island.wa.us
Subject: RE: Lone Lake

Eric,
I appreciate your reply and knew I could count on your club's support. We are not asking for any monetary support, but I did suggest to the steering committee that in the future, if the need arises, we could request from the clubs voluntary financial support to the extent they could afford toward implementation of whatever plan is undertaken for control of this menace.
I will keep you and your club informed as to actions taken by the Steering Committee.
It's a REAL problem.

>From: EricSauerN@netscape.net
>To: nyerges11@hotmail.com ("Gil Nyerges")
>Subject: RE: Lone Lake
>Date: Thu, 28 Oct 2004 21:53:06 -0400
>
>Gil, I appologize for the late response. I've been deer hunting for
>several weeks over near Republic. If it's not too late the Olympic Fly
>Fishers of Edmonds offer our support to the project. We currently have 63
>members living within the state. We had a Board of Directors meeting last
>night and I raised the issue of providing financial support. We don't have
>deep pockets but I think the Board is amenable to some support if I can
>bring a specific figure & purpose to them. Please keep us posted.
>
> Eric Sauer
> President

From: Michael Milner [michael@themilners.com]
Sent: Wednesday, October 22, 2003 12:40 PM
To: lonelakeweeds@yahoo.com
Subject: fishing on Lone Lake
Dear Lone Lake weed committee,
I am writing in support of your proposal of cleaning up the lake of all the weeds. I am a Seattle fire fighter and have a unique work schedule that allows a lot of time off for fishing. I live in Kenmore but come over often to Whidbey Island just to fish what has become my favorite fly fishing lake, Lone Lake. I have enjoyed bringing with me other fire fighters, family and friends to fish this beautiful lake with lots of large Rainbow trout. Unfortunately, the weeds have really become a nuisance. When I first started fishing this lake about 4 years ago it seems like the weeds were just along the shoreline, now you have to go way out in the middle to get away from the weeds. It won't be long before the whole lake will be taken over by the weeds and no one will be able to enjoy the lake. Please take the necessary steps to preserve this lake for all those that enjoy it! Let me know if there is anything I can do to help.

Sincerely,
Mike Milner

Michael@themilners.com

From: Jim McRoberts [jim4fish@comcast.net]
Sent: Wednesday, October 20, 2004 4:37 PM
To: susanh@co.island.wa.us

Cc: Schaad, Doug home; Nyerges, Gil & Gen
Subject: Lone Lake
Program Coordinator
Island County Noxious Weed Control Board
PO Box 5000
Coupeville, WA 98239

Dear Susan Horton:

I attended your presentation at the South Whidbey fire station a few weeks ago. It was well done. I good friend, Gil Nyerges, has ask that I express my concerns about the noxious weed, Brazilian elodea. Lone Lake is really only the tip of what could be a very big problem! As long as this invasive plant exists in any area it has the potential to invade many other areas. We must find a method to eradicate it quickly. I support your plans to remove the weed by any and all means possible keeping safety of the water supply in mind. If eradication is not considered possible, then methods to reduce the growth rate to near zero must be found so that some other control methods will be effective.
I am President of the Washington Fly Fishing Club and many of our members love to fish Lone Lake for it's trophy trout.

Respectfully,

James C. McRoberts
5430 Lake Washington Blvd. SE
Bellevue, WA 98006-2643

From: Peter Baird [Pedro_Lynn@msn.com]
Sent: Thursday, October 21, 2004 9:57 PM
To: susanh@co.island.wa.us
Subject: Lone Lake Elodea Infestation

Dear Susan,
As a fisherman and member of the Washington Fly Fishing Club who has enjoyed fishing Lone Lake in the past, I would like to lend my verbal support to implementation of the program to eradicate the Elodea infestation. As pointed out at the recent meeting this is a very grave threat not only for the future of this lake, but also any other lakes in the state which could be similarly infected if perpetuation of this major contaminant source is allowed to continue.

Sincerely yours,

Peter A Baird

From: Perry Barth [plbarth@juno.com]
Sent: Monday, October 25, 2004 1:40 PM
To: susanh@co.island.wa.us
Subject: Lone Lake

I sincerely hope that something can be done to clear up the weed problem in the lake. I'm a member of the Washington Fly Fishing Club, I live in Lynnwood, and I come up to fish the lake at least once a year. It is a charming lake, convenient to fish, and results in some economic benefit to the South Whidbey Island community. We always eat at one of the places, enjoy stopping in Langley, and have a wonderful outing. Please do all you can to save this special place. Thank you.

Sincerely yours
Perry L. Barth
4029 191st St. S.W.
Lynnwood, WA. 98036

From: Pncsmith@aol.com
Sent: Friday, October 22, 2004 9:05 AM
To: susanh@co.island.wa.us
Subject: Lone Lake weed problem

Program Coordinator,
I would like to add my support for anything that can be done to eliminate the overwhelming weed problem in Lone Lake. I have fished this highly productive for many years and was very concerned with the level of weed growth this
year. We would be loosing one of the wonderful fly fishing lakes on the West side if this weed is allowed to take over the lake.
Thank you for your time.
Sincerely, Pete Smith

----- Original Message -----
From: Ted Pearson
To: atedp@comcast.net
Sent: Saturday, October 02, 2004 9:32 PM
Subject: Lone lakeBaert Simmons <brenbart@whidbey.com>

Susan. My name is Ted Pearson. I live in Lake Forest Park, North of Seattle. I've enjoyed fishing Lone Lake for the opportunity of catching really large trout. Lone Lake is now almost not fishable because of the rapid growth of Brazilian Elodea and we risk loosing it as a quality fishing lake. For there to be any hope, it needs to be treated with Floridone or Diquat and then planted with grass carp. The small put and take fish in the other lakes in the area are not enough to attract me to the Island. This Brazilian Elodea is bad stuff. The lake was OK this spring and now its a swamp.

I'm member of the Northwest Fly Fishermen, Washington Fly Fishing Club and the Federation of Fly Fishers. We've worked hard to make this a quality lake and sure don't want to loose it.

Please do what you can to rescue this great fishing lake.
Thanks!

Ted Pearson

From: Tribley, Walter [WTribley@wvc.edu]
Sent: Thursday, October 21, 2004 9:01 AM

To: susanh@co.island.wa.us
Subject: Support for weed eradication

Dear Ms Horton:

My name is Walt Tribley, I am the President of the Wenatchee Valley Fly Fishers, when I am not doing my day job. Please accept my support of your efforts to control Brazilian Elodea. Our waters are a precious and wise conservation is the only answer way we will enjoy this resource in the long-term. If I can help you in this effort beyond indicating my support of your project, please let me know.

Best regards and deep appreciation of your efforts,

Walt Tribley (President, WVFF)

Walter A. Tribley, Ph.D., Director
Allied Health and Safety
Wenatchee Valley College
1300 Fifth St.
Wenatchee, WA 98801
Office Ph (509) 682-6665
Cell (509) 860-2284
Fax (509) 682-6661

From: Gil Nyerges [nyerges11@hotmail.com]

Sent: Thursday, October 07, 2004 5:16 PM

To: SusanH@co.island.wa.us

Subject: FW: Re: Fw: Lone Lake

From: "Doug Schaad" dcschaad@comcast.net

Reply-To: "Doug Schaad" <dcschaad@comcast.net>

To: "Gil Nyerges" <nyerges11@hotmail.com>

CC: "Jim McRoberts" <jim4fish@comcast.net>

Subject: Re: Fw: Lone Lake

Date: Wed, 6 Oct 2004 21:48:38 -0700

Gil -- Excuse the formal response that follows. It may be a bit easier to copy into a Word document.6 October 2004

To: Gil Nyerges

From: Douglas C. Schaad

Co-Chair Conservation Committee

Washington Fly Fishing Club

5020 38th Ave NE

Seattle WA 98105-2023

Re: Lone Lake

Mr. Nyerges:

Lone Lake continues to be a favorite among the membership of the Washington Fly Fishing Club. It remains one of the few Western Washington lakes within easy commuting distance, that provides the opportunity for a quality fly fishing experience. The recent incursion of Brazilian Elodea (BE) into Lone Lake is a matter of major concern to our membership. While the immediate concern is with Lone Lake, we all envision the spread of BE into Pass Lake, Cranberry, Erie and other surrounding waters. That said, the WFFC wishes to go on record as supporting current initiatives to eradicate BE from Lone Lake. For your records, I speak on behalf of 181 active members and 23 associate members of the Washington Fly Fishing Club. Should the need arise, I believe we could assemble a significant number of members to help with an on-the-lake eradication effort. I wish you well in this endeavor,

Douglas C. Schaad

Co-Chair Conservation Committee

Washington Fly Fishing Club

5020 38th Ave NE

Seattle WA 98105-3023

From: Gil Nyerges [nyerges11@hotmail.com]
Sent: Tuesday, November 02, 2004 8:21 AM

To: susanh@co.island.wa.us
Cc: pjclark@whidbeyisland.com
Subject: FW: Lone Lake

Susan,
Did I forward this to you - I don't remember, but I think you should have it.

From: "gte/gordon mckay" <gdmckay@gte.net>
To: "Gil Nyerges" <nyerges11@hotmail.com>
Subject: Lone Lake
Date: Fri, 1 Oct 2004 14:23:04 -0700

Hi Gil, I send a e-mail to all the clubs on the west side about showing support for Lone Lake. You can put Evergreen Fly Fishing Club and its 140 members supporting this project. You can also put the support from Bob Shirley President of the (WSCFFF) and also I have the power to give you all the club support from the Council as directed by Bob Shirley and the Conservation Committee. When the time comes I will contact the East Side clubs also, let me know, Jerry McBride is the other Co-chair of the WSCFFF Conservation.His phone number is 1-509-233-2108.

Lake Survey Appendix

Summary Report for the Lone Lake Aquatic Vegetation and Bathymetric Surveys

GOALS

This project has two goals. The first goal was to determine the lake-wide presence, distribution, and species composition of submerged vegetation in Lone Lake, Washington. The second goal was to determine the overall and incremental water volumes in the lake. The results of both goals will be used as tools to assist with planning lake management operations.

The assessment of submerged vegetation was conducted using two complimentary methods. A digital scientific hydroacoustic unit was used to record overall submerged vegetation coverage and plant height along a grid of transects in the lake. A double-sided thatch rake was used to sample specific plants for species and distribution along a grid of points across the lake. The data from the hydroacoustic unit was also used to measure water depths throughout the lake.

METHODOLOGY

Data Acquisition – General Information

The primary data collection tools used for this mission were a digital scientific echosounder linked to a differential Global Positioning System (GPS) beacon, and a portable

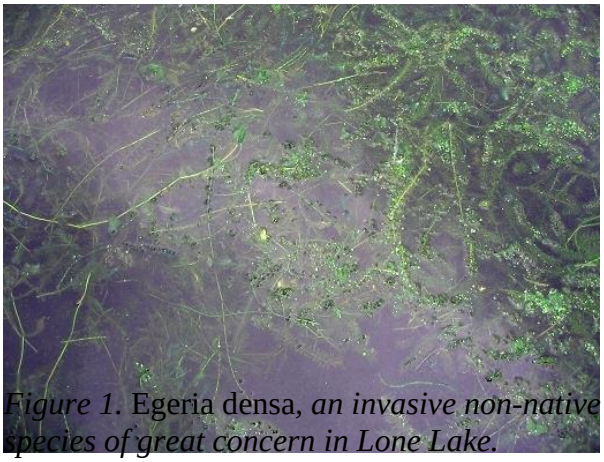


Figure 1. Egeria densa, *an invasive non-native species of great concern in Lone Lake.*

differential GPS unit with a double-sided thatch rake for collecting species point data. The Global Positioning System is a technological tool for accurately locating and recording coordinates on the Earth's surface.

Field work was conducted on September 15-16, 2004 by a ReMetrix employee. Equipment was mounted on a shallow-draft boat. Field sampling plans were prepared prior to data acquisition and approved by the customer. These sampling plans were uploaded to a navigational GPS to increase efficiency and accuracy of the data collection. Weather conditions were overcast with occasional showers both days. The first day was calm (0-5 mph wind) and the second day was mostly calm (5-10 mph wind). Air temperature was approximately 55-60 °F (12.8-15.5 °C). Water temperature was 62 °F (16.7 °C). Weather conditions did not hamper the data collection effort.

No water elevation guage or benchmark was found at the lake, though ReMetrix was informed that the lake was at normal stage during the field work. ReMetrix did insta temporary water guage during the field operations so that an approximate means of w level comparison can be made if future studies are undertaken (Figure 2).

Hydroacoustic Data Acquisition

A BioSonics DT-X 420 kHz digital scientific echosounder was used to collect the data for depth and vegetation presence/absence along the bottom of the lake. The acoustic signal from the echosounder is reflected back to the transducer when the signal encounters a density change in the water column. As an example, the lake bottom is a substantial density change as compared to the water column, and thus the acoustic signal bounces strongly off the lake bottom. Aquatic vegetation also represents a density change within the water column, though the amount of density difference varies due to plant abundance.

Figure 2. Temporary water level guages installed by ReMetrix during field work.

The frequency of the acoustic signal in the BioSonics echosounder is adjusted to maximize the visibility of plants while still providing an accurate bottom reading. Thus, even in dense plant beds, one can still record both the water depth and plant presence.

Figure 3 below shows an example of raw hydroacoustic data from a transect at Lone Lake.

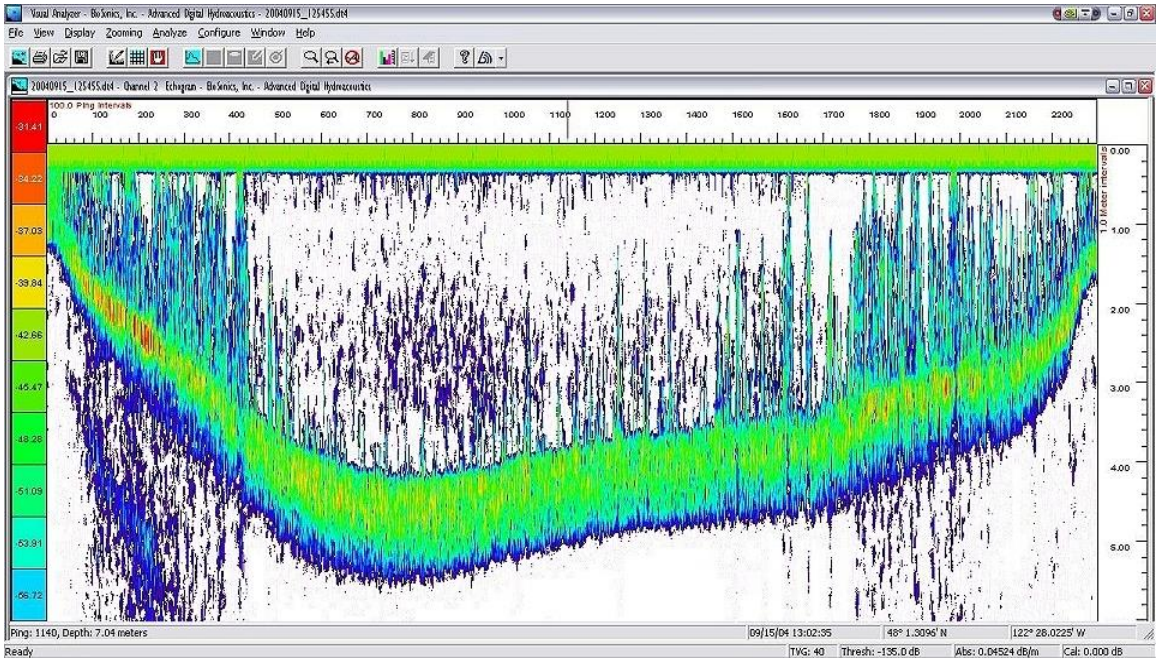


Figure 3. An example of raw hydroacoustic transect data from Lone Lake. The dense green band curving across the middle is the lake bottom in cross-section (depth in meters is shown on the scale at right). The blue-green spires perpendicular to the bottom are submerged aquatic plants in the water column. Dark blue signals within the water column are primarily signal noise, which is filtered out of the data during the c processing stage

.

The acoustic signal response is digitally recorded along with a corresponding coordinate from the DGPS beacon. For this survey, pre-planned transects were spaced at approximately 100-feet apart. A total of 46 transects of hydroacoustic data were collected throughout the water body (see the Hydroacoustic Points map in the Appendix). The echosounder was set to ping a minimum of five times per second, resulting in hundreds to thousands of data points along each transect. The acoustic data points on the map are so closely spaced that they appear to be continuous lines. Hydroacoustic data can not make a definitive distinction between species, which is the reason for also conducting the Vegetation Species Analysis.

Vegetation Species Acquisition

General Approach

Vegetation species survey information was acquired using a differential GPS unit and data collection sheets. The use of GPS facilitates replicate sampling in future studies. Representative survey points were selected throughout the lake. The GPS sample points were collected to characterize the aquatic plant species inventory. A total of 74

vegetation sample points were collected at Lone Lake (see the Species Diversity map in the Appendix for all 74 sample point locations). Fifty sample points were originally planned, though the efficiency of the data collection left enough time to collect additional points.

Vegetation species were sampled using a weighted, double-sided thatch rake (see Figure 4). The rake was lowered to the lake bottom, twisted a half turn, and then rotated steadily as it was brought to the surface. At each sample point the following information was recorded: vegetation species, relative density, relative abundance, and species habit. Table 1 shows the descriptions of each assessment category. The results of the vegetation point survey are discussed in the "Vegetation Species Analyses" section below.

Figure 4. Plant samples from Lone Lake with sampling rake.

Table 1. Descriptions of each plant classification category used in this study.

Density Scale	**Percentage Scale**	**Habit**
D = Dense (>60%)	100% = present in entire sample unit	3 = plant at surface or matting
C = Common (20-60%)	75% = present in 75% of sample unit	2 = plant extends >1/3 of water depth
B = Sparse (3-20%)	50% = present in 50% of sample unit	1 = plant extends <1/3 of water depth
A = Rare (<3%)	25% = present in 25% of sample unit	

DISCUSSION OF ANALYSES

Bathymetric Analyses from Hydroacoustic Data

The digital echosounder data points were processed using software designed for hydroacoustic data analysis. The software algorithm is able to identify the bottom depth for each point collected along a transect. The software analysis was supervised by a person to ensure that the analysis proceeded correctly.

The bathymetric data was plotted using Geographic Information Systems (GIS) software. From the data a bathymetric model was created using geostatistical software. One-foot contour intervals were created for this project. Again, as in all stages described in this report, the software analysis was supervised by a person to ensure that the analysis proceeded correctly. The resulting bathymetric contours were smoothed by the GIS data analyst.

The "Contours" map in the Appendix shows the completed bathymetric map for Lone Lake.

Creation of the bathymetric contours in a true geographic framework is necessary for calculating the water volume for each contour interval within the lake. The Volumetric Calculations table in the Appendix shows the incremental water volumes for Lone Lake.

Depth readings from the echosounder were double-checked against six physical depth readings, which were collected using a Jacob's staff and GPS. The Jacob's staff was a 20-foot-long telescoping pole of 2-inch diameter PVC piping with a "foot" on the bottom end of the pole. The foot was a six-inch piece of 2-inch diameter PVC pipe glued perpendicular to the length of the pole, forming a "T" shape. The Jacob's staff has graduated depth markings every 0.25-feet along its length (Figure 5.).

Figure 5. Jacob's staff (black PVC pole) used for physical depth sampling.

All six physical depth readings registered depths substantially deeper than the corresponding acoustic measurements (between 1.2- to 4.5-feet deeper). There was no consistent pattern to the varying amount of differential between the acoustic measurements and the Jacob's staff measurements.

After significant re-checking of data readouts, data quality, and various other possible sources of miscalculation, it was determined that the extremely soft sediment of the lake bottom is the source of the differential (see Figure 6). The hydroacoustic signal is significantly more sensiti than a Jacob's staff at detecting the density difference that marks the transition between the wa column and the soft-sediment layer. In Lone Lake, gradually increasing soft-sediment:water ratios eventually reach a threshold of sediment concentration that begins to reflect the relatively short-wavelength acoustic signals, yet still do not provide noticeable resistance to the Jacob's staff until much greater sediment:water ratios are reached. Alternatively, the Jacob's staff does not register the soft-sediment layer until it reaches sediment densities great enough to resist the downward force of the Jacob's staff.

Figure 6. Ponar sediment sample from Lone Lake. Sediment sampled by the Ponar was extremely soft and mucky.

Based on the consistency of the acoustic depth data from transect to transect and the inconsistency of the point depth data, ReMetrix decided that the acoustic data are the most reliable measurements from which to calculate water depths and bathymetric contours.

Vegetation BioCover and BioVolume Analyses from Hydroacoustic Data

The hydroacoustic data were also analyzed for overall vegetation biocover and vegetation biovolume. Biocover is a measure of the percentage of the sediment layer covered with

plants in any defined area—basically biocover relates to plant density on the bottom of the lake. Biovolume is a measure of how much of the water column is occupied by plants—basically biovolume indicates where plants may be reaching nuisance levels in the water column. Both are quantitative metrics. Biocover and biovolume are often related, however it is possible to have high biocover with low biovolume, and vice versa. Hydroacoustic data are the most reliable and efficient means to map lake-wide vegetation biocover and biovolume.

Similar to the bathymetric data analysis, the biocover and biovolume data for each transect were analyzed using customized hydroacoustic software. The software uses a patented algorithm to measure the submerged plant biocover and biovolume along the transects. Based on the results of the transect analyses, the areas between the transects are modeled using geostatistical software to produce a representation of submerged plant coverage and density in the lake. The results are a full-lake biocover map and a full-lake biovolume map, along with associated statistics. Both maps can be found in the Appendix.

BioCover

The results of the biocover analysis show that nearly all of the lake bottom is vegetated. Coverage in areas shallower than 11-feet is commonly greater than 50%, while coverage in areas shallower than 7-feet is commonly greater than 70%. The percent of coverage in areas deeper than 11-feet drops off significantly and is generally within the 5-30% range. A few small gaps in biocover exist in the deepest areas of the lake.

BioVolume

The results of the biovolume analysis correspond well to the biocover analysis. Biovolume is definitely concentrated in areas shallower than 11-feet. Between 5-feet of depth and 11-feet of depth, the biovolume commonly ranges between 5-40%, with a few small areas climbing into the 70% range. The greatest concentration of biovolume is found in waters less than 5-feet deep, extending in an arc from the central southwestern shore counterclockwise to parts of the northeastern sho However a few small pockets of very low (<5%) biovolume do exist near shoreline.

Waters deeper than 11-feet have biovolume less than 5%, which makes sense given the greatly reduced plant bottom coverage of these areas. Areas shown as black on the biovolume map should be interpreted as having between 1-5% biovolume since *Egeria densa* plants were found at nearly all sample points in Lone Lake, regardless of depth.

Vegetation Species Analyses from Point Data

Information collected during the vegetation survey is provided in the field data tables (Table 2, below). Data collected during the survey was used to create the vegetation maps found in the Appendix.

A total of seven submersed species were found during the survey. Each species is depicted on a map, and there is also a Species Diversity map which shows the number of species found at each sample point. Waters shallower than 11-feet generally have increased species diversity, though no distinct pattern of species diversity is visible between the 0-11-foot depth range.

Fig. 7. Egeria densa *caught in the Ponar sediment sampling device at Little Lake*

The species of greatest concern in this survey, *Egeria densa*, dominates the submerged plant assemblage and was found at 70 of the 74 sample sites (95%). It is reasonable to assume that this coverage percentage generally applies throughout the entire lake. The abundances of the remaining species can be found in Table 2.

Comparison of the *Egeria densa* densities with the biocover and biovolume maps yields good overall cross-correlation between the data types. Two maps showing this comparison are included toward the back of the Appendix (the maps "*Egeria densa* with BioCover" and "*Egeria densa* v BioVolume").

Table 2. Field vegetation sample point data. There were 74 total sample points; some sample points have multiple line entries—one for each species found at that site.

Site #	UTM Easting	UTM Northing	Genus and species	Common Name	Species Density	Species Percentage	Species Habit
LLV0	540278.7	5318455	***Egeria densa***	Brazilian waterweed	D	100	1
LLV1	540161.0	5318456	*Egeria densa*	Brazilian waterweed	C	75	2
LLV1	540161.0	5318456	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	2
LLV2	540221.2	5318527	*Egeria densa*	Brazilian waterweed	C	50	3
LLV2	540221.2	5318527	*Potamogeton zosteriformis*	Eelgrass pondweed	A	25	3
LLV2	540221.2	5318527	*Potamogeton nodosus*	American pondweed	A	25	3
LLV3	540278.0	5318584	*Egeria densa*	Brazilian waterweed	C	50	2
LLV3	540278.0	5318584	*Potamogeton zosteriformis*	Eelgrass pondweed	A	25	2
LLV3	540278.0	5318584	*Potamogeton nodosus*	American pondweed	A	25	2
LLV4	540341.6	5318640	*Egeria densa*	Brazilian waterweed	C	100	2

LLV5	540095.1	5318523	*Egeria densa*	Brazilian waterweed	C	75	2
LLV5	540095.1	5318523	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	2
LLV6	540157.1	5318578	*Egeria densa*	Brazilian waterweed	D	100	3
LLV7	540216.0	5318639	*Egeria densa*	Brazilian waterweed	B	75	2
LLV7	540216.0	5318639	*Ceratophyllum demersum*	Coontail	A	25	3
LLV8	540277.1	5318699	*Egeria densa*	Brazilian waterweed	D	100	2
LLV9	540337.3	5318762	*Egeria densa*	Brazilian waterweed	D	75	2
LLV9	540337.3	5318762	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	2
LLV10	540398.6	5318821	*Egeria densa*	Brazilian waterweed	D	75	1
LLV10	540398.6	5318821	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	1
LLV11	540460.0	5318880	*Egeria densa*	Brazilian waterweed	C	25	1
LLV11	540460.0	5318880	*Ceratophyllum demersum*	Coontail	B	25	2
LLV11	540460.0	5318880	*Potamogeton nodosus*	American pondweed	A	20	1
LLV11	540460.0	5318880	*Potamogeton praelongus*	White-Stemmed pondweed	B	20	2
LLV11	540460.0	5318880	*Potamogeton zosteriformis*	Eelgrass pondweed	B	10	2
LLV12	540034.6	5318576	*Egeria densa*	Brazilian waterweed	D	75	1
LLV12	540034.6	5318576	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	1
LLV13	540096.5	5318639	*Egeria densa*	Brazilian waterweed	B	75	3
LLV13	540096.5	5318639	*Ceratophyllum demersum*	Coontail	A	25	3
LLV14	540156.5	5318696	Absent				
LLV15	540219.8	5318762	*Egeria densa*	Brazilian waterweed	B		
LLV16	540282.4	5318819	*Absent*				
LLV17	540334.0	5318880	*Egeria densa*	Brazilian waterweed	B	50	3
Site #	**UTM Easting**	**UTM Northing**	**Genus and species**	**Common Name**	**Species Density**	**Species Percentage**	**Species Habit**
LLV17	540334.0	5318880	*Ceratophyllum demersum*	Coontail	A	50	3
LLV18	540400.7	5318938	*Egeria densa*	Brazilian waterweed	C	50	2
LLV18	540400.7	5318938	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	2
LLV18	540400.7	5318938	*Potamogeton zosteriformis*	Eelgrass pondweed	A	25	2
LLV19	540460.4	5319001	*Egeria densa*	Brazilian waterweed	C	50	1
LLV19	540460.4	5319001	*Ceratophyllum demersum*	Coontail	A	25	2
LLV19	540460.4	5319001	*Chara sp.*	Muskgrass	A	15	2
LLV19	540460.4	5319001	*Potamogeton zosteriformis*	Eelgrass pondweed	A	10	2
LLV20	539918.7	5318579	*Egeria densa*	Brazilian waterweed	D	50	1
LLV20	539918.7	5318579	*Potamogeton praelongus*	White-Stemmed pondweed	D	50	1
LLV21	539975.4	5318636	*Egeria densa*	Brazilian waterweed	D	100	1
LLV22	540036.6	5318696	*Egeria densa*	Brazilian waterweed	B	100	3

LLV23	540095.4	5318760	*Egeria densa*	Brazilian waterweed	B	100	3
LLV24	540157.6	5318820	*Egeria densa*	Brazilian waterweed	B	100	3
LLV25	540216.5	5318881	*Egeria densa*	Brazilian waterweed	B	100	3
LLV26	540278.5	5318941	*Egeria densa*	Brazilian waterweed	D	50	2
LLV26	540278.5	5318941	*Ceratophyllum demersum*	Coontail	B	25	2
LLV26	540278.5	5318941	*Chara sp.*	Muskgrass	A	25	2
LLV27	540337.4	5319000	*Egeria densa*	Brazilian waterweed	D	50	2
LLV27	540337.4	5319000	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	2
LLV27	540337.4	5319000	*Potamogeton zosteriformis*	Eelgrass pondweed	B	25	2
LLV28	540398.8	5319064	*Egeria densa*	Brazilian waterweed	D	100	1
LLV29	539855.2	5318638	*Egeria densa*	Brazilian waterweed	D	75	1
LLV29	539855.2	5318638	*Chara sp.*	Muskgrass	B	25	1
LLV30	539914.6	5318699	*Egeria densa*	Brazilian waterweed	B	50	1
LLV30	539914.6	5318699	*Ceratophyllum demersum*	Coontail	B	25	2
LLV30	539914.6	5318699	*Chara sp.*	Muskgrass	A	15	2
LLV30	539914.6	5318699	*Potamogeton praelongus*	White-Stemmed pondweed	A	10	1
LLV31	539977.4	5318760	*Egeria densa*	Brazilian waterweed	B	50	2
LLV31	539977.4	5318760	*Ceratophyllum demersum*	Coontail	A	25	1
LLV31	539977.4	5318760	*Potamogeton crispus*	Curlyleaf pondweed	A	25	2
LLV32	540031.4	5318822	*Egeria densa*	Brazilian waterweed	B	100	3
LLV33	540093.8	5318881	*Egeria densa*	Brazilian waterweed	B	50	3
LLV33	540093.8	5318881	*Ceratophyllum demersum*	Coontail	A	25	3
LLV33	540093.8	5318881	*Chara sp.*	Muskgrass	A		
LLV34	540158.6	5318945	*Egeria densa*	Brazilian waterweed	A		
Site #	**UTM Easting**	**UTM Northing**	**Genus and species**	**Common Name**	**Species Density**	**Species Percentage**	**Species Habit**
LLV34	540158.6	5318945	*Ceratophyllum demersum*	Coontail	A	50	3
LLV35	540219.9	5319009	*Egeria densa*	Brazilian waterweed	D	100	1
LLV36	540280.8	5319060	*Egeria densa*	Brazilian waterweed	D	75	1
LLV36	540280.8	5319060	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	1
LLV37	540337.4	5319124	*Egeria densa*	Brazilian waterweed	A	25	1
LLV37	540337.4	5319124	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	2
LLV37	540337.4	5319124	*Potamogeton zosteriformis*	Eelgrass pondweed	A	25	2
LLV37	540337.4	5319124	*Ceratophyllum demersum*	Coontail	A	25	1
LLV38	539860.7	5318763	*Egeria densa*	Brazilian waterweed	D	100	1
LLV39	539913.2	5318819	*Egeria densa*	Brazilian waterweed	C	75	2
LLV39	539913.2	5318819	*Chara sp.*	Muskgrass	A	25	2
LLV40	539973.1	5318878	Absent				

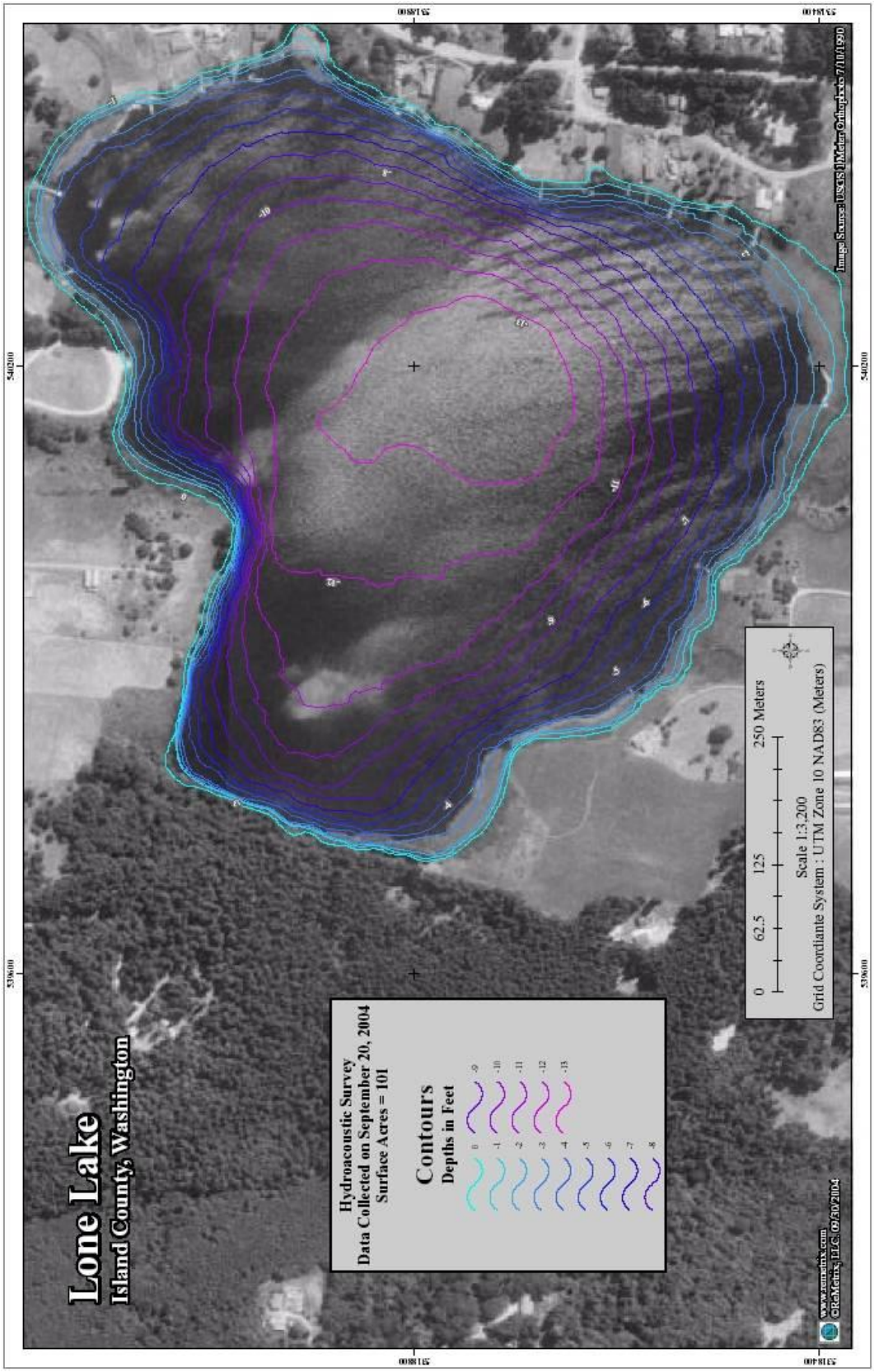
LLV41	540033.7	5318940	*Egeria densa*	Brazilian waterweed	B	100	3
LLV42	540096.8	5318996	*Egeria densa*	Brazilian waterweed	B	50	2
LLV42	540096.8	5318996	*Potamogeton praelongus*	White-Stemmed pondweed	B	50	2
LLV43	540155.3	5319060	*Egeria densa*	Brazilian waterweed	D	75	2
LLV43	540155.3	5319060	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	2
LLV44	539762.8	5318765	*Egeria densa*	Brazilian waterweed	D	50	1
LLV44	539762.8	5318765	*Potamogeton praelongus*	White-Stemmed pondweed	D	50	1
LLV45	539793.8	5318821	*Egeria densa*	Brazilian waterweed	D	50	2
LLV45	539793.8	5318821	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	2
LLV45	539793.8	5318821	*Ceratophyllum demersum*	Coontail	B	25	2
LLV46	539848.1	5318880	*Egeria densa*	Brazilian waterweed	D	100	3
LLV47	539914.9	5318941	*Egeria densa*	Brazilian waterweed	C	75	2
LLV47	539914.9	5318941	*Chara sp.*	Muskgrass	A	25	2
LLV48	539793.5	5318937	*Egeria densa*	Brazilian waterweed	D	75	2
LLV48	539793.5	5318937	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	2
LLV49	539859.8	5318997	*Egeria densa*	Brazilian waterweed	C	50	2
LLV49	539859.8	5318997	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	2
LLV49	539859.8	5318997	*Chara sp.*	Muskgrass	A	25	2
LLV50	539746.6	5318869	*Egeria densa*	Brazilian waterweed	D	100	2
LLV51	540403.4	5319125	*Egeria densa*	Brazilian waterweed	D	50	1
LLV51	540403.4	5319125	*Potamogeton praelongus*	White-Stemmed pondweed	B	20	1
LLV51	540403.4	5319125	*Potamogeton zosteriformis*	Eelgrass pondweed	B		
LLV51	540403.4	5319125	*Chara sp.*	Muskgrass	A		
Site #	**UTM Easting**	**UTM Northing**	**Genus and species**	**Common Name**	**Species Density**	**Species Percentage**	**Species Habit**
LLV52	540317.7	5318519	***Egeria densa***	Brazilian waterweed	D	75	1
LLV52	540317.7	5318519	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	1
LLV53	540217.5	5318425	*Egeria densa*	Brazilian waterweed	D	100	1
LLV54	540099.4	5318464	*Egeria densa*	Brazilian waterweed	D	100	1
LLV55	539994.1	5318535	*Egeria densa*	Brazilian waterweed	D	75	1
LLV55	539994.1	5318535	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	1
LLV56	539958.9	5318986	*Potamogeton praelongus*	White-Stemmed pondweed	B	50	2
LLV56	539958.9	5318986	*Potamogeton zosteriformis*	Eelgrass pondweed	B	50	2
LLV57	540407.4	5318754	*Egeria densa*	Brazilian waterweed	D	100	1
LLV58	540228.0	5319066	*Egeria densa*	Brazilian waterweed	D	100	1
LLV59	540287.6	5319107	*Egeria densa*	Brazilian waterweed	D	100	1
LLV60	540366.9	5319091	*Egeria densa*	Brazilian waterweed	D	100	1

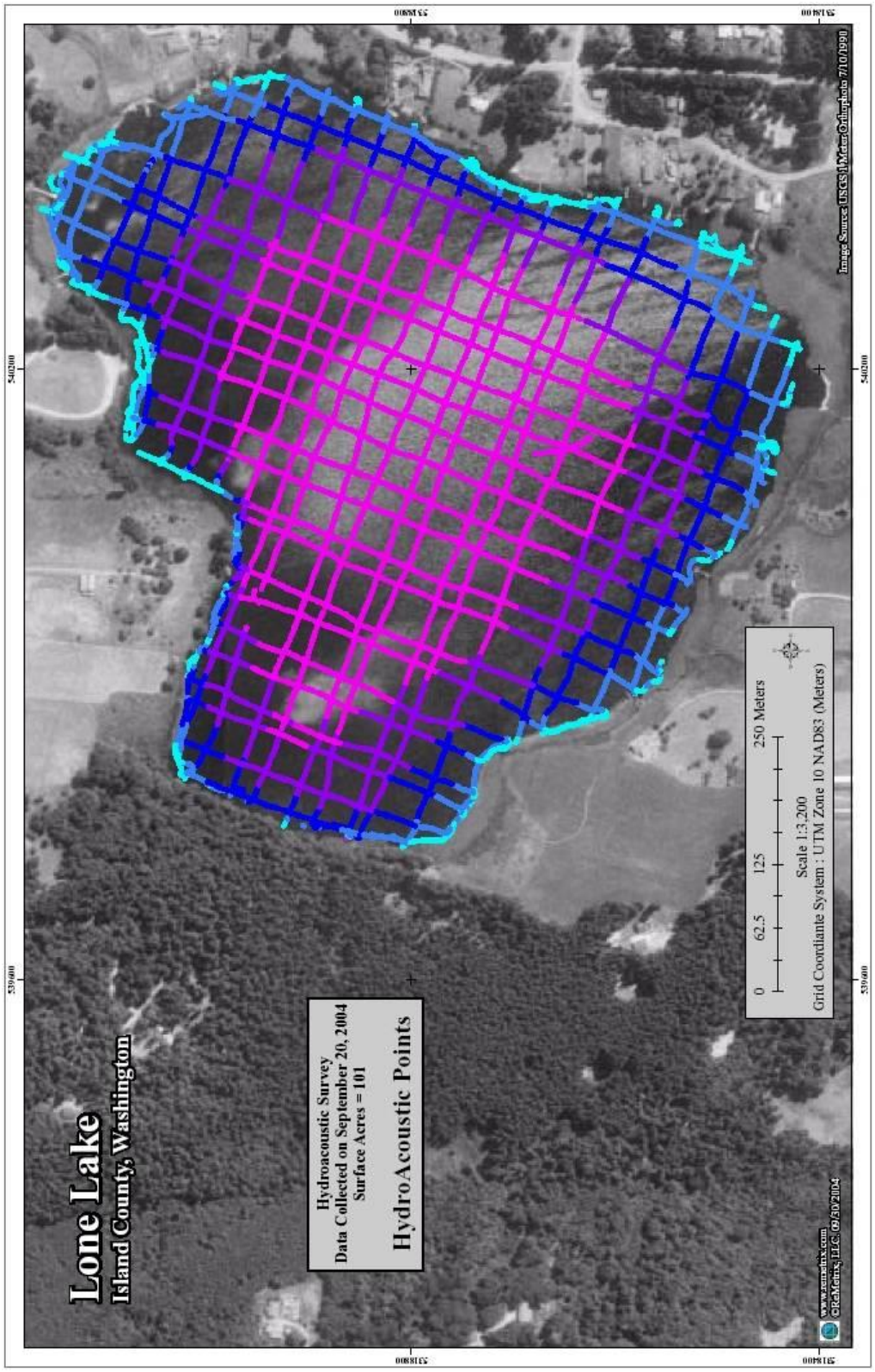
LLV61	540428.7	5319033	*Egeria densa*	Brazilian waterweed	C	75	2
LLV61	540428.7	5319033	*Potamogeton praelongus*	White-Stemmed pondweed	A	25	2
LLV62	540465.1	5318938	*Egeria densa*	Brazilian waterweed	D	100	1
LLV63	540354.5	5318706	*Egeria densa*	Brazilian waterweed	C	100	2
LLV64	540337.8	5318582	*Egeria densa*	Brazilian waterweed	C	100	2
LLV65	540252.0	5318488	*Egeria densa*	Brazilian waterweed	D	75	2
LLV65	540252.0	5318488	*Potamogeton zosteriformis*	Eelgrass pondweed	B	25	2
LLV66	540180.8	5318417	*Egeria densa*	Brazilian waterweed	C	75	2
LLV66	540180.8	5318417	*Ceratophyllum demersum*	Coontail	B	25	2
LLV67	540043.3	5318501	*Egeria densa*	Brazilian waterweed	C	100	2
LLV68	539953.2	5318555	*Egeria densa*	Brazilian waterweed	C	100	2
LLV69	539858.7	5318708	*Egeria densa*	Brazilian waterweed	B	100	2
LLV70	539758.3	5318825	*Egeria densa*	Brazilian waterweed	C	50	1
LLV70	539758.3	5318825	*Potamogeton praelongus*	White-Stemmed pondweed	B	50	1
LLV71	539771.4	5318913	*Egeria densa*	Brazilian waterweed	C	100	2
LLV72	539812.8	5318996	*Egeria densa*	Brazilian waterweed	B	100	2
LLV73	540130.6	5319035	*Egeria densa*	Brazilian waterweed	C	75	1
LLV73	540130.6	5319035	*Potamogeton praelongus*	White-Stemmed pondweed	B	25	1

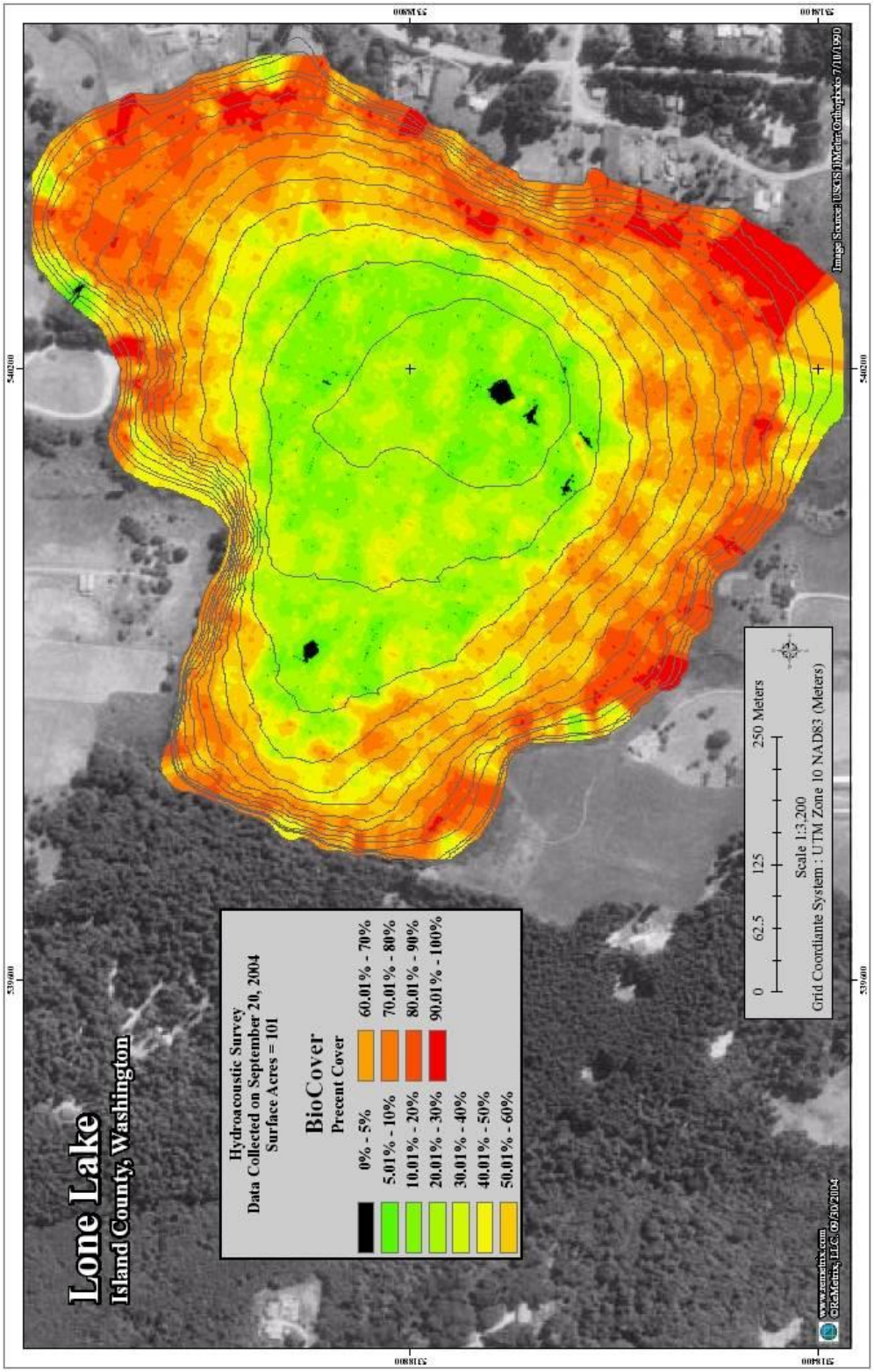
Figures 8 and 9. Lone Lake scenes showing patchy, topped-out Egeria densa *and emergent vegetation.*

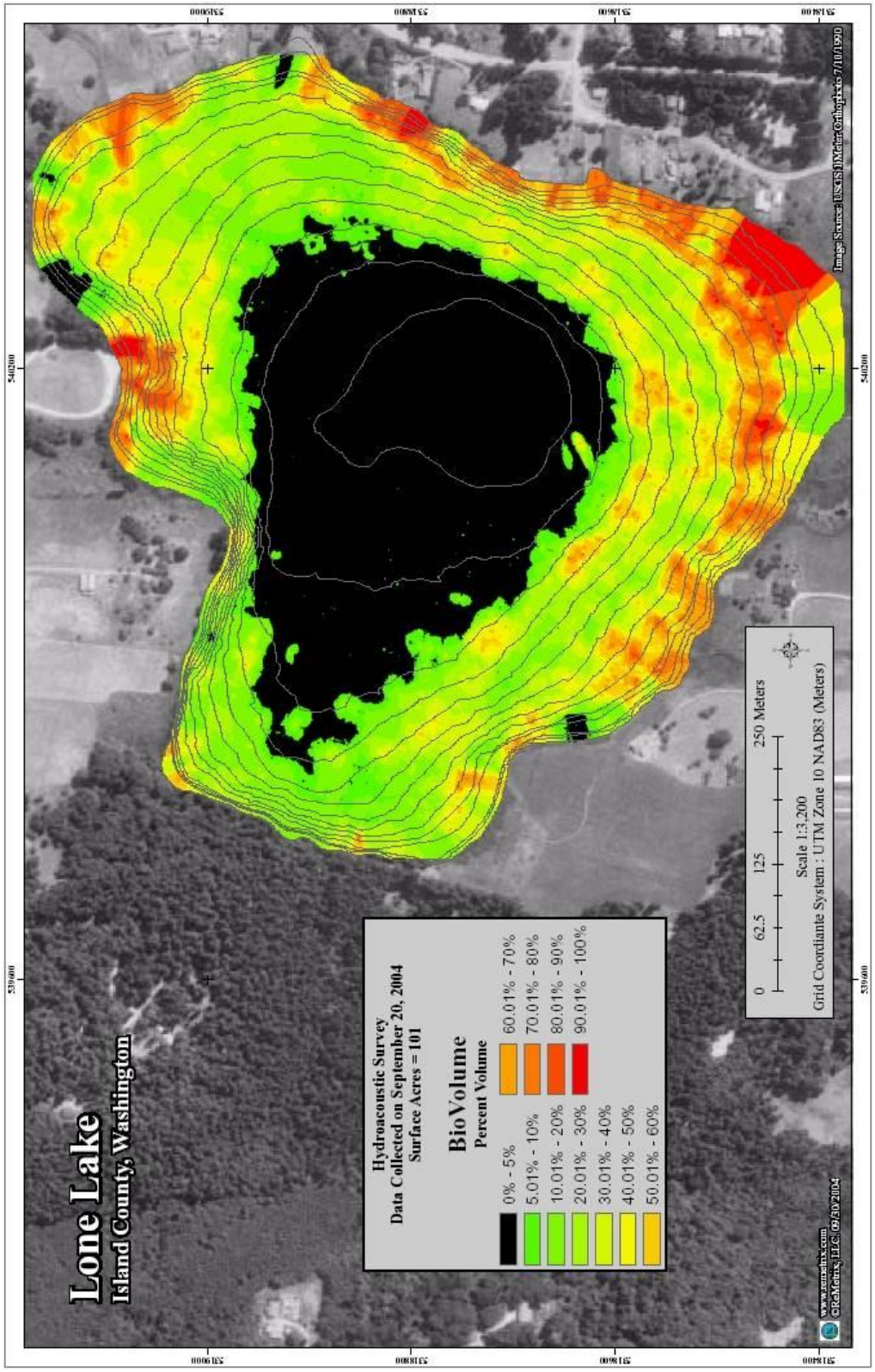
The data and calculations delivered for this project are presented to the best of ReMetrix's knowledge. Interpolated and/or statistically modeled data are inherently estimates, by definition, so no warranty or guarantee is made concerning such information presented herein. ReMetrix makes every reasonable effort to provide the most accurate data within the scope of the project and the limitations of the technology and associated equipment used to conduct the project. In effect, these data create a snapshot of project-area characteristics and conditions, but should at no time be interpreted as unequivocally accurate in every instance (particularly in regard to interpolated data).

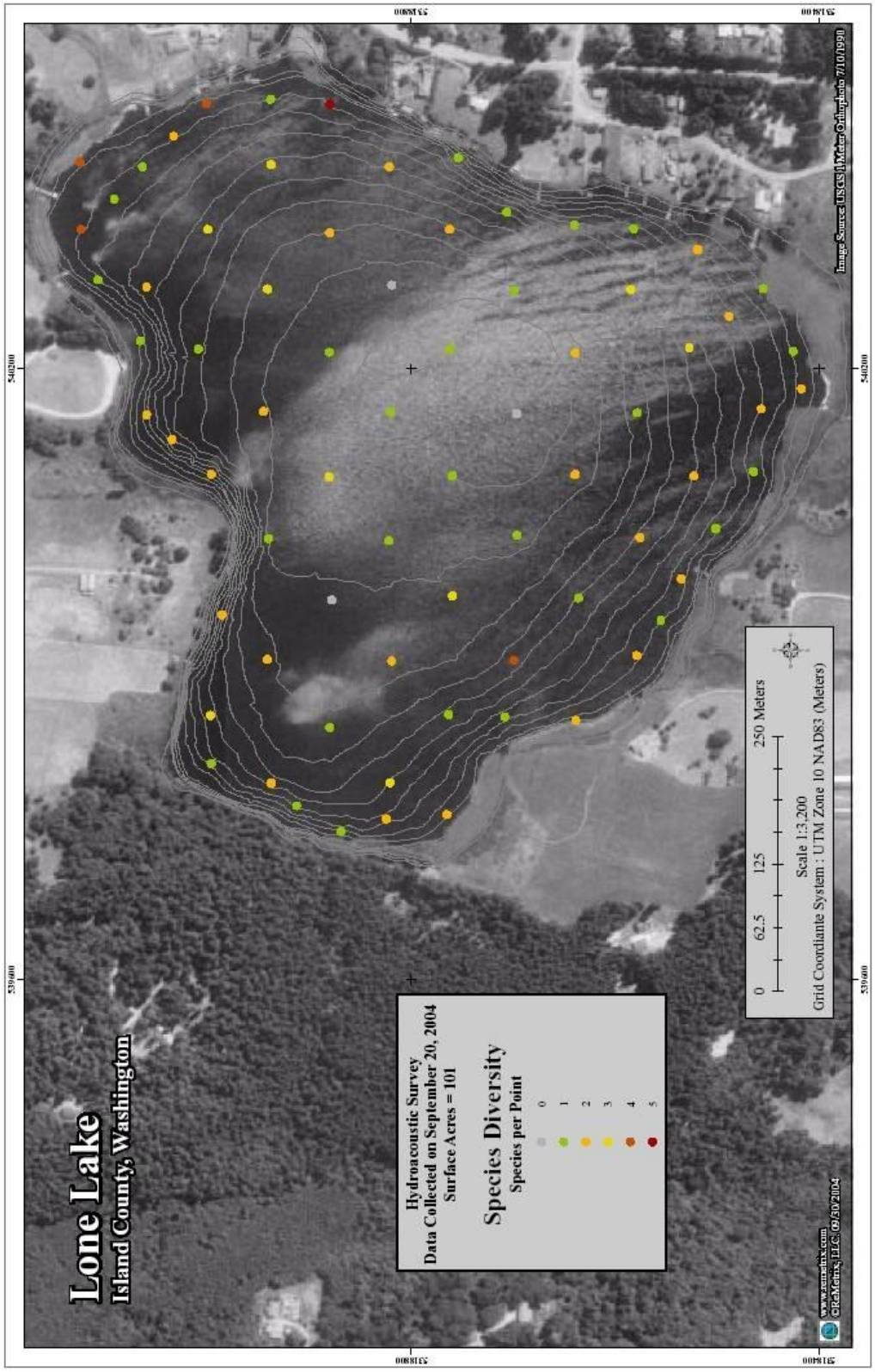
Appendix

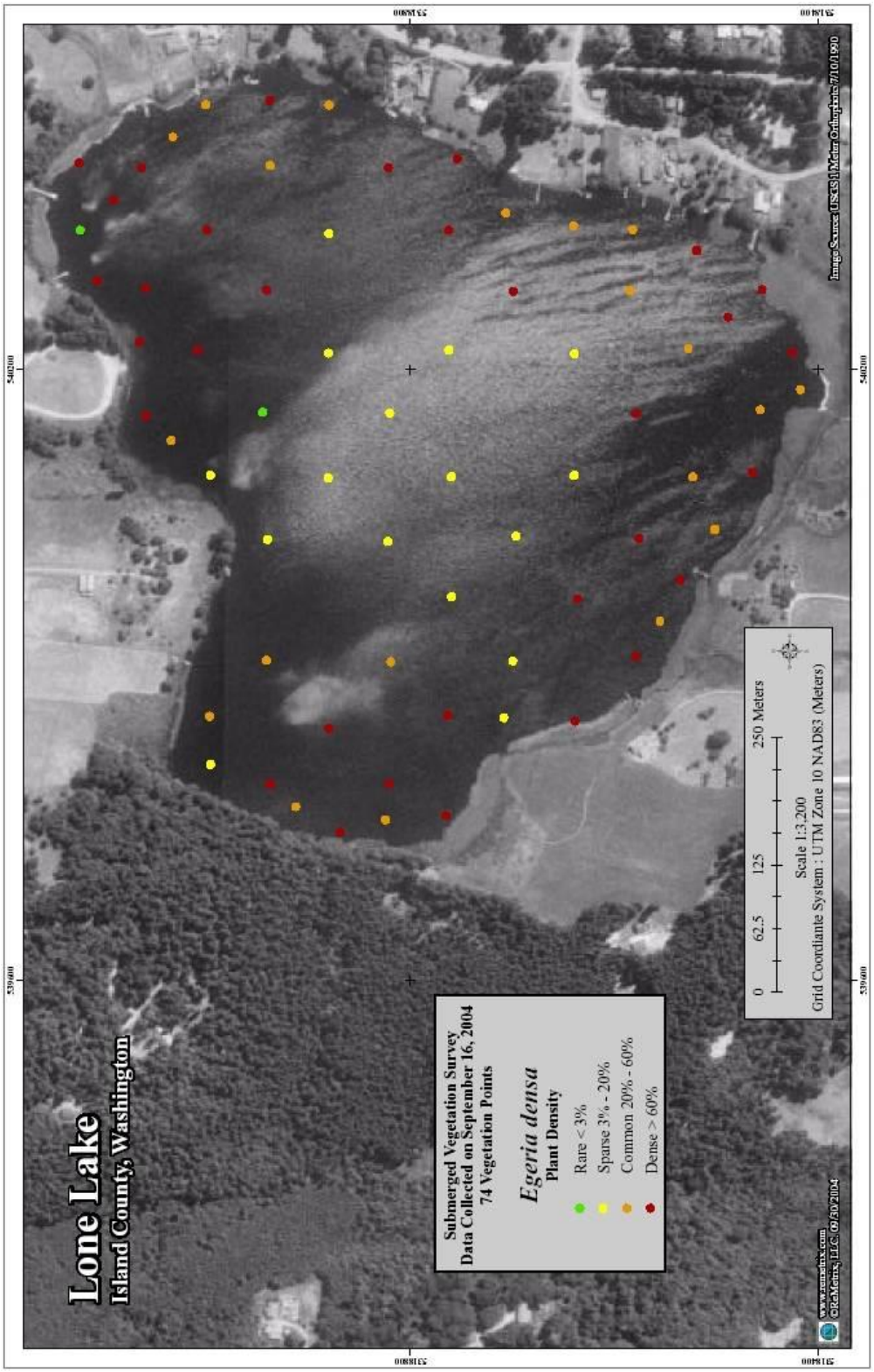

Lone Lake
Island County, Washington
Hydroacoustic Survey
Data Collected on September 20, 2004
Surface Acres = 101
Contours
Depths in Feet
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12
-13
0
62.5
125
250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS 0.Meter Orthophoto 7/10/1990
www.zonemetrix.com
©ReMetrix, LLC. 09/30/2004
539600
540200
5318400
5318800

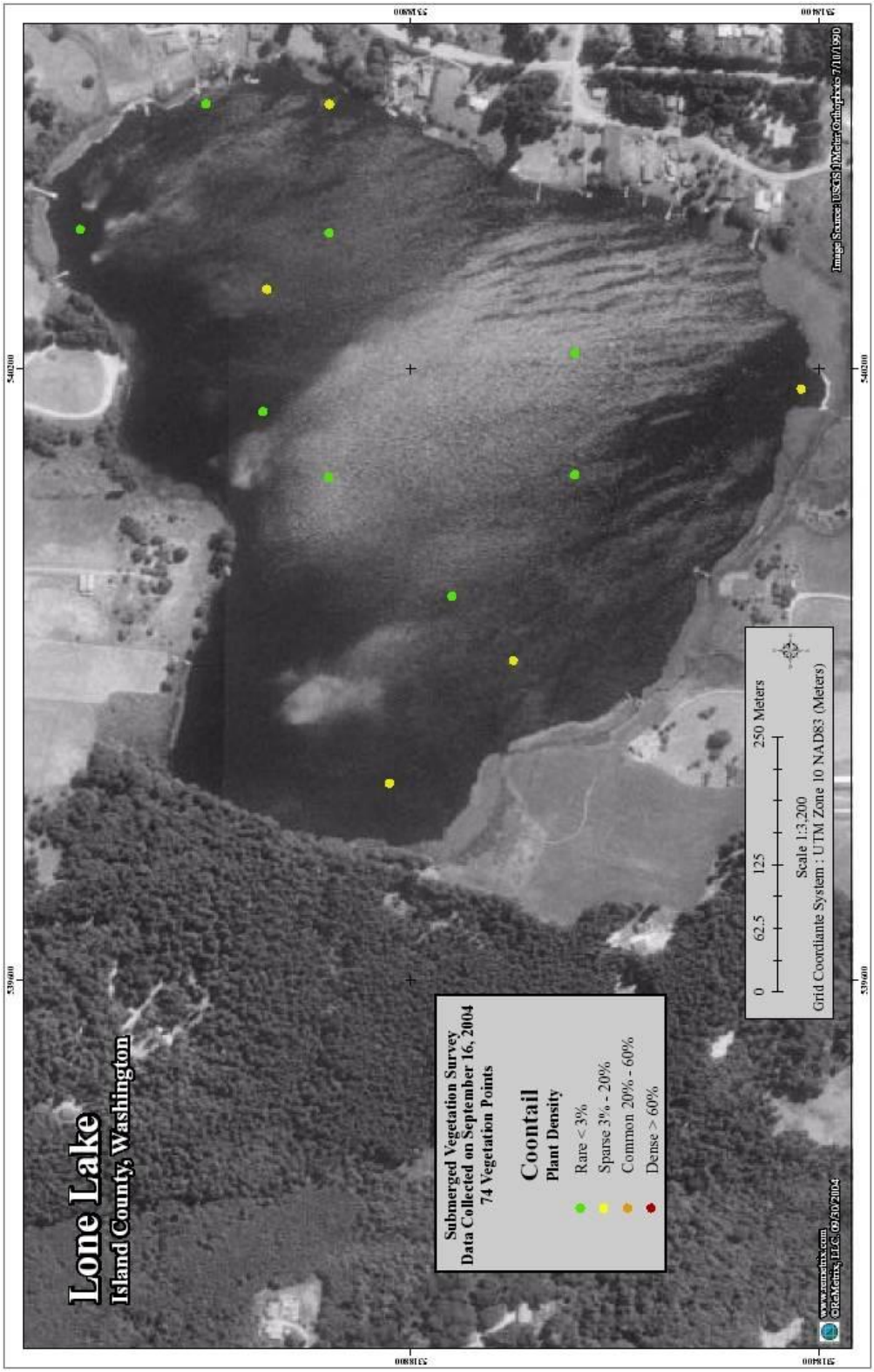

Lone Lake
Island County, Washington
Hydroacoustic Survey
Data Collected on September 20, 2004
Surface Acres = 101
HydroAcoustic Points
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS 1 Meter Orthophoto 7/10/1990
www.zenithx.com
©KeMerrill LLC, 09/20/2004
539600
540200
5318800
5318400

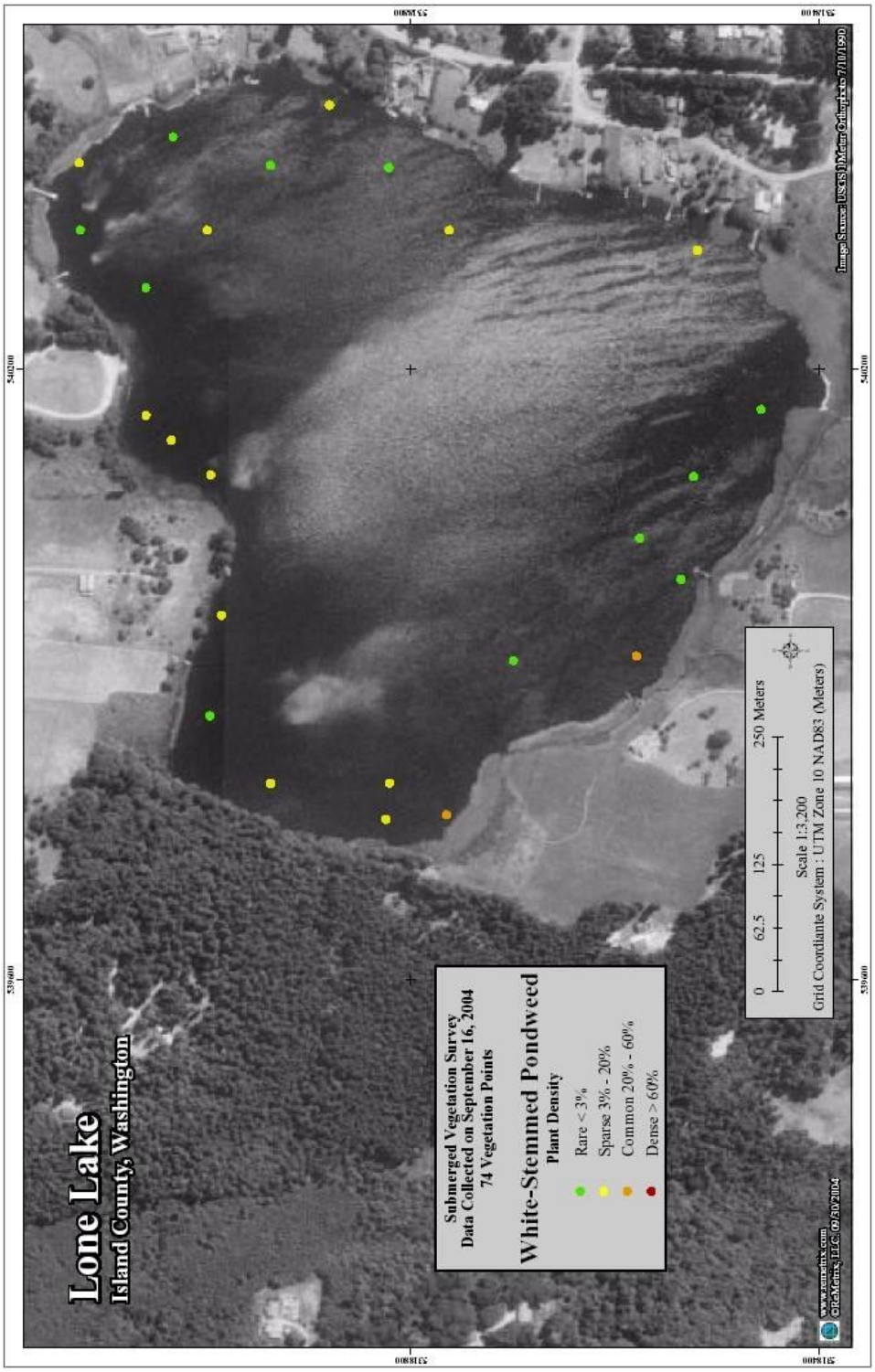

Lone Lake
Island County, Washington
Hydroacoustic Survey
Data Collected on September 20, 2004
Surface Acres = 101
BioCover
Precent Cover
0% - 5%
5.01% - 10%
10.01% - 20%
20.01% - 30%
30.01% - 40%
40.01% - 50%
50.01% - 60%
60.01% - 70%
70.01% - 80%
80.01% - 90%
90.01% - 100%
0
62.5
125
250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
539600
540200
5318800
5318400
Image Source: USGS DMetro Orthophotos 7/10/1990
www.remetrix.com
©ReMetrix, LLC. 09/30/2004

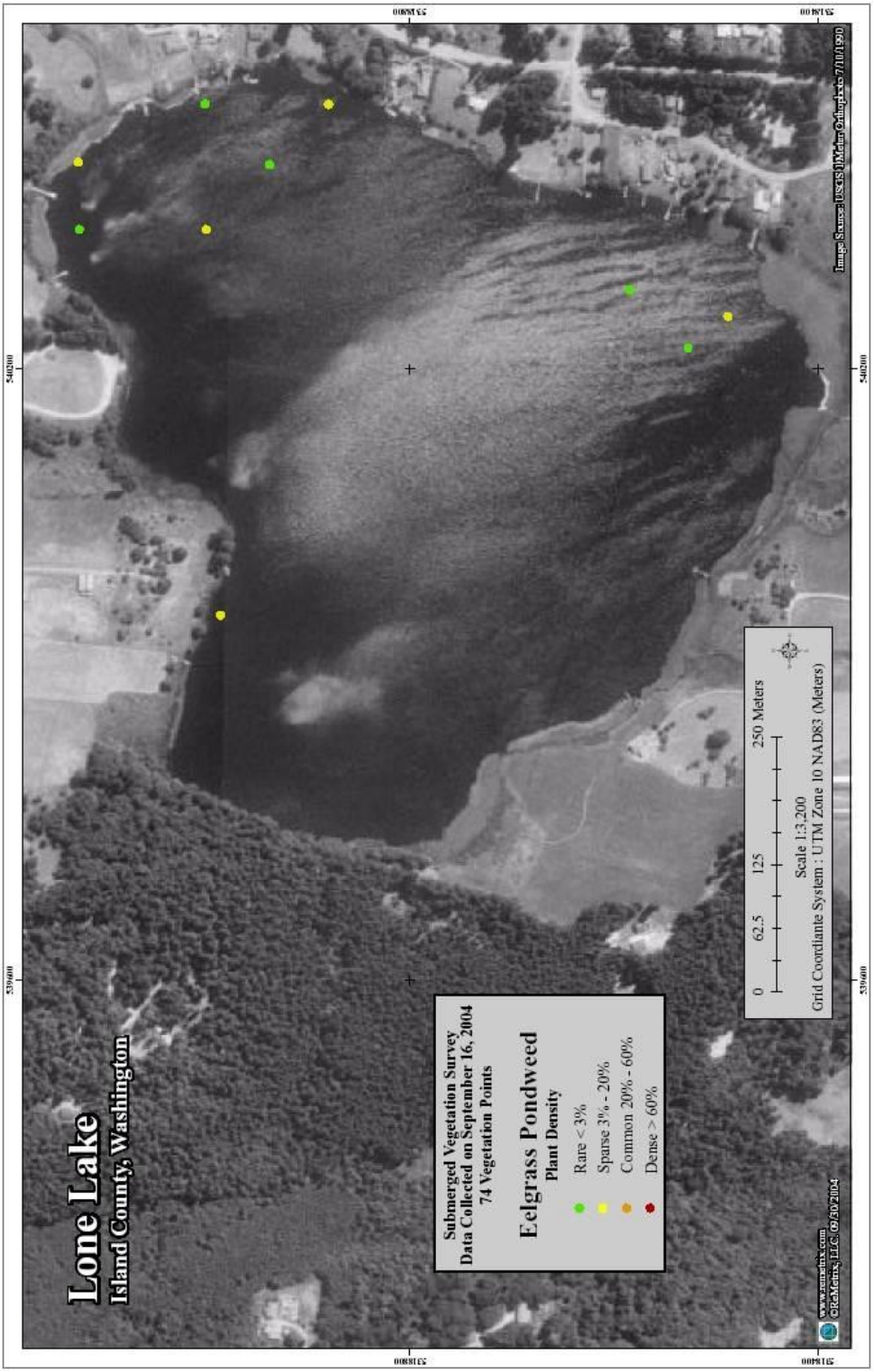

Lone Lake
Island County, Washington
Hydroacoustic Survey
Data Collected on September 20, 2004
Surface Acres = 101
BioVolume
Percent Volume
0% - 5%
5.01% - 10%
10.01% - 20%
20.01% - 30%
30.01% - 40%
40.01% - 50%
50.01% - 60%
60.01% - 70%
70.01% - 80%
80.01% - 90%
90.01% - 100%
0
62.5
125
250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS 1Meter Orthophoto 7/10/1990
www.zenithx.com
©KeMerrill LLC, 09/30/2004
539000
540200
5318400
5318600
5318800
5319000


Lone Lake
Island County, Washington
Hydroacoustic Survey
Data Collected on September 20, 2004
Surface Acres = 101
Species Diversity
Species per Point
0
1
2
3
4
5
0
62.5
125
250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
539600
540200
5318800
5318400
Image Source: USGS 1 Meter Orthophoto 7/10/1990
www.zenithx.com
©KeMerra, LLC, 09/30/2004


Lone Lake
Island County, Washington
Submerged Vegetation Survey
Data Collected on September 16, 2004
74 Vegetation Points
Egeria densa
Plant Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS 1/Meter Orthophoto 7/10/1990
www.sumatrix.com
GReMetrix, LLC 09/30/2004
539600
540200
541800
541400

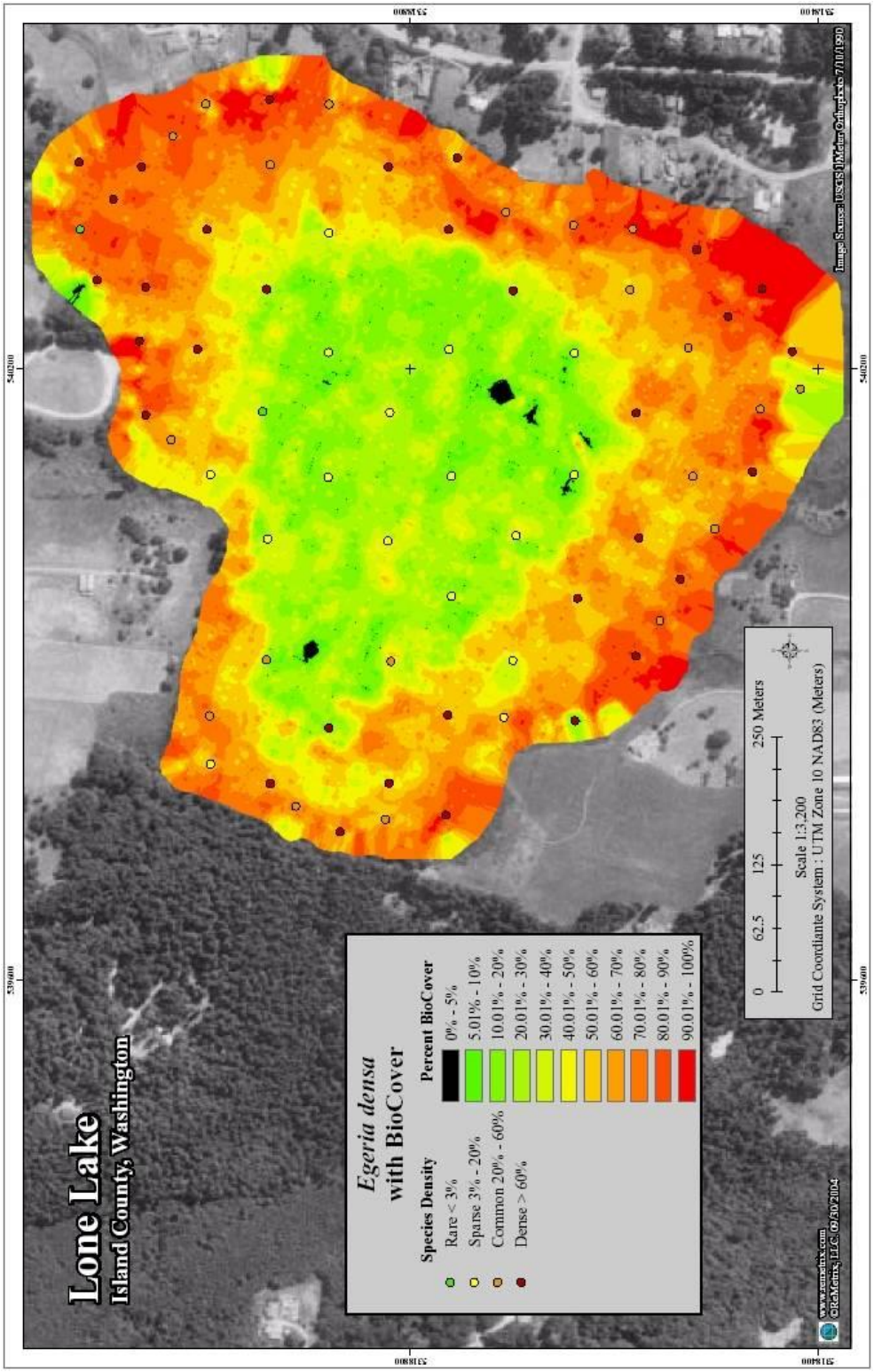

Lone Lake
Island County, Washington
Submerged Vegetation Survey
Data Collected on September 16, 2004
74 Vegetation Points
Coontail
Plant Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS 1Meter Orthophoto 7/10/1990
www.emapix.com
©EaMetrix, LLC, 09/30/2004
539600
540200
5318800

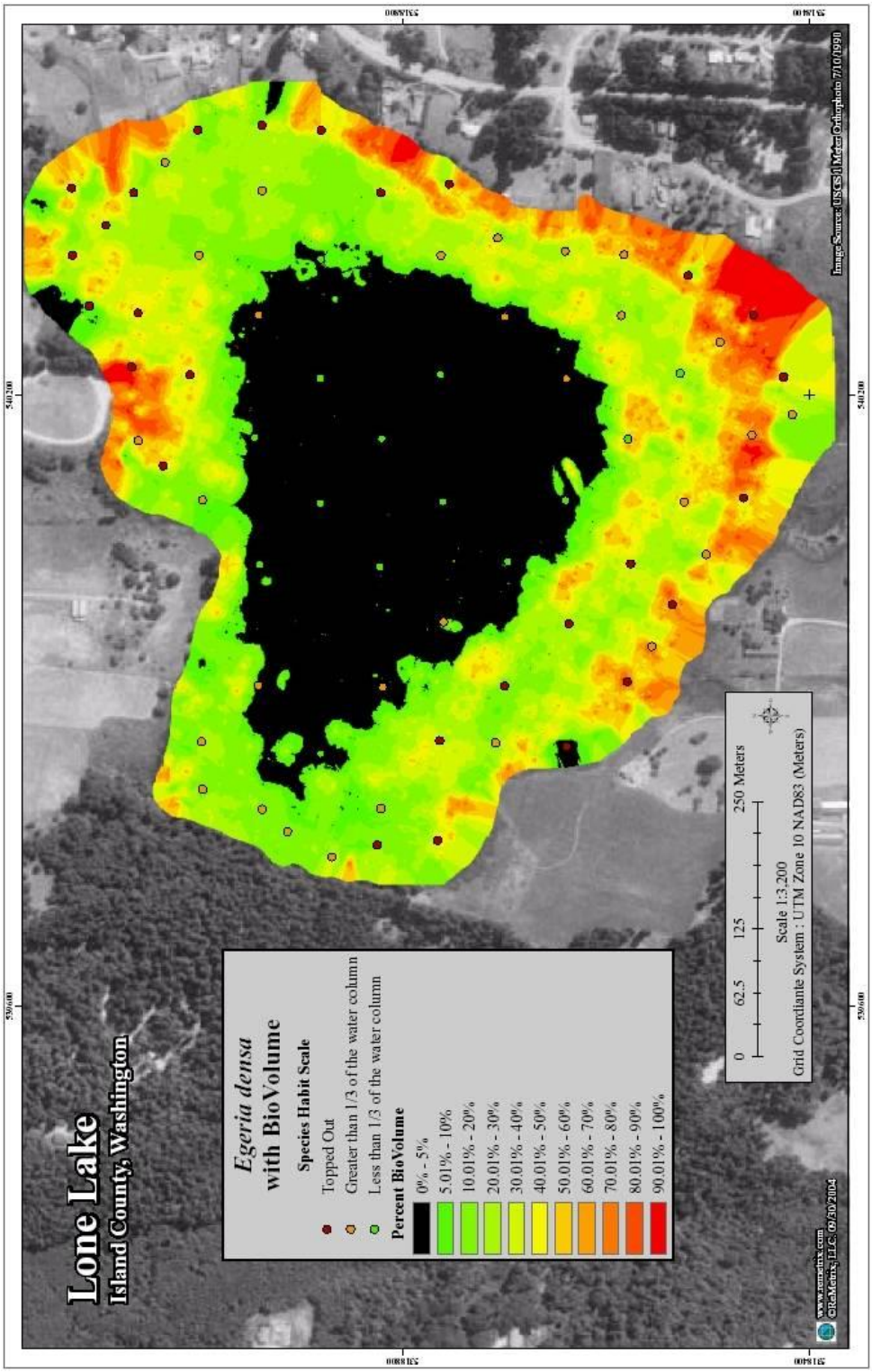

Lone Lake
Island County, Washington
Submerged Vegetation Survey
Data Collected on September 16, 2004
74 Vegetation Points
White-Stemmed Pondweed
Plant Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordinate System : UTM Zone 10 NAD83 (Meters)
539600
540200
5318800
5318400
Image Source: USGS DOMestic Orthophoto 7/10/1990
www.remetrix.com
©ReMetrix, LLC, 09/20/2004


Lone Lake
Island County, Washington
Submerged Vegetation Survey
Data Collected on September 16, 2004
74 Vegetation Points
Eelgrass Pondweed
Plant Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
539600
540200
5318800
5318400
www.sumatrix.com
©ReMetrix, LLC, 09/30/2004
Image Source: USGS 0.5Meter Orthophoto 7/10/1990


Lone Lake
Island County, Washington
Submerged Vegetation Survey
Data Collected on September 16, 2004
74 Vegetation Points
American Pondweed
Plant Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS Mater Orthophoto 7/10/1990
www.zematrix.com
GeoMatrix, LLC, 09/30/2004
539600
540200
5318400
5318800


Lone Lake
Island County, Washington
Submerged Vegetation Survey
Data Collected on September 16, 2004
74 Vegetation Points
Curlyleaf Pondweed
Plant Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
www.sumatrix.com
©ReMetrix, LLC, 09/30/2004
Image Source USGS 1/Meter Orthophoto 7/10/1990
539600
540200
5318800
5318400


Lone Lake
Island County, Washington
Egeria densa
with BioCover
Species Density
Rare < 3%
Sparse 3% - 20%
Common 20% - 60%
Dense > 60%
Percent BioCover
0% - 5%
5.01% - 10%
10.01% - 20%
20.01% - 30%
30.01% - 40%
40.01% - 50%
50.01% - 60%
60.01% - 70%
70.01% - 80%
80.01% - 90%
90.01% - 100%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
539600
540200
5318800
5318400
www.remetrix.com
©ReMetrix, LLC, 09/30/2004
Image Source: USGS Orthophoto 7/10/1990


Lone Lake
Island County, Washington
Egeria densa
with BioVolume
Species Habit Scale
Topped Out
Greater than 1/3 of the water column
Less than 1/3 of the water column
Percent BioVolume
0% - 5%
5.01% - 10%
10.01% - 20%
20.01% - 30%
30.01% - 40%
40.01% - 50%
50.01% - 60%
60.01% - 70%
70.01% - 80%
80.01% - 90%
90.01% - 100%
0 62.5 125 250 Meters
Scale 1:3,200
Grid Coordiante System : UTM Zone 10 NAD83 (Meters)
Image Source: USGS 1/1 Meter Orthophoto 7/10/1990
www.zumetrix.com
©ZuMetrix, LLC 09/30/2004
540200
530400
5318800
5318400

Fluridone Appendix

TOXICITY OF FLURIDONE

The following data comes from the Final Supplemental EIS (FSEIS) for Freshwater Aquatic Plant Management, February 2001. The risk assessment that the FSEIS was based on is from the 1992 Aquatic Plant Management Environmental Impact Statement. The fluridone risk assessment was not updated during the 2000, 2001 FSEIS updates.

Human Health

Fluridone is not teratogenic, not mutagenic, and is not listed or considered to be carcinogenic. There have been no reports of significant exposure to fluridone. No adverse effects are anticipated due to exposure to fluridone under the expected conditions of use. Drinking water must not exceed 0.15 parts per million to meet EPA's drinking water tolerance (Wisconsin DNR 1990), and the label recommends waiting from 7 to 30 days before using fluridone treated water for irrigation. The EPA label does not restrict use of fluridone-treated water for swimming or domestic purposes, but does contain a restriction against use of fluridone within ¼ mile of any potable water intake (Fluridone Human Health Risk Assessment, August 17, 2004). However, when treating at rates of 20 ppb or less, this restriction does not apply.

Available toxicology data were reviewed then an acceptable dose was calculated for each formulation assessed for risk to human health due to the use of fluridone. Next, a maximum acceptable concentration (MAC) in the water was determined based on expected human ingestion rates of water or aquatic organisms. The MAC was then compared to the estimated environmental concentration (EEC) (the concentration in a water body calculated from herbicide application rates and persistence data). If the EEC is less than the MAC, no increased risk to human health is expected (Fluridone Human Health Risk Assessment, August 17, 2004).

Significant routes by which the general public can be exposed to aquatic herbicides are:

1. Using the water body as a drinking water source (ingestion),
2. Swimming (incidental ingestion and dermal exposure),
3. Eating aquatic organisms (ingestion).

The acceptable dose (dose at which no adverse effects are expected to occur) for fluridone was calculated based on available toxicology data and on EPA regulations. This concentration, which was determined for each route of exposure, would be expected to cause no adverse effects to human health. The calculation of an acceptable dose assumes that the herbicide is not carcinogenic, and fluridone has been determined by EPA not to cause cancer.

For water ingestion, two intake rate scenarios were used; a worst-case analysis assuming the treated water was used as the drinking water supply, and

a more likely exposure scenario assuming incidental water ingestion while swimming. The incidental ingestion scenario is still conservative because it was assumed that people were exposed daily for a prolonged period of time (chronic exposure) to initial herbicide concentrations. Potential exposures would actually be much more limited when applications of herbicides only occurred once per year, and degradation half-lives reported in field studies range from 5-60 days for fluridone.

Estimated initial water concentrations did not exceed either the water supply MAC or the incidental ingestion MAC for adults or children. Also, estimated initial concentrations did not exceed calculated MACs for fluridone for the dermal exposure route and the ingesting of aquatic organisms. For dermal exposure, the model used to calculate a MAC was based on the assumption that contaminants are carried through the skin as a solute in water. Thus, the flux rate of water across the skin boundary was assumed to be the factor controlling contaminant absorption rate. For ingestion of aquatic organisms, the contaminant intake rate was calculated from a daily fish ingestion rate (6.5 grams/day) multiplied by a bioconcentration factor for accumulation of the contaminant in fish tissue.

In addition to potential risks from systemic absorption of the herbicides, there is a potential for effects from direct contact of herbicides with skin and eyes. Fluridone is not irritating to the skin, and only minor effects were noted after application of undiluted fluridone to the eyes of rabbits. Thus, no adverse effects are expected from, contact with dilute solutions.

It has been concluded that the use of fluridone according to label instructions does not pose any effect to human health. These are large margins of safety, and the amount of water a person would need to drink or the time a person would need to swim to reach the NOEL is very unrealistic (Fluridone Human Health Risk Assessment, August 17, 2004).

Algae

Parka et al. (1978) observed that fluridone did not appear to adversely affect desirable phytoplankton. Some reductions of less desirable phytoplankton such as *Anabaena* and *Anacystis* occurred after treatment at 0.3 and 0.3 ppm. In a study conducted in Greek ponds, a drastic reduction in phytoplankton species was observed shortly after fluridone application, and the population of *Cyanophyceae* (Cyanobacteria) disappeared after about two months (Kamarianos et al. 1989). The more desirable species such as diatoms increased significantly, especially epiphytic and benthic species.

In a study conducted in the laboratory, researchers concluded that fluridone may be toxic to alga growth and N2-fixation at concentrations between 0.5-19 µg/l (Trevors and Vedelago, 1985). Recovery from fluridone treatment was not apparent when *Scenedesmus quadricauda* was incubated for an extended period of time. It should be noted that actively growing cultures of *S.*

quadricauda were relatively insensitive to fluridone compared to cultures exposed at the beginning to the bioassay.

Impacts from release of nutrients during plant decomposition following fluridone treatment may include increased nutrient levels. Increased nutrient concentrations may result in increased alga blooms or in increased growth of other aquatic plants.

Aquatic Plants

Fluridone is an herbicide that is taken up by both shoot and root tissue of submersed vascular aquatic plants and moved to other parts of the plant within the vascular system (McCowen et al., 1979, Marquis et al., 1981). Translocation rate and direction (i.e. root to shoot or shoot to root) appear to be somewhat species dependent. Noticeable "dying off" or decrease in biomass of vegetation treated with fluridone begins approximately 8-16 days after treatment (Hall et al., 1984). Fluridone interferes with the synthesis of RNA, proteins, and carotenoid pigments in aquatic plants causing death by a form of sunburn (carotenoid pigments protect chlorophyll from ultraviolet light) (Bartels and Watson, 1978, Berard et al., 1978). Anderson (1981) concluded that treated American pondweed or sago pondweed need exposure to sufficient light for fluridone to work effectively, and that turbid water may reduce fluridone effectiveness on these species. Fluridone affects a variety of aquatic plants. A list of species susceptible to fluridone at an application rate of 0.1 ppm follows (Parka et al., 1978, Arnold, 1979):

Hydrilla	*Hydrilla verticillata*
American elodea	*Elodea canadensis*
Fanwort	*Cabomba caroliniana*
Eurasian watermilfoil	*Myriophyllum spicatum*
Coontail	*Ceratophyllum demersum*
Illinois pondweed	*Potamogeton illinoensis*
Southern naiad	*Najas guadalupensis*
Parrotfeather	*Myriophyllum aquaticum*
Common bladderwort	*Utricularia* spp.
Water celery	*Vallisneria* spp.
Arrowhead	*Sagittaria* spp.
Cattail	*Typha* spp.
Spatterdock	*Nuphar polysepala*
Reed canarygrass	*Phalaris arundinacia*

Animals

The bioconcentration factor (BCF) of fluridone in fish ranges from 0.9 to 3.7 (Elan, 1985) and from 1.6 to 15.5 (West et al., 1983) (although Moiré et al. (1982) report a BCF of 91 for rainbow trout and 128 for *Chironomus tentans*).

Hamelink et al. (1986) observed that the BCF for fluridone in catfish ranged from 2 to 9. A value of 100 is usually regarded as a significant factor. Given there is a very low probability that fluridone will bioaccumulate or biomagnify in fish, the need for concern for bald eagles and other threatened or endangered predators of fish in treated areas is also low.

Fluridone has a very low order to toxicity to zooplankton, benthos, fish, and wildlife, but may remain in fish tissue up to 120 days after treatment (Parka et al., 1978, McCowen et al., 1979, Arnold, 1979, Grant et al., 1979). Acute and 90-day sub-acute toxicological results for technical grade fluridone indicate the following (Parka et al., 1978):

ORGANISM	ROUTE	CONCENTRATION
Daphnia	Water	LC50 6.3 PPM
Rainbow Trout	Water	LC50 11.7 PPM
Bluegill	Water	LC50 14.3 PPM
Bobwhite Quail	Diet	LC50 ca 10,000 PPM
Mallard Duck	Diet	LC50 > 20,000 PPM
Mallard Duck	Acute Oral	LD50 > 2,000 mg/kg

No adverse effects were observed on crayfish, bass, bluegill, catfish, long-neck soft-shell turtles, frogs, water snakes, and waterfowl from the use of 0.1 to 1.0 PPM fluridone during field experiments (Arnold, 1979, McCowen, 1979).

Fish and Zooplankton

Zooplankton was reduced slightly when 1.0 PPM was applied, but populations quickly recovered. Total numbers of benthic organisms did not change significantly at 0.3 PPM; however 1.0 PPM did affect total number (Parka et al., 1978). Similar observations have been made with fluridone use in other parts of the world. Investigators of Gatun Lake, Panama, concluded that total numbers and community structure of zooplankton, phytoplankton, and benthic organisms did not vary significantly during field tests of fluridone (Theriot et al., 1979). Kamarianos et al. (1989) concluded that no detrimental effects occurred in fish productive aquatic ecosystems (Greek ponds) treated with fluridone. The uptake rate and clearance of fluridone by aquatic organisms is very low. Rainbow trout had a bioconcentration factor of 91 estimated by a pharmacokinetic model, while *Chironomus tentans* (4th instar) had an estimated bioconcentration factor of 128 (Muir et al., 1982).

The relatively high concentration of fluridone in the sediments during these experiments did not appear to have serious adverse effects on chironomid larvae. Parka et al. (1978) and Arnold (1979) reported that fluridone did not accumulate in fish. It was observed in bodies of bluegills 15 days after treatment, but the amount in the head or body did not exceed the concentration in the water. Grant et al. (1979) showed that channel catfish contained a low fluridone

residue (0.015 PPM) 120 days after treatment of ponds, but no fluridone residue was detected in largemouth bass or bluegill fish. Fluridone did not bioconcentrate in any of the fish species. In laboratory tests using mosquito fish (*Gambusia affinis*), McCowen et al. (1979) observed that they survived and produced young at all rates of fluridone treatment.

In a recent study, Hamelink et al. (1986) reported that fathead minnows were not affected by continuous exposure to fluridone of 0.48 mg/l or less over their life cycle. The researchers did not observe any effects when daphnids, amphipods, or midge larvae were continuously exposed to concentrations of fluridone (0.2 mg/l or less for 32 days, 0.6 mg/l or less for 60 days, or 0.6 mg/l or less for 30 days, respectively). They determined that the acute median lethal concentrations of fluridone were 4.3 mg/l for invertebrates and 10.4 mg/l for fish. In the same study, growth and survival of channel catfish were not negatively affected by continuous exposure to fluridone concentrations of 0.5 mg/l or less for 60 days after hatching. They also observed that channel catfish accumulated fluridone concentrations 2 to 9 times greater than concentrations in water, for a bioconcentration factor of 2 to 9.

In concluding remarks, Hamelink et al. (1986) stated that a favorable safety margin exists between fluridone concentrations that affect non-target organisms and concentrations needed to control weeds. They observed that the recommended application of 1 lb. /acre of fluridone to a pond with an average depth of 3 ft. provides a theoretical concentration 0.1 mg/l; therefore an initial fluridone concentration 0.1 mg/l or less is recommended to control weeds in ponds. Consequently, fluridone is not expected to have adverse effects on the species tested or on similar non-target aquatic organisms. Estimated environmental concentrations (EEC) for fluridone expected to occur in the water after applications at the recommended rate are 0.13 PPM (Final Acute Value, Final Residue Value, and Criterion Maximum Concentration), and 0.08 PPM (Final-Chronic Value and Criterion Continuous Concentration) (Aquatic Environmental Risk Assessment, Appendix I).

None of the criteria values are exceeded for fluridone; therefore it should be possible to use this herbicide without significant risk to 95% or more of aquatic animal species. However, up to 5% (statistically) of aquatic species could be impacted adversely. Economically important and endangered/threatened species are expected to be protected at the forecast herbicide application rates and estimated exposure concentrations (Aquatic Environmental Risk Assessment, Appendix I).

FLURIDONE FACT SHEET

http://www.doh.wa.gov/ehp/ts/Fluridone.doc

HUMAN HEALTH RISK ASSESSMENT

http://www.epa.gov/iris/subst/0054.htm

HERBICIDE LABEL INFORMATION

http://www.sepro.com/documents/SonarAS_MSDS.pdf

http://www.sepro.com/documents/SonarAS_Label.pdf

http://www.sepro.com/documents/SonarQ_Label.pdf

http://www.sepro.com/documents/SonarQ_MSDS.pdf