ELOIKA LAKE
INTEGRATED AQUATIC VEGETATION MANAGEMENT PLAN

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&
The Spokane County Conservation District
In
Partnership with
The Eloika Lake Association

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Eloika Lake Association

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Cover: Photograph courtesy of Eloika Lake Association. Photograph illustrates typical summer conditions of algal blooms and excessive aquatic vegetation.

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1.0 EXECUTIVE SUMMARY

Eloika Lake is a shallow lake in northern Spokane County that has been previously documented as having excessive aquatic plant and algae growth which interferes with the beneficial uses of the lake (Soltero et al. 1988). Eloika Lake is considered to be a meso-eutrophic water body that is strongly influenced by past and current anthropogenic land uses. The large amounts of sediment and debris from past logging practices has accumulated in the lake and decreased lake depth. The significant internal phosphorus cycling coupled with enriched sediments and sunlight perpetuates tremendous aquatic plant growth and decreases dissolved oxygen supply. In turn, the lake's beneficial uses including recreational boating, swimming, and fisheries have been impacted. This document intends to provide management strategies to control and eradicate various native and nonnative aquatic plants.

A recent aquatic plant survey found the presence of two introduced invasive aquatic species, and nine other native species. Eurasian Watermilfoil (*Myriophyllum spicatum*), a Class B noxious weed (quarantine), was identified around the perimeter of the lake. A few small plants identified as Curly-leafed pondweed (*Potamogeton crispus*), a Class C noxious weed, were found next to the public boat launch. Other native aquatic species, such as Fern-leafed pondweed (*Potamogeton robbinsii*), Coontail (*Ceratophyllum demersum*), White stemmed pondweed (*Potamogeton praelongus)* and Watershield (*Brasenia schrebi*) dominate the lake (approximately 76%). Three invasive shoreline species, Reed canarygrass (*Phalaris arundinacea* L.), Purple loosestrife (*Lythrum salicaria* L.), and Yellow flag iris (*Iris pseudacorus*) were found in various areas along the edges of Eloika Lake.

A committee of stakeholders reviewed the aquatic plant survey information and participated in developing management strategies for the control of the aquatic plants. Techniques that fostered preservation of the lake's ecology and the enhancement of waterfront properties were strongly favored. Education of local residents and recreational users was considered a high priority. Short-term strategies included an integrated approach of chemical use on a lake-wide scale followed with manual methods on a localized basis.

Long-term methods for controlling the excessive aquatic plant growth in selected areas included; the potential use of a water level control structure, harvesting, and chemical control, dredging of sediments, and establishing a volunteer invasive plant monitoring program.

2.0 INTRODUCTION

Eloika Lake is located in the northern part of Spokane County in eastern Washington, with the inlet, headwaters and substantial wetlands located in southwestern Pend Oreille County (Figure 2.1). The surface area of the lake is approximately 660 acres. The lake is a part of Water Resource Inventory Area 55 (WRIA 55), more commonly known as the Little Spokane River Watershed area. Eloika Lake has the West Branch of the Little Spokane River as both its main inlet and outlet. The center of the lake is approximately N 48° 1' 33.8", W 117° 22' 48.3". The lake is approximately 0.5 mi wide and 2.7 mi long and lays in a northwest to southeast direction 1 mile west of highway US 2, approximately 25 miles north of downtown Spokane. Eloika Lake has been classified as meso-eutrophic (Dept. of Ecology website) or hyper-eutrophic (Soltero et al 1988). The lake itself is shallow with an average depth of 7.4 ft (2.3m) and a maximum depth of approximately 15 ft (4.8m) (see Figure 2.2). The input for the lake is primarily (95%) the West Branch of the Little Spokane though there are several other small streams that flow into the lake (see Figure 2.3) (Soltero et al, 1988).

The property owners and other users of the lake have long known that excessive aquatic plant growth has reduced the lake's valuable beneficial uses such as water skiing and motorized boating. Efforts to address the issues within the lake and the watershed began years ago. In the mid 1950's the residents of Eloika Lake formed the first community organization to address issues and concerns about lake health and the illegal removal of a water level control structure at the outlet and on the West Branch of the Little Spokane River. In the 1980's the Eloika Lake Community Association re-organized with a goal to preserve and conserve the wetlands, watershed, wildlife, fisheries and to address worsening aquatic weed conditions. Many studies were conducted and documented in the 80's and 90's. In 2001, 'Community' was dropped from the organizations name and since then has been referred to as the 'Eloika Lake Association' (ELA). Also in 2001, ELA consulted with Spokane County Conservation District (SCCD) and prepared a draft aquatic vegetation management plan. It was never finalized. In 2008, a grant committee was formed by ELA and a grant was obtained through the Department of Ecology (DOE) to produce the current document, the Integrated Aquatic Vegetation Management Plan (IAVMP) for Eloika Lake, with guidance and assistance of the SCCD.

This IAVMP has been developed in accordance with the Washington State Department of Ecology's (WDOE) "A Citizen's Manual for Developing Integrated Aquatic Vegetation Management Plans" (WDOE, 1994) and "Guidance for Integrated Aquatic Vegetation Management Plans (WDOE, 2001).

FIGURE 2.1 Eloika Lake Location Map

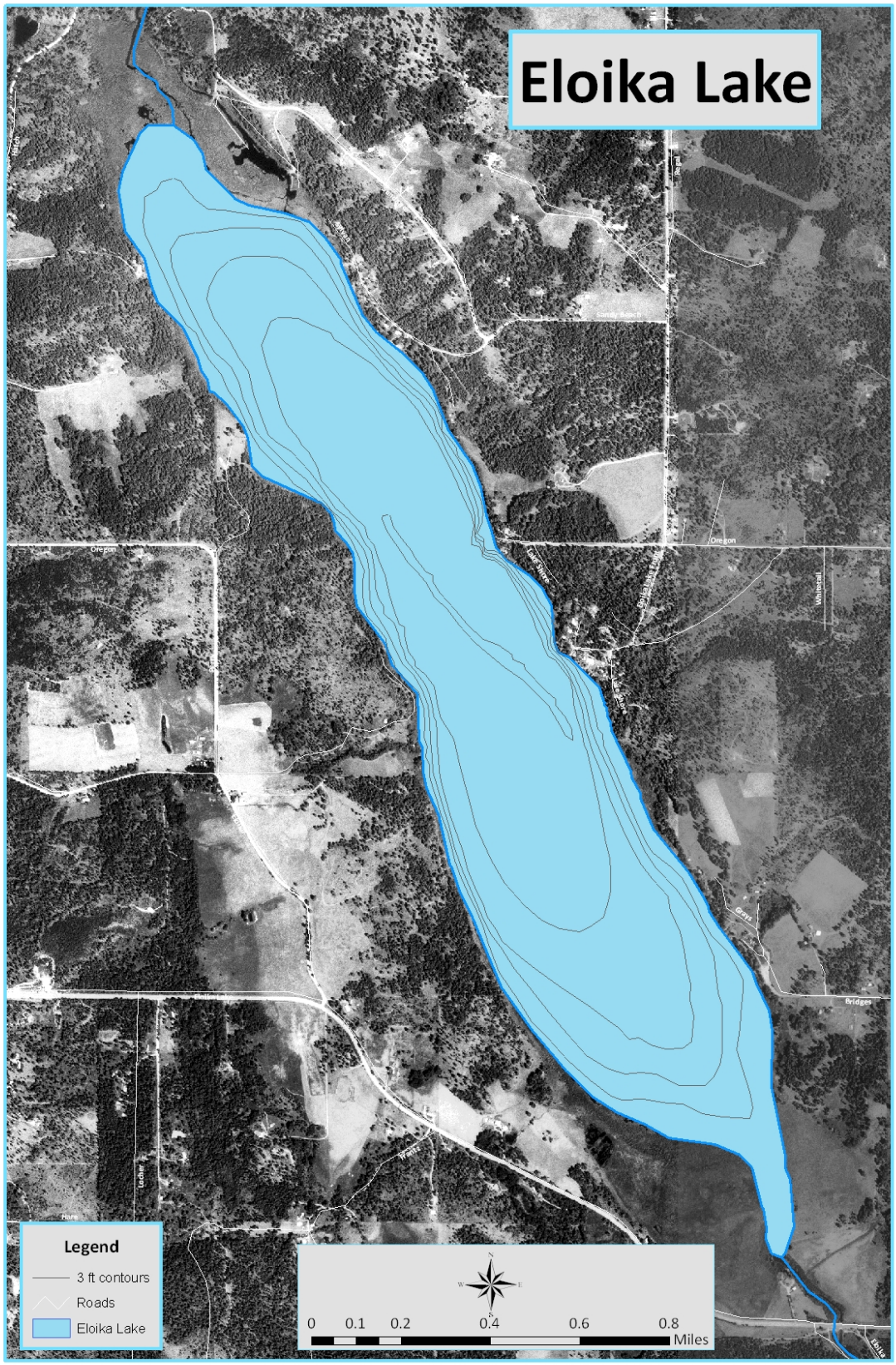

FIGURE 2.2 Eloika Lake Bathymetry Map

Eloika Lake Fish Tributaries

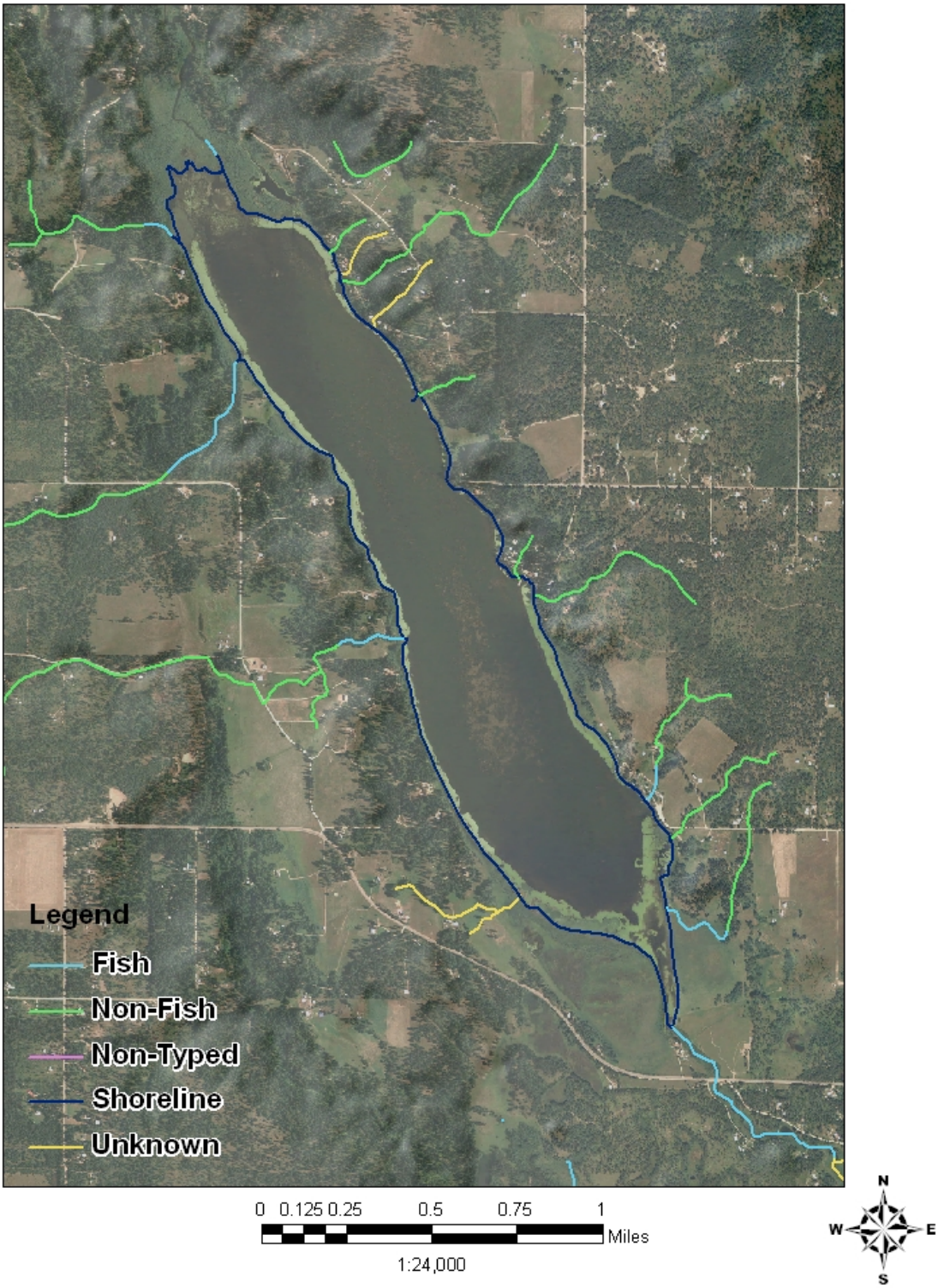

FIGURE 2.3 Eloika Lake Fish Tributaries

2.1 THE WATERSHED (including the West Branch Sub-basin)

The West Branch of the Little Spokane Watershed (see Figure 2.4) includes Diamond Lake, Sacheen Lake, Trout Lake, Horseshoe Lake and Eloika Lake along with several other smaller lakes. The watershed covers approximately 110 square miles (Golder, 2008). This sub-watershed has been further divided into the Diamond, Sacheen, Horseshoe and Eloika sub-watersheds (SCCD, 1992) to help differentiate this highly diverse area.

The West Branch watershed includes a portion of southern Pend Oreille County, southeastern Stevens County and northern Spokane County totaling approximately 66,560 acres (SCCD, 1992). The elevation of the watershed ranges from ~1900 feet above sea level (asl) at the confluence of the West Branch with the Little Spokane River near Milan to ~5277 asl at the top of Boyer Mountain (Golder 2008). The largest portion of the watershed (80%) is between 1900 and 2900 asl and that topography is dominated by broad glacial outwash plains with abandoned glacial outwash channels (Golder 2008). The channels are now occupied by streams, lakes and wetlands and include the Eloika Lake sub-watershed. Within the Eloika sub-watershed, approximately 6850 acres (~11% of the entire watershed) drains directly into Eloika Lake (SCCD, 1992). Most of the acreage is in Pend Oreille County and includes Fan Lake, the West Branch from Sacheen Lake, Trout Lake and Eloika Lake.

The area climate is temperate with temperatures below freezing in winter to over 100ºF in the summer. The area receives approximately 25 inches of rainfall per year, much of which is snow during the winter. Within the West Branch watershed, most of the land is forested (85%) with minor agricultural land uses (10%) and residential or summer homes (5%). Within the Eloika sub-basin the land is primarily rural lots. In Pend Oreille County the land use plan allows rural acre lots with a 5 acre (or larger) minimum, while in Spokane County the land use permits 20 acre tracts on the west side of Eloika Lake and residential parcels along the east shore of the lake. There are significant wetlands within the sub-basin that border Eloika Lake (Figure 2.5). The historical local economy was based on the forest industry and animal agriculture. The current trend appears to be based on development and the gradual build-out of retirement/residential community projects with recreational interests (SCCD, 1992).

Within the watershed and near Eloika Lake, there is an extraordinary abundance of wildlife. The area near the lake has great blue heron rookeries, nesting for osprey and bald eagles in addition to the numerous other birds and mammals. Eloika Lake is also used by many migratory waterfowl, especially in the spring. A more complete list of the mammals and birds can be found in Appendix A.

WRIA 55 & West Branch Little Spokane River Watershed

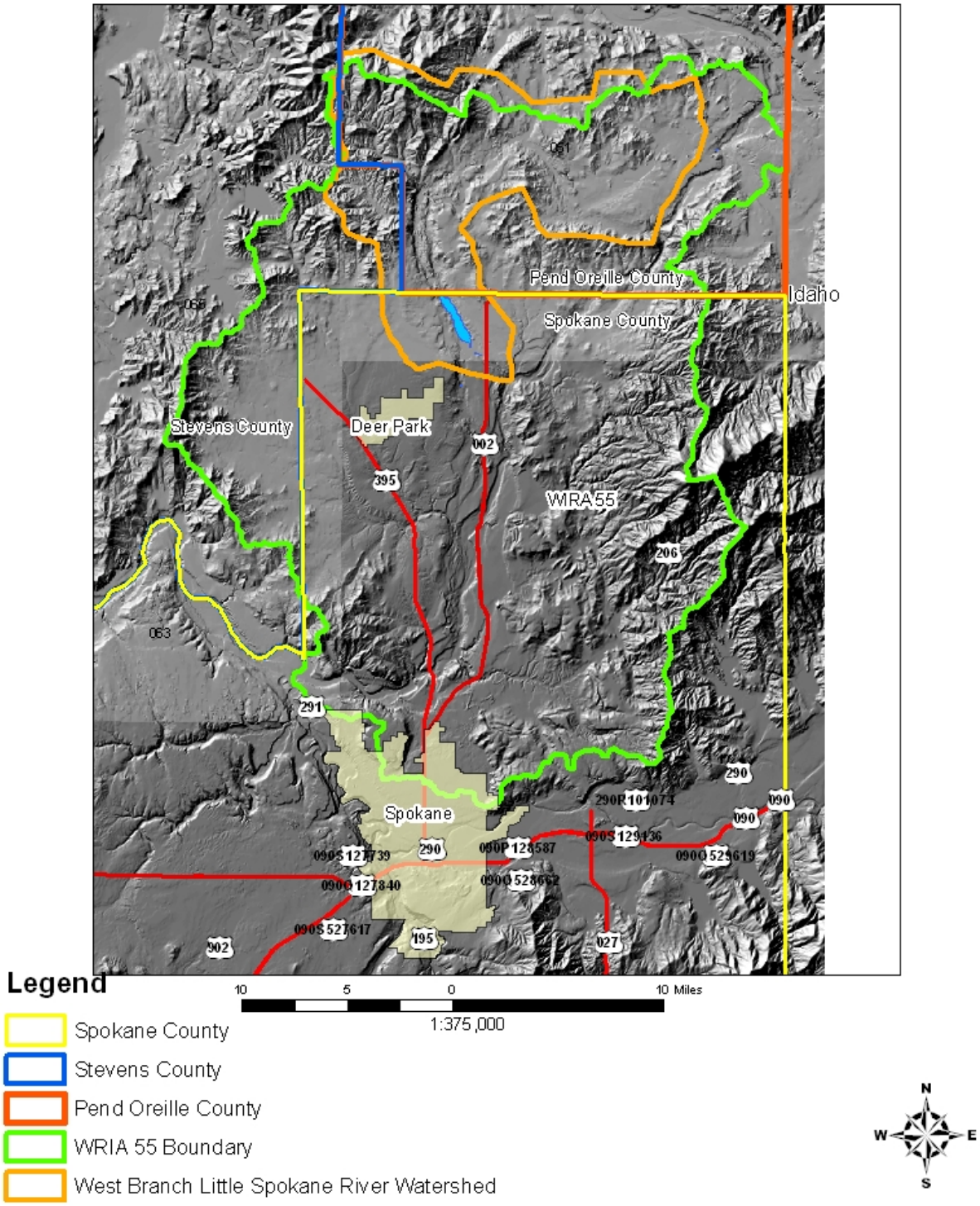

FIGURE 2.4 WRIA 55 & West Branch Little Spokane River Watershed

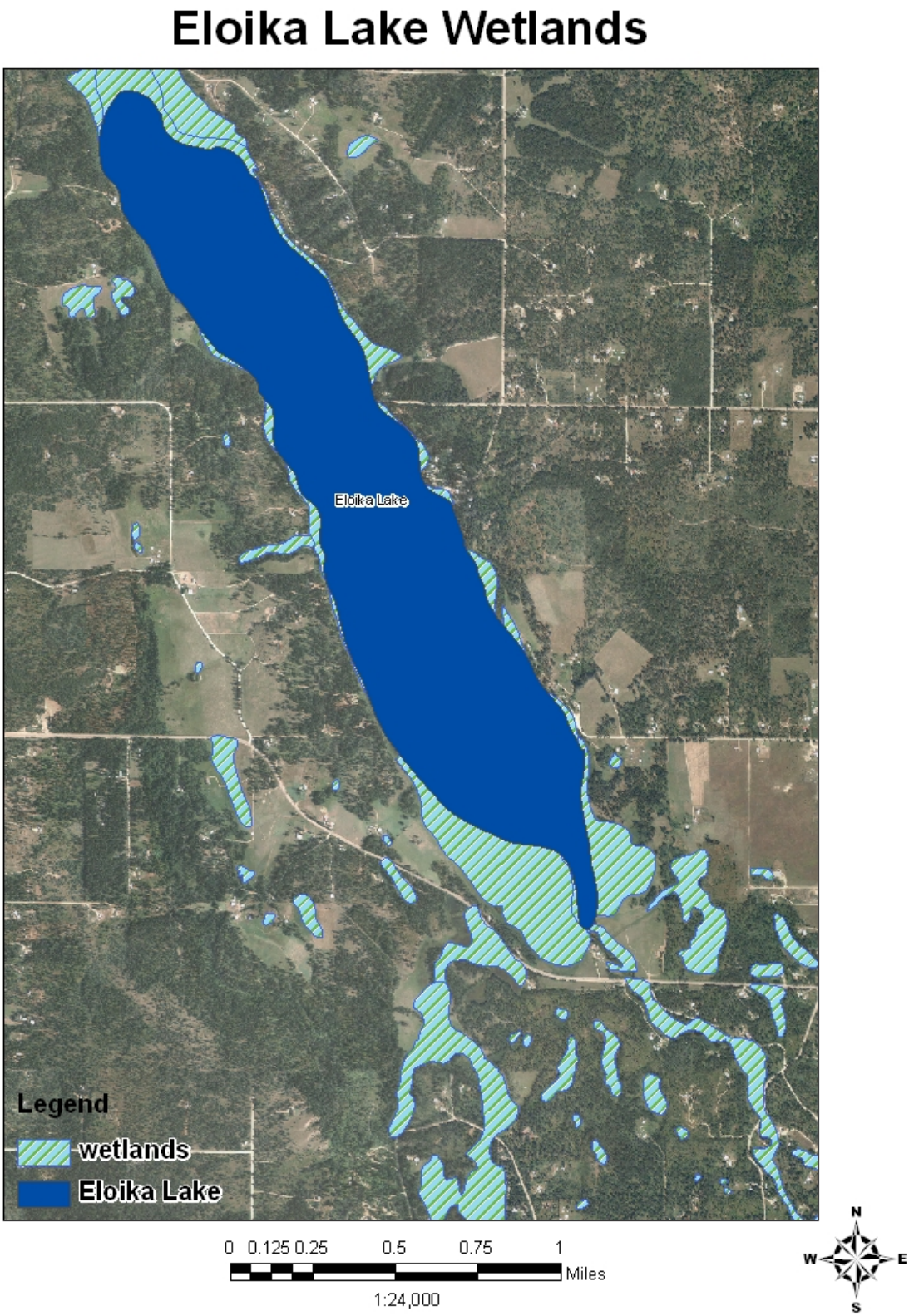

FIGURE 2.5 Eloika Lake Wetlands

2.2 THE LAKE

Eloika Lake is the last in a series of lakes along the West Branch of the Little Spokane River. Upstream activities, such as logging and clearing for farm land may have contributed to the accumulation of sediment deposits in the lake (local residents report up to 30+ ft deep in some locations). The water level is presently uncontrolled. Local residents believe this is due primarily to two separate events; the illegal removal of a water level control structure in the 1950's by a property owner along the river and in the mid 1970's, the reconstruction of the Eloika Lake road where it crosses the West Branch, just below the outlet of Eloika Lake. Although no as-builts have been found, it appears that the old culvert was replaced with a much larger box culvert and the road grade was raised. Low water conditions continue to affect the lake water quality with increasing amounts of aquatic vegetation, loss of depth, and increased water temperatures. Periodic beaver activity near the outlet temporarily raises the lake water levels.

Eloika Lake has two public access points. One is located at a resort called, "Jerry's Landing". A second is a public access boat launch maintained by the Washington State Department of Fish and Wildlife (WDFW). A Spokane County park (undeveloped) is located on the northern end (Figure 2.6). Spokane County does have a Shoreline Master Program and has designated the shorelines throughout the county. Eloika Lake has three shoreline designations; shoreline residential, rural conservancy, and natural (Figure 2.7).

Eloika Lake and the West Branch of the Little Spokane River are included within WRIA 55 and involved with Watershed Planning in Spokane County. The ELA has been actively involved in this planning effort. Part of this planning involves the need to maintain instream flows for the mainstem of the Little Spokane River for beneficial uses. Wetland restoration opportunities to increase water storage in the basin are of primary importance. Eloika Lake has been reviewed and chosen for additional study as a potential site for both surface water storage and wetland restoration (PBS&J, 2009).

2.3 WATER RIGHTS AND STATE OWNED AQUATIC LANDS

Most of the shoreline owners have individual (domestic exempt well) water rights. There are potentially a dozen property owners that do have irrigation and /or domestic surface water rights for the surface waters of the lake. A complete listing of the information provided by Spokane County is shown in Appendix B. There was no listing for Eloika Lake on the Water Rights Application Tracking System.

The State of Washington, under Article XVII, Section 1, asserts its ownership to the beds and shores of all navigable waters in the state up to and including the line of ordinary high water within the banks of all rivers and lakes. The Washington State

Department of Natural Resources (DNR) is the state agency of authority for the bed lands of Eloika Lake.

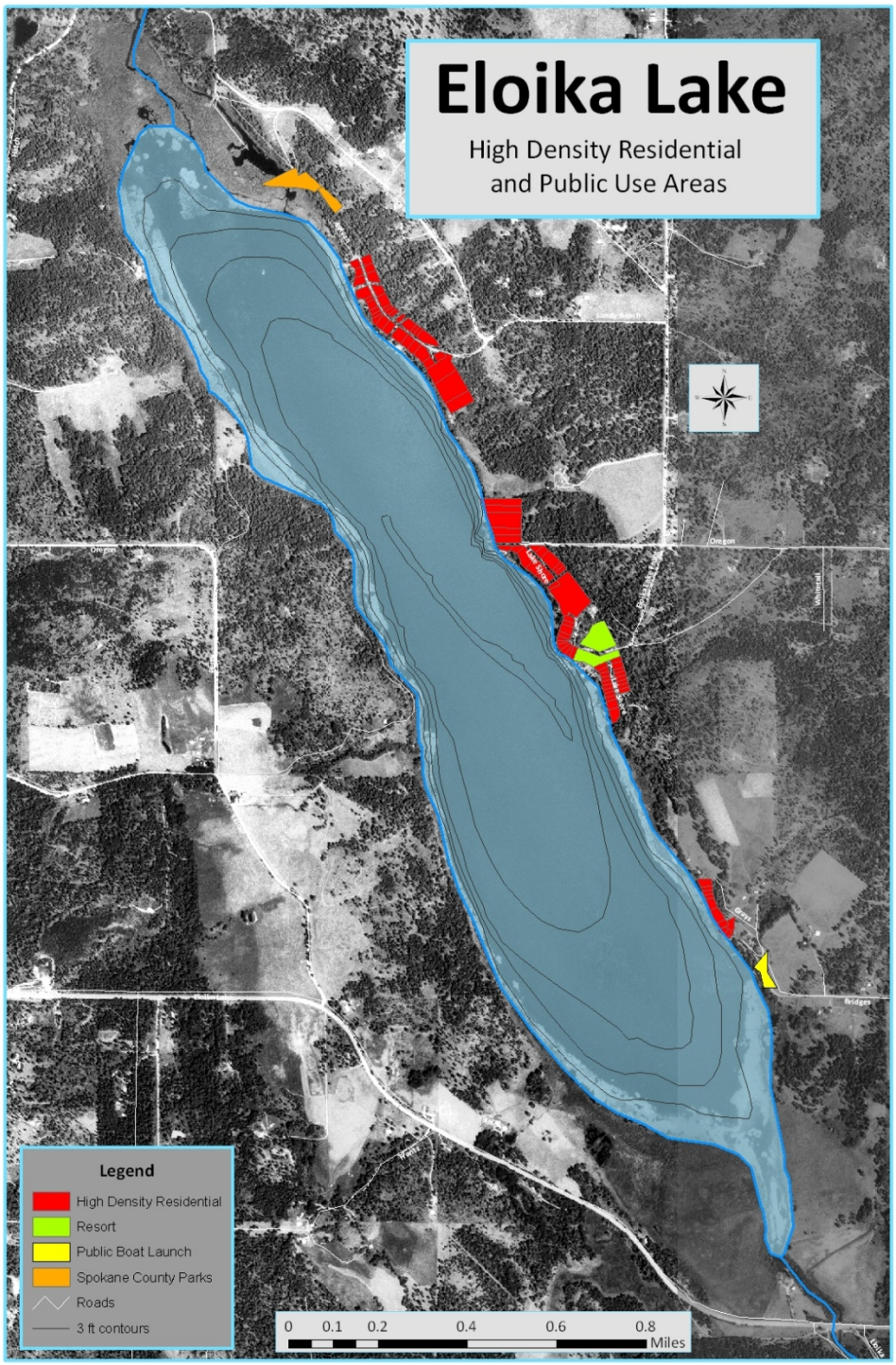

FIGURE 2.6 Eloika Lake Public Access and High Density Residential

Eloika Lake Shoreline Designations

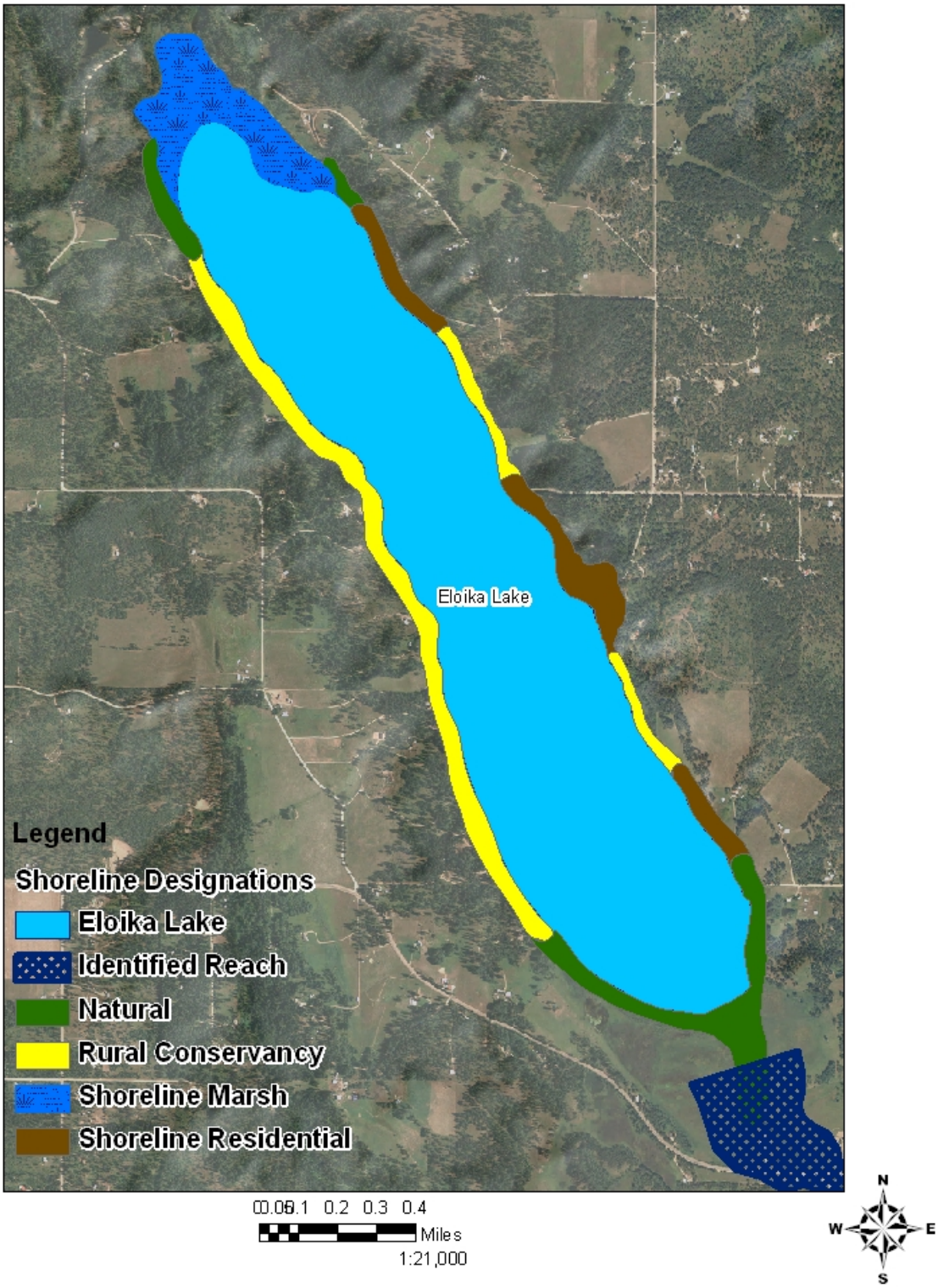

FIGURE 2.7 Eloika Lake Shoreline Designations

2.4 WATER QUALITY

Water quality data has been collected over a long period of time (twenty plus years) and thoroughly evaluated in the Soltero et al. report (1988) and the 1992 Eloika Lake Watershed Plan. Currently, water quality information is being collected by the Spokane County Conservation District. These reports indicate that the lake is mesotrophic, and that the nutrient levels fit the category of moderate levels of productivity. As mentioned above, the lake is categorized as hyper-eutrophic (Soltero et al, 1988) to meso-eutrophic (WDOE). The high level of productivity within the lake has been attributed to the internal nutrient cycling within the lake (Soltero et al, 1988). This eutrophic state (high levels of productivity) is considered the natural progression of lakes (eutrophication) which would gradually become wetlands and then terrestrial. Eutrophic lakes are typically shallow, like Eloika, and promote warm water fisheries.

2.5 BENEFICIAL USES OF ELOIKA LAKE

In general, Eloika Lake is used by the residents and the public for fishing, swimming, boating, wildlife viewing, aesthetics, fire protection and irrigation. A more complete list and the locations of these activities are shown in Appendix C. All these recreational opportunities occur in various regions of the lake and these recreational activities occur year-round with ice fishing, cross-country skiing, and snow shoeing in the winter.

The lake supports an excellent year-round spiny ray fishery. In the 2001 report (Divens et al, 2001), tench were the most abundant species by weight and number. The most abundant game fish included largemouth bass, pumpkinseed sunfish and black crappie. Yellow perch, brown bullhead, yellow bullhead, black bullhead, green sunfish, rainbow trout, brown trout and grass pickerel were also collected. It was noted that Eloika Lake has a high density of aquatic vegetation that was not stunting the growth of these species at this time and advised careful consideration of any plan to modify the aquatic vegetation.

As part of the planning process, the committee was asked to identify what activities and where each of those activities occurs on the lake. Committee members concurred that the heaviest motorized boating activity occurs along the east shoreline from the south end of Eloika Lake to mid-lake (due to the location of the public boat launch and Jerry's Landing Resort). At mid-lake, boat traffic then becomes more dispersed as do various recreational activities. In the future, the area between the two launches would be targeted for higher levels of invasive aquatic plant control. Thus, reducing spread of problem weeds throughout the lake and ultimately elsewhere in the watershed. The small County Park located at the northeast end of the lake is often utilized for launching small non-motorized water craft although there is no formal launch. From the input of the committee, the most actively used areas of the lake were near the shoreline and in the area between the resort and the public access area. These areas may receive higher levels of plant control. The high use areas and shoreline designations were combined to determine the priority level of control (Figure 2.8).

Eloika Lake Public Use & Access Areas

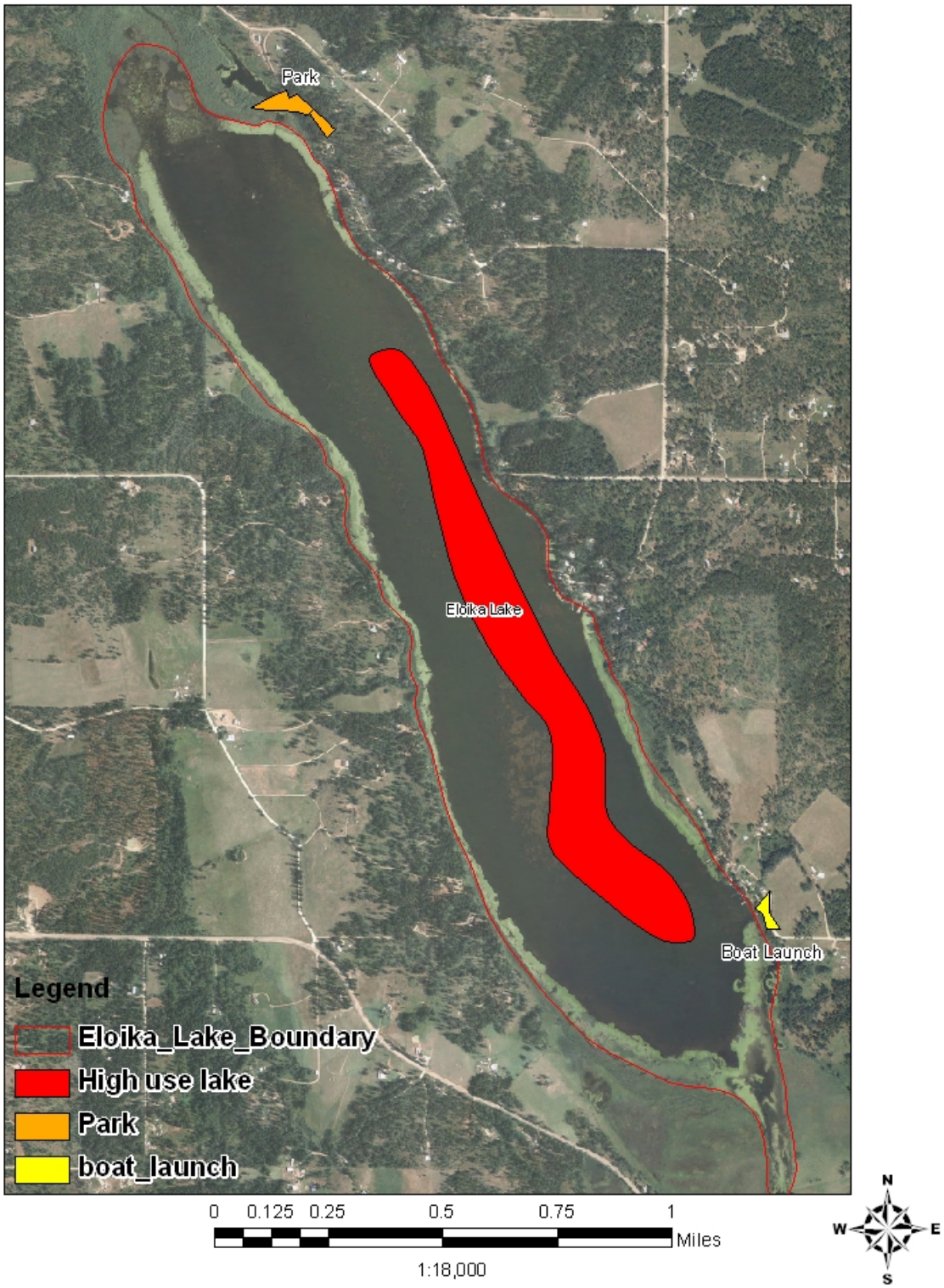

FIGURE 2.8 High Use and Priority Control Areas

2.6 AQUATIC AND SHORELINE PLANT INFORMATION

Eloika Lake has been extensively studied in the past and the reports on the water quality and watershed are used as the primary references in this document. Soltero et al, 1988, details the water quality and the restoration potential of the lake. In this report, the excessive aquatic plant and algae growth is attributed to internal phosphorus loading. The Soltero et al. report concluded that sediment removal or chemical inactivation was too costly but that water level control and decreasing external nutrient inflow may be the most cost effective techniques to potentially manage the excessive plant and algae growth of the lake. The aquatic plants found in Soltero's report did not include any invasive aquatic macrophytes. By 1994, the Washington State Dept. of Ecology had found Eurasian watermilfoil (*Myriophyllum spicatum)* at the boat launch and now lists it as present in the lake. Part of the objective of this vegetation management plan includes a current plant survey of the lake which has confirmed the presence of Eurasian watermilfoil and also found curly-leafed pondweed (*Potamogeton crispus)* present near the boat launch. This survey also found three invasive shoreline species present near the lake: purple loosestrife (*Lythrum salicaria*), yellow flag iris (*Iris pseudacorus*) and reed canarygrass (*Phalaris arundinacea*). The reed canarygrass and yellow flag iris had been previously known to have invaded the shoreline and wetland areas of the lake (SCCD 1992).

Spokane County's Noxious Weed Control Board classifies noxious weeds based on the stage of invasion of each species. The classification system is designed to prevent small infestations from becoming large infestations, and to contain already established infestations to regions of the state where they occur and prevent their movement to un-infested areas of Washington. All weeds on Spokane County's Weed List are nonnative species.

Noxious weeds and other invasive plants cost Washington State millions of dollars in lost production and control expenses. These plants damage recreational values, cause environmental degradation, displace native habitat, and impact wetlands and water bodies. Plants under quarantine are known to be invasive and detrimental to the native environment. Washington State has regulations in place to prevent further spread.

Class A Class A Weeds are non-native species with limited distribution in the state. Preventing new infestations is the highest priority. Eradication is required by law. The Spokane County Weed Board's Class A weeds are currently found growing wild in Spokane County and control is mandated by the WA State Noxious Weed Control Board.

Class B Designates Class B Designates weeds are species that are designated for control in certain regions of the state where they are not yet widespread. Preventing infestations in these areas is a high priority.

Class B In areas where Class B weeds are abundant, control is decided at the local level, containment is the primary goal. Class B weeds are

currently found growing wild in Spokane County and are mandated for control.

Class C Class C weeds are species that are widespread in the county and long-term programs of suppression and control are a local option, depending upon threats and feasibility of control in local areas. Class C weeds are currently found growing wild in Spokane County and are mandated for control.

Weeds Of Concern Weeds of Concern have a negative impact on property in Spokane County and when found, the Spokane County Noxious Weed Control Board will encourage their control.

The following plants found during the survey are listed as noxious weeds:

- Eurasian Watermilfoil (*Myriophyllum spicatum)* Class B (quarantine)
- Curly-Leafed Pondweed (*Potamogeton crispus*) Class C (state status)
- Yellow Flag Iris (*Iris pseudacorus*) Class B (designate)
- Reed Canarygrass (*Phalaris arundinacea L.)* Class C (state status)
- Purple Loosestrife (*Lythrum salicaria L.*) Class B (designate)

*Eurasian Milfoil is listed under Washington State and Spokane County as a Class B noxious weed and requires containment and control.

*Curly-leafed pondweed is designated as a Class C noxious weed for the State of Washington, but is not currently listed in Spokane County as a noxious weed.

*Yellow Flag Iris is listed as a Class B noxious weed in Washington State and a Class B Designate in Spokane County.

*Reed Canarygrass is listed as a Class C noxious weed in Washington State and is not currently listed as a noxious weed in Spokane County. Although Spokane County does not require property owners to control Reed canarygrass it is recommended.

*Purple Loosestrife is listed as a Class B noxious weed in Washington State and a Class B Designate in Spokane County.

2.6.1 Aquatic Plant Mapping & Characterization

The complete report of methodology and results of the aquatic plant survey conducted in September 2008 is presented in Appendix D. A brief summary is provided below.

Transects were located across the lake and samples (rake-toss) were collected at approximately 200m intervals on each transect. A total of 112 samples were taken. Each sample had the plants identified and rated for a relative frequency or an abundance value (in percentage of the total for that sample). Only two sample points (1.6%) found no plants. The samples typically contained more than one plant species. Each plant species was mapped individually (shown in Appendix D) and then categorized as either floating-leafed or submersed (See Figure 2.9). The results show that Eloika Lake is 98% littoral. The shoreline areas are pre-dominated by floating leafed plants and essentially the rest of the lake has a mixture of submersed plants. The Eurasian watermilfoil was found within a band from the shoreline out to about 2m in depth and the exact locations are shown in Figure 2.10. Coontail, white-stemmed pondweed and fern-leafed pondweed dominated the submersed plant areas. Watershield and spatterdock were the dominant floating-leafed plants. A complete listing of the aquatic plants is shown in Table 1. The lake residents are concerned because this survey (Sept 2008) did not show the plant species that grow to the surface of the lake and inhibit boating and other recreational uses of the lake earlier in the summer (personal communication). Previous aquatic plant surveys were conducted by Soltero et al. and the Department of Ecology. Comparisons between data are displayed in Table 2.

TABLE 1: 2008 Eloika Lake Aquatic Plant Survey Tabulated Results

SPECIES	**RELATIVE PERCENTAGE**	**RANK**	**NATIVE or INTRODUCED**
Fern leafed pondweed *(Potamogeton robbinsii)*	30.5	1	Native
Coontail *(Ceratophyllum demersum)*	18.2	2	Native
White stemmed pondweed *(Potamogeton praelongus)*	14.3	3	Native
Watershield or dollar pads, *(Brasenia schrebri)*	13.5	4	Native
Plant-like algae *(Nitella sp.)*	6.4	5	Native
Eurasian Watermilfoil *(Myriophyllum spicatum)*	5.6	6	Introduced
Common waterweed *(Elodea Canadensis)*	4.8	7	Native
Bladderwort *(Utricularia vulgaris)*	3.2	8	Native
Spatterdock *(Nuphar polysepa)*	2.1	9	Native
Unknown pondweed	1.4	10	

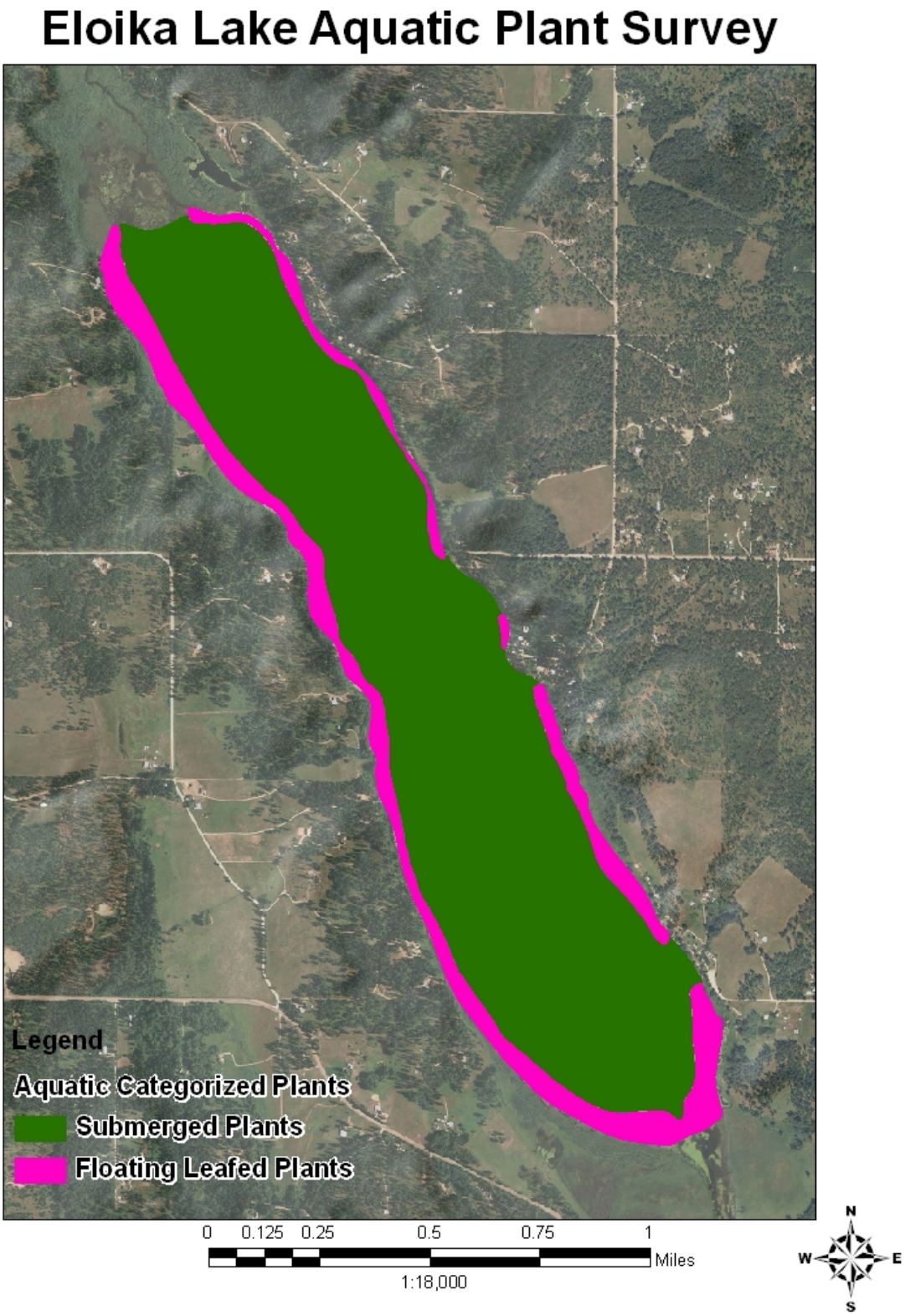

FIGURE 2.9 Eloika Lake Aquatic Plant Growth Categorization

Eloika Lake Eurasian Milfoil Locations

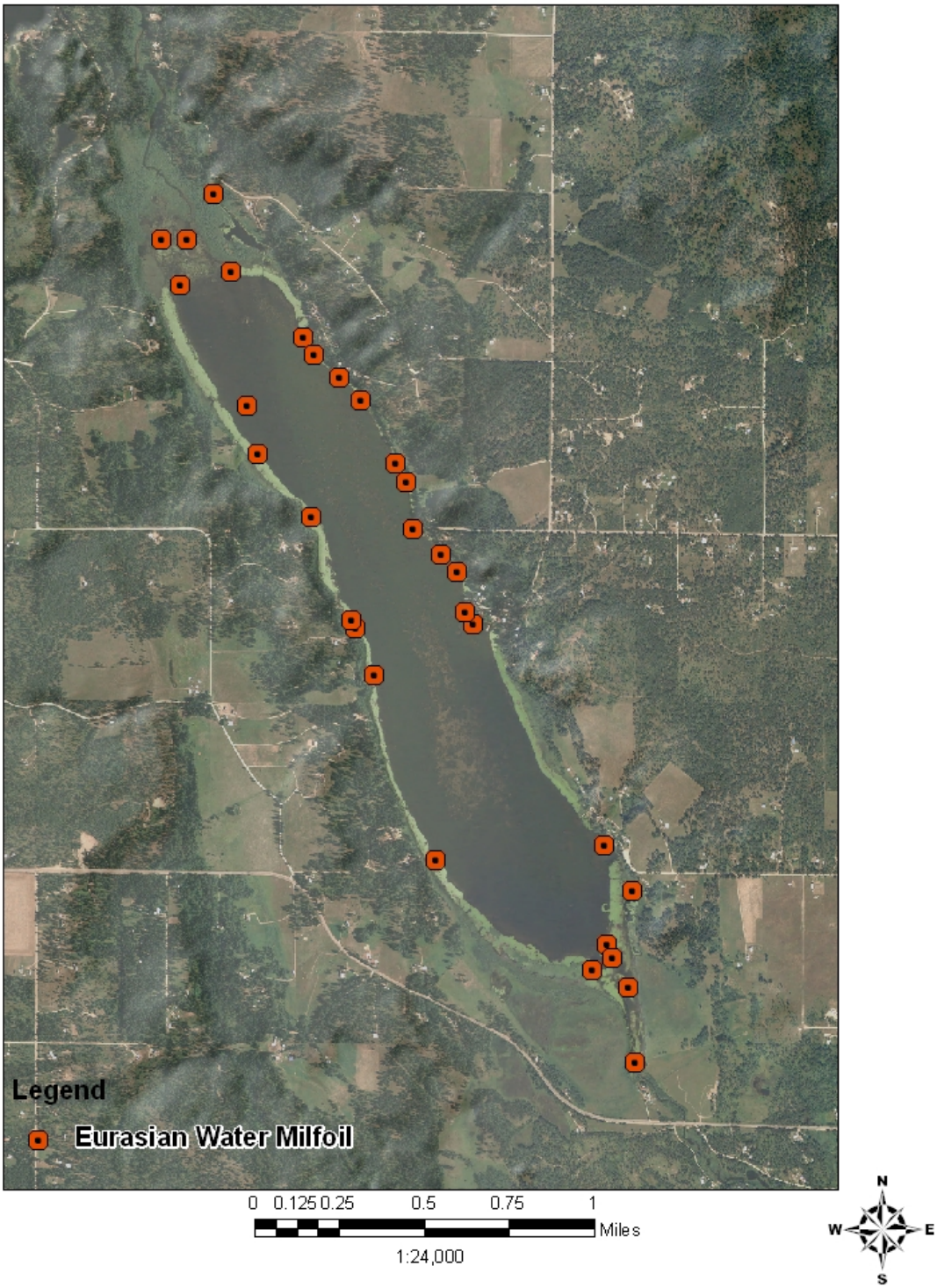

FIGURE 2.10 2008 Eloika Lake Eurasian Milfoil Survey

TABLE 2: Eloika Lake Current and Historical Plant Presence Comparison.

PLANT SPECIES	**Soltero et al.1988 Biomass if measured**	**DOE - historical**	**2008 Relative frequency**
Fern leafed pondweed *(Potamogeton robbinsii)*	60%	present	30.5%
Coontail *(Ceratophyllum demersum)*	4	present	18.2
White stemmed pondweed *(Potamogeton praelongus)*	25		14.3
Watershield or dollar pads, *(Brasenia schrebri)*	9	present	13.5
Plant-like algae *(Nitella sp.)*	-		6.4
Eurasian Watermilfoil *(Myriophyllum spicatum)*	*	present	5.6
Common waterweed *(Elodea Canadensis)*	4	present	4.8
Bladderwort *(Utricularia vulgaris)*	present	present	3.2
Spatterdock *(Nuphar polysepa)*	present	present	2.1
Floating leafed pondweed *(Potamogeton natans)*	present	present	
Nuttall's waterweed *(Elodea nuttallii)*		present	
yellow water-lily *(Nuphar lutea)*		present	
Slender Pondweed *(Potamogeton pusillus)*		present	
Richardson's pondweed *(Potamogeton richardsonii)*		present	
Eel-grass Pondweed *(Potamogeton zosteriformis)*		present	
Great duckweed *(Spirodela polyrhiza)*		present	present
Duckweed *(Lemna spp.)*	present	present	present
Bulrush species *(Scirpus spp.)*	present		present
Northern milfoil *(Myriophyllum sibericum)*	*	present	
Mare's tail *(Equisetum fluviatile)*	present		
Peat moss *(Sphagnum spp.)*	present		

*A milfoil species was noted as being present but the species was not identified in 1988 survey.

2.6.1.1 Phytoplankton Production

In the late 1980s, Soltero et al. conducted phytoplankton sampling in Eloika Lake. 71 species and 53 genera (Appendix E) were indentified (Soltero et al. 1988). Findings from this report indicated that the class *Chlorophyceae* had the greatest diversity and

that species of blue-green algae (*Cyanophyaceae*) dominated the summer algal blooms (Table 3).

In the spring, concentrations in chlorophyll a and algal biovolume resulted from small standing crops of chrysophyceans and cryptophyceans giving way to a moderate pulse of bacillariphyceans, dinnophyceans and early blue-green growth. By mid-summer, the blue-greens (*Anabaena* spp., *Gloeotricha* spp. and *Coelosphaerium Naegelianum*) comprised 99 percent of the monthly biovolume (Soltero et al. 1988). These blooms often persist through fall and then decline with diminishing water temperatures and light.

Table 3. Major Phytoplankton Species Ranking for Eloika Lake, WA (Soltero et al.1987)

Rank	Taxon	Biovolume (mm^3/l)
1	*Coelosphaerium Naegelianum*	7.348
2	*Anabaena spiroides*	3.171
3	*Gloeotrichia echinulata*	1.777
4	*Microcystis aeruginosa*	1.041
5	*Cryptomonas erosa*	1.037
6	*Anabaena planctonica*	0.996
7	*Uroglena volvox*	0.401
8	*Gloetrichia sp.*	0.385
9	*Melosira granulate*	0.181
10	*Glendinium sp.*	0.141

2.6.1.2 Threatened, Rare and Endangered Plants

In accordance with the Section 7(c) of the Endangered Species Act, the U.S. Fish and Wildlife Service have been contacted regarding plant species that may be considered endangered, threatened or rare in the area. No such plant species or communities are currently known to exist in the Eloika Lake Watershed.

The IAVMP committee reviewed the plant survey information given above and developed the following problem statement and management goals through a series of facilitated meetings in late 2008 and early 2009.

2.7 PROBLEM STATEMENT

Due to historic anthropogenic practices and activities, the natural eutrophication process in Eloika Lake has been significantly accelerated. The acceleration of this process has been compounded into an unbalanced cycle that generates nutrient rich sediment, reduces lake depth, produces periodic algal blooms, and promotes excessive annual macrophyte populations (both native and invasive). The silt composition in the lake consists primarily of organic material produced over decades of excessive internal vegetative growth, decay and deposition. Lake residents report the extent of the silt layer in the lake to be as much as 8-30+ feet deep throughout the lake. Public safety issues arising from these impacts are of significant concern for those who enjoy the beneficial uses that Eloika Lake has to offer. The primary beneficial uses of the lake that

have been impaired include recreation, aesthetics, fisheries/aquatic life, wildlife habitat, fire protection, irrigation and property amenities. Historic and recent surveys have documented the presence of five invasive plant species: Eurasian Watermilfoil, Curly-leafed Pondweed, Yellow Flag Iris, Reed canarygrass and Purple Loosestrife.

For simplicity, the problems are divided into three categories: the invasive species (shoreline and aquatic), the deep sedimentation and the excessive native aquatic plant and algae growth.

The invasive shoreline species listed above are the reed canarygrass and yellow flag iris that were noted as early as 1992 (SCCD). In addition, purple loosestrife has been found since then in some areas around the lake. Currently, this problem has not been mapped in detail but some potential treatment options are available.

One of the two invasive aquatic species, Eurasian Watermilfoil (EWM) has been mapped once and it is known to have some biological control (native weevil populations) present in the lake. As stated in the plant survey report, there is approximately 60 acres of EWM around most of the perimeter of the lake in depths from the shoreline out to approximately 2M deep. Whether the EWM is invading or being kept under some level of control by the native weevil population cannot be determined through the single plant survey that has been conducted to date. The committee did determine that some effort needs to be made to eliminate or reduce the EWM population rather than doing nothing. Therefore a large part of the strategy in the short term will be directed at EWM.

The curly-leafed pondweed was noted near the public access area only and may (or may not) be a problem that needs to be addressed. Further survey work needs to be done in the spring when this plant is actively growing.

Deep sediments are an issue that impairs water access, swimming, fish habitat and public safety. One boating accident on Eloika Lake resulted in the death of a young fisherman when the young man got stuck in the sediment and drowned while trying to 'right' the boat after it overturned. The deep sediments also hinder motor boat use on the lake and may lead to the formation of floating mats of plants and sediments mentioned by several committee members. Potential solutions to this problem are addressed below.

The continued impacts of aquatic plant cover result in negative effects to the local recreational users, the economy, and the environment. The disproportionate native plant and algae growth noted since 1988 inhibits beneficial uses across the lake (Soltero et al 1988). Motorized boating, swimming, and aesthetics are severely impacted on an annual basis. Angling, especially for bass lakes such as Eloika Lake, require some heavy vegetation, but the plants foul boat propellers and increase risk of spread through transfers to other lakes. The plant growth also endangers any water skiing, closes swimming beaches, and degrades water quality. This prolific growth of

native plants was considered to be caused by excessive internal nutrient (phosphorus) cycling (Figures 2.11 - 2.14).

FIGURE 2.11 Inhibited Motorized Boating

FIGURE 2.12 Prolific Aquatic Plant Growth

FIGURE 2.13 Dense Mats of Floating Vegetation

FIGURE 2.14 Submersed Aquatic Plants

2.8 MANAGEMENT GOALS

Short-term:

- Reduction or elimination of invasive plant species.
- Reduction of excessive vegetative growth within heavily populated/high use areas of the lake via both lake-wide management actions and individual efforts, resulting in an improvement of beneficial uses.
- Development and implementation of a balanced long-term management plan, with an emphasis on public education.

Long-term:

- Continued monitoring and control of vegetative growth with consideration of emerging technology and management strategies to maintain a holistic and

cutting edge approach to regulating vegetative growth, both invasive and excessive.

- A reduction of sediment and internal nutrient loads, resulting in the restoration of a balanced ecosystem and overall improvement of beneficial uses.

2.9 PAST MANAGEMENT EFFORTS

Past management efforts on Eloika Lake primarily consisted of two primary studies (Soltero et al. 1988; SCCD 1992). The studies include similar recommendations for the restoration of Eloika Lake. Soltero et al. concluded that dredging and/or nutrient inactivation would likely be the best, but costly, alternative to resolving the internal phosphorus loading issue. The report further stated that water level control would be the best proactive solution to controlling the macrophyte populations on the lake. The Management Plan developed through the SCCD agreed with the alternative to control the aquatic plant growth in the lake. A water control structure should be constructed at the outlet of the lake to manipulate lake levels and control the macrophytes. The structure would control water surface elevations between 1903' and 1907', pass runoff from storm events, and allow passage for fish.

A preliminary draft of restoration alternatives was produced in 1992 (Burton and Durgin 1992) by the SCS. Eight different approaches to dealing with excessive macrophyte growth were evaluated, one of which was drawdown of the lake level. Three different approaches to drawdown were developed and evaluated, all of which focused on low winter levels ranging from 1,899 to 1,903 ft MSL with growing season levels ranging from natural rise and fall to fixed elevations of 1,905 and 1,907 ft MSL. The analysis showed that the most effective approach in terms of weed management would be to maintain the lake at 1,907 ft MSL during the growing season and draw it down to 1,903 ft MSL in the winter (PBS&J 2009).

In 1994, The SCCD worked in cooperation with The Natural Resources Conservation Service to prepare preliminary designs for construction of a water control structure for Eloika Lake. The designs were completed in 1997 but the project idled due to funding issues for actual construction of the structure.

In 1998 a study was completed by Dr. John Buchanan for the Eloika Lake Community Association. The study focused on the Ordinary High Water Mark (OHWM) for the lake (Buchanan 1998). Buchanan's review and statistical analysis of historical records (22 years of lake USGS gaging data and spot surveys) concluded the OHMW to be set at 1,907.8'.

More recent efforts for Eloika Lake have evolved through the Watershed Planning Project in WRIA 55/57. Spokane County has been leading that effort and finalized the plan in 2006. Planning efforts relevant to Eloika Lake were developed late in the process (2008) through the Detailed Implementation Plan. Issue VI.A.02 and subsequent recommendations focused on water storage opportunities to augment instream flows for the Little Spokane River. Eloika Lake was targeted for further study.

In 2008, PBS&J was contracted to conduct a feasibility analysis of the installation of a water control structure at the outlet of Eloika Lake for the purpose of augmenting base flow to the Little Spokane River. PBS&J concluded that the water control structure was feasible and should move forward.

In 2008 a Watershed Implementation Plan for the West Branch Little Spokane River was finalized (Golder 2008). This plan identified the same Eloika Lake related issues as those specified in the greater WRIA 55/57 Plan.

2.10 AQUATIC AND SHORELINE PLANT CONTROL TECHNIQUES

2.10.1 No Action Alternative

The 'no action alternative' was not considered appropriate by the stakeholders involved in development of this plan. This group would like to see some management of the lake that will improve the beneficial uses and encourage a healthy and sustainable ecosystem. The management of the aquatic plants, both native and invasive, was considered highly important. The main goals included the control and/or elimination of the invasive species and management of the native plant growth to improve the quality of the recreational activities in the lake. One of the most important components of the management plan is considered to be education.

The majority of the following information on aquatic plant control is taken directly from the Department of Ecology's website.
(http://www.ecy.wa.gov/programs/wq/plants/management/index.html).

2.10.2 Manual Control Methods

2.10.2.1 Hand Pulling

Hand pulling is often used where aquatic plant densities are low, or in combination with mechanical methods in an effort to complete weed removal around edges where the machinery cannot effectively operate. This technique involves physical removal of the entire plant (root, stem and flowers) from the sediment or soil. Some sediment types may require the use of a trowel or other tool to loosen the roots. It can be very effective in small areas of low density plant populations. Some areas of rocky or gravel sediment makes this technique very difficult to remove the roots and therefore not effective. It can be done in shallow water with a little training but does require diving equipment in deeper waters. Some sites may not be suitable for hand pulling such as areas where deep flocculent sediments may cause a person hand pulling to sink deeply into the sediment. Hand pulling is often recommended in areas where native or desirable species are intermixed with nuisance, rare, or invasive species. When hand pulling milfoil, special care must be taken to not create fragments and if fragments are present, to remove any fragments from the water immediately. Some training is required to be effective at this technique.

Suitability for Eloika Lake

Hand pulling is not easily done in the deep sediments found in Eloika Lake because the individual can sink into the sediments. It will be included as a possible means for individual landowners to manage areas of their shoreline as stated in the “Aquatic Plant and Fish” booklet provided by the WA State Fish & Wildlife. The individuals need to be educated on how, when and where this technique can be used safely. The density of Eurasian Watermilfoil (EWM) beds in Eloika Lake may require other means of treatment. This technique would be appropriate for curly-leafed pondweed if the distribution is low in density and localized as found in the 2008 survey.

2.10.2.2 Cutting

Cutting differs from hand pulling in that plants are cut using a tool and the roots are not removed. Cutting is performed by standing on a dock or on shore and throwing a cutting tool into the water. A non-mechanical aquatic weed cutter is commercially available. Two single-sided stainless steel blades (razor sharp) forming a "V" shape are connected to a handle which is tied to a long rope. The cutter can be thrown about 20 - 30 feet into the water. As the cutter is pulled through the water, it cuts a 48-inch wide swath through the aquatic plants. Cut plants rise to the surface where they can be removed. The stainless steel blades that form the V are extremely sharp and great care must be taken with this implement. It should be stored in a secure area where children do not have access.

Suitability for Eloika Lake

Cutting is another technique that may be useful to the property owners around the lake. Lake residents utilizing this method should be educated in the technique and safety requirements. The method does have certain limitations that are explained in the booklet mentioned above.

2.10.2.3 Raking

A sturdy rake makes a useful tool for removing aquatic plants. Attaching a rope to the rake allows removal of a larger area of weeds. Raking literally tears plants from the sediment, breaking some plants off and removing some roots as well. Specially designed aquatic plant rakes are available. Rakes can be equipped with floats to allow easier plant and fragment collection. The operator should pull towards the shore because a substantial weight of material can be collected in a short distance.

Suitability for Eloika Lake

Raking could be a useful tool for Eloika Lake. However the raking motion can break plants into fragments. Raking also disturbs the bottom-dwelling animals and stirs up sediments, making it difficult to see the remaining plants.

Summary of Manual Methods

Manual methods create plant fragments. It's important to remove all fragments from the water to prevent them from re-rooting or drifting onshore. Fragments can root and form new plants. Plants and fragments can be composted or added directly to a garden.

Advantages

- Manual methods are easy to use around docks and swimming areas.
- The equipment is inexpensive.
- Hand-pulling allows the flexibility to remove undesirable aquatic plants while leaving desirable plants.
- These methods are environmentally safe.

Disadvantages

- As plants re-grow or re-colonize the cleared area from fragments, the treatment may need to be repeated several times each summer.
- Because these methods are labor intensive, they may not be practical for large areas or for thick weed beds.
- Even with the best containment efforts, it is difficult to collect all plant fragments. Most aquatic plants can re-grow from fragments.
- Some plants, such as water lilies which have massive rhizomes, are difficult to remove by hand pulling.
- Pulling weeds and raking stirs up the sediment and make it difficult to see remaining plants.
- Hand-pulling and raking disturbs bottom-dwelling animals.
- The V-shaped cutting tool is very sharp and must be used with great care.

Permits

The Washington State Department of Fish and Wildlife (WDFW) requires a permit called a Hydraulic Project Approval (HPA) for all activities taking place in the water including hand pulling, raking, and cutting of aquatic plants. The area is limited to a 10 foot swath near the dock for boating access for private landowners, however, public swimming areas and high use areas can also be kept clear. The booklet entitled “Aquatic Plants and Fish” (publication number APF 474777) serves as the HPA for the manual methods listed. The booklet is available as a free download from the WDFW website.

Costs

- Hand-pulling costs up to $130 for the average waterfront lot for a hired commercial puller. However, the costs can be significantly reduced if local landowners banded together and conduct the work themselves. Time and effort are the costs and limit the usefulness of this method.
- A commercial weed cutter costs about $130 with accessories.
- A commercial rake costs about $95 to $125. A homemade weed rake costs about $85 (asphalt rake is about $75 and the rope costs 35-75 cents per foot).

2.10.3 Physical or Environmental Manipulation Methods

2.10.3.1 Water Level Drawdown

Some aquatic plants can be effectively controlled when water bodies are dewatered by releasing water via a water level control structure (dam or weir) or by pumping. The effectiveness of control is determined by several factors including the amount of the water body bottom exposed, duration of exposure, presence of springs, and the weather

at the time of drawdown. The success or failure of drawdown in controlling plants can be highly variable from lake to lake and from year to year within the same water body. The impacts of fluctuating water levels are severe on a natural water body so this activity rarely occurs solely for milfoil control in Washington.

Water bodies suitable for water level drawdown are those with extensive infestations of milfoil or other plants and where drawdown occurs on a prolonged and regular basis. Because western Washington is so much wetter and milder than eastern Washington, drawdown is generally more successful in eastern Washington. Since milfoil survives in deeper water, drawdown will not totally eradicate milfoil from the water body. Generally water bodies with fluctuating water levels, such as reservoirs, are highly perturbed systems. Factors to consider when evaluating water level drawdown as a possible control for milfoil include:

- Presence of an outlet structure or the means to lower the water level;
- Amount of water body bottom exposed at different water levels;
- Timing of water withdrawal and return;
- Climate;
- Potential impacts to surrounding wetlands/emergent plants;
- Sediment type;
- Shoreline development;
- Species dependent on near-shore habitat;
- Endangered species and/or rare plants; and
- Sensitive areas (critical habitat).

Suitability for Eloika Lake

Water level drawdown is a technique that may be useful and was recommended as the best solution to the excessive plant growth (Soltero et al, 1988). Along these lines, a proposed engineering design has also been prepared (Durgin, 1994). Since the WRIA 55/57 currently is studying Eloika Lake as a potential water storage area for increased stream flow, drawdown may serve that additional purpose as well. Regarding inclusion in this plan, drawdown is a longer term possibility. Funding for such an endeavor may be difficult to secure and structure management should be overseen by an appropriate agency. The challenge of adjudicating the lake level would also have to be conducted.

The modified elevation levels of the lake necessary for aquatic plant control were estimated to be 4-6 feet and exceed the normal fluctuations of 3 feet. The County road and culvert lower the water level earlier in the year, so sustained higher water would be beneficial for changing the shoreline plants and potentially decreasing the aquatic plant growth in deeper areas of the lake (depending upon the turbidity of the lake). The reduced plant growth would reduce the internal nutrient recycling and gradually change the plant growth characteristics of the lake.

2.10.3.2 Installation of Bottom Barriers

Bottom barriers are semi-permanent “screening” materials laid over the top of plant beds, similar to using landscape fabric to suppress the growth of weeds in yards. In addition to controlling nuisance weeds around docks and in swimming beaches, bottom

screening has become an important tool to help eradicate and contain early infestations of noxious weeds such as milfoil. Pioneering or early infestation colonies that are too extensive to be hand pulled, can sometimes be covered with bottom screening material. For these projects, installers use burlap with rocks or burlap sandbags for anchors. By the time the screening material decomposes, the milfoil patches are dead as long as all the plants were completely covered.

Bottom screens can be installed by the home owner or by a commercial plant control specialist. Installation is easier in early spring after ice out before the plants start growing. It can be used on emergent species as well. Research has shown that much more fermentation gas (typically methane) is produced under bottom screens that are installed over the top of aquatic plants. These gases have a tendency to lift or bubble the barrier making it less successful at covering the plants and sometimes loosen the anchoring mechanism so that the barrier actually moves away. The less plant material that is present before installing the screen, the more successful the screen will be in staying in place. Bottom screens may also be attached to frames rather than placed directly onto the sediment. The frames may then be moved from one area to another allowing for control of a larger area with less material.

Advantages

- Properly installed bottom screens can control up to 100 percent of aquatic plants.
- Screen materials are readily available and can be installed by homeowners or by divers.

Disadvantages

- Because bottom screens reduce habitat by covering the sediment, they are suitable only for localized control.
- For safety and performance reasons, bottom screens must be regularly inspected and maintained.
- Machinery, fishing gear, propeller backwash, or boat anchors may damage or dislodge bottom screens.
- Improperly anchored bottom screens may create safety hazards for boaters and swimmers.
- Swimmers may be injured by poorly maintained anchors used to pin bottom screens to the sediment.
- Some bottom screens are difficult to anchor on deep muck sediments.
- Bottom screens interfere with fish spawning and bottom-dwelling animals.
- Without regular maintenance aquatic plants may quickly colonize the bottom screen.

Permits

Bottom screening in Washington requires hydraulic approval, obtained free from the Department of Fish and Wildlife. Check with your local jurisdiction to determine whether a shoreline permit is required.

Costs

Barrier materials cost $0.22 to $1.25 per square foot. The cost of some commercial barriers includes an installation fee. Commercial installation costs vary depending on sediment characteristics and type of bottom screen selected. It costs approximately $750 to have 1,000 square feet of bottom screen installed.

Suitability for Eloika Lake

The use of bottom barriers by local residents to control plants around individual swimming areas or near boat docks can be utilized on Eloika Lake. The limits and permitting are the same as mentioned above with manual techniques. Screening will be included as part of the education of the property owners. In some areas, the deep sediments will make the bottom barriers difficult to install, keep the barrier in place and maintain the barrier from sediment build up. This difficulty is amplified by winter ice and potential for the occurrence of “floating mats” as mentioned above.

2.10.4 Mechanical Control Methods

2.10.4.1 Cutting

Mechanical weed cutters cut aquatic plants several feet below the water's surface. Unlike harvesting, cut plants are not collected while the machinery operates. There are several versions of underwater weed cutters commercially available, including:

- Battery operated weed cutters
- Portable, boat-mounted cutting units
- Specialized barge-like cutting machines

Cutting is generally performed during the summer when plants are near the surface. All cut plants must be removed from the water body and this can be difficult and time consuming since the cutting machines have no mechanism to collect the plants mechanically.

Advantages of cutting:

- Results in immediate open areas of water.
- Can be targeted to specific locations, protecting designated conservancy areas from treatment.

Disadvantages of cutting:

- Plant material needs to be collected and many fragments are not collected.
- Temporary solution like mowing a lawn, it will probably need to be done repeatedly.

Suitability for Eloika Lake

The use of a mechanical cutter was not considered a possibility because the plant material would not be removed from the lake and therefore would add nutrients and decrease oxygen levels when the material decomposes.

2.10.4.2 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. Along with plants, harvesters also collect a large number of small fish and invertebrates. Amphibians and turtles have been known to be collected as well.

Advantages to Harvesting:

- Results in immediate open areas of water.
- Removing plants from the water removes the plant nutrients, such as nitrogen and phosphorus, from the system.
- Can be targeted to specific locations, protecting designated conservancy areas from treatment.

Disadvantages to Harvesting:

- Similar to mowing a lawn.
- Off-loading sites and disposal areas for cut plants must be available. On heavily developed shorelines, suitable off-loading sites may be few and require long trips by the harvester.
- Some large machinery is not easily maneuverable in shallow water or around docks or other obstructions.
- Many small fish and insects are often collected and killed by the harvester.
- Machines are expensive and require routine maintenance.
- Machinery may not be suitable for lakes with many bottom obstructions (stumps, logs) or for very shallow lakes (3-5 feet of water) with loose organic sediments
- Machinery brought into the water body from other locations need to be thoroughly cleaned and inspected before being allowed to launch. Otherwise new exotic species could be introduced to the water body.

Suitability for Eloika Lake

This as a possible option for Eloika Lake that could be used in selected areas, not the entire lake. Even though it may be costly, it may prove to be a useful tool in the long term control of the excessive plant growth near the surface of the lake.

2.10.4.3 Rotovation

Rotovators use underwater rototiller-like blades to uproot plants. The rotating blades churn seven to nine inches deep into the lake or river bottom to dislodge plant root crowns that are generally buoyant. The plants and roots may then be removed from the water using a weed rake attachment to the rototiller head or by harvester or manual collection. In some water bodies, rotovation can be used year-round to control plant growth. However, it is most effective in the winter and spring when plants have died back. Summer and fall rotovation usually requires the plants to be cut first since the longer plants wrap around the rototiller head, slowing the rotovation process.

Depending on plant density and sediment type, two to three acres per day can be rotovated. Because of the size of the equipment and high costs, rotovation is most suitable for use in larger lakes or in rivers. Because rotovation disrupts the sediment, it can create harmful environmental effects:

- Rotovation churns up the sediment causing water to become temporarily turbid with suspended sediments.
- Plant nutrients in the sediments, such as nitrogen and phosphorus, may be released into the water.
- Long-buried toxic materials in the sediment which may be present from land use activities such as boat building, storm water drainage, or combined sewage outfalls may be released into the water.
- Rotovation may interfere with fish spawning or migration.
- Where salmon runs are present, there is only a limited time window where rotovation is allowed to take place in Washington.

For these reasons, the Washington Department of Ecology, the Washington Department of Fish and Wildlife, and other agencies require permits for rotovation. Although rotovation is used in British Columbia, Canada and on the Pend Oreille River in Washington, rotovation has not become a popular method of plant control in other areas.

Advantages of Rotovation

- Results in immediate open areas of water.
- Removing plants from the water removes the plant nutrients, such as nitrogen and phosphorus, from the system.
- Can be targeted to specific locations, protecting designated conservancy areas from treatment.
- The effects of rotovation can last for two growing seasons; harvesting and cutting may need to be repeated several times during summer.

Disadvantages of Rotovation

- Similar to mowing a lawn.
- Off-loading sites and disposal areas for cut plants must be available. On heavily developed shorelines, suitable off-loading sites may be few and require long trips by the harvester.

- Some large machinery is not easily maneuverable in shallow water or around docks or other obstructions.
- Many small fish and insects are often collected and killed by the harvester.
- Harvesting, cutting and rotovation creates plant fragments which may increase the spread of invasive plant species throughout the water body.
- Machines are expensive and require routine maintenance.
- Machinery may not be suitable for lakes with many bottom obstructions (stumps, logs) or for very shallow lakes (3-5 feet of water) with loose organic sediments
- Machinery brought into the water body from other locations need to be thoroughly cleaned and inspected before being allowed to launch. Otherwise new exotic species could be introduced to the water body.

Permits

Rotovation in Washington requires hydraulic approval from the Department of Fish and Wildlife. Some Shoreline Master Programs may also require permits for these activities.

Costs

Costs per acre vary with numbers of acres cut/harvested/rotovated, accessibility of disposal sites to the harvested areas, density and species of the plants, and whether a private contractor or public entity does the work. Private contractors generally charge $500 to $800 per acre for harvesting and prices can be as high as $2,000 per acre for rotovation (if you can even find a contractor who has a rotovator). The purchase price of harvesters ranges from $35,000 to $110,000. Rotovators sell for $250,000. Cutting machines sell for under $20,000.

Suitability for Eloika Lake

Rotovation is not considered a viable option for Eloika Lake due to its many disadvantages, including costs and potential for environmental damage.

2.10.5 Biological Control Methods

2.10.5.1 Grass Carp

The grass carp, also known as the white amur, is a vegetarian fish native to the Amur River in Asia. Because this fish feeds on aquatic plants, it can be used as a biological tool to control aquatic plant growth. In some situations, sterile grass carp may be permitted for introduction into Washington waters. Permits are most readily obtained if the lake or pond is privately owned, has no inlet or outlet, and is fairly small. The objective of using grass carp to control aquatic plant growth is to end up with a lake that has about 20 to 40 percent plant cover, not a lake devoid of plants. In practice in Washington, grass carp often fail to control the plants or all the submersed plants are eliminated from the water body.

The Washington Department of Fish and Wildlife determines the appropriate stocking rate for each water body when issuing a grass carp stocking permit. Stocking rates for Washington lakes generally range from 9 to 25 fish (eight to eleven inch) per vegetated

acre. This number will depend on the amount and type of plants in the lake as well as spring and summer water temperatures. However, Fish and Wildlife generally err on the side of stocking the least amount of grass carp possible. To prevent stocked grass carp from migrating out of the lake and into streams and rivers, all inlets and outlets to the pond or lake must be screened. For this reason, residents on water bodies supporting a salmon or steelhead run are rarely allowed to stock grass carp into these systems.

Once grass carp are stocked in a lake, it may take from two to five years to control nuisance plants. Survival rates of the fish will vary depending on factors like presence of otters, birds of prey, or fish disease. A lake will probably need restocking about every ten years.

Success with grass carp in Washington has been variable. Sometimes the same stocking rate results in no control, control, or even complete elimination of all underwater plants. In 39 percent of the lakes, all submersed plant species were eradicated. It has become the consensus among researchers and aquatic plant managers around the country that grass carp are an “all or nothing” control option. Grass carp should be stocked only in water bodies where complete elimination of all submersed plant species can be tolerated.

Grass carp exhibit definite food preferences and some aquatic plant species will be consumed more readily than others. 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* (curly 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 watermilfoil) > *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).

Grass carp stocked into Washington lakes must be certified disease free and sterile. Sterile fish, called triploids because they have an extra chromosome, are created when the fish eggs are subjected to a temperature or pressure shock. Fish are verified sterile by collecting and testing a blood sample. Triploid fish have slightly larger blood cells and can be differentiated from diploid (fertile) fish by this characteristic. Grass carp imported into Washington must be tested to ensure sterility.

Because Washington does not allow fertile fish within the state, all grass carp are imported into Washington from out of state locations. Most grass carp farms are located in the southern United States where warmer weather allows for fast fish growth rates. Large shipments are transported in special trucks and small shipments arrive via air.

Here are some facts about grass carp:

Grass carp

- Are only distantly related to the undesirable European carp, and share few of its habits.
- Live for at least ten years and probably much longer in Washington waters.
- Will grow rapidly and reach at least ten pounds. Have been known to reach 40 pounds in the southern United States.
- Will not eat fish eggs, young fish or invertebrates, although baby grass carp are omnivorous.
- Feed from the top of the plant down so that mud is not stirred up. However, in ponds and lakes where grass carp have eliminated all submersed vegetation the water becomes turbid. Hungry fish will eat the organic material out of the sediments.
- Have definite taste preferences. Plants like Eurasian milfoil and coontail are not preferred. American waterweed and thin leaved pondweeds are preferred. Water lilies are rarely consumed in Washington waters.
- Are dormant during the winter. Intensive feeding starts when water temperatures reach 68° F.
- Is a river fish and tends to move from still waters into flowing waters.
- Are difficult to recapture if a water body has been overstocked.
- May not feed in swimming and boating areas or near docks and other sites where there is heavy human activity.

Advantages

- Grass carp are inexpensive compared to some other control methods and offer long-term control, but fish need to be restocked at intervals.
- Grass carp offer a biological alternative to aquatic plant control.

Disadvantages

- Depending on plant densities and types, use of grass carp may take several years to achieve plant control and, in many cases, invasive species control may not be achieved, and/or all submersed plants may be eliminated.
- The type of plants grass carp prefer may also be those most important for habitat and for waterfowl food.
- If the water body is overstocked, all submersed aquatic plants may be eliminated.
- Removing excess fish is difficult and expensive.
- If not enough fish are stocked, less-favored plants, such as Eurasian milfoil, may take over the lake.
- Stocking grass carp may lead to algae blooms.

- All inlets and outlets to the lake or pond must be screened to prevent grass carp from escaping into streams, rivers, or other lakes.

Permits

For Washington residents, a private fish stocking permit must be obtained from the Washington Department of Fish and Wildlife. Check with your Fish and Wildlife regional office to obtain a permit application. Also, if inlets or outlets need to be screened, a Hydraulic Project Approval application must be completed for the screening project.

Costs

In quantities of 10,000 or more, 8 to 12 inch sterile grass carp can be purchased for approximately $5.00 each for truck delivery. The cost of small air freighted orders will vary and is estimated at $10 to $20 per fish when including shipping costs.

Suitability for Eloika Lake

Grass carp were not considered a viable option for Eloika Lake for the following reasons: The inlet, streams and outlet would be difficult to install fish barrier controls; the size of the lake would require a very large number of fish; there is no desire to remove all the aquatic plants and the carp could disturb the sediments in the lake. In addition, it is unlikely that the WDFW would issue the permit needed to conduct this technique.

2.10.5.2 Milfoil Weevil

The milfoil weevil, *Euhrychiopsis lecontei*, has been associated with declines of milfoil (*Myriophyllum spicatum*) in the United States (e.g. Illinois, Minnesota, Vermont, and Wisconsin). Researchers in Vermont found that the milfoil weevil can negatively impact milfoil by suppressing the plants growth and reducing its buoyancy. In 1989, state biologists reported that Eurasian watermilfoil in Brownington Pond, Vermont had declined from approximately 10 hectares (in 1986) to less than 0.5 hectares. Researchers from Middlebury College, Vermont hypothesized that the milfoil weevil, which was present in Brownington Pond, played a role in reducing Eurasian watermilfoil. During 1990 through 1992, researchers monitored the populations of Eurasian watermilfoil and the milfoil weevil in Brownington Pond. They found that by 1991 Eurasian watermilfoil cover had increased to approximately 2.5 hectares (approximately 55-65 g/m^2) and then decreased to about 1 hectare (<15 g/m^2) in 1992. Weevil abundance began increasing in 1990 and peaked in June of 1992, where 3 - 4 weevils (adults and larvae) per stem were detected. These results supported the hypothesis that the milfoil weevil played a role in reducing Eurasian watermilfoil in Brownington Pond.

Another documented example where a major reduction of milfoil has been attributed to the milfoil weevil is in Cenaiko Lake, Minnesota. Researchers from the University of Minnesota reported a decline in the density of Eurasian watermilfoil from 123 g/m^2 in July of 1996 to 14 g/m^2 in September of 1996. Eurasian watermilfoil remained below 5 g/m^2 in 1997, then increased to 44 g/m^2 in June and July of 1998 and declined again to 12 g/m^2 in September of 1998. In contrast, researchers found that weevil abundance in Cenaiko Lake was 1.6 weevils (adults and larvae) per stem in July of 1996. Weevil

abundance, however, decreased with declining densities of Eurasian watermilfoil in 1996 and by September 1997 weevils were undetectable. In September of 1998 weevil abundance had increased to >2 weevils per stem.

Based on observations made by researchers in Vermont, Ohio and Wisconsin, it appears that having 2 weevils (or more) per stem is adequate to control Eurasian watermilfoil. However, as indicated by the study conducted in Cenaiko Lake, Minnesota, an abundance of 1.5 weevils per stem may be sufficient in some cases.

In Washington State, the milfoil weevil is present primarily in eastern Washington and feeds on both Eurasian and northern watermilfoil (*M. sibiricum*), the latter plant being native to the state. During the summer of 1999, researchers from the University of Washington determined the abundance of the milfoil weevil in 11 lakes in Washington. They found that weevil abundance ranged from undetectable levels to 0.3 weevils (adults and larvae) per stem. Fan Lake, in Pend Oreille County and has its outlet run into Eloika Lake, had the greatest density per stem at 0.6 weevils (adults, larvae and eggs) per stem. The weevils were present on northern watermilfoil. These abundance results are well below the recommendations made by other researchers in Minnesota, Ohio, Vermont, and Wisconsin, that is at least 1.5 - 2.0 weevils per stem in order to control Eurasian watermilfoil.

To date, there have not been any documented declines of Eurasian watermilfoil in Washington State that can be attributed to the milfoil weevil, although researcher Robert Creed speculated that declines of Eurasian watermilfoil in Lake Osoyoos and the Okanogan River may have been caused by the milfoil weevil.

Researchers in Minnesota have suggested that sunfish predation may be limiting weevil densities in some lakes. The latter may also be true in Washington State where sunfish populations are present in many lakes in the state, including those with weevils. In addition, other environmental factors that may be keeping weevil populations in check in Washington, but have yet to be studied, include over-wintering survival and habitat quality and quantity. Although the milfoil weevil shows potential as a biological control for milfoil, more research is needed to determine which factors limit weevil densities and what lakes are suitable candidates for weevil treatments in order to implement an effective cost and control program. Recent work by Jenifer Parsons at the Department of Ecology supports the Minnesota research which shows that the presence of sunfish like bluegill, crappie, perch, and pumpkinseed limit weevils. At this stage, using weevils for milfoil control is still experimental.

Suitability for Eloika Lake

The suitability of using weevils in Eloika Lake is possible in the future. At the present time, it is known that there are weevils in the lake though no study of the population or its effect on milfoil has actually been done. There are also many weevil predators. Anecdotally, the distribution of milfoil in Eloika appears to be less invasive and not forming a monoculture, as seen in other regional lakes lacking a native weevil population. Personal communications with a company specializing in this control

method discovered that the only means of increasing the weevil population would require a weevil breeding or production facility to be built. The cost and permitting was not offered by this company. The complete statement supplied by the company is in Appendix F. The other drawback to this technique is the constant fluctuations in the populations of the weevils and milfoil. When the milfoil levels decrease, the weevil population then decreases allowing for the milfoil population to increase. Following the milfoil population increase, the weevil population increases (or needs to be supplemented) causing the milfoil to decrease. This cycle gets repeated over time, so the level of milfoil control varies from year to year. This may be acceptable for some lakes but is not the preferred goal for Eloika Lake.

2.10.6 Chemical Control Methods

Aquatic herbicides are chemicals specifically formulated for use in water to kill or control aquatic plants. Herbicides approved for aquatic use by the United States Environmental Protection Agency (EPA) have been reviewed and are considered compatible with the aquatic environment when used according to label directions (See Appendix K for chemical label and Material Safety Data Sheets). However, some states, including Washington, also impose additional constraints.

Aquatic herbicides are sprayed directly onto floating or emergent aquatic plants or are applied to the water in either a liquid or pellet form. Systemic herbicides are capable of killing the entire plant. Contact herbicides cause parts of the plant in contact with the herbicide to die back, leaving the roots alive and able to re-grow. Non-selective, broad spectrum herbicides will generally affect all plants that come in contact. Selective herbicides will affect only some plants (often dicots - broad leafed plants like milfoil will be affected by selective herbicides, whereas monocots like curly leaf pondweed may not be affected). Most aquatic plants are monocots.

Because of environmental risks from improper application, aquatic herbicide application in Washington state waters is regulated and has the following restrictions:

- Applicators must be licensed by the Washington State Department of Agriculture.
- Because of a March 2001 court decision (9th Circuit District Court), applicants must obtain coverage under a discharge permit called a National Pollutant Elimination System Discharge (NPDES) permit before they can legally apply aquatic herbicides to the waters of the state.
- Ecology requires notification and posting before treatment and there are additional mitigations to protect rare plants or threatened and endangered species.

Ecology issued a "lake" NPDES general permit March 1, 2006 to cover the management of in-lake noxious weeds and native aquatic plants and algae. The Washington Department of Agriculture also has a general NPDES permit for the management of noxious weeds growing in wet areas such as freshwater wetlands, rivers, and estuaries.

For in-lake projects applicators and/or the state or local government sponsoring the project must obtain coverage under Ecology's Aquatic Plant and Algae Management NPDES permit before applying herbicides. For non-lake projects involving the treatment of noxious weeds in wet areas and estuaries, government sponsors and other entities can "contract" with the Washington Department of Agriculture under their NPDES permit for noxious weed control.

Aquatic Herbicides

Ecology currently issues permits for seven aquatic herbicides and two algaecides (as of 2006 treatment season) for aquatic plant treatment for lakes, rivers, and streams. Plant control in irrigation canals is covered under another permit. The chemicals that are permitted for use in 2006 under the Aquatic Plant and Algae Control Permit and the Noxious Weed Permit are:

Glyphosate

Trade names for aquatic products with glyphosate as the active ingredient include Rodeo®, AquaMaster®, and AquaPro®. This systemic broad spectrum herbicide is used to control floating-leaved plants like water lilies and shoreline plants like purple loosestrife. It is generally applied as a liquid to the leaves. Glyphosate does not work on underwater plants such as Eurasian watermilfoil. Although glyphosate is a broad spectrum, non-selective herbicide, a good applicator can somewhat selectively remove targeted plants by focusing the spray only on the plants to be removed. Plants can take several weeks to die and a repeat application is often necessary to remove plants that were missed during the first application.

Fluridone

Trade names for fluridone products include Sonar® and Whitecap®. Fluridone is a slow-acting systemic herbicide used to control Eurasian watermilfoil and other underwater plants. It may be applied as a pellet or as a liquid. Fluridone can show good control of submersed plants where there is little water movement and an extended time for the treatment. Its use is most applicable to whole-lake or isolated bay treatments where dilution can be minimized. It is not effective for spot treatments of areas less than five acres. It is slow-acting and may take six to twelve weeks before the dying plants fall to the sediment and decompose. When used to manage Eurasian watermilfoil in Washington, fluridone is applied several times during the spring/summer to maintain a low, but consistent concentration in the water. Granular formulations of fluridone are proving to be effective when treating areas of higher water exchange or when applicators need to maintain low levels over long time periods. Although fluridone is considered to be a broad spectrum herbicide, when used at very low concentrations, it can be used to selectively remove Eurasian watermilfoil. Some native aquatic plants, especially pondweeds, are minimally affected by low concentrations of fluridone.

2,4-D

There are two formulations of 2,4-D approved for aquatic use. The granular formulation contains the low-volatile butoxy-ethyl-ester formulation of 2,4-D (Trade names include AquaKleen® and Navigate®). The liquid formulation contains the dimethylamine salt of 2,4-D (Trade names include DMA*4IVM). 2,4-D is a relatively fast-acting, systemic, selective herbicide used for the control of Eurasian watermilfoil and other broad-leaved species. Both the granular and liquid formulations can be effective for spot treatment of Eurasian watermilfoil. 2,4-D has been shown to be selective to Eurasian watermilfoil when used at the labeled rate, leaving native aquatic species relatively unaffected. By court-order the butoxy-ethyl-ester formulation of 2,4-D can not be used in waters with threatened and endangered salmon-bearing waters in the Pacific Northwest.

Endothall

A trade name for the dipotassium salt of endothall is Aquathol®. Endothall is a fast-acting non-selective contact herbicide which destroys the vegetative part of the plant but generally does not kill the roots. Endothall may be applied in a granular or liquid form. Typically endothall compounds are used primarily for short term (one season) control of a variety of aquatic plants. However, there has been some recent research that indicates that when used in low concentrations, endothall can be used to selectively remove exotic weeds; leaving some native species unaffected. Because it is fast acting, endothall can be used to treat smaller areas effectively. Endothall is not effective in controlling Canadian waterweed (*Elodea canadensis*) or Brazilian elodea.

Diquat

A trade name for diquat is Reward®. Diquat is a fast-acting non-selective contact herbicide which destroys the vegetative part of the plant but does not kill the roots. It is applied as a liquid. Typically diquat is used primarily for short term (one season) control of a variety of submersed aquatic plants. It is very fast-acting and is suitable for spot treatment. However, turbid water or dense algal blooms can interfere with its effectiveness. Diquat was allowed for use in Washington in 2003 and Ecology collected information about its efficacy against Brazilian elodea in 2003. A littoral zone treatment in Battle Ground Lake in Clark County Washington in 2003 resulted in nearly complete removal of Brazilian elodea in that water body.

Triclopyr-TEA

A trade name for triclopyr is Renovate3®. There are two formulations of triclopyr. It is the TEA formation of triclopyr that is registered for use in aquatic or riparian environments. Triclopyr, applied as a liquid, is a relatively fast-acting, systemic, selective herbicide used for the control of Eurasian watermilfoil and other broad-leaved species such as purple loosestrife. Triclopyr can be effective for spot treatment of Eurasian watermilfoil and is relatively selective to Eurasian watermilfoil when used at the labeled rate. Many native aquatic species are unaffected by triclopyr. Triclopyr is

very useful for purple loosestrife control since native grasses and sedges are unaffected by this herbicide. When applied directly to water, Ecology has imposed a 12-hour swimming restriction to minimize eye irritation. Triclopyr received its aquatic registration from EPA in 2003 and was allowed for use in Washington in 2004.

Imazapyr

A trade name for imazapyr is Habitat®. This systemic broad spectrum, slow-acting herbicide, applied as a liquid, is used to control emergent plants like spartina, reed canarygrass, and phragmites and floating-leaved plants like water lilies. Imazapyr does not work on underwater plants such as Eurasian watermilfoil. Although imazapyr is a broad spectrum, non-selective herbicide, a good applicator can somewhat selectively remove targeted plants by focusing the spray only on the plants to be removed. Imazapyr was allowed for use in Washington in 2004.

Adjuvants

There are a number of adjuvants (surfactants, stickers, sinking agents) allowed for use under the NPDES permits. The Ecology webpage should be consulted for the latest permits for a list of the allowed products.

Algaecides

Endothall - Amine Salt

A trade name for the amine formulation of endothall is Hydrothol 191®. Hydrothol 191® is a rapidly acting non-selective contact herbicide or algaecide. In Washington Hydrothol 191® may only be used at very low concentrations for filamentous algae control or cyanobacteria control (blue-green algae) in selected waterbodies. Several treatments each season may be needed to control algae/cyanobacteria. Hydrothol 191® has a high acute toxicity to fish and must be used with extreme care. Because of fish impacts, Ecology does not allow concentrations higher than 0.2mg a.e./L of Hydrothol 191®. Unlike copper compounds that are also used for algae control, Hydrothol 191® does not accumulate in sediments and breaks down rapidly. There are water use restrictions associated with the use of Hydrothol 191® in Washington.

Peroxygen-based Granular Algaecide

Trade names include GreenClean® and Pak27®. These are peroxygen-based granular algaecides used for the prevention and control of algae in ponds, streams, irrigation systems, ornamental pools, and fountains. Areas being treated with these products must be closed to recreational activities during and for two-hours after treatment.

Copper Compounds

Copper compounds are no longer allowed for aquatic use in Washington state waters except under the NPDES permit for Irrigation Districts.

Advantages

- Aquatic herbicide application can be less expensive than other aquatic plant control methods, especially when used in controlling wide-spread infestations of state-listed noxious aquatic weeds.
- Aquatic herbicides are easily applied around docks and underwater obstructions.
- Washington has had some success in eradicating Eurasian watermilfoil, a state listed noxious weed, from some smaller lakes (350 acres or less) using aquatic herbicides.

Disadvantages

- Some herbicides have swimming, drinking, fishing, irrigation, and water use restrictions (check the label and general permit).
- Herbicide use may have unwanted impacts to people who use the water and to the environment.
- Non-targeted plants as well as nuisance plants may be controlled or killed by some herbicides.
- Depending on the herbicide used, it may take several days to weeks or several treatments during a growing season before the herbicide controls or kills treated plants.
- Rapid-acting herbicides like endothall and diquat may cause low oxygen conditions to develop as plants decompose. Low oxygen can cause fish kills.
- To be most effective, generally herbicides must be applied to rapidly-growing plants, although sometimes fall applications of perennial plants can also be effective..
- Some expertise in using herbicides is necessary in order to be successful and to avoid unwanted impacts.
- Many people have strong feelings against using chemicals in water. Find out what your neighbors think about chemical use before deciding to treat your water plants with herbicides.
- Some cities or counties may have policies forbidding or discouraging the use of aquatic herbicides. Check before hiring an aquatic herbicide applicator.

Permits

An NPDES permit is needed to apply any aquatic pesticide (including herbicides) to waters of the state. Some herbicide residue monitoring may be required and there is a permit fee for coverage under the Aquatic Plant and Algae Management permit. For aquatic plant or algae management in lakes (includes both noxious weeds and native plants and algae) apply to Ecology for coverage.

Aquatic Plant Permitting Contacts

Statewide Contact - (Permit administration and database management)
Jon Jennings
Phone: 360- 407- 6283
joje461@ecy.wa.gov

Statewide Contact - (Permit technical assistance)

Kathy Hamel
Phone: 360-407-6562
kham461@ecy.wa.gov

For noxious weed control in wet areas, estuaries, rivers, and lake shorelines (only) apply to the Washington Department of Agriculture to contract with them under their NPDES permit each treatment season. There is no permit or application fee to become a contractor under Agriculture's permit. However, the targeted weeds must be on the Washington's Noxious Weed List or on Agriculture's quarantine lists.

Costs of Herbicide Treatment
These costs are estimates and will vary from site to site depending on treatment rates, water depths, amount of notification needed, difficulty of access to the site, and other factors. Approximate costs for one acre herbicide treatment:

- Glyphosate: $300
- Fluridone: $900 -$1,000
- Endothall: $650
- 2,4-D: $300 to $600
- Diquat: $300 - $400
- Imazypyr: $800 to $1200

These costs are estimates and will vary from site to site depending on treatment rates, water depths, number of acres treated, logistics of the site, travel time for the applicator, etc.

<u>Suitability for Eloika Lake</u>
Herbicide treatments can be an effective short term strategy to deal with the invasive as well as native species in Eloika Lake. The recommended herbicides and species are as follows:

- Eurasian watermilfoil - 2,4-D &/or Triclopyr
- Purple Loosestrife - Glyphosate &/or Imazapyr
- Yellow Flag Iris - Glyphosate &/or Imazapyr
- Excessive Native Plants - Diquat
- Curly-leafed pondweed - Diquat (timing for species specific control)

2.10.7 Nutrient Inactivation

Nutrient inactivation is accomplished by adding a compound (or two) to the water that precipitates the phosphorus. Aluminum, iron, or calcium salts can inactivate phosphorus in lake sediments. Lake projects typically use aluminum sulfate (alum) to inactivate phosphorus. Alum may also be applied in small doses for precipitation of water column phosphorus. When applied to water, alum forms a fluffy aluminum hydroxide precipitate called a floc. As the floc settles, it removes phosphorus and particulates (including algae) from the water column (precipitation). The floc settles on the sediment where it forms a layer that acts as barrier to phosphorus. Phosphorus, released from the sediments, combines with the alum and is not released into the water to fuel algae blooms (inactivation). Algal levels decline after alum treatment because phosphorus levels in the water are reduced.

Suitability for Eloika Lake

The use of a lake-wide alum treatment would be an expensive and likely temporary (5 to 7 years) solution for nutrient reduction in Eloika Lake. Eloika Lake is shallow and the floc layer would have a high probability of being disturbed due to boating and other activities. Costs of alum application are primarily dependent on the form of alum used (wet or dry), dosage rate, area treated, equipment rental or purchase, and labor. Liquid alum has been used when large alum doses were needed. Treatment costs range from $280/acre to $700/acre ($450=approximate average) depending on the dosage requirements and costs to mobilize equipment (Wisconsin DNR, 2003).

2.10.8 New Technologies

There is a new type of technology that may prove worthwhile in Eloika Lake. The technique is to apply an enzymatic product (Mukk Busster™) to selected areas around the lake, especially near the shoreline. Though the product is known to have favorable results at reducing algae and aquatic plant growth, no data is available to predict if the product will be effective or actually reduce sediment layers as deep as those found in Eloika Lake. In an effort to test effectiveness, there was agreement between the ELA and Inland Water Pest Control & Consulting, LLC that a testing site would be beneficial (See Appendix J).

2.10.9 Aeration

Aeration is the pumping of air (or oxygen) through a pump and tubing system to specific (usually deepest) locations in the lake. On small ponds, this has been shown to be effective at mixing the water column and reducing the plant and algae growth in the pond. In small lakes, for example Wilderness Lake in Pend Oreille County, an aerator installed in the central area of the lake does affect a small area around the aerator plume that is less likely to have algae or aquatic plant growth. It does not prevent growth except in that localized area. On a larger scale, that includes a chemical injection, Newman Lake's Speece's cone has about the same result, a localized reduction in plant and algae growth within a small area around the discharge point of the apparatus.

Artificial circulation provides increased aeration and oxygen to a lake by circulating the

water to expose more of it to the atmosphere. Aeration systems are generally used in shallow water bodies. A number of artificial circulation systems can provide aeration including surface spray (fountains), paddlewheels, and air diffusers. Artificial circulation disrupts or prevents stratification and increases aerobic habitat. The effect of aeration on algae varies. Aeration does not necessarily decrease algal biomass, but may lead to fewer cyanobacterium (blue-green algae). Some cyanobacteria have gas vacuoles which allow them to regulate their position in the water column. By circulating the water, cyanobacteria may spend more of their time in the dark, reducing their competitive advantage over other kinds of algae. Internal loading of phosphorous may also decline if sediments remain oxygenated. When lake sediments lack oxygen, conditions exist to release phosphorus into the water.

Suitability for Eloika Lake

The use of an aerator on Eloika Lake would likely not be a useful restoration measure. Although there are aerators manufactured for shallow lakes and ponds, Eloika Lake is too large and shallow for aeration to be effective. Eloika Lake does not thermally stratify or at least not for a long enough period of time to allow for aeration to work (Soltero et al. 1988). Furthermore, this method has been shown to increase algal production.

2.10.10 Sediment Removal/Dredging

Heavy equipment or specialized hydraulic dredges can remove accumulated lake sediments to increase depth and to eliminate nutrient-rich sediments. Dredging may control rooted aquatic vegetation, deepen the water body, and increase lake volume. By removing nutrient-rich sediment, dredging may improve water quality. Some dredging drawbacks include re-suspension of sediments during the dredging operation and the temporary destruction of habitat. Large-scale dredging is extremely expensive due to equipment costs, permitting issues, and spoils disposal. Because of costs, dredging is typically done on a limited scale. Vancouver Lake in Washington was dredged in the early 1980's to help improve water quality. Although many shallow lakes may benefit from this method, the high expense of dredging limits its widespread use in most water bodies.

It is also possible to dredge parts of the lake and not the entire lake. Selective dredging could be used to deepen areas or open channels for boating access. Diamond Lake in Pend Oreille County is a good example. Two bays have been dredged, one around the perimeter of the bay only and the other bay completely removed sediments in the entire bay. The first bay was dredged around the perimeter about ten years ago and though aquatic plants are present in the deep channel that was formed, the channel remains as a boating access lane to the property owners there. The other bay, which was dredged completely about two years ago, is starting to show some aquatic plant growth where the dredging occurred. As a means of increasing the water depth for boating and other activities, these have been successful restoration management tools.

Suitability for Eloika Lake

This is one technique that may be looked at further. It may be possible for Eloika Lake to remove sediments in localized areas via dredging. The permitting required took one

group at Diamond Lake about 24 months to complete. The cost was approximately $15,000 per acre. The areas that may be the most beneficial (increasing depth of lake, improving fish habitat, improved swimming and boating activities) for dredging would have to be discussed with the regulatory agencies during the permitting process. However, it should be noted that the Department of Ecology does not fund dredging activities of any kind.

2.10.11 Shoreline Invasive Plants

Eloika Lake has three identified invasive shoreline plants; reed canarygrass, purple loosestrife, and yellow flag iris. Each of these plants can cause significant loss of habitat and are difficult to control and/or eradicate. A long-term management approach should be adopted and implemented by the Eloika Lake Association Members and local landowners.

Reed canarygrass (*Phalaris arundinacea* L.)

Reed canarygrass is considered native to North America and was introduced to agricultural areas to primarily control erosion (Anderson, 1961). It is a perennial grass that forms dense monotypic stands (Figure 2.15). It reproduces primarily through rhizomes but also has prolific seed production. It poses a major threat to wetland areas by eliminating native species and valuable habitat. Reed canarygrass can withstand many types of treatment including inundation, burning, and mechanical efforts.

Reed Canarygrass is not currently listed as a noxious weed in Spokane County.

However, control measures should be taken to manage established stands and prevent further spread.

FIGURE 2.15 Reed canarygrass
(Photograph courtesy of SCCD)

Mechanical efforts to control Reed canarygrass have been shown to be successful, but only when the culms were chopped just before or at anthesis (emergence of flowering parts). Individual treatments of plowing, cultivating, and mowing have not been shown to be particularly effective. If the rhizomes are chopped/broken and left, they will reproduce into new plants. The use of shade cloth (usually semi-opaque black plastic tarps) has also been known to reduce reed canarygrass stands, but not completely eradicate them (Apfelbaum and Rouffa 1987). Various methods of chemical control of Reed canarygrass have been tested and have shown varying degrees of success.

- Amitrol – effective on younger seedlings
- Glyphosate – effective on five to ten week-old seedling emergence
- Dalapon and Trichloracetic (TCA) has been shown to most effective when applied at anthesis.

In aquatic systems, short-term effects from herbicide use often include reduced dissolved oxygen, increased carbon dioxide, reduced pH, increased bacterial populations, changes in nutrient status, and changes in vegetation and faunal communities. Long-term effects depend on the persistence and toxicity of the herbicide (or surfactant or carriers) and the degree of habitat disturbance. Diquat, Paraquat, Dichlobenil, chlorthiamid terbutryne, and 2,4-D are recommended for use. Dalapon alone or in mixture with Paraquat or 2,4-D amine is efficient at canarygrass control for up to two years. However, only glyphosate (Rodeo®) is licensed for use in aquatic systems in Washington.

Suitability for Eloika Lake

Multiple long-term approaches to reed canarygrass should be utilized at Eloika Lake depending upon size of infestation. Some treatments, such as mechanical control may serve best in selected areas based on timing of cutting. Combined with chemical control applications, the species can be reduced and allow for native plants to re-establish.

Yellow flag Iris (*Iris pseudacorus* L.)

The following information is provided by The USDA-NRCS PLANTS Database, The King County Noxious Weed Program, Yellow Fag Iris BMP Sheet, and the Thurston County Yellow Flag Iris Fact/Prescription Sheet.

Yellow Flag Iris is listed as a Class B Designate noxious weed in Spokane County.

Containment and prevention of continued infestation of this species is a high priority.

Figure 2.16. Yellow Flag Iris
(Photograph courtesy of J.S. Peterson @ USDA-NRCS PLANTS Database)

Yellow flag iris is native to Europe and the Mediterranean (Figure 2.16). It is a popular garden plant and ornamental. It has been used to prevent erosion and is known for its uptake of metals and nutrients in wastewater treatment facility projects. Yellow flag iris is a perennial emergent plant that can invade and create dense monotypic communities

and reduce native habitats in wetland and lake margins. It can grow up to five feet tall and thrive in standing water.

Mechanical control of Yellow flag iris is effective if the entire plant can be removed. Rhizome fragments remaining in the soil will initiate new plants. Grazing has negligible effects and there are no currently known biological controls.

Yellow flag iris is susceptible to many different registered herbicide treatments. Glyphosate products such as Aquamaster® and Rodeo® have been shown to be effective in reducing Yellow flag iris (spot applications and stem injections are recommended). The following information is derived from a Thurston County Environmental Health Fact Sheet.

Spot or "wipe" applications are used to apply the herbicide directly on the target species and not the surrounding plants. Application of glyphosate products at a 2.5-5% solution in the fall has provided over 90% control of this species.

Hollow stem injection applications are conducted by first cutting the plant with clippers 8 to 9 inches about the root crown. A cavity needle is pushed into the stem and injects the plant with 0.5ml/stem of chemical. This method avoids spraying other plants, but may be useful for small areas of infestation.

Note: Based on the maximum annual use rate of glyphosate the combined total for all treatments must not exceed 8 quarts of this product per acre. At 0.5 mL per stem 8 quarts should treat approximately 15,000 stems. Products containing the active ingredient imazapyr (Habitat®, NuFarm Polaris®, etc), effectively control iris and are considered "moderate in hazard" by Thurston County's review process for the potential for chemical mobility and persistence. Applications of aquatic imazapyr products require a licensed applicator.

- Spot applications with imazapyr products are effective when the herbicide is sprayed directly onto the plants (avoid spraying other desirable plants). Spray each plant thoroughly on the stems and leaves enough to be wet but not dripping. Up to 100% control can be achieved if applied during fall with 1-1.5% solution.
- Do not use on areas where roots of desirable vegetation may extend and be exposed to potential injury.

Timing: Apply to actively growing foliage during the summer or fall before a killing frost. In general, fall treatments seem to be somewhat more effective than spring or summer. Bagging and disposing of mature seed heads is essential to reduce further spread of the species even with treatment.

Suitability for Eloika Lake

Wipe and spot applications or control of Yellow flag may be the best course of treatment

around the lake. A controlled approach is needed to reduce environmental harm and impacts to aquatic life and water quality. Treatment needs to be followed up with native plant restoration efforts.

Purple Loosestrife (*Lythrum salicaria L.*)

The following information is provided by The USDA-NRCS PLANTS Database, WDOE Invasive Plant Website, and Fact Sheet W-1132 (Revised) June 2004 from North Dakota State University, Rodney G. Lym, Professor of Plant Sciences.

Purple loosestrife, a beautiful garden plant with an aggressive nature, was first introduced into North America in the early 1800s. Purple loosestrife is a rhizomatous perennial forb introduced to North America from Eurasia and Africa. Wild infestations are associated with moist or marshy sites (Figure 2.17). The stems are erect (1.5 to 8 or more feet tall). The most identifiable characteristic of purple loosestrife is the striking rose to purple colored flowers. The flowers are arranged on a spike, which can be a few inches to 3 feet long.

Purple loosestrife is listed as a Class B Designate noxious weed in Spokane County.

Containment and prevention of continued infestation of this species is a high priority.

Figure 2.17. Purple Loosestrife
(Photograph courtesy of Gary A. Monroe @ USDA-NRCS PLANTS Database)

The most destructive impact of purple loosestrife invasions is on the ecology of aquatic sites. Purple loosestrife forms dense monotypic stands as it displaces native wetland plants. Under optimum conditions, a small isolated group of purple loosestrife plants can spread to cover aquatic sites in just one growing season. When purple loosestrife replaces native vegetation it also can displace wildlife. For example, songbirds do not consume the small hard seed. Muskrats use cattails to build their homes, and they show a preference for cattail over purple loosestrife for food. Waterfowl, especially ducks, avoid wetlands that have become dominated with purple loosestrife. In addition, overall waterfowl production decreases as suitable nesting habitat is eliminated. The plant's growth is generally too compact to offer cover, and cover may be as crucial to wildlife as food.

Spread of purple loosestrife is primarily by seed, but the plant can also spread vegetatively from stem cuttings. Research at NDSU has shown that seed viability of purple loosestrife growing in North Dakota wetlands ranged from 50 to 100 percent. With approximately 2.7 million seeds produced per plant, purple loosestrife has the potential to spread rapidly once established in an area.

Several methods are available for purple loosestrife control, including mechanical, biological, and chemical. The size and location of a specific infestation will determine the best control methods. In general, small infestations of a few plants can be controlled by digging, especially when plants are only a few years old. Larger infestations require treatment with herbicides and/or biological control agents.

Mechanical

Small infestations can be controlled by removing all roots and underground stems. It is difficult to remove all of the roots in a single digging, so monitor the area for several growing seasons to ensure that purple loosestrife has not regrown from roots or seed. This method is most useful on garden plantings or young infestations.

Dispose of plants and roots by drying and burning or by composting in an enclosed area. Take care to prevent further seed spread from clothing or equipment during the removal process. Removal of all plant material is important. Small segments of purple loosestrife stems can become rooted and reestablish the infestation.

Chemical

Herbicides can be used to control purple loosestrife in areas too large to be controlled by digging. Also, herbicides can be applied to individual plants selectively in landscape situations to prevent killing desirable plants. Infestations growing along streams or in marshy areas may require specialized equipment and application by trained professionals.

Rodeo or Roundup, various other trade names (glyphosate)

Glyphosate will provide good control of purple loosestrife when applied from July to early September. Many formulations of glyphosate are sold but only those labeled for aquatic use can be applied in or near water. For example, the Rodeo and Glypro formulations of glyphosate can be used in water. With the Rodeo or Glypro formulations, a nonionic surfactant approved for aquatic sites at 0.25% vol/vol must be added to the spray solution. Roundup and similar glyphosate formulations can be used to remove purple loosestrife from large plantings or infestations away from water. Glyphosate has no soil residual so it could be used to remove purple loosestrife located within an ornamental planting without having to dig in the flower bed. Best results have been obtained when glyphosate is applied as a 1 to 1.5% concentration (1 to 1.5 gallons glyphosate per 100 gallons of water) or (1.3 to 1.9 fl. oz./gallon of water) at bloom or shortly thereafter.

A variety of sprayers, including backpack sprayers and boat-mounted sprayers, can be used to control purple loosestrife in aquatic sites. Wick application is also effective but is labor intensive. Spray dye added to the tank may be useful to ensure uniform application to purple loosestrife with minimal herbicide applied to desirable plants.

Eliminating the entire vegetative cover will promote purple loosestrife seed germination, which can result in an increase in plant density rather than control. Since glyphosate does not provide residual control, treated areas will need to be monitored for regrowth from the roots or seedlings for several years. A 2,4-D formulation labeled for use near water applied as a 2% solution (2 gallons 2,4-D per 100 gallons of water) or (2.6 fl. oz./gallon of water) will prevent seedling establishment when applied in early fall or spring before the plants can establish perennial characteristics.

Garlon 3A (triclopyr)

Garlon is a selective broadleaf herbicide that will not kill cattail or other desirable monocot species. Important: Only Garlon 3A formulation is labeled for use in wetland sites. Minimize overspray to open water. See label for precautions for use near potable water intakes. Garlon will provide good to excellent purple loosestrife control when applied in the pre to early flower or late flower growth stages. Garlon should be applied as a 1 to 2% solution (1 to 2 gallons Garlon per 100 gallons of water or 1.3 to 2.6 fl. oz./gallon of water) and will provide some residual seedling control. Garlon can be applied in dryland sites but should not be used in landscapes or flower beds because soil residual of the herbicide may prevent establishment of other horticultural plants.

Regardless of the herbicide applied, the infested areas should be monitored to ensure that purple loosestrife does not reinfest from root or seed. Also, areas downstream from river or creek infestations and on all sides of a lake or pond infestation should be monitored for purple loosestrife seedlings.

Biological

There are three known bio-control insect species for purple loosestrife.

- *Galerucella pusilla* - a leaf-feeding beetle
- *Galerucella calmariensis* - a leaf-feeding beetle
- *Hylobius transversovittatus* - a root-mining weevil

In 1992 three beetles were released in Washington. Their damaging impact on purple loosestrife populations was evident in the Winchester Wasteway area of Grant County in 1997 and 1998. Biological control agents may provide the long term success in controlling this noxious weed.

Galerucella calmariensis and *G. pusilla* are both leaf-feeding chrysomelids. These beetles defoliate and attack the terminal bud area, drastically reducing seed production. The mortality rate to purple loosestrife seedlings is high. Evidence of *Galerucella* ssp.

damage are round holes in the leaves. Four to six eggs are laid on the stems, axils or leaf underside. The larvae feed constantly on the leaf underside, leaving only the thin cuticle layer on the top of the leaf. By 1996 populations of *Galerucella* ssp. visibly impacted purple loosestrife stands in the Winchester Wasteway.

Hylobius transversovittatus is a root-mining weevil that also eats leaves. This beetle eats from the leaf margins, working inward. The female crawls to the lower 2-3 inches of the stem then bores a hole to the pithy area of the stem where 1 -3 eggs are laid daily from July to September. Or, the female will dig through the soil to the root, and lay eggs in the soil near the root. The larvae then work their way to the root. *H. transversovittatus* damage is done when xylem and phloem tissue are severed, and the carbohydrate reserves in the root are depleted. Plant size is greatly reduced because of these depleted energy reserves in the root. The larvae evidence is the zig-zag patterns in the root.

Suitability for Eloika Lake

Purple loosestrife infestations around the lake appear to be confined to small areas at this time. Control of this species is a high priority and should be addressed immediately. Established stands should be eradicated through use of mechanical methods (pulling). Any roots missed will re-establish plants. New plants could then be addressed through tightly controlled chemical applications or continued rounds of pulling. Plant materials need to be properly disposed. Bio-control methods are typically utilized for large infestations and would not be applicable to Eloika Lake at this time.

3.0 PUBLIC INVOLVEMENT

A public meeting was scheduled and held in September, 2008. All the landowners and other potential stakeholders were invited. The other potential stakeholders consisted of the Kalispel Tribe, the Spokane Tribe, the WDFW, the SCCD and the WDOE. Of the twenty people that attended this meeting a steering committee of ten or so was formed. The steering committee had a series of meetings from October of 2008 through March 2009 that discussed the plant survey information, the plant control techniques and what educational material would be useful for Eloika Lake. The steering committee came to a general consensus for developing a strategic plan detailing the actions and responsibilities of local stakeholders and agencies (Table 4). The minutes of the steering committee meetings are shown in Appendix G.

The steering committee continued its efforts to inform and educate the local residents regarding aquatic weed management through workshops and development of educational materials. In 2009, the committee completed a Best Management Practices Booklet, A Common Aquatic Vegetation Brochure, and a new Eloika Lake Brochure. The ELA website information was updated and various articles were contributed to the local newspaper (Elk Sentinel). An Aquatic Weed Identification Workshop and Barbecue was held in 2009 and information was also presented at a booth during the annual Elk Days and Poker Paddle events. These and other efforts can be found in Appendix H.

FIGURE 3.1 Aquatic Weed ID Workshop

FIGURE 3.2 Kayak and Canoe Poker Paddle

4.0 THE INTEGRATED AQUATIC VEGETATION PLAN

TABLE 4: IAVMP Action Plan

Issue	Mgt Strategy	Action	Responsibility	Priority
Education	Short-term	Develop and build information kiosk	ELA and WDFW	1
		Develop Aquatic plant and fish booklet	ELA	2
		Plan and hold local workshops	ELA	2
		Develop and distribute shoreline booklet	ELA	2
		Develop various informational brochures	ELA	2
		Develop website information – maintain	ELA	3
	Long-term	Update brochure and kiosk information	ELA	1
		Continue workshops	ELA/local agencies	2
Eurasian watermilfoil control	Short-term	Chemical application	ELA, grant source	1
	Long-term	Monitoring and surveys	ELA, volunteers	3
		Chemical application	ELA, grant source	1
		Construct water control structure	ELA, grant source	2
		Augment weevil population	ELA, DNR,WDFW	3
Deep Sedimentation	Short-term	Enzymatic test/trial	IWPC, ELA	1
	Long-term	Selective dredging (high use/residential areas)	ELA, grant source	1
Shoreline Invasive Plants	Short-term	Purple Loosestrife control – mechanical/chemical	ELA, grant source	1
	Long-term	Yellow-flag iris and Reed canarygrass control	ELA, grant source	2
Excessive Native Plant & Algae Growth	Short-term	Land Use Mgt – BMPs, education	ELA	1
	Long-term	Chemical application – Watershield, Curly-leafed pondweed (high use areas)	ELA, grant source	1
		Construct water control structure	ELA, grant source	2
		Mechanical control - harvester	ELA, grant source	3
Funding	Short-term	Write grants (WDOE, RCO, others)	ELA, other agency	1
	Long-term	Form Lake Management District	ELA	2
		Form Flood Control or Sewer District	ELA	2

The following plan discusses both short and long term strategies or ideas that may be implemented depending upon funding, permitting and the willingness of the ELA to further the goals of this plan. It should be recognized that this plan can be added to or modified to more accurately reflect the changes in knowledge, technology or goals of the ELA.

As stated above, the areas for high levels of control were determined by comparing the usage areas and shoreline designations for the lake. In general the highest level of desired control intensity is near the shoreline and the area between the resort and the access area. Control intensity will be specific for each problem type.

4.1 Education

One of the elements expressed by the committee was to educate two main groups of people, the property owners and the recreational lake users. Usually the property owners are a subset of the lake users but it is reasonable to specifically address the property owners in addition to the lake users.

Two areas of concern were identified: aquatic plant identification and responsible lake and land use. To address the lake users, an information kiosk was constructed at the public access area. Signage or brochures on invasive species, aquatic plant identification, boating regulations and other information will be available at this location. The ELA is working with the WDFW on the design and information for this task. To target the property owners, workshops on plant identification and mapping will be conducted on an annual or biennial basis to maintain awareness and interest. Additional educational materials regarding EWM and other invasive species will be available and distributed. The ELA will coordinate efforts to continue collecting information on EWM and monitoring its locations for control purposes.

4.2 Control of Eurasian Water Milfoil (EWM)

For the short-term, the preferred control technique would be the use of selective aquatic herbicide such as 2,4-D (either amine or ester) to be applied by a licensed commercial applicator to the known locations of EWM. The applicator should include surveys, mapping and treatment reports to keep the ELA informed on the success of the applications. For the long-term, continued monitoring and surveying by the ELA can be used to determine if further chemical control is necessary. An optional long-term approach would be to augment the natural weevil population so that the level of EWM is kept within limits. The control area for EWM would be where-ever the milfoil is present.

An important aspect of any herbicide treatment involves the residents with water rights. Some residents may be exercising water rights from the lake for domestic use and/or irrigation. Before any herbicide treatment may be initiated, these landowners should be contacted and informed of the process. If the herbicide application poses any undue burden on their water right supply, then supplemental water should be provided to them to compensate any loss of use during application period.

4.3 Deep Sedimentation

The strategy for this problem is partially dependent upon the enzymatic test mentioned above. If this specific technique is feasible, then the landowners would have an option for reducing the sediment at least near the shoreline and docks. If this technique is not feasible, the long-term recommendation would be selective dredging in high use residential areas.

4.4 Excessive Aquatic Native Plant Growth and Algae Control

This is the most difficult task in the short term. One part will be the education of the land owners on best management practices (BMPs) for developing and living on a shoreline. The education would include development, landscaping, buffer zones, erosion prevention, product uses, septic tank maintenance and appropriate control techniques (and limits) permitted by the WDFW booklet, Aquatic Plants and Fish (APF). Information on BMPs will be developed into a simple document similar to the Washington Lake Booklet (WDOE) with guidelines and recommendations for Eloika Lake. The booklet will include the preservation of the tributary streams from potential non-point sources such as run-off, road development, buildings, trails and maintaining vegetative buffers along the streams.

The BMP booklet will be distributed along with the APF booklet to all the property owners, especially those that are residential. It is hoped that participation in the plant workshops mentioned will provide for distribution and understanding of these documents.

Under this plan, the high use areas; residential, public access and public swim areas would be considered high intensity control areas. It is possible to use chemical controls in the short term in these areas as long as small areas are done. Watershield (Brasenia) is a top priority and should be treated at the same time as EWM.

It is important to keep the balance of algae to plants. Treating large areas of plants could possibly cause the recycling of nutrients into an algae bloom, which would be worse than the plant problem. Also, large changes in the plant population may affect the fishery that exists there. So the use of this technique would be limited to small areas, not large ones.

Curly-leafed Pondweed populations appear to be minimal at this time (.5 acre) and contained near the public boat launch. It may be a priority to keep this population in check and eradicate it if possible. Turions and plant fragments can be carried on boats, trailers, motors and fishing gear from one water body to another, thus proper prevention techniques are essential to curb the spread of this aquatic invasive. Curly-leaf pondweed can spread rapidly. Long-term management requires the reduction or elimination of turions to interrupt the lifecycle. This plant can be controlled by chemical (diquat, endothall), mechanical/manual methods, fall drawdown and dredging are also effective.

Overall, the long term strategy for the lake has two possibilities, one is the water level control structure and the other is a harvester. The water level control structure would need permanent (more than 20 years) managing and financing. This strategy has an appeal to many at this time for various reasons. It would be a drastic change for the aquatic and shoreline vegetation. If this path is chosen, the requirements and potential changes are beyond the scope of this IAVMP. The harvester could be used in the high use areas and since most of the plant fragments are removed from the lake, the potential for algae blooms would be less than with chemical treatment. The harvester may also find a use in removing the floating mats of plants and sediment mentioned by the landowners. Eloika Lake appears to have a rapid lowering of water levels during the spring with water levels falling 12 to 18 inches between May and June. The rapid decline in water level coupled with the growth of the aquatic plants places the plants on the surface much earlier in the year than most other lakes. A harvester could remove the upper meter of aquatic plants in late spring. This would allow the harvester to cover more area per day. However, it is costly to operate and maintain the equipment.

4.5 Shoreline Invasive Plants

Three shoreline invasive plants were identified around the perimeter of the lake (Reed canarygrass, Yellow flag iris, and Purple loosestrife). Some were not identified as

noxious weeds in Spokane County, but it is strongly recommended that control measures are taken to reduce existing stands and prevent further spread. An adaptive plan to eradicate these species should be further developed. The plan should address the following:

1. The control/eradication of the existing plants and rhizome system.
2. Exhaust the seed bank.
3. Plant restoration implementation as needed.
4. Prevention of new seeds or stem fragments from entering the watershed.

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APPENDIX A

Mammals and Birds Common to Eloika Lake Watershed

MAMMALS COMMON TO THE STUDY AREA: (Not an all inclusive list)

Beaver	Red squirrel
Muskrat	Northern flying squirrel
Mink	Least chipmunk
Ermine	Yellow pine chipmunk
Long-tailed weasel	Black bear
Raccoon	White tailed deer
Porcupine	Coyote
Striped skunk	Washington ground squirrel
Snowshoe hare	Cottontail rabbit
Bats	Otters
Mice	Voles
Moles	

MAMMALS SEEN INFREQUENTLY:

Moose	Mountain lion
Bobcat	Elk

OTHER SPECIES SEEN IN STUDY AREA:

Frogs	Bull frogs	Toads	Turtles
Garter snakes	Rubber boas	Salamanders	Crawdads

BIRDS COMMON TO THE STUDY AREA: (Not an all inclusive list)

Great Blue heron	Canada Goose
Red-necked grebe	Mallard
Wood duck	Canvasback
Green-winged teal	Pintail
Redhead	American coot
Common Goldeneye	Bufflehead
Osprey	Red-tailed hawk
Coopers hawk	American kestrel
American Bald eagle	Great horned owl
Western gull	Killdeer
Belted kingfisher	Common nighthawk
Ruffed grouse	Spruce grouse
Blue grouse	Pileated woodpecker
Common flicker	Red-breasted nuthatch

Violet-green swallow	Tree swallow
Calliope hummingbird	Allen’s hummingbird
Red-winged blackbird	Yellow-headed blackbird
American crow	American robin
Steller's jay	Gray jay
Mountain chickadee	Black-capped chickadee
Oregon junco	American goldfinch
Varied thrush	Cedar waxwing
Western bluebird	Black-billed magpie
Western meadowlark	Winter wren
Sparrows	Evening grosbeak
Turkeys	California bobwhite quail
Turkey vultures	Downey Woodpecker
Owl (multiple species)	Raven
Quail	American White Pelican
Common Loon	Cormorant
Common merganser	Hooded Merganser
Pied –Billed Grebe	American Bittern (less common now)
Snow Geese (migrant)	Trumpeter Swans
Northern Shoveler	Ring-necked duck
Lesser Scaup	Harlequin
Ruddy Duck	Chinese ring-necked pheasant

APPENDIX B

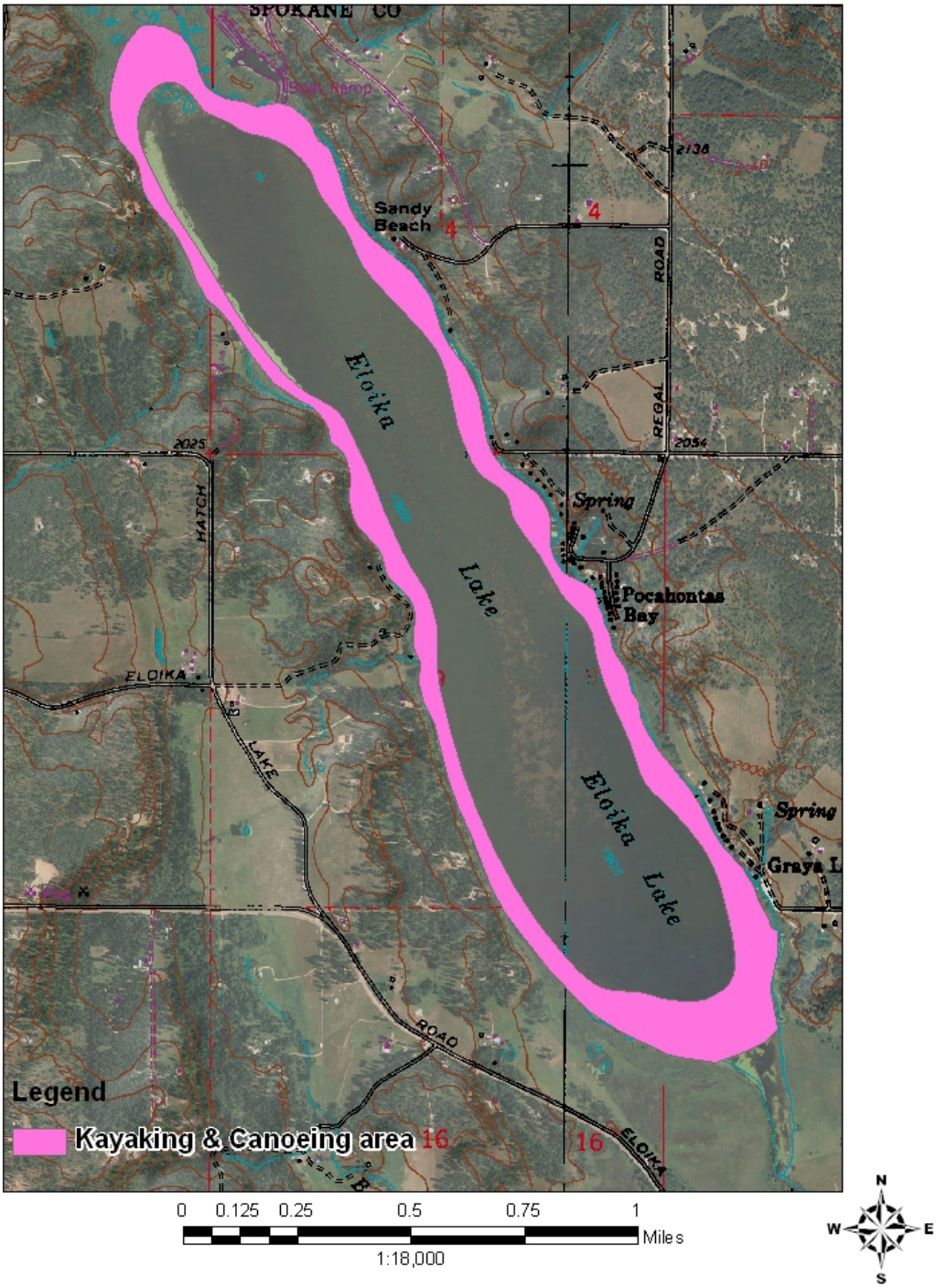
Eloika Lake Surface Water Rights (source: Spokane County).

DOCUMENT NUMBER	DOCUMENT TYPE	PURPOSE LIST	DATE PERMIT ISSUED		PRIORITY DATE	CFS	ACRE FEET
S3-29289	CERTIFICATE	IR·DS·	13-Apr-93		10-Sep-92	0.02	2
S3-21461CWRIS	CERTIFICATE	DS·	28-May-74		12-Jul-73	0.02	2
S3-21757CWRIS	CERTIFICATE	IR·	18-Nov-74		18-Sep-73	0.02	1
S3-21759CWRIS	CERTIFICATE	DS·	06-Nov-74		18-Sep-73	0.02	2
S3-22827CWRIS	CERTIFICATE	RE·DS·	17-Jan-75		22-Mar-74	0.01	1
S3-24047CWRIS	CERTIFICATE	IR·	07-Mar-79		09-Nov-74	0.01	1.6
S3-26687CWRIS	CERTIFICATE	DS·	12-Jan-82		03-Oct-80	0.01	1
S3-26789CWRIS	CERTIFICATE	DS·	13-Nov-81		27-Jan-81	0.01	1
S3-27475CWRIS	CERTIFICATE	IR·DS·	06-Dec-84		15-Feb-83	0.02	2
S3-28205CWRIS	CERTIFICATE	DS·	22-Jul-87		12-May-86	0.022	1
S3-28766CWRIS	CERTIFICATE	DS·	18-Jun-91		25-Apr-90	0.02	1
S3-29007CWRIS	CERTIFICATE	DS·	30-Apr-92		07-May-91	0.015	2
S3-113244CL	CLAIM/L	IR					

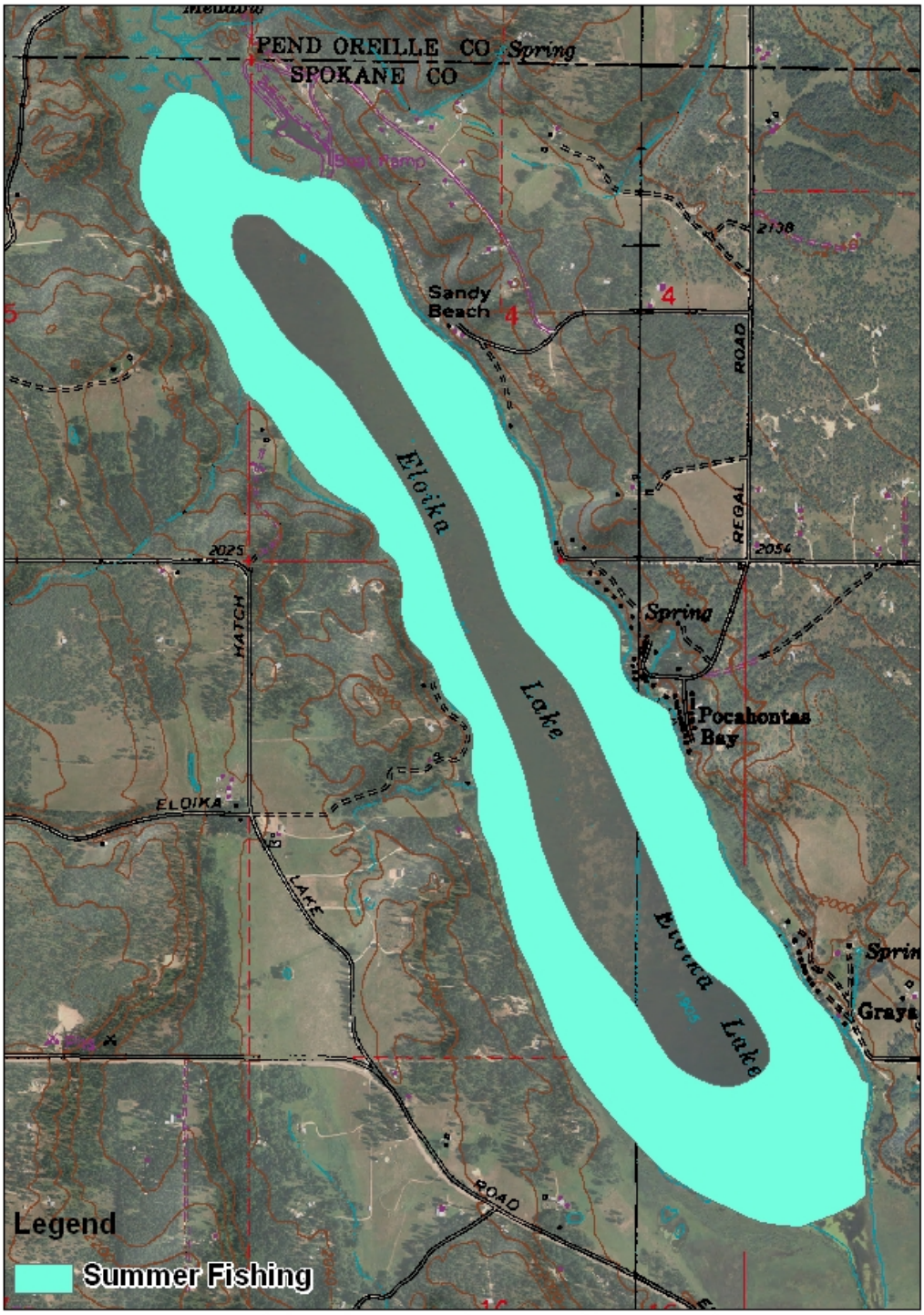
APPENDIX C

Eloika Lake Beneficial Use Maps

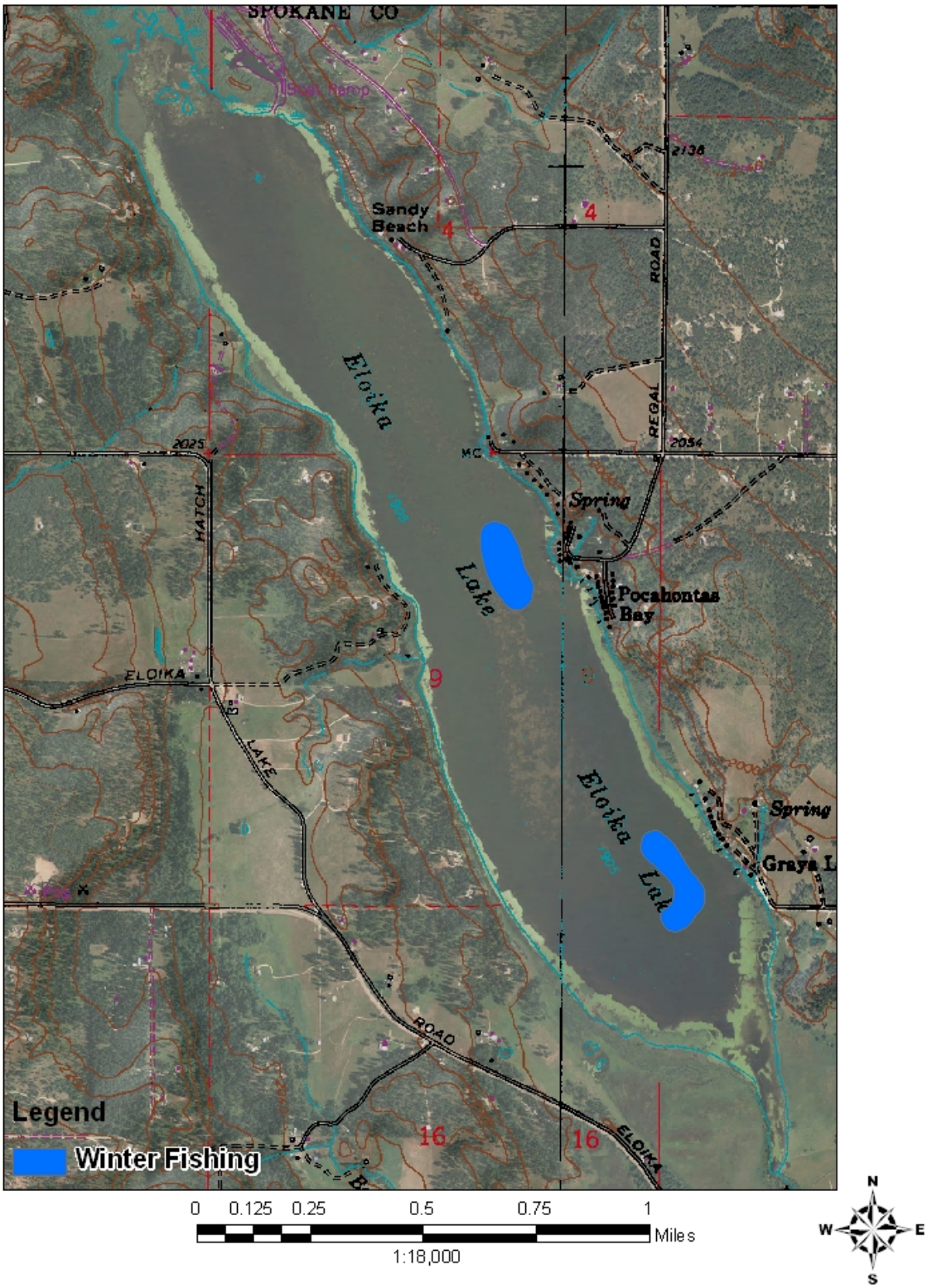
Eloika Lake Kayaking / Canoeing



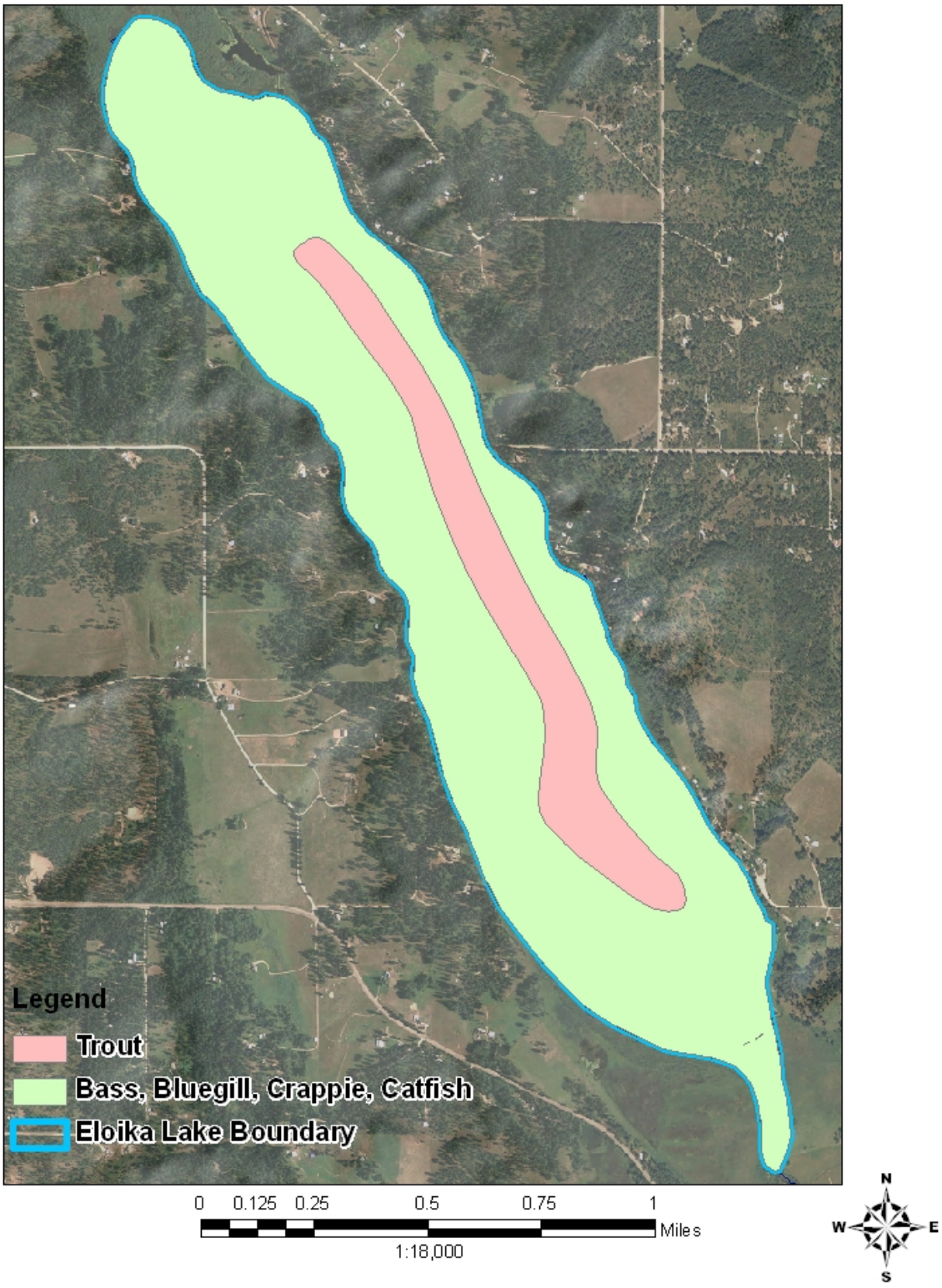
Eloika Lake Summer- Fishing



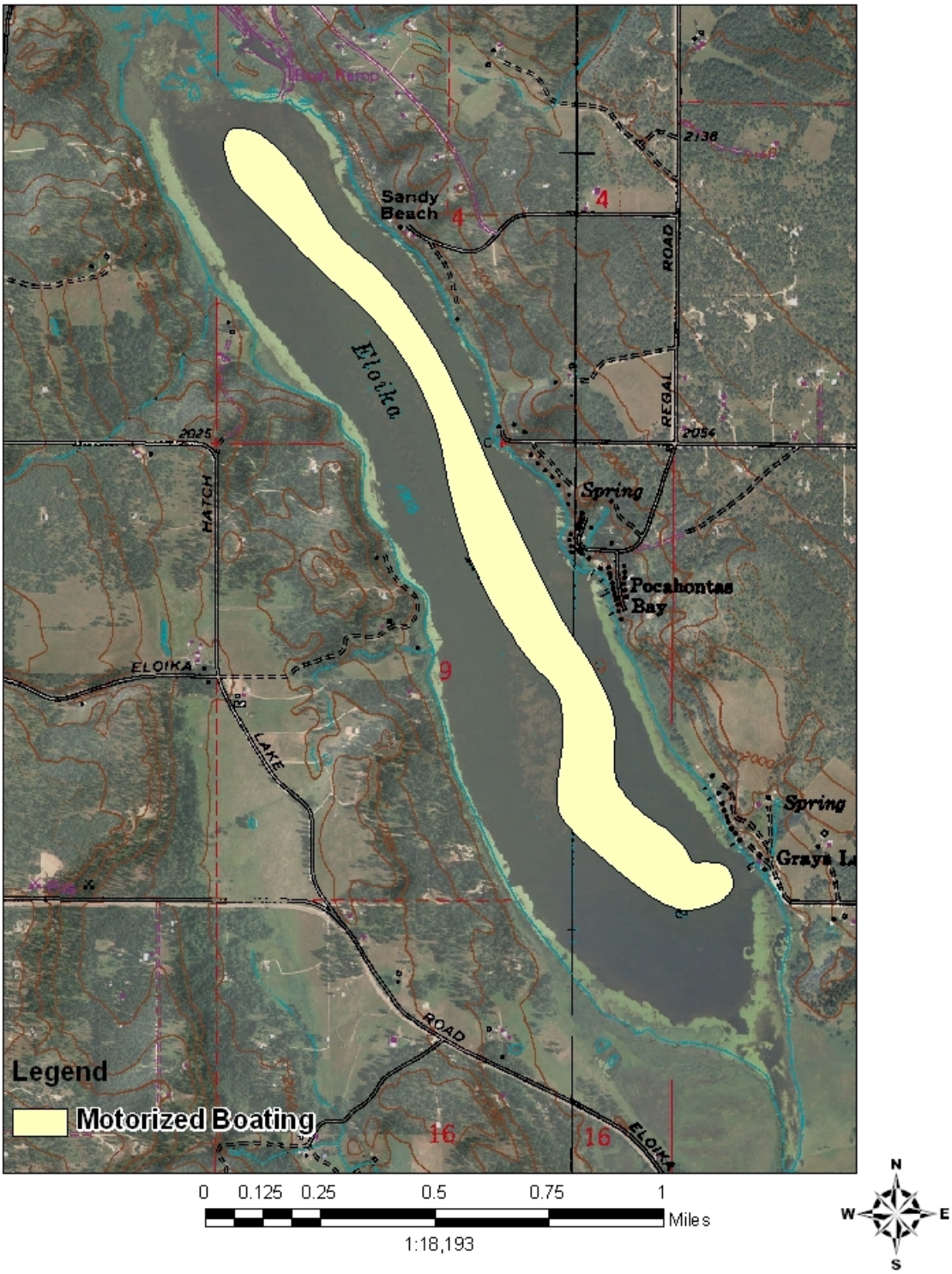
Eloika lake Winter- Fishing



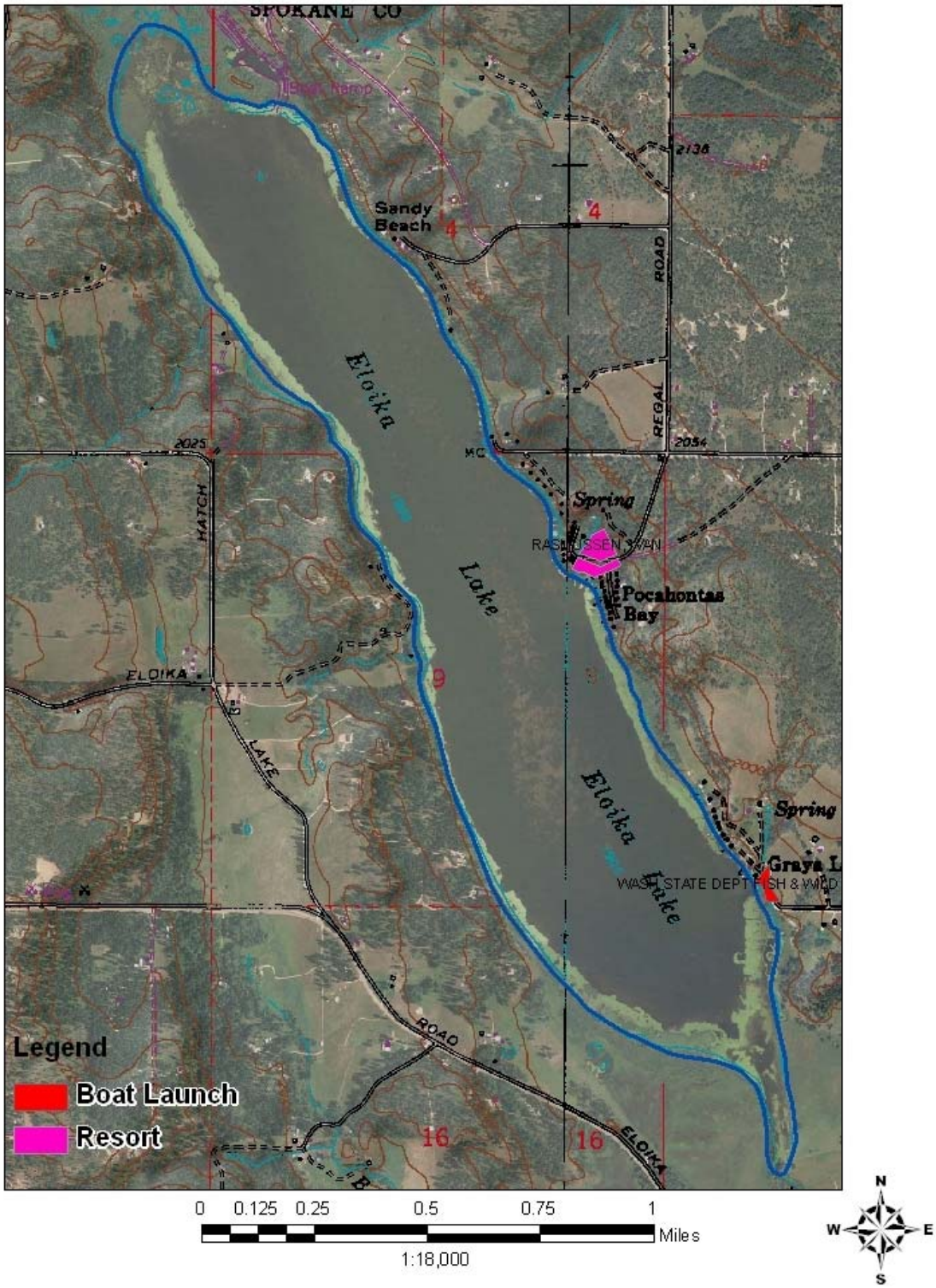
Eloika Lake Fisheries & Aquatic Life



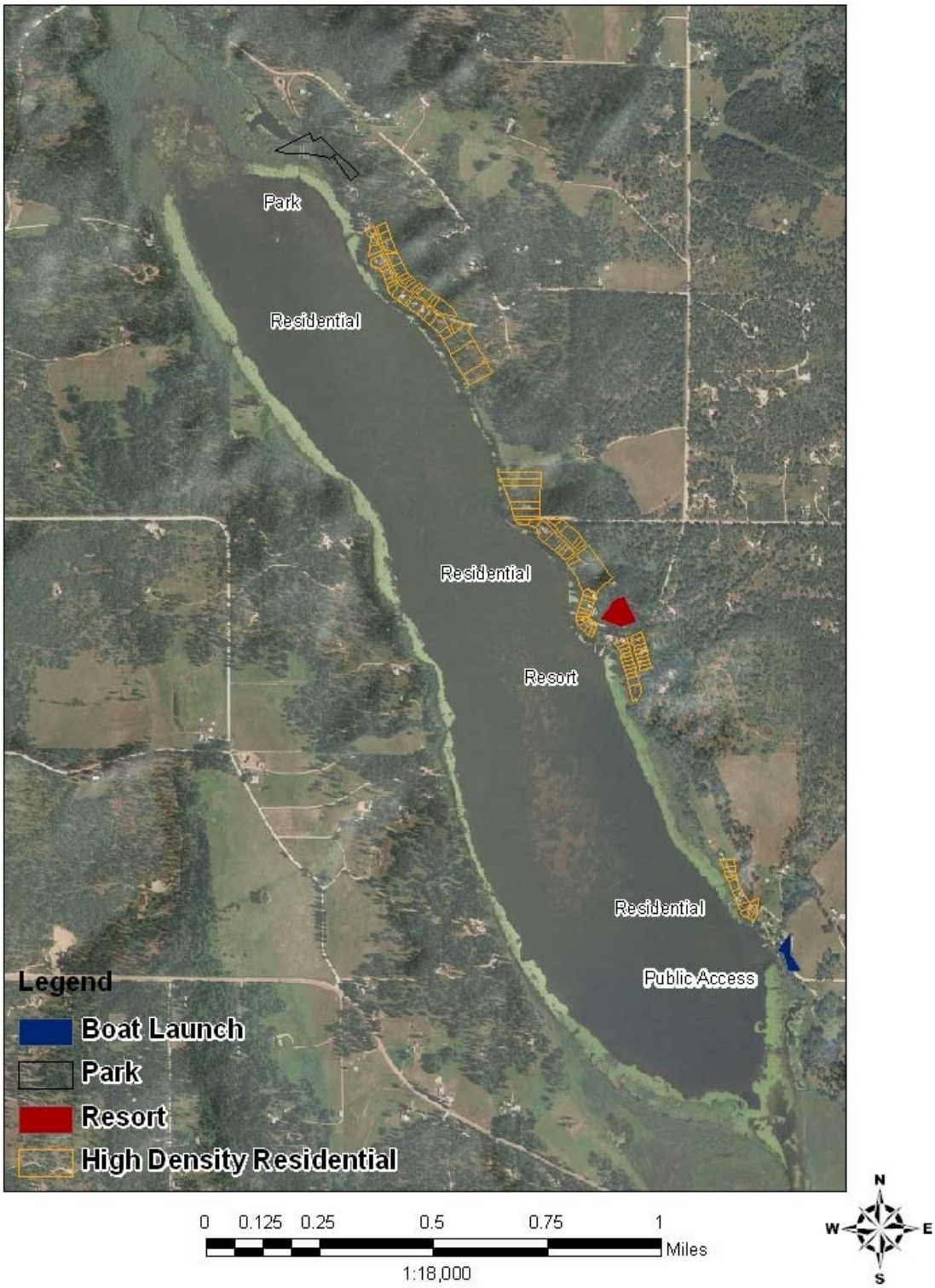
Eloika Lake Motorized Boating



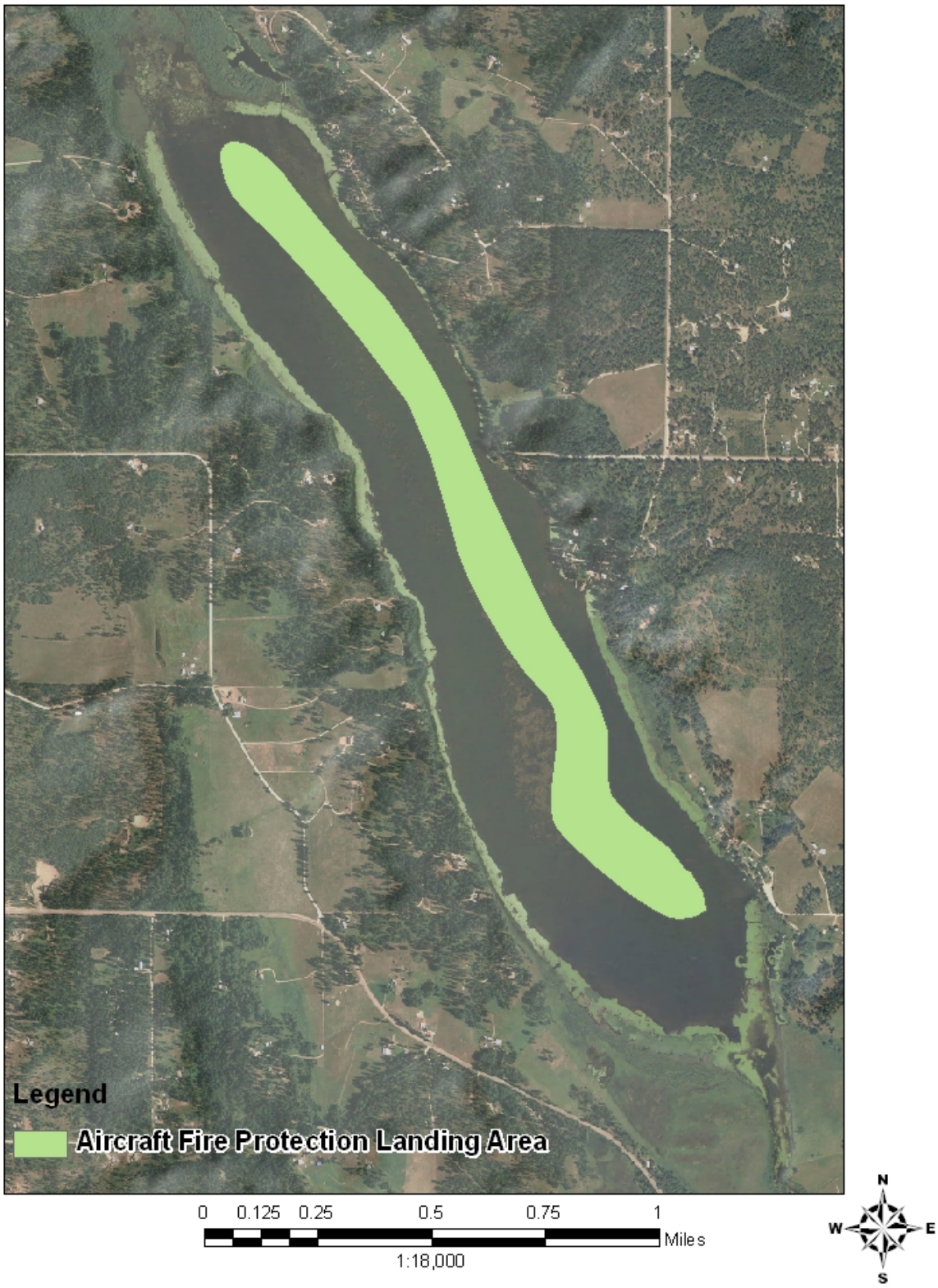
Eloika Lake Public Access



Main Features of Eloika Lake

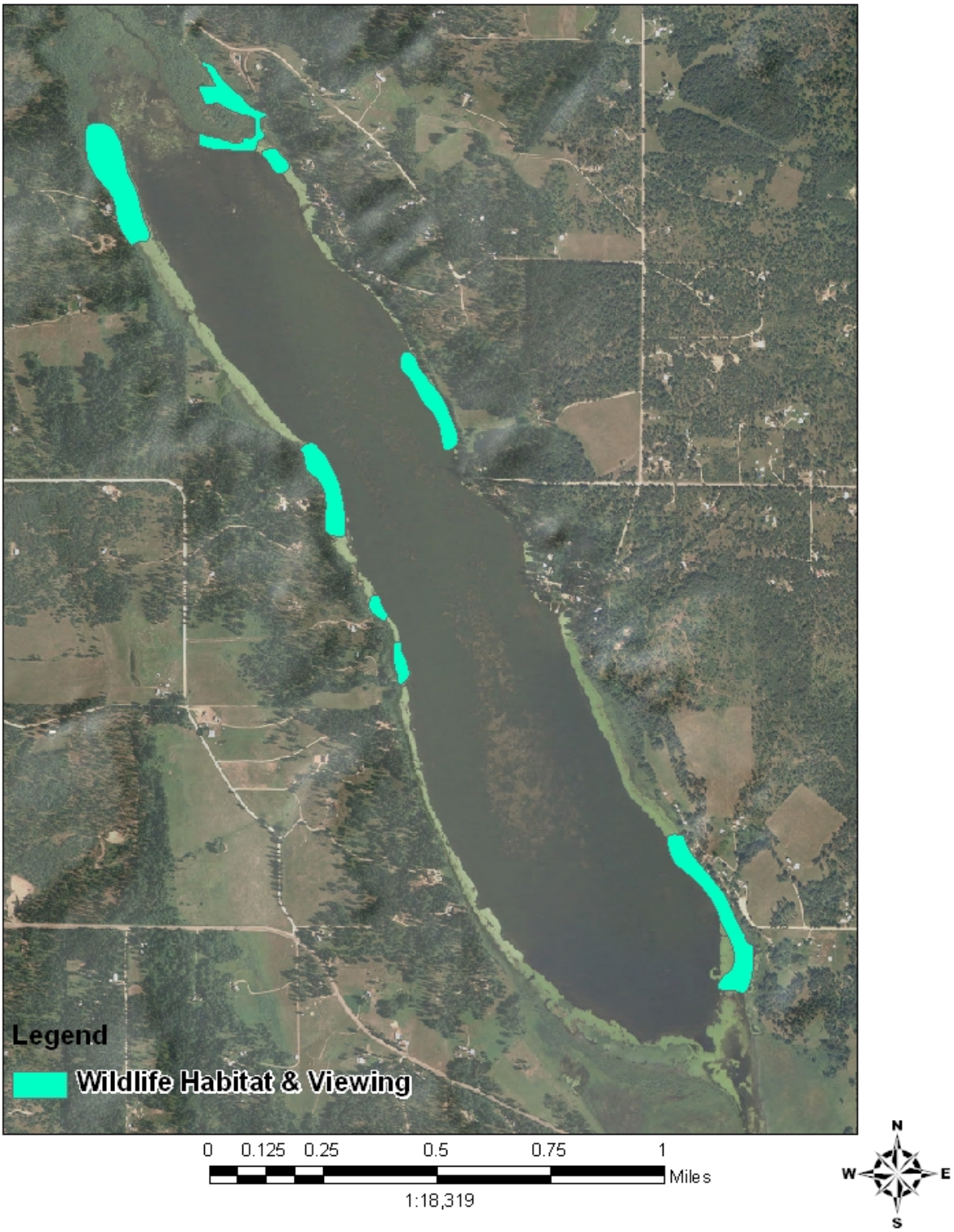


Eloika Lake Fire Protection Landing Area



Great Blue Heron Rookery

Eloika Lake Wildlife Habitat & Viewing Areas



APPENDIX D

2008 Eloika Lake Aquatic Plant Survey Report
conducted by IWPCC.

An Aquatic Plant Survey of Eloika Lake Conducted in September, 2008

Submitted as part of the development of an integrated aquatic vegetation management plan grant by Inland Water Pest Control & Consulting, LLC.

October 31, 2008

INTRODUCTION

The aquatic plant population of Eloika Lake has been studied in previous years. The data indicate species lists and prevalence but no general mapping has been shown in recent years. The following plant survey was conducted to determine which aquatic species are present and their distribution. The survey also included identifying the invasive species that are present in the lake. The results are to be used in the development of an aquatic vegetation management plan for Eloika Lake.

METHODOLOGY

Eloika Lake was sampled on September 5 & 8 of 2008 by traversing the lake in a boat on approximately 200m intervals. Along each transect line; 3 to 5 points were sampled so that a rough grid pattern (200m intervals) was established. At each sampling point, a GPS marker or waypoint was collected on a Garmin handheld GPS. These data points were then transferred to DeLorme XMap software and are shown in Figure 1. Also at each point; a rake-toss sample was collected and the plants were identified by genus and species. In addition, the relative frequency of each species was noted on the datasheet. There were ten categories used during this survey. During this sampling procedure comments on the shoreline species and other notes of invasive species were added under the comment column of the data sheet.

At total of 112 points were sampled. The relative frequency of each species at each point is shown in Appendix 1. Some minor adjustments were made from the field data so that each sample point had 100% as a total frequency. The relative frequencies were then summated and divided by the total to yield an approximate percentage of each plant species found.

RESULTS

In addition to the Eurasian Watermilfoil identified on the data sheet, there were some areas on the north and south shorelines of the lake that had some yellow flag iris, *Iris pseudacorus,* and there were a few small plants identified as curly-leafed pondweed, *Potamogeton crispus* found next to the boat launch. These two species are mentioned because they are invasive species. During some discussion with the lake residences, purple loosestrife, *Lythrum salicaria* was also considered to be present though this was not noted in the survey.

For each species noted on the datasheet, the presence of that species was indicated for each of the waypoints. The resulting maps of the species locations are shown in figures 2 thorough 10. In order to more easily visualize the growth patterns throughout the lake, the plants are grouped as emergent, floating or submersed. The results are shown in Figure 11. The pattern has been filled between the waypoints and shows the lake as being entirely littoral. This fits with the data since only two sample points noted that no plants were found.

TABLE 1: Tabulated Results of the data showing species and rating.

SPECIES	RELATIVE PERCENTAGE	RANK
Fern leafed pondweed *Potamogeton robbinsii*	30.5	1
Coontail *Ceratophyllum demersum*	18.2	2
White stemmed pondweed *P. praelongus*	14.3	3
Watershield or dollar pads, *Brasenia schrebri*	13.5	4
Plant-like algae *Nitella sp.*	6.4	5
Eurasian Watermilfoil *Myriophyllum spicatum*	5.6	6
Common waterweed *Elodea canadensis*	4.8	7
Bladderwort *Utricularia vulgaris*	3.2	8
Spatterdock *Nuphar polysepa*	2.1	9
Unknown pondweed	1.4	10

The shoreline plants are pre-dominantly reed canary grass, though some cattails and bulrushes were also present. The timing of the survey made it difficult to distinguish the plants from the boat. The shoreline plants were not thoroughly identified though cattails and yellow flag irises were noted.

The shallow shoreline area of the lake is predominated by spatterdock (*Nuphar*) and/or watershield (*Brasenia*). These two species form a band that extends from the shoreline out 30 or more feet in places. Some Eurasian Watermilfoil was also found in these areas though not in all of the sample points. Extending into the deeper water, Eurasian watermilfoil was found in up to 6 feet of water, usually as the dominant plant. As the water depth increased, the aquatic plant species shifted to native plants, usually fern-leafed pondweed, white-stemmed pondweed and coontail. It should be noted that in the northeastern channel (mined area) that duckweed and filamentous algae were noted. As a side note, there was a small area of excessive algae (localized algae bloom) at the boat launch on the first day of the survey.

Comparison to previous plant surveys will be discussed in the management plan.

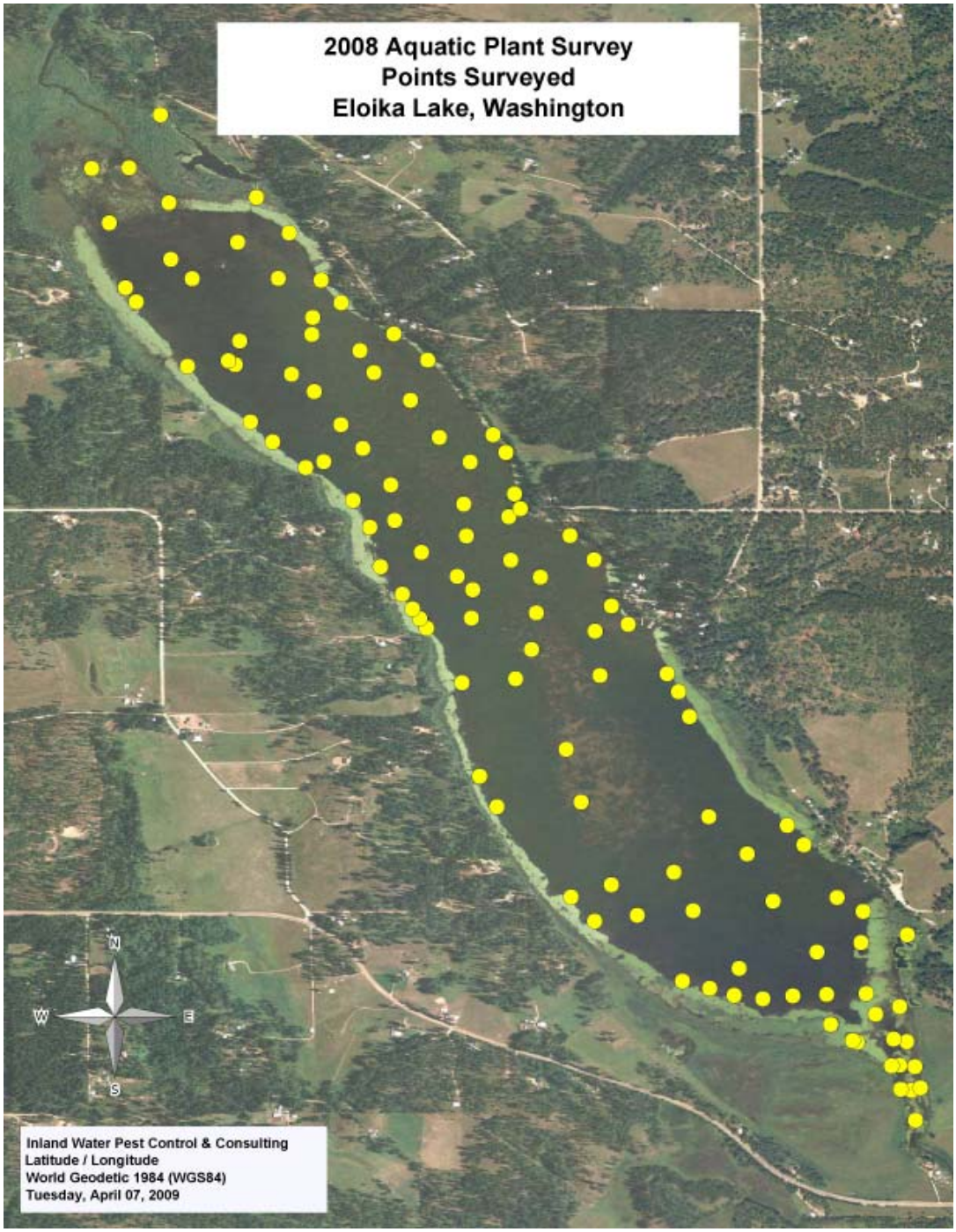


FIGURE 1: SAMPLE LOCATIONS on ELOIKA LAKE

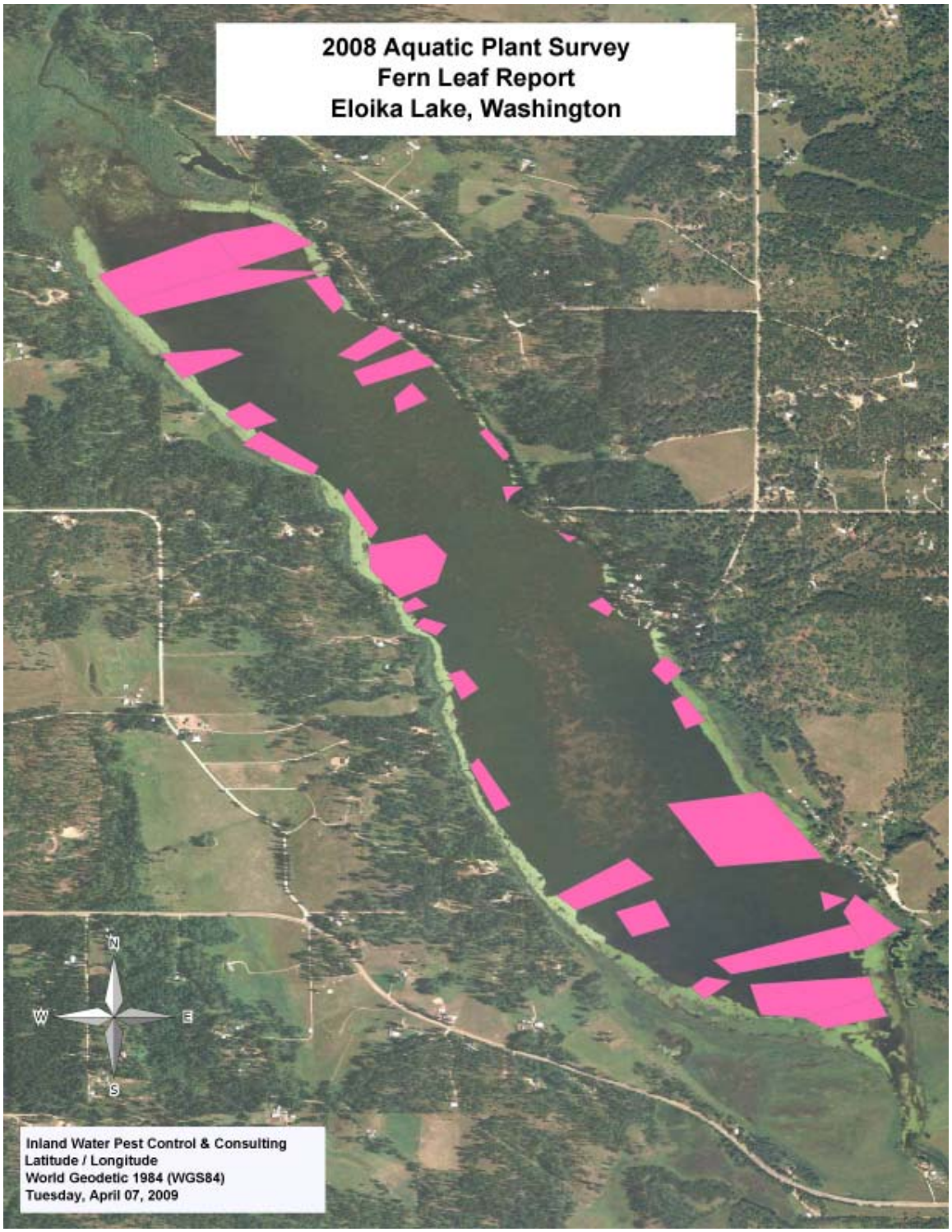


FIGURE 2: LOCATIONS of FERN LEAFED PONDWEED on ELOIKA LAKE

FIGURE 3: LOCATIONS of COONTAIL in ELOIKA LAKE

FIGURE 3: LOCATION of WHITE STEMMED PONDWEED in ELOIKA LAKE

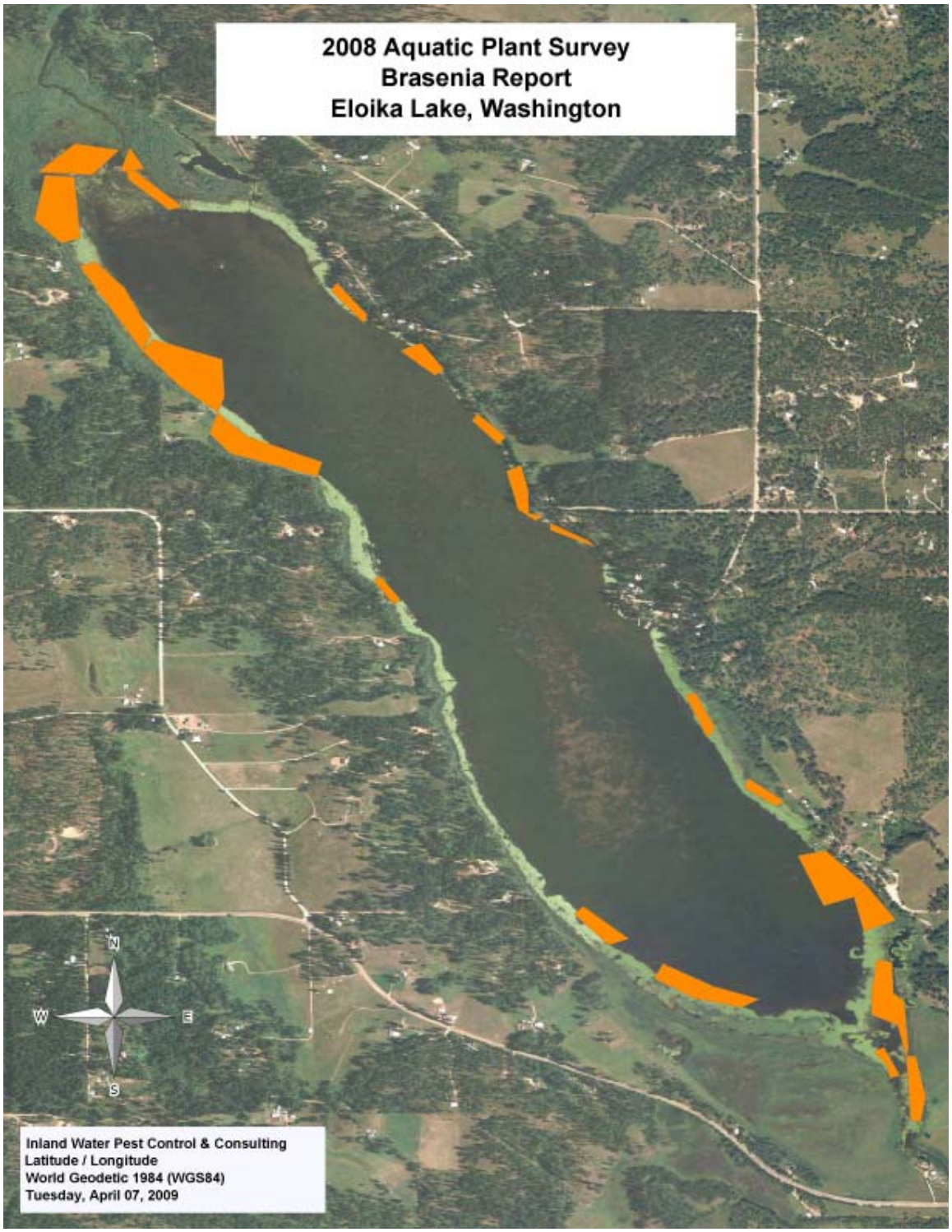


FIGURE 4: LOCATION of WATERSHIELD on ELOIKA LAKE

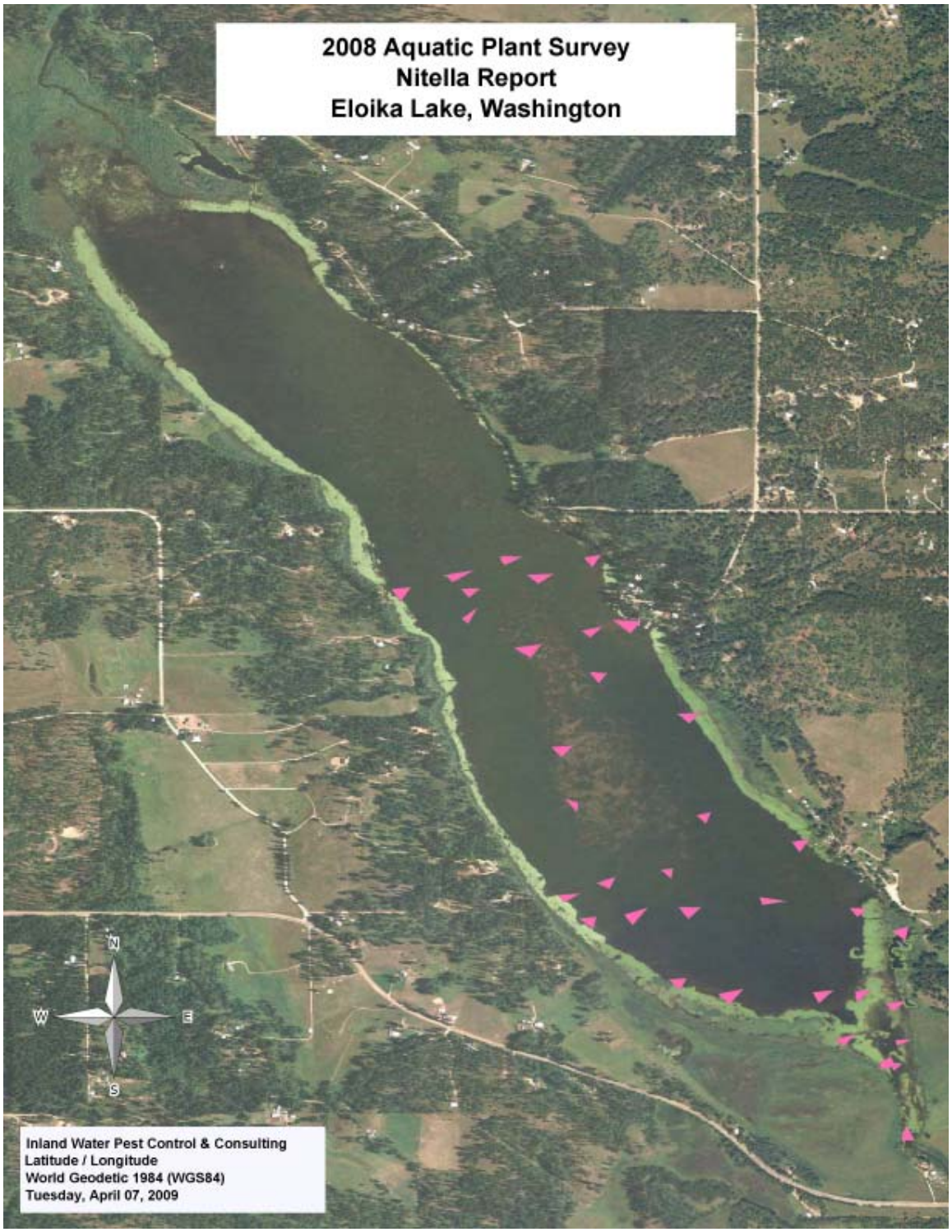


FIGURE 5: LOCATION of NITELLA sp on ELOIKA LAKE

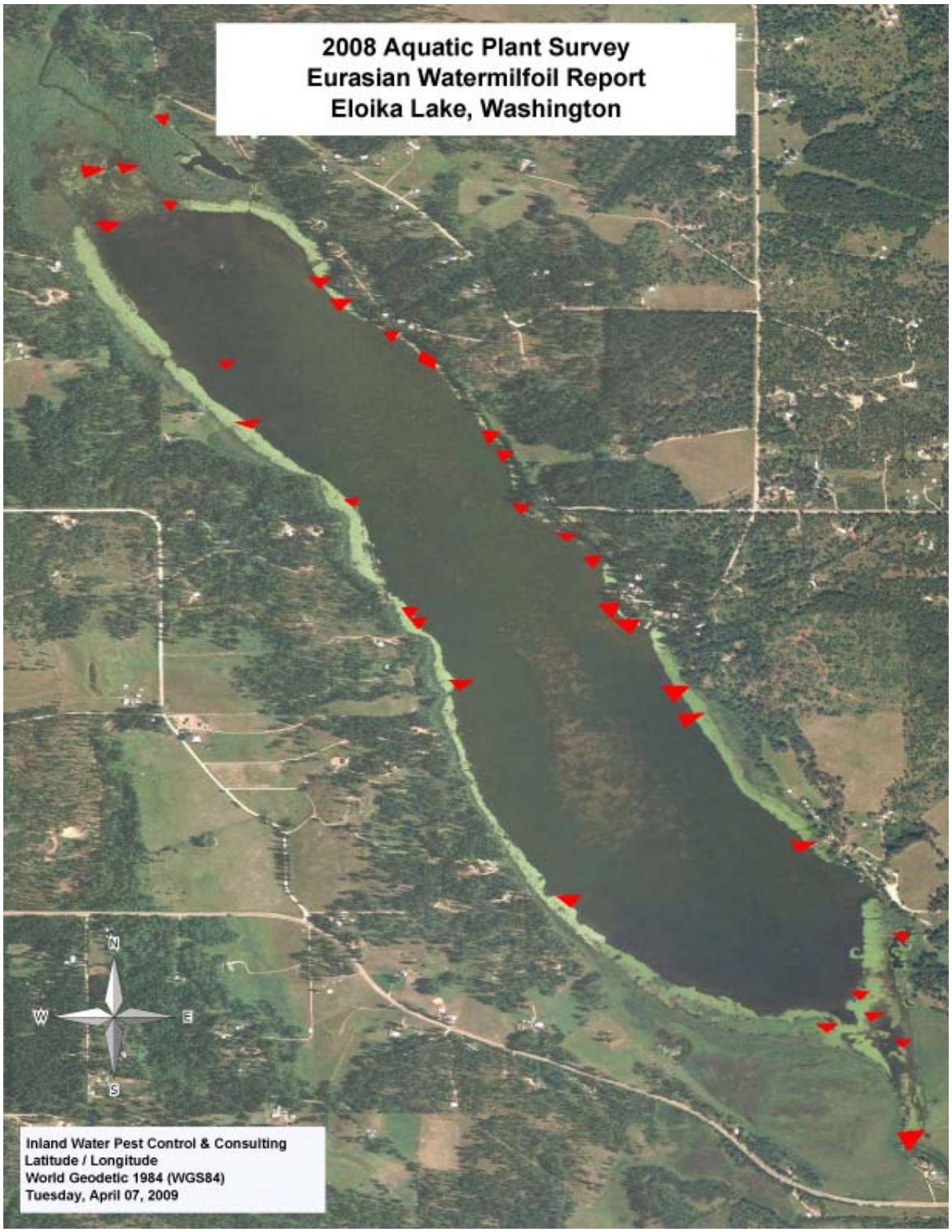


FIGURE 6: LOCATIONS of EURASIAN WATERMILFOIL in ELOIKA LAKE

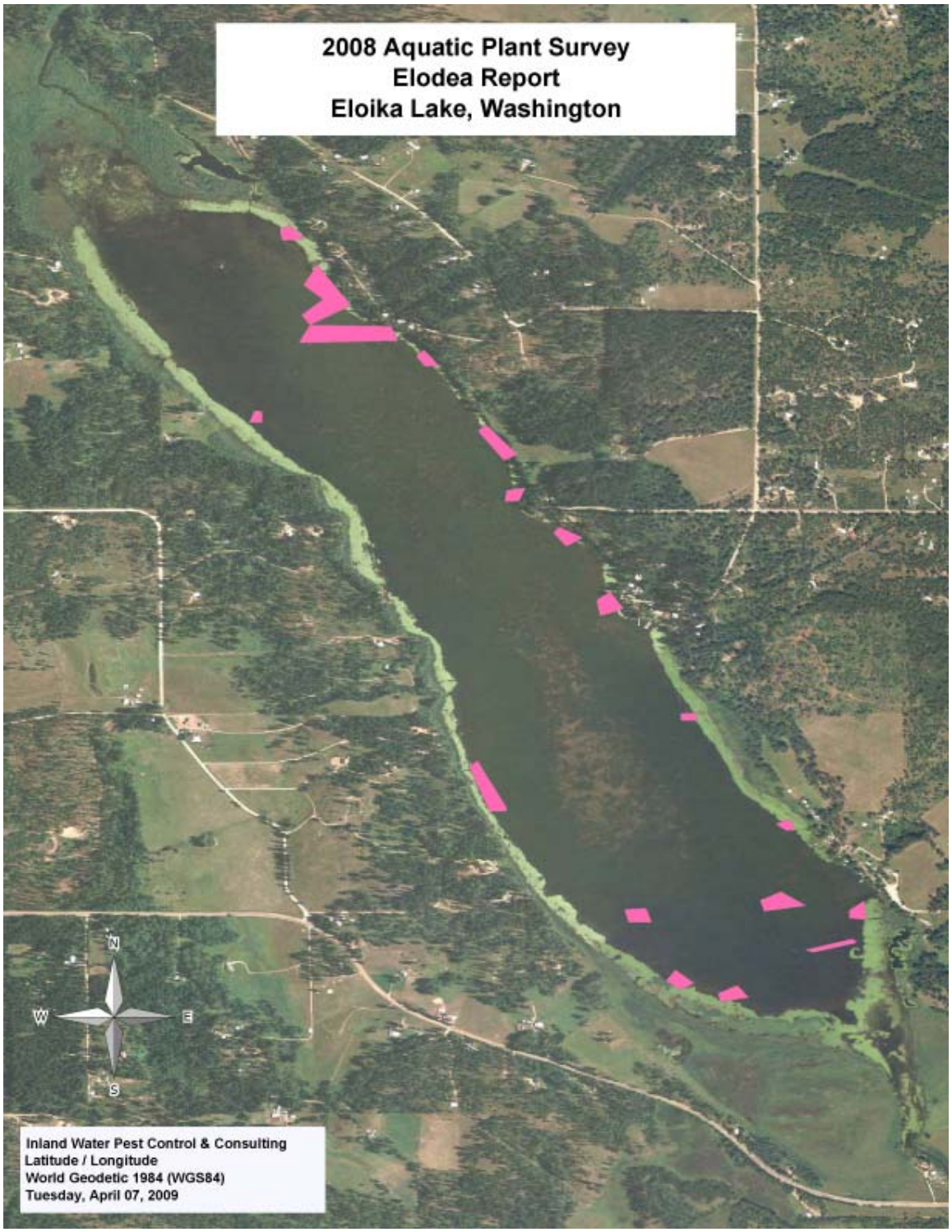


FIGURE 7: LOCATIONS of COMMON WATERWEED (*Elodea)* in ELOIKA LAKE

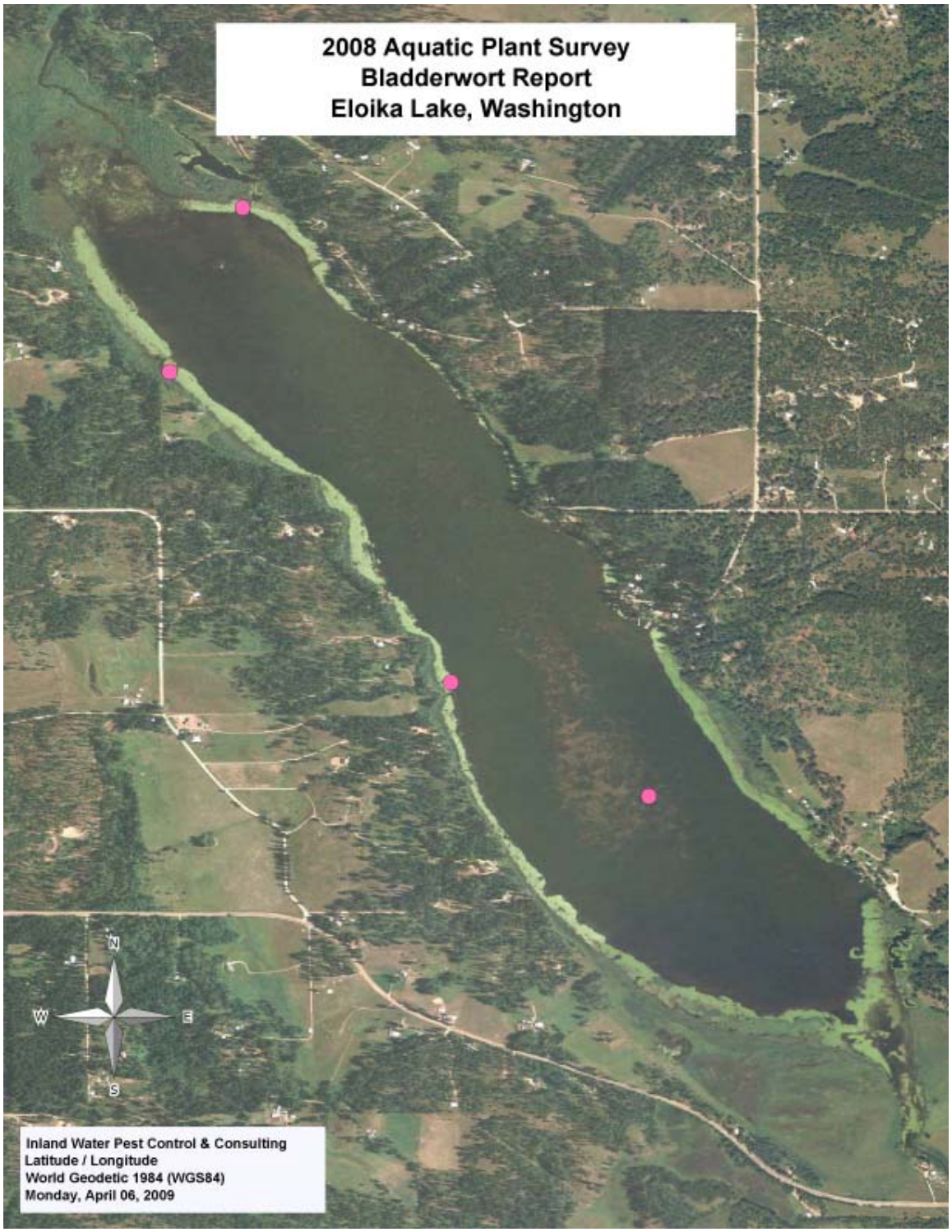


FIGURE 8: LOCATIONS of BLADDERWORT in ELOIKA LAKE

FIGURE 9: LOCATIONS of SPATTERDOCK in ELOIKA LAKE

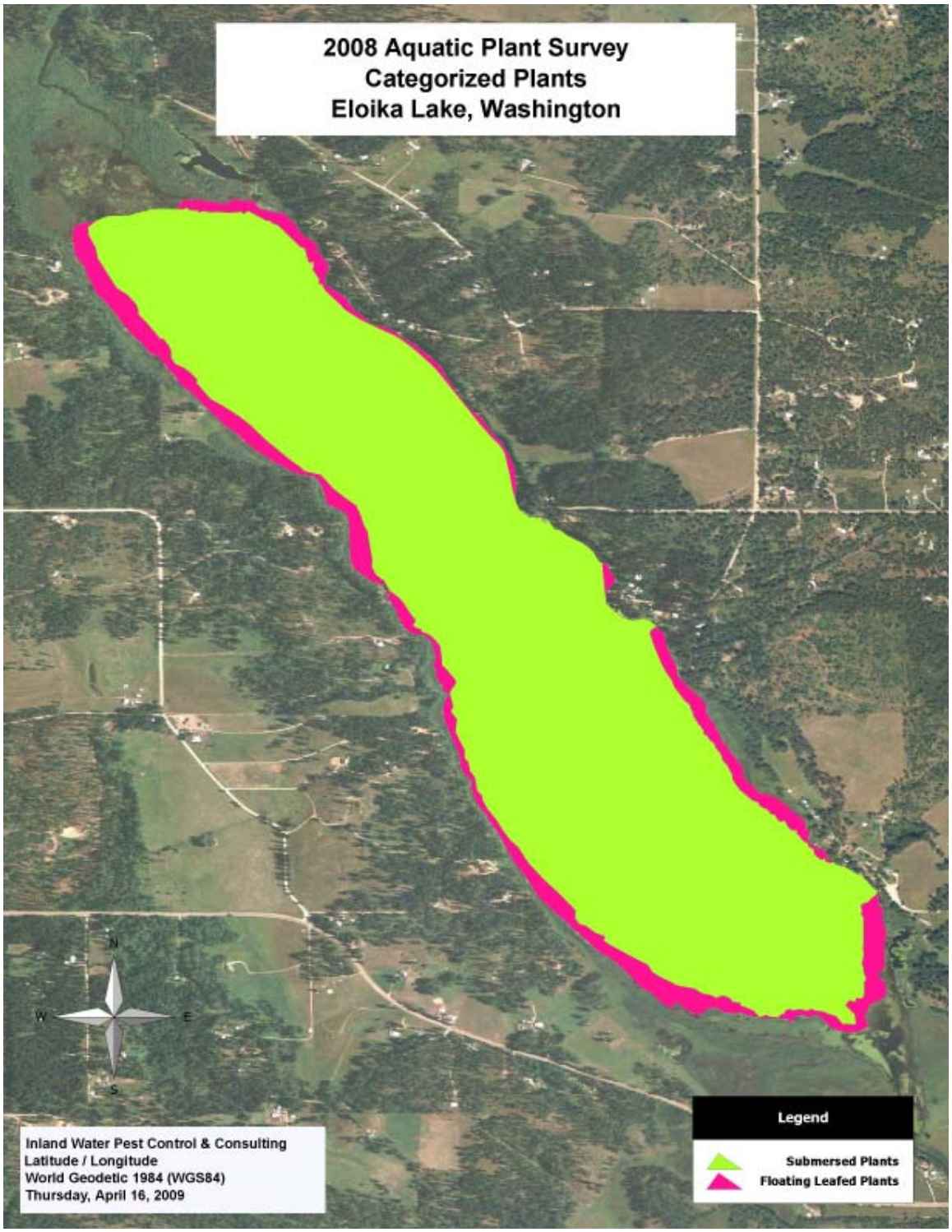


FIGURE 11: PLANT COMPOSITION of ELOIKA LAKE by PLANT CATEGORY

DATA SHEETS from the PLANT SURVEY

Date	Waypoint #	EWM	Elodea	White stemmed Pondweed Potamogeton praelongus	P. Sp (unknown)	Fern leafed pondweed, P. robbinsii	Spadderdock, Nuphar polysepa	Watershield, Brasenia schreberi	Bladderwort, Utricularia vulgaris	Coontail, Ceratophyllum demersum	Plant-like algae, Nitella sp.	Comments	TOTAL
9/5/2008	214	30		20					20	10	20		100
	215							100					100
	216							100					100
	217							50	50			YF Iris	100
	218			5				95				bulrush	100
	219							100				nuphar	100
	220			33				34	33				100
	221								95		5		100
	222	30						50			20	bulrush	100
	223								50	10	40		100
	224			5				35	60			nuphar	100
	225	present											0
	226						45	45		5	5		100
	227	30				30			20	20			100
	228	5				10		85					100
	229							100					100
	230	5				40		25		25	5		100
	231			10		80					10	dead plants	100
	232				5	90					5		100
	233				5	95							100
	234		5					70		20	5		100
	235				5	95							100
	236		5		5		70			15	5	nuphar & cattails	100
	237			10		90							100
	238		5	10		85							100
	239		5			50				45			100
	240	5				5					90		100
	241		20			20		50		5	5		100

Date	Waypoint #	EWM	Elodea	White stemmed Pondweed Potamogeton praelongus	P. Sp (unknown)	Fern leafed pondweed, P. robbinsii	Spadderdock, Nuphar polysepa	Watershield, Brasenia schreberi	Bladderwort, Utricularia vulgaris	Coontail, Ceratophyllum demersum	Plant-like algae, Nitella sp.	Comments	TOTAL
9/05/08	243		25	25	5					25	20		100
	244			50						45	5		100
	245		20	20	5	20				20	15		100
	246							95			5	cattails	100
	247	25				55				10	10		100
	248			20		60				10	10		100
	249			80						10	10		100
	250			10		90						diatoms & algae	100
	251	20				70					10	nuphar	100
	252		5	5		90							100
	253			20		50				15	15	brasenia	100
	254			50	5					25	20		100
	255		10			90							100
	256		10			80				10			100
	257									60	40		100
	258	5	5	5	5	70				5	5	brasenia	100
	259	present											0
	260			5	5	90						brasenia	100
	261									50	50		100
	262				100							P. richardsonii	100
	263	10		10		70				10			100
	264			5						45	50		100
	265			30	5					30	35		100
	266	50									50		100
	267	50	45			5						brasenia	100
	268											No Plants	0
	269			35						35	30		100
	270					90				10		brasenia	100
	271	present											0
	272	present				90				10			100
	273			30						35	35		100
	274			30	5					30	35		100
	275	35								35	30		100

Date	Waypoint #	EWM	Elodea	Pondweed Potamogeton praelongus	P. Sp (unknown)	Fern leafed pondweed, P. robbinsii	Spadderdock, Nuphar polysepa	Watershield, Brasenia schreberi	Bladderwort, Utricularia vulgaris	Coontail, Ceratophyllum demersum	Plant-like algae, Nitella sp.	Comments	TOTAL
9/9/2008	1	present	85			5		5		5			100
	2			5						90	5		100
	3			80						5	15		100
	4			5		70				20	5	brasenia	100
	5					100							100
	6					75				25			100
	7									100			100
	8											No Plants, scattered coontail	0
	9	90						10					100
	10	present	25			25		25		25			100
	11			90						10			100
	12			95						5			100
	13			10		80				10			100
	14	present		25		50				25			100
	15									100			100
	16			100									100
	17	5	50			20				25			100
	18	50	10			10		15		15			100
	19			75						25			100
	20			25						75			100
	21			85						15			100
	22					50		25		25			100
	23					80		20					100
	24			80						20			100
	25			25		25				50			100
	26	35	35					30					100
	27	5	25			50		20					100
	28			10		70				20			100
	29			15						85		eel grass, Heterantha	100
	30			10		90						brasenia	100
	31	20	30			50							100
	32			75						25			100
	33			25		50				25			100
	34	10	45			45						brasenia	100
	35		10	75						15			100
	36			25						75			100

Date	Waypoint #	EWM	Elodea	White stemmed Pondweed Potamogeton praelongus	P. Sp (unknown)	Fern leafed pondweed, P. robbinsii	Spadderdock, Nuphar polysepa	Watershield, Brasenia schreberi	Bladderwort, Utricularia vulgaris	Coontail, Ceratophyllum demersum	Plant-like algae, Nitella sp.	Comments	TOTAL
	37	5				80		5		10			100
	38					80		10		10			100
	39			25						75			100
	40		10	45						45			100
	41	20	20			10		50					100
	42	10	20			70							100
	43			35		35				30			100
	44			20		70				10			100
	45					100						brasenia	100
	46					100						brasenia	100
	47			10		80				10			100
	48			10		80				10			100
	49		10			50		40					100
	50							10	30	60			100
	51	15								85		duckweed, algae	100
	52	15					30	30		25			100
	53	15					30	30		25			100
	54	15					30	30		25			100
	55	15					30	30		25			100
TOTALS		**590**	**535**	**1603**	**155**	**3415**	**235**	**1514**	**358**	**2005**	**690**	**11100**	**11100**
PERCENT		**5.32**	**4.82**	**14.44**	**1.40**	**30.77**	**2.12**	**13.64**	**3.23**	**18.06**	**6.22**	**100.00**	

APPENDIX E

Phytoplankton Class and Species List for Eloika Lake, WA (Soltero et. al. 1987).

Class Bacillariophyceae	Class Cryptophyceae
Asterionella formosa Hassall	*Chroomonas sp.* Hansgirg
Cocconeis sp. Ehrenberg	*Cryptomonas erosa* Ehrenberg
Cyclotella sp. Kuetzing	*Rhodomonas sp.* Karsten
Cymbella sp. Agardh	
Fragilaria construens Ehrenburg	
Fragilaria crotonensis Kitton	Class Euglenophyceae
Fragilaria intermedia Grunow	*Euglena sp.* Ehrenberg
Fragilaria sp. Lyngbye	
Melosira granulate Ehrenberg	Class Dinophyceae
Synedra acus Kuetzing	*Ceratium hirundinella* Muel., Dujardin
Syndera delicatissima W. Smith	*Glenodinium sp.* Ehrenberg, Stein
Synedra intermedia Ehrenberg	*Gymnodinium sp.* Stein, Kofoid, Swezy
Synedra sp. Ehrenberg	
Class Chlorophyceae	Class Cyanophyceae
Ankistrodesmus falcatus Corda	*Anabaena planctonica* Brunnthaler
Chaetosphaeridium globosum Klebahn	*Anabaena spiroides* Klebahn
Chaetosphaeridium sp. Klebahn	*Aphanizomenon flos-aquae* Ralfs
Chlamydomonas sp. Ehrenberg	*Aphanizomenon sp*. Morren
Chlorogonium elongatum Dangeard	*Aphanocapsa delicatissima* West & West
Coccomonas sp. Stein	*Aphanocapsa sp. Naegeli*
Dymorphococcus sp. Takeda	*Coelospharium Naeglianum* Unger
Elakatothrix viridis Snow, Printz	*Dactylococcopsis acicularis* Lemmerman
Gloeocystis sp. Naegeli	*Gloeotrichia echinulata* J.E. Smith
Golenkinia radiata Chodat, Wille	*Gloeotrichia sp.* Agardh
Gonium sp. Mueller	*Microcystis aeruginosa* Kuetzing
Lagerheimia ciliate Lagerheim, Chodat	*Microcystis sp.* Kuetzing
Oocystis eremosphaeria G.M. Smith	*Spirulina sp.* Turpin
Oocystis sp. Naegeli	
Palmodictyon sp. Kuetzing	
Pediastrum boryanum Turpin	Class Chrysophyceae
Pluerotaenium sp. Naegeli	Chlorocloster sp. Pascher
Scenedesmus arcuatus Lemmerman	Chromuling sp. Cenkowski
Scenedesmus bijuga Turpin, Lagerheim	Chrysococcus sp. Klebs
Scenedesmus incrassatulus Bohlin	Dinobryon bavaricum Imhof
Schroederia setigera Schroed., Lemmerman	Dinobryon calciformis Bachman
Schroederia sp. Lemmerman	Dinobryon cylindricum Imhof
Sphaerocystis schroeteri Chodat	Epipyxis sp. Ehrenberg
Sphaerocystis sp. Chodat	Mallomona sp. Perty
Staurastrum paradoxum Meyen	Ochromonas sp. Wystozki
Staurastrum sp. Meyen	Peroniella sp. Gobi
Tetraedron hastatum Reinsch, Hansgirg	Uroglena volvox Ehrenberg

APPENDIX F

Biological Control of Eurasian Watermilfoil Statement from EnviroScience representative.

Biological Control

The use of a natural enemy or disease to fight the spread of an invasive weed is referred to as a biological control. These controls are usually highly selective, targeting only the species of interest. The creation and implementation of weed control plans should include biological controls whenever possible because of their safety and specificity for the targeted weed. This process may take longer than the use of herbicides or other control methods and will not lead to complete eradication of the weed. Rather, the weed and its biocontrol agent will achieve a natural fluctuating balance over time. Biological controls have the potential to provide safe, cost-effective, long term control of nuisance weeds with few, if any, side effects. Classical biocontrol involves an exotic species being used to control an exotic species.

For Eurasian watermilfoil (EWM), the only practical biocontrol agent is a North American native weevil *Euhrychiopsis lecontei,* commonly referred to as the milfoil weevil*. E. lecontei*'s native host is the Northern milfoil *M. sibiricum*. Observations of natural declines of EWM in Brownington Pond VT lead to the discovery that *E. lecontei* shows a preference for the invasive EWM over its native host (Newman et al. 1997). Researchers at the University of Minnesota (Newman et al. 1997) also demonstrated that the weevil performs better on the exotic EWM than on the native host. In addition, they found that development times were shorter on EWM than on northern watermilfoil

The milfoil weevil is widely distributed in the northern United States and Canada, but is rarely found at densities high enough to affect wide scale control of stands of Eurasian water milfoil. Research pioneered by Sheldon (1997) revealed that introducing weevils in high densities could facilitate high reproductive effort by the weevils resulting in expanding and sustainable populations. While both adult and juvenile life stages of the insects feed on EWM, the larval stage does the greatest amount of damage that leads to plant declines. Adults feed on milfoil leaves and deposit their eggs on apical meristems. When the eggs hatch, the larval stages begin work boring into the succulent EWM stems. The pupae then complete the tunneling when they bore back out through the stems to the surface. The activities of these two life stages of milfoil weevil damage the EWM in several ways. First, the tunneling and holes cause the plants to loose their buoyancy. Water infiltrates the plants and they sink out of the water column. Second, the tunneling disrupts the flow of carbohydrates up and down the stems, essentially starving the root system. EWM plants need this store of carbohydrates to live through the winter months and initiate new growth early in the spring.

Because the milfoil weevil is a specialist feeder, native non-milfoil plants are not affected and able to colonize where EWM is removed. This allows for a healthier aquatic system that can support a more diverse plant and animal community. Alternative control methods often have negative ecological consequences that the milfoil weevils do not. The use of herbicides damages many aquatic plants and affects the native weevil populations by removing their food source. Another popular method, mechanical harvesting, will cause fragmentation of the EWM. These fragments float across the surface of the water body and re-root, thereby increasing the spread of the invasive plant. Removal of the tops of the plants will also remove any resident weevils.

Field and lab data suggest that the milfoil weevil tolerates a wide range of water quality conditions, including pH, and physical characteristics of the EWM, such as mineral deposits, algae, and assorted epiphytes.

Weevils generally produce three to five generations per summer before the last late-summer generation migrates to shore to overwinter. They spread gradually through the water body. Because dispersal tends to be gradual and driven by both water flow and wind patterns, multiple stocking events over a three to five year period may be desirable. As with most biological control methods, milfoil weevils will not totally eradicate EWM. In time, the plants and insects will develop the same kind of balance we observe in natural systems. Because *E. lecontei* is a true milfoil specialist (Solarz and Newman, 1995), nuisance levels of EWM can be greatly reduced over several seasons using the MiddFoil® process without causing damage to other nontarget organisms.

The native range of *E. lecontei* is separated into 3 ecoregions (Creed and Sheldon, 1994) (Newman and Maher, 1995). The Northeast US, Upper Midwest US and the Western Canada/Northwest US. The insects in all three ecoregions are one species but some genetic differences may occur between regions. *M. spicatum* have been confirmed in at least 44 states and 3 Canadian provinces. These plants are also considered to be one species while they may have genetic differences from region to region. Because of these regional differences it is considered prudent to raise milfoil weevils on their regional EWM plants and to release insects back into the regions they came from originally.

Scientists at Middlebury College in VT in cooperation with those at EnviroScience, Inc. used this information to develop the MiddFoil® process, a set of techniques for culturing, stocking and monitoring the progress of the milfoil weevil. Although certain aspects of the program are considered proprietary information, in general the program involves stocking groups of several thousand insects of all the same age, and at the same time, in several locations within a water body to be treated.

Since 1998 when the weevil first became commercially available, a number of lakes in the Eastern and Midwestern United States, as well as Ontario, Canada, have achieved EWM control after implementing the MiddFoil® program. Dramatic reductions in EWM have been seen within a year of milfoil weevil augmentation in some cases. The

sustainability of the milfoil weevil is demonstrated by the fact that since the program became available, some lakes have reportedly had control for up to nine years after one or two consecutive seasons of weevil stocking.

As the weevil population increases, any other management strategies aimed at EWM control that are in use should be reduced, and then stopped completely. In order for a weevil stocking program be successful, a high level of commitment from lake residents and managers is needed. Nuisance levels of EWM took years to grow and will likely take a number of years for milfoil weevils to increase their population size sufficiently to obtain lake-wide control.

References

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APPENDIX G

Eloika Lake IAVMP Meeting Minutes

MINUTES FROM OCTOBER 22, 2008 MEETING

Summary

The Aquatic Plant Survey results were presented to the steering committee and included the abundance and locations for the aquatic plants that were found at the time of the survey. After the results, the discussion revolved around what invasive plants need to be addressed in the plan and some overall potential lake management strategies were mentioned. This discussion will be used as part of the problem statement and management goals for the plan.

Details

The plant survey identified Eurasian Watermilfoil, yellow flag iris and curly-leafed pondweed as the only invasive or noxious plants seen. As an addition, purple loosestrife was mentioned as being a problem as well and will be included in the plan. The data from the survey will be included in the survey report and plan though it was not presented at the meeting.

It was determined that Eurasian Watermilfoil, yellow flag iris and purple loosestrife be addressed in the plan. It was also suggested to include nutrient loading information and the excessive native plant growth in the problem statement. Data from the TMDL studies (WSU) may be useful also. Plant free zones for high use areas were also brought up.

The discussion mentioned nutrient reduction, lake levels and wetland retention (banking). It was also a concern of the group to educate the land owners as to what can be done as individuals or clusters of individuals so that the overall goals are reached. Quiet recreation was mentioned as a goal. Some discussion of beavers included the spreading of yellow flag iris, loss of trees and flooding concerns.

Liberty Lake and Newman Lake were mentioned as examples of alum treatments for nutrient reduction and included discussing the Speece's cone and oxygenation. It was noted that the low dissolved oxygen levels at the bottom of the lake increase the solubility of the phosphates and other nutrients. Alum treatments were mentioned as a way of trapping the nutrients in the sediment. Dredging was also discussed as another means of eliminating the nutrients present in the lake. Some type of sediment analysis and water content would be necessary for this option. The permitting issues were mentioned and that it took a small group at Diamond Lake almost 2 years to obtain the necessary permits and approvals.

It was suggested to have an 'Executive Summary' in the plan to include both the short term and long term goals that can be used as a part of a lake management plan. Some

discussion of permits, best management practices, docks and ownership of the land under the water ensued and personal versus association actions were to be delineated.

MINUTES FROM OCTOBER 29, 2008 MEETING

Summary

Various techniques for invasive weed control were discussed, including a list of what private landowners can do. Techniques included physical, mechanical, biological and chemical alternatives. Most of the discussion revolved around chemical techniques. Drafts of a problem statement and a management goal were distributed and will be discussed at the next meeting.

Details

The techniques started with the “Do Nothing” and mentioned that curly-leafed pondweed would probably have this action because we do not know the extent of the problem at this time. A comment was made about a slide in the presentation and it was requested that the wording change from “May” to “Ultimately”.

For the physical techniques, raising the water level was mentioned but that is not considered to be a technique by the Dept. of Ecology. It may work but it depends on the turbidity of the water body. For the bottom barrier, it was noted that the material cost is $0.30 per square foot and then there is costs associated with installation and maintenance. It does not remove sediments and fish hooks, motors and people can snag the material.

For mechanical techniques, it was mentioned that there is used equipment available.

For biological controls, weevils and carp were discussed. The weevils are probably present in Eloika all ready but the permitting and propagation have been a problem in utilizing this method. It was noted that the population cycles would fluctuate under this technique also.

For the chemical methods, a description of herbicides was given. Harmful effects on fish and other wildlife have been studied by the EPA and the WA State DOE. There are a limited number of herbicides that can be used in Washington. Copper sulfate is not approved in WA for lake usage because of its toxicity. There was some discussion on the permitting notifications and costs of various herbicides for use on aquatic plants. It was also mentioned that the WA DOE has added some restrictions to the herbicides when used within the state. The permitting process was covered also.
It was noted that there are lake-wide treatments and localized treatments. The permitting process and time-frame were covered also.

As far as the silt build-up, IWPCC would be willing to try a new product if approved by the DOE.

In discussing the use of 2,4-D, effectiveness of the treatment and the objections of its use were discussed. It was noted that this herbicide also affects Nuphar, Brasenia and coontail. For yellow flag iris, two herbicides can be used. These are imazapyr and glyphosate.

Sediment control and core sampling were discussed. Proper techniques and equipment need to be examined. It was mentioned that it would be good to partner with the WA St. Fish & Wildlife group for the boat launch remodeling.

Finally, personal actions that can be taken were discussed. Public outreach and education are needed here. It is apparent that the native plants are as big (or a bigger) problem than the invasive species noted.

A draft problem statement and management goal were handed out and will be discussed at the next meeting. We will also discuss where on the lake some of the controls may be implemented.

MINUTES FROM NOVEMBER 12, 2008 MEETING

Summary

The draft problem statement and management objectives were reviewed including the comments of Greg, Dan and Tammy. Dan's re-wording was considered to be the best and will be further refined. The other main topic was about the lake usage and locations. It was proposed to have a map sent out with a list of uses so that the participants could show where the lake is used for each of those uses. This will be reviewed at the next meeting.

Details

Comments about the draft problem statement and management goals were discussed in detail concerning the sedimentation/ nutrient recycling problems at the lake. IWPCC proposed doing an enzymatic treatment on a small scale to see if was worthwhile. There was some concern about the oxygen depletion and nutrient problems and IWPCC said that this would be researched and discussed later.

In the problem statement, reed canary grass was brought up but there is no immediate methodology to deal with this invasive species. For the purple loosestrife, herbicide and manual methods were suggested by the Pend Oreille County Noxious Weed Board Coordinator (Sharon Sorby). It was mentioned that there needs to be both short term and long term strategies in the management plan. The Dept. of Ecology has grants that can be applied for to help with the invasive species but not for the nuisance (excessive growth) native plants. There was some discussion about the classes of the noxious (invasive) plants. The following is the correct description of the classes of noxious weeds though this may not have been accurately described at the meeting.

- Class A-Non-native species that are limited in distribution in Washington. State law requires that these weeds be eradicated.
- Class B-Non-native species that are either absent from or limited in distribution in some portions of the state but very abundant in other areas. The goals are to contain the plants where they are already widespread and prevent their spread into new areas.
- Class C-Non-native plants that are already widespread in Washington State. Counties can choose to enforce control, or they can educate residents about controlling these noxious weeds.

The accelerated eutrophication process was mentioned and should probably include algae blooms also. Aeration was mentioned as an additional technique for inclusion in the plan.

The lake usage discussion started with the boat launch enhancements the Fish & Wildlife have been planning. There is a file that shows the plan. There is no boat wash included but education is a part of it. It was noted that this management plan should be in the draft form and then schedule the education and kiosk information. It was suggested that a map be made with elevation lines, parcel outlines, and wetlands be obtained from the planning office.

It was noted that there is heavier winter fishing on the lake. It was also noted that the inlet and outlet areas are used in the summer. If possible, the spawning locations should probably be mapped also.

The following is the list of uses for the lake that will need to be diagramed onto a map.

a-Fishing in the summer
b-Fishing in the winter
c-Fire Protection of area (plane)
d-Fire Protection of housing (local pump in lake)
e-Hunting
f-Swimming
g-Boating, (skiing, boarding, tubing)
h-Boating, (kayak, canoe)
i-Jet ski (personal watercraft, motorized)
j-boating, sailing
k-aesthetics
l-Wildlife viewing
m-Wildlife habitat
n- Irrigation
o-Quality of life
p- Residential (year-round)
q- Residential (seasonal)
r-Property Value (aesthetics, quality of life)

MINUTES FROM NOVEMBER 18, 2008 MEETING

Summary

The uses of the lake were discussed and the diagrams put together by Lauri were shown. Several comments were made about the designated county park on the north end of the lake and how far up the inlet the usage map should include. Further discussion on the control techniques was discussed and with the emphasis being on a lake-wide plan with individual efforts in aiming at a common goal. Education, sedimentation and lake level control were discussed further and restoration was mentioned. In regards to restoration, no time frame could be determined. The AHWM (Average High Water Mark) and lake level adjudication were also brought up but no determination was made.

Details

Several diagrams that were prepared by Lauri were shown and the discussion revolved around the designated county park on the north end of the lake. It was determined that the two main public access areas were the F&W launch and Jerry's Resort. It was noted that Jerry's Resort is the last resort within the watershed. As the discussion continued, there was some mention of how far up the inlet this plan would cover and where does the Pend Oreille County line intersect the water. On the other end of the lake, it was mentioned that a sedimentation delivery problem could be at the culvert.

For the uses, fishing by the season was determined to occur at different areas of the lake. It was also mentioned that migratory waterfowl (e.g. swans) use the lake. Other wildlife uses included the two bald eagle nests, otters, deer and turkeys present around the lake. These last two can be hunted also. For fishing, there is some data from a survey done in 2000 as to the size and species present. In the areas of higher concentrations of residences, it was noted that the changes that may happen as a result of implementing the management plan could increase the usage of the lake for some of these activities. From the discussion, IWPCC determined that there was enough input for the water usage to be compiled for the plan.

Discussion went back to the control methods and how to include some statement about preserving the numerous springs and Artesian wells in the area. When discussing the methods, there was some discussion revolving around the lake-wide preferred methods and what individual property owners could do. It was also mentioned that the yellow flag iris, purple loosestrife and reed canary grass were wetland species that were not necessarily aquatic. The primary methods should include chemical and manual (mechanical) techniques and a biological option included, possibly as a follow-up to the other techniques. Since the wetlands extend into Pend Oreille County, the group was interested in the county line and the boundary between the lake and the wetland. No real answers were discussed.

At this point, the floating bogs and shoreline root-balls were considered to be part of the natural process, the floating bogs occurring in the fall and shoreline root-balls occurring

during the spring. The only known method would be for mechanical removal or enzymatic degradation. This problem still needs some more investigation.

It was generally agreed to that the floating leafed plants should be chemically controlled in the high use areas as a lake-wide strategy and that the individual owners could do this by contract. This will take some education and funding to make it happen. It should be cited that the sediment and excessive growth are a public safety hazard as noted in the 2001 draft plan. The sediment and nutrient reduction would be more of a long-term goal. The lake level control may help with this goal also. During the discussion, the term 'restoration' was used and it was noted that restoration needs to relate to a previous time. No time frame was noted but there was mention of previous information of Average High Water Marks (AWHM) can be located. A previous lake-level adjudication process was not completed and may help with some ideas on what to address here for the lake-level control.

As a means of eliminating plant growth, someone asked about shading products. Though these are used in small ponds, the cost is rather prohibitive for doing and an entire lake. The products diffuse rapidly and would also flow out of the lake.

There was some discussion as to the wording of the problem statement in regards to the terms 'contributes to' in comparison to a causal relationship. It was also mentioned that the sediment (silt) has been measured by some residents and is 8 to more than 20 feet deep. Once the plan is drafted and this group has discussed it, there will be an on-going education and implementation section. It should also include the term emerging technology.

ELOIKA LAKE IAVMP minutes from Jan. 19, 2009

A handout of the techniques in summarized form (two tables) was given to the participants.

Discussion started about the first draft of plan. Question about which areas would be the high use areas and which areas would be a high level of control. It was explained that the high use areas equate to areas where a high level of control would be appropriate. It was requested that the draft have page numbers included.

For the water quality data table, it was requested that more current information from the SCCD be included and maybe add something about sample collection differences. It was also requested that a glossary be added since this document will be read by both a technical group and a group of layman.

The 'Aquatic Plant and Fish' booklet from the WDFW (Washington Dept. of Fish & Wildlife) is the Hydraulic Project Approval (HPA) for the landowners and explains which techniques and limitations the landowners can utilize. It is considered part of the education component of the plan.

The group requested that a prioritized ranking be done for the techniques and should include a ‘cost effectiveness’ evaluation. For example, the harvester could be used in spots which may make it a good technique for small areas. Another example would be the draw down. Water level control and draw down are basically the same and the ongoing studies of PBS&J should be noted.

At this point the batteries died and further notes were lost.

ELOIKA LAKE IAVMP minutes from Feb 11, 2009

A handout of the grant timelines was handed out. As part of the deep sediment issue, a proposed test of an enzyme treatment was discussed. To conduct this test a permit will be needed and an area needs to be picked which would not be a ‘critical spawning area’. The later point, should be discussed with Fish & Wildlife, but is not thought to be overly restrictive since deep sediments usually prevent spawning.

The list of mailing addresses needs to be updated so that notifications can be given as part of the permit. The Eloika Lake Association (ELA) wants a proposal for their board meeting by Feb. 15. This would include test site parameters and the measurements to be taken. IWPCC was given to ‘go ahead’ for obtaining the permit.

The Kiosk was mentioned and this lead to who is recording the volunteer hours. The discussion lead to the following: Meeting attendance will be submitted to the SCCD by IWPCC, Mike Carney will collect any addition time sheets from the volunteers (Kiosk design, editing, and brochure preparation) and it will be up to the volunteers to fill in the appropriate form and get the forms to Mike.

The Kiosk design needs to be discussed with Fish & Wildlife to find out when it will be built and what can be put on the display.

The first draft of the plan was mentioned and the comments from Greg Sweeney and Walt Edelen have not been incorporated prior to this meeting. It was discussed that one more draft should be sent out by Feb 16 that includes the edits. It is expected that all the comments will be received back to IWPCC by Feb 25.

The booklet “Guidelines to IAVMP” was mentioned and the on-line location of that booklet was to be found and shared with the group.

The plan needs to have some public meetings and it was decided that the ELA was having a general membership meeting and that would be a good start at informing the public about the plan. The date was set as April 8 in the Riverside Fire Station. IWPCC will give about a 30 minute presentation to the group. Further discussion on a ‘workshop’ set the date for it to on May 16. It was also mentioned that the SCCD is having an annual meeting in Elk on May 30.

Attendance at the ELA general meeting and the workshop will be counted as volunteer hours for the grant. In-kind total for the grant is approximately $8000.

The other topic of discussion is the Best Management Practices (BMP) for the streams and shorelines. It should include the non-point source nutrient reduction that is the responsibility of the landowner, development planning and plants. Lory has compiled a set of plant pictures also.

ELOIKA LAKE IAVMP minutes from Feb 25, 2009

The draft and timelines for the plan were the key points.

Timeline for the final draft was estimated to be by mid-March if all the comments have been received. Comments have been received from Bill, Mike, Tammy and Sheldon. The comments from the SCCD have not been received and Dan had to work late so would be late to this meeting.

The other grant timelines:

- Kiosk-on track but the meeting with Fish & Wildlife has not occurred yet.
- The workshop on May 16 is being scheduled.
- The GIS files have been sent to the SCCD. It is not known if the files are adequate for use by SCCD.
- The enzyme test was approved by the ELA board, the Notice of Intent is being published for all the potential herbicide treatments and is good for 5 years provided that the annual wastewater fee is paid. This permit gives the residents the ability to hire an applicator to treat individually within the limits of the plan.

An explanation of invasive species and native species treatments was given. Invasive species (e.g. Eurasian Watermilfoil) can be treated anywhere on a lake-wide level. Treatment of native plants using herbicides is limited to individual landowners and what is determined as appropriate in the management plan. For the lake-wide control of native plants, water level control or harvester use will be set-up for high use/high control areas only. If herbicides are used for native plant control on a lake-wide basis, it would be limited to 30% of the surface area which is ~180 acres for a lake this size. Usually the limits of the plan would be access areas and swimming areas and at most 25% of the shoreline. The emergent plans need a completely separate plan for the Dept. of Ecology. This was initially going to be included in this plan but will not. The emergent plants will be mentioned only as being observed and that the required mapping has not been done.

Further discussion of the plan led to points in the technique table. It was mentioned that some selective dredging (long term) may be useful to deepen the lake and prevent the lake from experiencing the zero oxygen levels near the bottom. Aeration may be helpful for oxygenating small areas but not on a lake-wide scale.

The ELA is a 501-C-3 non-profit. This enables more funding sources to be explored. The Environmental Financial Center website allows for searching for sources, some of which can be used for matching funds, educational materials, organizational assistance and more specific projects.

Under the educational component of the plan, the landowners need to know about; plant identification, landowner techniques, the limitations and landscaping.

The following are comments as the group went through the second draft on screen:

- Cross reference the specific points in the guidelines with the plan.
- The description of the watershed should be like the Golder report.
- Re-state the problem statement to show pictures and include drowning, dangers of swimming, the lake of waterskiing and PWC usage and possibly include power motor damage also. Make adjustments and then sent out draft again.
- It should read as ‘excessive plant and algae growth’ rather than ‘excessive algae and plant growth’.
- Nutrient inactivation methods need to be added.
- Lists are not all inclusive.
- Better graphics and figures.
- Problem statement, break out the individual problems with examples of each.
- Define goals over time such as short term versus long term, level of control desired and how to monitor changes.
- Culvert is for rapid drainage of lake in spring when the lake level used to stay higher longer into the summer.
- Fish needs to be expanded or categorized as game fish and other fish.
- Beneficial uses map needs correction to include access area
- Need a better intro for the plant survey, especially related to the timing of the survey.
- Need to develop a contact person for plants.
- Emergent plants are not all emergent, maybe shoreline plants would be better category.
- Environmental manipulation should be ecological management.
- Need to break out mechanical pros and cons for each technique, rather than lumping together.
- Permit stuff and other comments should be specific for Eloika.
- Biocontrol and EnviroScience statement.
- Grass carp
- Facts on aerator for private use related to gas TMDL, oxygenation and temperature.
- Prioritize methods, add a funding strategy and an implementation strategy.
- Eliminate emergent plants, implement surveys in spring of 2009 for curly-leafed pondweed, and add long term goals.
- Tables by priority, don’t go beyond scope.
- No names in water rights

ELOIKA LAKE IAVMP minutes from March 11, 2009

The meeting began by reviewing the tasks.
Kiosk: The meeting with Fish & Wildlife went well. Planning the re-construction of the access area to begin sometime after July 1 and be completed by Sept. The elevation was thought to be in-line with the water control structure proposal. At the kiosk, there will be signage and have some brochures available for the public to take with them. The information should be available by the workshop on May 16 or by the April 8 meeting.

The lake specific best management practices (BMPs) needs to get completed by then also. The SCCD and IWPCC will meet next week to get the comments from the SCCD and to negotiate a new deadline for the submission. The SCCD wants the submission to be a clean final document. Lory agreed to help with the brochures and booklet.

The watershed and lake maps will be re-done prior to submission also. The group wanted to include the treatment procedures and notification (posting) requirements also.

There was a handout of the strategic plan broken down into areas and timeframe (short or long term). The following is the discussion and voting of the elements within the plan.

Education
- Workshop
- Booklets (BMPs, Plant identification, Aquatic Plant and Fish booklet)
- Website
- Continuing education

ALL are Short term and High Priority

Emergent species to be omitted

Aquatic Invasive Species (short term)

High Priority	Surveying & Mapping
	Treatment with herbicide
	Landowner applications
Medium	Diver hand-pulling
Low	Augment biological control

Excessive Sedimentation

Enzymatic treatment test	Short term High priority
Selective dredging	Long term

Alum Treatment (trapping of nutrients with chemicals)
- Low priority

Oxygenation or aeration by landowners
- Low priority

Excessive Native Plant Growth (Reduce nutrients)
- Non-point source reduction in nutrients by landowners to include BMPs

High priority and both short and long term. (see education above)

Herbicide treatments
Short or Long term Medium priority
Harvester for picking up floating mats
Long term
Grass Carp (not recommended by consultant)
Long term Low priority
Aeration by landowners
Low priority
Water level control (on-going studies)
High priority Long term for installation

Limits to herbicide applications mentioned again.
Invasive species can treat 100% of lake
Native species can treat up to 30% (~180acres) maximum, usually in high use areas such as access points and public swimming areas (resort).

BMPs
Septic tank maintenance
Under education
Sewer system and water system
Long term

Additional comments:
Property owners want areas from shore out to access lake.
Plant growth at the outlet may prevent flow out of lake at times.

APPENDIX H

Project In-Kind Contribution Summary

The ELA provided various matching funds to the development of the IAVMP. The in-kind included; cash, development of educational materials, meeting attendance, workshops, small related projects, website development, lake monitoring, and assistance with design and installation of a public kiosk.

Educational Materials:

- **Best Management Practices Booklet** - completed July of 2009
- **Eloika Lake Common Aquatic Vegetation Brochure** – completed May of 2009
- **Eloika Lake Brochure** – completed July of 2009
- **Website Development (Eloikalake.com) website** – completed and updated as of July 2009
- **Elk Sentinel Newspaper** – monthly articles featuring information and updates for and about Eloika Lake. Distributed to 5000 local residents. Additional articles/information appeared in a variety of publications in 2009. Elk Sentinel articles available on-line at www.eloikalake.com.

Meetings/Workshops/Public Events:

- **Public Meeting** – Riverside Fire Station May 13th, 2009, purpose of meeting was to present information regarding the draft IAVMP.
- **Aquatic Weed Identification Workshop and Barbecue** – Hosted by ELA and presentation by Tom Wimpy (consultant) - Held August of 2009.
- **Elk Days, ELA Booth** – purpose was to provide educational materials and displays about: invasive aquatic species, shoreline and vegetation management, the watershed, water quality and ELA and organization activities. Completed June 20-21st of 2009.

Small Related Projects:

- **Aquatic Herbicide Weed Treatment** - Consultant Tom Wimpy contracted with lake residents for treatment along dock areas. Eurasian Milfoil reduction was noted. Completed August of 2009.
- **Erosion Diversion Project** at culvert/road crossing of the West Branch, Little Spokane River above Eloika Lake. Area had been area of concern due to steep road grade and sedimentation running into the river above Eloika Lake. Communications between ELA and Pend Oreille County resulted in project completion – August of 2009. ELA volunteers continue to monitor this site on a regular basis.
- **Mukk Busster™ Enzyme Test** – Consultant Tom Wimpy, in cooperation with ELA, applied enzyme product to two test plots on Eloika Lake and monitored for several months. Depth of sediment was measured at test plot locations and no noticeable reduction in the sediment and/or aquatic weeds was observed. June – August of 2009
- **Aquatic Plant Survey** – ELA members and SCCD assisted consultant Tom Wimpy conduct aquatic plant survey on Eloika Lake. Completed September 2008

Other:

- **Boat launch and ELA Kiosk** – the WDFW boat launch was reconstructed. An agreement between WDFW and ELA resulted in approval of a Kiosk built by ELA for the purpose of providing educational materials to recreational users. Kiosk focus will be on aquatic invasive species, the watershed and ELA activities. Kiosk completed Fall 2009
- **Lake Monitoring** – lake and aquatic weed monitoring by ELA volunteers is on-going.
- **Cash Contribution** - $1,600.00 by ELA

Eloika Lake IAVMP In-Kind Contribution Budget

In-Kind	Hrs	$
IAVMP Meetings	186	$2,790
Cash	N/A	$1,500
Plant ID Meeting	42	$ 630
Vegetation Mgt Meeting	16.5	$ 248
*Individuals (misc.)	237	$3,555
TOTAL		$8,723

*Individual hours were spent on various grant-related activities including the development of educational materials, website, and other small projects.

Photograph of New Informational Kiosk at Eloika Lake (Total Approx. Cost $336)

APPENDIX I

Newsletter Articles and Releases

Spokesman Review News Release
For Immediate Release
April 30, 2009

Contact: Tammy Magnuson-President
Eloika Lake Association
P.O. Box 54
Chattaroy, WA 99009
(509) 292-2100
eloika@aimcomm.com

"Breakfast Fundraiser and Workshop to benefit Eloika Lake's AquaticVegetation Management efforts"

The Eloika Lake Association, a non-profit organization, will host a fundraiser breakfast on Saturday, May 9th from 8-11 a.m. at the VFW, located in downtown Elk, Washington. Menu offerings will be; pancakes and sausage, biscuits and gravy, coffee, tea and juice. The cost will be $5 for adults and $3 for children 8 and under. All proceeds from this will benefit the…..

On Saturday, May 16th from 2-4 p.m., a free workshop will be conducted by Inland Water Pest Control & Consulting and the Eloika Lake Association, to help lake residents learn to identify aquatic weeds, in particular, those that are non-native invasive species. The workshop will be conducted at the Eloika Lake public boat launch located adjacent to Bridges Road, one mile west of Highway 2 and Millers One Stop Grocery and Gas. After the workshop, the lake association will host a BBQ for all workshop attendees. It is asked that you bring your own chair, beverage and a side dish or dessert to share.

For more information and to register for the Aquatic Management Workshop and BBQ, please call 509-292-2100 or email the association at Eloika@aimcomm.com. For additional news regarding Eloika Lake, please visit its website at www.eloikalake.com

Elk Sentinel Newsletter Article 5/9/09:

Eloika Lake became ice-free on April 12th and it didn't take long for waterfowl to settle in. The sleek and stealthy Common Loons were some of the first to show, with their beautiful calls echoing around the lake. What a thrill it is to hear and see these rare and sensitive birds, who are so threatened by fishing line entanglement and lead poisoning. Loons will die within several days of ingesting lead sinkers, thinking they are small pebbles which are needed to aid with digestion. This is a tragic event that occurs annually in our regional waters, with numerous species of waterfowl. Recreationists must be more proactive and take care of our precious waters. You can help by using lead free sinkers, not tossing fishing line, hooked fish and other debris overboard. Not only do waterfowl suffer the consequences of such actions, but so to do eagles, ospreys and other wildlife. Witnessing the death of these animals from such carelessness is agonizing, so please be thoughtful while having fun on the water.

The returning waterfowl cavity nesters have been plentiful this spring, including wood ducks, buffleheads, hooded and common mergansers and golden eyes. Our river friends, the otters, have been playfully playing the water along the shoreline, while beavers are busy accessing flooded wetlands for those normally harder-to-reach trees and vegetation. The Ospreys returned as the ice retreated and have been battling with the Bald Eagles over territorial disputes. Several of the nests that the Ospreys use yearly did not survive the rough winter and Eagles are rather picky about who their neighbors will be. Many have witnessed their exciting aerial acrobatics. The immature eagles seem to enjoy harassing the ducks, causing them to dive repeatedly and submerge for protection. The woods around the lake have revealed what a hard winter it was, with many deer and turkey carcasses scattered about. Mother Nature tries to provide balance, though by the looks of our yards, gardens and trees, it seems the deer/turkey population is out of balance – having eaten most everything. Winter snowfall did a fine and somewhat devastating job of pruning the bigger conifer and deciduous trees as well. It's not too soon to think about clearing this past winter's deadfall to eliminate ladder fuels for the fast-approaching fire season.

With spring here at long last, many boaters have been out fishing and others paddling, enjoying early season access and the benefits of higher water. Eloika Lake Association (ELA) members will work with a consultant beginning in May to do test plots around the lake, testing a fairly new product called Muck Buster. It is a natural enzyme product that can help reduce sedimentation. It has been used successfully in ponds and we plan to see if it can be effective in a larger lake. Expect to see some test plots on both the East and West shoreline of the lake this summer. Please stay clear of those areas, as water disturbance needs to be minimized. Lake association members will be monitoring the test plots for results.

On Saturday, May 9th, the lake association will host a breakfast at the VFW in Elk, from 8 -11a.m. The menu options are: pancakes and sausage or biscuits and gravy, both served with coffee, tea or juice. Prices will be $5 for adults and $3 for kids 8 and under. This will be a great opportunity to take Mom out to breakfast early, the day before Mothers' Day, or have a good breakfast before heading out to all the plant and yard sales that will be happening in our area that Saturday.

A public meeting will be held Wednesday, May 13th beginning at 6 p.m. at the Riverside Fire Station. This meeting is to present information about the Aquatic Vegetative Management Plan that has been written for Eloika Lake. Mr. Thomas Wimpy of Inland Water Pest Control & Consulting will discuss the purpose, recommendations and goals of the plan. ELA members worked closely with Mr. Wimpy to develop the plan for Eloika Lake. All lake residents are encouraged to attend the meeting. A follow-up workshop will be held Saturday, May 16th. The Eloika Lake Association and Mr. Wimpy will host this hands-on Aquatic Weed Identification Workshop. The field session is being presented as an educational tool for lake owners to learn more about native and non-native aquatic weeds, identification, treatment options, state requirements and procedures for removal and disposal. Those attending need not be members of the association – it is open to any lake or river resident. The association will provide a BBQ/Social afterwards, so that lake neighbors can get to know one another better. The workshop begins at 2 p.m. and ends at 4 p.m. It will be held at the public boat launch, located off Bridges Road, just west of Millers One Stop. The BBQ will follow the workshop, please bring your own beverage and lawn chair. The rest is being provided by the lake association. You must

call 292-2100 or email eloika@aimcomm.com to reserve a spot, if you plan to attend the workshop and/or BBQ.

In other news, the lake association is developing a new brochure, as well as a booklet for lake residents that will include the best management practices for taking care of your shoreline and wetland areas. It will be another tool to assist in learning more about potential or existing impacts to our lake and how best to protect and enhance the lake and be good land and water stewards. Among the things we have learned about Eloika Lake, we know that it is relatively healthy in many respects, due in part to lower population densities compared to other lakes of similar size. The lake association's goal is to educate its members as well as others, and strive for more informed action when dealing with water or aquatic weed issues. We hope that lake residents will take advantage of the free workshop being offered on the 16th and the educational materials that have been put together by the Eloika Lake Association and Thomas Wimpy. For more information, please email the association at eloika@aimcomm.com or contact Tammy at 292-2100.

One of the key supporters of the ELA's efforts in recent years is the Spokane County Conservation District (SCCD). They will be holding their annual meeting on May 30th, Saturday from 10 a.m. – 2:30 p.m. at the Inland Grange. The meeting includes a free lunch and a tour of area projects the Conservation District has been conducting. Contact the SCCD office at 509-535-7274 for more details.

Additional information about Eloika Lake may be viewed at www.eloikalake.com

Elk Sentinel Newsletter Article 6/9/09:

The Eloika Lake Association (ELA) had a very busy month of May, including a breakfast fundraiser on May 9th which was held at the Elk VFW. Thank you to all who came and for your support of the Eloika Lake Association. It was a great success and we hope to do it again next year. Many thanks to our generous donors; All Around Rentals, Bill Egger Meats, Jerry's Landing Resort, Millers One Stop, Riverside Foods and Rosauers. These Elk and Deer Park area businesses continually show their support of community events and it is greatly appreciated. Special thanks to Ruth Rasmussen for organizing the breakfast. Thanks to the VFW, and to the ladies of the lake association for your hard work and great cooking.

A public aquatic weed workshop conducted by Inland Water Pest Control & Consulting LLC, was held on May 16th, followed by a fun barbeque and potluck at Jerry's Landing Resort. The barbeque was hosted by the ELA. Thank you to the members and lake neighbors for all the wonderful food, and to the grill masters, Dennis Jaeger, Mike Carney and Sheldon Magnuson. Thank you to Mary Harmon for coordinating the food and barbeque preparations. Thank you Jerry, Laurie, Julie and Andy for the use of your wonderful resort! Everyone enjoyed what was one of the first and warmest days of spring, which we were all so very thankful for. Additional thanks to all 35 attendees of the workshop which was led by Tom Wimpy of Inland Water Pest Control & Consulting. Workshop participants learned by personal observation, which weeds are present in Eloika Lake. They were able to identify them with the aid of ELA's new weed identification brochure and Tom's assistance, to show some of the subtle differences. Time and practice looking at weeds will make residents and lake users alike more aware of weed types and population densities around the lake. Anyone with questions or

concerns about infestations may contact the lake association through our website www.eloikalake.com or by email at eloikalake@aimcomm.com.

In other aquatic news, Inland Water Pest & Control Consulting Inc. applied the first application of the biological enzyme product Mukkbuster on May 20th. This will be a summer-long test to see if this product has potential to reduce the sedimentation in Eloika Lake. There are two test locations on the east and west shores of the lake. These areas are visually identified and it is appreciated if boaters would observe from afar, so as not to disturb the areas being tested. The lake association is grateful to Inland Water Pest & Control Consulting for donating their time, in services and product, to conduct this test. We'll keep you posted on the results.

The ELA and Inland Water Pest Control & Consulting has been permitted by the Department of Ecology to treat with aquatic herbicides this summer around lake docks, which will kill weeds for up to several months. This will allow easier access from docks to the main lake or to provide clearer swim areas. You may contact Inland Pest Control & Consulting LLC at wimthom@aol.com or 509-535-3035 for further information, costs and time frame for applications.

Please visit the Eloika Lake Association booth at Elk Days to see and hear about what's new and upcoming! Check out our website and better yet, join the association to help continue the positive work that is being accomplished. Don't forget to go fishing, it has been great!

Elk Sentinel Newsletter Article 8/9/09:

Eloika Lake Association Announces Annual Meeting & Potluck Social

The Eloika Lake Association (ELA) will host its **Annual Summer Member / Guest Meeting and Potluck Social** on **Saturday, August 15th** at **4:00 pm**. The second of two yearly general meetings is being hosted on the lake by Jerry's Landing Resort. All lake and watershed residents, members of the lake association, friends and neighbors are welcome to attend.

The purpose of the meeting is to catch up with neighbors, recreational users and friends of the lake, while also having a fun time and electing new officers and board members for the next two-year term. The annual meeting is a great way to become better informed about Eloika Lake and to meet others who share two beautiful things in common - the lake and the watershed which feeds her.

A summary overview of the annual ELA board report will cover on-going projects and accomplishments over the past year. Hot off the ELA press, attendees will receive copies of the "Integrated Aquatic Vegetation Management Plan" for Eloika Lake and the "Better Management Practices Handbook" for lake residents. Several new brochures have also been completed and will be available. The ELA website has recently been updated (www.eloikalake.com) – with more to come.

A lot of time and talent has been spent by association members over the past few years, primarily dealing with invasive aquatic weeds, shoreline protection, native plants and our most precious resource, the water, of course. Many Eloika Lake residents are 'hands-on' with local and state agencies in volunteer efforts that have been widely successful.

Progress is being made! The first state-sanctioned herbicide treatment of invasive aquatic species was recently completed on Eloika Lake.

Attendance at the annual Eloika Potluck Social is a simple and fun way to say "thanks" to those working so hard for the benefit of all who use and enjoy Eloika Lake. Please bring a chair, utensils and a main dish or dessert to share at the potluck. Beverages will be provided by the association. Remember, it's also time to renew memberships or join if you are new to the area. 'Active' members with a few hours to spare are always welcome, and there are many different and unique ways to help preserve and improve the lake. Join or renew on August 15.

In other news, the Bridges Road boat launch is under construction while being upgraded; use is restricted until completion slated for mid-August. New accessible toilets were installed in June, a vast improvement. Future users of the launch will enjoy a brand new ramp, dock, accessible walk-way and signage. The Eloika Lake Association will build a new information kiosk to help keep lake users up to speed on laws and lake issues. The new launch facility will compliment efforts to reduce aquatic nuisance weeds and provide easier launching and access to the lake.

Upcoming Eloika Lake Events: Please mark these on your calendar.

- Saturday August 15th – Annual Meeting – Jerry's Landing Resort
- Saturday September 19th – 3rd Annual Kayak & Canoe Poker Paddle

For more information, visit www.eloikalake.com or e-mail the lake association at eloika@aimcomm.com.

Enjoy the peace and quiet of Eloika Lake this summer by visiting Jerry's Landing Resort!

Elk Sentinel Newsletter Article 9/9/09:

The always fun and colorful **3rd Annual Kayak and Canoe Poker Paddle** will be held on Saturday, **September 19th** and will launch this year from historic Jerry's Landing Resort on Eloika Lake. The Poker Paddle which begins at 9:00 a.m. will feature the same format as in the past, with five card stops all around the lake. The three best hands win the top prizes, with drawings held for the rest of the prizes. New festivities have been added this year and include the addition of overnight camping at the resort, an evening bon-fire Saturday night, and a free guided lake paddle tour Sunday for event participants. The early morning paddle, led by Eloika Lake resident Tammy Magnuson will feature the lakes history, wildlife observation and peaceful surroundings.

You may now pre-registration for the Poker Paddle by contacting Spokane Parks and Recreation Department at 509-625-6200 or www.spokaneparks.org , enter activity code #10441. Cost to pre-register is $12 per person and to pre-order a Poker Paddle long-sleeved t-shirt, an additional $15. If you need a kayak, you may reserve one at the same time for $15. Boat rentals are limited, so early registration with Parks and Recreation is suggested. Please note, late registration/ sign-in the day of the event will begin at 9:00 a.m. and will cost $15 per person. Poker Paddle t-shirts will be available for $20, while supplies last. Camping and canoe rentals are available through Jerry's Landing Resort. Contact the resort at 509-292-2337 for reservations and let them know you will be a poker paddle participant. For more information, please visit the Eloika Lake website at www.eloikalake.com or email eloika@aimcomm.com or call 509-292-2100.

In other exciting news, the new and much improved boat ramp is open! The reconstruction project which includes accessible ramp, dock, toilet, walkways, parking and new signing, is expected to be completed by September 1st. Thank you to the Washington Department of Fish and Wildlife, for their efforts in securing the funding for the project and their cooperation in working with the Eloika Lake Association on the new information kiosk.

Please remember, wherever you camp or recreate, pack it in/pack it out! Keep our precious natural resources clean and pristine for everyone.

Spokesman Review News Release
Eloika Lake Association – Elk, Washington
Date: 9/10/9

Tammy Magnuson, (509)292-2100 or eloika@aimcomm.com

The Eloika Lake Association's 3rd Annual Kayak and Canoe Poker Paddle will take place Saturday, September 19th on Eloika Lake from 9:00 a.m. to 1:00 p.m. New this year, the event will take place and launch from Jerry's Landing Resort, located off Oregon Road, 22 miles northeast of Spokane just west of Highway 2.

The always fun and colorful event for any type of paddle craft is open to anyone age 8 and over. The Eloika Lake Association (ELA) is host and event coordinator, with sponsorship provided by Spokane Parks and Recreation.

Participants will need to provide their own watercraft or make provisions to rent one. There will be five card stop locations around the lake, taking in the quiet and peaceful setting along the way. Prizes will be awarded to the three best poker hands, with drawings for numerous other prizes at the end of the event.
This event helps raise awareness about the many beneficial uses of Eloika Lake and to promote fun, clean and healthy recreation. As a fundraiser for the Eloika Lake Association, monies raised support educational and environmental awareness efforts. ELA is a non-profit 501(c) 3 organization.

To pre-register, contact Spokane Parks and Recreation at 509-625-6200 or on-line at www.spokaneparks.org and enter activity number 10441 to sign-up. If pre-registered, the event cost is $12 per person. Late registration will begin at 9 a.m. Saturday and will cost $15. For additional information, please contact ELA at 509-292-2100 or by email at eloika@aimcomm.com.

For those who wish to camp overnight, Jerry's Landing Resort is offering a reduced fee for Poker Paddle participants. Please contact the resort at 509-292-2337 for reservations.

Elk Sentinel Newsletter Article 10/9/09:

Early autumn has arrived to our tree lined lake. Green leaves are starting to turn golden. Warm mellow day temperatures with cool nights are helping to coax lake dwellers out of summer mode and into autumn activities. A few lucky fishermen have been able to enjoy the fall quiet, while sitting on the dock at Jerry's Landing Resort. Others find themselves all alone out on the lake in their boats, especially so during the week. The noisy Ospreys began their long migration south starting in mid-September. Suddenly, there is a real quiet peace around the lake. Even the resident Blue Herons are spending more time elsewhere, perhaps on the rivers. The lake is teeming with young frogs and catfish however, as enjoyed by one young visitor recently. Eight year old Alex Hawley, grandson of lake resident Lory Roth, needed nothing more than a small net, a flashlight and enthusiasm only a kid can seem to muster, to find lots of aquatic night life on Eloika. Life on Eloika this time of year is serene and sweet.

The running of the Third Annual Kayak and Canoe Poker Paddle was held on Saturday, September 19th. Many lake residents probably weren't aware that fifty boats were on the lake and all at once. The colorful kayaks and canoes are quiet as they glide peacefully through the water. This year's event, the biggest yet, was held at Jerry's Landing Resort for the first time, and went off without a hitch. Only one reported blister needed to be attended to by the medical crew. Mother Nature graced the event with a beautiful and mostly calm day and every participant that started, finished. The best winning poker hands were: first, Sally Jo Hampton with a Full House, second place went to Ted Wise and third was awarded to Karen Osborn. Congratulations! The top three prizes awarded were a kayak paddle and Eloika Lake mug, a headlight and a compact outdoor first aid kit. Numerous gift certificates, glass art and recreation items were distributed through random drawings to all participants. Everyone went home a winner. Spokane Parks and Recreation was on site to assist with kayak instruction and launching. Twenty-five volunteers from the Eloika Lake Association and additional 'friends' of Eloika Lake made the event possible. Special thanks must go out to Laurie and Jerry Rasmussen for the use of the resort for the event. Many heartfelt thanks to the following supporters and generous donors: Deer Park Printers, Freespace LLC, Hagan Hardware, Jo Lynn's

Java, Kay Lodahl (artist), Lory Sue Enterprises (Graphic Design & Photography), Mountain Gear, REI, Riverside Service, Schroder Motor, Silver Beach Resort at Spirit Lake, Smokey Bear, The Unicorn Mercantile, Washington Department of Fish and Wildlife and Westside Pizza. Thank you to all Poker Paddle participants and to all who make this annual event fun. We'll see you next fall for the Fourth Annual!

Photos of the Poker Paddle may be viewed at www.eloikalake.com and were taken by Eloika Lake resident, Lory Roth. Happy Fall everyone!

Eloika Lake Survey Card (October 2009)

Eloika Lake Survey Card The Eloika Lake Association appreciates your time and thoughts. Please check all that apply. ***Thank you.***

Purpose of Use:
_Fishing from dock or shore
_Fishing from boat
_Kayaking/Canoeing
_Wildlife Viewing
_Ice Fishing
_other_____

If Fishing: type of fish sought:
_Largemouth Bass
_Crappie
_Perch
_ German Brown Trout
_other_____

Season during your visit:
_Spring
_Summer
_Fall
_Winter

How many times do you visit a year? _____
Todays Date: _____
Where do you live: City_____
State_____
Country/Providence_____

What do you think are Eloika Lake's best qualities?
_Location to_____
_Year-round fishing
_Scenic Viewing
_Wildlife
_Waterfowl
_ Fisheries
_other_____

Type of Watercraft:
_Row boat
_Small motor boat
_Large motor boat
_Paddle boat
_other
Additional Comments: please use this space to note other interests or concerns.
_____
_____
_____
Your name/address or email address if you would like to be updated about Eloika Lake in the future.

APPENDIX J

Various Project Related Photographs

Mukk Busster™ Testing Photographs – June 2009
(Photographs credited to Lory Roth, ELA Member)

TEST AREA
PLEASE
LEAVE IN
PLACE

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95

Poker Paddle 2009 Photographs

2009 Plant ID Workshop and Barbecue Photographs

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APPENDIX K

Aquatic Plant Herbicide Labels and Material Safety Data Sheets

- AquaPro
- AquaMaster®
- AquaThol® K
- Avast!*SC
- DMA®4 IVM
- Habitat®
- Navigate®
- Renovate® 3
- Renovate® OTF
- Reward®
- Rodeo®
- Sonar*A.S.
- Weedar® 64

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