Aquatic Plants Technical Assistance Program

2001 Activity Report

June 2002

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Aquatic Plants Technical Assistance Program

2001 Activity Report

by
Jenifer Parsons, Betsy Dickes,
and Arline Fullerton

Environmental Assessment Program
Olympia, Washington 98504-7710

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Abstract

The objectives of the Aquatic Plant Technical Assistance Program are to

◊ Provide advice on aquatic plant identification, biology, and management to government agencies and the public.

◊ Document aquatic plant distribution and habitat through site visits.

◊ Assist with evaluating projects supported by Freshwater Aquatic Weed Program grant money.

During the 2001 field season, aquatic plant data were gathered at 54 different waterbodies located throughout the state. Several previously unknown populations of non-native invasive aquatic plants were recorded. *Typha domingensis* (southern cat-tail) was discovered in Herman and Hutchinson Lakes, Adams County. This cat-tail has never before been reported in Washington, and in fact this represents a significant northward range extension for this species. *Myriophyllum spicatum* (Eurasian watermilfoil) was found for the first time in Erie Lake, Skagit County; Silver Lake, Spokane County; Dog Lake, Yakima County; Mattoon Lake, Kittitas County, Fiorito Lakes, Kittitas County; Hutchinson Lake, Adams County; and Caliche Lake, Grant County. Also, new populations of *M. spicatum* were reported and confirmed by this program in Roses Lake, Chelan County and Capitol Lake, Thurston County. In addition to routine aquatic plant monitoring, we continued monitoring Kress Lake in Cowlitz County. This is part of a special project investigating the impact of low levels of the contact herbicide endothall on the aquatic plant community.

Other accomplishments for this program during 2001 include the following: gathered plants for the herbarium collection, provided educational and technical outreach to private and public entities, and assisted with projects funded by Freshwater Aquatic Weed Program grant money.

Introduction

Legislative action in 1991 (RCW 43-21A.660) established the Freshwater Aquatic Weed Account to provide expertise on aquatic plant issues and a source of grant money for local aquatic plant management projects. The need for this program was recognized when the spread of aquatic plant problems in the state's public waters outgrew the ability of agencies to adequately address them. To provide technical expertise for aquatic plants, one full-time position was created within the Environmental Assessment Program of the Department of Ecology. The objectives for this position are as follows:

- Provide technical assistance on aquatic plant identification and management to government agencies and the public.
- Conduct site visits to identify aquatic plants, evaluate plant community structure and identify the existence or potential for problems, particularly as they relate to invasive non-native aquatic plants.
- Assist with rating grant applications to the Freshwater Aquatic Weed Account.

The purpose of this report is to document the progress of the Aquatic Plant Technical Assistance Program with respect to these objectives during 2001, concentrating on site visit results.

To reduce confusion, all plants in this document are referred to by their scientific names. Table 1 lists the common names for the plants most frequently mentioned in the text.

Table 1. Scientific and common plant names.

Scientific Name	**Common Names**
Cabomba caroliniana	fanwort
Egeria densa	Brazilian elodea
Hydrilla verticillata	hydrilla
Ludwigia hexapetala	water primrose
Lysimachia vulgaris	garden or yellow loosestrife
Lythrum salicaria	purple loosestrife
Myriophyllum aquaticum	parrotfeather
Myriophyllum spicatum	Eurasian watermilfoil
Nymphaea odorata	fragrant waterlily
Phragmites australis	common reed
Typha angustifolia	narrow leaf cattail
Utricularia inflata	big floating bladderwort

Technical Assistance

After the Freshwater Aquatic Weed Account was established, an external advisory committee identified technical assistance for aquatic plant taxonomy, ecology, and management as a high priority for the new Freshwater Aquatic Weed Management Program. Technical assistance was later defined as "Provid(ing) technical expertise within Ecology and to other agencies, local governments, lakes groups, and the general public regarding aquatic plant ecology and taxonomy, aquatic plant management, development of integrated aquatic plant management plans, and other aquatic plant management issues. Assistance will be provided through on-site visits, development of technical reports, participation in public workshops, and presentations to private and public groups and societies."

Providing technical assistance involves working with public and private sectors to develop a broad understanding of the roles aquatic plants play in the ecosystem and how human behavior influences aquatic plant communities. Table 2 lists activities where we provided formal technical assistance. We also assisted the public and local governments on an informal basis through phone conversations, identification of mailed plant specimens, and informal meetings that are not listed. These functions are also performed to a large degree by Kathy Hamel of Ecology's Water Quality Program, though her accomplishments are not reported here.

Over the eight years of this program we have produced publications on various aspects of aquatic plant biology, ecology, identification, control and sampling. Much of this information is available on Ecology's web pages at http://www.ecy.wa.gov/ under "Environmental Info/Watersheds" and under "Programs/Water Quality/Aquatic Plants and Lake Issues."

Table 2. Aquatic plant technical outreach activities - 2001.

Function or Product	Date	Location	Role
Report on 'Condition of Freshwaters in Washington State for the Year 2000'	2/01		Contributing author
Western Aquatic Plant Management Society Conference	3/01	Las Vegas, NV	Attended board meeting, attended sessions
Washington Lakes Protection Association Conference	4/01	Spokane, WA	Attended annual conference
Meeting of Lake Sutherland Committee	4/01	Port Angeles, WA	Presented information on biology and control of *M. spicatum*
Phragmites working group meeting	5/01	Spokane, WA	Participated in first meeting of the *Phragmites* working group
Publication of 'An Aquatic Plant Identification Manual for Washington's Freshwater Plants'	6/01		Publication of aquatic plant ID manual after years of work
Publication of 'Aquatic Plant Sampling Protocols'	6/01	Olympia, WA	Wrote report detailing sampling protocols used.
Herbicide Resistance Study	6/01	various lakes	Collected plants for use by researchers studying herbicide resistant noxious weeds.
Myriophyllum genetic analysis	7-9/01	various lakes	Provided samples of *Myriophyllum* species for analysis at Portland State University
Zebra mussel monitoring	7-9/01	various lakes	Collected samples as part of an effort led by the Department of Fish and Wildlife
Meet with citizens and officials concerned with Hummel Lake	8/01	Lopez Island, San Juan County	Provided comments and an updated aquatic plant map for lake restoration committee
Training in aquatic plant ID	9/01		Provided training for Thurston County Noxious Weed Board personnel
Rare plant inventory	9/01	Arrowhead Lake, Mason County	Conducted a rare plant inventory and provided documentation
Meeting of the WRIA 29 Planning Committee	9/01	Carson, WA	Presented information on identification, biology and control of *M. spicatum*
Noxious Weed added to monitor list	10/01		Provided written description on the identification and biology of *Potamogeton crispus* (curly leaf pondweed)
Meet with Forest Service Personnel	10/01		Inventoried and discussed control options for *M. spicatum* in Dog Lake, Yakima County
Washington Noxious Weed Board Written Findings	11/01		Provided a fact sheet on the identification, biology and control of *Iris pseudacorus* (yellow flag)

Site Visits

Introduction

This section documents aquatic plant surveys conducted during the 2001 field season. The general purpose of site visits was to identify aquatic plants, targeting exotic invasive species. We also evaluated plant community structures, estimated the extent of, or potential for aquatic plant problems, and suggested possible management options if requested. Another important aspect of the site visits was to expand the aquatic plant database and herbarium collection. One special project was also undertaken this year assessing the effects of low levels of the herbicide endothall on the aquatic plant community of Kress Lake, Cowlitz County.

Site Visit Objectives

The specific 2001 site visit objectives were as follows:

- Revisit selected lakes with exotic invasive plants in order to assess plant population changes since earlier surveys.
- Revisit other selected lakes considered to be at high risk for a non-native plant invasion.
- Conduct field surveys in selected lakes that had not been previously surveyed by this program.
- Continue plant community monitoring projects on selected lakes.
- Collect detailed plant biomass and frequency data from Kress Lake, Cowlitz County.

After the site visits any newly discovered populations of invasive non-native species were reported to the local noxious weed control board representative or county lake monitoring personnel. Also, sightings of plants listed as rare by the State Natural Heritage Program (Washington Natural Heritage Program, 1997) were reported appropriately.

Field Methods

For a detailed discussion of field methods and data quality control, refer to Aquatic Plant Sampling Protocols (Parsons, 2001) and the Aquatic Plant Technical Assistance Final Quality Assurance Project Plan (Parsons, 1995). The main goal of field site visits is to create the most comprehensive species list possible for each waterbody. This facilitates the discovery of potentially problematic aquatic plants and provides baseline aquatic plant distribution information.

For most lakes the method used is to circumnavigate the littoral zone in a small boat. When a different plant or type of habitat is observed, samples are collected for identification using a weighted rake, by hand-pulling or by visual observation. In addition, notes on species distribution, abundance, and maximum depth of growth are made. This method was recommended by other aquatic plant researchers (Sytsma, 1994; Warrington, 1994) and was used successfully during the previous years of this program. However, it should be noted that because the surveys are conducted from the surface, small populations of any plant species may be overlooked. Secchi depth data were also collected at most lakes. The Secchi depth was measured in deep, open water using a 20.3 cm (8 inch) diameter black and white disk.

All field visits occurred between late spring and early fall to correspond with the time of maximal plant growth and flowering. Sampling locations were recorded with a written description, visual placement on a map, and with a Global Positioning System (GPS) unit. We collected voucher specimens of any unusual plant species and known or suspected exotic species. These were pressed, mounted, and retained in the herbarium collection (see Herbarium section in this report). All data were recorded on field forms and entered into a relational database.

In addition to the data collected for our program, we collected samples to aid several other research projects. Specimens of *Myriophyllum* species were sent to Portland State University researchers to aid in genetic studies of this genus. Specimens of *M. spicatum* and *Egeria densa* were sent to Purdue University researchers to contribute to a study being conducted in cooperation with SePro Corp. (the makers of the fluridone-based herbicide Sonar®) looking into herbicide resistant strains of these species. We also collected plankton samples to assist the Department of Fish and Wildlife in their search for zebra mussels.

Aquatic Plant Survey Results

During the 2001 field season 58 site visits were made to 54 different waterbodies. Highlights of results from these surveys are provided in this section. In addition, several projects will be elaborated on in subsequent sections. These include:

- Results from the Kress Lake herbicide assessment project.
- Rare plants found.
- Aquatic plant monitoring results from Burke Lake, Grant County and Lake Leland, Jefferson County.

General Results

Appendix A lists the lakes where aquatic plant data were gathered during the 2001 field season, the extent of the survey, and any aquatic plants listed with the Washington State Noxious Weed Control Board that were found (Chapter 16-750 WAC). A similar table with data summarizing all eight years of this program is contained in Appendix B. The primary author will provide additional information on any of the listed waterbodies upon request.

The results of these surveys include the discovery of previously unknown populations of several listed noxious weeds. *Myriophyllum spicatum* (Eurasian watermilfoil) was found in Erie Lake, Skagit County; Silver Lake, Spokane County; Dog Lake, Yakima County; Mattoon Lake, Kittitas County, Fiorito Lakes, Kittitas County; Hutchinson Lake, Adams County and Caliche Lake, Grant County. Also, new populations of *M. spicatum* were reported and confirmed by this program in Roses Lake, Chelan County and Capitol Lake, Thurston County. New populations of *Lythrum salicaria* were found at Hutchinson Lake, Adams County; Caliche Lake, Grant County; and Myron and Wenas Lakes, Yakima County. Last year's tentative identification of *Typha angustifolia* in Herman Lake, Adams County actually was *Typha domingensis* (southern cat-tail). This species was also found in nearby Hutchinson Lake, and the species could be fairly widespread in the Columbia National Wildlife Refuge area. This cattail has never before been reported in Washington, and in fact this record represents a significant northward range extension for this species. It is not currently listed with the State Noxious Weed Board, and it is not known if it will prove to be invasive. We will monitor these populations and check for additional locations in future years.

Appendix C and Figures 1 and 2 contain maps illustrating where known populations of the noxious invasive aquatic plants *Myriophyllum spicatum*, *Egeria densa*, and *Myriophyllum aquaticum* occur in Washington. Appendix D is a table listing the known locations of other aquatic invasive non-native species listed with the Washington State Noxious Weed Control Board (Chapter 16-750 WAC). The maps and table include sites that have been visited by Aquatic Plant Management Program personnel and those reported by reliable sources. Also included are waterbodies where weed eradication efforts have been undertaken within the last five years. If no recurrence of the targeted weed occurs in five years, then the lake or pond is removed from the list or maps. Locations that have had successful weed eradication programs include Goss Lake, Island County; Killarney and Youngs Lakes in King County; Silver Lake, Cowlitz County; and Surfside Lake, Pacific County.

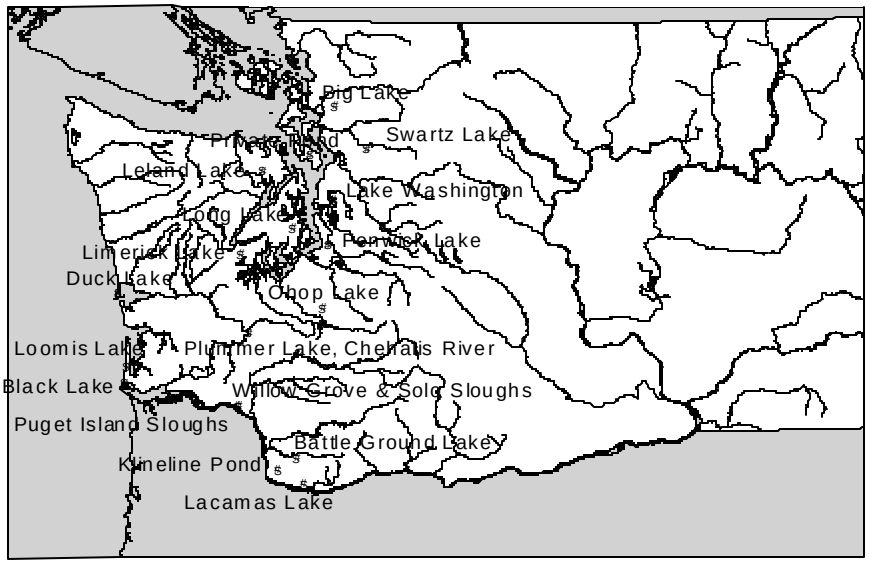

Figure 1. Known locations of *Egeria densa* in Washington, 2001.

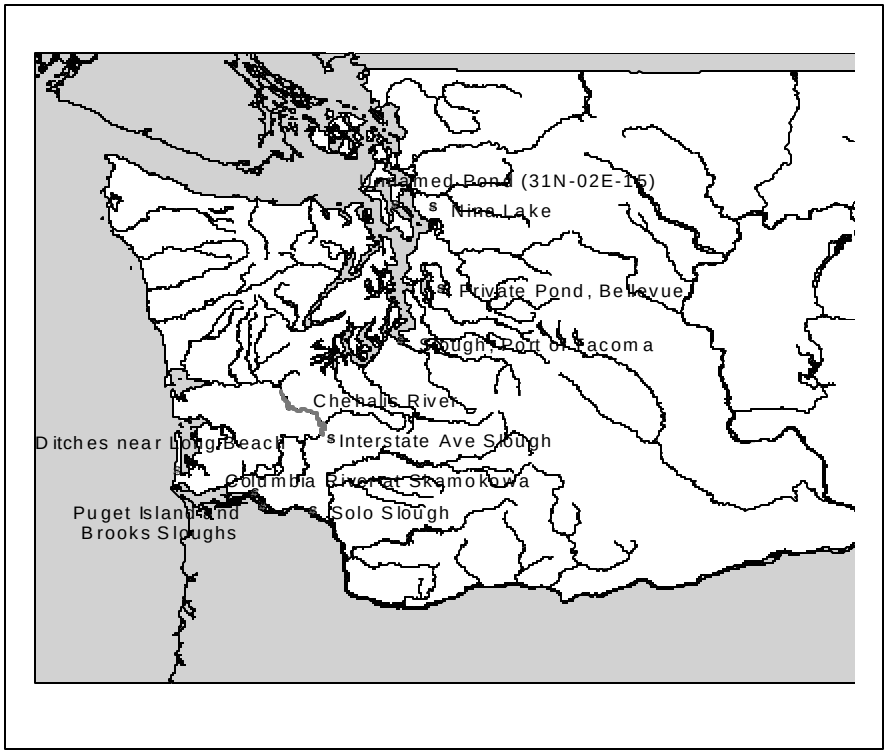

Figure 2. Known locations of *Myriophyllum aquaticum* in Washington, 2001.

Kress Lake Study

Introduction

The Kress Lake Project is a cooperative effort between Ecology, the Washington Department of Fish and Wildlife (WDFW), and ElfAtochem (now Cerexa gri Corp.). In 2000, Cerexagri representatives approached Ecology with a proposal to treat a test lake in Washington with the contact aquatic herbicide Aquathol K® (active ingredient endothall). The project purpose is to demonstrate the ability of Aquathol K® to control an exotic species (*Myriophyllum spicatum*) and to improve the fishery and lake access for anglers. Ecology is monitoring the effects of the herbicide on the aquatic plant community. The WDFW agreed to track the effects on the fish community. The herbicide application was performed by a licensed applicator at the expense of the herbicide manufacturer.

Study Site

Kress Lake in Cowlitz County was selected as the test site because it is both a popular fishing lake and has a nuisance population of *M. spicatum*. It was also attractive because the State owns the lake and shoreline, so no lake front property owners would be impacted by the study.

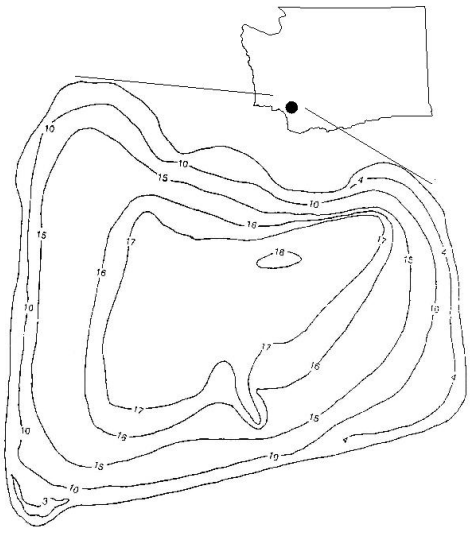

Figure 3: Kress Lake

Kress Lake is a 30-acre manmade lake located just off of Interstate 5 about 20 miles south of Kelso in southwest Washington State (Figure 3). It is more or less oval in outline with a maximum depth of 18 feet. The shoreline consists of a short steep bank with trees and shrubs. A walking trail circles the lake at the top of the embankment. The lake is managed by WDFW for fishing from shore or small boats. No combustion engines are allowed.

Prior to initiation of this study the aquatic plant community extended throughout the lake. *Myriophyllum spicatum* was the dominant plant, and formed a ring of surfacing vegetation around the lake edge. Two pondweed species and the macroalgae *Chara* sp. made up the majority of the remaining species.

The WDFW manages Kress Lake for a mixed fishery. Fish species present include rainbow trout, brown trout, cutthroat, steelhead, channel catfish, largemouth bass, bluegill, pumpkinseed, crappie and warmouth. It is a popular recreation area for anglers as well as recreational boaters, hikers, and horseback riders (Kelsey, 2001).

Methods

Aquatic Plants

The aquatic plant community has been assessed four times so far for this study; before the herbicide treatment (June 13, 2000), ten weeks after treatment (August 24, 2000), one year after treatment (June 21, 2001) and 1.3 years after treatment (September 6, 2001). Biomass and frequency data were gathered at points throughout the lake on all but the last sample date at which time only frequency data was collected. In addition to the quantitative data, a composite species list and secchi depth data were collected on each sample date. Follow-up studies to collect the same suite of data are planned for June 2002.

Frequency Data

Plant samples were gathered systematically at points on a 30.5 meter (100 foot) grid for the frequency data analysis. The grid was developed using a Geographical Information System (GIS) (Madsen 1999). However, in the field the point coordinates from the GIS did not correspond with the data the Global Positioning System (GPS) unit was providing. Due to the small size of the lake, the field personnel felt they could visually estimate the point locations with sufficient accuracy.

At each point samples were gathered from the port side of the boat. Samples were gathered using two metal leaf rakes bolted back to back with the handles removed and replaced with a 30-meter marked rope. The rake was thrown twice, and all recovered species were recorded. The depth of each sample site was also recorded.

Data were entered into a relational database and a Chi-square two-by-two analysis was performed on the common species to look for differences between all four sample dates. The probability was adjusted using a Bonferroni correction to account for multiple comparisons.

Biomass

Biomass data were gathered at points located throughout the lake. These points were randomly selected from the same point grid used for the frequency data collection. Samples were collected with a metal rake attached to a long aluminum handle. The rake was lowered to the substrate and turned 360° to collect the plants within the circle scribed by the rake tongs. The rake was 0.38 meters wide, so sampled approximately a 0.1 square meter area. The sample was brought to the surface and placed into a plastic bag labeled with the sample location and depth. The samples were transported to the lab where they were sorted by species and placed into pre-weighed and numbered paper bags. They were dried in a forced air oven at approximately 95° C, until they reached a constant weight. They were then weighed to .01 gram accuracy and

the bag weight was subtracted to give the macrophyte dry weight. These data were entered into a relational database and analyzed for differences among the three dates using one-way Analysis of Variance (ANOVA). We performed a $\log_{10}+1$ transformation on the data to approximate a normal distribution. The resultant p-values were adjusted using a Bonferroni correction to account for multiple comparisons. Post-hoc analysis determined which of the comparisons were significant.

Herbicide Application

The first herbicide application took place on June 21, 2000. Ten acres were treated around the edge of the lake using Aquathol K®. The application rate was 1.5 ppm, using about 6 gallons per acre. The second treatment was a month later. Another 10 acres were treated out from the shoreline toward the center of the lake using the same application rates and amounts (McNabb, 2001).

Results and Discussion

The species list from each sample date shows that the species diversity was greatest in June 2001 (Table 3). A total of 12 different submersed taxa were present at that time, this is almost double the number found before the herbicide treatment. The number of taxa observed decreased to 9 by the September 2001 sampling event, either due to sampling variability or possibly the increasing dominance by a few species making locating rare species more difficult, or the seasonal die off of selected species. One species, *Heteranthera dubia*, was identified before treatment but not during any of the sampling events after treatment.

Table 3. List of species from Kress Lake and the dates on which they were found.

Scientific name	Common name	6/13/00	8/24/00	6/21/01	9/6/01
Callitriche sp.	water-starwort	v		v	
Callitriche stagnalis	pond water-starwort			v	
Ceratophyllum demersum	Coontail; hornwort			v	v
Chara sp.	muskwort	v	v	v	v
Elodea canadensis	common elodea	v	v	v	v
Heteranthera dubia	water star-grass	v			
Myriophyllum spicatum	Eurasian water-milfoil	v	v	v	v
Nitella sp.	stonewort				v
Potamogeton amplifolius	large-leaf pondweed	v		v	v
Potamogeton crispus	curly leaf pondweed			v	v
Potamogeton sp (thin leaved)	thin leaved pondweed		v	v	v
Potamogeton sp.	pondweed		v		
Potamogeton zosteriformis	eel-grass pondweed			v	
Ranunculus flammula	creeping buttercup			v	
Utricularia sp.	bladderwort	v		v	v

Point Intercept Frequency

A total of 371 samples were collected on the four sample dates, 90 in June 2000, 95 in August 2000, 94 in June 2001, and 92 in September 2001. For the data analysis the *Potamogeton* spp. (pondweeds) were grouped together due to difficulty in differentiating the species. *Ceratophyllum demersum* and *Nitella* sp. were omitted from the analysis because they were only found in a few samples.

Figure 4 presents a graph of the Chi squared analysis results. The macroalgae *Chara* sp. was found at significantly higher frequency in both the June 2001 and September 2001 samples when compared with both of the samples from 2000. The same pattern was true for *E. canadensis*, which was also significantly higher in September 2001 than in June 2001. *Elodea canadensis* and *Chara* sp. are both resistant to endothall (Skogerboe and Getsinger, 2002), so they likely had a head start over other native plants that were more susceptible to the herbicide. The *M. spicatum* was significantly lower at all post treatment sampling times than the pretreatment sample (June 2000). However, it also increased significantly between June 2001 and September 2001. The *Potamogeton* spp. followed the same pattern as the *M. spicatum* with a significant reduction in all post treatment samples compared with pre-treatment frequency, but it did not demonstrate a significant recovery by September 2001. The *Utricularia* sp. showed a significant increase in September 2001 compared with all prior samples. Samples where no plants were collected increased significantly three months after treatment (August 200 compared with June 2000) and decreased again significantly by one year later (September 2001).

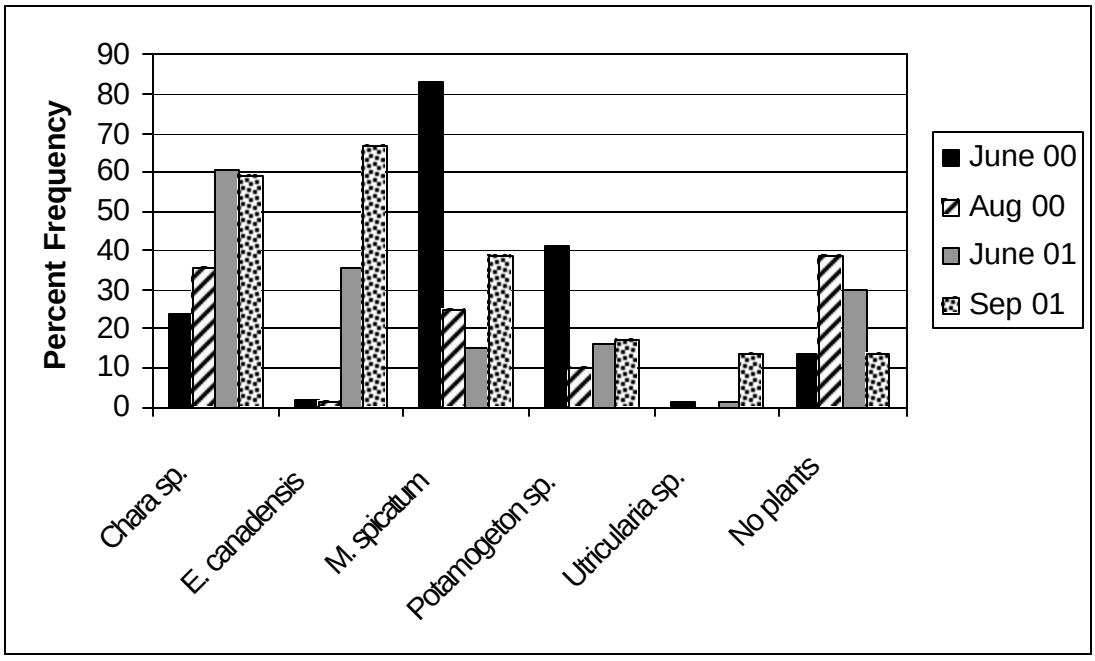

Figure 4: Chi square analysis results of the Kress Lake frequency data for the four sample dates.

These results indicate that in the short-term (three months after treatment) the herbicide reduced the frequency with which the vascular plants were found, while not affecting the

macroalgae *Chara* sp. During this period vascular plants were being reduced to the point of eliminating plant cover completely in locations throughout the lake. By one year after treatment and throughout that summer (June 2001 and September 2001) the frequency of *Chara* sp. appeared to level-off while some of the vascular plants increased (*Elodea, M. spicatum, Utricularia*). This recovery appears to be filling in areas left bare of plants the previous summer. The *Potamogeton* sp. do not appear to be rebounding yet.

Biomass

Biomass data were gathered at 90 locations throughout the lake, 30 on each of the sampling dates (June 2000, August 2000, and June 2001). As with the point intercept frequency data, the *Potamogeton* spp. were combined at the genus level. The *Ceratophyllum demersum* and *U. vulgaris* were omitted from the analysis due to too few occurances.

Two species showed a significant change in their biomass between the sampling periods (Table 4). *Elodea canadensis* increased significantly one year after treatment when compared with both the pretreatment sample (June 2000) and August 2000. Significantly less *M. spicatum* biomass was collected both in August 2000 and June 2001 compared with June 2000.

Table 4. Mean biomass (with standard deviation in parentheses) and ANOVA results from common species.

	Biomass (g/m^2)			
	June '00	Aug '00	June '01	P-value
Chara sp.	211 (495)	254 (585)	106 (159)	0.68
E. canadensis	.03 (.2)	.01 (.07)	55 (159)	**0.00***
M. spicatum	76 (82)	.85 (2.2)	23 (112)	**0.00***
Potamogeton sp.	20 (52)	1.6 (5.2)	13 (44)	0.20

* significant at $P \leq .05$

Conclusion

These results indicate that the herbicide endothall (Aquathol K®) significantly reduced both the biomass and frequency of observation of the target plant, *M. spicatum*, over the study period. However, by 1.3 years after treatment M. spicatum was showing a significant increase in frequency, so the duration of its control may be ending. The results also show an increase in overall submersed aquatic plant species diversity one year after treatment, likely the result of increased available habitat. The impact on other species included a reduction in *Potamogeton* spp. frequency likely a direct result of the herbicide, and increases in frequency and/ or biomass of *E. canadensis*, *Chara* sp and *Utricularia* sp. one year after treatment, probably a result of increased available habitat and/or resistance to the herbicide.

Rare Plants

In addition to the weedy species, populations of plants listed as rare by the Washington Natural Heritage Program (WNHP) (Washington Natural Heritage Program, 1997) were observed during the field surveys. Two populations of Limosella acaulis were noted in Grant County. One population of Potamogeton obtusifolius was revisited in Mason County, and another new population was confirmed from a specimen brought by Thurston County personnel from a Thurston County lake. All sightings were reported to the WNHP database manager.

Plant Community Monitoring Projects

Leland Lake *Egeria densa*

Leland Lake is a 110-acre shallow lake in rural Jefferson County on the east side of the Olympic Peninsula. Historically it has supported a diverse community of native vegetation that provided important wildlife habitat for many species including amphibians and wintering trumpeter swans. It is also well known as a popular warm water fishery (Collins, 1995).

In late May 1994 an isolated though well developed population of *Egeria densa* was discovered in the western end of the lake. Additional site visits were made in 1995 and 1996 to monitor the *Egeria* spread. In 1997 the Jefferson County Conservation District along with several local community members completed a detailed aquatic plant and water quality study, supported by grant money from the Aquatic Weed Management Fund. They found that *Egeria* was present along 85% of the 27 transects inventoried for aquatic plants. The results of this study were included in an Integrated Aquatic Plant Management Plan. The Plan called for localized *Egeria* control in the swimming area near the boat launch and around private docks. More aggressive measures were not called for at this time due to financial restraints, and concern about the environmental impacts of the control methods (Taylor and Gately, 1998). In 1999, 2000 and 2001 we again monitored the lake to further document the *Egeria* population.

Figures 5 and 6 present maps of the *Egeria* coverage in 1994, 1996, 1999 and 2000. The day of the 2001 survey was very windy, so only about half of the lake was inventoried. Results of that survey are not included here, but that part of the shoreline that was covered indicates that the coverage was similar or slightly less that what was documented in 2000. The maps illustrate the rapid spread of this plant throughout most of the littoral zone. In 1994 the *Egeria* appeared restricted to the southern end of the lake. By 1996 it had spread into a significant portion of the main lake body. In 1999 it was found nearly throughout the littoral zone, and the cover of *Egeria* in relation to the native macrophyte species had increased substantially. In 2000 the *Egeria* coverage appears to be reduced in many areas of the lake compared with 1999. The lake will continue to be monitored to see if the *Egeria* population continues to decline, or if the population is merely fluctuating year to year as the growing conditions change.

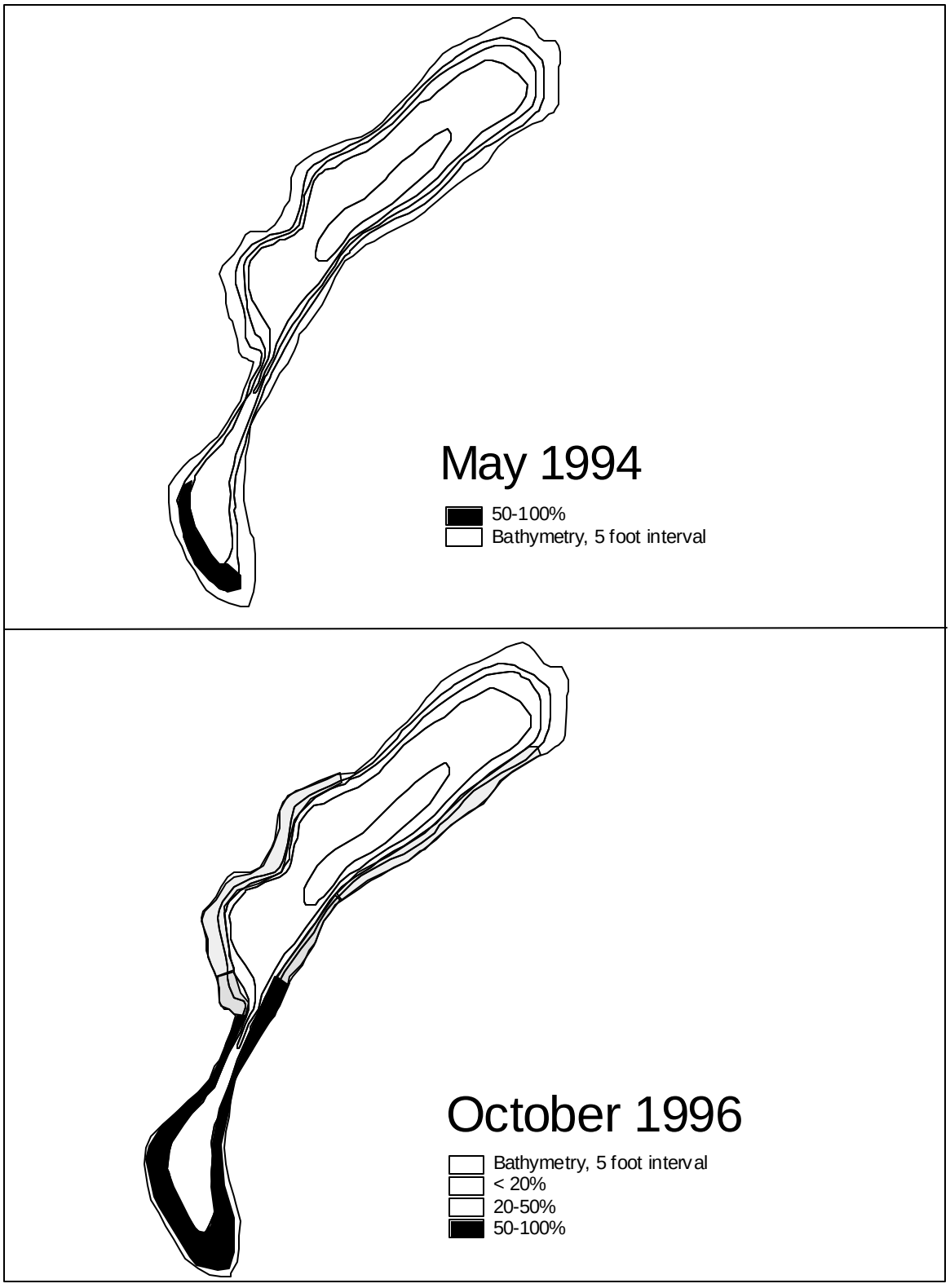

Figure 5: Lake Leland *Egeria densa* percent cover, 1994 and 1996.

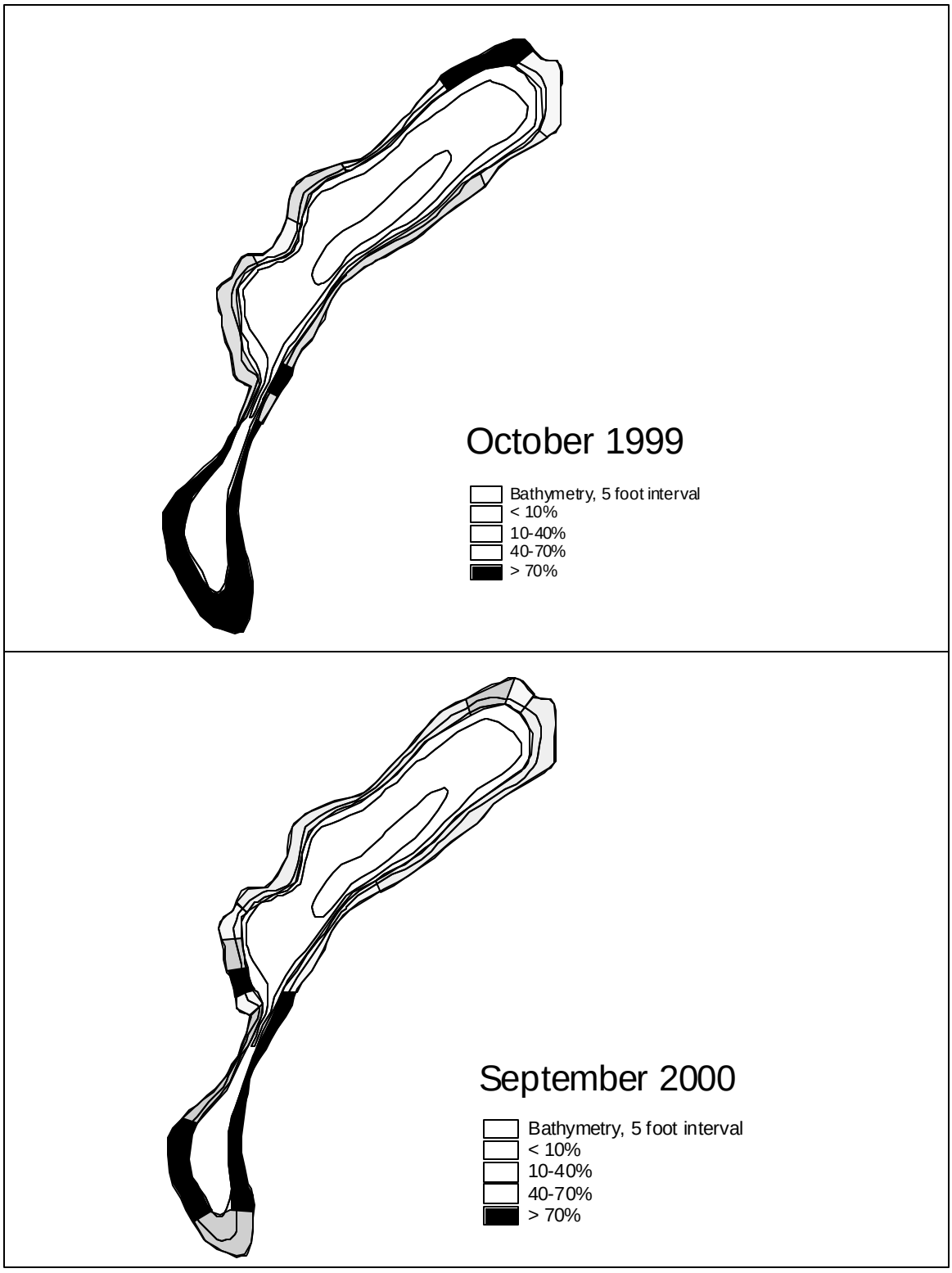

Figure 6. Lake Leland *Egeria densa* percent cover in 1999 and 2000.

Burke Lake *Myriophyllum spicatum*

Burke Lake is one of several lakes in the Quincy Wildlife Area located in Grant County, approximately seven miles south of Quincy. It is managed by the Department of Fish and Wildlife for a recreational fishery. We have been conducting plant monitoring projects on several of these lakes during years when we have the time at the end of the growing season. We produce the distribution maps by collecting data along transects and by spot sampling other areas of the lake. Previous reports have discussed plant community dynamics in nearby Evergreen and Quincy Lakes (Parsons, 1997).

Burke Lake is a long, narrow 72 acres with a maximum depth of 33 feet and mean depth of 15 feet. The lake formed in about 1955 from irrigation runoff and seepage (Dion et al, 1976). It is not use for irrigation storage, so the water level is relatively constant year round (Foster, 2001). Most of the aquatic plant habitat occurs at the far ends of the lake, with the middle consisting of steeper and rockier habitat. We originally inventoried the plant community of Burke Lake in 1994, at which time it contained a mixed community dominated by the macroalgae *Chara* sp, and the native vascular plants *Elodea canadensis* and *Myriophyllum sibiricum* (northern milfoil). No *M. spicatum* was found at that time. The lake was visited again in 1996, at which time it had a pioneering population of *M. spicatum* (Figure 7). By September 1999 *M. spicatum* was dominant or co-dominant throughout the central and most of the eastern end of the lake. *Chara* sp. was the dominant plant in the west end of the lake (Figure 7). Interestingly, in September 2001 *M. spicatum* was not dominant in any part of the lake, and the part where it was co-dominant had been reduced from what it was in 1999. *Chara* sp had become dominant throughout much of the shoreline formerly occupied by vascular plants (Figure 8).

It is not known why the *M. spicatum* declined in Burke Lake during 2001. One possibility is the presence of the herbivorous weevil *Euhrychiopsis lecontei*. This weevil was discovered in Burke Lake in 2000 (Tamayo, 2002). This weevil will graze on both *M. spicatum* and *M. sibiricum*, and both of these species appear to be on the decline, at least for now. This lake will continue to be monitored to see if the current trend persists. *Myriophyllum spicatum* population levels have also fluctuated in nearby Evergreen Lake over the years, and this lake is also known to host *E. lecontei* (Parsons, 1997; Tamayo, 1998).

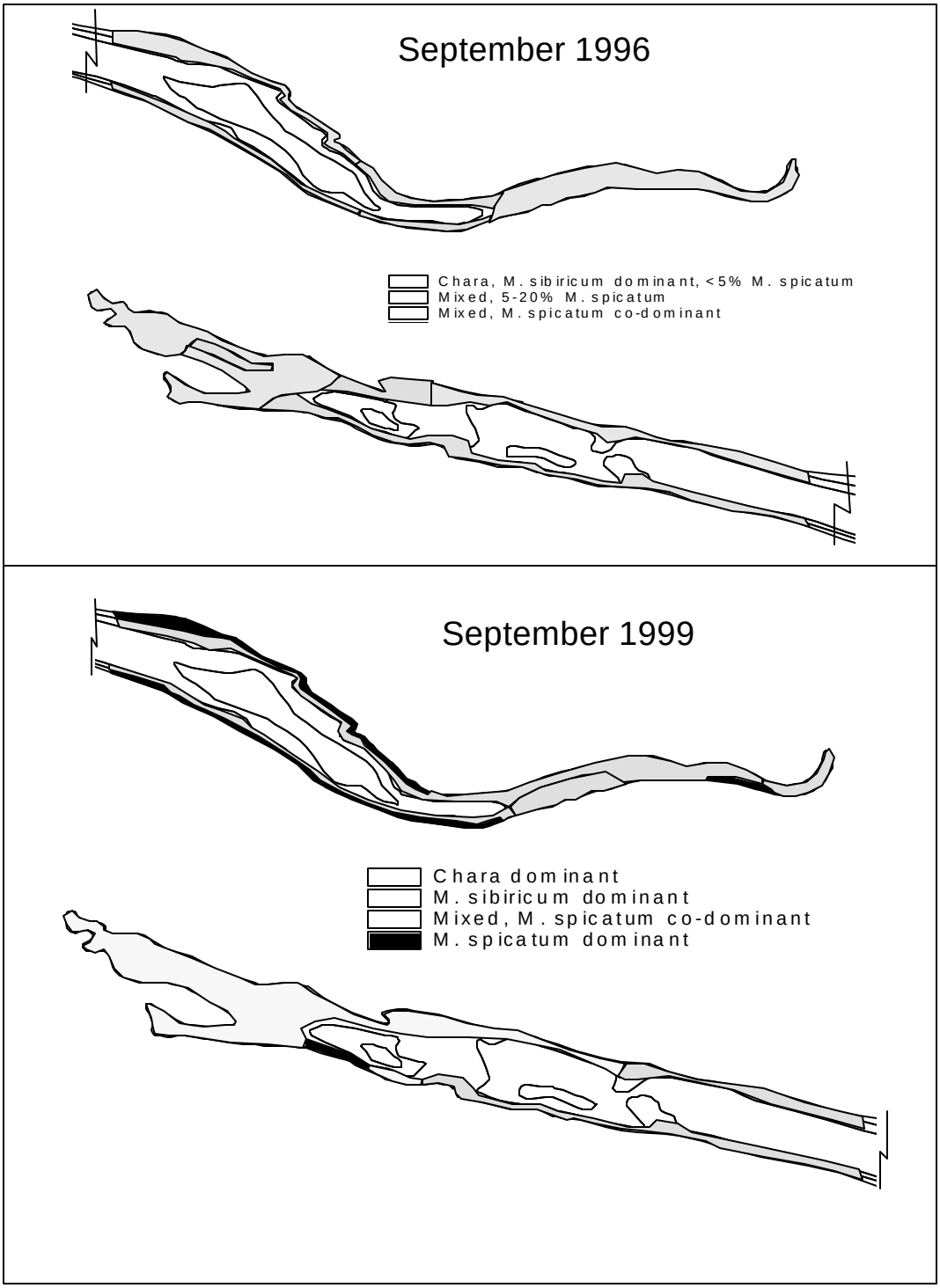

Figure 7. Aquatic plant community in Burke Lake, 1996 and 1999.

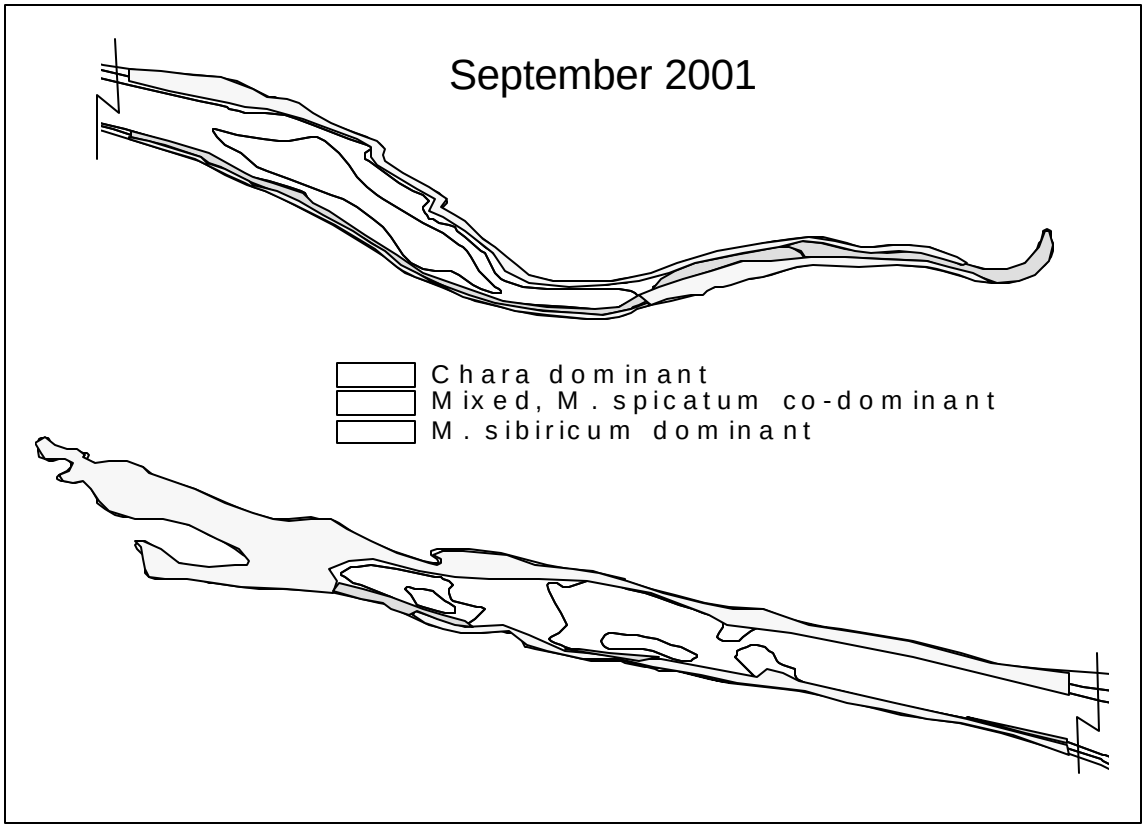

Figure 8. Aquatic plant community in Burke Lake, 2001.

Herbarium

Methods Used in Aquatic Plant Identification

All plants were identified to the lowest taxonomic group possible, usually to species unless critical features of the plant were missing (such as flowers or fruits). To assure proper identification, a number of books and other sources were consulted as cross references (see Parsons, 2001 for a list). In addition, several people from within and outside the agency are consulted in cases where identification is difficult. If this is not conclusive, the plant is sent to national taxonomic experts for an opinion. Kartesz (1994), The Jepson Manual (Hickman, 1993), and the Flora of North America (Flora of North America Editorial Committee, 1993) are used to ensure the nomenclature is current.

Methods Used in Collection and Preservation

The methods used to preserve collected aquatic plants were those of Haynes (1984). First, all available plant parts (roots, stem, and flowering parts) were collected and sealed in a wet plastic bag. Within three days, but usually sooner, the plants were washed, identified, and arranged on a sheet of 100% rag herbarium paper. If the plant was too limp to maintain its shape in air, it was arranged on the paper in a tray of water. The herbarium sheets with plants and a written site description were then sandwiched between newspaper, blotter paper and cardboard in a plant press. When the specimen dried, it was fixed to the paper with herbarium glue or binding tape (if it was not already sufficiently adhered from the wet pressing process). A label with identification and collection information was attached. These finished reference specimens are stored in a sealed herbarium cabinet located in the Ecology headquarters building benthic laboratory.

Currently, the herbarium collection contains 120 unique taxa from 40 families (Appendix E). There are a total of 398 specimens, and in most cases each species is represented by more than one specimen. Each time a noxious weed is found; a collection is made and kept as a record. Additional taxa will be added to the herbarium as they are collected in future years. Also, specimens from aquatic plant mapping projects funded under the Aquatic Weed Management grant program are housed in this herbarium. The collection is available to both Ecology staff and the public as a reference and permanent record.

Aquatic Weed Management
Fund-Related Activities

Money was available from the Aquatic Weed Management Fund (AWMF) to fund a grant cycle in autumn 2001 for fiscal year 2002. This year we had approximately $300,000 to fund projects qualifying for assistance. Table 5 lists the eight applicants that applied for funding in the order they were received. The projects were evaluated and prioritized by a team of Ecology employees familiar with lake issues. We had enough money this year to fund all projects, and all were awarded the grant money requested with the following contingencies: the Town of Hunts Point and the Sacheen Sewer and Water District must produce an Ecology approved Integrated Aquatic Vegetation Management Plan by June 1, 2002; and Snohomish Noxious Weed Board must include all noxious aquatic weeds in their project (the original request was for Japanese knotweed only).

In addition to the regular funding cycle, one application for early infestation funds was received and funded during 2001. It was for control of *M. spicatum* in Lake Erie, Skagit County. For additional information on this grant program and the use of the monies contact Kathy Hamel at the Department of Ecology, Water Quality Program.

Table 5. List of applicants for AWMF grant funds in Fiscal Year 2002 and the amount awarded.

Applicant Name	**Project Title**	**Requested Amount**
Skamania County	Skamania County Aquatic Weed Plan	$ 30,000
Town of Hunts Point	Hunts Point Milfoil Eradication Implementation	$ 75,000
Sacheen Sewer & Water District	Sacheen Lake Milfoil Control	$ 75,000
Department of Natural Resources	CRSP Purple Loosestrife & Parrotfeather Control	$ 15,000
Snohomish Noxious Weed Board	Stillaguamish River Survey Project	$ 20,784
Whatcom Noxious Weed Board	Strange Waterweeds are Making Problems	$ 36,750
City of Rock Island	Rock Island Lakes Planning Project	$ 30,000
Liberty Sewer & Water District	Aquatic Weed Management Plan Liberty Lake	$ 15,000
		$297,534

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Appendix A

Site Visit Table 2001

County	Waterbody Name	WRIA	Date	Survey Extent	Invasive Species
Adams	Herman Lake	41	7/10/01	whole littoral	*L. salicaria*
	Herman Lake	41	8/7/01	north coves	none
	Hutchinson Lake	41	8/27/01	selected areas	*M. spicatum, L. salicaria*
Chelan	Fish Lake	45	9/10/01	boat launches	*L. vulgaris*
	Roses (Alkali) Lake	47	9/11/01	whole littoral	*M. spicatum*
	Wapato Lake	47	9/11/01	whole littoral	*M. spicatum*
	Wenatchee Lake	45	9/12/01	east end	*none*
Clallam	Sutherland Lake	18	4/13/01	selected areas	*M. spicatum*
Cowlitz	Kress Lake	27	6/21/01	whole littoral	*M. spicatum*
	Kress Lake	27	9/6/01	whole littoral	*none*
Grant	Burke Lake	41	9/19/01	whole littoral	*M. spicatum, L. salicaria*
	Caliche Lake	41	9/28/01	whole littoral	*M. spicatum, L. salicaria*
	Evergreen Lake	41	10/10/01	east end	*M. spicatum, L. salicaria*
	Priest Rapids Lake	36	6/27/01	selected areas	*M. spicatum, L. salicaria*
	Stan Coffin Lake	41	7/11/01	whole littoral	*M. spicatum, L. salicaria*
Island	Cranberry Lake	6	8/7/01	selected areas	none
	Goss Lake	6	8/8/01	whole littoral	none
Jefferson	Crocker Lake	17	8/8/01	selected areas	none
	Leland Lake	17	8/9/01	selected areas	*E. densa*
King	Killarney Lake	10	9/18/01	whole littoral	*L. salicaria*
Kittitas	Fiorito Ponds	39	6/26/01	selected areas	*M. spicatum*
	Hanson Ponds	39	11/2/01	selected areas	none
	Kiwanis Pond	39	9/14/01	selected areas	none
	Lavender Lake	39	9/14/01	whole littoral	*M. spicatum*
	Mattoon Lake	39	8/21/01	whole littoral	*M. spicatum*
	Roza Reservoir	39	5/20/01	selected areas	none
	Roza Reservoir	39	6/26/01	whole littoral	none
	Wild Duck Lake	39	8/17/01	selected areas	none
Lewis	Plummer Lake	23	7/30/01	whole littoral	*E. densa*
	Swofford Pond	26	7/31/01	whole littoral	*M. spicatum*
Mason	Limerick Lake	14	9/13/01	whole littoral	*E. densa, U. inflata*
	Simpson (Arrowhead) Lake	22	9/17/01	whole littoral	none
Pacific	Black Lake	24	8/2/01	selected areas	*E. densa*
	Loomis Lake	24	8/1/01	whole littoral	*M. spicatum, E. densa*

County	Waterbody Name	WRIA	Date	Survey Extent	Invasive Species
Pend Oreille	Frater Lake	59	8/28/01	whole littoral	none
	Marshall Lake	62	8/28/01	whole littoral	*M. spicatum*
	Mill Pond	62	8/27/01	whole littoral	none
	Nile Lake	62	8/27/01	whole littoral	*M. spicatum*
Pierce	Kapowsin Lake	10	6/15/01	selected areas	none
	Ohop Lake	11	9/19/01	whole littoral	*E. densa*
	Rapjohn Lake	11	9/19/01	whole littoral	none
San Juan	Hummel Lake	2	8/7/01	whole littoral	none
Sherman	Deschutes River (Oregon)		9/27/01	selected areas	none
Skagit	Erie Lake	3	8/6/01	whole littoral	*M. spicatum*
Spokane	Eloika Lake	55	8/29/01	whole littoral	*M. spicatum*
	Medical, West Lake	43	8/30/01	whole littoral	none
	Silver Lake	34	8/30/01	selected areas	*M. spicatum*
Thurston	Lois Lake	13	8/12/01	selected areas	*M. spicatum*
	Patterson Lake	13	9/18/01	whole littoral	none
Yakima	Byron Lake	37	7/9/01	selected areas	*M. spicatum, L. salicaria*
	Dog Lake	38	8/15/01	whole littoral	*M. spicatum*
	Dog Lake	38	10/25/01	selected areas	none
	Giffin Lake	37	8/1/01	selected areas	*L. salicaria*
	Leech Lake	38	8/24/01	whole littoral	none
	Morgan Lake	37	8/1/01	selected areas	none
	Myron Lake	38	6/25/01	selected areas	*L. salicaria*
	Unnamed Pond (13N-18E-12)	37	7/27/01	selected areas	none
	Wenas Lake	39	7/17/01	selected areas	*L. salicaria*

Appendix B

Site Visit Summary Table 1994-2001

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Adams	Herman Lake	41	7/28/98	whole lake	*Lythrum salicaria*
			7/10/2001	whole lake	
			8/7/2001	north coves	
			9/27/2000	whole littoral	
	Hutchinson Lake	41	8/27/2001	selected areas	*M. spicatum, L. salicaria*
	Sprague Lake	34	9/16/1997	south half	none
			9/1/1999	selected areas	none
Asotin	Snake River at Chief Timothy S.P.	35	8/4/1997	3 sites	none
Chelan	Antilon Lake	47	8/31/1994	from shore, N and S ends	none
	Chelan Lake	47	8/31/1994	from City Park shore	*Myriophyllum spicatum*
	Dry Lake	47	8/31/1994	from shore, east end	none
	Fish Lake	45	6/16/1997	west shore	none
			8/12/1999	west end	*Lysimachia vulgaris*
			9/10/2001	boat launch areas	
	Roses Lake	47	8/31/1994	south shore	none
			6/17/1997	whole littoral	none
			9/11/2001	whole littoral	*M. spicatum*
	Wapato Lake	47	8/31/1994	entire shoreline	*Myriophyllum spicatum*
			6/27/1995	whole littoral	
			8/8/1995	whole littoral	
			9/11/1995	whole littoral	
			6/24/1996	whole littoral	
			7/15/1996	milfoil sites	
			9/16/1996	milfoil sites	
			7/16/1997	whole littoral	
			8/10/1999	whole lake	
	Wenatchee Lake	45	9/1/1994	west end, east boat launch	none
			8/9/1999	east and west ends	none
			9/12/2001	east end	none
Clallam	Beaver Lake	20	7/9/1996	whole littoral	none
			8/15/2000	whole littoral	none
	Crescent Lake	19	7/10/1996	4 sites	none
			8/15/2000	boat launch areas	none
	Ozette Lake	20	7/9/1996	3 sites	none
	Pleasant Lake	20	7/11/1996	whole littoral	none
			8/15/2000	whole littoral	none
	Sutherland Lake	18	7/11/1996	whole littoral	none
			8/14/2000	whole littoral	*Myriophyllum spicatum*
			4/13/2001	selected areas	
	Unnamed (30N-04W-17)	18	7/13/1995	ID from plant sample	*Myriophyllum spicatum*
Clark	Battleground Lake	28	4/13/1994	from dock only	*Egeria densa*
			6/17/1999	whole lake	*Egeria densa*
	Caterpillar Slough	28	8/15/1995	spot check from boat	*Myriophyllum spicatum*
	Columbia River at Ridgefield	28	8/15/1995	spot check from boat	*Myriophyllum spicatum*
					Lythrum salicaria
	Lacamas Lake	28	9/3/1997	whole littoral	*Egeria densa*
			6/17/1999	whole lake	*Egeria densa*
	Vancouver Lake	28	8/15/1995	spot check from shore	none
Columbia	Snake River at Little Goose Dam	35	8/5/1997	spot check, boat	*Myriophyllum spicatum*
	Snake River near Lyons Ferry	35	8/5/1997	spot check, boat	*Myriophyllum spicatum*

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Cowlitz	Kress Lake	27	9/30/1999	whole shore	*Myriophyllum spicatum*
			6/13/2000	whole lake	
			8/24/2000	whole lake	
			6/21/2001	whole lake	
			9/6/2001	whole lake	
	Merrill Lake	27	6/23/1999	several sites	none
	Sacajawea Lake	25	8/4/98	3 sites, shore	none
			6/23/1999	whole lake	none
	Silver Lake	26	9/7/1994	several locations thu' lake	*Myriophyllum spicatum*
			9/19/1995	several sites, from boat	none
			8/4/1998	south half	none
			9/30/1999	launch area	none
	Solo Slough	25	4/13/1994	spot check from shore	*Myriophyllum aquaticum*
			7/14/1994	spot check from shore	*Cabomba caroliniana*
			8/16/1995	from shore	*Egeria densa*
			8/8/1996	from shore	*Ludwigia hexapetala*
			5/28/1997	spot check from shore	*Myriophyllum spicatum*
			8/4/1998	1 site, shore	
	Willow Grove Slough	25	4/13/1994	spot check from shore	*Cabomba caroliniana*
			7/14/1994	spot check from shore	*Myriophyllum spicatum*
			8/16/1995	several sites, from boat	*Egeria densa*
			8/4/98	1 site, shore	*Lythrum salicaria*
					Myriophyllum spicatum
Douglas	Jameson Lake	44	6/26/1996	1 site from shore	none
Ferry	Curlew Lake	60	8/22/1995	5 sites, whole littoral	none
			8/2/1996	4 sites (luanches)	none
			8/13/1997	5 sites (launches)	none
			5/19/1998	2 sites, boat	none
			7/28/1999	10 sites, launches	none
	Ellen Lake	58	8/23/1995	whole littoral	none
	Ferry Lake	52	8/13/1997	whole littoral	none
	Swan Lake	52	8/13/1997	whole littoral	none
	Trout Lake	58	8/22/1995	whole littoral	none
	Twin Lakes	58	8/23/1995	4 sites, both lakes	none
			8/14/1997	3 sites, both lakes	none
Franklin	Kahlotus Lake	36	9/28/2000	one area, from shore	none
	Scooteney Reservoir	36	7/26/1995	spot check from shore	*Myriophyllum spicatum*
	Snake River - Lower Monumental Dam	33	8/20/1996	spot check, boat	*Myriophyllum spicatum*
	Snake River at Ice Harbor Dam	33	8/19/1996	spot check, boat	*Myriophyllum spicatum*
	Snake River at Levey Park	33	8/19/1996	spot check, boat	none
	Snake River at Windust Park	33	8/20/1996	spot check, boat	none
	Snake River at Lyons Ferry	34	8/5/1997	spot check, boat	*Myriophyllum spicatum*
Garfield	Snake River at Lower Granite Dam	35	8/4/1997	spot check, boat	none
Grant	Alkali Lake	42	7/16/1996	whole littoral	none
	Babcock Ridge Lake	41	7/24/1995	2 sites, whole littoral	*Myriophyllum spicatum*
					Lythrum salicaria
	Banks Lake	42	6/25/1996	spot check, shore	none
	Billy Clapp Lake	42	8/30/1995	4 sites, whole littoral	*Myriophyllum spicatum*
	Blue Lake	42	7/16/1996	whole littoral	none

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Grant	Burke Lake	41	6/28/1994	entire shoreline	*Lythrum salicaria*
			9/19/1996	whole littoral	*Myriophyllum spicatum*
			9/24/1997	whole littoral	
			9/9/98	whole lake	
			9/29/1999	whole lake	
			9/19/2001	whole littoral	
	Caliche Lake	41	9/28/2001	whole littoral	*M. spicatum, L. salicaria*
	Canal Lake	41	8/30/1995	4 sites, whole littoral	*Lythrum salicaria*
			9/27/2000	whole littoral	
	Corral Lake	41	7/25/1995	whole littoral	*Lythrum salicaria*
	Crater Lake	41	7/24/1995	spot check from shore	none
	Deep Lake	42	6/25/1996	whole littoral	none
	Dry Falls Lake	42	6/25/1996	spot check, shore	none
	Evergreen Lake	41	6/27/1994	entire shoreline	*Lythrum salicaria*
			9/12/1995	8 transects, whole littoral	*Myriophyllum spicatum*
			9/18/1996	8 transects, whole littoral	
			9/23/1997	8 transects, whole littoral	
			9/9/98	whole lake	
			9/28/1999	whole lake	
			10/10/2001	east end	
	Frenchman Hills	41	7/29/98	1 site, shore	*Lythrum salicaria*
	Heart Lake	41	9/26/2000	whole littoral	none
	Lenore Lake	42	7/17/1996	whole littoral	none
	Long Lake (17N-29E-32)	41	8/31/1995	2 sites, whole littoral	none
			9/27/2000	whole littoral	none
	Moses Lake	41	7/15/98	10 sites, boat	*Lythrum salicaria*
	Park Lake	42	6/26/1996	whole littoral	none
			9/10/98	whole lake	none
	Potholes Reservoir	41	8/7/1994	6 sites on N & W side	*Myriophyllum spicatum*
			7/16/98	10 sites, boat	none
	Priest Rapids Lake	36	6/27/2001	selected areas	*M. spicatum, L. salicaria*
	Quincy Lake	41	6/28/1994	entire shoreline	*Lythrum salicaria*
			9/13/1995	3 transects, whole littoral	
			9/17/1996	3 transects, whole littoral	
			9/22/1997	whole littoral	
			9/8/98	whole lake	
			9/29/1999	whole lake	
	Rocky Ford Cr	41	7/28/1997	spot check, shore	*Lythrum salicaria*
	Soda Lake	41	7/25/1995	whole littoral	none
			9/26/2000	whole littoral	none
	Stan Coffin Lake	41	6/29/1994	entire shoreline	*Myriophyllum spicatum*
			7/11/2001	whole littoral	*Lythrum salicaria*
	Warden Lake	41	7/25/1995	2 sites, whole littoral	*Lythrum salicaria*
			7/28/98	whole lake	
			9/26/2000	whole lake	none
	Winchester Wasteway	41	7/26/1995	spot check from shore	*Lythrum salicaria*
			7/28/98	1 site, shore	
	Windmill Lake	41	8/30/1995	south end	none
			9/27/2000	whole littoral	*Lythrum salicaria*
Grays Harbor	Aberdeen Lake	22	7/22/1996	whole littoral	none
			8/16/2000	whole littoral	none

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Grays Harbor	Duck Lake	22	9/9/1995	2 sites, from shore	*Egeria densa*
			8/18/98	main lake	*Lythrum salicaria*
					Myriophyllum spicatum
			9/21/1999	10 sites	
	Failor Lake	22	6/25/1997	whole littoral	none
			8/16/2000	whole littoral	none
	Quinault Lake	21	10/7/1996	75% of littoral	none
	Sylvia Lake	22	7/22/1996	whole littoral	none
			8/16/2000	whole littoral	none
Island	Cranberry Lake	6	8/24/1994	4 sites around lake	none
			9/5/1996	spot check, shore	none
			8/7/2001	selected areas	none
	Crockett Lake	6	9/4/1996	spot check, shore	none
	Deer Lake	6	9/4/1996	whole littoral	none
	Goss Lake	6	9/5/1996	whole littoral	none
			8/4/1999	whole lake	none
			8/8/2001	whole littoral	none
	Lone Lake	6	9/4/1996	whole littoral	*Lythrum salicaria*
Jefferson	Anderson Lake	17	7/8/1996	whole littoral	none
	Crocker Lake	17	5/24/1994	northwest half - littoral	none
			6/14/1995	whole littoral	
			6/11/1996	whole littoral	
			8/27/1997	whole littoral	
			9/3/98	whole lake	
			8/8/2001	selected areas	none
	Leland Lake	17	5/24/1994	entire shoreline	*Egeria densa*
			6/14/1995	whole littoral	
			10/3/1995	whole littoral	
			11/8/1995	Egeria site	
			6/11/1996	whole littoral	
			7/2/1996	whole littoral	
			10/2/1996	whole littoral	
			8/27/1997	spot check	
			9/3/98	whole lake	
			10/7/1999	whole lake	
			9/14/2000	whole lake	
			8/9/2001	selected areas	
	Tarboo Lake	17	7/2/1996	whole littoral	none
King	Alice Lake	7	8/12/1999	whole lake	*Lysimachia vulgaris*
					Lythrum salicaria
	Desire Lake	8	9/7/1999	whole lake	*Lythrum salicaria*
			7/8/1999	whole lake	*Myriophyllum spicatum*
	Killarney Lake	10	9/18/2001	whole littoral	*L. salicaria*
	Lucerne Lake	9	6/9/1995	outlet	*Hydrilla verticillata*
			7/15/1995	spot check	*Myriophyllum spicatum*
	Meridian Lake	9	7/10/1997	whole littoral	*Lythrum salicaria*
					Myriophyllum spicatum
	Morton Lake	9	8/19/1997	whole littoral	none
	Otter (Spring) Lake	8	7/8/1999	whole lake	*Myriophyllum spicatum*
					Typha angustifolia
	Pipe Lake	9	6/1/1995	several sites, divers	*Hydrilla verticillata*

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
King			6/9/1995	near boatlaunch, outlet	*Myriophyllum spicatum*
			7/12/1995	from shore	
			7/15/1995	6 sites, biomass samples	
			8/1/1995	6 sites, biomass samples	
			6/18/1996	spot check, boat	
			7/21/1997	3 sites	
			6/9/98	whole lake	
			11/17/98	3 sites, boat	
			6/10/1999	selected areas	
	Sawyer Lake	9	8/7/1997	whole littoral	*Myriophyllum spicatum*
			7/21/1999	whole lake	*Typha angustifolia*
	Steel Lake	9	5/11/1994	entire shoreline, divers	*Myriophyllum spicatum*
	Shady Lake	9	7/8/1999	whole lake	*Myriophyllum spicatum*
	Washington Lake	8	8/24/98	Juanita Bay	*Egeria densa*
					Myriophyllum spicatum
	Wilderness Lake	9	8/19/1997	whole littoral	*Lythrum salicaria*
					Myriophyllum spicatum
Kitsap	Buck Lake	15	7/22/98	whole lake	*Lythrum salicaria*
	Horseshoe Lake	15	8/22/1996	whole littoral	none
			7/20/2000	whole littoral	none
	Island Lake	15	7/22/98	whole lake	none
	Kitsap Lake	15	8/3/1995	2 sites, whole littoral	none
			8/28/1997	4 sites	none
			7/1/98	south end	none
	Long Lake	15	9/12/1994	several locations	*Egeria densa*
			3/17/1995	6 transects, whole littoral	*Myriophyllum spicatum*
			7/22/1997	2 sites	*Lythrum salicaria*
			8/28/1997	3 sites	
			8/17/1999	selected areas	
	Mission Lake	15	9/9/1996	whole littoral	none
			6/18/98	whole lake	*Utricularia inflata*
	Panther Lake	15	8/2/1995	whole littoral	none
	Square Lake	15	7/22/1997	spot check, shore	none
			6/2/1999	1 site, shore	*Utricularia inflata*
	Wildcat Lake	15	10/4/1995	4 sites, whole littoral	none
			8/20/98	whole lake	none
	William Symington Lake	15	9/16/98	whole lake	none
	Wye Lake	15	7/1/98	1 site, shore	*Utricularia inflata*
Kitsap/Mason	Tiger Lake	15	9/9/1996	whole littoral	none
			6/14/1999	whole lake	none
Kittitas	Cle Elum Reservoir	39	7/29/98	1 site, shore	none
	Easton Lake	39	8/30/1994	spot check from shore	none
			6/18/1997	spot check, shore	none
	Fiorito Ponds	39	6/26/2001	selected areas	*M. spicatum*
	Hanson Ponds	39	11/2/2001	selected areas	none
	Kiwanis Pond	39	8/30/1994	spot check from shore	none
		39	9/14/2001	selected areas	none
	Lavender Lake	39	6/18/1997	whole littoral	*Myriophyllum spicatum*
			7/27/98	whole lake	
			9/14/2001	whole littoral	
	Mattoon Lake	39	8/30/1994	most of shoreline	none

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Kittitas.			8/21/2001	whole littoral	*M. spicatum*
	Roza Reservoir	39	6/26/2001	whole littoral	none
	Unnamed Ponds near Easton	39	6/18/1997	spot check, shore	none
	unnamed ponds	39	8/30/1994	spot checks	Lythrum salicaria at one
	Wild Duck Lake	39	7/27/98	2 sites, shore	none
			7/12/1999	whole lake	none
			8/17/2001	selected areas	none
Klickitat	Columbia River at Bingen	29	8/14/1995	spot check from shore	*Myriophyllum spicatum*
	Columbia River at Maryhill	30	8/14/1995	spot check from boat	*Myriophyllum spicatum*
	Horsethief Lake	30	8/14/1995	spot check from shore	*Myriophyllum spicatum*
			6/17/1999	1 site, shore	*Amorpha fruticosa*
	Spearfish Lake	30	6/17/1999	whole shore	*Epilobium hirsutum*
Lewis	Carlisle Lake	23	8/20/1997	whole littoral	none
	Chehalis River	23	7/27/1995	shoreline, from boat	*Myriophyllum aquaticum*
			9/10/1996	1 site from shore	
			7/23/1997	spot check, shore	*Egeria densa*
			8/20/1997	1 mile of river	
	Interstate Ave Slough	23	8/20/1997	spot check, shore	*Myriophyllum aquaticum*
	Mayfield Reservoir	26	10/5/98	south half	*Myriophyllum spicatum*
	Plummer Lake	23	8/20/1997	whole littoral	*Egeria densa*
			7/30/2001	whole littoral	
	Swofford Pond	26	9/15/98	east end	*Myriophyllum spicatum*
			7/31/2001	whole littoral	
Lincoln	Sprague Lake	34	8/6/1994	cove at NE end of lake	none
Mason	Benson Lake	14	7/23/1996	whole littoral	none
			7/20/2000	whole littoral	none
	Devereaux Lake	15	8/16/1994	spot check from shore	none
	Haven Lake	15	8/16/1994	entire shoreline	none
			6/8/98	whole lake	none
	Isabella Lake	14	7/19/1994	entire shoreline	none
			8/2/1995	checked for rare plant	none
			8/18/1997	whole littoral	*Lythrum salicaria*
			7/18/2000	whole littoral	
	Island Lake	14	7/23/1996	whole littoral	*Myriophyllum spicatum*
			6/24/1997	whole littoral	
			7/9/98	whole littoral	
			7/13/2000	whole littoral	none
	Limerick Lake	14	8/15/1994	entire shoreline	*Egeria densa*
			7/13/1995	spot check, boat	*Utricularia inflata*
			7/22/1997	2 sites	
			7/8/98	whole lake	
			7/13/2000	whole lake	
			9/13/2001	whole littoral	
	Lost Lake	14	8/11/1994	entire shoreline	none
			6/10/1997	whole littoral	none
			7/18/2000	whole littoral	none
	Lystair (Star) Lake	22	6/12/98	whole lake	none
	Maggie Lake	15	8/19/98	whole lake	none
	Mason Lake	14	8/7/1996	whole littoral	none
			9/14/98	whole lake	*Myriophyllum spicatum*
			9/22/1999	whole shore	

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Mason			9/13/2000	selected areas	
	Nahwatzel Lake	22	6/26/1997	whole littoral	none
			7/14/2000	whole littoral	none
	Phillips Lake	14	7/20/98	whole lake	none
			6/8/1999	whole lake	none
			8/17/2000	whole lake	none
	Simpson (Arrowhead) Lake	22	9/17/2001	whole littoral	none
	Spencer Lake	14	8/15/1994	most of shoreline	*Lythrum salicaria*
			7/13/1995	spot check, boat	*Lythrum salicaria*
			8/22/1996	south end, boat	none
			7/22/1997	2 sites	none
			6/15/1999	whole lake	*Utricularia inflata*
			8/17/2000	whole lake	
	Tee Lake	15	8/19/98	whole lake	none
	Trails End (formerly Prickett)	15	6/16/98	whole lake	*Lythrum salicaria*
					Utricularia inflata
	Wooten Lake	15	8/16/1994	most of shoreline	none
			6/16/98	whole lake	none
			7/22/1999	whole lake	none
Okanogan	Aeneas Lake	49	7/25/1994	entire shoreline	none
			7/12/1999	south end	none
	Alta Lake	48	6/29/1995	whole littoral	none
	Big Twin Lake	48	8/9/1995	most of littoral	none
			8/11/1999	whole lake	none
	Blue Lake (37N-25E-22)	49	7/14/1999	whole lake	none
	Bonaparte Lake	49	8/27/1996	whole littoral	none
	Buffalo Lake	53	8/21/1995	3 sites, boat	none
	Chopaka Lake	49	7/13/1999	selected areas	none
	Conconully Lake	49	7/26/1994	7 sites thru' shoreline	*Myriophyllum spicatum*
	Conconully Reservoir	49	7/26/1994	north end	none
			9/18/1997	whole littoral	*Myriophyllum spicatum*
	Crawfish Lake	52	8/28/1996	whole littoral	none
	Davis Lake	48	8/9/1995	whole littoral	none
			8/10/1999	1 site, shore	none
	Duck (Bide-a-Wee) Lake	49	8/28/1996	spot check, shore	none
			9/18/1997	spot check	none
	Ell Lake	52	7/15/1999	whole lake	none
	Fish Lake	49	7/26/1994	entire shoreline	none
			7/14/1999	whole lake	none
	Green Lake	49	6/29/1995	2 sites, whole littoral	none
	Leader Lake	49	8/29/1996	whole littoral	none
	Little Twin Lake	48	8/9/1995	whole littoral	none
			8/11/1999	whole lake	none
	Long Lake	52	7/15/1999	whole lake	none
	Omak Lake	49	8/28/1996	north end, boat	none
	Palmer Lake	49	7/27/1994	boatlaunches, from shore	none
			6/28/1995	whole littoral	none
			7/13/1999	whole lake	*Myriophyllum spicatum*
	Patterson Lake	48	8/10/1995	2 sites, whole littoral	none
			8/10/1999	whole lake	none
	Pearrygin Lake	48	8/10/1995	3 sites, whole littoral	*Lythrum salicaria*

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Okanogan			8/11/1999	whole lake	
	Round Lake	52	7/15/1999	whole lake	none
	Sidley Lake	49	8/27/1996	spot check, shore	none
	Spectacle Lake	49	7/27/1994	5 sites, various locations	none
			8/27/1996	whole littoral	none
			9/17/1997	3 sites	none
			7/14/1999	selected areas	none
	Wannacut Lake	49	7/28/1994	3 sites	none
	Whitestone Lake	49	7/27/1994	5 sites, various locations	*Myriophyllum spicatum*
			6/28/1995	6 sites, whole littoral	*Lythrum salicaria*
			8/26/1996	whole littoral	
			9/17/1997	whole littoral	
			7/13/1999	1 site, shore	*Myriophyllum spicatum*
Pacific	Black Lake	24	7/12/1994	spot check, shore	*Egeria densa*
			8/8/1996	most of shoreline	
			8/26/1997	whole littoral	
			6/22/1999	1 site, shore	*Myriophyllum spicatum*
			8/2/2001	selected areas	
	Island Lake	24	7/14/1994	entire shoreline	none
			8/26/1997	whole littoral	none
	Loomis Lake	24	7/13/1994	most of shoreline	none
			8/25/1997	whole littoral	*Myriophyllum spicatum*
			6/22/1999	whole lake	*Egeria densa*
			8/1/2001	whole littoral	
	O'Neil Lake	24	7/12/1994	entire littoral	none
			8/25/1997	spot check, shore	none
	Surfside Lake	24	7/13/1994	5 sites from bridges	none
			8/25/1997	spot check, shore	none
Pend Oreille	Bead Lake	62	8/12/1997	coves, 5 sites	none
	Big Meadow	61	7/26/2000	west basin	none
	Browns Lake	62	7/31/1996	spot check, shore	none
			8/25/1999	whole lake	none
	Davis Lake	62	8/2/1994	most of littoral	none
			7/30/1996	north end, boat launch	*Myriophyllum spicatum*
			8/12/1997	whole littoral	
	Diamond Lake	55	8/2/1994	boatlaunch, from shore	none
			7/31/1996	east end, boat launch	none
			8/11/1997	west half	none
	Fan Lake	55	8/3/1994	entire shoreline	*Lythrum salicaria*
			8/12/1997	whole littoral	
	Frater Lake	59	8/1/1996	spot check, shore	none
			8/28/2001	whole littoral	none
	Half Moon Lake	62	7/31/1996	north end	none
	Horseshoe Lake	55	7/13/98	west half	none
	Kent Meadows Lake	62	8/25/1999	2 sites, shore	none
	Leo Lake	59	7/28/1999	whole lake	none
	Little Spokane River	55	8/2/1994	at Fertile Valley Rd crossing	*Myriophyllum spicatum*
			8/2/1994	at Haworth Rd crossing	none
	Marshall Lake	62	8/1/1994	3 sites, mostly at inlets	none
			8/24/1999	whole lake	*Myriophyllum spicatum*

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Pend Oreille			8/28/2001	whole littoral	
	Mill Lake	62	8/1/1996	2 sites, shore	none
			8/27/2001	whole littoral	none
	Nile Lake	62	8/1/1996	spot check, shore	*Myriophyllum spicatum*
			8/27/2001	whole littoral	
	Parker Lake	62	8/24/1999	1 site, shore	none
	Pend Oreille River	62	8/1/1996	spot check, shore	*Myriophyllum spicatum*
	Sacheen Lake	55	8/2/1994	3 sites, covered entire shore	*Myriophyllum spicatum*
					Lythrum salicaria
	Skookum Lake, North	62	7/31/1996	spot check, shore	none
			8/24/1999	whole lake	none
	Skookum Lake, South	62	7/31/1996	whole littoral	none
	Sullivan Lake	62	8/1/1996	north and south, boat	none
	Trask Pond	57	8/25/1999	shore	none
	Unnamed Wetland near Usk	62	8/1/1996	shore	none
Pierce	American Lake	12	10/4/1994	4 sites	none
			10/6/98	whole lake	none
	Bay Lake	15	9/28/1995	whole littoral	*Lythrum salicaria*
			9/13/2000	whole littoral	
	Carney Lake	15	7/1/98	1 site, shore	none
	Clear Lake	11	7/21/1994	entire shoreline	*Myriophyllum spicatum*
			6/12/1996	whole littoral	
			6/23/1997	whole littoral	*Typha angustifolia*
			7/6/1999	whole lake	
	Harts Lake	11	6/17/1996	spot check, shore	*Myriophyllum spicatum*
			7/3/1996	whole littoral	
			6/24/1999	whole lake	
	Kapowsin Lake	10	9/20/2000	northeast half	*Typha angustifolia*
			6/15/2001	selected areas	
	Ohop Lake	11	7/25/1996	whole littoral	*Egeria densa*
			9/25/1997	whole littoral	
			9/19/2001	whole littoral	
	Rapjohn Lake	11	7/25/1996	whole littoral	none
			8/2/1999	whole lake	none
			9/19/2001	whole littoral	none
	Silver Lake	11	6/17/1996	spot check, shore	none
	Spanaway Lake	12	9/11/1996	whole littoral	*Lythrum salicaria*
	Steilacoom Lake	12	6/19/1996	spot check, boat	none
			8/26/98	whole lake	none
			10/21/98	1 site, boat	none
	Tanwax Lake	11	7/21/1994	entire shoreline	none
			9/12/1996	whole littoral	none
			7/6/1999	whole lake	*Typha angustifolia*
	Tapps Lake	10	9/21/2000	boat launch area	*Myriophyllum spicatum*
	Whitman Lake	11	8/5/1999	whole lake	none
San Juan	Cascade Lake	2	9/9/1997	whole littoral	none
	Hummel Lake	2	9/8/1997	whole littoral	none
			8/7/2001	whole littoral	none
	Mountain Lake	2	9/9/1997	whole littoral	none
	Sportsman Lake	2	9/10/1997	whole littoral	none

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Skagit	Beaver Lake	3	8/25/1994	entire shoreline	none
			9/15/1999	whole lake	*Myriophyllum spicatum*
	Big Lake	3	8/23/1994	3 sites, extreme ends	*Egeria densa*
			8/23/1994	& launch	*Myriophyllum spicatum*
			9/15/1999	whole lake	
	Campbell Lake	3	6/7/1994	entire shoreline	none
			8/13/1996	whole littoral	*Myriophyllum spicatum*
			7/2/1997	whole littoral	
			8/4/1999	whole lake	
	Cavanaugh Lake	5	8/24/98	whole lake	none
	Clear Lake (34N-05E-07)	3	8/25/1994	boatramp only	*Myriophyllum spicatum*
			9/15/1999	whole lake	
	Cranberry Lake	3	8/25/98	2 sites, shore	none
			9/11/2000	north end, from shore	none
	Erie Lake	3	8/24/1994	Entire shoreline	none
			8/13/1996	spot check, shore	none
			7/2/1997	whole littoral	none
			9/16/1999	whole lake	none
			9/11/2000	whole lake	none
			8/6/2001	whole littoral	M. spicatum
	Everett Lake	4	8/15/1996	spot check, shore	none
	Heart Lake (35N-01E-36)	3	8/24/1994	most of shoreline	none
			8/13/1996	whole littoral	none
			8/25/98	whole lake	*Myriophyllum spicatum*
			9/11/2000	whole lake	
	McMurray Lake	3	6/6/1994	entire shoreline	*Myriophyllum spicatum*
			8/23/1994	entire shoreline	
			8/3/1999	whole lake	
	Pass Lake	3	7/2/1997	spot check, shore	none
	Sixteen Lake	3	6/6/1994	entire shoreline	*Myriophyllum spicatum*
			8/3/1999	whole lake	
Skamania	Coldwater Lake	26	8/27/98	80% of shore	*Myriophyllum spicatum*
	Drano Lake	29	6/17/1999	1 site, shore	*Myriophyllum spicatum*
Snohomish	Blackmans Lake	7	8/5/98	whole lake	*Lythrum salicaria*
	Flowing Lake	7	9/12/2000	whole littoral	none
	Goodwin Lake	7	6/20/1995	3 sites, littoral survey	*Myriophyllum spicatum*
	Howard Lake	5	7/20/1999	whole lake	none
	Ki Lake	5	7/19/1999	whole lake	none
	Martha Lake (31N-04E-18)	5	7/20/1999	whole lake	none
	Martha Lake (27N-04E-01)	8	8/5/98	whole lake	none
	Nina Lake	7	6/20/1995	2 sites, from shore	*Myriophyllum aquaticum*
	Riley Lake	5	7/19/1999	whole lake	*Lythrum salicaria*
	Roesiger (north arm) Lake	7	8/6/98	whole lake	*Myriophyllum spicatum*
					Lythrum salicaria
	Roesiger (south arm) Lake	7	8/25/1994	east side, littoral	none
			6/21/1995	spot check, boat	none
			8/29/1995	most of shoreline	none
			8/6/98	whole lake	*Myriophyllum spicatum*
	Shoecraft Lake	7	8/15/1996	whole littoral	*Myriophyllum spicatum*
	Stevens Lake	7	9/10/1997	4 sites	none

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Spokane	Amber Lake	34	8/5/1994	at boatramp, from shore	none
	Badger Lake	34	8/5/1994	2 sites at extreme ends	none
	Chapman Lake	34	8/24/1995	3 sites	none
	Clear Lake	43	8/4/1994	4 sites, most of shoreline	none
	Downs Lake	34	8/3/1994	from shore - one location	none
	Eloika Lake	55	8/3/1994	3 sites, missed some places	*Myriophyllum spicatum*
			8/29/2001	whole littoral	
	Fishtrap Lake	43	8/4/1994	3 sites	none
	Liberty Lake	57	7/13/98	whole lake	*Myriophyllum spicatum*
			7/27/2000	4 sites	
	Long Lake (reservoir)	54	8/6/1994	2 sites near boatlaunch	*Lythrum salicaria*
			8/25/1995	1 site	*Nymphoides peltata*
			8/31/1999	selected areas	*Myriophyllum spicatum*
	Medical Lake	43	7/14/98	whole lake	none
	Medical, West Lake	43	7/14/98	whole lake	none
			8/30/2001	whole littoral	none
	Newman Lake	57	8/31/1999	south end	none
			7/26/2000	north end	none
	Silver Lake	34	8/4/1994	only at boatramp (closed)	none
			8/24/1995	2 sites	none
			7/28/2000	whole littoral	none
			8/30/2001	selected areas	*M. spicatum*
	Williams Lake	34	8/5/1994	boatlaunch and south end	none
			9/16/1997	whole littoral	none
Stevens	Black Lake	59	7/25/2000	whole littoral	none
	Deep Lake	61	7/30/1997	whole littoral	none
			7/25/2000	all but west shore	none
	Deer Lake	59	7/29/1997	whole littoral	none
			7/27/1999	whole lake	none
			7/27/2000	boat launch areas	none
	Gillette Lake	59	7/27/1999	whole lake	none
	Jumpoff Joe Lake	59	7/29/1997	whole littoral	none
			7/27/2000	whole littoral	none
	Loon Lake	59	9/25/1996	whole littoral	*Myriophyllum spicatum*
			7/31/1997	1 site	*Lysimachia vulgaris*
			6/24/98	whole lake	*Lythrum salicaria*
			8/11/98	whole lake	
			6/28/1999	whole lake	
	Starvation Lake	59	7/26/1999	whole lake	none
	Waitts Lake	59	7/30/1997	whole littoral	*Lythrum salicaria*
Thurston	Black Lake	23	7/8/1994	north end	none
			4/18/1995	1 site to test methods	none
	Black River near Gate	23	8/18/98	1 site, shore	*Polygonum hydropiper*
			9/15/98	1 site, shore	
			9/30/98	5 mile reach	
			10/20/1999	5 mile reach	
	Clear Lake	11	8/7/1995	1 site	none
	Hicks Lake	13	5/24/1995	3 sample sites, shoreline	*Utricularia inflata*
	Lawrence Lake	13	11/7/1995	spot check from shore	none
	Lois Lake	13	8/12/2001	selected areas	*M. spicatum*
	Long Lake	14	6/6/1995	spot check	*Myriophyllum spicatum*

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Thurston			9/20/1995	milfoil site	
			10/18/1995	spot check	
			11/2/1995	milfoil site	
	Munn Lake	13	6/3/98	1 site, shore	*Utricularia inflata*
			10/14/98	1 site, shore	
			5/25/1999	1 site, shore	
			6/21/1999	whole lake	
			9/7/2000	whole littoral	
	Offutt Lake	13	7/7/98	whole lake	none
	Patterson Lake	13	9/18/2001	whole littoral	none
	Summit Lake	14	7/23/1997	west end	none
	Ward Lake	13	7/6/98	whole lake	none
Wahkiakum	Brooks Slough	25	6/22/1999	1 site, shore	*Myriophyllum aquaticum*
	Columbia River at Cathlamet	25	8/16/1995	spot check, boat	*Lythrum salicaria*
					Myriophyllum spicatum
	Columbia River at Skamokawa	25	8/8/1996	spot check, boat	*Lythrum salicaria*
	Puget Island Sloughs	25	5/16/1995	2 sloughs, from shore	*Egeria densa*
					Myriophyllum aquaticum
Walla Walla	Snake River - Lower Monumental Dam	33	8/20/1996	spot check, boat	*Lythrum salicaria*
					Myriophyllum spicatum
	Snake River at Charbonneau Park	33	8/19/1996	spot check, boat	none
	Snake River at Fishhook Park	33	8/19/1996	spot check, boat	none
	Snake River at Ice Harbor Dam	33	8/19/1996	spot check, boat	*Myriophyllum spicatum*
Whatcom	Cain Lake	3	8/14/1996	whole littoral	none
			9/13/1999	whole lake	none
	Samish Lake (East Arm)	3	6/30/1997	whole littoral	none
			9/14/1999	whole lake	none
	Samish Lake (West Arm)	3	6/30/1997	whole littoral	none
			9/14/1999	whole lake	none
	Silver Lake	1	7/1/1997	whole littoral	*Butomus umbelatus*
			9/12/2000	whole littoral	
	Terrell Lake	1	8/14/1996	whole littoral	*Lythrum salicaria*
			9/14/1999	whole lake	
	Toad (Emerald) Lake	1	7/3/1997	whole littoral	none
	Whatcom Lake	1	6/21/1995	3 sites, littoral, west basin	*Myriophyllum spicatum*
	Wiser Lake	1	8/14/1996	spot check, shore	none
			7/1/1997	whole littoral	none
Whitman	Rock Lake	34	8/5/1994	south boatramp, from shore	none
			9/15/1997	spot check, shore	none
	Snake River at Central Ferry	35	8/5/1997	spot check, shore	*Myriophyllum spicatum*
	Snake River at Little Goose Dam	35	8/5/1997	spot check, boat	*Myriophyllum spicatum*
	Snake River at Lower Granite Dam	35	8/4/1997	spot check, boat	*Myriophyllum spicatum*
Yakima	Byron Lake	37	7/9/2001	selected areas	*M. spicatum, L. salicaria*
	Dog Lake	38	7/30/98	whole lake	none
			8/15/2001	whole littoral	*M. spicatum*
			10/25/2001	selected areas	
	Giffin Lake	37	7/19/1995	from shore	none

County	Waterbody Name	WRIA	Date	Survey Extent	Noxious Aquatic Weeds
Yakima			8/1/2001	selected areas	*L. salicaria*
	Leech Lake	39	7/30/98	whole lake	none
			8/24/2001	whole littoral	none
	Morgan Lake	37	7/19/1995	spot check, from shore	none
			8/1/2001	selected areas	none
	Myron Lake	38	6/25/2001	selected areas	*L. salicaria*
	pond nr hwy 12	37	8/8/1994	one spot, from shore	none
			7/27/2001	selected areas	none
	Unnamed pond (14N-19E-31)	39	7/18/1995	spot check, from shore	none
			7/29/98	1 site, shore	none
	Unnamed Ponds (12N-19E-20)	37	7/18/1995	spot check, from shore	*Myriophyllum spicatum*
			7/29/1998	4 sites, shore	*Lythrum salicaria*
	Wenas Lake	39	7/29/98	whole lake	none
			7/17/2001	selected areas	*L. salicaria*
	Yakima River	37	8/8/1994	from Selah to Arboretum	*Lythrum salicaria*
			9/27/1994	Arboretum to Union Gap	*Lythrum salicaria*
			7/19/1995	Mabton Bridge	none

Appendix C

Myriophyllum spicatum Distribution Map

Lakes Known to Contain Eurasian milfoil (*Myriophyllum spicatum*), as of December, 2001

County	Waterbody Name	County	Waterbody Name
Adams	Hutchinson Lake	Lewis, con't	Mayfield Reservoir
Chelan	Chelan Lake		Riffe Lake
	Cortez (Three) Lake		Swofford Pond
	Domke Lake	Mason	Island Lake
	Roses Lake		Mason Lake
	Wapato Lake	Okanogan	Conconully (Salmon) Lake
Clallam	Sutherland Lake		Conconully Reservoir
	unnamed pond		Okanogan River
Clark	Caterpillar Slough		Osoyoos Lake
	Columbia River at Ridgefield		Palmer Lake
Clatsop, OR	Columbia River at Astoria		Whitestone Lake
Columbia	Snake River, Little Goose Dam	Pacific	Black Lake
Cowlitz	Kress Lake		Loomis Lake
	Willow Grove Slough	Pend Oreille	Davis Lake
Franklin	Scooteney Reservoir		Diamond Lake
	Snake River, Ice Harbor Dam		Fan Lake
	Snake River, Lower Mon. Dam		Little Spokane River
	Snake River at Lyons Ferry		Marshall Lake
Grant	Babcock Ridge Lake		Nile Lake
	Banks Lake		Pend Oreille River
	Billy Clapp Lake		Sacheen Lake
	Burke Lake	Pierce	Clear Lake
	Caliche Lake		Harts Lake
	Columbia R., Priest Rapids Lake		Hidden Lake
	Evergreen Lake		Tapps Lake
	Moses Lake	Skagit	Beaver Lake
	Potholes Reservoir		Big Lake
	Stan Coffin Lake		Campbell Lake
	Winchester Wasteway		Clear Lake (34N-05E-07)
	Winchester Wasteway Ext.		Erie Lake
Grays Harbor	Duck Lake		Heart Lake
King	Bass Lake		McMurray Lake
	Desire Lake		Sixteen Lake
	Dolloff Lake	Skamania	Coldwater Lake
	Green Lake		Drano Lake
	Lucerne Lake	Snohomish	Goodwin Lake
	Meridian Lake		Roesiger Lake
	Neilson (Holm) Lake		Shoecraft Lake
	Number Twelve Lake		Silver Lake (28N-05E-30)
	Otter (Spring) Lake		Stevens Lake
	Phantom Lake	Spokane	Eloika Lake
	Pipe Lake		Liberty Lake
	Sammamish Lake		Silver Lake
	Sawyer Lake	Stevens	Black Lake
	Shadow Lake		Gillette Lake

County	Waterbody Name	County	Waterbody Name
King	Shady Lake	Stevens	Heritage Lake
	Ship Canal		Long Lake (Reservoir
	Star Lake		Loon Lake
	Steel Lake		Sherry Lake
	Union Lake		Thomas Lake
	Washington Lake	Thurston	Capitol Lake
	Wilderness Lake		Lois Lake
Kitsap	Long Lake		Long Lake
Kittitas	Fiorito Ponds		Scott Lake
	Lavender Lake	Wahkiakum	Columbia River, Cathlamet
	Mattoon Lake	Walla Walla	Snake River, Ice Harbor Dam
	Private Pond		Snake River, Lower Mon. Dam
Klickitat	Columbia River, Bingen	Whatcom	Whatcom Lake
	Columbia River, Maryhill	Whitman	Snake River, Low. Granite Dam
	Horsethief Lake	Yakima	Byron Lake
Lewis	Carlisle Lake		Dog Lake
	Cowlitz River		Unnamed Ponds nr. Parker

Myriophyllum spicatum distribution, 2001

Appendix D

Locations of aquatic invasive non-native species (other than M. spicatum, E. dens, and M. aquaticum)

Scientific name	Weed Class	County	Waterbody Name
Cabomba caroliniana	Class B	Clatsop	Cullaby Lake
(fanwort)		Cowlitz	Solo Slough
		Cowlitz	Willow Grove Slough
Hydrilla verticillata	Class A	King	Lucerne Lake
(hydrilla)		King	Pipe Lake
Ludwigia hexapetala (water primrose)	Monitor	Cowlitz	Solo Slough
Nymphaea odorata	Class C	Chelan	Fish Lake
(fragrant waterlily)		Chelan	Roses (Alkali) Lake
		Clark	Battleground Lake
		Cowlitz	Sacajawea Lake
		Cowlitz	Silver Lake
		Grant	Canal Lake
		Grant	Heart Lake
		Grays Harbor	Aberdeen Lake
		Jefferson	Leland Lake
		King	Alice Lake
		King	Beaver Lake No. 2
		King	Burien Lake
		King	Cottage Lake
		King	Desire Lake
		King	Dolloff Lake
		King	Fivemile Lake
		King	Geneva Lake
		King	Haller Lake
		King	Joy Lake
		King	Kathleen Lake
		King	Killarney Lake
		King	Leota Lake
		King	Lucerne Lake
		King	Marcel (Loop) Lake
		King	McDonald Lake
		King	Meridian Lake
		King	Morton Lake
		King	Neilson (Holm) Lake
		King	North Lake
		King	Number Twelve Lake
		King	Panther Lake
		King	Pine Lake
		King	Pipe Lake
		King	Retreat Lake
		King	Sawyer Lake
		King	Shadow Lake
		King	Shady Lake

Scientific name	Weed Class	County	Waterbody Name
		King	Star Lake
		King	Steel Lake
		King	Trout Lake
		King	Wilderness Lake
		Kitsap	Buck Lake
		Kitsap	Horseshoe Lake
		Kitsap	Island Lake
		Kitsap	Kitsap Lake
		Kitsap	Long Lake
		Kitsap	Mission Lake
		Kitsap	Square Lake
		Kitsap	Tahuya Lake
		Kitsap	Wildcat Lake
		Kitsap/Mason	Tiger Lake
		Mason	Benson Lake
		Mason	Isabella Lake
		Mason	Island Lake
		Mason	Limerick Lake
		Mason	Lost Lake
		Mason	Lystair (Star) Lake
		Mason	Mason Lake
		Mason	Nahwatzel Lake
		Mason	Spencer Lake
		Mason	Trails End (formerly Prickett)
		Mason	Wooten Lake
		Pacific	Loomis Lake
		Pend Oreille	Diamond Lake
		Pend Oreille	Sacheen Lake
		Pierce	American Lake
		Pierce	Bay Lake
		Pierce	Clear Lake
		Pierce	Harts Lake
		Pierce	Ohop Lake
		Pierce	Silver Lake
		Pierce	Spanaway Lake
		Pierce	Tanwax Lake
		Pierce	Whitman Lake
		San Juan	Hummel Lake
		Skagit	Beaver Lake
		Skagit	Big Lake
		Skagit	Campbell Lake
		Skagit	Cavanaugh Lake
		Skagit	Clear Lake (34N-05E-07)
		Skagit	Erie Lake
		Skagit	Heart Lake (35N-01E-36)

Scientific name	Weed Class	County	Waterbody Name
		Skagit	McMurray Lake
		Snohomish	Blackmans Lake
		Snohomish	Bosworth Lake
		Snohomish	Cochran Lake
		Snohomish	Devils (Lost) Lake
		Snohomish	Flowing Lake
		Snohomish	Howard Lake
		Snohomish	Ketchum Lake
		Snohomish	Ki Lake
		Snohomish	Loma Lake
		Snohomish	Martha Lake (27N-04E-01)
		Snohomish	Martha Lake (31N-04E-18)
		Snohomish	Nina Lake
		Snohomish	Panther Lake
		Snohomish	Roesiger (north arm) Lake
		Snohomish	Roesiger (south arm) Lake
		Snohomish	Serene Lake (28N-04E-34)
		Snohomish	Shoecraft Lake
		Snohomish	Stevens Lake
		Snohomish	Stickney Lake
		Snohomish	Sunday Lake
		Spokane	Long Lake (Reservoir)
		Spokane	Newman Lake
		Stevens	Deer Lake
		Stevens	Gillette Lake
		Stevens	Loon Lake
		Stevens	Waitts Lake
		Thurston	Black Lake
		Thurston	Elbow Lake
		Thurston	Hicks Lake
		Thurston	Lawrence Lake
		Thurston	Long Lake
		Thurston	Munn Lake
		Thurston	Offutt Lake
		Thurston	Patterson Lake
		Thurston	St. Clair
		Thurston	Summit Lake
		Thurston	Ward Lake
		Whatcom	Cain Lake
		Whatcom	Samish Lake (East Arm)
		Whatcom	Toad (Emerald) Lake
		Whatcom	Wiser Lake
		Yakima	Giffin Lake
		Yakima	Morgan Lake
		Yakima	Unnamed Ponds (12N-19E-20)

Scientific name	Weed Class	County	Waterbody Name
Nymphoides peltata (yellow floating heart)	Class B	Spokane	Long Lake (Reservoir)
Potamogeton crispus	monitor	Adams	Hutchinson Lake
curly-leaf pondweed		Adams	Sprague Lake
		Clallam	Crescent Lake
		Clark	Caterpillar Slough
		Columbia	Snake River at Little Goose Dam
		Columbia	Snake River near Lyons Ferry
		Cowlitz	Kress Lake
		Ferry	Curlew Lake
		Franklin	Snake River at Levey Park
		Franklin	Snake River at Lower Monumental Dam
		Franklin	Snake River at Lyons Ferry
		Franklin	Snake River at Windust Park
		Garfield	Snake River at Lower Granite Dam
		Grant	Babcock Ridge Lake
		Grant	Banks Lake
		Grant	Billy Clapp Lake
		Grant	Blue Lake
		Grant	Burke Lake
		Grant	Evergreen Lake
		Grant	Heart Lake
		Grant	Moses Lake
		Grant	Potholes Reservoir
		Grant	Priest Rapids Lake
		Grant	Stan Coffin Lake
		Grant	Winchester Wasteway
		King	Beaver Lake No. 2
		King	Deep Lake
		King	Fivemile Lake
		King	Marcel (Loop) Lake
		King	Washington Lake
		Kitsap	Kitsap Lake
		Kitsap	Long Lake
		Kittitas	Fiorito Ponds
		Kittitas	Mattoon Lake
		Kittitas	Roza Reservoir
		Klickitat	Columbia River at Bingen
		Klickitat	Columbia River at Maryhill
		Klickitat	Horsethief Lake
		Klickitat	Spearfish
		Lewis	Swofford Pond
		Okanogan	Patterson Lake

Scientific name	Weed Class	County	Waterbody Name
		Pierce	American Lake
		Pierce	Harts Lake
		Pierce	Ohop Lake
		Pierce	Spanaway Lake
		Pierce	Steilacoom Lake
		Pierce	Tanwax Lake
		Skagit	Big Lake
		Skamania	Drano
		Spokane	Long Lake (Reservoir)
		Spokane	Medical, West Lake
		Thurston	Capitol Lake
		Thurston	Long Lake
		Wahkiakum	Columbia River at Skamokawa
		Walla Walla	Snake River at Charbonneau Park
		Walla Walla	Snake River at Lower Monumental Dam - Walla Walla
		Whatcom	Wiser Lake
		Whitman	Rock Lake
		Whitman	Snake River at Central Ferry
		Whitman	Snake River at Little Goose Dam
		Whitman	Snake River at Lower Granite Dam
		Yakima	Byron Lake
		Yakima	Myron Lake
		Yakima	Unnamed pond (14N-19E-31)
		Yakima	Unnamed Ponds (12N-19E-20)
		Yakima	Yakima River
Utricularia inflata	Monitor	Cowlitz	Silver Lake
(swollen bladderwort)		Kitsap	Horseshoe Lake
		Kitsap	Mission Lake
		Kitsap	Square Lake
		Kitsap	Wye Lake
		Mason	Limerick Lake
		Mason	Spencer Lake
		Mason	Trails End (formerly Prickett)
		Pierce	Rapjohn Lake
		Thurston	Hicks Lake
		Thurston	Munn Lake

* Weed classes as stated by the Washington State Noxious Weed Control Board.

- Class A weeds require eradication
- Class B weeds are designated for control in areas of the state where their distribution is still limited
- Class C weeds are usually widespread in Washington, control is a local option
- Monitor weeds are plants of concern for which more data are being gathered

Appendix E

Herbarium Specimens, Grouped by Family

Herbarium Specimens - Grouped by Family

Family	Scientific	Common
Alismataceae		
	Alisma gramineum	narrowleaf water-plantain
	Sagittaria cuneata	Arumleaf arrowhead, wapato
	Sagittaria graminea	slender arrowhead
	Sagittaria rigida	bur arrowhead
Apiaceae		
	Cicuta douglasii	western water-hemlock
	Hydrocotyle ranunculoides	water-pennywort
	Lilaeopsis occidentalis	lilaeopsis
Asteraceae		
	Megalodonta beckii	water marigold
Azollaceae		
	Azolla mexicana	mexican water-fern
Boraginaceae		
	Myosotis laxa	small flowered forget-me-not
	Myosotis scorpioides	common forget-me-not
Brassicaceae		
	Nasturtium officinale	water-cress
	Rorippa palustris	marsh yellowcress
	Subularia aquatica	awlwort
Butomaceae		
	Butomus umbellatus	flowering rush
Cabombaceae		
	Brasenia schreberi	watershield
	Cabomba caroliniana	fanwort
Callitrichaceae		
	Callitriche hermaphroditica	northern water-starwort
	Callitriche heterophylla	different-leaved water-starwort
	Callitriche stagnalis	pond water-starwort
	Callitriche verna	spring water-starwort
Campanulaceae		
	Lobelia dortmanna	water gladiole; water lobelia
Ceratophyllaceae		
	Ceratophyllum demersum	Coontail; hornwort
Characeae		
	Nitella sp.	stonewort
	Tolypella intricata	macro algae
Crassulaceae		
	Crassula aquatica	pygmy-weed
Cyperaceae		

Family	Scientific	Common
	Carex unilateralis	one-sided sedge
	Cyperus erythrorhizos	red rooted cyperus
	Dulichium arundinaceum	Dulichium
	Eleocharis acicularis	needle spike-rush
	Eleocharis sp.	spike-rush
	Scirpus acutus	hardstem bulrush
	Scirpus americanus	american bulrush
	Scirpus cyperinus	wool-grass
	Scirpus fluviatilis	river bulrush
	Scirpus maritimus	seacoast bulrush
	Scirpus nevadensis	Nevada bulrush
	Scirpus subterminalis	water clubrush
Elatinaceae		
	Elatine americana	American waterwort
	Elatine sp.	waterwort
	Elatine triandra	three-stamen waterwort
Equisetaceae		
	Equisetum fluviatile	water horsetail
Fontinalaceae		
	Fontinalis antipyretica	water moss
Haloragaceae		
	Myriophyllum aquaticum	parrotfeather
	Myriophyllum hippuroides	western watermilfoil
	Myriophyllum quitense	waterwort watermilfoil
	Myriophyllum sibiricum	northern watermilfoil
	Myriophyllum sp.	water-milfoil
	Myriophyllum spicatum	Eurasian water-milfoil
	Myriophyllum verticillatum	whorled watermilfoil
Hippuridaceae		
	Hippuris vulgaris	common marestail
Hydrocharitaceae		
	Egeria densa	Brazilian elodea
	Egeria najas	Asian anacharis
	Elodea canadensis	common elodea
	Elodea nuttallii	Nuttall's waterweed
	Hydrilla verticillata	hydrilla
	Vallisneria americana	water celery
Isoetaceae		
	Isoetes sp.	quillwort
Juncaceae		
	Juncus acuminatus	tapered rush
	Juncus bulbosus	bulbous rush

Family	Scientific	Common
Lamiaceae		
	Lycopus asper	rough bungleweed
Lemnaceae		
	Wolffia borealis	water-meal
Lentibulariaceae		
	Utricularia inflata	big floating bladderwort
	Utricularia macrorhiza	common bladderwort
	Utricularia minor	lesser bladderwort
	Utricularia sp.	bladderwort
	Utricularia vulgaris	common bladderwort
Menyanthaceae		
	Menyanthes trifoliata	buckbean
	Nymphoides peltata	water fringe
Najadaceae		
	Najas flexilis	common naiad
	Najas gradalupensis	Guadalupe water-nymph
Nymphaeaceae		
	Nuphar polysepala	spatter-dock, yellow water-lily
Onagraceae		
	Epilobium hirsutum	fiddle-grass
	Ludwigia hexapetala	water primrose
	Ludwigia palustris	water-purslane
Poaceae		
	Cinna latifolia	wood reed-grass
	Glyceria borealis	northern mannagrass
	Zizania aquatica	wild rice
Polygonaceae		
	Polygonum amphibium	water smartweed
	Polygonum hydropiper	marshpepper smartweed
	Polygonum hydropiperoides	common smartweed
Pontederiaceae		
	Heteranthera dubia	water star-grass
Potamogetonaceae		
	Potamogeton alpinus	red pondweed
	Potamogeton amplifolius	large-leaf pondweed
	Potamogeton crispus	curly leaf pondweed
	Potamogeton diversifolius	snailseed pondweed, diverse leaf
	Potamogeton epihydrus	ribbonleaf pondweed
	Potamogeton foliosus	leafy pondweed
	Potamogeton friesii	flat-stalked pondweed
	Potamogeton gramineus	grass-leaved pondweed
	Potamogeton illinoensis	Illinois pondweed

Family	Scientific	Common
	Potamogeton natans	floating leaf pondweed
	Potamogeton nodosus	longleaf pondweed
	Potamogeton obtusifolius	bluntleaf pondweed
	Potamogeton pectinatus	sago pondweed
	Potamogeton praelongus	whitestem pondweed
	Potamogeton pusillus	slender pondweed
	Potamogeton richardsonii	Richardson's pondweed
	Potamogeton robbinsii	fern leaf pondweed
	Potamogeton sp.	pondweed
	Potamogeton vaginatus	sheathing pondweed
	Potamogeton zosteriformis	eel-grass pondweed
Primulaceae		
	Lysimachia nummularia	creeping loosestrife
	Lysimachia thyrsiflora	tufted loosestrife
	Lysimachia vulgaris	garden loosestrife
Ranunculaceae		
	Ranunculus aquatilis	water-buttercup
	Ranunculus flammula	creeping buttercup
Ruppiaceae		
	Ruppia cirrhosa	ditch-grass
Scrophulariaceae		
	Gratiola neglecta	hedge-hyssop
	Limosella acaulis	mudwort
	Limosella aquatica	mudwort
	Lindernia dubia	false-pimpernel
	Veronica anagallis-aquatica	water speedwell
Sparganiaceae		
	Sparganium angustifolium	narrowleaf bur-reed
	Sparganium eurycarpum	broadfruited bur-reed
	Sparganium nutans	small bur-reed
	Sparganium sp.	bur-reed
Typhaceae		
	Typha angustifolia	lesser cat-tail
	Typha domingensis	Southern cat-tail
	Typha X glauca	hybrid cat-tail
Zannichelliaceae		
	Zannichellia palustris	horned pondweed