

Survey of Aquatic Plants in Select Coastal Lakes in Oregon

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November 30, 2000

Introduction

In 1986, triploid grass carp were introduced into Devils Lake (Lincoln City, Oregon) to control excessive aquatic plant growth of both native and nonnative species. A subsequent stocking in 1993 was followed by the elimination of almost all submersed vegetation in Devils Lake. Aquatic plants are an important component of a lake ecosystem because they reduce wave impacts, create habitat and ameliorate water quality. The loss of aquatic plants in Devils Lake has created concern for this ecosystem. Signs that the habitat may be degraded include, a declining bass fishery, reduction of waterfowl populations, and algae blooms. A current study is underway to examine the viability of the propagule bank at Devils Lake to determine its status in the absence of grass carp. The primary objectives of the study is to provide information on the composition of the propagule bank in Devils Lake. Information obtained from the study can be used to determine what future management approaches will be most effective in the restoration of Devils Lake.

As a component of that study, a survey was conducted to gather information on existing macrophyte populations in other nearby coastal lakes. The primary objective of this survey was to collect data on species composition and distribution. Collected data will be used to compare diversity and ecological integrity (native vs. nonnative) within these lakes, help identify species collected in the Devils Lake, and suggest potential species that could be introduced into Devils Lake to restore its ecosystem.

Methods

Nine Lakes were surveyed for aquatic macrophytes (Table 1). Lakes surveyed for this study were chosen for their inclusion in the Oregon coast ecoregion and for their close proximity to Devils Lake. Lakes greater than 100 acres and having boat ramps were considered to be more susceptible to an invasion by nonindigenous plants. Depending upon the determined susceptibility, boat availability and weather, one of

three different survey strategies was selected for each lake. The different strategies vary in intensity and are summarized as follows.

- Level 1 Walk the shore line around the boat dock (if present) looking for plant fragments. Cast the plant rake around the dock. Wade shallows in the area around dock checking for plants. Make a plant list and collect specimens for herbarium.

- Level 2 Walk the shore line around the boat dock (if present) looking for plant fragments. Extend the area of the study to at least 100ft on both sides of the boat ramp. Survey at least one addition site away from boat dock. Cast the plant rake around the study area and extensively wade shallows to check for plants. Make a plant list and collect specimens for herbarium.

- Level 3 Walk the shore line around the boat dock (if present) looking for plant fragments. Extend the area of the study to at least 100ft on both sides of the boat ramp. Cast the plant rake around the study area and extensively wade shallows to check for plants. Use a boat to extensively study area out from shore. Make a plant list and collect specimens for herbarium.

Table 1. Lakes Surveyed for Aquatic Macrophytes, Summer 2000.

Cape Meares Lake	Collard Lake	Munsel Lake
Clear Lake	Eckman Lake	Olalla Reservoir
Cleawox Lake	Mercer Lake	Sutton Lake

*Valsetz Lake was to be included but this lake no longer exists.

Specimens were refrigerated until identified. A list of reference guides used for species identification is listed in appendix A. Specimens were determined as native or non-native (black print is native, bold print is non-native, shaded background is highly invasive). Herbarium specimens were pressed and mounted on acid free paper.

Appendix B contains a list of preserved species.

Results

Cape Meares Lake

Acres: 73

Date: 9/18/00

Survey Type: Level 2

Sites: Site 1, boat launch; fishing area just off Bayocean Road near wooden sign

Site 2, area just east of ocean, near homes, shore along road going to Cape Meares State Park.

Site 3, north shore of lake, along levee

Notes: The lake shore is heavily vegetated at sites 1 and 2. An unidentified *Juncus* or *Eleocharis* lines almost the entire shoreline of the lake with the exception of the north shore. Islands of this species were observed in the west end of the lake. The north shore appears to have been disturbed from its natural condition as a result of the levee construction. Rocky shore line may inhibit plant growth. *Elodea canadensis* was the predominant species but species diversity in this lake was notable.

Name	Site	Name	Site
Elodea canadensis	1,2	Potamogeton berchtoldii	1
Chara spp.	1,2	Potamogeton epihydrus	1,2
Eleocharis spp. or Juncus spp.	1,2	Potamogeton richardsonii	2
		Sparganium angustifolium	1

Clear Lake

Acres: 153

Date: 8/2/00

Survey Type: Level 2

Sites: Site 1, Surveyed entire western shore line. Clear Lake does not have public boat launch.

Notes: The town of Florence procures its drinking water from Clear Lake. Currently there is little development along its shores. Three submersed species are growing along the western shoreline, of which *Brasenia schreberi* is the most abundant and can be found in scattered patches along the midwestern shore. It is especially heavy at the outlet where it grows with *Scirpus validus* (or *acutus*). A submersed *Juncus* spp. was collected along the western shore line that is abundant and less than 5 inches tall.

Name	Site	Name	Site
<i>Brasenia schreberi</i>	1	<i>Potamogeton amplifolius</i>	1
<i>Juncus</i> spp.	1		

Cleawox Lake

Acres: 87

Date: 8/3/00

Survey Type: Level 3

Sites: Surveyed entire shore line of lake.

Notes: Aquatic plants can be observed along most of the shore with the exception of the dune shoreline. *Potamogeton foliosus* is the dominant species in shallow areas.

Growth is only heavy in a cove that is blocked off by logs, where the dominant species is *Potamogeton natans*.

Name	Site	Name	Site
Juncus sp.	various	Potamogeton foliosus var. foliosus	entire lake
Chara sp.	various	Potamogeton natans	log jam area

Collard Lake

Acres: 43

Date: 8/1/00

Survey Type: Level 1

Sites: Sampled one location on north shore of lake

Notes: Because most of the shore line is privatized, it was difficult to access this lake.

There are a few homes around the lake that have maintained much of the natural terrestrial vegetation. From the shore, this lake did not appear to have an aquatic plant problem. In addition to samples collected with the rake, the only other aquatic macrophyte observed from shore was *Nuphar lutea*.

Name
Brasenia schreberi
Juncus spp.
Nuphar lutea

Eckman Lake

Acres: 45

Date: 7/24/00

Survey Type: Level 2

Sites: Site 1, fishing dock in northwest corner of lake at outlet.

Site 2, Middle of the eastern shore of the lake

Notes: Eckman does not have a public boat ramp but does maintain a fishing dock.

Vegetation is thick at site one. *Potamogeton* spp. is the dominant species followed by *Myriophyllum aquaticum* and *Potamogeton nodosus*. *Potamogeton* spp. is thickest off the dock in the deeper water and covered with filamentous algae while *M. aquaticum* and *P. nodosus* are heaviest along the shore line. *Myriophyllum spicatum* is found scatter near the shoreline and around the fishing dock. The sediment at site two appears to be more course than site 1. The dominant vegetation there is *M. aquaticum* forming thick matts along the shore line. *Sparganium angustifolium* is also found scattered throughout this site. Visual inspection from the road determined that *M. aquaticum* forms thick matts along the entire shoreline of the lake but is especially dense near the inlet.

Name	Site Found	Name	Site Found
<i>Chara spp.</i>	2	<i>Nitella spp.</i>	1
<i>Callitriche stagnales</i>	1	<i>Potamogeton nodosus</i>	1
<i>Myriophyllum aquaticum</i>	1,2	<i>Potamogeton spp.</i>	1
<i>Myriophyllum spicatum</i>	1	<i>Sparganium angustifolium</i>	2
<i>Najas flexilis</i>	1	<i>Spirodela polyrhiza</i>	1

Mercer Lake

Acres: 359

Date: 8/4/00

Survey Type: Level 3

Sites: Site 1 - Arm one, includes area around boat ramp (little development)

Site 2 - Arm two, western most arm (numerous homes line the shore)

Site 3 - Arm three, northern most are (numerous homes line the shore)

Notes: *Egeria densa* forms heavy mats throughout the entire lake. These mats exist in up to eight feet of water and may be present in deeper waters. This species appeared to be less prevalent along the less developed northeast shore. *Elodea canadensis* is the second most common species in Mercer Lake. It grows near the boat dock and at

various other locations around the lake, sometimes growing among *E. densa* and *Nuphar lutea*. A small pocket of plant diversity exists along the mid-southern shore.

Name	Site	Name	Site
<i>Egeria densa</i>	1,2,3	<i>Potamogeton richardsonii</i>	site 2
<i>Elodea canadensis</i>	1,2,3	<i>Potamogeton robbinsii</i>	site 2
<i>Nuphar lutea</i>	1,2,3	<i>Sparganium angustifolium</i>*	site 1**
<i>Potamogeton amplifolius</i>	site 2		

* Not positive on species ** found only at inlet.

Munsel Lake

Acres: 110

Date: 8/3/00

Survey Type: Level 3

Sites: Site 1 - area around boat dock and western shoreline (numerous homes around shoreline)

Site 2 - northwestern shoreline (numerous homes around shoreline)

Site 3 - eastern shoreline (little development)

Notes: Macrophyte growth is extremely thick along the western and northwestern shores. *Nymphaea odorata* dominates the western shore, while *Brasenia schreberi* dominates the northwestern shore. Aquatic plant growth declines along the eastern shore where development is almost nonexistent.

Name	Site	Name	Site
<i>Brasenia schreberi</i>	1,2	<i>Potamogeton epihydrus</i>	1,2
<i>Nymphaea odorata</i>	1	<i>Potamogeton richardsonii</i>	1,2

Olalla Reservoir

Acres:113

Date: 7/26/00

Survey Type: Level 2

Sites: Site 1, Just off the parking lot and to the east and west of the swim area

Site 2, On the east shoreline, between the swim area and the boat ramp

Site 3, The boat ramp

Site 4. Where the old road crosses the eastern arm of the lake

Notes: Only electric motor boats are allowed at Olalla and the boat ramp is primitive. The western shoreline was impossible to reach by foot because access to it was fenced off. However an extensive survey was accomplished along the eastern shore line and the eastern most arm of the lake. Vegetation is sparse at all sites but is heaviest at site 4. Casts of the plant rake produced small quantities of vegetation, suggesting sparse macrophyte coverage within the lake. Olalla is a deep lake (up to 65 feet) which may inhibit plant growth. *Elodea canadensis* is the dominant species throughout the lake and is found at three of the four sites. Other species appear to be distributed in specific locations around the lake. An unidentified *Juncus* grows in Olalla as well as three additional unidentified species of which two might be a *Elatine* and a *Potamogeton*.

Name	Site	Name	Site
Chara sp.	4	Myriophyllum hippuroides	3
Elatine americana	3	Potamogeton berchtoldii	4
Elodea canadensis	1,3,4	Potamogeton pusillus	3
Juncus sp.	1, 4	Utricularia vulgaris	2

Sutton Lake

Acres: 107

Date: 8/2/00

Survey Type: Level 2(3)

Sites: Site 1 - Boat ramp area (state park)

Site 2 - Northwestern shore along highway 101

Site 3 - North corner of lake along highway 101

Site 4 - Eastern shore off Sutton Lake Road (residential homes)

Notes: An attempt was made to survey this lake in a boat but high winds prohibited the boat from getting very far from the boat ramp. The channel leading to the boat dock is almost entirely closed off by *Nuphar lutea*. This lake appears to be highly productive and has a mixture of native and invasive species. *Egeria densa* is present at site 4. This is not surprising because Mercer Creek flows into the lake along that shoreline, connecting Sutton and Mercer Lakes. As was previously mentioned, Mercer Lake is heavily invaded with *E. densa*. There were two additional species found at site 2 that were not identified.

Name	Site	Name	Site
<i>Brasenia schreberi</i>	1	<i>Nymphaea odorata</i>	3
<i>Ceratophyllum demersum</i>	3,4	<i>Nuphar lutea</i>	1,3
<i>Egeria densa</i>	4	<i>Potamogeton berchtoldii</i> *	2
<i>Fontinalis antipyretica</i>	3	<i>Utricularia vulgaris</i>	3

* Not positive on species

Discussion

Six of the lakes contain nonnative macrophytes but only three include highly invasive species. All of the lakes surveyed in this study are much smaller than Devils Lake (678 acres). However, the biggest lake, Mercer, does maintain the greatest coverage of highly invasive macrophytes than any of the other lakes. Surprisingly, the

second to smallest lake, Eckman, maintains the next largest population of highly invasive macrophytes. This is especially remarkable because Eckman does not have a public boat ramp.

This survey demonstrates that diversity of native macrophytes exists within Oregon's coastal lakes. Twenty native plant species were observed among the surveyed lakes. *Brasenia schreberi* is found in four out of the nine lakes making it the most commonly found native. However, in two of these lakes, significant coverage of *B. schreberi* was beginning to degrade the ecosystem. *Potamogeton richardsonii* and *Nuphar lutea* were the second most frequently observed native species. While *N. lutea* can be aggressive at times, it does not appear to be a cause for concern in any of the lakes surveyed. Likewise, the numerous native *Potamogeton* species identified, are not present in excessive quantities.

Conclusion

While it is typically presumed that large lakes with public boating are more likely to be inhabited with invasive macrophytes, this survey demonstrates that all lakes can be susceptible to invasions regardless of their size or access availability. Three highly invasive macrophytes were recorded among the lakes surveyed, creating a cause for concern. Additional monitoring in these and other coastal lakes should be conducted to determine the extent to which these ecosystems are degraded. Integrated management plans should be established immediately to avoid further degradation of these lakes. Mercer Lake is already in a highly degraded state and action needs to be taken to manage vegetation before the water quality and recreational opportunities diminish even further.

This survey described the types of native plants found in Oregon's coastal lakes. A list of possible native plants that are best suited for coastal lake environments has been created. This facilitates Devils' Lake restoration attempts by providing suggested species that might thrive and enhance the lake's ecosystem if they were to be found

growing there and/or introduced into the lake. By knowing which native species are more likely to be aggressive in their growth, researchers can avoid costly mistakes by omitting such species. Additional research on the species identified from this survey should be completed before any final consideration is made.

Appendix A

References

- Borman, S., R. Korth, J. Temte. 1997. *Through the Looking Glass, A field Guide to Aquatic Plants*. Wisconsin Lakes Partnership, Steven Point, Wisconsin.
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- Hitchcock, C.L. , A. Cronquist. 1973. *Flora of the Pacific Northwest*. University of Washington Press, Seattle, Washington.
- Spear-Cooke, S. 1997. *A Field Guide to the Common Wetland Plants of Western Washington and Northwestern Oregon*. Seattle Audubon Society, Seattle Washington.
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Appendix B

Specimens Preserved in Portland State Herbarium

Lake	Species	Herbarium Number
Cape Meares	<i>Potamogeton epihydrus</i>	LSCM001
Cape Meares	<i>Potamogeton berchtoldii</i>	LSCM002
Cape Meares	<i>Potamogeton richardsonii</i>	LSCM003
Cape Meares	<i>Sparganium angustifolium</i>	LSCM004
Clear	<i>Potamogeton amplifolius</i>	LSCL001
Eckman	<i>Myriophyllum aquaticum</i>	LSE001
Eckman	<i>Myriophyllum spicatum</i>	LSE002
Eckman	<i>Potamogeton nodosus</i>	LSE003
Eckman	<i>Sparganium angustifolium</i>	LSE005*
Mercer	<i>Egeria densa</i>	LSME001
Mercer	<i>Elodea canadensis</i>	LSME002
Mercer	<i>Potamogeton richardsonii</i>	LSME003
Mercer	<i>Potamogeton robbinsii</i>	LSME004
Munsel	<i>Nymphaea odorata</i>	LSMU001
Munsel	<i>Potamogeton epihydrus</i>	LSMU002
Olalla Rservoir	<i>Myriophyllum hippuroides</i>	LSO001
Sutton	<i>Brasenia schreberi</i>	LSS001
Sutton	<i>Ceratophyllum demersum</i>	LSS002

* There is no specimen labeled LSE004

Note: Herbarium Numbers are labeled as follows:

example: LSS002

(LS) = Lake Surveys (S) = initial for lake, S is for Sutton (00) = year survey was completed, 2000 (2) = number of sample preserved from that particular lake.