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Alaska Aquatic Plant Survey Report 2005

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2005

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Introduction

Invasive, non-indigenous plants can degrade water quality and fish habitat when they invade lakes, ponds, and streams. Changes in plant community architecture in lakes due to invasion by canopy-forming invasive aquatic plants can result in loss of native plant biodiversity and reduction of the structural complexity of the underwater habitat (Engel 1987; Madsen et al 1994). Differences in photosynthetic biochemistry between non-indigenous and native plants can result in large diurnal pH and dissolved oxygen concentrations (Spencer et al 1994). In Alaska, because of the prevalence of floatplanes as a means of transport, invasive aquatic plants could also present a risk to human life and property.

Humans are the primary means of dispersal of non-indigenous aquatic plants. Unintentional transportation on trailered boats is a known vector of movement of invasive plants between lakes (Johnstone et al 1985; Pfauth & Sytsma 2004). Another vector is deliberate introduction by humans. The fragrant waterlily (*Nymphaea odorata*), for example, has been intentionally planted in lakes in western North America (Brayshaw1989). The recent increase in popularity of water gardens has resulted in escape of ornamental, aquatic plants into natural systems (e.g., *Nymphoides peltata* in Oregon). The aquarium trade is another mechanism by which invasive, aquatic plant species are transported (Kay and Hoyle 2001, Padilla and Williams 2004).

In Alaska, transport of plant fragments on floatplanes flying between waterbodies in urban population centers and those in more remote locations within the state is a likely vector of aquatic plant introduction. Float plane and trailered boat traffic between the state of Alaska and regions to the south (Canada and contiguous US) are also likely sources of new infestations.

Aquatic plants in the native flora of Alaska range south into other lower latitude portions of North America as well as into the other circumboreal regions. For example, the 15 species of *Potamogeton* listed by Hulten (1969) have distributions that extend to the northeastern portion of the U.S. (Crowe and Hellquist, 2000). The state also supports two species of *Myriophyllum*, as well as *Lemna* spp., *Utricularia* spp., and others that are common throughout the contiguous states. It is therefore likely that introduced, invasive aquatic plants that have already established in Canada and the contiguous 48 states of the U.S., such as *M. spicatum* (Eurasian watermilfoil) and *P. crispus* (curlyleaf pondweed), would survive and thrive if introduced into waterbodies of Alaska.

The revised taxonomic status of *Myriophyllum spicatum* subspecies *exalbescens* is a source of confusion regarding the presence of *M. spicatum* in Alaska. Since the publication of Hulten's 1969 flora of the state, the taxon has been elevated to species status - *M. sibiricum* (Aiken and Cronquist 1988). Older plant lists and collections often did not include the subspecies appellation and were recorded only as *M. spicatum*, which is the currently accepted name for the invasive Eurasian watermilfoil. Thus, one could easily and mistakenly conclude from older records that the exotic, invasive Eurasian species is already present in the state.

Early detection of new infestations is key to control of invasive aquatic plants. Delays in detection and rapid response greatly increase the costs of control and greatly reduce the likelihood of successful mitigation or elimination of the harmful effects of the invasion. Since aquatic plant species vary in their response to management activities, the effective management of infested lakes and ponds is also predicated upon a good understanding of the species present. Regular surveys are critical to development of baseline information on aquatic plant communities and early detection of new invaders.

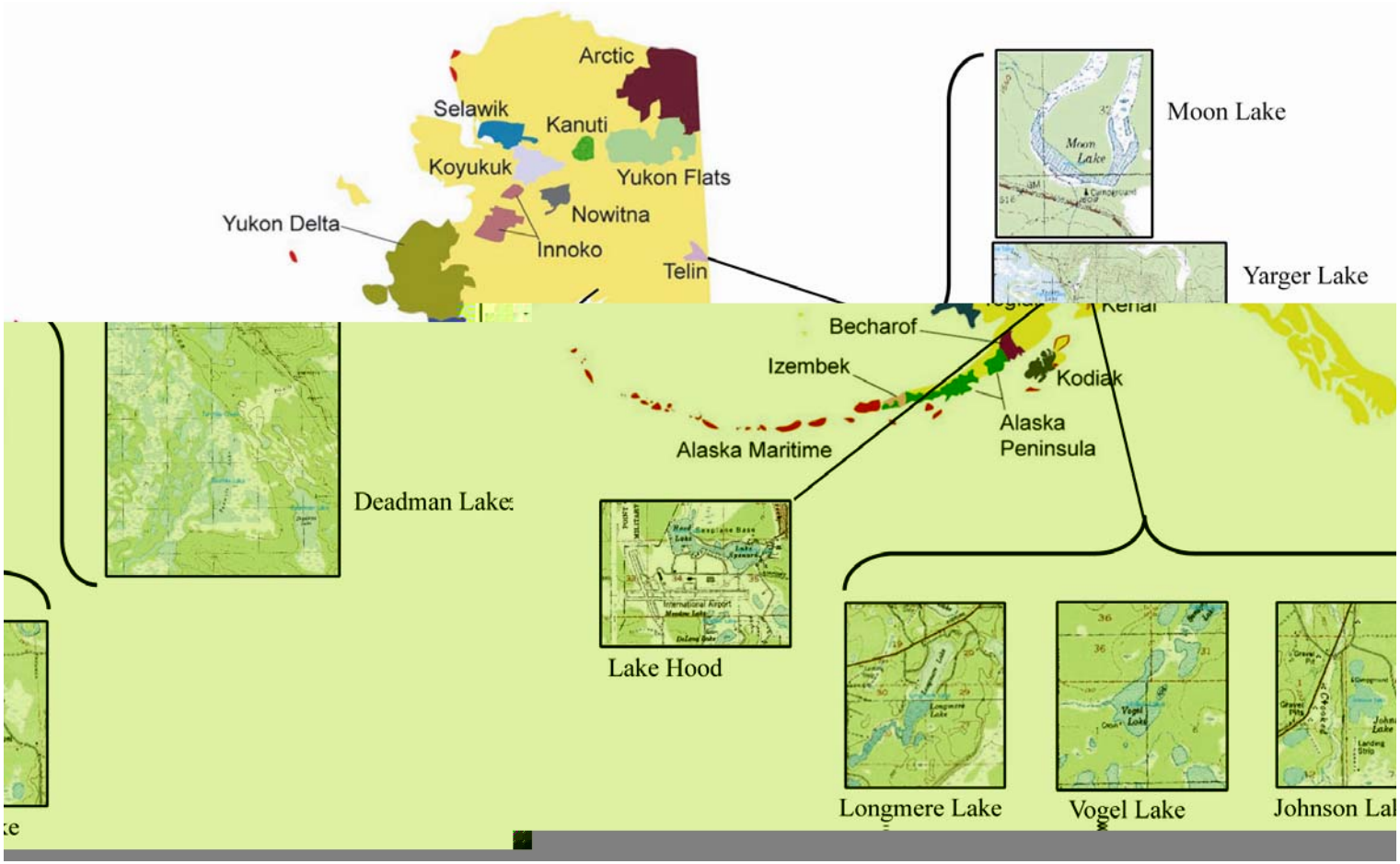
Submersed, aquatic plant communities in Alaska were systematically surveyed and documented by Hulten (1968) in the mid-twentieth century. Since then, local aquatic plant communities, such as those inhabiting waterbodies within the Kenai National Wildlife Refuge (NWR), have been occasionally surveyed (Friedersdorff 1983).

This report presents the results of field surveys of submersed and floating-leaved aquatic plants conducted in summer 2005 in six waterbodies located within, or near, two National Wildlife Refuges and one lake in a major urban center (Table 1, Figure 1). The waterbodies were chosen by US Fish and Wildlife Service personnel based on accessibility to and use by humans using trailered boats and/or floatplanes.

Table 1. Waterbodies surveyed for aquatic plants in 2005.

Waterbody name	Location	Date surveyed
Moon Lake	Near Tok	8/1/2005
Yarger Lake	Within Tetlin NWR	8/2/2005
Deadman Lake	Within Tetlin NWR	8/2/2005
Vogel Lake	Within Kenai NWR	8/4/2005
Johnson Lake	Near Kenai NWR	8/5/2005
Longmere Lake	Near Kenai NWR	8/5/2005
Lake Hood	Ted Stevens Anchorage International Airport	8/6/2005

Figure 1. Map of Alaska NWRs and survey locations.



Methods

The survey focused on submersed and floating-leaf aquatic plants in the littoral zones of the surveyed waterbodies. Fringing wetlands and emergent species were not sampled but notes of major species present were recorded. Surveys were conducted by tossing a plant sampling rake into the lake, retrieving the rake, and identifying the plant species in the sample. Some aquatic plant species, such as the submersed *Isoetes* species and tiny, floating-leaved species such as *Lemna*, are not well sampled with this method. Thus, visual observations were also made to supplement rake sampling. Surveys were conducted until no new species were found for a period of one hour. Lakes were accessed by boat, canoe, or floatplane except for Lake Hood which had limited foot access from floatplane docks. Surveys included GPS locations of each rake toss and a visual estimate of abundance of each species found. A voucher specimen for each species found in each lake was preserved and delivered to the Alaska Natural Heritage Program office in Anchorage for deposit into the University of Alaska Herbarium (ALA). Duplicate specimens of some species were similarly preserved and left at the Tetlin and Kenai NWRs for deposit into their herbaria. References used in plant identification were Hulten (1968), Brayshaw (1989), Crowe and Hellquist (2000), and Hamel et al (2001).

Results

A total of 29 aquatic, flowering plant species; one macro-alga; one liverwort; and two aquatic mosses were documented in this survey. No nonnative, aquatic plant species were discovered during the survey. Short descriptions of each lake along with a species list of submersed and floating leaved aquatic plants found in each lake follow. Notes on emergent plant species are included in the lake descriptions. Refer to Appendix A for GPS coordinates and species found at each sample point and Appendix B for a table summarizing waterbody characteristics.

Moon Lake lies within an Alaska State Park northwest of Tetlin NWR and has easy access from the Alaska Highway. The park has a public campground and the lake serves as a floatplane base for the USFWS. Access to the lake was by USFWS canoe. Lake water was very clear (Secchi disk depth was 1.8 meters with the disk resting on the lake

bottom) and large colonies of submersed aquatic plants inhabit both arms of the lake. Sediment in the lake varied from silt to peaty muck. Extensive mats of *Lemna trisulca* and large beds of *Potamogeton praelongus* were especially notable. A complete species list is found in Table 2.

Table 2. Moon Lake species list (near Tetlin National Wildlife Refuge, AK)

Botanical name	Common name
Chara sp.	Muskwort (alga)
Hippuris vulgaris	Mare's tail
Lemna trisulca	Star duckweed
Myriophyllum sibiricum	Northern watermilfoil
Potamogeton filiformis	Slender leaved pondweed
Potamogeton gramineus	Grass leaved pondweed
Potamogeton obtusifolius	Blunt leaved pondweed
Potamogeton praelongus	White stemmed pondweed
Potamogeton richardsonii	Richardson's pondweed
Ranunculus trichophyllus	Water buttercup
Secchi disk: 1.8 m	
Note: 2 aquatic mosses also found in samples	

Yarger Lake is situated on the flats southeast of Northway Junction. It is easily accessible from the Alaska Highway by trailered boat and from the air by floatplane. The waters of Yarger Lake were silty with a Secchi disk depth of .71 meter. The lake bottom is a firm layer of fine silt. A large emergent marsh comprised of *Carex* sp., *Equisetum* sp., and *Typha latifolia* lies on the west side of the lake. A complete species list is found in Table 3.

Table 3. Yarger Lake species list (Tetlin National Wildlife Refuge, AK)

Botanical name	Common name
Chara sp.	Muskwort (alga)
Lemna minor	Lesser duckweed
Lemna trisulca	Star duckweed
Hippuris vulgaris	Mare's tail
Myriophyllum sibiricum	Northern watermilfoil
Polygonum amphibium	Water smartweed
Potamogeton filiformis	Slender leaved pondweed

Potamogeton friesii	Flat stalked pondweed
Potamogeton gramineus	Grass leaved pondweed
Potamogeton obtusifolius	Blunt leaved pondweed
Potamogeton praelongus	White stemmed pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton zosteriformis	Flat stem pondweed
Ricciocarpus sp.	Riccia (liverwort)
Utricularia intermedia	Flat leaved bladderwort
Utricularia macrorhiza	Common bladderwort
Secchi disk: .71 m	

Deadman Lake is situated near Yarger Lake to the south of the Alaska Highway. There is a public campground at Deadman Lake accessible from the highway and the lake itself gets occasional floatplane traffic. The waters of this lake were very clear with a Secchi disk depth of 4.0 meters and an estimated maximum water depth of 6.4 meters. This lake had a firm substrate composed of fine silt. Much of the littoral areas of the lake are covered with the leaves of *Nuphar variegatum*, especially at the southern end. Common emergents include *Menyanthes trifoliata, Equisetum* sp., and *Calla palustris*. A complete species list is found in Table 4.

Table 4. Deadman Lake species list (Tetlin National Wildlife Refuge, AK)

Botanical name	Common name
Myriophyllum verticillatum	Whorled watermilfoil
Nuphar variegatum	Small yellow pondlily
Polygonum amphibium	Water smartweed
Potamogeton filiformis	Slender leaved pondweed
Potamogeton friesii	Flat stalked pondweed
Potamogeton gramineus	Grass leaved pondweed
Potamogeton praelongus	White stemmed pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton zosteriformis	Flat stem pondweed
Ranunculus trichophyllus	Water buttercup
Sagittaria cuneata	Arum leaved arrowhead
Sparganium minimum	Slender bur-reed
Utricularia intermedia	Flat leaved bladderwort
Utricularia macrorhiza	Common bladderwort

Secchi disk: 4.0 m

Vogel Lake is located in the northern portion of the Kenai NWR and was accessible by air. The plants in the lake were sampled off the float of a USFWS floatplane. One sample point was from the shore of the USFWS cabin at the south end of the lake. Lake waters were clear with a Secchi disk depth of 4.1 meters. The substrate in the north end is mushy and the lake appears to be filling in while that in the south end is primarily gravel. Emergents present included *Carex* sp., *Juncu*s sp., *Menyanthes trifoliata*, *Scirpus* sp., and *Sparganium angustifolium.* A complete species list is found in Table 5.

Table 5. Vogel Lake species list (Kenai National Wildlife Refuge, AK)

Botanical name	Common name
Chara sp.	Muskwort (alga)
Isoetes echinospora	Quillwort
Lemna trisulca	Star duckweed
Myriophyllum verticillatum	Whorled watermilfoil
Nuphar polysepalum	Yellow pondlily
Nymphaea tetragona	White waterlily
Potamogeton gramineus	Grass leaved pondweed
Potamogeton natans	Floating leaved pondweed
Potamogeton obtusifolius	Blunt leaved pondweed
Potamogeton pusillus	Small pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton robbinsii	Fern leaf pondweed
Potamogeton zosteriformis	Flat stem pondweed
Utricularia intermedia	Flat leaved bladderwort
Utricularia macrorhiza	Common bladderwort
Secchi disk: 4.1 m	

Johnson Lake is located within a state park and is equipped with a public boat ramp. The lake is in a semi-urban setting and is heavily used by the general public. Common emergents include *Menyanthes trifoliata* and *Sparganium angustifolium.* A complete species list is found in Table 6.

Table 6. Johnson Lake species list (Kasilof, AK)

Botanical name	Common name
Hippuris vulgaris	Mare's tail

Myriophyllum sibiricum	Northern watermilfoil
Nuphar polysepalum	Yellow pondlily
Potamogeton gramineus	Grass leaved pondweed
Potamogeton friesii	Flat stalked pondweed
Potamogeton pectinatus	Sago pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton zosteriformis	Flat stem pondweed
Utricularia macrorhiza	Common bladderwort
Secchi disk: 3.2 m	

Longmere Lake is an elongated, rectangular-shaped lake which is used as floatplane base by residents who live on the lakeshore. The south end is less developed and contains more emergent species while the remainder of the lake has been developed with docks for floatplanes, jet skis, and boats; private residences onshore; and small beaches. Almost no emergents inhabit this portion of the lake. There is a public boat ramp but most of the surrounding property is privately owned. There are no inlet or outlet streams. The lake substrate is a firm layer of fine silt and much of the lake bottom is covered with a layer of aquatic moss. Common emergents include *Menyanthes trifoliata* and *Sparganium angustifolium.* A complete species list is found in Table 7.

Table 7. Longmere Lake species list (Soldotna, AK)

Botanical name	Common name
Callitriche sp	Water starwort
Nuphar polysepalum	Yellow pondlily
Polygonum amphibium	Water smartweed
Potamogeton gramineus	Grass leaved pondweed
Subularia aquatica	Awlwort
Secchi disk: 1.7 m	

Lake Hood is a shallow basin which was joined to neighboring Lake Spenard by a channel in 1940. The conjoined waterbodies, known as the Lake Hood Seaplane Basin and managed by the Ted Stevens Anchorage International Airport, comprise the largest and most active seaplane basin in the world. Private individuals and commercial air taxi operators use the approximately 404 slips situated on the lake complex. Lake waters support abundant aquatic macrophyte growth which gets entangled on aircraft floats and

rudders. Plans are underway for macrophyte control using a mechanical harvester (CH2M Hill 2005). All samples were collected from shore with the plant rake thus no Secchi disk reading was obtained. Few emergents were seen except for *Calla palustris* and *Sparganium angustifolium.* A complete species list is found in Table 8.

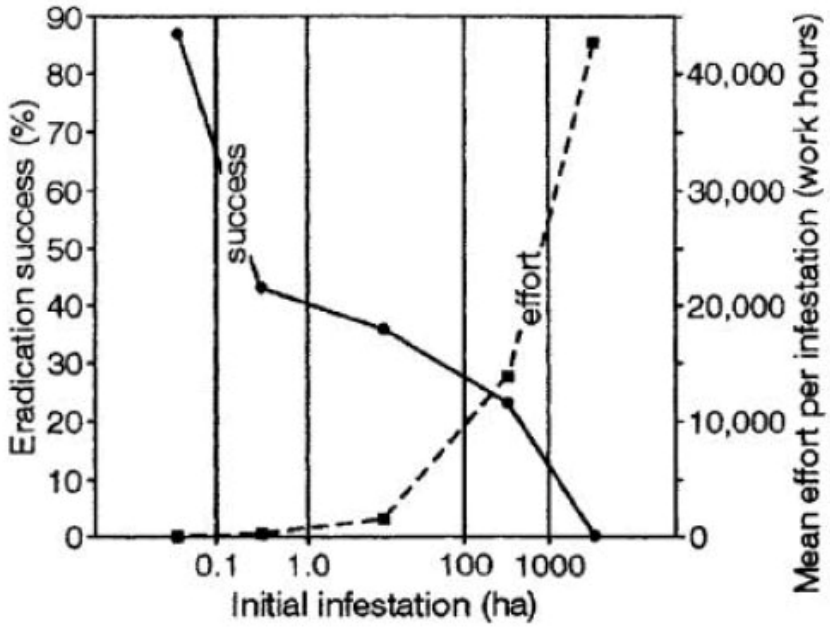
Table 8. Lake Hood species list (Anchorage, AK)

Botanical name	Common name
Eleocharis acicularis	Needle spike-rush
Myriophyllum sibiricum	Northern watermilfoil
Myriophyllum verticillatum	Whorled watermilfoil
Potamogeton gramineus	Grass leaved pondweed
Potamogeton friesii	Flat stalked pondweed
Potamogeton pectinatus	Sago pondweed
Potamogeton praelongus	White stemmed pondweed
Potamogeton richardsonii	Richardson's pondweed
Potamogeton zosteriformis	Flat stem pondweed
Zannichellia palustris	Horned pondweed
Secchi disk: n/a	

Conclusions and recommendations

No non-native aquatic plants were found in the surveyed lakes, which suggests that prevention and early detection should be the focus of aquatic plant management in these lakes. Rejmanek and Pitcairn's (2002) analysis of data from California shows that the earlier infestations were detected (i.e., the smaller the population size), the less the cost for treatment (Figure 2). The California data make clear that a strategy aimed at early detection and prevention can result in significant cost savings relative to detection and treatment at later stages of infestation.

Figure 2. Eradication success vs. effort (from Rejmanek and Pitcairn 2002)



It is our recommendation that federal and state agencies in Alaska should focus their efforts on public education and regular surveys of high risk waterbodies. A statewide organization focused on invasive and noxious plant management in Alaska has produced a strategic plan (Hebert 2001) which makes similar recommendations. We also recommend that educational signs be posted at waterbodies having easy public access. An example of a sign aimed at both plants and animal invaders is contained in Appendix C. Lake Hood, in particular, should be surveyed annually for aquatic invasive plants. Surveys should be done in July and August when most aquatic plant species have achieved maximum biomass (making detection and identification easier) but have not yet senesced. This survey has made a start at inventorying waterbodies which are at risk for invasion by non-native, aquatic, nuisance plants, but much more extensive surveys, pathway analyses, and monitoring are needed to get a clear picture of the risks which aquatic, invasive plants present to Alaska fish, wildlife and human populations.

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Appendix A. Survey data

Estimates of species abundance are indicated by numbers in parentheses after species names. 1= sparse, 2= moderately abundant, 3 = abundant

Table 9. Moon Lake, near Tok, Alaska

Latitude	Longitude	Species		
63.37603	143.54447	*Lemna trisulca (3)*	*Potamogeton richardsonii (2)*	*Myriophyllum sibiricum (2)*
		Hippuris vulgaris (1)	*Potamogeton filiformis (2)*	**Chara* sp.(2)
63.38141	143.53662	*Potamogeton gramineus (1)*	*Potamogeton obtusifolius (1)*	*Potamogeton praelongus (3)*
		Ranunculus trichophyllus (1)		

* *Chara* is a freshwater macro alga
Secchi disk: 1.8 meters (disk on lake bottom, water very clear)

Table 10. Deadman Lake, Tetlin NWR, Alaska

Latitude	Longitude	Species		
62.88796	141.54355	*Nuphar variegatum (3)*	*Potamogeton filiformis (1)*	*Potamogeton friesii (1)*
		Potamogeton richardsonii (2)	*Potamogeton zosteriformis (3)*	*Potamogeton praelongus (3)*
		Myriophyllum verticillatum (2)	*Lemna trisulca (2)*	*Utricularia macrorhiza (1)*
		Sparganium minimum (1)	aquatic moss	
62.88437	141.54467	*Potamogeton praelongus (3)*	*Myriophyllum verticillatum (2)*	*Polygonum amphibium (2)*
62.87748	141.54607	*Potamogeton praelongus (3)*	*Myriophyllum verticillatum (2)*	*Lemna trisulca (2)*
		Nuphar variegatum (3)	aquatic moss	
62.87310	141.54597	*Utricularia macrorhiza (1)*	*Utricularia intermedia (1)*	*Sparganium minimum (2)*
		Lemna trisulca (2)	*Nuphar variegatum (3)*	*Potamogeton zosteriformis (3)*
		Menyanthes trifoliata †		
62.878393	141.55170	*Sagittaria cuneata (1)*	*Potamogeton richardsonii (2)*	*Potamogeton friesii (1)*
		Nuphar variegatum (3)	*Utricularia macrorhiza (1)*	*Potamogeton filiformis (1)*
		Potamogeton gramineus (1)	*Calla palustris* †	*Menyanthes trifoliata*.
62.88009	141.55597	*Ranunculus trichophyllus (1)*	*(3)*	*Lemna trisulca (1)*
		Potamogeton richardsonii (2)	*Potamogeton zosteriformis*	*Myriophyllum verticillatum (2)*
		Potamogeton praelongus (2)	*Nuphar variegatum (3)*	*Sagittaria cuneata (1)*

		Calla palustris †		
62.89184	141.55572	*Potamogeton praelongus (2)*	*Potamogeton richardsonii (2)*	*Sagittaria cuneata (1)*
		Myriophyllum verticillatum (2)	*Lemna trisulca (2)*	*Potamogeton zosteriformis (2)*
		Sparganium minimum (2)	*Nuphar variegatum (3)*	*Utricularia macrorhiza(1)*
		Menyanthes trifoliata †		

† plant is an emergent
Secchi disk: 4.0 meters, max. depth ~6.4 meters

Table 11. Yarger Lake, Tetlin NWR, Alaska

Latitude	Longitude	Species		
62.96473	141.64255	*Potamogeton obtusifolius (1)*	*Myriophyllum sibiricum (2)*	*Potamogeton richardsonii (2)*
		Potamogeton friesii (1)	*Potamogeton zosteriformis (3)*	
62.96303	141.65268	*Myriophyllum sibiricum (2)*	*Lemna trisulca (2)*	*Lemna minor (1)*
		Utricularia macrorhiza (1)	*Potamogeton filiformis (1)*	*Potamogeton obtusifolius (1)*
		*Ricciocarpus natans**		
62.96259	141.65365	*Lemna trisulca (1)*	*Myriophyllum sibiricum (2)*	*Utricularia macrorhiza (1)*
		Potamogeton richardsonii (3)	*Chara* sp.(1)*	
62.96186	141.66168	*Hippuris vulgaris (2)*	*Utricularia macrorhiza (1)*	*Potamogeton gramineus (1)*
		Potamogeton sp.	*Myriophyllum sibiricum (1)*	
62.95765	141.65600	*Polygonum amphibium (3)*	*Lemna trisulca (2)*	*Potamogeton zosteriformis (2)*
		Potamogeton richardsonii (2)	*Utricularia macrorhiza (1)*	*Myriophyllum sibiricum (2)*
		Potamogeton filiformis (1)	*Potamogeton praelongus (2)*	*Potamogeton gramineus (2)*
		Potamogeton obtusifolius (1)s		
		Hippuris vulgaris (1)		

* *Ricciocarpus* is a liverwort, *Chara* is a macro-alga
Secchi disk: .71 meter

Table 12. Vogel Lake, Kenai NWR, Alaska

Latitude	Longitude	Species		
60.99648	150.42001	*Nuphar polysepalum (3)*	*Sparganium minimum (2)*	*Utricularia intermedia (1)*
		Potamogeton robbinsii (3)	*Utricularia macrorhiza (1)*	*Potamogeton natans (2)*
		Potamogeton gramineus (1)	*Menyanthes trifoliata* †	*Sparganium angustifolium* †
		Aquatic moss		
60.99565	150.42593	*Nuphar polysepalum (3)*	*Potamogeton obtusifolius (1)*	*Potamogeton pusillus (1)*
		Myriophyllum verticillatum (2)	*Potamogeton robbinsii (3)*	*Nymphaea tetragona (2)*
		Potamogeton zosteriformis (2)	*Sparganium angustifolium* †	*Scirpus* sp. †

60.99319	150.42628	*Nuphar polysepalum (2)*	*Potamogeton natans (2)*	*Potamogeton pusillus (1)*
		Nymphaea tetragona (2)	*Sparganium minimum (2)*	*Potamogeton zosteriformis (3)*
		Lemna trisulca (2)	*Myriophyllum verticillatum (2)*	*Hippuris* sp.
		Sparganium angustifolium †		
60.988870	150.43444	*Chara* sp.*	*Isoetes echinospora (2)*	*Potamogeton natans (2)*
		Aquatic moss	*Nuphar polysepalum (3)*	*Sparganium minimum (2)*
		Carex sp. †	*Juncus* sp. †	
60.98546	150.42774	*Potamogeton robbinsii (3)*	*Nymphaea tetragona (2)*	*Potamogeton natans (1)*
		Potamogeton gramineus (1)	*Myriophyllum verticillatum (2)*	*Nuphar polysepalum (2)*
		Potamogeton richardsonii (2)	*Potamogeton zosteriformis (2)*	*Isoetes echinospora (2)*

† plant is an emergent
Secchi disk: 4.1 meters

Table 13. Longmere Lake, Soldotna, Alaska

Latitude	Longitude	Species		
60.50964	150.90749	*Potamogeton gramineus (1)*	*Subularia aquatica (2)*	*Callitriche* sp.
		Isoetes occidentalis (2)	*Sparganium angustifolium* †	Aquatic moss
60.50933	150.90546	*Polygonum amphibium (2)*	*Nuphar polysepalum (2)*	*Callitriche* sp.
		Eleocharis sp. †	*Sparganium angustifolium* †	*Subularia aquatica (3)*
60.50669	150.90328	*Potamogeton gramineus (1)*	*Nuphar polysepalum (2)*	*Sparganium angustifolium* †
		Subularia aquatica (3)		
60.49347	150.91872	*Potamogeton gramineus (2)*	*Subularia aquatica (2)*	*Nuphar polysepalum (2)*
		Isoetes occidentalis (2)	*Callitriche* sp.	Aquatic moss
		Eleocharis sp. †		
60.50043	150.91649	*Nuphar polysepalum (2)*	*Potamogeton gramineus (2)*	

† plant is an emergent
Secchi disk: 1.71 meter

Table 14. Johnson Lake, Kasilof, Alaska

Latitude	Longitude	Species		
60.29557	151.26778	*Potamogeton gramineus (2)*	*Myriophyllum sibiricum (2)*	*Menyanthes trifoliata.* †
		Potamogeton richardsonii (3)	*Potamogeton pectinatus (3)*	*Potamogeton zosteriformis (3)*
60.29572	151.26614	*Potamogeton richardsonii (2)*	*Myriophyllum sibiricum (2)*	*Potamogeton zosteriformis (2)*
		Nuphar polysepalum (3)	*Potamogeton pectinatus (2)*	*Menyanthes trifoliata* †
		Aquatic moss		
60.29408	151.26554	*Sparganium angustifolium* †	*Potamogeton richardsonii (2)*	*Nuphar polysepalum (2)*

		Potamogeton zosteriformis (2)	*Myriophyllum sibiricum (2)*	
60.29278	151.26687	*Nuphar polysepalum (3)*	*Myriophyllum sibiricum (2)*	*Potamogeton zosteriformis (3)*
		Potamogeton richardsonii (2)	*Menyanthes trifoliata* †	*Potamogeton gramineus (1)*
		Utricularia vulgaris (1)		
60.28907	151.26022	*Potamogeton richardsonii (2)*	*Nuphar polysepalum (3)*	
60.28711	151.26605	*Potamogeton zosteriformis (3)*	*Potamogeton pectinatus (2)*	*Myriophyllum sibiricum (2)*
		Nuphar polysepalum (3)	*Sparganium angustifolium* †	*Potamogeton richardsonii (2)*
60.29248	151.26689	*Hippuris vulgaris (1)*		

† plant is an emergent
Secchi disk:3.2 meters

Table 15. Lake Hood, Anchorage, Alaska

Latitude	Longitude	Species		
61.17863	149.97480	*Myriophyllum sibiricum (3)*	*Potamogeton richardsonii (3)*	*Potamogeton pectinatus (3)*
		Potamogeton gramineus (2)	*Potamogeton friesii (2)*	*Eleocharis acicularis (3)*
		Polygonum sp.		
61.17933	149.97012	*Zannichellia palustris (2)*	*Sparganium angustifolium* †	*Eleocharis* sp. †
		Potamogeton gramineus (2)	*Potamogeton praelongus (2)*	*Potamogeton friesii (1)*
61.18594	149.96861	*Potamogeton pectinatus (3)*	*Potamogeton zosteriformis (2)*	*Myriophyllum sibiricum (2)*
		Potamogeton richardsonii (2)	*Eleocharis* sp. †	
61.18224	149.96859	*Calla palustris* †	*Myriophyllum verticillatum (1)*	*Potamogeton pectinatus (3)*
		Potamogeton zosteriformis (2)		

† plant is an emergent
Shore access only – unable to access mid-lake for Secchi reading

Appendix B. Waterbody characteristics.

Table 16. Waterbody characteristics

Waterbody name	Date surveyed	Secchi depth	Est. max. lake depth	Sediment type	Setting
Moon Lake	8/1/2005	1.8 meters	1.8 meters	silt to peaty muck	Rural
Yarger Lake	8/2/2005	.71 meter	.71 meter	fine silt	Rural
Deadman Lake	8/2/2005	4.0 meters	6.4 meters	fine silt	Rural
Vogel Lake	8/4/2005	4.1 meters	n/a	peaty muck to silt	Remote rural
Johnson Lake	8/5/2005	3.2 meters	n/a	n/a	Semi-urban
Longmere Lake	8/5/2005	1.71 meter	n/a	fine silt	Semi-urban
Lake Hood	8/6/2005	n/a	n/a	n/a	Urban

Appendix C. Aquatic Nuisance Species sign.

STOP
Harmful Species

Unwanted plants and animals can ruin your favorite fishing and boating waters.

It is unlawful to transport zebra mussels, noxious aquatic weeds, and other aquatic nuisance species.
- OAR 635-056, OAR 603-52-1200

- **REMOVE** all plants and animals from boats, motors, trailers, anchors and gear before and after launching.
- **INSPECT** hard to reach spots, damp areas and other protected places where harmful species can survive for days.
- **DRAIN** all water from boats, trailers, tackle and gear before leaving the area.
- **DISPOSE** of livewell water, bait, plants and other material away from shore, or in trash cans.

To report harmful species please call (toll free) 1-866-INVADER or contact these agencies for more information: