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Aquatic Plant Surveys in the Bureau of Land Management, Medford District, 2010-2011

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AQUATIC PLANT SURVEYS IN THE BUREAU OF LAND MANAGEMENT, MEDFORD DISTRICT, 2010-2011

Report Prepared for the Bureau of Land Management, Medford District

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Nymphoides peltata in the Little Squaw Lake, Jackson County, Oregon.

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INTRODUCTION

The introduction of invasive aquatic plant species (IAPS) can cause significant ecological and economic harm. IAPS can displace native aquatic plant species, impair recreation, and degrade water quality. Early detection of new invasions can improve chances for successful eradication or containment to reduce the risk of IAPS spread. The Oregon Department of Agriculture (ODA) lists the most egregious offenders as "Noxious Weeds" which are defined as plants classified by the Oregon State Weed Board that are injurious to public health, agriculture, recreation, wildlife, or any public or private property (ODA 2011).

Several IAPS classified as noxious have been detected within the Medford District of the Bureau of Land Management (BLM) in Southern Oregon including yellow floating heart (*Nymphoides peltata*) and yellow flag iris (*Iris pseudacorus*) (http://nas.er.usgs.gov/ accessed 12/9/2011).

During the summers of 2010 and 2011, IAPS surveys were conducted at selected reservoirs, lakes, and river boat launches within the Medford District to determine the extent of IAPS infestations as well as the distributions of native aquatic plant species. This report summarizes results of the surveys and provides recommendations for management of IAPS within the Medford District. Observations of any invasive aquatic animal species such as New Zealand mudsnails (*Potamopyrgus antipodarum*) are also reported.

SURVEY SITES

Surveys were conducted within the Medford District which includes portions of Douglas, Jackson, and Josephine County, Oregon. Samples were collected at five boat launches on the Rogue River, two Illinois River sites and nine lakes and reservoirs (Figure 1). All lakes and reservoirs lie within the Rogue and Illinois River basins with the exceptions of Hyatt Reservoir and Howard Prairie Lake which lie within the Klamath River basin. Outflow from these reservoirs is diverted to the Rogue Basin for irrigation.

The surveyed waterbodies ranged in size from 1.5 hectares (3.7 ac) to 12.8 km^2 (3155 ac) at elevations from 188 to 1532 m (617 to 5026 ft) (Table 1). Most of the sites are easily accessible and popular for fishing and boating.

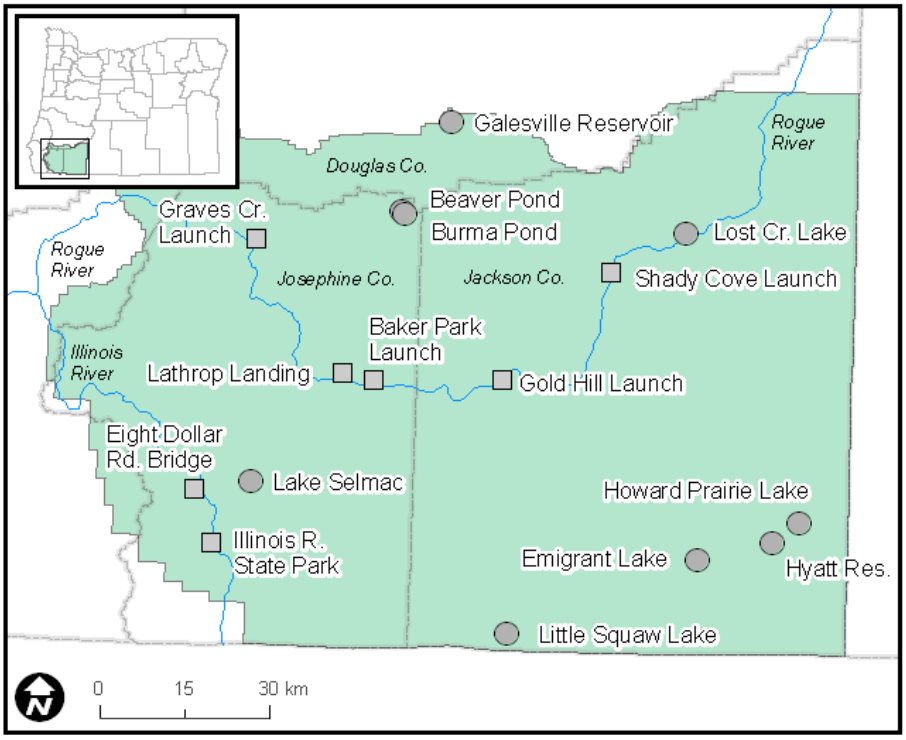

FIGURE 1. WATERBODIES WITHIN THE BLM MEDFORD DISTRICT SURVEYED FOR AQUATIC PLANTS DURING 2010 AND 2011. SQUARES REPRESENT RIVER BOAT LAUNCH SITES, CIRCLES REPRESENT LAKE AND RESERVOIR SITES.

TABLE 1. SURFACE AREA, ELEVATION, AND LOCATION OF SURVEYED WATERBODIES.

Waterbody name	Surface area (km^2)	Elevation (m)	Latitude	Longitude
Howard Prairie Lake	7.973	1383	42.22024	-122.39385
Hyatt Reservoir	3.276	1532	42.18735	-122.45060
Emigrant Reservoir	3.157	685	42.15688	-122.61051
Little Squaw Lake	0.073	940	42.03188	-123.01532
Lake Selmac	0.565	426	42.26155	-123.57908
Lost Creek Lake	12.768	572	42.68111	-122.65225
Secesh Reservoir (Burma Pond)	0.015	875	42.70353	-123.27326
Beaver Pond	0.008	970	42.69973	-123.26548
Galesville Reservoir	1.783	566	42.84854	-123.17015
Illinois River at State Park	-	363	42.15954	-123.65831
Illinois River at 8 Dollar Bridge	-	387	42.24560	-123.69856
Rogue River at Shady Cove	-	425	42.61338	-122.81416
Rogue River at Gold Hill	-	326	42.43736	-123.04197
Rogue River at Baker Park	-	273	42.42947	-123.31987
Rogue River at Lathrop Landing	-	265	42.43858	-123.38777
Rogue River at Graves Creek	-	188	42.65028	-123.58600

SURVEY METHODS

Aquatic plant samples were collected using 1) a double-sided thatch rake attached to a lightweight aluminum pole or 2) a double sided thatch rake attached to a rope. Samples were collected by lowering the rake to the sediment with the pole, twisting 180 degrees, and retrieving attached plants; or by

throwing the rake and retrieving the attached plants using the rope. An underwater view tube and a visual scan of the shoreline were also used to detect plant species.

Surveys were conducted by boat and from shore at the lake and reservoir sites, and from shore at the river sites. Samples were collected at approximately 100 sites distributed across each the five of the largest six waterbodies: Hyatt Reservoir, Howard Prairie Lake, Emigrant Lake, Galesville Reservoir, and Lake Selmac (Table 2). Fewer samples were collected from the sixth large waterbody, Lost Creek Lake, because the reservoir supports few rooted aquatic plants due to large water level fluctuations. River sites were scanned for aquatic plants from shore and in shallow water with a focus on backwaters and protected shores.

Sampling sites were randomly distributed across Lake Selmac since most of the lake is within the littoral zone. Sampling sites at the other large waterbodies were targeted habitats likely to support diverse plant assemblages such as protected bays, but also covered the range of habitats across each waterbody. Fewer rake samples were collected from the smaller waterbodies (Burma Pond, Beaver Pond, Little Squaw Lake), however all areas of the waterbodies were visited by boat and representative areas were thoroughly scanned using an underwater view tube.

At each sample site or area, species presence, estimated relative abundance, and GPS coordinates were recorded. At sites sampled with the rake attached to a pole, sample depth was recorded. Plants were identified to species using morphological characteristics in the field or lab when possible. *Myriophyllum sp.* samples that could not be identified using morphological features were submitted for genetic identification to the Annis Water Resources Institute at Grand Valley State University.

Surveys were conducted between 8/21 and 8/23/2010 and between 8/3 and 8/7/2011. All data are stored in a Microsoft Access database.

TABLE 2. SURVEY DATES, METHODS AND COUNTS OF SURVEY POINTS.

Survey site	Survey date	# survey points	Survey methods
Howard Prairie Lake	8/4/2011	104	Point samples at likely habitats distributed across entire lake
Hyatt Reservoir	8/3/2011	100	Point samples at likely habitats distributed across entire lake
Emigrant Lake	8/5/2011	99	Point samples at likely habitats distributed across entire lake
Little Squaw Lake	8/23/2010	30	Point samples at representative likely habitats and scan of entire lakeshore
Lake Selmac	8/22/2010	100	Random points distributed over entire lake
Lost Creek Lake	8/6/2011	16	Point samples at representative likely habitats and scan of representative shoreline
Burma Pond	8/21/2010	50	Point samples distributed across entire lake
Beaver Pond	8/21/2010	6	Scan of entire pond surface and selected point samples
Galesville Reservoir	8/2, 8/7/2011	99	Point samples at likely habitats distributed across entire lake
Illinois River	8/22/2010	2	Scan of shorelines and backwater areas
Rogue River	8/6/2011	5	Scan of shorelines and backwater areas

SURVEY RESULTS

INVASIVE AQUATIC PLANT SPECIES DISTRIBUTIONS

Four IAPS that are on ODA's noxious weed list, yellow floating heart (*Nymphoides peltata*), Eurasian watermilfoil (*Myriophyllum spicatum*), yellow flag iris (*Iris pseudacorus*) and purple loosestrife (*Lythrum salicaria*) were collected during the surveys. Three other IAPS, curly leaf pondweed (*Potamogeton crispus*), reed canarygrass (*Phalaris arundinacea*), and a hybrid of the non-native Eurasian with the native western watermilfoil (*Myriophyllum spicatum x sibiricum*), were also collected.

Potamogeton crispus was the most widely distributed submerged IAPS and was present at six of the nine lake and reservoir sites, and four of the seven river sites (Table 3). *Myriophyllum spicatum* was present and abundant in Howard Prairie Lake and Lake Selmac. *M. spicatum* was also present at both Illinois River sites, but at low density, presumably due to periodic scouring during high flows. A report of *Myriophyllum sp.* in Secesh Reservoir (personal communication, M. Mousseaux, BLM) was not confirmed during the survey.

Myriophyllum spicatum x sibiricum observations in Howard Prairie Lake and the Gold Hill Boat Ramp on the Rouge River are the first recorded observation of the hybrid in Oregon. It has been observed in Idaho and Washington, however (personal communication, R. Thum, Grand Valley State University).

TABLE 3. SUBMERGED INVASIVE AQUATIC PLANT SPECIES DETECTED IN THE BLM MEDFORD DISTRICT DURING 2010 AND 2011.

Waterbody name	*Myriophyllum spicatum*	*M. sibiricum x spicatum*	*Nymphoides peltata*	*Potamogeton crispus*
Howard Prairie Lake	X	X		X
Hyatt Reservoir				X
Emigrant Reservoir				X
Little Squaw Lake			X	X
Lake Selmac	X			X
Lost Creek Lake		*No invasive aquatic plants observed*		
Secesh Reservoir (Burma Pond)		*No invasive aquatic plants observed*		
Beaver Pond		*No invasive aquatic plants observed*		
Galesville Reservoir				X
Illinois River at State Park	X			
Illinois River at 8 Dollar Bridge	X			
Rogue River at Shady Cove		*No invasive aquatic plants observed*		
Rogue River at Gold Hill		X		X
Rogue River at Baker Park				X
Rogue River at Lathrop Landing				X
Rogue River at Graves Creek				X

HOWARD PRAIRIE LAKE

Three non-native plant species were identified in Howard Prairie Lake: *Potamogeton crispus*, *Myriophyllum spicatum*, and *M. spicatum x sibiricum* (Table 4). The identification of *M. spicatum x sibiricum* was determined for one specimen submitted to Annis Water Resources Institute at Grand Valley State University. It is not known whether specimens that were morphologically similar to the positively identified specimen or specimens that more closely resembled *M. spicatum* are all hybrids or if there are

non-hybrid populations that exist within the lake. Regardless, the *Myriophllum* species were very abundant (Table 4) and distributed throughout the lake as was *Potamogeton crispus* (Figure 2).

Common hornwort or Coontail (*Ceratophyllum demersum*) was the most abundant native plant species followed by water buttercup (*Ranunculus aquatilis*) and the macroalage *Chara.* These three species and the *Myriophyllum* species formed extremely dense beds throughout the lake. *C. demersum*, an unrooted plant, grew over depths of up to 7.8 meters.

TABLE 4. AQUATIC PLANT SPECIES ENCOUNTERED AT HOWARD PRAIRIE LAKE DURING AUGUST 2011 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Ceratophyllum demersum	35	Native	
Chara sp.	26		
Myriophyllum sibiricum x spicatum	23	Invasive	Identification verified using genetic markers
Ranunculus aquatilis	23	Native	
Potamogeton sp.	14		Thin leaf species (*P. pusillus* or *P. foliosus*)
Potamogeton crispus	13	Invasive	
Eleocharis acicularis	10		
Elodea canadensis	10	Native	
Eleocharis sp.	9		
Nitella sp.	9		
Gratiola sp.	8		
Myriophyllum spicatum	7	Invasive	
Potamogeton gramineus	5	Native	
Persicaria amphibia	4	Native	
Potamogeton diversifolius	4	Native	
Rumex sp.	4		
Carex sp.	3		
Limosella aquatica	3	Native	
Callitriche hermaphroditica	2	Native	
Poaceae	2		
Mentha sp.	1		
Myriophyllum sp.	1		Possibly *M. hippuroides*

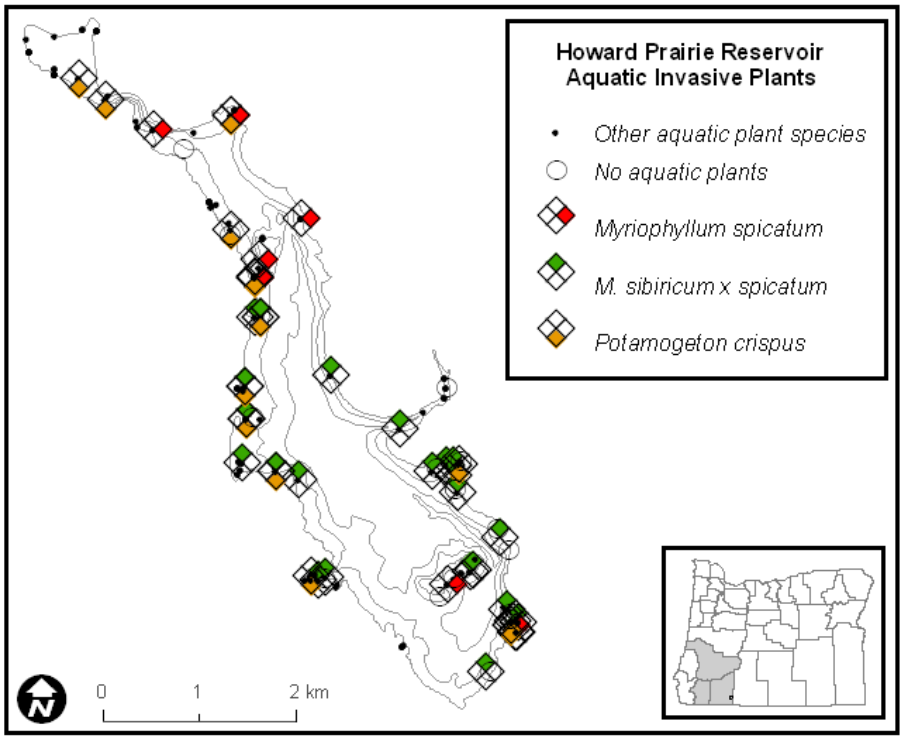

FIGURE 2. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM HOWARD PRAIRIE LAKE DURING 2011 SURVEYS.

HYATT RESERVOIR

Potamogeton crispus was the only non-native plant aquatic plant species identified in Hyatt Reservoir. *P. crispus* was present in 17 percent of the 100 samples collected (Table 5) and was distributed though all parts of the lake (Figure 3). The presence of *Myriophyllum sibiricum*, a native species that can be difficult to distinguish from the non-native *M. spicatum* or *M. spicatum x sibiricum,* was confirmed using genetic techniques by the Annis Water Resources Institute at Grand Valley State University. It is entirely possible, however, that *M. spicatum* or *M. spicatum x sibiricum* were present but not detected since both species were confirmed in nearby Howard Prairie Lake. One other *Myriophyllum* species was collected from Hyatt Reservoir. The species was likely *M. hippuroides* (western watermilfoil), however, the mature reproductive characteristics required for positive identification were not present and a sample was not submitted for genetic identification.

The native species *Elodea canadensis*, *Potamogeton gramineus*, *M. spicatum*, and *Ranunculus aquatilis* were all abundant throughout the littoral zone of the reservoir. Two macroalgae that were not identified to species, *Chara* and *Nitella*, were also very abundant.

TABLE 5. AQUATIC PLANT SPECIES ENCOUNTERED AT HYATT RESERVOIR DURING AUGUST 2001 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Elodea canadensis	24	Native	
Potamogeton gramineus	23	Native	
Chara sp.	22		
Nitella sp.	21		
Myriophyllum sibiricum	18	Native	Identification verified using genetic markers
Potamogeton crispus	17	Invasive	
Ranunculus aquatilis	15	Native	
Eleocharis sp.	11		
Persicaria amphibia	7	Native	
Sagittaria sp.	4		
Sparganium angustifolium	3	Native	
Eleocharis acicularis	1	Native	
Myosotis sp.	1		
Myriophyllum sp.	1		Possibly *M. hippuroides*
Potamogeton richardsonii	1	Native	
Potamogeton pusillus	1	Native	

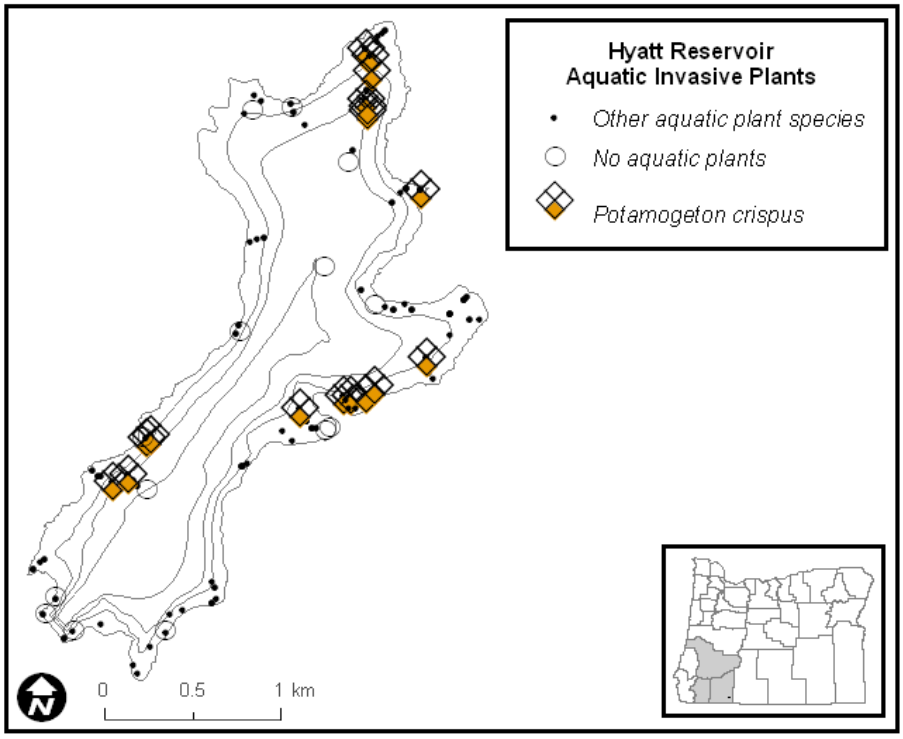

FIGURE 3. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM HYATT RESERVOIR DURING AUGUST 2011 SURVEYS.

EMIGRANT LAKE

Habitat suitable for aquatic plant growth was limited at Emigrant Lake due to the extensive steep, rocky shorelines. *Potamogeton crispus* was the only non-native aquatic species present in the reservoir (Table 6) and was only detected at two sites within protected bays (Figure 4). The most common species encountered were the macroalgae *Chara* and *Nitella*. Spikerush (*Eleocharis sp*.) waterthread pondweed (*Potamogeton diversifolius*), water knotweed (*Persicaria amphibia*) and waterclover (*Marsilea sp.*) were abundant at a few localized spots.

TABLE 6. AQUATIC PLANT SPECIES ENCOUNTERED AT EMIGRANT LAKE DURING AUGUST 2011 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Chara sp.	38		
Nitella sp.	21		
Eleocharis sp.	10		
Potamogeton diversifolius	8	Native	
Persicaria amphibia	4	Native	AKA *Polygonum amphibium*
Marsilea sp.	3		
Mentha arvensis	3	Native	
Ranunculus aquatilis	3	Native	
Fontinalis sp.	2		
Potamogeton sp.	2		*P. pusillus* or *P. foliosus*)
Potamogeton crispus	2	Invasive	
Lemna sp.	1		
Limosella aquatica	1	Native	
Ludwigia palustris	1	Native	
Potamogeton epihydrus	1	Native	

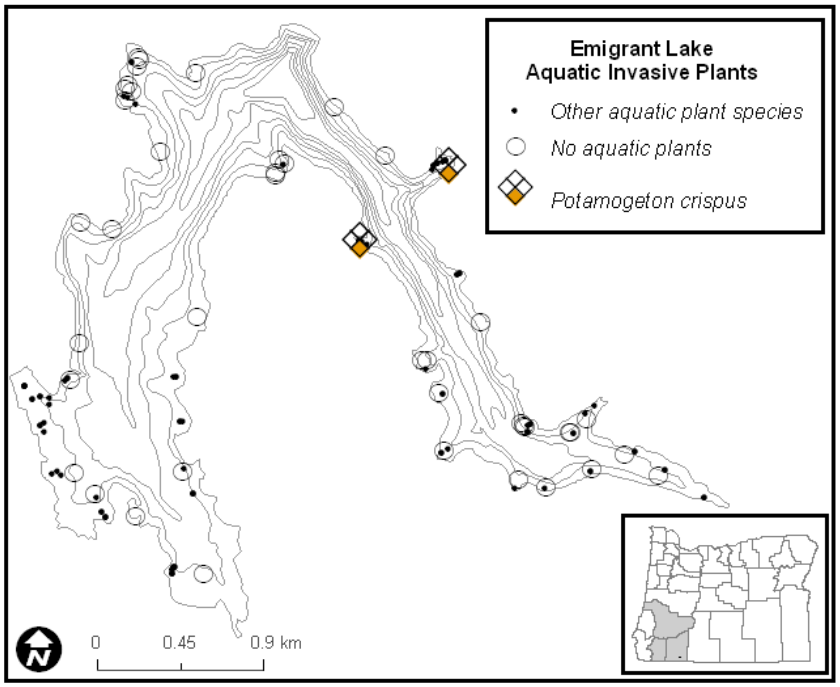

FIGURE 4. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM EMIGRANT LAKE DURING AUGUST 2011 SURVEYS.

LOST CREEK LAKE

There is very little suitable habitat for rooted aquatic plant growth in Lost Creek Lake due to steep shoreline and seasonal water level fluctuations of up to 60 ft. There were no IAPS observed at Lost Creek Lake during the August 2011 surveys. Only two plant species, an aquatic moss (*Fontinalis sp.*) and a macroalgae species (*Nitella sp.*) were collected (Table 7). Limited point grab samples were collected (Figure 5) due to the lack of plants and habitat, however; the shoreline was thoroughly scanned below the narrow upstream section of the reservoir.

TABLE 7. AQUATIC PLANT SPECIES ENCOUNTERED AT LOST CREEK LAKE DURING AUGUST 2011 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Fontinalis sp.	15	Unknown	
Nitella sp.	2	Unknown	

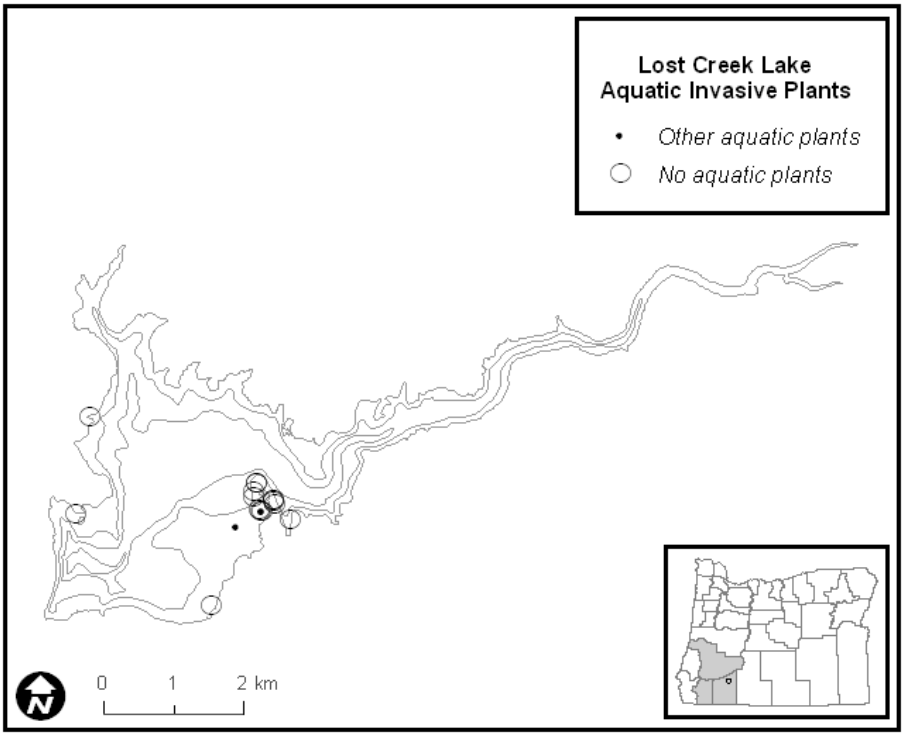

FIGURE 5. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM LOST CREEK LAKE DURING AUGUST 2011 SURVEYS.

LITTLE SQUAW LAKE

Three non-native species, curly leaf pondweed (*Potamogeton crispus*), yellow floating heart (*Nymphoides petata*), and yellow flag iris (*Iris pseudacorus*), were observed in Little Squaw Lake during August, 2010 (Table 8). *Nymphoides pelata* is an ODA class "A" Designated Weed (ODA 2011) which is defined as: "a weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent." ODA recommends eradication or intensive control when and where class "A" weeds are found.

N. peltata was primarily constrained to a dense patch at the northeast corner of the lake, although a few plants were observed along the eastern shore of the lake (Figure 6). All sites with observations were flagged by the USFS as part of their attempts at eradication by mechanical removal. The USFS also installed a containment boom around the dense patch to minimize spread throughout the lake.

Potamogeton crispus was collected from five of the sampling sites and was observed between sites. The most robust *P. crispus* populations were observed at south end of the lake near the inlet from Squaw Creek. *Iris pseudcorus* was observed at several patches, mostly along the southeast shore.

The most abundant species encountered were the native species Canadian waterweed (*Elodea canadensis*) and western watermilfoil (*Myriophyllum sibiricum*). The *M. sibiricum* identification was verified by Grand Valley State University using genetic techniques.

TABLE 8. AQUATIC PLANT SPECIES ENCOUNTERED AT LITTLE SQUAW LAKE DURING AUGUST 2010 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Elodea canadensis	57	Native	
Myriophyllum sibiricum	23	Native	Identification verified using genetic markers
Potamogeton crispus	17	Invasive	
Ceratophyllum demersum	13	Native	
Iris pseudacorus	10	Invasive	
Sparganium angustifolium	7	Native	
Carex sp.	3		
Lemna sp.	3		
Nymphoides peltata	3	Invasive	
Scirpus sp.	3		
Typha latifolia	3	Native	

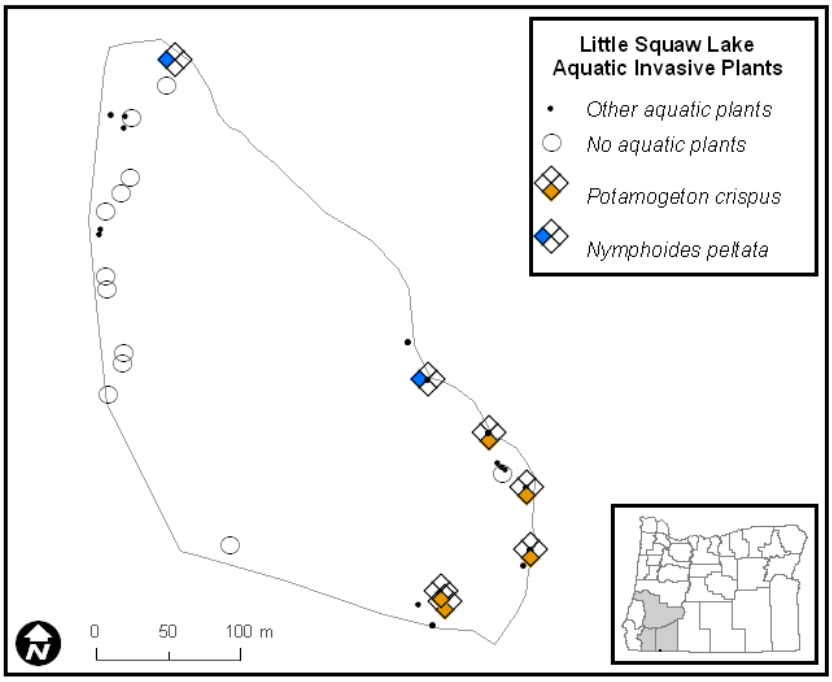

FIGURE 6. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM LITTLE SQUAW LAKE DURING AUGUST 2010 SURVEYS.

LAKE SELMAC

Two aquatic invasive plant species, Eurasian watermilfoil (*Myriophyllum spicatum*) and curly leaf pondweed (*Potamogeton crispus*) were present (Table 9) and widespread (Figure 7) throughout Lake Selmac during the August 2010 survey. The *M. spicatum* identification based on morphological characteristics was verified by Grand Valley State University using genetic techniques.

Common native species included *Ceratophyllum demsum*, *Elodea canadensis*, and the macroalgae *Nitella*. *Najas gracillima*, a species not previously reported in Oregon but native to California, was also abundant in Selmac Lake.

TABLE 9. AQUATIC PLANT SPECIES ENCOUNTERED AT LAKE SELMAC DURING AUGUST 2010 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Ceratophyllum demersum	43	Native	
Nitella sp.	43		
Elodea canadensis	24	Native	
Najas gracillima	21	Native	First identification in Oregon
Vallisneria americana	20	Native	
Myriophyllum spicatum	8	Invasive	Identification verified using genetic markers
Potamogeton crispus	8	Invasive	
Ludwigia palustris	3	Native	
Potamogeton sp.	3		Thin leaf species (*P. pusillus* or *P. foliosus*)
Carex sp.	1		

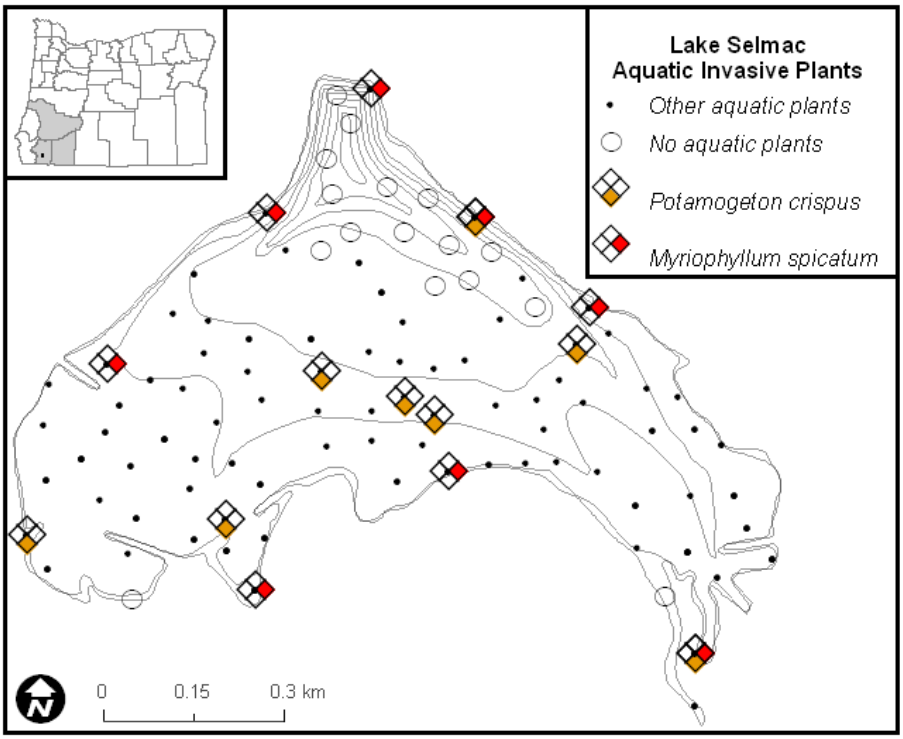

FIGURE 7. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM LAKE SELMAC DURING AUGUST 2010 SURVEYS.

GALESVILLE RESERVOIR

Curly leaf pondweed (*Potamogeton crispus*) was the only non-native submersed aquatic plant species observed in Galesville Reservoir during the August 2011 survey (Table 10). The distribution of *P. crispus* was limited to the eastern shore near the Miwalita Park boat launch (Figure 8). The non-native obligate wetland plant reed canarygrass (*Phalaris arundinacea*) was also present at a few small patches along the eastern shore of the reservoir. Habitat suitable for aquatic plant growth was limited along much of the western end of the reservoir due to rocky sediment and steep slopes.

Common native species present included a thin leaf species of *Potamogeton* (*P. pusillus or P. foliosus*), two narrow leaf *Potamogeton* species (*P. nodusus and P. epihydrus*), their hybrid (*P. nodusus x epihydrus*), and *Elodea canadensis*. The thin leaf species could not be positively identified because mature seeds were not present. The macroalgae *Chara* and *Nitella* were also common in the reservoir.

TABLE 10. AQUATIC PLANT SPECIES ENCOUNTERED AT GALESVILLE RESERVOIR DURING AUGUST 2011 SURVEYS.

Scientific name	% of samples with species present	Status	Notes
Chara sp.	42		
Potamogeton sp.	32		Thin leaf species (*P. pusillus* or *P. foliosus*)
Nitella sp.	22		
Potamogeton nodosus x epihydrus	17	Native	
Mentha arvensis	10	Native	
Elodea canadensis	9	Native	
Potamogeton nodosus	9	Native	
Fontinalis sp.	8		
Eleocharis sp.	6		
Myosotis sp.	4		
Potamogeton epihydrus	3	Native	
Callitriche sp.	2		
Carex sp.	2		
Potamogeton crispus	2	Invasive	
Eleocharis acicularis	1	Native	
Phalaris arundinacea	1	Invasive	
Ranunculus aquatilis	1	Native	

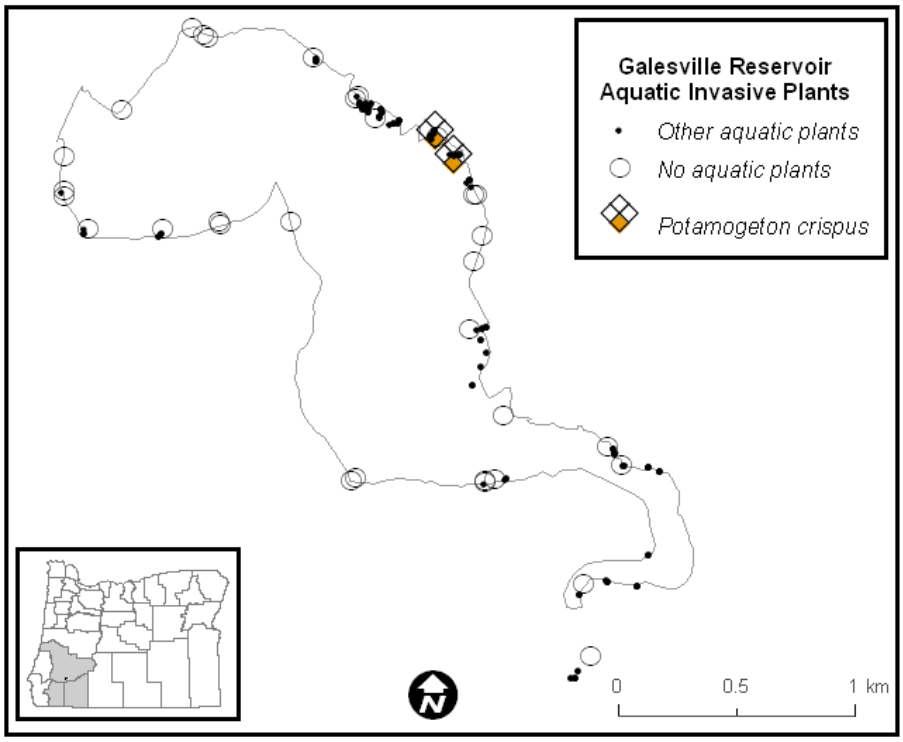

FIGURE 8. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM GALESVILLE RESERVOIR DURING AUGUST 2011 SURVEYS.

SESECH RESERVOIR (BURMA POND) AND BEAVER POND

No known non-native aquatic plant species were observed in Sesech or Beaver ponds during the 2010 surveys. The aquatic plant community in Sesech Reservoir was dominated by big leaf pondweed (*Potamogeton amplifolius*) and the macroalgae *Chara* (Table 11). Milfoil (*Myriophyllum sp*.) had been reported in Sesech Reservoir (personal communication, M. Mousseaux, BLM); however, it was not detected during the 2010 surveys.

The surface of Beaver Pond was covered by a mixture of *Chara sp.* and Illinois pondweed (*Potamogeton Illinoensis*) and was surrounded by common cattail (*Typha latifolia*) and bulrush (*Scirpus sp.*). The entire surface of both ponds was covered with aquatic plants (Figure 9).

TABLE 11. AQUATIC PLANT SPECIES ENCOUNTERED AT BURMA AND BEAVER PONDS DURING AUGUST 2010 SURVEYS.

Waterbody	Scientific name	% of samples with species present	Status	Notes
Sesech Res.	*Chara sp.*	66		
	Potamogeton amplifolius	44	Native	
	Potamogeton sp.	4		Thin leaf species (*P. pusillus or P. foliosus*)
	Poaceae	2		
	Sparganium natans	2	Native	
	Typha latifolia	2	Native	
	Scirpus sp.	Common		
Beaver Pond	*Chara sp.*	Common		
	Typha latifolia	Common	Native	
	Scirpus sp.	Common		
	Potamogeton Illinoensis	Common	Native	

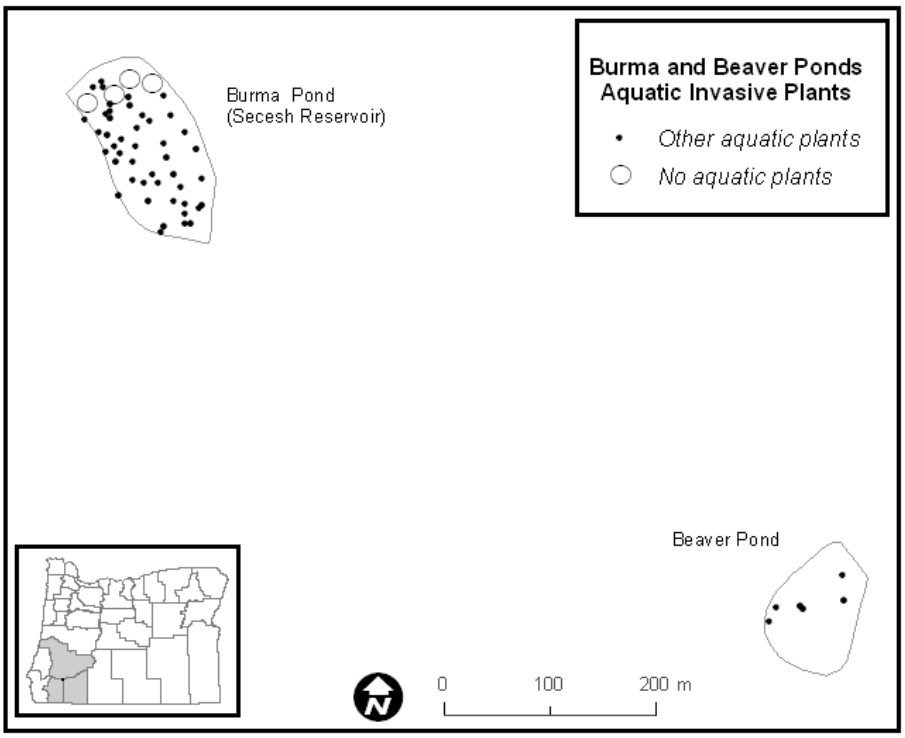

FIGURE 9. AQUATIC INVASIVE PLANT SPECIES SAMPLES COLLECTED FROM BURMA AND BEAVER PONDS DURING AUGUST 2010 SURVEYS.

ILLINOIS AND ROGUE RIVER SITES

Five invasive aquatic plant species were observed at Illinois and Rogue River sites during the 2010 and 2011 surveys (Table 12). Eurasian watermilfoil (*Myriophyllum spicatum*) was the only aquatic plant species present at the two Illinois River sites and was present at low density in backwater areas. The identification as *M. spicatum* from morphological characteristics was confirmed by Grand Valley State University using genetic techniques.

A hybrid of *M. spicatum* and the native *M. sibiricum* was collected at the Gold Hill boat launch site on the Rogue River just upstream of the town of Gold Hill. Only one small specimen was observed at the site. The identification was verified by Grand Valley State University. This collection, along with the collection from Howard Prairie Lake, are the first recorded observations of the hybrid in Oregon.

Curly leaf pondweed was the most common and abundant IAPS observed at the Rogue River sites. It was present at all sites with the exception of the Shady Cove boat launch, the most upstream site. The native Canadian waterweed (*Elodea canadensis*) was observed at all Rogue River sites and was abundant in the backwaters at Gold Hill, Baker Park, Lathrop Landing, and the Graves Creek sites. Native coontail (*Ceratophyllum demersum*) was abundant at Graves Creek and native horned pondweed (*Zannichellia palustris*) was abundant at Lathrop Landing.

TABLE 12. AQUATIC PLANT SPECIES ENCOUNTERED AT ILLINOIS AND ROGUE RIVER SITES DURING AUGUST 2010/11 SURVEYS.

Scientific name	Illinois River at 8 Dollar Rd Bridge	Illinois River State Park	Rogue River at Baker	Rogue River at Gold Hill	Rogue River at Lathrop Landing	Rogue River at Shady Cove	Rogue River at Graves Creek
Ceratophyllum demersum							*X*
Carex sp.						*X*	
Elodea canadensis			*X*	*X*	*X*	*X*	*X*
Iris pseudacorus				*X*			
Juncus sp.						*X*	
Lythrum salicaria			*X*		*X*		*X*
Mentha arvensis						*X*	
Myriophyllum sibiricum x spicatum				*X*			
Myriophyllum spicatum	*X*	*X*					
Phalaris arundinacea			*X*			*X*	
Polygonum sp.					*X*		
Potamogeton crispus			*X*	*X*	*X*		*X*
Zannichellia palustris					*X*		

MANAGEMENT RECOMMENDATIONS

The presence of IAPS in the BLM's Medford District, while not ideal, is not surprising. Many of these lakes are popular recreation destinations and thus uncleaned boats, trailers and other recreational equipment is a likely vector for unintentional introduction of IAPS. Remote locations, like Little Squaw Lake where three IAPS were documented, suggest potential hitch-hiking of propagules with birds or other wildlife from infested waterbodies, or the possible intentional introduction by humans. Any management of existing infestations should be part of an integrated aquatic vegetation management plan in order to mitigate negative impacts to aquatic habitats and maintain beneficial uses. The management recommendations suggested here are aimed at prevention of further introductions where feasible and early detection of novel infestations of high priority IAPS species.

Seven of the 48 species documented during the 2010-2011 lake, reservoir and river boat launch surveys were invasive aquatic plant species (IAPS); these seven species were present in 9.4% of the total 1123 samples taken from all sites. Four are recognized as noxious weeds by the Oregon State Weed Board; these include yellow floating heart (*Nymphoides peltata*), Eurasian watermilfoil (*Myriophyllum spicatum*),

yellow flag iris (*Iris pseudacorus*) and purple loosestrife (*Lythrum salicaria*). "A" designated weed species are those of "economic importance which [occur] in the state in small enough infestations to make eradication or containment possible; or [are] not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent" (ODA 2011). For "A" listed weeds, such as *Nymphoides peltata*, the recommended management goal is "eradication or intensive control. Eradication may not be feasible for logistical or fiscal reasons, but substantial reductions in infestations of aquatic weeds are possible with diligent, persistent treatment for over many years. Six years of experience with numerous *N. peltata* infestations in western Oregon support the idea that continued treatments and various techniques and continued treatments are essential (G. Miller – ODA, pers. comm.). "B" designated weed species are those of "economic importance which [are] regionally abundant, but which may have limited distribution in some counties" and the recommended management goal is intensive control as determined on a site-specific and case-by-case basis and biological control where a integrated statewide management is not feasible (ODA 2011).

Curly leaf pondweed (*Potamogeton crispus*), reed canary grass (*Phalaris arundinacea*), and a hybrid of the non-native Eurasian with the native western watermilfoil (*Myriophyllum spicatum x sibiricum*), were also collected but are not listed noxious weeds in Oregon. Each of these species has the potential of being invasive, but have not been demonstrated to warrant noxious weed status at the current time.

Future early detection efforts should identify and prioritize previously unsurveyed waterbodies, especially those where boat ramps or other frequent recreational usage suggest increased odds of IAPS introduction. We recommend future surveys follow the methods outlined in this report in order to facilitate detection of change over time within waterbodies, while also promoting the knowledge of native aquatic plant distributions. Two relatively rare species were found during surveys of Emigrant Lake and Howard Prairie Reservoir. *Potamogeton diversifolius* was found in both these waterbodies and is deemed critically imperiled in Oregon; a species of *Marsilea* was found in Emigrant Reservoir but could not be identified to the species level due to the lack of sporocarps. *Marsilea vestita* and *M. oligospora* are native to Oregon; *M. vestita* has not yet been evaluated under the Natural Heritage Network Ranking system, but is considered by the ORBIC to be "potentially threatened or endangered in Oregon or throughout its range" (OBIC 2010).

Additionally, surveys should be conducted at regular intervals – ideally every two to three years. This interval would allow weed infestations that may be already present at low densities limited time to spread and thereby facilitate control or eradication measures, should they be undertaken. 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. 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. Repeated surveys, even at less frequent intervals than two to three years, would still provide valuable information about the health of existing plant populations and improve understanding about potential infestation sites.

Signs should be installed and/or maintained at all boat ramps instructing boaters to clean their trailers and boats before and after launching. All signage should be consistent with the CLEAN-DRAIN-DRY message advocated by the Western Regional Panel Aquatic Nuisance Species (Zook and Phillips 2009). Additionally, appropriate staff within the BLM and other agencies in the region should be familiar with high priority aquatic weed species. The IAPS in Table 13 should be considered a high risk for introduction due known infestations in Southern Oregon or neighboring regions, or their frequent use in the

ornamental and/or aquarium trade. Outreach materials for many of these species are available from ODA's Noxious Weed Control Program or PSU-CLR.

TABLE 13. IAPS OF HIGH CONCERN FOR SPREAD AND/OR INTRODUCTION INTO OREGON WATERBODIES.

Scientific name	Common Name	OR Noxious Weed List Rating
Butomus umbellatus	flowering rush	A
Cabomba caroliniana	Fanwort	unrated
Egeria densa	Brazilian egeria	B
Hydrilla verticillata	Hydrilla	A
Iris pseudacorus	yellow flag iris	B
Ludwigia spp.	floating water primrose	B
Lythrum salicaria	purple loosestrife	B
Myriophyllum aquaticum	parrotfeather	B
Myriophyllum heterophyllum	Variable-leaf milfoil	unrated
Myriophyllum spicatum	Eurasian water milfoil	B
Nymphaea odorata	fragrant waterlily	unrated
Nymphoides peltata	yellow floatingheart	A
Phragmites australis ssp. *australis*	common reed	A
Potamogeton crispus	Curly leaf pondweed	unrated
Trapa natans	European water chestnut	A

REFERENCES

Oregon Biodiversity Information Center. 2010. Rare, threatened and endangered species of Oregon. Institute for Natural Resources, Portland State University, Portland, Oregon. 105 pp.

Oregon Department of Agriculture. 2011. Noxious weed policy and classification system 2011. Oregon Department of Agriculture Noxious Weed Control Program.

Rejmanek, M. and M.J. Pitcairn. 2002 "When is eradication of exotic plant pests a realistic goal?" in Turning the Tide: the Eradication of Invasive Species, C.R. Veitch and M N. Clout (eds), Occasional Paper of the IUCN Species Survival Commission #27.

Zook B, and S. Phillips. 2009. Recommended uniform minimum protocols and standards for watercraft interception programs for dreissenid mussels in the western United States. Western Regional Panel on Aquatic Nuisance Species. Retrieved 12/14/2011 from http://www.aquaticnuisance.org/wordpress/wp-content/uploads/2009/01/Recommended-Protocols-and-Standards-for-Watercraft-Interception-Programs-for-Dreissenid-Mussels-inthe-Western-United-States-September-8.pdf