4-2013

Aquatic Invasive Plant Surveys in the BLM Medford District During 2012

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Report to the Bureau of Land Management

by
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April 2013

Abstract

Aquatic plant surveys were conducted at 22 waterbodies located within the Bureau of Land Management's Medford District during the summer of 2012. Sites included eleven lakes, ponds or reservoirs and six reaches along the Rogue and Applegate Rivers. Five sampling areas surveyed during 2010 and 2011 were revisited to determine the extent of known non-native species infestations, positively identify rare species, or verify the absence of an expected non-native species. Plant specimens were collected at up to 50 sites at each waterbody using plant rakes or by observation. The non-native submersed species curly leaf pondweed (*Potamogeton crispus*) and Eurasian x northern watermilfoil (*Myriophyllum sibiricum x spicatum*) were widespread throughout the District. Eurasian watermilfoil (*Myriophyllum spicatum*) was present at two sites. Emergent non-native aquatic species included parrotsfeather (*Myriophyllum aquaticum*), yellow flag iris (*Iris pseudacorus*), purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinaceae*), floating primrose-willow (*Ludwigia peploides*) and slender waternymph (*Najas gracillima*).

Cover photo: native aquatic plants hairy water-fern (*Marselia vestita*), longleaf pondweed (*Potamogeton nodosus*) and submerged muskgrass (*Chara sp.*) in Agate Reservoir, Jackson County, Oregon (Photo by Rich Miller, 8/26/2012).

Introduction

Aquatic invasive plants pose a significant ecological and economic threat to the waters of the Pacific Northwest (Sanderson et al. 2009). Submersed species such as such as hydrilla (*Hydrilla verticillata*) and Eurasian watermilfoil (*Myriophyllum spicatum*) and floating leaf species such as yellow floating heart (*Nymphoides peltata*) can lead to low dissolved oxygen concentrations and high pH values that are harmful to other aquatic life, can outcompete native species, and can inhibit recreational use. Emergent species such as reed canary grass (*Phalaris arundinaceae*) can also outcompete native species and alter hydrologic patterns.

Early detection of aquatic invasions provides managers with opportunities for eradication or control and may decrease the overall cost of management (Rejmánek and Pitcairn 2003). The Center for Lakes and Reservoirs at Portland State University (CLR) conducted early detection invasive plant surveys at eleven lakes, ponds or reservoirs and six reaches along the Rogue and Applegate Rivers (Figure 1; Table 1). Survey waterbodies were selected by Medford BLM district personnel. Five additional waterbodies that were previously surveyed by CLR for the BLM were revisited to determine the extent of hybrid Eurasian x northern watermilfoil (*Myriophyllum sibiricum x spicatum*) infestations in Hyatt and Howard Prairie Reservoirs; verify the non-detection of *Myriophyllum spp*. in Burma and Beaver Ponds; and identify a water clover population (*Marselia sp.*) in Emigrant Reservoir to species.

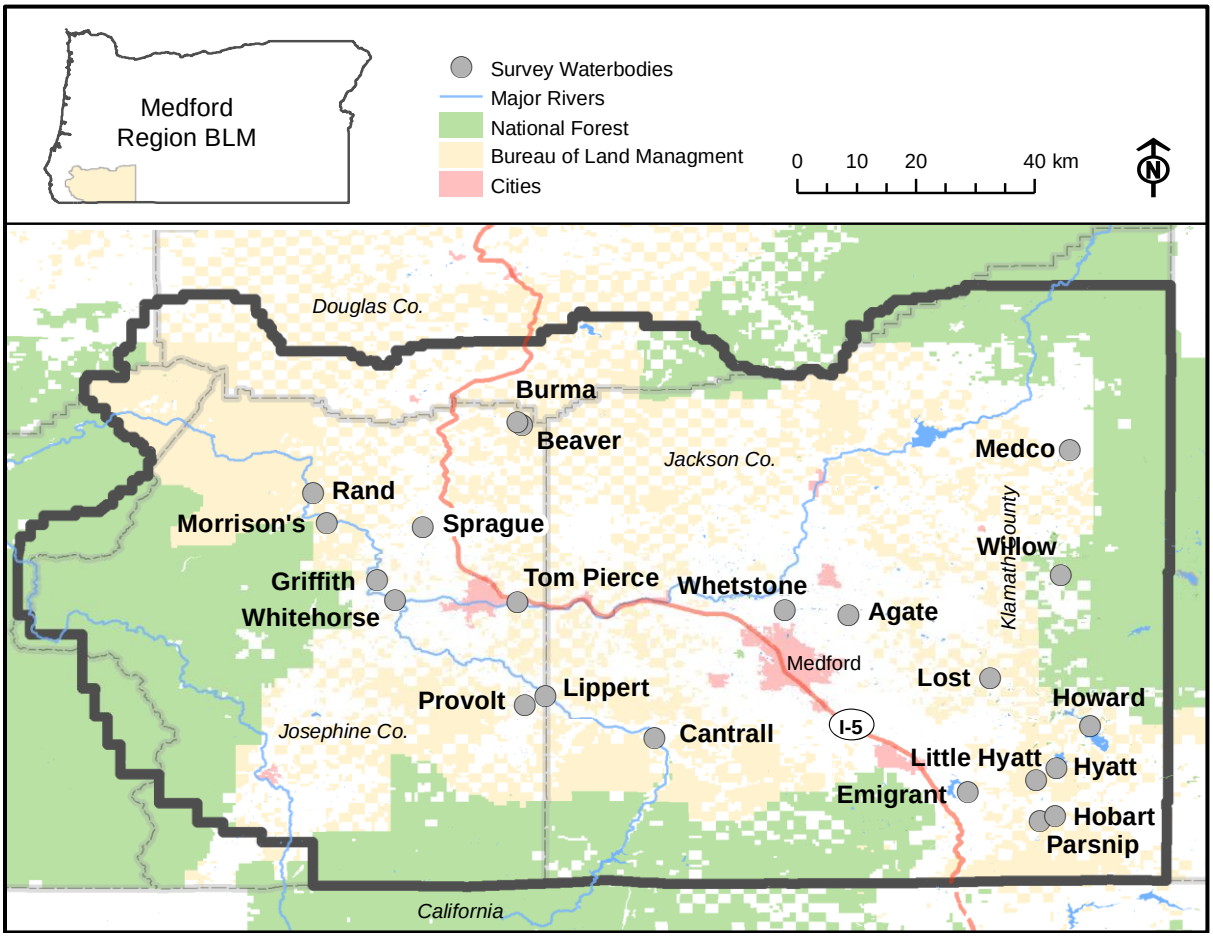


Figure 1. Location of survey lakes within the BLM Medford Region.

Table 1. Location and characteristics of surveyed sites.

Site	Type	Latitude	Longitude	County	Area (ac)
Hobart Lake	Lake	42.09798	-122.48080	Jackson	12
Lost Lake	Lake	42.31440	-122.55708	Jackson	6
Parsnip Lakes	Wetland	42.10551	-122.45776	Jackson	11
Agate Reservoir	Reservoir	42.41079	-122.77067	Jackson	204
Beaver Pond	Reservoir	42.69972	-123.26538	Josephine	2
Burma Pond (Secesh Res.)	Reservoir	42.70348	-123.27325	Josephine	4
Emigrant Reservoir	Reservoir	42.14237	-122.59003	Jackson	780
Howard Prairie Reservoir	Reservoir	42.24318	-122.40461	Jackson	1970
Hyatt Lake	Reservoir	42.17811	-122.45632	Jackson	810
Lippert Pond	Reservoir	42.27338	-123.26210	Josephine	5
Little Hyatt Reservoir	Reservoir	42.16018	-122.48657	Jackson	11
Medco Pond	Reservoir	42.66150	-122.43593	Jackson	69
Provolt Nursery Pond	Reservoir	42.28850	-123.23024	Josephine	2
Sprague Nursery Pond	Reservoir	42.54342	-123.41671	Josephine	3
Whetstone Pond	Reservoir	42.41840	-122.86765	Jackson	15
Willow Lake	Reservoir	42.47115	-122.44903	Jackson	312
Cantrall Buckley	Applegate River	42.22376	-123.06572	Jackson	-
Griffin Co. Park	Rogue River	42.46334	-123.48583	Josephine	-
Morrison's Lodge	Rogue River	42.55058	-123.56216	Josephine	-
Rand Recreation Area	Rogue River	42.59587	-123.58273	Josephine	-
Tom Pierce Co. Park	Rogue River	42.43050	-123.27336	Josephine	-
Whitehorse Park	Rogue River	42.43300	-123.45849	Josephine	-

Methods

Aquatic plant species composition was assessed at up to 50 sampling sites in each waterbody (Figures 2). Surveys were conducted between August 21 and August 31, 2012. Sites were haphazardly distributed to span the geographic and the different habitat types within each lake, e.g. protected shorelines, shallow and deepwater littoral zones. Submerged and floating leaf samples were collected from a boat with a double-sided thatch rake attached to a graduated pole. The graduated pole was lowered vertically to the sediment surface, rotated 180 degrees, and attached material was retrieved. The total area sampled was approximately 0.15 m^2 for each pole sample. GPS location, sample depth, date, and preliminary species identifications were noted on field datasheets. Voucher specimens were placed in labeled plastic bags and placed on ice for verification. Field identifications were verified for all submerged and floating leaf species using Crow and Hellquist (2000; 2006), Hamel and Parsons (2001), and Brayshaw (2001). Selected specimens were pressed for archive at the Portland State University herbarium.

Emergent or shoreline species were visually surveyed with a focus on selected Oregon Department of Agriculture class “A” and “B” designated noxious weeds (Table 2) (2012). Emergent and shoreline plants that are not on the ODA list were not identified to species.

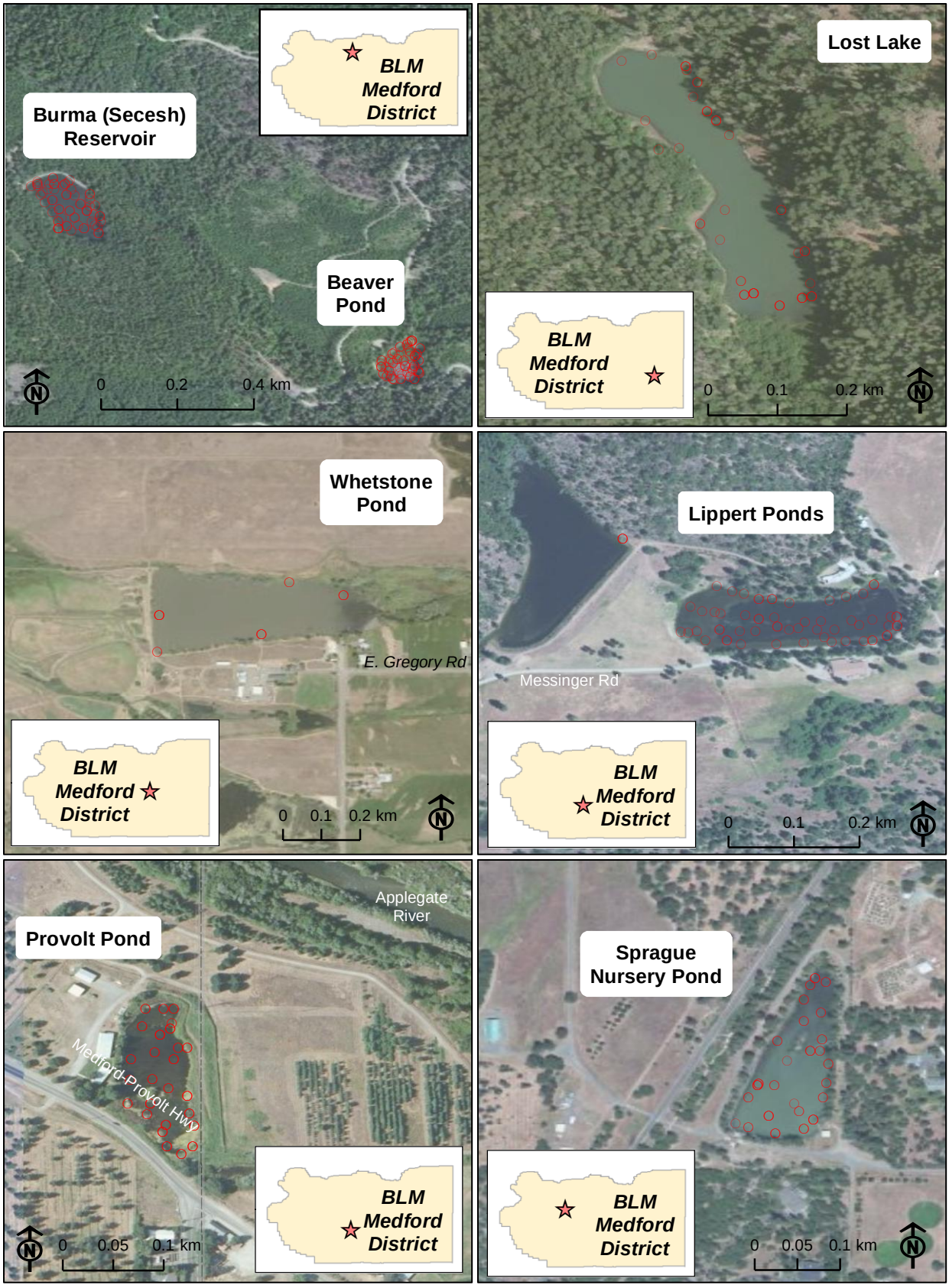


Figure 2. Sample sites within surveyed waterbodies.

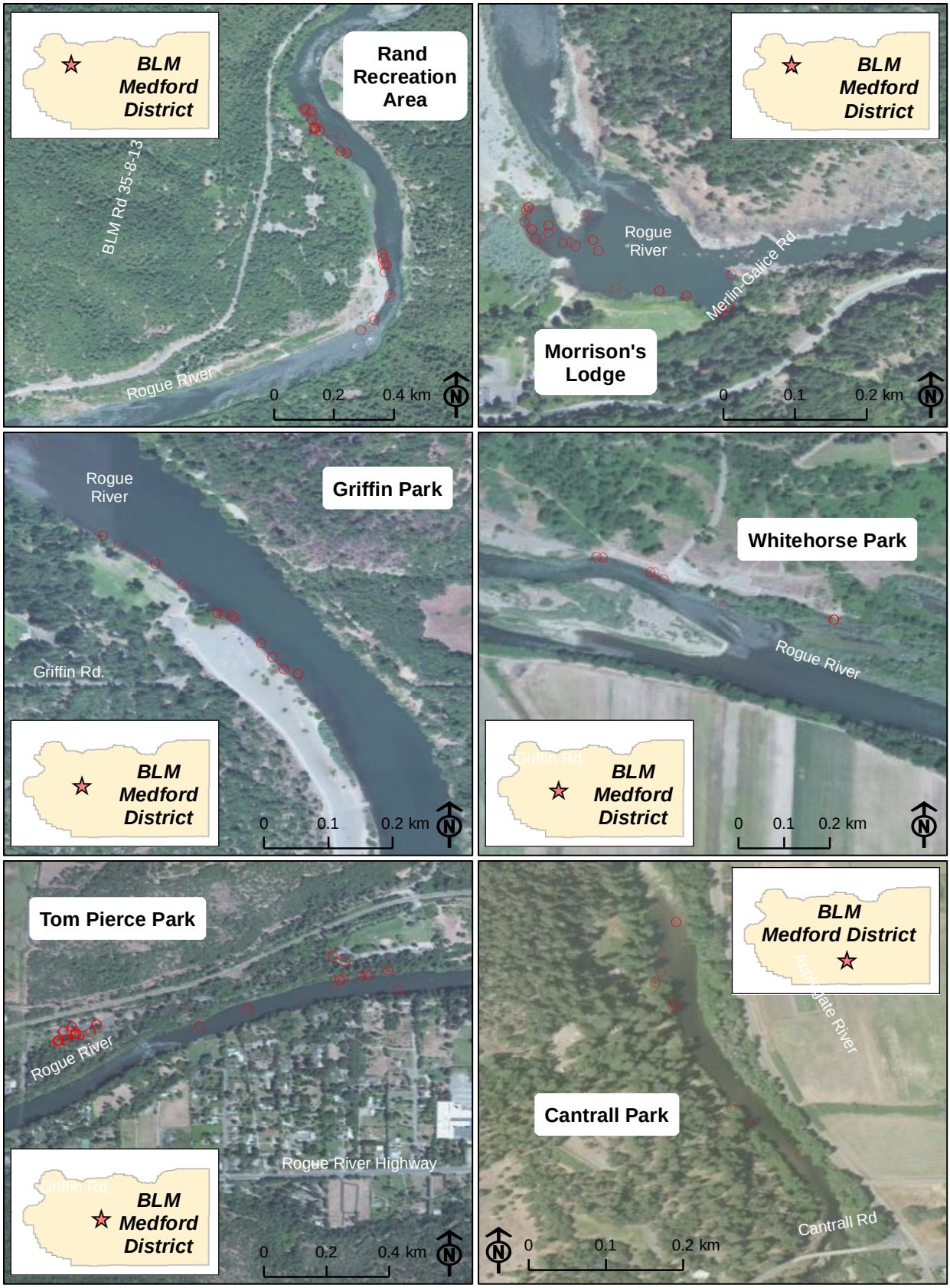
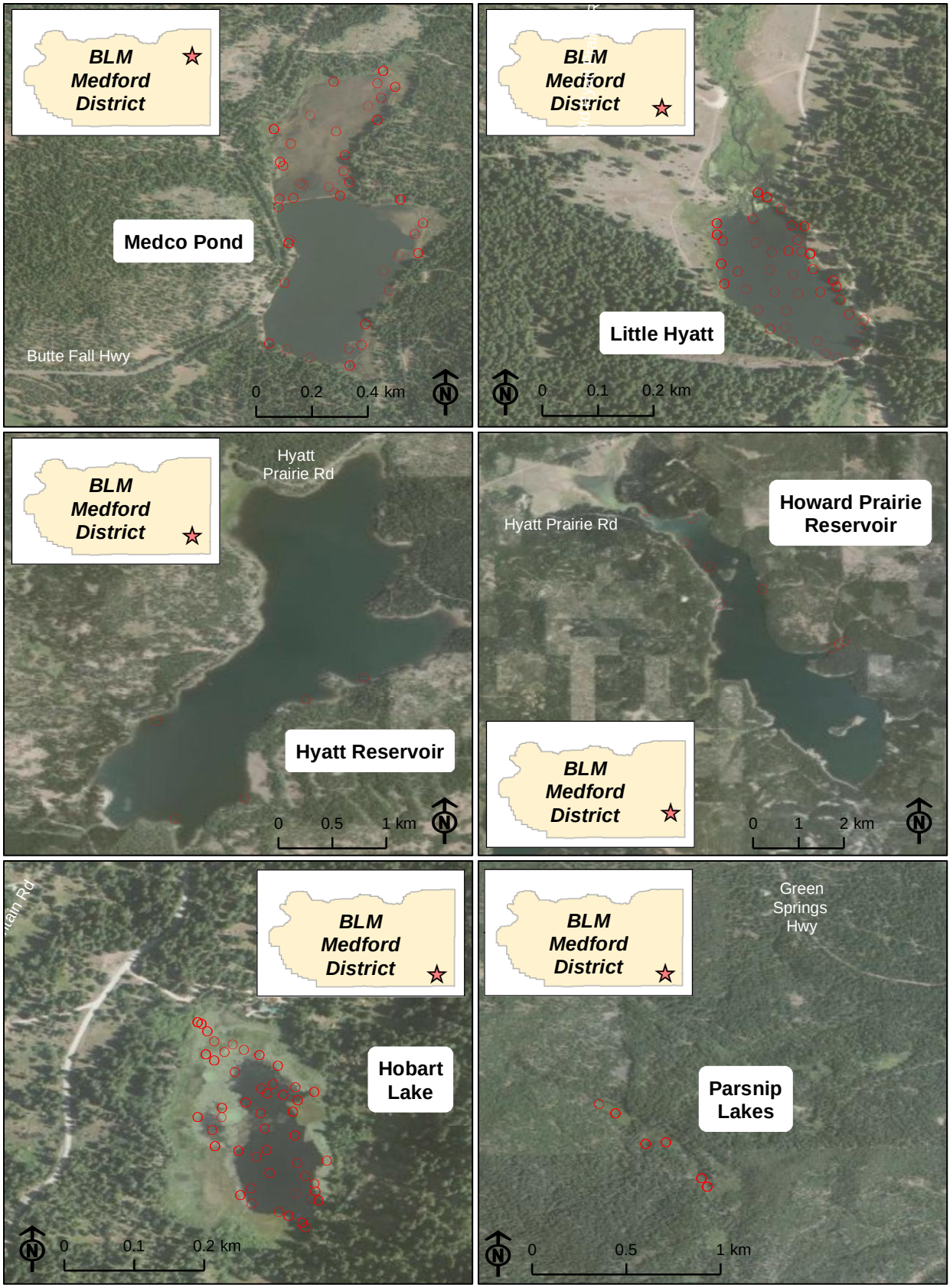


Figure 2 (continued). Sample sites within surveyed waterbodies.



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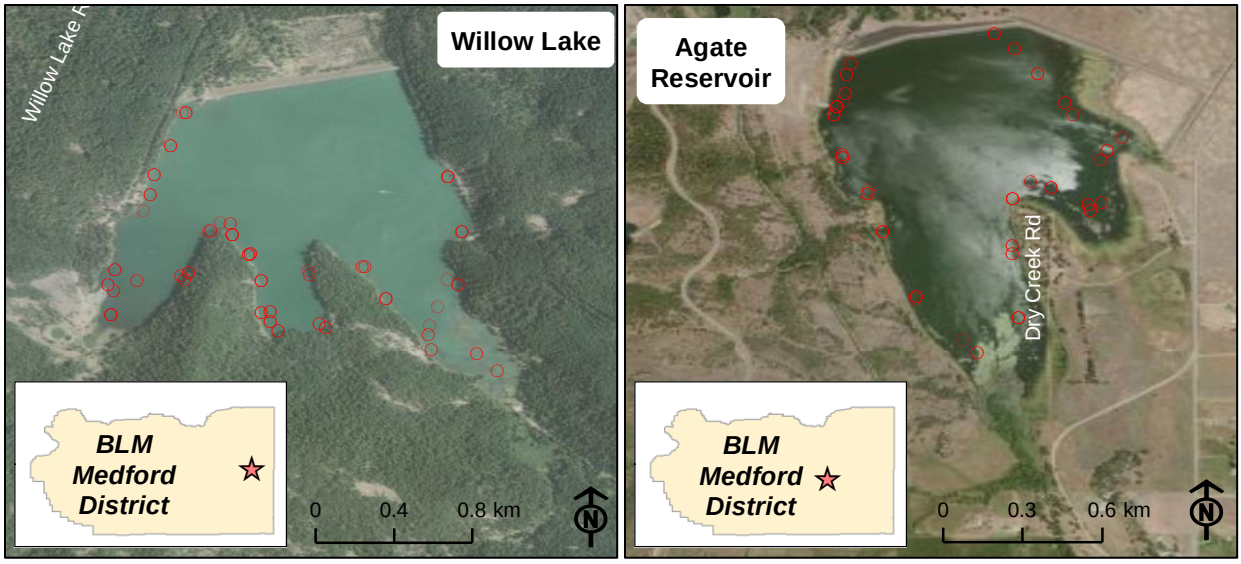

Figure 2 (continued). Sample sites within surveyed waterbodies.

Table 2. Oregon Department of Agriculture designated noxious aquatic weeds targeted during surveys.

Growth habit	Noxious weed designation	Scientific name	Common name
Emergent or shoreline	A	*Phragmites australis ssp. australis*	common reed
		Trapa natans	European water chestnut
		Butomus umbellatus	flowering rush
	B	*Rubus armeniacus*	Himalayan blackberry
		Fallopia japonica	Japanese knotweed
		Lythrum salicaria	purple loosestrife
		Tamarix ramosissima	saltcedar
		Iris pseudacorus	yellow flag iris
Submerged or floating leaf	A	*Hydrilla verticillata*	hydrilla
		Nymphoides peltata	yellow floating heart
	B	*Ludwigia peploides*	floating water primrose
		Ludwigia hexapatala	six petal water primrose
		Ludwigia grandiflora	large-flower primrose-willow
		Myriophyllum spicatum	Eurasian watermilfoil
		Myriophyllum aquaticum	parrot's feather
		Egeria densa	South American waterweed

Results and Discussion

Thirteen non-native species including seven species that are listed as ODA "Class B" designated weeds were collected during the surveys. The "Class B" weeds collected were parrotsfeather (*Myriophyllum aquaticum*), Eurasian watermilfoil (*Myriophyllum spicatum*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Fallopia japonica*), yellow flag iris (*Iris pseudacorus*), himalayan blackberry (*Rubus armeniacus*), and floating primrose-willow (*Ludwigia peploides*). The six additional invasive plants that were collected but are not on ODA's weed list are reed canary grass (*Phalaris arundinaceae*), bittersweet nightshade (*Solanum dulcamara*), fragrant water lily (*Nymphaea odorata*), curly leaf pondweed (*Potamogeton crispus*), slender water

nymph (*Najas gracillima*), and a hybrid of the "B" listed Eurasian watermilfoil with the native northern watermilfoil (*Myriophyllum spictaum x sibiricum*).

Potamogeton crispus was the most common non-native species and was collected from 11 of the 22 waterbodies surveyed (Figure 3; Table 3). Previous surveys within the Medford District collected *P. crispus* from Hyatt Reservoir, Howard Prairie Reservoir, Emigrant Lake, Selmac Lake, Little Squaw Lake, Galesville Reservoir, and numerous sites along the Rouge River (Sytsma et al. 2011).

Myriophyllum sp. samples were collected from Howard Prairie, Hyatt Reservoirs, and the Rogue River at Gold Hill during 2011 that could not be identified to species based on morphological characteristics. The samples were submitted to the Molecular Ecology Laboratory at Grand Valley State University for identification using genetic techniques which resulted in identification as a hybrid of the non-native *M. spicatum* with the native *M. sibiricum* (Sytsma et al. 2011). This particular hybrid had not previously been detected in Oregon and can be even more invasive and less sensitive to herbicide treatment than *M. spicatum* (Larue et al. 2012). Eleven additional Howard Prairie Reservoir samples and five Hyatt Reservoir samples were collected during 2012 and submitted for genetic identification to determine the extent of infestation and whether the un-hybridized species were present. All samples were identified as *M. spicatum x sibiricum*. Samples collected from the Rogue River at Rand Recreation Area and Griffin County Park were also identified as *M. spicatum x sibiricum* (Figure 3). Samples collected from Lippert and Provolt Ponds were identified as *M. spicatum*. A third species of watermilfoil, *Myriophyllum aquaticum*, was collected from the Rogue River at Whitehorse County Park.

Slender water nymph (*Najas gracillima*) was collected from Agate Reservoir, Willow Lake, and the Charles A. Sprague Nursery Pond. The only other known occurrence of this species in Oregon is in Selmac Lake from surveys conducted during 2010 (Sytsma et al. 2011). *N. gracillima* is listed as native to the Eastern US and California in the Flora of North America North of Mexico (2008). The Jepson Manual, however, lists the California population as naturalized (non-native) (Baldwin et al. 2012). An author of the Jepson Manual indicated that the native status assigned to the California population in the Flora of North America was likely an oversight since the same taxonomic experts contributed to both publications (Thomas J. Rosatti, Jepson and University Herbaria, personal communication, March 25, 2013). In its native range *N. gracillima* is listed as endangered in Indiana and Ohio, extirpated in Maryland, threatened in Pennsylvania, and of special concern in Kentucky and Maine (2013).

The emergent species reed canary grass (*Phalaris arundinaceae*) was present in four, purple loosestrife (*Lythrum salicaria*) was present in three, and floating primrose-willow (*Ludwigia peploides*) was present in two waterbodies or river reaches (Figure 4). The remaining non-native aquatic species were limited to single waterbodies.

Four of the waterbodies contained no known non-native plant species: Beaver Pond, Burma (Secesh) Pond, Lost Lake, and Parsnip Lakes (Table 3). Native plant species composition was diverse in most waterbodies. Hobart Lake was the most diverse of the waterbodies with 15 submerged or floating leaf aquatic plant species. Only one species, fragrant water lily (*Nymphaea odorata*), was non-native.

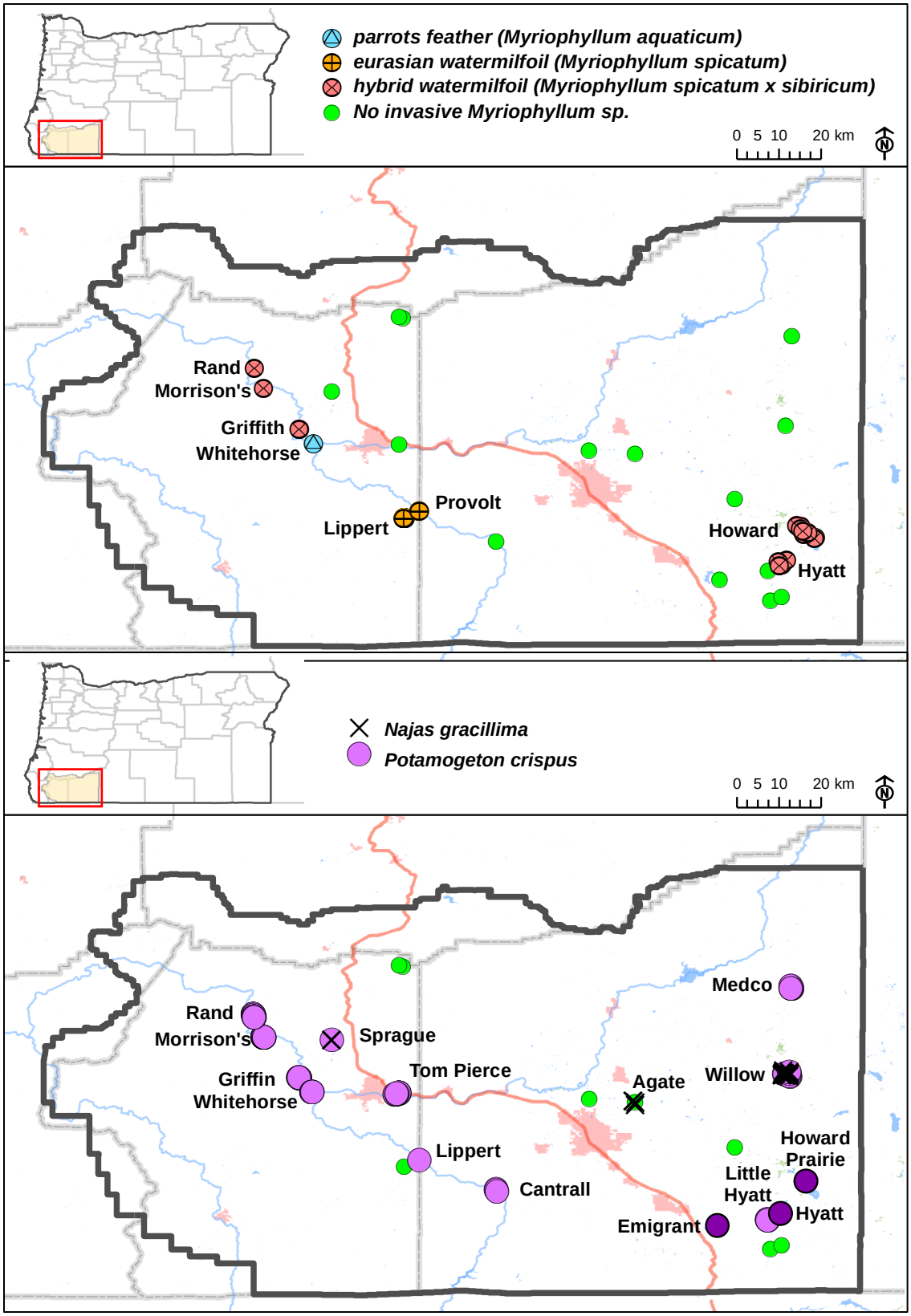

Figure 3. Survey sites within the BLM Medford District with non-native *Myriophyllum spp.* (top panel) and *Potamogeton crispus* and *Najas gracillima* (bottom panel) detections.

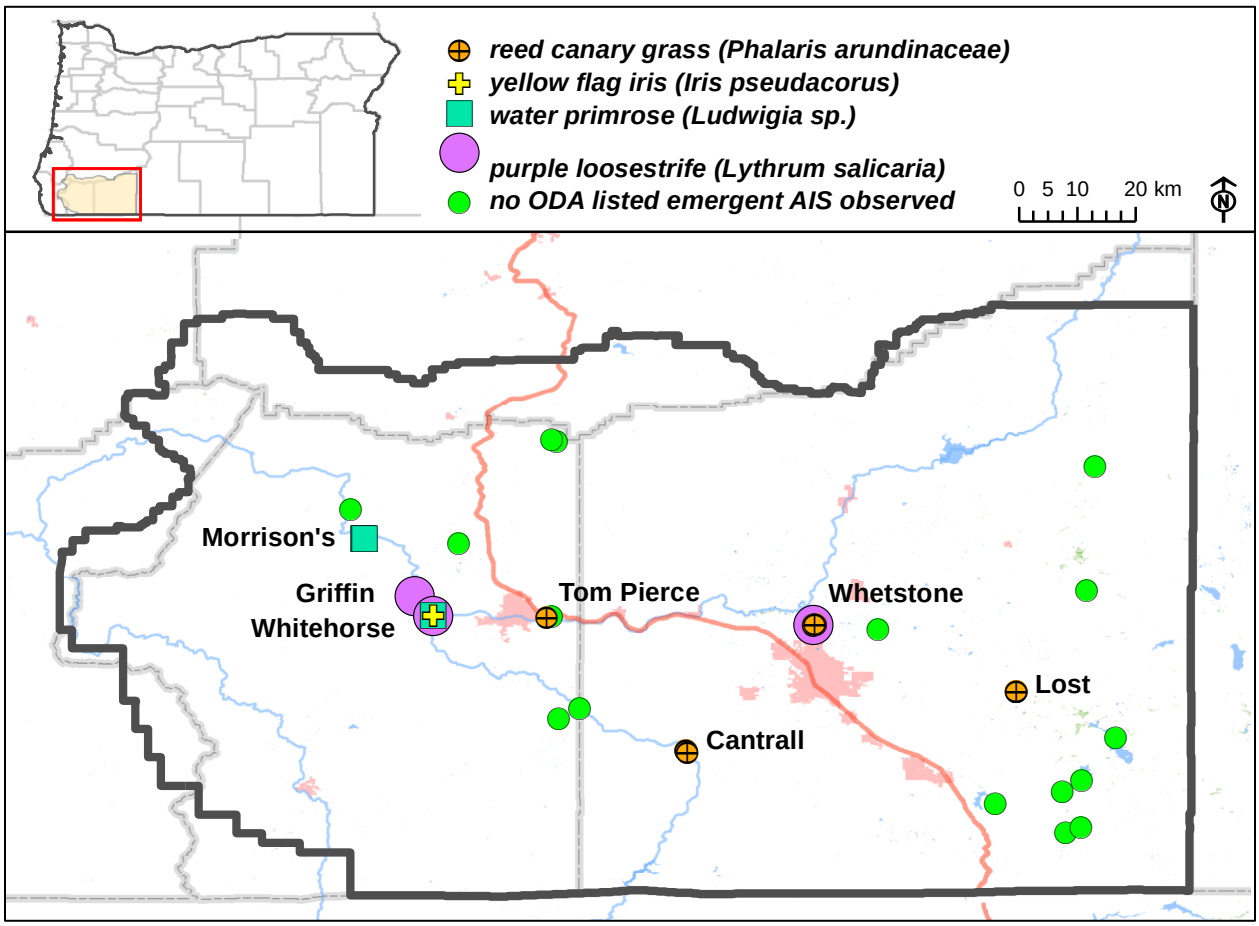

Figure 4. Survey sites within the BLM Medford District and sites with ODA listed emergent AIS detected.

Table 3. Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Agate Reservoir	*Chara sp.*	muskgrass	66	submersed	likely native	No non-native *Chara sp* .recorded in the PNW
	Nitella sp.	nitella	49	submersed	likely native	No non-native *Nitella sp* .recorded in the PNW
	Marselia vestita	hairy water-fern	6	floating leaf	native	
	Najas gracillima	**slender water nymph**	**12**	**submersed**	**non-native**	
	Potamogeton nodosus	longleaf pondweed	55	floating leaf	native	
	Potamogeton pusillus	small pondweed	12	submersed	native	
	Eleocharis sp.	spikerush	6	emergent	likely native	likely E. *parvula*
	Eleocharis sp.	spikerush	63	emergent	likely native	possibly *E. palustris*
	Persicaria amphibia	water smartweed	29	emergent	native	
Beaver Pond	*Chara sp.*	muskgrass	85	submersed	likely native	No non-native *Chara sp* .recorded in the PNW
	Fontinalis sp.	fontinalis moss	3	submersed	likely native	No non-native *Fontinalis sp* .recorded in the PNW
	Eleocharis palustris	common spikerush	3	submersed	native	
	Potamogeton foliosus	leafy pondweed	7	submersed	native	
	Potamogeton natans	floating-leaved pondweed	65	floating leaf	native	
	Schoenoplectus sp.	bulrush	3	emergent	likely native	Likely *S. acutus*
	Sparganium sp.	bur-reed	3	emergent	likely native	Flowers necessary for species identification were not present
	Lysichiton americanus	Skunk cabbage	3	emergent	native	
	Typha latifolia	common cattail	7	emergent	native	
Burma Pond	*Chara sp.*	muskgrass	58	submersed	likely native	
	Nitella sp.	nitella	18	submersed	likely native	
	Potamogeton amplifolius	big leaf pondweed	56	submersed	native	
	Carex sp.	sedge	5	emergent	likely native	Not one of the ODA watch list species
	Poacea sp.	grass	3	emergent	likely native	Not one of the ODA watch list species
Lost Lake	*Fontinalis sp.*	fontinalis moss	32	submersed	likely native	No non-native *Fontinalis sp* .recorded in the PNW
	Nitella sp.	nitella	10	submersed	likely native	No non-native *Nitella sp* .recorded in the PNW
	Eleocharis palustris	common spikerush	28	submersed	native	
	Potamogeton foliosus	leafy pondweed	22	submersed	native	
	Potamogeton natans	floating-leaved pondweed	2	floating leaf	native	
	Carex sp.	sedge	2	emergent	likely native	Not one of the ODA watch list species
	Schoenoplectus sp.	bulrush	2	emergent	likely native	no flowers present
	Sparganium sp.	bur-reed	6	emergent	likely native	no flowers present
	Hipparus vulgaris	mares tail	2	emergent	native	
	Persicaria amphibia	water smartweed	10	emergent	native	

Table 3 (continued). Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Hobart Lake	*Lemna sp.*	duckweed	2	floating leaf	likely native	most likely *L. minor*
	Nitella sp.	nitella	6	submersed	likely native	No non-native *Chara sp* .recorded in the PNW
	Ceratophyllum demersum	coontail	94	submersed	native	
	Lemna trisulca	star duckweed	6	floating leaf	native	
	Myriophyllum verticillatum	whorled milfoil	12	submersed	native	
	Nuphar polysepala	splatterdock	22	floating leaf	native	
	Potamogeton amplifolius	big leaf pondweed	42	submersed	native	
	Potamogeton natans	floating-leaved pondweed	68	floating leaf	native	
	Potamogeton praelongus	white-stemmed pondweed	8	submersed	native	
	Potamogeton pusillus	small pondweed	8	submersed	native	
	Utricularia macrorhiza	common bladderwort	68	submersed	native	
	Utricularia sp.	bladderwort	2	submersed	native	*U. minor* or *U. gibba*, both native species
	Nymphaea odorata	**fragrant waterlily**	**12**	**floating leaf**	**non-native**	
	Carex sp.	sedge	16	emergent	likely native	Eight native *Carex spp.* are listed for Hobart L. in Oregon Flora Project
	Eleocharis sp.	spikerush	2	emergent	likely native	*E. macrostachya* listed for Hobart L. in Oregon Flora Project
	Juncus sp.	rush	2	emergent	likely native	
	Sparganium sp.	bur-reed	2	emergent	likely native	*Sparganium emersum* in Oregon Flora Project
	Menyanthes trifoliata	bog bean	10	emergent	native	
	Potentilla palustris	marsh cinquefoil	16	emergent	native	
	Sparganium natans	small bur-reed	8	emergent	native	
	Typha latifolia	common cattail	6	emergent	native	
Lippert Pond	*Ceratophyllum demersum*	coontail	62	submersed	native	
	Eleocharis acicularis	needle-leaf spikerush	6	submersed	native	
	Marselia vestita	hairy water-fern	2	floating leaf	native	
	Potamogeton sp.	thin leaf pondweed	2	submersed	native	
	Zannichellia palustris	horned pondweed	2	submersed	native	
	Myriophyllum spicatum	**Eurasian watermilfoil**	**52**	**submersed**	**non-native**	
Whetstone Pond	***Solanum dulcamara***	**bittersweet nightshade**	**25**	**emergent**	**non-native**	
	Schoenoplectus tabernaemontani	softstem bulrush	25	emergent	native	
	Typha latifolia	common cattail	50	emergent	native	
	Lythrum salicaria	**purple loosestrife**	**13**	**emergent**	**non-native**	
	Phalaris arundinacea	**reed canary grass**	**63**	**emergent**	**non-native**	
	Rubus armeniacus	**Himalayan blackberry**	**25**	**emergent**	**non-native**	

Table 3 (continued). Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Little Hyatt Res.	*Lemna sp.*	duckweed	30	floating leaf	likely native	Likely *L. minor*
	Nitella sp.	nitella	18	submersed	likely native	No non-native *Nitella spp* .recorded in the PNW
	Ceratophyllum demersum	coontail	10	submersed	native	
	Elodea canadensis	Canadian waterweed	60	submersed	native	
	Potamogeton crispus	**curly leaf pondweed**	**18**	**submersed**	**non-native**	
	Carex sp.	sedge	16	emergent	likely native	Three *Carex spp*. collected from Little Hyatt Res.
	Eleocharis sp.	spikerush	8	emergent	likely native	
	Juncus sp.	rush	6	emergent	likely native	Two *Juncus spp.* collected from Little Hyatt Res.
	Poacea sp.	grass	22	emergent	likely native	Possibly *Glyceria borealis*
	Sparganium sp.	bur-reed	10	emergent	likely native	Two *Sparganium spp.* collected from Little Hyatt Res.
	Myosotis laxa	forget-me-not	2	emergent	native	
	Persicaria amphibia	water smartweed	4	emergent	native	
	Typha latifolia	common cattail	4	emergent	native	
Medco Pond	*Bryophyta*	moss	14	submersed	likely native	No non-native *Bryophyta spp* .recorded in the PNW
	Callitriche sp.	water starwort	2	submersed	native	
	Nitella sp.	nitella	6	submersed	likely native	No non-native *Nitella spp* .recorded in the PNW
	Ceratophyllum demersum	coontail	28	submersed	native	
	Eleocharis acicularis	needle-leaf spikerush	2	submersed	native	
	Elodea canadensis	Canadian waterweed	10	submersed	native	
	Myriophyllum verticillatum	whorled milfoil	10	submersed	native	
	Nuphar polysepala	splatterdock	2	floating leaf	native	
	Potamogeton amplifolius	big leaf pondweed	2	submersed	native	
	Potamogeton natans	floating-leaved pondweed	54	floating leaf	native	
	Potamogeton pusillus	small pondweed	20	submersed	native	
	Nymphaea odorata	**fragrant waterlily**	**2**	**floating leaf**	**non-native**	
	Potamogeton crispus	**curly leaf pondweed**	**14**	**submersed**	**non-native**	
	Carex sp.	sedge	14	emergent	likely native	Two *Carex spp.* collected from Medco Pond
	Persicaria hydropiperoides	water pepper	16	emergent	native	
	Ludwigia palustris	water purslane	4	emergent	native	
	Menyanthes trifoliata	bog bean	6	emergent	native	
	Schoenoplectus tabernaemontani	softstem bulrush	2	emergent	native	
	Typha latifolia	common cattail	6	emergent	native	

Table 3 (continued). Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Parsnip Lakes	*Lemna sp.*	duckweed	50	floating leaf	likely native	Likely *L. minor*
	Lemna trisulca	star duckweed	17	floating leaf	native	
	Myriophyllum verticillatum	whorled milfoil	84	submersed	native	
	Nuphar polysepala	splatterdock	84	floating leaf	native	
	Potamogeton pusillus	small pondweed	67	submersed	native	
	Potamogeton sp.	Floating leaf pondweed	100	submersed	native	*P. natans* or *P.oakesianus*
	Utricularia macrorhiza	common bladderwort	84	submersed	native	
	Utricularia sp.	bladderwort	17	submersed	native	*U. minor* or *U. gibba*
	Carex sp.	sedge	100	emergent	likely native	12 native *Carex spp*. recorded in Parsnip Lakes (Oregon Flora Project)
	Eleocharis sp.	spikerush	84	emergent	likely native	Four native *Eleocharis spp*. recorded in Parsnip Lakes (Oregon Flora Project)
	Mentha sp.	mint	34	emergent	likely native	Likely *M. arvensis*
	Poacea sp.	grass	50	emergent	likely native	
	Sparganium sp.	bur-reed	50	emergent	likely native	*Sparganium emersum* recorded in Parsnip Lakes (Oregon Flora Project)
	Sparganium natans	small bur-reed	84	emergent	native	
	Typha latifolia	common cattail	34	emergent	native	
	Veronica scutellata	marsh speedwell	34	emergent	native	
Provolt Nursery Pond	*Chara sp.*	muskgrass	4	submersed	likely native	No non-native *Chara spp* .recorded in the PNW
	Ceratophyllum demersum	coontail	27	submersed	native	
	Elodea canadensis	Canadian waterweed	54	submersed	native	
	Najas flexilis	nodding water nymph	43	submersed	native	
	Potamogeton pusillus	small pondweed	89	submersed	native	
	Spirodela polyrrhiza	giant duckweed	4	floating leaf	native	
	Stuckenia filiformis	slender-leaf pondweed	62	submersed	native	
	Stuckenia pectinata	sago pondweed	35	submersed	native	
	Myriophyllum spicatum	**Eurasian watermilfoil**	**12**	**submersed**	**non-native**	
	Potamogeton crispus	**curly leaf pondweed**	**4**	**submersed**	**non-native**	
	Sparganium sp.	bur-reed	4	emergent	likely native	
	Schoenoplectus tabernaemontani	softstem bulrush	4	emergent	native	

Table 3 (continued). Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Howard Prairie R.	***Myriophyllum spicatum x sibiricum***	**Eurasian x northern hybrid watermilfoil**	*****	**submersed**	**non-native**	**Identification verified by Grand Valley State University using genetic techniques**
Hyatt Lake	***Myriophyllum spicatum x sibiricum***	**Eurasian x northern hybrid watermilfoil**	*****	**submersed**	**non-native**	**Identification verified by Grand Valley State University using genetic techniques**
Charles A. Sprague (Sprague) Nursery Pond	*Nitella sp.*	nitella	8	submersed	likely native	No non-native *Nitella spp* .recorded in the PNW
	Callitriche heterophylla	different leaf water starwort	4	submersed	native	
	Ceratophyllum demersum	coontail	16	submersed	native	
	Eleocharis acicularis	needle-leaf spikerush	4	submersed	native	
	Najas flexilis	nodding water nymph	97	submersed	native	
	Najas gracillima	**slender water nymph**	**8**	**submersed**	**non-native**	
	Potamogeton foliosus	leafy pondweed	93	submersed	native	
	Potamogeton crispus	**curly leaf pondweed**	**4**	**submersed**	**non-native**	
Willow Lake	*Chara sp.*	muskgrass	40	submersed	likely native	No non-native *Chara spp* .recorded in the PNW
	Eleocharis acicularis	needle-leaf spikerush	2	submersed	native	
	Elodea canadensis	Canadian waterweed	6	submersed	native	
	Najas gracillima	**slender water nymph**	**44**	**submersed**	**non-native**	
	Persicaria amphibia	water smartweed	2	floating leaf	native	
	Potamogeton crispus	**curly leaf pondweed**	**12**	**submersed**	**non-native**	
	Potamogeton nodosus	longleaf pondweed	54	floating leaf	native	
	Potamogeton pusillus	small pondweed	56	submersed	native	
	Potamogeton sp.	pondweed	2	submersed	native	*P. alpinus*, *P. grammineus*, or *P. alpinus x grammineus*
	Ranunculus aquatilis	white water-buttercup	2	submersed	native	

*Howard Prairie and Hyatt Reservoir sites were only surveyed for Myriophyllum spp. Full aquatic plant surveys were conducted in 2011 (Sytsma et al. 2011).

Table 3 (continued). Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Cantrall Buckley	*Lemna sp.*	duckweed	7	floating leaf	likely native	
	Elodea canadensis	Canadian waterweed	19	submersed	native	
	Potamogeton crispus	**curly leaf pondweed**	**25**	**submersed**	**non-native**	
	Mentha spicata	spearmint	7	emergent	native	
	Veronica anagallis aquatica	water speedwell	7	emergent	native	
	Phalaris arundinacea	**reed canary grass**	**38**	**emergent**	**non-native**	
	Euthamia occidentailis	western goldentop	7	emergent	native	
Griffin County Park	*Ceratophyllum demersum*	coontail	14	submersed	native	
	Elodea canadensis	Canadian waterweed	47	submersed	native	
	Stuckenia sp.	pondweed	20	submersed	native	either *S. filiformis* or *S. pectinatus*
	Myriophyllum spicatum x sibiricum	**Eurasian x northern hybrid watermilfoil**	**14**	**submersed**	**non-native**	
	Potamogeton crispus	**curly leaf pondweed**	**80**	**submersed**	**non-native**	
	Lythrum salicaria	**purple loosestrife**	**7**	**emergent**	**non-native**	
Morrison's Lodge	*Ceratophyllum demersum*	coontail	23	submersed	native	
	Elodea canadensis	Canadian waterweed	46	submersed	native	
	Stuckenia pectinata	sago pondweed	10	submersed	native	
	Zannichellia palustris	horned pondweed	10	submersed	native	
	Myriophyllum sp.	**watermilfoil**	**5**	**submersed**	**likely non-native**	**Probably *M. spicatum x sibiricum*** but sample was not submitted for genetic ID
	Potamogeton crispus	**curly leaf pondweed**	**82**	**submersed**	**non-native**	
	Ludwigia peploides	**floating willow-primrose**	**10**	**emergent**	**non-native**	***L. peploides*** **species ID tentative based on deltate brachts (Hoch and Grewell 2012)**
Rand Recreation Area	*Elodea canadensis*	Canadian waterweed	37	submersed	native	
	Ranunculus aquatilis	white water-buttercup	7	submersed	native	
	Myriophyllum spicatum x sibiricum	**Eurasian x northern hybrid watermilfoil**	**4**	**submersed**	**non-native**	
	Potamogeton crispus	**curly leaf pondweed**	**84**	**submersed**	**non-native**	
	Fallopia japonica	**Japanese knotweed**	**4**	**emergent**	**non-native**	

Table 3 (continued). Aquatic plant species collected and the occurrence rate at sites within waterbodies. Non-native species are in bold print.

Waterbody	Species name	Common name	% of sites	Growth habit	Status in Oregon	Comments
Tom Pierce County Park	*Azolla sp.*	mosquito fern	31	floating leaf	likely native	
	Lemna sp.	duckweed	18	floating leaf	likely native	
	Nitella sp.	nitella	27	submersed	likely native	
	Callitriche hermaphroditica	autumn water starwort	5	submersed	native	
	Callitriche heterophylla	different leaf water starwort	5	submersed	native	
	Ceratophyllum demersum	coontail	40	submersed	native	
	Elodea canadensis	Canadian waterweed	44	submersed	native	
	Potamogeton sp.	thin leaf pondweed	31	submersed	native	*P. foliosus* or *P. pusillus*
	Ranunculus aquatilis	white water-buttercup	9	submersed	native	
	Zannichellia palustris	horned pondweed	22	submersed	native	
	Potamogeton crispus	**curly leaf pondweed**	**66**	**submersed**	**non-native**	
	Poacea sp.	grass	18	emergent	likely native	
	Ludwigia palustris	water purslane	14	emergent	native	
	Persicaria lapathifolia	common knotweed	5	emergent	native	
	Sparganium angustifolium	narrowleaf bur-reed	22	emergent	native	
	Phalaris arundinacea	**reed canary grass**	**5**	**emergent**	**non-native**	
Whitehorse County Park	*Elodea canadensis*	Canadian waterweed	10	submersed	native	
	Hydrocotyle ranunculoides	water pennywort	10	floating leaf	native	
	Ranunculus aquatilis	white water-buttercup	10	submersed	native	
	Potamogeton crispus	curly leaf pondweed	70	submersed	non-native	
	Sparganium sp.	bur-reed	10	emergent	likely native	
	Persicaria lapathifolia	common knotweed	10	emergent	native	
	Iris pseudacorus	**yellow flag iris**	**10**	**emergent**	**non-native**	
	Ludwigia peploides	**floating willow-primrose**	**10**	**emergent**	**non-native**	***L. peploides* species ID tentative based on deltate brachts (Hoch and Grewell 2012)**
	Lythrum salicaria	**purple loosestrife**	**10**	**emergent**	**non-native**	
	Myriophyllum aquaticum	**parrotfeather water milfoil**	**10**	**emergent**	**non-native**	

References

Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti, and D. H. Wilken. 2012. The Jepson manual: vascular plants of California. University of California Press Berkeley, CA.

Brayshaw, T. C. 2001. Pondweeds, bur-reeds and their relatives of British Colombia: aquatic families of monocotyledons. Victoria, BC: Royal British Colombia Museum 250p.-illus.. ISBN 771895747.

Crow, G. E., and C. B. Hellquist. 2000. Aquatic and wetland plants of northeastern North America. Volume One: pteridophytes, gymnosperms, and angiosperms: dicotyledons. The University of Wisconsin Press Madison, Wisconsin.

---. 2006. Aquatic and Wetland Plants of Northeastern North America, Volume II: A Revised and Enlarged Edition of Norman C. Fassett's A Manual of Aquatic Plants, Volume II: Angiosperms: Monocotyledons. University of Wisconsin Press.

Efloras. 2008. Published on the Internet http://www.efloras.org, accessed 26 March 2013, Missouri Botanical Garden, St. Louis, MO & Harvard University Herbaria, Cambridge, MA.

Hamel, K., and J. Parsons. 2001. An Aquatic Plant Identification Manual for Washington's Freshwater Plants. Washington State Department of Ecology.

Hoch, P. C., and B. J. Grewell. 2012. Ludwigia in Jepson Flora Project (eds.) Jepson eFlora, http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=31652. Accessed on March 28, 2013.

Larue, E. A., M. P. Zuellig, M. D. Netherland, M. A. Heilman, and R. A. Thum. 2012. Hybrid watermilfoil lineages are more invasive and less sensitive to a commonly used herbicide than their exotic parent (Eurasian watermilfoil). Evolutionary Applications.

ODA. 2012. Oregon Department of Agriculture Noxious Weed Control Policy and Classification System.

Rejmánek, M., and M. J. Pitcairn. 2003. When is eradication of exotic pest plants a realistic goal?, p. 249-253. *In* C. R. Veitch and C. M. N. [eds.], Turning the tide: the eradication of invasive species: Proceedings of the International Conference on eradication of island invasives. IUCN-The World Conservation Union.

Sanderson, B. L., K. A. Barnas, and A. Michelle Wargo Rub. 2009. Nonindigenous species of the Pacific Northwest: an overlooked risk to endangered salmon? BioScience 59: 245-256.

Sytsma, M., R. Miller, and V. Morgan. 2011. Aquatic Plant Surveys in the Bureau of Land Management Medford District, 2010-2011, Report Prepared for the Bureau of Land Management, Medford District. Portland State University.

USDA. 2013. The PLANTS Database (http://plants.usda.gov, 25 March 2013). National Plant Data Team, Greensboro, NC.