



Vascular Plant Inventory of Coastal Bogs, Wetlands, and Lakeshores, Olympic National Park (2005)

Natural Resource Technical Report NPS/NCCN/NRTR—2009/174



ON THE COVER

Wish Creek wetlands in the Ozette area of Olympic National Park

Photograph by: Joshua Chenoweth, NPS

Vascular Plant Inventory of Coastal Bogs, Wetlands, and Lakeshores, Olympic National Park (2005)

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Abstract

Although the wetlands of the coastal strip of Olympic National Park are known to harbor many rare plant species, these areas have had relatively few botanical surveys. This project was undertaken to ensure that vascular plants of coastal bogs, wetlands, and lakeshores were adequately represented on the park's species list. A total of 26 sites were examined, representing contrasting hydrologic settings associated with lakeshores and other wetlands, and encompassing nearly the entire south to north extent of the coastal strip. In total, 270 different plant taxa were recorded. Of these 210 were native, 34 were non-native, and 26 were of unknown origin (mostly not identified to species). One species new to the park was found, river bulrush (*Schoenoplectus fluviatilis*). The total included 21 taxa on rare plant lists for the park, the state, or both. Most of the exotic taxa were encountered infrequently. Notable exceptions were reed canarygrass (*Phalaris arundinacea*) and evergreen blackberry (*Rubus laciniatus*). Exotic plant species were usually not common where they were encountered. However, four exotic species were common at various locations around Ozette Lake (reed canarygrass, bulbous rush (*Juncus bulbosus*), common forget-me-not (*Myosotis scorpioides*), and fragrant water-lily (*Nymphaea odorata*)). Given the systematic and concentrated effort in this study, it was surprising that only one species new to the park was found. It appears that though individual sites may harbor many vascular plant species, variation between sites is low. Extensive additional investment in a search for species new to the park does not appear to be warranted.

Executive Summary

Although the wetlands of the coastal strip of Olympic National Park are known to harbor many rare plant species, these areas have had relatively few botanical surveys. This project was undertaken to ensure that vascular plants of coastal bogs, wetlands, and lakeshores were adequately represented on the park's species list. A total of 26 sites were examined, representing contrasting hydrologic settings associated with lakeshores and other wetlands, and encompassing nearly the entire south to north extent of the coastal strip. Ozette Lake was a focus of the study, due to both the high probability of rare plant species, and interest in current and former spawning areas for federally-listed Ozette sockeye salmon. Study sites included wetlands identified on the National Wetland Inventory map, sites identified on aerial photographs, potential riverine surge plain (estuarine) locations, and the shoreline, lagoons and sloughs along Ozette Lake. As many as three habitat zones were surveyed at each site: Inundation zone (seasonally inundated lakeshores); Upland zone (above Inundation zone and commonly separated from it by a band of sweet gale (*Myrica gale*); and Bog (upland, permanently wet or moist areas usually containing *Sphagnum* and other moisture-dependent plants). In total, 270 different plant taxa were recorded. Of these 210 were native, 34 were non-native, and 26 were of unknown origin (mostly not identified to species). One species new to the park was found, river bulrush (*Schoenoplectus fluviatilis*). Twenty-one taxa are recognized by either Olympic National Park, the Washington Natural Heritage Program, or both for their rarity. Most of the exotic taxa were encountered infrequently. Notable exceptions were reed canarygrass (*Phalaris arundinacea*) and evergreen blackberry (*Rubus laciniatus*). Nearly all the occurrences of reed canarygrass were around Ozette Lake. For the most part, exotic plant species were not common where they were encountered. However, four exotic species were common at various locations around Ozette Lake (reed canarygrass, bulbous rush (*Juncus bulbosus*), common forget-me-not (*Myosotis scorpioides*), and fragrant water-lily (*Nymphaea odorata*)). This study achieved the stated objective of increasing knowledge of the vascular flora in the coastal wetlands of Olympic National Park. Given the systematic and concentrated effort in this study, it was surprising that only one species new to the park was found. It appears that though individual sites may harbor many vascular plant species, variation between sites is low. Earlier botanical exploration of a few selected sites appears to have captured most of the vascular plant diversity of the area. Extensive additional investment in a search for species new to the park does not appear to be warranted.

Introduction

Olympic National Park contains more than 60 miles of Pacific coastline, including the largest section of wilderness coast in the lower 48 states. This area harbors some of the best examples of Pacific coastal bogs and wetlands in Washington State. Relatively remote, and known for impenetrable vegetation, this is one of the areas in the park with the fewest plant surveys. Previous studies documented a high proportion of rare vascular plants in the coastal region of the park, especially along the shores of Ozette Lake (Schreiner et al. 1994; Buckingham et al. 1995). The area is well-known for several species more-or-less narrowly restricted to the Pacific Coast of North America (e.g. *Gentiana douglasiana* and *Carex macrocephala*) and as recently as 1998, *Coptis trifolia*, a bog taxon new to Olympic National Park and the lower 48 states was discovered in this area. This project was undertaken to ensure that vascular plants of coastal bogs, wetlands, and lakeshores were adequately represented on the park's species list.

Study Area

Vascular plant species were identified within contrasting hydrologic settings associated with lakeshores and other wetlands within the coastal strip of Olympic National Park. A total of 26 sites were examined. The sites encompassed nearly the entire south to north extent of the coastal strip, from Kalaloch Bog Forests to Willoughby Lake near Shi Shi Beach (Fig. 1). The shoreline and adjacent wetlands of Ozette Lake were a focus of the study, accounting for 15 of the surveyed sites (Fig. 2, Table 1). The focus on the lake was due to both the high probability of rare plant species, and requests from park fisheries biologists for information on conditions at current and former spawning areas for federally-listed Ozette sockeye salmon.

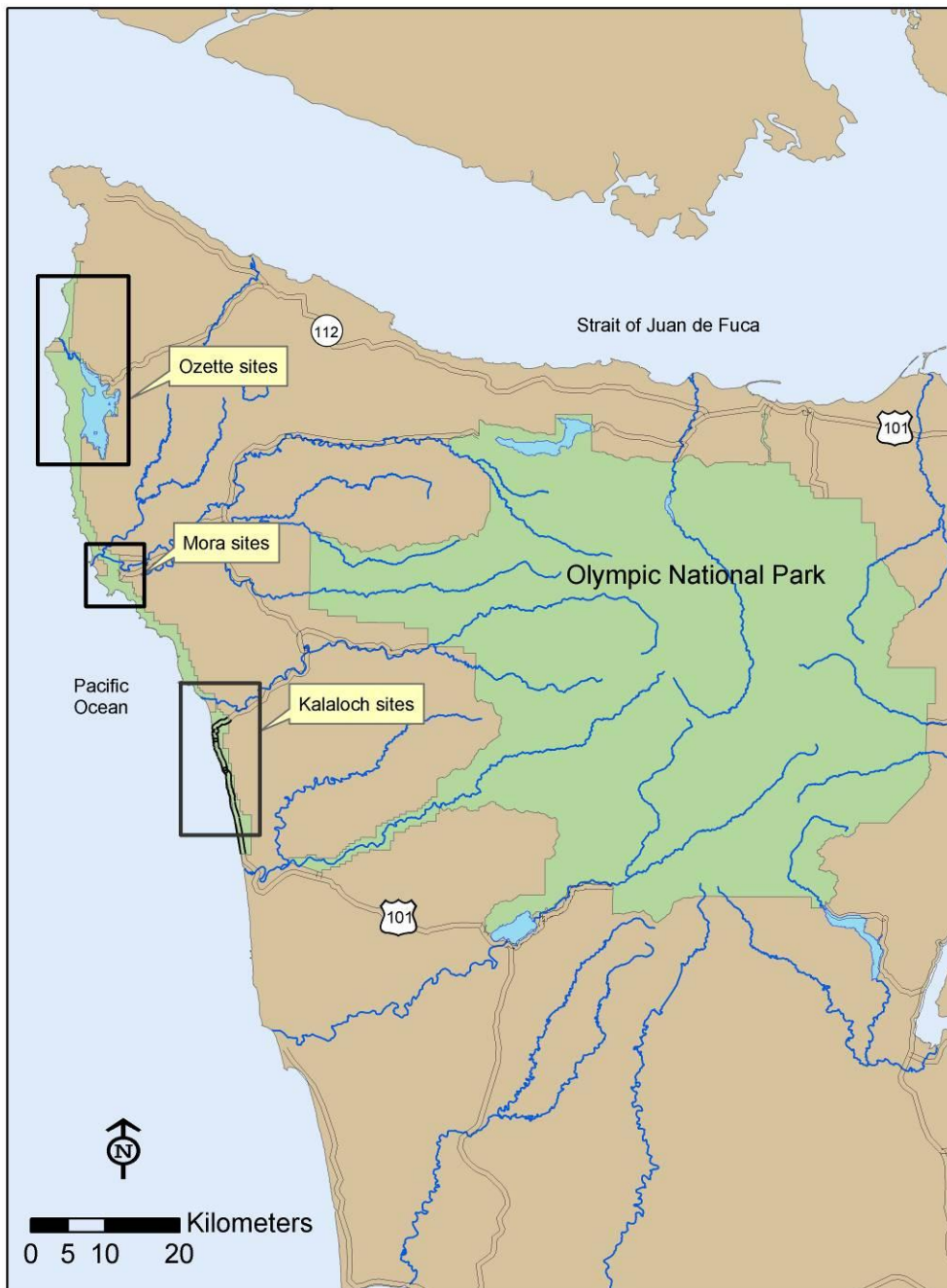


Figure 1. Locator map for study sites within the coastal strip of Olympic National Park.

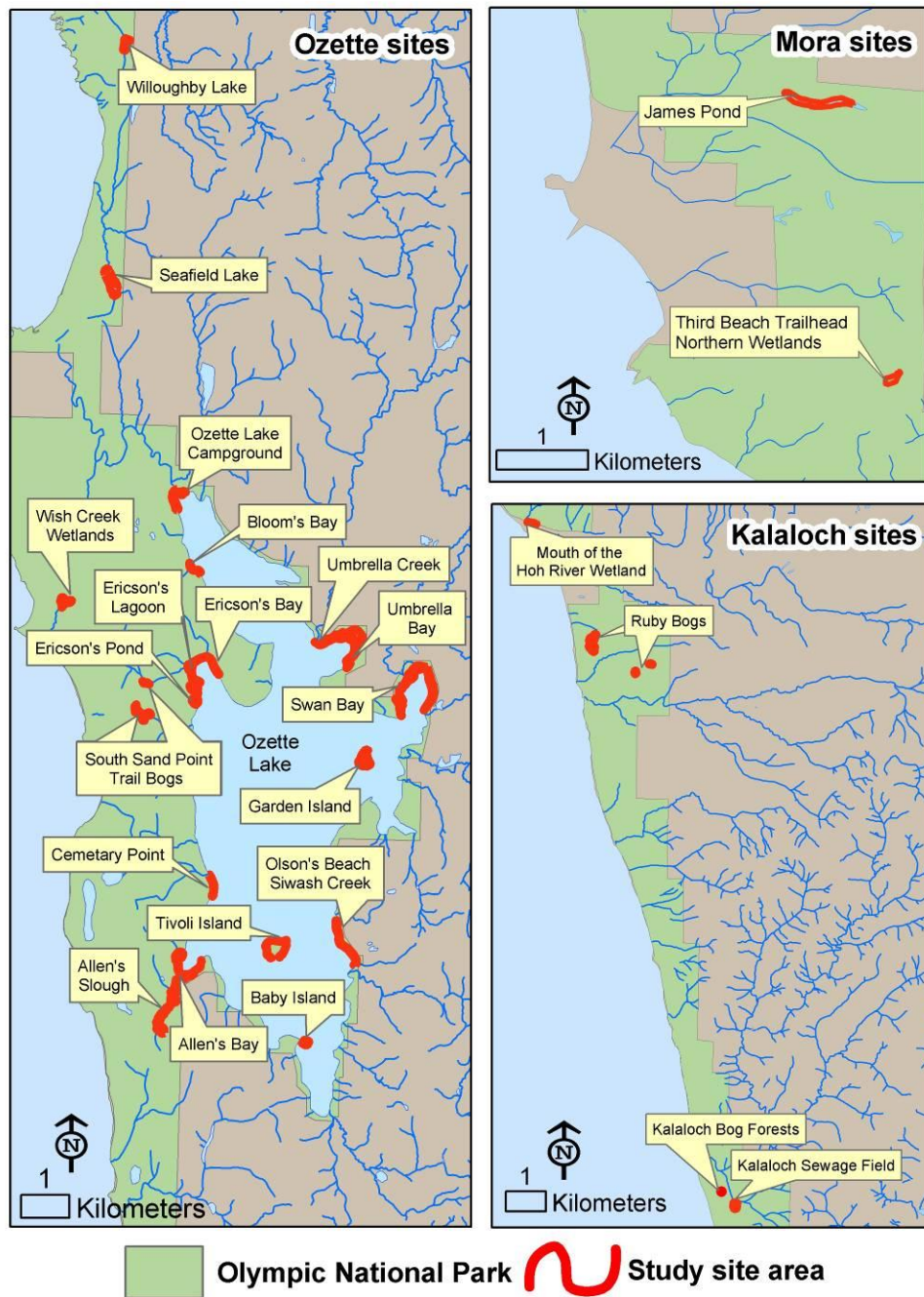


Figure 2. Detailed location of study sites within Ozette, Mora, and Kalaloch areas of the coastal strip of Olympic National Park.

Table 1. Study sites and numbers of polygons for coastal bog and wetlands vascular plant inventory.

Study site	Number of polygons
Allen's Bay	8
Allen's Slough	5
Baby Island	4
Bloom's Bay	4
Cemetery Point	3
Ericson's Bay	9
Ericson's Lagoon	1
Ericson's Pond	1
Garden Island	13
James Pond	1
Kalaloch Forest Bogs	0
Kalaloch Sewage Field	1
Mouth of the Hoh River wetland	1
Olson's Beach Siwash Creek	5
Ozette Lake Campground	6
Ruby Bog	4
Seafield Lake	4
South Sand Point Trail Bogs	4
Swan Bay	6
Swan Bay Lagoon	1
Third Beach Trailhead Northern Wetlands	1
Tivoli Island	7
Umbrella Bay	7
Umbrella Creek	0
Willoughby Lake	2
Wish Creek Wetlands	3

Methods

Sites were chosen in northwestern and western lowlands of Olympic National Park in an effort to survey wetland areas considered under-botanized. These included wetlands identified on the National Wetland Inventory map, sites that looked promising on aerial photographs, potential riverine surge plain (estuarine) locations, and the shoreline, lagoons and sloughs along Ozette Lake.

At selected sites, up to three habitat zones were surveyed:

Inundation--area along lake shore that is seasonally inundated by water, from the emerging shore to lake depths where aquatic plants no longer occur or visibility is obscured.

Upland--area above the inundation zone, commonly separated from the inundation zone by a band of sweet gale (*Myrica gale*). This zone commonly contains meadow forb communities, *Carex*, *Juncus*, and *Salix* species.

Bog--Upland area that remains wet to moist year-round and is usually characterized by having *Sphagnum*, *Carex*, and *Juncus* species, and other moisture-loving plants.

Polygons were identified on the ground to represent the area occupied by a particular plant community. Within each polygon, a complete survey of vascular plants was performed. In the office, GPS points from the field were used as aids in order to digitize the outlines of the polygons in Arcview, using aerial photographs as a base.

Polygons were numbered consecutively for each site. Ideally a new polygon was created each time there was an obvious change in plant community, or if a significant distance separated the communities. Occasionally a polygon change may represent an arbitrary end point that reflects a change in geomorphology or survey date. Each survey location is identified by three key descriptors: Site, Polygon #, and Habitat Zone.

All species encountered in each polygon were recorded on data sheets. When the species could not be determined in the field, descriptive notes were taken, and samples were brought back to the lab for analysis. Vouchers were collected for difficult-to-identify specimens, and those not previously known from the area. Many of these specimens were pressed and are retained in the Olympic National Park Herbarium. Hitchcock and Cronquist (1973) was the primary key used, unless another key was recommended by Buckingham et al. (1995). Species were identified to subspecies following the nomenclature of the Integrated Taxonomic Information System (2004) and Buckingham et al. (1995).

All species were noted as common (C), uncommon (U), or rare (R). Only dominant plants were recorded as 'common.' Plants that occurred in one or two places were recorded as 'rare'; all other vascular plant species were recorded as 'uncommon.'

Results

Polygons were surveyed at 24 of the 26 sites visited, for a total of 101 polygons. At the 24 sites, the number of polygons surveyed ranged from one to 13, with a median value of four. The inundation habitat zone was the most common, accounting for 57 polygons. The upland and bog habitat zones accounted for 27 and 17 polygons, respectively. At two sites, no polygons were sampled, either because the objective was a more qualitative reconnaissance of vegetation types (Kalaloch Forest Bogs), or because the visit occurred too late in the season for accurate assessment of abundance (Umbrella Creek).

In total, 270 different plant taxa were recorded, most of which were identified to species, subspecies, or variety (Appendix). Of these 210 were native taxa, 34 were non-native, and 26 were of unknown origin (mostly not identified to species). One species new to the park was found, river bulrush (*Schoenoplectus fluviatilis*). Twenty-one taxa are recognized by either Olympic National Park, the Washington Natural Heritage Program, or both for their rarity. Fourteen are on the park's list of rare species, five are listed as "sensitive" by the state (vulnerable or declining), and two are listed as "threatened" (likely to become endangered). Two taxa are included on the state's "Review Group 1," indicating potential concerns that require more fieldwork to assign to the appropriate category.

Of the exotic taxa, most were encountered infrequently (Table 2). Notable exceptions were reed canarygrass (*Phalaris arundinacea*), which occurred at over half the sites, and evergreen blackberry (*Rubus laciniatus*), which occurred at about one quarter of the sites. Nearly all the occurrences of reed canarygrass were around Ozette Lake or nearby (i.e., Wish Creek wetlands). However, it was also recorded at James Pond, near the Mora Ranger Station. Evergreen blackberry was found around Ozette Lake, at the mouth of the Hoh River, and at the Kalaloch Sewage Field. Nineteen of the 24 sites where polygons were surveyed had exotic taxa.

Table 2. Constancy (number of sites present out of 24 total) of exotic vascular plant taxa.

Taxon	Constancy
<i>Phalaris arundinacea</i>	13
<i>Rubus laciniatus</i>	7
<i>Callitriche stagnalis</i>	5
<i>Agrostis capillaris</i>	4
<i>Hypochaeris radicata</i>	4
<i>Iris pseudacorus</i>	4
<i>Juncus bulbosus</i>	4
<i>Ranunculus repens</i> var. <i>repens</i>	4
<i>Trifolium repens</i>	3
<i>Cirsium arvense</i>	2
<i>Gnaphalium uliginosum</i>	2
<i>Mentha spicata</i>	2
<i>Myosotis scorpioides</i>	2
<i>Nymphaea odorata</i>	2
<i>Plantago lanceolata</i>	2
<i>Polygonum hydropiper</i>	2
<i>Rumex acetosella</i>	2
<i>Sagina apetala</i>	2
<i>Anthoxanthum odoratum</i>	1
<i>Cerastium glomeratum</i>	1
<i>Cerastium semidecandrum</i>	1
<i>Digitalis purpurea</i>	1
<i>Holcus lanatus</i>	1
<i>Hypochaeris</i> sp.	1
<i>Juncus conglomerates</i>	1
<i>Leucanthemum vulgare</i>	1
<i>Lotus pedunculatus</i>	1
<i>Medicago lupulina</i>	1
<i>Mentha X piperita</i>	1
<i>Mycelis muralis</i>	1
<i>Rubus discolor</i>	1
<i>Rumex obtusifolius</i>	1
<i>Taraxacum</i> sp.	1
<i>Vicia sativa</i> ssp. <i>sativa</i>	1
<i>Vulpia bromoides</i>	1

For the most part, exotic plant species were not common where they were encountered. However, four exotic species were common at various locations around Ozette Lake. Reed canarygrass was common at three sites on the northeast side of the lake and was the only exotic species recorded as common at more than one site. The other exotic species that were common at a site were bulbous rush (*Juncus bulbosus*), common forget-me-not (*Myosotis scorpioides*), and fragrant water-lily (*Nymphaea odorata*).

Discussion

This study achieved the stated objective of increasing knowledge of the vascular flora in the coastal wetlands of Olympic National Park, areas which have previously received little attention. Field crews inspected 26 locations throughout the park's coastal strip and recorded comprehensive species lists at 24 locations. A vascular plant species new to the park was recorded. New location and habitat information was recorded for 21 species on either park or state lists of rare or threatened species. These listed species accounted for 10% of the native plant species encountered, demonstrating the relative richness of rare plants in this area. However, given the systematic and concentrated effort in this study, it was surprising that only one species new to the park was found. It appears that though individual sites may harbor many vascular plant species, variation between sites is low. Furthermore, earlier botanical exploration of a few selected sites appears to have captured most of the vascular plant diversity of the area. Extensive additional investment in a search for species new to the park does not appear to be warranted.

Exotic taxa were a relatively minor component of the flora. Most of the exotic taxa were neither ubiquitous among sites nor dominant (i.e., abundance category 'common') where they occurred. The most important exception was reed canarygrass, which was both ubiquitous around Ozette Lake and dominant in some areas on the northeast side of the lake. Reed canarygrass is an aggressively invasive species which has been recognized by park staff as a serious concern, including the populations at Ozette Lake (Olson et al. 1991). This study did not focus on invasive exotic plants. However, information from this study can be used to identify locations where populations are small and control might be achieved with modest effort, and other areas that will require more sustained and intensive attention.

Conclusion

The coastal wetlands of Olympic National Park are rich in rare vascular plants, one of which was unknown to occur in the park prior to this study. This study was the most thorough examination of this flora to date, including a variety of habitats throughout the park's coastal strip. Given the extent of the coastal strip and the difficulties of access, there may be additional vascular plant species yet to be added to the park's species list, though they are likely to be few. Any future work should take advantage of this study, by targeting different locations, or different portions of the growing season. Exotic plants occurred at most sites, though most exotic plant species were found at few sites and were not dominant where they occurred. The exception was reed canarygrass, which occurred at most of the sites around Ozette Lake and was dominant in some areas.

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Appendix. List of vascular plant taxa recorded in polygons.

Acer circinatum
Achillea millefolium
Agrostis aequivalvis
Agrostis capillaris
Agrostis oregonensis
Agrostis scabra var. *scabra*
Agrostis sp.
Alnus rubra
Amelanchier alnifolia
Anaphalis margaritacea
Anthoxanthum odoratum
Arceuthobium campylopodum
Argentina egedii ssp. *egedii*
Artemisia sp.
Athyrium filix-femina ssp. *cyclosorum*
Blechnum spicant
Botrychium multifidum
Boykinia occidentalis
Brasenia schreberi
Calamagrostis canadensis var. *langsдорffii*
Calamagrostis crassiglumis
Callitriche heterophylla ssp. *bolanderi*
Calamagrostis nutkaensis
Callitriche palustris
Callitriche sp.
Callitriche stagnalis
Calamagrostis stricta ssp. *inexpansa*
Carex aperta
Carex aquatilis var. *dives*
Carex buxbaumii
Carex deweyana var. *deweyana*
Carex echinata
Carex echinata ssp. *echinata*
Carex exsiccata
Carex interrupta
Carex lenticularis var. *lipocarpa*
Carex livida var. *radicaulis*
Carex obnupta
Cardamine oligosperma var. *oligosperma*
Cardamine pensylvanica
Carex sp.
Carex stipata var. *stipata*
Carex utriculata
Carex viridula ssp. *viridula*
Ceratophyllum echinatum
Cerastium glomeratum
Cerastium semidecandrum
Cirsium arvense
Cirsium sp.
Claytonia sibirica
Comarum palustre
Cornus sericea ssp. *occidentalis*
Cornus unalaschkensis
Crassula aquatica
Crataegus douglasii
Deschampsia caespitosa
Deschampsia cespitosa ssp. *cespitosa*
Dichanthelium acuminatum var. *fasciculatum*
Digitalis purpurea
Dodecatheon jeffreyi ssp. *jeffreyi*
Drosera rotundifolia var. *rotundifolia*
Dulichium arundinaceum
Eleocharis acicularis var. *acicularis*
Eleocharis palustris
Eleocharis sp.
Elodea canadensis
Epilobium ciliatum
Epilobium sp.
Equisetum arvense
Equisetum fluviatile
Eriophorum chamissonis
Festuca sp.
Fragaria chiloensis ssp. *pacifica*
Frangula purshiana
Galium aparine
Galium boreale
Galium trifidum
Galium triflorum
Gaultheria shallon
Gentiana douglasiana
Gentiana sceptrum
Geum macrophyllum var. *macrophyllum*
Glyceria elata
Gnaphalium uliginosum
Hippuris vulgaris
Holcus lanatus
Hypericum anagalloides
Hypochaeris radicata
Hypochaeris sp.
Iris pseudacorus
Isoetes maritima
Isoetes occidentalis
Isoetes sp.
Juncus acuminatus
Juncus articulatus
Juncus balticus var. *balticus*

Juncus balticus var. *vallicola*
Juncus bolanderi
Juncus bufonius
Juncus bulbosus
Juncus conglomeratus
Juncus covillei var. *covillei*
Juncus effusus
Juncus ensifolius
Juncus filiformis
Juncus nevadensis var. *nevadensis*
Juncus sp.
Juncus supiniformis
Kalmia polifolia
Lathyrus palustris var. *palustris*
Ledum groenlandicum
Leucanthemum vulgare
Lilaeopsis occidentalis
Linnaea borealis ssp. *longiflora*
Lobelia dortmanna
Lonicera involucrata
Lotus pedunculatus
Ludwigia palustris
Luzula multiflora ssp. *frigida*
Luzula sp.
Lycopodium clavatum var. *clavatum*
Lycopodiella inundata
Lycopus uniflorus var. *uniflorus*
Lysichitum americanum
Maianthemum dilatatum
Malus fusca
Medicago lupulina
Mentha arvensis
Menziesia ferruginea
Mentha spicata
Menyanthes trifoliata
Mentha X piperita
Microseris borealis
Mimulus alsinoides
Mimulus guttatus
Montia parvifolia ssp. *parvifolia*
Mycelis muralis
Myosotis laxa
Myosotis scorpioides
Myrica gale var. *gale*
Myriophyllum quitense
Myriophyllum sibiricum
Myriophyllum sp.
Najas flexilis
Nephrophyllidium crista-galli
Nuphar lutea ssp. *polysepala*
Nymphaea odorata

Oemleria cerasiformis
Oenanthe sarmentosa
Phalaris arundinacea
Phragmites australis
Physocarpus capitatus
Picea sitchensis
Pinus contorta var. *contorta*
Platanthera dilatata var. *dilatata*
Plantago lanceolata
Plantago macrocarpa
Plantago major
Plantago maritima var. *juncoides*
Platanthera stricta
Poa sp.
Polygonum amphibium var. *stipulaceum*
Polypodium glycyrrhiza
Polygonum hydropiper
Polystichum munitum
Polystichum sp.
Populus balsamifera ssp. *trichocarpa*
Populus sp.
Potamogeton epihydrus
Potamogeton gramineus
Potamogeton natans
Potamogeton pusillus ssp. *tenuissimus*
Potamogeton richardsonii
Potamogeton sp.
Prunus emarginata
Prunella vulgaris
Prunella vulgaris ssp. *lanceolata*
Pseudotsuga menziesii var. *menziesii*
Pteridium aquilinum
Pteridium aquilinum var. *pubescens*
Ranunculus aquatilis
Ranunculus flammula
Ranunculus repens var. *repens*
Rhynchospora alba
Ribes sp.
Rorippa palustris ssp. *occidentalis*
Rosa gymnocarpa var. *gymnocarpa*
Rosa nutkana
Rosa sp.
Rubus discolor
Rubus laciniatus
Rubus parviflorus
Rubus pedatus
Rubus spectabilis var. *spectabilis*
Rubus ursinus ssp. *macropetalus*
Rumex acetosella
Rumex obtusifolius
Rumex sp.

Sagina apetala
Sagittaria cuneata
Sagittaria latifolia var. *latifolia*
Salix hookeriana
Salix lucida ssp. *lasiandra*
Salix scouleriana
Salix sitchensis
Salix sp.
Sambucus racemosa
Sanguisorba officinalis
Schoenoplectus acutus var. *acutus*
Schoenoplectus fluviatilis
Schoenoplectus subterminalis
Schoenoplectus tabernaemontani
Scirpus atrocinctus
Scirpus microcarpus
Scirpus sp.
Sisyrinchium idahoense var. *idahoense*
Sisyrinchium littorale
Solidago sp.
Sparganium eurycarpum
Sparganium fluctuans
Sparganium angustifolium
Spiraea douglasii var. *menziesii*
Spiranthes romanzoffiana
Stachys chamissonis var. *cooleyae*
Stachys sp.
Stellaria calycantha
Subularia aquatica var. *americana*
Symphoricarpos albus var. *laevigatus*
Symphyotrichum foliaceum var. *foliaceum*
Symphyotrichum subspicatum var. *subspicatum*
Taraxacum sp.
Taxus brevifolia
Thermopsis gracilis var. *ovata*
Thuja plicata
Tofieldia glutinosa ssp. *brevistyla*
Torreyochloa pallida var. *pauciflora*
Trisetum canescens
Trisetum cernuum var. *cernuum*
Trientalis europaea ssp. *arctica*
Trifolium repens
Tsuga heterophylla
Typha latifolia
 Unknown aquatic #1
 Unknown *Carex* #1
 Unknown grass #1
 Unknown grass #2
 Unknown herb #1
 Unknown *Juncus* #1
 Unknown *Juncus* #2

Unknown shrub
Utricularia intermedia
Utricularia macrorhiza
Utricularia minor
Vaccinium caespitosum var. *paludicola*
Vaccinium ovalifolium
Vaccinium ovatum var. *ovatum*
Vaccinium ovatum
Vaccinium oxycoccus
Vaccinium parvifolium
Vaccinium sp.
Vaccinium uliginosum
Vallisneria americana
Veronica americana
Veronica scutellata
Veronica sp.
Viburnum edule
Vicia sativa ssp. *sativa*
Viola palustris var. *palustris*
Viola sp.
Vulpia bromoides

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