

Shoreline Planting Guide: Devils Lake

Lincoln City, Oregon





Devils Lake Water Improvement District
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www.DLWID.org

The first water improvement district of its kind in the State of Oregon, the Devils Lake Water Improvement District (DLWID) has been the conduit for managing Devils Lake since its inception in 1984. As a special taxing district, DLWID receives funding from area property owners to work for the improvement of the many aspects of Devils Lake.

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INTRODUCTION

The shoreline of a lake connects important shallow water habitat and the upland environment. Stable shorelines play many important roles in maintaining healthy aquatic ecosystem structure and function. Physically, shoreline vegetation provides shade to help regulate the temperature of shallow water areas, stabilize banks through root growth, and provide platforms and cover for a variety of organisms including waterfowl, fish, invertebrates, and amphibians. By stabilizing the shoreline, water clarity is increased while inputs of nutrient and contaminant are reduced.

Poorly stabilized shorelines result in increased sedimentation that subsequently reduce species diversity, light, property area, lake capacity, and buries fish spawning areas. Shoreline erosion results from natural (wind) and manmade (boats) waves that wear away soil and rock as well as overland water movement, burrowing animals, and downslope pressure from steep hillside.

Native communities of submersed vegetation similarly provide structure and function in aquatic ecosystems. A healthy submersed plant community reduces wind mixing and sediment turnover, and provides cover for prey species and refugia for invertebrates. Additionally aquatic vegetation provides cover for fish and food for waterfowl.

BACKGROUND AND PURPOSE

In Devils Lake, dense growth of nuisance aquatic vegetation was present from the early 1960s until 1986 when Chinese grass carp were introduced as a biocontrol agent. More than 20 years later, the lake is essentially devoid of submersed vegetation and prolific and sometimes toxic algae blooms have increased. The remaining carp are not expected to survive the next five years, providing an opportunity for the return of aquatic macrophytes.

At least eight native aquatic plant species have been reported from Devils Lake; however, results of an experiment to identify the viable seed/propagule bank using carp exclosures found only two native submersed species and five non-native species¹. These data strongly suggest that in the absence of grass carp, non-native aquatic plant species are again likely to dominate Devils Lake. Establishing submersed vegetation *prior to* the loss of grass carp will reduce the likelihood of reinfestation dominance by non-native plant species; however, the presence of a biocontrol agent requires installation of exclosures to prevent grazing on newly established plants.

Largemouth bass, a non-native species also present in Devils Lake, are widely known as ambush predators that use submersed vegetation to prey upon other fish species. Though largemouth bass are more likely to benefit from dense growth of invasive submersed plants, even the presence of native plants arguably provides opportunities for bass to prey upon threatened coho salmon, also present in the lake. So, in addition to preventing grass carp from grazing on native plant species, exclosures must also be used to prevent largemouth bass from using submersed vegetation for preying on threatened coho salmon. Additionally, because establishing native vegetation does not happen overnight, revegetation efforts should begin prior to the complete absence of grass carp.

¹ Waggy. 2002. Devils Lake Aquatic Plant Propagule Bank Characterization. MEM Project, Portland State University.

There is also increasing concern over shoreline degradation around Devils Lake due to poor stabilizing vegetation coupled with high wind-driven wave action. In some cases bank destabilization is the result of upland runoff and/or poor soil permeability. With that in mind, shoreline stabilization may need to begin with planting upland species, moving toward the shoreline and submersed habitats.

The purpose of this guide is to provide lakefront property owners at Devils Lake with a foundation of tools and resources to improve water quality and shoreline stabilization on their property. This guide provides information on selecting native trees, shrubs, shoreline-emergent, and submersed vegetation, planting instructions, lists local nurseries, and provides additional resources.

PLANT PROPAGATION AND PLANTING METHODS

Various propagule types and planting methods may be used to establish shoreline and submersed vegetation, and selection depends on factors such as water level, plant species, and season. Successful restoration projects often require that the type of plant propagule and the planting technique be species - specific and site - specific. Additionally, availability of propagules will change seasonally and propagules for all the desired species may not be uniformly available. The following are broad recommendations for some plant propagules.

- Seeded coir log - constructed of interwoven coconut fiber bound in a tube by biodegradable netting. Coir logs provide physical bank stabilization and can be pre-seeded with native plants.
- Seeding - broadcast mix of native grasses and sedges for shorelines not exposed to high wind/wave action. Broadcast seeds up to 25 lbs/acre.
- Container and bare root plants - whole potted plants typically stand the best chance of survival; however, this can often be expensive and labor intensive. Trees and shrubs are most commonly started in containers and planted the same way as terrestrial landscape plants. Bare root plants are often available in the dormant season (late winter) and are typically less expensive than container plants, more choices may be available, and their success may be greater because they are not pot-bound. In either case, ensure plants are sufficiently buried and in areas of high wind or wave action, consider trimming the above ground vegetation to about 10 inches to reduce stress.
- Live stakes - quickly establish to provide excellent bank stabilization, cover for wildlife, and shade for establishing other low-growing plant species. Cut ½ to 1 in. diameter stems to 12 to 24 in. long and remove the branches then gently push the cutting into the soil. Using local sources of willow is a simple way of increasing the likelihood of establishment.
- Stem fragments - many submersed aquatic plants will sprout roots, rhizomes, or stolons from stem fragments. As a rule, the greater the leaf density on the stem fragment, the greater the likelihood of new growth. Fill peat pots with moist lake sediment, cut stem fragments to at least 8 in., and gently plant in soil to about 3 in. or deeper. Use sand or clay to cover the sediment to hold the stem in place, otherwise the stem will float away.

Also, to reduce air bubbles in the pots, “burp” the pot by gently tapping it from the bottom.

- Dormant propagules - many emergent and submersed aquatic plants produce dormant propagules such as tubers (picture at right) or winterbuds. These plant parts are similar to potatoes or other high starch-containing plant part. These propagules can either be harvested from existing plants or purchased from a reputable source. Dormant propagules are simply planted by burying in about 4 in. of sediment and covering with sand to prevent them from floating away. Some sources provide biodegradable cloth mesh bags along with the tubers. Place some damp soil and 3 to 5 tubers per bag and either tie or staple the bag closed. Drop into the water, or better yet, push or bury the bag slightly into the soil (being careful not to damage the tubers).



DESIGN CONSIDERATIONS

Successful revegetation projects require sufficient background information on the site and careful planning. Some considerations include:

- Hydrology - look at the big picture and consider how water from upland areas may be contributing to erosion across the property or an unstable shoreline. Also consider water level and species tolerance for dry, moist, or wet soils.
- Historic vegetation - what native plants are found in adjacent natural areas? What is the spatial arrangement of the vegetation that could be mimicked to provide a similar natural look on your property?
- Planting arrangement - protect more palatable and easily damaged species by planting more robust species (e.g., bur reed, cattails) around them.
- Know What's Below. Call Before You Dig - Dial 8-1-1 or contact the Oregon Utility Notification Center (OUNC) at 1-800-332-2344 or www.digsafelyoregon.com to locate utility lines.
- Viewscape - consider trimming existing trees rather than removing them and consider the benefits of trees in providing privacy from other lake users.
- Slope - for steep-sloped shorelines, consider using rapid growing ground covers and hardscaping structures to stabilize the soil quickly rather than tilling the soil and planting slow-growing species. Also, consider using meandering pathways to the lake to limit direct runoff from property.

- Fetch and shoreline aspect - consider the prevailing winds and human habits that influence both natural and made-made waves. High wind/wave action could limit successful establishment of broadcast seeds so consider using seeded coir logs.

NON-NATIVE SPECIES

Non-native plants often crowd out native species, reduce diversity, alter natural chemical processes, impede water conveyance, and disrupt natural lake mixing. The presence of Brazilian elodea and Eurasian watermilfoil in Devils Lake prompted the introduction of grass carp as a biocontrol agent in the late 1980s and again in the early 1990s. Both plant species are common to coastal lakes in Oregon.

Preventing the introduction of non-native vegetation requires diligence on the part of homeowners, boaters, and natural resource managers. When purchasing plant material, consult a reputable source familiar with local natural history and who understands the impacts of non-native species introductions. In many cases, it only takes one non-native plant stem or tuber to instigate an infestation. A list of non-native plants of concern may be found in Appendix A and information on specific species may be found from internet sources listed in Appendix B. Also, consider contacting your local agriculture extension office or a master gardener.

In addition to non-native plant species, other hitchhikers can easily be transported *to* or even *from* Devils Lake. For example, zebra mussels are widespread in the Midwestern U.S. and extreme caution should be exercised to ensure that plant material was not obtained from an infested waterbody. Conversely, Devils Lake unfortunately has New Zealand mudsnails and protocols should be followed to ensure that shovels, gloves, waders and any other tools or equipment used during the planting process be completely cleaned and dried to remove all sediment, plant material, water or other vectors that could transport non-native species. The U.S. Bureau of Reclamation developed the *Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species*. A link to this guide may be found in Appendix B.

ENVIRONMENTAL CONCERNS AND REQUIREMENTS

Shoreline and submersed plants benefit fish and wildlife and stabilize shorelines. Dense plant growth, native or otherwise, can be problematic for other water uses. In the 1980s, non-native plant growth dominated Devils Lake and while native plants are generally preferable, even native plants can interfere with recreational activities such as water skiing and fishing.

Prior to establishing shoreline or submersed plants, a comprehensive management strategy should be in place. Residents are strongly encouraged to contact the DLWID prior to conducting any work below the OHWM (10.4 ft. MSL). Working in the lake or along the shoreline below the OHWM (10.4 ft. MSL) requires an Access Agreement from the Oregon Department of State Lands (DSL). A copy of the form may be found on the DSL website at: http://www.oregonstatelands.us/DSL/LW/docs/short_term_access.doc.

The design and installation of exclosures to prevent grazing and to coho-bass interaction also requires a Special Use application from DSL and approval from Oregon Department of Fish and

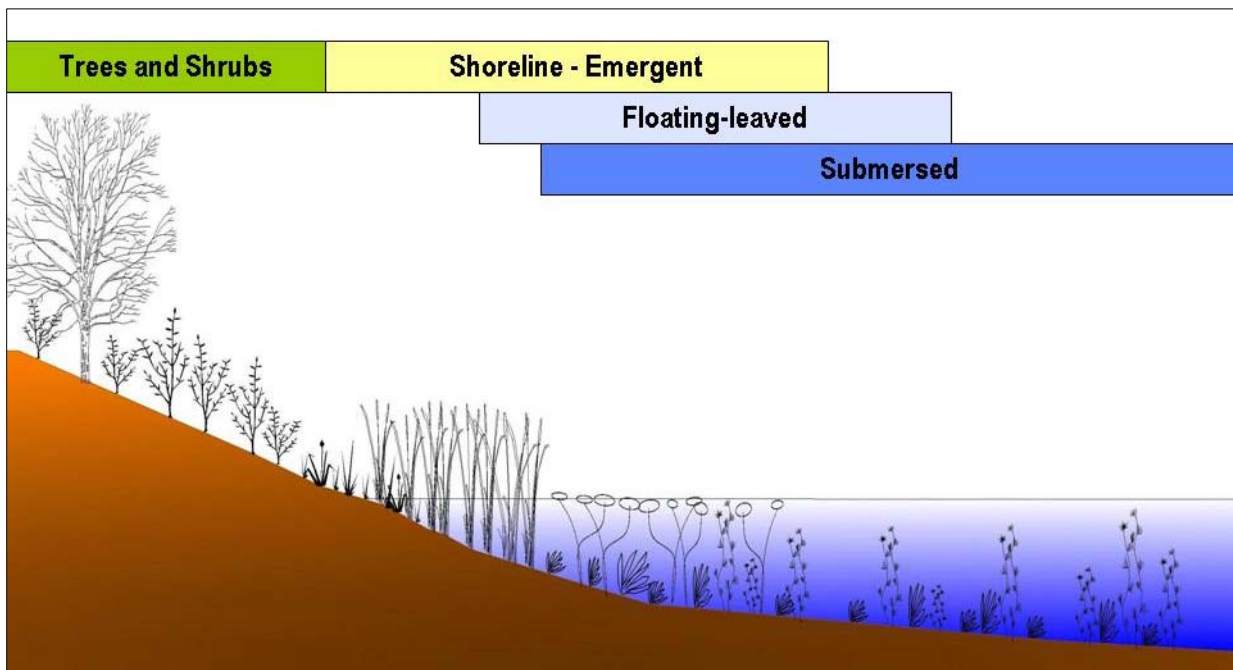
Wildlife. Further information on the DSL application and exclosure design requirements may be obtained from the DLWID.

PLANT TYPES AND ZONES

Physical and environmental factors determine which plant species survive in different parts of a landscape: from the upland area around a lake, to the shoreline, and into the lake. Soil moisture, slope, wave impacts, water depth, and sun availability act in concert along this continuum to provide suitable conditions for different plant species.

This continuum is often discussed in terms of the ordinary high water mark (OHWM), or the *line on the bank made by the water when it rises to its highest level each year to the limit of upland vegetation (not to be confused with the flood line)*. At Devils Lake, the OHWM is 10.4 feet above mean sea level (MSL). If you are unsure of the OHWM around your property, consider using stakes to monitor water levels over an extended period of time or better yet, over several seasons.

The plants listed in this guide are separated into four vegetation types, based largely on their growth form and survivability in relation to the OHWM: 1) Trees and Shrubs, Shoreline-Emergent, Floating-leaved, and Submersed.



Trees and Shrubs

Native trees and shrubs help to percolate water down through the sediment, thereby avoiding some overland water flow that can lead to increased erosion. They also provide an opportunity to “frame” your property line and viewscape and act as centerpieces for other plants, contributing to a more natural feel. Simultaneously, they provide privacy both between properties and from on-lake users. The trees and shrubs listed in this guide are known to occur in or near lake shorelines, wet meadows, and even into upland areas. Examples include: red-osier dogwood, Pacific willow, Pacific ninebark and other willows.

Shoreline-Emergent

Shoreline-emergent plants grow along the edges of lakes or on moist ground. Some of the most beneficial shoreline stabilization may be obtained by this plant community. Plants in this group prefer moist to wet soils and include low-growing ground covers and emergent species. Examples include: sedges, cattail, common spikerush, bulrush, and bur reed.

Floating-leaved Aquatic

Floating-leaved aquatic plants form a mat of stems, leaves, and flowers that grow on the water surface. They typically grow near the shoreline in water less than three feet deep. Floating-leaved plants provide habitat and cover for wildlife and waterfowl. Examples include: water smartweed, western yellow pond lily, and floating-leaved pondweed.

Submersed Aquatic

Submersed aquatic plants grow completely underwater (except for some flowers and fruits). Some only grow a few inches while others grow to the water surface where they “top out”. “Top out depth” refers to the maximum depth a plant stem can grow and still reach the water surface. That is, a plant may top out in 4 ft. of water, beyond which it would not likely reach the water surface. Top out depth depends on species, light, the slope of the lake bottom, wave action, grazing, and sediment nutrients. The physical presence of submersed plants reduces sediment resuspension by wave action and provides important habitat and food for numerous organisms, including waterfowl, fish and aquatic invertebrates. Submersed plants are particularly vulnerable to control by grass carp currently in Devils Lake. Efforts to restore the submersed plant community should include structures to exclude grass carp herbivory; however, permits are required for installation and property owners should consult with the DLWID prior to installation. Examples of submersed plants include: clasping-leaved pondweed, slender naiad, and small pondweed.



Common Name(s): Douglas spirea
 Scientific Name(s): *Spiraea douglasii*
 Growth Form: Tree/shrub
 Height: 3 to 11 ft.
 Sun Exposure: Full sun to part shade
 Reproduction: Seed, rhizome
 Propagation: 1 or 2 gal. pots
 Planting Zone: Moist to wet
 Planting Guidance: Plant 6-8 feet on center during fall/winter/spring when ground is moist
 Comments: Rapidly spreading and can crowd out other plantings; only plant in areas where quick cover and limited diversity is desired



Spiraea douglasii (Douglas Spirea)
 East Co. Oregon Wetlands
 2/19/2016
 © 2016 Kari Murie, courtesy of Oregon Flora Project



Spiraea douglasii var. *douglasii* (Douglas Spirea)
 Douglas Spirea
 Harney Co., Jackson Prairie Wetlands, Clatsop, 41° 50' 19" N, 123° 2' 20" W
 June 13, 2016, K. Murie
 © 2016 Kari Murie, courtesy of Oregon Flora Project



Spiraea douglasii var. *douglasii* (Douglas Spirea)
 Douglas Spirea
 Josephine Co., Clear Creek Center, Smith, site code 1185, 42° 27' 6.38" N, 123° 41' 50.81" W
 June 27, 2017
 © 2017 Kari Murie, courtesy of Oregon Flora Project



Common Name(s): Hookers willow
Coast willow

Scientific Name(s): *Salix hookeriana*

Growth Form: Tree

Height: Up to 10 to 20 ft./ 10 ft. spread

Sun Exposure: Sun

Reproduction: Seed; stems

Propagation: Stem cuttings (>0.5 inch around and 2.0 to 2.5 ft. long) staked into the shoreline; plant September to March

Planting Zone: Moist to wet

Planting Guidance: Plant 2-3 feet on center where water table is within one to feet of soil surface

Comments: Leaves hairy with grayish green hues; capable of withstanding salt spray; excellent for slope stabilization; fast growing





Common Name(s): Pacific ninebark
 Scientific Name(s) *Physocarpus capitatus*
 Growth Form: Tree/shrub
 Height: Up to 13 ft./10 -15 ft. spread
 Sun Exposure: Sun to shade
 Reproduction: Seed
 Propagation: 1 gal. pots, saplings
 Planting Zone: Moist to wet
 Planting Guidance: Plant 6-8 feet on center from
 October to April when
 ground is moist
 Comments: White flowers clusters in
 early summer; capable of
 withstanding a wide range of
 conditions; unusual scaly
 bark. Typically grows 10-15
 feet in height with equivalent
 spread. Known to attract
 hummingbirds and
 butterflies



Physocarpus capitatus (maxim)
 Pacific ninebark
 Josephine Co., Deer Creek Center, Belton, site code 1222, 43 281744296W 123 02154023N
 May 27, 2007
 ©2007 Ken Molten, courtesy of Oregon Flora Project



Physocarpus capitatus (maxim)
 Pacific ninebark
 Lane Co., Highway 36, northeast of Madras
 May 25, 2007, CRP collection
 © 2007 Austin Lohrer, courtesy of Oregon Flora Project



Common Name(s): Pacific willow
Scientific Name(s): *Salix lasiandra*
Growth Form: Tree/shrub
Height: Up to 20 to 40 ft.
Sun Exposure: Part shade to sun
Reproduction: Seed, stems
Propagation: Cuttings or container stock
Planting Zone: Moist to wet
Planting Guidance: Plant using live stakes
Comments: Excellent for bank stabilization





Common Name(s): Red-osier dogwood
 Scientific Name(s): *Cornus sericea*
Cornus stolonifera
 Growth Form: Tree/shrub
 Height: 4 to 15 ft./10 ft. spread
 Sun Exposure: Sun to shade
 Reproduction: Fruit, stems
 Propagation: Cuttings, container stock
 Planting Zone: Moist to wet
 Planting Guidance: Plant live cuttings 6-8 feet on center from October to April when ground is moist
 Comments: Attractive red bark during winter; survives even in shallow water; flowers white; berries pale blue; favored deer browse; often used for restoration sites though success may be less than willows





Common Name(s): Sitka spruce
Scientific Name(s): *Picea sitchensis*
Growth Form: Tree
Height: Up to 200 ft.
Sun Exposure: Sun to part shade
Reproduction: Seed
Propagation: Bare root, containers, cuttings, seed
Planting Zone: Moist to wet
Planting Guidance: Plant whole trees purchased in 2 to 15 gal. containers; can start from 5 to 10 cm cuttings treated with IBA (plant hormone that promotes root growth) and planted in sandy soil with stakes to provide stability
Comments: Evergreen; provides habitat for numerous animals including mammals, reptiles, amphibians and birds; provides winter nesting sites





Common Name(s): Vine maple
Scientific Name(s): *Acer circinatum*
Growth Form: Tree/shrub
Height: Up to 25 ft./20 ft. spread
Sun Exposure: Part shade to shade
Reproduction: Seed
Propagation: Sapling, 1 gal. pots
Planting Zone: Higher edge above shoreline
Planting Guidance: Plant 8-10 feet on center from October to April when ground is moist
Comments: Attractive spring and fall color; quick growth; forms dense thickets





Shoreline-Emergent

Common Name(s): Awl-fruited sedge
Saw-beaked sedge
Stalk grain sedge

Scientific Name(s): *Carex stipata*

Growth Form: Emergent grass-like

Height: Up to 3.5 ft.

Sun Exposure: Part shade to sun

Reproduction: Seed

Propagation: Seed, container, bare root, sprigs

Planting Zone: Wet

Planting Guidance: Plant 2 ft. on center for bare root or container stock. Seed in at 2 lbs/10,000 sq. ft during fall

Comments: Flowers May through August; clump forming





Shoreline-Emergent

Common Name(s):	American sloughgrass, Western sloughgrass
Scientific Name(s):	<i>Beckmannia syzigachne</i>
Growth Form:	Shoreline grass
Height:	Up to 3 ft.
Sun Exposure:	Full sun
Reproduction:	Seed
Propagation:	Cool season annual or short lived perennial grass
Planting Zone:	Shallow roots; drainage regime gradient from excessively drained to permanent, or near-permanent gravitational water available throughout most summers
Planting Guidance:	Seed at 2 lbs/10,000 ft.2 from October to April; recommend tilling soil prior to seeding to discourage weeds



©1994 Clayton J. Antieau



Shoreline-Emergent

Common Name(s): Bluejoint reedgrass
Canada Bluejoint
Canadian
reedgrass

Scientific Name(s): *Calamagrostis canadensis*

Growth Form: Shoreline emergent

Height: Up to 3 to 6 ft.

Sun Exposure: Full sun

Reproduction: Seed, rhizome

Propagation: Cool season
perennial grass
Best suited to moist
to saturated soils,

Planting Zone: but not soils
inundated by water

Planting Guidance: Seed in at 3 lbs/10,000 sq. ft from October to April when ground is moist

Comments: Blooms late June to August; may become weedy and displace desirable
vegetation; commonly used in wetland restoration projects; rhizomes bind
soil; forage for elk and deer and habitat for small mammals, waterfowl and
other birds





Shoreline-Emergent

Common Name(s): Camas
Scientific Name(s): *Camassia quamash*
Growth Form: Shoreline
Height: Up to 1 ft.
Sun Exposure: Sun to part shade
Reproduction: Tuber, seed
Propagation: 1 gal. container
Planting Zone: Dry to moist
Planting Guidance: Plant tubers in fall
Comments: Occurs primarily in seasonally wet swales (springtime). Spikes of bluish-purple flower clusters. Important plant for Native American use



Camassia quamash (native)
Benton Co., Corvallis
May 5, 2011. QFP confirmed
© 2011 Alston Linton, courtesy of Oregon Flora Project



Camassia quamash (native)
Lane Co., photographer's yard
May 13, 2008. QFP confirmed
© 2008 Bruce Newhouse, courtesy of Oregon Flora Project



Shoreline-Emergent

Common Name(s): Broad-leaved cattail
Scientific Name(s): *Typha latifolia*
Growth Form: Emergent
Height: Up to 5 to 8 ft.
Sun Exposure: Sun to part shade
Reproduction: Seed, rhizome
Propagation: Bare root, container, seeds
Planting Zone: Moist to wet
Planting Guidance:
Comments: Readily spreads so direct planting is probably not necessary; attractive to birds; easily confused with narrow-leaf cattail (*T. angustifolia*) which grows deeper and tends to be very invasive





Shoreline-Emergent

Common Name(s): Common spikerush
Scientific Name(s): *Eleocharis palustris*
Growth Form: Emergent
Height: 1.5 ft.
Sun Exposure: Full sun
Reproduction: Rhizome
Propagation: Seeds, sprigs, plugs
Planting Zone: Moist to wet
Planting Guidance: Seeds (do not cover); plugs 12 to 18 in apart



Comments: Can survive permanent water inundation for up to 4 mos. or where water table seasonally drops to 12 in. below water table; good for erosion control and wildlife food and cover





Shoreline-Emergent

Common Name(s): Golden sedge
Scientific Name(s): *Carex aurea*
Growth Form: Shoreline grass
Height: Up to 1.5 ft.
Sun Exposure: Full sun to part shade
Reproduction: Rhizomes
Propagation: Bare root, seed, sprigs, container
Planting Zone: Moist to wet
Planting Guidance: Plant approximately 1,700 to 4,800 per acre
Comments: Low growing ground cover; brilliant foliage of gold with green margins



©2005 Ben Legler



Photo credit: University of Minnesota Extension



Shoreline-Emergent

Common Name(s):	Marsh cinquefoil Purple marshlocks
Scientific Name(s):	<i>Comarum palustre</i> <i>Potentilla palustris</i>
Growth Form:	Shoreline; sprawling perennial
Height:	Up to 2 ft.
Sun Exposure:	Partial shade to full sun
Reproduction	Stolon
Propagation:	Seeds; rhizomes
Planting Zone:	Wet
Planting Guidance:	Seeds may be ordered, however they may be difficult to find commercially
Comments:	Flowers deep red, turning purple late summer; sprawls along the shoreline; flowers produce foul odor to attract pollinators; currently in bog at Devils Lake



Comarum palustre (purple)
marsh cinquefoil, purple marshlocks
Linné (1753) - North Park, Middle Fork
photo by Bruce Nestor/USFWS 2013. CNF Landmark
© 2013 Bruce Nestor/USFWS (courtesy of Oregon Trust Project)



Shoreline-Emergent

Common Name(s): Narrow-leaf bur reed
 Scientific Name(s): *Sparganium angustifolium*
 Growth Form: Submersed, floating, sometimes emergent
 Depth: Up to 3 to 9 ft.
 Sun Exposure: Full sun to part shade
 Reproduction: Seed
 Propagation: Seed; divided plants
 Planting Zone: Wet
 Planting Guidance: Plant whole plants or seedlings directly in place during the summer



Sparganium angustifolium (native)
 Floating bur reed, narrow leaf bur reed
 Lake U.S. near Okech
 Aug. 12, 2008 (D.F. confirmed)
 © 2008 Gerald D. Carr, courtesy of Oregon Flora Project

Comments: A closely related species, broad-fruit bur reed (*Sparganium eurycarpum*) is also native; however, it is known to be problematic in some western waters. Other closely related, but non-native species are widely available but should NOT be planted (e.g., European bur reed, *S. emersum*)



Sparganium angustifolium (native)
 Floating bur reed, narrow leaf bur reed
 Jefferson Co., Jack Lake, Canyon Creek Meadows Trailhead, near Mount Jefferson Wilderness, 1870m
 Aug. 12, 2008 (D.F. confirmed)
 © 2008 Gerald D. Carr, courtesy of Oregon Flora Project



Shoreline-Emergent

Common Name(s): American mannagrass
Scientific Name(s): *Glyceria grandis*
Growth Form: Shoreline grass-like
Height: Up to 3 to 4 ft.
Sun Exposure: Sun to shade
Reproduction: Seed
Propagation: Seed; transplants
Planting Zone: Moist to wet
Planting Guidance: Whole plants in moist soil (saturated during first growing season)



Comments: May grow as single plant or in clumps; rapidly establishes; desirable understory; waterfowl feed on seeds; provides cover for wildlife; does not tolerate salinity. A closely related species, reed mannagrass (*Glyceria maxima*), is highly invasive





Shoreline-Emergent

Common Name(s): Panicked bulrush
Small-fruited bulrush

Scientific Name(s): *Scirpus microcarpus*

Growth Form: Shoreline emergent

Height: 20 to 60 in. tall

Sun Exposure: Shade intolerant

Reproduction: Rhizomes

Propagation: Bare root, container, seeds, sprigs

Planting Zone: Moist to wet

Planting Guidance: Plant bare root plants in saturated soils

Comments: Blooms June to August; rapid growth rate ;valuable food and nesting habitat for wildlife; rapid growth; an alternative to taller growing cattails





Shoreline-Emergent

Common Name(s): Slough sedge
Scientific Name(s): *Carex obnupta*
Growth Form: Emergent; grass-like
Height: Up to 3 ft. tall
Sun Exposure: Part shade to sun
Reproduction: Rhizomes, seeds
Propagation: Bare root, seedlings, container stock
Planting Zone: Moist to wet
Planting Guidance: One plant per 3 ft. on center
Comments: Evergreen under some conditions; valuable cover and food for wildlife; provides erosion protection; spreads quickly and is frequently used for restoration





Shoreline-Emergent

Common Name(s):	Three square bulrush Common bulrush
Scientific Name(s):	<i>Schoenoplectus pungens</i> <i>Scirpus americanus</i> <i>Scirpus pungens</i>
Height:	Up to 3 ft. tall
Sun Exposure:	Shade to full sun
Reproduction:	Rhizomes; seeds
Propagation:	Rhizomes; (and seeds but not recommended)
Planting Zone:	Shoreline to approx. 1 ft. deep
Planting Guidance:	Transplanting whole plants for greatest success
Comments:	Emergent; seeds consumed by wetland birds; emergent stems provide nesting habitat birds; submersed stems provide habitat for aquatic invertebrates; fast colonizer



Photo credit: Alabama Department of Conservation and Natural Resources



Photo credit: ©1999 Fred Weinmann



Shoreline-Emergent

Common Name(s):	Stream violet
Scientific Name(s):	<i>Viola glabella</i>
Height:	Less than 0.5 ft. tall
Sun Exposure:	Part shade to shade
Reproduction:	Rhizome, seed
Propagation:	Container plants
Planting Zone:	Moist to wet
Planting Guidance:	Plant as other common landscaping plant – dig hole to about 2 inches deeper than container in moist area, further moisten the sediment, insert plant and cover.
Comments:	Shoreline groundcover; flowers yellow; limited stabilization value; dies back in winter





Shoreline-Emergent

Common Name(s): Tufted hairgrass
Tussock grass

Scientific Name(s): *Deschampsia cespitosa*

Height: Variable, up to 5 ft. tall with approximately 12 in. spread

Sun Exposure: Partial shade

Reproduction: Seed

Propagation: Tuber, cuttings/stakes; seeding

Planting Zone: Shoreline; dry to moist

Planting Guidance: 2 to 3 lbs. seed/acre in spring or fall (cut to ½ lb. in areas where greater plant diversity is sought; divided whole plants in late spring;

Comments: Attractive in groups for meadow effect; tuft-forming; occurs in both fresh- and salt-water areas; intolerant of year-round flooding; known to attract butterflies



Deschampsia cespitosa (Native)
tufted hairgrass
Lane Co., Murphy
July 22, 2008 CFP confirmed
© 2008 Bruce Newhouse, courtesy of Oregon Flora Project



Deschampsia cespitosa (Native)
tufted hairgrass
Lane Co., Murphy
July 22, 2008 CFP confirmed
© 2008 Bruce Newhouse, courtesy of Oregon Flora Project



Shoreline-Emergent

Common Name(s): Wapato
Arrowhead

Scientific Name(s): *Sagittaria latifolia*

Height: Up to 2 ft. tall

Sun Exposure: Part shade to sun

Reproduction: Stolons, rhizomes, tubers

Propagation: Potted whole plants

Planting Zone: Wet

Planting Guidance: Whole plants in fabric pots; tubers sown directly into sediment; commercially available as whole plants but will spread by seed and runners

Comments: Emergent leaves; white flowers; fast-growing; prefers gentle slopes; ducks favor the shoots, tubers, and seeds; attracts butterflies



Sagittaria latifolia (native)
broadleaf arrowhead, wapato
Columbia Co., Seaside Island
July 4, 2003 CFP confirmed
© 2003 Bruce Newhouse, courtesy of Oregon Flora Project



Sagittaria latifolia (native)
broadleaf arrowhead, wapato
Columbia Co., Seaside Island
July 4, 2003 CFP confirmed
© 2003 Bruce Newhouse, courtesy of Oregon Flora Project



Shoreline-Emergent

Common Name(s): Yellow monkey-flower
Scientific Name(s): *Mimulus guttatus*
Height: Less than 2 ft. tall
Sun Exposure: Sun to shade
Reproduction: Annual from fibrous roots or perennial from stolons, rhizomes or rooting from stem nodes; seed; stem sprigs
Propagation: Container stock
Planting Zone: Moist to wet
Planting Guidance: Plant from container in moist area
Comments: Shoreline groundcover; found on wet ledges, seeps, streams, near springs; limited stabilization value





Floating - leaved

Common Name(s):	Floating-leaved pondweed
Scientific Name(s):	<i>Potamogeton natans</i>
Maximum Depth:	Approximately 5 ft.
Reproduction:	Seed; bare root, stem fragments
Propagation:	Bare root, stem fragments
Planting Zone:	Submersed
Planting Guidance:	Commercial sources of propagules is limited
Comments:	Rapid growth rate; submersed and floating leaves differ in their shape and function





Floating - leaved

Common Name(s): Water shield
Water target

Scientific Name(s): *Brasenia schreberi*

Maximum Depth: Approximately 4 ft.

Sun Exposure: Shade intolerant

Reproduction: Rhizome, seed

Propagation: Rhizome

Planting Zone: Submersed near shoreline

Planting Guidance: Rhizomes directly into the lake bottom

Comments: Currently present in Devils Lake; rapid vegetative growth rate; may grow dense in shallow water along shoreline



Photo credit: Toni Pennington



Water shield
Brasenia schreberi
Photo by Vic Ramey
Copyright 1999 Univ. Florida

Photo credit: Vic Ramey, University of Florida/IFAS Center for Aquatic and Invasive Plants. Used with permission



Floating - leaved

Common Name(s): Water smartweed
Scientific Name(s): *Polygonum amphibium*
Maximum Depth: Approximately 3 ft.
Reproduction: Seeds, rhizomes, stolons
Propagation: Rhizomes, stolons
Planting Zone: Shallow shorelines
Planting Guidance: Commercial sources of propagules is limited
Comments: Blooms June to September; seeds provide food for waterfowl, song birds, and upland game birds



Photo credit: Toni Pennington



Floating - leaved

Common Name(s): Western yellow pond lily
Spatterdock

Scientific Name(s): *Nuphar polysepala*
Nymphaea polysepala
Nuphar polysepalum
Nuphar lutea ssp. *polysepala*
Nuphar lutea

Maximum Depth: Approx. 4 ft.

Sun Exposure: Shade intolerant

Reproduction: Rhizome, seed

Propagation: Rhizomes

Planting Zone: Submersed near shoreline

Planting Guidance: Rhizomes directly into the lake bottom

Comments: Currently present in Devils Lake; rapid vegetative growth rate; may become weedy; however, this pond lily is an alternative to fragrant water lily (*Nymphaea odorata*) which is highly invasive and should NOT be planted



Nuphar polysepala (native)
Western yellow pond lily
Clatsop Co., north of Gearhart, Highway 101, ca. 2 mi. north of Del Rey Beach State Park Road, Highland Lane
May 12, 2008 GFP confirmed
© 2008 Gerald D. Cain, courtesy of Oregon Flora Project



Nuphar polysepala (native)
Western yellow pond lily
Lake Co., MFA
photo by Bruce Neal Newhouse May 18, 2003 GFP confirmed
© 2003 Bruce Newhouse, courtesy of Oregon Flora Project



Submersed

Common Name(s): Claspingleaved pondweed
Scientific Name(s): *Potamogeton richardsonii*
Maximum Depth: 2 to 12 ft.
Top Out Depth: Approximately 9 ft.
Reproduction: Roots, rhizomes, winter buds, tubers, seeds
Propagation: Commercial sources of propagules is limited
Planting Zone: Submersed
Planting Guidance: Likely to spread from existing populations
Comments: Currently present in Devils Lake



Photo credit: Shannon Brattebo



Richardson's pondweed
Potamogeton richardsonii
Photo by Vic Ramey
Copyright 2001 Univ. Florida

Photo credit: Vic Ramey, University of Florida/IFAS Center for Aquatic and Invasive Plants. Used with permission



Submersed

Common Name(s):	Slender naiad Bushy pondweed Nodding water nymph Slender water nymph
Scientific Name(s):	<i>Najas flexilis</i>
Maximum Depth:	Approximately 13 ft.
Top Out Depth:	Generally no greater than 5 ft.
Reproduction:	Stem sprigs, seed
Propagation:	Seed; stem fragments
Planting Zone:	Submersed
Planting Guidance:	Likely to spread from existing populations
Comments:	Currently present in Devils Lake; eaten by waterfowl and provides shelter for aquatic insects and small fish; capable of growing to about 2 ft.; will likely spread on its own; known to become very dense in some western lakes



Photo credit: Don Cameron



Submersed

Common Name(s): Small pondweed
Lesser pondweed

Scientific Name(s): *Potamogeton pusillus*

Maximum Depth: Approximately 15 ft.

Top Out Depth: Approximately 4 to 6 ft.

Reproduction: Seeds; winter buds

Propagation: Commercial sources of propagules is limited

Planting Zone: Submersed

Planting Guidance: See Propagation; if still present in Devils Lake then likely to spread from existing populations

Comments: Previously known to occur in Devils Lake; tolerates brackish conditions; submersed stems may grow to water surface; seeds provide food for wildlife



Virginia Tech Weed I.D. Guide



Common Name(s): White water buttercup
White water crowfoot

Scientific Name(s): *Ranunculus aquatilis*

Maximum Depth: Approximately 15 ft.

Top Out Depth: Less than 6 ft.

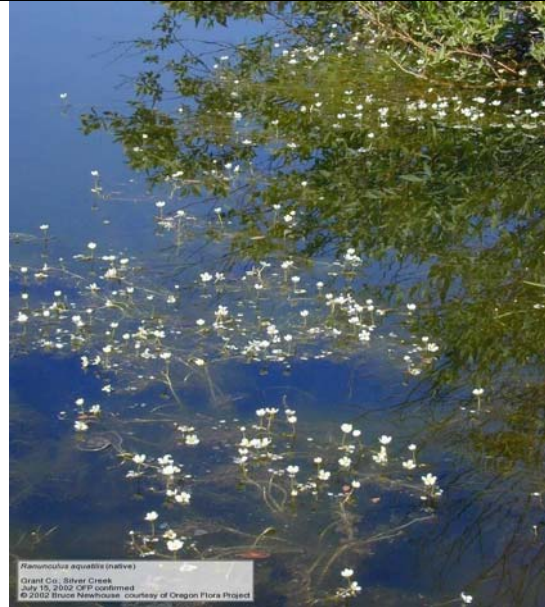
Reproduction: Seeds; stem
fragments

Propagation: Stem fragments

Planting Zone: Submersed

Planting Guidance: Roots are produced
along the lower
portions of the stems
that can be either
directly planted or
potted in peat pots

Comments: Submersed stems,
some floating leaves,
emergent flowers;
fruits eaten by
waterfowl



Ranunculus aquatilis (native)
Grant Co., Silver Creek
July 15, 2002 CFP confirmed
© 2002 Bruce Henchouse, courtesy of Oregon Flora Project



Ranunculus aquatilis var. *aquatilis* (native)
leafy water buttercup
Lane Co., Spectra North, Roosevelt Avenue, Eugene, 130m
May 1, 1991
© 1991 Wilcox L. Bluhm, courtesy of Oregon Flora Project



Submersed

Common Name(s): Illinois pondweed
Scientific Name(s): *Potamogeton illinoensis*
Maximum Depth: Approximately 15 ft.
Top Out Depth: Approximately 8 ft.
Reproduction: Rhizomes, seeds, tubers
Propagation: Tubers
Planting Zone: Shallow shorelines



Illinois pondweed
Potamogeton illinoensis
Photo by A. Murray
Copyright 2001 Univ. Florida

Photo credit: A. Murray, University of Florida/IFAS Center for Aquatic and Invasive Plants. Used with permission

Planting Guidance: Place some damp soil and 3 to 5 tubers per bag and either tie or staple the bag closed. Drop into the water, or better yet, push or bury the bag slightly into the soil (being careful not to damage the tubers)

Comments: Tubers provide food for waterfowl; floating leaves may or may not be present



Common Name(s): Fern-leaf pondweed
Robbins' pondweed
Scientific Name(s): *Potamogeton robbinsii*
Maximum Depth: Approximately 15 ft.
Top Out Depth: Typically does not top out
Reproduction: Seeds, rhizomes, winter buds
Propagation: Rhizomes, stems
Planting Zone: Submersed shorelines to deeper open water



Planting Guidance: Very little information is available on planting guidance for plant; however, some nurseries may have the capability of rearing starts for restoration projects
Comments: A robust, usually low growing submersed plant that only tops out during flowering (late summer); slow growth rate with moderate vegetative spread; stems can grow to 5 ft.; although typically around 2 ft. tall



Underwater observers network
Copyright (C) Blaise Barréte 2019

Photo credit: Underwater Observers Network (www.rosm.ca)



Submersed

Common Name(s): Quillwort
Scientific Name(s): *Isoetes* sp.
Maximum Depth: Prefers deeper water, up to approximately 25 feet
Top Out Depth: Does not top out
Reproduction: Spores
Propagation:
Planting Zone: Completely submersed or moist sediment, depending on the species



Photo credit:

Planting Guidance: Very little information is available on planting guidance for plant as it largely spreads by spores; *Isoetes lacustris* available for purchase online (bare root); however, this species is not native to the west coast (USDA PLANTS Database (<http://plants.usda.gov>))

Comments: There are at least three quillwort species in the vicinity of Devils Lake – largely differentiated by the number of lobes on the corm (underground stem) and habitat (completely submersed or moist sediment). Sources for this plant may be difficult to find; however, *Isoetes nuttallii* (Nuttall's quillwort) is common to lakes along the Oregon coast

GLOSSARY

Erosion - The process by which soil or rock material is worn down and carried away by wind or water; erosion is increased when vegetation is removed and soil is left exposed.

Infiltration - Water seeping into the ground through pores in soil, sand, or gravel or through cracks in bedrock; infiltration can help minimize erosion.

Ordinary High Water Mark (OHWM) - Line on the bank made by the water when it rises to its highest level each year to the limit of woody vegetation (not to be confused with the flood line).

Propagule - Typically vegetative portions of a plant, such as a bud or other offshoot, that aid in dispersal of the species and from which a new individual may develop.

Rhizomes – Root like subterranean stem, commonly horizontal that typically produces roots below and shoots above.

Riparian zone - Land area adjacent to a stream or lakeshore that may experience periodic flooding or a high water table.

Runoff - Water flowing over the surface of land or soil; runoff can cause erosion and is increased when surfaces are paved or covered with roofs, patios, or decks.

Stolon – A horizontal stem just below the ground surface that can produce new plants from buds at its tips or nodes.

Top out depth - Maximum depth a plant stem can grow and still reach the water surface

Topography - Shape or contour of the land; topography and slope influence how property should be developed; construction or /other activity on steep slopes increases runoff and erosion.

Tuber - An enlarged, fleshy, and reproductive food-storage structure produced on an underground stem.

Turion - An overwintering structure that is scaly or often thick and fleshy that detaches and spouts in the spring.

Vegetative reproduction - ability of plants to reproduce without sexual reproduction, by producing new plants from existing vegetative structures.

Watershed - The drainage basin or area in which surface water drains toward a lake or stream; ground water flow may or may not parallel surface topography.

Appendix A Non-native Plant Species to Avoid

Common Name	Scientific Name
Indigo bush	<i>Amorpha fruticosa</i>
Giant reed	<i>Arundo donax</i>
Butterfly bush	<i>Buddleia davidii</i> (and its cultivars)
Flowering rush	<i>Butomus umbellatus</i> ^a
Fanwort	<i>Cabomba caroliniana</i>
Pondwater starwort	<i>Callitriche stagnalis</i>
Scotch broom*	<i>Cytisus scoparius</i> ^b
Striated broom	<i>Cytisus striatus</i> ^b
Brazilian elodea*	<i>Egeria densa</i> ^b
Asian anacharis	<i>Egeria najas</i>
Water hyacinth	<i>Eichhornia crassipes</i>
Hairy willowherb	<i>Epilobium hirsutum</i>
Giant horsetail	<i>Equisetum telmateia</i> ^b
French broom	<i>Genista monspessulana</i>
Reed sweetgrass	<i>Glyderia maxima</i>
English ivy*	<i>Hedera helix</i>
Hydrilla	<i>Hydrilla verticillata</i> ^a
European frog-bit	<i>Hydrocharis morsus-ranae</i>
Policeman's helmet	<i>Impatiens glandulifera</i> ^b
Yellow flag iris*	<i>Iris pseudacorus</i>
Water primrose	<i>Ludwigia hexapetala</i>
Floating primrose-willow	<i>Ludwigia peploides</i>
Uruguayan water primrose	<i>Ludwigia uruguayensis</i>
Creeping jenny*	<i>Lysimachia nummularia</i>
Spotted loosestrife	<i>Lysimachia punctata</i>
Garden yellow loosestrife	<i>Lysimachia vulgaris</i>
Purple loosestrife*	<i>Lythrum salicaria</i>
Parrotfeather	<i>Myriophyllum aquaticum</i> ^b
Variable-leaf milfoil	<i>Myriophyllum heterophyllum</i>
Eurasian watermilfoil*	<i>Myriophyllum spicatum</i> ^b
Fragrant waterlily*	<i>Nymphaea odorata</i>
Yellow floating heart	<i>Nymphoides peltata</i> ^a
Reed canary grass*	<i>Phalaris arundinaceae</i>
Common reed	<i>Phragmites australis</i> ssp. <i>australis</i> ^a
Japanese knotweed*	<i>Polygonum cuspidatum</i>
Himalayan knotweed*	<i>Polygonum polystachyum</i>
Giant knotweed*	<i>Polygonum sachalinense</i>
Curlyleaf pondweed	<i>Potamogeton crispus</i>
Creeping buttercup	<i>Ranunculus repens</i>
Watercress	<i>Rorippa nasturtium-aquaticum</i>
Creeping yellow cress	<i>Rorippa sylvestris</i> ^b
Himalayan blackberry*	<i>Rubus armeniacus</i> ^b
Grass-leaved arrowhead	<i>Sagittaria graminea</i>
Delta arrowhead	<i>Sagittaria platyphylla</i>
Bur- or sessile-fruited arrowhead	<i>Sagittaria rigida</i>

Common Name	Scientific Name
Giant salvinia	<i>Salvinia molesta</i>
Bog bulrush	<i>Schoenoplectus mucronatus</i>
Smooth cordgrass	<i>Spartina alterniflora</i> ^{a, t}
Common cordgrass	<i>Spartina anglica</i> ^{a, t}
Denseflower cordgrass	<i>Spartina densiflora</i> ^{a, t}
Saltmeadow cordgrass	<i>Spartina patens</i> ^{a, t}
Spanish broom	<i>Spartium junceum</i>
Water chestnut	<i>Trapa natans</i> ^a
Narrowleaved cattail	<i>Typha angustifolia</i>
Gorse	<i>Ulex europaeus</i> ^b
Swollen bladderwort	<i>Utricularia inflata</i>
Tapegrass*	<i>Vallisneria americana</i>

* Known to occur in Devils Lake or its watershed

^a Oregon Department of Agriculture Class A Noxious Weed

^b Oregon Department of Agriculture Class B Noxious Weed

^t Oregon Department of Agriculture Target Weed

Appendix B Additional Resources and Sources of Plant Material

	Upland plants	Emergent plants	Submersed plants	Shoreline overview	Native plants	Non-Native plants/other species	Rare/Threatened plants	Restoration
Additional Resources								
Blue Green Thumb www.bluegreenthumb.com	X	X		X	X	X		
Blue Thumb: Planting for Clean Water http://www.bluethumb.org/shorelines	X	X	X					
Burke Museum of Natural History and Culture http://biology.burke.washington.edu/herbarium/imagecollection.php	X		X		X	X		
California Native Plant Link Exchange http://www.cnplx.info/	X	X	X		X			
CalPhotos Database http://calphotos.berkeley.edu/	X							
Consortium of Pacific Northwest Herbaria http://www.pnwherbaria.org/resources.php#databases	X				X			
Garden Guides www.garden-guides.com	X	X	X		X			
<i>Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species</i> http://www.usbr.gov/ppsl/								
King County Native Plant Guide http://green.kingcounty.gov/gonative/Index.aspx	X				X			
Minnesota Shoreland Management Resource Guide http://www.shorelandmanagement.org/index.html				X				
Oregon Department of Fish and Wildlife (pg. 28) New Zealand Mudsail Decontamination Protocols http://oregonstate.edu/dept/ODFW/spawn/pdf%20files/reports/09SiteVerificationManual.pdf						X		
Oregon Department of Forestry Riparian species www.oregon.gov/ODF/FIELD/Nursery/Native_Plants.shtml	X				X			
Oregon Department of State Lands: Riparian Restoration http://www.oregon.gov/DSL/PERMITS/bioengineering.shtml		X						X
Oregon Flora Project http://www.oregonflora.org/index.php	X						X	
Oregon Native Plant Nurseries http://www.plantnative.com/nd_or.htm	X				X			
Oregon Native Plant Society http://www.npsoregon.org/	X	X			X		X	
Oregon State University http://seedcert.oregonstate.edu								
Oregon State University, Yamhill County Extension Service (select Eco Gardening, then Streamside Gardening) http://extension.oregonstate.edu/yamhill/				X	X	X		
Planting the Seed from Environment Canada http://www.on.ec.gc.ca/wildlife/docs/doc-planting-e.html#planting		X	X		X	X		X

	Upland plants	Emergent plants	Submersed plants	Shoreline overview	Native plants	Non-Native plants/other species	Rare/Threatened plants	Restoration
Sound Native Plants http://www.soundnativeplants.com/index.htm	X	X	X	X				X
Streambank Revegetation and Protection: A Guide for Alaska http://www.sf.adfg.state.ak.us/sarr/restoration/techniques/techniques.cfm	X	X	X	X				X
USDA Plants Database http://www.plants.usda.gov/	X	X	X			X	X	
Washington Department of Ecology http://www.ecy.wa.gov/programs/wq/plants/plantalgaeid.html		X	X			X		
Sources of Plant Material and Information								
Bear Valley Nursery and Landscape 2114 U.S. 101 Lincoln City, OR 97367-2251 (541) 996-2327	X	X			X			X
Blake's Coastal Nursery 6750 Gleneden Beach Loop Rd Gleneden Beach, OR 97388 (541) 764-5140	X	X	X		X			
Champoeg Nursery 9661 Yergen Rd. NE Aurora, OR 97002 (503) 678-6348 http://champoegnursery.com/	X	X			X			
Coyote Gardens Katie Brehm, BLA Neskowin, OR (503) 392-9439								X
Echo Valley Natives 18883 S. Ferguson Rd. Oregon City, OR 97045 (503) 631-2451 www.echovalleynatives.com	X	X			X			
Fourth Corner Nurseries www.uwsp.edu/uwexlakes/conventions/2010								
Freshwater Farms, Inc. 5851 Myrtle Avenue Eureka, CA 95503-9510 (800) 200-8969 http://www.freshwaterfarms.com/	X	X	X		X			X
Kester's Wild Game Food Nurseries, Inc. (800) 558-8815 Email: pkester@vbe.com http://www.kestersnursery.com/index.htm	X	X	X					
Oak Point Nursery, Willamette Valley (503) 508-9555 http://www.oakpointnursery.com	X				X			
North Fork Native Plants Driggs, ID (877) 444-6996 www.nativesolutions.com	X	X			X			X

	Upland plants	Emergent plants	Submersed plants	Shoreline overview	Native plants	Non-Native plants/other species	Rare/Threatened plants	Restoration
Plant Native (list of native plant nurseries) http://www.plantnative.com/nd_or.htm	x	x	x		x			
Plant Oregon – The Nursery on Wagner Creek 8677 Wagner Creek Rd. Talent, OR 97540 (541) 535-3531 http://www.plantoregon.com/	x							
River Refuge Seed Company 26366 Gap Road Brownsville, OR 97327 (541) 466-5309 http://riverrefugeseed.com/index.html	x	x			x			x
Scholls Valley Native Nursery, LLC Tigard, OR (503) 624-1766 http://www.schollsvalley.com	x	x			x			
Spiros Landscapes 3822 NE Megginson St. Newport, OR 97365 (541) 265-5115	X	X			X			x
Wallace W Hansen 2158 Bower Ct. S.E. Salem, OR 97317-9216 (503) 581-2638 www.nwplants.com	x	x			x			

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