Target Ecosystems for Natural Areas in Kirkland

An essential step in any restoration project is having a mental picture of how the site is expected to appear and function following restoration. It is important to develop, clear, achievable and measurable restoration goals. For example, the goal may be to restore a site to forested conditions with at least 100 conifer trees per acre. Knowing that goal will affect not only plant selections and spacing, but also maintenance prescriptions to ensure conifer survival.

Relatively undisturbed natural areas can be used as reference sites or models to set these goals. While it is unrealistic to expect to restore a disturbed natural area to historical conditions, particularly in a developed urban area subject to constantly changing conditions, such a reference system serves as a useful starting point and as a yardstick against which to measure progress.

Ecosystems in Kirkland

Naturally occurring ecosystems in Washington have been well-documented. Descriptions of these systems can be found on the Washington State Department of Natural Resources and U.S. National Vegetation Classification websites. Based on these descriptions, we have identified eight broad target ecosystems for natural areas found in Kirkland parks and open spaces.

- Novel Ecosystems
- Freshwater Marsh
- Scrub-shrub Wetland
- Forested Swamp
- Wet to Moist Conifer-Deciduous Forest
- Moist to Dry Conifer-Deciduous Forest
- Dry Forest and Woodland
- Landslide Forest and Shrubland

A dominant target ecosystem has been assigned to each restoration management unit. However, conditions within a management unit may be variable, within each target ecosystem there may be different plant communities. Stewards and project managers are encouraged to use descriptions of target ecosystems as a general guide and to tailor planting plans and maintenance prescriptions based on smaller scale site conditions.

The descriptions in this document include a list of plants commonly found in each ecosystem. This is not an exhaustive list. Dominant plant species are printed in bold; plant species in parentheses are commonly seen at some sites but in small amounts.

Novel Ecosystems

In developed urban areas, there may be site limitations precluding the use of a naturally occurring ecosystem as a reference system. This includes sites where:

- soil conditions have been degraded through historical land use, e.g. where topsoil has been removed
- view corridors need to be maintained, thus limiting the planting palette to low-growing vegetation
- sightlines need to be maintained for safety reasons, e.g. along trails and near roads
- the presence of features such as manhole covers, stormwater drains, rain gardens, or overhead powerlines, limit the type of vegetation that can be installed
- a specific land use has been designated for that site such as a butterfly garden or edible plants.

Freshwater Marsh

General Description:

Permanently to semi-permanently flooded wetlands dominated by emergent herbaceous species, mostly tall graminoids such as small-fruited bulrush, slough sedge and broad-leaf cattails. These systems typically occur in a mosaic with other wetland types, often along edges of lakes and ponds or stream floodplains.

Vegetation:

Trees and shrubs are absent or sparse.

Ground layer: broad-leaf cattail, common spike rush, small-flowered bulrush, hard-stem bulrush, slough sedge, soft rush, small-fruited bulrush.

Disturbed sites: These sites are typically degraded and dominated by non-native invasive vegetation like reed canary grass, narrowleaf cattail, purple loosestrife and garden loosestrife.

Additional reading:

Rocchio, F.J. & Crawford, R.C. (2015) *Ecological Systems of Washington State. A guide to Identification.* https://www.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf?nglki. Natural Heritage Report 2015-04, p. 322.

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org]. *G517 Deschampsia beringensis - Argentina egedii - Carex obnupta Vancouverian Freshwater Coastal Marsh & Wet Meadow Group.* https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=848795

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org]. *M301 Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup.* https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=860623

Scrub-Shrub wetland

General Description:

Scrub-shrub swamps are dominated by tall deciduous shrubs and located in depressions and around lakes or ponds where water tables fluctuate seasonally, commonly occurring in a mosaic with other wetland types.

Vegetation:

These wetlands are typically dominated by one or more of the following tall shrub species: **willows, red-twig dogwood**, **Douglas spiraea.** Other shrubs may include Pacific crabapple and salmonberry.

Ground layer: sedges, horse tail, skunk cabbage.

Disturbed sites: Reed canary grass is frequently present in the ground layer.

Additional reading:

Rocchio, F.J. & Crawford, R.C. (2015) *Ecological Systems of Washington State. A guide to Identification.* https://www.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf?nglki. Natural Heritage Report 2015-04, p. 283.

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org]. *A3834 Cornus sericea Pacific Slope Shrub Swamp Alliance.* https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=899886

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org]. *A3835 Salix hookeriana - Salix sitchensis - Spiraea douglasii Wet Shrubland Alliance.* https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=899887

Forested Swamp

General Description:

Saturated or seasonally flooded mixed conifer-deciduous forests occurring at seep sites, edges of lakes and streams or small patches in depressions. Often hummocky topography due to downed trees. Very diverse hydrophytic/wetland vegetation growing in wet depressions and shrubs and trees establishing on drier microsites.

Vegetation:

Overstory trees: **western hemlock, western redcedar**, **Sitka spruce**, **red alder**, **Oregon ash**, black **cottonwood, bigleaf maple**, **Pacific willow,** cascara, grand fir, shore pine, paper birch.

Tall shrubs: **devil's club**, **willows**, **salmonberry, red-twig dogwood**, thimbleberry, vine maple, stink currant, salal, snowberry, Douglas spiraea, sweet gale, beaked hazelnut, black twinberry, stink currant, Pacific ninebark, red elderberry, high-bush cranberry.

Ground layer: **skunk cabbage**, **slough sedge**, **lady fern**, **piggyback plant**, **Dewey sedge** deer fern, western sword fern, false lily-of-the-valley, salal, enchanter's nightshade, Siberian miner's lettuce, spreading woodfern, blue wildrye, northern oak fern, water parsley, redwood sorrel, coltsfoot, Cooley's hedge nettle, clasping twisted stalk, rosy twisted stalk, foamflower, false bugbane, stinging nettle.

ID Tips:

- Poorly drained mucky sites with standing water in depressions at least part of the year.
- Plants only found in wetlands, such as skunk cabbage are always present. Other moisture-loving species like piggyback plant, slough sedge, lady fern, horsetail and salmonberry are common.
- At disturbed sites the tree canopy is often dominated by deciduous trees like bigleaf maple, red alder, and black cottonwood. Salmonberry may be dominant. Stinging nettle commonly found.
- Dominant invasive understory species may include reed canary grass or creeping buttercup, in addition to Himalayan blackberry and/or English ivy.

Additional reading

- Rocchio, F.J. & Crawford, R.C. (2015) *Ecological Systems of Washington State. A guide to Identification.* https://www.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf?nglki. Natural Heritage Report 2015-04, p. 278.
- USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org] CEGL007322 Tsuga heterophylla - (Thuja plicata, Alnus rubra) / Lysichiton americanus - Athyrium filix-femina Swamp Forest. https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=979484
- USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org] CEGL003388 Alnus rubra / Athyrium filix-femina - Lysichiton americanus Swamp Forest. https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=684932

Wet to Moist Conifer-Deciduous Forest

Hydrology & Soils:

Conifer-deciduous mixed forest with overstory canopy characterized by Douglas-fir and/or western hemlock and/or western redcedar. The understory is dominated by western sword fern and/or salmonberry or devil's club. Soils are well-drained to poorly drained and well-watered from upstream sources, seeps or streams, but not wet enough to support wetland plants.

Vegetation:

Dominant overstory trees: **Douglas-fir, western hemlock and/or western redcedar**

Co-dominant or understory trees: **grand fir, bigleaf maple, red alder, black cottonwood**, Oregon ash, Sitka spruce, western yew, Pacific dogwood, cascara (paper birch, western white pine)

Tall shrubs: **salmonberry**, **vine maple**, **devil's club, red elderberry, red huckleberry**, beaked hazelnut, Indian plum, snowberry, evergreen huckleberry, ocean spray, stink currant, bald hip rose, blackcap raspberry, serviceberry, swamp currant, Scouler's willow, black twinberry, western crabapple

Ground layer: **sword fern**, **lady fern**, **spreading woodfern, Pacific waterleaf, Pacific bleeding heart**, western trillium, dull Oregon-grape, trailing blackberry, salal, bracken fern, orange honeysuckle, Dewey sedge, deer fern, fringe cup, piggyback plant, vanilla leaf, wild lily of-the-valley, enchanter's nightshade,

Siberian miner's lettuce, stinging nettle, western starflower, licorice fern, mountain sweet-cicely (maidenhair fern, wild ginger, goats beard, three-flowered bedstraw, rattlesnake plantain, twinflower, large false Solomon's seal, star-flowered Solomon's seal, redwood sorrel, Smith's fairy bells, clasping twisted stalk, foamflower, pioneer violet, evergreen violet, pathfinder, Hooker's fairy bells, baneberry)

ID Tips:

- The ground layer of is generally dominated by sword fern. Western bleeding heart and Pacific waterleaf are common.
- Salmonberry and red elderberry are typical shrubs. Devil's club may be common at wetter sites.
- At disturbed sites, the canopy may be dominated by deciduous trees bigleaf--maple, red alder and/or black cottonwood trees. Salmonberry often dominates the understory at such sites. Also look for stinging nettle or horsetails.
- Dominant invasive understory species may include reed canary grass or creeping buttercup in addition to Himalayan blackberry and/or English ivy.

Additional reading

For a general description:

Rocchio, F.J. & Crawford, R.C. (2015) *Ecological Systems of Washington State. A guide to Identification.* https://www.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf?nglki. Natural Heritage Report 2015-04, p. 75.

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org] A3377 Tsuga heterophylla - Pseudotsuga menziesii / Rubus spectabilis Mesic Forest Alliance https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=899501

Common plant associations:

Chappell, C.B. (2004). Western hemlock - Douglas-fir / sword fern - spreading woodfern. TSHE-PSME/POMU-DREX. *Upland Plant Associations of the Puget Trough*, p. 135 https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004). Western redcedar - western hemlock / devils club / sword fern. THPL-TSHE/OPHO/POMU. *Upland Plant Associations of the Puget Trough.* https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 133.

Moist to Dry Conifer-Deciduous Forest

General description:

Conifer-deciduous mixed forest with overstory canopy dominated by Douglas-fir and/or western hemlock. Evergreen shrubs, salal and dull Oregon-grape, dominate the understory. Sword fern may be present. Vine maple is also common. Occurs on well-drained sites with moist to dry soils throughout much of the year, often on steeper slopes with warmer aspects (west- or south-facing).

Vegetation:

Dominant overstory trees: **Douglas-fir** and**/**or **western hemlock**

Co-dominant or understory trees: **bigleaf maple, western redcedar**, Pacific madrone, shore pine, grand fir, western white pine, cascara, Pacific dogwood, red alder, black cottonwood, bitter cherry, Pacific yew.

Tall shrubs: **vine maple**, **red huckleberry**, **beaked hazelnut**, **ocean spray**, **thimbleberry, bald hip rose**, **snowberry**, evergreen huckleberry, serviceberry, Indian plum, mock orange, blackcap raspberry, red elderberry, tall Oregon-grape, Pacific rhododendron, swamp currant.

Ground layer: **salal**, **dull Oregon-grape**, **sword fern**, **trailing blackberry**, deer fern, western trillium, vanilla leaf, bracken fern, western starflower, licorice fern, evergreen violet, western trillium, vanilla leaf, orange honeysuckle, hairy honeysuckle, lady fern, deer fern, stinging nettle, mountain sweet-cicely (hairy honeysuckle, three-flowered bedstraw, western bunchberry, baneberry, pathfinder, wild ginger, fireweed, enchanter's nightshade, Siberian miner's lettuce, spreading woodfern, wood's strawberry, rattlesnake plantain, plumed false Solomon's seal, star-flowered Solomon's seal, licorice fern, Hooker's fairy bells).

ID Tips:

- Forested site with salal and/or dull Oregon-grape dominating the understory. Sword fern may also be present. Western starflower, vanilla leaf and bracken fern commonly occur.
- At disturbed sites the canopy may be dominated by deciduous trees, primarily bigleaf maple.
- Himalayan blackberry and/or English ivy often dominate the understory at disturbed sites. Bracken fern and/or trailing blackberry are also common on disturbed sites.

Additional reading:

For a general description:

Rocchio, F.J. & Crawford, R.C. (2015) *Ecological Systems of Washington State. A guide to Identification.* https://www.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf?nglki. Natural Heritage Report 2015-04, p. 71.

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org] A3379 Tsuga heterophylla - Pseudotsuga menziesii / Holodiscus discolor Dry Forest Alliance https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=899503
USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee,

Washington DC. [usnvc.org] A3378 Tsuga heterophylla - Pseudotsuga menziesii / Cornus unalaschkensis Mesic Forest Alliance https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=899502

Common plant associations:

Chappell, C.B. (2004) Douglas-fir – western hemlock / salal – dwarf Oregon-grape PSME-TSHE/GASH-MANE. *Upland Plant Associations of the Puget Trough,* p. 101 https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004) Douglas-fir – western hemlock / salal/ western swordfern PSME-TSHE/ GASH/POMU. *Upland Plant Associations of the Puget Trough,* p. 103. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004) Douglas-fir - western hemlock / dwarf Oregon-grape - sword fern PSME-TSHE/MANE-POMU. *Upland Plant Associations of the Puget Trough* , p. 109 https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004) Douglas-fir/salal/sword fern. PSME/GASH/POMU. *Upland Plant Associations of the Puget Trough,* p. 81. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Also consider:

Chappell, C.B. (2004) Douglas-fir – western hemlock / evergreen huckleberry. PSME-TSHE/VAOV. *Upland Plant Associations of the Puget Trough,* p. 115. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004) Douglas-fir/salal-ocean spray. PSME/GASH-HODI. *Upland Plant Associations of the Puget Trough,* p. 79. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004) Douglas-fir/ocean spray-snowberry. PSME/HODI-SYAL. *Upland Plant Associations of the Puget Trough,* p. 84. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004) Douglas-fir – western hemlock / dwarf Oregon-grape PSME-TSHE/ MANE. *Upland Plant Associations of the Puget Trough,* p. 107 https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u

Chappell, C.B. (2004). Douglas-fir / salal / sword fern. PSME/GASH/POMU. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 81.

Dry Forest and Woodland

Forests or woodlands on dry soils dominated by Douglas-fir. Pacific madrone, shore pine or grand fir can be co-dominant. The understory consists of shrub species indicative of dry conditions such as ocean spray, snowberry or tall Oregon-grape and western fescue. This ecosystem is typically found in drier areas in the rain shadow of the Olympic Mountains, and sunny, south-facing slopes, often along saltwater shorelines.

Vegetation

Dominant overstory trees: **Douglas-fir** with or without **Pacific madrone**
Co-dominant or understory trees: grand fir, shore pine, bigleaf maple and Garry oak. Western redcedar and western hemlock are absent or inconspicuous.

Tall shrubs: **beaked hazelnut, ocean spray, snowberry**, evergreen huckleberry, bald hip rose, tall Oregon-grape, and serviceberry.

Ground layer: typically includes low-growing shrubs such as **salal, trailing blackberry**, dull Oregon-grape, orange honeysuckle and hairy honeysuckle; grasses such as **western fescue**, California brome, blue wild rye, (bearded fescue, Alaska onion grass); herbs such as American vetch, Sierra pea vine, woodland strawberry, common bedstraw, vanilla leaf, western starflower, mountain sweet-cicely, rattlesnake plantain; and ferns, mostly **bracken fern**, sword fern, and licorice fern

Additional reading:

USNVC [United States National Vegetation Classification]. (2019) United States National Vegetation Classification Database, V2.03. Federal Geographic Data Committee, Vegetation Subcommittee, Washington DC. [usnvc.org] . A3716 Pseudotsuga menziesii - Abies grandis - Arbutus menziesii Forest & Woodland Alliance. https://www1.usgs.gov/csas/nvcs/nvcsGetUnitDetails?elementGlobalId=899768

Chappell, C.B. (2004). Douglas-fir – grand fir / beaked hazelnut / sword fern PSME-ABGR/COCO/POMU . *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 61.

Chappell, C.B. (2004). Douglas-fir – grand fir / western fescue PSME-ABGR/FEOC. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 63.

Chappell, C.B. (2004). Douglas-fir – grand fir / salal PSME-ABGR/GASH. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 65

Chappell, C.B. (2004). Douglas-fir - grand fir / oceanspray / sword fern. PSME-ABGR/HODI/POMU. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 67.

Chappell, C.B. (2004). Douglas-fir - Pacific madrone / salal. PSME-ARME/GASH. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 69

Chappell, C.B. (2004). Douglas-fir - Pacific madrone / oceanspray / hairy honeysuckle. PSME-ARME/HODI/LOHI. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 71.

Chappell, C.B. (2004). *Upland Plant Associations of the Puget Trough*, Douglas-fir - Pacific madrone / evergreen huckleberry. PSME-ARME/VAOV. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 73.

Chappell, C.B. (2004). Douglas-fir / beaked hazelnut / sword fern – threeleaf foamflower. PSME/COCO/POMU-TITR . *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 75.

Chappell, C.B. (2004). Douglas-fir / beaked hazelnut – snowberry / sword fern. PSME/COCO-SYMPH/POMU. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 77.

Chappell, C.B. (2004). Douglas-fir / salal – oceanspray. PSME/GASH-HODI. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 79

Chappell, C.B. (2004). Douglas-fir / oceanspray - common snowberry. PSME/HODI-SYAL. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 83.

Chappell, C.B. (2004). Douglas-fir / baldhip rose – oceanspray. PSME/ROGY-HODI. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 87.

Chappell, C.B. (2004). Douglas-fir – western redcedar – (grand fir) / salal. PSME-THPL-(ABGR)/GASH. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 89.

Chappell, C.B. (2004). Douglas-fir / snowberry – serviceberry. PSME/SYMPH-AMAL. *Upland Plant Associations of the Puget Trough*, https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u, p. 91.

Landslide Forest and Shrubland

General Description:

Typically found on steep slopes or landslide deposits, the tree canopy in these frequently disturbed areas are often dominated by deciduous trees such as big-leaf maple and/red alder. The shrub layer is also mostly deciduous and include species indicative of disturbed conditions like salmonberry and Indian plum. The herbaceous layer is typically well-developed and can be very diverse; fringe cup is a common component of the herbaceous layer.

Vegetation:

Overstory trees: **bigleaf maple**, **red alder, cascara,** bitter cherry, Pacific madrone, grand fir, Sitka spruce, Douglas-fir, western redcedar, western hemlock, Pacific yew, Pacific dogwood, paper birch.

Tall shrubs: **salmonberry**, **Indian plum, vine maple, beaked hazelnut, red elderberry, snowberry, ocean spray**, **red huckleberry**, thimbleberry, evergreen huckleberry, Scouler's willow, tall Oregon-grape, mock orange, black swamp gooseberry, red-flowering currant, bald hip rose, blackcap raspberry.

Ground layer: **sword fern**, **fringe cup**, **stinging nettle, trailing blackberry**, **Pacific waterleaf**, lady fern, salal, dull Oregon-grape, western trillium, wild ginger, orange honeysuckle, hairy honeysuckle, Dewey sedge, vanilla leaf, baneberry, western maidenhair fern, goats beard, lady fern, spreading wood fern, cow's parsnip, large false Solomon's seal, star-flowered Solomon's seal, false lily-of-the-valley, skunk cabbage, bracken fern, Hooker's fairy bells, redwood sorrel.

ID tips:

Any slope steeper than 40% (equivalent to 22 degrees) should be considered potentially unstable. Some clues that a slope may be unstable include slumping or cracks in the soil, or trees that are pistol-butted (i.e. trees with curved trunks) or growing at odd angles. Uneven topography.

Additional reading

Rocchio, F.J. & Crawford, R.C. (2015) *Ecological Systems of Washington State. A guide to Identification.* https://www.dnr.wa.gov/publications/amp_nh_ecosystems_guide.pdf?nglki. Natural Heritage Report 2015-04, p. 64.

Chappell, C.B. (2004). Bigleaf maple - red alder / sword fern – fringecup. ACMA-ALRU/POMU-TEGR *Upland Plant Associations of the Puget Trough*, p. 34. https://www.dnr.wa.gov/publications/amp_nh_upland_puget.pdf?7xo4u.

General Planting Guidelines

Right plant, right place:

Choose plants that are appropriate for the planting site—consider exposure (is the site sunny or shady), soil moisture, and other site limitations or desired functions.

Soil moisture:

- examine the existing vegetation—are the plants currently growing on the site moisture-loving (e.g. reed canary grass, salmonberry or cottonwood) or do they prefer drier sites (e.g. English ivy, ocean spray or Douglas-fir),
- look for signs of mucky soil or standing water,
- consider topography--areas at the top of slopes are likely to be drier, than low-lying sites,
- south- and west-facing slopes are generally drier and sunnier than north- and east- facing slopes,
- coarser-textured sandy soils are better-drained than finer-textured soils containing more silt and clay, leading to drier site conditions.

Exposure:

- south- and west-facing slopes are generally drier and sunnier than north- and east- facing slopes,
- take into account the location of existing structures and trees that may shade the planting site.

Other plant selection considerations:

- consider the location of utilities like overhead powerlines or stormwater features that maintenance crews may need to access,
- restrict vegetation next to trails or park entrances to low-growing plants, both for safety reasons and to limit maintenance needs,
- also think about other functions offered by specific plants like aesthetic appeal, erosion and sediment control, screening properties, or wildlife habitat.

Trees:

For most forested sites, the goal in terms of tree canopy, is 100 to 200 healthy trees per acre, i.e. trees spaced about 15 to 20 feet apart. This includes both conifer and hardwood trees, with evergreen trees (conifer and madrone) making up half to two-thirds of that number. In general:

Trees per acre at various spacings

Spacing (ft)	Trees/Acre
10	436
15	194
20	109
25	70

- Avoid planting trees closer than 10 ft. to an existing tree.
- Underplant deciduous canopy and smaller canopy gaps with shade tolerant conifer trees (western hemlock, western redcedar, grand fir).
- Plant sun-loving trees such as Douglas-fir and Pacific madrone in larger canopy gaps and at forest edges.

- Aim for diversity, both in terms of species and ages.

If thinning of existing trees is not an option, it may not be possible to achieve this goal for sites that are already forested—many urban forested sites are characterized by closely-spaced Douglas-fir plantations or dense thickets or red alder.

Understory:

For forested sites, a robust understory with a combination of tall shrubs and small trees (eye-level) and ground cover (up to knee-height) vegetation, indicates that trees are spaced far enough apart that sunlight is reaching the forest floor. Where invasive non-native vegetation like Himalayan blackberry or English ivy have been removed, it will be necessary to install understory vegetation:

- add shade-tolerant understory species like Indian plum, bald hip rose, beaked hazelnut, vine maple, salal, dull Oregon-grape, and western sword fern to forested sites.
- add sun-loving tall shrubs and ground covers like red-flowering currant, tall Oregon-grape, ocean spray, thimbleberry, serviceberry, mock orange, Scouler's willow, Nootka rose, snowberry to forest edges.
- It's important to give planted trees enough room to grow—understory vegetation planted too close will compete with trees for resources (nutrients, light and water), leading to stress and limiting their capacity for healthy growth.
- It may be necessary to control understory vegetation by pruning during the first six years after planting trees. After year 6, healthy trees should be tall enough to outcompete understory vegetation.
- Wait to plant more delicate herbaceous species like evergreen violet or trillium until invasive plant regrowth is less vigorous.