

CARILLON WOODS STEWARDSHIP PLAN

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1. INTRODUCTION

1.1 Park Description

Carillon Woods is an 8.71-acre park owned by the City of Kirkland. The park, which is surrounded by low-density residential neighborhoods, is located at 5429 106th Avenue NE in the Central Houghton Neighborhood in Kirkland, Washington (City of Kirkland, 2013a; City of Kirkland, 2014).

Situated on a west-facing slope above Lake Washington, the main feature of the forested park is a steep-sloped ravine in the western part of the park. This ravine forms the headwaters of Carillon Creek.

1.2 Park Background

The City of Kirkland acquired the Carillon Woods property in 2004 to develop as a neighborhood park for the Central Houghton area. Prior to that, the property belonged to King County Water District #1. Spring-fed wells on the site had provided the community of Yarrow Point with water since 1888, officially becoming King County's first water district in 1916. Increasing urbanization of the Kirkland area led to concerns about contamination of the groundwater by polluted surface water, eventually resulting in decommissioning of the system.

A number of factors have impacted the health of forested areas in Carillon Woods. Large areas of the park were logged and cleared of vegetation during the early 1900s. By 1936 there were at least two houses on the property, one along NE 55th Street, and one adjacent to NE 53th Street (King County, 2014). These structures were removed during the 1940s, but the native vegetation in these areas never completely recovered. Deciduous trees now prevail in forested areas once dominated by conifer trees, and non-native invasive species, such as English/Atlantic ivy and Himalayan blackberry, form a significant component of the forest understory.

In 2005, the City of Kirkland and Forterra (then the Cascade Land Conservancy) joined forces to address the declining health of forests and other natural areas in Kirkland parks. The result was the Green Kirkland Partnership, a program that draws on City of Kirkland resources, volunteers, and partners such as Forterra, to restore City-owned forests and other natural areas according to a [20-Year Forest Restoration Plan](#) (City of Kirkland, 2008). Forested areas in Carillon Woods

are among the sites targeted for restoration under this plan. Restoration work at this park has been ongoing since 2005.

1.3 Plan Purpose

The volunteer Green Kirkland Steward program is a critical component of the 20-Year Forest Restoration Plan. The purpose of this stewardship plan for Carillon Woods is to assist park managers and volunteer Green Kirkland Stewards with the ongoing restoration and management of natural areas in the park. The goal of restoration at the park is to cultivate a resilient forest, resistant to non-native species invasion, which will provide habitat for wildlife and improved ecosystem services, including stormwater retention and reduced flooding, removal of air pollutants, and carbon sequestration. Stewardship objectives include:

- management of invasive plant species
- establishment of native vegetation, including trees, particularly conifers, and understory species
- ongoing monitoring and maintenance of restored areas

2. SITE ASSESSMENT

2.1 Organization

To help organize stewardship efforts and to provide a spatial reference, Carillon Woods has been divided into seven restoration management units. Management units 02 and 07 were further divided into subunits. These management units were established based on a number of factors including soil characteristics, native vegetation communities, hydrology, disturbance history, and landmark features such as trails.

Hardscape, landscaped and open water areas were excluded, as these areas are not suitable for restoration activities. Figure 1 shows the location, extent, and restoration status of the management units at the park. As of December 2013, 4.7 acres of a total of 9.4 acres of park and adjacent right-of-way areas in Carillon Woods, have been enrolled in restoration.



Figure 1. Restoration management units at Carillon Woods.

2.1 Social Inventory

2.1.1 Attractions and Facilities

Carillon Woods is a neighborhood park designated for passive recreational uses. The park offers a children's play area, but no restroom facilities. Limited on-street parking is available. Paved wheelchair-accessible and natural soft-surfaced paths wind through the forested park.

Interpretive signage, explaining the history and geology of the site, have been installed at a viewing platform overlooking the ravine. A butterfly demonstration garden at the park entrance features native plants used by butterflies at different times of their lifecycle (City of Kirkland, 2012).

2.1.2 Demographics

Park users are mostly residents of the surrounding single-family residential neighborhoods. There are several schools in the vicinity, including Northwest University, Kirkland's Seventh Day Adventist School, Emerson High, International Community School and Eastside Preparatory School.

2.2 Ecological Inventory

2.2.1 Methods

A rapid assessment protocol, developed by EarthCorps and Forterra's Green Cities Program, was used to collect baseline ecological data for each management unit at Carillon Woods. This protocol is designed to provide a general overview of site characteristics and vegetative cover. Instead of setting up sampling plots, data is collected by walking through each management unit and assessing average conditions. For each management unit, data was collected on aspect, slope, soil properties, downed and standing dead wood, litter layer, canopy characteristics, understory species, invasive plant species cover, and restoration needs. For more detail on the protocol, see Appendix I.

2.2.2 General Site Characteristics

The general site characteristics are summarized in Table 1. The topography is generally flat, sloping gently to the west over most of the park. Management units 03 and 04 consist of a steep-sided ravine, with 03 dominated by the stream, seeps, and associated wetland areas.

Relics of the now-defunct water supply system, including a well house and pipes, are still present. Management units 03, 04, and 05 are fenced off to prevent public access to the former well sites.

The southern half of the park comprises predominantly mixed conifer-deciduous forest, with deciduous forest dominating the northern half of the park (Figure 2). Only two small management units in the northeastern corner of the park are not forested: 02-2 comprises the butterfly garden, and 02-3 features a rain garden planted with shrubs and herbaceous plants. Coarse woody debris cover is low in most management units, and there are few snags in the park.

2.2.3 Geology & Soils

The surface geology in the upland areas of the park consists predominantly of glacial till. Underlying the till is a 30 to 40-foot thick deposit of glacial outwash sands, underlain by compacted silt/clay (Washington State Department of Natural Resources, 2014).

The majority of the soils formed in these glacial deposits have been mapped as Alderwood gravelly sandy loam and Indianola loamy fine sand (United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), 2013). These soils are generally moderately well- to well-drained. Minor components of other soil types can also be expected. Field observations confirmed that the soil in most management units is sandy, with minor silt and gravel in places (Table 2).

Steep slopes in the park have been identified by the City of Kirkland as potentially high risk for landslides and erosion (City of Kirkland, 2003). Field observations indicated that the soils are generally stable. Erosion has previously been reported in areas of upwelling. Removal of vegetative cover and soil disturbance is likely to result in increased erosion.

Light compaction is present in 02-1 in areas adjacent to the children's play area. Minor compaction was also observed in 07 where there is an informal trail leading to what appears to be a hang-out spot.

Table 1: General site characteristics

Management Unit	01	02-1	02-2	02-3	02-4
Area (acres)	1.74	0.17	0.09	0.05	0.08
Average aspect	west	west	west	west	west
Average slope	low	low	low	low	low
Elevation low/high (feet)	234/278	278/282	278/282	284/284	284/286
Exposure	shade	partial shade-shade	sun	sun	shade
Habitat type	deciduous forest	deciduous forest	butterfly garden	meadow/grassland	deciduous forest
CWD cover (%)	5-10	0-5	0-5	0-5	0-5
Snag density	low	low	none	none	none
Special features	paved & unpaved trails; outlook; tool box; old homesite	paved trail	paved trail	paved trail; rain garden	paved trail
Features of adjacent areas	road	play area; road	play area; park entrance; road	play area; road	climbing rock; road
Management Unit	03	04	05	06	07-1 & 2
Area (acres)	0.82	1.60	0.16	0.79	3.86
Average aspect	west	west	west	west	west
Average slope	medium	high	low	low	low
Elevation low/high (feet)	126/198	174/266	236/268	274/288	250/288
Exposure	partial sun	shade	shade	shade	partial sun
Habitat type	riparian forest	deciduous forest	deciduous forest	deciduous forest	conifer-deciduous mixed forest
CWD cover (%)	0-5	5-10	0-5	0-5	5-10
Snag density	low	low	low	low	low
Special features	ravine; mountain beaver; seeps, stream & wetland; well house & water pipes; fence	ravine; mountain beaver; powerline; seeps; fence	fence	paved & unpaved trails	unpaved trails; hang-out spot, dumping spot; old homesite
Features of adjacent areas	fence			road	road

CWD=coarse woody debris

Snag density: low =1-5 stems/acre; medium=5-20 stems/acre; high=>20 stems/acre



Figure 2. Map of existing habitat types at Carillon Woods.

Table 2: Soil characteristics

Management Unit	01	02-1	02-2	02-3	02-4
Soil moisture*	dry	dry	dry	dry	dry
Soil stability	stable	stable	stable	stable	stable
Soil texture	sand	sand	sand	sand	sand
Compaction	none	light	none	none	none
Cause of compaction	-	play area	-	-	-
Litter depth (inches)	½-1"	½-1"	<½"	<½"	<½"
Bare ground (%)	0-5	0-5	10-25	25-50	10-25
Management Unit	03	04	05	06	07-1 & 2
Soil moisture*	saturated	damp	dry	dry	dry
Soil stability	stable	stable	stable	stable	stable
Soil texture	gravel	sand	sand	silt	sand
Compaction	none	none	none	none	light
Cause of compaction	-	-	-	-	informal trail, hang-out spot
Litter depth (inches)	½-1"	>1"	½-1"	>1"	½-1"
Bare ground (%)	0	0-5	25-50	0	0-5

*Based on conditions during summer 2013

2.2.4 Hydrology

Carillon Woods is part of the Carillon Creek drainage basin in the Lake Washington-Cedar River Watershed. Carillon Creek originates in a forested ravine within the park, then flows west, entering Lake Washington at Carillon Point (The Watershed Company, 1998a; City of Kirkland, 2013b). The stream is fed by small hillside seeps occurring towards the bottom of the ravine. These seeps form when rainwater, percolating vertically through the thick layer of glacial outwash sand, reaches the underlying layer of silt/clay. It then travels laterally along this

relatively impervious layer, surfacing along the slopes of the ravine. Small pockets of wetland are associated with the stream and seeps. Soils in the upland areas are generally dry (Table 2).

Erosion of sandy soils along the upper reaches of the stream has been causing ongoing problems downstream, where deposition of the sediment load cause flooding and affect salmon habitat.

2.2.5 Wildlife

Carillon Woods provides habitat for a variety of terrestrial wildlife, including mammals, birds, amphibians, and reptiles. Signs of mountain-beaver activity have been observed along the slopes in management units 03 and 04. Coyotes have also been seen at the park. A list of wildlife species believed to use natural areas in Kirkland is available in the [Kirkland's Streams, Wetlands and Wildlife Study](#) report (The Watershed Company, 1998a).

Although no fish have been reported in the section of Carillon Creek flowing through the park, the lower reaches of the stream, closer to where it enters Lake Washington, is used by salmonids—both coho salmon and cutthroat trout have been observed (The Watershed Company, 1998a).

2.2.6 Native Vegetation Characteristics

Native vegetation characteristics for each management unit are summarized in Table 3. Scientific names of plant species can be found in Appendix III. Note that only the dominant species present are recorded during the rapid assessment.

Management units 07-1 and 07-2 (Mixed conifer-deciduous forest)

Management units 07-1 and 07-2 are characterized by mixed conifer-deciduous forest. The dominant tree species in this area are bigleaf maple, Douglas-fir, western redcedar, red alder, and Pacific madrone. Overstory canopy cover is between 50 and 75%, and average tree diameter is 15 to 20 inches.

Conifer tree density is low (<50 stems/acre). Regenerating conifer tree density is also low; species include western redcedar and grand fir. Many of the conifer saplings were installed during restoration, but naturally regenerating western redcedar trees also occur, particularly in

less disturbed areas. Deciduous tree density is higher at 50-150 stems/acre. Regenerating deciduous tree density is low and consists mostly of bigleaf maple and bitter cherry.

Native shrub cover is high (more than 75%). Dominant species include Indian plum, ocean-spray, salmonberry, red elderberry, beaked hazelnut, and low Oregon-grape. Wood's rose, which occurs more commonly east of the Cascade Mountains, is also present. Herbaceous cover is between 25 and 50% and consists predominantly of western sword fern, trailing blackberry, and stinging nettle.

Management units 01, 02-1, 02-4, 04, 05, and 06 (Deciduous forest)

The dominant overstory trees in the deciduous forest habitat consist of bigleaf maple, black cottonwood, and red alder, with subordinate Douglas-fir and western redcedar. Overstory canopy cover is generally more than 50%, with the exception of 02-4 where canopy cover is less than 25%. Overstory tree diameter averages between 15-20 inches.

Regenerating tree density is variable, and in the case of conifers, mostly comprised of trees planted during restoration. Naturally regenerating western redcedar trees do occur in less disturbed parts of 06. Species include western redcedar, western hemlock, Douglas-fir, grand fir, cascara, and bigleaf maple.

With the exception of 02-4, understory cover is generally sufficient. Dominant shrubs include beaked hazelnut, red elderberry, thimbleberry, salmonberry, Indian plum, low Oregon-grape, evergreen huckleberry, ocean-spray, red twig dogwood, mock orange, and vine maple. Western sword fern, bracken fern, trailing blackberry, stinging nettle, enchanter's nightshade, and wood fern dominate the herbaceous layer.

Management unit 03 (Riparian forest)

The vegetation in the riparian corridor associated with Carillon Creek consists mainly of deciduous forest. Dominant species include bigleaf maple and western redcedar in the overstory, salmonberry, devil's club and red elderberry in the shrub layer, and skunk cabbage, giant horsetail, and lady fern in the herbaceous layer. Both overstory and regenerating tree densities are low.

Management unit 02-2 (Butterfly garden)

Aside from two mature trees, one bigleaf maple and one Douglas-fir, and a shore pine sapling, the vegetation in this area consists of sun-loving herbs and shrubs installed since 2011. Species

include evergreen huckleberry, ocean-spray, red twig dogwood, red elderberry, red-flowering currant, Nootka rose, mock orange, low Oregon-grape, western sword fern, beach strawberry, kinnikinnick, sea-thrift, Douglas' aster, fringecup, goldenrod, fireweed, pearly everlasting, and western columbine.

Management unit 02-3 (Meadow/Grassland)

The main feature of this area is a swale along the eastern boundary of the park. The sides of the swale appear to have been planted with shrubs such as tall Oregon-grape and a low-growing horticultural variety of dogwood. Other native shrubs and herbaceous species include sparse plantings of evergreen huckleberry, ocean-spray, western sword fern, yarrow, stinging nettle, and fireweed. Although there are no mature trees in this area, saplings of western redcedar, grand fir, bigleaf maple, red alder, and Garry oak saplings are present.

Table 3: Native vegetation Characteristics

Management Unit	01	02-1	02-2	02-3	02-4
Overstory tree canopy cover (%)	>76	51-75	0-25	0-25	0-25
Overstory conifer tree density	low	low	low	none	low
Regenerating conifer tree density	medium	low	none	low	none
Overstory deciduous tree density	high	medium	low	none	low
Regenerating deciduous tree density	medium	low	none	low	none
Average tree diameter (inches)	5-15	15-20	15-20	-	15-20
Shrub cover (%)	75-100	25-50	5-25	0-5	0-5
Herbaceous cover (%)	50-75	5-25	5-25	5-25	5-25
Dominant tree species	black cottonwood, bigleaf maple, Douglas-fir	bigleaf maple, red alder, Douglas-fir	bigleaf maple, Douglas-fir	-	bigleaf maple, Douglas-fir
Dominant regenerating tree species	western redcedar, western hemlock, Douglas-fir, grand fir, cascara, American elm**	Douglas-fir, western redcedar	shore pine	western redcedar, grand fir, bigleaf maple, red alder, Garry oak	-
Dominant shrub species	vine maple, thimbleberry, beaked hazelnut, Indian plum, low Oregon-grape	Indian plum, evergreen huckleberry, low Oregon-grape	evergreen huckleberry, ocean-spray, red twig dogwood, low Oregon-grape	evergreen huckleberry, ocean-spray, tall Oregon-grape, dogwood*	Indian plum, mock orange, evergreen huckleberry, low Oregon-grape
Dominant herbaceous species	western sword fern, bracken fern, stinging nettle, licorice fern	western sword fern, stinging nettle, trailing blackberry, enchanter's nightshade	western sword fern, beach strawberry, kinnikinnick, sea-thrift, Douglas' aster, fringe-cup, goldenrod, western columbine	western sword fern, fireweed, yarrow, stinging nettle	western sword fern

Stem density: low=0-50 stems/acre; medium=50-150 stems/acre; high=>150 stems/acre

* Horticultural variety **Native to the eastern United States

Table 3: Native vegetation characteristics (continued)

Management Unit	03	04	05	06	07-1 & 2
Overstory tree canopy cover (%)	50-75	>75	>75	>75	50-75
Overstory conifer tree density	low	low	low	low	low
Regenerating conifer tree density	None	none	low	low	low
Overstory deciduous tree density	low	medium	medium	medium	medium
Regenerating deciduous tree density	low	low	low	medium	low
Average tree diameter (inches)	15-20	15-20	15-20	15-20	15-20
Shrub cover (%)	75-100	75-100	25-50	75-100	75-100
Herbaceous cover (%)	50-75	5-25	0-5	5-25	25-50
Dominant tree species	bigleaf maple, western redcedar	bigleaf maple, western redcedar	bigleaf maple, red alder	bigleaf maple, western redcedar, red alder, Douglas-fir	bigleaf maple, western redcedar, Pacific madrone, Douglas-fir, red alder
Dominant regenerating tree species	bigleaf maple	bigleaf maple	western redcedar, bigleaf maple	western redcedar, bigleaf maple	western redcedar, grand fir, bigleaf maple, bitter cherry
Dominant shrub species	salmonberry, devil's club, red elderberry	Indian plum, salmonberry, red elderberry	Indian plum, red elderberry, low Oregon-grape	salmonberry, Indian plum, red elderberry, low Oregon-grape, evergreen huckleberry	salmonberry, ocean-spray, beaked hazelnut, Indian plum, red elderberry, low Oregon-grape, Wood's rose*
Dominant herbaceous species	skunk cabbage, giant horsetail, lady fern	western sword fern, northern wood fern, stinging nettle	trailing blackberry, western sword fern	western sword fern, northern wood fern, trailing blackberry	trailing blackberry, western sword fern, stinging nettle, licorice fern

Stem density: low=0-50 stems/acre; medium=50-150 stems/acre; high=>150 stems/acre

*Native east of the Cascade Mountains

2.2.7 Non-Native Invasive Vegetation

Non-native invasive vegetation characteristics are summarized in Table 4. Scientific names of plant species can be found in Appendix III.

Invasive overstory trees were observed only in 02-1 and 02-7, where sweet cherry trees are present in some areas. Regenerating invasive tree density is low, but pervasive, and includes sweet cherry, English holly, cherry-laurel, horse-chestnut, Norway maple, sycamore maple, and European mountain-ash.

The dominant shrub species is Himalayan blackberry. Note that evergreen blackberry is also commonly present but, for the purposes of this report, is included with Himalayan blackberry. Blackberry cover is less than 5% in most management units. More significant cover was reported in management units 07 and 03. Spurge-laurel is also present in 07. Invasive herbaceous species are present in most management units, and include English/Atlantic ivy, periwinkle, herb Robert, hedge false bindweed, bluebells, and creeping buttercup.

3. STEWARDSHIP

The primary management concerns at Carillon Woods include:

- the presence of non-native invasive plants
- the scarcity of mature conifer trees and lack of conifer tree regeneration in some areas
- the risk of erosion along sandy steep slopes, especially in areas requiring large-scale removal of invasive species.

The basic restoration approach followed by the Green Kirkland Partnership is invasive plant removal, followed by planting with native species. Planting a variety of native species is recommended, with planting palettes for forested areas including trees, particularly conifers, to regenerate the overstory, and a variety of tall shrubs and ground covers to increase structural and compositional diversity in the understory. Continued maintenance and monitoring will be required for several years to ensure restoration success.

Table 4: Non-native invasive vegetation characteristics

Management Unit	01	02-1	02-2	02-3	02-4
Overstory stem density	none	none	none	none	none
Regenerating stem density	medium	low	none	none	none
Shrub cover (%)	0-5	0	0-5	0-5	0-5
Herbaceous cover (%)	0-5	0-5	0-5	0-5	0-5
Dominant tree species	-	sweet cherry	-	-	-
Dominant regenerating tree species	Norway maple, sweet cherry, English holly	English holly, sweet cherry	-	-	-
Dominant shrub species	Himalayan blackberry	-	-	Himalayan blackberry	-
Dominant herbaceous species	herb Robert, ivy, creeping buttercup	hedge bindweed, herb Robert, ivy bluebells	-	hedge bindweed, ivy, herb Robert, creeping buttercup	ivy, herb Robert, bluebells
Management Unit	03	04	05	06	07-1 & 2
Overstory stem density	none	none	none	none	low
Regenerating stem density	low	low	low	low	low
Shrub cover (%)	5-25	0-5	0-5	0-5	5-25
Herbaceous cover (%)	0-5	50-75	0-5	5-25	25-50
Dominant tree species	-	-	-	-	Sweet cherry
Dominant regenerating tree species	English holly, sweet cherry	English holly	English holly, cherry-laurel	horse-chestnut, English holly, sycamore maple	English holly, European mountain-ash, cherry-laurel, horse-chestnut
Dominant shrub species	Himalayan blackberry	-	-	Himalayan blackberry	Himalayan blackberry, spurge-laurel
Dominant herbaceous species	ivy	ivy, lesser periwinkle	ivy	herb Robert, ivy, hedge bindweed, lesser periwinkle, bluebells	ivy, herb Robert, hedge bindweed, bluebells

Stem density: low=0-50 stems/acre; medium=50-150 stems/acre; high=>150 stems/acre

3.1 Best Management Practices

The best management practices for Green Kirkland Steward restoration activities are summarized below. More detailed descriptions of these practices are available in the [Green Kirkland Steward Field Guide](#) (Green Cities Partnerships, 2014). Links to additional resources are included in the discussion below—website addresses for these and other resources are listed in Appendix II.

3.1.1 Invasive Species Removal

For help with the identification of invasive plants, as well as additional resources about removal and disposal methods, see the [King County Noxious Weed website](#) (King County, 2014). Most control methods need to be applied over several growing seasons to be effective. The best time to manually remove plants by digging or hand pulling, is between fall and spring, when the ground is moist and soft. Minimize soil disturbance to avoid germination of seeds of invasive species. Mulch bare ground, and plant cleared areas with native species, to discourage non-native plants from re-colonizing. Volunteers are restricted from using power tools or applying herbicide in City of Kirkland parks. Such treatments can only be applied by Parks staff or contracted crews. Best practices for removal of specific species are as follows:

Himalayan and Evergreen Blackberry

Himalayan and evergreen blackberry are robust, thicket-forming shrubs that spread both by seed and by rooting at cane tips. Removal of blackberry consists of a two-step process: cutting the canes, followed by grubbing out the root balls. Blackberry canes are cut about one foot above the ground using loppers or pruners. Root balls are then dug up completely, using a shovel, to prevent regrowth. Removed plant material can be composted on site, but avoid contact with damp soil since plants can regrow from root and stem fragments. To minimize soil disturbance along steep slopes, dabbing cut canes with herbicide may sometimes be a more appropriate treatment than digging up root balls.

English/Atlantic Ivy

Ivy is an evergreen vine that spreads both by seed and by rooting at nodes along the vine. Physical removal is the most effective way to control ivy. The top priority is to create lifesaver or survival rings around infested trees. Start by cutting ivy vines at shoulder height and at the

base of the tree. Remove all ivy from shoulder-height down. Do not attempt to pull down vines from higher up the tree; they will die and decompose in time. Pulling vines down from high branches can be dangerous and possibly damage the tree.

Clear ivy in a radius of at least five feet around trees by grubbing out ivy roots. Remove extensive swathes of ivy on the ground by clipping the edges of a five to ten-foot-wide section. Starting from one edge, continue clipping and digging, while rolling the mat of ivy into a log.

Small patches of ground-growing ivy can be removed by loosening the soil with a shovel and pulling by hand. Ivy can be composted on site but make sure that removed plant material is not in contact with the soil.

Suckering Invasive Trees and Shrubs

This category includes Portugal laurel, cherry laurel, sweet cherry, English holly, and common hawthorn. Cutting down these plants without removing the roots causes it to send up suckers, exacerbating the problem. Small, young plants may be hand pulled or removed using a Weed Wrench™ or similar tool. Note that freshly cut stems or branches of some species can re-root if in direct contact with the soil.

Mature invasive trees requires chemical removal methods, such as cut-stump or lance treatment. Cut-stump treatment consists of the application of herbicide to the cut portion of the trunk immediately after cutting. Lance treatment is a newer, less labor-intensive method that involves injecting herbicide shells into the base of the tree trunk.

Herb Robert

Herb Robert is a low-growing winter or spring annual that reproduces solely by seed. Pull plants by hand to remove; grasp the plant firmly at the base to get all the roots out. Monitor the site throughout the growing season and remove any new plants. Large patches can be covered with sheet mulch.

Plants without seeds or mature flowers can be composted on site. Put flowering plants, and those beginning to set seed, into a trash bag for disposal. If plants are in full seed it may be better to leave them in place until the next season when the risk of seed dispersal is lower.

Creeping Buttercup

Creeping buttercup is a low-growing perennial plant species. Use a shovel or hand tool to dig up plants; be sure to remove all roots, runners, and growing points. Buttercup can sprout from nodes along stem and root fragments. Incomplete digging or use of a cultivator or other cutting tools may make the problem worse. Large, very dense patches can be sheet-mulched. Spreading mulch over a layer of cardboard is more effective than spreading mulch alone.

Periwinkle

Periwinkle is a spreading perennial vine that thrives in the shade. Manually remove by digging or pulling up the vines. Grub out the roots to prevent re-growth. For more effective treatment, cover the area with cardboard, black plastic, or weed fabric after initial removal. Leave the cover in place for at least a year.

3.1.2 Composting

Composting on site is cost effective, helps to leave organic material and nutrients on site, and provides excellent habitat for wildlife, but may not be appropriate for all plant species and/or sites (Green Cities Partnerships, 2014). Guidelines for composting removed plant material are available in the [Green Kirkland Steward Field Guide](#).

3.1.3 Planting & Mulching

Best Management Practices for planting and mulching are available in the [Green Kirkland Steward Field Guide](#). Plant between late fall and early spring to ensure sufficient soil moisture for plant establishment. It may be necessary to water plants during the dry summer months for the first three years after planting.

Mulching around plants serves several purposes: it helps to conserve soil moisture, moderate soil temperatures, deter weed growth, and prevent soil erosion. Organic mulches, such as wood chips, also add organic matter and some nutrients to the soil.

When it comes to plant selection there are a number of factors to consider: In natural ecosystems, specific assemblages of plant species tend to grow together, typically in areas with similar environmental conditions and disturbance history. When developing a plant palette for a site, consider site conditions, particularly soil texture and moisture, slope aspect and position, and exposure (sun or shade). Bear in mind that environmental conditions can change over short

distances. Also take into account surrounding land uses, especially in urban areas. For example, it may be necessary to limit plant selections to low-growing species to preserve view corridors, or to maintain visibility along trails for safety reasons.

Then identify the target plant community you will use as a reference. This target plant community could be based on field observations from a nearby relatively undisturbed site, published information, or a combination. Several resources to help with plant selection are listed in Appendix II.

3.1.4 Special Considerations

Special care should be taken when working in geologically hazardous areas, such as steep slopes, or in sensitive areas such as in wetlands or along streams and lakes, or their buffers:

Slope Management

Removal of vegetation and soil disturbance along slopes may trigger erosion or landslides. The risk of erosion or landslides depends on many factors, including slope angle and length, soil properties, underlying geology, type and amount of vegetative cover, and the presence of water on the slope. Where large areas have been cleared of invasive plants, the slope may need to be stabilized. Consider the following best management practices:

- Select invasive removal techniques that involve the least amount of soil disturbance.
- Where slopes are not too steep, apply wood chip mulch. If the slopes are too steep to retain mulch, commercially available erosion control products can be applied. WoodStraw® works well on slopes with a grade of up to about 50% (~ 27°); on steeper slopes, coir matting is an appropriate choice.
- Place large woody debris across the slope to divert water flowing down the slope.
- Establishing vegetation on slopes offers long-term protection against erosion. Live-staking with species like willows is a way to establish vegetation cover in a relatively short time, provided there is enough soil moisture. Select plant species with fibrous root systems that will help bind the soil. Plant trees at the crest or toe of the slope; avoid installing trees that will grow to a large size along the slope itself. Plant species appropriate for slopes are listed on the State of Washington Department of Ecology [Slope Stabilization and Erosion Control](#) website.

For safety reasons, volunteers are not permitted to work on slopes steeper than 40%. When working in areas with medium to high slopes, stewards should discuss appropriate treatments with Green Kirkland Partnership staff.

Wetlands, Streams, and Lakes

Plants in wetlands and adjacent to streams and lakes perform many functions. Vegetation slows down surface runoff, allowing water to soak into the soil, and intercepts sediments, excess nutrients, and other pollutants. Plant roots also bind the soil, helping to reduce erosion. Trees contribute woody debris to streams, improving fish habitat and slowing down stream flow, and trees and shrubs create shade, reducing stream water temperatures. Vegetation in these areas also provides food and shelter for wildlife.

Take care to minimize impacts to these sensitive areas during restoration treatments by following these general guidelines:

- Stewards should consult with Green Kirkland staff before conducting first time removal of invasive plants or planting within 10 feet of the stream channel or in particularly wet, muddy, or erodible areas of wetlands. It may be necessary to check with the Public Works and/or Planning Departments before working in these areas.
- Limit the number of volunteers working in these areas to reduce the amount of foot traffic.
- Avoid clearing large areas of vegetation at one time, especially in areas sloping down towards the stream channel.
- Minimize soil disturbance during manual invasive plant removal, and cover exposed areas of soil with a layer of mulch.
- Replant exposed areas by installing native plant species that grow fast and have good soil-binding properties. Live stakes of native willows, red-twig dogwood, black cottonwood, black twinberry, Pacific ninebark, red elderberry, and salmonberry work well in relatively wet areas. Consider including native sedges, grasses, and rushes.
- If herbicide use cannot be avoided, check permitting requirements and use herbicides specially formulated for such areas. Herbicide treatments can only be applied by Parks staff or contracted crews.

3.2 Materials

To request materials for restoration activities, fill out a [Tools, Materials & Event Request Form](#) (click on the Steward Resources link on the [GreenKirkland.org](#) webpage) at least three weeks in advance of the event, and email to greenkirkland@kirklandwa.gov.

Tools

There is a lock box with tools at Carillon Woods. For larger volunteer events, the Green Kirkland tool trailer can be requested. An inventory of tools and equipment in the trailer is available at [GreenKirkland.org](#) under [Steward Resources](#).

Mulch

For help on calculating the amount of wood chip mulch to order, consult the [Green Kirkland Steward Field Guide](#). Other types of mulch commonly used include burlap sacks and cardboard, usually in combination with wood chip mulch.

Plant material

Guidelines for calculating the number of plants needed, as well as tools for selecting appropriate plant species, are available in the [Green Kirkland Steward Field Guide](#). A handy calculator for estimating the quantity of plants needed is available on the [Sound Native Plants Nursery website](#).

3.3 Recommendations

Restoration status and considerations, as well as recommendations for each management unit, are summarized in Tables 5 and 6, respectively. Approximately 50% of the target area have already been enrolled in restoration.

Management units 01, 02-1, 02-4, 05, 06, and 07

Management units 01, 02-1, 02-4, 05, and parts of 06 and 07-1 and 07-2, have already been enrolled in restoration (Figure 1), but will require ongoing maintenance for several years. Except for 05, all of these areas are accessible to volunteers to do restoration work.

Management recommendations include the following:

- Continue to manually remove invasive species, particularly Himalayan blackberry, ivy, and hedge false bindweed.

- Remove invasive tree species according to the guidelines outlined in the Best Management Practices section of this document.
- The target habitat for these areas is conifer-deciduous mixed forest (Figure 3). Additional installation of plants is recommended for parts of all these management units:
 - Install trees, especially conifers, where mature and regenerating conifer trees are absent or sparse. Include species like Douglas-fir and grand fir for planting in more exposed areas, and western hemlock and western redcedar in shadier spots.
 - Plant additional forest understory species where extensive removal of invasive plant species have occurred, or where installed plants have died. Appropriate species will be determined by local site exposure and soil conditions. Native plant species already growing in the forest are well-adapted to site conditions and are good first choices for restoration plantings (see Table 3 for appropriate species). Additional species to consider include snowberry, baldhip rose and salal.
- Summer watering of plants for the first 3 years after installation may be necessary in some areas.

Management unit 02-2

The only recommendation for the butterfly garden, management unit 02-2 is continued maintenance—mostly weeding and mulching.

Management unit 02-3

The butterfly garden will be expanded into this area (Figure 3). To maintain the sunny conditions required by the plants in the butterfly garden, it is recommended that tree saplings in this area be removed. Native vegetation in this management unit is very sparse. Supplemental planting should be a priority. Because this area is so exposed, and plantings so sparse, maintaining a layer of mulch and watering during dry periods in the summer, will be crucial to success.

Management unit 03

The target habitat for the riparian forest and associated wetland areas in management unit 03 is also conifer-deciduous mixed forest, but plantings should include species suitable for wetter

conditions. This area is not appropriate for volunteers to work in. Due to of the risk of erosion, particularly in areas of upwelling, restoration work in 03 will require consultation with the City of Kirkland Public Works Department. This area requires mostly spot removal of English/Atlantic ivy and Himalayan blackberry, and treatment of invasive tree species. Establishment of additional vegetative cover will help prevent erosion.

Management unit 04

As in most of the Carillon Woods, the target habitat for this management unit is conifer-deciduous mixed forest (Figure 3). Because of the steep slopes and associated risk of erosion, this area is not appropriate for volunteers to work in. Approximately 35% of 04 has been enrolled in restoration. Work in remaining parts of this management unit consists mostly of removal of invasive plant species. Slope stabilization and replanting, may be required in some areas.

Table 5: Restoration status and considerations.

Management Unit	01	02-1	02-2	02-3	02-4
Target habitat	conifer-deciduous mixed forest	conifer-deciduous mixed forest	butterfly garden	butterfly garden	conifer-deciduous mixed forest
Active restoration	yes	yes	yes	yes	yes
Area in restoration (%)	100	100	100	100	100
Accessibility	volunteers	volunteers	volunteers	volunteers	volunteers
Special considerations	-	-	-	-	-
Management Unit	03	04	05	06	07-1 & 2
Target habitat	riparian forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest
Active restoration	no	no	yes	yes	yes
Area in restoration (%)	0	35	100	11	46
Accessibility	crew/staff	crew/staff	crew/staff	volunteers	volunteers
Special considerations	environmentally sensitive area; risk of erosion; no public access	steep slopes; risk of erosion; environmentally sensitive area; no public access	no public access	-	-

Table 6: Management recommendations for each management unit.

Management Unit	Control of invasive plants by manual removal	Ivy lifesaver rings	Invasive tree removal		Slope stabilization/ Erosion control	Plant installation
			Manual removal	Herbicide treatment		
01	spot	X	X	X		X
02-1	spot		X	X		X
02-2	spot					
02-3	spot					X
02-4	spot	X				X
03	spot	X	X	X	X	X
04	large-scale	X	X	X	X	X
05	spot	X	X	X		X
06	spot	X	X	X		X
07-1 & 2	spot	X	X	X		X



Figure 3. Map of target habitat at Carillon Woods.

3.4 Volunteers

The first volunteer Green Kirkland Steward at Carillon Woods was enrolled in 2009 and has been leading smaller restoration events at the park. Larger events, attracting between 50 and 150 volunteers, are generally held on an annual basis. Volunteers for these larger events are recruited and managed by contracted environmental organizations or professionals. A separate group of volunteers, the Kirkland Community Wildlife Habitat Team, is responsible for maintaining the butterfly garden.

Volunteers at restoration events typically include park neighbors and community members, corporate groups, youth groups, faith-based groups, and students filling community service hours.

3.5 Monitoring

Monitoring is an essential step in restoration, particularly in urban areas surrounded by development. Such areas experience ongoing disturbance and are prone to invasion by non-native, invasive plant species. Monitoring can take different forms, including photo documentation, visual inspection, and scientific monitoring.

Visual inspection

The most basic form of monitoring is simply to walk through a site and do a visual inspection. Factors to assess include plant health, invasive plant cover, or anything else that may affect restoration success. Target performance standards are site and species dependent, but for most invasive plant species, cover of more than approximately 5-10% will trigger maintenance actions. The benchmark for survival of installed trees and shrubs is ~85%. Higher mortality should lead to a reevaluation of restoration methods and corrective actions, such as supplemental watering or replanting with species better able tolerate site conditions. In addition to regular site visits by Green Kirkland Stewards, City managers and/or staff visit sites at least once a year as part of developing annual work plans.

Photo documentation

Photo documentation is a good method of tracking development of restoration sites. This entails establishing photo points and taking repeated photos of the same area over time.

When establishing photo points and taking photos consider the following:

- Along with photos, provide walking directions to the photo point location and a detailed description of the surrounding area. Include information about landmarks that will make it easier to relocate the site. Also, record the direction of shooting, the park name, management unit number, the date, and the name of the photographer.
- Repeat photos should be taken at the same time of year to allow for meaningful comparisons. Include notes on significant developments or activities at the site that occurred since the previous photo was taken.
- Try to take repeat photos at the same time of day. If possible, take the photo facing south, with the sun behind you and the sunlight shining on the landscape facing you. This helps prevent glare and avoids direct sunlight in the shot. Taking photos on a cloudy but bright day can help avoid strong shadows.
- To ensure consistency when taking repeat photos, take a copy of the previous photos to the site with you, and use it to compare with the field of view.
- Submit photos and recorded information to Green Kirkland Partnership staff for archiving.

Scientific monitoring

Scientific monitoring involves setting up permanent plots and collecting quantitative data over time. This method is more labor intensive and rigorous than visual inspection or photo documentation, but does allow for in-depth evaluation of site conditions and the effectiveness of management techniques. The Green Cities program has developed a set of [Standardized Monitoring Protocols](#) (Green Cities Partnerships, 2012). Trained volunteers, staff, or contractors collect data on plant survival, vegetative cover, tree density, coarse woody debris, and soil conditions. A permanent restoration plot was installed by EarthCorps and volunteers in management unit 07 during summer 2012. Plot conditions were re-evaluated in 2013. Monitoring reports are available from Green Kirkland staff upon request.

3.6 Timeline

Restoration at Carillon Woods has been ongoing since 2005. Large areas targeted for restoration have yet to be enrolled. Due to the park's location in an urban environment and continued pressure from invasive plant species, areas already in restoration will require many years of ongoing maintenance and monitoring. The timeline for restoration will depend on the availability of resources. An annual work plan, created towards the beginning of each calendar

year by Stewards, Green Kirkland and other City of Kirkland staff, and contracted crews, lays out what work is planned for each management unit for that year.

4. REFERENCES

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APPENDIX I. RAPID ECOLOGICAL ASSESSMENT PROTOCOLS

These rapid assessment protocols were designed to provide a general overview of the conditions present in each management unit within a park. For each management unit, data collection includes a Site Characteristics Inventory and a Vegetation Inventory.

Site Characteristics Inventory

This inventory assesses attributes such as slope, aspect, soil type, and other features of the management unit that can aid in creating a restoration plan.

Aspect

Aspect refers to the direction in which water flows off the site. Options include N, NE, E, SE, S, SW, W, NW, or Flat. A compass is used to determine the predominant direction of slope on the site.

Slope

This is a measurement of slope angle. It is measured using an electronic or mechanical clinometer, or it can be visually estimated. Use the following categories:

- low, which is equivalent to 0-8% or 0-5°
- medium, which is equivalent to 8-25% or 5-14°
- steep, which is equivalent to >25% or >14°

Soil Moisture

Soil moisture refers to the general moisture conditions of the soil as they appear at the time of measurement, or are most likely to appear on any given summer day. Options include standing water, saturated soil, damp soil, or dry soil.

Soil Type

Soil type refers to the dominant size of mineral particles in the sample (sand, silt, clay, or gravel). A small sample of soil is taken from several areas and examined. Sandy soils feel gritty. Clay soils feel sticky. Silty soils feel smooth or slippery. Muck is a special category of soil that consists mostly of decomposed organic matter. Muck is usually black and found in wetlands.

Soil Compaction

Soil compaction occurs when the mineral particles in the soil are compressed, often as a result of foot traffic, or vehicles and heavy equipment moving over the soil. During the site assessment, the presence of areas compacted as a result of human activity, such as trails, is

recorded. The general degree of compaction in each management unit is estimated using the following categories: none, light, moderate, or heavy.

Soil Stability

The assessment of soil stability consists of looking for evidence of soil movement in the management unit. Categories include none, erosion, slumping, or slides.

Litter Depth

A pencil or small ruler is used to probe the depth of the litter layer on top of the soil. The depth of the litter layer is recorded in one of the following categories: <1/2", 1/2-1", 1-2", 2-5", >5".

Bare Ground

Percent bare ground, or mulch without plants, is recorded in one of the following categories: 0-5%, 5-10%, 10-25%, 25-50%, >50%.

Coarse Woody Debris (CWD)

The percent cover of coarse woody debris (diameter must be greater than 5 inches) on the ground is visually estimated. Record as 0-5%, 5-10%, 10-25%, 25-50%, or >50% cover.

Snag Density

The number of standing dead trees with a DBH (diameter at breast height) of greater than 5 inches is estimated. Record as none, low (1-5 stems per acre), medium (5-20 stems per acre), or high (>20 stems per acre).

Overstory Tree Diameter

The average diameter at breast height (DBH) of overstory trees, i.e. trees with a DBH larger than 5", in the management unit is recorded in one of the following categories: 5-15", 15-20", 20-30", or >30".

Habitat Type

Habitat type is classified as follows:

- Forests are characterized by more than 25% tree canopy cover. To determine forest habitat type, there must be 30% or greater overstory cover of that type of tree present.

The characteristics of different forest types are as follows:

- Conifer forest—overstory dominated by conifer trees
- Conifer-deciduous mixed forest—conifer and deciduous trees each comprise more than 30% of the overstory

- Deciduous forest—overstory dominated by deciduous trees
- Madrone forest—more than 30% of the overstory dominated by Pacific madrone trees
- Madrone-conifer mixed forest—madrone and conifer trees each make up more than 30% of the overstory
- Madrone-deciduous mixed forest—madrone and deciduous trees each make up more than 30% of the overstory
- Forested wetland—more than 30% of trees growing in standing water or saturated soils, or more than 30% of area has small wetlands present entirely beneath overhanging forest canopy
 - Riparian forest—forest dominated by the presence of a stream or lake
- Savannah—10-25% tree canopy with unmaintained grass, shrubs, or both
- Oak savannah—10-25% tree canopy dominated by oak trees with unmaintained grass, shrubs, or both
- Shrubland—less than 10% overstory canopy and dominated by shrubs or regenerating trees
- Riparian shrubland— shrubland adjacent to a stream or a lake, with less than 10% overstory canopy, and dominated by shrubs or regenerating trees
- Shrub-scrub wetland—less than 10% overstory canopy, and dominated by shrubs or regenerating trees growing in standing water or saturated soils
- Emergent wetland—herbaceous plants growing in standing water or saturated soils
- Grassland/Meadow—less than 10% tree canopy with unmaintained grass

Special features

Special features such as wetlands, streams, dumps, encampments, power lines, roads, etc. found on, or adjacent to, the site are listed.

Vegetation Inventory

Overstory Canopy Cover

The percentage overstory tree (DBH>5") canopy cover present in the management unit is estimated visually. The following categories are used: 0-25%, 25-50%, 50-75%, >75%.

Tree Density

The relative densities of overstory (>5 inches DBH) and regenerating trees (<5 inches DBH) are estimated. The approximate stems per acre and spacing are used to determine tree density according to the rubric below. Tree density is recorded as none, low, medium, or high.

Stem density	none	low	medium	high
Number of stems/acre	0	0-50	50-150	>150
Spacing (feet on center)	-	43-30	30-17	<17

Shrub Cover

The area covered by native and invasive shrub species is visually estimated and expressed as a percentage of the total area and recorded in the following categories: 0-25%, 25-50%, 50-75%, or >75%.

Herbaceous Cover

For the purpose of this assessment, the herbaceous layer includes herbaceous plants, graminoids (grasses, rushes, and sedges), and ferns. The percentage cover of native and invasive species in the herbaceous layer is visually estimated and recorded as 0-25%, 25-50%, 50-75%, or >75%.

Dominance

Dominance refers to the species of greatest prevalence/biomass and which has the most influence on the plant community. Indicate dominance by placing a number between 1 and 3 after each species, with 1 being most dominant. Species sharing a value of 1 are co-dominant. A value of 2 refers to a prevalent but not dominant species, and a 3 is considered least prevalent. Up to four species of trees, shrubs, or herbaceous plants can be listed for each category.

Restoration

The general scale and type of restoration that is required in the management unit is noted.

Relevant information includes:

- the percentage of the management unit in active restoration
- the scale of restoration needed, i.e. spot or large-scale
- type of invasive removal needed, i.e. manual removal, invasive tree treatment, herbicide treatment, or survival rings

- other actions needed, such as additional planting, erosion control, existing site maintenance
- accessibility , i.e. volunteer, contractor, steps slopes, etc.

APPENDIX II. ADDITIONAL RESOURCES

City of Kirkland

City of Kirkland Comprehensive Plan, Central Houghton Neighborhood:

<http://www.codepublishing.com/wa/kirkland/?html/KirklandCPNT.html>

City of Kirkland, GIS Maps:

http://www.kirklandwa.gov/depart/Information_Technology/GIS/GIS_Maps.htm

Cross Kirkland Corridor:

http://www.kirklandwa.gov/Community/Cross_Kirkland_Corridor/About.htm

King County iMap (Interactive Mapping Tool) Property Information:

<http://www.kingcounty.gov/operations/GIS/Maps/iMAP.aspx>

Green Kirkland Partnership

20-Year Forest Restoration Plan:

<http://www.kirklandwa.gov/Assets/Parks/Green+Kirkland+Partnership+PDFs/Green+Kirkland+Partnership+20+year+plan.pdf>

Restoration Resources

Restoration Tools

Green Kirkland Steward Field Guide:

<http://www.kirklandwa.gov/Assets/Parks/Green+Kirkland+Partnership+PDFs/GKP+Forest+Steward+Field+Guide.pdf>

Green Cities Toolbox:

http://www.forterra.org/what_we_do/build_community/green_cities/green_cities_toolbox

Monitoring

Green Cities Standardized Monitoring Protocol:

http://www.forterra.org/files/Monitoring_Field_Guide_2013.pdf

Photo Point Monitoring, USDA Forest Service:

http://www.fs.fed.us/eng/rsac/invasivespecies/documents/Photopoint_monitoring.pdf

Invasive Plant Species

California Invasive Plant Council: <http://www.cal-ipc.org/ip/management/wwh/pdf/19632.pdf>

King County Noxious Weed Control Board:

<http://www.kingcounty.gov/environment/animalsAndPlants/noxious-weeds/weed-control-board.aspx>

Washington State Noxious Weed Control Board: <http://www.nwcb.wa.gov/>

Plant Selection

Green Cities Native Plant Guide:

http://www.forterra.org/files/pdfs/GreenCities_Steward_Plant_Guide.pdf

Sound Native Plants: <http://www.soundnativeplants.com/species-selection-guide>

Washington Native Plant Society: <http://www.wnps.org/landscaping/herbarium/index.html>

Plant Associations in Washington's Puget Trough Ecoregion, Washington State Department of Natural Resources: <http://www1.dnr.wa.gov/nhp/refdesk/communities/index.html>

Preliminary Classification of Freshwater Wetland Vegetation in Western Washington, Washington State Department of Natural Resources:

http://www.dnr.wa.gov/Publications/amp_nh_wetland_class.pdf

Habitat Descriptions, Northwest Habitat Institute: <http://www.nwhi.org/index/habdescriptions>

Ecosystems, Washington Native Plant Society:

http://www.wnps.org/ecosystems/eco_system_home.htm

Erosion, Landslides & Slope Stabilization

Greenbelt Consulting:

http://www.soundnativeplants.com/sites/default/files/uploads/PDF/Unstable_slopes.pdf

Slope Stabilization and Erosion Control, Washington State Department of Ecology:

<http://www.ecy.wa.gov/programs/sea/pubs/93-30/index.html>

Wood Strand Erosion Control Mulch, forestconcepts™: <http://www.woodstraw.com/>

Hydrology, Geology & Soil

Kirkland's Streams, Wetlands and Wildlife Study, The Watershed Company:

<http://www.kirklandwa.gov/Assets/Planning/Planning+PDFs/Watershed+Report+July+1998+Part+1.pdf>

<http://www.kirklandwa.gov/Assets/Planning/Planning+PDFs/Watershed+report+July+1998+Part+2.pdf>

<http://www.kirklandwa.gov/Assets/Planning/Planning+PDFs/Watershed+report+July+1998+appendices.pdf>

Surface Geology GIS data, Washington State Department of Natural Resources:

http://www.dnr.wa.gov/ResearchScience/Topics/GeosciencesData/Pages/gis_data.aspx

Web Soil Survey, United States Department of Agriculture—Natural Resources Conservation Service (USDA-NRCS): <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>

Fish and Wildlife Habitat

Kirkland's Streams, Wetlands and Wildlife Study, The Watershed Company:

<http://www.kirklandwa.gov/Assets/Planning/Planning+PDFs/Watershed+Report+July+1998+Part+1.pdf>

<http://www.kirklandwa.gov/Assets/Planning/Planning+PDFs/Watershed+report+July+1998+Part+2.pdf>

<http://www.kirklandwa.gov/Assets/Planning/Planning+PDFs/Watershed+report+July+1998+appendices.pdf>

APPENDIX III. NATIVE PLANT SPECIES

The table below lists native plant species recorded in natural areas of parks in Kirkland during this project. Non-native plants that are not considered invasive are also included.

Broadleaf trees	
<i>Scientific Name</i>	Common Name
<i>Acer macrophyllum</i>	bigleaf maple
<i>Acer rubra</i> *	red maple
<i>Alnus rubra</i>	red alder
<i>Arbutus menziesii</i>	Pacific madrone
<i>Frangula purshiana</i>	cascara
<i>Fraxinus latifolia</i>	Oregon ash
<i>Fraxinus excelsior</i> *	European ash
<i>Populus deltoides</i> *	eastern cottonwood
<i>Populus trichocarpa</i>	black cottonwood
<i>Prunus emarginata</i>	bitter cherry
<i>Quercus garryana</i>	Garry oak/ Oregon white oak
<i>Quercus palustris</i>	pin oak
<i>Salix</i> spp.	willow tree
<i>Salix matsudana</i> 'Tortuosa'	corkscrew willow
<i>Ulmus americana</i> *	American elm
Conifer trees	
<i>Scientific Name</i>	Common Name
<i>Picea abies</i> *	Norway spruce
<i>Picea pungens</i> *	Colorado blue spruce
<i>Picea sitchensis</i>	Sitka spruce
<i>Pinus contorta</i> var. <i>contorta</i>	shore pine
<i>Pseudotsuga menziesii</i>	Douglas-fir
<i>Thuja plicata</i>	western redcedar
<i>Tsuga heterophylla</i>	western hemlock
Shrubs	
<i>Scientific Name</i>	Common Name
<i>Acer circinatum</i>	vine maple
<i>Amelanchier alnifolia</i>	western serviceberry
<i>Arctostaphylos uva-ursi</i>	kinnikinnick/red bearberry
<i>Berberis/Mahonia aquifolium</i>	tall Oregon-grape
<i>Berberis /Mahonia nervosa</i>	low/dull Oregon-grape
<i>Cornus sericea</i>	red twig/red-osier dogwood
<i>Corylus cornuta</i>	beaked hazelnut
<i>Holodiscus discolor</i>	ocean-spray/creambush
<i>Lonicera involucrata</i>	twinberry/black twinberry

*Not native; introduced in the Pacific Northwest

Shrubs	
Scientific Name	Common Name
<i>Myrica californica</i>	Pacific wax myrtle/bayberry
<i>Myrica gale</i>	sweet gale
<i>Oemleria cerasiformis</i>	Indian plum
<i>Oplopanax horridus</i>	devil's club
<i>Philadelphus lewisii</i>	Lewis' mock orange
<i>Ribes lacustre</i>	swamp currant/swamp gooseberry
<i>Ribes sanguineum</i>	red-flowering currant
<i>Rosa gymnocarpa</i>	baldhip/wood rose
<i>Rosa nutkana</i>	Nootka Rose
<i>Rosa pisocarpa</i>	cluster/swamp/peafruit rose
<i>Rosa woodsii</i>	Wood's/pearhip rose**
<i>Rubus parviflorus</i>	thimbleberry
<i>Rubus spectabilis</i>	salmonberry
<i>Rubus ursinus</i>	trailing blackberry
<i>Salix</i> spp.	willow
<i>Sambucus racemosa</i>	red elderberry
<i>Spiraea douglasii</i>	Douglas' spiraea/western hardhack
<i>Symphoricarpos albus</i>	snowberry
<i>Vaccinium ovatum</i>	evergreen huckleberry
<i>Vaccinium parvifolium</i>	red huckleberry
<i>Viburnum edule</i>	squashberry/high-bush cranberry
<i>Viburnum opulus</i> var. <i>Americanum</i>	cranberry tree/American cranberry bush
Ferns	
Scientific Name	Common Name
<i>Blechnum spicant</i>	deer fern
<i>Dryopteris expansa</i>	northern wood fern
<i>Polypodium glycyrrhiza</i>	licorice fern
<i>Polystichum munitum</i>	western sword fern
<i>Pteridium aquilinum</i>	bracken fern
Herbs & Vines	
Scientific Name	Common Name
<i>Anaphalis margaritacea</i>	western pearly everlasting
<i>Aquilegia formosa</i>	western columbine
<i>Armeria maritima</i>	sea-thrift
<i>Aruncus dioicus</i>	goatsbeard
<i>Chamerion angustifolium</i>	fireweed

** Native east of the Cascade Mountains

Herbs & Vines	
Scientific Name	Common Name
<i>Circaea alpina</i>	enchanter's nightshade
<i>Dicentra formosa</i>	Pacific bleeding heart
<i>Epilobium</i> sp.	willowherb
<i>Fragaria chiloensis</i>	beach strawberry
<i>Equisetum arvense</i>	common/field horsetail
<i>Equisetum telmateia</i>	giant horsetail
<i>Fragaria vesca</i>	woodland strawberry
<i>Geum macrophyllum</i>	largeleaved/bigleaf avens
<i>Galium</i> spp.	bedstraw
<i>Hydrophyllum tenuipes</i>	Pacific waterleaf
<i>Lysichiton americanus</i>	skunk cabbage
<i>Penstemon rupicola</i> ***	rock penstemon/cliff beardtongue
<i>Sisyrinchium californicum</i>	golden-eyed grass
<i>Solidago lepida</i>	western Canada goldenrod
<i>Stachys cooleyae</i>	Cooley's hedge- nettle
<i>Symphyotrichum subspicatum</i>	Douglas' aster
<i>Tellima grandiflora</i>	fringecup
<i>Tolmiea menziesii</i>	piggyback plant
<i>Typha latifolia</i>	common/broad-leaf cattail
<i>Urtica dioica</i>	stinging nettle
Graminoids (Grasses, sedges & rushes)	
Scientific Name	Common Name
<i>Carex obnupta</i>	slough sedge
<i>Carex deweyana</i>	Dewey's sedge
<i>Eleocharis palustris</i>	common spikerush
<i>Glyceria elata</i>	tall mannagrass
<i>Juncus effusus</i>	common/soft rush
<i>Schoenoplectus tabernaemontani</i>	soft-stem/great bulrush
<i>Scirpus microcarpus</i>	small-fruited/panicled bulrush

***Typically occurs in the Cascade Mountains at mid- to high elevations

APPENDIX IV. NON-NATIVE INVASIVE PLANT SPECIES

The table below lists the common and scientific names of non-native, invasive plant species recorded in Kirkland parks during rapid site assessments. Note that landowners are required to control certain noxious weed species. These plants are indicated in the list by an asterisk. Noxious weeds are non-native plants that are difficult to control once established, and that may be injurious to agricultural and/or horticultural crops, natural habitats and/or ecosystems, and/or humans or livestock. More information is available from the [Washington State Noxious Weed Control Board](#) and the [King County Noxious Weed Control Program](#).

Trees	
Scientific name	Common name
<i>Acer platanoides</i>	Norway maple
<i>Acer pseudoplatanus</i>	sycamore maple
<i>Aesculus hippocastanum</i>	horse-chestnut
<i>Crataegus monogyna</i>	common/English/one-seed hawthorn
<i>Ilex aquifolium</i>	English holly
<i>Laburnum anagyroides</i>	golden chain-tree
<i>Prunus avium</i>	sweet/bird cherry
<i>Prunus cerasifera</i>	cherry plum
<i>Prunus laurocerasus</i>	cherry laurel/English laurel
<i>Prunus lusitanica</i>	Portugal laurel
<i>Sorbus aucuparia</i>	European mountain-ash
Shrubs	
<i>Buddleja davidii</i>	butterfly bush
<i>Cytisus scoparius</i>	Scot's/Scotch broom
<i>Daphne laureola</i>	spurge-laurel
<i>Rubus armeniacus</i>	Himalayan blackberry
<i>Rubus laciniatus</i>	evergreen/cutleaf blackberry
Herbs & Vines	
<i>Conium macalatum</i>	poison hemlock
<i>Cichorium intybus</i>	chicory/ wild succory
<i>Cirsium arvense</i>	Canada thistle
<i>Cirsium vulgare</i>	bull thistle
<i>Convolvulus/Calystegia arvensis</i>	field bindweed
<i>Convolvulus/Calystegia sepium</i>	hedge false bindweed
<i>Geranium robertianum</i>	herb Robert
<i>Hedera helix</i>	English ivy
<i>Hedera hibernica</i>	Atlantic ivy

Herbs & Vines	
Scientific name	Common name
<i>Hyacinthoides</i> spp.	bluebells
<i>Hypericum perforatum</i>	St. John's wort
<i>Hypochaeris radicata</i>	hairy cat's ear
<i>Impatiens glandulifera</i>	policeman's helmet*
<i>Impatiens capensis</i>	spotted jewelweed
<i>Iris pseudacorus</i>	yellow iris
<i>Lactuca serriola</i>	prickly lettuce
<i>Lamiastrum galeobdolon</i>	yellow archangel
<i>Lapsana communis</i>	nipplewort
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Lotus corniculatus</i>	bird's foot trefoil/birdfoot deervetch
<i>Lythrum salicaria</i>	purple loosestrife*
<i>Polygonum x bohemicum</i>	Bohemian knotweed
<i>Polygonum cuspidatum</i>	Japanese knotweed
<i>Polygonum polystachyum</i>	Himalayan knotweed
<i>Polygonum sachalinense</i>	giant knotweed
<i>Ranunculus repens</i>	creeping buttercup
<i>Rumex acetosella</i>	sheep/ red sorrel
<i>Senecio jacobaea</i>	tansy ragwort*
<i>Solanum dulcamara</i>	bittersweet nightshade
<i>Typha angustifolia</i>	narrow-leaf cattail
<i>Verbascum thapsus</i>	common/great mullein
<i>Veronica serpyllifolia</i>	thyme-leaved speedwell
<i>Vinca major</i>	bigleaf/greater periwinkle
<i>Vinca minor</i>	common/lesser periwinkle
Graminoids	
<i>Phalaris arundinacea</i>	reed canary grass

*Control required by King County and/or Washington Noxious Weed Control Board (King County, 2014).