

CRESTWOODS PARK STEWARDSHIP PLAN

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1. INTRODUCTION

1.1 Park Description

Crestwoods Park is a 27-acre community park owned by the City of Kirkland. The park is located at 1818 6th Street in Kirkland, Washington, straddling the border between the Norkirk and South Juanita Neighborhoods. It is surrounded mostly by low- to medium-density residential developments, with Kirkland Middle School located across the road from the park to the west. The Cross Kirkland Corridor, a 5.75-mile segment of the Eastside Rail Corridor to be developed as a multi-modal transportation corridor, defines the eastern boundary of the park (City of Kirkland, 2013a; City of Kirkland, 2014).

1.2 Park Background

Originally homesteaded by Andrew Nelson in 1877, the Crestwoods Park site was acquired in 1968 to be developed as a community park¹. The site remained undeveloped until 1990, when the southwestern quadrant of the park, previously used as a landfill by the City of Kirkland, was transformed into sports fields, a children's playground, and picnic areas. The remainder of the park, consisting predominantly of upland forest, was retained as undeveloped open space.

A number of factors have impacted the health of forested areas in Crestwoods Park. Logging of the once-dominant conifer trees during the early 20th century, has resulted in a forest dominated by deciduous trees. Increasingly urban land uses in the surrounding areas led to further changes, including the introduction of non-native invasive plant species such as English/Atlantic ivy and Himalayan blackberry. In many parts of the park, these plants now dominate 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 Crestwoods Park are among the areas targeted for restoration.

¹ A community park is usually 12 to 30 acres in size and provide opportunities for a mix of active and passive types of recreation, serving both the larger community and the surrounding neighborhood.

Restoration in Crestwoods Park was initiated in 2012 as part of a partnership agreement between Forterra and the rock band, Pearl Jam. To mitigate for carbon emissions generated during their 2009 World Tour, the band funded restoration of 33 acres of urban forests in Kirkland, Redmond, Kent, and Seattle, including 9 acres in Crestwoods Park.

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 Crestwoods Park 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, Crestwoods Park has been divided into eleven restoration management units. 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 the end of 2013, 10.3 acres of a total of 19.3 acres of parkland and surrounding right-of-way areas had been enrolled in restoration.

2.2 Social Inventory

2.2.1 Attractions and Facilities

Crestwoods Park features a children’s playground, athletic fields (soccer, softball, and baseball), a basketball court, and undeveloped forested areas. Additional facilities at the park include picnic tables, benches, and restrooms. There are 116 parking spaces available for park visitors.

A network of nature trails through the forest connects with trails in Cotton Hill Park and provides access to the Cross Kirkland Corridor. The park is a popular destination for walkers and joggers—a set of 210 stairs near Forbes Creek Drive has achieved local landmark status.

2.2.2 Demographics

The variety of facilities at Crestwoods Park draws visitors not just from the surrounding mostly single-family residential neighborhoods, but also from the larger Kirkland community.

2.3 Ecological Inventory

2.3.1 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 Crestwoods Park. 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.

2.3.2 General Site Characteristics

The general site characteristics are summarized in Table 1. The natural areas in the park are dominated by deciduous forest (Figure 2). Many of the big-leaf maple and black cottonwood trees dominating the tree canopy are reaching the end of their lifespans, and broken and damaged tree limbs are common. Coarse woody debris cover is low in most management units and there are few snags in the park.

The northern part of the park (management units 01 to 05) consists of a medium to steep slope facing north to northwest. A small ravine, forming the boundary between management units 02 and 04, opens up into a broader depression at its southern extent, forming management unit 03.

The topography in the southern part of the park is variable, with steep east-facing slopes in some areas, particularly in management unit 10. A steep embankment separates the sports fields from relatively flat, forested areas in management units 06 and 07. Along the east side of the park, another rapid drop in elevation separates the now-defunct railroad bed from forested areas.

A network of unpaved trails crisscrosses the forested areas in the park. A cleared area in management unit 03 is littered with garbage, and appears to be used as a hang-out spot.

2.3.3 Geology & Soil

The surface geology of the park consists of glacial drift deposits, with interlayered fine-grained sand, silt, and clay in the northern and eastern parts of the park, and predominantly sandy deposits to the south and west (Washington State Department of Natural Resources, 2014). Soils formed in these glacial drift deposits have been classified as Indianola and Ragnar loamy fine sand (United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), 2013). Minor components of other soil types can also be expected. Field observations indicated that soils in the park range from sand to silt (Table 2).

The depth of the litter layer is less than ½ inch throughout the park. Vegetation cover is relatively dense, with the average percent bare soil in each management unit less than 5%.

Unstable soil conditions were not observed, but steep slopes in the park have been identified as high-risk areas for landslides by the City of Kirkland (City of Kirkland, 2003). There is also an increased risk of erosion where these types of soil occur along steep slopes (United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), 2013). Minor compaction and erosion were noted in some areas, mostly associated with trail use, stream access, and restoration activities. Past use of steep areas in management units 01 and 02 by mountain-bikers caused considerable erosion and compaction in places, leaving deep scars on the landscape.

Table 1: General site characteristics

Management Unit	01	02	03	04
Area (acres)	2.17	2.58	0.37	2.16
Average aspect	north	north	northwest	northwest
Average slope	medium to high	medium; high in places	medium	medium; high in places
Elevation Low/High (feet)	72/188	130/186	100/136	94/174
Exposure	shade	shade	shade	shade
Habitat type	deciduous forest	deciduous forest	deciduous forest	deciduous forest
CWD cover (%)	0-5	0-5	5-10	0-5
Snags	low	low	low	low
Special features	unpaved trail & mountain bike ramps	unpaved trail & mountain bike ramps	unpaved trail; cleared social hang-out spot	unpaved trail; stream/drainage ditch
Notable features of surrounding areas	-	-	-	Cross Kirkland Corridor
Management Unit	05	06	07	08
Area (acres)	1.74	3.90	3.02	0.28
Average aspect	north to northeast	northeast	southeast	east
Average slope	medium	low	low; high in places	low
Elevation Low/High (feet)	186/218	182/220	180/218	180/196
Exposure	shade	shade	shade	partial sun
Habitat type	deciduous forest	deciduous forest	deciduous forest	riparian forest
CWD cover (%)	5-10	5-10	10-25	5-10
Snags	none	low	low	low
Special features	unpaved trail	unpaved trail; steep embankment	unpaved trail; steep embankment	unpaved trail; stream & wetland
Notable features of surrounding areas	sports fields	sports fields; Cross Kirkland Corridor	sports fields; Cross Kirkland Corridor	Cross Kirkland Corridor

CWD=coarse woody debris

Snags: low=1-5/acre; medium=6-20/acre; high=>20/acre

Table 1: General site characteristics

Management Unit	09	10	11
Area (acres)	1.81	0.96	0.29
Average aspect	east	east	southeast
Average slope	medium	medium to high	medium; high in places
Elevation Low/High (feet)	190/230	180/212	180/230
Exposure	shade	shade	partial sun
Habitat type	deciduous forest	deciduous forest	deciduous forest
CWD cover (%)	10-25	5-10	5-10
Snags	low	low	low
Special features	dump; unpaved trail	unpaved trail	unpaved trail
Notable features of surrounding areas	sports fields	Cross Kirkland Corridor	residential development in close proximity

CWD=coarse woody debris

Snags: low=1-5/acre; medium=6-20/acre; high=>20/acre

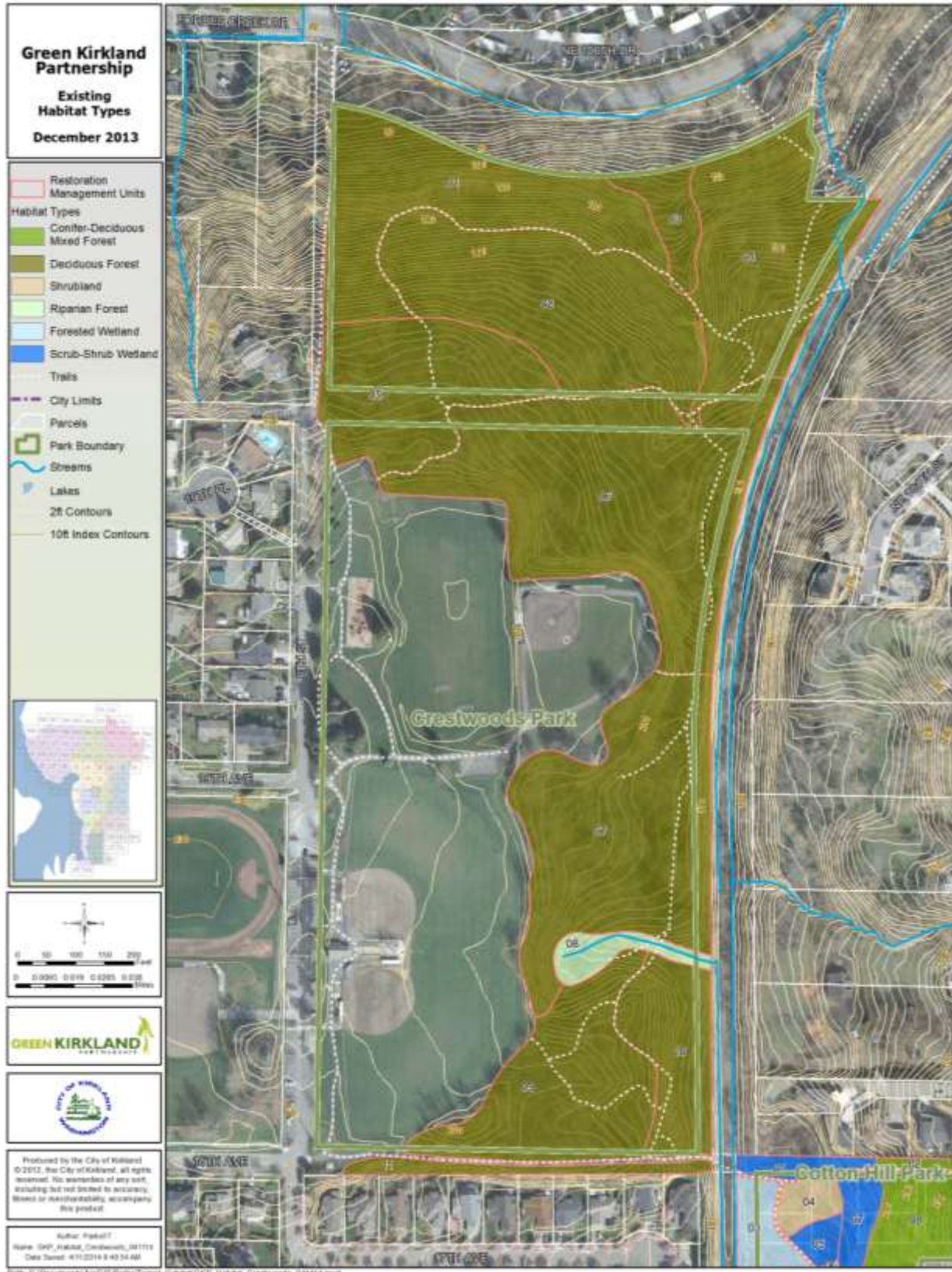


Figure 2. Existing habitat types at Crestwoods Park.

Table 2: Soil characteristics

Management Unit	01	02	03	04	05	06
Soil moisture*	damp	dry	damp	damp	dry	dry
Soil stability	stable	stable	stable	stable	stable	stable
Soil texture	silt	silt	sand	sand	sand	sand
Compaction	light	light	light	none	light	light
Cause of compaction	social trails; bike ramps	social trails; bike ramps	social trail		restoration area	trail
Litter Depth (")	< 1/2	< 1/2	< 1/2	< 1/2	< 1/2	< 1/2
Bare ground (%)	0	0	0-5	0-5	0-5	0-5
Management Unit	07	08	09	10	11	
Soil moisture*	dry	dry to saturated	dry	dry	dry	
Soil stability	stable	stable	stable	stable	stable	
Soil Texture	sand	silt	silt	silt	silt	
Compaction	light	none	light	light	none	
Cause of compaction	trail		trail	trail		
Litter Depth (")	< 1/2	< 1/2	< 1/2	< 1/2	< 1/2	
Bare ground (%)	0-5	0	0-5	0-5	0	

*Based on conditions during later summer 2013

2.3.4 Hydrology

Crestwoods Park is located in the Lake Washington-Cedar River Watershed within the Forbes Creek and Moss Bay drainage basins (City of Kirkland, 2013b). A small, deeply incised stream, fed mainly by stormwater runoff from the sports fields and residential areas to the west, traverses management unit 08, creating localized wetland conditions. A drainage ditch that cuts across the very northeastern corner of the park in management unit 04, eventually feeds into Forbes Creek to the north of the park.

Seepage along the relatively steep slopes in the northern part of the park results in moister soil conditions in several areas, as indicated by damp soil conditions in parts of 01, 03, and 04, even during the dry summer months, and the presence of moisture-loving plants such as salmonberry and Douglas' spiraea.

2.3.5 Wildlife

Crestwoods Park provides habitat for a variety of terrestrial wildlife, including mammals, birds, amphibians, and reptiles. A list of wildlife species that can be expected to use natural areas in Kirkland parks is available in the [Kirkland's Streams, Wetlands and Wildlife Study](#) report (The Watershed Company, 1998a).

2.3.6 Native Vegetation Characteristics

Native vegetation characteristics are summarized in Table 3. Scientific names of plant species can be found in Appendix III.

Overstory tree canopy cover is generally high (>75%), with average tree diameter between 5 and 20 inches. Big-leaf maple is the dominant overstory tree species. Other deciduous trees include red alder and black cottonwood. Native willow trees are also present in management unit 08.

Conifer tree cover is sparse throughout the park, with conifers absent from the overstory in several management units. Where present, species include western redcedar, Douglas-fir, and western hemlock.

Regenerating tree density is low to medium and consists largely of deciduous species.

Regenerating conifer tree density is somewhat higher in areas already in restoration, due to the installation of western redcedar, Douglas-fir and Sitka spruce saplings.

Native shrub and herb cover is variable, with the lowest values in management unit 11. Shrubs include red elderberry, salmonberry, Indian plum, red-twig dogwood, beaked hazelnut, thimbleberry, Douglas' spiraea, baldhip rose, low Oregon-grape, salal, red huckleberry, and swamp gooseberry. Western sword fern, trailing blackberry, fringe-cup, enchanter's nightshade, stinging nettle, piggyback plant, Pacific bleeding heart, Pacific waterleaf, bracken fern, willowherb, and common horsetail comprise the herbaceous layer in most areas. Skunk cabbage and tall mannagrass are also present in wetter areas in 08.

2.3.1 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.

The overstory canopy does not include any invasive tree species; regenerating stem density is low in most management units. Species include Portugal laurel, one-seed hawthorn, sweet cherry, cherry-laurel, English holly, European mountain ash, and golden chain-tree.

The dominant shrub species is Himalayan blackberry. Evergreen blackberry is also commonly present in minor amounts, but, for the purposes of this report, is included with Himalayan blackberry. Blackberry is pervasive with cover of up to 75% in many areas. Vigorous regrowth of Himalayan blackberry was observed in areas cleared during restoration.

Cover of invasive species in the herbaceous layer is up to 75% in many management units. Species include reed canary grass, herb Robert, knotweed, English/Atlantic ivy, greater periwinkle, creeping buttercup, nipplewort, and thyme-leaf speedwell. Of these, knotweed, reed canary grass, greater periwinkle, and ivy are the greatest concerns.

Table 3: Native Vegetation Characteristics

Management Unit	01	02	03	04
Overstory tree canopy cover (%)	>75	>75	>75	>75
Average tree diameter (inches)	15-20	15-20	5-15	5-15
Overstory conifer tree density	low	low	low	low
Regenerating conifer tree density	low	low	medium	low
Overstory deciduous tree density	medium	medium	medium	medium
Regenerating deciduous tree density	low	low	low	medium
Shrub cover (%)	50-75	50-75	5-25	25-50
Herbaceous cover (%)	25-50	25-50	50-75	50-75
Dominant tree species	big-leaf maple, red alder, western redcedar, Douglas-fir	big-leaf maple, red alder, Douglas-fir, western redcedar	big-leaf maple, red alder, western redcedar	big-leaf maple, red alder, black cottonwood, western redcedar
Dominant regenerating tree species	western redcedar, Douglas-fir, big-leaf maple, red alder	Douglas-fir, western redcedar, big-leaf maple	western redcedar, Sitka spruce, red alder	Sitka spruce, western redcedar, Douglas-fir, red alder, big-leaf maple
Dominant shrub species	red elderberry, salmonberry, Indian plum, red-twig dogwood	salmonberry, Indian plum, beaked hazelnut, red elderberry	salmonberry, Indian plum	beaked hazelnut, salmonberry, Indian plum, red elderberry, thimbleberry, Douglas' spiraea
Dominant herbaceous species	western sword fern, trailing blackberry, fringecup, enchanter's nightshade	western sword fern, trailing blackberry, stinging nettle, fringecup, bigleaf avens	western sword fern, trailing blackberry, piggyback plant	western sword fern, trailing blackberry, Pacific bleeding heart, Pacific waterleaf

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

Table 3 continued: Native Vegetation Characteristics

Management Unit	05	06	07	08
Overstory tree canopy cover (%)	50-75	>75	>75	0-25
Average tree diameter (inches)	5-15	5-15	5-15	5-15
Overstory conifer tree density	none	low	low	none
Regenerating conifer tree density	high	none	low	none
Overstory deciduous tree density	medium	medium	medium	low
Regenerating deciduous tree density	low	medium	medium	low
Shrub cover (%)	5-25	25-50	50-75	5-25
Herbaceous cover (%)	25-50	5-25	25-50	25-50
Dominant tree species	big-leaf maple, red alder	big-leaf maple, black cottonwood, Douglas-fir, western redcedar	big-leaf maple, black cottonwood red alder, western redcedar, western hemlock, Douglas-fir	big-leaf maple, red alder, willow
Dominant regenerating tree species	Douglas-fir, western redcedar, Sitka spruce, western hemlock, cascara, red alder	big-leaf maple, red alder	big-leaf maple, red alder, cascara, western redcedar	red alder
Dominant shrub species	beaked hazelnut, salmonberry, Indian plum	beaked hazelnut, Indian plum, salmonberry, baldhip rose, salal, Douglas' spiraea	Indian plum, beaked hazelnut, low Oregon-grape, salal	salmonberry
Dominant herbaceous species	bracken fern, western sword fern, trailing blackberry, willowherb	fringecup western sword fern, stinging nettle	trailing blackberry, western sword fern, fringecup, Dewy's sedge	lady fern, tall mannagrass, common horsetail, skunk cabbage, piggyback plant

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

Table 3 continued: Native Vegetation Characteristics

Management Unit	09	10	11
Overstory tree canopy cover (%)	>75	>75	0-25
Average tree diameter (inches)	15-20	15-20	5-15
Overstory conifer tree density	low	low	low
Regenerating conifer tree density	none	none	low
Overstory deciduous tree density	medium	medium	medium
Regenerating deciduous tree density	medium	low	low
Shrub cover (%)	50-75	50-75	0-5
Herbaceous cover (%)	50-75	5-25	5-25
Dominant tree species	big-leaf maple, red alder, western redcedar	big-leaf maple, Douglas-fir	big-leaf maple, red alder, black cottonwood, western redcedar
Dominant regenerating tree species	red alder, big-leaf maple	big-leaf maple	big-leaf maple, red alder, western redcedar
Dominant shrub species	beaked hazelnut, Indian plum, red huckleberry, swamp gooseberry	Indian plum, beaked hazelnut, salmonberry, red huckleberry, low Oregon-grape	beaked hazelnut, Indian plum
Dominant herbaceous species	western sword fern, trailing blackberry, fringe cup, Dewy's sedge	western sword fern, trailing blackberry, willowherb	western sword fern, bracken fern, trailing blackberry

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

Table 4: Non-native invasive vegetation characteristics

Management Unit	01	02	03	04
Overstory stem density	none	none	none	none
Regenerating stem density	low	low	none	low
Shrub cover (%)	0-5	25-50	5-25	25-50
Herbaceous cover (%)	0-5	0-5	0-5	0-5
Dominant tree species	-	-	-	-
Dominant regenerating tree species	cherry plum	English holly, sweet cherry, cherry plum	-	English holly, Portugal laurel, sweet cherry, one-seed hawthorn
Dominant shrub species	Himalayan blackberry	Himalayan blackberry	Himalayan blackberry	Himalayan blackberry
Dominant herbaceous species	reed canary grass	herb Robert, creeping buttercup	herb Robert, creeping buttercup	herb Robert, creeping buttercup, reed canary grass
Management Unit	05	06	07	08
Overstory stem density	none	none	none	none
Regenerating stem density	low	low	none	low
Shrub cover (%)	5-25	50-75	50-75	50-75
Herbaceous cover (%)	5-25	25-50	5-25	0-5
Dominant tree species	-	-	-	-
Dominant regenerating tree species	Portugal laurel, one-seed hawthorn, sweet cherry, cherry-laurel	English holly, European mountain ash, Portugal laurel, golden chain-tree, one-seed hawthorn	one-seed hawthorn, sweet cherry, English holly, Portugal laurel, European mountain ash, cherry-laurel	-
Dominant shrub species	Himalayan blackberry	Himalayan blackberry, evergreen blackberry	Himalayan blackberry	Himalayan blackberry
Dominant herbaceous species	knotweed, creeping buttercup, nipplewort, reed canary grass	reed canary grass, knotweed, creeping buttercup, ivy	ivy, reed canary grass	reed canary grass, thyme-leaf speedwell

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

Table 4: Non-native invasive vegetation characteristics

Management Unit	09	10	11
Overstory stem density	none	none	none
Regenerating stem density	none	low	none
Shrub cover (%)	5-25	25-50	50-75
Herbaceous cover (%)	5-25	5-25	50-75
Dominant tree species	-	-	-
Dominant regenerating tree species	English holly, sweet cherry	sweet cherry	-
Dominant shrub species	Himalayan blackberry	Himalayan blackberry	Himalayan blackberry
Dominant herbaceous species	reed canary grass, greater periwinkle	reed canary grass	reed canary grass, knotweed, creeping buttercup, herb Robert, ivy, bindweed

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

3. STEWARDSHIP

The primary management concerns at Crestwoods Park include:

- the presence of non-native invasive plants
- the scarcity of mature conifer trees and lack of conifer tree regeneration
- the risk of erosion along steep slopes, especially in areas requiring large-scale removal of invasive species
- the abundance of informal trails resulting in trampling of vegetation, soil compaction, and erosion, creating conditions unfavorable for native plant regeneration

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 for several years will be required to ensure restoration success.

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.

Knotweed Complex

Species in the knotweed complex include Japanese knotweed, giant knotweed, Himalayan knotweed, and Bohemian knotweed, a hybrid between giant and Japanese knotweed. These plants are tall, clump-forming, herbaceous perennials that spread by underground rhizomes and, less commonly, seed. Plants can regrow from stem or root fragments.

Repeated cutting or digging can be used to control small, isolated infestations of knotweed. Dried out stems can be composted, but do not compost roots or rhizomes. Herbicide treatment (foliar spray or stem injection), applied during the summer months, is recommended for larger

infestations. Stewards should discuss appropriate treatments for each site with the Green Kirkland Partnership staff.

Suckering Invasive Trees & Shrubs

This category includes Portugal laurel, cherry laurel, sweet cherry, English holly, butterfly bush, black locust, and common hawthorn. Cutting down these trees without removing the roots causes them 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 require chemical removal methods, including cut-stump or lance treatment. Cut-stump treatment consists of 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. Plants can be removed by hand; grasp the plant firmly at the base and pull. 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.

Reed Canary Grass

Reed canary grass is a tall wetland grass that spreads by seeds and rhizomes. Small patches of reed canary grass may be hand-pulled or dug out. Thoroughly remove the entire root mass to

avoid re-growth. If stems are not underwater, small infestations may be covered by black plastic or non-woven geotextile fabric. This will not completely eliminate reed canary grass, but will reduce the density and allow establishment of native vegetation. Mowing twice a year is an alternative approach.

Large patches may require herbicide treatment. Reed canary grass does not do well in shade—the best long-term management strategy is to install relatively dense plantings of trees and shrubs.

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:

- 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. Also 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 Crestwoods Park. 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 calculation of 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 and tools for selecting appropriate plant species are available in the [Green Kirkland Steward Field Guide](#). See Appendix II for additional resources. A handy calculator for estimating quantity of plants needed is available on the [Sound Native Plants](#) website.

3.3 Recommendations

Restoration status and considerations, as well as recommendations for each management unit, are summarized in Tables 5 and 6, respectively. The target habitat for most of Crestwoods Park is conifer-deciduous mixed forest (Figure 3). Plant palettes should be tailored according to local environmental conditions, especially in management unit 08 where wetter soil conditions occur in the vicinity of the stream. Management units 01 to 05 have been enrolled in restoration (Figure 1), representing about 47% of the area targeted for restoration.

Management units 01 to 05

Management units 01 through 05 are in active restoration (Figure 1) but will require ongoing maintenance for several years. Management recommendations are as follows:

- Continue to manage invasive species, particularly Himalayan blackberry, reed canary grass, ivy, and knotweed.
- Remove invasive tree species.
- Install additional plants and mulch with wood chips where extensive removal of invasive plant species have occurred, or where installed plants have died.
- Closely monitor the recovery of vegetation in areas disturbed by mountain biking to determine whether additional treatments are necessary. Coarse woody debris has been laid across the slope to discourage further use of mountain bike trails and prevent additional erosion.

Management units 06, 07, 09 and 10

These management units are composed of large areas where slopes are gentle enough to allow restoration work by volunteers. Locally steep conditions in some areas will require professional crews, both for safety reasons, and to allow installation of treatments to prevent erosion, especially where large-scale removal of invasive plants are required. Consult with Green Kirkland Partnership staff before initiating work along steep slopes. Recommendations include the following:

- Plant additional conifer trees—western redcedar in shady, moist spots, and, in drier areas, western hemlock in the shade, and Douglas-fir and grand fir in canopy gaps.
- Plant understory species in areas where large-scale removal of invasive plants is necessary. Appropriate species will be determined by local site exposure and soil conditions. A relatively diverse suite of understory species is growing in patches of less-invaded forest in the park—dominant species are listed in Table 3. These species are well-adapted to site conditions and are good first choices for restoration plantings.

Management unit 08

Most of this area is appropriate for restoration by volunteers, but, because of sensitive areas along the stream, restoration work should proceed in close consultation with Green Kirkland Partnership staff. High inputs of nutrient-laden stormwater make this area more prone to invasion by undesirable plant species and more challenging to restore. Recommendations include:

- Manually remove Himalayan blackberry and reed canary grass.

- This management unit is relatively exposed, and removal of Himalayan blackberry may result in increased cover of sun-loving reed canary grass. Installing relatively dense plantings of fast-growing trees and shrubs will help to control the spread of reed canary grass by providing competition and by creating shade. Installation of live stakes of fast-growing native willows in areas most at risk of reed canary grass invasion is a good option.

Management unit 11

Management unit 11 is a relatively exposed, narrow (less than 20 feet wide) right-of-way bordered by a trail on one side and a residential development on the other. Most of this management unit is appropriate for restoration by volunteers, but steep slopes at the western end of this area will need to be attended to by professional crews. Very little native vegetation is present in this management unit and large-scale removal of invasive species are required. Successful establishment of native plants in this management unit will be challenging.

Recommendations for this area include:

- removal of invasive plant species
- establishment of fast-growing, hardy plants such as Douglas-fir, snowberry and sword fern
- maintaining a layer of wood chip mulch to suppress weed regrowth and preserve soil moisture.

Additional recommendations for all management units

It is recommended that trails in the park be mapped and undesirable informal trails identified and decommissioned. Decommissioning should include blocking trail access by large woody debris or other structures, scarification of compacted soil and, where necessary, planting.

Table 5: Restoration status and considerations.

Management Unit	01	02	03	04
Target Habitat	conifer-deciduous mixed forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest
Active restoration	yes	yes	yes	yes
Area in restoration (%)	100	100	100	100
Accessibility	volunteer/crew	volunteer/crew	volunteer	volunteer/crew
Special considerations	steep slopes	steep slopes	-	steep slopes
Management Unit	05	06	07	08
Target Habitat	conifer-deciduous mixed forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest	riparian forest
Active restoration	yes	no	no	no
Area in restoration (%)	100	0	0	0
Accessibility	volunteer	volunteer/crew	volunteer/crew	volunteer/crew
Special considerations	-	steep slopes	steep slopes	wet areas
Management Unit	09	10	11	
Target Habitat	conifer-deciduous mixed forest	conifer-deciduous mixed forest	conifer-deciduous mixed forest	
Active restoration	no	no	no	
Area in restoration (%)	0	0	0	
Accessibility	volunteer	volunteer/crew	volunteer/crew	
Special considerations	-	steep slopes	steep slopes	

Table 6: Management recommendations for each management unit.

Management Unit	Control of invasive plants by manual removal	Ivy lifesaver rings	Knotweed herbicide treatment	Invasive tree removal		Slope stabilization/ Erosion control	Plant installation
				Manual removal	Herbicide treatment		
01	spot			x	x	x	X
02	large-scale			x	x	x	X
03	spot						X
04	large-scale			x	x	x	X
05	large-scale		x*	x	x	x	X
06	large-scale	x	x	x	x	x	X
07	large-scale	x		x	x	x	X
08	large-scale						X
09	spot			x	x		X
10	large-scale		x	x	x	x	X
11	large-scale	x		x	x	x	X

*Herbicide has been applied to knotweed in management unit 05, but repeat applications may be necessary.



3.4 Volunteers

Two large restoration events were held at Crestwoods Park in 2012 as part of the Pearl Jam-funded restoration project. Volunteers for these events were recruited by Forterra and managed by Forterra's Washington Conservation Corps (WCC) crew. These events each attracted between 100 and 150 volunteers. Similar large events, usually managed by contracted environmental organizations or professionals, will likely be held on an annual basis. Volunteers at restoration events typically include park neighbors and community members, youth groups, faith-based groups, and students filling community service hours.

Crestwood Park's first volunteer Green Kirkland Steward was enrolled in 2012, and will be responsible for smaller restoration events. In addition, a group of University of Washington students will be doing restoration work in the park during 2013-2014, as part of the UW Restoration Ecology Network (REN) program.

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. Photo points have already been established in management units 02 and 05 in Crestwoods Park. Locations of these photo points have yet to be mapped. The goal for Green Kirkland sites is to establish at least one photo point per management unit.

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. Two permanent monitoring plots, one in management unit 02 and one in 04, were installed at Crestwoods Park by the WCC crew during 2012. Conditions in these monitoring plots

were reevaluated in 2013. Monitoring reports are available from Green Kirkland Partnership staff upon request.

3.6 Timeline

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. Large areas targeted for restoration have yet to be enrolled. The timeline for restoration depends on the availability of resources. An annual work plan created towards the beginning of each calendar year by stewards, Green Kirkland Partnership 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 level 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 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.

Snags

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— 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 which plants are most dominant 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 either 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, steep slopes, etc.

APPENDIX II. ADDITIONAL RESOURCES

City of Kirkland

City of Kirkland Comprehensive Plan:

<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

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>

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	
Scientific Name	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	
Scientific Name	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	
Scientific Name	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>	dull/low 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>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).