Orchard Street Ravine
Vegetation Management Plan

Prepared for:

City of Seattle Department of Parks and Recreation
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Acknowledgements

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I. OVERVIEW

A. Introduction

Orchard St. Ravine is a 2.2 acre site comprised of two Parks owned parcels of land separated by an unimproved street right-of-way (38th Ave SW), with another unimproved right-of-way (SW Orchard St.) bordering the northeast side of the site also included in the greenspace. The majority of the woodland site contains a madrone-Douglas fir forest situated on west and southwest facing slopes, while the remainder of the site is fairly flat and open with dense thickets of blackberry. The forest type found at Orchard St. is one that is fairly scarce in Seattle – data reveals that only 52 acres out of 2700 acres of Seattle's urban forest in Parks ownership that was surveyed contains the conifer-madrone forest that is present at the Orchard St. site. As is seen throughout the city, the woods exhibit signs of decline and invasion by non-native species.

The site is surrounded by single family residences and has a small parking area that can accommodate up to four or five cars in a dead-end cul-de-sac on SW 38th St. The majority of park users, however, access the ravine area on foot, as it is a neighborhood park, not a destination park. This is not anticipated to change even with proposed vegetation and trail improvements. Human use of the site is mainly passive wildlife observation and enjoyment of the greenspace by neighbors as an aesthetic amenity; there is no trail access to the interior of the site. Wildlife use is fairly high with over 52 species of birds observed, and mammals including coyote regularly using the site.

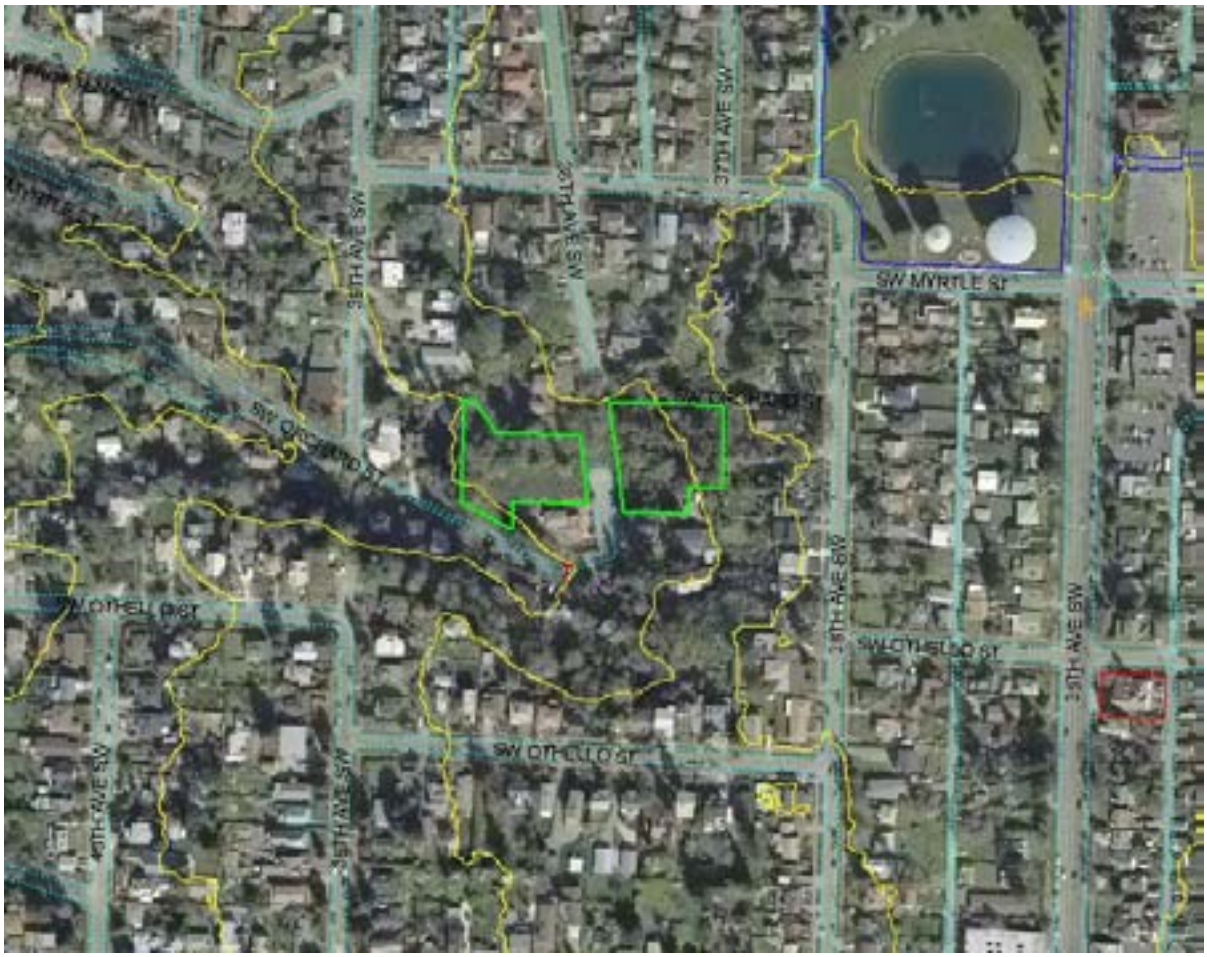
Orchard St. Ravine is located approximately 1 mile east of Lincoln Park and the shoreline of Puget Sound. There are several parallel wooded ravines in this area providing a band of vegetation lying roughly between the Myrtle Reservoir and the northern edge of Lincoln Park. West of California Ave SW along the length of Lincoln Park there is also a band of woods bisecting the residential neighborhood. These wooded areas do provide some sort of loosely connected vegetated corridor for terrestrial and avian species to move across this developed landscape (Figure 1).

The Orchard St. Ravine has been an unmanaged greenspace since the time of Parks purchase. To allow this site to reach its potential for both improved human enjoyment and wildlife benefits, active vegetation management will be needed now and into the future. Creation of a vegetation management plan is the documentation of this process to define goals, develop recommendations, set priorities, and establish management guidelines that will result in the improvement of this site over time, and to ensure continuity in management and stewardship practices.

B. Site Location, History, and Context

Orchard Street Ravine is located in West Seattle at 7200 38th Ave SW. The 2.2 acre site combines two irregularly-shaped parcels totaling 1.5 acres of Park property joined together by 0.75 acres of undeveloped street rights of way. The site abuts single-family residences on nearly all sides.

Figure 1 Orthophoto of Project Site, Orchard St. Ravine



Orthophoto from City of Seattle GIS, photo date 2005, 50-ft contours shown, north is up.

Geologic Background, Topography and Natural Systems

One of the most notable features of the ravine is its landform. It is both inviting and formidable with its open sun-bowl shape and near vertical sides.

"The Orchard Street Ravine () is about 500 to 1,000 feet west southwest of (Myrtle Reservoir) near 36th Avenue SW and SW Myrtle Street. The (site) is in a bowl-shaped area with steep slopes around the rim and gentle to moderate slopes below. The steep slopes begin at about elevation 500 feet near the SW Orchard Street end to the east, just north of the residential house along SW Othello Street, and south of the residences that are approximately in line with and west of the SW Orchard Street end. The steep slopes extend down to about elevation 400 to 430 feet, where SW Orchard Street coming up from the west turns north into 35th Avenue SW. The (site) near 35th Avenue SW has mostly gentile to moderate slopes. The upper steep slopes of the park site are within City of Seattle Environmentally Sensitive Areas for landsliding and steep slopes."[1]

[1] Shannon & Wilson, Inc., February 22, 2006 Memorandum to Seattle Parks and Recreation

"The Seattle geologic map (Troost and others, 2004) shows the Orchard St. site is a complex composition of landslide deposits of glacial till and Esperance sand, all underlain by Lawton clay. Very dense Vashon till caps the top of the site, near and east of the SW Orchard Street end. Hard and very hard Lawton clay is present below and downslope from the site. The Esperance sand sandwiched between till and Lawton clay, creates what is known as a contact zone at the sand clay interface. The contact zone is where local slides are typically generated. Once a slide has developed, the material is deposited in a complex jumble in the runout zone or base of the slide scarp.

The U of W and the USGS geologists identified a landslide head scarp at the top of the site which generally coincides with the steep slopes west of 36th Avenue SW, north of SW Othello Street and south of SW Myrtle Street. A hallmark of landslide material in the West Seattle area is a mix of till, sand and clay generally found at landslide sites throughout the Puget Sound lowlands. The Orchard Street Ravine basin material is composed of just such a mix of slide debris from the upper till cap and the sandwiched Esperance sand. These landslide deposits average about 500 to 600 feet in width near the park peak elevation and continue to appear in the ravine downslope to California Way S.W.[2]

The ravine has remained relatively undeveloped over time, which has allowed it to function as a small island of open space, attractive to wildlife in part due to a lack of human presence. The site has been host to a wide range of bird species, as well as home to an urban coyote and very likely other urban wildlife. As with many similar areas in Seattle, the site's vegetation composition has degraded over time. The remnant forest is heavily invaded by non-native plant species, which will ultimately reduce habitat viability by out-competing native vegetation.

Cultural History

For thousands of years, people have inhabited West Seattle and enjoyed the inherent beauty and natural resources of the peninsula. From a short history on West Seattle: "There were at least 17 Duwamish and Suquamish villages in the Puget Sound region when the Denny party arrived. Indian artifacts dating to the sixth century have been found at one archeological site on the West Seattle peninsula. The point where the party landed (now marked by an obelisk at 63rd Avenue SW and Alki Avenue SW) had long been used as a Duwamish burial site. Nonetheless, the settlers claimed ownership of all they could survey under the 1850 Donation Land Law".[3]

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[2] Mark Orth, Seattle Parks and Recreation, pers. comm.

[3] History Ink/HistoryLink, Admin@historylink.org**;** Seattle Neighborhoods: West Seattle -- Thumbnail History File #3428

In the early 1900s, construction of a street-car line by land developers encouraged further settlement near the ravine. Annals from one of these early residents attest to this area's natural beauty:

> *"Wildly picturesque in the very heart of the Gatewood area was a trail called Orchard Canyon, which by gradation down through the years became Orchard Street. Old settlers describe it first as a deep and thickly wooded ravine, interspersed with fallen logs over which fell busy little streams. Beside these grew wild currant, Oregon grape, and in the more shaded spots ferns in rank profusion, where deer paused daintily to drink."*[4]

"In 1989 the forested area at the dead end of SW Orchard Street, known as Orchard Street Ravine was threatened by development. The neighbors formed a group called "Neighbors of Orchard Street Ravine" (Neighbors), and began the long process toward preservation of the property as a Natural Area.

By 1993 Orchard St. Ravine was among the Seattle Parks Department's mapped areas prioritized for purchase. In June 1993 Orchard Street Ravine applied for purchase under the King County Conservations Future Funds Local Projects Grant Program. The Orchard Street Ravine was selected for purchase in July of 1993 as a result of receiving high marks on the Conservation Future Funds selection criteria.

The site was purchased as a "win-win solution" between neighbors, a willing seller and Seattle Parks' Open Space Program. It has been preserved as a Natural Area-Greenspace. The Parks Department recognized that the ravine was the upper-most part of the Gatewood Creek Watershed. Because the ravine contains large areas of critically steep slopes it was deemed best suited for wildlife habitat and passive-use recreation."[5]

The property was ultimately acquired by the City of Seattle Parks and Recreation Department (Parks) in 1996. The photo shows a view to the west site from the cul-de-sac entry at the time of Parks Acquisition. Subsequent neighborhood planning recognized this valuable open space in an otherwise densely residential area, and identified the ravine as an element in the proposed "Green Crescent." This would provide a linking of "green" spaces through the neighborhood,

[4] from Gladys Kittoe's ***The Hill in My Life*** describing her arrival to Orchard Ravine in 1926

[5] Friends of Orchard Street Ravine, History of Orchard Street Ravine, part of submittal to Seattle Parks Board of Park Commissioners (Parks Board) February 2006

including walking routes to connect the ravine with other open spaces, e.g. nearby High Point and Lincoln Park Annex. The Morgan Junction Neighborhood Plan also proposed restoration and preservation of this natural area.

C. Purpose of VMP

The Vegetation Management Plan (VMP) for the Orchard St. Ravine is intended to be used as a tool to direct site restoration. The VMP is a record of the vision and goals for the site as developed in public process, and the recommended actions to achieve those goals. More specifically, it provides a list of recommended actions, their level of importance, and the funding that will be needed to perform them. The VMP provides a work plan for the site – for Parks staff that are overseeing implementation over time, paid contractors that are hired to perform certain tasks, and for the ongoing site stewardship by neighborhood volunteers. The VMP also provides baseline vegetation data for the site that can be used to assess restoration success and changes in vegetation communities in the future.

D. Project History

The 2000 Pro Parks Levy provided $175,000 for Orchard St. Ravine Improvements. The natural area was acquired by Parks in 1996 after much work by neighbors identified the site as a potential open space. The Morgan Junction Neighborhood Plan proposed trail access and restoration work. Through site assessments with Parks staff and considerable community input during the project planning process, it became clear that vegetation restoration is a high priority for this site. The quality of experiences by open space visitors can be enhanced by developing a clear vision for vegetation management, which will help guide future restoration and ongoing maintenance activities.

II. MANAGEMENT VISION AND OBJECTIVES

A. Vision for the Site

This natural area is envisioned to continue its vital function for wildlife habitat, and provide opportunities to simply enjoy nature through quiet activities such as walking on trails. The vision for the restoration of a healthy native plant community is to use the existing and site-defining forest remnants as a guide to restore balance, vitality, and sustainability to the native plant communities on the site. In this scenario, invasive species are scarce and controlled by ongoing site stewardship, canopy trees are healthy and regenerating naturally, and understory shrubs provide multiple layers beneath the tree canopy. Snags and woody debris create nesting, foraging, and refuge for numerous wildlife guilds, and the site is used by a myriad of terrestrial and avian wildlife species throughout the year. In terms of plant species composition, a typical forest patch of this type, located on relatively dry south and southwest facing slopes has roughly an even mixture of Douglas fir and madrone. It has small amounts of Scouler willow, cedar, hemlock, and grand fir. On the ground there is a fairly dense cover of salal, with some bracken fern and sword fern mixed in, with pre-dominantly oceanspray and hazelnut overhead in the sub-canopy layer.

B. Goals and Objectives

1. Overall Parks Natural Area Goals

Seattle Parks and Recreation manages over 6,000 acres of park land. A variety of goals and objectives are identified for management of open spaces and natural areas. These goals are elements of the Seattle Parks COMPLAN 2000, including a report titled "Urban Wildlife and Habitat Management Plan" (Miller, 2000), the Urban Forestry Program and Seattle Parks Tree Policy. A sampling of relevant goals from these documents include:

- Provide for forest community restoration in Seattle's park and open spaces with appropriate, site-specific reforestation projects. Involve…volunteers and other community organizations in such efforts.
- Maintain the living park inventory of plants and trees, focusing on reforestation, enhancement and restoration of natural communities, plant replacement, turf restoration, control of nuisance plants, and provision of proper conditions for growth.
- Promote native vegetation character, assist natural processes, conserve soil and water quality, protect and enhance wildlife, buffer land uses and ensure public safety.
- Continue and increase wildlife habitat protection and enhancement efforts, promote internal education and consistency in Department actions, promote volunteer involvement in wildlife habitat protection and enhancement, and promote interdepartmental and interagency cooperation to protect wildlife.
- Develop maintenance plans for trees that consider such elements as tree health, long-term reforestation needs, historical context, public safety, aesthetics, potential infrastructure damage.

These goals are quite broad, and the concepts in them have been a common thread in community planning and dialogue about Orchard St. Ravine.

2. Goals for Orchard Street Ravine

Specific goals for Orchard St. Ravine stem from the broad goals stated above, as well as a more detailed awareness of "place" gleaned from site investigations and ideas for how the open space fits in the neighborhood and can be comfortably used by both people and wildlife. Goals are identified as follows:

- Promote maintenance of a naturally functioning condition that supports diverse wildlife habitat and requires few resources to maintain.
- Improve forest health and encourage natural forest regeneration, increase native species diversity and structural complexity.
- Engage community members and provide environmental education through site stewardship.
- Protect sensitive areas and wildlife through minimal development, phased restoration activities, and best management practices.
- Maintain good visibility for safety at access points and trails.

III. EXISTING CONDITIONS

A. Vegetation

1. Data Collection Methods

Data Plot Distribution and Characteristics

A total of four data plots were distributed in the three different vegetation communities found on the site, as determined by site visits and aerial photo interpretation. Within the three vegetation types, four management units were identified (Table 1). Sampling was performed on April 25 and April 28, 2006, with a follow-up site visit to verify several species on May 11, 2006. Data plots were 0.10 acre in size, the typical plot size used for sampling in Parks VMPs. A total of 0.4 acres were sampled for the vegetated 2.12 acres of the site – or approximately 19% of the site. The cul-de-sac was omitted from the site acreage of 2.2 acres for the sampling, but portions of adjacent right-of-ways were included in the total acreage to be managed under this plan (Figure 2).

Table 1 Description of Management Units Within Orchard St. Ravine

Management Unit	Characteristics	Size (acres)	# of Sampling Plots
Forest Remnant	conifer/deciduous forest, S-SW slopes	1.28	2
Blackberry Thicket	blackberry dominated, flat	0.38	1
Blackberry Thicket Steep	blackberry dominated, steep S-SW slopes	0.24	none
Disturbed Sandy Soils	open, disturbed, very sandy and droughty soils	0.23	1
totals		***2.13***	***4***

Plots were located randomly, but also due to the small size of management units, they were located such that they would fit within the available area without compromising the intention of the plot shape – long and rectangular. One plot had to be shorter and wider than the standard 8 meter x 50 meter shape preferred. Where possible, plots were oriented along an east-west axis; adjustments to this were made depending on the shape of the management unit. One corner of each sampling plot was marked with a 2"x2" wooden stake, as indicated on the site map, and two GPS corner points for each plot were recorded to within 1 meter accuracy. No sampling was done in the Blackberry Thicket Steep MU because it was only it was only differentiated from the Blackberry Thicket MU for purposes of management not differences in plant community type.

Vegetation Assessment

Tree density, vegetation cover, and habitat features were the three main characteristics recorded at each sampling plot. Tree density was assessed by identifying and counting all trees with trunks occurring within plot boundaries. All species that could achieve canopy height (>20'ht.) were included (invasives such as holly, laurel, mountain ash, etc. were included in this tally). Height and diameter at breast height (dbh) were recorded for each tree; for trees smaller than 4.5' in height, an average stem diameter to the nearest 1/2" was recorded. Trees with dbh > or =5" were also assessed for health (qualitative = good, fair, poor), and the presence of ivy and clematis was recorded. Canopy cover was

visually estimated within each quadrat of the plot (a quadrat was a rectangle ¼ or $^1/_5$ the area of the total plot area). Cover was defined as the area of the ground covered by the outer perimeter of the foliar spread of the tree.

Vegetation cover was visually estimated in the shrub and groundlayer as well. Coverage for all species present was recorded by quadrat.

Snags and coarse woody debris (CWD) were the two types of habitat features assessed. CWD was only recorded if it was >5" diameter, and was classified in one of three decay classes. Decay class 1 represents wood that is only recently down, and still has intact branches, bark, and hard trunk wood. Decay class 3 represents wood that is in an advanced stage of decay, with little or no bark remaining, obvious decay, soft wood, and/or other vegetation establishing on it. Decay class 2 is used for all wood in between these two stages. Diameter and length of all CWD was measured and used to estimate cubic feet per acre for each vegetation community. All standing dead wood (snags) were recorded, and decay class assigned to these as well.

Data was recorded on field forms found in Appendix A following SUNP and Parks methodology.

2. Sampling Results

Overall Vegetation Characteristics

Vegetation sampling performed for the development of the VMP indicate that 60% of the site is conifer-madrone forest, with canopy trees in declining health and little to no native tree regeneration. The forested habitat also has very high levels of invasive cover by ivy and Himalayan blackberry, with a very high stem count of holly and laurel regeneration.

An additional 30% of the site is predominantly blackberry thicket, approximately half of which lies on flat ground and half is located on very steep slopes at the west end of the site. Blackberry cover is up to 96% in these areas, with little or no native species present.

The remaining 10% of the site is an area with disturbed sandy fill soils and numerous native tree saplings (madrone, alder, and bigleaf maple). This portion of the site also has large areas of bare ground and herbaceous weedy species with invasive shrub species such as Scots broom, butterfly bush, and Himalayan blackberry.

A total of 45 plant species were identified in the survey – 47% or twenty-one species were native. Fourteen were tree species, seven of which were native and the other seven were non-native invasive species. Nineteen species were shrubs, twelve of which were native and seven were non-native invasives. The remaining nine species were herbs, three of which were native, two non-native invasive, and the remainder were non-native but not particularly invasive. A complete list of all species identified in the survey can be found in Appendix B.

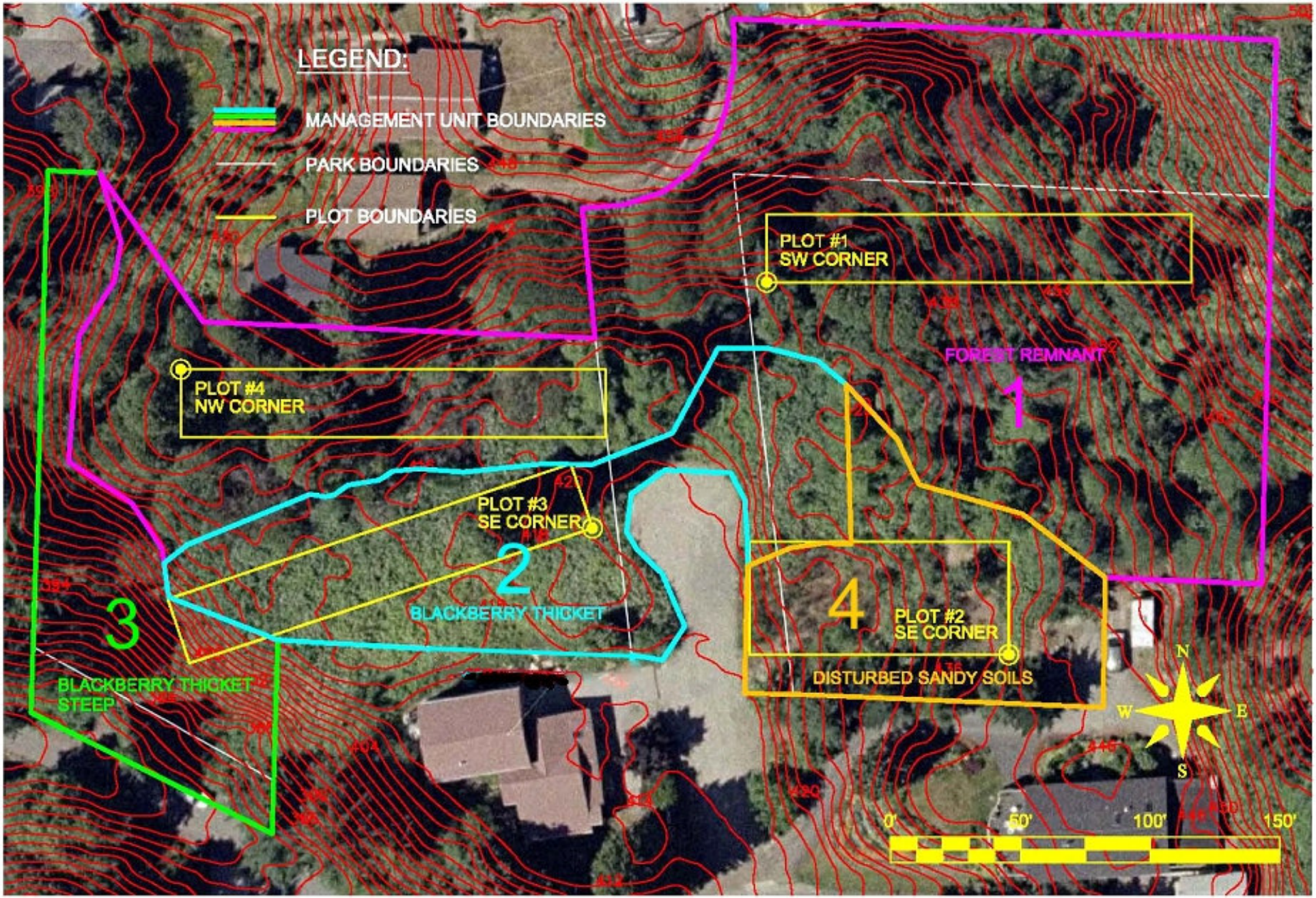


Figure 2 Management Units and Sampling Plots, Orchard St. Ravine

BASEMAP

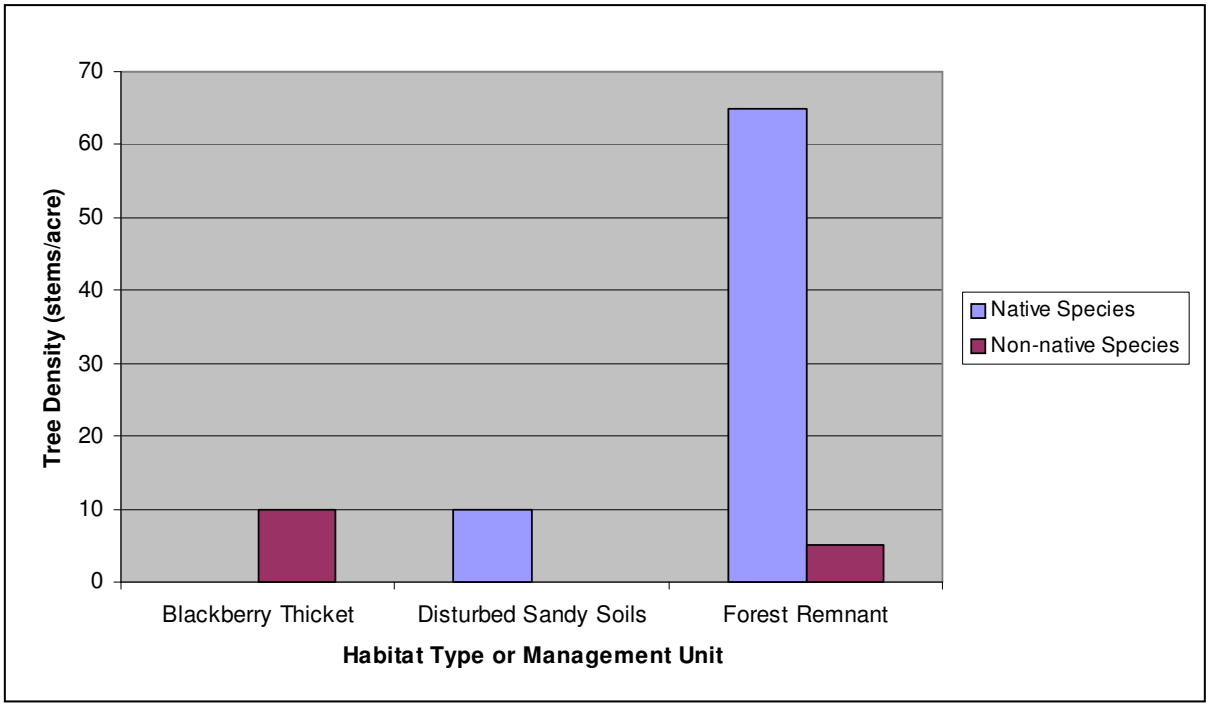
DESIGN M. Fischer DR. N. Silverman CHK APVD	Natural Systems Design P.O. Box 15209 Seattle, WA 98115	CITY OF SEATTLE PARKS DEPARTMENT	ORCHARD ST. RAVINE VMP VEGETATION SAMPLING PLOTS	Sheet 1 of 1 Date May, 2006

Overstory Community Composition, Density, Cover, Size, and Health

Forest habitat was found in only one of the four management units, which covers 60% of the vegetated site – the Forest Remnant MU (Figure 3). Only trees with a diameter greater than 5" were included in the data analysis of the overstory. The broadleaf evergreen-conifer forest at Orchard St. consists of an average density of 65 trees/acre (range 40-90 trees/acre), with an average of 62% madrone (range 44-80%), 11% Douglas fir (range 0-22%), and 26% deciduous (range 20-33%). Species represented in the canopy in order of frequency were: madrone, bitter cherry, Douglas fir, and ornamental (Mazzard) cherry.

An average of 10% (range 0-20%) of the mature canopy trees present were non-native. Average tree diameter of native species was 17.2", and average height was 64'. Canopy cover of native species averaged only 19.2% (range 17-21.4%). Tree health was relatively low with 77% of the native trees counted in either poor or fair condition, and 85% of them with either ivy, clematis, or both growing up into the tree. Madrones and cherry species seemed to have the poorest health and invasive problem – Douglas fir was healthy, free from invasives, and with good canopy cover.

Figure 3 Tree Density for Overstory (Trees >5"dbh) by Habitat Type, Orchard St. Ravine

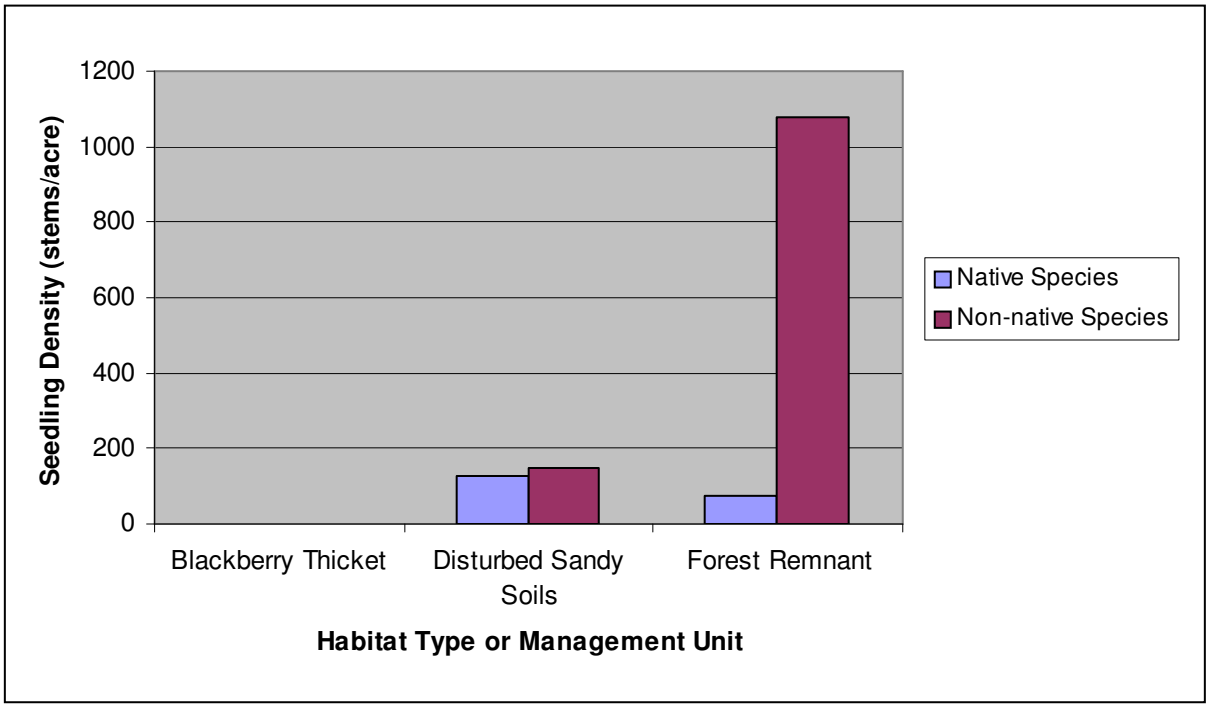


Tree Regeneration

Native tree regeneration at Orchard St. Ravine is extremely low (Figure 4). In the Forest Remnant MU it averages only 75 stems/acre (range 60-90 stems/acre) for native species, but 1080 stems/acre (range 750-1410 stems/acre) of non-native species, almost entirely holly and laurel seedlings, with holly outnumbering laurel roughly 3:1. There is no conifer regeneration and virtually no madrone regeneration; regenerating native species are bigleaf maple, Scouler willow, and bitter cherry.

The Blackberry Thicket MU has no regeneration of tree species at all, except for localized root suckering from the Lombardy poplar located there. The Disturbed Sandy Soils MU exhibits the most native tree regeneration on the site at 130 stems/acre, but also has 150 stems/acre of non-native regeneration, and contains only one tree with a dbh greater than 5". Regenerating native species in this MU in order of descending frequency are: madrone, red alder, bigleaf maple, and Douglas fir. Native regeneration is high in this unit probably because it has large areas of bare soils, has been most recently disturbed, and has readily available seed sources from madrone, fir, and alder and not of the shade-preferring holly and laurel.

Figure 4 Stem Density for Regenerating Trees (Trees <5"dbh) by Habitat Type, Orchard St. Ravine

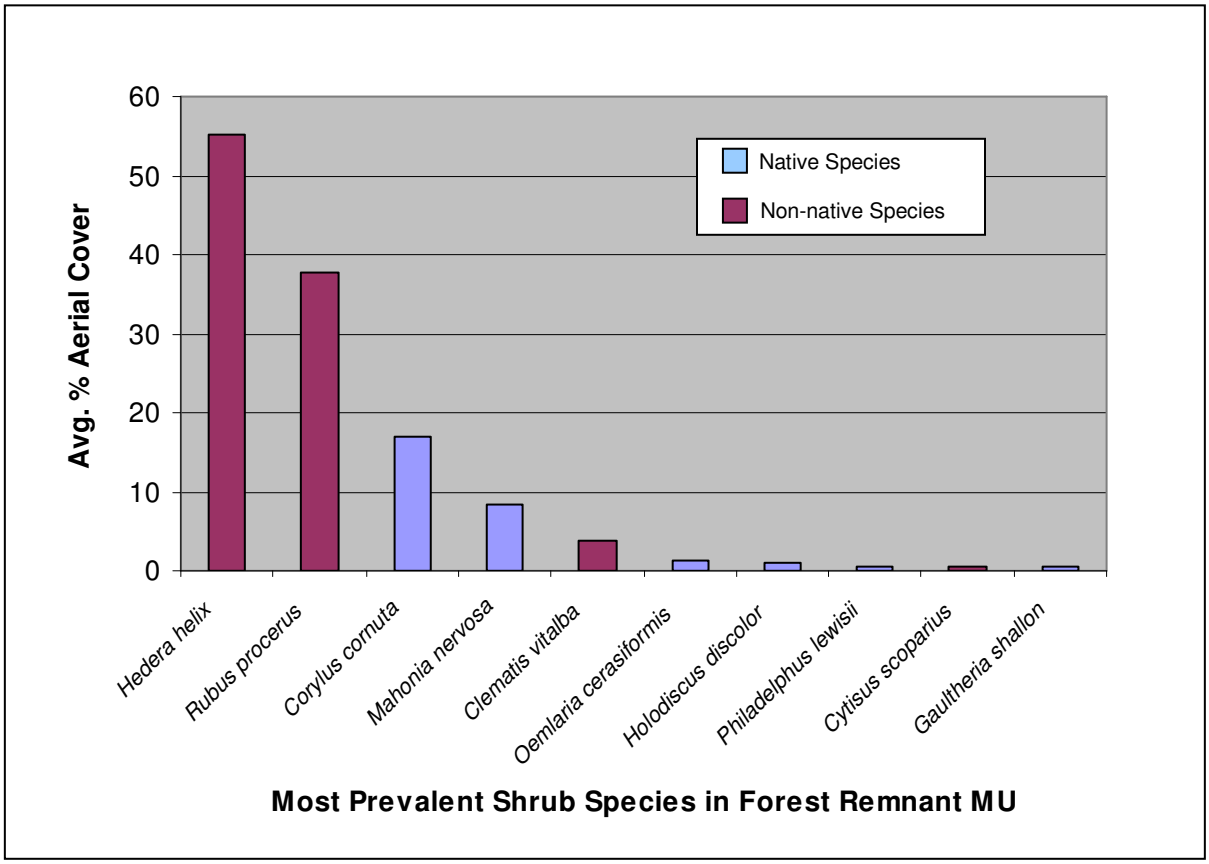


Shrub Layer Community Composition and Cover

Twelve native shrub species and seven non-native invasive shrub species were found in the Orchard St. Ravine, with the greatest native species diversity in the Forest Remnant MU, exhibiting eleven of the twelve native species on the site. Native shrub cover is also highest in the Forest Remnant MU, averaging 29% (range 12.6-45%), whereas in the Blackberry Thicket and Disturbed Sandy Soils MU native shrub cover is less than 0.5% and is represented by only three species total – sparse incidence of hazelnut, oceanspray, and red elderberry (Figure 5).

The twelve native shrub species, though some in sparse densities and infrequently occurring, are typical of the conifer-madrone forest. They are: hazelnut, low Oregon grape, indian plum, oceanspray, mock orange, salal, baldhip rose, snowberry, dewberry, orange honeysuckle, red huckleberry, and red elderberry.

Figure 5 Average % Aerial Cover for Most Frequently Occurring Shrub Species in Forest Remnant MU, Orchard St. Ravine



Herbaceous Layer Community Composition and Cover

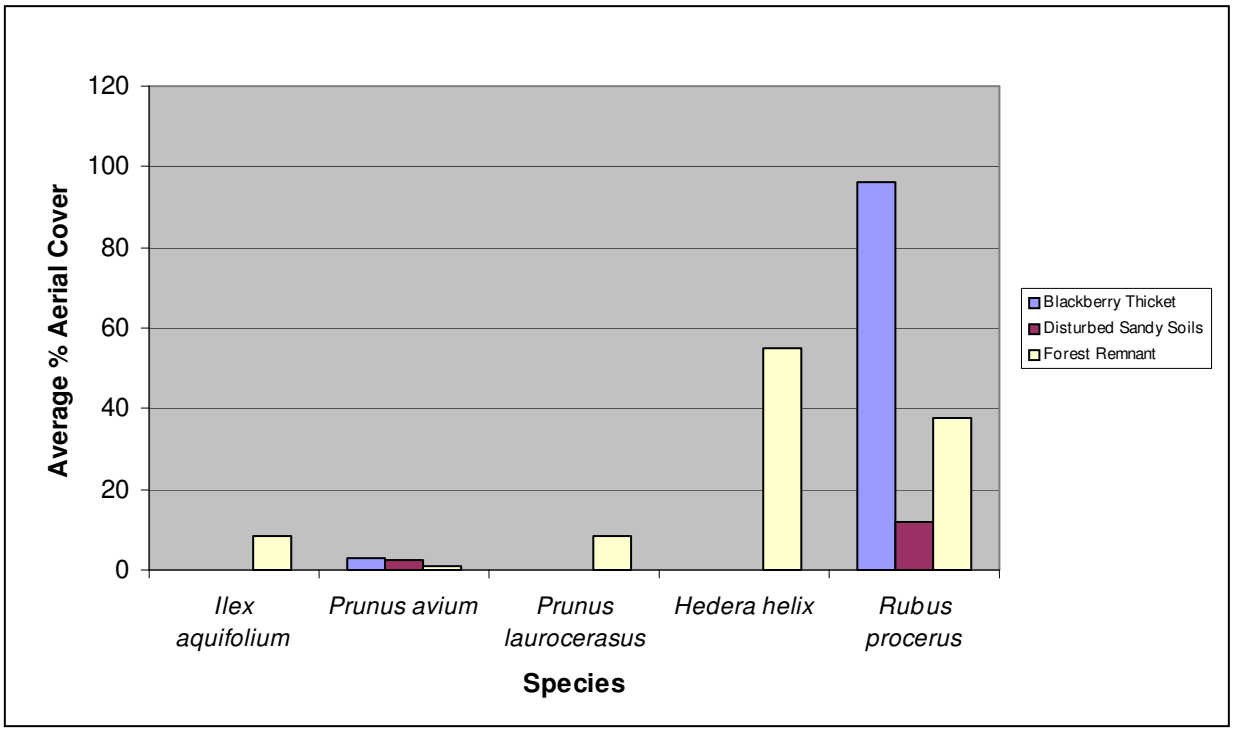
The herbaceous layer is unremarkable in terms of both species diversity, density, and cover – twelve species were identified, three of them native. The Blackberry Thicket MU has no herbs present. The Forest Remnant MU has a total of less than 5% herbaceous cover, which is mostly sword fern and knotweed, with traces of bracken fern and cow parsnip. The Disturbed Sandy Soils MU has large areas of grass and moss covering less than 50% of the site, with a mixture of weedy disturbed site non-native herbs such as cat's ear, plantain, self-heal, and sheep sorrel. Bindweed and knotweed are the invasive species of concern in this plant layer.

Non-native Invasive Species

Non-native invasive species are found in all vegetation layers in the Orchard St. Ravine. A total of sixteen non-native invasive species were found in all three vegetation layers combined. Five species were found in at least two of the management units; two species (ornamental cherry and blackberry) were ubiquitous at the site and were found in all three units. Ivy and blackberry combined had an average cover of 92.8% in the Forest Remnant MU, also the only MU in which ivy, English laurel, and holly were found thriving in the shadiest habitat on the site.

Blackberry was dominant at 96% cover in the Blackberry Thicket MU. Besides the most frequently occurring species shown in Figure 6 below that greatly compromise the vitality of this site, other species of concern are: clematis, Scots broom, butterfly bush, knotweed, European mountain ash, English hawthorne, and a variety of ornamental broadleaf evergreens that occur occasionally. These are all species that are currently not widespread at the site, but could become problematic if not controlled and removed completely when possible.

Figure 6 Aerial Cover of Most Frequently Occurring Non-native Invasive Species, Orchard St. Ravine



Snags and CWD

Snags and CWD were present only in the Forest Remnant Management Unit. Snag density averaged 30/acre, with an average dbh of 13", and an average height of 40'. Two thirds of the snags were madrone; the remainder were cherry species. Cherry snags tend to be of much smaller diameter and height, and decay much faster than madrone. CWD volume averaged 1867 ft^3/acre, with a wide range from 663-3070 ft^3/acre. This variation can best be explained by the small sample size, as well as the huge volume provided by a multi-trunked downed madrone in one of the plots, and fairly small diameter and length pieces in the other sample plot in this MU.

3. Hazard Trees

Limited hazard tree potential exists in the ravine. Trees are not considered hazardous unless they are within striking distance of people or property. As of this writing there are no trails or structures within the ravine, so there are no designated hazard trees.

Installation of the stewardship trail identified in this document will create a potential hazard situation with one tree, a large multi-trunked red alder in the flat area adjacent to the cul-de-sac – in the Blackberry Thicket MU. Red alder is an arboreal species with a relatively short lifespan. This particular alder shows signs of decline with several large dead branches and should be pruned of weak and dead wood upon installation of the trail. Subsequent monitoring and eventual removal or habitat pruning to convert this tree into a snag by a certified arborist or Parks Tree Crew will be required to ensure safety on the trail. As trails are constructed in the future, other potential hazard trees will be identified and pruned, snagged, or removed. Parks Senior Urban Forester will review all action taken relevant to hazard trees.

4. Other Significant Trees

Lombardy poplar occurs on the site with one substantial specimen over 100-ft tall in the flat area just southwest of the large red alder mentioned above. This tree is a fast-growing invasive species that spreads through root-suckering. Lombardy poplar can overtake a site and limit regeneration of other tree species. Currently the tree is a pinnacle in an otherwise open area and as such provides valuable habitat. It is recommended that this tree be pruned and injected with herbicide for conversion to a snag before restoration planting occurs in the Blackberry Thicket MU where it stands in order to limit its ability to further propagate invasive trees on the site. It should then be monitored and removed if necessary at a later stage.

Several large, standing dead Pacific madrone and conifer trees dot the ravine. These trees provide excellent wildlife habitat and pose limited risk as they are not adjacent to trails or structures. All snags (standing dead trees) should be left on site as habitat, except where directly adjacent to any future trail installation.

B. Soils and Topography

The Orchard St. Ravine is characterized by moderate to steep south and southwest-facing slopes. The steepest portions of the site are located in the northeast corner and north end of the site along the upper edge of the ravine bowl in the Forest Remnant MU, and in the west end in the Blackberry Thicket Steep MU. Slopes in these areas range from 40-50%[6]. In contrast, the Blackberry Thicket MU along the south side of the site is relatively flat. Portions of the site are classified as City of Seattle Environmentally Critical Areas (landslide prone and steep slopes).

Soils at Orchard St. Ravine are generally drier silty sand, evidenced by the dominant vegetation on the site[7]. Soils in the Blackberry Thicket MU and the Disturbed Sandy Soils MU include imported fill soils of unknown origin. Surface soils in the Disturbed Sandy Soils MU are particularly coarser grained then elsewhere on the site. Leaf litter and organic matter is sparse, particularly in areas where organic material doesn't reach

[6] Seattle Parks and Recreation, November 22, 2005 Memorandum to Seattle Parks and Recreation – Final Design Program for Orchard St. Ravine Improvements
[7] Shannon & Wilson, Inc., February 22, 2006 Memorandum to Seattle Parks and Recreation

the ground – in areas with dense blackberry thickets (Blackberry Thicket MU, Blackberry Thicket Steep MU) and in areas with dense ivy covering the ground (large areas of the Forest Remnant MU). Surface soils in the steepest areas of the site tend to be the most unstable, and in some areas (Blackberry Thicket Steep MU) will require slope stabilization techniques/bioengineering as part of the invasive removal and replanting process.

C. Wildlife

Orchard St. Ravine provides nesting, foraging, and refuge for numerous wildlife species, particularly birds and small mammals (Appendix C). At least 54 species of birds (including 12 confirmed nesting species) have been observed using the site, including the pileated woodpecker, which is a WDFW Priority Habitats and Species State Candidate Species[8,9]. Regular sitings of a coyote, and evidence of resting or denning observed in a shrub thicket surrounding the base of a madrone during vegetation sampling confirm use of the site by this species. No comprehensive wildlife survey was done for this plan – the compiled species list consists of confirmed wildlife sitings by citizens at Orchard St. Ravine.

Wildlife habitat quality at Orchard St. Ravine is probably limited by a number of factors including: small size of site, lack of direct connectivity to other and larger natural areas, lack of natural surface water features (stream, wetland, seeps), surrounding land use and associated human impacts and disturbance, degraded habitat quality. However, all these factors do not discourage current levels of wildlife use, which are cited as one of the site's most valuable assets. Landscape level characteristics are things that cannot be changed, but on-site habitat quality can be improved greatly with vegetation management to: increase overall plant community health, increase native species diversity and structural diversity, decrease the distribution and cover by invasive species, and increase the number of wildlife features such as snags and down wood. Temporary displacement of some wildlife species will likely occur during this phased process, but the long-term benefits should easily outweigh any short-term temporary impacts.

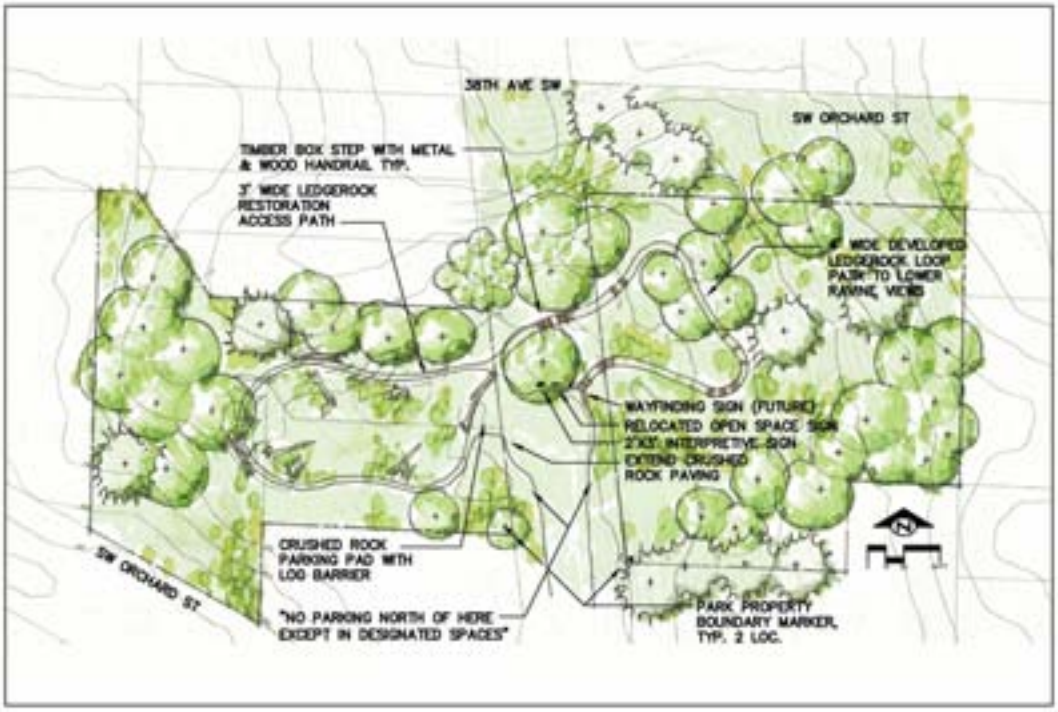
D. Trails and Site Access

At the time this document is being written (Spring-Summer 2006), there is no formalized access to the ravine, other than a graveled cul-de-sac on 38th Ave SW to the south, and opportunities to look into the ravine from its edges at the north, east and west. A few exploratory trails have been cut into the blackberries. Figure 7 illustrates the trail access that is planned for construction in conjunction with an initial phase of restoration work. It will provide trail access to the ravine, a restoration site access trail in the western portion of the site, a shared restoration-materials-staging/parking space, property markers at key locations, and a trailhead with an interpretive sign. There is also a trail feasibility

[8] Richard Friend – Audubon Master Birder, April 8,1991 Bird List
[9] Patricia Thompson – WDFW Wildlife Biologist, February 7, 2006 Memorandum to Seattle Parks and Recreation

study being conducted to evaluate trail options that would provide a neighborhood connection through the ravine to 36th Ave SW or 38th Ave SW.

Figure 7 Proposed Lower Loop Trail Ravine Access Plan, Orchard St. Ravine



As people will be using these trails, it is important for them to feel comfortable and safe in doing so. While it is not considered possible to make an area crime-proof, some development and management decisions can facilitate "crime prevention through environmental design (CPTED)." It is recommended practice in CPTED guidelines to encourage natural surveillance (ie. allow views into an area, select and maintain vegetation adjacent to walkways so there is a visible clear area – see Figure 8), reinforce that the space is public territory with clear signage, and encouraging frequent use. Aside from the simple act of walking here, this can take the form of weekly neighbor "patrols" to pick up litter or look for signs of unwanted activity, which can then be reported to police.

Figure 8 Typical Trail Corridor Vegetation Management

Maintain clear areas next to pathways that are easy to see over, under, around or through – for a distance of 6-8 feet from the path edge, select and maintain vegetation that is generally no more than 2-3 feet in height, or trimmed up to 8-feet from the ground.

IV. MANAGEMENT RECOMMENDATIONS

A. Overall Management Recommendations

- **Rejuvenate existing Douglas fir-madrone forest habitat**

Orchard Street Ravine is dominated by a south and southwest facing dry slope with a mixed Douglas fir-madrone forest. This habitat type comprises 1.28 acres, or 60% of the entire site. Though overrun by invasive species within the forest as well as around its disturbed edges, this habitat type still defines the site. Horticultural cherry trees are prevalent both as mature trees and seedlings, but currently do not pose as significant of a threat to the forest as other invasives present on the site. Mature trees are under siege by ivy and clematis, and regeneration of desirable native tree species is essentially non-existent. Regeneration of holly and laurel is extremely high, and English ivy forms a thick impenetrable groundcover through large areas of the forested portion of the site. These characteristics match the profile of this forest type at other sites in Seattle[10].

The presence of these invasives has resulted in declining health of the existing canopy and stopped the natural processes of canopy regeneration. Ivy and clematis must be removed from mature trees, additional young trees should be planted, and the shrub layer should be converted back to a native dry slope understory. Many shrub species typically found in this plant association are still present, although sparse in density and cover. Average native shrub cover (average 29%) is far below the average reported for other sites with this forest type in Seattle (average 89%)[11]. However, the native species present do represent the plant palette that was once dominant in the

[10] Seattle Urban Nature Project, Citywide Habitat Assessment Interim Report – March 2006
[11] Seattle Urban Nature Project, Citywide Habitat Assessment Interim Report – March 2006

shrub layer and provide a template for what can be planted in the future to restore this habitat type.

- **Convert large areas completely invaded by invasive species such as blackberry to desirable native shrub and forest plant communities.**

Blackberry thicket covers the flat bench along the south end of the site, as well as the steep slope dropping off the west edge. These areas total 0.62 acres, or 30% of the site. Invasive species are so dominant here, with virtually no natives present, that removal work can be done with mechanized equipment for efficient clearing of the invaded areas where slope steepness allows. These areas will need intensive clearing, site preparation (sheet mulching, chipping), planting, and follow-up site maintenance to successfully convert them to native habitat. It is expected that temporary displacement of wildlife will occur at the site with this kind of clearing, ultimately resulting in a significantly higher value habitat than what currently exists.

- **Eradicate small, discrete populations of invasive species before they become problematic.**

A total of sixteen non-native invasive species were found on the site. Of these at least four are not particularly invasive or problematic, five are extremely widespread and problematic, but seven species have only limited distribution, are not yet problematic, but have the potential to be unless they are eradicated as soon as possible. These are excellent candidates for rapid control and eradication. The following species are on this list: trees - English hawthorne (*Crataegus monogyna*), European mountain ash (*Sorbus acuparia*); shrubs – butterfly bush (*Buddleja davidii*), Scots broom (*Cytisus scoparius*), knotweed (*Polyganum sp.*), and ornamental broadleaf shrub species such as cotoneaster (*Cotoneaster sp.*) and daphne (*Daphne sp.*). Most of these are found predominantly in the forested areas with at least partial shade, except for butterfly bush and Scots broom, which are out in the open areas and on edges.

- **Provide increased habitat features (CWD and snags) for wildlife throughout site.**

Coarse woody debris and snags are important habitat for birds, small mammals, and amphibians. These wildlife guilds use down woody debris and standing dead wood for breeding, roosting, denning, foraging, nesting, and refuge. In western Washington forests over 150 terrestrial wildlife species are known to use down wood as primary or secondary components of their habitat requirements (Bartels et al, 1985). A subset of these species could be expected to use urban forest habitat such as the one at Orchard St. Ravine.

In addition, down and dead wood are part of the soil building and tree regeneration processes, as decomposition adds nutrients, invertebrates, microbes, and structure to the surface soil layer, and provides plant establishment sites for later seral tree and shrub species such as western hemlock and red huckleberry (Spies et al, 1988). Adding wood to the site, particularly in areas that currently have little to none, will accelerate a natural process that will take a long time to catch up on its own. Portions of the site that are recommended for conversion are particularly suited to importing

wood as site access will be easy while equipment is on site and before replanting occurs.

- **Promote wildlife protection and habitat enhancement whenever possible in management decisions and restoration practices.**

Improvement of wildlife habitat and protection of wildlife is cited by Parks and WDFW staff and citizens as a priority for Orchard St. Ravine. General principles of habitat improvement will benefit a wide variety of species without specifically focusing on one particular target species.

Structural Diversity

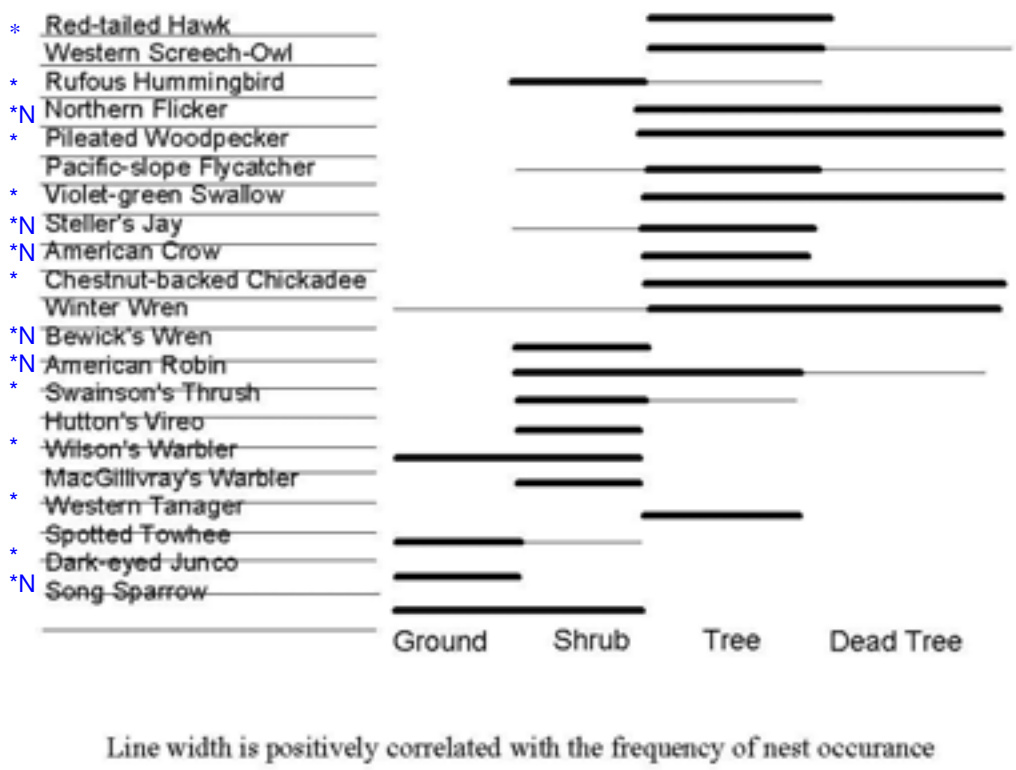
Increasing structural diversity of the plant communities on site is very important. Structural diversity refers to the complexity, and variation in textures, heights, distribution and functions of the plants and other landscape elements on the site including slopes, depressions, micro-topographical variation in the ground surface, snags, downed wood, and stumps. Conversion of invasive thickets to native habitat, creating snags, adding downed wood, and increasing native plant species diversity are the main things that will increase structural diversity at the site, and thereby increase the number and variety of niches for wildlife species. Figure 9 below illustrates research on urban songbird nest location preferences in the Seattle area that confirms this principle of variety and diversity.

Natural Functions

Restoring natural functions can be achieved in many ways. Planting trees and removing invasives that prevent successful seedling establishment will re-establish native tree regeneration. Adding downed wood will help re-establish normal soil cycles of decomposition and encourage soil microbes and insects. This in turn helps plant growth and provides an insect food source for birds and predator insects. Removing invasive thickets and groundlayer species such as ivy will allow a native shrub layer to re-establish and thrive, thereby increasing structural diversity, adding leaf litter to the ground, and again contributing to normal soil processes, plant growth, and soil-building.

Native plant species will attract insects that are specialized to feed on or pollinate certain species, and birds that are particular to specific insect prey and fruits or berries. Nesting preferences among birds can also determine which species might be found at a site due to the vegetation. Higher quality habitat that has higher function tends to attract more specialized (and native) species across many guilds, while lower quality, lower functioning habitat attracts generalists (often non-native wildlife species).

Figure 9 Urban Songbird Nesting Preferences in Puget Sound Forests[1]



[1] **Adapted from graph in University of Washington College of Forest Resources. "Maintain Native Plants for Wild Birds". Conservation of Forest Songbirds in the Puget Sound Area. http://courses.washington.edu/vseminar/factsh.htm**
*** indicates species that has been observed at Orchard St. Ravine**
***N indicates species that has been confirmed nesting at Orchard St. Ravine**

Exterior Edge

Protecting the exterior edge with of the site will protect the interior habitat. The edge should be protected from invasion by non-native invasive plant species by re-planting densely and by choosing native species that will form thickets and create micro-site conditions that will successfully discourage and compete with opportunistic invasive plant species. This will also help protect the interior of the site from disturbance from adjacent human activity, and may reduce songbird nest predation (by jays, crows, raccoons, rats, domestic cats), which tends to be higher in narrow habitat patches with lots of open exterior edge.

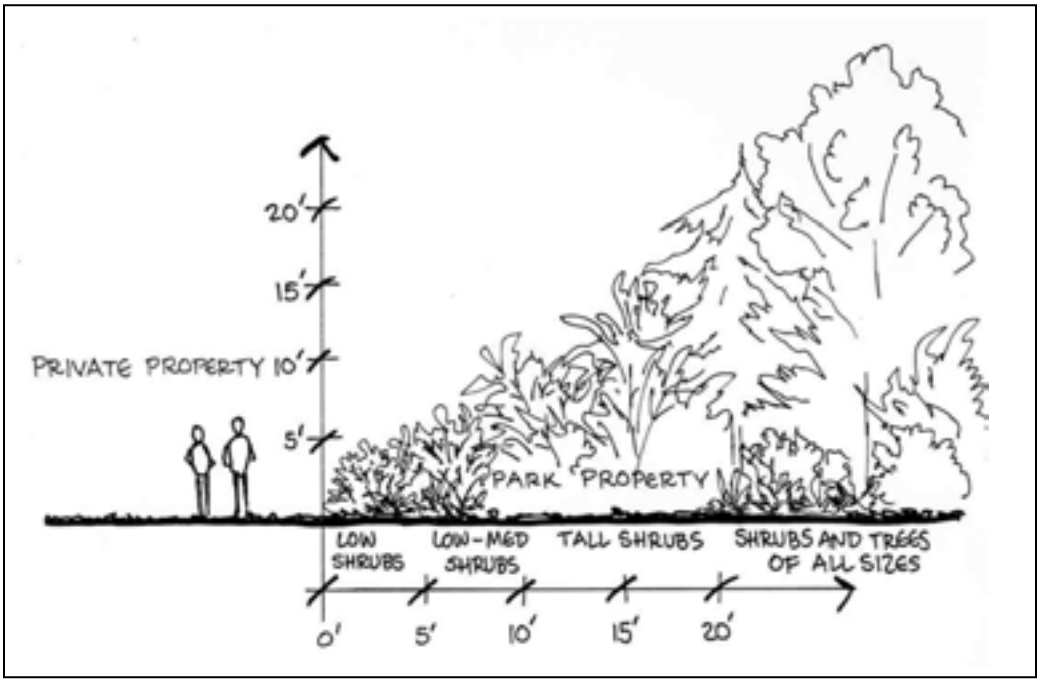
- **Protect public-private property edge from the perspective of adjacent property owners, human users of the site, native plant community health, and wildlife**.

The size, shape, and landscape location of the ravine dictate that it is impacted by surrounding human use. The ravine has a lot of exterior edge abutting private residential property, and therefore has very little interior habitat. However, it is used

by numerous wildlife species and guilds, and is also valued for its aesthetics by its human neighbors. Exterior edge makes a natural area susceptible to invasion by non-native plant species, both from direct invasion from adjacent landscaped areas and by providing microclimatic site conditions that favor invasives – excessive light, regular site disturbance, poor soil quality, excessive heat.

Planting along these exterior edges should focus on maintaining visual access into the site for neighbors aesthetic and safety needs, and protecting wildlife users and interior native plant communities by establishing resilient plant communities that can protect wildlife and resist re-invasion by invasive plant species (Figure 10). The eventual construction of a trail within the site will also require thoughtful planting along trail edges to provide safe sightlines for trail users without sacrificing native plant communities and wildlife privacy.

Figure 10 Typical Proposed Edge Planting Along Private/Parks Property Boundary for Orchard St. Ravine



- **Maintain consistency with Parks Tree Policy with regard to distribution and location of planted trees.**

Parks Tree Policy clearly states that tree removals or pruning for the purposes of preserving or improving views will only be done in designated viewpoints. There are no designated viewpoints in or surrounding Orchard St. Ravine. Whereas it is possible to consider view corridors from public viewpoints that are not designated, it is not feasible to consider individual view corridors from all private properties surrounding the ravine when installing new plantings that include trees. However, tree species selection for new plantings will not include any species that will attain heights greater than those species already existing on site.

B. Targets and Prescriptions by Management Area

1. Forest Remnant

Target

The Forest Remnant of Douglas fir-Madrone forest is to be managed to improve the health and diversity of all native vegetation layers by removing and controlling invasives and supplemental planting of native tree species that are not currently regenerating naturally. Overstory and shrub species that are under-represented and overwhelmed by invasives should also be planted as invasives are removed from these vegetation layers. A comparison of existing relevant studies is useful to determine the specific characteristics of the target plant community (Table 2). Tree density targets are difficult to ascertain due to lack of good data for this forest type in the urban setting. Minimum targets are established based on SUNP data for similar forest type in Seattle. Targets for CWD and snags are established based also on scarce existing data and what is reasonable given existing site conditions. Creating snags out of existing live trees, for example, is not recommended at this time unless trees are habitat pruned to resolve hazard tree issues, or as a way of controlling invasive tree species. Adding CWD should be done as is possible given site access and limits on size of wood that can be hand carried into the site by crews.

Conifer-Madrone forests surveyed in Seattle are typically comprised of roughly 25% madrone, 40% conifer, and 35% deciduous canopy with an average native tree density of 128 trees/acre, ranging from 90-160 trees/acre[12]. Data from the Washington DNR Natural Heritage Program that reflects survey data from less urban areas, characterizes this forest type by a 50-60% madrone canopy, with a 40-50% Douglas fir component and less than 5% cover by other species such as western red cedar, hemlock, grand fir, Scouler willow, and shore pine[13]. Tree density was not reported in the DNR survey results.

The small number of plots sampled (5) in the Seattle survey is indicative of the scarcity of this forest type that remains here. The significant deciduous component and lower madrone cover may indicate the declining health of this species due to urban stress and fungal diseases, and thus the presence of bigleaf maple and red alder as early seral species that are not seen in the healthier and less disturbance prone outlying areas sampled by Washington DNR (22 plots). In any case, these survey results do provide some guidance for setting targets for the Orchard St. Ravine forest.

[12] Seattle Urban Nature Project, Citywide Habitat Assessment Interim Report – March 2006

[13] Chris Chappell, Washington DNR Natural Heritage Program, "Upland Plant Associations of the Puget Trough Ecoregion, Washington" – Fact sheet – Douglas fir-Pacific madrone/salal. 2006. www.wdnr.wa.gov/nhp/refdesk/communities/html/assoc_tables.html

Table 2 Comparison of Survey Results for Douglas fir-Madrone Forest Types Used in Setting Restoration Targets for Orchard St. Ravine Forest Remnant Management Unit

		SUNP Seattle Survey[1]	Washington DNR Survey[2]	Orchard St. Ravine Existing	Orchard St. Ravine Future
Tree Density trees/acre	**avg.** **range**	128 90-160	na na	65 40-90	>140
Forest Composition Trees (native species)		25% madrone 40% conifer 35% deciduous	60% madrone 50% D. fir <5% each: cedar, hemlock, Scouler willow, grand fir, shore pine	72% madrone (range 44-100%) 11% D. fir (range 0-22%) 17% deciduous (range 0-33%)	50-60% madrone 30-40% D. fir <5% each: cedar, hemlock, Scouler willow, grand fir
Forest Composition Shrubs (native species)		23% salal 12% dewberry 12% low Or. grape 26% hazelnut baldhip rose bracken fern indian plum oceanspray red huckleberry snowberry sword fern	62% salal 21% hazelnut 11% oceanspray 10% honeysuckle 8% low Or. grape <3% each: baldhip rose bracken fern dewberry evrgrn. huckleberry serviceberry snowberry sword fern	17% hazelnut 8% low Or. grape <3% each: baldhip rose dewberry honeysuckle indian plum mock orange oceanspray red huckleberry salal snowberry	25-50% salal 15-25% hazelnut 10-15% oceanspray 10-15% low Or. grape 5-10% honeysuckle <5% each: baldhip rose dewberry indian plum mock orange red huckleberry evrgrn. huckleberry serviceberry snowberry sword fern bracken fern
Forest Composition Shrubs (invasive species)		12% English ivy 18% Him. blckbry English laurel English holly	na	55% English ivy 9% English holly 9% English laurel 4% clematis <4% each Eng. hawthorne orna. cherry knotweed Europ. mtn. ash Scots broom misc. orna. shrubs	<10% English ivy <1% English holly <1% English laurel <1% clematis <4% orna. cherry none: Eng. hawthorne knotweed Europ. mtn. ash Scots broom misc. orna. shrubs
Forest Composition CWD cu.ft/acre	**avg.** **range**	246 24-756	na	1867 663-3070	2000 Add variety of species and sizes for varied decay classes
Forest Composition Snags (stems/acre)	**avg** **range**	32 0-100	na	30 (only found in one plot)	Snagging live trees at this time is only recommended if needed to resolve hazard tree or invasive species issues

[1] Seattle Urban Nature Project, Citywide Habitat Assessment Interim Report – March 2006
[2] Chris Chappell, Washington DNR Natural Heritage Program, "Upland Plant Associations of the Puget Trough Ecoregion, Washington" – Fact sheet – Douglas fir-Pacific madrone/salal. 2006. www.wdnr.wa.gov/nhp/refdesk/communities/html/assoc_tables.html

Prescription

1a Existing trees should be immediately relieved of ivy and clematis by creating tree survival rings.

1b Invasive species that are scarce or are distributed in limited areas but threaten to spread should be removed with the goal of total eradication before they spread further and become a problem. In this management unit these species are: cotoneaster, daphne, Scots broom, English hawthorne, and European mountain ash. These plants can be hand-pulled anytime of year if small enough. Larger individuals must be cut and stump treated with herbicide to prevent re-sprouting. Cut stump treatments should be done at the time of year when the herbicide of choice is at its most effective with regard to physiological plant processes.

1c Control and eliminate knotweed infestations that currently occur in isolated stands scattered within unit. The only effective removal method is direct stem injection of all individual stems greater than ½" diameter anytime during the growing season. Follow-up with foliar application of re-sprouts for 2-3 years in early spring after emergence to complete removal.

1d Remove laurel and holly sprouts from shrub layer by handpulling anytime of year if small enough, and using cut stump treatment with herbicide for larger individuals.

1e Expand tree survival rings by clearing larger areas of ivy within treed portions of the unit to prepare for planting of desirable native trees and shrubs. See Table 3 below for plant palette.

1f Plant Douglas fir, madrone, and grand fir in canopy gaps where partial sunlight exists. Areas of localized soil moisture and shade e.g. where patches of knotweed currently exist, limited quantities of western red cedar and Scouler willow could be added. Downed rotting wood or areas of localized richer soil could be planted with western hemlock in small quantities. The following shrubs can be added: salal, baldhip rose, snowberry, low Oregon grape, oceanspray, thimbleberry, hazelnut, orange honeysuckle, mock orange, sword fern, serviceberry. See Table 3 below for plant palette.

1g Add CWD as material becomes available and at locations where site access allows hand-carrying of material. Suggested locations for imported CWD are areas that are newly cleared of ivy groundlayer and have bare ground. CWD can become part of the infill planting and be placed after clearing of invasives, but before planting occurs in localized areas. Refer to Section B.1. and Table 2 for guidelines.

Table 3 Target Plant Community Composition for Forest Remnant Management Unit, Orchard St. Ravine

Species and Layer	Common Name	Approx. Overall Planting Proportion Within Plant Layer*	Planting Density**
Trees			
Arbutus menziesii	Pacific madrone	50-60%	8-12'
Pseudotsuga menziesii	Douglas fir	30-40%	10-15'
Abies grandis	grand fir	<5%	10-15'
Salix scouleriana	Scouler willow	<5%	8-10'
Thuja plicata	western red cedar	<5%	10-15'
Tsuga heterophylla	western hemlock	<5%	10-15'
Shrubs and Ground			
Gaultheria shallon	salal	40-70%	2-3'
Corylus cornuta	hazelnut	15-25%	6-8'
Holodiscus discolor	oceanspray	10-15%	6-8'
Mahonia nervosa	low Oregon grape	5-10%	2-3'
Rosa gymnocarpa	baldhip rose	5-10%	2-4'
Symphoricarpos albus	snowberry	5-10%	2-4'
Rubus parviflorus	thimbleberry	5-10%	3-5'
Polystichum munitum	sword fern	5-10%	2-3'
Amelanchier alnifolia	serviceberry	<5%	4-6'
Lonicera ciliosa	orange honeysuckle	<5%	3-6'
Philadelphus lewisii	mock orange	<5%	4-6'

***Planting Proportion refers to the overall plant composition within a plant layer that is selected for any given planting area within the unit. The percentages indicated are to be used as a guide to determine this when a planting is being done.**

****Planting Density refers to the average spacing to be used when installing plants. Plant quantities should be determined using the planting proportions, planting density, and Seattle Parks Department's BMPs for planting.**

2. Blackberry Thicket

Target

The Blackberry Thicket Management Unit is to be managed for complete conversion of invasive species thicket to a native shrub and forest plant community representing an early seral stage of the mature Douglas fir-madrone forest type. Currently this unit contains no native trees, and has approximately 98% cover by invasive shrubs, almost entirely blackberry. Park edges will be managed to remain as shrub communities, and areas that are planted with tree species will take into account current private residence locations and planned trail construction to minimize future hazard tree issues.

Species used and targets for tree densities will be similar to those used for the existing forest (Forest Remnant Management Unit), but there will be a greater emphasis on early seral species because this unit currently does not have any existing canopy to underplant, or any existing native shrub species to plant outwards from. Cedar, hemlock, and grand fir, for example, are tree species that will not be appropriate for planting in this unit at this time, but can be added at a later stage of restoration. Shrub species such as low Oregon grape, salal, and sword fern, though major components of the mature forest type, are also not appropriate for this earlier seral stage.

Prescription

2a Begin conversion process as soon as possible by removing/clearing blackberry and grubbing major root systems from entire unit during late summer season. Immediately after clearing and grubbing, sheet mulch entire cleared area with cardboard (double layer if possible) and follow with 6" chip mulch spread over entire area. ***Alternatively***, do a mid-summer season mowing of entire thicket area, and then follow up with a late summer re-mowing and grubbing of major root systems, finishing with the same mulching treatment as described above. Two mowings may help weaken blackberry root systems a little more and lower the incidence and vigor of resprouts.

1h Add CWD distributed throughout unit, but mainly in interior. Larger diameter and length of wood is more useful to a wider range of wildlife species and guild then smaller shorter pieces. Any species, deciduous or conifer, that is not prone to sprouting (e.g. non-native poplar) is appropriate to use. Refer to Section B.1. and Table 2 for guidelines.

2b Plant cleared area at high densities in late fall-early winter. Space trees at an average of 12' on center and shrubs at an average of 3-6' on center depending on the size of the mature shrub. See Table 4 below for plant palette and Figure 10 for typical parks boundary edge planting treatment.

2c Perform follow-up weed maintenance on initial planting starting in early spring following planting. Expected weeds in the short term are field bindweed and blackberry (re-sprouting). In the longer term, knotweed, Scots broom, and butterfly bush may try to colonize the site.

2d Watering of plantings will be required for at least two growing seasons following planting.

2e Supplemental planting to fill in gaps will also be expected within the first three year period. The site should be monitored to determine whether any particular species are more or less successful at establishing, and adjustments in species selection should be made accordingly.

2f On installation of restoration site access trail, prune weak and dead wood from red alder. Continue to monitor and habitat prune or remove when needed at a later time. Habitat pruning or removal will be most cost-efficient if work is done concurrently with habitat pruning of Lombardy poplar (Task 2h below).

2g Before vegetation installation begin to remove large Lombardy poplar from management unit. Tree may be topped by a certified arborist and injected with herbicide to stop growth and promote development of a significant habitat snag. Habitat pruning will be most cost-efficient if work is done concurrently with

pruning of red alder (Task 2g above). Snag will need to be monitored and possibly removed entirely at a later time.

2h Once microclimatic shade pockets have been created by established plants (5-10 years), follow-up planting of additional species that are typical of later seral stages can be done.

Table 4 Target Plant Community Composition for Blackberry Thicket Management Unit, Orchard St. Ravine

Species and Layer	Common Name	Approx. Overall Planting Proportion Within Plant Layer*	Planting Density**	Planting Stage***
Trees				
Arbutus menziesii	Pacific madrone	50-60%	8-12'	initial
Pseudotsuga menziesii	Douglas fir	30-40%	10-15'	initial
Alnus rubra	red alder	10-15%	5-8'	initial
Abies grandis	grand fir	<5%	10-15'	later seral
Salix scouleriana	Scouler willow	<5%	8-10'	later seral
Thuja plicata	western red cedar	<5%	10-15'	later seral
Tsuga heterophylla	western hemlock	<5%	10-15'	later seral
Shrubs and Ground				
Holodiscus discolor	oceanspray	15-20%	6-8'	initial
Ceanothus velutinus	snowbrush	10-15%	3-5'	initial
Mahonia aquifolium	tall Oregon grape	5-10%	3-5'	initial
Rosa nutkana	Nootka rose	5-10%	2-4'	initial
Rosa gymnocarpa	baldhip rose	5-10%	2-4'	initial
Symphoricarpos albus	snowberry	5-10%	2-4'	initial
Rubus parviflorus	thimbleberry	5-10%	2-4'	initial
Amelanchier alnifolia	serviceberry	<5%	4-6'	initial
Philadelphus lewisii	mock orange	<5%	4-6'	initial
Mahonia nervosa	low Oregon grape	5-10%	2-3'	later seral
Polystichum munitum	sword fern	5-10%	2-3'	later seral
Gaultheria shallon	salal	40-70%	2-3'	later seral
Corylus cornuta	hazelnut	15-25%	6-8'	later seral
Lonicera ciliosa	orange honeysuckle	<5%	3-6'	later seral

***Planting Proportion refers to the overall plant composition within a plant layer that is selected for any given planting area within the unit. The percentages indicated are to be used as a guide to determine this when a planting is being done.**

****Planting Density refers to the average spacing to be used when installing plants. Plant quantities should be determined using the planting proportions, planting density, and Seattle Parks Department's BMPs for planting.**

*****Planting Stage indicates when in the process of plant community restoration this species should be planted. An initial designation means the species is appropriate for planting at the site in its current condition. Later seral means that this species should not be planted until initial plantings are well established, and the site conditions have changed enough to become more favorable for this species.**

3. Blackberry Thicket Steep

Target

Management targets for this unit will be the same as for the adjacent and similar Blackberry Thicket MU. This invasive thicket is also recommended for conversion to a native shrub and forest plant community representing an early seral stage of the mature Douglas fir-madrone forest type. Currently this unit contains no native trees, though it does have some canopy shade from large trees off site and across Orchard St. to the south, and from trees to the east and west along the narrow finger of the MU that extends northwards. No data was taken in this MU, but the existing plant community is much the same as that of the Blackberry Thicket MU.

Some special considerations for site work and planting will need to occur due to the slope steepness. Clearing will be done with different equipment, it will cost more due to steepness of slopes, and soil and slope stabilization work (erosion control fabric, coir logs) will need to be part of the pre-planting site prep. It is anticipated that the planting will be a bit different in that trees may not be advised on the slope if soils are unstable and loose and may be limited to less steep portions of the slope or near the top and not on the steepest mid-sections of the slope. This evaluation will need to be made once the site is cleared. Any areas that are deemed too steep for trees would be planted as dense shrub communities.

Park edges will be managed to remain as shrub communities, and areas that are planted with tree species will take into account current private residence locations and the street below to minimize future hazard tree issues.

Species used and targets for tree densities will be similar to those used for the existing forest (Forest Remnant Management Unit), but there will be a greater emphasis on early seral species because this unit currently has only limited canopy shade cast from adjacent trees to underplant. It also lacks significant areas of existing native shrub species to plant outwards from. Cedar, hemlock, and grand fir, for example, are tree species that may be appropriate for planting in only select portions of this unit at this time, but can be added at a later stage of restoration. Shrub species such as low Oregon grape, salal, and sword fern, though major components of the mature forest type, are also not appropriate for this earlier seral stage except in areas that have canopy shade.

Prescription

3a Begin conversion process as soon as possible by removing/clearing blackberry and grubbing major root systems from entire unit during late summer season. Immediately after clearing and grubbing, apply slope and soil stabilization as needed (erosion control fabric, coir logs, chip mulch). Due to slope steepness, only one round of clearing is recommended.

3b Add CWD where slopes allow. CWD could be incorporated into slope stabilization or can be used to create planting pockets. Larger diameter and length of wood is more useful to a wider range of wildlife species and guild then smaller shorter pieces. Any species, deciduous or conifer, that is not prone

to sprouting (e.g. non-native poplar) is appropriate to use. Refer to Section B.1. and Table 2 for guidelines.

3c Plant cleared area at high densities in late fall-early winter. Space trees at an average of 12' on center and shrubs at an average of 3-6' on center depending on the size of the mature shrub. See Table 5 below for plant palette and Figure 10 for typical parks boundary edge planting treatment.

Table 5 Target Plant Community Composition for Blackberry Thicket Steep Management Unit, Orchard St. Ravine

Species and Layer	Common Name	Approx. Overall Planting Proportion Within Plant Layer*	Planting Density**	Planting Stage***
Trees				
Arbutus menziesii	Pacific madrone	50-60%	8-12'	initial
Pseudotsuga menziesii	Douglas fir	30-40%	10-15'	initial
Abies grandis	grand fir	<5%	10-15'	later seral
Salix scouleriana	Scouler willow	<5%	8-10'	later seral
Thuja plicata	western red cedar	<5%	10-15'	later seral
Tsuga heterophylla	western hemlock	<5%	10-15'	later seral
Shrubs and Ground				
Holodiscus discolor	oceanspray	15-20%	6-8'	initial
Ceanothus velutinus	snowbrush	10-15%	3-5'	initial
Mahonia aquifolium	tall Oregon grape	5-10%	3-5'	initial
Rosa nutkana	Nootka rose	5-10%	2-4'	initial
Rosa gymnocarpa	baldhip rose	5-10%	2-4'	initial
Symphoricarpos albus	snowberry	5-10%	2-4'	initial
Rubus parviflorus	thimbleberry	5-10%	2-4'	initial
Amelanchier alnifolia	serviceberry	<5%	4-6'	initial
Philadelphus lewisii	mock orange	<5%	4-6'	initial
Mahonia nervosa	low Oregon grape	5-10%	2-3'	later seral
Polystichum munitum	sword fern	5-10%	2-3'	later seral
Gaultheria shallon	salal	40-70%	2-3'	later seral
Corylus cornuta	hazelnut	15-25%	6-8'	later seral
Lonicera ciliosa	orange honeysuckle	<5%	3-6'	later seral

***Planting Proportion refers to the overall plant composition within a plant layer that is selected for any given planting area within the unit. The percentages indicated are to be used as a guide to determine this when a planting is being done.**

****Planting Density refers to the average spacing to be used when installing plants. Plant quantities should be determined using the planting proportions, planting density, and Seattle Parks Department's BMPs for planting.**

*****Planting Stage indicates when in the process of plant community restoration this species should be planted. An initial designation means the species is appropriate for planting at the site in its current condition. Later seral means that this species should not be planted until initial plantings are well established, and the site conditions have changed enough to become more favorable for this species.**

3d Perform follow-up weed maintenance on initial planting starting in early spring following planting. Expected weeds in the short term are field bindweed and blackberry (re-sprouting). In the longer term, knotweed, Scots broom, and butterfly bush may try to colonize the site.

3e Watering of plantings will be required for at least two growing seasons following planting.

3f Supplemental planting to fill in gaps will also be expected within the first three year period. The site should be monitored to determine whether any particular species are more or less successful at establishing, and adjustments in species selection should be made accordingly.

3g Once microclimatic shade pockets have been created by established plants (5-10 years), follow-up planting of additional species that are typical of later seral stages can be done.

4. Disturbed Sandy Soils

Target

Extremely disturbed and altered soil conditions within this entire unit will determine the plant community that can be established here. Soils in the unit are sandy and dry; currently the unit has a few sapling madrones, but is characterized by large areas of bare ground and a mixture of moss, grasses, and non-native forbs. Blackberry, Scots broom, and non-native cherry saplings are also present. These site conditions favor conversion of this unit to either an open meadow community or a sandy soil forest community.

A meadow community would resemble the gravelly sandy outwash prairies still found in South Puget Sound and would include mosses, lichens, and meadow grasses such as red fescue, blue bunchgrass, and prairie junegrass. Also present would be forbs such as camas, lomatium, yarrow, brodiaea, and lupine. Conversion to a meadow community would be very labor intensive as far as removal and control of invasive shrubs already present on the site and likely to re-invade the site on a continuing basis. There would be no establishment of shade that would help eliminate invasive shrubs into the future, and maintenance to sustain the plant community as meadow, to arrest further succession and natural progression of the unit to shrub and forest, would be ongoing. Therefore, conversion of this unit to a native shrub and forest community is recommended, and conversion to a meadow community has been considered, and abandoned as a labor-intensive, expensive, and difficult to sustain option.

Conversion of this unit to a madrone forest with a shore pine component would include understory shrubs such as snowbrush, serviceberry, and possibly oceanspray and mock orange. Groundcover species would include kinnikinnick, bracken fern and coastal strawberry. It is anticipated that planting of successive seral species will not occur within the lifetime of this VMP due to the nature of the soils in the unit.

Prescription

4a Begin invasive control by removing Scots broom. Stop the proliferation of further seed by removing large individuals that flower and set seed, as well as smaller seedlings that are still easy to remove by handpulling when soil is moist and soft in the winter and spring. Larger plants can be removed with a weed wrench or if too large to wrench, can be cut and stump treated with herbicide.

4b Remove butterfly bush by handpulling smaller seedlings, wrenching larger plants, or cutting them and stump-treating them with herbicide.

4c Remove ornamental cherry tree saplings by cutting and stump-treating them with herbicide.

4d Mow blackberry canes with hand-mowing equipment once or twice durin gthe summer season and then grub the roots after the second mowing. Immediately sheet mulch these areas with cardboard and apply 6" of chip mulch on top of cardboard.

4e Add CWD distributed throughout unit, but mainly in interior. Larger diameter and length of wood is more useful to a wider range of wildlife species and guild then smaller shorter pieces. Any species, deciduous or conifer, that is not prone to sprouting (e.g. non-native poplar) is appropriate to use. Refer to Section B.1. and Table 2 for guidelines.

4f Plant areas cleared of invasives (Table 6), as well as areas that are currently bare ground in the late fall or early winter season. All newly planted areas should be mulched with 4-6" of wood chip mulch.

4g Perform follow-up weed maintenance on initial planting starting in early spring following planting. Expected weeds in the short term are field bindweed and blackberry (re-sprouting). In the longer term, knotweed, Scots broom, and butterfly bush may try to colonize the site.

4h Watering of plantings will be required for at least two growing seasons following planting.

4i Supplemental planting to fill in gaps will also be expected within the first three year period. The site should be monitored to determine whether any particular species are more or less successful at establishing, and adjustments in species selection should be made accordingly.

Table 6 Target Plant Community Composition for Disturbed Soils Management Unit, Orchard St. Ravine

Species and Layer	Common Name	Approx. Overall Planting Proportion Within Plant Layer*	Planting Density**
Trees			
Arbutus menziesii	Pacific madrone	50-60%	8-12'
Pinus contorta var. contorta	shore pine	20%	8-10'
Pseudotsuga menziesii	Douglas fir	10%	10-15'
Alnus rubra	red alder	10%	5-8'
Shrubs and Ground			
Arctostaphlyos uva-ursi	kinnikinnick	20-25%	1-3'
Fragaria chiloensis	coast strawberry	20-25%	12-18"
Holodiscus discolor	oceanspray	10-15%	6-8'
Amelanchier alnifolia	serviceberry	10-15%	4-6'
Philadelphus lewisii	mock orange	5-10%	4-6'
Pteridium aquifolium	bracken fern	5-10%	2-3'
Mahonia aquifolium	tall Oregon grape	<5%	3-5'

***Planting Proportion refers to the overall plant composition within a plant layer that is selected for any given planting area within the unit. The percentages indicated are to be used as a guide to determine this when a planting is being done.**

****Planting Density refers to the average spacing to be used when installing plants. Plant quantities should be determined using the planting proportions, planting density, and Seattle Parks Department's BMPs for planting.**

V. PROJECT PRIORITIES AND IMPLEMENTATION PHASING

A. Implementation Priorities

Implementation of the recommended actions in the VMP will be done incrementally over time with highest priority tasks performed earliest in the process. However, depending on funding and levels of community stewardship, it may make sense to work concurrently on tasks at different priority levels. Table 7 below summarizes the list of recommended tasks and what will be required in terms of funding and expertise to perform them.

Table 7 Priority Actions, Timing, Expertise and Costs for Orchard St. Ravine VMP Implementation

Priority and Prescription	Seasonal Timing	Expertise Required	Crew Days[i]	Heavy Equipment Operator Days[ii]	Materials and Equipment Rental Costs	Approx. Cost
HIGH PRIORITY ACTIONS						
1a Create tree survival rings	all year	Volunteer and Crew[iii]	2		$0-$400	$3,000
1b Remove limited distribution invasives	all year	Volunteer and Crew	2		$0-$400	$3,000
1c Control knotweed	summer	Crew[iv]	2		$50	$2,650
2a Clear blackberry thicket	summer	Heavy Equipment Operator and Crew	5	1		$5,500
2b Add CWD	fall	Heavy Equipment Operator and Crew	1	1		$1,820
2c Plant cleared and prepped blackberry thicket area	late fall-early winter	Volunteer and Crew	3 or 5 (steep)		$3,700[v]	$7,600
2d Follow-up weed maintenance	spring-summer	Volunteer and Crew	9 (3/yr)			$11,700
2e Water newly planted areas (2 years)	summer	Volunteer or Crew	15 (10 in 1st yr, 5 in 2nd yr.)		$7,000	$19,000
2g Prune large red alder	summer	Certified arborist[vi]	1			$1,000
2h Snag Lombardy poplar	summer	Certified arborist	1			$1,750
3a Clear blackberry thicket	summer	Heavy Equipment Operator and Crew	5			$6,500
3b Add CWD	fall	Heavy Equipment Operator and Crew	1			included in 2b
3c Plant cleared and prepped blackberry thicket area	late fall-early winter	Volunteer and Crew	2		$2,300[vi]	$4,900
3d Follow-up weed maintenance	spring-summer	Volunteer and Crew				included in 2d
3e Water newly planted areas	summer	Volunteer or Crew				included in 2e
4a Remove Scots broom	all year	Volunteer and Crew	2			$2,600
4b Remove butterfly bush	all year	Volunteer and Crew	2			$2,600
MODERATE PRIORITY ACTIONS						
1d Remove laurel and holly seedlings	all year	Volunteer and Crew	2			$2,600
1e Expand tree survival rings and prep for planting	all year	Volunteer and Crew	2			$2,600
1f Plant cleared and prepped areas	late fall - winter	Volunteer and Crew	1			$1,300

Priority and Prescription	Seasonal Timing	Expertise Required	Crew Days[i]	Heavy Equipment Operator Days[ii]	Materials and Equipment Rental Costs	Approx. Cost
MODERATE PRIORITY ACTIONS (cont'd)						
2f Infill plant in previously planted area	late fall-early winter	Volunteer and Crew	2 (1/yr)		$500	$3,100
4d Remove blackberry	summer	Crew	3 (1/yr)			$2,600
4f Plant prepped areas	late fall-early winter	Volunteer and Crew	1		$2000	$3,300
4g Perform weed maintenance of planted areas	spring-summer	Volunteer				
4h Water newly planted areas	summer	Volunteer				
LOW PRIORITY ACTIONS						
1g Add CWD	summer-fall	Crew	1	1		$1,300
2g Remove or habitat prune large red alder, leave wood on site[vii]	summer	Certified arborist				$1,750
2h Remove or habitat prune Lombardy poplar snag	summer	Certified arborist				$1,750
2i Follow-up planting with later seral species	late fall-early winter	Volunteer			$1,000	$1,000
3g Infill plant in previously planted areas	late fall-early winter	Volunteer			$400	$400
4c Remove ornamental cherry saplings	all year	Crew	3 (1/yr)			$3,900
4e Add CWD	all year	Crew	1			$1,300
4i Infill plant in previously planted areas	late fall	Volunteer			$400	$400

[i] A Crew Day refers to a 4-6 person crew for 8-10 hours at approximately $1300 per day. Parks 3-person Natural Area Crew has limited availability, but can support pieces of this work at $1000 per day. Summer watering crew rates vary by contractor (current estimate is based on a 2-person crew for a day per watering event + project management for $800/day).

[ii] Heavy equipment operator rate is $65 per hour or $520 per day including any available Parks equipment. Additional equipment rental may be required.

[iii] Crew and proper Best Management Practices for erosion control may be required on steep slopes.

[iv] Crew with permit from Parks Resource Conservation Coordinator required for herbicide application.

[v] Plants assumed at $8 per plant, 1-2 gallon at wholesale, and average 6-ft O.C. spacing

[vi] Arborist crew rate is estimated at $100 per hour + materials for certified arborist and grounds-man or $1000 per day for 3-person Parks Tree Crew

[vii] Removal/habitat pruning of red alder and pruning of Lombardy popular will be significantly less challenging and cause far less site disturbance if done after blackberry clearing but before restoration plantings are installed in the Blackberry Thicket MU.

LOCATION OF NUMBERED ACTIONS: 1=Forest Remnant MU, 2=Blackberry Thicket MU, 3=Blackberry Thicket Steep MU, 4=Disturbed Sandy Soils MU

Bracketed rows indicate that these actions must be budgeted and performed as a sequenced group that cannot be separated.

B. Implementation Timeline

The table below reflects an implementation timeline of 10 years for the tasks described in the VMP. This is a relatively short timeframe for a typical VMP, however the site is relatively small and there is committed funding to accomplish a large portion of the work up front. Although plants will not grow any faster at Orchard St. Ravine than any other typical restoration site, the majority of the invasive removal work, and planting is anticipated to be fairly manageable in this timeframe due to the size of the site, and the nature of the invasives on site. Obviously, restoration work at maintenance levels and monitoring will be needed at Orchard St. beyond the 10 year timeframe, but this site seems well-suited to an accelerated and focused timeframe of 10 years.

Tasks are shown with a targeted start and end year to illustrate anticipated timing and level of effort if work is achieved as is expected and site conditions are as estimated. For example, weed maintenance in the Blackberry Thicket MU (Task 2d) is anticipated to be necessary for three seasons after planting is accomplished. This is reasonable if weeding is done well and thoroughly for this duration of time, and if the site follows a typical pattern of weed re-growth and desirable plant establishment seen at other similar sites in the city. If weeding is performed poorly (not well-timed, not regularly throughout season, not thoroughly) and plant growth suffers as a result, the weed maintenance period would have to be extended. The column indicating Year Completed is to be used as a simple check-in tool for Parks staff and community volunteers and is to be filled out over the lifespan of the VMP as work is accomplished.

Initial work that consists almost entirely of high priority actions is assumed to be done almost entirely by paid work crews, and comprise the bulk of the overall implementation expense. Later tasks of lower priority that are to be done further into the 10 year time span will be less costly, partly because they are less intensive and smaller in scope, but also because the project is assumed to have a much bigger component of volunteer participation by that time. This is reasonable to expect, given the pattern of stewardship over time observed on other similar projects throughout the city, and given the more volunteer-appropriate nature of the tasks as the project progresses. Invasive removal, for example will involve handwork over smaller areas, and not large-scale removal for which machinery is required, or the use of herbicides, which cannot be done by volunteers.

Projected task timeline with budget expended is shown in Table 9. Moderate and Low priority tasks span a longer portion of the 10 year timeline because some of these are actions that can be undertaken anytime during this period, or because they are tasks that require ongoing small input of work or periodic follow-up rather than a shorter duration of intensive work. Examples of work that can be done anytime are things like importing CWD into the Forest Remnant and Disturbed Sandy Soils MU (Tasks 1g and 4e). Examples of work that is of longer duration and doesn't need to be completed in one intensive work effort are things like infill planting the Forest Remnant MU (Tasks 1e-1f).

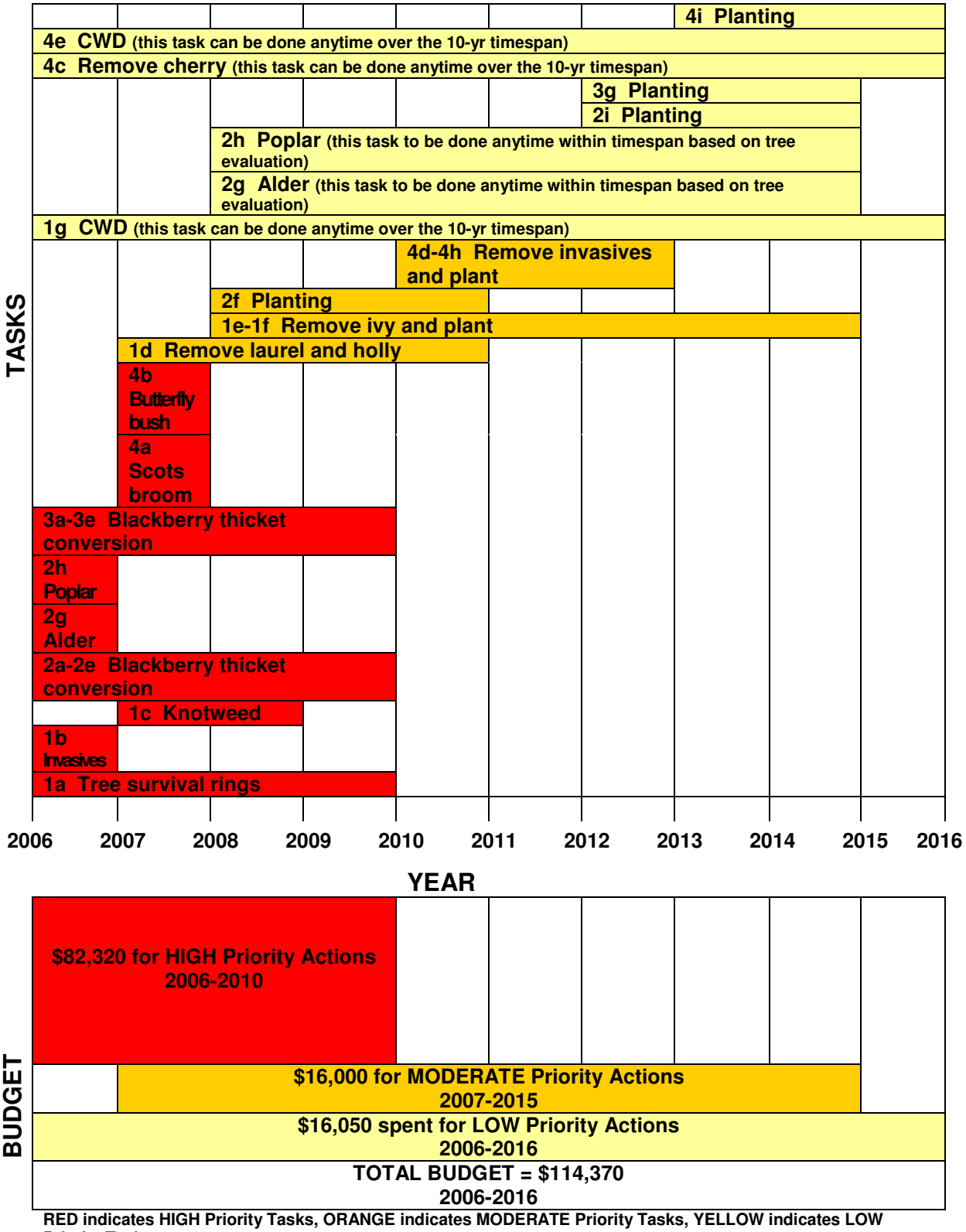
Table 8 Expected Timeline for 10 Year VMP Implementation, Orchard St. Ravine

Task	Target Year START	Target Year END	Year Completed	Duration of Task
HIGH PRIORITY ACTIONS				
1a Create tree survival rings	2006	2008		2 years
1b Remove limited distribution invasives	2006	2006		One-time w/follow-up
1c Control knotweed	2007	2009		3 years
2a Clear blackberry thicket	2006	2006		One-time
2b Add CWD	2006	2006		One-time
2c Plant cleared and prepped blackberry thicket area	2006-07	2007		One-time
2d Follow-up weed maintenance	2007-09	2009		3 years
2e Water newly planted areas	2007-08	2008		2 years
2g Prune large red alder	2006-07	2006-07		One-time
2h Snag Lombardy poplar	2006-07	2006-07		One-time
3a Clear blackberry thicket	2006	2006		One-time
3b Add CWD	2006	2006		One-time
3c Plant cleared and prepped blackberry thicket area	2006-07	2007		One-time
3d Follow-up weed maintenance	2007-09	2009		3 years
3e Water newly planted areas	2007-08	2008		2 years
4a Remove Scots broom	2007	2007		One-time w/follow-up
4b Remove butterfly bush	2007	2007		One-time w/follow-up
MODERATE PRIORITY ACTIONS				
1d Remove laurel and holly seedlings	2007	2010		4 years
1e Expand tree survival rings and prep for planting	2008	2014		7 years
1f Plant cleared and prepped areas	2008	2014		7 years
2f Infill plant in previously planted area	2008	2011		3 years
4d Remove blackberry	2010	2010		One-time
4f Plant prepped areas	2010	2010		One-time
4g Perform weed maintenance of planted areas	2010-13	2013		3 years
4h Water newly planted areas	2011-2012	2012		2 years
LOW PRIORITY ACTIONS				
1g Add CWD	anytime	anytime		ongoing
2g Remove or habitat prune large red alder, leave wood on site	2008-14	2008-14		One-time
2h Remove or habitat prune Lombardy poplar	2008-14	2008-14		One-time
2i Follow-up planting with later seral species	2012-14	2012-14		2 years
3g Infill plant in previously planted areas	2012-14	2012-14		2 years
4c Remove ornamental cherry saplings	anytime	anytime		One-time w/follow-up
4e Add CWD	anytime	anytime		One-time
4i Infill plant in previously planted areas	2013-16	2013-16		2 years

LOCATION OF NUMBERED ACTIONS: 1=Forest Remnant MU, 2=Blackberry Thicket MU, 3=Blackberry Thicket Steep MU, 4=Disturbed Sandy Soils MU

Bracketed rows indicate that these actions must be budgeted and performed as a sequenced group that cannot be separated.

Table 9 Implementation Table for Work to be Completed 2006-2016, Orchard St. Ravine



RED indicates HIGH Priority Tasks, ORANGE indicates MODERATE Priority Tasks, YELLOW indicates LOW Priority Tasks
LOCATION OF NUMBERED ACTIONS: 1=Forest Remnant MU, 2=Blackberry Thicket MU, 3=Blackberry Thicket Steep MU, 4=Disturbed Sandy Soils MU

C. Cost Estimates

Estimated total cost of implementing all restoration tasks identified in this plan is $114,370. High priority actions total $82,320, moderate priority actions total $16,000 and low priority actions total $16,050. Costs are estimated based on 2006 rates, and best guesses as far as how much work will be required to accomplish a given task. These numbers are not fixed, and will assuredly vary (some lower, some higher) as the project proceeds. Estimated costs are called out as line items here and some cost savings will be realized by grouping specific actions due to reductions in crew or equipment mobilization costs. As an example, items 4a and 4b call for removing Scots broom and butterfly bush at 2 crew days each. Combined, these efforts may be achievable in 3 or 3.5 crew days at a cost savings of $650 to $1300.

Crew time estimates here are conservative and based on limited volunteer participation. Substantial portions of the crew time called out in this budget could be off-set with increased volunteer activity. Watering is an example of this. All watering for high priority projects is currently budgeted as a contracted task due to its importance in helping plant establishment at this challenging site. Watering infrastructure and labor is a costly budget item. However, watering contracts can be adjusted if there are willing volunteers to perform some of this work. The most efficient system will consist of installation of a new service connection and a main line stub up to a quick coupler or a hose bib in the Blackberry Thicket MU. This line will be used for watering in the high priority thicket conversion areas, and will also be used to do any other watering of new plantings that will be required over the lifespan of the VMP in other MUs.

There is currently no watering budget for labor included in total project costs for moderate and low priority tasks that require watering of new plantings (tasks 1f, 2f, 4h, 2i, 3g, 4i). For the most part watering needs of these projects will be far less intensive than planting that is done in open sites with full sun and poor soil (eg Blackberry Thicket MU). It is also anticipated that site stewardship will be regular and committed enough by that time to assume any watering tasks, or that additional funding resources (grants) have been secured to cover these costs.

D. Monitoring

Monitoring of the work areas should be done using Parks guidelines and monitoring field forms for volunteer monitoring of restoration areas (see Appendix D). Monitoring data should be transferred and submitted in electronic form using Excel spreadsheet templates provided by Parks Urban Forester. Basic plant survival and cover monitoring of areas that have been planted, as well as monitoring of invasive control will greatly inform follow-up actions that may be required to keep the site moving towards the prescribed targets. Long term and more detailed site monitoring will be done by Seattle Parks and Green Seattle Partnership staff following protocols developed by these entities.

VI. RESOURCES

The life of this open space and our stewardship of it will continue long into the future. There is currently a Pro Parks Levy project at this location. The $175,295 budget is

allocated to plan, design and develop a trail access to the ravine including parking and signage, and to implement portions of the VMP. This budget also provides funding for development of this plan, which will guide current and future management activities. As noted above, the estimates are conservative and can be further off-set by increased volunteer activity.

Long Term Site Stewardship

The Green Seattle Partnership (GSP) is a unique public-private partnership, formed in 2004, dedicated to promoting a livable city by re-establishing and maintaining healthy urban forests. GSP staff including Parks Urban Foresters and Cascade Land Conservancy Project Managers are available to assist community volunteers in implementing portions of this VMP that extend beyond the Pro Parks levy funds allocation. Volunteers from FOStR attended the 2006 GSP Forest Stewards training where they received materials on how to coordinate projects with the Partnership. Staff assist volunteers by creating annual work plans to define project goals, advertising volunteer events, arranging for tools and materials delivery to volunteer events, and identifying and assisting with grant applications. Parks staff from several divisions including Southwest District staff, Volunteer Coordinators, and Horticulture & Forestry Services are also available to support the continuation of work at Orchard St. Ravine.

Appendix E has an extensive list of potential grant resources that could be accessed to fund later phases of the work prescribed for Orchard St. Ravine. Grants that function as matches for existing funding should be applied for as soon as possible within the next four-year period while project funding still exists to support a match. After that time, a match will consist mainly of volunteer labor valued at a certain hourly rate or other money that has been secured for the project beyond what Pro Parks has allocated. Table 10 below shows a detailed breakdown of the work prescribed in this VMP by year to help identify what the work will cost on an annual basis as the site progresses and work is completed.

Table 10 Task Implementation Timeline and Working Budget by Year, Orchard St. Ravine

Pro Parks Levy Project

ORCHARD STREET RAVINE IMPROVEMENTS

TASK IMPLEMENTATION TIMELINE AND WORKING BUDGET ILLUSTRATION

*Note, this captures the projected budget at a point in time (July 2006), based on our best estimates for the work. As the project proceeds, actual costs for work items will vary. We will group contracted tasks for the greatest efficiency possible.

KEY
ALLOCATED OR SPENT
HIGH PRIORITY RESTORATION ACTIONS
MEDIUM PRIORITY RESTORATION ACTIONS
LOW PRIORITY RESTORATION ACTIONS
V = Volunteer partnership opportunities

2005		**Projected Costs**	***Notes***
FIXED COSTS (1% ART/DESIGN COMM)	$	2,000	
PLANNING, ENV. REVIEW, EARLY DESIGN	$	32,000	
SUBTOTAL 2005	***$***	***34,000***	
2006			
PLANNING, EARLY DESIGN, PERMITS, PROJ. MGMT.	$	15,000	
DESIGN (CONSTRUCTION, PERMIT PLANS)	$	11,000	
VMP DEVELOPMENT, WORKSHOPS	$	15,000	
TRAIL CONSTRUCTION	$	25,000	
WATER ALLOWANCE	$	7,000	
1a Create tree survival rings - $3000	$	750	*V, Pro-rated for 4-yr span, 1st yr*
1b Remove limited distribution invasives - $3000	$	3,000	*V, One-time cost*
2a & 3a Clear blackberry thicket - $12000	$	12,000	*Lower areas, one-time.*
2b & 3b Add CWD - $1820	$	1,820	*Pro-rated for 3-yr span, 1st yr*
2c & 3c Plant cleared and prepped blackberry thicket area - $12500	$	12,500	*V, One-time cost*

2g Prune large alder near trail - $1000	$	1,000	*Move up in timeline to utilize construction resources*
2h Snag poplar - $1750	$	1,750	*Move up in timeline to utilize construction resources*
1g Add CWD - $1820	$	1,300	*Move up in timeline to utilize construction resources*
4c Remove ornamental cherry saplings - $3900	$	3,900	*Move up in timeline to utilize construction resources*
4e Add CWD - $1820	$	1,300	*Move up in timeline to utilize construction resources*
SUBTOTAL 2006	***$***	***112,320***	

2007

1a Create tree survival rings - $3000	$	750	*Pro-rated for 4-yr span, 1st yr*
1c Control knotweed - $2650	$	1,325	*Pro-rated for 2-yr span, 1st yr*
2d & 3d Follow-up weed maintenance	$	3,900	*V, Pro-rated for 3-yr span, 1st yr*
2e & 3e Water newly planted areas	$	8,000	*V, Pro-rated for 2-yr span, 1st yr*
4a Remove Scot's broom - $2600	$	2,600	*One-time cost*
4b Remove butterfly bush - $2600	$	2,600	*One-time cost*
1d Remove laurel and holly seedlings - $2600	$	1,300	*Pro-rated for 2-yr span, 1st yr, volunteer yrs 3&4*
SUBTOTAL 2007	***$***	***20,475***	

2008

1a Create tree survival rings - $3000	$	750	*Pro-rated for 4-yr span, 1st yr*
1c Control knotweed - $2650	$	1,325	*Pro-rated for 2-yr span, 2nd yr*
2d & 3d Follow-up weed maintenance	$	3,900	*V, Pro-rated for 3-yr span, 2nd yr*
2e & 3e Water newly planted areas	$	5,000	*V, Pro-rated for 2-yr span, 2nd yr*
1d Remove laurel and holly seedlings - $2600	$	1,300	*V, Pro-rated for 2-yr span, 2nd yr, volunteer yrs 3&4*
1e Expand tree survival rings and prep for planting - $2600	$	2,600	*V, One-time, first year cost, volunteer follow-up*
1f Plant cleared and prepped areas - $1300	$	1,300	*V, One-time, first year cost, volunteer follow-up*
2f Infill plant in previously planted area - $3600	$	1,200	*V, Pro-rated for 3-yr span, 1st yr*
2g Evaluate and possible prune large alder and poplar - $1000	$	3,500	*Move up in timeline to utilize construction resources*
2h Evaluate poplar and possible removal - $1750	$	1,750	*Move up in timeline to utilize construction resources*
SUBTOTAL 2008	***$***	***22,625***	

Subtotal through 2008 ***$189,420***

Pro Parks Levy funds projected to be expended about this time

2009 & BEYOND

1a Create tree survival rings - $3000	$	750	*V, Pro-rated for 4-yr span, 1st yr*
2d & 3d Follow-up weed maintenance - $11700	$	3,900	*V, Pro-rated for 3-yr span, 3rd yr*
2h Remove or habitat prune Lombardy poplar - $2500	$	2,500	

2i Follow-up planting with later seral species - $1000	$	1,000	
2f Infill plant in previously planted area - $3400	$	2,400	*Pro-rated for 3-yr span, 2nd and 3rd yr*
3g Infill plant in previously planted areas - $400	$	400	
4d Remove blackberry - $2600	$	2,600	
4f Plant prepped areas - $3300	$	3,300	
4g Perform weed maintenance of planted areas - free	$	-	
4h Water newly planted areas - volunteer	$	-	
4i Infill plant in previously planted areas - $400	$	400	
SUBTOTAL 2009 & BEYOND	***$***	***17,250***	

Overall Project Costs **$ 206,670**

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APPENDIX A – DATA FORMS

COVER DATA SHEET – SPECIES AND AERIAL COVER

Monitoring Plot # _____ Park_____

Slope/Aspect_____ Date:_____

Data Collected by:_____ Page_____of_____

	COVER PER QUADRAT (1-20% for each Quadrat)					
Species	**Quad 1**	**Quad 2**	**Quad 3**	**Quad 4**	**Quad 5**	**Totals**
TREES						
SHRUBS						
HERBS						
Litter						
Bare						

TREE DENSITY DATA SHEET

Monitoring Plot # ________ Park____________________________

Slope/Aspect____________ Date:____________

Data Collected by:___________________________ Page _____ of ______

SPECIES	Height	Diameter	Length (CWD)	Health/Decay Class	Ivy	Clematis

APPENDIX B – LIST OF PLANT SPECIES IDENTIFIED, ORCHARD ST. RAVINE

			Average %Cover by Management Unit		
Vegetation Layer and Species	**Common Name**	**Origin**	**Blackberry Thicket**	**Disturbed Sandy Soils**	**Forest Remnant**
Canopy					
Acer macrophyllum	bigleaf maple	N		2.2	2.3
Alnus rubra	red alder	N		0.8	
Arbutus menziesii	Pacific madrone	N		6	9.2
*Buddleja davidii**	butterflybush	I	0.4	4	
Cornus nuttalii	Pacific dogwood	N			0.01
*Crataegus monogyna**	English hawthorne	I			0.2
*Ilex aquifolium**	English holly	I			8.6
Populus nigra	Lombardy poplar	I	4		
Prunus avium	Mazzard cherry	I	3.2	2.6	1
Prunus emarginata	bitter cherry	N			2
*Prunus laurocerasus**	English laurel	I			8.6
Pseudotsuga menziesii	Douglas fir	N		5.2	9
Salix scouleriana	Scouler willow	N			2
*Sorbus acuparia**	European mountain ash	I			0.01
Shrub					
Clematis vitalba	clematis	I	1		3.8
Corylus cornuta	hazelnut	N		.4	17
Cotoneaster sp.	cotoneaster	I			0.01
Cytisus scoparius	Scots broom	I		3.2	0.5
Daphne sp.	daphne	I			0.01
Gaultheria shallon	salal	N			0.4
Hedera helix	English ivy	I			55.1
Holodiscus discolor	oceanspray	N	0.4		1.1
Lonicera ciliosa	orange honeysuckle	N			0.01
Mahonia nervosa	low Oregon grape	N			8.35
Oemlaria cerasiformis	indian plum	N			1.21
Ornamental broadleaf shrub		I			0.5
Philadelphus lewisii	mock orange	N			0.51
Rosa gymnocarpa	baldhip rose	N			0.02
Rubus procerus	Himalayan blackberry	I	96	12	37.7
Rubus ursinus	dewberry	N			0.02
Sambucus racemosa	red elderberry	N	0.02		
Symphoricarpos albus	snowberry	N			0.12
Vaccinium parvifolium	red huckleberry	N			0.01
Herb					
Convolvulus arvensis	bindweed	I			0.01
Grass		NN		34.2	
Heracleum lanatum	cow parsnip	N			0.1
Holcus lanatus	velvetgrass	NN		2.2	
Hypochaeris radicata	cat's ear	NN		1.4	
Moss				11.4	
Plantago lanceolata	English plantain	NN		0.06	
Polyganum sp.	knotweed	I			1.3
Polystichum munitum	sword fern	N		0.04	3.2
Prunella vulgaris	self-heal	NN		1.6	
Pteridium aquilinum	bracken fern	N			0.1
Rumex acetosella	sheep sorrel	NN		0.8	

Origin: N=native, I=non-native invasive, NN=non-native

*invasive species all found in the shrub layer, but with the potential for attaining canopy size (>20' ht.)

APPENDIX C – WILDLIFE SPECIES OBSERVED IN ORCHARD ST. RAVINE

BIRDS

1. Band-tailed pigeon*
2. Rock dove
3. Western Flycatcher
4. Olive-sided Flycatcher
5. Common Crow*
6. American Robin*
7. Starling*
8. Stellar's Jay*
9. Song Sparrow*
10. Rufous Sided Towhee*
11. Hermit Thrush
12. Swainson Thrush
13. Varied Thrush
14. Northern Flicker*
15. Bewick's Wren*
16. Golden Crowned Kinglet
17. Ruby Crowned Kinglet
18. Bushtit*
19. Black Capped Chickadee
20. Chestnut Backed Chickadee
21. American Goldfinch
22. Pine Siskin
23. Bohemian Waxwing
24. Cedar Waxwing
25. Darkeyed Juncoe
26. Brown Headed Cowbird
27. White Crowned Sparrow
28. Golden Crowned Sparrow
29. Purple Finch
30. House Finch*
31. House Sparrow
32. Brewer's Blackbird
33. Tree Swallow
34. Violet Green Swallow
35. Barn Swallow*
36. Red Breasted Nuthatch
37. Wilson Warbler
38. Townsends Warbler
39. Yellow Rumped Warbler
40. Rufous Hummingbird
41. Anna's Hummingbird
42. Downy Woodpecker
43. Pileated Woodpecker **
44. Evening Grosbeak
45. Ruffed Grouse
46. California Quail
47. Bald Eagle***
48. Great Horned Owl
49. Sharp Shinned Hawk
50. Red Tailed Hawk
51. Merlin
52. American Kestrel
53. Western Tanager
54. Scrub Jay

* denotes confirmed nesting
** denotes WDFW Priority Habitats and Species State Candidate species
*** denotes WDFW listed Species of Concern

MAMMALS

1. coyote
2. raccoon
3. eastern gray squirrel
4. possum

APPENDIX D – MONITORING DATA FORMS

PLANT INSTALLATION MONITORING FORM

Park		**Date**	
Site ID		**Recorder**	
Plot ID		**Team**	

INSTRUCTIONS: In "# Installed" column, enter plot total from *Plant Installation Documentation* form. Record "Growth" as the approximate height difference between installation and current (See "Approx. Height" column on *Plant Installation Documentation* form).

Crown Class (Overstory, Understory, Shrub, Herb)	Scientific & Common Name	# Installed	# Healthy	# Stressed	# Dead	Growth	Notes

Yearly Cycle Implementation Schedule

Site ID #: _____

Activity	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Site Preparation												
Invasive Management												
Planting												
Site Improvements												
Maintenance												
Monitoring												

APPENDIX E – GRANT RESOURCES

Table 11 List of Potential Grant Resources for Restoration Projects, Orchard St. Ravine

Company Name	Contact	Focus	Dollar Range	Due
Ben. B. Cheney Foundation	Dr. William O. Rieke, M.D. Executive Director Ben B. Cheney Foundation 1201 Pacific Avenue, Suite 1600 Tacoma, WA 98402 206-572-2442	Lasting benefit for educational purposes. Can be staff time, equipment, travel (i.e. field trips), or enhancement of an environmental education site. Start with a letter of interest.	$5,000-50,000	Quarterly
Brainerd Foundation	The Brainerd Foundation, 1601 Second Avenue, Suite 610, Seattle, WA 98101 206-448-0676 or fax 206-448-7222 **info@brainerd.org** http://www.brainerd.org	Environmental quality for the Northwest. Program areas include endangered ecosystems and communications and capacity building. Start with a letter if inquiry.	$5,000-50,000	March / June/ November
Bullitt Foundation	Bullitt Foundation, 1212 Minor Avenue, Seattle, WA 98101-2825, Emory Bundy, 206-343-0807, **www.bullitt.org**	Environmental education projects that benefit the Pacific Northwest. Specifically problems that disproportionately impact lower-economic people in urban and rural communities. Projects that build and strengthen the environment and educate the public about protecting and restoring the environment will be given priority. Complete the application as described.	Up to $10,000 or over $10,000	May and November
Environmental Education Grants	Environmental Protection Agency, Region 10, EXA-142, 1200 Sixth Avenue, Seattle, WA 98101 Sally Hanft, Environmental Ed. Grants Coordinator (206) 553-1207 or 1-800 424-4EPA **http://www.epa.gov/enviroed/grants.html**	Supports environmental education projects that enhance the public's awareness, knowledge, and skills to make informed decisions that affect environmental quality. Can be curriculum development or integration of environmental ed into the classroom.	$5,000-25,000 or over $25,000	November
GreenWorks!	Caroline Alston, 202-463-2472 or caroline_alston@plt.org GreenWorks! Grants, 1111 - 19th Street NW #780, Washington, DC 20036 **www.sendit.nodak.edu/plt/greenw.html**	Associated with Project Learning Tree's curriculum. Encourages students to participate in community-based partnerships. Implementing projects such as graffiti paint overs, tree plantings, stream clean-ups, and recycling.	$200-1,000	October

Company Name	Contact	Focus	Dollar Range	Due
Home Depot Environmental Grants	Director, Community Affairs, The Home Depot, 2455 Paces Ferry Road, Atlanta, Georgia 30339 www.homedepot.com	Environmental research and education of forestry and ecology, green building design, clean-up and recycle, and lead poisoning prevention. Can recruit Home Depot volunteers to help with labor.	Various	Anytime, rolling deadline
Magic Apple Grants	Department of Ecology, Annie Phillips, P.O. Box 47600, Olympia, WA 98504-7600, 360-407-6408, Fax 360-407-6426 **aphi461@ecy.wa.gov** **http://www.ecy.wa.gov/programs/wq/links/funding.html**	Individual teachers who promote knowledge and stewardship of clean water. Water quality education may include test kits, supplies, or field trips.	$750	March
National Fish & Wildlife Foundation	1120 Connecticut Avenue, NW, #900 Washington, DC 20036 Kathleen Pickering (202) 857-0166 **http://www.nfwf.org**	Non-profit organizations, local, state or federal government agencies are eligible to apply for funds for community-based projects that improve and restore native salmon habitat, remove barriers to fish passage, or for the acquisition of land/ conservation easements on private lands where the habitat is critical to salmon species. Proposals should focus on building local partnerships to implement on-the-ground restoration projects. Throughout the year they also provide many types of challenge grants to assist priority fish, wildlife, and plant conservation programs.	$5,000 or $10,000-150,000	Anytime, rolling deadline
National Tree Trust	National Tree Trust, 1120 G St. NW, Suite 770, Washington, DC 20005 800-846-8733	Seedling order program. Fill out the order form (part 1) to reserve your trees. Describe your project by filling out a separate form (part 2).	Various	Part 1 due in May; part 2 due in October

Company Name	Contact	Focus	Dollar Range	Due
Natural Resources Stewardship Network	King County, Linda Vane (206) 296-8042 or **linda.vane@metrokc.gov** website: **http://dnr.metrokc.gov/wlr/pi/nrsn.htm** Also see DNR Grant Exchange: **http://dnr.metrokc.gov/wlr/pi/grants.htm** Ken Pritchard, (206) 296-8265	Assists urban forestry and watershed stewardship projects by matching the resources of its partners to the needs of communities. Technical assistance and grants are available for projects within the urban growth area of King County that enhance, protect and manage urban forest, soil and water resources through citizen stewardship and volunteer efforts.	$10,000-75,000	February and October
Puget Sound Water Quality Action Team	PIE Award Program, Puget Sound Water Quality Action Team, P.O. Box 40900, Olympia, WA 98504-0900, 360-407-7300 **http://www.wa.gov/puget_sound/Programs/Pie_fund.htm**	Public Involvement and Education grants. Small and large projects must directly relate to Puget Sound and involve community partnerships. Focus on solutions for local pollution problems; protecting, preserving, and restoring habitat; motivating people to be environmental stewards; and partnering with others for lasting results.	Small awards up to $3,000, large awards up to $50,000	February or ASAP after November for small awards, and November for large awards
Schoolyard Habitats Program	National Wildlife Federation, **http://www.nwf.org/schoolyardhabitats/** 703-790-4000	Development of an environmental study site. Includes projects such as bird watching, native planting, pond life studies, wildlife observations. Must be interdisciplinary, standards-based, hands-on, and inexpensive.	Various	March
Seeds for Education	Donna VanBuecken, Executive Director, Wild Ones Natural Landscapers, P.O. Box. 1274, Appleton, WI 54912-1274 920-730-3986 **http://www.for-wild.org**	Native plant education: enhancement and development of an outdoor learning site. Must include use of and teaching about native plants or seeds. Children need to be involved in the project.	Small awards	November

Company Name	Contact	Focus	Dollar Range	Due
Small Change for a Big Difference	King County, Donna Kalka (206) 296-8494 E-mail **donna.kalka@metrokc.gov** **http://dnr.metrokc.gov/wlr/pi/SmallChange.htm** Start with a letter of intent. See website for grant guidelines.	Salmon and watershed education, enhancement, protection, and restoration efforts in King County.	Up to $1000	Anytime, rolling deadline
Urban Reforestation & Habitat Restoration	King County, Kate Stenberg, Wildlife Program Planner (206) 296-7266 **http://dnr.metrokc.gov/wlr/lands/urhrdesc.htm**	Grants support projects to reforest urban areas, remove invasive non-native plant species, or provide wildlife habitats.	$2,000-10,000	October and April
Washington Native Plant Society	Fayla Schwartz, WNPS Education Committee Chair Everett Community College 2000 Tower Street Everett, WA 98201 425-388-9451, **fschwart@evcc.ctc.edu** or **http://www.wnps.org**	Projects may be in the form of a permanent public display including plantings or labeling of native plants, guidelines for an interactive website, or a teacher resource package.	$500	May and November
Washington State DNR Urban and Community Forestry Program – Community Forestry Assistance Grant	Washington Dept. of Natural Resources Urban and Community Forestry Program P. O. Box 47037 Olympia, WA 98504-7037 **Urban_forestry@wadnr.gov** 1-800-523-TREE	Tree planting, education, maintenance.	$3000-$10,000	Not known (2004 literature)
WaterWorks Block Grants	King County, Ken Pritchard 206-296-8265, **ken.pritchard@metrokc.gov** **http://dnr.metrokc.gov/wlr/waterres/wsf/wsfinfo.htm**	Individual grants are available for projects that protect or improve watersheds, rivers, lakes, wetlands, and tidewater. Projects must provide opportunities for stewardship.	$5,000 and $50,000	April and August

Excerpted from: ESS Grant Examples for Workshops (**http://www.wfpa.org/ee/WFPAEE/ESS/Grant_info/grant_examples.htm**)