Northgate Community Greenbelt Restoration

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Introduction

This landscape design and management plan has been drafted as the foundation for a neighborhood greenbelt restoration being spearheaded by the Neighbors of Greenbelt organization, a neighborhood constituency that aims to improve the existing aesthetics and use of the greenbelt. The greenbelt is located at the intersection of North 107th Street and Densmore Avenue North in the Northgate neighborhood. The site is one of the neglected greenbelts bordering the busy vehicular Northgate Way, and is owned by the City of Seattle Parks Department. The lot is approximately half of an acre in size, and is steeply sloped in many places, limiting its potential as public open space. In addition to its steepness, the absence of site management throughout the years has allowed aggressive invasive plants, primarily Himalayan blackberry (*Rubus discolor*), to take over the site and choke out more desirable native plants. There are also powerlines running north to south through the site, which resulted in the topping of all of the existing deciduous and evergreen trees growing under them, further decreasing the visual appeal of the site. This vertical limitation is a challenge in establishing an effective vegetative barrier to visually screen Northgate Way and the houses below the site. The greenbelt has also become a dumping site for truckloads of cement, household garbage, and yard waste, harming the plant and animal habitat and degrading the neighborhood for surrounding residents.

After the initial site analysis, our group met with Marjorie Brewster, a representative from the Neighbors of Greenbelt, to clarify the neighborhood's expectations for the site and discuss the site's limitations. Our group has generated the following proposed design and management manual for Neighbors of Greenbelt and the Parks Department. This plan's purpose is to serve as a basis for restoring the site from invasive weeds and eroding soil, and reestablishing a mostly native garden that will increase diversity and enhance wildlife habitat, ecological functioning, and aesthetics - thus providing passive recreation and stewardship opportunities for the surrounding community.

Site Analysis

Site Use

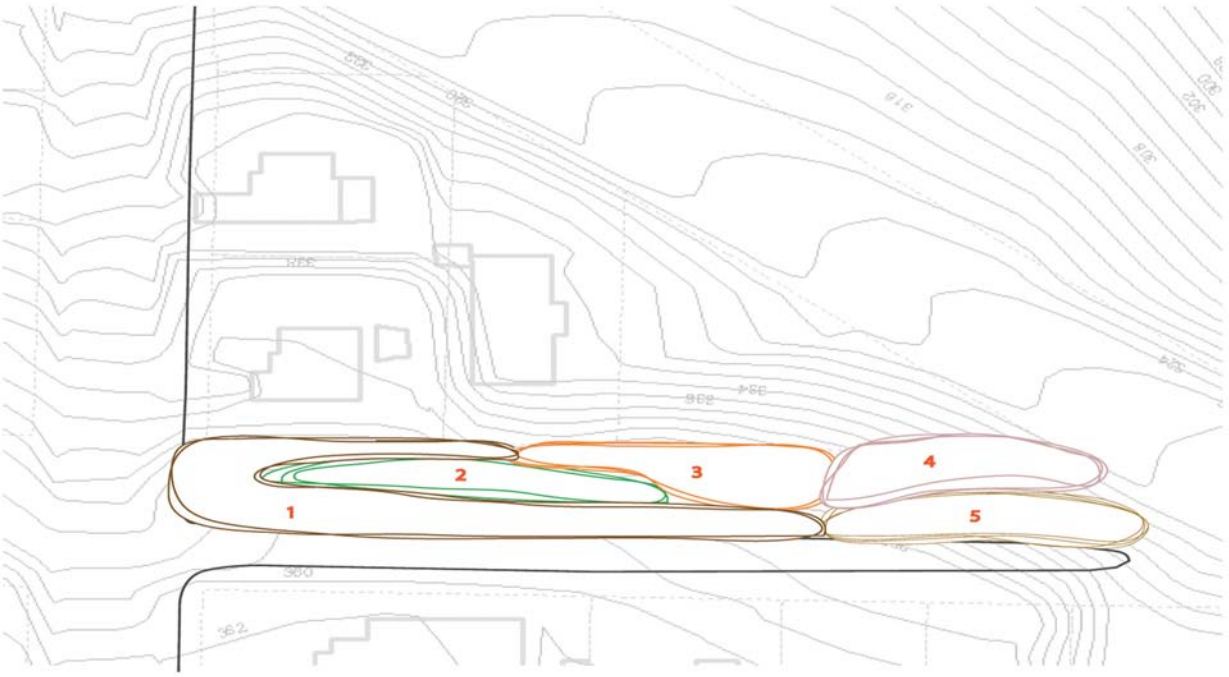
Currently this site is not being used for any productive activities. It is mostly being used as a "dump site." People have been seen dumping truckloads of waste and debris onto the site, and neighbors use the site as a place to discard their yard waste. The only other people who venture on site are maintenance crews from Seattle Public Utilities. The site does however support some wildlife – birds and small mammals.

Soil Analysis

Analyzing soil properties is a critical step that should take place prior to landscape plant selection. Soil characteristics will determine the nature of vegetation that is able to grow at a particular site. Soil properties were evaluated through both texture and lab analysis. Soil supports the growth of plants by providing six essential things. Below is a list of things that plants obtain from soil (Brady and Weil 2):

- Physical Support
- Air
- Water
- Temperature moderation
- Nutrient elements
- Protection from toxins

Soils properties can vary greatly within small areas, and soil interfaces can be especially drastic in urban areas. Five total samples were taken from different locations at the site. The five locations were separated based on differences in soil texture, current vegetation and slope. A map delineating the five soil zones has been provided below.



Soil Texture

Soil texture is a property that determines many other important characteristic. Texture can influence drainage, pH, mineral and water holding capacity, and pore space (Brady and Weil 15). Soil mineral particles form from the break down of rocks. Texture is determined by the type of parent material and the amount of weathering that has taken place. Soil particles range in size from microscopic clay particles, to midsize silt particles, to the coarsest particles of sand. The quantity of each type of particle found in a soil determines the soil texture class.

Spaces between soil particles provide pore space. It is in these pore spaces that air and water circulate, plant roots grow and soil organisms live. The amount and size of pore space in the soil determines the amount of water and air available to plant roots. The larger the soil particle the more pore space available. Coarser soils drain easily, and will have available more air than water. The coarsest of soils often do not hold enough water to support large plant populations. A very fine textured clay soil will have very small pores, which will inhibit infiltration rates and

slow drainage. Texture also plays an important role in nutrient availability. Smaller particles are able to hold nutrients more efficiently than larger particles.

The type of soil most valuable to plants is a soil that is made up of all three particles sizes. A soil that contains clay, silt and sand particles is called a loam (Brady and Weil 99). The percentage of each type of particle determines the soil class. A chart has been created that describes the characteristics of the five soil zones at the site.

Soil Texture Chart

Location Number	Texture Class	Texture Properties
#1	Silt Loam	• Medium textured soil • Easiest to manage • Holds adequate water and nutrients • Sufficient pore space
#2	Silt Loam	• Medium textured soil • Easiest to manage • Holds adequate water and nutrients • Sufficient pore space
#3	Sandy Loam	• Medium to Coarse in texture • Holds some water and minerals • Large pore space, drains easily
#4	Sand	• Coarse textured soil • Holds low amounts of nutrients and water • Large pore space, drains easily • Alkaline
#5	Sandy Loam	• Medium to Coarse in texture • Holds some water and minerals • Large pore space, drains easily

Texture can be easily analyzed through the feel method. This method involves taking a small amount of soil and wetting it. Soil is at the proper moisture content for the texture analysis if it feels moldable, with the consistency of putty. Soil texture can be determined by how the wet soil reacts to handling. A cast test and a ribbon test, as well as soil grittiness will determine the soil texture class. Refer to the "Soil Texture by Feel Flow Chart" in the Appendix for specific directions. This chart was provided by Dr. Darlene Zabowski, Professor of Soil Science at the University of Washington.

Lab Analysis

To assure that accurate recommendations were received from the soil analysis lab at the University of Massachusetts, the guidelines for soil collection were followed. One soil sample was taken from each of the five zones. Samples were taken by using a soil probe, which was used to extract a soil profile twelve inches in depth. Samples were placed in labeled bags. Later the samples were left out to dry, re-bagged, and then sent off to the soil testing laboratory.

The laboratory provided analysis of soil organic matter content, nutrient levels, cation exchange capacity, pH, buffering capacity and lead levels. Lab recommendations for soil improvements were also provided. Soil zones one, two, three and five have acceptable soil pH, low levels of lead contamination, adequate organic matter, nutrients and cation exchange capacity. No soil adjustments or fertilizer applications are needed at these zones.

Zone four however is not in the desired pH range. Soil in zone four is classified as sand. The soil pH is a measure of soil acidity, and soil pH has a direct correlation to plant growth. Most plant species prefer the soil pH between 5.5 and 8.3 (Clark, Harris and Matheny 80).. Zone four has a pH of 6.8 and a pH buffering capacity of 7.2. Although the soil is in the preferred pH range, plant species that will survive in this soil will be limited. The buffering capacity is the soils ability to resist changes in pH. A soil with a high buffering capacity will require greater amounts of materials used to change pH (Brady and Weil 570)..

Lab analysis reveals that nutrient levels and organic matter are adequate for zone four but the cation exchange capacity is not in the desired range. The cation exchange capacity (CEC) is a value given on a soil analysis report that indicates the soils capacity to hold nutrients. The CEC, however, is not something that is easily adjusted. The CEC of the soil is determined by the amount of clay and humus that is present. The amount and particle size of these two substances in the soil are very important because they improve the nutrient and water holding capacity of the soil (Brady and Weil 253). The particles of a sandy soil are not efficient at holding nutrients, and limited nutrients will inhibit the growth of plants.

The soil in zone four will be a limiting factor for plant success. Because of this we recommend that the sand be removed from the site. The sand present at the site is not naturally occurring and must have been dumped. Please refer to the site preparation section for methods for the sand removal.

The lab analysis, by the University of Massachusetts, is provided in Appendix B. The sample ID listed on the analysis sheets corresponds to the soil zones. Directions for analysis interpretations and recommendations have also been included.

Hydrology

Please refer to the links provided for more information and resources on national and regional climate, weather, hydrology, flood hazards and more:

- U.S Geological Survey (USGS) / U.S Department of the Interior
  1-888-ASK-USGS - http://wa.water.usgs.gov/
  - Water Resources of Washington State
  - Rain: A Water Resource- http://wa.water.usgs.gov/outreach/rain.htm
- National Weather Service, Seattle, WA with
  - *Recent* River *and* Storm *Warning and Forecast*
  - Hydrologic Data and Forecasts http://www.wrh.noaa.gov/Seattle/forecast02.html

In urban landscapes such as the Northgate Greenbelt Restoration site, the hydrologic cycle has been altered by impermeable surface such as asphalt, buildings, and compacted soil; as a result, these factors prevent water from percolating into the soil, therefore the water does not enter the natural surface and ground water system. These urban conditions create high amounts of surface water runoff because of less percolation into the ground. Our climate plays a major role with the amount of surface water runoff because Seattle receives such high amounts of precipitation throughout the year. In fact, Mitsch and Gosseling, authors of *Wetlands* say, "The percentage of precipitation that becomes surface flow depends on a number of variables, with climate being the most important (fig. 5-9). Humid cool regions such as the Pacific Northwest, western British Columbia, and the northeastern Canadian provinces have 60 to 80 percent of precipitation converted to runoff." (126)

Figure 6.6 below is from *Elements of the Nature and Properties of Soils* by Brady and Weil, and it illustrated how soil structure and vegetation influence the rate at which precipitation infiltrates and percolates into the ground water system. The top left picture shows high amounts of runoff because of both no vegetation cover to intercept the rain and compacted soil structure. Urban conditions like this assist "flashy floods" or high amounts of surface water runoff in short periods of time when rainfall is heaviest. Caren Crandell from the Corps of Engineers explains, "Storm water run-off – "flashy" hydrology with high peak flows over a short period of time; an urban area of 7-20% development can increase peak flow by 5X." (3)

On the other hand, the top right picture of Figure 6.6 shows how some vegetation cover decreases the amount of runoff and increases rainfall infiltration and percolation into the soil. However, because the soil is compacted there is still a considerable amount of runoff especially during times of high rainfall. Conversely, the bottom two diagrams illustrate how water infiltration and percolation can be increased with non-compacted porous soil structure and high vegetation cover. Notice when the soil is not compacted and has high vegetation cover such as trees, shrubs, and other plants, that the rainwater infiltrates and

percolates into the soil and ground water system at a much greater rate compared to previous examples.

Indeed, vegetation and porous soil structure help slow down the rate and amount of surface water runoff from site. Throughout this document there are a number of strategies and techniques such as planting vegetation, application of mulch, and installation of aboveground obstructions that help decrease the impact of “flashy floods” and surface water runoff.

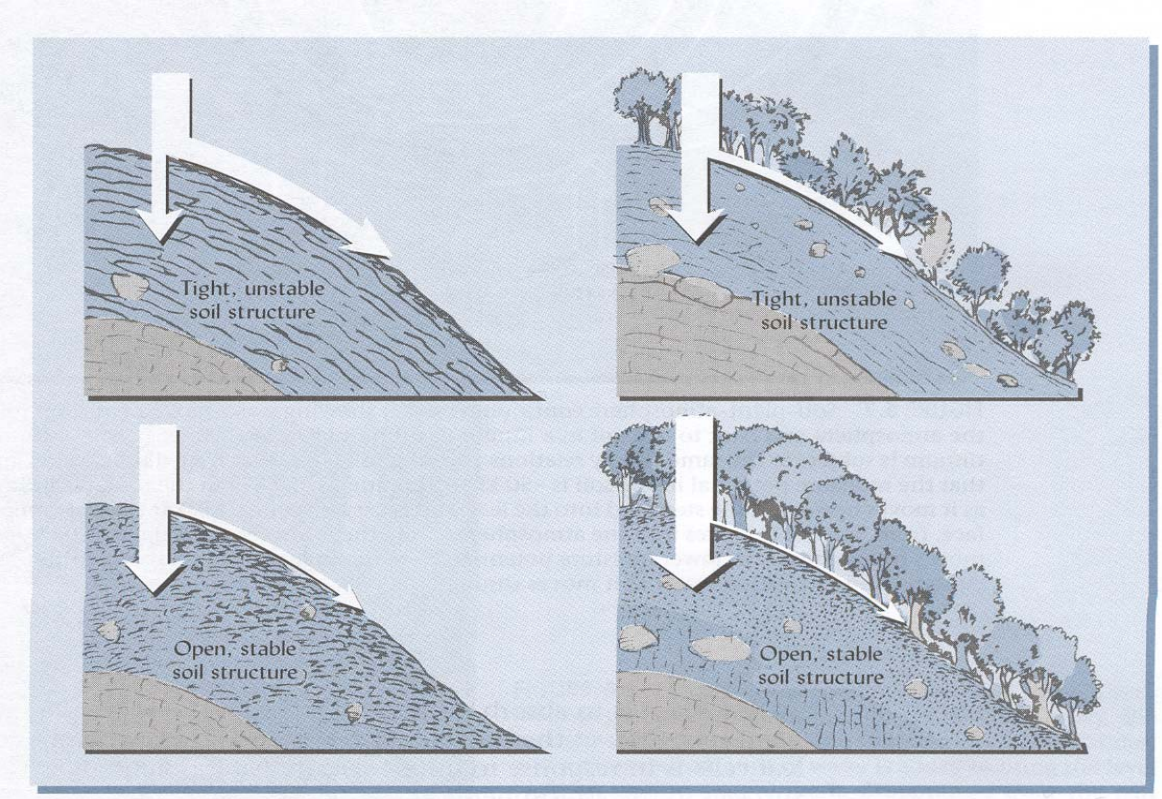


FIGURE 6.6 Influence of soil structure and vegetation on the partitioning of rainfall into infiltration and runoff. The upper two diagrams show soils with tight, unstable structure that resists infiltration and percolation. The bare soil is especially prone to surface sealing and resulting high losses by runoff. Even with forest cover, the low-permeability soils cannot accept all the rain in an intense storm. The two lower diagrams show much greater infiltration into soils that have open, stable structures with significant macropore space. The more open soil structure combined with the protective effects of the forest floor and canopy nearly eliminate surface runoff.

Topography

The topography at the Greenbelt Restoration site differs throughout the entire area; in fact some areas of the site are greatly influenced by topography in terms of vegetation productivity, hydrology, location and construction of structures and paths, slope stability, elevation, aspect, and more. “Starting a restoration project with the proper topography is essential to the development and persistence of the desired ecological community. Slope, elevation and aspect can determine the species composition of both herbaceous and forested communities.” (Harker, et al. 98)

In *The American Heritage Dictionary*, the word aspect is defined as, “A position or side facing a given direction.” The slope at the Greenbelt Restoration site has an east facing aspect indicating cooler and less windy conditions. In fact, here is what it says in the *Landscape Restoration Handbook, “* North-and east-facing slopes generally have less exposure to wind and sunlight, and being more mesic than south-and west-facing slopes support a greater diversity of plant and animal species.” (46) Mesic refers to habitats or landscapes that acquire more moisture and water. The handbook also says, “ Through its influence on water availability, aspect can also directly influence important functions such as primary productivity. Considerations of these factors are important in selecting species for restoration efforts.” (Harker, et al 98)

Again, the topography at the Greenbelt Restoration site and the steep gradient of the slope varies throughout the entire site, therefore goals must be set to assist slope stabilization where the grade is steepest and soil erosion is of most concern. Furthermore, Steven Whisenant, author of *Repairing Damaged Wildlands: A Process-Orientated, landscape-Scale Approach* states, “Soil erosion is the most common and damaging form of degradation since it ultimately degrades the physical, chemical, and biological properties of soil, and is irreversible.” (38)

Prior to learning how to resolve land degradation caused by soil erosion, it is key to first understand the mechanics of erosion. According to Brady and Weil, authors of *Elements of the Nature and Properties of Soils*, “erosion is a process that changes soil into sediment” and there are two types of erosion. There is geological erosion and accelerated erosion. Geological erosion

is “soil erosion that takes place naturally, without the influence of human activities.” And “Accelerated erosion occurs when people disturb the soil or the natural vegetation by grazing livestock, cutting forests, plowing hillsides, or tearing up land for construction of roads and buildings.” (475-476) I want to add the fact that inappropriate dumping of earth material and yard waste over banks and hillsides also accelerates soil erosion and an unfavorable mix of assorted soil types. Without doubt bare soil, rainfall, and inappropriate dumping of yard waste are the leading cause of potential soil erosion at the Northgate Greenbelt Restoration site.

Here is a recent example of accelerated erosion on site caused by inappropriate dumping

Still, erosion is more problematic where the slope has bare soil because of direct exposure and contact with falling raindrops. In fact, Seattle receives approximately 36 inches of rain per year causing many landslides and soil erosion dilemmas throughout the Puget Sound region. Likewise, Brady and Weil articulate that “Accelerated erosion is often 10 to 1000 times as destructive as geological erosion, especially on sloping lands in regions of high rainfall.” (476).

The mechanics of water erosion is a three-step process as discussed in *Elements of the Nature and Properties of Soils* appearing in section 15.3. (480)

1. *Detachment* of soil particles from the soil mass.
2. *Transportation* of the detached particles down hill by floating, rolling, dragging, and splashing.
3. *Deposition* of the transported particles at some place lower in elevation.

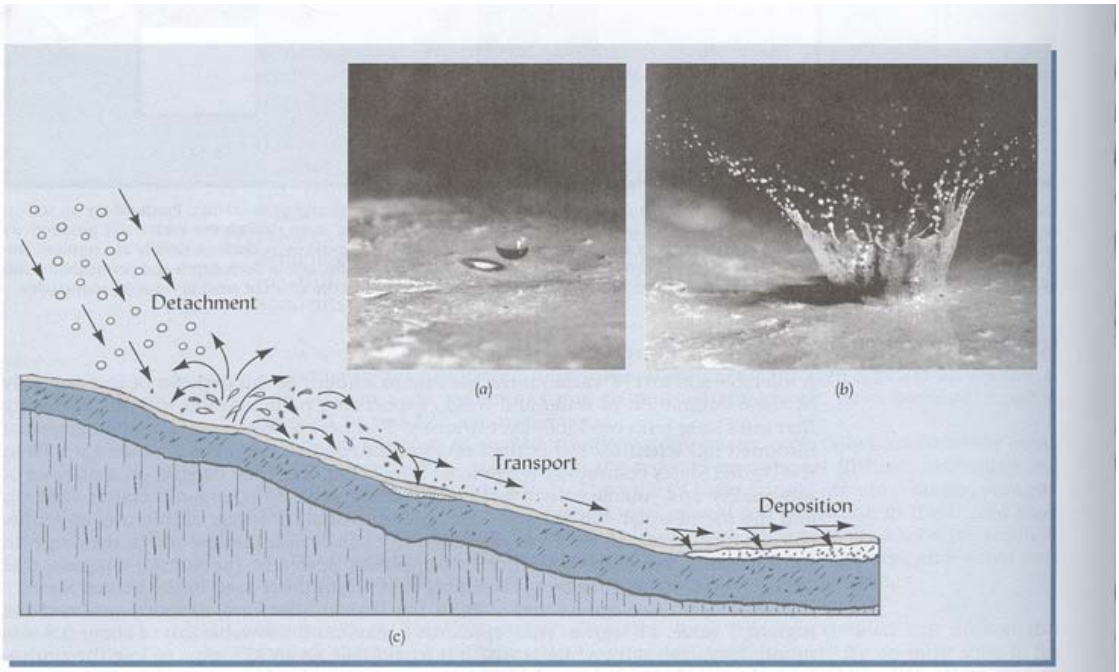


FIGURE 15.6 The three-step process of soil erosion by water begins with the impact of raindrops on wet soil. (*a*) A raindrop speeding toward the ground. (*b*) The splash that results when the drop strikes a wet, bare soil. Such raindrop impact destroys soil aggregates, encouraging sheet and interrill erosion. Also, considerable soil may be moved by the splashing process itself. The raindrop affects the detachment of soil particles, which are then transported and eventually deposited in locations downhill (*c*).

480 *Soil Erosion and Its Control*

Also accredited is that smooth soil surfaces with contact of raindrops cause most of the soil particle detachment from the face of the earth. The velocity and size of raindrops certainly have an affect on the rate at which the soil erodes, especially when both Accelerated and Geological

erosion are of concern. Brady and Weil explain the important elements involved with the process of soil erosion caused by water. These factors also contribute to erosion in general as well:

> The major factors that affect erosion by water are quantified in the **universal soil-loss equation (USLE)**: (482)
>
> A = RKLSCP
>
> A, the predicted soil loss, is the product of
>
> | | |
> |---|---|
> | R = rainfall erosivity | R is a Rain-related factor |
> | K = soil erodibility | |
> | L = slope length | K, L, & S are Soil-related factors |
> | S = slope gradient or steepness | |
> | C = cover and management | |
> | P = erosion-control practices | C, & P are Land-management factors |

Brady and Weil talk about each factor that assists soil erosion caused by water.
Rainfall erosivity (R) takes into account three factors such as total rainfall, intensity, and seasonal distribution of rain of given region. Rain intensity is most important because large raindrops have more energy to detach particles from the soil surface. In addition, rain intensity also creates massive runoff; as a result detached soil particles have greater ability to be transported to lower elevation. "Gentle rains of low intensity may cause little erosion, even if the total annual precipitation is high" (483)

Next, soil erodibility (K) refers to the potential and susceptibility of soil erosion does to soil characteristics and particular soil type. According to Brady and Weil, infiltration capacity and structural stability of the soil are the two most important elements influencing erosion. Also

mentioned is the fact that high soil erodibility includes high contents of silt and fine sand, types of clay minerals, and impervious soil layers, etc. (483)

L and S factors involve topography in terms of length and steepness of slope on soil erosion. "The longer the slope, the grater the opportunity for concentration of the runoff water." On the other hand, the cover and management (C) such as different types of vegetation cover and cropping systems can indeed help control erosion and runoff. "Undisturbed forests and dense grass provide the best soil protection and are equal in their effectiveness." Covering the soil surface with minimal organic matter and vegetation can help significantly to reducing soil erosion. (484)

Lastly, "The P factor is the ratio of soil loss with a given support practice to the corresponding loss if row crops were planted up and down the slope." (487) Some support practices include tillage, strip-cropping, terrace systems, grassed pathways narrow strips of vegetation, and large woody debris. In fact, Brady and Weil state, "Narrow strips of permanent vegetation (usually grasses and shrubs) planted on the contour can act as barriers to slow down runoff, trap sediment, and eventually build up "natural" or "living" terraces." (487)

These factors that control soil erosion differ across the landscape and are site specific; but they may degrade a site at small or large scale. The universal soil-loss equation (USLE), "can however, show how varying any combination of the soil- and land-management – related factors might be expected to influence soil erosion, and therefore can be used as a decision-making and in choosing the most effective strategies to conserve soil." (483) For more information please refer to chapter 15 "Soil Erosion And Its Control" in *Elements of the Nature and Properties of Soils.*

For assistance on how to implement slope stabilization and erosion control, please refer to the management considerations section of this plan where you can read through a variety of unique and valuable techniques.

Utility Lines

It is essential to consider plant location in relationship to overhead and underground utilities. Identification of the services routed through the area will be a critical safety and liability step. Overhead utility lines and underground water and gas lines have been located and at the site. The underground gas and water lines have been marked at the site. If these need remarking please call the state department of buried cable lines at 1-800-424-5555.

The mature height of plants selected must be appropriate for the space allowed under overhead utility lines. Plants exceeding a 20 foot height should not be planted under these lines. If trees are planted that exceeded this height limit they may require height pruning that will result in an unnatural appearance and may compromise the health and life span of the trees. Tall trees will require more service and will create a significant hazard if they come in contact with wires. Selecting plants appropriate for the site can eliminate potential hazards, reduce service expenses and improve landscape appearance (ISA "Avoiding Tree and Utility Conflicts").

Rooting habits should be considered when selecting plants. Tree roots often co-exist with underground utilities. However, if underground repairs are required the roots can sustain significant damage during digging and equipment use (ISA "Avoiding Tree and Utility Conflicts"). When planting, it is important to never assume that underground utilities are deeper than you plan to dig. Soil grade may have changed or guidelines may not have been followed. Always locate underground utilities before digging.

Existing Vegetation

Common Name	Scientific Name	Description
butterfly bush	*Buddleia davidii*	Invasive shrub
Himalayan blackberry	*Rubus discolor*	Invasive vine
English holly	*Illex aquifolium*	Invasive tree/shrub
English ivy	*Hedera helix*	Invasive vine
honeysuckle	*Lonicera sp*	vine
western hemlock	*Tsuga heterophylla*	Tree
big leaf maple	*Acer macrophyllum*	Tree
Prunus	*Prunus sp*	Tree
Indian plum	*Oemleria cerasiformis*	Shrub
Oregon grape	*Mahonia nervosa*	Shrub
sword fern	*Polysitchum munitum*	Fern
western red cedar	*Thuja plicata*	Tree
Yucca	*Yucca sp*	shrub

Management Considerations

Invasive Species

Existing Conditions

Currently, large portions of the site are covered with the introduced species Himalayan blackberry (*Rubus discolor*). This is a woody shrub, which has naturalized and is widespread throughout King County (King County Noxious Weed Control Program). It forms dense thickets and is very difficult to control once established. Total eradication is not possible (Robson). Once removed, it will require constant periodic maintenance to keep it from reestablishing. This species is the invasive of foremost concern on the site due to its amount and difficulty to control.

There are five other invasive species that have been identified on site, but are not as widespread and will be easier to remove and control if action is taken as soon as possible. These are English ivy (*Hedera helix*), English holly (*Ilex aquifolium*), English/cherry laurel (*Prunus laurocerasus*), butterfly bush (*Buddleia davidii*) and Scot's broom (*Cytisus scoparius*). There are also some herbaceous weeds on site, such as common dandelion (*Taraxacum officinale*), few-seeded bittercress or shotweed (*Cardamine oligosperma*), and non-native lawn grasses. These are located mostly along the western portion of the site. However, these are of little concern compared to woody invasive species that require immediate attention. Therefore, they will not be dealt with in this section other than to say that the mulch that will be added to the site may suppress them, and those that survive can be hand-weeded.

The ivy is growing on the north side of the site, climbing a few feet up the trunks of some of the trees that are slated to be removed. It is also growing on the ground in a few scattered areas, primarily along the central east side of the side next to the neighboring properties. English laurel is growing at the northeast edge of the site, just south of N. 107th street. There are several small shrubs near the edge of the driveway and fence line of the neighboring property at 1705 N. 107th

street. The butterfly bush is about 8-10 feet tall, and is growing near the top of the slope in a level area near the end of Densmore Ave N. It is somewhat surrounded by blackberry. There are two Scot's broom plants, both on the north side of the site. Both are blending in well and not very noticeable. One is at the very northeast corner and the other is about 15 feet farther to the south and more in the middle. The English holly is mostly along the east edge of the northern portion of the site, near the fence line of the neighboring property. These invasive species are likely to spread before their removal is coordinated and executed, so ability to correctly identify the plants that need to be removed is important. Following are brief descriptions and images of these species.

Identification

Note that English ivy has 2 forms, with variable leaves. Both are pictured below.

Species **Identifying Characteristics**	Image
Himalayan Blackberry *Shrub that forms dense thickets. Thick squarish stems with large, vicious broad-based thorns. Broadly oval-shaped leaves, also with thorns. Long arching canes up to 25 feet long* (Robson).	
English Ivy - Juvenile form *Vine that grows mostly on the ground, forming dense mats. 3-lobed glossy dark green leaves with lighter colored veins.*	

English Ivy - Adult form *Vine that climbs. Has dark blue or black berries when in fruit. Leaves usually lighter green, more ovate and not distinctly lobed like juvenile life stage.*	
English Laurel *Woody shrub or tree with large, glossy leaves, broader at the end than at the base. Black berries when in fruit. Single or multi-stemmed.*	
English Holly *"Classic holly." Woody shrub or tree, usually single-stemmed. Dark green glossy leaves have indented edges between sharp points and a distinct central vein. Red berries when in fruit.*	
Butterfly Bush Multi-stemmed lanky shrub with arching growth form. Long, narrow fuzzy leaves. Purple, white, or pink lilac-like flowers on the ends of stems.	 Image from: http://www.littleyorkplantation.com/attractbutterflies.htm
Scot's Broom *Leaves are flattened and look like stems. Whole plant is green with flexible branches. Yellow flowers and leguminous fruits (pea pods).*	 scot's broom Image from: http://dnr.metrokc.gov/wlr/lands/weeds/weedid.htm

* Photographs taken by Marlo Mytty, co-author, unless otherwise specified.

Problems with Invasive Plants

All of the species in the above table are listed on the 2003 King County Noxious Weed List. Noxious weeds are defined as "non-native plants that have been introduced […] [by humans and] because of their aggressive growth and lack of natural enemies […] can be highly destructive, competitive, and difficult to control" (King County Noxious Weed Control Program). However, none of the weeds on site are currently regulated by law within the county, because they are not Class A, B or C Noxious Weeds on the King County list. (King County Noxious Weed Control Program). The invasive species on site are listed legally as follows.

English ivy and Scot's broom are considered "Noxious Weeds of Concern" by the county (King County Noxious Weed Control Program). "Because these plants are common in King County, control is not currently required". Nonetheless, their control and containment is encouraged and recommended (King County Noxious Weed Control Program). At the state level, English ivy is a Class C Noxious Weed, which means that it is "already widely established in Washington, […] [but counties are allowed] to enforce control if locally desired" (Washington State Noxious Weed Control Board, Class C Weeds). Scot's broom is listed as a Class B Noxious Weed at the state level. Class B Weeds "are established in some regions of Washington, but are of limited distribution or not present in other regions of the state. Because of differences in distribution, treatment of Class B weeds varies between regions of the state." […] " In regions where a Class B species is already abundant or widespread, control is a local option" (Washington State Noxious Weed Control Board, Class B Weeds). Scot's broom is not currently designated for control in King County, but its immediate control is recommended due to its invasive properties.

Although not yet well established within the boundaries of this property, ivy is of special concern because it is a major threat to the urban forest. Ivy forms a monoculture, covering the ground and blocking out and smothering native plants. It provides little or no habitat value for native wildlife and affects trees negatively, especially when it climbs up into the canopy. It adds weight to a tree's limbs, reduces the airflow around the trunk, and "makes a tree more susceptible to canopy failure, wind stress, and disease" (Washington Native Plant Society). Ivy can also block light to a tree's leaves, reducing its ability to photosynthesize. There are significant areas of ivy

established on an adjacent property that faces Northgate Way, growing just east of the site boundary. One of the trees on this property is being smothered by ivy. We suggest that cooperation of the property owner be obtained and permission sought to also remove ivy on this property (especially from the tree) before it spreads to the greenbelt. Once it has been removed, education of the property owner that periodic maintenance will be necessary to keep it at bay is suggested. Since ivy is relatively slow growing, yearly removal should be a sufficient maintenance interval to keep it under control (Washington Native Plant Society).

Four of the other invasive species on site – Himalayan blackberry, butterfly bush, English holly, and English laurel are listed as "Obnoxious Weeds" by the county. These are weeds that "have escaped from intentional plantings and now are widespread in King County. [Because they] […] often impact and degrade native plant and animal habitat", they are recognized as invasive, but there is no regulation of them at this time. (King County Noxious Weed Control Program).

Because all of these species are enough of a concern to be included on the King County Noxious Weed List and classifications are subject to change, we are encouraging their removal and continued, attempted eradication. These weeds are growing throughout greenbelts and parks in Seattle and reducing diversity. They compete with native plants, crowding or choking them out, and sometimes physically harm them - especially English ivy and Himalayan blackberry.

Removal Methods

Himalayan blackberry

Timing

Because blackberry is covering a large portion of the site and is providing food, cover and nesting sites for birds and possibly small mammals, its removal will constitute a major disturbance to wildlife. To minimize the impact of this disturbance, it should be removed after nesting season is over, ideally no earlier than late August. September or October would be ideal. Once the blackberry has been removed and other site preparation measures have been completed,

suggested native plants (especially salmonberry) should be installed the immediately following fall to accelerate reestablishment of structure, nesting, and cover sites for wildlife.

Method

Because of the large amount of blackberry on site, we recommend using powered equipment for removal. A bulldozer or commercial mower isn't feasible because of the hilly and uneven topography of the site. Rental of handheld brushcutters (see image below) from a large equipment rental store, such as Aurora Rents on 175th and Aurora, and participation of a large volunteer group to accomplish this task is recommended. Local home improvement stores and smaller tool rental stores that we contacted only have one brushcutter on hand; but with the amount of blackberry on site, we recommend renting at least three or four of them to be able to complete the job in a single day or weekend. Rental fees have been included the budget.

Gas-powered brush cutter

Image from: http://www.aurorarents.com/

To make the process easier, we emphasize that either a volunteer group from an organization be coordinated, or that neighborhood invasive removal event signs be posted to garner support. Because of budget constraints, garden tools should be borrowed from neighbors and/or provided by volunteers if possible. Volunteers should be cautioned to wear appropriate clothing for blackberry removal - thick pants, long sleeves, hats, glasses, and heavy gloves. Refreshments should be provided and volunteers thanked.

Quick List of Steps for fast reference:

- Arrange volunteer group
- Gather or arrange for the following tools and supplies for event:
  - several pairs of lopping shears and/or pruning shears (see images below in ivy section)
  - shovels
  - heavy-duty plastic garbage bags or truck bed to pile and transport cut plant material to the "Clean Green" at the city transfer station
  - tarps for piling cut plant material on for easy transport and minimum of seed spread
  - thick gardening gloves
- Rent brushcutters (and other needed tools not able to borrow) the morning of event:
  – 3-4 brushcutters, assuming have 8 or more people to help
  - get instructions, gas, a few extra blades, and safety glasses that go with brushcutters
- Cut down blackberry with brushcutters and dig out the roots
- Remove all plant material (especially canes, berries and roots) from the site and bring to the "Clean Green" at a city transfer station for composting

Of the current "best methods" available for removal and control of blackberry, for this site we recommend cutting the stems or canes close to the ground with the brushcutters, and then digging out the roots using shovels (Robson). For efficiency, it may work best to have 3 or 4 volunteers cutting the blackberry down with brushcutters, while another 3 or 4 volunteers transport the canes onto tarps and cut them into pieces small enough to get them into garbage bags or onto a truck bed. Once the blackberry has all been cut down, the roots can be dug up with shovels. This way if the entire removal can't be accomplished in one day, perhaps at least the canes can all be cut down so that the brushcutters can be returned the same day to avoid

additional rental fees. The roots can always be dug up at a later time. All plant material, berries, and roots should be removed from the site to avoid the spread of seeds. The material should not be left to compost on site or in anyone's yard. By taking invasive vegetation to the city "Clean Green", it will be recycled by professional composters who can raise the temperature high enough to kill most weed seeds.

One other effective variation of this removal method is to cut the blackberry stems down so that they are about a foot tall. Then the cut stems can be painted with the herbicide glyphosate, which is sold under the name Round-up (Robson). Either method will work, but we suggest the first method for three reasons. Volunteers may be hesitant to apply herbicides, and removing the blackberry roots and all of the canes will immediately improve the aesthetics as well as make it easier for fall planting. Some blackberry is sure to continue to grow back no matter what the removal method, so continued maintenance and removal of regrowth is crucial keep it under control until the native plants can establish, fill in, and reduce the space available for blackberry to invade.

English ivy

Since there is not very much ivy established yet on site, this weed should take only a few people and a short amount of time to remove. However, if support of the adjacent property owner is secured and removal of ivy is allowed on the adjacent site, removal will be a little more involved.

* The following information on ivy and its removal has been obtained from Washington Native Plant Society's IvyO.u.t. web page (http://ivyout.org/index.html).

Timing

If removing ivy in spring, caution is recommended to avoid disturbing nesting birds.

Safety Issues

Ivy should not be pulled down out of a tree above or it could bring dead branches or a hornet's nest with it. Skin in contact with ivy should be covered because it causes rashes in some people.

Method

Recommended Tools:

- Gloves
- Shovels

Lopping Shears

Pruning Shears

Pruning Saw

Images from: http://www.gardenerstoolshed.com/

Ivy should be removed from trees first. We recommend removing the ivy from the infested tree(s) on site even though they are to be cut down, because woodchips from these trees will be used to mulch the site. If the ivy is left on the trees when they are cut and chipped, ivy leaves and stems will be mixed in with the wood chips, and ivy plants could regrow from these fragments.

To remove ivy growing on trees:

- Use loppers, pruning shears, or a pruning saw to cut through each vine at shoulder height and at ankle height. Care should be taken not to wound the bark of trees that are to be preserved.
- Strip or pry the ivy away from the tree between the two cuts, again taking care not to damage the tree's bark.
- Pull up the ivy around the base of the tree and keep pulling it out until it is at least six feet away from the trunk on all sides.
- Get out as many of the roots as possible.

The ivy left will be above shoulder height in the trees. Because it has been cut off from its roots, it will eventually die. After it is dead and dried up it can be removed more easily by somebody using a ladder very carefully – perhaps the property owner or a professional.

To remove ivy on the ground:

- Pull and dig up as many of the roots as possible.
- If ivy is tangled up with native plants, cut the ivy from around the native plants first and then remove it so that the native plants aren't damaged.

Yearly maintenance will be needed to keep the ivy under control, but because it is relatively slow growing in comparison to other invasive weeds such as Himalayan blackberry, much less effort is required. The second year will require only about 10 percent of the effort of the initial removal, and the subsequent years will require only about 10 percent of the effort of the second year (Washington Native Plant Society).

English laurel, English holly, butterfly bush, and Scot's broom

Since these plants are very limited on site, one or two people should be sufficient for removal. However, their presence necessitates immediate action because of their invasive nature and ability to quickly spread.

Timing

These plants can be removed at any time, but it is recommended that they be removed as quickly as possible before they flower again. If berries, flowers, or other fruits are present at the time of removal, care should be taken to keep them from dropping on the ground and spreading seeds. However, there may be problems accessing some of these plants until the blackberry has been removed.

Method

Recommended tools:

- Pruning saw (see image in ivy section) or heavier saw if needed
- Loppers (see image in ivy section)
- Shovels
- Heavy-duty garbage bags

All of these plants should be completely removed and the roots dug out. To remove holly and laurel, branches can be cut or sawed off and then the stump and roots removed with a shovel. If it is easy to remove the entire plant without cutting off the branches first and without spreading fruits, they can just be dug up and removed. Both of these plants will sprout back from the base, so it is important to remove the stumps.

For the butterfly bush, it is essential to control seeds as much as possible during removal. If the flowers have already seeded at the time of removal, try to cover them with a bag and then cut the flowers off and let them drop inside the bag to avoid spreading seeds all over the ground. Once the flowers have been contained, just cut the shrub to the ground with loppers and dig out, or simply dig out if easier. This should be a fairly easy shrub to remove.

Scot's broom should also be dug completely out by the roots (Robson). This is a difficult shrub to remove, but it is important to get all of the roots because this plant can also resprout and is an invasive of great concern due to its ability to quickly spread and persist. Extreme care should be taken to remove and contain any of the seeds, which are found in leguminous "pea pods".

Put all of the vegetation in garbage bags and remove it from the site. It is again suggested that these plants be taken to the city “Clean Green” for composting. If the holly and laurel stumps are too big, they may have to be dumped separately for a fee.

Plant Selection

The Selection Process

In order to increase the success rate of plantings in the urban environment a plant selection process should take place. This selection process must find a way to put “the right plant in the right place.” Every plant has a genetic code that enables it to grow to certain height and exhibit specific growth characteristics. Proper plant selection and placement will ensure plant health and reduce factors that cause stress. Plants under stress are more susceptible to environmental problems, disease and insect damage, and may require additional applications of fertilizer, water, and pesticides. Before selecting a plant, important questions must be asked: What is the purpose of the plant? What are the planting site characteristics? And what are the characteristics of the plant? Answering these questions will help assure that the selected plant has the best chance for healthy growth and survival. Planning ahead will also maximize the benefits of the plant and minimize the associated costs (Gould).

All plant species have certain environmental requirements. Because of these requirements careful site evaluations need to take place. The first step in the selection process starts with evaluation of the site where the plant is to be planted. Knowing the characteristics of the planting site can help determine what species are suitable for the specific site conditions. Amount of growth space, soil characteristics, wind and light patterns, and site structures are some of the site factors that should be considered (Gould).

Soil conditions are among the most critical site considerations for plant growth and survival. Soil conditions must be assessed to identify fertility, aeration, and drainage. Within short

distances the soil conditions can vary dramatically throughout the urban environment. Soil texture influences soil fertility and the way water and air move through soil. A laboratory can test soil nutrients, fertility and pH levels (Gould). The amount and quality of soil present at the planting site can limit the number of tree species that will be successful. Improvements can be made to poor soil to expand the plant pallet.

Other environmental conditions should also be considered during the selection process. Environmental factors that influence plant success include light, wind, and precipitation patterns as well as temperature extremes (Gould). A plant's hardiness can determine its ability to survive in extreme temperatures. Certain species can be cold hardy, and some can be heat tolerant. Some species require full sunlight for proper growth and flower bloom, and others do well in partial shade. High winds can cause drought like conditions and may also uproot newly planted trees.

Assessing the impact of current structures and anticipating future construction can also provide information essential for plant selection. Certain sites may have space constraints limited by roadways, buildings, overhead and underground utilities among many others. Structures can impact drainage, water run-off and reflected light (Urban Forestry South). There needs to be adequate room for the selected species when it reaches maturity. A site evaluation should look at all factors that influence plant health and also should look at conflicts that may require removal in the future. Planning ahead to avoid structure and utility conflicts can lessen the chance of costly mistakes.

All plants require maintenance but if the correct species are chosen maintenance will be significantly less. Every plant species has its own pest problems. Severity and susceptibility can vary with geography. Evaluation of the problems associated with insects, pests and disease will reveal which species may require less plant health care in the future. Budget limitations typically force selection of species with lower associated maintenance costs. Pruning needs, fertilizer, watering, pest management and root control should merit consideration. Selection of species that are good performers, suited to the site and less susceptible to infestation can greatly improve plant survival, aesthetics and will in turn reduce maintenance or replacement.

The next step in the selection process considers the design requirements. The design requirements relate to physical attributes of the tree that enrich the landscape, and also give insight to the function of the tree (Simonds) (ISA "Tree Selection"). Plants perform various functions in the landscape. A plant's function may be to provide shade, provide visual interest such as fall color, decrease soil erosion, create wildlife habitat or reduce wind speeds (Urban Forestry South). Knowing the intended function of the plant will help determine which species are suitable.

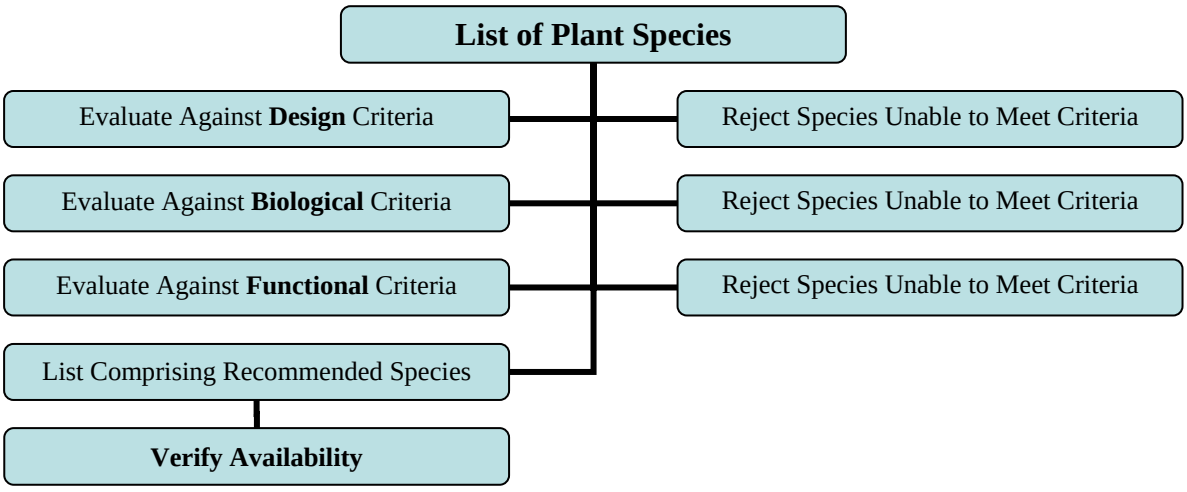
Now that the basis for the selection process has been established, specific species can now be assessed for their compatibility with the site. The process involves taking a long list of species and weeding out what species meet the site criteria. The species selection process requires consideration of three key selection criteria. The criteria concern plant compatibility with design criteria, biological criteria, and functional criteria (Gould). To increase the likelihood of success the selected species must meet all the requirements.

To identify if a species meets the design criteria, physical attributes need to be assessed. Compatible species must serve their intended function (ISA "Tree Selection"). Species that will not serve the intended function can be removed from the list. Also, consideration must be given to plant characteristics such as deciduous or evergreen, tree form and habit, the ultimate canopy size, and tree foliage, fruits and color. Species that meet the design requirements can move down to the next assessment.

A plant's biological tolerances determine its potential to succeed at the site. Plants that made it through the design criteria can now be assessed if they are compatible with the biological criteria. A species must be able to succeed in the environmental conditions present at the site. The site precipitation and wind patterns, soil conditions, and temperature extremes must be assessed to meet the tolerances of the plant species. Consideration needs to be given to a species susceptibility to disease and pests common to the area. Species that do not meet these requirements can be removed from the list. The remaining species that have been suitable to design and biological criteria can now be assessed against the functional criteria.

The functional criteria involve the selection of species that have characteristics that will enhance the trees potential of survival. The selected species must be readily available and have the capacity to reestablish after being transplanted. Species must have acceptable fruit and leaf fall and must also be compatible with the maintenance budget.

The three main criteria discussed here are not exhaustive. Other issues that are valuable to the site should be evaluated against and weighed in balance. Utilizing this selection process will ensure proper plant selection and placement. JD Hitchmough first illustrated the selection process, later it was modified by Arborist Bryan Gould. Their tree selection process can be illustrated as follows.



Plant Palette

All plants were selected using the selection process. Each plant has been evaluated based on appropriateness for design, environmental and functional criteria. Plant sources, quantity, and environmental preferences have been provided in the chart below.

Plant Name	pH	Sun Preference	Drought Tolerance	Quantity	Image
Trees					
Vine maple *Acer circinatum*	5.5-7.5	Full shade	Low	2	
Leyland cypress *Cupressocyparis leylandii*	6-7.5	Full sun	Medium	10	 *Image from: http://www.uah.edu/admin/fac/grounds/castwel.htm

Shrubs					
Mock orange *Philadelphis lewisii*	6-7.5	Full sun to partial shade	Unknown	12	 *Information and Image from: http://www.msu.edu/user/asquith/by/menu.htm
Oceanspray *Holodiscus discolor*	6-7.5	Full sun to partial shade	Low	12	

Red flowering currant *Ribes sanguineum*	6-7.5	Partial shade	Medium	12	 *Image from: http://home.pacifier.com/~neawanna/humm/rfcu.html
Evergreen huckleberry *Vaccinium ovatum*	5.5-7.5	Partial shade to full shade	Medium	12	

Redosier dogwood *Cornus sericea*	4.8-7.8	Partial shade	Medium	38	
Snowberry *Symphoricarpos albus*	6-7.8	Partial shade	High	12	
Mohave scarlet firethorn *Pyracantha 'mohave'*	5.8-8	Full sun	Low	12	 *Image from: http://www.hcs.ohio-state.edu/hort/plantlisting/p/pyracantha128.html

Salmonberry *Rubus spectabilis*	5.7-7.2	Partial shade	High	60	
Rock rose *Cistus L.*	6.0-7.5	Full sun	High	15	
Rhododendron 'Blue Peter'	Acidic	Full sun to partial shade	Unknown	5	 *Image and information from: http://www.crocus.co.uk/Catalog/GardenPlants/?ContentType=Plant_Card&ClassID=2180

Rhododendron 'Hotei'	Unknown	Full sun to full shade	Unknown	6	 *Image and information from: http://www.rhodo.com/Details.cfm?NewID=222
Silk tassel bush *Garrya elliptica*	Unknown	Partial shade	Unknown	12	 *Information and Image from: http://www.laspilitas.com/plants/324.htm

'Julia Phelps' *Ceanothus* 'Julia Phelps'	4-8	Full sun	High	12	 *Information and Image from: http://www.laspilitas.com/plants/165.htm
Groundcovers					
Beach strawberry *Fragaria chiloensis*	5.8-7.8	Partial shade	Medium	15	

Yarrow *Achillea millefolium*	6-8	Full sun to partial shade	Medium	20	

Deer fern *Blechnum spicant*	5.5-7	Partial to full shade	Low	40	
Dull Oregon grape *Mahonia nervosa*	5.5-7.5	Partial to full shade	High	60	
Sword fern *Polystichum munitum*	5.8-7.5	Partial to full shade	Low	80	

All plant information and images are from the United States Department of Agriculture plant database unless otherwise noted. Website: http://plants.usda.gov

Planting Design

Our site design is primarily derived from the client's vision of a low maintenance, evergreen garden with native plants that would facilitate wildlife habitat and improve site aesthetics. Due to various limitations, such as the existence of powerlines and steep topography, most existing trees are to be removed and reused as either functional logs or wood chip mulch. The general master plan includes a circular path system for residents to recreate, relax, mingle, and to walk their dogs. Logs from existing trees will be used to frame the path, to reinforce the slope, and for benches. In the center of the path roundabout, a wildlife snag will be created using an existing hemlock on site. Several vine maples will be planted around the path's terminus to enhance foliage and textural variety. Low growing shrubs, whose height at maturity would not exceed 20 feet, will be planted along the area immediately beneath the encasement to avoid future pruning or other overgrowth maintenance issues. To screen views of rooftops and Northgate Way, a linear row of Leland cypress (*Cupressocyparis leyandii*) trees will also be planted along the eastern boundary of the site. The rest of the site is divided into three different zones. Each zone emphasizes a specific theme represented by different plant palettes and arrangements. These themes are:

1. Aesthetics-oriented
2. Habitat-friendly
3. Drought tolerant herbaceous border

Among all the themes, improving **site aesthetics** is the most effective way for the residents to reclaim this no-man's-land from illegal dumping activities. On both the northern corner (at the

intersection of NE 107th St. and Densmore Ave.) and the area along the Northgate Way, colorful shrubs have been selected to create a sense of place and ownership. At the northern corner, white snowberry (*Symphoricarpos albus*), mock orange (*Philadelphus lewisii*), red flowering currant (*Ribes sanguinem*), sword fern (*Polystichum munitum*), and purple *Ceanothus* 'Julia Phelps' have been selected to create a visually intriguing zone to catch the attention of driver's-by. Along the Northgate Way, contrasting purple *Rhododendron* 'Blue Peter' and yellow *Rhododendron* 'Hotei' have been chosen to brighten up the unnoticeable roadside greenbelt as well.

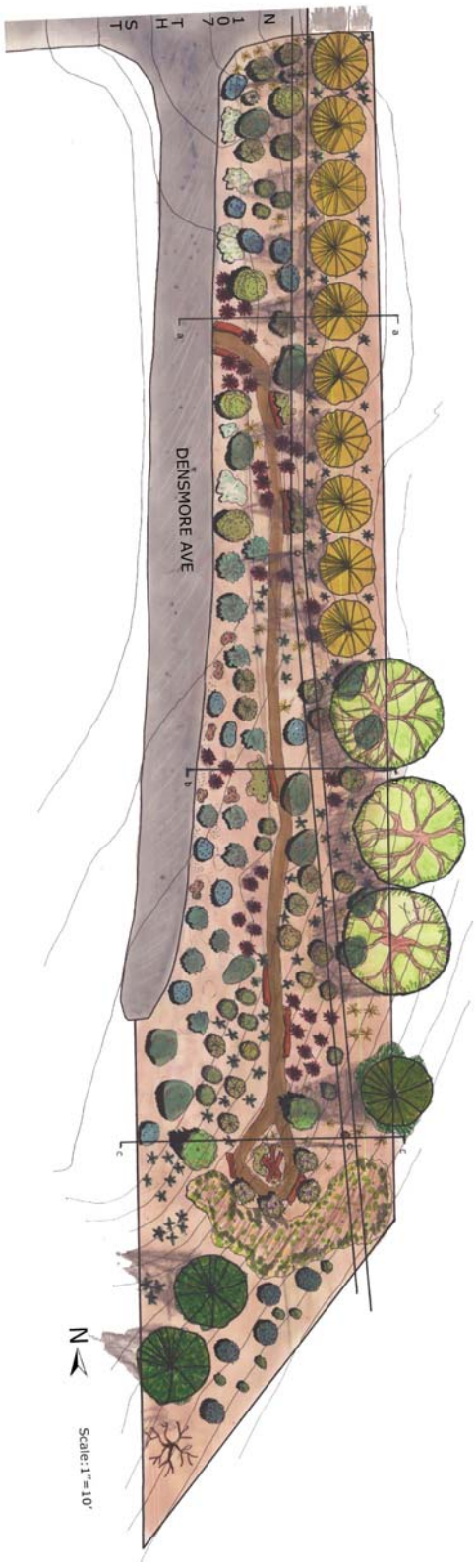
Further back from the southern edge, a grove of salmonberry (*Rubus spectabilis*) and snowberry (*Symphoricarpos albus*) will create a **habitat-friendly corner** for local wildlife. Deer fern *(Blechnum spicant)* and sword fern (*Polystichum munitum*) will be heavily planted here for optimal growth utilizing the shade created by two mature cedar trees nearby. In addition, several ocean spray (*Holodiscus discolor*) and Oregon grape (*Mahonia nervosa*) will be scattered throughout the site to provide food for wildlife. Wildlife snags have also been incorporated in the plan to provide nesting opportunities for sound birds.

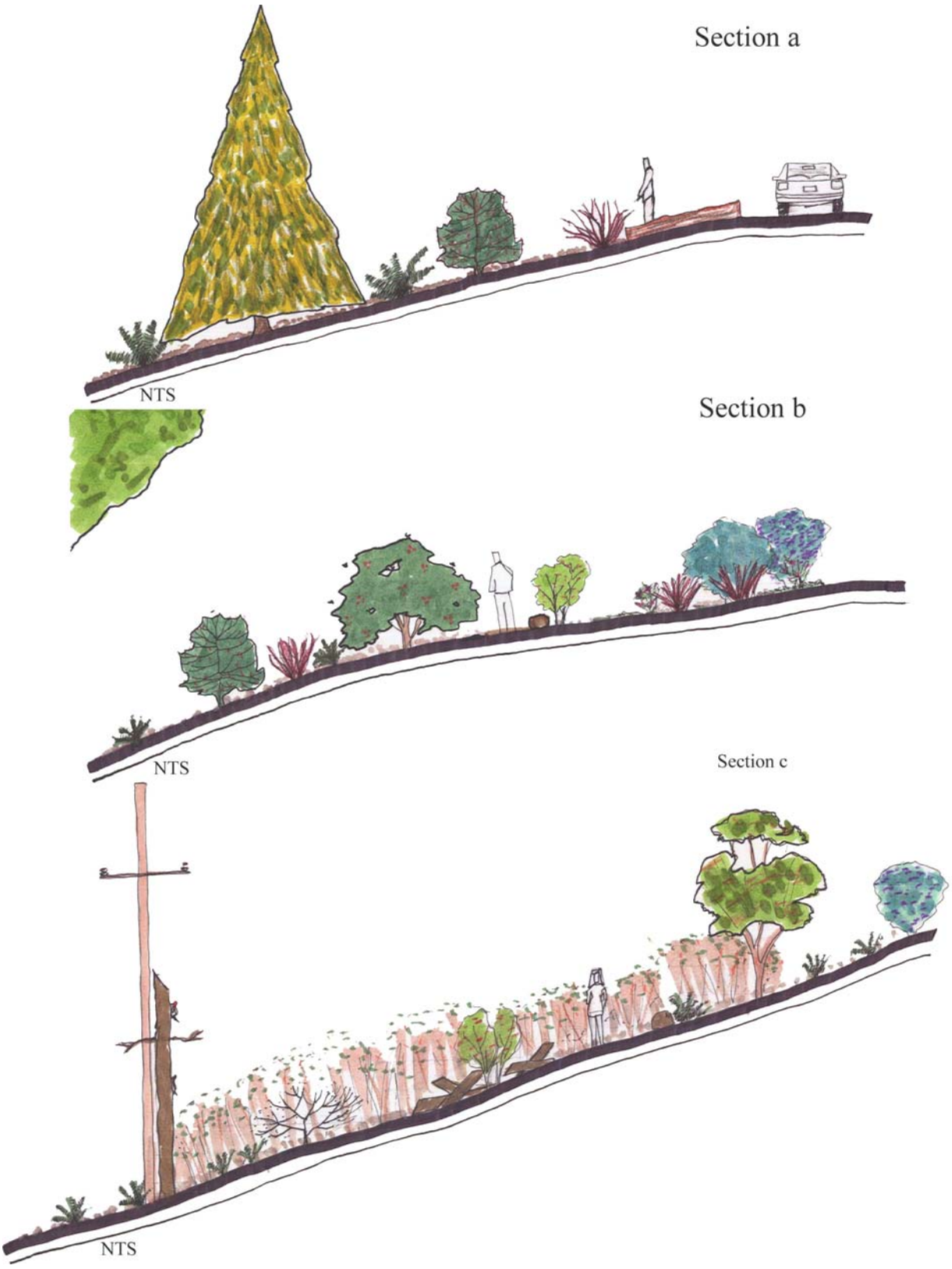
At the most exposed area adjacent to Densmore Ave., a **drought-tolerant herbaceous border** is proposed to create more visual variety for residents. These plants include pink rockrose (*Cistus creticus*), red twig dogwood (*Cornus sericea*), and evergreen silk tassel bush (*Garrya elliptica*) along with beach strawberry (*Fragaria chiloensis*) as groundcover to reduce soil erosion.

In creating this plant palette, we also paid attention to the seasonal interest that each of the individual plants would bring to the greenbelt. Oregon grape, salmonberry, and snowberry all

flower in spring but bear different colored berries at different times of the year. Spring green vine maple (*Acer circinatum*) turns into clouds of crimson in fall that is simply joyful. Red twig dogwood is prized for its vibrant red branches when all the leaves have fallen off in winter. The rest of the plants were chosen primarily for their interesting forms or blossoms, or in regard to the site's limitations or specific needs.

Schematic Design




Section a
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Wildlife

Importance of Habitat

One of Neighbors of Greenbelt's objectives for this project is to "attract birds and small wildlife". To do this, it is important to provide as many of the elements needed by wildlife as possible in the restoration of this site. Greenbelts are important patches of habitat for native wildlife in urban areas, where greenspace is ever shrinking. "The population of Washington State is expected to double over the next 50 years. As a result, urban and suburban development will increase dramatically, especially in the Puget Sound region. Conservation of birds and other wildlife will become increasingly difficult as natural habitats are lost […] One way we can begin this process is to increase the suitability of both our yards and parks as habitat for native birds (Marzluff)." This statement well illustrates the importance of restorations such as one this for wildlife. For these reasons, we have attempted to provide for some of the basic needs of wildlife in our plan, while still meeting the objectives of improving neighborhood aesthetics.

Existing Habitat

Several large mature trees and a little bit of native understory of Oregon grape and salal along the south half of the site are providing habitat for native fauna. There are three western redcedars (*Thuja plicata*), a small Pacific madrone (*Arbutus menziesii*) hanging over the sidewalk on Northgate Way, and several bigleaf maples (*Acer macrophyllum*). Some of these trees are straddling the property lines or may be on adjacent property, but all are physically connected with the site and currently providing a small but contiguous habitat for wildlife. Unfortunately most of the other trees on site have been haphazardly topped (rather than selectively pruned) due to their location under power lines and are unsightly as well as potential future hazards. We are recommending that all of the previously topped trees be removed, or turned into snags where appropriate to enhance wildlife habitat. We have selected five trees in good locations to be either turned into snags or left standing in their current condition to become wildlife snags where not hazardous. These are detailed in the tree removal section. Although mature healthy trees on the property are few and are limited to the southern end due to the presence of overhead wires, they

are providing a good foundation for wildlife habitat. A bird nest is visible in a bigleaf maple (see photo below), and the following birds were seen or heard in the greenbelt: black-capped chickadee, Northern flicker, and hummingbird.

Bigleaf maples and bird nest

Most of the cover and understory structure on site is currently being provided by Himalayan blackberry (*Rubus discolor*). It is likely also relied upon as a food source by local animals due to its proliferation of late summer berries. Since this is an invasive species that forms a dense monoculture, crowding out other native shrubs and tree regeneration, it is undesired. A plan has been provided for its removal in the "Invasive Species" section of this booklet. However, because it is providing the majority of existing habitat on site, its removal may have short-term detrimental effects on any wildlife depending on it. To minimize the impact on wildlife, it has been recommended that the blackberry be removed in late summer, after birds and small mammals have finished nesting to give them a chance for survival. Planting with native plants that provide food, cover, and some structure should be done the immediately following fall so that these elements will be regained as quickly as possible.

Plans to Enhance Existing Habitat

Our major strategies to enhance existing habitat are to reestablish a diverse collection of native plants with food, cover, and nesting value for various wildlife, and to add physical habitat structures – both natural and manmade - to the site. If the invasive species are kept at bay and the natives allowed to establish, the result will be a more varied structure than currently provided by

the dense monoculture of blackberry covering most of the site. One of the plants we selected, salmonberry (*Rubus spectabilis*), provides an important home for the nesting of some native birds. Out of several nesting substrates in a study, most bird nests were found in this shrub. Far fewer nests were found in Himalayan blackberry (*Rubus discolor*) (see Figure 3 below) (Marzluff). Salmonberry is also rhizomatous and can form dense thickets, so our hope is that it will serve as a strong competitor against the blackberry if it is able to gain an initial foothold. We plan to plant it in some of the more heavily infested areas and on the slope.

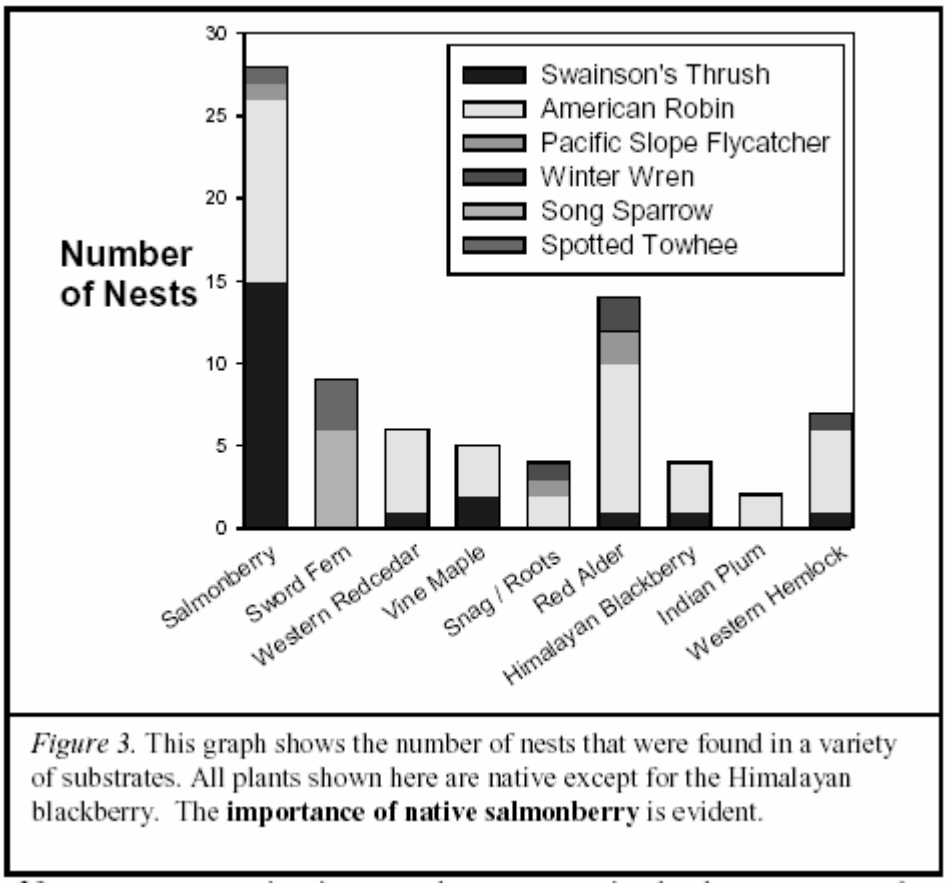


Figure 3. This graph shows the number of nests that were found in a variety of substrates. All plants shown here are native except for the Himalayan blackberry. The **importance of native salmonberry** is evident.

Figure taken from Marzluff : "Making Your Land More Appealing to Wild Birds: Maintain Native Plants!"

Although we had to balance aesthetic considerations with wildlife value in planning, more than half of the plants we selected are food sources for various wildlife. Oceanspray, red flowering currant, salmonberry, and snowberry attract hummingbirds. Oceanspray and beach strawberry are larval food plants for butterflies and moths. Yarrow, Oregon grape, mock orange, and salmonberry supply food to adult butterflies and moths. Oceanspray, Oregon grape, red

flowering currant, salmonberry, snowberry, evergreen huckleberry, and beach strawberry all provide fruit. Oceanspray, Oregon grape, mock orange, red flowering currant, salmonberry, snowberry, evergreen huckleberry, vine maple, yarrow, and beach strawberry are nectar or pollen sources. Oceanspray and vine maple provide leaves or seeds. (Seattle Audubon Society Conservation Committee)

In addition increasing the availability of food and structure by establishing native plants on site, adding physical habitat structures will further increase the wildlife value of the site by providing supplemental cover for hiding or nesting. Following are various ways suggested to accomplish this. Making and arranging these structures can be fun allow people to express their creativity. Also, all of the materials needed can be found on the site or gathered from neighbors yard waste, so zero cost is involved.

Logs

When the topped trees are removed, arrange with the arborist for wood about 4 inches in diameter and larger to be saved and cut into logs to be placed on site. Woody debris is important for wildlife cover, feeding, and perching; as well as for retaining soil moisture during dry periods and adding slowly releasing nutrients into the soil. Logs can be set up in attractive arrangements along trails, edges, or around plants. Different sizes and ages (stages of decay) support different species, so it is important to leave the existing decaying wood on site as well. Due to the hilly topography of the site, logs that are thought to be unattractive can be placed in areas that are not visible. Placing these logs in more remote areas of the site will also decrease disturbance to the wildlife using them.

Brush piles or Root wads

Brush piles and root wads are great places for shelter and nesting. There are good instructions for creating brush piles on the National Wildlife Federation website: http://www.nwf.org/backyardwildlifehabitat/logpile.cfm/. Monroe suggests making “a sturdy structure out of logs and branches that provides shelter while still allowing enough spaces for animals to move around. Your goal is to provide a topography of nooks and crannies, a fortress of crevices and interlocking branches to provide hiding places for dozens of animal species.”

There are many sizes and shapes of brush piles that can be made. Usually you start with a base of larger logs or a large stump and cover it with progressively smaller logs or branches, leaving some amount of space in the center. A good area for a brush pile would be in a less visible and less disturbed area of the site. One word of caution is to not use any invasive species to create brush piles. Even if the plants are dead, some species may resprout, or seeds may fall from flowers or fruits remaining and spread on the site.

Snag creation

The arborist who is hired to remove the trees should also leave some snags as detailed in the "Tree Removal" section in this booklet. Snags are standing dead trees used for feeding by woodpeckers and other birds, as well as for food storage and nesting by both birds and mammals. They have become rare in urban environments, because dead trees are usually removed for safety or aesthetic reasons. Providing snags wherever possible is important, because some native wildlife species depend on snags for survival or reproduction.

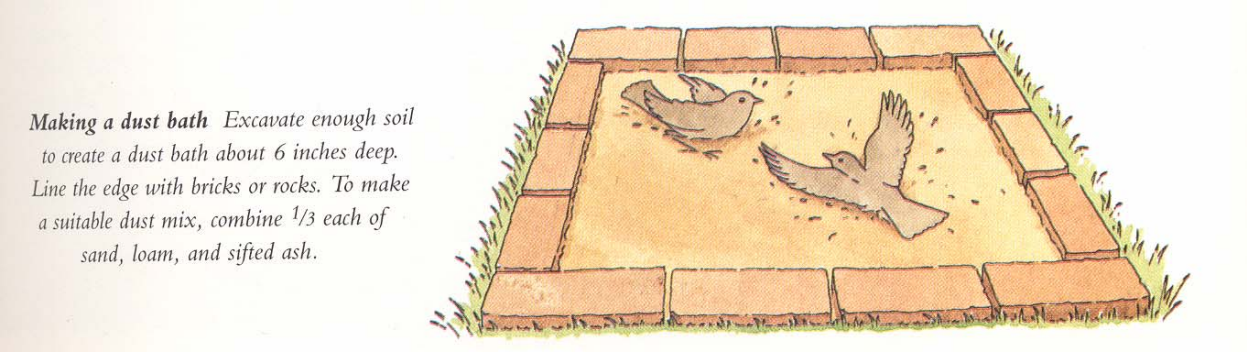
Rock piles

Piles of rocks provide shelter for invertebrates (insects) and amphibians; and if in the sun, basking sites for butterflies. There is a pile of small-medium sized rocks that appear to have been dumped at the edge of Densmore Ave N (left photo below). Another pile of cement chunks was also recently dumped down the hill at the end of the Densmore Ave N (right photo below). These rocks can be arranged into piles to create cover and wintering sites for insects.

For variety, a few piles should be created and placed in different areas of the site. One could be placed close to a shrub that will eventually grow over it and provide further shelter. Another good placement would be in the sun for butterflies to bask. Piles with varied sizes of rocks will also create diverse sized gaps for shelter and dormant stages of insects.

Butterfly mud patch and Bird dust bath

A small one to two-foot square patch of bare dirt would be beneficial as a dual-purpose area for birds and butterflies. Birds often take dust baths when it is dry, and butterflies feed on the minerals in soil when it is wet. For butterflies this should be placed in the sun, out of wind, and near nectar plants (Washington Department of Fish and Wildlife). We suggest placing it somewhere at the top west edge of the site where it is sunny. For birds, Kress suggests excavating "enough soil to create a dust bath about 6 inches deep" (Kress). This should work for butterflies as well as it may serve as a spot for water collection. The cement blocks or stones that were dumped on site, wood, or some leftover bricks from a neighbor's yard (as in the photo below) could be used to make an attractive border.



From: Kress

Threats to Wildlife

Since improving wildlife habitat is a goal of the site, neighbors should be educated about the dangers of free-roaming cats and dogs. Cats are a major predator of birds, killing millions of birds each year, even cats that are well fed (Marzluff). Educating neighbors to keep cats indoors will improve the wildlife value of the site. Dogs have also been seen roaming freely through the

belt and defecating on the site. Not only can this spread disease, but it also destroys aesthetics of the site. Neighbors should be asked to watch their loose dogs and clean up after them.

Slope Stabilization and Erosion Control

Brady and Weil state, “On some sites with long and/or steep slopes, erosion control achieved by management of vegetative cover, residues, and tillage must be augmented by the construction of physical structures or other steps aimed at guiding and slowing the flow of runoff water.” (487) Planting strips of vegetation suitable for slope stabilization help slow down water runoff and collect mobile sediment. The vegetation and collected sediment eventually create “natural” terraces in the hillside assisting soil stabilization. Here is an example of vegetative barriers illustrated by Brady and Weil on page 489.

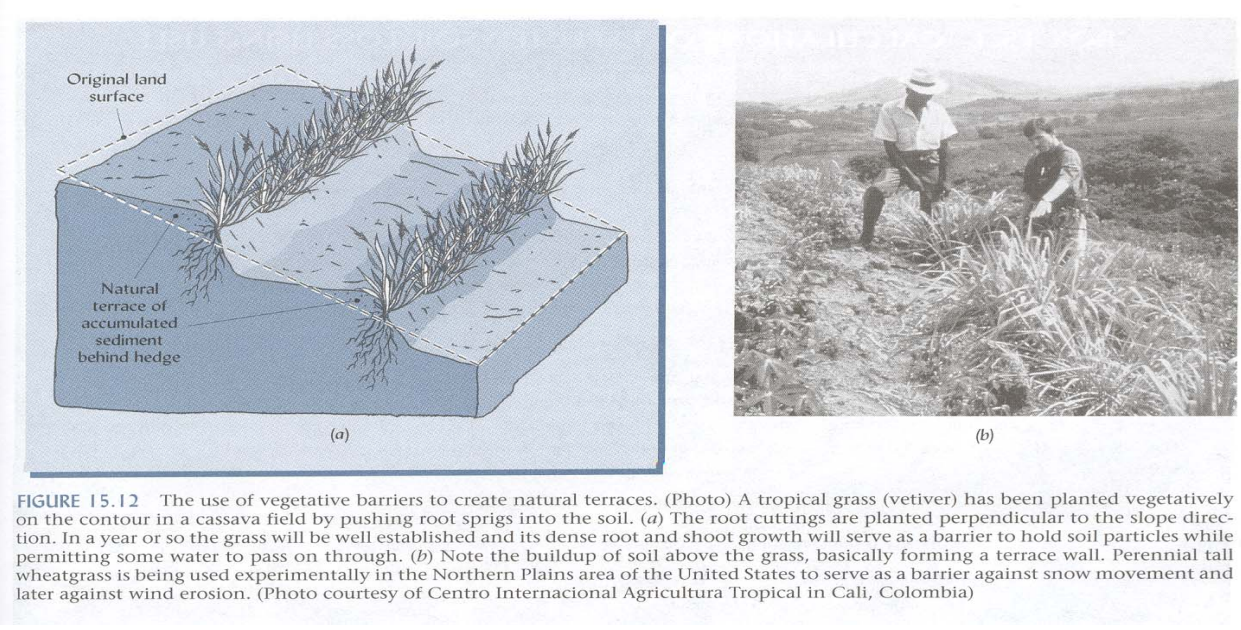


FIGURE 15.12 The use of vegetative barriers to create natural terraces. (Photo) A tropical grass (vetiver) has been planted vegetatively on the contour in a cassava field by pushing root sprigs into the soil. (*a*) The root cuttings are planted perpendicular to the slope direction. In a year or so the grass will be well established and its dense root and shoot growth will serve as a barrier to hold soil particles while permitting some water to pass on through. (*b*) Note the buildup of soil above the grass, basically forming a terrace wall. Perennial tall wheatgrass is being used experimentally in the Northern Plains area of the United States to serve as a barrier against snow movement and later against wind erosion. (Photo courtesy of Centro Internacional Agricultura Tropical in Cali, Colombia)

The authors of *Arboriculture*, Harris, Clark, and Matheny also recommend a few strategies for planting on steep slopes such as planting pocket, slope serration, and wattling. Special planting techniques are very useful because uneven watering, heavy rainfall and soil erosion can expose roots and threaten the survival of newly planted vegetation. However, once the plants are established they dramatically help control erosion because of rainfall interception and roots structural stability.

Figure 10-13 illustrates a planting pocket and is said to be the simplest and most common planting technique on steep slopes for assisting irrigation and controlling the movement of water. "Re-form the pocket as needed in the first year or two until the plant becomes established. For continued irrigation, you may want to consider a drip system (see chapter 13). (288)

Planting Pocket

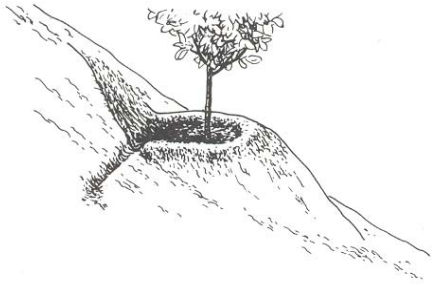


Figure 10-13 A plant is set toward the downhill edge of the basin near the original surface of the slope. The basin should be deepest near the back to accumulate water and any eroded soil. An overflow is cut into firm soil so that the basin will not be easily washed out.

Special Planting Situations Chap. 10

Harris and others also recommend slope serration, and they say that "Slopes are sometimes cut into steps that measure about 1 m (3 to 4 ft) in both the horizontal and the vertical." They also state. " The steps should slope toward the hill so that water will drain into the soil." (288) This is illustrated in figure 10-14 below. Terracing hillsides and banks has always been a great method

for assisting in slope stabilization, especially planted with suitable vegetation. The next method recommended by Harris and co-authors is what they call wattling illustrated in figure 10-15 below. " Wattling has successfully stabilized the surface of fill slopes, reduced erosion, and helped to establish plants on difficult sites.

Figure 10-14 Slope serration provides growing sites on cut slopes. Woody plants or grass can be planted or volunteer plants grown from local seed.

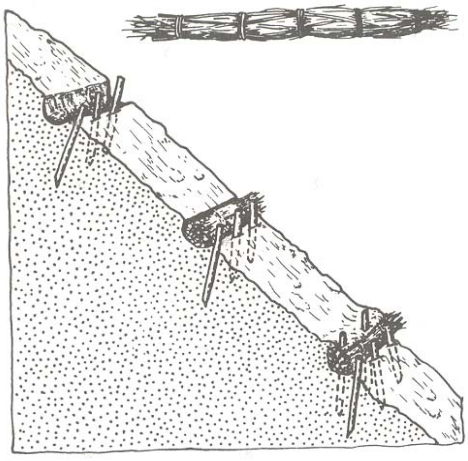


Figure 10-15 Wattling in the process of being installed on a slope: At the top, a shallow trench on the contour is ready to receive the bundles of wattling (center). Stakes are driven through the bundles for greater stability (bottom). While workers are installing the row above, the lower row of wattling will be covered by soil and firmed into place (adapted from Gray and Leiser, 1982).

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Recently cut, long, slender, branches are tied into elongated bundles that are partially buried in contoured trenches cut across the slopes." (290) It was also noted that if the wattling was made from species that root easily such as willow (*Salix sp.*) they could become part of the hillside by growing and assist stabilization. More information about wattling can be found on page 290 in *Arboriculture Integrated Management of Landscape Trees, Shrubs, And Vines.*

For additional information about planting on steep slopes please refer to this website and provided resources:

- Department of Ecology
  - Controlling Erosion Using Vegetation
    http://www.ecy.wa.gov/programs/sea/pubs/93-30/container.html
  - Access Washington - http://access.wa.gov/

Here is a lecture handout that has additional information in regards to slope stabilization including a more extensive list of plants suitable for these conditions. Disregard the trees for the Greenbelt Restoration project.
EHUF 480: Selection and Management of Landscape Plants
Professor Linda Chalker Scott

Provided source: Greenbelt Consulting

For More Information

- Washington State Department of Ecology
  (360) 407-6000 – www.ecy.wa.gov
  - print and on-line version of:
    Vegetation Management: A Guide for Puget Sound Bluff Property Owners, pub. 93-31

- Washington Native Plant Society
  (206) 527-3210 – www.wnps.org
  - Native Plants of Western Washington, brochure
  - Landscape Ideas for the Environment, series

- Puget Sound Water Quality Action Team
  1-800-54SOUND – www.wa.gov/puget_sound
  - Puget Sound Shoreline Stewardship Guidebook
  - Low Impact Development, brochure

- Greenbelt Consulting
  (360) 341-3433 – www.greenbeltconsulting.com
  - Biostructural Erosion Control: Incorporating Vegetation in Engineering Designs
  - Restoring Native Vegetation on Coastal Bluffs
  - Preserving Native Vegetation to Reduce Stormwater Impacts
  - Value, Benefits, and Limitations of Vegetation in Reducing Erosion

Selected Native Species for Planting to Reduce and Maintain Slope Stability

Groundcovers

Sword fern	*Polystitchum munitum*
Deer fern	*Blechnum spicant*
Trailing Blackberry	*Rubus ursinus*
Kinnikinnik	*Arctostaphlos urva-ursi*
Bunchberry	*Cornus conadensis*
Twin Flower	*Linnaca borealis*

Shrubs

Redtwig Dogwood	*Cornus stolonifera*
Common Snowberry	*Symphoricarpus alba*
Nootka Rose	*Rosa nutkana*
Baldhip Rose	*Rosa gymnocarpa*
Red-Flowering Current	*Ribes sanguineum*
Oceanspray	*Holodiscus discolor*
Serviceberry	*Amelanchier alnifolia*
Pacific Ninebark	*Physocarpus capitatus*
Mock-orange	*Philadelphus lewisii*
Beaked Hazel	*Corylus cornuta*
Vine Maple	*Acer circinatum*
Twinberry	*Lonicera involucrate*

Trees

Pacific Yew	*Taxus brevifolia*
Pacific madrone	*Arbutus menziesii*
Douglas Fir	*Pseudotsuga menziesii*
Bigleaf Maple	*Acer macrophyllum*
Shore Pine	*Pinus contorta*
Western Redcedar	*Thuja plicata*
Western Whitepine	*Pinus monticola*
Sitka Spruce	*Picea sitchensis*

*Note: It should be clearly understood that the use and success of plants to reduce slope problems is dependent on site specific conditions such as slope, geology, light and water availability, aspect, and soils. Planting on slopes requires a clear understanding of the processes affecting slopes, techniques to employed to ensure success, and the potential hazards of working on steep slopes in vulnerable areas. Permits may be required before slope restoration planting begins. Check with the appropriate local city or county agency.(Greenbelt Consulting)

Source:

Greenbelt consulting, 2003 – (360) 341-3433 – www.greenbeltconsulting.com

In addition, Whisenant talks about ways of improving soil surface conditions to improve soil stability and water infiltration. There are many techniques, but I would like to say a few words about two main strategies to help improve soil surface conditions. The two general approaches are to increase roughness of soil surface and to add aboveground obstructions. Increasing the soil surface roughness helps reduce runoff and erosion, retain precipitation near where it falls, and vegetation, which establishes and uses resources like water and nutrients. (56) Vegetated foliage also intercepts raindrops from landing directly on the soil surface, therefore reducing erosion caused by rainfall "splash". Appling mulch such as wood chips and other forms of organic matter significantly help increase soil surface roughness as well. For more information about the benefits of mulch and application techniques please refer to the mulch section of this report under Management Considerations.

Also, Richard's EHUF senior project from the University of Washington is an excellent resource for learning more about mulch. Richard Ivan Josef Bailey under the guidance of http://www.cfr.washington.edu/research.mulch/bailey/plan.htm

On the same line, adding aboveground obstructions also help increase soil surface roughness, but more importantly they stabilize the soil and improve water infiltration. Aboveground obstructions include materials such as logs, rocks, felled trees, mulching, brush piles, living plants, and the use of annual plants. Rocks, logs, felled trees, and other large woody debris are

all excellent and suitable materials for assisting slope stabilization and water infiltration at the Greenbelt Restoration site. (56)

Here are some photos and some text from another student project at the University of Washington showing how large woody debris is beneficial at stabilizing steep slopes (Students). Students who were engaged in the project photographed the pictures shown below. I would like to pass these photos on to help demonstrate the idea and perhaps apply as a reference at the Northgate Greenbelt Restoration project. The left over tree trunks from cutting the trees down on site may work well for this technique.

Slope Stabilization - Woody Debris

Large woody debris from around the park was installed on the steepest areas of the site. This helped to keep mulch on the slope, while protecting plants as well.

You can find these images and more information about this specific project at the following URL:
http://depts.washington.edu/uwren/capstone_courses/REN_Students/2002_Restoration_Projects/frink/frinkwoodpics.htm

Organic Mulch

One way to help the landscape retain moisture is to mulch it, and mulches perform other services too. Mulch allows soil to stay damp longer after rainfall or watering because it helps prevent evaporation. Retention of moisture aids in water conservation and protects plants from droughty conditions. A proper application of mulch can suppress weeds, moderate the effects of temperature fluctuations, reduce soil compaction over time, and will overall optimize growing conditions (Neir, Upham and Warminski)). If the mulch is an organic material it will contribute humus to the soil as it decomposes, and will also spur the work of beneficial soil organisms that help nourish plants (Clark, Harris and Matheny 162).

Mulch is applied to the top of the soil surface and is not incorporated into the soil like a soil amendment. The most accessible, and cost efficient, type of mulch for this project will be wood chips. Wood chips will be available from downing the unwanted trees then chipping them. Also, wood chips are often free from local arborists and professional chippers.

When placed on the surface as mulch wood chips will not tie up soil nitrogen. However, incorporating wood ships into the soil can create a nitrogen deficiency due to a carbon-nitrogen imbalance (Chalker-Scott, *The Myth of Phytotoxic Yard Waste*). For this reason we propose that the site be mulched not amended. Mulching will also be less labor intensive. Any chipped or shredded wood will be good mulch. The best type is small, medium and large sized particles all mixed together. Wood chips make ideal mulch at little or no cost.

Additional Benefits from mulching with wood chips include (Clark, Harris and Matheny 162):

- Saves Labor: less time needed for weeding and watering
- Saves Water: far less watering needed, mulch increases rain absorption and decreases evaporation
- Safer: no need for chemical weed killers or herbicides
- Optimizes growing conditions
- Moderates temperature fluctuations in the soil

- Eliminates injury to trunk from landscape equipment
- Reduces soil compaction over roots and adds loft
- Helps the soil retain oxygen
- Nourishes the soil by adding nutrients as it decomposes
- Increase earthworm population resulting in better aeration
- Helps prevent erosion by absorbing rainfall and preventing runoff

Site Dumping

As mentioned previously, illegal dumping of household garbage, yard waste, construction materials, and miscellaneous items into the greenbelt is a major problem and needs to be addressed. Since we started the project, another truckload of cement blocks was dumped off of the end of the street down the slope into the greenbelt, destroying vegetation, pulling soil down the slope, and killing any wildlife taking cover there.

Given that this is an illegal activity and probably done mostly at night, people engaging in these types of behaviors are not likely to stop dumping based on improved greenbelt aesthetics. Continued dumping could destroy new plantings and counteract measures taken to decrease erosion. Therefore, we strongly encourage the installation of “No Dumping” signs and a fence at the south end of Densmore Avenue North as a physical barrier to stop trucks from backing up and dumping loads of waste down the hill. Simple signs explaining that this is a greenbelt restoration may also help to deter some dumpers.

Site Preparation

Tree Removal

Because of the power line easement, the majority of trees in the greenbelt have been either cut down, topped, or had major branches cut to various heights, which are now sending out numerous sprouts. Most of these are bigleaf maples (*Acer macrophyllum*) growing directly under the powerlines or other unidentified deciduous trees nearby. These trees are all in a highly visible area of the greenbelt and look quite unattractive. Since they are growing in a location where there isn't enough room for them, and their topping has compromised their health as well as the aesthetics of the greenbelt, we are recommending their removal. The trees to be completely removed are all on the "top" portion (northern half) of the site. They should be cut as close to the ground as possible to avoid future sprouting, which could decrease the aesthetics of the site. We are not recommending stump removal for cost and soil conservation reasons.

Leave Trees

Trees to be left on the site, either fully intact or as snags, have been marked with flagging around the trunk. Since there are so many trees to be removed, it made more sense to mark the trees to be kept. However, it is likely that some of the flagging will be removed by people before this plan is implemented, so a detailed description of the trees to be retained follows.

There is one maple on the upper area of the site near all the topped trees that adds visual interest (photo 1 below). It mainly consists of one large branch. This may be a desirable tree to leave if it can be cut in a way that will preserve its look, while cutting off the end growing toward the powerline and avoiding future sprouting. There is also a bigleaf maple down the hill to the east from the end of Densmore that has been cut on only one side (photo 2 below). If only the cut branch on the side that is growing toward the powerline is removed, the rest of the tree could be salvaged or allowed to turn into a nice snag tree if in poor health. Any subsequent sprouting from

the base of the tree where the branch was removed wouldn't be visible due to the topography of the site.

Photo 1 – Big leaf maple with visual interest

Photo 2 – Bigleaf maple to salvage

There are a few intact bigleaf maples just east of the powerlines that are not interfering with them (photo 3 below) and should be retained. These are very close to or straddling the property line, so it is difficult to tell whether or not they are on the site. Either way, they are healthy trees and should not be cut down. There are also several bigleaf maples near Northgate Way that appear to be healthy. They are contiguous with the site, but may be on nearby property. Either way, these should also be retained (photo 4 below).

Photo 3 – Intact bigleaf maples

Photo 4 – More intact maples by Northgate Way

There are three nice western redcedars at the south end of the site near Northgate Way. Two of them are pictured in foreground of photo 5 (below). One of these may be on the neighboring

property. The other one is pictured in the background of photo 6 (below). These trees are the only healthy mature conifers on site and should all be retained.

Photo 5 – Two western redcedars (foreground)
Dead Pacific madrone (background)

Photo 6 – Western redcedar (background)
Topped western hemlock (foreground)

We have identified four potential snag trees (other than the 2 bigleaf maples mentioned above as possible snags). A description and photo of each one follows. Some of them can probably be left standing as is, but the arborist is the expert who should determine the suitability of the snag trees, whether they can be left alone to turn into snags naturally, or need to be cut down to a certain height. One of these is the only western hemlock (*Tsuga heterophylla*) on site (photo 6 foreground, and photo 7). It is growing right under powerlines next to Northgate Way and has been topped.

Photo 7 – Topped western hemlock by Northgate Way

Photo 8 – Dead Pacific madrone

Another is the Pacific madrone (*Arbutus menziesii*) pictured in photo 8 (above). It is already dead, but it may be on the neighboring property. Exact boundary lines will have to be determined before cutting this tree. The two other potential snag trees are unidentified species pictured below (photos 9 and 10). Both are missing bark already and are good foraging trees for woodpeckers. These trees may be ok to leave standing since there is no target.

Photo 9 – Snag tree - unknown species in foreground

Photo 10 – Snag tree – unknown species

All of the trees recommended for snags (with the exception of the unusual bigleaf maple in photo 1) are not very visible from the main portion of the greenbelt. They are on the southern half of the site and hidden by a hill. Although they are close to Northgate Way, they aren't particularly noticeable from there either, due to the shape of the road and bank of vegetation next to the sidewalk. An interpretive sign explaining the role of snags could be placed next to the western hemlock for people walking along Northgate Way. It would add a nice addition as well as an opportunity for public education and appreciation of the greenbelt.

The city may provide its own arborist for this project, but if not we strongly encourage the use of an ISA certified arborist (certified by the International Society of Arboriculture: http://www.pnwisa.org/) to handle the tree removals and snag creations. Although we have marked all trees that will stay (either as healthy trees or as snags), some of these flags could be removed by citizens, so it is important to have a tree expert on site. It is very important that the

few healthy and salvageable trees in the greenbelt not be cut down, so a reputable professional should be hired. Two ISA certified arborists recommended for this type of work are:

Ian MacCallum -- Trees for Life, Inc.
PO Box 1586, Bothell, WA 98041
425/485-4758 -- Fax: 425/487-2079
Email: treesforlife@earthlink.net
Web Site: www.treesforlifeinc.net
Specialties: Consulting and all phases of Arboriculture for private & Commercial Properties. Specializing in Creating & Executing Tree Management Plans for Golf Courses and other Large Properties.

Robert J. Osborn -- Sound Tree Services, Inc.
PO Box 1251 Seahurst, WA 98062
Phone: 206/246-3804 Fax: 206/246-6281
Specialties: Pruning, Tree Care Technical Removals, Hazard Evaluation, Planting.

We also emphasize that it is very important to coordinate with the City of Seattle on establishing the exact property lines on the site. The greenbelt is contiguous with other properties, and some trees appear to be straddling boundary lines. It is difficult to determine the property lines with a map, so the city should come out and mark them before any cutting is done.

Site Clean up

Illegal dumping of landscape debris, hazardous waste, and construction material on site has many connotations, one of which is the fact that plants will not grow and survive when planted in substandard soil and environmental conditions. Unfavorable conditions such as piles of sand, mixed yard debris, and assorted concrete, rock, and brick must be restored with quality soil to support plant survival. The plants, animals, and whole surrounding environment will also benefit from a concentrated effort to clean up garbage, plastics, and other contaminated substance on

site. “Improved soil quality, in turn, enhances the soil’s capacity to support plants, resist erosion, prevent environmental contamination, and conserve water.” (Brady and Weil 507)

Refuse News - June 15, 1999

Illegal Dumping at Epidemic Levels by John Waddell

> The City of Seattle in recent years has stepped up its campaign against illegal dumping by opening an Illegal Dumping, Litter, Graffiti and Water Quality Hotline. The hotline was established not only to stop illegal dumping, but to prevent what the city calls the "domino effect" of illegal disposal. Says the city: "illegal dumping is a gateway for other forms of illegal activities. If illegal dumping is tolerated, it is like sending a message to criminals and vandals that it is okay to dump garbage in the community. From our experience, that leads to other illegal activities showing up on the streets." (Waddell

http://www.zerowasteamerica.org/RefuseNewsIllegalDumping.htm

U.S. Environmental Protection Agency

“Pay As You Throw” (PAYT)

Illegal Diversion

Seattle, Washington, has also found no association between implementation of PAYT and an increase in illegal dumping. In fact, 60 to 80 percent of the illegal dumping incidents in the city are associated with remodeling waste, old refrigerators, and construction debris—waste that the city suspects comes from small contractors who do hauling on the side.

June 12th, 2002
http://www.epa.gov/epaoswer/non-hw/payt/top8.htm

Conservation & Environment: Illegal Dumping

Illegal Dumping

Junk in the streets or accumulating in our neighborhoods is not something we want to see

Use the Online Illegal Dumping Report Form to report illegally dumped garbage in your area. You can also call the Illegal Dumping Report Line at (206) 684-7587.

http://www.ci.seattle.wa.us/util/ept/Illegal%20dumping/default.htm

Mulch Application

Suppressing unwanted weeds is one of the main objectives of the mulch application. To be effective in thwarting weeds, the mulch material used must block light to underlying weeds yet allow air and moisture into the soil to benefit the roots of wanted plants. A uniform application of mulch at a minimum depth of ten inches across the landscape will be necessary to control invasive and weedy species (Chalker-Scott). Most herbaceous weeds will be effectively controlled with a thinner layer of mulch but a thicker layer is necessary to control the blackberry infestation. To increase mulch effectiveness it will be beneficial to remove all weedy and invasive species prior to the mulch application.

The mulch should be applied prior to new plant installation. This will reduce the chances of plants becoming damaged while mulch is being distributed. The mulch can easily be pushed back to expose bare soil at planting time. After plants have been installed the mulch can redistributed over the exposed soil, but it will be necessary to retain a minimum circumference of four inches of bare soil around each plant trunk. Piling mulch against the trunks of woody species can expose the bark to intolerable wet conditions. This wetness will cause the bark to decay making the plant susceptible to disease which will eventually cause plant death (Clark, Harris and Matheny 173).

Wood chips are organic material that will decompose over time. The decomposition is beneficial as it adds to soil fertility. Additional applications of wood chip mulch will be necessary to maintain the ten inch minimum depth. During plant establishment the additional applications of mulch will be critical.

Local Professionals who provide mulch at little or no cost:

Aadams Tree Service Inc	(425) 284-2860
Ballard Tree Service Inc	(206) 782-4847
Best Tree Service	(206) 365-6760
Mike's Tree Service	(206) 772-2173

Plant Installation Guidelines

The planting information can be found at this website
http://cru.cahe.wsu.edu/CEPublications/misc0337/misc0337.pdf

See Appendix document "Plant it Right: Restoration Planting Techniques"
(WSU Cooperative Extension).

Aftercare and Maintenance

Maintaining weeds and adequate soil moisture are the two essential elements during the first few years of plant establishment. During extensive dry periods it is especially important to evenly water plants, not wet, to assist appropriate root growth and formation. In the Pacific Northwest, the dry period each year falls between the months of June and August. In addition, controlling weeds and invasive species is also critical for the assistance of plant development because weedy species out compete desired plants for nutrients, water, and light.

Monitoring and controlling invasive species on site must continue for subsequent years to maintain superior site health and vigor. Managing invasive plant species may cause difficulties because juvenile invasive plants often do not appear like mature established plants. For instance, English ivy leaves change physical form as they mature with young leaves more lobed shaped and ending with a more narrow mature leaf shape. Information about identification and methods for invasive removal are discussed in the invasive species section of this plan.

Likewise, fertilizing is not part of aftercare and maintenance especially when the site is properly prepared. “Fertilizer often promotes weed growth at the expense of the native species. In cases where severe nutrient deficiency is suspected of inhibiting a planting, an all-purpose fertilizer can be used at half the strength recommended on the label.” Furthermore, rhododendrons and azaleas are acid-loving plants and may require acidifying fertilizers. (Harker 60)

Aftercare and site maintenance will also include periodic reapplication of mulch in addition to monitoring large woody debris and other slope stabilization techniques. The reapplication of mulch will continue to suppress weeds and invasive species as well as improve soil conditions like help retain soil moisture. Mulch application recommendations are illustrated in the mulch section of this plan. Moreover, maintaining planting techniques on steep slopes is also essential for the lasting survival and function of the site. This includes assuring that planting pockets, wattling, or other planting or slope stabilization methods are sustaining environmental and physical condition of the site.

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