Leschi Cable Car Bridge Pathway Plan

A Class Project for EHUF 480, Winter 2004

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Abstract

Friends of Frink Park approached the EHUF 480: Selection and Management of Landscape Plants class at the University of Washington with a project: to restore the Leschi historic cable car bridge and the surrounding area to its former glory in the landscape plan designed by J.C. Olmsted. Maria Do, Jennifer Low, Jennifer Brennan, Tim Saunders, and Emily Johnson were the students selected for the team. Working with information gathered from the Frink Park and Upper Leschi Park Concept Plan, we analyzed soil samples, assessed site conditions, and met with neighbors to discuss concerns and get input. After 10 weeks of hard work, a design and management plan has been produced.

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Introduction

The Leschi Park historic cable car bridge once served as the main route for transportation from Lake Washington to downtown. Today it still serves as a local link between the waterfront and various neighborhoods above. Friends of Frink Park is a local organization of concerned citizens who have taken an interest in restoring the area to its initial design of being a naturalized park. This area of the park currently serves many purposes to the local residents, however, the vegetation of the area has become highly overgrown and dominated by invasive species. The goal of this project is to restore and enhance the aesthetic appeal of the park by creating a vegetation design and management plan that will be implemented by the volunteers of Friends of Frink Park.

History

The history of Frink Park is a fabric that is rich in diversity. In the 1850's the area that was to become Frink Park was used as a launching point for the Battle of Seattle, between Chief Leschi and the settlers in the area. In 1869 the area that was to become Leschi received its first residents. In the 1880's the old growth forest that covered the area was logged.

In the 1880's the Seattle Railroad Company built the Jackson St. cable car line. This served faithfully until the 1900's to connect the downtown city of Seattle to the Leschi area. In 1903 J.C. Olmsted suggested the layout that was to become Frink Park. This design was almost finished by the time of the Alaskan-Yukon pavilion.

The park was enlarged in 1930 by a huge land donation left by the deceased John M. Frink. In the 1940's the cable car line was finally disbanded. The park has slowly fallen into decline over the last half century. During this time, invasive vegetation has taken over and paths have fallen into disrepair. In recent years the Friends of Frink Park along with students from the University of Washington have been creating a restoration in Frink Park that will lead to a sustainable future for this area.

Figure 3-1. Yesler cable car trestle in the early 1890's

Yesler Cable Car Trestle early 1890's

Historical Society of Seattle & King County

Project Goals and Objectives

- Overall Objectives

  -Create a space that has more inviting features while maintaining natural aspects
  -Integrate neighborhood concerns into park design with attention to park visibility and usage
  -Create a sustainable forest with a natural succession pattern
  -Define a relationship between the historical bridge and the natural aspects
  -Coordinate ideas and input with the community

This project attempted to combine the desires that were discovered from the Frink Park and Upper Leschi Park Concept Plan, with the special opportunities we found on the historic cable car site. The concept plan expressed a desire for a natural, native space for the surrounding neighborhood to enjoy.

The first objective deals with conserving the natural elements in our space while removing any unwanted elements that would detract from the overall experience of the park. Those unwanted elements include invasive species, unattractive materials such as plastic piping, hazard trees and unsafe slopes. These elements would be replaced with aesthetically pleasing plant species that are mostly natives. This would serve to enhance the natural aspect of the park while increasing sustainability.

The second objective is meant to make sure the community has a voice in our design. It is important for the neighborhood to feel that this park is as much their creation as it is ours. This design should incorporate the community's concerns and provide a solution to them. The design takes into consideration the desires of the community and enhances park accessibility while creating more view sheds.

The third objective is to create an environment that will not need to be highly maintained or manicured. The goal is to create a space that through proper plant placement coupled with proper species selection, will become more self-reliant over time. By picking plants that are adapted to the correct light conditions, water usage, wind damage, and soil conditions in the historic cable car area, a self sustaining ecosystem will be present.

The fourth goal is to design a relationship between the bridge and natural aspects of the park. By looking at the bridge as a gateway into the pastoral open area and view sheds of Lake Washington, while also looking at the entry way of the forested area of the park as a gateway into a native Northwest forest, an area is defined in which a transition must occur. This transition area becomes a prime site that will allow the smooth gradient of forest to manicured park. By designing this space as an area that has elements of both areas (ornamental and native), a flowing transition is created for park users to comfortably traverse that boundary. This then becomes a place that defines the change of the park, while linking the park together.

The last goal of this project is to inform the neighborhood of the progress of the design, and make positive checks to update any new concerns they have about the historic cable car bridge.

Site Constraints and Opportunities

- Forest Area

Constraints	Opportunities
Invasive vegetation	-A chance to revegetate with natives
Lack of conifer regeneration due to thick canopy	-Remove hazard trees to thin canopy, and plant successional conifers
Unsafe slope of forest path	-Reduce slope with natural logs as a gentle terracing
Excess water on forest paths	-Expand existing bridge -Build additional bridge -Use gravel to secure path -Use wetland plants to transpirate excess water
Hazard trees	-Remove and leave as snags for habitat

Our group felt that any constraint was also an opportunity for improvement; so for each issue that was discovered in the park, an outlook was cultivated that focused our attention on improvements for these areas.

The first constraint is the massive amount of invasive vegetation located in the park and bordering neighbor's houses. This creates an opportunity by providing a blank canvas in the landscape once invasives have been removed. This area creates an opportunity for us to design a sustainable park using native vegetation that also has a high aesthetic value.

The second constraint is the inability of a conifer forest to succeed the deciduous forest now in place. This constraint becomes an opportunity by installing a planting design that will naturally succeed the deciduous forest and slowly replace it with a coniferous forest. This succession is a natural process in Pacific Northwest ecosystems and the thick canopy makes it difficult for this succession to occur. In addition, there are limited seed sources nearby, further hindering the chance that conifers will naturally be able to grow and thrive in this area. By removing hazard trees which are an existing danger to park users, we create holes in the canopy that will allow light to puncture though. With the help of planting trees, this should aid the development of a conifer forest.

The third constraint is the unsafe slope of the path in certain areas of the forest. By using trunks and large limbs retained from hazard trees removed from the park, this constraint is turned into an opportunity. To maintain the native feel of the park we would like to use the trunks and large limbs from the removed hazard trees to gently reduce the slope of the path in certain areas by introducing terracing.

The fourth constraint deals with the amount of water that is on the forest paths. This can be both unpleasant and dangerous for park users. To turn this into an opportunity, it is recommended to create a more secure path that is safer, more user-friendly, and ties the experience of the forest together. We also would like to deal with the excess water issue by using wetland plants in the boggy area of the park. This would help transpire the water into the atmosphere, create habitat, and provide an experience for park users that would reinforce the feeling of being in a natural wooded forest.

The last forest constraint is the hazard trees. By using these trees for slope reduction, while leaving as much of the tree trunk as is safe to create habitat for birds and other wildlife, an opportunity can be created for increased biodiversity.

- **Bridge**

Constraints	Opportunities
High light exposure	-Use of ornamental plants that are sun loving and high aesthetic value
Invasive plants and a non-sustainable plant palette	-Remove invasive plants and replace with native sustainable vegetation
Wet conditions/boggy soil conditions	-Use plants that have a shallow rooting system and a high transpiration rate
Slope	-Enhance view corridor while evening out the degree of slope

The primary constraints along the bridge's pathway is the high light exposure and wet conditions due to lack of drainage along the shallow soils at the top of the bridge. These constraints limit the use of plantings to shallowly rooted plants, such as groundcovers and low-lying shrubs that prefer high light exposure.

Another constraint along the bridge's pathway is the large number of invasive blackberry bushes that need to be removed and replaced with native vegetation that will introduce a diverse, sustainable planting palette to engage the senses and enhance the bridge pathway experience.

The final constraint along the bridge pathway is the steep slope that continues from the east entrance (gateway) up to the top of the bridge. Here is the opportunity to regrade and flatten this slope to ease the physical access to the bridge and open up the view corridor that extends through the bridge and leading into the forest canopy.

- **Gateway**

Constraints	Opportunities
Wet conditions at base of slope	-Stabilize trail and slope to increase visibility of trail
High light exposure	-Extend views to and through bridge and celebrate through signage and native ornamental species
Potential for heavy foot traffic	-Stabilize trail by use of porous gravel to allow for safe trail use with out damaging plant roots
Invasives	-Remove and use native vegetation that has a high aesthetic value.
Unsafe slope at north eastern trail entrance	-Remove sand and re-grade entrance, so that views are connect form the bridge

Currently, the east entrance to the bridge is plagued by blackberry bushes, and a steep, wet slope. Sand was spread on the surface of the slope to prevent further erosion in this area, but the loosely consolidated sand poses a potential safety hazard to both ascend and descend this trail. Thus, slope stabilization by means of regrading and/or planting of slope stabilizing and erosion preventative groundcovers and low lying shrubs has the potential to minimize these hazards and provide additional aesthetic interest at the gateway.

The east end of the bridge provides the opportunity to place prominent placemarkers in the form of a variety of native plantings (low maintenance ornamentals preferred) and informational/educational signage to emphasize this entry point as a gateway in order to expose and celebrate the bridge, as well as encourage pedestrian flow through this portion of the pathway.

The high light exposure poses a planting constraint, where the selection of sun-loving plants is necessary. This also poses the opportunity to introduce, low-maintenance, native ornamentals to the bridge's gateway.

- **Edges**

Constraints	Opportunities
Erosion	-Plant low lying ground cover and or shrubs to stabilize slope
Invasives/undefined edge	-Create sense of edge while removing invasives and use native ornamentals to create a sustainable planting scheme that defines sight boundaries

Erosion control is a primary constraint along the edges of the bridge. At both ends of the bridge are steep slopes that are in risk of severe erosion and pose a safety hazard to trail users. Slope stabilizing plantings would be beneficial at these edges to minimize erosion along these areas.

The lack of definition along the edges poses another challenge. Desire paths have been carved out by trail users at both ends of the bridge. Here lies the opportunity to further define and clear these secondary paths to the trail by means of plantings to delineate site boundaries and access to the trail.

Site Assessment

- Existing Conditions

-In the forest area, there is an abundance of invasive species including English holly, English ivy, Himalayan blackberry, clematis and cherry laurel. These species are endangering the health of the forest by climbing into the canopies of the deciduous trees and out-competing native vegetation. Invasives have colonized to the point where biodiversity and habitat have been inhibited. In addition to the over-abundance of invasive species, there is a lack of native species. The quality of the paths running through the park is deteriorating due to erosion caused by water flow. The combination of water flow and steep paths cause these walkways to be unsafe to everyday users. The soils of the paths are especially unsafe due to the extreme amounts of water flowing over them. The paths are retained in certain places by green pipes that are aesthetically unpleasing. The potential to use the excessively wet soils as a substrate for installing wetland plants is an exciting prospect. Finally, it will be both feasible and straightforward to turn the forest area that currently exists into an area that is both aesthetically pleasing and sustainable.

-On the historic cable car bridge, there is also a profusion of invasive species, consisting mainly of Himalayan blackberry and English ivy. There are extremely shallow soils, to an estimated depth of six inches. There is grass and a few herbaceous weeds growing on top of the bridge. The path leading up to the bridge on the east side is covered with a thick layer of sand. The path leading from the historic cable car bridge into the woods is narrow and nearly hidden behind a mound of blackberry. Overall, the bridge is not being used for its potential as a landmark and an entry point into the park and the trail system. We feel it could be better used as a focal point/gateway for the entire park. The viewshed from the bridge looking out to Lake Washington is very picturesque. This potential will be addressed in our design.

- Current Plant List: These are plants that currently reside in the forest that were located upon assessment.

Common Name	***Scientific Name***
English Holly	*Ilex aquifolium*
English Ivy	*Hedera helix*
Cherry laurel	*Prunus laurocerasus*
Clematis	*Clematis vitalba*
Big leaf maple	*Acer macrophyllum*
Western Hemlock	*Tsuga heterophylla*
Sword fern	*Polystichum munitum*
Bitter Cherry	*Prunus emarginata*
Western Red Cedar	*Thuja plicata*
Oregon Grape	*Mahonia nervosa*
Red Flowering Currant	*Ribes sanguineum*
Poplar	*Populus sp.*
Hawthorn	*Crataegus monogyna*
Himalayan Blackberry	*Rubus discolor*
Douglas Fir	*Pseudotsuga menziesii*
Spruce	*Picea sp.*
Birch	*Betula sp.*
Beaked Hazel Nut	*Corylus cornuta*

- Hydrology

  - Natural Forest Zone

    The slope of this area is fairly steep and has the most invasives and the largest percentage of dense vegetation. The storm water in this area runs down the slope and settles into a depression in the forested area of the park. In the winter, the soil in the park becomes heavily saturated, causing muddy and boggy paths to occur. In the summer, these areas tend to dry out.

- Bridge Zone

  The soil on the bridge is layered topsoil on top of an impermeable bridge surface. Since there is no drainage system in place, the soil becomes saturated. It can remain this way for several days. The lack of an undefined path denies users a dry walking path and instead dictates that each user find their own dry path across the bridge.

- Edge Zone

  The water runoff in this area of the park is currently causing erosion and therefore needs to be stabilized with vegetation. If water can be intercepted by plants before it reaches the edge and runs into neighborhoods or roads, damage to the surrounding landscape can be minimized.

- Gateway Zone

  As the water runs off the bridge area, it creates muddy, wet conditions at the base of the slope leading from the bridge to Lake Washington. The potential for heavy foot traffic as more users are made aware of the bridge can pose a problem with soil compaction if the moist soils are not taken into consideration. Because this area will serve as a view point and gathering area, it is essential that this area is dry and pleasant for walking pedestrians.

- Soil Assessment

  The first soil sample that was taken from the area was just west of the foot bridge, 20ft up into the wet area. In this area the pH level is too high for planting. The level is 6.8. In the early fall it is best to top-dress the soil with 3 to 4 cups sulfur/ per 100sq feet. This will bring down the pH level in this area. For the rest of the site, the pH level was in the right range for the plants selected. For a more detailed description of the soils in this site, please refer to the site preparation section as well as appendix A.

Design Plan

- Design Objectives

  Use of a diverse, low maintenance native plant palette to create a series of spaces and transitions between these spaces that encourage trail and park users to experience the trail's path and its progression from a the formal gateway at the west end of the Cable Car Bridge and into the informal forest canopy at the east end of the site. Plant selection and placement have been determined by their suitability in these different site conditions, as well as their ability to add aesthetic interest and celebrate and enhance the visibility of the Cable Car Bridge.

The design plan identifies the site in four distinct zones, each to be treated according to factors such as soil and slope conditions, light exposure, site sensitivity, pedestrian traffic, and overall spatial experience.

-Gateway
-Bridge
-Bridge/Forest Transition
-Forest Canopy Zone

- Gateway (Park/Bridge Transition) Objectives

To create a formal entrance that identifies and directs people to the Cable Car Bridge path and provides signage that informs the public of its historical significance in Frink Park and to the Leschi community. Through the use of native shrubs and trees, that includes a diverse palette of both evergreen and deciduous trees and shrubs that flower in different seasons to maintain year-round aesthetic interest in this space. Trees and medium sized shrubs at both sides of the bridge will create a view corridor that will direct views toward the cable car bridge, while adjacent area at the sloped edges of the bridge will be planted with slope-stabilizing ground-covers to minimize erosion.

- Bridge Objectives

To celebrate the bridge by enhancing its visibility, improving pedestrian access, exposing view corridors, and creating a plant palette that is resistant to the heavy foot traffic within this area and engages the senses to provide an enjoyable experience through and across the Cable Car Bridge.

Blackberries blanket both the east and west ends of the bridge and must be removed to promote its exposure from the park as well as to oncoming pedestrian traffic from the Forest/Canopy areas. The steeply sloped and eroded path at the west end of the bridge must be graded for safety and prevention of further erosion, as well as opening up view corridors through the bridge and easier access up to the bridge.

The plant palette must be considerate of the shallow soils on the bridge (6 inches deep), and will consist of ground covers that are fairly resistant to foot traffic, such as Creeping Thyme. Shallowly rooted, medium shrubs are recommended for this area, such as Daphne odora (Winter Daphne) and Ribes sanguineum (Red Flowering Current). These will act as a buffer between the trail and the bridge wall, providing additional plant interest, with a mixture of both deciduous and evergreen flowering shrubs to provide plant interest alongside the bridge and prevent access over the edge of the bridge (safety concerns).

- Bridge/Forest Transition Objectives

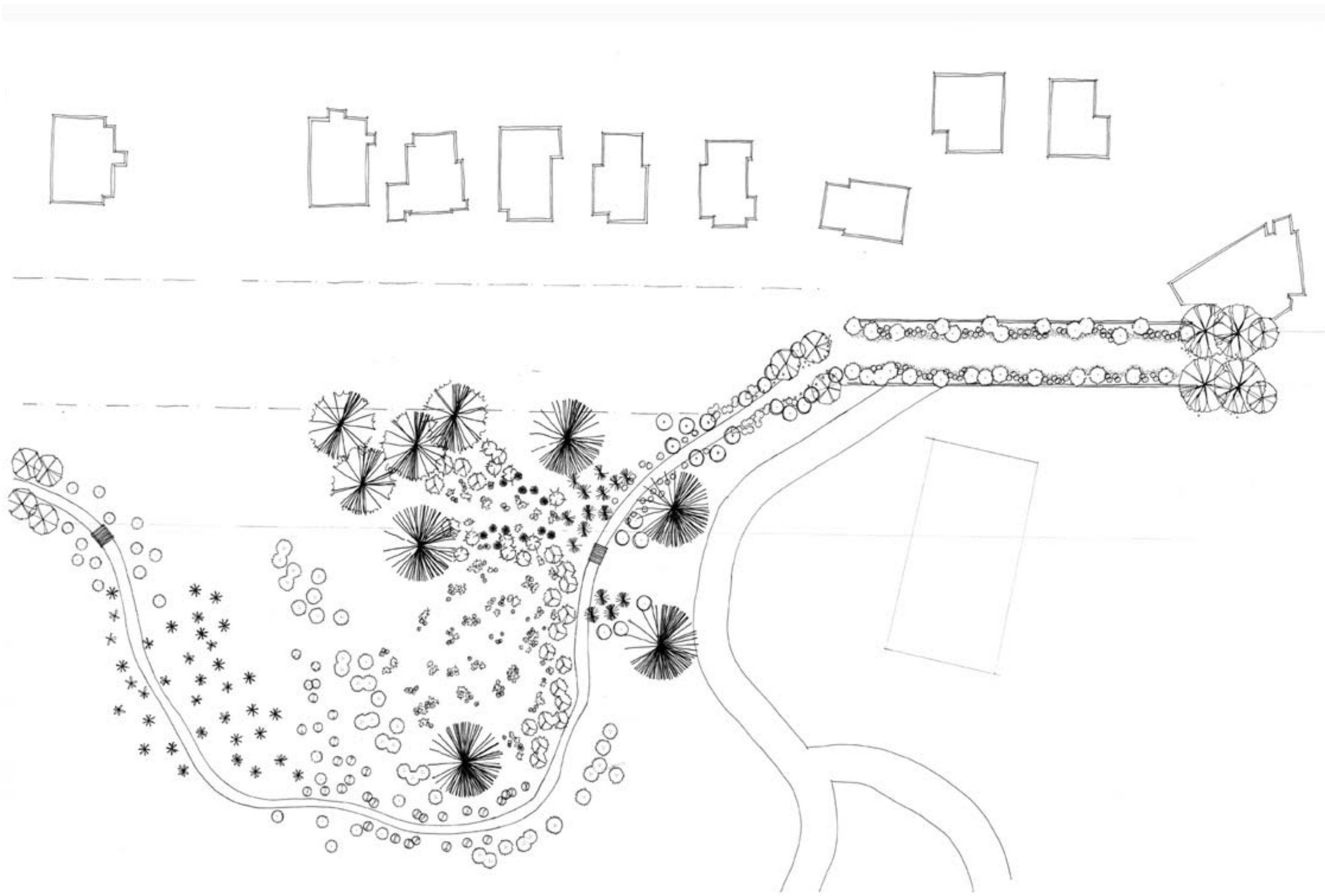
To identify the transition from the more formal and ornamental plant aesthetic of the bridge to the more informal stretch of path that leads into the 'natural' areas just northeast of the bridge. Here, the plant palette is a mixture of both native ornamental and restorative wet area plants that identify the intersection between these different areas along the trail.

Trees and medium shrubs continue the main axis and view corridor through the bridge's path to further encourage and direct traffic into the forest canopy. Here, the paths are widened and the secondary path from Lake Washington Blvd onto the east end of the bridge is identified with low-lying shrubs to provide convenient access to and from the bridge at this side.

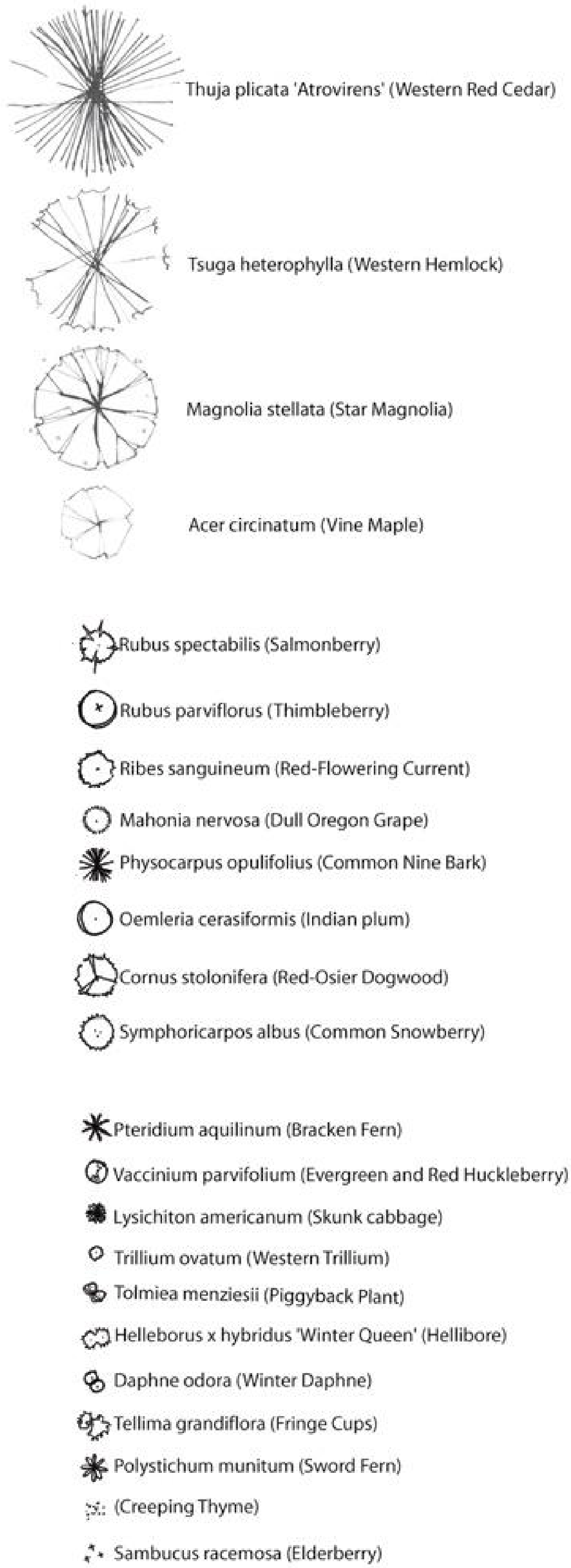
As another point of entrance/exit along the path, it is also important to expose the structure of the bridge, which is currently obstructed by invasives (primarily blackberries). The removal of these invasives and exposure of the bridge will improve the visual and physical access at this transition point.

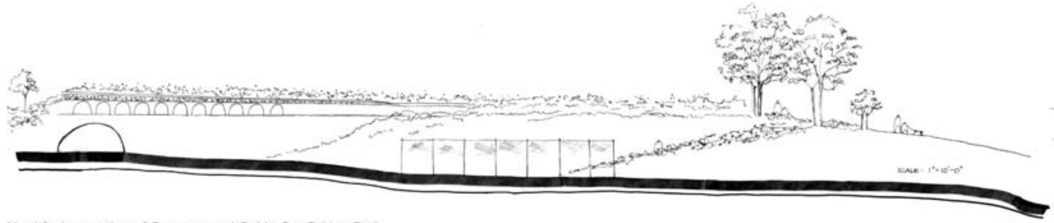
- Forest Canopy Zone

A distinct change occurs as the path continues beyond the cable car bridge and into the park's forest canopy. Here, the pedestrian meanders through a less-controlled space than the formality of the path to and along the Cable Car Bridge, and enters the shadier, wetter, forested area. Unlike the celebratory and ornamental experience within the Gateway and Bridge areas, the Forest Zone is the "natural" area of the park. Low lying shrubs continue to run alongside this area to help define the trail through the sensitive forest area that will be restored through the removal of invasives and installation of water tolerant trees and shrubs. There is no formal design to the forest canopy, but a diverse native plant palette will be established to mitigate the potential for erosion along the area's steep slopes and native, water tolerant plants are recommended for installation in the wet areas of the forest zone to support and maintain existing habitat. For the all-season use of the trail, the trail surface will be composed of crushed gravel and untreated logs will also be used to terrace and stabilize the trail at its steeper points.



NATIVE PLANTING PALETTE





Northfacing section of Gateway and Cable Car Bridge Path.

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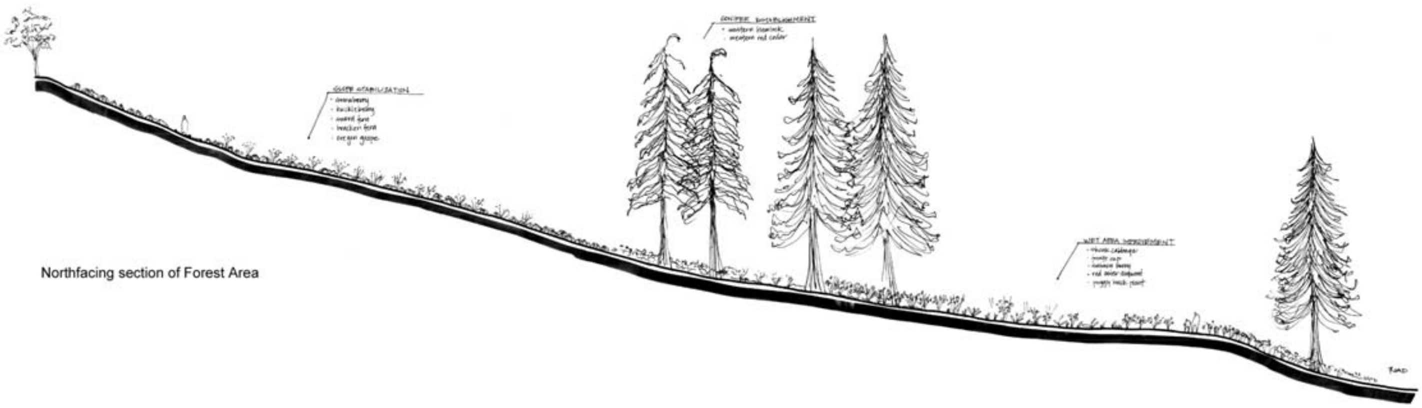

Northfacing section of Forest Area

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Site Preparation

The site preparation will primarily involve extensive removal of invasive species to create space for native vegetation to flourish. With the help of volunteers, it will take approximately six months to remove the invasives to the point where they are no longer threatening. It is crucial that the non-native plants continue to be removed throughout the year in large increments. In addition to invasive plant removal, other aspects of site preparation include: hazard tree removal/monitoring, trail stabilization and soil amendments. All of these actions are measures that will be taken to enhance the sustainability of the site over time.

- **Invasive Removal:**

There are 5 dominant invasive species that inhabit this area of the park. They are: *Ilex aquifolium, Prunus laurocerasus, Hedera helix, Rubus discolor,* and *Clematis vitalba.* All of them are very difficult to remove and will need to be constantly managed over time to prevent significant new growth. These species will be removed with the help of volunteers and equipment such as mowers, weed-whackers, shovels, and the herbicide Roundup.

Removal of English Holly (*Ilex aquifolium*): While this plant does not impose a significant risk on its own, it is the combination of having a male and female plant near each other that allows new plants to germinate and dominate the understory. For this site, we recommend that the female plant be removed to inhibit reproduction. To remove the tree, cut the trunk off just above ground level and dig the roots up with a shovel. We also recommend that the male tree be removed following the same procedure.

Removal of Cherry Laurel (*Prunus laurocerasus*): Cherry laurel can grow to an enormous size and choke out underlying native plants on the forest floor. Because of the size of this shrub, cutting it down and digging up the root ball is a good idea. Also, any new, smaller plants can be pulled by hand.

Removal of English Ivy (*Hedera helix*): English Ivy is difficult to remove because its waxy leaves are resistant to most chemicals and it is a vine, which allows it to climb up into the canopy and diminish the health of the forest. For removal of vertically climbing ivy, it is best to pull as much off the tree trunks as possible and cut the rest, severing it from its nutrient source in the ground below. The remaining ivy on the tree will slowly die and it can be removed later if possible. Most ivy that is creeping along the ground can be pulled by hand. Ivy that is growing on the ground and too big to pull up can be cut off with pruning shears. Roundup should then be brushed onto the freshly cut stems. Roundup will most likely only be effective on the freshly cut stems, not the actual ivy leaves, due to their thick waxy cuticle. For more information on Roundup, see the removal of Himalayan Blackberry section.

Removal of Himalayan Blackberry (*Rubus discolor*): One tactic that seems to be successful in removing blackberry is to mow it down, which prevents the plant leaves from delivering nutrients to the root mass. If mowing is done consecutively over time, it significantly weakens the plants and hinders new growth. Another treatment proposed in the concept plan, in addition to mowing, is to apply Roundup to treat the remaining blackberry stumps once it has been mowed. The following quote is from the Concept Plan: "Roundup is a glyphosphate-based herbicide that is the preferred choice when working near aquatic resources due to its relatively short persistence". Please refer to section 6, page 21 of the Frink Park Concept Plan for more information on application and regulations of using Roundup.

Removal of Clematis (*Clematis vitalba*): Like English ivy, this invasive clematis is a hardy vine that can shade out entire tree canopies. It is recommended to remove this plant between March and July, before it flowers, although it may be hard to detect. As with ivy, cutting the clematis that is climbing up into the canopy off at its ground source will cause it to die. Pulling lateral plants or weed-whacking heavy jungles of this giant mass may be necessary.

In addition to removing all of the invasives and treating the ivy and blackberry stumps with Roundup, eight inches of wood-chip mulch will be applied to the site. Mulch plays a vital role in keeping weeds down, reducing erosion, improving moisture retention in the soil, and protecting newly established plants from damage and temperature extremes. From an economic point of view, mulch saves money by requiring less maintenance and watering to be done on the site, further adding to the sustainability of an area. For a timeline of when each treatment should be applied, see the end of the site preparation section.

- **Hazard Tree Assessment:**

In the midst of removing invasives, it is recommended that the site be analyzed for the presence of hazard trees. Hazard trees are trees that have some sort of defect such as root rot, fungal infections or structural problems, as well as a target (pedestrians, property). The combination of the two could possibly result in injury or death and it is this realization that makes the assessment of hazard trees absolutely crucial. Many of the trees at this site, especially older Big Leaf Maple (*Acer macrophyllum*) can be classified as hazard trees. Rather than plotting these trees on a map, members of our group flagged particular trees at the site with yellow ribbon that we thought posed potential high-risk to park visitors and nearby property. It is advised, however, to hire a professional certified arborist to visit the site, confirm this hazard analysis, and remove the selected trees. Any trees that are removed from the site should be left as snags to provide optimal habitat for birds, insects, and wildlife. The remaining wood should be used to construct support for the trail system.

- **Trail Stabilization**

  With the removal of hazard trees and invasive plants, a focus on trail stabilization also needs to be initiated. Currently, the trails of this area of the park are extremely steep and slippery when wet. Trails that pass through the wet area are constantly muddy and inundated with water. Our group proposes first to extend the existing wooden bridge across the wet area while adding an additional bridge further up the hillside on an area of the trail that is constantly interrupted with water. By adding bridge structure, the trails will be protected against erosion from water while being safer and drier for pedestrians to walk on. To address the steepness of the surrounding trails, we propose terracing the trail with logs left over from hazard tree cuttings. This will create the effect of "steps" and help park visitors to not slip or fall during wet weather conditions.

- **Soil Amendments and Preparation:**

  A soil test was done based on 5 samples taken from different areas of this site. No major deficiencies were found, however, it was discovered that the soil is too alkaline in some areas and not conducive to vigorous plant health (especially for native plants). In the soil test results, it was recommended that certain sections the soil be amended with sulfur to increase acidity. However, elemental sulfur is difficult to find; Professor Linda Chalker-Scott of the University of Washington, recommends we use Ammonium Sulfate, an amendment that can easily be found at any garden center or nursery. Ammonium Sulfate is absorbed only on soil particles (which makes it ideal for wet areas), does not move readily with soil water (so it lasts longer), and will also deliver the form of nitrate more beneficial to the plant and the soil over time. This will be done to the soil most likely after the invasives have been removed, but before the mulch and planting. In addition to adding sulfur to the soil, one goal of the project is to reduce the chances of erosion and soil destabilization. This will be accomplished by pulling plants in stages, mulching with coarse wood chips directly after, and planting new native plants soon after to minimize the time when the soil is bare and root free. Areas of the site that will receive soil amendment are as follows:

1. Forest Wet Area: The pH in this portion of the site is too high to support native plant growth. Native forests in the Pacific Northwest are commonly acidic, ranging from 3.5-5.5 on the pH scale. This wet area was tested at a pH of 6.8. While this is an optimal pH for growing ornamental plants, it is too high for the natives that will be planted in this area. To increase acidity in new plantings, it is recommended to incorporate sulfur at 4 cups per cubic yard. For existing plantings, add ¾ cup sulfur every 100 square feet as a top dressing. In addition to adding sulfur, spreading an acidic organic mulch such as pine needles will increase acidity.

2. Middle (Top) of Historic Cable Car Bridge: The soil in this area is sufficient for all types of plant growth except ground covers because they require more acidity. Follow guidelines for amending with sulfur as noted in #1. In addition to sulfur amendment, treat site with wood chips as mulch.

3. Sandy Trail, End of Bridge (Gateway Area): The soil in this area is sufficient for all types of plant growth except ground covers because they require more acidity. Follow guidelines for amending with sulfur as noted in #1. In addition to sulfur amendment, treat site with wood chips as mulch.

- **Site Preparation Timeline**

  Year 1

  February-Arborist to diagnose and remove hazard trees.
  April-Do all trail maintenance.
  June-Remove Holly, Clematis, and Cherry Laurel and mulch area to eight inches.
  August- Mow and apply herbicide to Blackberries and Ivy and mulch area to eight inches.
  September- Continue to remove remaining invasives, begin soil preparation and amendment for planting in November, and mulch area with wood chips to eight inches.

Installation

Once the site preparation has been completed, you are ready to do the installation. Installation will occur in two phases. In the first phase, shrubs and woody species are planted in the fall. This allows the new plantings time to grow roots and adjust to soil conditions over the rainy winter season. The second phase of planting is done in the spring, when herbaceous species are planted.

Phase One
Species to Plant

Common Name	Scientific Name	Approximate Quantity
Vine Maple	*Acer Circinatum*	9
Star Magnolia	*Magnolia stellata*	20
Winter Daphne	*Daphne odora*	50
Red Elderberry	*Sambucus racemosa*	20
Indian Plum	*Oemleria cerasiformis*	10
Sword Fern	*Polystichum munitum*	20
Red-Osier Dogwood	*Cornus stolonifera*	15
Common Nine Bark	*Physocarpus opulifolius*	15
Common Snowberry	*Symphoricarpos albus*	35
Red Huckleberry	*Vaccinium parvifolium*	17
Evergreen Huckleberry	*Vaccinium ovatum*	17
Dull Oregon Grape	*Mahonia nervosa*	20
Western Red Cedar	*Thuja plicata* 'Atrovirens'	5
Western Hemlock	*Tsuga heterophylla*	4

Phase Two
Species to Plant

Common Name	Scientific Name	Approximate Quantity
Creeping Thyme*	*Thymus serpyllum*	60
Red Flowering Currant	*Ribes sanguineum*	26
Thimbleberry	*Rubus parviflorus*	7
Salmonberry	*Rubus spectabilis*	11
Bracken Fern	*Pteridium aquilinum*	15
Skunk Cabbage	*Lysichiton americanum*	12
Fringe Cups	*Tellima grandiflora*	30
Piggyback Plant	*Tolmiea menziesii*	25
Hellebore	*Helleborus x hybridus* 'Winter Queen'	25
Western Trillium	*Trillium ovatum*	22

* We recommend a mixture of the following cultivars of creeping thyme: Hartington Silver, Highland Cream, Golden Lemon, and RedC.

- **How to install a plant**

There are seven steps to installing a plant. First, look at the root system of the plant. Then dig a hole at least twice as wide but no deeper than the root mass. Second, create a small mound at the bottom of the hole and rough up the inner edges of the hole so that they are no longer smooth from the shovel. Third, place the tree in the hole and spread the roots so they are directed outwards, not down. This ensures that the plant will be equally supported on each side. Next, fill the hole in with only the soil that came out of the hole. It is important not to add anything foreign to the planting hole. The fifth step is to create a berm around the plant at least six inches away from the trunk. This helps draw water toward the roots. Apply mulch outside of the berm to a height of eight inches. Mulch is applied outside the berm because plant stems/trunks need at least six inches of cleared space around them. The last step in plant installation is to water the plant.

- **Notes**

There are a few more instructions and tips for different types of plant installation. For bareroot plants, make sure the roots don't dry out before planting by setting the plants in either sawdust or mulch. This keeps the roots moist while you dig the hole. When you are ready to put the plant in the ground, simply take it out of the sawdust/mulch, brush it off, and proceed according to the instructions above. Ball and burlap plants should have all burlap, string, and as much soil as possible removed before they are placed in the ground. Not all burlap and string are biodegradable and those that aren't can cause problems for the plant in the future. The soil in the root ball should be removed because it is not the same as the soil the plant will be rooted in. Putting the remnant soil into the planting hole with the roots is essentially amending the planting hole, which is something that should be avoided. Container plants should have as much soil removed from their roots as well for the same reason. For container plants that have circling roots, four equally-spaced vertical slices should be made in the root mass. This does not harm the roots. Instead it causes the roots to both stop circling and to produce new roots. Finally, newly installed plants should not be pruned. Pruning causes the plants to put more energy into producing leaves and branches. This is bad for newly installed plants because they should be directing their energy to forming new roots. The only exception to this rule is to cut off damaged branches that are going to die anyways.

- **Timeline**

Year 1
November-Plant Phase One.
Year 2
April-Plant Phase Two.

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Management

Once the installation is complete, there are four steps to managing the site. They are: cutting/applying herbicide to the blackberries and ivy, hand-pulling weeds, maintaining mulch levels, and assessing planting success and re-planting if necessary.

- **Cut/Herbicide Blackberries and Ivy**

  The blackberries and ivy should be cut down again every August because it is the time in their lifecycle that they are the most vulnerable. They will need to be cut back because blackberries have large root balls that store nutrients and can send up new shoots. Ivy is just very vigorous and invasive. Eventually the native plants installed will shade out these invasives, but until this time, they should be cut back. Applying Roundup to the cut stems increases the likelihood that the blackberries and ivy will die.

- **Hand-Pull Weeds**

  As with the blackberries, it is important to pull weeds and other invasives out as they emerge. We recommend weeding every spring so that herbaceous weeds as well as invasive seedlings are removed.

- **Mulch**

  The benefits of mulch cannot be stressed enough. Mulch adds nutrients to the soil, suppresses weeds, insulates plants in the winter, and absorbs water in the summer, cooling plants. The recommended mulch regime for our site is eight inches the first two years, six inches the third year, four inches the fourth year, and two inches the fifth year. We recommend initially mulching after removing the invasives, and again after the plant installation. We also advise reducing the mulch from eight inches to two inches because initially a high level of mulch is required to suppress weeds and nourish new plantings. Over time the plants need to adapt to having less mulch, to make sure they can survive without it when the site is no longer managed.

- **Plant Assessment/Re-Planting**

  In any restoration or landscape installation, it is necessary to assess the success of the initial installation. It is natural that a few plants won't survive. The reasons for this are varied, ranging from disease to improper care to bad installation. The solution is to re-plant. Two years after the installation we recommend re-planting to replace any failed plants. We recommend waiting two years to do this because we believe that one year just isn't enough to determine whether a plant has taken to the site or not. To replace the plant, simply remove the failed plant and follow the planting instructions found in the installation section to replace it with a healthy plant of the same species.

Management Timeline

- **Year 2**
  -March-Hand-pull new weeds and invasives.
  -**August-**Cut/Herbicide Blackberries and Ivy.
  -**November-**Mulch to eight inches.

- **Year 3**
  -March-Hand-pull new weeds and invasives.
  -**August-**Cut/Herbicide Blackberries and Ivy.
  -**November-**Mulch to six inches. Assess shrubs and woody species and plant more if necessary.

- **Year 4**
  March-Hand-pull weeds and invasives.
  April-Assess herbaceous species and plant more if necessary.
  August-Cut/Herbicide Blackberries and Ivy.
  November-Mulch to four inches.

- **Year 5**
  March-Hand-pull weeds and invasives.
  August-Cut/Herbicide Blackberries and Ivy.
  November-Mulch to two inches.

Integrated Timeline

Site Prep
Installation
Management

- **Year 1**
  February-Arborist to diagnose and remove hazard trees.
  April-Do all trail maintenance.
  June-Remove Holly, Clematis, and Cherry Laurel and mulch to eight inches.
  August- Mow and herbicide Blackberries and Ivy and apply mulch to eight inches.
  September-Continue to remove remaining invasives, begin soil preparation and amendment for planting in November, and mulch area with wood chips to eight inches.
  November-Plant Phase One: Shrubs and Woody Species. Apply mulch as topdressing to eight inches.

- **Year 2**
  -**March-**Hand-pull new weeds and invasives.
  -**April-**Plant Phase Two: Herbaceous species. Apply mulch as topdressing to eight inches.
  -**August-**Cut/Herbicide Blackberries and Ivy.
  -**November-**Mulch to eight inches.

- **Year 3**
  -**March-**Hand-pull new weeds and invasives.

-**August-**Cut/Herbicide Blackberries and Ivy.
-**November-**Mulch to six inches. Assess shrubs and woody species and plant more if necessary.

- **Year 4**
  -**March-**Hand-pull weeds and invasives.
  -**April-**Assess herbaceous species and plant more if necessary.
  -**August-**Cut/Herbicide Blackberries and Ivy.
  -**November-**Mulch to four inches.

- **Year 5**
  -**March-**Hand-pull weeds and invasives.
  -**August-**Cut/Herbicide Blackberries and Ivy.
  -**November-**Mulch to two inches.

Appendix A: Soil Results Assessment

Soil quality can greatly affect plant health. For instance, available nutrients, compaction, and drainage are only a few of the qualities considered when assessing a soil. Our initial assessment of our site at Frink Park included taking five soil samples and sending them to a processing lab at the University of Massachusetts, Amherst. Their analysis results and our recommendations follow, but first a few notes.

Notes on Soil Results: On many of the samples, the lab results tell us that our soil pH is too high. When this is written, it means that compared to a typical Pacific Northwest native plant forest, the soil pH is too high. For example, most forest soils in the Pacific Northwest are acidic, ranging from 3.5-5.5 on the pH scale. One of our soil results tells us that our soil pH is too high at 6.8. The optimal range for plant growth pH is 5.5-7.5. A pH of 6.8 may be too high for native plants that are used to growing at a pH of 4, but for ornamental plantings it may be ok. In Arboriculture, 4th Ed. by Harris, Clark and Matheny, it states that "elemental sulfur increases acidity" so this may be a consideration if levels of acidity should be increased. However, elemental sulfur is difficult to find; University of Washington Professor Linda Chalker-Scott recommends we use Ammonium Sulfate. Ammonium Sulfate is absorbed only on soil particles (which makes it ideal for wet areas), does not move readily with soil water (so it lasts longer), and will also deliver the form of nitrate more beneficial to the plant and the soil over time. If this is a natural forest area, why is the acidity so high in this park? Poorly drained sites or areas where water collects, as well as areas with limited conifer growth all experience more alkaline conditions. The areas of our site that have high pH have both of these qualities.

Basic Rule of Thumb: when planting native plants and ornamental groundcovers, we need to amend the soil to match it to the more acidic "natural" soil conditions common in this region. Other ornamental plantings will probably do fine with a pH between 5.5-7.5. As our forest matures and we have more conifers, they will help maintain increased soil acidity.

A Small Lesson in Ecology: Coniferous forests thrive in the Pacific Northwest because of the mild climate and ample winter rainfall. They drop their needles throughout the year; and when the needles decompose, they make the soil acidic. Many of our native shrubs are Ericaceous plants, from the family Ericaceae, that thrive in acidic soil. The family includes plants such as rhododendrons, azaleas, kinnikinnick, heather and others.

- **Sample 1: Forest Wet Area**

  Results: For all plant types (Ericaceous, ground covers, deciduous trees, shrubs, vines): This soil acidity is too high (6.8 pH). To increase acidity in new plantings, incorporate sulfur at 4 cups per cubic yard. For existing plantings, add ¾ cup sulfur every 100 square feet as a top dressing. In addition to adding sulfur, spreading an acidic organic mulch such as pine needles will increase acidity.

  Recommendations: Add sulfur as well as acidic mulch throughout site.

- **Sample 2: 15 feet from Bridge (Transition from Bridge into Forest)**

  Results: This area has adequate pH (5.5), good nutrient levels, and high organic matter. These are optimal conditions for growing all types of plants; however mulch is recommended to retain moisture and suppress weeds.

  Recommendations: Mulch only, no amendment needed for any plant type.

- **Sample 3: Downhill From Slope, 20 feet from trail (On Side of Steep Slope in Forest Area)**

  Results: For deciduous trees, shrubs and vines, the soil is optimal with sufficient pH (6.1), good nutrient levels and optimal organic matter. However, for growing Ericaceous shrubs or groundcovers, the pH is too high and sulfur is once again recommended (refer to sample 1). In addition, the potassium level in this area of the site is extremely high. It is advised not to add any fertilizer with potassium in it at this time.

  Recommendations: Because virtually no Ericaceous shrubs or ground cover will be planted in this area no amendment is needed. Mulch should be added as a top dressing. Do not add potassium.

- **Sample 4: Middle of Bridge**

  Results: For deciduous trees, shrubs and vines, the soil is optimal with sufficient pH (6.0), good nutrient levels and optimal organic matter. However, for growing Ericaceous shrubs or groundcovers, the pH is too high and sulfur is once again recommended (refer to sample 1).

Recommendations: Because virtually no Ericaceous shrubs will be planted in this area, amend with sulfur only in areas of ground cover. Otherwise, no amendment is needed for the rest of the area. Mulch should be added as a top dressing.

- **Sample 5: Sandy Trail, End of Bridge (Gateway Area)**

Results: For deciduous trees, shrubs and vines, the soil is optimal with sufficient pH (6.0), good nutrient levels and optimal organic matter. However, for growing Ericaceous shrubs or groundcovers, the pH is too high and sulfur is once again recommended (refer to sample 1). In addition, the potassium level in this area of the site is extremely high. It is advised not to add any fertilizer with potassium in it at this time.
Recommendations: Because virtually no Ericaceous shrubs will be planted in this area, amend with sulfur only in areas of ground cover. Otherwise, no amendment is needed for the rest of the area. Mulch should be added as a top dressing. Do not add potassium.

Results and Interpretation of Soil Tests

The goal of soil testing is to provide guidelines for the efficient use of soil amendments, such as lime and fertilizer. Those provided with your soil test are the best now available for the crop chosen. Problems directly related to disease, insects, and to some extent weather and cultural practices can not be addressed by a soil test.

The Soil Sample - One of the most important steps in soil testing is obtaining the soil sample. It should represent the soil in which the plants are or will be growing. Randomly take several small samples across the area of concern, through a depth that contains or will contain the bulk of the plant's roots. A poor sample will result in bad recommendations.

- **SOIL TEST RESULTS**

Soil pH, Buffer pH, and pH adjustments - Soil pH is a measure of the soils acidity and is a primary factor in plant growth. When pH is maintained at the proper level for a given crop, plants nutrients are at maximum availability, toxic elements are often at reduced availability, and beneficial soil organisms are most active. Most plants prefer a soil pH between 5.5 and 7.5 and the majority do best in the middle part of this range. Some notable acid-loving exceptions are blueberries, potatoes, and rhododendrons.

Due to the climate and rock-types in which the soils of New England have formed, soils here tend to be naturally very acidic (4.5-5.5). For this reason they must often be amended with materials capable of raising the pH. Many products are available to accomplish this, but ground limestone is the most common. Lime recommendations are made in its terms.

Buffer pH is a measure of the soil's capacity to resist pH change after lime has been added. Two soils with the same soil pH may have quite different buffer pH's, and thus one will require significantly more limestone than the other to obtain an optimal soil pH. The extent to which the buffer pH is lower than 6.8 is proportional to the amount of limestone needed.

Occasionally soil pH must be lowered, because either the plant requires acid soil, or the soil was previously over-limed. Incorporating elemental sulfur is the most effective way to lower soil pH. In the soil the sulfur oxidizes to sulfuric acid. One to two pounds of sulfur will lower the pH of most New England soils about 0.5 unit. Unfortunately, sulfur is rarely available in garden centers. Contact the Soil Lab for other options.

Cation Exchange Capacity and Percentage Base Saturation - Cation exchange capacity (CEC) is an important measure of the soil's ability to retain and to supply nutrients. The bulk of this capacity in limed New England soils resides in finely divided soil organic matter. A smaller contribution comes from the soil's clay particles. The basic nutrient cations (positively charged ions) of Calcium (Ca^{++}), Magnesium (Mg^{++}), and Potassium (K^{+}), and the acidic cations of Aluminum and Hydrogen account for nearly all the adsorbed cations in the soil. Very sandy soils, low in organic matter, commonly have CEC's less than 5. New England soils with very high CEC's (greater than 40) are invariably rich in organic matter. A CEC between 10 and 15 is typical and usually adequate.

CEC is important because it represents the primary soil reservoir of readily available Potassium, Calcium, Magnesium and several micronutrients. It also helps to prevent their leaching. The ease with which a plant gains access to these nutrients depends somewhat on the relative percentages of the adsorbed cations. For this reason it is suggested that percentage saturation levels be held within loosely defined ranges. For example, a soil with base saturations of Calcium 70%, Magnesium 12% and Potassium 4% would is considered balanced for most crops and has a soil pH of about 6.5.

Individual Nutrients

Nitrogen (N) - Nitrogen is **essential** to nearly every aspect of plant growth. Nitrogen is absorbed from the soil as nitrate (NO3-) and ammonium (NH4+). This soil test estimates their current levels. Fertilizer recommendations are not generally made on the basis of these measurements because their levels can fluctuate greatly with soil and weather conditions over short periods of time. Instead, they are used to assess extremes of nitrogen fertility. For example, very high ammonium levels can be toxic to theroots of many plants, particularly if the soil pH is above 7. Very high levels of either form may coincide with fertilizer “burn." Recommendations are made on the presumptions that very little nitrogen remains in the soil after the growing season and that most crops require between 1 and 4 lbs of nitrogen per 1000 square feet per year. Adjustments are often made for soils recently or continuously supplied with manure or compost, which contain nitrogen that will be released during the growing season.

Phosphorus (P) or Phosphorus Pentoxide (P2O5) - Among other important functions, phosphorus provides plants with a means of using the energy harnessed by photosynthesis to drive its metabolism. A deficiency of this nutrient can lead to impaired vegetative growth, weak root systems, and fruit and seed of poor quality and low yield. Soil phosphorus exists in a wide range of forms. Some is present as part of soil organic matter and becomes available to plants as the organic matter decomposes. Most inorganic soil Phosphorus is bound tightly to the surface of soil mineral particles. Warm, moist, well aerated soils at about pH 6.5 optimize the release of both these forms. Plants require fairly large quantities of phosphorus, but the levels of phosphorus available to plant roots at any one time is quite low. Soil tests attempt to assess the soil’s ability to supply phosphorus from bound forms during the growing season.

Potassium (K) or Potash (K2O) - Potassium rivals nitrogen as the nutrient element absorbed in greatest amounts by plants. Like nitrogen, a relatively large proportion of plant-available potassium is taken up by crops each growing season. Plants deficient in potassium are unable to utilize nitrogen and water efficiently, and are more susceptible to disease. Most available potassium exists as an exchangeable cation (see above). The slow release of potassium from native soil minerals can replenish some of the potassium lost by crop removal and leaching. This ability, however, is limited and variable. Fertilization is often necessary to maintain optimum yields.

Calcium (Ca) - Calcium is essential in the proper functioning of plant cell walls and membranes. Sufficient calcium must also be present in actively growing plant parts, especially storage organs such as fruits and roots. Properly limed soils with a constant and adequate moisture will normally supply sufficient calcium to plants. High humidity and poor soil drainage hinder calcium movement into these plant parts and should be avoided.

Magnesium (Mg) - Magnesium acts together with phosphorus to drive plant metabolism and is part of chlorophyll, a vital substance for photosynthesis. Like Calcium, Magnesium is ordinarily supplied through liming. Low magnesium levels in many soils will normally not cause problems provided the exchangeable cations (see above) are in good balance. If Mg levels are low and lime is required, dolomitic lime (rich in Mg) will be recommended. If Mg is low and lime is not required, Epsom salt (magnesium sulfate) may be incorporated at a rate of 5-10 lbs/1000 square feet.

Micronutrients - The micronutrients are elements essential to plants, but required in very small amounts. In most properly limed soils they are available in sufficient quantities. Five of these (iron, manganese, zinc, copper, and boron) are tested routinely . Micronutrient fertilizer recommendations are not available. Extremely high values, however, are noted.

Aluminum - Aluminum is not an essential nutrient for plants. At elevated levels it can be extremely toxic to plant roots and limit the plant's ability to take up phosphorus. Extractable aluminum increases greatly at soil pH's below 5.5. Proper liming, however, will lower aluminum to acceptable levels. Aluminum sensitivity varies greatly with plant type. Acid-loving plants, such as rhododendrons, can tolerate very high aluminum levels. Lettuce, carrots and beets are very sensitive. Hydrangea, a non-sensitive plant, produces blue flowers at low pH and pink flowers at high pH due to the effect of aluminum on pigment formation.

Toxic <u>Heavy</u> <u>Metals</u> - This laboratory routinely tests lead (Pb) and cadmium (Cd). Lead is naturally present in soils in the range of 15 to 40 parts lead per million parts soil (ppm). At these levels it presents no danger to people or plants. Soil pollution with lead-based paints and the tetraethyl lead of past automotive fuels have increased soil lead levels to several thousand ppm in some places. Unless the total lead level in your soil exceeds 150 ppm, it is simply reported as low and can be considered safe (assuming the sample submitted was representative of the area of concern). Values above 300 ppm are potentially dangerous to people. In such cases consult the separate insert on soil lead levels.

Cadmium is extremely toxic to both plants and animals. It is naturally present in soils at safely low levels (less than 1 ppm). Industrial discharges of cadmium, however, often cause municipal sewage sludge to contain elevated levels of cadmium. Composted sludges are often used as soil amendments. Although safe upper limits of cadmium for both plants and animals have not been established, monitoring soil Cd levels helps avoid excesses when such materials are used. Unless the cadmium in your soil exceeds 1 ppm it is not reported.

Soluble Salts - Soluble salts (SS), such as those used on roads to promote melting and those present in many commercial (and some natural) fertilizers, can cause severe water stress and nutritional imbalances in plants. Generally, seedlings are more sensitive than established plants to elevated SS levels and great variation exists between plant species. Most soils have values between 0.08 and 0.50 by the method used by this lab. The middle of this range is typical of most fertile mineral soils. Values higher than 0.60 may cause damage to sensitive plants (such as onions, etc.). A SS level can change rapidly in the soil due to leaching (washing out), so evaluating its significance must consider the effects of time and growing conditions. Excessive SS levels can often be corrected by leaching with liberal amounts (2 to 4 inches) of fresh water. Normal off season precipitation will usually correct salt problems resulting from over-fertilization.

GENERAL COMMENTS- Implementing the recommendations given in the enclosed report will correct the nutrient status of your soil for the plant type indicated. It may or may not solve a given horticultural plant growth problem. Other cultural factors may need to be evaluated. Many reports provide both “natural and organic” and “synthetic chemical” fertilizer alternatives.

The numerical results of this soil test reflect the properties of your soil and the analytical procedures used by the UMass lab. One can not directly compare the extracted nutrient levels of one laboratory to those of another, because different labs may use different procedures. However, the evaluation of the results (whether they represent low, medium or high levels) and the accompanying recommendations should be consistent between labs if all other factors of crop production are the same.

*For the convenience of everyone, a hard copy of the actual soil test results has been inserted at the back of this document

Appendix B: Budget

- Bridge

  Design Inc. (206-365-4145) a landscape construction company estimated the two foot bridges located in the natural area of the park, for a total of $1,200.00 ($600 ea). This number is not exact and is a variable dependent upon materials cost

- Gravel

  Pacific Topsoil carries a 5/8 minus size of gravel, which is estimated at $34.25 per yard. 5/8 Minus settles into a compacted and smooth walking surface. We recommend 30 yards of gravel making the estimated price $1027.50.

- Mulch

  Pacific Topsoil sells a wood chip mulch (type: path way mix) that sells for $11.50 per yard. We recommend 100 yards of mulch as a starter (although more will probably be needed). This works out to a total cost of $1150.00. This cost can be offset by contacting the Arborists who operate in and around the Leschi area. They will often give free chipped wood after working in yards. Please make sure to specify that no invasive plant species are mulched in the mix.

- Soil

  Pacific Topsoil carries a non-organic soil media (type: screen loam). This type is priced at 13.03 per yard. We recommend 25 yards for a grand total of $325.75.

  *All mulches, soils and gravel can be ordered from Pacific Topsoil (425-451-3707) Prices are a variable of bulk and will change with season, quantity of order, and type of material.

Common Name	Scientific Name	Nursery	2"-4" pots	1-2 gal	4-5 gal	5-7 gal	7-8 gal	BB (2/3')	Approx. QTY
Gateway									
Vine Maple	*Acer circinatum*	Wells-Medina			49.5	69.95	87.5		2
Star Magnolia	*Magnolia stellata*	Wells-Medina			42-62				20
Bridge									
Creeping Thyme	*Thymus serpyllum*	Wells-Medina	2.75						60
Red Flowering Currant	*Ribes sanguineum*	Wells-Medina		24.95				30	26
Winter Daphne	*Daphne odora*	Wells-Medina		39.95					50
Transition									
Red Elderberry	*Sambucus racemosa*	Wells-Medina			~35.00				20
Indian Plum	*Oemleria cerasiformis*	Swansons		10.95		35-40			10
Thimbleberry	*Rubus parviflorus*	Swansons		10.95		35-40			7
Salmonberry	*Rubus spectabilis*	Wells-Medina		9.95-14.95					11
Vine Maple	*Acer circinatum*	Wells-Medina			49.5	69.95	87.5		3
Forest Area									
(Ferns)									
Sword Fern	*Polystichum munitum*	Wells-Medina		12.95					20
Bracken Fern	*Pteridium aquilinum*	Wells-Medina		9.95-14.95					15
(Wetland Plants)									
Skunk Cabbage	*Lysichiton americanum*	MSK Nursery		9.95-14.95					12
Fringe Cups	*Tellima grandiflora*	MSK Nursery		9.95-14.95					30
Piggyback Plant	*Tolmiea menziesii*	MSK Nursery		9.95-14.05					25
(Shrubs)									
Common Nine Bark	*Physocarpus opulifolius*	Wells-Medina							15
Common Snowberry	*Symphoricarpos albus*	Wells-Medina	24.95						35
Red Huckleberry	*Vaccinium parvifolium*	Wells-Medina	24.95						17
Evergreen Huckleberry	*Vaccinium ovatum*	Wells-Medina	24.95						17
Indian Plum	*Oemleria cerasiformis*	Swanson's		10.95		35-40			6
Dull Oregon Grape	*Mahonia nervosa*	Wells-Medina	2.75						20
(Flowers)		Wells-Medina							
Hellebore	*Helleborus 'Winter Queen'*	Wells-Medina		19.95					25
Western Trillium	*Trillium ovatum*	Wells-Medina	9						22
(Trees)		Wells-							

		Medina							
Western Red Cedar	*Thuja plicata 'Atrovirens'*	Wells-Medina		3/4' BB 50.00					5
Red Osier Dogwood	*Cornus stolonifera*	Wells-Medina		14.95					15
Western Hemlock	*Tsuga heterophylla*	Wells-Medina		12.00-18.00					4
Vine Maple	*Acer circinatum*	Wells-Medina			49.5	69.95	87.5		4

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