North Creek Forest Restoration

Bothell,
University of Washington

University of Washington Restoration Ecology Network Capstone 2014-15

Location: North Creek Forest,NE 204 and 108 Ave NE, Bothell, WA 98011

Client:

Emily Sprong, Executive Director: Friends of North Creek Forest

Team Members:

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PROJECT SUMMARY

Overview

This is a detailed report of the 2014-2015 North Creek Forest restoration project for Friends of North Creek Forest. A team of six students from the University of Washington Restoration Ecology Network (UW-REN) Capstone course structured and applied a restoration plan unique to this forest between October 2014 and May 2015. This project was made possible through Friends of North Creek Forest, community volunteer effort and the course instructors. Three UWREN restoration projects have already taken place and more are planned for the future as Friends of North Creek continues to purchase, protect and enhance Bothell's largest remaining forest.

Figure 1: Yard waste pile in polygon 1 prior to restoration

Figure 2: Polygon 1 after the waste pile removal and restoration

Summary

Before restoration began, this site's western edge was beginning to be overwhelmed by the invasives *Hedera helix, Rubus bifrons* and *Ilex aquifolium*. Many of the trees along the western edge were overgrown with *H. helix* reaching up into the tree canopy and working its way into the forest while *R.bifrons* was beginning to infiltrate the understory. These invasives were inhibiting the succession of native species and needed to be removed before installing a diverse range of native plants. The surrounding forest acted as a reference when designing a work plan.
The project goals are to:

- Protect and enhance the establishment of the low-elevation western hemlock forest community
- Enhance the forest ecosystem function and species diversity
- Encourage both short term and long term community involvement

Major accomplishments for this project were:

- Removed sixteen cubic yards of invasive plant material and yard waste
- Installed 39 different species of plants
- Built a total of 14 living fascines and wattles
- Logged 846.5 community volunteer hours and 798 team hours
- Created a community gathering and educational areas on site

Figure 3: Team Photo: (from left) Autumn Nettey, Jordan Muhs, Mckenzie Brocker, Savannah Rose, Ashley Shattuck, and Tahira Nurjaman

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Eagle Scouts for their installations of a trail staircase to make the entrance to our site safer, as well as a community bulletin board which made engaging and education of the public possible.

Text Revisions

Background

In 2000 when the North Creek Forest (NCF) was slated for development, concerned citizens began to organize to oppose the destruction of the forest. After eleven years of no conservation efforts, Jim and Carolyn Freese decided to take a stand to protect their backyard, the largest remaining forest in Bothell. Friends of The North Creek Forest (FNCF) was formed in 2011 and began the process of procuring the forest land, purchasing over nine acres in 2013. While continuing to secure the remaining acres from development they were also actively involved in building stewardship through community. With hundreds of thousands of volunteer hours, the forest is being restored and is on track to function as a healthy ecosystem (FNCF).

A. Location

The North Creek Forest site is located within the city of Bothell, just south of the Snohomish County line that divides the city. The site is located within a conservation easement held by the homeowners association of the surrounding Maywood neighborhood. To the west, the site is bordered by the housing subdivision. To the east it is bordered by the western edge of North Creek Forest (NCF), a 64-acre mixed-conifer urban forest. The forest is surrounded by the city of Bothell on three sides and by Interstate-405 to the east (Fig. 1). A small greenbelt leads from the NCF into the suburban matrix, following NE 204th Pl. in an east-west direction behind residential properties. In addition to the homes, there are schools and a few small parks that make up the area west of the site. The closest park is Royal Oaks, a 2.5-acre neighborhood park two blocks to the west of the site. It contains mature shrubs and conifers, but is primarily landscaped as a small recreational park with play areas and sports courts.

B. Site Polygons

The five polygons are divided based on specific challenges, existing plant communities, and topography. Strong visual features are referenced, such as the waste pile, trails, culvert, and the stream and used to delineate polygon boundaries (Fig. 2).

Polygon 1 (P1) has a thirty year-old neighborhood yard waste dump pile near the street, that spills down into the ravine. *R.bifrons* marks the south boundary of this polygon.
Polygon 2 (P2) begins at the trailhead and runs north just past the *H. helix* covered trees such as *Alnus rubra*. Both P1 and P2 are flat and run along the top western edge of the ravine.
Polygon 3 (P3) is steep with a sixty degree slope that tapers off into polygon 4 (P4). The trail is the southern border for both P3 and P4.
Polygon 4 (P4) is bound on two sides by the trail. It is distinguishable by its relatively flat topography and its lack of invasives.
Polygon 5 (P5) is located south of the creek and below P1. This polygon's eastern edge includes the beginning of a cluster of *I. aquifolium*. The stream is not included in the restoration site.

C. Physical Factors

Friends of the North Creek Forest have identified a critical area within the conservation easement for the project site. The site begins at the eastern edge of the street and continues east into the forested ravine for approximately 100 feet, where the topography begins to level out. Overall, the site is 1/3-acre in size and is currently a second-growth forest composed primarily of mixed deciduous/conifer overstory. The understory is made up of species commonly associated with second-growth forested riparian sites in the western hemlock eco-region. The dominant canopy layer includes *Alnus rubra* and *Acer macrophyllum,* and has a dominant shrub layer composed primarily of *Rubus spectabilis* and *Polystichum munitum*. The site has elements representative of wetland, riparian, and upland forested areas found throughout the lower Puget Sound region. Groundwater flows out of a culvert and is cutting through the southern third of our site. The water runs into North Creek, a Class II salmon bearing stream, which flows into a large expanse of wetlands that abuts UW Bothell and Cascadia College campus. Ground water also seeps from the steep slope and is known to be present throughout most of the year (FNCF 2011). A significant portion of the site is located on the steep slope, while a portion of our site sits outside of the city owned property and is located within easement property controlled by 26 homeowners.

D. Existing Biota and Soils

The soils on the site are consistent in composition. In P1 the soil profile had a very thin organic horizon, atop loamy-sand which transitioned into coarse gravel after about a foot in depth. The soils were a dark brown/black color, indicative of rich organic content, but not well developed. At the base of the slope in P3, the soil has a similar profile, composed of sandy/loam, but having coarser grained sands than in P1. The A horizon was rich in organic content and the organic horizon was better developed than the soil profile from P1. A foot down in the soil in both polygons coarse gravel became the dominant component. The results of this soils analysis remain consistent with National Resources Conservation Service(NRCS) soil survey data which classify the surrounding soils as "Alderwood gravelly sandy loam". The NRCS soil survey additionally classifies the soil components as being 85% Alderwood, 5% Everett, 5% Indianola, 3% Shalcar, and 2% Norma (NRCS WSS 2014). There were no obvious signs of soil compaction, but there were several depression areas heavily saturated with water. Parts of the trail adjacent to stream headwaters, seep and become heavily saturated during storm events.

The Department of Natural Resources general community classifications do not accurately describe the floristic composition because the site has previously been disturbed (Chappell 2006). The dominant overstory species are *A. macrophyllum* and *A. rubra*. The less dominant tree upper canopy species include a few conifers, such as *Thuja plicata* and *Tsuga heterophylla*. *R. spectabilis*, *Acer circinatum* make up the majority of the mid-level canopy. Currently, the understory is characterized by *Polystichum munitum, Rubus ursinus, Oemleria cerasiformis* and *R. spectabilis.*

Restoration Needs and Opportunities

The three main invasive species *H.helix, R.bifrons* and *I.aquifolium* are in need of removal and control. P1 and 2 both have large clumps of *R. bifrons* that are beginning to grow down into the forest. P2 and 3 have *H. helix* covered trees and over half of the area of P3 is covered with *H. helix. I. aquifolium* has established in P2 and 3 and is beginning to appear in P5. P1 has two other exotics that will also require removal. When overlaying the invasive plants map onto the native plants map it is evident that the invasive plants are beginning to dominate the western portion of the site. These invasive plants are inhibiting this site from reaching a diverse late successional stage. Although no restoration will occur on the stream

running through the site, currently pollutants from the street and neighborhood drain directly into the stream, especially during storm events. Through the goals and objectives the runoff coming down the hill will be slowed and this will prevent further erosion.

Tasks and Approaches

Goal 1: Protect and enhance the establishment of the low-elevation western hemlock forest community within the site.

Objective 1-1: Remove and suppress invasive species both at its source and within the forest.
Task 1-1a. Remove all *H. helix* and *R. discolor*, both above and below ground. *Ilex aquifolium* will be removed as well.
AD1: R. discolor was removed from all polygons and border regions except for a 4x3-m clump that was left on the southern side of polygon 1 at the request of the neighboring homeowner who wanted access to berries for personal consumption.
Approach: Starting from the top of the slope, *H. helix* will be rolled into a round mat. Special care will be taken to pull any roots or runners that were left behind. Ivy that has climbed the tree will be cut around the circumference of the base of the tree at shoulder height and pulled back away from the tree. The portion of the plant remaining in the tree will be left there to dry. Removed plant material will be stored in a pile on a tarp to dry out until it can be removed from the site entirely. The aboveground segments of *R. discolor* will be removed by cutting with loppers and the root crowns will be dug out. All removed plant material will be stored in a waste pile until it can be removed.
Justification: Removal of the *H. helix* has been proven to be most successful when it is rolled from the ground up into a cylindrical mat or cut from around the base of tree. These removal methods allow for the protection of existing native vegetation. (Walama Restoration Project 1997). Removing the root crowns of *R. discolor* offers more certainty in the suppression of the species in the long run (Soll 2004).
Task 1-1b. Remove English holly (*I. aquifolium*) above ground.

AD2: *I. aquifolium* was left standing across the site as we lack the qualifications to pursue the most effective route of removal. Due to constraints of the project, FNCF has considered a management plan for the removal of holly in the near future.

Approach: Established holly bushes will be cut down and removed from the site. *I. aquifolium* is able to regenerate from shoots, so herbicide application would be ideal for best results.

Justification: Since holly is the least prominent invasive species on the project site, it is very imperative to remove it to prevent spread deeper into the forest (King County 2008). After the shrub has been cut, herbicide should be applied to the stem to kill roots and prevent regeneration from sprouting.

Task 1-1c. Cover soil with woodchip mulch to protect soil and suppress invasive plants.

Approach: After invasive plants are removed, woodchip mulch will be applied 6-10 inches deep. The mulch will be sourced from a local arborist in Woodinville.

Justification: Applying woodchip mulch has been proven to be effective at suppressing regeneration of weeds, preventing surface erosion, and retaining soil moisture. Mulch can impede the movement of water or falling precipitation and thus allow for better recharge into water table (Ewing 2014, Chalker-Scott 2007).

Objective 1-2: Remove yard waste pile.

Task 1-2a. Remove yard waste and dead plant material in pile.

Approach: The yard waste pile will be deconstructed using hand tools and physical removal by hand. Vegetation at the top of the pile will be removed first to expose the remainder of the pile beneath. Any woody debris will be separated and left on site, while all other material will be removed from the site entirely.

Justification: Communal yard waste piles are just one example of the many ways that invasive species are introduced to natural areas within an urban matrix. Invasive species are often encouraged when they are used in residential areas and the failure by members of the neighborhood to utilize yard waste services can result in unintended spread, as is the case on this particular site (Okerman 2000). Invasive plants can have rather direct impacts on natural areas, when they form monocultures, exclude native plants or change ecosystem functions. By removing the pile the potential for continued invasion from this particular source and thus

the threat of exclusion of native species and changing ecosystem functions is vastly reduced (Dozier 2001).

Objective 1-3: Promote ecological trajectory towards a late-successional stage.
Task 1-3a: Install a suite of species characteristic of a late-successional forest in the lowland Puget Sound region.
Approach: Two tree species (*T. heterophylla and T. plicata*) will be installed on the site in areas with dense upper canopy.
Justification: Emphasis will be given to establish individuals within close proximity to existing stands of A. rubra. This will allow *T. heterophylla* and *T. plicata* to establish well in the shade of the existing canopy, but will also guide successional trajectory towards future conditions as the *A. rubra* reaches the end of its lifecycle. *T. plicata* is often considered a climax species throughout the majority of its geographic range and thus a viable late-successional species to include on the site (Tesky 1992). Like *T. plicata, T. heterophylla* is also considered a climax, late-successional species in forests of the Pacific Northwest.

Objective 1-4: Create a vegetation buffer zone along the western edge of site.
Task 1-4a: Dig up sod and remove from site.
AD3: Sod was only removed from part of polygon 1 and a small section of polygon 2. A buffer of sod had to be left between the site and the road due to a buried utility cable.
Approach: Dig up and peel back the root mass of existing sod.
Justification: By removing root mass, the potential for the grass to continue to persist is greatly reduced. Exposing the soil will make installation of potted plants, stakes, and bare roots easier and make for less competition (from grass) until the newly planted individuals can establish. There are other methods that could be used to knock back the grass, such as solarization, but physical removal will prove more effective and feasible in such a small area (Pfeifer-Meister et al. 2007).
Task 1-4b: Install a native hedgerow buffer.
Approach: Aggressively growing species, particularly P. capitatus and H. discolor, will be planted quite densely on the northern border of the site.

AD4: *S. lucida* was also used as a buffer because it is fast growing and will quickly offer competition with encroaching himalayan blackberry.

Justification: This area is the most prone to invasion by non-natives on the site. By planting the area densely with such species, there is a greater chance at defending the site from invasion of nonnative species by creating a dense wall of vegetation. P. capitatus is a species that's widely used in restoration; not only for its stout structure, but also for its rooting capabilities which will help hold the soil in place (WACD 2014).

Goal 2: Enhance forest ecosystem function and species diversity.

Objective 2-1: Reduce erosion potential from invasive removal.

Task 2-1a: Install fascines on slope following invasive removal.

Approach: Cuttings from *S. lucida ssp. lasiandra, C. sericea,* and *R. spectabilis* will be collected locally, and then made into fascine bundles. The bundles will be embedded in the soil and secured horizontally along the slope areas with stakes.

Justification: Due to the steepness of the slope and the composition of the soil texture it is suitable to install a live fascine (COP 2008). Three foot cuttings will be collected in eight inch bundles and tied into twenty foot sections. A trench will be dug on the hillside following a contour line across the entire slope and the bundle will be placed into it and buried almost entirely (~80%). The live fascine will be held in place with stakes spaced every two feet (WSDOE 1993).

Task 2-1b: Plant *P. munitum* along the slope.

Approach: Salvaged *P. munitum* will be installed throughout the sloped areas and specifically above the newly installed fascines.

Justification: Anchoring the soil by creating a mass of living roots will help prevent soil erosion from continuing in P1 and P3. Building ridges of root and plant mass will divert and slow the water's descent down the slope which will increase the sites hydrological function.

Task 2-2c: Apply mulch to the slope

AD5: Mulch was applied to a depth of six inches on the slope. No mulch was applied in polygon 5 and mulch was applied in only a portion of polygon 4.

Approach: Mulch will be applied at a depth of 3"- 4" to help suppress the return of invasive species, mitigate soil erosion and to increase soil moisture retention.
Justification: Applying woodchip mulch has been proven to be effective at suppressing regeneration of weeds, preventing surface erosion, and retaining soil moisture. Mulch can impede the movement of water or falling precipitation and thus allow for better recharge into water table (Ewing 2014, Chalker-Scott 2007).

Objective 2-2: Increase native plant species diversity.
Task 2-2a: Apply and install a diverse palette of native plants species from a variety of local sources.
Approach: Snohomish County Conservation District will be the main supplier of plants augmented with salvaged plants and species from local nurseries. Bare root plants will be purchased instead of container plants whenever possible. To save money and conserve species, some plants will be sourced from salvage events. When possible species that can be live staked will be harvested.
Justification: Bare root plants have advantages over container plants in that bare root plants tend to have a higher survival rate, establish quicker, are generally older than container plants and have stronger woody stems and roots systems (Stevens 2004). Salvaging plants is cost effective. Guidelines in "Grow Your Own Native Landscape" will be carefully considered to help ensure transplanting success. Using a variety of sources to obtain native plants helps to increase species diversity.

Objective 2-3: Enhance structural habitat diversity.
Task 2-3a: Acquire a variety of native species with divergent growth characteristics.
Approach: Installing plants with diverse growth characteristics will create a multi-level canopy layer.
Justification: Planting a diverse palette of native species will attract native animals and repel or survive native organisms that harm them. Native plants often attract a wide variety of native animals and are more adapted to the region's climate and soil conditions. (Leigh) Introducing as many components of the natural community will sustain and increase wildlife

populations. Vegetative structural diversity ensures that the requirements for both food and habitat of individual species are met. (Harker, Evans, Evans, Harker 1993)

Task 2-3b: Install plants according to planting plan.

Approach: Plants gathered for each polygon are sorted by growth characteristics and dispersed throughout the site accordingly. The roots of bare root plants will be untangled and soaked in water for 3-6 hours; care will be taken to not let the roots dry out. A wide hole will be dug and the soil will be turned in a 3ft. radius around the hole. The plant will be inserted then the hole will partially filled, tamped down and filled to the root crown. Container plants will be removed from the container, the root ball will be broken up and roughened around the sides. If roots are curving they will be straightened out and encircled roots will be cut off where they begin to circle. The plant will be placed in the hole previously dug and the roots arranged to point outward. The hole will be partially filled with soil and water added, then tamped down, then filled completely with soil. All plants will be watered thoroughly after planting. Care will be taken to not allow puddles to form.

Justification: By planting species correctly the rates of survival and longevity of the species are increased. These planting methods have been presented as most effective for healthy plants (Leigh 2013, Chalker-Scott 2009).

Objective 2-4: Increase functional resiliency.

Task 2-4a: Install multiple species within the same niche which perform overlapping ecological functions and wide range tolerances.

Approach: Research will be done on plants which are more resilient to changes in climate which would be experienced by our site in the future. We will also plant species in quantities to ensure the highest survival rates and persistence of ecological functions.

Justification: Installing plants with a long term focus requires taking into account changes in climate which are taking place. Establishing a large diversity of species with overlapping niches increases the site's ability to be more resilient in the event of disturbances.

Task 2-4b: Install plants which attract wildlife.

Approach: The plants chosen have wildlife value for pollinators, insects, small birds, and small mammals.
Justification: Attracting wildlife is a goal for enhancement of a healthy and functioning forest. Additionally it may attract interest from the neighbors and surrounding schools in the native species which inhabit and pollinate the forest.

Goal 3: Encourage both short and long-term community involvement.

Objective 3-1: Create an aesthetically appropriate trail entrance.
Task 3-1a: Install a suite of native plants which are colorful and of different heights.
Approach: The buffer zone installed will serve as an aesthetically pleasing trail entrance. The plan is to install the entrance in multiple layers. The plants closest to the edge of the forest will be comprised of *A. circinatum, P. capitatus,* and *H. discolor.* The latter two species will be planted most densely and in the greatest quantities. The plants beyond these will consist of large amounts of *C. sericea,* along with a few *C. cornuta* and *A. grandis*. Closest to the street a multitude of species will be installed which flower and/or produce berries of multiple heights and growth forms. These include *R. sanguineum, P. lewisii,* and *F. vesca.*
Justification: By planting densely and in multiple layers, invasive species will be physically restricted from re-establishing in the site (Hedgerows 2014). Plants that are the tallest are chosen for the back of the entrance, nearest to the forest and proceed to get smaller in form as they approach the curb. This creates a gentle transition and aesthetically pleasing trail entrance into the urban matrix from the forest. Additionally, by making the trailhead attractive and planting densely we hope to curb the neighbors from dumping waste onsite.
Task 3-1b: Maintain a well mulched trail entrance.
Approach: The trail will be continuously maintained with layers of wood-chip mulch until the project is completed. This may have to occur a few times depending on the quantity of volunteers and any damage incurred to the trail.

Justification: Mulch on the trail makes for a more inviting trail than mud. Furthermore, mulch protects the trail from erosion, keeps the walking path evident, and the trail clear of mud. Evidence also shows that mulch can prevents compaction of soil, improves water infiltration, and suppresses pathogens and pests (Chalker-Scott 2007).

Objective 3-2: Provide educational opportunities including ethnobotanical knowledge.
Task 3-2a: Create a brochure for public access to understand the ethnobotanical importance of plants at the site.
AD6: The information for the brochure was given to the Emily Sprong, the Executive Director of Friends of North Creek Forest. She wanted to wait until she had an organization logo and color scheme to produce the brochures.
Approach: A site map will be created marking each plant installed on site and its ethnobotanical importances for native cultures throughout history. These brochures will be at the bulletin board near entry of the site for the public to use as they enter the trail. Additionally, during the restoration, information will be posted on the billboard on-site so that the future plans for the area will be relayed to the public.
Justification: By leaving this information education will continue beyond the scope of this project and make it an enjoyable experience as well. Modern culture has largely forgotten the uses of plants around us, this project hopes to remind the public of human connections to the environment.
Task 3-2b: Educate students during planting process on native values for plants.
Approach: Work parties will be used not only for accomplish tasks but as a chance to share the importance of native species and their uses by Salish coastal tribes.
Justification: Tribal understanding of plant uses is a valuable knowledge which is being lost with time. By providing this information to the public the knowledge base will be expanded and it will restore interest in studying the uses of plants by human cultures in everyday life.

Objective 3-3: Engage the local community in planting process.
Task 3-3a: Arrange work parties including FNCF, UW Bothell students, neighbors, and local grade schools.

Approach: Outreach to these communities will include using flyers, emails, social media and person communication to participate in work events.
Justification: By building relationships with communities in close proximity to the site the hope is to foster stewardship beyond this project to maintain the forest in the future. These communities will have an opportunity to develop personal ties to an ecosystem which affects them on a local scale.
Task 3-3b: Post bulletins on the entry board to engage the public.
Approach: Informational flyers will be created to share knowledge, the site plans, and announce work parties.
Justification: Posting information at the trailhead kiosk will show the community that people are actively involved. Sharing information is a good way of passively engaging the community. This will also relay the intentions for the site's future; therefore, gaining public support and curbing waste dumping activities on the site.

Specific Work Plans

Site Preparation Plan
Current Conditions
Polygon 1 has an established yard waste dump pile that spills down into the ravine. There is approximately a 50% canopy cover that is mostly from *A. rubra*. There are some *E. arvense,* as well as *R. bifrons* along the southern boundary. There was also *H. helix* covering all the open spaces in this polygon, but most of it has been taken out already through work parties.
Polygon 2 has no canopy cover and is on a flat grass covered surface. It is threatened by the encroachment of *R. bifrons* and *A. rubra*. There are two *I. aquifolium* shrubs that may spread if they are not removed.
Polygon 3 has the largest number of *R. bifrons* and *H. helix*. Once again, the majority of the invasives have been taken out of this polygon already by volunteers. It is located on a steep slope that is experiencing surface erosion. This polygon also has partial sunlight under a mixed conifer-deciduous canopy.

Polygon 4 has almost no invasives within its boundaries. The upper canopy here is about 40% closed and is made up of predominantly *A. rubra*. The middle canopy is poorly established, but where it is, it's dominated by young *A. macrophyllum*. The understory is characterized by dominant *R. spectabilis* thickets. There is also a fair mixture of *O. cerasiformis*, *R. ursinus*, and *P. munitum* found in areas not dominated by *R. spectabilis*.

Polygon 5 is also minorly affected by invasives. *R. bifrons* threatens to enter through the western border of the polygon but the established *R. spectabilis* thickets seem to be a tough competitor, keeping it at bay. This polygon is the largest, but also the most diverse in species. *M. nervosa* was found here, but nowhere else on the site. The canopy in this area is the tallest found on the site, and is dominated primarily by A. macrophyllum with a significant portion of established evergreen species including *T. plicata*. A large *P. menziesii* was discovered in the southern portion of the polygon. *T. plicata* seems to be naturally regenerating quite well in the area, as several seedlings were found. The only invasive that was found within the interior of Polygon 5 was a handful of well-established *I. aquifolium* shrubs.

Site Preparation Activities

Polygon 1 will need the yard waste pile covering the hillside taken out. The group has already put up red tape in an attempt to prevent the neighbors from further dumping, but that has been unsuccessful. The hope is that once more planting has been done in the top of the polygon the neighbors will not want to dump their garbage and concrete on the site anymore. The remaining invasive species will then need to be taken out. Finally, fascines will need to be put in for erosion control before mulching and planting can be done.

Polygon 2 will need the remaining *H. helix*, *R. bifrons*, and *I. aquifolium* removed. This polygon is the only available space to hold the mulch pile, garbage bins, and yard waste container, making this the last polygon to be planted.

AD7: A few *I. aquifolium* was left standing across the site as we lack the qualifications to pursue the most effective route of removal. Due to constraints of

the project, FNCF has considered a management plan for the removal of holly in the near future.

Polygon 3 will need the remaining *H. helix*, *R. bifrons*, and *H. helix* removed. Fascines have already been put in on the hillside. Mulching will still need to be finished up, but there are already some *P. munitum* put in to help stabilize the slope in case of a rain event in the near future.

Polygon 4 will need the remaining *R. bifrons* removed. Mulching will need to be completed in this area. There have already been a few *P. munitum*, *T. plicata*, and *V. parvifolium* planted due to the need to be put in the ground immediately after the King County Conservation District salvage event.

Polygon 5 will need the few *R. bifrons* and *I. aquifolium* that occur removed. There is a lot of woody debris that can be left and mulched over.

AD8: A few *I. aquifolium* was left standing across the site as we lack the qualifications to pursue the most effective route of removal. Due to constraints of the project, FNCF has considered a management plan for the removal of holly in the near future.

Logistical Considerations

There is plenty of parking along the street in the surrounding neighborhood for volunteers. There is a tarp set up in between polygons 1 and 2 where mulch will be dumped as needed. When volunteer events are held a tent will be set up where participants will sign in and have access to food and beverages courtesy of Friends of the North Creek Forest. The volunteers have also helped us make a path from our site to the community partners' house for easier access to the bathrooms. The backyard of the house will be used as a staging area for plants and cuttings.

AD9: The tarp between polygon 1 and 2 was only used temporarily. An area was left unplanted close the the street on the north side of polygon 2 so mulch could be dumped relatively easily.

Planting Plan

Polygon 1

The western edge of the site (Polygon 1 and 2) are most affected by disturbance and invasive encroachment therefore it is an objective to create a vegetative buffer zone that could aggressively compete with invasive species like *R. discolor* and *H. helix.* The hydrology and the light exposure of these polygons differs from other areas of the site as the soils are better drained and they receive full sun exposure in the latter half of the day. These differences pose a challenge for water availability in late summer so by planting species that are drought tolerant, such as *H. discolor*, *A. grandis* and *R. gymnocarpa,* this problem can be alleviated while establishing a vegetation buffer that aggressively competes with encroaching non-natives (Leigh 2013). *C. sericea* and *P. capitatus* will be planted in large quantities in the buffer zone for aesthetic color, structure, and habitat.

AD9: *C. sericea* was used for soil stabilization on the slopes and *S. lucida* was used as a buffer instead. This was because *S. lucida* is faster growing that *C. sericea* and more abundantly available.

Creating a multi-layer canopy is a crucial approach to outcompeting invasive species, there will be a palate of species of different form and size installed to achieve this goal. This polygon also contains a waste dump from the neighborhood which will be cleared. The true nature of the slope is not currently clear; once the debris is removed a decision to install fascines on this slope will be made. Regardless, plantings on this slope will include *A. circinatum*, *C. sericea*, *P. capitatus*, and *A. aleuticum*.

AD10: *A. aleuticum was not used in this polygon because it was utilized elsewhere. S. racemosa was installed on this slope.*

Polygon 2

This polygon also forms the buffer zone at the entrance to the site. Plants would be chosen and arranged similarly to polygon 1 with the addition of a greater number of *A. grandis* and *A. circinatum*. All species chosen are native plants that are primarily not present on site; this increases species and structural diversity. A suite of species will be

installed from tall evergreen conifers to low-growing groundcovers creating vertical diversity. Additionally, there will be plantings in a clump-gap distribution to create horizontal diversity. The plants chosen offer wildlife value as well providing protection against foot traffic (Leigh 2013). Consideration was given to choosing a variety of species with overlapping attributes to increase functional resiliency.
Additionally, all species chosen will assist in fulfilling the third goal of encouraging both short-term and long-term community involvement in the site. Through work party events, volunteers will assist with the plant design and installation. *R. sanguineum, F. purshiana*, *A. circinatum, R. gymnocarpa, F. vesca and H. discolor* will be introduced to create a site that is aesthetically pleasing with an inviting trail entrance. Creating an engaging and attractive planting, especially in Polygon 1 and 2, will in the long-term entice the community to visit and return to the site. The rich diversity of the species on site will provide educational and ethnobotanical learning opportunities for the students and the community.

Polygon 3

This polygon has a steep slope covered by *H. helix* that needs special consideration. In the areas most prone to erosion will have fascines installed. They will be built out of *S. lucida* and *C. sericea* live stakes to increase slope stabilization and water filtration. There will be approximately 9-15 fascines of 8" diameter installed along this slope every 3-5' at a slight angle to allow for water drainage to occur over them (Adams et al. 2008).

AD11: Wattles were also used in polygon 3 to stabilize areas of the hillside that were experiencing sloughing. A total of seven fascines were installed--four in polygon 1 and three in polygon 3. The fascines installed in polygon 3 were primarily made of willow, while those in polygon 1 were primarily dogwood, salmonberry, and lesser component of willow.

P. munitum will be planted along this slope in large quantities from salvage events and from splitting current resources on site to also control erosion of the slope. This species' root systems and environmental tolerances are ideal to install in this slope as erosion control (Leigh 2013). An additional planting of a suite of ground cover and

mid-canopy species that will slow rainfall that erodes the soil, such as *R. leucodermis, O. organa* and *T. grandiflora* will occur in this polygon. These species will also cover the soil especially in evergreen shade, therefore competing with the re-encroachment of *H. helix* (Simon 2004). To further add to the structural diversity of the slope, thus increasing interception of rain, *S. racemosa, R. lacustre* and *L. involucrata* will be planted in the gaps of the established canopy. These species have root structures with soil binding qualities, further stabilizing the slope, and provide wildlife food and habitat (Leigh 2013).

Polygon 4 and 5

Since polygons 4 and 5 are least affected by invasive species, therefore it is a goal to protect and enhance the forest structure that already exists. The dominant groundcover species found within these polygons is comprised of *P. munitum* and *O. cerasiformis,* with the latter greatly outnumbering the former. More *P. munitum* will be installed to enhance the current understory composition. Additionally *B. spicant* and *A. aleuticum* plantings will further enhance and compliment the understory structure.

AD12: *P. munitum* and *B. spicant* were not planted in polygon 5 because it was determined that polygon already had a sufficient amount of understory growth, especially when compared to the other polygons.

The upper canopy consists of a mixture of coniferous and deciduous species with *A. rubra* and *A. macrophyllum* dominating the site area. The conifer species are sparsely distributed and primarily consist of *P. menziesii* with a few scattered *T. plicata* and *T. heterophylla.* Since *T. plicata* and *T. heterophylla* are found in limited number on the site, establishing a larger number of these species will contribute to enhancing the current structure of the forest. These species are the dominant late successional species found within the western hemlock zone, by planting them the ecological trajectory of the site is promoted towards that of a late-successional western hemlock forest. Additionally a suite of ground cover species found in mid-late successional western hemlock forests will be installed; including species such as, *V. sempervirens, A. triphylla, T. menziesii, and T. grandiflora*. These species will add habitat, structural, and species diversity while enhancing the forest's aesthetic value.

AD13: *V. sempervirens, A. triphylla*, *T. menziesii*, and *T. grandiflora* were not used in polygon 5 because they were species that either existed on site as a significant portion of ground cover, or weren't available from nurseries plants were sourced from. *V. sempervirens and A. triphylla* were not used in polygon 4 or anywhere on site because they were not able to be obtained.

Other Plans

An ethnobotanical display area will be designed and implemented beginning in Polygon 1 and 2 then following the trail downhill (See Figure 2; Goal 3, Objective 3-2). The plants selected will be of significance to the native Coast Salish people, listed in the planting plan. There will be numbered markers near the plants which will correspond to a map on a brochure (available at the trailhead sign) detailing the common name, Latin name, and Lushootseed name (Task 3-3b). Additionally there will be information about that plant's uses to the Coast Salish people, such as medicinal, subsistence, weaving, and tools, among others (Task 3-3b). We hope to garner more ethnobotanical information and guidance from the Tulalip Tribes. A few members of our team have met with community members of the Tulalip Tribes and visited the Hibulb Cultural Center. This ethnobotanical area on our site and brochure will provide an educational and cultural opportunity to visitors to the park (Goal 3, Objective 3-2).

AD14: No markers, brochures, or information about the Salish people were put on the site. The Tulalip Tribe grant was not given to Friends of North Creek Forest, so it was not in the budget to add these extra educational amenities to the site. However, Friends of North Creek Forest plans to mark selected plants near the foot trail in the near future. Emily, requested that information be left about ethnobotany for the installed species in an unformatted manner, as FNCF has not mocked up an official stationery. Two documents regarding ethnobotanic uses and wildlife benefits of installed plants were left with FNCF for future uses.

Time and materials permitting, a fern pyramid could be constructed to add interest and an ascetic quality to the trail in Polygon 2 or 3 (Goal 3, Objective 3-1). This will require sword ferns and dirt base to produce the pyramid. It will be around six feet tall and four

feet wide. The labor can be done by the team or by volunteers. This will add intrigue to the site as well as interest in using native plants for landscaping.

AD15: The fern pyramid was not built due to the time constraints and a greater need for fern species elsewhere on site.

Design for the Future

The intent for the future of the site is to direct the forest toward a late-successional, low-elevation western hemlock forest. The plants installed will have educational and ethnobotanical value as well as ecological importance for the forest and the surrounding matrix for generations beyond this project. To accomplish these goals, it requires active maintenance of the site beyond the initial planting phase. Some anticipated issues are continued anthropogenic disturbances from the surrounding matrix. This will be an ongoing issue in the future requiring upkeep. This site will rely on the continued involvement of the Friends of North Creek Forest to act as stewards of the forest. By working with Friends of North Creek Forest closely in all of the phases of planning and working on this site, shared goals have been produced for the future of the forest. Community beyond this organization is important as well and we hope to involve students of the UW Bothell campus and the neighbors of the site in the continued maintenance.

The neighborhood community will be involved by directly communicating to them the goals for the future of this project. Some neighbors have already expressed concerns about the waste pile on the site. This will be addressed by posting signs at the site outlining the change in waste disposal practices needed for the health of the forest as well as the economic and ecological benefits of the work accomplished at the site. Additionally this will be communicated directly to neighbors as work is actively being completed on site. To attract UW Bothell students we have contacted the Community Based Learning center to post work events in student-wide e-mails, newspaper and bulletin boards. Furthermore, professors with classes related to the environmental science field will be engaged to promote student involvement in the site as well as with the FNCF for continued stewardship. This will create a positive response in UW Bothell peers by working in an environment which so closely affects them. Some members of

this team are in the process of developing a horticultural club for UW Bothell, which will work in part with the stewardship of North Creek Forest.
The maintenance of this site will involve repeated mulching, watering, and weeding initially to allow for the successful establishment of the planted species. Continued long-term maintenance will have to face the challenges of re-encroachment of invasive species, trampling by human foot-traffic, and changing climate conditions. By promoting educational and stewardship opportunities through FNCF and UW Bothell a long lasting commitment to the health of the site will transpire.

Team Roles and Contributions

Mckenzie Brocker worked on the tasks and approaches for our work plan. She has been an active member in our team meetings. Mckenzie has great communication skills and even met with the members of the Tulalip Tribes to gain information for putting an ethnobotanical garden on our site. Mckenzie attended the first volunteer event on November 7th coordinated by Friends of North Creek Forest. She also has been staying on top of the schedule and Gantt chart. **Mckenzie attended many volunteer events throughout the project as well weekly or biweekly team meetings to finish the course documents, install plants, and continue maintenance weeding. She worked hard on developing maintenance strategies in the Stewardship plan and documenting schedules and hours spent to complete this project.**

Jordan Muhs worked on the tasks and approaches for the work plan document. He did part of the final formatting and editing of the paper. Jordan has been the lead communicator and meeting coordinator. He has also taken the lead on mapping out the polygons and getting site measurements. **Jordan attended several volunteer events and helped lead volunteers in planting and fascine building. He helped salvage, plant, and take care of site post-installation. Jordan also completed the site**

monitoring report for the stewardship plan and assisted Autumn in creating the As-Built map.

Autumn Nettey did a variety of work and completed many tasks. She spent time salvaging plants, researching best practices and methods for restoration and slope stabilization. She spent many hours doing manual restoration work of removing invasive species, applying mulch, installing plants and watering of plants.She worked on the tasks and approaches for the work plan and helped with the final editing. She produced all of the detailed maps for all our project reports. She met with some members from the Tulalip tribe and makes the drive from Seattle to Bothell every week for our meetings. If she is unable to meet in person, she is available to meet online. **Autumn has a considerable amount of knowledge and skills with online map making. Autumn attended and help lead many of the volunteer events.**

Tahira Nurjaman completed the budget plan for the document. She has attended almost every meeting and is always enthusiastic about getting work done. She attended the second work party on January 23rd. She has been actively recruiting volunteers for the community work parties. **Tahira has attended almost all of the volunteer events. She assisted Jordan on conducting baseline monitoring as well as worked on the short term maintenance plan on stewardship plan, and text revision for as buitreport. She actively watered the sites on weekly basis and also attended weekly team meetings.**

Savannah Rose completed the site description as well as the restoration needs and opportunities for the work plan document. She also completed the team roles and contributions section of the paper. Savannah has attended both volunteer events on November 7th and January 23rd. She has attended every weekly meeting and helped Jordan with the mapping of the polygons on site. **Savannah has attended almost all of the volunteer events and led small groups through restoration activities. She was a major contributor to all of the documents produced over the year and helped**

with the final edits. She attended almost every team meeting and participated in the collection of plants at the salvage and at the nursery.

Ashley Shattuck completed the labor budget for the work plan and completed final editing & formatting for the work plan. She is an active contributor to our weekly meetings and always goes above and beyond to get work done outside of our meeting times as well. She also met with the Tulalip Tribe members to inquire about the possible ethnobotanical garden. She attended the second work party on January 23rd. **Ashley attended almost every volunteer event, weekly team meetings, and team meetings with the professors. She researched much of the information for documents and completed to final edits. She contributed greatly to the final poster and assisted in salvaging and installing many of the plants.**

Map Revisions & Addition

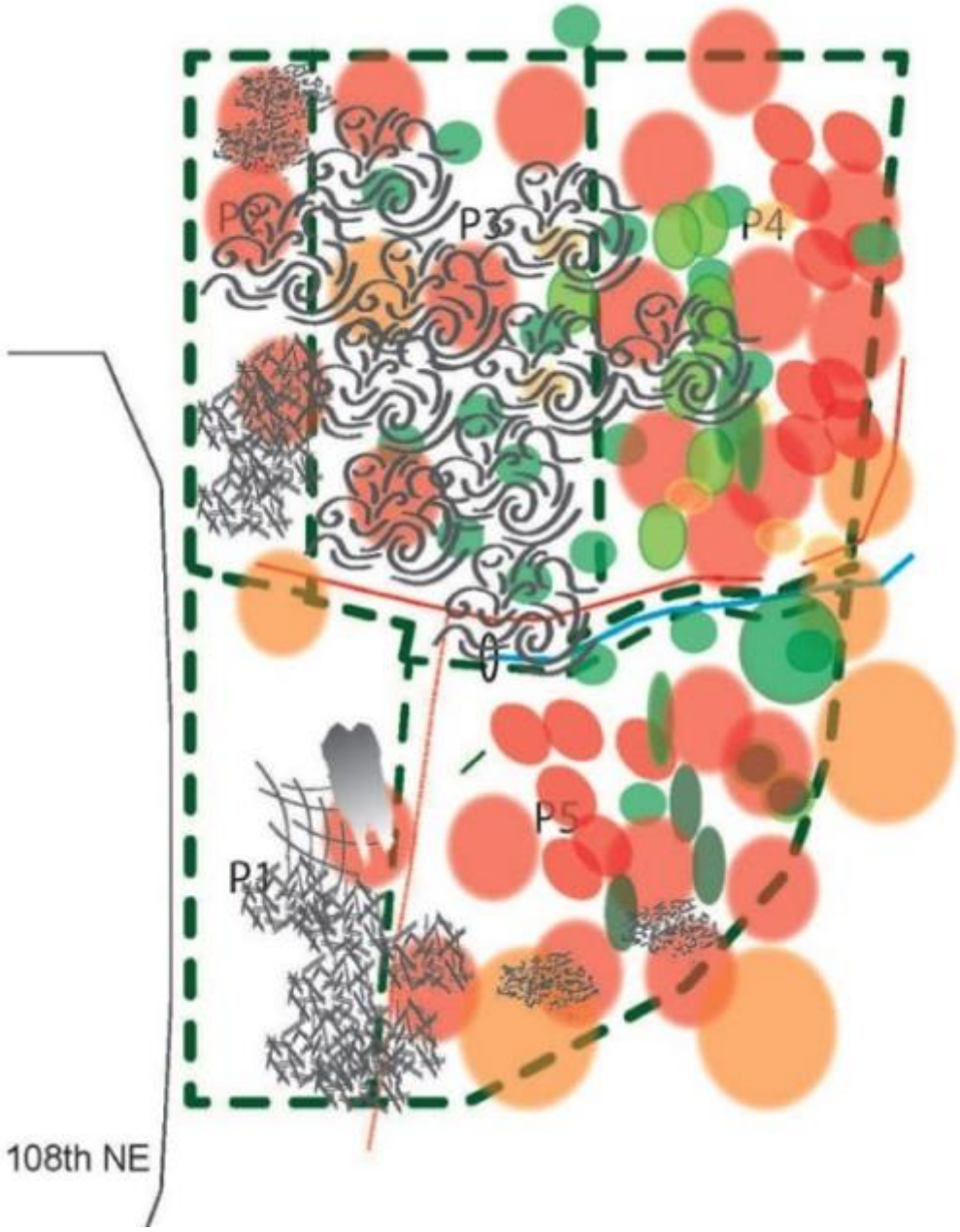


Figure 4: Original invasive and native species overlay map

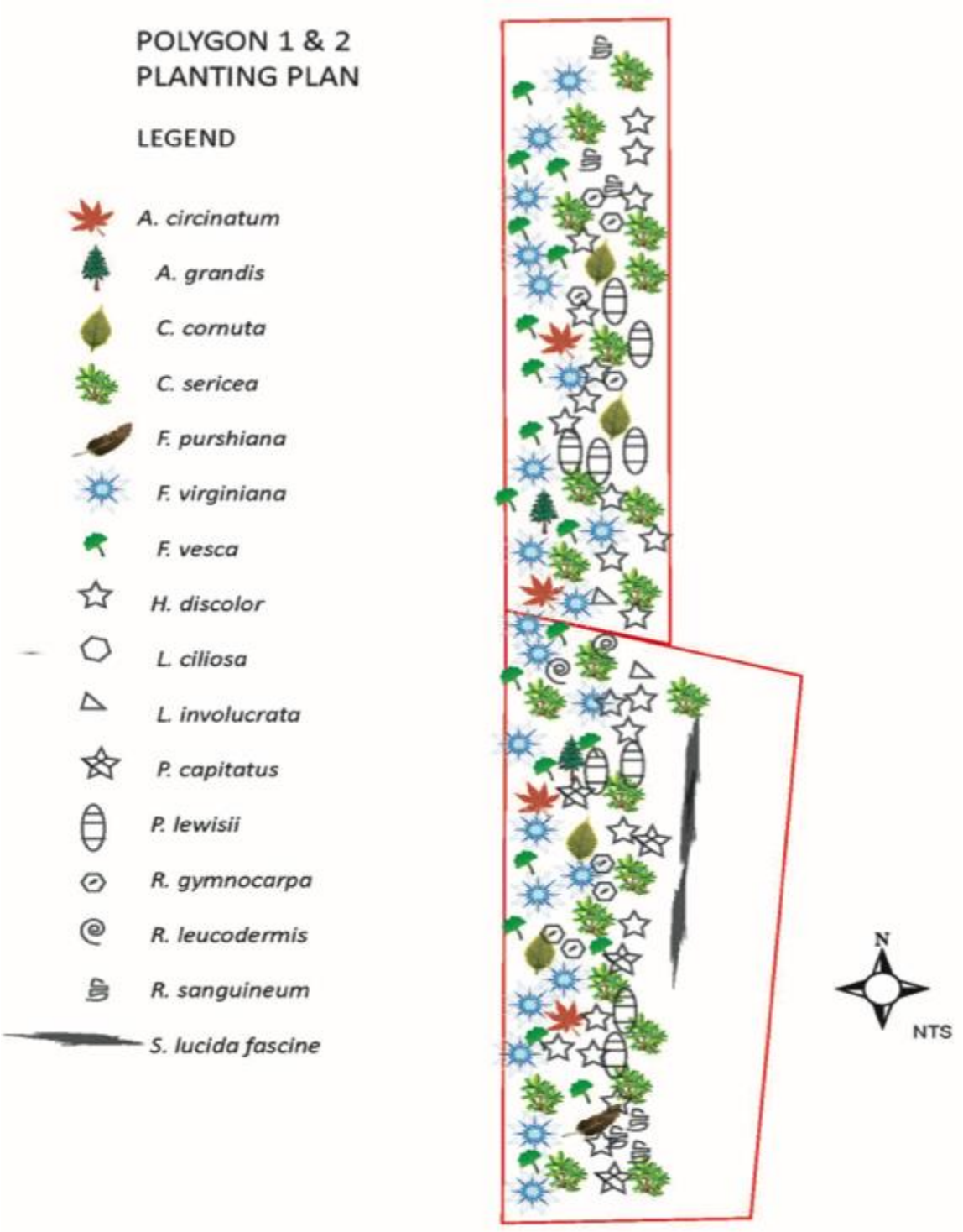


Figure 2: Original general planting plan map (Polygon 1 and 2)

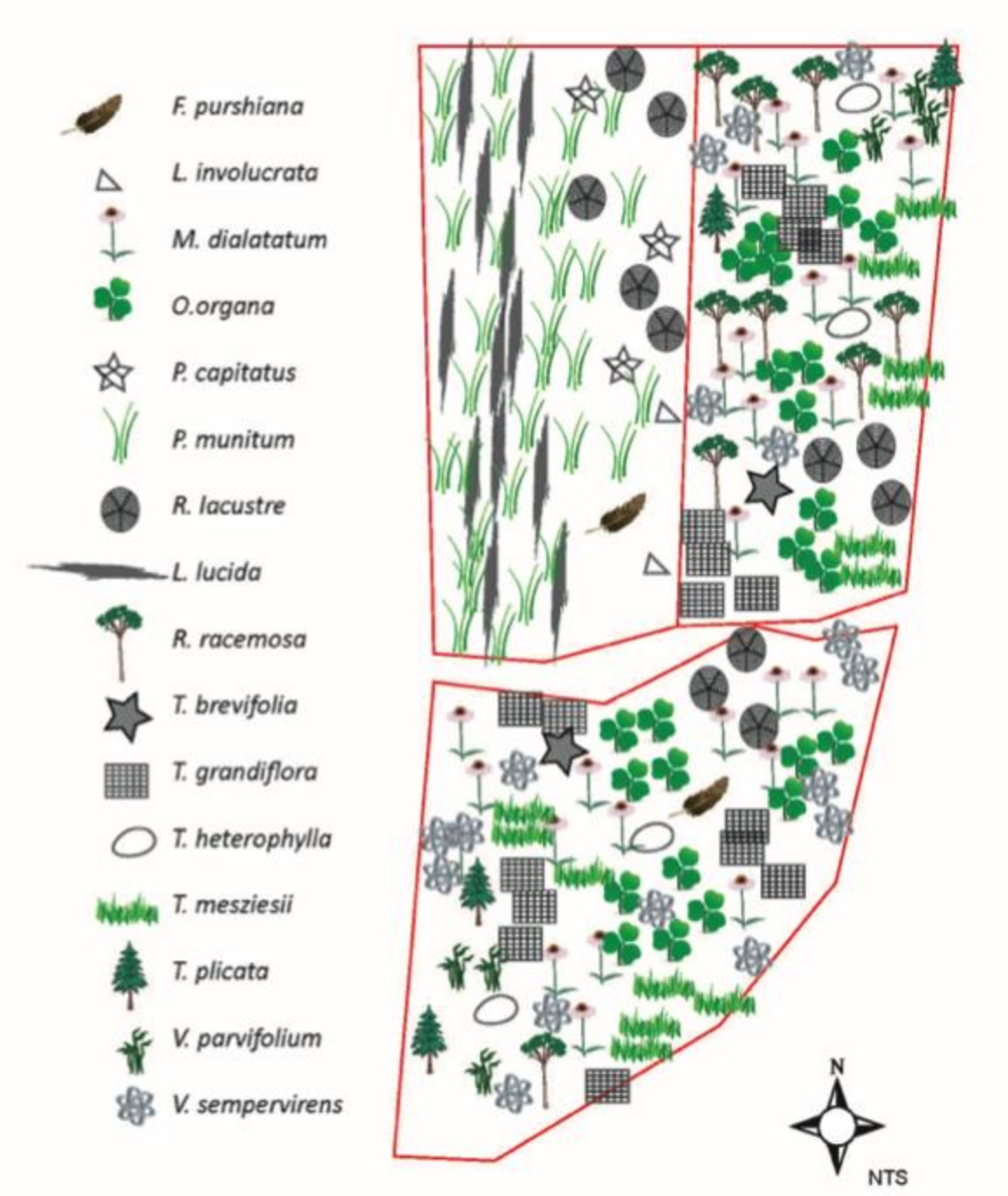


Figure 3: Original general planting plan map (Polygon 3,4,5)

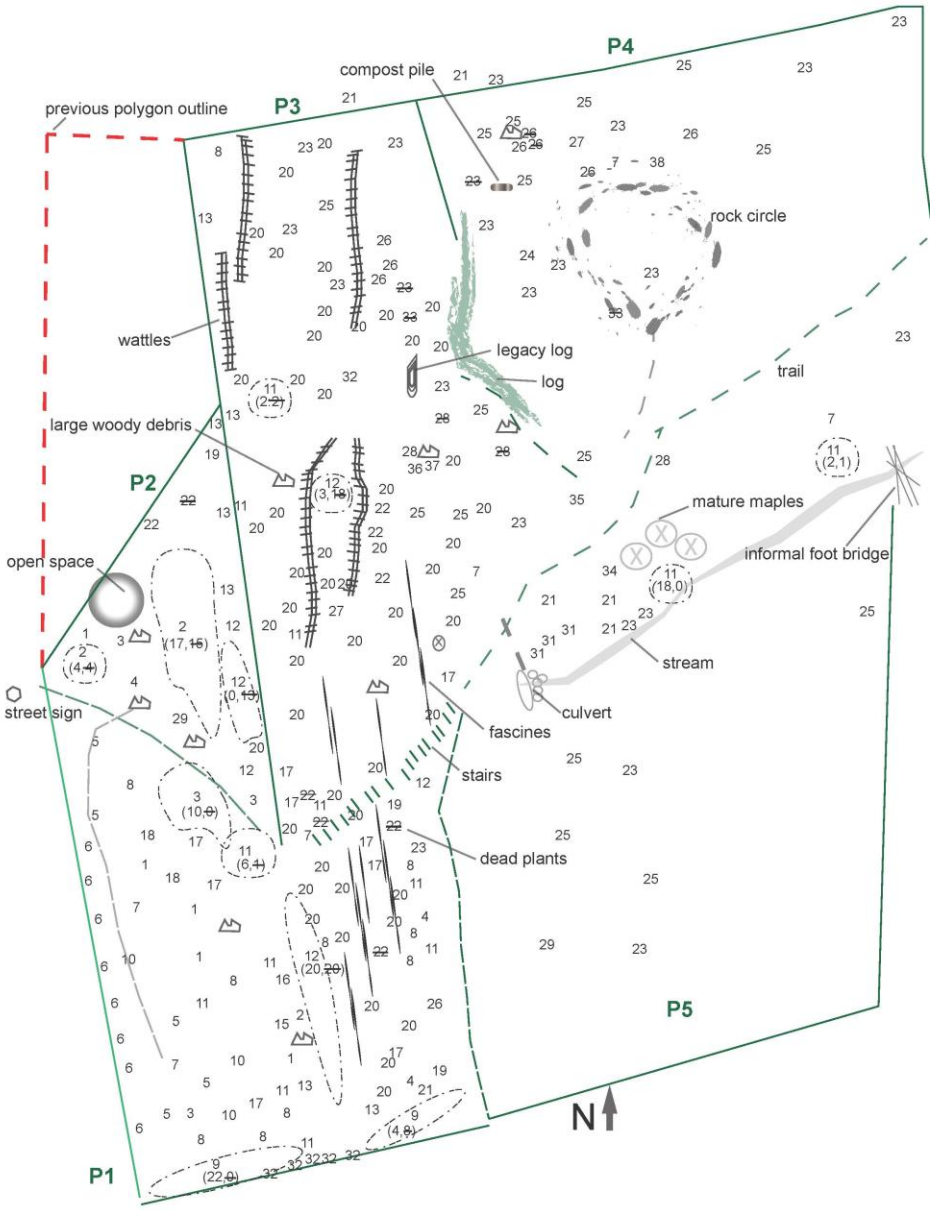


Figure 4: As-built map of installed species and structural elements (see plant legend on following page)

Plant Legend

1. Black twinberry - *Lonicera involucrata*
2. Oceanspray - *Holodiscus discolor*
3. Nootka rose - *Rosa nutkana*
4. Big leaf maple- *Acer macrophyllum*
5. Baldhip rose - *Rosa gymnocarpa*
6. Woodland Strawberry - *Fragaria vesca*
7. Red flowering currant - *Ribes sanguineum*
8. Grand fir - *Abies grandis*
9. Pacific willow - *Salix lucida* ssp. *lasiandra*
10. Orange honeysuckle - *Lonicera ciliosa*
11. Ninebark - *Physocarpus capitatus*
12. Red-osier dogwood - *Cornus sericea*
13. Red elderberry - *Sambucus racemosa*
14. Blue elderberry - *Sambucus nigra*
15. Bracken fern - *Pteridium aquilinum*
16. Serviceberry/saskatoon - *Amelanchier alnifolia*
17. Mock orange - *Philadelphus lewisii*
18. Blackcap raspberry -*Rubus leucodermis*
19. Indian plum - *Oemleria cerasiformis*
20. Sword fern - *Polystichum munitum*
21. Fringecup -*Tellima grandiflora*
22. Vine maple - *Acer circinatum*
23. Western redcedar - *Thuja plicata*
24. Pacific bleeding heart - *Dicentra formosa*
25. Western hemlock -*Tsuga heterophylla*
26. Deer fern - *Blechnum spicant*
27. Low oregon grape - *Mahonia nervosa*
28. Red huckleberry - *Vaccinium parvifolium*
29. Douglas fir - *Pseudotsuga menziesii*
30. Devil club - *Oplopanax horridus*
31. Maidenhair fern - *Adiantum pedatum*
32. Salmonberry - *Rubus spectabilis*
33. Beaked hazelnut - *Corylus cornuta*
34. Inside out flower -*Vancouveria hexandra*
35. Foam flower -*Tiarella cordifolia*
36. Redwood sorrel - *Oxalis oregana*
37. Violet - *Viola adunca*
38. Spiny wood fern - *Dryopteris expansa*

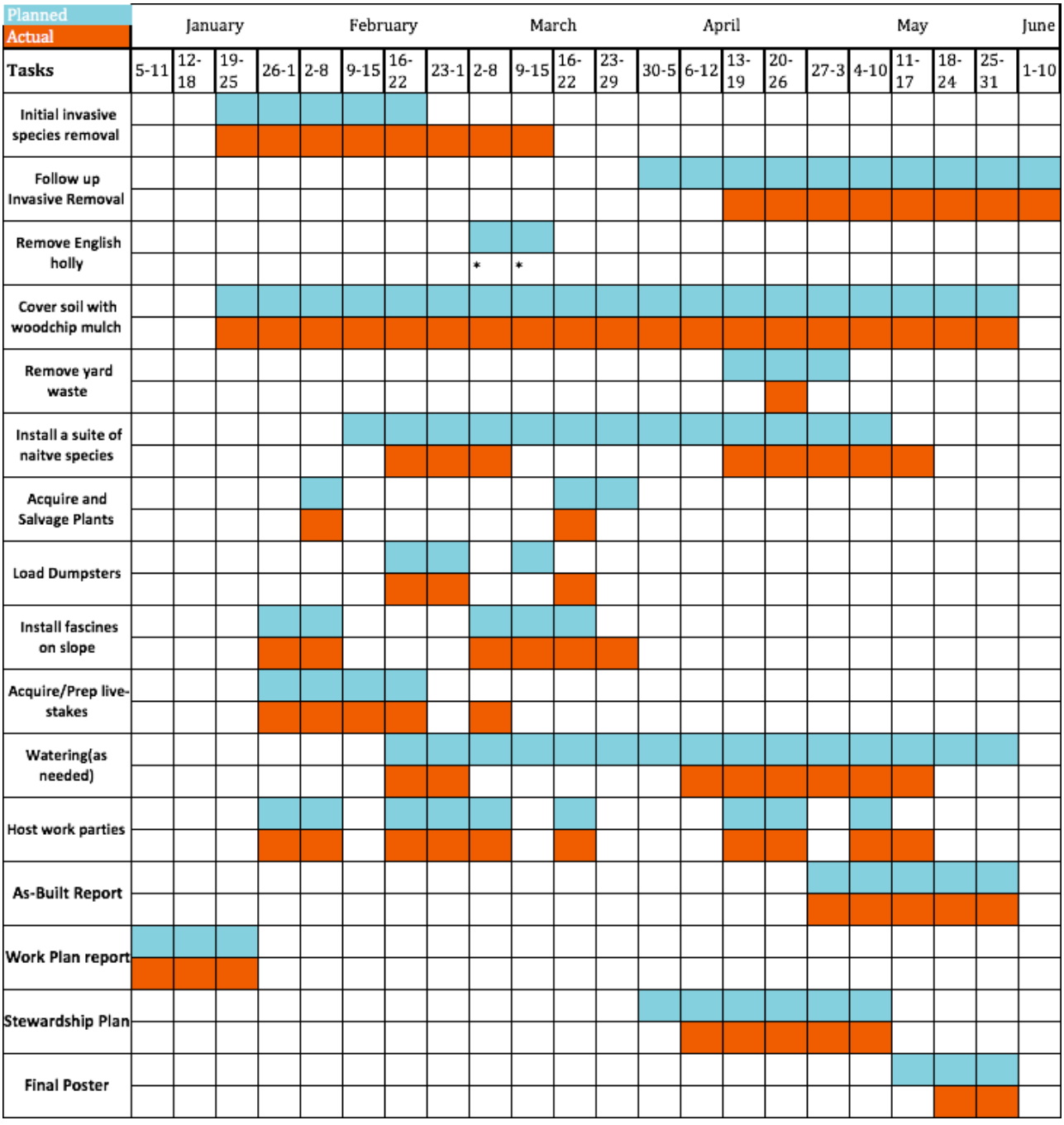
Table Revisions

Table 1: Materials Table

Task	Materials	Quantity	Source	Tools	#	Source
1-1a 1-2a	Dumpster	1	~~Waste Mgmt~~ **NW Arboriculture**	Shovels	5	FNCF
1-1b 1-3a 3-1a	Woodchip Mulch	~~200 cu. yd~~ 70 cu. Yd	~~Local Arborist~~ **NW Arboriculture**	Gloves	20	FNCF
2-1a	Twine	100 yd	~~Local Hardware Store~~ **Home Depot**	Loppers	10	FNCF
2-3a	Burlap	35 sq. m	~~Craigslist~~ King County Cons. Dist.	Buckets Wheelbarrows Rakes	10 3 3	FNCF FNCF FNCF

Timeline Revisions

Table 2: Gantt chart



a. Financial Budget

In the original budget plan, the cost and quantity of dumping services necessary for this project was greatly underestimated. Part of this was due to the unknown circumstances of the waste pile in polygon one. Thanks to Northwest Arboriculture's donation, sixteen cubic yards of waste was removed from the site at no cost. What we learned here is to not to hesitate to ask for donations from outside sources. Another lesson learned is that plants can be aquired relatively easily without any expenditure. We were able to salvage all of our swordfern which otherwise would have been too costly to procure in the size necessary for our requirements.

Table 3: Categorized expenditures for project

Expenditures by Major Category	**Cost**
Plants	
Trees	~~$56~~ **$81**
Shrubs	~~$240~~ **$347.50**
Ground Cover	~~$48~~ **$123**
Ferns	~~$0~~ **$10**
Subtotal plants + Tax	~~$376.68~~ **$572.43**
Mulch	0
Tools	0
Transportation	0
Disposal Fees	~~$100.78~~ **$0**
Printing	$20
Project Total	~~$497.46~~ **$593.43**

Taking our experiences on this project to into the future, we have learned to explore other nurseries more in-depth before purchases. Most of the budget was spent at Snohomish Conservation plant sales. The bare-root plants received were smaller and of lesser quality while being similiarly priced as plants found at Go Natives Nursery. Another lesson learned was to be careful with purchasing and installing ground cover species. In total, we spent $123 on ground cover species and lost about two-thirds of those to mortality. In the future, we would recommend to install ground covers from healthy established plants by transplanting or purchase larger (larger than 4”), healthy plants to ensure greatest success with ground cover species.

b. Labor Budget

The labor budget revealed we exceeded what was estimated in both team and volunteer hours. As far as lessons learned, time management and tracking of hours was definitely one of hardest things to adjust to. None of us had experience in estimating the time it would take to complete each task. As the project progressed we improved at estimating how much time it would take to complete each task or how much volunteer time were required; now at the end of the project we have a much clearer picture of how many hours it takes to complete a whole project such as this as well as specific tasks. As far as just keeping track of the hours worked, we finally perfected a system in the last quarter. However, this was a difficult process to get used to; not having previous experience tracking hours spent on report writing, or keeping track of large groups of volunteers and what exactly they did. The biggest problem faced with this was having to go back and calculate hours from multiple Gantt charts made for each meeting, instead of keeping track of them as the project progressed, in a single document.

Table 4: Labor budget

Labor Budget			
Task	**Team Hours**	**Volunteer Hours**	**Total**
Invasive species removal			
Expected	24	208	232
Actual	48	250	298
Mulching			
Expected	20	428	448
Actual	31.5	407	438.5
Remove yard waste			
Expected	120	0	120
Actual	30.5	36	66.5
Planting			
Expected	86	77	163
Actual	58	60	118
Load Dumpsters			
Expected	22	12	34
Actual	28.5	12	40.5
Install fascines on slope			
Expected	52	40	92
Actual	51.5	81.5	133
Acquire/Prep plants			
Expected	110	0	110
Actual	114	0	114
Watering			
Expected	9	0	9
Actual	12	0	12
As-Built Report			
Expected	65	0	65
Actual	55	0	55
Work Plan report			
Expected	120	0	120
Actual	151	0	151
Stewardship Plan			
Expected	120	0	120
Actual	164	0	164
Final Poster			
Expected	40	0	40
Actual	54	0	54
Total Hours			
Expected	788	765	1553
Actual	798	846.5	1644.5

c. Planting Plan

We originally designed a planting plan with room for flexibility and our post-installation survey demonstrated that we were able to install relevant species while maintaining the integrity of our original design. A learning lesson taken away was that plans tend to change as the project evolves. For example, after removing the yard waste pile it became evident that light conditions differed from original observations, making the installment of sun-tolerant species necessary.

Some plants died before we were able to plant them as the mulch and waste piles were covering the planting areas. A lesson learned is that plants should be acquired in stages as needed, or to have a better equipped greenhouse/staging area.

Appendices

Appendix 1: Tables

Table 5: Finalized plant budget

Final Budget						
Sno-County Conservation District Plant Sale						
Form	**Common Name**	**Scientific Name**	**Form**	**Qty**	**$/plant**	**Total**
Expenditure by Major Category	**Western red cedar**	***Thuja plicata***	**bareroot**	**10**	**$1.60**	**$16.00**
Tree	**Western hemlock**	***Tsuga heterophylla***	**bareroot**	**20**	**$1.60**	**$32.00**
Tree	**Grand fir**	***Abies grandis***	**bareroot**	**5**	**$1.60**	**$8.00**
Shrub	**Vine maple**	***Acer circinatum***	**bareroot**	**10**	**$1.60**	**$16.00**
Shrub	**Deer fern**	***Blechnum spicant***	**Plugs (4")**	**9**	**$2.67**	**$24.00**
Shrub	**Ocean spray**	***Holodicus discolor***	**bareroot**	**40**	**$1.60**	**$64.00**
Shrub	**Nootka**	***Rosa***	**bareroot**	**10**	**$1.60**	**$16.00**

	Rose	***nutkana***				
Shrub	**Mock orange**	***Philadelphus lewisii***	**bareroot**	**10**	**$1.60**	**$16.00**
Shrub	**Pacific ninebark**	***Physocarpus capitatus***	**5" plug**	**50**	**$1.60**	**$80.00**
Shrub	**Red flowering currant**	***Ribes sanguineum***	**bareroot**	**10**	**$1.60**	**$16.00**
Shrub	**Beaked hazelnut**	***Corylus cornuta***	**bareroot**	**5**	**$1.60**	**$8.00**
Ground Cover	**Fringecup**	***Tellima grandiflora***	**bareroot**	**30**	**$1.60**	**$48.00**
Subtotal						**$344.00**
Tax (9.5%)						**$32.68**
Total						**$376.68**

Go Natives! Nursery

Form	Common Name	Scientific Name	Size	Qty	$/plant	Total
Shrub	**Honeysuckle, Orange**	***Lonicera ciliosa***	**1 gal**	**2**	**$5.00**	**$10.00**
Shrub	**Currant, Red Flowering**	***Ribes sanguineum***	**3gal**	**2**	**$3.00**	**$6.00**
Shrub	**Serviceberry**	***Amalanchier alnifolia***	**2 gal**	**1**	**$6.00**	**$6.00**
Shrub	**Twinberry**	***Lonicera involucrata***	**1 gal**	**3**	**$3.00**	**$9.00**
Shrub	**Ninebark, Pacific**	***Physocarpus capitatus***	**1 gal**	**2**	**$3.00**	**$6.00**
Shrub	**Raspberry, Blackcap**	***Rubus leucodermis***	**1 gal**	**2**	**$3.00**	**$6.00**
Ground	**Bleeding**	***Dicentra***	**4 in**	**4**	**$2.50**	**$10.00**

Cover	**Heart**	***formosa***				
Shrub	**Elderberry, Red**	***Sambucus racemosa***	**5 gal**	**4**	**$5.00**	**$20.00**
Shrub	**Rosa, Baldhip-Small Fruit**	***Rosa gymnocarpa***	**1 gal**	**5**	**$2.00**	**$10.00**
Shrub	**Mock Orange**	***Philadelphus lewisii***	**2 gal**	**2**	**$5.00**	**$10.00**
Shrub	**Rose, Nootka**	***Rosa nutkana***	**2 gal**	**2**	**$5.00**	**$10.00**
Shrub	**Oceanspray**	***Holodiscus discolor***	**5 gal**	**1**	**$9.00**	**$9.00**
Ground Cover	**Violet, Early blue**	***Viola adunca***	**4 in**	**4**	**$2.50**	**$10.00**
Ground Cover	**Foam Flower**	***Tiarella trifoliata***	**1 gal**	**1**	**$5.00**	**$5.00**
Fern	**Fern, Maidenhair**	***Adiantum pedatum***	**1 gal**	**2**	**$5.00**	**$10.00**
Ground Cover	**Strawberry, Woodland**	***Fragaria vesca***	**4 in**	**8**	**$1.75**	**$14.00**
Ground Cover	**False Lilly of the Valley**	***Maianthemum dilatatum***	**4 in**	**18**	**$2.00**	**$36.00**
Shrub	**Elderberry, Blue**	***Sambucus cerulea***	**1 gal**	**1**	**$5.50**	**$5.50**
Tree	**Cedar, W. Red**	***Thuja plicata***	**1 gal**	**3**	**donation**	**0**
Tree	**Hemlock, Western**	***Tsuga heterophylla***	**10 gal**	**1**	**$25.00**	**$25.00**
Total:						**$217.50**
10% off						**$21.75**
Total after Discount						**$195.75**

Additional Expenses	Planned	Actual
Mulch	**$0.00**	**$0.00**
Tool Rental	**$0.00**	**$0.00**
Transportation	**$0.00**	**$0.00**
Printing	**$20.00**	**$20.00**
Disposal Fee	**$100.78**	**$0.00**
Subtotal Additional Expenses	**$120.78**	**$20.00**
Project Total	**$497.46**	**$592.43**