North Creek Forest
University of Washington Restoration Ecology Network Capstone 2013-2014

Location: Interstate 405, Bothell, WA 98021

Clients: Jim Freese and Friends of North Creek Forest

UW-REN Team Members:

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I. Project Summary

Overview

At 64 acres, North Creek Forest (NCF) is the largest remaining urban forest in the city of Bothell (Friends of North Creek Forest 2013). In the North Creek neighborhood, it is located directly west of Interstate 405 and about a mile north of the University of Washington Bothell (UWB) and Cascadia Community College campuses (Figure 1). This report describes the North Creek Forest restoration project that took place from October 2013 to June 2014. A team of six students in the University of Washington Restoration Ecology Network (UW-REN) capstone program created and implemented a management plan for the restoration of the site with the support of their community partner, Jim Freese and Friends of North Creek Forest (FNCF), and from their capstone instructors. Occupying an area of roughly 2,145 square meters (approximately half an acre), the project site is located on the eastern edge of North Creek Forest, a forest which was defined as a priority habitat by the Washington Department of Fish & Wildlife (Friends of North Creek Forest 2013). By June 2014, three restoration projects have taken place at North Creek Forest, leaving space for future restoration.

Before and after photos of the site (October 30, 2013 and May 30 2014)

Pre-Restoration Description

This year's restoration site-measures at about 2,145 square meters and is made up of three polygons defined by their different characteristics. Polygon 1 sits on the eastern edge of the site at the entrance (Figure 2), which has partially been invaded by reed canarygrass (*Phalaris arundinacea*), and initially had very little canopy cover. Most of this area was cleared and mulched by the 2012-2013 UW-REN team and received little shade from the mature *Thuja plicata* (western redcedar), *Pseudotsuga menziesii* (Douglas-fir), *Acer macrophyllum* (bigleaf maple), and *Quercus garryana* (Garry oak), on its northern edge. Underneath this stand of mature trees were patches of *Rubus bifrons* (Himalayan blackberry) and *Ilex aquifolium* (English holly). The southern edge contained a few seedlings of *P. menziesii*, *T. plicata*, and *Picea sitchensis* (Sitka spruce) from the previous UW-REN team. Polygon 2 was the most disturbed area of the site having been invaded by 15 foot tall, dense stands of *R. bifrons* with very little native vegetation such as *Rubus spectabilis* (salmonberry) intermingled within them. Also within

these stands were an abandoned, derelict car and trailer. On the southern edge is a *Salix scouleriana* (Scouler willow) that has grown on its side and propagated via layering down towards Polygon 1. Polygon 3 was the least disturbed and is the edge of the seral forest adjacent to the site. This area is comprised of mature *A. macrophyllum*, *T. plicata*, *P. menziesii*, *Acer saccharinum* (silver maple), as well as *R. spectabilis*, *Polystichum munitum* (western sword fern), *Athyrium filix-femina* (lady fern), *Tolmiea menziesii* (youth on age), *Rubus parviflorus* (thimbleberry), *Oemleria cerasiformis* (Indian plum), *Acer circinatum* (vine maple), and *Mahonia nervosa* (low Oregon grape). On the northern edge was another abandoned, derelict car surrounded by a few patches of *R. bifrons*. Due to the fact that this polygon has established native plants and shade, only small patches of *R. bifrons* are present and have not encroached the area. This polygon most represents the upland mixed conifer-deciduous North Creek Forest and was the area that our team modeled the restoration of the more disturbed polygons after.

Ecological Concerns

The primary concern of the project site is the monoculture of *R. bifrons* that covered approximately three-fourths of the area. This heavy invasion of *R. bifrons*, interspersed with *I. aquifolium* and *P. arundinacea*, has disrupted the natural successional stages that could otherwise have allowed the site to seamlessly blend into the adjacent seral forest over time. Along with disrupting natural succession, the conditions created by these invasive species decreased the biological diversity which limited the quality and quantity of animal habitat across the site. In addition, anthropogenic debris from unauthorized residence and illegal dumping were also present above and below the ground surface, thus adversely altering the soil characteristics and decreasing its ability to support optimal vegetation conditions. To help maintain and protect this anthropogenically disturbed habitat, human-assisted restoration is necessary.

Approaches

- Remove invasive species such as *R. bifrons, P. arundinacea, I. aquifolium,* and *Sorbus aucuparia* (European mountain-ash), from the site to minimize competition and increase biodiversity.
- Remove abandoned vehicles and anthropogenic debris
- Create an upland mixed conifer-deciduous forest habitat by planting a diverse array of native plant species to support native fauna and enhance the North Creek ecosystem.
- Apply a minimum of 6 inches of wood chip mulch to help suppress the regeneration of invasive plant species, minimize soil erosion, retain soil moisture, and supply the soil with nutrients.
- Utilize the restoration site as a living educational workshop to provide hands-on activities for students and community members as well as provide an aesthetic component for visitors to enjoy.

- Promote active community involvement and stewardship opportunities to help maintain, protect, and preserve North Creek Forest.

Major Accomplishments

- Restored about 0.53 acres of an edge ecosystem in a maturing seral forest.
- With the help of volunteers, we removed about 2689 cubic yard of invasive *R. bifrons*, *I. aquifolium*, and *P. arundinacea* that previously occupied about 65% of the site and formed an almost impenetrable bramble.
- Removed and excavated about 4000 pounds of anthropogenic debris from above and below the ground.
- With the help of community partners and volunteers, we removed three derelict vehicles and various broken appliances from the site.
- With the help of FNCF recruited a large number of volunteers to help restore the site.
- Used rocky debris found on site to create a rock mound for wildlife habitat.
- Diverted an ephemeral stream to reduce soil erosion across the site.
- A total of 759 plants were installed, which includes: 103 evergreen trees, 174 deciduous trees, 390 shrubs, 35 ferns, 15 herbaceous plants, 32 groundcover plants, 1 bulb, and 9 graminoids. These native species were installed to assist the site's succession to the adjacent seral forest.

NCF UW-REN team members.
From left to right: Janice Jap, Deanna Yip, Ryan Isaacson, Spencer Murray, Sarah Park, Carolyn Stapp

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- UW-REN professors Warren Gold, Crescent Calimpong, Kern Ewing, Jim Fridley, and Carleen Weebers, who have supported us with constructive feedback and suggestions throughout the restoration project.
- UW Bothell Topics of Environmental Studies professor Amy Lambert, and her students who participated in the volunteering event held in March.
- UW Bothell campus lead gardener Tyson Kemper, King Conservation District, and Carolyn Stapp, who donated native plants to the site.
- Mike Hughes, Ian Melanson, and Rod Styles who volunteered to operate heavy machinery to allow the removal of derelict vehicles possible and transformed the cut cherry slabs, in the form of benches and log rounds, to be incorporated into the site for seating.
- A to Z Tree and Stump, Northwest Arboriculture LLC, and Northwest Arbor Care who donated wood chip mulch to our site.
- Kristin Kinder of Waste Management who donated a dumpster for invasive species and yard waste removal.
- Tadpole Haven, Kruckeberg Nursery, Whatcom Conservation District, and Center for Urban Horticulture Annual Plant Sale who worked with our group to purchase plants.
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FRIENDS of North Creek Forest

UNIVERSITY OF WASHINGTON BOTHELL

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University of Washington
Restoration Ecology Network
Bothell - Seattle - Tacoma

II. As-Built Report

A. Background

Site Description

Location

At 64 acres, North Creek Forest (NCF) is the largest remaining urban forest in the city of Bothell (Friends of North Creek Forest 2013). In the North Creek neighborhood, it is located directly west of Interstate 405 and about a mile north of the University of Washington Bothell (UWB) and Cascadia Community College campuses (Figure 1). The west side of the forest is bordered by developed residential areas, including houses and Canyon Park Junior High School (Figure 1). The south side of the forest is adjacent to North Creek Heights apartment complex and the north side of the forest is bordered by a residential area (Figure 1).

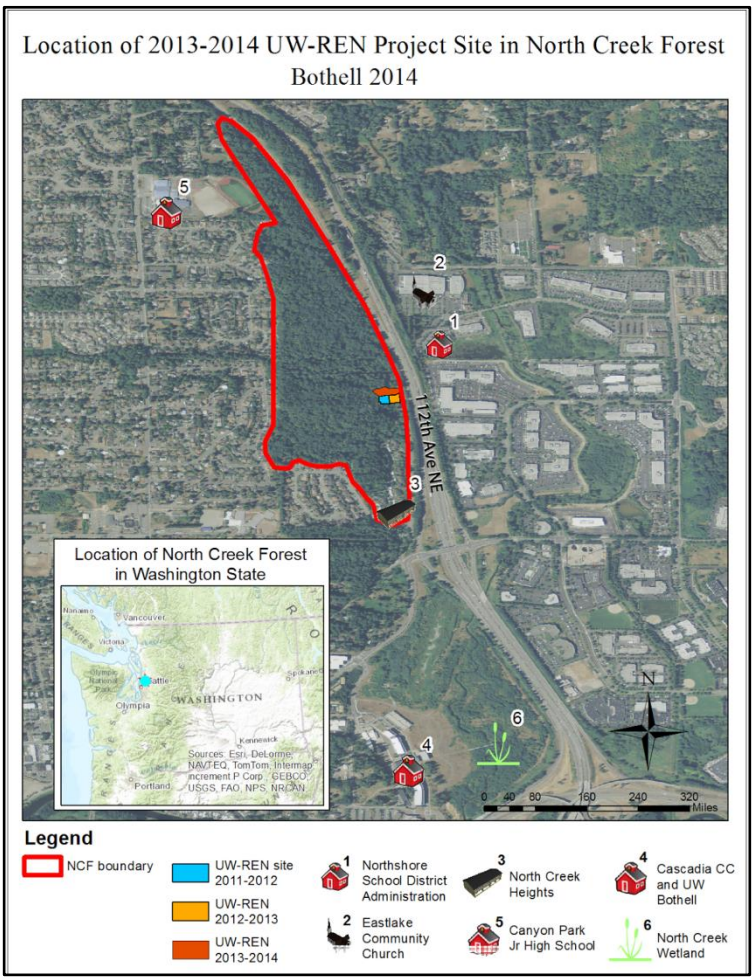

Figure 1: Location of North Creek Forest and its surrounding landmarks. In this map, the forest is bordered by a red line. All UW-REN restoration site is located right next to each other on the southeastern edge of the North Creek Forest.

The restoration site for 2013-14 is located near the end of 112th Avenue NE on the southeastern edge of the forest (Figure 1). In relation to the UW-REN restoration projects over the last two years, our site is adjacent to and directly north of both the 2011-2012 and 2012-2013 sites (Figure 1). This site was chosen to be immediately adjacent to previously restored sites because it will maintain habitat continuity and reduce fragmentation within the forest. Furthermore, the control and suppression of invasive plants on this site will reduce their encroachment onto past restoration site territory so that their current progress is not jeopardized. The site also provides rich opportunities for habitat improvement. Approximately two thirds of the site lacks an upper tree canopy with limited vertical layering and is predominantly composed of dense stands of *Rubus bifrons* (Himalayan blackberry) intermixed with some *Rubus spectabilis* (salmonberry) shrubs. These conditions provide a limited diversity of cover, food, and vegetation structure for native wildlife. Being the largest remaining urban forest in Bothell, the preservation of the area is critical in maintaining the health and function of the local ecological landscape it is a part of. It is also an important resource for the community of Bothell for its value as a tool for educational and recreational opportunities, especially considering the forest's proximity to local schools.

Site Description

The site is approximately 0.53 acres on a moderately steep (25°) eastern-facing slope. As one traverses west through the site, the species composition and vegetation structure change drastically. The east side of the site is the easiest access which is mostly open and covered in wood chip mulch. The majority of our site has been infested with dense thickets of *R. bifrons* leaving little to no room for native plants to grow and develop. The western edge of the site lies against the large remainder of NCF which is in a seral stage of succession. The seral areas are comprised of mixed conifers and deciduous trees estimated as young to middle-aged (Friends of North Creek Forest). Based on topography and distinct differences in plant species composition and structure (Table 13), we have divided our site into three different polygons (Figure 2).

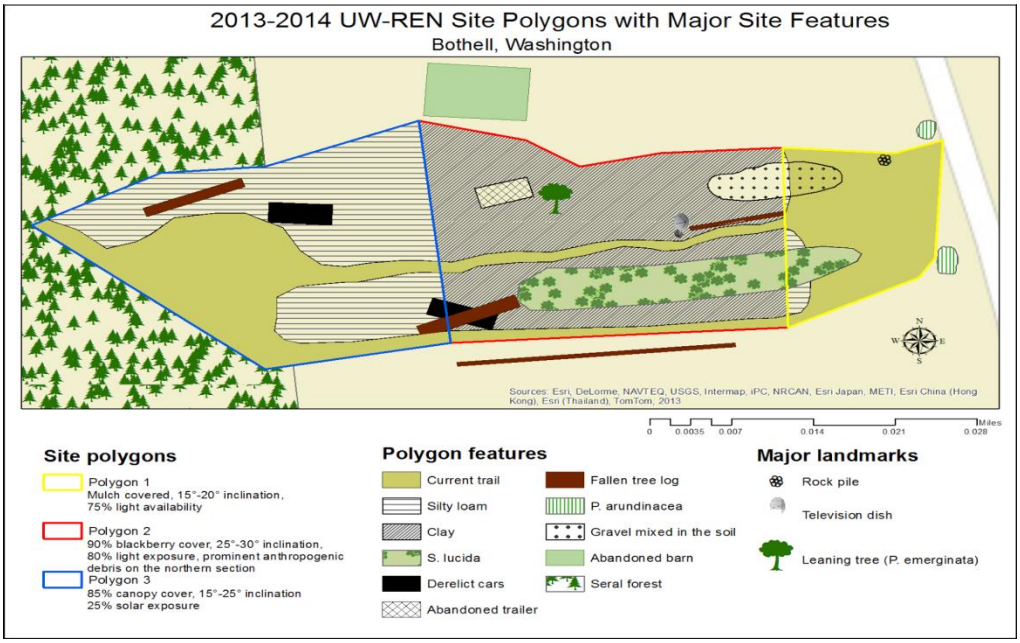

Figure 2: Original site map before site trail and ephemeral stream diversion. Location of derelict vehicles are shown.

AD1: Alterations to the trail system and the existence of the ephemeral stream are design elements that are not present in the original maps. Due to the high levels of soil saturation and standing water from stormwater runoff, a stream bed was created in order to divert water flow across the site. New trails that circumvented the most saturated areas were created to provide better access to the northern edge of the site.

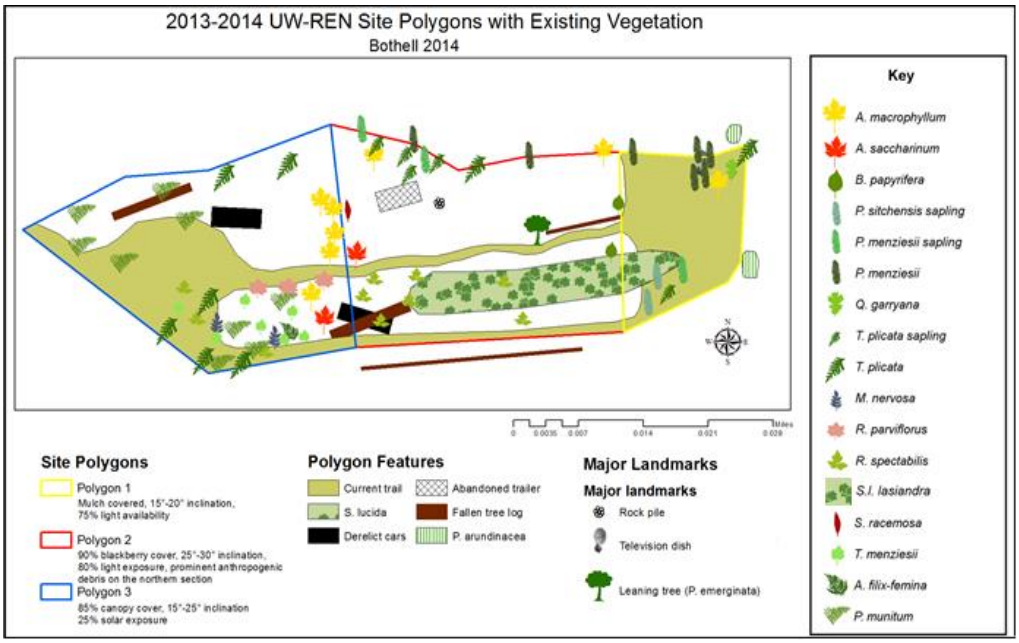

Figure 3: Original map of site polygons with existing native vegetation.

The first polygon is on the eastern side of our site. Previously this area had been invaded by *R. bifrons*, however this invasive was trimmed and cleared away, including the removal of their rhizomes, during the restoration work done by the UW-REN team of 2012-2013. Wood chip mulch has been applied unevenly to the area at an average depth of 5 inches to suppress any re-emerging invasive plants, enhance the soil over time through organic breakdown of the wood chips, minimize moisture loss, and to increase the topographic diversity of the site with small mounds. This has left the polygon to be mostly open with little diversity of species and vegetation structure. Two small patches of *Phalaris arundinacea* (reed canarygrass) are located on the east edge of this polygon along the ditch (Figure 2). The southern patch seems to be an extension of a larger patch that was removed from the 2012-13 restoration project that has reemerged and spread into the site. On the northern edge of this polygon are specimens of *Pseudotsuga menziesii* (Douglas-fir), *Thuja plicata* (western redcedar), *Acer macrophyllum* (bigleaf maple), and *Quercus garryana* (Oregon oak) (Figure 3). These trees cover approximately 50% of the total canopy cover of the polygon and provide some shade to the area. At the base of these trees are some stands of *R. bifrons* up to 4 feet tall. At the southern edge of the polygon are a few seedlings of *P. menziesii*, *Picea sitchensis* (Sitka spruce), and *T. plicata* (Figure 3). In the future these species will mature and propagate throughout the site to create a continuous forest ecosystem from Polygon 1 to polygon 3. It should be noted that in between 112th Ave SE and I-405 to the east of the restoration site used to be a strip of maturing coniferous trees that acted as a natural sound barrier which has been removed by the Washington State Department of Transportation this fall. In addition to acting as a natural sound barrier, it formerly provided this polygon at the eastern edge of our site with some shade.

Polygon 2 is dominated with dense thickets of *R. bifrons* that reach up to 15 feet and cover approximately 90% of the area. Of all the areas across the site this is the most disturbed. There are only a small number of native plants surviving along the northern and southern edges due to the aggressive growth of the dominant *R. bifrons.*On the northern edge of this polygon are some *T. plicata* and *A. macrophyllum* seedlings, mature *P. menziesii*, and *Rubus parviflorus* (thimbleberry) plants trailing in from polygon 3 (Figure 3). On either side of the trail in between the stands of *R. bifrons* are two specimens of *Betula papyrifera* (paper birch) and intermingled in these stands are some *R. spectabilis* shrubs (Figure 3). Also found were a number of *Salix lucida* ssp. *lasiandra* (Pacific willow) shrubs that spread out from the eastern edge of the *R. bifrons* in Polygon 1 on up through the center of polygon 2 on the south side of the trail (Figure 3). The lack of canopy shade has allowed these invasive blackberry plants to thrive, which in turn smothers native plants and arrests successional progression. In addition, an old derelict car and trailer have been abandoned in this polygon and will be removed to avoid potential leaching of oily residue into the soil (Figure 2). Our primary restoration efforts will take place in this polygon.

AD2: After the leaves had grown back, we found that the willow stand was not Pacific willow, but Scouler's willow (*Salix scouleriana*).

The third polygon is where the stands of *R. bifrons* end and the edge of the upland mixed forest begins. This polygon is the most diverse in our site in regards to structure and species composition. It is comprised of maturing specimens of *A. macrophyllum*, *T. plicata*, *P. menziesii*, and a non-native *Acer saccharinum* (silver maple) with tree cover of up to approximately 85%

(Figure 3). The understory is comprised of a mixture of *Polystichum munitum* (sword fern), *Tolmiea menziesii* (youth on age), *Athyrium filix-femina* (lady fern), *R. spectabilis*, *Mahonia nervosa* (low Oregon grape), *R. parviflorus*, *Sambucus racemosa* (red elderberry), and *Acer circinatum* (vine maple) covering up to approximately 80% of the area (Figure 3). A second abandoned car is located on the north side of this polygon which will be removed along with the derelict car and trailer found in polygon 2 (Figure 2). Along the northern edge are some trailing stands of *R. bifrons* from the second polygon and a few *Ilex aquifolium* (English holly) plants. These invasives are situated in a small gap which allows them to persist, but the dense shade provided by the maturing trees prevents them from spreading and invading the rest of the polygon. This polygon will be our model for the restoration of the more disturbed areas in our site.

Habitat

The forest's structural and vegetative diversity provide native fauna with habitat, nesting areas, browsing options, food, and cover year round. According to Friends of North Creek Forest (FNCF), this urban forest broadly is home to various native animals including *Odocoileus hemionus* ssp. *columbianus* (black-tailed deer), *Dryocopus pileatus* (pileated woodpecker), *Tamiasciurus douglasii* (douglas squirrel), and *Aplodontia rufa* (mountain beaver). Washington Fish and Wildlife has labeled *D. pileatus* a "priority species" due to the fact that they help control the size of the bug population at NCF and their abandoned nests become homes for other birds (FNCF 2013). Amphibians, including *Ensatina eschscholtzii* (ensatina) and *Plethodon cinereus* (red back salamander) also reside in the forest for cover. Protecting North Creek Forest and restoring the disturbed areas within it will ultimately protect and support these animals as they are important components of this ecosystem.

Restoration Needs and Opportunities

Our restoration site borders the eastern edge of a seral upland conifer forest, an area critical to wildlife as edges are transition zones between forested and open areas. The edges of NCF host a considerable number of native avian species such as *Bubo virginianus* (great-horned owl), *Buteo jamaicensis* (red-tailed hawk), and *Haliaeetus leucocephalus* (bald eagle). During the winter, *H. leucocephalus* roost in the trees of NCF to thermoregulate and to save energy. Managing the forest implies that they have habitat with restricted human disturbances for these essential processes to take place (Stalmaster 1983). In addition, NCF is part of a watershed that is connected to the Sammamish River which is home to various salmon species including *Oncorhynchus tshawytscha* (Chinook), *Oncorhynchus kisutch* (coho), and *Oncorhynchus nerka* (sockeye) (King County 2009). Protecting the creeks in NCF is a vital part of protecting the salmon population (which is an essential food staple for *H. leucocephalus*). Therefore, it is critical to make sure the restoration of this site can support this ecosystem and its complex interactions to sustain high flora and fauna species diversity. The monoculture of *R. bifrons* that has invaded polygon 2 and sections of polygons 1 and 3 has arrested the succession of this forest edge (King County 2013c). It has limited the development of native plant species and structural diversity and provides limited resources for native wildlife. Restoring the site with a diverse

selection of native plants will provide several benefits. As the trees and shrubs mature, they will provide shade to the area to help prevent the possible regrowth and spread of invasive plant species (Task 1.1d). In addition, the established shade will enhance the growth of shade-thriving understory species and drive succession forward to assimilate into the seral forest that it is adjacent to (Objective 1.2). Establishing structural diversity will also create habitats for a wide variety of native animals (Task 1.2c). Due to the fact that this site is part of the largest urban forest in Bothell, WA, this project is a great tool for educating the community about the importance of preserving this natural area. This project will provide many opportunities for children and members of the community to volunteer at the site and learn about the importance of ecological restoration.

B. Tasks and Approaches

Goal I - Promote the development of a native upland mixed conifer / hardwood forest habitat that will support native flora and fauna.

- Objective 1.1 – Remove as many invasive species as possible, focusing on the two most prevalent invasives on site: *R. bifrons* and *I. aquifolium*, and use approaches that will prevent regrowth of the invasive species.
    - Task 1.1a: Removal all *R. bifrons* above and below the soil.
        - Approach: In areas where brambles of *R. bifrons* are prevalent, blackberry canes will be cut to within 0.5 m above the soil with loppers so that their location will be visible for future rhizome removal. In addition, *R. bifrons* that have entangled native vegetation will be trimmed away. Remaining rhizomes will then be manually uprooted from the soil using shovels and placed in a 40 cubic yard dumpster provided by Waste Management.
        - Approach Justification: Past studies have shown that removal of entire *R. bifrons* rhizomes is considered to be more effective in preventing regrowth than removing only the portion of the plant that is above the surface (Leigh 1999).
    - Task 1.1b: Remove all *I. aquifolium* above and below the soil.
        - Approach: In areas where they are present as young seedlings, *I. aquifolium* will be removed manually by completely uprooting the plants. If individuals have grown into large trees or have developed thick stems that are too difficult to be manually extracted, we will frill these individuals and then treat them regularly with glyphosate-based herbicides such as Roundup. There is one *I. aquifolium* that is growing out of the base of an *A. macrophyllum* on site which will be cut down as close to the ground as possible and monitored over time to determine if this method is effective in preventing regrowth. This is an interesting situation in which we will not use herbicides due to the fact that it may potentially have a negative effect on the on the growth and success of the *A. macrophyllum.*
        - Approach Justification: King County Noxious Weed Control Program suggests practitioners to pull or dig out roots if possible, or apply triclopyr- or glyphosate-based herbicides directly into the cut stems. Experience has shown

that cutting the base of *I. aquifolium* stems alone are not enough to kill the plants since they will re-sprout from the crown (King County 2013b).

AD3: Treatment using Glyphosate-based herbicide was not carried out by the UW-REN team and was suggested to our community partner. To prevent potentially harming the surrounding vegetation, herbicide will be applied directly to the frilled part of the trees during dry weather to prevent the herbicide from seeping into the soil.

- Task 1.1b: Apply wood chip mulch across the site to help prevent regrowth of invasive species.
  - Approach: Wood chip mulch, donated by local arborists, will be applied at a depth of at least 6 inches over areas that have been cleared of *R. bifrons* and *I. aquifolium*.
  - Approach Justification: Past studies have shown that the application of wood chip mulch helps control *Rubus* spp. and improves site conditions for plant establishment and survival. Target plants that grow with the application of adequate mulching have higher survival rates, are larger, and grow more vigorously (Chalker-Scott 2007).
- Task 1.1d: Develop vertical structure across the site to create favorable conditions for target species while limiting the growth potential of any volunteer *R. bifrons* that might appear in the future (Bennett 2006).
  - Approach: We will install native species that are fast-growing and are able to provide quick shade across the most exposed polygons. Several species that accomplish these objectives are *Alnus rubra* (red alder), *A. macrophyllum, Populus balsamifera* ssp. *trichocarpa* (black cottonwood), *Salix scouleriana* (Scouler's willow) and *Physocarpus capitatus* (Pacific ninebark).
  - Approach Justification: These plants are fast-growing species that are fit for early successional conditions (Gold 2013b). Their fast-growing and short-lived nature allow these plants to establish canopy cover for other seedlings and understory species and to shade out invasive species, thus establishing an accommodating habitat condition for later successional species. *P. capitatus,* specifically, are able to form close-knitted canopies that are relatively short-lived (about 5 years) compared to other species (Gonzalves 2007).

AD4: *Salix lucida* ssp. *lasiandra* (Pacific willow) was used instead of *S. scouleriana*.

- Objective 1.2 – Plant a diverse array of native species that will promote future growth and success of the ecosystem being restored.
  - Task 1.2a: Install species that will mature and develop different canopy levels throughout the site.
    - Approach: Creating an understory by utilizing a combination of ground cover and herbaceous plants such as *Arctostaphylos uva-ursi* (Kinnikinnick), *Fragaria chiloensis* (coastal strawberry), *Gaultheria shallon* (salal), *P. munitum*, and *Lupinus polyphyllus* (large-leaved lupin). Develop a mid and woody understory with a variety of shrubs and small trees including: *Cornus nuttallii* (Pacific dogwood), *Oemleria cerasiformis* (Indian plum), *Ribes sanguineum* (red-flowering currant), *A. circinatum*, and *Rosa gymnocarpa*

(baldhip rose). Finally, install additional tree species that will, in the long term, create a diverse overstory. These trees include *Abies grandis* (grand fir), *A. macrophyllum*, *A. rubra*, *P. sitchensis*, *P. balsamifera* ssp. *trichocarpa*, *P. menziesii*, and *T. plicata.*

- Approach Justification: These species have been selected for their ability to coexist well, drive succession forward, and provide structural diversity. We have included tree species such as *P. balsamifera* ssp. *trichocarpa* and *A. rubra* which would not be present towards the end of the seral stage of a forest comprised of mixed coniferous and deciduous trees. They will mature quickly and provide shade for developing seedlings such as *T. plicata* (Ewing 2014). When these quick-growing trees die, they will create openings in the canopy and make room for other plant species to establish.

- Task 1.2b: Use plant species that have high survival rates in the climate they are being planted in.
  - Approach: We will install species in polygons whose microclimates suit each plant's growth needs to ensure survivability and future development.
  - Approach Justification: We divided our site polygons based on their soil characteristics, amount of exposure to solar radiation, and their predominant vegetation composition. Another planting consideration is the areas where stormwater runoff creates saturated soil conditions that alter the microclimate similar to wetlands. We will use native plant species that are best adapted to grow in each microsite to ensure high survival rates (Sound Native Plants 2014).

AD5: We added three raised beds in Polygon 2 to accommodate additional upland vegetation, such as *P. menziesii*, *T. plicata*, and *A. macrophyllum*, in areas where soil saturation becomes exceptionally high due to stormwater runoff. Two of these beds were placed at the center of the polygon and one was placed along the stream bank to allow *Oplopanax horridus* (devil's club) as well as *P. sitchensis* to grow.

- Task 1.2c: Plant species that will accommodate the needs of native wildlife.
  - Approach: We will include combinations of plant species that provide shelter, browse, food, and cover for native wildlife.
  - Approach Justification: By increasing the diversity of vegetation composition and structure of species with traits that are beneficial to the local wildlife, we can attract native fauna and provide them with essential resources (Stinson 1998).

- Objective 1.3 – Create a stewardship plan for FNCF with instructions to ensure the continuing success of the restoration site.
  - Task 1.3a: Create a timeline of desired site maintenance and future volunteering opportunities to ensure invasive species regrowth is limited.
    - Approach: Determine specific future dates to return to the site to make sure that there is no regrowth of invasive species and that the native species being planted are thriving. A modified Gantt chart will be used to track the project's maintenance progress on a weekly basis during the first six months and we will work together with FNCF to determine specific dates for work parties.

- Approach Justification: Close maintenance and monitoring of the site is essential so that we can detect any potential problems or damages early during the restoration project and proceed to promptly resolve the issue (Clewell 2007). Even if there is no apparent regrowth of invasive species, we need to maintain monitoring plant growth, mulching, and tracking plant health and maturation into the near future to ensure that ecological succession moves in the desired direction. Keeping close track of the amount of work done by volunteers and project workers is also crucial for FNCF's administrative purposes for obtaining grants and other fundings. Moreover, a well-designed volunteer plan will allow project practitioners to estimate the amount of time required to achieve specific goals so that each work party can be coordinated efficiently.

AD6: A maintenance timetable has been created in order to effectively communicate to our community partner when and where to implement various maintenance activities (Table 14).

- Task 1.3b: Continually clarify the goals and objectives of the work plan as maintenance progresses and monitoring continues at the site.
  - Approach: Appoint a delegate to update the needs of the site through the goals of the stewardship plan based on walk-throughs of the site and current conditions. This task will be done once every six months.
  - Approach Justification: The interaction between elements that make up our project site is numerous as well as complex; therefore, it is important to acknowledge any unforeseen changes that occur to our site and adapt them in accordance to the project objectives and stewardship plan.
- Task 1.3c: Work with FNCF to make sure the stewardship plan will be used.
  - Approach: Along with a representative from FNCF, determine a person or persons to overlook the stewardship plan and make sure that it is being implemented properly.
  - Approach Justification: Given that practitioners acquire a significant amount of knowledge of the project site along the course of the project, it is best to utilize the project planning that they have prepared.

Goal II – Remove as much anthropogenic debris located within the restoration site as possible.

- Objective 2.1 – Remove the abandoned derelict vehicles on site.
  - Task 2.1a: Remove all invasive species surrounding the vehicles and clear a path to remove the car from the area.
    - Approach: We will make a path through the thick *R. bifrons* brambles that hide one derelict vehicle by cutting through the dense vegetation with loppers, making the canes short enough for authorized vendors to maneuver around to remove the crushed abandoned vehicle.
    - Approach Justification: The established *R. bifrons* has formed a very dense thicket that reaches as high as 15 feet tall. Considering that the derelict car is stuck right in the middle of the vegetation, clearing a path

that is safe for the volunteers and practitioners to pass through is, therefore, mandatory.

- Task 2.1b: Hire a vendor to cut the abandoned car pieces into manageable sizes to be able to remove them from the site.
  - Approach: We will work together with FNCF to find an authorized vendor to operate the necessary machinery to cut up a large tree that has fallen onto the abandoned car before disassembling the abandoned vehicle.
  - Approach Justification: Given that project practitioners are restricted from wielding powered machinery and powered tools, we will have to rely on an authorized vendor to accomplish this task.

AD7: Mike Hughes, Ian Melanson, and Rod Styles, who are authorized to operate heavy machinery, volunteered in assisting the removal of derelict vehicles and the fallen tree.

- Task 2.1c: With teams of people, carry out the disassembled car pieces.
  - Approach: Once the derelict vehicles are cut into manageable pieces, we will work with teams of volunteers to carry out the pieces either by hand or with wheelbarrows.
  - Approach Justification: Since the derelict cars are located in polygon 2 and polygon 3, we will have to move and place the disassembled car pieces near the entrance temporarily. We will load the car parts into dump trucks from this location.
- Task 2.1d: Remove remaining debris that has been sitting underneath the abandoned cars and trailer.
  - Approach: Group members and volunteers will remove remaining vehicle parts and other anthropogenic debris that may have been buried underground and, therefore, missed from early scavenging sessions. Using shovels and clawed mattocks, we will break up the hardened soil below where the cars were located and comb through the soil to ensure all debris has been collected. If there appears to be evidence of leaked fluids from the vehicles, we will determine what additional steps should be taken in order to remedy the disturbed soil.
  - Approach Justification: The majority of anthropogenic debris that is found in polygon 2 are found partially or fully concealed under the surface. Therefore, to preserve our site's soil quality, we will remove all debris before the application of wood chip mulch.

AD8: Subsequent effort to excavate as much debris out of the ground from the northern section of Polygon 2, in the area designated as the island, revealed that many tiny pieces of plaster debris were mixed in with the soil. Thus complete debris removal was not possible given the limited labor and time. After consulting Kent Parkinson, who is familiar with building material, it was determined that the material is biodegradable and that it would be safe to leave the small remaining pieces.

- Objective 2.2 – Remove and properly dispose of all other debris found on site.
  - Task 2.2a: Separate the debris by recycleable categories so it can be properly disposed of.

        - Approach: Volunteers and project team members will comb through the soil and debris in search of recyclable materials such as glassware and metals and separate them to be discarded accordingly.
        - Approach Justification: Most of the remaining anthropogenic debris on site is recyclable. Thus, it is important to follow the proper waste removal process to foster a sustainable restoration agenda.
    - Task 2.2b: Take separated debris to proper facilities to be disposed of.
        - Approach: The separated materials will then be transported by a truck rented from U-Haul to the local garbage and recycling center for proper deposit including the derelict car parts.
        - Approach Justification: The sorted debris will be discarded to the nearest garbage and recycling site that is open for business after we finish transferring and piling up the vehicles: Houghton Transfer Station, which is located at 11724 NE 60th St in Kirkland.

AD9: The car parts placed at the entrance were not properly disposed of due to the fact that they were stolen before transport could be arranged.

Goal III – Use community involvement and education to help maintain the site and continue assisting the restoration of the forest.

- Objective 3.1 – Contact local schools and organizations concerned with maintaining and improving the environment and present them with an opportunity for hands-on learning and volunteering as well as show them firsthand what the work of dedicated volunteers can accomplish for the benefit of the environment.
    - Task 3.1a: Contact representatives from local schools.
        - Approach: We will establish connections with contact personnel at local schools and organizations for future recruitment and education purposes.
        - Approach Justification: We plan on cultivating a relationship that fosters educational opportunities with the community through participation in activities such as invasive species identification and removal, flora and fauna observations, educational trail talks regarding the importance of the forest as a part of a larger ecological system, and on-site artistic planting activities. This community involvement will work to foster stewardship pride for generations to come.

AD10: In an effort to catch up on volunteer hours, our community partner contacted local schools to recruit volunteers for work parties. The members of our team found that we had less time for recruitment than originally anticipated.

    - Task 3.1b: Contact local organizations that have been involved in past events to keep them involved and updated of the progress of the UW-REN restoration projects.
        - Approach: We will contact representatives of local organizations to maintain our connections with them and inform them of future volunteering opportunities.

        - Approach Justification: Friends of North Creek Forest has had several of its direct contacts from local businesses move on in their professional careers. Therefore, we are trying to "reconnect" with the new staff and representatives of these organizations to continue these relationships in the future. Currently, Spencer Murray is representing our team and the organization to re-establish partnerships with the new human resources representative of Waste Management. By providing us with a dumping container to store cut *R. bifrons* canes, they are assisting in an important process of this restoration project and we are, in return, helping their business.

AD11: Our community partner contacted local organizations to recruit volunteers for work parties as well.

    - Task 3.1c: Show volunteers and community members the progress the restoration site has made.
        - Approach: A poster presentation can be made to showcase the progress and accomplishments that the team and North Creek Forest have made. In addition, we will create a trail system that showcases a variety of native species which can be used to show the benefits of restoration and inspire youth and community partners to support future work.
        - Approach Justification: Promoting our accomplishments through poster and walkthrough sessions will create interactive, educational, and informative opportunities about the project and the Friends of North Creek Forest organization. By doing this, we hope to get community support for the sustainability of North Creek Forest.
    - Task 3.1d: Use previously dedicated volunteers to find new ones.
        - Approach: We will encourage new volunteers to invite other people to future volunteering opportunities.
        - Approach Justification: According to Friend of North Creek's past experiences, door-to-door recruitment for new volunteer members is considered to be the most effective method to get people to join the weekly work parties. However, since the number of volunteers has been rising recently, encouraging each of these people to invite their acquaintances to the work party will increase the chances of newcomers joining future volunteering events.
- Objective 3.2 – Use social media such as Facebook and the Friends of North Creek Forest's website to promote work parties, gain volunteers, and let the public know about the restoration work occurring at North Creek Forest.
    - Task 3.2a: Constantly update calendars about work party events planned for the future.
        - Approach: Communicate future volunteering opportunities to volunteers that have signed up for the North Creek Forest e-newsletter and post updates on North Creek Forest's homepage.
        - Approach Justification: Broadcasting upcoming volunteering opportunities via social media is another effective method to acquire volunteers. In

addition, information shared in this manner is easily relayed from one individual to another.

- Objective 3.3 – Place posters promoting the restoration work at North Creek Forest throughout the local community.
    - Task 3.3a: Place promotional posters throughout the UWB and Cascadia campuses.
        - Approach: Work with the student government at both campuses and ask for permission to put up posters. We can also take this opportunity to work with local artists and students to create visually appealing posters.
        - Approach Justification: Putting up posters around campus will bring awareness to the students and staff about the restoration projects going on at their local urban forest that they may not have known about otherwise.

AD12: Due to the challenges of collaborating with the campus Sustainability Organization, budget limitations, as well as time restraints, the development of promotional posters were not implemented.

    - Task 3.3b: Place promotional posters at local businesses including restaurants and coffee shops.
        - Approach: Work with the local businesses to include any necessary legal disclaimers and logos on our materials.
        - Approach Justification: Putting posters up at local businesses will inform the community of the restoration projects transpiring at NCF and bring awareness to the importance of these projects.
    - Task 3.3c: Install posters at local middle and high schools where we have contact with environmental teachers who support our work and would encourage students to volunteer. We will then follow up with classroom presentations.
        - Approach: We will contact the school representatives to ask for permission to hang our posters and then work with a poster artist to create a poster that will catch the attention of young students.
        - Approach Justification: Getting young children involved in a restoration project such as this one will help teach them the importance of preserving natural habitats and how we can help make a difference through sustainable practices.
- Objective 3.4 – Utilize local media sources such as the UWB student newspaper, the UWave Campus Radio station, and Bothell Reporter to promote the restoration of our site and specific volunteer events.
    - Task 3.4a: Create an overview of our work and future plans at our site and use that as a framework for all promotional materials.
        - Approach: After creating a presentation we can approach the local media sources with the work that we are doing and the benefit it will have on the community. We can share with them the different ways students are getting involved and how many community members are working to not only restore NCF, but to create a living laboratory for future generations.
        - Approach Justification: If the public is not aware of the importance and value of NCF, then they are not likely to support future work around the site or approve the use of public funds to be used for its maintenance.

Local media is one of our greatest resources for getting the word out and increasing awareness of the work being done.

- Task 3.4b: Work with the BS (Bothell Student) Times to write a short ad that can be submitted to the paper to gather student volunteers.
  - Approach: The BS Times is the University of Washington Bothell's quickest method to make students aware of what is transpiring on campus. By writing a short advertisement, we can generate interest and increase student involvement.
  - Approach Justification: Although we do not expect an abundance of volunteers as a reaction to posting in the Times, what we do expect is recognition and awareness of what it is we are doing at North Creek Forest. By following up with classroom presentations, information tables, and possibly presenting at events, we hope to connect with interested students for this year's project and for restoration work in the coming years.
- Task 3.4c: Write an article for the Bothell Reporter to inform the community about our efforts at our site and to encourage people to come out and volunteer.
  - Approach: Have one person from the group contact Bothell Reporter and provide a summary of our project and propose a request for coverage.
  - Approach Justification: Having professional and official coverage of our team's project should generate interest and support from the community. Being featured in any sort of media source can also enhance future opportunities for funding and volunteers.

AD13: The ad for Bothell Student Times and the article for the Bothell Reporter were not written due to time constraints.

C. Specific Work Plans

Site Preparation Plan

Current Conditions

Our site is located on an eastern-facing moderately sloped section of the North Creek Forest that gradually declines eastward to the direction of 112th Ave NE. Subsequent to the removal of *R. bifrons* brambles that covered about two-third of our project site, we found that the ground was also unevenly sloped upwards from the southern border of the site to the northwestern corner of the project area. Canopy cover and structural/species diversity decreases as one move away from the edge of the seral forest to the exposed east end of the site. Overall, approximately two thirds of the site lacks an upper canopy cover, vertical layering, and aboveground cover provided by the non-native species dominating the site prior to invasive species removal. Due to this nature, a majority of the site receives plenty of exposure to solar radiation all year round. This condition, together with Bothell's average annual precipitation of 34.32 inches (USA.com 2010), determines the site's soil moisture. Soil characteristics also vary across the site gradient and upon observation, also affect the vegetation species grown there. Considering these variabilities across the site gradient, we divided our project site into three polygons based on predominant vegetation, soil characteristics, and the amount of exposure to solar radiation (Table 13).

Site Polygons

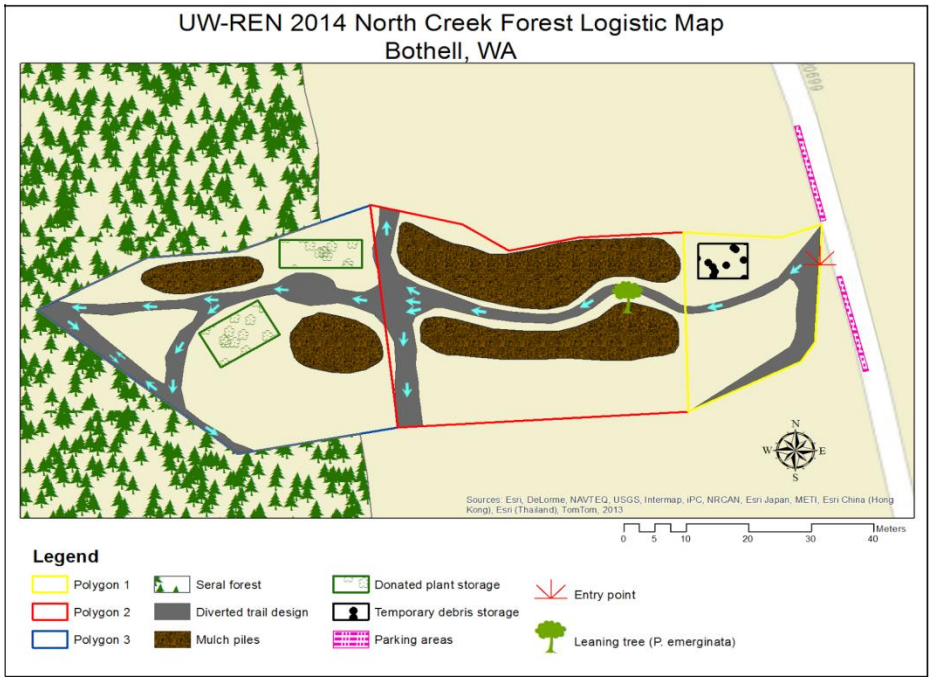

Figure 4: Original logistics map with initial trail system diversion. Compare changes with Figure 5.

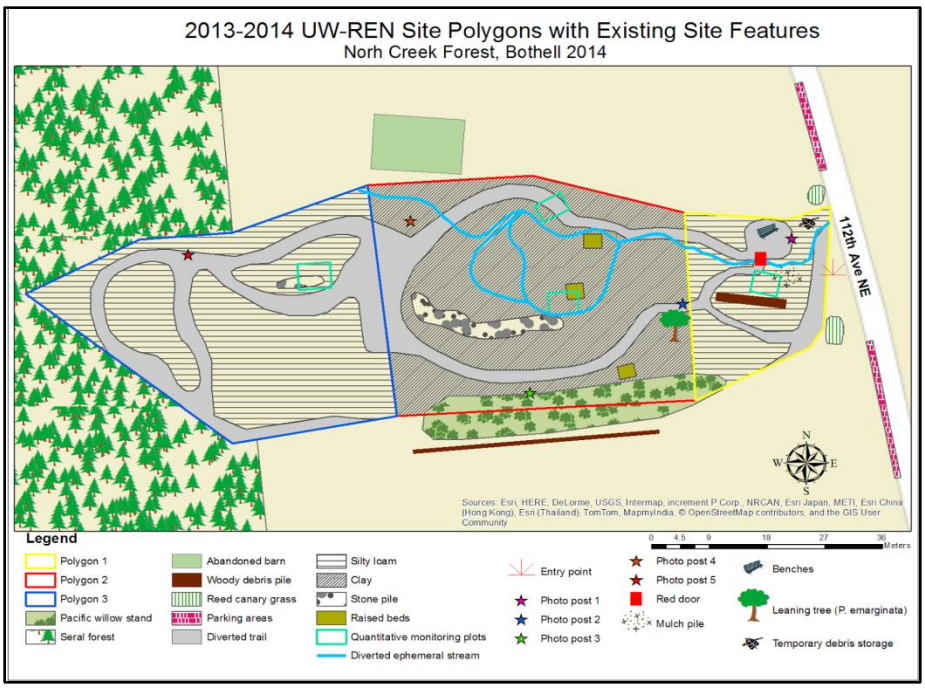

Figure 5: As-built map showing project site divided into three polygons based on their soil characteristics, amount of exposure to solar radiation, and their predominant vegetation composition. Major features and alterations to the site have been updated. Derelict vehicles have been removed out from site and therefore not showed in the map.

Polygon 1

Polygon 1 is located at the eastern edge of the site and is adjacent 112th Ave NE (Figure 2). This polygon receives direct sunlight from the east due to the removal of a strip of maturing coniferous trees that used to provide shade and act as natural sound barriers between I-405 and 112th Ave NE back in 2013 (WSDT 2014). This results in Polygon 1, which has the least canopy cover, to receive the most intense solar radiation of the site year round (Figure 2, Table 13). The exposure to the adjacent road and the removal of the conifer strip may cause it to be potentially vulnerable to invasive species introduction in the future. The ground is sloped, ascending about 15 to 20 degree westward. The soil is composed mainly of silty loam that does not hold water well. About 2 meters from the northern edge of Polygon 1, there is a considerable amount of gravel mixed in the soil causing a distinguishable change in soil structure and density (Figure 2, Table 13). About 80% of the ground surface is covered by an uneven layer of wood chip mulch, which was applied by the UW-REN team of 2012-2013 as a part of their project plan. This uneven surface introduces a restoration-oriented disturbance, while the prevalent anthropogenic disturbance on this site is present as abandoned anthropogenic debris (wiring, tile floor, bottles, and plastic bags). Some layers of leaf litter can be found in the northeastern corner of the polygon where clusters of deciduous and coniferous trees are growing (Figure 3). Several native species that provide canopy cover to the site are: *P. menziesii*, *Q. garryana*, *A. macrophyllum*, *T. plicata*, and *Salix lucida* ssp. *lasiandra* (Pacific willow) (Figure 3). The invasive *R. bifrons* establish themselves as small clusters in the ditch bordering the eastern edge of the polygon, and several young *I. aquifolium* can be found at the northwestern edge of the polygon.

AD14: Scouler's willow (*Salix scouleriana*).

Polygon 2

Located on a moderately sloped ground that ascends about 25-30 degrees westward, polygon 2 is located west of Polygon 1 (Figure 2). The soil here is mainly composed of clay soil which holds the highest moisture content compared to the other two polygons (Table 13). Similar to Polygon 1, there is a considerable amount of gravel mixed in the soil on the northeastern edge of the polygon (Figure 2). This polygon also receives high amounts of light although it is not exposed to direct solar radiation completely due to the shade provided by the plants in adjacent restoration sites. Several native species that form a small percentage of the overall canopy covers of polygon 2 are: *S. lucida* ssp. *lasiandra*, *A. macrophyllum*, *T. plicata,* and *R. spectabilis* (Figure 3). Thick brambles of *R. bifrons* characterize this area's vegetation composition; this invasive species dominates about 90% of the available ground space, thus pushing a small number of native vegetation to the edge of the dense thickets (Figure 3). Due to its dense establishment, rhizome removal is likely to be intense in the future and extensive digging may cause potential disturbances in the soil. Anthropogenic disturbance in this polygon is prevalent all over the polygon as either underground or aboveground litters (wiring, brick, concrete, glass bottles, oil filter, metal, tires, a camper trailer, a derelict car, kitchen supplies, plastic, floor tiling, chain, etc.).

AD15: Scouler willow (*Salix scouleriana*).

Polygon 3

Polygon 3 is located at the highest topographical point on site bordering the seral forest (Figure 2). This polygon has the highest percentage of canopy cover and is the most diverse in species composition and structure. Due to its dense canopy cover, most sunlight, approximately 80%, is filtered before reaching the ground, thus exposing the soil to less intense solar radiation and providing enough shade to slow the growth of invasive *R. bifrons* from spreading far from the southwestern corner. *I. aquifolium*, which is present in the northern corner of this polygon, is also partially suppressed. The soil has a sandy composition as well as a silty loam texture that does not hold moisture well (Table 13); however, the dense canopy cover allows it to retain enough moisture to prevent desiccation. Several native species that make up the plant distribution of this polygon are: *P. munitum*, *A. filix-femina*, *A. macrophyllum*, *T. plicata*, *M. nervosa*, *T. menziesii*, *A. circinatum*, *R. spectabilis*, and *S. racemosa* (Figure 3). Anthropogenic disturbance is present in the form of anthropogenic debris including: a derelict station wagon, tiling, broken glass, and carpeting on the northeastern section of the polygon. This portion of the polygon is adjacent to polygon 2 and the dilapidated barn on the northern edge of polygon 3, so anthropogenic debris can be found strewn around the perimeter.

Site Vegetation

Polygon 1 is an exposed area with little structural and species diversity. Dense clusters of deciduous and coniferous species can be found on the northeastern corner of the site, where several species such as *P. menziesii, Q. garryana, A. macrophyllum, and T. plicata* predominate,

forming about 50% of the overall canopy covers in Polygon 1. A sparse distribution of *P. sitchensis, P. menziesii, and T. plicata* saplings can also be found scattered around the southeastern side of the polygon (Figure 3). The invasive *P. arundinacea* is present as two small patches on either side of a ditch located at the eastern end of the polygon, occupying about 5% of the site; however, their current presence pose little concern to the restoration project. Another invasive species is *R. bifrons* which encroach from the adjacent polygon 2 occupying about 30% of Polygon 1. Their presence in Polygon 1 is partially suppressed by the application of wood chip mulch from the previous UW-REN team despite of the sufficient amount of sun exposure that this polygon receives.

AD16: Not only was the entrance applied with wood chip mulch to minimize the reinvasion of *R. bifrons*, but the previous UW-REN team cleared this area of *R. bifrons* plants and their roots.

Polygon 2 is the most disturbed area of the site. Dense thickets of *R. bifrons* dominate about 90% of the understory, thus pushing off a small variety of native species such as *T. plicata, A. macrophyllum,* and *P. menziesii*, which make about 5% of the canopy cover, to the northern edge of the polygon where the adjacent clusters of maturing *P. menziesii* from the neighboring areas provide moderate shade for these species to persist (Figure 3). Several *R. spectabilis* stands are the only species that can thrive among the *R. bifrons* brambles (Figure 3). This dense establishment of *R. bifrons* understory in polygon 2 prevents the establishment of species and structural diversity. Other species that are also present in polygon 2 as individual stands are *B. papyrifera, A. saccharinum,* and *S. racemosa* (Figure 3).

Polygon 3 has the most structural and species diversity with *A. macrophyllum* and *T. plicata* making about 50% of the upper canopy cover. The sub-canopy layer is mainly composed of native species such as *A. circinatum* and *S. racemosa*. The ground layer is composed mainly of *T. menziesii* that make about 40% of the overall ground coverage, and clusters of *M. nervosa* that make up about 20% of the ground coverage. The dense canopy of polygon 3 allows these native species to establish themselves in this area while shading out the invasive *R. bifrons*, thus keeping it from spreading throughout the polygon.

Site Preparation Activities

Due to its presently sparse condition, Polygon 1 will receive little site preparation prior to future native species installations. Modifications will include removal of invasive species, application of at least 6 inches of wood chip mulch, native species installation, and potential existing trail diversion. Removal of *R. bifrons* canes that encroach from polygon 2 and several young *I. aquifolium* individuals on the northeastern corner of the polygon will be the main treatments to Polygon 1. These invasive species will be removed manually by group members, project practitioners, and volunteers. Additional wood chip mulch layers will be added on top of the current mulched surface and on areas where invasive species are predominant to suppress re-growth in the future. We will not remove the *P. arundinacea* that grows in the ditch adjacent to Polygon 1, considering that it is managed by the City of Bothell and any modifications made to this area may involve bureaucratic consequences which can potentially hinder the project. Although the currently dormant *P. arundinacea* pose little concern to the project, future

practitioners have to anticipate and be prepared for potential encroachment into the polygon during the species' growth peak in mid-June given there is enough moisture present in the ditch (King County 2011). In a scenario which encroachment is imminent, we will follow King County's *P. arundinacea* removal protocol that instructs to manually remove the existing root mass for small patches (King County 2011).

Invasive species removal, disposal of anthropogenic debris, application of a minimum of 6 inches of wood chip mulch, and native species installation will be the main treatments to Polygon 2. Since this polygon has a dense establishment of *R. bifrons* and anthropogenic debris embedded in the ground, we will focus on digging out *R. bifrons* rhizomes and excavate any debris above or below the ground out of Polygon 2 prior to mulching and native species installations. Two derelict vehicles that can be found on the northern and southern section of the polygon will also be stripped down to manageable sizes and be removed properly from our site (Figure 2). Once all debris is removed from the area, we will carefully examine the soil to ensure that no automotive fluids leaked into the ground which would require further action such as removing the contaminated soil. Besides increasing structural and native species diversity, plant installation in this area is also aimed to minimize soil erosion associated with sloped sites.

Polygon 3 is characterized as having a low percentage of invasive species cover relative to the other polygons as well as having high species diversity and plenty of organic matter. Modifications of this polygon will include removal of non-native species and excavation of a derelict vehicle, application of 8" of wood chip mulch, and native species installation. A small cluster of *R.bifrons* stands on the southwestern corner of the polygon will be manually removed and treatments that are done to the derelict vehicles in polygon 2 will also be applied to the vehicle in polygon 3. After all of the vehicle remains in polygon 3 have been deposited, mulch will be spread over the polygon prior to native plant installation. Potential vegetation to be installed in polygon 3 will also account for erosion control associated with a more inclined slope than the other two polygons.

AD17: Minimal planting was done in Polygon 3 due to the diverse native species already established across the area. Erosion control is not a big concern where the slope is steepest since there are a number of large trees and shrubs protecting the soil from stormwater runoff.

Logistical Considerations

Potential Area Disturbance

Our entry point is located on the east end of Polygon 1, which faces the road, and the trail that goes inside the polygons transverses in a fairly straight route to the seral forest that is located on the western edge of the site (Figure 5). We will divert this current trail to accommodate the plant species installation design. These visions are an embodiment of our project's response to concerns relating to visitor safety, project site's aesthetic appeal, and most importantly, the enhancement of our site's long term ecological process. However, human traffic may risk exposing the newly installed plants to being trampled or disturbed. In response to this concern, we will mark several areas that are deemed vulnerable with markers and barriers. We will also

divert visitor traffic to other areas through the use of topographical modifications such as mounds and ground depressions. To prevent accidental trespassing, we will also install plants in clusters to form islands that can be easily distinguished from the site trails.

Mulch

We will designate the northern and southern sections of polygon 2 and polygon 3 as a temporary mulch deposit site and mark the area as such since most of wood chip mulch will be applied to both of these polygons (Figure 4). This location is open, easily spotted, and provides easy access for practitioners and volunteers. The northern and southern sections of polygon 2 and polygon 3 also receive moderate to high shade from nearby maturing tree clusters which will protect the mulch from direct sunlight. By designating a specific place for mulch deposit, the aggregated mulch pile will be away from the road with little anthropogenic disturbances. In addition, since the designated area does not obstruct the main walking path, it will not interfere with visitors' and practitioners' access to the site. We will put a sign in areas designated for mulch deposit and also make sure to clearly communicate with the local arborists to make sure that they are clear about the designated mulch deposit.

AD18: Temporary mulch drop off location was moved near the entrance of the site (Figure 5). A sign was not installed due to the large area set aside and the close contact maintained with donating arborists.

Planting Plan

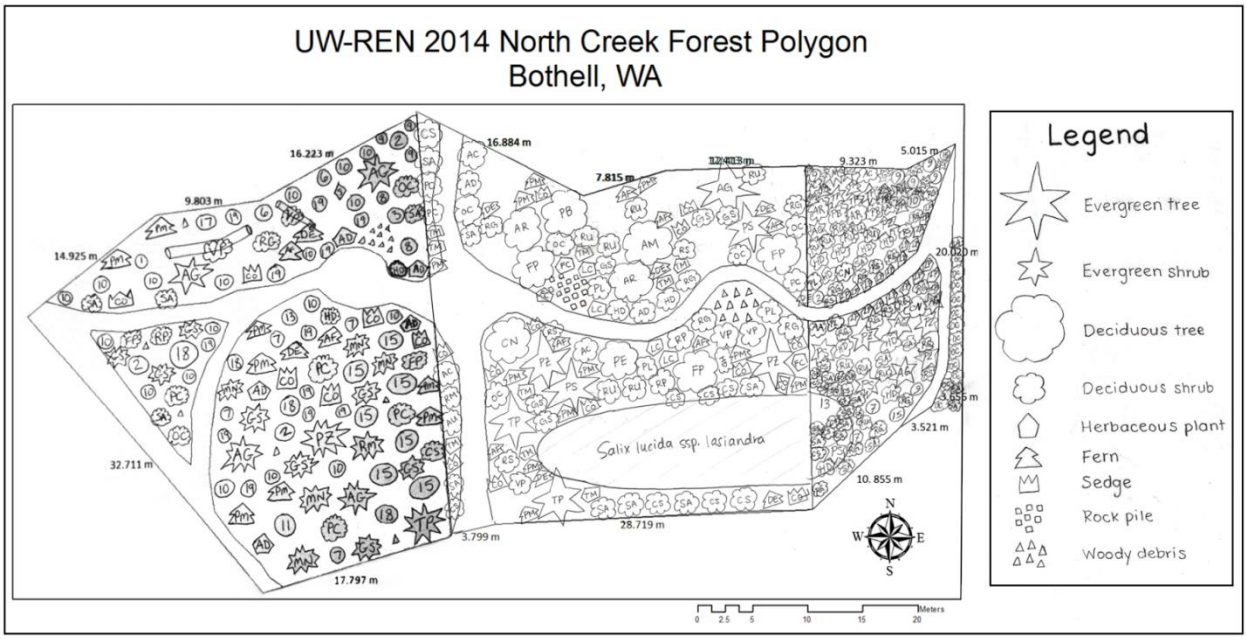

Figure 6: Initial trail system diversion with the original planting plan. Each existing native vegetation is represented by a numbered circle, while species planned to be planted on site are represented as distinct shapes with characteristic abbreviations as shown in the legend. This map corresponds with Table 2.

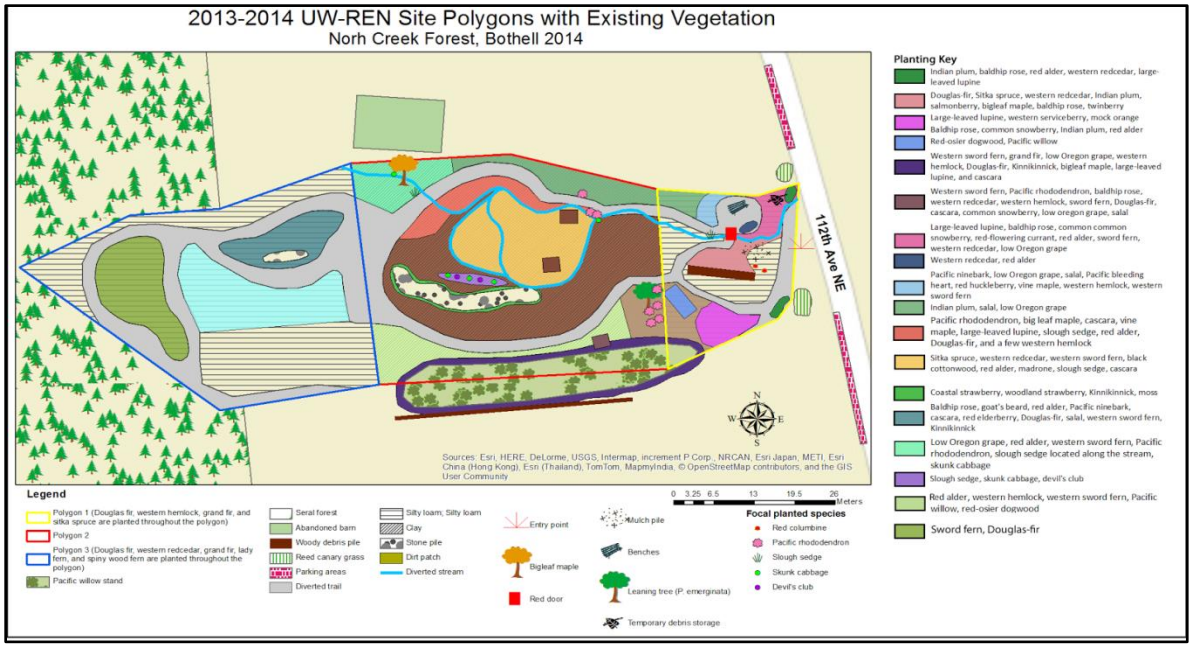

Figure 7: As built map with the current planting plan. Colored areas represent a combination of distinct species installed around the area, which are described on the right side of the map.

Polygon 1

Another challenge that needs to be addressed is the lack of shade over most of the polygon. Light exposure is a particular concern for *G. shallon, A. circinatum, Rhododendron macrophyllum* (Pacific rhododendron), and *T. plicata*. For this reason, we will plant 5 *G. shallon*, 2 *A. circinatum*, as well as *P. munitum* in the small amount of shade available on the northern edge (Figure 6). We will also install 7 *P. munitum* along the north side (Figure 6). To help create shade for the 3 developing *T. plicata* seedlings, we will plant a protective crescent alternating 3 *A. rubra* with 3 *P. balsamifera ssp. trichocarpa*. We will plant them on the northern half of the polygon where there is greater mixture of gravel in the soil. The quick growing *A. rubra* and the *P. balsamifera ssp. trichocarpa* will be planted on the southwestern edges with the *T. plicata* installed on the northern side protecting the young *T. plicata* from direct sun exposure (Ewing 2014) (Figure 6). *Rhododendron macrophyllum* is a species that thrives under shaded conditions and is known to be difficult to transplant with only moderate success in establishment (SNP 2014). In order to establish it in sun-abundant Polygon 1, we will plant 5 *R. macrophyllum* near the southern edge of Polygon 1 where there is shade from the *S. lucida ssp. lasiandra* that will help to protect them from overexposure (Figure 6). In addition, the use of organic mulch, in this case wood chip mulch, provides nutrients and protection for the *R. macrophyllum*'s shallow root structure. The presence of *S. lucida ssp. lasiandra* will create a partial wind buffer to protect against winter winds which are known to negatively impact *R. macrophyllum* (WNPS 2014).

AD19: *Dicentra formosa* (Pacific bleeding heart), *M. nervosa*, *P. capitatus*, *Vaccinium parvifolium* (red huckleberry), *Tsuga heterophylla* (western hemlock), *O. cerasiformis*, and *Symphoricarpos albus* (snowberry) were added to the shaded northern section of Polygon 1 (Figure 7).

AD20: A row of *O. cerasiformis* was added to Polygon 1 bordering the ditches (Figure 7).

AD21: Several species with showy flowers such as *R. gymnocarpa*, *Aquilegia formosa* (western red columbine), *R. parviflorus*, and *L. polyphyllus*, were planted around the entrance of the site next to the diverted trail to add aesthetic appeal.

AD22: A mature *S. scouleriana* is located in this polygon, not *S. lucida* ssp. *lasiandra*.

AD23: The quantities of various species have changed from the original plan in order to accommodate the donated plants (Table 4).

Polygon 2

Polygon 2 is the most disturbed area of the site. It is invaded by dense thickets of *R. bifrons* that reach up to 15 feet and covered up to 90% of the polygon (Figure 2, Table 13). *Rubus bifrons* competes with native vegetation and reduces species biodiversity (King County 2013c). The objectives for polygon 2 are to remove the invasive species and establish a diverse array of native vegetation to attract native wildlife and eventually mature to assimilate into the seral forest and reduce habitat fragmentation (Objective 1.1 and 1.2). Our selection of different native plants will establish structural diversity and provide habitat and other resources that native wildlife depend on (Task 1.2c). We will also establish a variety of quick-growing trees and

shrubs that will provide shade to the area to impede the potential regrowth of *R. bifrons* in addition to applying a thick layer of wood chip mulch.

Fast-growing plants will initiate succession, catalyze the colonization of the area, and establish structural diversity for the site (Task 1.2a). They will provide quick shade and impede the regrowth of the shade-intolerant *R. bifrons* (King County 2013c) (Task 1.1d). To accomplish this we will add 1 *A. macrophyllum*, 2 *A. rubra*, 1 *P. balsamifera* ssp. *trichocarpa*, and 2 *P. menziesii*. The fallen leaves of the deciduous trees will accumulate and provide the soil with nutrients over time. In addition, *A. rubra* roots will supply the soil with fixed atmospheric nitrogen (USDA Forest Service 1989). The *A. rubra* trees will be placed in areas where the derelict cars used to be to supply the soil with nitrogen and other nutrients. 1 *A. grandis* will be added on the northern edge of the polygon. It is a slow-growing tree but it will provide the area with woody debris as it matures (Gold 2013c). As these trees mature, they will create an ideal habitat for understory plants that do well in partial shade. In areas where there will be partial shade we will install: 3 *A. circinatum*, 1 *A. uva-ursi*, 2 *Aruncus dioicus* (goat's beard), 12 *Carex obnupta* (slough sedge), 2 *C. nuttallii*, 8 *Cornus sericea* (red-osier dogwood), 3 *Frangula purshiana* (cascara), 5 *G. shallon*, 4 *Lonicera ciliosa* (orange honeysuckle), 6 *O. cerasiformis*, 3 *Philadelphus lewisii* (mock orange), 3 *P. capitatus*, 2 *P. sitchensis*, 11 *P. munitum*, *1 Prunus emarginata* (bitter cherry), 3 *R. parviflorus*, 7 *Symphoricarpos albus* (common snowberry), 2 *T. plicata*, 10 *T. menziesii*, and 2 *Vaccinium parvifolium* (red huckleberry) (which will be installed near woody debris). Species such as *A. circinatum, C. nuttallii, and O. cerasiformis* do well in forest edges; they will be planted mostly along the borders of the polygon where there is partial shade (King County 2013a). Others that can handle both full sun and partial shade, such as *F. purshiana* (in partial, deciduous shade), *P. capitatus*, and *S. albus*, will be installed in the open areas of the polygon (King County 2013a).

AD24: *Tolmiea menziesii is* excluded from the planting plan for Polygon 2 and from the final planting plan. This species was replaced with *O. cerasiformis*, *G. shallon*, and *M. nervosa* on the northern section of the polygon, where there is enough shade producing plants established around the area.

AD25: All the recently installed *P. emarginata* saplings are dead.

AD26: Three raised beds were installed where the following species were planted: *P. munitum, A. grandis, M. nervosa, T. heterophylla, P. menziesii, A. uva-ursi, L. polyphyllus,* and *F. purshiana*.

AD27: 3 *Abies grandis* were added instead of a lone plant to add survival chances.

AD28: Plants that were used significantly more than initially assumed are *A. uva-ursi, F. purshiana, G. shallon, O. cerasiformis, P. munitum,* and *T. plicata*.

AD29: The main plant species that was used significantly less than initially assumed is *C. obnupta.*

Polygon 3

Polygon 3 as has been explained previously as a micro-environment with significant amounts of shade due to an abundance of vertical vegetation. With this in mind, our plan includes species that can flourish without an incredible amount exposure to light and grow well in areas with woody debris. *Vaccinium parvifolium* will be placed in close proximity to the logs found on the northern end of the site due to it flourishing in soils with high potentiality for mycorrhizal decay of woody elements such as decomposing nurse logs (Sonnenfeld 1987). For this reason 7 *G. shallon* have been included in our plan as they thrive under layered plant canopies (Gold 2013b). Also included for tolerance of more shady conditions are 6 *C. obnupta*, 7 *P. munitum*, 2 *Dryopteris expansa* (spiny wood fern), 5 *M. nervosa*, 2 *F. purshiana*, 3 *P. capitatus*, 1 *P. menziesii*, 1 *R. macrophyllum*, 1 *T. plicata*, and 2 *V. parvifolium*. The plants listed above have been placed in such a way that they will either be mostly covered in shade currently or be covered in shade once the larger trees we are planting such as 1 *T. plicata*, 4 *A. grandis*, and 1 *P. menziesii*, have matured.

Even though a substantial amount of the space in polygon 3 is covered in shade, we have also included species that are not as shade tolerant in places where there are pockets of light and on the edges of the site (Gold 2013b). These species include 1 *C. sericea*, 2 *O. cerasiformis*, 1 *R. gymnocarpa*, 1 *R. parviflorus, and* 4 *S. albus*. Some of these species have been included at the center of the polygon where there is a canopy opening due to an abandoned derelict vehicle taking up ground space. With this vehicle removed as a part of our projected plan (Objective 2.1), this opening will be ideal for species that can establish areas with higher levels of sunlight. In addition, the inclusion of *C. sericea, F. purshiana, P. capitatus, R. gymnocarpa,* and *S. albus* was with the intention that these plants and their inherent beauty would provide an artistic element to the plant selection and create a desirability to be involved with the forest in future volunteers (Task 3.1c).

Several plant species in this polygon were also included in this planting plan with the notion that they were to provide food and browse-bearing plants as well as habitat structure for potential wildlife interaction (Table 12) (Task 1.2c). These plants include *G. shallon, O. cerasiformis, S. albus, V. parvifolium, F. purshiana, P. capitatus,* and *R. parviflorus.* Many of these plant species provide nectar for hummingbirds and other creatures such as bees (Gold 2013b and Gold 2013c). Also as was previously mentioned, these species can provide food and shelter for native wildlife such as *D. pileatus* and *T. douglasii* through their layered canopy structure as they develop over time (Gold 2013c; Bull and Holthausen 1997).

AD30: *Cornus sericea, S. albus, R. macrophyllum, V. parvifolium, R. parviflorus,* and *P. capitatus* were excluded from this polygon due to better suitability in other locations.

AD31: *Corylus cornuta* var. *californica, A. macrophyllum, Tellima grandiflora* (fringecup), *A. dioicus, A. uva-ursi, S. racemosa, R. spectabilis, Lysichiton americanum* (western skunk cabbage), *D. expansa,* and *A. circinatum* were added to the planting plan (Table 4).

AD32: Part of the area where the derelict vehicle was removed has now been converted into a stock nursery of additional plants donated by King Conservation District.

AD33: The quantities of various species have changed from the original plan in order to accommodate the donated plants (Table 4).

Table Revisions

Table 1: Existing vegetation on site. ID numbers correspond to species locations on Figure 6.

ID Number	Latin Name	Common Name
1	*Acer circinatum*	vine maple
2	*Acer macrophyllum*	bigleaf maple
3	*Acer saccharinum*	silver maple
4	*Athyrium filix-femina*	lady fern
5	*Betula papyrifera*	paper birch
6	***Castanea sativa****	**European chestnut***
7	***Equisetum arvnense***	**field horsetail**
8	*Ilex aquifolium**	English holly*
9	*Mahonia nervosa*	low Oregon grape
10	*Oemleria cerasiformis*	Indian plum
11	*Picea sitchensis*	Sitka spruce
12	*Polypodium glycyrrhiza*	licorice fern
13	*Polystichum munitum*	western sword fern
14	***Prunus emarginata***	**bitter cherry**
15	*Pseudotsuga menziesii*	Douglas-fir
16	*Quercus garryana*	Garry oak
17	*Rubus bifrons**	Himalayan blackberry*
18	*Rubus parviflorus*	thimbleberry
19	*Rubus spectabilis*	salmonberry
20	***Rubus ursinus***	**trailing blackberry**
~~16~~	~~*Salix lucida ssp. lasiandra*~~	~~Pacific willow~~
21	***Salix scouleriana***	**Scouler willow**
22	*Sambucus racemosa*	red elderberry
23	***Sorbus aucuparia****	**European mountain-ash***
24	*Thuja plicata*	western redcedar
25	*Tolmiea menziesii*	youth on age

*Invasive plant species

Table 2: List of new plant species to be installed on our site. The abbreviations are used to identify the new plants to be installed in Figure 6.

Abbreviation Key	Latin Name	Common Name
AG	*Abies grandis*	grand fir
AC	*Acer circinatum*	vine maple
AM	*Acer macrophyllum*	bigleaf maple
AR	*Alnus rubra*	red alder
AA	*Amelanchier alnifolia*	western serviceberry
AU	*Arctostaphylos uva-ursi*	Kinnikinnick
AD	*Aruncus dioicus*	goat's beard
AF	*Athyrium filix-femina*	lady fern
CO	*Carex obnupta*	slough sedge
CN	*Cornus nuttallii*	Pacific dogwood
CS	*Cornus sericea*	red-osier dogwood
DE	*Dryopteris expansa*	spiny wood fern
FC	*Fragaria chiloensis*	coastal strawberry
FP	*Frangula purshiana*	cascara
GS	*Gaultheria shallon*	salal
HD	*Holodiscus discolor*	oceanspray
LC	*Lonicera ciliosa*	orange honeysuckle
LP	*Lupinus polyphyllus*	large-leaved lupine
MN	*Mahonia nervosa*	low Oregon grape
OC	*Oemleria cerasiformis*	Indian plum
PL	*Philadelphus lewisii*	mock orange
PC	*Physocarpus capitatus*	Pacific ninebark

Abbreviation Key	Latin Name	Common Name
PS	*Picea sitchensis*	Sitka spruce
PM	*Polystichum munitum*	sword fern
PB	*Populus balsamifera* ssp. *trichocarpa*	black cottonwood
PE	*Prunus emarginata*	bitter cherry
PZ	*Pseudotsuga menziesii*	Douglas-fir
RM	*Rhododendron macrophyllum*	Pacific rhododendron
RS	*Ribes sanguineum*	red-flowering currant
RG	*Rosa gymnocarpa*	baldhip rose
RP	*Rubus parviflorus*	thimbleberry
RU	*Rubus spectabilis*	salmonberry
SS	*Salix scouleriana*	Scouler's willow
SA	*Symphoricarpos albus*	common snowberry
TP	*Thuja plicata*	western redcedar
TM	*Tolmiea menziesii*	youth on age
VP	*Vaccinium parvifolium*	red huckleberry

Table 3: Quantity and form of plants to be ordered.

Species	Polygon 1			Polygon 2			Polygon 3		
	#	Form	(m)	#	Form	(m)	#	Form	(m)
Abies grandis	~~4~~	~~2 gallon container (1 gal)~~	~~6~~	3	2 gallon container	6	~~4~~	~~2 gallon container~~	~~6~~
Acer circinatum	2	bare root	4.5	1	bare root	4.5			
Acer macrophyllum				7	bare root	6			
Alnus rubra	7	1 gallon container	4	18	1 gallon container	4			
Amelanchier alnifolia	~~1~~	~~1 gallon container~~	3						

Species	Polygon 1			Polygon 2			Polygon 3		
	#	Form	(m)	#	Form	(m)	#	Form	(m)
Arctostaphylos uva-ursi				10	bare root	0.5			
Aruncus dioicus				1	1 gallon container	1	3	1 gallon container	1
Athyrium filix-femina				7	1 gallon container	1.5	~~2~~	~~1 gallon container~~	~~1.5~~
Carex obnupta				7	4" container	1	1	4" container	1
Cornus nuttallii	1	1 gallon container	3	3	1 gallon container	3			
Cornus sericea	~~9~~	~~live stakes~~	~~1.5~~	~~8~~	~~live stakes~~	~~1.5~~	~~1~~	~~live stakes~~	~~1.5~~
Dryopteris expansa				~~6~~	~~1 gallon container~~	~~0.5~~	1	1 gallon container	0.5
Fragaria chiloensis				16	4" container	0.5			
Frangula purshiana				14	bare root	3	4	2 gallon container	3
Gaultheria shallon	21	4" container	1	10	bare root	1	2	4" container	1
Holodiscus discolor	~~9~~	~~bare root~~	~~2~~	**2**	bare root	2	2	bare root	2
Lonicera ciliosa				~~4~~	~~1 gallon container~~	~~2~~			
Lupinus polyphyllus	3	1 gallon container	1						
Mahonia nervosa							**1**	bare root	3
Oemleria cerasiformis	18	1 gallon container	3	20	1 gallon container	3	~~2~~	~~1 gallon container~~	~~3~~
Philadelphus lewisii	~~2~~	~~bare root~~	~~1.5~~	4	bare root	1.5			
Physocarpus capitatus				3	bare root	3	~~3~~	~~bare root~~	~~3~~
Picea sitchensis	4	1 gallon container	4.5	4	1 gallon container	4.5			
Polystichum munitum	4	1 gallon container	1	18	1 gallon container	1	8	1 gallon container	1
Populus balsamifera ssp. trichocarpa	4	bare root	6	4	bare root	6			
Prunus emarginata				4	1 gallon container	3			
Pseudotsuga menziesii	11	1 gallon container	bare root	8	bare root	4.5	8	bare root	4.5
Rhododendron macrophyllum	3	1 gallon container	bare root	4	bare root	3.5	~~1~~	~~bare root~~	~~3.5~~
Ribes sanguineum	5	bare root	2.5	3	bare root	2.5			

Species	Polygon 1			Polygon 2			Polygon 3		
	#	Form	(m)	#	Form	(m)	#	Form	(m)
Rosa gymnocarpa	23	1 gallon container	2	41	1 gallon container	2	2	1 gallon container	2
Rubus parviflorus				3	bare root	1.5	3	bare root	1.5
Rubus spectabilis	6	bare root	1.5	40	bare root	1.5			
~~***Salix scouleriana***~~ ***Salix lucida ssp. lasiandra***	4	live stakes	2.5						
Symphoricarpos albus	1	live stakes	1.5	10	live stakes	1.5	~~4~~	~~live stakes~~	~~1.5~~
Thuja plicata	10	1 gallon container	6	21	1 gallon container	6	8	1 gallon container	6
Tolmiea menziesii				10	4” container	0.5			
Vaccinium parvifolium				2	bare root	2	~~2~~	~~bare root~~	~~2~~
Total	127			298			41		

Table 4: List of installed plants currently living on the site.

Species	Polygon 1	Polygon 2	Polygon 3
Abies grandis		3	1
Acer circinatum	18		1
Acer macrophyllum	1	7	2
Alnus rubra	2	17	
Arbutus menziesii		1	
Arctostaphylos uva-ursi	1	10	1
Aruncus dioicus		1	3
Athyrium filix-femina	1		
Blechnum spicant	9	1	
Carex obnupta	1	7	1
Cornus nuttallii	18	3	
Corylus cornuta var. californica		5	1
Dicentra formosa	1		
Dryopteris expansa			1
Fragaria sp.		16	
Frangula purshiana		14	4

Species	Polygon 1	Polygon 2	Polygon 3
Gaultheria shallon	1	10	2
Holodiscus discolor		2	
Iris douglasii		0	
Lonicera involucrata	1		
Lupinus polyphyllus	4		
Lysichiton americanum		1	1
Mahonia aquifolium	1		
Mahonia nervosa	1	13	1
Mahonia repens		1	
Malus fusca	1	6	
Oemleria cerasiformis	0	20	11
Oplopanax horridus		2	
Philadelphus lewisii		4	
Physocarpus capitatus	3		
Picea sitchensis	7	4	
Pinus contorta		0	
Polystichum munitum	4	18	7
Populus balsamifera ssp. trichocarpa	3	4	
Prunus emarginata		0	
Pseudotsuga menziesii	20	8	8
Rhododendron macrophyllum	6	4	
Ribes sanguineum		4	
Rosa gymnocarpa	1	31	2
Rubus parviflorus		1	
Rubus spectabilis	3	8	3
Sambucus racemosa	4	18	5
Symphoricarpos albus	1	10	
Tellima grandiflora			1
Thuja plicata	2	20	7
Tsuga heterophylla	0	9	
Vaccinium ovatum	9	6	
Vaccinium parvifolium	4	2	

Species	Polygon 1	Polygon 2	Polygon 3
Total alive per polygon	128	291	63

Table 5: General materials list.

Task	Materials	Qty	Source	Task	Tools	Qty	Source
1.1c	Mulch	574.60 cubic yards	Local Arborists	1.1a	Loppers	20	FNCF
1.2a	Flagging	3 rolls	FNCF	2.1d	Wheelbarrows	5	FNCF
1.2b	Plants	>150	Salvage Operations Donations: **(Conservation District plant sale, UW, Earth Day donation)** Purchase: **(Whatcom Conservation District, Center for Urban Horticulture annual plant sale, and Kruckeberg Botanic Garden)**	1.1b	Shovels	15	FNCF
1.2 c	Garbage bags	30	FNCF	2.1a	Pitchforks	5	FNCF
2.1 d	Tarps	7	FNCF	2.1a	Gloves	40	FNCF
3.1 d	BBQ and food	~20 burgers/week	FNCF	2.1a	Rakes	6	FNCF

Lessons Learned

Budget Plan

For the overall financial budget, the majority of our expenditures were allocated to purchasing plants. Plants salvage events and live stake collections proved to be–worthwhile investments of time and effort. The plants supplied from these events allowed us to stretch our tight budget significantly. We also learned that the distances to plant vendors should be incorporated into budget considerations, given that transportation fees may offset or even eclipse the amount of money saved from purchasing cheaper plants from farther plant sales or nurseries. Mulch donations from local arborists were also a major relief to our budgeting plan. However, it is worth mentioning that request for mulch donations was often tardy in terms of delivery, since most arborists did not consider this task to be their priority, so future practitioners should allow as little as 1 month for mulch acquisition. Besides mulch, we also did not allocate any of our funding for tools required for work parties since all of them were provided by the FNCF. There were, however, a one or two work parties where a few more tools would have been useful. Given the premise that a large number of volunteers are coming to the site, practitioners should consider requesting extra tools from community partners.

Financial Budget

One of the first financial lessons we learned is the importance of planning. Our team missed the ordering deadlines for the majority of the Conservation District (CD) plant sales while we were creating our initial plans and budgets. By the time we had our financial budget in order, the only CD plant sale we could utilize was in Whatcom County. Although we saved a great deal of money on plants, the cost of reimbursements for gas and travel far outweighed the savings on plants. If we are to face similar procedures in the future, we will make sure to prepare enough funds prior to purchasing plants at one of the nearby CD plant sales saving both time and money.

The second lesson we learned is the value of salvaging plants. At the 2014 Ueland Tree Farm annual plant salvage event in Bremerton, we were able to fill two truckloads of large, healthy plants. Although there had been a certain amount of mortality in the plants salvaged, overall they have done very well. Not only were these plants free but they are of a size that we could not find at local nurseries. In addition to plant salvaging, our team learned the benefit of collecting live stakes. Even with the high rate of mortality, enough of the lives stakes have thrived to make it well worth the time and effort involved in collection.

The third and final financial lesson learned would be that sites change dramatically between the seasons. Areas in the western end of our site held a much larger number of plants then were first observed. If our planting area had remained the same configuration, we would have had more plants than we needed. By the end of May, the bushes and shrubs leafed out, in particular the *R. spectabilis* and *R. gymnocarpa*, and it became difficult to find areas to plant at the western end of the site that would enhance habitat and succession. In the end, the plants we ordered were utilized in the extended northern edge of our site and they also allowed us to create a more densely planted landscape.

Table 6: Breakdown of financial budget.

Expenditures by Category	Cost
Plants	
Coniferous Trees	~~$106~~ **$43.00**
Deciduous Trees	~~$141~~ **$67.80**
Shrubs	~~$243~~ **$327.92**
Herbaceous and Groundcovers	~~$727~~ **$335.27**

Expenditures by Category	Cost
Subtotal Plants + tax	~~$1,217~~ **$819.09**
Mulch	
Subtotal Mulch	0
Soil	
Subtotal Soil	**$61.32**
Tool Rental	
Subtotal Rental	0
Transportation	
Subtotal Transportation	0
Printing	
Subtotal Printing	$20
U-haul use for trash removal	$388.00
Subtotal for Houghton Transfer Station dump and U-haul usage.	$388.00
Supplies for Volunteer Events	FNCF
Loppers	FNCF
Wheelbarrows	FNCF
Shovels	FNCF
Pitchforks	FNCF
Rakes	FNCF
Gloves	FNCF
Flagging Materials	FNCF
Garbage Bags	FNCF
Tarps	FNCF
BBQ, Snacks, and Drinks	FNCF

Expenditures by Category	Cost
Project Total	~~**$1,630**~~ **$1,288.41**

Revenue

Table 7: Breakdown of sources of revenue.

Revenue by Fund Source	Value
Course Fee Allotment	$600
Cash Donations	$30
Cash Donations by Community Partner	~~$1,000~~ **$888**
Project Total	$ 1,630 **$1,518**

Labor Budget

One important lesson that we learned was to divide large number of volunteers coming into the site into smaller, more manageable groups and have at least one person assigning tasks and demonstrating how they are done and then to keep moving around to assist other groups. This allow optimum use of volunteer service and allow practitioner to monitor changes made by volunteers more closely to detect any error in task implementation early. We did this by placing potted plants around the site prior to the arrival of volunteers and instructed them to install plants where the pots had been placed. However, since this did not eliminate the occurrence of misplanting, practitioners are therefore encouraged to move around to monitor other groups.

Table 8: Breakdown of work hours on site. Note some labor hours are estimations.

Activities	Team Hours	Volunteer Hours	Total
Site Assessment			
Expected	24	10	34
Actual	978	10	988

Activities	Team Hours	Volunteer Hours	Total
Site Preparation			
Expected	12	4	16
Actual	45	57	102
Activities	**Team Hours**	**Volunteer Hours**	**Total**
Removal of Invasive Species			
***Rubus bifrons* removal**			
Expected	113	276	389
Actual	113	511	624
***Ilex aquifolium* removal**			
Expected	4	1	5
Actual	4	3	7
Plant Acquisition			
Planning (Researching plant availability and creating planting plans)			
Expected	96	5	101
Actual	96	7	103
Nurseries (Future orders and acquisition)			
Expected	12	4	16
Actual	20	7	27
Salvages (Future events)			
Expected	34	12	46
Actual	36	36	72
Live Stake (Locating viable sites and acquisition)			
Expected	20	8	28
Actual	12	15	17
Planting			
Polygon 1			
Expected	30	90	120
Actual	73	177	240

Polygon 2			
Expected	40	60	100
Actual	83	111	194
Polygon 3			
Expected	25	45	70
Activities	**Team Hours**	**Volunteer Hours**	**Total**
Actual	52	83	135
Spreading Mulch			
Expected	20	40	60
Actual	178	74	252
Total	**1,670**	**1,091**	**2,761**

Planting Plan

When it comes to our planting plan, there were changes and adjustments in the plant species that were used, the number of plants, and placement. These alterations were made to accommodate the plant donations we received, the plants we salvaged, the ephemeral stream that formed on site, and the installation of new features such as raised beds and a rock mound. The large volume of volunteers out on site also affected on the final outcome of our planting design. Our team tried to follow the original planting plan as closely as we could, but many changes were made throughout the site. We learned that the actual plant installation process will not always follow the original planting plan on paper.

We received a large donation of plants from the King Conservation District which included plant species that were not originally in our plan such as *Malus fusca* (Pacific crabapple) and *Fragaria vesca* (wild strawberry). We also received donations from community members and the lead gardener of UWB, Tyson Kemper, which added to our growing list of total plants. The new water feature on site (Figure 5), which was added in response to the high volume of stormwater runoff, also created changes in our plan. We had to take into account the amount of moisture and saturation that would be present when the small ephemeral stream flowed with water during rainy seasons. We added plants that would tolerate more moist conditions in these areas such as *Lysichiton americanum* (western skunk cabbage), *Oplopanax horridus* (devil's club), and *Carex obnupta* (slough sedge). Due to the fact that these areas would become moister than originally thought, we created raised beds to accommodate the upland plants that we had that would otherwise do poorly and possibly die here. With all of these donations, purchases, and changes to our planting plan list, the volume of plants that were used differed from our original measurements as well. Some plant species were used more throughout the site than originally intended, others were used less. We learned that the original planting plan on paper is more of a guide than an exact map of what goes where. It will change throughout the restoration process and we have to be prepared to use adaptive management to address those changes.

Through trial and error during the actual planting process, our team learned how vital it is to install the plants as soon as we can and not wait too long to put them in the ground. Due to our individual lives, busy schedules, and time constraints, a lot of the plants were not planted right away. Some of our bare root plants were still wrapped, sometimes for as long as 2-3 weeks. Fortunately, most of them made it with some watering and were successfully installed. Others, unfortunately, died before installation or had a difficult time establishing to the site. Most of our planting took place throughout the spring. Ideally, we would have liked to install our plants late winter to early spring, or whenever a certain species is dormant, in order to handle them when it is least disruptive. We learned how important the timing of our planting is to better ensure successful establishment.

Lastly, the high number of work parties and high volume of volunteers out on site created some changes in our final planting design. With a lot of people moving around and doing various activities on a fairly small site, a few problems arose. Some of the less visible plants, such as live stakes and small groundcover species, were sometimes trampled or mulched over. Our team tried to flag plants as soon as they were planted, but sometimes that wasn't enough for visibility, especially for the smaller plants. To minimize plant mortality, our team started off some of the work parties with lessons on how to properly plant. Every now and then, some volunteers installed plants improperly. If these plants were spotted, we made an attempt to replant them properly. But with the large number of volunteers throughout the site at once, not all of the improperly planted plants were spotted to be reinstalled. Therefore, some plants had difficulty establishing to the site. These incidents decreased the number of total plants that were alive, but we learned that these events will happen no matter what and that we have to adjust to them as best as we can.

IV. Work Timeline

Table 9: Gantt chart of weekly objectives for winter quarter 2014.

Key	x Planned	♦ Planned
	x Actual	♦ Actual

Tasks	Jan 6-10	Jan 11-17	Jan 18-24	Jan 25-31	Feb 1-7	Feb 8-14	Feb 15-21	Feb 22-28	Mar 1-7	Mar 8-14
Obtain Volunteers for Work Parties	x	x	x	x	x	x	x	x	x	
			x	x				x	x	x
Create a Planting Plan for Each Polygon		♦								
		♦								
Complete Draft Work Plan				♦						
					♦					
Mid-Quarter Peer Evaluation					♦					

					♦					
Final Work Plan						♦				
							♦			
Community Partner Work Plan Approval							♦			
							♦			
Tasks	**Jan 6-10**	**Jan 11-17**	**Jan 18-24**	**Jan 25-31**	**Feb 1-7**	**Feb 8-14**	**Feb 15-21**	**Feb 22-28**	**Mar 1-7**	**Mar 8-14**
Site Walk-Through						♦		♦		
						♦				♦
Peer Evaluation										♦
										♦
Seek Donations from Local Businesses	x	x	x	x	x	x	x	x	x	x
							x	x	x	x
Remove Invasive Species from Site	x	x	x	x	x	x	x	x	x	x
	x	x	x	x	x	x	x	x	x	x
Remove Trash from Site	x	x	x	x	x	x	x	x	x	x
	x	x	x	x	x	x	x	x	x	x
Schedule Debris Pickup from Site			♦							
			♦							
Obtain Dumpster from Waste Management				♦						
				♦						
Acquire Mulch					x	x	x	x	x	x
						x	x	x	x	x
Spread Mulch on Site							x	x	x	x
							x	x	x	x
Obtain Plants				x	x	x	x	x	x	x
					x	x	x	x	x	x
Prepare Site for Planting						x	x	x	x	x
	x	x	x	x	x	x	x	x	x	x
Install Live Stakes							x	x	x	
							x	x	x	x

Table 10: Gantt chart of weekly objectives for spring quarter 2014.

Key	x Planned	♦ Planned
	x Actual	♦ Actual

Tasks	Mar 31-Apr 4	Apr 5-11	Apr 12-18	Apr 19-25	Apr 26-May 2	May 3-9	May 10-16	May 17-23	May 24-30	May 31-June 6
Obtain Volunteers for Work Parties	x	x	x	x	x	x	x	x	x	
	x	x	x	x	x	x	x	x	x	x
Site Walk-Through										♦
										♦
Seek Donations from Local Businesses	x	x	x	x	x	x	x	x	x	
				x						
Remove Invasive Species from Site	x	x	x	x	♦					
	x	x	x	x	x	x	x	x	x	x
Remove Trash from Site	x	♦								
	x	x	x	x	x	x	x	x	x	x
Schedule Debris Pickup from Site	x	♦								
Acquire Mulch	x	x	♦							
	x	x	x	x	x	x	x	x	♦	
Spread Mulch on Site	x	x	x	x	x	x	♦			
	x	x	x	x	x	x	x	x	♦	
Obtain Plants	x	x	x	x	x	x	♦			
	x	x	x	x	x	x	x	x	x	x
Prepare Site for Planting	x	x	x	x	x	x	♦			
	x	x	x	x	x	x	x	x	x	
Planting	x	x	x	x	x	x	x	x	x	♦
	x	x	x	x	x	x	x	x	♦	
Create Stewardship Plan	x	x	x	x	x	x	♦	x	♦	
					x	x	♦	x	♦	

V. Design for the Future

The long term goal for this site is to create an environment that will allow it to be assimilated into the upland conifer-deciduous forest, is an effective aid for educative purposes, is welcoming to the public, and is beneficial for wildlife. In 50 years, shrubs and small trees in the understory should grow enough vertical structure as well as ample shade to foster optimal habitat conditions for developing conifer seedlings and to prevent invasive species regrowth (Task 1.2a). This development will contribute to the creation of more diverse vertical structure on site and we expect short-lived species to retire and give way to new seedlings through natural recruitment and for the conifer forest to mature in the next 100 years (Task 1.2a). In order to support these conditions, we incorporated horizontal and vertical layering into our design to enhance species richness (Gold 2013a), while allowing room for trails to the road, adjacent sites, and access to the upper polygons. In addition, we want to create a high level of diversity to attract a variety of wildlife (Leigh 1999) and to offer additional educational opportunities for students by showcasing native plants (Objective 1.2; Objective 3.1). As deciduous and coniferous trees mature, less maintenance will be required each year. However, it is important to continue fostering an ongoing relationship with the community to ensure needed maintenance is performed. The establishment of trails, seating areas, and an open glade will create an environment that is ideal for educational and personal enrichment far into the future.

1. Project Design for Long Term Success

Our team's plan has been designed to enhance the site through both long term and short term goals and objectives. We approached this project with the needs of local wildlife, as well as those of students and community members, in mind. As such, the development of a more extensive canopy, through planting coniferous and deciduous trees as well as dense plantings of aggressive native shrubs, will create shade to help reduce re-establishment of invasive species. This design element will allow increased growth of the native species and provide additional sources of food and cover for numerous wildlife species as plant succession progresses (Table 12). Another consideration was the seasonal water saturation of the soil and stormwater runoff across much of the site. Some adjustments were made to the flow of stormwater runoff, slowing the rate at which water flows across the site during heavy precipitation events, to prevent erosion and to allow walking trail to be usable in all seasons. The creation of the seasonal stream bed, which stores and slowly release stormwater runoff, has the added benefit of more effective natural filtration as the water passes through the banks lined with wetland species (Task 1.2b). Working under the same principle, the plant species chosen across the site are suited for the needs of each microclimate and will ultimately allow connection to the surrounding North Creek Forest, therefore creating a more expansive and diverse wildlife habitat in an otherwise urban area (Task 1.2b).

2. Partnership in Stewardship

In order to facilitate successful restoration of the site, a long-term maintenance and monitoring plan will be created for our community partner. The FNCF is a capable organization

that periodically hosts community and education-based work parties; these activities will be further enhanced by a comprehensive plan that will detail the maintenance requirements and when these activities should be performed for each polygon. Although our restoration project will end in June, maintenance requirement will need to continue throughout the summer and monitoring and maintenance should continue to the foreseeable future (Objective 1.3).

Through continued mulching, the reinvasion of invasive plant species will be limited (Task 1.1c). However, it is expected that a few challenges will occur in the first few years after the completion of our restoration project. We expect to see some *R. bifrons* germinating on site due to the fact that we are not capable of completely extirpating *R. bifrons* and because seeds from adjoining sites may have spread onto our site by animals. FNCF may take this opportunity to educate the community on the ecological effects of invasive plant species in native habitats and offer hands-on sessions maintaining and controlling invasive plant species through removal, planting native plants, and mulching. In addition to these activities, there will also be educational walkthroughs where students are taught lessons and courses on ecological attributes and functions. By hosting these events, we and FNCF can effectively keep the community involved as well as continue the maintenance of our site.

These kinds of positive interactions with community members, particularly those able to benefit from them academically, are exactly the kind of situations members of our UW-REN team and FNCF hope to continue to facilitate in the future. Our vision for this disturbed site is to create a self-sustaining habitat that will eventually develop into part of a mature forest, but that will not be possible without help. As the forest grows and changes from this early planting successional stage, to a seral stage forest, and then to a mature conifer forest, we expect both UW-REN and FNCF to be there maintaining and monitoring the site and promoting community involvement. The UW-REN team's stewardship plan is a perpetually driven ecological education project organized by students and community members who enjoy giving their time to a worthwhile cause. We hope that this restoration project will inspire the community as well as future students to continue being stewards of this vital component of the North Creek ecosystem to ensure the success of restoration.

VI. Appendix

Table 11: Description of favorable conditions for the new plants to be installed on site (refer to Table 4).

Species	Favorable Conditions
*Abies grandis**	MOISTURE - Favors loose soil with moderate moisture levels. LIGHT - Likes moderate shade levels but can handle sunlight with moisture.
*Acer circinatum****	MOISTURE - Favors well drained soil nitrogen rich soils, as well as wet and moist soils. LIGHT - Likes to grow from full sun to deep shade.

Species	Favorable Conditions
*Acer macrophyllum***	MOISTURE - Found in well drained soils that still retain some moisture such as riparian slopes. Commonly found in somewhat early successional forests. LIGHT - Likes higher levels of sunlight but can be found in moderately shady conditions. Often found in forest canopy gaps.
*Alnus rubra****	MOISTURE - Can withstand variable amount of water and can survive in a disturbed site. LIGHT - Likes a lot of sun but it can be found in somewhat shady conditions. Can withstand early successional site conditions and is a nitrogen fixing plant.
*Amelanchier alnifolia*****	MOISTURE- Found in medium well drained soils. LIGHT- Likes the higher levels of sunlight, but can also be found in a partial shade condition.
*Arctostaphylos uva-ursi*****	MOISTURE- Discovered in dry to medium moisture, well-drained soil. LIGHT- Prefers full sun to mostly sunny conditions.
*Aruncus dioicus*****	MOISTURE - Prefers moist conditions. LIGHT - Grows in partial sun and shade.
*Athyrium filix-femina****	MOISTURE - Grows in medium to wet soil and damp shady woodlands. LIGHT - Prefers moist shady areas.
*Carex obnupta*****	MOISTURE - Grows well in sandy soil that ranges from moist to dry site LIGHT - Can grow in full sun to mostly shady conditions.
*Cornus nuttallii****	MOISTURE - Prefers well-drained soils, grows on forests and woods, open forests, and mixed forest LIGHT - Prefers to grow on sunny to partially shaded site
*Cornus sericea**	MOISTURE - Likes high moisture environments that have occasional dry periods. LIGHT - Prefers high light levels but can be found on edges of open patches in relatively low shade conditions.
*Dryopteris expansa****	MOISTURE - Moist forest and openings LIGHT - Grows well under partial shade to full shade
*Fragaria chiloensis*****	MOISTURE - Prefers moist to dry sandy soil LIGHT - Species thrives well under sunny to full sun sites.
*Frangula purshiana*****	MOISTURE - The soil is well drained from moist to dry areas. LIGHT- The shade ranges from full shade to moderate shade.
*Gaultheria shallon*****	MOISTURE - Prefers sites that are drier. LIGHT - Favors shadier conditions as well as forested sites that are in later successional stages. It is versatile and can be found in a variety of light conditions.

Species	Favorable Conditions
*Holodiscus discolor****	MOISTURE - Does best in moist but well drained soil conditions. LIGHT - Will tolerate lower light levels but is typically found in sunny conditions.
*Lonicera ciliosa******	MOISTURE- Found in moist wetlands at a higher altitude. LIGHT- Species grows well under partially sunny and shaded sites, mostly sunny sites, to full sun.
*Lupinus polyphyllus****	MOISTURE- Found in riparian wetlands but contains a toxic alkaloid soil. LIGHT- Suitable in part shade to part sunlight.
Species	**Favorable Conditions**
*Mahonia nervosa******	MOISTURE - Prefers moderately moist sites that allow water to drain easily. LIGHT - Thrives in deep shade and partial shade.
*Oemleria cerasiformis*******	MOISTURE - Is able to grow on both wet and dry conditions as long as high levels of water saturation does not occur continuously. LIGHT - Found more commonly in partially shady conditions along the edge of forested areas.
*Philadelphus lewisii****	MOISTURE - Can grow in a variety of different habitats with various soil moisture ranging from dry soil to moist rich sites; species is adaptable to various ecological conditions. LIGHT - Species grows best under full sun.
*Physocarpus capitatus*******	MOISTURE - Can thrive in wetland environments that do not experience flooding. LIGHT - Tolerates high light conditions but is commonly found in partially shady light levels.
*Picea sitchensis****	MOISTURE - Can withstand sandy soil when it's fairly wet. LIGHT - Can tolerate a wide range of shaded conditions.
*Polystichum munitum*******	MOISTURE- An organic soil that can handle acidic conditions LIGHT - Prefers mostly shady conditions, can tolerate full shade.
Populus balsamifera ssp. *trichocarpa*******	MOISTURE - Favors wet and sandy soils. LIGHT - Thrives in full sun. Does not do well in heavily shaded conditions.
*Prunus emarginata*******	MOISTURE - A deciduous shrub that favors open woods on rich nutrient soil. Found is moist areas, sandy soils, and gravel soils. LIGHT- Shade intolerant in riparian sites and sparse woods.
*Pseudotsuga menziesii****	MOISTURE - A conifer species that grows on low soil PH from 5-6, the soil is poorly drained or compacted.

	LIGHT- This species can tolerate full sun to moderate shade.
Species	**Favorable Conditions**
*Rhododendron macrophyllum****	MOISTURE - Favors moist to fairly dry coniferous or mixed forests, thrives well in soil with high organic content. LIGHT - Grows best on sites under full sun such as openings or forest margins.
*Ribes sanguineum****	MOISTURE - Grows well on dry and open sites such as open woods and disturbed sites. LIGHT - Thrives under full and partial sun-lit areas.
*Rosa gymnocarpa****	MOISTURE - Grows well in dry to moist sites; species is adaptable to various habitats. LIGHT - Grows mostly under full sun, partially sunny, or shaded areas.
*Mahonia nervosa******	MOISTURE - Prefers moderately moist sites that allow water to drain easily. LIGHT - Thrives in deep shade and partial shade.
*Oemleria cerasiformis*******	MOISTURE - Is able to grow on both wet and dry conditions as long as high levels of water saturation does not occur continuously. LIGHT - Found more commonly in partially shady conditions along the edge of forested areas.
*Philadelphus lewisii****	MOISTURE - Can grow in a variety of different habitats with various soil moisture ranging from dry soil to moist rich sites; species is adaptable to various ecological conditions. LIGHT - Species grows best under full sun.
*Physocarpus capitatus*******	MOISTURE - Can thrive in wetland environments that do not experience flooding. LIGHT - Tolerates high light conditions but is commonly found in partially shady light levels.
*Picea sitchensis****	MOISTURE - Can withstand sandy soil when it's fairly wet. LIGHT - Can tolerate a wide range of shaded conditions.
*Polystichum munitum*******	MOISTURE- An organic soil that can handle acidic conditions LIGHT - Prefers mostly shady conditions, can tolerate full shade.
Populus balsamifera ssp. *trichocarpa*******	MOISTURE - Favors wet and sandy soils. LIGHT - Thrives in full sun. Does not do well in heavily shaded conditions.
*Prunus emarginata*******	MOISTURE - A deciduous shrub that favors open woods on rich nutrient soil. Found is moist areas, sandy soils, and gravel soils. LIGHT- Shade intolerant in riparian sites and sparse woods.

Species	Favorable Conditions
*Pseudotsuga menziesii****	MOISTURE - A conifer species that grows on low soil PH from 5-6, the soil is poorly drained or compacted. LIGHT- This species can tolerate full sun to moderate shade.
*Rhododendron macrophyllum****	MOISTURE - Favors moist to fairly dry coniferous or mixed forests, thrives well in soil with high organic content. LIGHT - Grows best on sites under full sun such as openings or forest margins.
*Ribes sanguineum****	MOISTURE - Grows well on dry and open sites such as open woods and disturbed sites. LIGHT - Thrives under full and partial sun-lit areas.
*Rosa gymnocarpa****	MOISTURE - Grows well in dry to moist sites; species is adaptable to various habitats. LIGHT - Grows mostly under full sun, partially sunny, or shaded areas.
*Rubus parviflorus***	MOISTURE - Grows well on moist to dry soils, although species prefers dry soils upon maturation. Species is intolerant of saturation. LIGHT - Species grows well under full sun to partial shade and is commonly found in open sites.
*Rubus spectabilis****	MOISTURE - Favors moist soils like those found in wetlands. LIGHT - Can be implemented in several different successional range periods due to its ability to tolerate a broad spectrum of light conditions.
*Salix lucida ssp. lasiandra****	MOISTURE - Can tolerate high levels of moisture and is fast growing. LIGHT - Prefers high light levels and sunny conditions.
*Salix scouleriana****	MOISTURE - Likes areas similar to wetland edges where it's exposed to moisture but not abundant saturation. LIGHT - Thrives in high light conditions but is also more shade tolerant compared to other willow species.
*Symphoricarpos albus****	MOISTURE - Lives in dry to moist sites and open forest. LIGHT - Thrives under partial to full sun sites.
*Thuja plicata****	MOISTURE - Is able to tolerate moderately water saturated soil. LIGHT - Seedlings will do better in some shade but it can be found in a broad range of light conditions as long as it is fully saturated with water.
*Tolmiea menziesii****	MOISTURE- A perennial plant that requires a lot of moisture. LIGHT- Due to a lack of moisture, it does not tolerate much sun or dry conditions.
*Vaccinium parvifolium****	MOISTURE- Prefers soil conditions that are loamy and acidic with decaying organic matter. Soils tend to be nitrogen poor.

	LIGHT- Shade tolerance ranges from partial shade to full shade.

*Reference: Gold - Freshwater Wetland Shrubs & Trees
**Reference: Gold - Lowland Forest Trees & Shrubs
***Reference: Pojar & Mackinnon - Plants of the Pacific Northwest Coast
**** Reference: Leigh - Grow Your Own Native Landscape
*****Washington Native Plant Society

Table 12: Wildlife benefits of the new plants to be installed.

Species	Wildlife Benefits
*Abies grandis***	Shelter: Evergreen covers for birds and small mammals.
*Acer circinatum*****	Seeds/Foliage: Seeds are eaten by many mammals and birds including the song sparrow, nuthatch, squirrels, and deer. Deer will also eat young shoots.
*Acer macrophyllum***	Shelter: Provides nesting sites for avian species as well as cover for other animals.
*Alnus rubra**	Shelter: Habitat for various wildlife species.
*Amelanchier alnifolia*****	Foliage/Fruit: Twigs are eaten by deer. Berries are food for many species of birds including the spotted towhee, flicker, and waxwing as well as providing food for deer.
*Arctostaphylos uva-ursi*****	Fruit: Many species of birds feed on the berries as well as deer.
*Aruncus dioicus******	Foliage/ Nectar: Leaves provide forage for deer and flowers attracts butterflies and hummingbirds.
*Athyrium filix-femina******	Shelter: Seasonal cover for birds and mammals.
*Cornus nuttallii*****	Fruit/ Shelter: Berries are eaten by birds, leaves host insect larvae.
*Cornus sericea**	Shelter/ Fruit: Caterpillars can be found making this species their habitat. Additionally, fruits that are produced can be potential food for various bird species as well as mammals.
*Fragaria chiloensis******	Fruit/ Nectar: Fruits provide food for small mammals and birds, flowers attract pollinators.
*Frangula purshiana*****	Foliage/ Shelter/ Fruit: Foliage is eaten by deer and used as cover for other wildlife. Berries are eaten by many bird species.
*Gaultheria shallon***	Fruit/ Shelter: Offers berries as food for small mammals, provides cover for animals.
*Holodiscus discolor***	Foliage/ Nectar: Found to provide browse material and cover for mammals as well as nectar for some birds.
*Lonicera ciliosa****	Nectar: Attracts hummingbirds.
*Lupinus polyphyllus*****	Seeds/ Nectar: Provides seed for birds and small mammals and nectar for birds and insects.

Species	Wildlife Benefits
*Mahonia nervosa***	Shelter/ Fruit: Provides low evergreen ground cover for small mammals as well as fruits as a food source.
*Oemleria cerasiformis*****	Nectar/ Fruit: This species is heavily favored by bird species as it provides nectar for hummingbirds and fruits for other bird species.
*Philadelphus lewisii****	Shelter/ Nectar/ Seeds: Deciduous shrubs are browsed by deer and elk. Butterflies harvest the nectar. Birds eat the seeds.
*Physocarpus capitatus**	Shelter: Can provide dense vegetation cover for small mammals as well as structure for bird nests.
*Picea sitchensis****	Shelter: A large coniferous tree that can provide evergreen cover for a variety of species.
*Polystichum munitum****	Shelter: Provides year-long cover and is easily salvaged.
Populus balsamifera ssp. *trichocarpa****	Resin/ Shelter: Bees collect the resin for anti-infectant and for sealing intruders out of their hives, trees provide cover and shelter for many species of birds.
*Prunus emarginata****	Fruit/ Nectar/ Shelter: Provides berries and nectar for native mammals and insects, leaves provide foraging, thickets provide shelter.
*Pseudotsuga menziesii**	Shelter: Provides lasting canopy cover and food bearing habitat for bird and mammal species as this coniferous evergreen can live for centuries.
*Ribes sanguineum****	Nectar: Provides nectar for both hummingbird and butterfly species.
*Rosa gymnocarpa*****	Fruit: Rose hips provide food for wildlife.
*Rubus parviflorus****	Shelter/ Fruit: Foliage provides dense cover and berries are eaten by many birds and small mammals.
*Rubus spectabilis**	Nectar/ Shelter: Offers nectar for bees and hummingbirds. Its shrub-like structure also allows cover for small animals.
*Salix lucida ssp. lasiandra****	Foliage/Shelter: Offers browse for deer as well as habitat for birds.
*Salix scouleriana**	Shelter: Offers fast growing habitat and cover for bird species.
*Symphoricarpos albus****	Nectar/ Berries/ Shelter: Provides nectar for pollinators, elk and deer browse leaves and twigs, berries provide food for mammals

	and birds, provides shelter for small animals.
Species	**Wildlife Benefits**
*Thuja plicata**	Shelter: Can provide nesting area and cover for bird species.
*Vaccinium parvifolium*****	Berries/ Nectar: Berries and nectar provide foods for wildlife.

*Reference: Gold - Freshwater Wetland Shrubs & Trees
**Reference: Gold - Lowland Forest Trees & Shrubs
***Reference: Pojar & Mackinnon - Plants of the Pacific Northwest Coast
****Reference: Stinson and Fisher - Native Plants for Wildlife
*****Washington Native Plant Society

Table 13: Polygon characteristics table.

Descriptions	Polygon 1	Polygon 2	Polygon 3
Soil texture	Silty loam	Clay	Sandy to silty loam
Soil moisture	Does not hold water well, soil crumbles in hand when pressed	Water comes out of soil when squeezed	Does not hold water well, soil crumbles in hand when pressed
Slope	15-20°	25-30°	15-25°
Light availability (including seasonal variation and describe overstory canopy)	90%	75%	50%
Present vegetation: species & general abundance (including native and nonnative)	*S. lucida ssp. lasiandra* (3); *A. macrophyllum* (1); *Q. garryana* (1); *T. plicata* (5); P. menziesii (2); *R. bifrons* (along northern edge of polygon)	*R. bifrons* (abundant in about 75% of polygon); *I. aquifolium* (3); *R. spectabilis* (intermingled with *R. bifrons*); *S. lucida ssp. lasiandra* (1); *Prunus virginiana* (2)	*P. munitum* (throughout); A. filix-femina (throughout); *A. macrophyllum* (2); *T. plicata* (3); *M. nervosa* (clusters); *T menziesii* (40% coverage); *A. circinatum* (1); *I. aquifolium* (1); *R. spectabilis* (4); *S. racemosa* (5)
Human impacts	Anthropogenic and plant compost debris	Anthropogenic and plant compost debris	Anthropogenic and plant compost debris

	and invasive species removal and continued restoration from past efforts	and Invasive species removal	and Invasive species removal
Other considerations	Disturbance from continuation of last year's project, ditch at the bottom of polygon and street to East of polygon constrain planting of certain species	Abandoned pile of cement pieces and plaster	Condemned barn bordering North side of site and piles of debris left in/around barn. There are also pieces of an abandoned car still left on the site.

Table 14: North Creek Forest's maintenance time table from Stewardship Plan

January		**February**		**March**	
Activity	*When*	*Activity*	*When*	*Activity*	*When*
Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.
Remove litter.	As needed.	Remove litter.	As needed.	Remove litter.	As needed.
Inspect installed plants.	1-2 times a month.	Inspect installed plants.	1-2 times a month.	Inspect installed plants.	1-2 times a month.
Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.
Photo monitoring.	Once a month.	Photo monitoring.	Once a month.	Photo monitoring.	Once a month.
Community involvement.	1+ a month.	Community involvement.	1+ a month.	Community involvement.	1+ a month.
April		**May**		**June**	
Activity	*When*	*Activity*	*When*	*Activity*	*When*
Water plants before 10am or after 6pm.	1-2 times a week or as needed.	Water plants before 10am or after 6pm.	1-2 times a week or as needed.	Water plants before 10am or after 6pm.	2-3 times a week or as needed.
Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.
Remove litter.	As needed.	Remove litter.	As needed.	Remove litter.	As needed.
Inspect installed plants.	1-2 times a month.	Inspect installed plants.	1-2 times a month.	Inspect installed plants.	1-2 times a month.
Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.
Photo monitoring.	Once a month.	Photo monitoring.	Once a month.	Photo monitoring.	Once a month.
Community involvement.	1+ a month.	Mulch.	As needed.	Mulch	As needed.
		Community involvement.	1+ a month.	Community involvement.	1+ a month.

July		**August**		**September**	
Activity	*When*	*Activity*	*When*	*Activity*	*When*
Water plants before 10am or after 6pm.	2-3 times a week or as needed.	Water plants before 10am or after 6pm.	2-3 times a week or as needed.	Water plants before 10am or after 6pm.	1-2 times a week or as needed.
Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.
Remove litter.	As needed.	Remove litter.	As needed.	Remove litter.	As needed.
Inspect installed plants.	1-2 times a a month.	Inspect installed plants.	1-2 times a a month.	Inspect installed plants.	1-2 times a a month.
Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.
Photo monitoring.	Once a month.	Photo monitoring.	Once a month.	Photo monitoring.	Once a month.
Mulch.	As needed.	Mulch.	As needed.	Mulch.	As needed.
Community involvement.	1+ a month.	Community involvement.	1+ a month.	Community involvement.	1+ a month.
October		**November**		**December**	
Activity	*When*	*Activity*	*When*	*Activity*	*When*
Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.	Remove invasive plant species including Himalayan blackberry, English holly, and European mountain-ash.	As needed. Early detection and eradication will minimize removal efforts.
Remove litter.	As needed.	Remove litter.	As needed.	Remove litter.	As needed.
Inspect installed plants.	1-2 times a month.	Inspect installed plants.	1-2 times a month.	Inspect installed plants.	1-2 times a month.
Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.	Pest monitoring.	1-2 times a month.
Photo monitoring.	Once a month.	Photo monitoring.	Once a month.	Photo monitoring.	Once a month.
Community involvement.	1+ a month.	Community involvement.	1+ a month.	Community involvement.	1+ a month.

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