Richmond Beach Saltwater Park
Vegetation Management Plan

Prepared for: City of Shoreline

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November 2008

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ACKNOWLEDGEMENTS

The authors would like to express their gratitude to Maura Shelton, Amy Deardorff, David Ahl, Charlie Delius, Cara Ganders, and Amy Johnson; all of whom participated in restoration efforts at the park in 2006-2007 as students in the University of Washington (UW) Restoration Ecology Network program. Many thanks go out to them for sharing their research and for their enthusiasm in restoring a challenging site to natural habitat. Special thanks goes to Maura for taking the time to provide a tour of the restoration area, sharing what worked and what didn't, and reviewing portions of this vegetation management plan to include the specific planting and slope stabilization methods the UW students implemented at the park.

In addition, select portions in Appendix C were adapted from the *Golden Gardens Vegetation Management Plan* (2004) and the *Sand Point Magnuson Park Vegetation Management Plan* (2001). The authors of this vegetation management plan acknowledge the work of Sound Tree Solutions, Arboriculture and Restoration and Sheldon and Associates. These three firm's contributions to urban park vegetation management plans have provided practical and efficient management of the natural park environment in tandem with management of the landscaped environment, with the resulting outcome of bringing the beauty of our native habitat to park users. Any errors in this plan are the author's responsibility and do not reflect on the work of Sheldon and Associates, Sound Tree Solutions or Arboriculture and Restoration.

Executive Summary

This Vegetation Management Plan (VMP) has been prepared to address the goals, objectives, and methods for restoring and managing native habitats at Richmond Beach Saltwater Park. This treasured resource in the Shoreline community encompasses 42 acres on Puget Sound with a wide sandy beach and sweeping views of the Sound and the Olympic mountains from virtually every part of the park. The park offers diverse opportunities to its many users and neighbors and offers facilities for picnics, beach barbecues, upland walking trails and direct public access to the saltwater shoreline that provides a popular venue for beach walks, birding, and wind surfing. With the exception of the main access road, parking areas, picnic shelters and some lawn, the park remains essentially a natural place; with visitors coming from across the greater Seattle area and by neighbors who simply walk through the front gates.

This VMP reflects the City of Shoreline's Board of Parks, Recreation and Cultural Services (PRCS) intent that the park should remain a more natural place with improved opportunities for interpretative walks, trails, and habitat enhancement. It also incorporates the perspectives of community representatives and selected residents living adjacent to the park. Their valuable feedback was gathered at public open houses held at the park and through questionnaires.

This document is intended to be a tool for the City of Shoreline to use for long-term restoration and management of the native habitats at the park. It is organized so that it can be easily used both by city park maintenance staff and by city-sponsored volunteer groups. Given the large areas slated for invasive species control and native habitat restoration, a long-term plan is needed to successfully accomplish the PRCS' goals. Thus, this plan has been prepared with a 20-year focus.

The VMP begins with a brief overview of the park history (chapter 1) and an overview of the 2006 Draft Master Plan goals for the park, plus issues identified through the public involvement process during master plan development (chapter 2).

The rest of this document provides clear direction regarding what should be done, where it should be done, and when it should be done. Chapter 3 introduces the recommended approach in decision-making and implementing this VMP. It also describes the particular types of work in the park, differentiating activities that are best and/or more safely performed by City professional staff and activities that present opportunities for citizen stewardship/volunteers/corporate involvement in coordination with park staff. Legal implications, such as permitting and railroad right-of-way access, and cost implications are also included in the chapter 3.

Chapter 4 presents five Landscape Zones that were identified based on the existing vegetation types, land use, and geomorphic distinctions within the park. Within in each Landscape Zone, distinct Management Areas are identified. Chapter 5 discusses the plan objectives and outlines the specific restoration and maintenance activities needed to restore, maintain, and manage each of the Management Areas. Lastly, chapter 6 provides instructions on how to carry out monitoring activities that will help in determining whether the restoration is successful. It describes monitoring methods and provides templates for field data collection. In addition, recommendations are discussed for adaptive management if the restoration does not perform as expected.

Supporting information is provided in the appendices include recommended native plant lists by habitat type, instructions for the recommended management and maintenance practices, an annual maintenance schedule, and forms for planning a restoration and for monitoring restored habitat.

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Chapter 1

1.0 HISTORIC AND EXISTING CONDITIONS

Richmond Beach Saltwater Park is located at 2021 NW 190th Street in the City of Shoreline, Washington (see Figure 1.1). The following is a short history of the park, from pre-Euro-American settlement to the present day. Historically, the park and surrounding areas were part of the territory of the Shilsholamish (a Coast Salish people). In the Lushootseed, the Native language of Puget Sound, this area was known as q´ueqˆe´waidet (pronounced as kai-yoo-kai-yoo-ahts), the word for kinnikinnick (*Arctostaphylos uva-ursi)*. This evergreen groundcover was smoked like tobacco, and was used to stretch tobacco supplies by both Indian and non-Indian people. The slope above the waterline was probably a good source of this valuable plant (Thrush 2006).

Beyond its plant resources, the beach was also an important camping site for local Native people, and for those workers who came from as far away as British Columbia to work in the Puget Sound agricultural industry. Early residents remembered seeing Native families camped at Richmond Beach from 1890's to the First World War.

Homesick settlers named the community surrounding Richmond Beach after Richmond, England. In 1890, C. W. Smith platted the property as Richmond Beach to sell parcels as a business and resort community. When the Great Northern Railway Company built a depot in 1907-8, improved access helped the area become a popular resort community. Some original summer houses can still be recognized in the neighborhood surrounding the park.

Around 1905, the property ended up being used to mine sand and gravel to build the new railroad bed along the Puget Sound shoreline. The current steep-sloped, bowl-shaped form of the park was the result of sand and gravel being washed out of the gravel bank by the Richmond Beach Sand and Gravel Company. After gravel was moved to the beach, it was loaded onto barges from a pier and towed to Seattle. This operation lasted until 1915 (King County 1985).

After World War I, until about 1935, old unseaworthy ships were beached and burned at the present day park site. After ships had burned, metals were salvaged from the beach at low tide and shipped to Seattle for reuse. Small pieces of scrap metal can still be found today on the beach.

In 1959, King County purchased the land from the Great Northern Railway Company. The partially developed park was opened in 1963 as part of the King County Park system. In 1994, construction was completed on major new improvements to the park including restrooms, parking improvements and trails.

Jurisdiction of the park was transferred to the City of Shoreline following incorporation in 1995. Since then, significant improvements made to the park include picnic shelters, a play area, reconfiguration of the upper bluff trail, beach trail improvements, and a habitat restoration project that replaced Scots Broom with dune grass at select locations on the beach and lower parking lot.

Habitat restoration designed in coordination with the University of Washington Restoration Ecology Network began in 2007. Located near the playground in the central activity center, the goal of this restoration is to replace Scots broom with a stable native bluff/dune plant community, stabilize steep slopes, and preserve the view corridors in the park.

As part of development of the 2006 Master Plan, several studies were conducted to identify existing vegetation, habitat, and soils conditions. The following brief summary of these studies (Hewitt Architects 2006) describes the current conditions in the park.

The 42-acre park is characterized by striking and unique topography with dramatic views of Puget Sound and the Olympic mountain range due to the historic sand and gravel excavations. The majority of the site is a steep semi-circular bowl separated from the beach on Puget Sound by the 250-foot wide Burlington Northern Railroad right-of-way. One main road provides access at the northwest corner of the park at approximately 200 feet in elevation and winds south and east down to the lower parking lot at about 80

feet in elevation. While the majority of the site has steep slopes, there are several relatively level benches that provide recreational areas, including the upper terrace and upper bluff trail, the mid-level picnic terrace and small parking lot, and the central activity area that includes the lower parking lot, picnic shelter, playground and the beach trailhead. Pedestrian access is provided to the beach via a foot bridge over the railroad tracks.

Due to the removal of the overburden, soils in the park consist of loose gravelly sand. Gullies caused by erosion from surface water runoff have formed on the steep slopes to the east of the railroad tracks, creating a washboard effect across much of the park. In addition, informal trails created by park users have added to the erosion. The beach on the west side of the railroad tracks consists of sand and cobble and is relatively level.

A number of diverse plant communities occur in the park ranging from well maintained lawn to natural habitat. Maintained lawn and/or landscaped beds of ornamental shrubs and flowers occur on the upper terrace, park entrance overlook, and at the entrance to the lower parking lot. Over the majority of the park, the non-native species of Scots broom and Himalayan blackberry have thrived in the severely altered and depleted soils present at the park. In the central portion of the park, the non-native shrubs form a dense thicket dominated by Scots broom. On the northern southwest-facing slopes, a dense mosaic of both Scots broom and Himalayan blackberry occur with Pacific madrone and Douglas fir trees scattered across the slope. On the southern northwest-facing slopes the non-native shrubs grow less densely with native shrubs, such as oceanspray, tall Oregon grape, and big-leaf maple saplings and Pacific madrone trees scattered throughout. Nearly all of the maintained park and non-native shrub habitat is low-growing and allows for the open, dramatic views of Puget Sound and the mountains that are enjoyed by park users and neighboring residents, alike.

The most natural habitat at the park is just east of the railroad tracks. The west-facing slope at the south end of the park supports a forest community of red alder, Pacific madrone, and big-leaf maple with a densely growing understory of oceanspray, salmonberry, red elderberry, twinberry, and Himalayan blackberry. A wetland is located both north and south of the beach access trail at the base of the slope. This area supports red alder and willow trees, with Himalayan blackberry and field bindweed. Due to the dense thickets of blackberry and stinging nettle, park users have not accessed or created trails through the upland and wetland forests.

Vegetation on the beach is made up of dense thickets of Scots broom and Himalayan blackberry with trails and open sand areas created by park users. One lone Douglas fir is situated in the middle of this non-native shrub habitat. A few pockets of dune grass, planted by the City of Shoreline as part of a dune restoration project, occur near the beach access trail.

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Chapter 2

2.0 PARK MASTER PLAN GOALS

Goals for the Saltwater Park VMP were developed in conjunction with the 2006 Saltwater Park Master Plan (Hewitt Architects 2007). The Master Plan, adopted by the Shoreline City Council in February 2007, was developed based on an assessment of current park conditions, public involvement of citizens and park users at open house events at the park, and interviews by the Shoreline PRCS with community representatives and selected residents living adjacent to the park. The following goals were used to guide development of the Master Plan:

- Preserve and protect Saltwater Park as a community asset and amenity for the citizens of Shoreline.
- Improve accessibility to the beach and amenities of the park, and to views of Puget Sound.
- Improve the overall appearance of the park without significantly altering its existing character.
- Upgrade existing site amenities to improve their safety and durability, extend their useful life and integrate their design.
- Implement a series of selective site improvements and a program of restoration ecology to control erosion and eliminate invasive plant species.
- Increase the capacity of the park by providing improved, safe and convenient access and circulation to all parts of the park.

In considering the results of the site assessment and discussion with stakeholders, potential projects were identified to achieve the goals of the Master Plan and were approved by the City Council in December 2006. The projects relating to the natural environment at the park include:

- Control access to steep fragile slopes throughout the park to reduce erosion and protect vegetation by constructing formal boardwalks and stairways in selected locations.
- Control drainage and surface water runoff.
- Protect the wetland, and forested buffer habitat within the park.
- Use ornamental landscaping on the upper terrace and upper bluff trail, and on the mid-level terrace area.
- Control erosion on steep slopes throughout the park and restore native habitat by removing invasive plants and replacing them with dune grass and other native plant species tolerant of the dry, sandy and gravelly soils at the park.
- Remove invasive plant species and nurture/augment native plants in the wetland system and its buffer located west of the lower parking lot.
- Remove invasive plant species and restore native habitat on beach dunes.
- Avoid planting vegetation that will affect views from the park entrance, upper bluff trail and picnic areas.
- Create a community participation program to involve volunteers in habitat restoration efforts.
- Work with the University of Washington Restoration Ecology Network program in habitat restoration efforts.

The success of projects involving habitat improvement and restoration adjacent to and within the railroad right-of-way will require the cooperation of the railroad.

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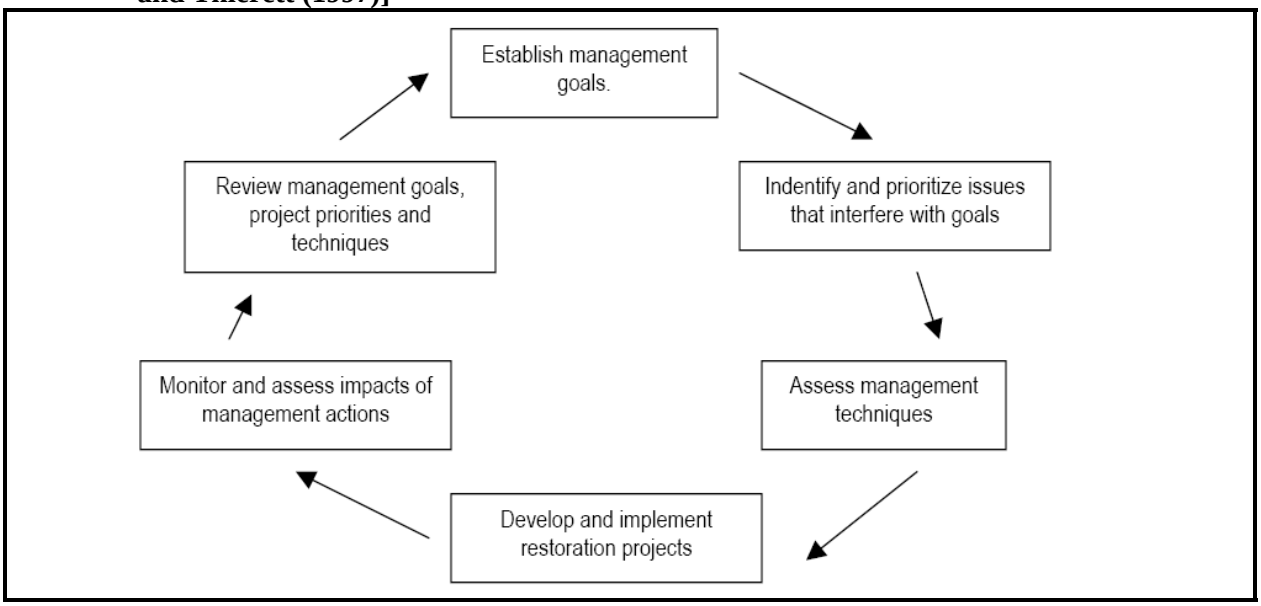
Chapter 3

3.0 PLAN APPROACH

3.1 ADAPTIVE MANAGEMENT

Adaptive management is the recommended approach to achieve the Master Plan goals at the park as outlined in chapter 2. This management approach was chosen due to the unique environmental challenges at the park including the stresses of prolonged sun exposure, high temperatures, highly erodable soils, and open exposure to storms. Adaptive management offers a flexible system of experimentation, monitoring, and subsequent decision-making that can provide the greatest feedback in developing a successful restoration strategy at the park. Until now, techniques for planting and/or invasive species control have been tried in various areas of the park with varying results. However, there has been no formal way of tracking and evaluating these results to learn from them. A system of adaptive management, as illustrated in Table 3-1, will allow PRCS staff and volunteers to set up, implement, and evaluate results of management strategies and create new strategies for future projects.

Table 3-1. Adaptive Management Flowchart [adapted from Schwartz and Randall (1995) in Luken and Thierett (1997)]



As illustrated above, adaptive management is a cycle that began with the establishment of the overall management goals outlined in chapter 2. The conditions that that do not currently meet park goals are described for each landscape zone in chapter 4. The recommended management technique for each management area is presented in chapter 5. The adaptive management steps are presented in the sections below; section 3.1.1 addresses development and implementation of restoration projects, section 3.1.2 addresses monitoring, evaluating the success of restoration projects, and reviewing management priorities and techniques.

3.1.1 GETTING STARTED

After reviewing chapters 3 through 6, the community volunteer group or the city maintenance staff is now ready to take the next adaptive management step. That is, develop a specific project. The most important part of completing a successful restoration project is in the thoughtful planning of it. Planning begins with choosing the restoration area (see sections 3.2 through 3.4 in this chapter), taking into consideration

the important issues around the appropriate use of volunteer help (section 3.5) and critical area permitting (section 3.6). While choosing a restoration project, it is important to coordinate with Shoreline PRCS staff to make sure that any new projects fit into the overall VMP goals.

Once a restoration site is chosen, the next step involves development of a written project plan so that the objectives are clearly communicated and documented. Two forms are provided in Appendix A for this purpose. Many decisions will be made as part of the initial planning process. For example, decisions will be made concerning what actions to take (see chapter 5), the project schedule (Appendix C), native plants to use (Appendix B), working with volunteers (section 3.5), implementation plans (Appendix C), maintenance plans (Appendix C) and monitoring plans (chapter 6 and Appendices D and E). It is helpful to involve people with experience in a variety of backgrounds in the planning of the site, as well as coordination with the PRCS staff.

All projects, whether initiated by Shoreline PRCS or a community volunteer group, should provide the city with the basic information on the proposed project in a standard format. This allows all involved parties, from the volunteers to the park maintenance staff, to have a clear understanding of the project and the project needs (such as irrigation plans, native plants to be ordered and delivery of plants, clean up of removed invasive species, timing of project, and monitoring plan). It will assist getting adequate resources (labor, funding, and materials) in place to complete the project and meeting the vegetation management goals. This step also facilitates basic communication between the PRCS work groups that may not have daily contact. The project plan can also be used to measure how well the work met the project objectives when the project is monitored and evaluated. The planning forms in Appendix A must be reviewed and approved by the PRCS before a project is executed. Ideally, the essential data on the forms can be entered into a spreadsheet to keep track of projects in the park.

Once the project is reviewed and approved, implementation of the project can proceed. Prior to any site work, coordination between the volunteer group and PRCS planning and maintenance staff is an important step in:

- procuring the approved supplies,
- setting up appropriate the staging areas for supplies,
- arranging for public notices to announce volunteer days, and
- coordinating with the park maintenance staff regarding irrigation and clearing out removed vegetation.

Other items to be aware of include making arrangements with the PRCS to set up the necessary paperwork for volunteers to sign on work days, making sure that public notices announcing volunteer days are placed well in advance of the event to attract enough people to get the job done, and having first aid supplies and water available for volunteers.

Finally, the day of the site work arrives. It is best to have one person who can supervise the overall project such as being aware of time, the project boundaries, and the work to be completed. This person would also coordinate with city staff during the day. It is also helpful to have folks on hand who can be the 'experts' for specific tasks, such as showing volunteers how to properly remove invasive species, the distance to space out the new plantings, proper planting methods for native species, etc.

3.1.2 MONITORING AND REVIEWING

After a project is completed, monitoring is an important follow-up action (see chapter 6). The monitoring data (recorded on the data sheets provided in Appendix D) can then be compared to the project plan to evaluate the results of the project. Ideally, representatives of the city and the volunteer group will coordinate on the evaluation to review the monitored conditions with what was expected during the planning of the project. In this way, if the project does not meet the expected results modifications in the

project objectives or techniques can be made. The modifications can be used during on-going management of the completed restoration area and in future restoration projects. It is important to write down any modifications and attach it as an addendum to the original written restoration plan so that future projects can benefit from the lessons learned. In addition, it is important for follow up documentation to include discussions of what did and did not work, elements that were crucial to the success of the restoration, and elements that were not necessary. The documentation will be invaluable for future projects.

Restoration projects completed in the Erosion Landscape Zone by the UW Restoration Ecology Network are ideal to begin using adaptive management strategy given their recent installation and documented restoration plans that include the goals and techniques used. By monitoring these restoration areas using the methods in chapter 6 and evaluating the success of the restoration, the results documented from this project can provide invaluable information for future restoration projects on the steep slopes in the Erosion Landscape Zone.

3.2 IMPLEMENTATION PRIORITIES

This section of the vegetation management plan provides a basis for prioritizing restoration at the park on the larger levels of the Landscape Zones and Management Areas discussed in chapter 4. The following section, section 3.3 Choosing Specific Restoration Sites, provides guidelines for prioritizing and deciding where to place specific, defined restoration sites within each Management Area.

The conditions observed in each Management Area were measured against the goals outlined in chapter 2. Priorities were chosen to achieve those goals based on the immediate need to remedy environmental conditions and efficient resource utilization. Key strategies considered were:

- Reducing the invasive plant seed bank throughout the park.
- Restoring native plant communities.
- Maintaining quality habitat where the plant community is being threatened by invasive species.
- Maximizing the use of volunteer and community resources.
- Selecting both smaller (incremental) projects that can be "adopted" by neighborhood groups and/or schools, and larger one-time projects for event-based groups (i.e. a one-time effort to clear the Scots broom and stabilize the slopes while another group installs the plantings).
- Utilizing volunteer efforts. Professional services (PRCS staff and/or consultants) can be used to help set up a project. Follow up tasks and on-the-ground tasks can be carried out by available volunteers.

These strategies, and the lack of any urgent management needs for park user safety, point to focusing initial restoration projects on replacing invasive species with higher functioning native habitat on an incremental basis as funds and labor resources allow. The first priority projects are geared toward creating a more natural environment using native trees, shrubs, and groundcover and maintaining existing forest health. These projects focus on removing invasive species that threaten the health of mature trees and reducing the invasive seed bank throughout the park while also increasing native plant communities and the native plant seed bank.

The highest priority is restoration in the Erosion and Scrub Zones as work in these areas has the greatest potential for reducing the invasive seed bank and restoring native habitat. By virtue of the steep hillsides in these Zones, work in these areas will remove the invasive seed source that affects both the areas where invasive species now occur and downslope habitats. Planting native vegetation will restore a native seed

bank that will spread downslope and result in natural recruitment of native plants. Another high priority is removal of English ivy growing on trees in the Upland Forest Zone.

A secondary priority is removing English ivy growing on the ground in the Upland Forest Management Area. Another secondary priority is removing Himalayan blackberry from the Wetland Management Area in the Forest Zone. While most of the forest habitat in the wetland is highly functioning, areas along the wetland boundaries are being overtaken by blackberry that is outcompeting native shrubs and groundcover plants.

The Beach Zone is included as a secondary priority, but should be done only after the other high priority and secondary projects described above are completed. This is because the extensive seed source of invasive species in the adjacent railroad right-of-way will create a labor-intensive, high-maintenance need for weeding and invasive species control at the beach. Another reason is that removal of invasive species in the Erosion and Scrub Zones is considered a higher priority as changes in those areas will affect other downslope areas of the park. Removal of invasive species in the Forest Zone is also a higher priority than beach restoration because the invasive species, particularly the English ivy, are threatening the health of trees in an existing native habitat.

There are also additional issues in the Beach Zone that must be addressed before native habitat restoration can be successful, including creating a plan to limit and direct foot traffic by park users and their pets in a way that will protect any new, sensitive plantings. This is particularly important in the Beach Zone because the native plants will consist primarily of groundcover species that may resemble weeds to the untrained observer and, given the easy access and use of the area for bonfires and parties, it will require some dedicated planning to ensure the success of changing the invasive thickets to a native habitat. Thus, planning for the Beach Zone restoration could be done while other higher priority projects are being implemented.

Table 3-2 lists the priority of management projects. In addition, on-going maintenance tasks are included as a priority as these tasks are essential to the long-term success of restoration projects. The maintenance tasks must be carried out beyond the 3-year establishment period and include monitoring the health of planted vegetation, invasive species control, and bare soil repair. In essence, the on-going maintenance can be considered to be a stand-along project that is just as important as the initial planting of native species. There are other projects discussed in chapter 5 that are not included in this table, such as additional American dune grass plantings, that are lesser priority projects. However, they are not considered to be optional activities, but additional needs that can be addressed following implementation of the projects listed below.

Table 3-2. Priority Management Projects in Richmond Beach Saltwater Park.

	Erosion Zone	**Forest Zone**	**Beach Zone**
First Priorities			
Non-native Shrub MA[1]	Control invasive plants, install bioengineered slope stabilization, re-plant cleared areas with natives, project to be done in incremental areas.		Develop a trail and foot traffic plan to minimize impacts to restored native habitat.
Upland Forest MA	Control invasive plants, install bioengineered slope stabilization, re-plant cleared areas with natives.	Remove English ivy that grows on trees.	
Wetland MA	Investigate the need for critical area permits, obtain permits if needed		

Table 3-2. Priority Management Projects in Richmond Beach Saltwater Park (continued)

	Erosion Zone	Forest Zone	Beach Zone
Secondary Priorities			
Non-native Shrub MA			Control invasive plants, re-plant cleared areas with natives, project to be done in incremental areas.
Upland Forest MA		Remove English ivy growing on the ground, allow for native regeneration or re-plant cleared areas with natives, project to be done in incremental areas.	
Wetland MA	Control invasive plants, re-plant steep slopes with native live stakes, project to be done in incremental areas.		
On-going Maintenance – to be started as soon as individual restoration projects are implemented			
Monitoring	Conduct informal survey of restored areas in the spring and late summer each year, conduct formal monitoring in years 5, 7, 10, 13, 17, and 20	Conduct informal survey of restored areas in the spring and late summer each year, conduct formal monitoring in years 5, 7, 10, 13, 17, and 20	Conduct informal survey of restored areas in the spring and late summer each year, conduct formal monitoring in years 5, 7, 10, 13, 17, and 20
Invasive Species Control	In the spring and late fall selectively remove invasive plants from native plants in restored areas	In the spring and late fall selectively remove invasive plants from native plants in restored areas	In the spring and late fall selectively remove invasive plants from native plants in restored areas
Bare Soil Repair	Replant with natives	Replant with natives	Replant with natives, protect from foot traffic

1 – MA = Management Area (as defined in chapter 4)

3.3 CHOOSING SPECIFIC RESTORATION SITES

Management Areas dominated by invasive species should be divided into smaller, more manageable and practical restoration sites. An adaptation of the Bradley Method (Bradley 1971) is presented in this section to provide guidelines for choosing smaller, incremental restoration sites within Management Areas. Developed in Australia by Joan Bradley, her method was used by herself and her sister who, on a volunteer basis, successfully hand-cleared a 40-acre woodland reserve of invasive vegetation over a number of years. The result has been that the reserve needs attention only once or twice a year in vulnerable spots such as roadsides and clearings to maintain a weed-free state. This method has also been used in California to restore large areas of invasive species to native habitat. The Bradley method is based on three general principals:

- Protect existing native species and work outward to areas more heavily infested with invasive plants.

- While removing invasive plants, keep disturbance to soils and existing native plants within the restoration area to a minimum.
- Allow native plant regeneration to dictate the rate and size of successive areas of weed removal – do not clear areas that are too big to maintain.

The basis of this method is the ability of native plant species to re-colonize by tipping the ecological balance away from the invasive plants and toward the native plants. Ideally, invasive plant removal would start in an area dominated by native species. When clearing invasive plants from heavily infested areas, the resulting conditions of bare, disturbed soil exposed to full sun encourage the rapid re-growth of invasive plants. By starting in areas with native plants and working outward in small increments adjacent to the established native habitat, the native vegetation is favored and its natural regenerative power will prevail over the invasive plants. It is still possible to start in areas that are dominated by invasive plants. However, the size of the initial area to be cleared will need to be based on the ability of volunteers to keep up with the need to remove the re-growth of invasive plants until the new native habitat is well established.

In applying the Bradley method to the park, both the general principals of this method and the park conditions need to be considered because the steep slopes contribute to the spread of invasive plant seeds throughout the park via gravity. Thus, the recommendation for the park includes the Bradley methods principals AND beginning at the higher elevations in the park in order to minimize the spread of invasive seeds into restored sites.

The highest priority Landscape Zones at the park have little to no established native vegetation. The Upland Forest Management area in the Erosion Zone and scattered areas of the Scrub Zone do have a few established trees, but the understory in these and the other management areas in the Erosion Zone are extensively dominated by invasive species. Given these conditions at the park, the following recommendations are made for choosing the initial restoration site in these Zones:

- In the Erosion Landscape Zone - Non-native Management Area: start along the main access road and the UW restoration site. In the areas located south of the main access road, begin work adjacent to the same area where restoration work is proposed in the Steep Slope Hazard Management Area.
- In the Erosion Landscape Zone - Steep Slope Hazard Management Area: start at the southwest end where this area abuts the forest habitat.
- In the Erosion Landscape Zone - Upland Forest Management Area: this area may be small enough to be done as one entire restoration site. If it is broken out into smaller sites, begin at the east end at the higher elevations.
- For the Scrub Landscape Zone, the initial restoration site can begin at the highest elevation grouping of native trees.

The Bradley method plan of work is designed for any number of people within a volunteer group to follow and requires keeping to a set sequence of actions. Start by getting rid of the invasive species and, given the ecological conditions at the park, implement the other management tasks as outlined in chapter 5 and Appendix C. Once that area has established native vegetation and regular invasive species management is being conducted, then move outward from the restored area about 12 feet on all sides and begin the process again. This provides the established native plants in the restored area with the opportunity to move into adjacent newly cleared area via seeds and rhizomes. As the native vegetation takes hold in the newly cleared areas, continue to extend the invasive clearing in increments of no more than 12 feet from the established restored native habitat.

It is important to maintain the advantage that has already been gained as native habitats are restored and reclaimed. The success of this method depends on resisting the temptation to clear more deeply into

heavily infested areas of invasive species before the regenerating natives have become established. The Bradley method found that excluding light from the ground is important in reducing weed seed germination. Thus, native plants do not need to be very tall, but should form a dense ground cover (this includes the combined groundcover, shrub, and tree layer). Invasive species seeds will continue to germinate in newly cleared areas, so their removal and any other maintenance tasks needed to establish the new native plants (and thus the native seed source) is more important than starting to clear new sites. It is important to bring the restored native habitat right up to the border of the invasive infestation to provide shade and native seeds.

The Bradley method also allows for a "peninsula" method that presents the opportunity for experimentation to determine the most efficient method to reduce the invasive infestation and restore native habitat. Areas heavily infested by invasive species can be weakened by clearing the invasives from many small areas less than 6 feet in diameter. By placing these areas close together, the invasives can be reduced to narrow peninsulas and native plantings can be established among the invasives. These areas may need even more attention for invasive species control given the close proximity of the invasive plants, but they may also result in quicker establishment of the native plantings due to protect from the harsh ecological elements of sun and wind on the steep slopes.

The Bradley method involves patience in establishing the restored native habitat and staying power in continuing to remove and control invasive species in the restored areas. The restored native habitat will continue to mature and will increase the shade that controls the invasive species. Thus, the native plant community will be able to out-compete the invasive species for water, nutrients, and sun, on its own.

3.4 IMPLEMENTATION STRATEGIES

The rate of implementation will depend on a number of factors – community stewardship, available funding, the interest of the larger community of volunteers in the city, and a dedicated PRCS staff person to coordinate and oversee projects. The main ingredient in ensuring the success of the native habitat restoration at the park will be in the maintenance of the restored areas to ensure that invasive plants do not overwhelm the new native plantings. Thus, allocation of resources for this purpose at the park needs to focus on continually removing invasive plants and encouraging the establishment of planted native species.

The majority of the work will likely be done by volunteers, and youth and environmental training groups. PRCS staff and/or contractors may be involved in some portions of the work as outlined in section 3.5 Volunteers vs. Professionals. The reason for this is that it is not prudent to use volunteers to work on steeper slopes or apply herbicides.

Establishment of and maintaining a strong volunteer stewardship network in the community will be critical to the implementation success of this vegetation management plan. Parks departments in other nearby jurisdictions have found that community stewardship often increases and builds momentum once implementation activities have started and results are being noticed. Some recommendations to pursue in the effort to establish a strong volunteer base include are not limited to:

- Coordinate with local school and youth groups to adopt portions of the park.
- Establish community relations through EarthCorps Leadership Grant activities.
- Involve local university students who need practicum/projects for ecological restoration courses (University of Washington Restoration Ecology Network, UW Wetland Science and Management Certificate Program, UW Bothell Campus Student Ecology Club).
- Establish a "Friends of Saltwater Park" or promote a focus group like "Friends of Richmond Beach Saltwater Park Wetland".

3.5 VOLUNTEERS VS. PROFESSIONALS

A study completed in 1997 conducted a scientifically designed parallel-testing study comparing volunteer and professional data to determine whether volunteers were able to collect credible monitoring data (Ely 2000). Using established volunteer monitoring programs for King County Department of Natural Resources, macroinvertebrates were collected by both volunteers and professionals from the same streams using the same methods. The study found that, with training, volunteers were able to follow the field collection methods to the same precision as conducted by professionals. There was a small difference in the ability of the volunteers to identify the species of macroinvertebrates, with the professional analysis increasing the precision of identification by about 13%. Thus, the conclusion was that data collected by volunteer data collection is extremely useful for reconnaissance level monitoring; which is the level of monitoring needed at the Richmond Beach Saltwater Park. Specific information regarding a volunteer monitor program is presented in chapter 6.

An ambitious and intensive natural habitat monitoring project called Watershed Community Link was carried out in King County, Washington from July 1995 to September 1996 using 132 volunteers to monitor 12 wetlands and their buffers (Miller et al 1998). Volunteers collected data on birds, amphibians, vegetation, water level, soils, and surrounding land uses. They did everything from establishing transect lines to identifying plant species and estimating plant cover. The County found that the value of using volunteer monitoring went far beyond data collection. The volunteers became stewards and local teachers. They learned how to talk to County Council members and how to write grant proposals. They produced brochures and invited community members to field days to build trails, clean up trash, and talk about the benefits and values of the natural environment. While the Watershed Community Link project lasted for only one year, several groups continued to monitor and care for the sites they were monitoring under the program. In addition, the data collected by the Watershed Community Link project has been used to prepare long-term management plans and document baseline conditions prior to development and restoration projects.

3.6 CRITICAL AREA PERMITTING

The wetland habitat and slopes that are 40 percent or steeper at the park meet the definition for critical areas. The wetland at the park is defined as a critical area by local, state, and federal regulatory agencies. In addition to protecting the wetland itself, a protective buffer is also typically assigned to a critical area; with the width of the buffer based on the physical characteristics and/or functions performed by the wetland. The wetland at the park has been assigned a 75-foot wide buffer. The steep slopes at the park are regulated only at the local (city) level.

Most activities within the wetland and its protective buffer are regulated, including some restoration activities. In addition, critical area compliance with one agency does not necessarily fulfill permitting requirements of any other agencies. Permits required by each individual agency would need to be obtained through separate processing with each agency. At the local level, the permitting agency is the City of Shoreline, at the state level: the Washington State Department of Ecology- Shoreline Department, and at the federal level: the U.S. Army Corps of Engineers - Regulatory Section.

Based on 2007 regulations, no critical area permitting is needed for the type of work that is proposed in the Wetland Management Area or on the steep slopes in the Erosion and Scrub Zones as long as the following parameters are met:

- No heavy equipment will be used to remove/clear non-native invasive species or other vegetation in the wetland.
- Existing grades on steep slopes will remain unchanged, except to install fascines by hand.

- Cleared areas in the wetland will be replanted using only native vegetation.
- No decrease in area or functional performance of the wetland or its buffer.
- No structures will be placed that interfere with the natural flow of water through the wetland.

If any restoration project proposes to use heavy equipment for grading purposes, to remove/control non-native vegetation, to clear vegetation in such a way that the water quality of the wetland is affected, or to place flow-control structures then a permit may be needed from the City. In addition, any impacts from filling as described above to the wetland would require authorization from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act, Nationwide Permit 27 - Aquatic Habitat Restoration, Establishment, and Enhancement Activities.

It is important to note that critical area regulations are constantly evolving. Thus, it is important to check the current local, state, and federal regulations before working in wetlands or their buffers.

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Chapter 4

4.0 LANDSCAPE ZONES AND MANAGEMENT AREAS

In order to prepare specific management objectives for the diverse habitats at the park, it has been divided into five Landscape Zones. The Landscape Zones are based on areas defined by the existing vegetation type, pattern of use and/or geomorphic distinctions in the park. The Zones are shown on Figure 4-1. Some of the areas shown in Figure 4-1 do not match the existing conditions. The Phase I project changes to the current park conditions include constructing an upper parking lot that is currently a picnic area, enlarging the mid-level parking area, installing landscaping and adding an open pavilion/trellis to the mid-level picnic area, installing a beach wash-down area near the restrooms at the beach, and constructing raised stairs and trails on the steep slopes between the park entrance and the central activity center. One additional improvement shown in Figure 4-1, expansion of the central activity center to connect the picnic shelter and playground, is a future improvement project, but is not part of the Phase I project improvements.

Each Landscape Zone has been divided into one or more Management Areas, which are specific areas where regular maintenance activities are necessary to restore and/or maintain the targeted vegetation communities. Figure 4-2 shows the management areas.

Information on the existing conditions of the natural environment at the park is based on the *Draft Phase I Summary Report for the Richmond Beach Saltwater Park Master Plan* (Hewitt Architects 2005), *UW-REN Saltwater Park Capstone Project* report (Ahl et al 2007), *Richmond Beach Saltwater Park Master Plan* (Hewitt Architects 2007), and numerous site visits in 2005, 2006, and 2007. The five Landscape Zones identified within the park are described below, followed by a description of the Management Areas within each particular Zone.

4.1 COMMUNITY ACTIVITY LANDSCAPE ZONE

The approximately 10-acre Community Activity Zone encompasses the high use areas of the park. This zone consists of most of the 'built' elements of the park and areas that have landscaping using ornamental vegetation and/or maintained lawn. This zone includes the upper terrace and bluff trail, caretaker's residence and grounds, park entrance and upper overlook, mid-level picnic area,

4.1.1 BUILT AND ORNAMENTAL LANDSCAPING MANAGEMENT AREA

Built areas to the east of the railroad tracks include the main access road, the upper, lower and mid-level parking lots; the central activity center that consists of restrooms, picnic shelter, and play ground; the beach trail, and the bridge over the railroad. The upper parking area is part of the Phase I projects and has not been constructed yet. It is currently used as a picnic area. Most of these built areas are on level ground and do not include vegetation. However, the lower parking lot does have a few planting beds where dune grass was been planted in the last few years. On the beach, west of the railroad tracks, built improvements include the restroom facility, a picnic shelter with tables and barbecues, a volleyball court, a fire pit, Native American sculpture with interpretive signs, and the paved beach access trail.

Ornamental areas are situated on level ground and include the upper terrace and bluff trail, caretaker's residence and grounds, park entrance and upper overlook, the mid-level picnic area, and the beach area. Vegetation in the upper terrace and the grounds around the caretaker's residence consists of maintained lawn with beds of planted shrubs and trees. The park entrance overlook adjacent to NW 190th Street has narrow gardens of ornamental shrubs and flowers and the park entrance has a few low plantings around the park sign. The mid-level picnic area does not currently have ornamental plantings. As part of the Phase I Master Plan project, ornamental plantings will be added to nearly all the locations within this management area.

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4.2 EROSION LANDSCAPE ZONE

The Erosion Zone is located on the steep, bowl-shaped slopes in the central portion of the park. It is approximately 8 acres in size and is dominated by non-native vegetation. Numerous steep, narrow 'ravines' have been cut through these slopes due to the surface water runoff that has carved into the hillsides just below the main access road. The resultant rolling topography encourages microclimates where many mosses, lichens and fungi form a cryptobiotic crust that binds the soil and provides some slope stabilization where the ground surface has not been disrupted by trails or other disturbances. Basic soil assessment in this zone conducted by students in the University of Washington Restoration Ecology Network program revealed that the soil in this zone is very sandy with no topsoil and has very little moisture absorption and retention making it very dry even after a significant downpour.

Wooden stairs provide a formal pathway through this zone in several places down the steep slopes just west of the park entrance. Numerous informal paths are laced though out this zone, many of which have been heavily eroded by foot traffic. As part of the Phase I Master Plan project, a system of raised stairs, boardwalks, and viewing platforms will be built to allow low-growing vegetation to establish underneath these structures and to protect the steep slopes from further erosion. Management Areas within this Zone are described below.

4.2.1 UPLAND FOREST MANAGEMENT AREA

A small portion in this zone consists of upland forest habitat located within a deep, narrow, steep-sided ravine next to the existing stairway that leads from the park entrance down to the central activity area. Several Douglas fir and big-leaf maple trees are growing in the base and on the sides of the ravine. Two of the Douglas fir trees at the upper west end of the ravine were burned in a recent fire. The understory is dominated by a dense thicket of Himalayan blackberry throughout most of the ravine. A few oceanspray shrubs also occur in this area. The presence of these understory species, and the lack of Scots broom, suggest that there may be groundwater seepage close to the ground surface in the ravine.

4.2.2 NON-NATIVE SHRUB MANAGEMENT AREA

This management area makes up the dominant plant community in the Erosion Zone and is located on 15 percent to greater than 40 percent slopes on west and northwest-facing slopes in the park. Non-native Scot's broom and Himalayan blackberry dominate this entire area. On the west-facing slopes, Scots broom is the dominant plant and forms dense thickets with some blackberry intermixed. Very few trees occur in these dense thickets. On the northwest-facing slopes, non-native plants still dominate but are less dense with scattered native shrubs, such as oceanspray, tall Oregon grape, and big-leaf maple saplings and Pacific madrone trees, scattered throughout. There are a few locations near the central activity center where Scots broom was removed and non-native dune grass, *Ammophila arenaria*, was introduced. The dune grass has taken well; however, Scots broom is beginning to establish and will eventually shade out the dune grass if it is not controlled.

As part of their restoration project in this management area, University of Washington Restoration Ecology Network students identified cryptobiotic crust, comprised of mosses, lichens, and fungi that functions to bind the soil and provides stabilization to the sandy, steep slopes in this Area.

4.2.3 UNSTABLE SLOPE HAZARD MANAGEMENT AREA

This area occurs on the steep, nearly vertical slopes located upslope from the Caretaker residence and the mid-level picnic terrace. These slopes are covered with a dense thicket of Himalayan blackberry. A few

shrubs also occur on these slopes, such as native big-leaf maple saplings, oceanspray, and red elderberry alson with the non-native Scots broom.

4.3 FOREST LANDSCAPE ZONE

The approximately 5-acre Forest Zone is located immediately east of the railroad right-of-way across the length of the park and extends westward into the railroad right-of-way. This zone is comprised of relatively undisturbed habitat located on steep slopes to the south of the beach access trail and on gently sloping ground to the north of the trail.

4.3.1 UPLAND FOREST MANAGEMENT AREA

This management area is located on the steep slopes south of the beach access trail; extending up the slope as far east as the upper terrace. This slope is very dry and supports an open-canopy forest dominated by Pacific madrone and big-leaf maple with a densely growing understory of western trumpet honeysuckle, native roses, and oceanspray. Himalayan blackberry is found throughout the forest. The lower elevation of the forest, near the beach trail, has densely-growing non-native English ivy, an invasive plant that covers the ground in dense patches and is climbing up some of the trees and posing a hazard to the health of the trees. Japanese knotweed, an extremely pernicious invasive species, also occurs in at least one patch near the beach access trail.

4.3.2 WETLAND MANAGEMENT AREA

The Wetland Management Area is located both north and south of the beach access trail just east of the railroad right-of-way. Wetland habitat within park boundaries was delineated in September 2007 and is rated as a Type II wetland per the Shoreline Municipal Code (Touchstone EcoServices 2007).

Wetland habitat located south of the trail is supported by several seeps that emerge at the break in the slope (at the base of the upland forest management area) and water can be heard running down the remainder of the slope into the railroad right-of-way. These wetter conditions support a forest dominated by red alder and willows with a dense understory of salmonberry, red elderberry, and big-leaf maple saplings. Himalayan blackberry thickets grow found throughout wetland. The ground layer include stinging nettle and giant horsetail.

To the north of the beach access trail, the wetland is supported by numerous seeps along the entire east of the wetland. This portion of the wetland is situated within a gently sloping depression that extends off the park property to the north. Water leaves the wetland via a narrow swale that delivers water into the drainage ditch that runs along the east side of the railroad tracks. Water from the wetland outlets into Puget Sound via an 18-inch diameter culvert under the railroad bed.

Wetland north of the beach trail contains a mixture of freshwater forested, scrub-shrub and emergent classes of wetland vegetation. Trees include Pacific willow, Sitka willow, and red alder, while the shrub layer contains salmonberry and Himalayan blackberry. The emergent vegetation is dominated by tall horsetail, common cattail, common nettle, watercress, and bittersweet nightshade. The adjacent buffer habitat includes Himalayan blackberry stinging nettle, English ivy, morning glory, and Canada thistle, with a few black cottonwood trees growing on the upper portions of the buffer.

4.4 SCRUB LANDSCAPE ZONE

The approximately 5-acre Scrub Zone is located along the northern end of the park on steep, south-west facing slopes. This zone has a relatively homogenous habitat and so has been assigned only one

management area. The extremely steep slopes in this Zone have kept park users from creating as many informal trails as are found in other areas of the park. Most of the informal trails through this area occur at or near the base of the slope where the topography is not as steep. Nearly all the trails in this zone are oriented parallel to the slope and appear to have assisted in preventing major surface erosion even though the soils in this Zone are the same loose gravelly sand found in the Erosion Zone.

4.4.1 NON-NATIVE SHRUB MANAGEMENT AREA

The Non-Native Shrub Management Area is dominated by densely growing patches of Scots broom and Himalayan blackberry; with a few oceanspray near the top of the slope. The only exception is at the east end of the area where a recent fire occurred. Re-establishing vegetation in the burn area consists of patches of blackberry thickets and non-native grasses. Individual trees and small groupings of trees that grow throughout this area include Douglas fir, Pacific madrone, and big-leaf maple.

4.5 SHORE LANDSCAPE ZONE

The approximately 4-acre Shore Zone encompasses the natural areas west of the railroad right-of-way. This zone is used heavily for picnics, sunbathing, beach walking, and wind surfing as people enjoy the beach, nearshore dunes, and offshore areas.

This zone, situated on relatively level ground includes approximately 900 linear feet of Puget Sound shoreline. Intertidal substrate along the shoreline is a mix of cobbles, gravel and sand. The beach, sloping up from the high tide mark to the vegetated areas, is primarily sand. Vegetation includes extensive thickets of non-native shrubs, small landscaped areas by the restroom facility, and a small slope stabilization project planted by the city at the west end of the beach access bridge.

The railroad right-of-way is marked by a fence along the eastern edge of this Zone. The right-of-way consists of a dense thicket of non-native shrubs.

4.5.1 NON-NATIVE SHRUB MANAGEMENT AREA

The majority of this area is located north of the beach access bridge, with a narrow band along the eastern edge of this Zone to the south of the bridge. It consists of dense thickets dominated by Scot's broom with some Himalayan blackberry intermixed. To the north of the beach access bridge, this Area is laced with informal paths and occasional sandy clearings. One lone Douglas fir is growing in the center of this Area.

Now that the landscape zones and management areas have been described, the next step in deciding on a restoration project is to review the management objectives presented in chapter 5. Chapter 5 provides a list of overall management objectives for the park and specific management actions to take in each management area. Appendix C, intended to be used in tandem with Chapter 5, provides directions in carrying out each of the recommended management actions.

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Chapter 5

5.0 MANAGEMENT OBJECTIVES AND ACTIONS

The management objectives presented in this chapter have been developed from the significant public input provided during the park Master Plan development (see chapter 2). Overall general objectives are outlined below for the three main areas within the park that received the most input from the public regarding their current conditions and the desired conditions. These areas are:

- the beach area – everything west of the railroad right-of-way
- the west-facing bowl - from the park entrance down to the lower parking lot and beach access trail
- the wetland and forest - along the east side of the railroad tracks.

The beach area, contained within the Community Activity and Beach Landscape Zones, will retain both natural and developed areas. Developed areas include the picnic and restroom area, volleyball area, statue and seating area, and general promenade area from the beach access trail down to the shoreline. The natural areas include the cobble and sand beaches, and the dense thickets of invasive plants. The overall vegetation management objectives for the beach area include:

- Removing the thickets of Scots broom and Himalayan blackberry.
- Replanting the cleared areas with native trees, shrubs, and forbs that are drought tolerant and adapted to the salty, sandy soils along the Puget Sound shoreline.
- Retaining the large Douglas fir to the north of the picnic shelter.
- Creating a plan for trails and foot traffic throughout the newly planted areas in order to minimize impacts to the restored habitat.

The west-facing bowl area, which encompasses the Erosion and Scrub Landscape Zones, includes the built improvements of the access road, caretaker's house, parking lots, playground, and picnic areas. The majority of the bowl is the thickets of invasive species and the restoration areas done by the UW students. The overall vegetation management objectives for the west-facing bowl area include:

- Retaining the majority of this area as natural habitat.
- Removing invasive thickets incrementally.
- Replanting the cleared areas with native grasses, herbs, shrubs, and trees that are drought tolerant, provide wildlife habitat, increase the aesthetic backdrop to other park amenities, and are adapted to the dry, steep, sandy slopes.
- Installing bioengineered slope stabilization as part of the native plant restoration efforts.

By restoring native plants throughout the west facing slope area, erosion will be significantly reduced by lessening wind exposure, foliage on the plants will intercept raindrops, plant roots will bind the soil surface particles and restrain soil movement due to frost.

The wetland and forest area, contained within the Forest Landscape Zone, includes healthy, diverse, and dense vegetative cover. For the most part, the existing habitat exhibits the structural diversity and plant species richness that provides high functioning wildlife habitat. The overall vegetation management objectives for this area include:

- Removing the English ivy from healthy trees and the forest floor.
- Replanting cleared areas with a diversity of native shrubs and trees that provide wildlife habitat and are adapted to upland, pacific Northwest forests.
- Removing Himalayan blackberry and field bindweed in the wetland and wetland buffer.
- Replanting cleared areas with native trees and shrubs adapted to wetland and buffer conditions.

The following sections outline specific vegetation management actions that are recommended in order to achieve the general management objectives discussed above. Management actions are based on recommendations of the contributing authors and City staff, and on the results of the restoration project at the park conducted by students of the University of Washington Restoration Ecology Network.

This section provides clear directions as to **what** should be done, **where** it should be done, and **when** it should be done to restore native habitat and maintain the vigor and health of restored and preserved native vegetation. This information is intended to be used together with Appendix C, which describes **how** to do it.

In addition to listing management actions, a brief outline of goals and objectives is presented for each management area. By having clear goals and objectives, it will be easy to design restoration projects that meet the long-term management goals for the natural park habitat. Each of the goals and objectives are derived from the adopted Master Plan, input from the public and best professional judgment of the contributing authors and City staff.

5.1 COMMUNITY ACTIVITY LANDSCAPE ZONE

5.1.1 BUILT AND ORNAMENTAL MANAGEMENT AREA

Goal: Manage the built environment and any ornamental landscaped areas to ensure the health and vigor of the surrounding natural environment.

Objectives:

- Remove any non-native invasive plants that could be a seed source for adjacent natural habitats.
- Maintain and, if needed, enhance vegetation in the lower parking lot habitat islands.

Management Actions: Management will consist mainly of weeding and control of invasive plants that may grow in and near the adjacent native habitat areas. Any native planting done in this management area should be limited to replacing unsuccessful dune grass plantings in the habitat islands in the lower parking lot.

WEEDING AND INVASIVE CONTROL

Control of invasive vegetation will be needed throughout the management area and especially in the habitat islands in the lower parking lot. Scots broom is particularly problematic in the habitat islands. Other invasive species observed at the park that need to be controlled in order to avoid providing a seed bank that will affect the adjacent natural areas include Himalayan blackberry, morning glory (also know as field bindweed), thistle, English ivy, and holly.

Because this Area is already regularly maintained by the City's park maintenance staff, most invasive plants will be removed at the seedling stage when mowing the lawns and weeding the landscaped ornamental plant beds. Because there is a widespread seed bank of invasive species throughout the park, it is possible that some invasive vegetation may become established along the edges of this management area. All invasive plants need to be controlled at every stage of their development in order to avoid providing a seed bank that will affect the adjacent natural areas.

PLANTING

Plant native dune grass to augment previously planted dune grass in the lower parking lot habitat islands.

3 YR. ESTABLISHMENT CARE

This care will be needed for any new plantings that are added to the habitat islands in the lower parking lot.

PRUNING

If native trees and/or shrubs are incorporated into the maintained and ornamental landscape in this Management Area, pruning of woody native vegetation should be kept to a minimum. Native trees and shrubs can be pruned as needed for plant health or hazardous limbs; and on the upper terrace to maintain reasonable views of Puget Sound and the Olympic Mountains from the upper bluff trail and the adjacent residences to the east and north of the park.

5.2 EROSION LANDSCAPE ZONE

5.2.1 UPLAND FOREST MANAGEMENT AREA

Goal: Preserve and enhance upland forest as native habitat for wildlife

Objectives:

- Remove and/or control non-native invasive species and replace them with native plants.
- Supplement the existing native understory and canopy tree vegetation to create structurally diverse habitat.
- Stabilize the steep slopes and eroded gullies using bioengineering techniques

Management Actions: Recommended actions focus on restoring the disturbed habitat within this narrow ravine to a more natural habitat with a more diverse habitat structure than presently occurs. This restoration can create an area that is a highly functioning habitat for small birds and mammals as well as an aesthetically pleasing area for park users.

WEEDING AND INVASIVE CONTROL

Invasive vegetation most likely to be a problem in this ravine includes Himalayan blackberry and Scots broom. Woody debris from invasive plant removal that does not sucker or sprout from cuttings or branches can be used to create brush piles as a habitat feature. Following the initial weed removal and planting with native species, invasive plant removal will need to continue to be done on regular basis as described in Appendix C.

PLANTING

Native plants should be installed after clearing of invasive plants to create less than optimal growing conditions for the sun-loving blackberry and Scots broom found in this area. Planting should occur after any soil amending and/or sheet mulching is completed.

Planting requires a commitment to the 3-year establishment care. Without that commitment, the extremely harsh conditions at the park will likely result in complete loss of planted native material and creation of an optimum environment for invasive plant re-establishment.

Plant species selected should reflect the microclimate conditions at this steep sided ravine. Native plants that are optimal for this location include those that have a spreading root system that will help to stabilize the steep, sandy slopes; are drought tolerant; and can tolerate sun with periods of shade. Recommended species include ocean spray and snowberry in the shrub layer and Douglas fir and shore pine in the tree layer. These early seral species can tolerate the current hot, dry and sunny conditions in the ravine. Once this first planting is established and provides some protection from the sun, additional species that require

some shade can be planted to increase the plant diversity in this area. For additional species see Appendix B for the list of recommended plant species for open, dry, part sun/part shade.

AMENDING SOILS

Soil amendment with organic material is highly recommended wherever native plants will be installed given the nutrient-poor, sandy soils at the park. If bioengineered slope stabilization will be done, soil amendments can be worked in the soils using a shovel after the slope stabilization has been installed.

BIOENGINEERED SLOPE STABILIZATION

Woody debris removed as part of the weed and invasive control (that is, those plants that do not sucker or sprout from cuttings, branches or roots) can be used to create fascines to assist with slope stabilization and create small benches for the new native plantings. Brush layering and other organic structures can also be used to stabilize the slopes in this area.

Geotextiles may be needed on the steeper slopes in the ravine to protect the slopes from erosion due to rain drops and surface water runoff.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species. When possible, the entire restoration should be sheet mulched rather than placing mulch only around plants. Sheet mulching helps to retain moisture in the soil and to discourage the growth of weeds that compete with the desired native plantings for water and nutrients.

Mulching on the steep slopes in this ravine will require stabilization so that it does not slip down the slope. Stabilization can be accomplished by using geotextiles, such as jute netting, or by creating impediments to downslope creep, such as fascines, brush layering, or installation of other organic surface obstructions (e.g. logs and rocks).

WATERING

Regular watering during the driest part of the growing season for at least the first three growing seasons after installation of native plants is necessary to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the methods recommended on steep slopes and the schedule outlined in Appendix C.

3 YR. ESTABLISHMENT CARE

This care will be needed for any new native plantings. See Appendix C for details.

PRUNING

Pruning should be limited to removal of limbs that pose a hazard to the adjacent trails or public safety. Otherwise, dead limbs can be allowed to fall onto the forest floor as woody debris to serve as a habitat feature. Misshapen or hazardous limbs may not be a critical issue in the central part of the ravine where no stairs or trails occur. Best professional judgment should be used when considering limb removal, with the focus on habitat enhancement opportunities and public health and safety.

REMOVING PLANTS

Other than invasive vegetation, plant removal should be conducted only when hazard trees need to be removed or diseased plant material needs to be replaced. When possible, removing vegetation in this forested ravine should be done between August and March to avoid potential disruption of nesting and fledging birds. If a tree to be removed does not pose a public safety threat, girdling and/or trimming as needed to leave standing dead wood for snag habitat is preferable to complete removal. This is particularly appropriate when the tree is located on the ravine slopes, by leaving a snag or stump, the roots of the tree will continue to aid in slope stabilization. Woody debris from native plant removal can be left or placed as wildlife habitat, such as brush piles, large woody debris, or snags.

5.2.2 NON-NATIVE SHRUB MANAGEMENT AREA

Goal #1: Restore this area to a diverse native habitat while preserving view corridors throughout the park.

Objectives:

- Remove and/or control non-native invasive species and replace them with native trees, shrubs, and forbs.
- Stabilize the steep slopes and eroded gullies using bioengineering techniques

Goal #2: Foster resident and community engagement with the landscape through stewardship opportunities.

Objective:

- Create opportunities and clear guidelines for volunteer and resident involvement with landscape restoration and on-going care.

Management Actions: Recommended actions focus on restoring the disturbed habitat on the steep and eroded slopes to a natural habitat with a diverse habitat structure while still preserving views of Puget Sound and the Olympic Mountains.

WEEDING AND INVASIVE CONTROL

Invasive vegetation most likely to be a problem in this area is Scots broom, with some areas of Himalayan blackberry. In addition, morning glory (also known as field bindweed) is a dominant invasive species on the steep slopes adjacent to the Wetland Management Area. On areas where densely-growing invasive species have been removed from steep slopes, it will be necessary to stabilize the slopes right away using bioengineering techniques and native plants. Due to the widespread extent of invasive species on sloped areas, it is recommended to clear these areas incrementally in manageable lots and to allow the planted native trees and shrubs to become established and stabilize the slope before a new area of the slope is exposed. The Bradley method as described in the section 3.3 is recommended when considering the most beneficial siting and size of the restoration area.

Woody debris from invasive plant removal that does not sucker or sprout from cuttings or branches can be used to create brush piles as a habitat feature.

Following the initial weed removal and planting with native species, invasive plant removal will need to continue to be done on regular basis as described in Appendix C.

PLANTING

Native plants should be installed after clearing of invasive plants to create less than optimal growing conditions for the sun-loving blackberry and Scots broom found in this area. Planting should occur after any soil amending and/or sheet mulching is completed.

Planting requires a commitment to the 3-year establishment care. Without that commitment, the extremely harsh conditions at the park will likely result in complete loss of planted native material and creation of an optimum environment for invasive plant re-establishment.

Plant species selected should reflect the microclimate conditions on these slopes. New plants will be subject to intense sun and hot wind in the summer, and cold winds in the winter. Due to the gullies eroded throughout this area, there will also be small pockets of more protected areas. Native plants that are optimal for this location include those that have a spreading root system that will help to stabilize the steep, sandy slopes; and that are drought tolerant. Recommended species include ocean spray and snowberry in the shrub layer, and shore pine, Douglas fir, and Pacific madrone in the tree layer. For additional species see Appendix B for the list of recommended plant species for open, dry, sunny slopes. Shrubs can be planted throughout the area, but trees should only be planted at mid- to low elevations to preserve the views in the park over the long term.

AMENDING SOILS

Soil amendment with organic material is highly recommended wherever native plants will be installed given the nutrient-poor, sandy soils at the park. If bioengineered slope stabilization is to be done, soil amendments can be worked in the soils using a shovel after the slope stabilization has been installed.

BIOENGINEERED SLOPE STABILIZATION

Woody debris removed as part of the weed and invasive control (plants that do not sucker or sprout from cuttings, branches or roots) can be used to create fascines to assist with slope stabilization and create small benches for the new native plantings. Brush layering and other organic structures can also be used to stabilize the slopes in this area.

Geotextiles may be needed on the steeper slopes in the ravine to protect the slopes from erosion due to rain drops and surface water runoff.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species. When possible, the entire restoration should be sheet mulched rather than placing mulch only around plants. Sheet mulching helps to retain moisture in the soil and to discourage the growth of weeds that compete with the desired native plantings for water and nutrients.

Mulching on the steep slopes in this area will require stabilization so that it does not slip down the slope. Stabilization can be accomplished by using geotextiles, such as jute netting, or by creating impediments to downslope creep, such as fascines, brush layering, or installation of other organic surface obstructions (e.g. logs and rocks).

WATERING

Regular watering during the driest part of the growing season for at least the first three growing seasons after installation of native plants is necessary to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the methods recommended on steep slopes and the schedule outlined in Appendix C.

3 YR. ESTABLISHMENT CARE

This care will be needed for any new native plantings. See Appendix C for details.

PRUNING

Pruning should be limited to removal of limbs that pose a hazard to the adjacent trails or public safety. Otherwise, dead limbs can be allowed to fall to the ground as woody debris to serve as a habitat feature. Misshapen or hazardous limbs may not be a critical issue in the central part of the slopes where no stairs or trails occur. Best professional judgment should be used when considering limb removal, with the focus on habitat enhancement opportunities and public health and safety.

REMOVING PLANTS

Other than invasive vegetation, plant removal should be conducted only when hazard trees need to be removed or diseased plant material needs to be replaced. Dead shrubs should be left as a habitat feature. When possible, removing vegetation should be done between August and March to avoid potential disruption of nesting and fledging birds. If a tree to be removed does not pose a public safety threat, girdling and/or trimming as needed to leave standing dead wood for snag habitat is preferable to complete removal. In addition, leaving a snag or stump will allow the roots to continue to aid in slope stabilization. Woody debris resulting from native plant removal that does not sucker or sprout from cuttings or branches can be left or placed as wildlife habitat, such as brush piles, large woody debris, or snags.

CRYPTOBIOTIC SOILS

Cryptobiotic soils are very fragile and also provide important soil stability, moisture retention, and nutrient accumulation to the soils at the park. While it would be impossible to avoid affected these soils during restoration activities, care should be taken to minimize disturbance to these soils as much as possible.

The University of Washington Restoration Ecology Network students are currently conducting an experiment to determine whether the cryptobiotic soils they identified in this Area can be re-established. The experiment is in the initial phase and no information is available at this time as to the possibility or the method of encouraging the formation of cryptobiotic soils at the park. If the experiment finds that it is possible to do so, the methods and supplies needed to restore those soils can be documented and added as an amendment to this plan.

5.2.3 STEEP SLOPE HAZARD MANAGEMENT AREA

Goal: Restore this area to a diverse native habitat while preserving view corridors throughout the park.

Objectives:

- Remove and/or control non-native invasive species and replace them with native trees, shrubs, and forbs.
- Stabilize the steep slopes and eroded gullies using bioengineering techniques
- Remove tall-growing woody plants that occur on the slopes.

Management Actions: Recommended actions in this area focus on restoring the disturbed habitat on the steep and eroded slopes to a natural habitat with a diverse habitat structure while still preserving views of Puget Sound and the Olympic Mountains.

WEEDING AND INVASIVE CONTROL

Himalayan blackberry is the dominant invasive problem in this Area. The Bradley method as described in the section 3.3 is recommended when considering the most beneficial siting and size of the restoration area. However; because Himalayan blackberry grow outward in all directions from the tips of their canes, it will be important to start at one end of this management area and work steadily across the slope. If there is any lapse in maintaining the areas that have already been cleared the blackberry will quickly invade the

previously cleared areas. It is a fast grower and could undo any restoration efforts in 12 to 18 months if the restored areas are not maintained.

On areas where densely-growing invasive species have been removed from steep slopes, it will be necessary to stabilize the slopes right away using bioengineering techniques and native plants. Due to the widespread extent of invasive species on these slopes, it is recommended to clear these areas incrementally in manageable lots and to allow the planted native shrubs to become established and stabilize the slope before a new area of the slope is exposed.

Following the initial weed removal and planting with native species, invasive plant removal will need to continue to be done on regular basis as scheduled in Appendix C.

PLANTING

Native plants should be installed after clearing of invasive plants to create less than optimal growing conditions for the sun-loving blackberry and Scots broom found in this area. Planting should occur after any soil amending and/or sheet mulching is completed.

Planting requires a commitment to the 3-year establishment care. Without that commitment, the extremely harsh conditions at the park will likely result in complete loss of planted native material and creation of an optimum environment for invasive plant re-establishment.

Because preserving views of the Sound and mountains is one of the goals for this area, tall-growing trees and shrubs that interfer with the view from the upper bluff trail will need to be avoided. In addition, plant species selected should reflect the microclimate conditions on these slopes. New plants will be subject to intense sun and hot wind in the summer, and cold winds in the winter. Native plants that are optimal for this location include those that have a spreading root system that will help to stabilize the steep, sandy slopes; and that are drought tolerant. Recommended species include low-growing shrubs such as the native trailing blackberry, blackcap raspberry, snowberry, and oceanspray. For additional species see Appendix B for the list of recommended plant species for open, dry, sunny slopes.

AMENDING SOILS

Soil amendment with organic material is highly recommended wherever native plants will be installed given the nutrient-poor, sandy soils at the park. If bioengineered slope stabilization is to be done, soil amendments can be worked in the soils using a shovel after the slope stabilization has been installed.

BIOENGINEERED SLOPE STABILIZATION

Woody debris removed as part of the weed and invasive control and that does not sucker or sprout from cuttings, branches or roots can be used to create fascines to assist with slope stabilization and create small benches for the new native plantings. If snowberry cuttings are available, brush layering using this species can also be used to stabilize these slopes.

Geotextiles may be needed on the steepest areas to protect the slopes from erosion due to rain drops and surface water runoff.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species. When possible, the entire restoration should be sheet mulched rather than placing mulch only around plants. Sheet mulching helps to retain moisture in the soil and to discourage the growth of weeds that compete with the desired native plantings for water and nutrients.

Mulching on the steep slopes in this area will require stabilization so that it does not slip down the slope. Stabilization can be accomplished by using geotextiles, such as jute netting, or by creating impediments to downslope creep, such as fascines, brush layering, or installation of other organic surface obstructions (e.g. logs and rocks).

WATERING

Regular watering during the driest part of the growing season for at least the first three growing seasons after installation of native plants is necessary to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the methods recommended on steep slopes and the schedule in Appendix C.

3 YR. ESTABLISHMENT CARE

This care will be needed for any native plantings. See Appendix C for details.

PRUNING

Pruning should be limited to removal of limbs that pose a hazard to the adjacent trails or public safety. Otherwise, dead limbs can be allowed to fall to the ground as woody debris to serve as a habitat feature. Misshapen or hazardous limbs may not be a critical issue in the central part of the slopes where no stairs or trails occur. Best professional judgment should be used when considering limb removal, with the focus on habitat enhancement opportunities and public health and safety.

REMOVING PLANTS

Because preserving views of the Sound and mountains is important in this area, tall-growing trees and shrubs that interfer with the view from the upper bluff trail will need to be managed. Because all vegetation growing on these slopes performs the important function of stabilizing soils, management of shrubs and trees should be limited only to those that extend 4 feet above the upper bluff trail.

Scattered native woody species have been observed on the slopes, including oceanspray, red elderberry, and big-leaf maple. The oceanspray and red elderberry are slow-growing and tend to remain low enough to allow views from above. Even taller growing species can be left in place to help stabilize slopes; only removing them if they begin to interfere with views from the upper bluff trail. Any tall-growing shrubs that interfere with views can be pruned back. If trees need to be removed, they should be made into snags to increase wildlife habitat values and allow the roots to continue to aid in slope stabilization.

Plant removal should be conducted only when hazard trees that pose a public safety risk need to be removed or diseased plant material needs to be replaced. Dead shrubs should be left as a habitat feature. When possible, removing vegetation should be done between August and March to avoid potential disruption of nesting and fledging birds. Woody debris resulting from native plant removal that does not sucker or sprout from cuttings or branches can be used in less steep areas for wildlife habitat, such as brush piles, or large woody debris.

CRYPTOBIOTIC SOILS

Cryptobiotic soils may be present in this Management Area. Prior to doing any work, the Area should be investigated for the presence of this soil. Cryptobiotic soils are very fragile and also provide important soil stability, moisture retention, and nutrient accumulation to the soils at the park. While it would be impossible to avoid affected these soils during restoration activities, care should be taken to minimize disturbance to these soils as much as possible. If it is present, the same actions should be taken as outlined in the Erosion Zone – Non-native Shrub Management Area treatment actions.

5.3 FOREST LANDSCAPE ZONE

5.3.1 UPLAND FOREST MANAGEMENT AREA

Goal: Preserve and enhance native plant communities to benefit habitat for wildlife.

Objectives:

- Remove and/or control non-native invasive species and replace them with native trees, shrubs, and/or forbs.
- Enhance forest habitat to increase species diversity and structural complexity by planting additional native species in all vegetation community layers.
- Prevent alterations to seeps that provide a water source to forest vegetation and to the downstream wetland.
- Create brush piles from woody debris removed during park maintenance activities.
- Create large woody debris on the ground from logs and stumps of native trees acquired during park maintenance activities.

Management Actions: Recommended actions in this area focus on preserving and enhancing the existing high functioning habitat present in this area. There are pockets of invasive species, such as ivy and Himalayan blackberry, adjacent to the beach trail that are choking out the low-growing native vegetation and the health of the some of the trees is being compromised. Removing invasive species and restoring native woody plants will re-establish the complex structure and diverse plant community that is typical for forests adjacent to the Puget Sound shore.

WEEDING AND INVASIVE CONTROL

Invasive vegetation most likely to be a problem in this Area is English ivy, with some areas of Himalayan blackberry, Japanese knotweed and scattered English holly. The Bradley method as described in the section 3.3 is recommended when considering the most beneficial siting and size of the restoration area. Woody debris from blackberry removal can be used to create brush piles as a habitat feature after the canes have died back completely; otherwise, there is the chance that the blackberry will propagate and start a new thicket where the brush pile is placed.

Following the initial weed removal and planting with native species, invasive plant removal will need to continue to be done on regular basis as described in Appendix C.

PLANTING

Native plants should be installed after clearing of invasive plants and after any soil amending and/or sheet mulching is completed.

Planting requires a commitment to the 3-year establishment care. Without that commitment, there will likely be some loss of planted native material.

Plant species selected should reflect the microclimate conditions on these slopes. Native plants that are optimal for this location include those that are drought tolerant and have a spreading root system that will help to stabilize the sandy slopes. The list of recommended plant species for forested, moderately moist shade native plants in Appendix B can be used to choose the most appropriate plants in this area. Recommended species include Indian plum and red elderberry in the shrub layer and western hemlock, bitter cherry, and cascara in the tree layer.

AMENDING SOILS

Soil amendment is highly recommended wherever native plants will be installed given the sandy, nutrient-poor soils at the park.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species.

WATERING

Regular watering during the driest part of the growing season for at least the first three growing seasons after installation of native plants is necessary to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the methods recommended on steep slopes and the schedule outlined in Appendix C.

3 YR. ESTABLISHMENT CARE

This care will be needed for any new native plantings. See Appendix C for details.

PRUNING

Pruning should be limited to removal of limbs that pose a hazard to the adjacent trails or public safety. Otherwise, dead limbs can be allowed to fall to the ground as woody debris to serve as a habitat feature. Misshapen or hazardous limbs that occur away from the beach access trail may not be a critical issue. Best professional judgment should be used when considering limb removal, with the focus on habitat enhancement opportunities and public health and safety.

REMOVING PLANTS

Other than invasive vegetation, plant removal should be conducted only when hazard trees need to be removed or diseased plant material needs to be replaced. Dead shrubs should be left as a habitat feature. When possible, removing vegetation should be done between August and March to avoid potential disruption of nesting and fledging birds. If a tree to be removed does not pose a public safety threat, girdling and/or trimming as needed to leave standing dead wood for snag habitat is preferable to complete removal. In addition, leaving a snag or stump will allow the roots to continue to aid in slope stabilization. Woody debris resulting from native plant removal that does not sucker or sprout from cuttings or branches can be left or placed as wildlife habitat, such as brush piles, large woody debris, or snags.

5.3.2 WETLAND MANAGEMENT AREA

Goal: Preserve and enhance native plant communities to benefit habitat for wildlife.

Objectives:

- Remove and/or control non-native invasive species and replace them with native trees and shrubs.
- Enhance the wetland and adjacent riparian upland to increase species diversity and structural complexity by planting additional native species in all vegetation community layers.
- Prevent alterations to seeps that provide hydrology to the wetland and stream.
- Create brush piles from woody debris removed during park maintenance activities.
- Create large woody debris on the ground from logs and stumps of native trees acquired during park maintenance activities.

- Stabilize the steep slopes using bioengineering techniques.

Management Actions: Recommended actions in this area focus on restoring the disturbed habitat within the wetland and on the steep and eroded slopes to the east of the wetland. Removal of blackberry in wetland buffer may reduce water loss sufficiently to increase the flow of water from seeps and springs into the wetland.

WEEDING AND INVASIVE CONTROL

Invasive vegetation most likely to be a problem in this area is Himalayan blackberry and morning glory (also known as field bindweed). Because of the ability of both of these species to propagate from various plant parts, it will be important to immediately put all parts into heavy duty lawn bags and dispose of them appropriately offsite. On areas where these densely-growing species have been removed from steep slopes, it will be necessary to stabilize the slopes right away using bioengineering techniques and native plants. Due to the widespread extent of invasive species on sloped areas, it is recommended to clear these areas incrementally in manageable lots to allow the planted native trees and shrubs to become established and stabilize the slope before a new area of the slope is exposed. The Bradley method as described in the section 3.3 is recommended when considering the most beneficial siting and size of the restoration area.

Following the initial weed removal and planting with native species, invasive plant control will need to continue to be done on regular basis as scheduled in Appendix C. In addition, a species that does not currently occur in this area now, but is likely to appear after soil disturbance is reed canarygrass. Thus, subsequent control efforts should also include this species.

PLANTING

Native plants should be installed after clearing of invasive plants, soil amending and/or sheet mulching is completed. Planting requires a commitment to the 3-year establishment care. Without that commitment, the extremely harsh conditions at the park will likely result in some loss of planted native material and possible creation of an optimum environment for invasive plant re-establishment.

Plant species selected should reflect the microclimate conditions in this area, including sloped wetland, low-lying wetland and sloped upland buffer habitat. Appendix B provides a list of native plant species for forested wetland/ riparian that can be used to choose the most appropriate plant species for the variety of conditions encountered here. Native plants that are optimal for the wetland include western red cedar in the tree layer and Sitka willow, Scoulers willow, and Hookers willow in the shrub layer. In the wetland buffer optimal plants include Oregon ash and western hemlock in the tree layer and black twinberry, Pacific ninebark, and red-osier dogwood.

Shrubs and trees can be planted throughout the lower elevations in this area, but only shrubs should be planted at the upper elevations on the eastern slope to preserve the views into the wetland from the central activity area

AMENDING SOILS

Soil amendment is highly recommended in the steep, sandy buffer slopes wherever native plants will be installed. If bioengineered slope stabilization is to be done, soil amendments can be worked in the soils using a shovel after the slope stabilization has been installed.

BIOENGINEERED SLOPE STABILIZATION

Where steep slopes occur, slope stabilization will be an important action after removal of the non-native invasive species that dominate the buffer. Woody debris removed as part of the weed and invasive control and that does not sucker or sprout from cuttings, branches or roots can be used to create a brush

'fascine' and imbedded in the slope to assist with slope stabilization and create small benches for the new native plantings.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species. Mulch should not be used where soils within the wetland are mucky or any area that is subject to flooding as the mulch will be carried away and may end up obstructing natural water flows or burying new plantings.

WATERING

Regular watering on the sandy slopes in the buffer is necessary during the driest part of the growing season for at least the first three growing seasons after installation of native plants to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the schedule in Appendix C and by utilizing drip lines or soaker hoses to avoid erosion and the creation of gullies in the steep slopes of the buffer. Watering is not necessary in portions of the wetland where water stays at least within 12 inches of the soil surface. Any native plantings on the outside edges of the wetland should be monitored during the dry season to determine whether supplemental watering is needed.

3 YR. ESTABLISHMENT CARE

This care will be needed for any new native plantings. See Appendix C for details.

PRUNING

Pruning should be limited to removal of limbs that pose a hazard to the adjacent trails or public safety. Otherwise, dead limbs can be allowed to fall to the ground as woody debris to serve as a habitat feature. Misshapen or hazardous limbs are not a critical issue where no trails occur. Best professional judgment should be used when considering limb removal, with the focus on habitat enhancement opportunities and public health and safety.

REMOVING PLANTS

Other than invasive vegetation, plant removal should be conducted only when hazard trees need to be removed or diseased plant material needs to be replaced. Dead shrubs should be left as a habitat feature. Woody debris resulting from native plant removal that does not sucker or sprout from cuttings or branches can be left or placed as wildlife habitat, such as brush piles, large woody debris, or snags.

5.4 SCRUB LANDSCAPE ZONE

5.4.1 NON-NATIVE SHRUB MANAGEMENT AREA

Goal: Restore this area to a diverse native habitat while preserving view corridors throughout the park.

Objectives:

- Remove and/or control non-native invasive species and replace them with native trees, shrubs, and forbs.
- Stabilize steep slopes and eroded gullies using bioengineering techniques.

Management Actions: Recommended actions in this area focus on restoring the disturbed habitat on the steep and eroded slopes to a natural habitat with a diverse habitat structure while still preserving views of Puget Sound and the Olympic Mountains from the park entrance and the adjacent overlook.

WEEDING AND INVASIVE CONTROL

Invasive vegetation most likely to be a problem in this Area is Himalayan blackberry, with some areas of Scots broom. On areas where densely-growing invasive species have been removed from steep slopes, it will be necessary to stabilize the slopes right away using bioengineering techniques and native plants. Due to the widespread extent of invasive species on sloped areas, it is recommended to clear these areas incrementally in manageable lots and to allow the planted native trees and shrubs to become established and stabilize the slope before a new area of the slope is exposed. The Bradley method as described in the section 3.3 is recommended when considering the most beneficial siting and size of the restoration area.

Woody debris from invasive plant removal that does not sucker or sprout from cuttings or branches can be used to create brush piles as a habitat feature.

Following the initial weed removal and planting with native species, invasive plant removal will need to continue to be done on regular basis as scheduled in Appendix C for Himalayan blackberry and Scots broom.

PLANTING

Native plants should be installed after clearing invasive plants to create less than optimal growing conditions for the sun-loving blackberry and Scots broom found in this area. Planting should occur after any soil amending and/or sheet mulching is completed.

Planting requires a commitment to the 3-year establishment care. Without that commitment, the extremely harsh conditions at the park will likely result in complete loss of planted native material and creation of an optimum environment for invasive plant re-establishment.

Plant species selected should reflect the microclimate conditions on these slopes. New plants will be subject to intense sun and hot wind in the summer, and cold winds in the winter. Due to the gullies eroded throughout this Area, there will also be small pockets of more protected areas. Native plants that are optimal for this location include those that have a spreading root system that will help to stabilize the steep, sandy slopes; and that are drought tolerant. Appendix B provides a list of recommended plant species for open, dry, sunny slopes that can be used to choose the most appropriate plant species. Recommended species in the shrub layer include ocean spray, snowberry, and in shady conditions, red-flowering currant. Recommended species in the tree layer include Pacific madrone and shore pine. Shrubs can be planted throughout the area, but trees should only be planted at mid- to low elevations to preserve the views in the park from NW 190th Street and the park entrance.

AMENDING SOILS

Soil amendment with organic material is highly recommended wherever native plants will be installed given the nutrient-poor, sandy soils at the park. If bioengineered slope stabilization is to be done, soil amendments can be worked in the soils using a shovel after the slope stabilization has been installed.

BIOENGINEERED SLOPE STABILIZATION

Woody debris removed as part of the weed and invasive control and that does not sucker or sprout from cuttings, branches or roots can be used to create fascines to assist with slope stabilization and create small benches for the new native plantings. Brush layering and other organic structures can also be used to stabilize the slopes in this area.

Geotextiles may be needed on the steeper slopes in the ravine to protect the slopes from erosion due to rain drops and surface water runoff.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species. When possible, the entire restoration should be sheet mulched rather than placing mulch only around plants. Sheet mulching helps to retain moisture in the soil and to discourage the growth of weeds that compete with the desired native plantings for water and nutrients.

Mulching on the steep slopes in this area will require stabilization so that the mulch does not wash down the slope. Stabilization can be accomplished by using geotextiles, such as jute netting, or by creating impediments to downslope creep, such as fascines, brush layering, or installation of other organic surface obstructions (e.g. logs and large rocks).

WATERING

Regular watering during the driest part of the growing season for at least the first three growing seasons after installation of native plants is necessary to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the schedule in Appendix C and by utilizing drip lines or soaker hoses to avoid erosion and the creation of gullies in the steep slopes of this area.

3 YR. ESTABLISHMENT CARE

This care will be needed for any native plantings. See Appendix C for details.

PRUNING

Pruning should be limited to removal of limbs that pose a hazard to the adjacent trails or public safety. Otherwise, dead limbs can be allowed to fall to the ground as woody debris to serve as a habitat feature. Misshapen or hazardous limbs may not be a critical issue in the central part of the slopes where no stairs or trails occur. Best professional judgment should be used when considering limb removal, with the focus on habitat enhancement opportunities and public health and safety.

REMOVING PLANTS

Other than invasive vegetation, plant removal should be conducted only when hazard trees need to be removed or diseased plant material needs to be replaced. Dead shrubs should be left as a habitat feature. When possible, removing vegetation should be done between August and March to avoid potential disruption of nesting and fledging birds. If a tree to be removed does not pose a public safety threat, girdling and/or trimming as needed to leave standing dead wood for snag habitat is preferable to complete removal. In addition, leaving a snag or stump will allow the roots to continue to aid in slope stabilization. Woody debris resulting from native plant removal that does not sucker or sprout from cuttings or branches can be left or placed as wildlife habitat, such as brush piles, large woody debris, or snags.

CRYPTOBIOTIC SOILS

Cryptobiotic soils may be present in this area. Prior to doing any work, the area should be investigated for the presence of this soil. Cryptobiotic soils are very fragile and also provide important soil stability, moisture retention, and nutrient accumulation to the soils at the park. While it would be impossible to avoid affected these soils during restoration activities, care should be taken to minimize disturbance to

these soils as much as possible. If it is present, the same actions should be taken as outlined in the Erosion Zone – Non-native Shrub Management Area treatment actions.

5.5 SHORE LANDSCAPE ZONE

5.5.1 NON-NATIVE SHRUB MANAGEMENT AREA

Goal: Restore this area to a diverse native habitat.

Objectives:

- Control non-native invasive species and replace them with native trees, shrubs, and forbs.
- Densely plant the edge of the railroad right-of-way to create an aesthetic and natural barrier between the beach and the dense invasive plant thickets in the right-of-way.

Management Actions: Recommended actions in this area focus on controlling the invasive species that currently dominate the beach vegetation and replanting the cleared areas with native vegetation known to survive in sandy, dry soils along the Puget Sound shoreline. While the beach area does not have steep slopes as found in other areas of the park, it does have several limiting factors that present a challenge in restoring native vegetation. These factors include the sandy soils, lack of fresh water, and high level of informal foot traffic. Currently, this area has a number of informal pathways through the Scots broom and has several large cleared areas that are used for bonfires. To be successful in restoring native vegetation on the beach, a formal trail system and perhaps a formal meeting area that is accompanied by educational signage will be needed to keep native plants from being trampled and designed habitat features from being used for firewood. Before any restoration plan is pursued, the Shoreline PRCS will need to develop a trail plan that includes trail design to direct foot traffic, methods to discourage unwanted pathways, and signage. When new plantings are installed anywhere close to trail traffic, barriers will likely be necessary to discourage trampling by curious humans and dogs. This is particularly important for restoration plantings in this management area where steep slopes do not serve as a deterrent to foot traffic. Brush, logs, fence and restoration signage can be employed as conditions warrant.

An additional limitation for restoration is the invasive seed source in the railroad right-of-way. This offsite seed source will continue to contaminate any native vegetation planted in the beach zone. Habitat restoration in this area will require continual, permanent, regularly scheduled maintenance.

WEEDING AND INVASIVE CONTROL

Invasive vegetation most likely to be a problem in this area is Scots broom and Himalayan blackberry. In addition to the dense thickets of Scots Broom found to the north of the beach access area, Scots broom is also re-establishing in the planted dune grass area at the southwest end of the beach access bridge. Because of the abundant Scots broom seed bank in the park and the adjacent railroad-right-way, it will be imperative that regularly scheduled invasive plant removal is implemented to avoid competition with the new native plantings. permanent, and regularly scheduled weeding maintenance will be required in this area to keep the invasive species from out-competing the native vegetation should be done annually as scheduled in Appendix C. The Bradley method as described in the section 3.3 is recommended when considering the most beneficial siting and size of the restoration area.

Sheet mulching the entire restoration area with at least 4 inches of compost may serve to discourage weeds and germination of Scots broom.

PLANTING

Before any native plants are installed, the PRCS will need develop a trail plan as discussed above in the Management Actions section. When new plantings are installed anywhere close to trail traffic, barriers

will likely be necessary to discourage trampling by curious humans and dogs. Brush, logs, fence and restoration signage can be employed as conditions warrant.

It is doubtful that there is enough water in the soils of this are to support native shrubs and trees. A hydrology study to document the depth to groundwater can be conducted to determine whether trees and shrubs would survive. If not, herbaceous plants that are adapted to the dry, sandy soils in this area can be used. New plants will be subject to salt spray, drought conditions, intense sun and hot wind in the summer, and cold winds in the winter. Appendix B provides a list of recommended plant species for open, dry, sunny beach habitat. Recommended species include the native American dune grass, Nootka rose, and Puget Sound gumweed.

Planting requires a commitment to the 3-year establishment care. Without that commitment, the extremely harsh conditions at the park will likely result in complete loss of planted native material and creation of an optimum environment for invasive plant re-establishment.

As a measure to limit the amount of seeds entering the beach area from the adjacent railroad right-of-way, hurricane fence (fencing with slats or other type of barrier) is recommended along the edge of the right-of-way and planting native shrubs and trees more densely to create a barrier that may minimize the amount of seed and distance the seeds can intrude into the beach habitat.

MULCHING

Areas cleared of invasive species and/or planted with native vegetation must be mulched to suppress re-growth of unwanted plants and to conserve soil moisture. It is particularly important to mulch around newly planted trees and shrubs to reduce competition from weedy species.

WATERING

Regular watering during the driest part of the growing season during the 3-year establishment period will be necessary to allow optimal vigor and survival of the new native plantings. Irrigation designs and constraints must be planned before restoration plans are implemented because watering is essential for restoration success. Watering should be done using the schedule in Appendix C.

3 YR. ESTABLISHMENT CARE

This care will be needed for any native plantings. See Appendix C for details.

REMOVING PLANTS

Other than invasive vegetation, plant removal should be conducted only when hazard trees need to be removed or diseased plant material needs to be replaced. Dead shrubs should be left as a habitat feature. When possible, removing vegetation should be done between August and March to avoid potential disruption of nesting and fledging birds. If a tree to be removed does not pose a public safety threat, girdling and/or trimming as needed to leave standing dead wood for snag habitat is preferable to complete removal. In addition, leaving a snag or stump will allow the roots to continue to aid in slope stabilization. Woody debris resulting from native plant removal that does not sucker or sprout from cuttings or branches can be left or placed as wildlife habitat, such as brush piles, large woody debris, or snags.

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Chapter 6

6.0 MONITORING

Monitoring is a critical component in implementing restoration projects. Monitoring also ensures that restoration projects receive the necessary follow-up care to ensure long-term success of the project. It also provides informative data needed to evaluate whether the project goals of this vegetation management plan are being accomplished. In addition, the data collected during monitoring can be evaluated to determine whether a restoration project is successful or whether changes or additional actions are needed to create the desired native habitat. If the project goals are not being met, the adaptive management process described in chapter 3 can be used to bring the project back on track.

This vegetation management plan assumes that most of the restoration monitoring will be done by volunteers. A successful monitoring program that involves volunteers is a good way to achieve the goal of creating a lasting community of citizen stewards at the park and to work within available funding for such a large area. Volunteer programs also require attention and management from the city park department. It is usually most beneficial to have one dedicated staff person who can set up and manage volunteers for parks throughout the city.

6.1 VOLUNTEER MONITORING

Creating a volunteer monitoring program involves a number of important and diverse elements from attracting a volunteer group, to managing and training the group. Based on the limits of this vegetation management plan, only the volunteer field monitoring elements is presented in this section. There are many useful resources available that provide an enormous amount of information on the other aspects of managing a volunteer program. One resource that has information specific to the Pacific Northwest is The Volunteer Monitor Project at website: http://www.epa.gov/volunteer/issues.htm that provides issues of a newsletter, which includes the creation and management details of working with community volunteers. Community outreach and good management of people are essential ingredients of a successful volunteer program and can be found at this website in volumes:

- Spring 1996 - Managing a Volunteer Monitoring Program (co-edited by the Bellevue Stream Team)
- Fall 1997 - Community Outreach

Other elements to build a strong volunteer monitoring program can be found in volumes:

- Fall 1992 – Building Program Credibility
- Fall 1993 – Fundraising
- Fall 1995 – Data Management

6.1.1 VOLUNTEER FIELD MONITORING PROGRAM DEVELOPMENT

Developing the volunteer field monitoring program can be a complex task. To begin with, the areas proposed for restoration at the park are extremely variable given the park's diverse slope topography and orientation, and the range of habitats from dry slope to wetland. Further complicating the monitoring program design is the broad range of questions from both the people conducting the monitoring and the PRCW staff interpreting the monitoring data. For instance:

- Is the restoration area changing from the intended habitat? If so, could changes be due to human intrusion of the area? Surface water runoff? Encroachment by invasive species?
- Are management actions (i.e., re-vegetation, invasive species removal, slope stabilization) having the desired results?

- Are the restored areas performing the way they were expected to? (that is, shading out invasive species, creating a self-sustaining diverse habitat while also preserving view corridors)

Selection of monitoring activities will depend on the reasons a restoration area is being monitored. For instance, monitoring erosion at restoration areas in the Erosion and Scrub Zones will be an important element. However, in the slight slopes of the upland forest where ivy is removed, erosion is not an issue. In all the restoration areas, monitoring the health and vigor of native species and the percent cover of invasive species will be the cornerstone of the monitoring program.

The volunteer monitoring program developed and tested in King County in the early 1990s (King County Watershed Community Link described in section 3.5) (Miller et al 1996) found that a uniform set of monitoring methods cannot be applied rigidly to every volunteer group and situation. They also learned that volunteers need time to develop a sense of ownership and stewardship for a restoration area early on. Volunteers that were asked to collect information at different sites did not bond with any particular site. However, when a volunteer group monitored one area they became intimately familiar with "their" area, they knew the people responsible for managing the area and understood the role the area played in the larger landscape. Many continued to watch over their area for years beyond the monitoring program. So, while it requires more attention and time by the PRCS to organize volunteers in this way, the pay off is that a lasting community of citizen stewards can be created and quality data that can be used by the PRCS and other city managers is collected.

Based on the experience of the King County Watershed Community Link, the following tips for successful use of volunteers were documented to assist others in embarking on their own volunteer-based monitoring program:

1) Avoid "Learning Overload"

   Volunteers need to absorb a lot of information, including specialized skills such as identifying plants. To make this task manageable, break the training into small units that are spaced out over the course of the monitoring period. Trainings can be scheduled at the appropriate season for the task at hand. For example, training in laying out transects in the first spring after installation, and for plant identification each spring before the first invasive species survey. This ensures that the information is fresh in the volunteers' minds as they conduct monitoring surveys.

   Volunteers in the King County program had good things to say about the monitoring trainings. They especially valued having different topics taught by experts in those fields.

2) Provide On-Site Assistance

   Each monitoring team received site assistance from the program staff the first time they performed a new task. Site visits proved to be very useful in building a group's competence and confidence, especially for technically difficult procedures like establishing transects or surveying vegetation, and are well worth the few hours of staff time per visit.

3) Make Use Of "Expert" Volunteers

   The plant monitors were assisted by graduates of the Native Plant Stewardship course (offered at Washington State University Cooperative Extension/King County). The use of "expert volunteers" is highly recommended, many of them are glad to lend a hand since it helps them fulfill their required hours of community service. Other such expert volunteers could include Audubon-trained master birders if a bird count is desired.

4) Permanently Mark All Sites

Transect lines and monitoring stations are initially established using benchmarks, compass bearings, and a tape measure. In theory, it seems simple to use these same tools to find the original site. In practice, locating the exact same monitoring station is extremely difficult and the difficulty increases as time goes by: the restoration habitat changes and different people may need to locate the stations over the years.

It is recommended to use a permanent marker such as an 8-inch piece of rebar or 12-inch penny nail driven into the ground to mark stations. The marker can be located using a metal detector and is unlikely to be disturbed by vandals. Everything should be marked - including transect lines, monitoring stations, photo points – both in the field and on maps. Documenting change over time is the primary reason for monitoring the restoration habitats at the park and duplicating the exact station locations is the only way to do it accurately.

5) Only Fully Trained Volunteers Should Collect Data

The Watershed Community Link program found that volunteers who joined the program after the trainings had occurred produced flawed monitoring data. To prevent that problem, the policy became that only volunteers who had attended the appropriate training session could collect data. Others could provide assistance, such as recording data.

6) Check Data Promptly

Quality assurance and quality control is an important element of monitoring and is achieved by having experts do parallel testing at 5 percent of the volunteer sample plots. Volunteer data sheets should be reviewed as soon as they are turned in so that there is the opportunity to give immediate feedback to volunteers and correct problems as the monitoring goes along.

6.1.2 VOLUNTEER MONITORING METHODS

Given the benefits of a more flexible monitoring system, the recommended monitoring protocol offers alternative methods for collecting data, depending on the volunteers' level of expertise, the training that can be provided, and the available time and funding (Bertolotto 1996). Several methods for vegetation surveys (the most complex data collection needed at the park) are presented below in order of increasing complexity.

A **Reconnaissance Walk** involves the volunteers walking the restoration area with another "expert" volunteer (see section 6.1.1) to identify major vegetation communities, locate photo stations, identify surrounding land use. This method is typically conducted prior to restoration work and is used to gather data that serves as a baseline of existing conditions. Following the restoration work, another reconnaissance walk can be conducted to provide a baseline of the new native plantings, slope stabilization work, and to establish the location of transects and monitoring stations.

Plant Survival Surveys are designed for use in areas where native plantings have been installed. Volunteers are provided with a planting plan listing the native species planted and the number of each species. For each species, the volunteers count the plants they see and compare that number to the number planted. They also note the plant conditions (live, dead, or stressed), any colonization by other volunteer plants (native plants that self-propagated), and any colonization by invasive non-native species. Data from plant survival surveys can be used to evaluate the success of a planting, pinpoint areas where problems may exist (stress or death of plants due to lack of irrigation or slope failure), areas where re-planting is needed, and identify species that should not be replanted in an area given their low survival rates.

Volunteers require little training or prior knowledge to successfully complete a plant survival survey. Before conducting the survey they can consult guidebooks to familiarize themselves with the particular species listed in the planting plan and that are known to occur in the park.

Vegetation Assessment Surveys provide qualitative information on the character of restoration vegetation communities. Volunteers walk the site to determine the major plant communities in the restoration area, then set up sample plot locations that best represent the observed plant communities. Plots are circular, with the radius depending on the predominant type of vegetation in the plot (10 meters for forest, 5 meters for shrub, and 1 meter for herbaceous). In each plot, the volunteers record 3 to 5 of the most dominant plant species in each vegetation layer (tree, shrub, and herb). Data from the vegetation assessment surveys can be used to determine whether the restoration plantings are establishing as the intended habitat type(s), and can be correlated with other data (e.g. slope stability) to get a better overall sense of how the installed restoration is functioning within the park conditions.

A vegetation assessment survey does not require extensive botanical identification skills. However, it is more appropriate for volunteers who are familiar with a site and have already identified the most common plants that occur there.

Percent Cover Vegetation Surveys are the most time-consuming, quantitative, and complex of these methods. The same plot sizes are used as in the vegetation assessment survey, but the plots are located every 50 feet along established transects that traverse the restoration area. Within each plot, volunteers identify all plant species and estimate the percent cover within the plot for each individual species. This method is excellent for showing changes in vegetation over time. If a planner or program manager suspects that adjacent land uses or changes are impacting a restoration area, percent cover surveys can help to indicate whether that is happening. The data can also be used to document the evolution of the restoration area to a more mature habitat and what planted species do the best in particular conditions.

The training required for this type of survey is extensive. Volunteers must be skilled in plant identification and setting up transects. Linking skilled botanists with volunteer groups that do not already have botanical skills is a must.

The field data collection protocols and data sheets used for the vegetation assessment methods described above is unique for each different method. The data sheets included in Appendix D of this plan were adapted from field data collection sheets created and field tested by the King County Watershed Community Link program. If specific instructions are desired for field data collection, field protocols used in the King County Watershed Community Link program can be reviewed in *Monitoring Wetlands: A Manual for Training Volunteers* (Miller et al 1996).

6.2 MONITORING SCHEDULE AND PERFORMANCE TARGETS

Monitoring restoration areas and collecting data is important to assess the success of the restoration project and to determine whether any adaptive management actions are needed to ensure the long-term success of the project. Performance targets are needed at set time intervals (that coincide with the monitoring schedule) in order to interpret the monitoring data and decide whether additional management of a restoration site is necessary.

In general, initial monitoring should be done before native vegetation is planted to provide baseline data of the area. Monitoring is recommended for each year during the 3-year establishment period. Given the challenging ecological conditions and the extensive invasive species seed bank at the park, this is the time when any problems at the restoration site need to be addressed expeditiously to assist with long-term success of each restoration project. Following the 3-year establishment period, monitoring is recommended at the 5-year, 10-year, 15-year, and 20-year post-implementation periods at each restoration project. Monitoring is best done by a person who is uninvolved with project management and maintenance in order to provide a non-biased assessment of the restoration.

Because monitoring at the park will be done primarily by volunteers, the most useful parameters need to be identified, measured, and documented in a straight forward format that can be easily interpreted by those who are maintaining each restoration site. This allows the individuals that are managing the restoration site to use the data collected during each monitoring year to determine whether native plant establishment is successful or whether adaptive management is needed to ensure the current and future health of the desired native community. The key parameters and performance targets are presented in Appendix E.

While targets years 10, 15, and 20 are the same – it is still important to monitor the restoration areas each of those years since the habitat will still be maturing during the 20-year monitoring period and adaptive management may be needed.

6.3 ADAPTIVE MANAGEMENT

Adaptive management at a given restoration area may be necessary if evaluation of the monitoring data determines that performance targets are not being met. In this case, volunteer stewards who are very familiar with the on-the-ground conditions at the restoration site and PRCS staff can work together to determine the potential causes for failure to meet the performance targets and recommend appropriate actions to address the problem. The proposed contingency actions will depend on funding available and the problem being addressed. For instance, if all plants of a single species die, a more appropriate replacement species can be replanted. If invasive species are out-competing the native vegetation, additional weed control efforts may be warranted. Under certain conditions, irrigation may be necessary for longer than the originally designated 3-year period, and repair or increase in slope stabilization may be needed. In addition, over time, new restoration methods are discovered as native habitats are restored throughout the U.S. Research of the newest techniques will be an important aspect of the monitoring task for the park and, if warranted, the new techniques can be added to the repertoire of management techniques described in this document.

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Appendix B

APPENDIX B

RECOMMENDED NATIVE PLANT LISTS

Table B-1: Recommended Native Species List for Planting Open, Dry, Sunny Slopes

(Erosion Zone: non-native shrub management area and steep slope hazard management area; and Scrub Zone: non-native shrub management area)

Note: This plant community is intended to be primarily a shrub community. American dune grass should be the dominant groundcover species. Any trees planted should be placed at the lower elevations of the slope in order to maintain the open view corridor at the Park.

	Scientific Name	Common Name	Recommended Spacing (on-center)
Trees			
Early Seral			
	Acer macrophyllum	Big-leaf maple	20’
	*Arbutus menziesii**	Pacific madrone	30’
	Pinus contorta var. *contorta*	Shore pine	30’
	Psuedotsuga menziesii	Douglas fir	30’
	*Quercus garryana**	Garry oak	15’
Shrubs			
Early Seral			
	Amelanchier alnifolia	Western serviceberry	8’
	Berberis aquifolium	Tall Oregon grape	4’
	*Corylus cornuta**	Beaked hazelnut	8’
	Holodiscus discolor	oceanspray	6’
	Philadelphus lewisii	Mock orange	6’
	Rhamnus purshiana	cascara	8’
	Rubus leucodermis	Blackcap raspberry	3’
	Rubus ursinus	Trailing blackberry	3’
	Symphoricarpos alba	Common snowberry	2’
Later Seral			
	Gautheria shallon	Salal	2’
	Ribes sanguineum	Red-flowering currant	3’
	Rosa gymnocarpa	Baldhip rose	3’
Groundcover			
	Achillea millefolium	yarrow	2’
	Anaphalis margaritacea	Pearly everlasting	2’
	Arctostaphylos uva-urvsi	kinnikinnick	2’
	Fragaria chiloensis	Beach strawberry	1’
	Leymus mollis	American dune grass	1’
	Lupinus littoralis	Seashore lupine	2’

* These species tend to be more difficult to establish. Expect high mortality rates.

APPENDIX B

RECOMMENDED NATIVE PLANT LISTS

Table B-2: Recommended Native Species List for Planting in Forested, Dry, Part Shade/Part Sun
(Erosion Zone: upland forest management area)

Note: This plant community is intended to be an open-canopy forest with a densely growing shrub understory. American dune grass should be the dominate groundcover species. Any trees planted should be placed at the lower elevations of the slope in order to maintain the open view corridor at the Park.

	Scientific Name	Common Name	Recommended Spacing (on-center)
Trees			
Early Seral			
	Acer macrophyllum	Big-leaf maple	20’
	Alnus rubra	Red alder	10’
	Psuedotsuga menziesii	Douglas fir	30’
	Rhamnus purshiana	cascara	10’
Later Seral			
	Tsuga heterphylla	Western hemlock	20’
Shrubs			
Early Seral			
	*Corylus cornuta**	Beaked hazelnut	6’
	Berberis aquifolium	Tall Oregon grape	2’
	Holodiscus discolor	oceanspray	2’
	Oemlaria cerasiformis	Indian plum	4’
	Philadelphus lewisii	Mock orange	4’
	Polystichum munitum	Sword fern	3’
	Ribes sanguineum	Red-flowering currant	5’
	Rosa gymnocarpa	Baldhip rose	
	Rubus parviflorus	thimbleberry	4’
	Symphoricarpos alba	snowberry	4’
Later Seral			
	Gaultheria shallon	salal	4’
	Vaccinium ovatum	Evergreen huckleberry	4’
	Vaccinium parvifolium	Red huckleberry	4’
Groundcover			
	Achillea millefolium	yarrow	2’
	Anaphalis margaritacea	Pearly everlasting	2’
	Arctostaphylos uva-urvsi	kinnikinnick	2’
	Fragaria chiloensis	Beach strawberry	1’
	Leymus mollis	American dune grass	1’

* These species tend to be more difficult to establish. Expect high mortality rates.

APPENDIX B

RECOMMENDED NATIVE PLANT LISTS

Table B-3: Recommended Native Species List for Planting Open, Dry, Sunny Beach
(Beach Zone: non-native shrub management area)

Note: This plant community is intended to be a mosaic of shrub and groundlayer habitats.

	Scientific Name	Common Name	Recommended Spacing (on-center)
Trees			
	Pinus contorta var. *contorta*	Shore pine	30’
Shrubs			
	Arctostaphylus columbiana	Hairy manzanita	5’
	Arctostaphylus uva-ursi	kinnikinnick	3’
	Holodiscus discolor	Oceanspray	5’
	Rosa nootkana	Nootka rose	4’
	Salix hookeriana	Hooker’s willow	4’
	Salix scouleriana	Scouler’s willow	4’
	Symphoricarpos alba	Common snowberry	2’
Groundcover			
	Abonia latifolia	Yellow sand-verbena	1’
	Ambrosia chamissonis	Silver bursage	1’
	Carex macrocephala	Bighead sedge	2’
	Distichlis spicata	Seashore saltgrass	1’
	Fragaria chiloensis	Beach strawberry	1’
	Grindelia integrifolia	Puget Sound gumweed	1’
	Lathyrus japonicus	Beach pea	1’
	Leymus mollis	American dune grass	1’
	Lupinus littoralis	Seashore lupine	2’
	Spergularia macrotheca	Beach sandspurry	1’

APPENDIX B

RECOMMENDED NATIVE PLANT LISTS

Table B-4: Recommended Native Species List for Planting in Forested, Moderately Moist Shade
(Forest Zone: upland forest management area)

Note: This plant community is intended to be a closed-canopy forest with a well-developed shrub understory.

	Scientific Name	Common Name	Recommended Spacing (on-center)
Trees			
	Acer macrophyllum	Big-leaf maple	20’
	Prunus emerginata	Bitter cherry	10’
	Rhamnus purshiana	cascara	10’
	Thuja plicata	Western red cedar	20’
	Tsuga heterphylla	Western hemlock	20’
Shrubs			
	Acer circinatum	Vine maple	6’
	Berberis nervosa	Dull Oregon grape	2’
	Gaultheria shallon	salal	2’
	Lonicera involucrata	Black twinberry	4’
	Oemlaria cerasiformis	Indian plum	4’
	Polystichum munitum	Sword fern	3’
	Rosa nutkana	Nootka rose	5’
	Rubus parviflorus	thimbleberry	4’
	Rubus spectabilis	salmonberry	4’
	Sambucus racemosa	Red elderberry	4’
	Vaccinium ovatum	Evergreen huckleberry	4’
	Vaccinium parvifolium	Red huckleberry	4’
Groundcover			
	Achlys triphylla	Vanilla leaf	1’
	Dicentra formosa	Bleeding heart	1’
	Geum macrophyllum	Large-leaf avens	random
	Maianthemum dilatatum	False lily-of-the-valley	2’
	Smilacina racemosa	False Solomon’s seal	2’
	Tellima grandiflora	Fringecup	2’
	Tiarella trifoliata	Foam flower	2’
	Tolmiea menziesii	Youth-on-age	2’

APPENDIX B

RECOMMENDED NATIVE PLANT LISTS

Table B-5: Recommended Native Species List for Planting in Forested Wetland/Riparian
(Forest Zone: wetland management area)

Note: This plant community is intended to be a closed-canopy forest with a well-developed shrub understory.

	Scientific Name	Common Name	Recommended Spacing (on-center)
Trees			
	Fraxinus latifolia	Oregon ash	20’
	Picea sitchensis	Sitka spruce	20’
	Salix lucida var. *lasiandra**	Pacific willow	2’
	Thuja plicata	Western red cedar	20’
	Tsuga heterphylla	Western hemlock	20’
Shrubs			
	Acer circinatum	Vine maple	6’
	Cornus sericea	Re-osier dogwood	6’
	Lonicera involucrata	Black twinberry	4’
	Oplopanax horridum	Devil’s club	4’
	Physocarpus captitatus	Pacific ninebark	8’
	Rhamnus purshiana	cascara	8’
	Rubus spectabilis	salmonberry	4’
	*Salix hookeriana**	Hooker’s willow	2’
	*Salix scouleriana**	Scouler’s willow	2’
	Salix sitchensis	Sitka willow	2’
Groundcover			
	Glyceria elata	Tall mannagrass	1’
	Juncus ensifolius	Dagger-leaf rush	1’
	*Lysitchitum americanum***	Skunk cabbage	random
	*Maianthemum dilatatum***	False lily-of-the-valley	2’
	Scirpus microcarpos	Small-fruited bulrush	2’
	*Tolmiea menziesii***	Youth-on-age	2’

* Plant as lives stakes
** These species require shady conditions

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Appendix C

APPENDIX C
IMPLEMENTATION PRACTICES

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APPENDIX C
IMPLEMENTATION PRACTICES

1.0 INTRODUCTION

The practices described in this section are those referenced in Chapter 5-Management Objectives and Actions. Chapter 5 and this appendix are meant to be used together. Chapter 5 describes what is to be done, when it is to be done, and where it is to be done. This appendix provides specific information on how to carry out the management actions directed in Chapter 5. The discussion below provides the level of detail needed to carry out the management and maintenance recommendations at the park.

These implementation practices are based on recommendations from the UW Restoration Ecology Network program and adaptations from the *Richmond Beach Saltwater Park VMP* (City of Shoreline 1999), *Golden Gardens Park VMP* (Walker et al 2003), and *Sand Point Magnuson Park VMP* (Sheldon 2001). The practices are tailored to the specific conditions found at the park and consist of effective methods to establish and maintain native vegetation and habitats.

Before beginning the discussion on the management practices, the next section addresses important safety issues to consider when doing restoration projects; particularly when volunteer help is an integral part of the restoration efforts.

1.1 SAFETY ISSUES

1.1.1 HERBICIDE APPLICATION

Using herbicides is not recommended for volunteer labor. This control method requires careful handling and should only be done by a person licensed by the Washington State Department of Agriculture.

Most of the invasive species removal methods in this VMP consist of manual removal to order to utilize volunteers and community groups as much as possible. However, if conditions warrant, invasive species can also be controlled using herbicide. A few examples would be very dense thickets of Himalayan blackberry that manual methods have not been able to control, field bindweed in any amount, and on steep slopes where the roots of densely growing invasive species stabilize the slopes. In the last example where removal of the roots may de-stabilize the slope, using herbicide could effectively kill the invasive plants but leave the roots in place to hold the slope while new native plantings are becoming established.

Effective methods for herbicide application on each specific invasive species are covered in section 2.8, below.

1.1.2 SLOPES

Working on slopes is challenging and can result in injury to workers. In addition to the steepness of slopes found at the park, soils are sandy and prone to sloughing. The following guidelines are presented in Table A-1 (see page A-2) as guidelines to assist in reducing risk of injury to workers and damage to slopes. They set limits on where volunteers can work and provide for erosion control measures where warranted. It also provides some latitude for utilizing native regeneration where slopes do not require rapid vegetation cover.

APPENDIX C
IMPLEMENTATION PRACTICES

Table A-1. Guidelines for Working on Slopes

SLOPE	Re-vegetation Guidelines	Bioengineering Guidelines	Volunteer Involvement
0-15%	Immediately after clearing, fence off bare ground and plant with native vegetation to attain 100% foliar coverage* within 5 years of first clearing. Alternately, in existing forests where invasive species have less than 20% overall cover: after clearing, fence off bare ground and allow seed bank to sprout for one growing season. If native regeneration is not sufficient, plant to attain 100% foliar coverage* within 5 years of first clearing.	None	Yes
16-40%	Use above strategy to provide 100% foliar coverage* within 3 years of first clearing.	Prior to planting install facines or native woody debris fastened perpendicular to the slope at intervals of 3 to 4 feet.	Yes
41-60%	Install native plants as soon as bioengineering technique is installed. Attain 100% foliar coverage* within 3 years of first clearing.	Same requirements as for 16040% slopes, plus cover bare soil with erosion resistant mulch within 30 days of clearing. geotechnical review of project is required if any significant earth moving is planned.	Non-professional volunteers must be supervised by qualified professionals.
>61%	Seeding with sterile annual grasses recommended; planting native plants as soon as possible to provide 100% foliar coverage* within 3 years of first clearing; tree species are limited to shorter species (<30 ft. mature height).	Geotechnical design of project required with departmental review; geotextile coverage of bare soils strongly recommended.	Non–professional volunteer labor not permitted.

* Foliar coverage includes grasses and other groundcover in addition to leaves on shrubs and trees.

APPENDIX C
IMPLEMENTATION PRACTICES

2.0 MANAGEMENT ACTION TASKS

2.1 THREE YEAR ESTABLISHMENT AND CARE

Typically, new plantings should have an intensive follow-up care program for the first three years after the initial plant installation. When planning a project it will be important to commit to this follow-up care in order for the native plant restoration to become established and able to out-compete invasive species. The most important components of this care program are mulching, watering, and weeding. A three-year calendar showing the timing for maintenance actions is shown below in Table A-2. Adjustments to the three-year maintenance calendar, in terms of actions taken, should be made depending on the particular project site conditions.

New plantings should receive regular watering because of the western exposure and sandy soils. Site access can make this task labor-intensive. A means of conveying water to plantings could include a temporary irrigation system, spraying from a water tank, or hand-carried containers. The watering system should be developed for each project during the initial project planning stage.

Mulching at the time of plant installation is an important element in assisting a site to retain moisture and to reduce germination of weeds and invasive plants. Although, in limited cases a decision may be made not to mulch in very steep areas because the mulch would simply slide down the slope during heavy rains. Any decision to reduce mulching would need to be made early in the planning phases of the project and would need to be reviewed by the PRCS staff.

Weed control should be done with diligence given the abundant seed bank at the park. Based on previous restoration projects, the success of a habitat restoration projects at the park will depend on regular and frequent weeding of the newly planted area until the native plants can shade out the invasive species.

Detailed instructions on how to perform these and other implementation actions can be found in the following sections in this appendix:

Actions:	**section**
Mulching	2.2
Planting	2.3
Pruning and Vegetation Removal	2.4
Bioengineered Slope Stabilization	2.5
Amending Soils	2.6
Watering	2.7
Weeding and Invasive Species Control	2.8
Cryptobiotic Soils	2.9

Once the intensive three-year period is over and plantings have become established, the restored habitats will still need to receive attention and maintenance at a less intensive level. Care of these planted areas should be incorporated into regular ongoing maintenance that occurs within the management area that they are located.

In addition, there may be one time maintenance actions such as removing tree stakes and inorganic or fabric mulch, if used. If inorganic sheet mulch, such as plastic, was used in areas of severe invasive species problems, the plastic should be removed during the dormant season after 3 years. Where slopes are less that 15%, the entire area should be mulched with a 4-5 inch layer of composted wood chips. Where slopes are greater than 15%, Wood StrawTM (or similar material) may be a more appropriate mulch.

Table A-2. Three-Year Establishment Care Calendar

Timing (by month)[1]:	J	F	M	A	M	J	J	A	S	O	N	D
Action												
During Installation												
Mulching	To be done at the time of plant installation											
Watering	To be done at the time of plant installation											
Year 1												
Mulching								▒	▒	▒		
Weeding				•	•	▒	▒	▒	▒			
Watering					▒	•	•	•	•	•		
Year 2												
Mulching								▒	▒	▒		
Weeding				•	•	▒	▒	▒	▒			
Watering					▒	•	•	•	•	•		
Year 3												
Mulching				▒	▒						▒	▒
Weeding				•	•	▒	▒	▒	▒			
Watering					▒	•	•	•	•	•		
Removing Inorganic Mulch											▒	▒

1 The double columns for each month indicate the first two weeks and the later weeks in the month.

• Indicates specific time to perform action for the most beneficial results.

▒ Indicates a range of time to perform action as needed, in addition to the specific timing shown by "•". Actual timing & frequency during this range can be determined for each project based on the site conditions.

2.2 MULCHING

[Adapted from Seattle Department of Park and Recreation *Landscape, Horticulture and Urban Forestry BMPs* (1999), '*City Among the Trees*' (1998) and Sound Native Plants bulletin titled "*Mulches for Restoration and Mitigation Projects*" (2006)]

Mulching is one of the easiest and most important maintenance practices for protecting and nurturing all planted vegetation types. When site access is possible, mulching is an essential component of any natural area planting project for suppressing weeds and invasive plant species. Mulch helps to reduce root competition with weeds, conserves soil moisture and keeps soil cool, and adds organic matter to nutrient-deficient soils. In areas where slopes are steep, bioengineering techniques need to be incorporated prior to mulching in order to stabilize the slopes and to create benches so that the mulch does not slide off the slope (see section 2.5).

The best approach for large restoration sites is to divide the site into practical, smaller zones (relative to planting areas) and sheet mulch each zone. Sheet mulching is defined as a continuous layer of mulch 4 to 6 inches deep over the entire restoration site; and is particularly important where large areas of invasive species have been removed. Native plants can be installed through the mulch. The mulch will need to be moved back away from the stems/trunks of the plantings to prevent crown rot and/or insect damage. Mulch should be maintained at a depth of 4-6 inches throughout the 3-year establishment period.

Past mulching practices usually called only for mulching around each individual installed native plant. That method, found to have multiple disadvantages, often resulted in weeds quickly growing up into the mulch from the surrounding non-mulched areas and the loss/compromise of the moisture conserving function of the mulch. In contrast, sheet mulching will function to suppress weeds that compete with the new plantings for water and nutrients and will keep the soils moist and cool.

It may not be feasible to transport large quantities of mulch into the steeper areas of the Park where planting will occur. On areas where slopes are 15% or less, composted wood chips can be used as mulch. While wood chips of recycled plant material from the park may be available at no cost, this mulch material is not appropriate for steep slopes. In areas with mild slopes where there are also mature trees, the wood chip mulch must be composted for at least 4 weeks to prevent the accidental spread of pathogenic fungi to park trees.

On slopes greater than 15%, Wood Straw™ and/or straw can be used as mulch because of these materials have less tendency than wood chips to be washed off steep slopes during storm events. New plantings can be installed into both of these materials.

Plastic, landscape fabric or inorganic mulch should be avoided in most cases. The only exception would be areas that have dense thickets of invasive species where manual removal methods jave been ineffective or where steep slopes make is dangerous to remove the invasive species manually. In these cases, using fabric or inorganic mulch may be the most effective strategy to prepare the area for native plantings. If plastic weed cloth is used it will need to be removed once native plants are established; otherwise it will hinder rhizome and stolon growth and may take decades to break down. Compost or leaf mulch can be added either underneath the inorganic mulch layer if soil amendments are desired.

2.3 PLANTING

[Planting instructions are adapted from Seattle Department of Parks and Recreation *Landscape, Horticulture and Urban Forestry BMPs* (1999), King County Water and Land Resources Bulletin titled "*Live Stakes Cutting and Planting Tips*", and Sound Native Plants bulletin titled "*Mulches for Restoration and Mitigation Projects*" (2006)]

Due to the extensive cover of invasive species at the park, each management area should be divided into smaller, more practical and manageable zones when planning for native plantings. New native plantings should be done only in areas where invasive species have already been removed. Chapter 4 in the VMP discusses priorities regarding which management areas to begin restoration work on and also presents the Bradley Method as a way to determine the appropriate location and size of planting zones within each management area.

The basic procedure of plant installation is essentially the same no matter which management area they are planted in. The layout of plants should be in informal and irregular groupings of a variety of species to mimic naturally occurring plant communities. Specific instructions for planting trees, shrubs, and herbaceous material are given below.

APPENDIX C
IMPLEMENTATION PRACTICES

Site preparation, species selection, and planting layout are site-specific and depend on the ecological conditions present in each management area. Species lists for native plants that are appropriate for the various soil, sun, and moisture conditions at the Park are provided in Appendix B.

Plant material used for native plantings need to be obtained from local nurseries that raise plants that are acclimatized to western Washington's climate; that is, wet, cool winters and hot, dry summers. Native plants are available as bare root, container plants (in a vary of sizes), seeds, and live stakes. The type of plant chosen will depend on site conditions, budget, and water resources. Plant species, sizes, and type will need to be decided during the planning phase of a restoration project.

Each type of plant material has its advantages and challenges. Bare roots plantings are more economical that container plants; often 1/10 the cost of a container plant. However, there is a limited window of time that bare roots plants are available from growers, usually from October through December. And for the best survival and health of bare root plantings they must be installed between October through November or February through April. In addition, there tends to be greater mortality of bare root plantings. If this type of planting is used, up to 25% more plants will need to be used than if container plants are used.

Container plants are more flexible in planting time. However they require a lot more water to survive and thrive than do the bare roots plants. Container plants tend to be the more expensive way to purchase plants. However, they also usually have the most developed root system and tend to have the highest survival rate compared to the other planting types.

Live stakes are about as economical as bare roots plants. If they are collected on site by volunteers there is no cost for plant material, but there would be costs involved with organizing and managing the volunteers. Live stakes are easier to install than both bare root and container plants. The limiting factor for this type of plant material is that only a few native species will readily re-grow from stakes and quick timing between cutting and planting. Native species that readily grow from stakes include willows, black cottonwood, red-osier dogwood, and snowberry.

Seeds are the most economical, but there is uncertainty in the germination rate due to uncontrollable ecological conditions. Surface obstructions and depressions on the steep slopes at the park can assist with germination, as will seeding areas where the slopes have been benched using bioengineering techniques. Grasses and clovers tend to germinate more readily than shrubs, trees, and other herbaceous plants. A general seeding rate is 1000 to 1500 Pure Live Seed (PLS)/square meter.

The UW restoration project found that a number of native groundcover plants re-established on their own after removal of the Scots broom, including common yarrow and several grasses. The UW Restoration Ecology Network students found that American Dune grass plugs that were transplanted from the lower parking area had a higher survival rate than newly purchased grass plants in containers.

Trees

The two basic steps in planting are preparing the site, and setting the tree or shrub. Proper preparation will encourage root growth rather than adding to the difficulties already challenging the newly planted trees or shrubs.

- Protect bare root plants from root drying prior to and immediately after planting. It is best to soak the roots in containers of water for 24 hours before planting.

- Ideal planting hole is 3 times the diameter of the root spread or root ball (for smaller plants the planting hole should be no smaller than 12 inches wider than the root spread or root ball).
- One of the most common causes of plant mortality is planting too deeply, which results in stem rot and/or suffocation of the roots. In non-sandy soils, the most beneficial placement of the root ball is about ½ inch above the surrounding soil. In sandy soils, the root collar should be at the soil surface. In all cases, the plant needs to be seated firmly on undisturbed underlying subsoil.
- Backfill the planting hole with native soil (that is, soil from the restoration area).
- It is most beneficial to sheet mulch prior to planting. If mulch will only be placed around each plant, mulch around trees can be placed in a 36 inch diameter around the stem and around shrubs the mulch can be placed in a 24 inch diameter ring around each stem. In all cases, it is important to make sure the mulch does not touch the plant stem, but does cover most of the root ball.
- Trees should not be fertilized at the time of planting.
- Balled and burlapped (B&B) trees need to first be placed in the hole and plumbed vertically. All rope needs to be removed from around the tree trunk and the top 1/3 of the burlap needs to be folded back down into the hole. Whenever possible complete removal of the top third of burlap by cutting it away with a sharp knife is preferred. It is important not to remove any B&B packaging material until the tree is in the hole and securely plumbed in its final position.
- For container plants, rough up the soil and roots on the outer inch of the root ball before planting to stimulate growth. If the plant is root bound (roots are circling the outside of the root ball), tease them outward and prune off any that don't fit into the planting hole. There have also been recommendations from some restoration landscapers to remove all the soil around roots; however, this is a very labor intensive practice and it is easy to lose a major part of the rootball.
- Backfill soil in lifts of 4 to 6 inches at a time with compaction of each layer. Do not compact muddy backfill. Water thoroughly after back-filling to settle the soil, eliminate air pockets, and re-wet the root system.
- If the project scope allows, watering soil rather than compacting is preferred. Backfill ½ the soil in the tree pit and thoroughly drench with water. Complete backfilling and then thoroughly drench with water again. This method is preferred for removing air pockets and settling soil, but can be impractical on big jobs or jobs using volunteers.
- If hand-watering of trees is planned, any trees planted in sandy or loamy soils need to have a 3-inch high berm erected just past the perimeter of the planting hole to funnel water to the root ball and wet the hole/sidewall interface. Berms should not be constructed in clay soils or heavily compacted sites.
- Stake only in situations where normal planting procedures do not provide a stable plant; otherwise, staking is not needed.
- If stakes are used, ties for stakes should be a biodegradable or flexible fastener that avoids collaring the trunk if the ties are not removed in a timely fashion.
- Stakes must be removed at the end of the first year after planting.
- Do not wrap tree trunks.
- Remove tree trunk wrapping materials, tags, and all ties at the time of planting.

Shrubs

- Refer to general guidelines for trees, above.
- Protect bare root plants from root drying prior to and immediately after planting.
- Plant shrubs with proper spacing to allow for spread at mature size.
- Rough up the soil and roots on the outer inch of the root ball before planting to stimulate growth. If the plant is root bound (roots are circling the outside of the root ball), tease them outward and prune off any that don't fit into the planting hole.
- Plant bare root stock at the same depth as they were grown in the nursery.

Herbs

- Space plantings to provide adequate coverage to compete with weeds.
- Remove containers prior to placement in the planting pit.
- Rough up the soil and roots on the outer inch of the root ball before planting to stimulate growth.
- If the plant is root bound (roots are circling the outside of the root ball), tease them outward and cleanly prune exceptionally long roots to create a uniform root mass.
- Protect bare root plants from root drying prior to and immediately after planting.

Live Stakes

Live stakes are cuttings harvested from live native plants. Stakes are cut from the parent plant and then installed directly into the soil where they establish roots and grow to maturity. The best species to use for live stakes are willow species, black cottonwood, snowberry, and red-osier dogwood. A moist substrate is needed for at least 4-6 weeks during the period the live stake is rooting and becoming established. Although live staking can be done throughout the year, to maximize survival the best time for taking cuttings and installing them is during the dormant season, between early November and late February. Success rates for drier sites may be increased if larger cuttings are used.

Stakes can be harvested from an appropriate site or purchased. For the best survival rates, they need to be installed as soon as possible after harvesting – ideally within 24 to 72 hours – and kept wet in a bucket, out of the wind and in the shade until installed. Stakes need to be at least 2 to 3 feet in length and 3/4 inch or more in diameter for willows and cottonwood, and greater than 1/2 inch in diameter for red-osier dogwood and snowberry. If harvesting your own stakes, no more that 5% of the parent plant should be removed at any one time to avoid injuring the plant.

Stakes can simply be pushed into the ground where the soil is soft enough, or by using rebar to create a planting hole in compact and gravelly soils. Hitting the stakes with a mallet is not recommended as this disrupts the plant's internal water balance. The stake must be installed as vertically as possible and right side up; that is, with the buds facing up. They need to be installed at least half way into the ground, and can be installed deeper with 3 to 6 inches remaining above ground with a minimum of 2 buds showing above ground. Lightly pack the soil around the stake so that no air pockets remain. Watering the stakes will help remove air pockets and create good soil contact below the ground for the length of the stake, particularly when rebar has been used as a planting tool. No additional topsoil is needed.

2.4 PRUNING AND VEGETATION REMOVAL

[Information in this section is adapted from. *A City Among the Trees: An Urban Forestry Resource Guide* (City of Seattle Urban Forest Coalition. 1998).]

Pruning is not a common practice of forest management in natural areas but can be important for achieving safety and forest health goals. Pruning and removal of park vegetation must be done under supervision of qualified professionals, either City staff or hired contractors. Technical expertise is required to avoid damaging valuable vegetation. Normally, native shrubs on hillsides do not need pruning, except along street or trail edges to allow for ease of traffic.

For the most part, trees in Richmond Beach Saltwater Park will be left to grow naturally. In rare instances, trees may be pruned or removed when it is necessary to avoid and minimize risks to park users, adjacent properties, and right-of-ways. Any removal of trees needs to follow typical permitting and procedures for hazard trees. Other than the specific situations listed above, tree pruning or removal is discouraged. In order to create healthy and structurally-diverse native habitat, any maintenance of trees needs to be restricted to achieving a direct project objective. Such objectives could include:

- A mature tree could be pruned or removed to encourage nearby sapling trees to grow or for a specific park improvement project. Wherever possible, the preferred technique for reducing competition will be pruning. If a tree is removed, it can be converted to a 'snag', essentially a branchless trunk, rather than complete removal. This reduces costs and increases habitat features at the Park.
- A gap can be created in the forest by cutting down 3 trees to allow shade tolerant tree saplings to thrive within the forest canopy. A larger gap can be created to provide enough sunlight to allow sun-loving saplings to grow.
- A group of closely growing sapling trees may be 'thinned' by cutting down weaker, damaged or poorly located trees until there is enough space between the remaining trees for them to grow to mature size. Some planned projects may plant trees closely together to quickly create shade for the purpose of discouraging the re-growth of invasive species. In this case the planting plan would need to include thinning in the future to allow for healthy tree growth.
- Low branches on trees along a trail or road may be pruned to provide overhead and side clearance.
- Trees may be pruned to maintain the view corridor from the upper terrace. In this case, trees should never be 'topped' as this creates an unhealthy tree and a potentially hazardous situation for park users. Instead, any tree that interferes with the upper terrace views should be limbed and cut back to create a snag or stump as a habitat feature.
- Except for the purposes of snag creation, trees in the Park should never be topped.

In most cases, derelict trees in natural areas do not pose a hazard and should be left standing. If the tree is defective AND it may fall on park users, trails, roads, or other park infrastructure; it would be considered to be a hazard.

- Any hazard trees that are not able to be made safe by corrective pruning will need to be removed.
- Work with the PRCS to alert the community before tree removal begins to provide opportunity for comment.

Large woody debris and brush piles are critical habitat elements that are often lacking in habitat areas of parks. When large trees have been removed, recycle as much of the parts of the woody debris on site as possible. Trunks and large branches that will not sprout can be placed directly on the ground within the habitat areas to function as large woody debris. Brush (non-sprouting limbs and branches from the tree tops) can be used for wildlife brush piles scattered throughout the habitat zones. Placement of brush piles and large woody debris is dependant on the slopes. Brush piles should only be placed on slopes that are 30% or less because on steeper inclines the weight of the wood has the potential to cause slides after the slope becomes saturated during the wet season; thus, disturbing vegetation and soils in newly restored areas. Logs can be placed on level ground and slopes. However, if logs are placed on slopes greater than 30% that have trails or other activity areas downslope, the logs will need to be well anchored for public safety reasons.

Habitat features can be placed within both wetland and upland habitat in the Park. Smaller material not used for brush piles can be chipped and used as mulch.

2.5 BIOENGINEERED SLOPE STABILIZATION

[Adapted from *Bioengineering Techniques to Revegetate Streambanks* (Moore et al 1996)]

Steep slope stabilization will be an important element in minimizing soil erosion following invasive species removal. It will also establish beneficial conditions for new habitat plantings. Live stakes, fascines, brush layering, and other organic material can be used for this purpose. Eventually, the roots of native plans that have been installed on the slopes will also serve to stabilize the slopes.

Live stakes planted at 1 to 2 feet on-center can be used to stabilize slopes. Willows, black cottonwood, and red-osier dogwood can be used on moist to wet slopes. Snowberry can be used on moist to dry slopes. Section 2.3 in this appendix has instructions and installation methods for live stakes.

Fascines are recommended on the dry steep slopes found at the park. A fascine is a long-cylindrical bundle of brush material that is anchored perpendicular to the slope. Ideally, fascines should be placed on slopes that are steeper than 30 percent at the Park. Fascines are known to reduce soil erosion by slowing the flow of runoff down the slope face and trapping soil particles that would otherwise wash downslope. They add organic material to the soil as they decompose and create relatively level benches for native plantings.

Typically fascines are created from live stakes. At the park, Scots broom removed during invasive species control can be recycled into fascines. Th tough dense branching of the Scots broom can serve to retain loose soil. As it degrades over time it will provide much needed nutrients to the soils. Only Scots broom that is not in flower, has not gone to seed, and from which the roots have been removed should be used to create fascines. The individual plants can be tied using biodegradable jute to create the bundles. The length of the bundle will depend on the length of the slope to be stabilized. Fascines can be lashed together to build them to the length needed. Or, if created at shorter lengths, overlap the fascines enough to eliminate gaps.

Fascines can also be created using cleared Himalayan blackberry stalks. However, this plant can root from stems that come into contact with the ground. If using this plant for fascines, it will be important to lay them on plastic and dry them completely before creating fascines. Because of the thorns on this plant, it may not be a preferred species for this purpose.

To install the fascines, start at the bottom of the slope and place them perpendicular to the slope fall line. Then pound stakes into the ground at intervals of 3 to 4 feet immediately downslope and angled slightly away from the fascine. Only about 4 inches of the stake should be visible above the fascine. In previous fascine installations, the UW Restoration Ecology Network students found that untreated 2X2 wooden stakes that were at least 4 feet long were necessary to create a sturdy anchor for the fascines, given the loose sandy soil conditions at the park. For extra stability, pound wood stakes through the middle of the fascine at a 45 degree angle to the slope and placed so that they are staggered between the downslope stakes. Once the fascines are anchored, soil from the slope above the fascine is shoveled down against the fascine and stomped down well to work the soil through the fascine. In general, after backfilling, only the very top 10 to 15% of the fascine should be visible. The UW Restoration Ecological Network students found that building the fascine wide enough to be able to leave approximately 8 inches of fascine exposed above the resulting bench worked well at the Park in order to shield the new plantings from wind and sun.

After installing the first fascine, work up the slope to place additional fascines. Given the loose and erosion-prone soils at the Park, fascines should be placed every 3 to 5 feet up the slope.

Live fascines can also be used at the Park when the right conditions are present and are constructed and installed in the same manner as discussed above for the Scots broom fascines. Live fascines provide added erosion control as the fascines develop root systems. Use the species discussed in the section 2.3 in this appendix. However, given the dry conditions at the Park, live fascines will be most successful in areas with seeps. Live fascines made from snowberry may be successful in dry areas, but should be placed late in the fall and will need to receive the same irrigation as recommended for new plantings.

After the fascines are placed, foot traffic through the stabilized area should be minimal to reduce disturbance to the area. Soil amendments can be carefully hand-dug into the resulting benches prior to planting native vegetation. Any irrigation placed in the area should be placed to minimize the erosive force of water moving down slope (eventually, the established native plantings will serve to reduce water erosion throughout the area). It is important not to ignore the project after it has been installed. Periodic maintenance is needed to check the stability of the placed fascines. additional fascines may need to be placed to stop any continuing erosion. Checking the terraces also allows for observation of the new native plantings and to monitor whether the plants are receiving enough water to survive. In the first summer after planting, maintenance check-ups should be conducted every few weeks. After that, the frequency of needed check-ups can be determined on a project specific basis.

Brush layering is a re-vegetation technique that combines layers of dormant cuttings (live stakes) with soil to re-vegetate and stabilize slopes. Cuttings are placed on horizontal benches that follow the contour of the slope. The benches are cut to angle down and back into the slope. For narrow benches, the benches can be created using shovels. For larger benches, mechanized equipment can be used where access is available.

The dormant branches can be cut from the parent plant at 3-4 feet in length and ¼ to 2 inches in diameter. The same storage and timing of planting should be followed as described in section 2.3 for live stakes. Begin by creating a bench at the bottom of the slope so the bench is 2-3 feet deep and angles slightly down and into the slope. Dormant branches are placed on the bench, slightly criss-crossing, with the cut ends placed into the slope and the tips extending beyond the edge of the bench by no more than ¼ of the total branch length. Plant 20-25 branches per linear yard. Place 24 inches of soil on top of the branches and tamp into place. Continue to build layers up the slope.

The steep slopes at the Park can be treated with this technique if a biodegradation fabric (such as jute netting) is used to hold the soil in place between the plant layers. The lower edge of the fabric would be placed on top of the first layer of dormant branches to anchor in the cloth, 24 inches of soil is placed on top of the fabric, then the fabric is rolled up over the soil and into the next bench and the next layer of dormant branches will be placed on top of the fabric. The fabric should not entirely cover the branches, but should be at least 1 foot into the bench.

The **Brush Donut** is a technique devised by Kern Ewing and used by the UW Restoration Ecological Network students to protect the new plantings located in severe conditions. Brush donuts protect plantings on steep slopes from drying out due to high exposure to wind (hot in the summer and cold in the winter) and sun. They help to slow evaporation from soils around the plantings, add organic matter to the soil as they decompose, and provide some protection from slope erosion around the plantings due to rain drops or irrigation spray. The brush donut is made using Scots broom after the roots have been removed and the branches are bound in a wreath shape. One wreath is made for one planting in order to provide maximum protection to the new plant. It should be large enough to be placed around the new planting without touching any part of the plant. The wreath should be staked in place to keep it from falling against the planting. It is easiest to make the donut while the Scots broom is still relatively green and easy to bend.

2.6 AMENDING SOILS

Soils in Richmond Beach Saltwater Park are well-drained, mineral soils with sandy textures. Organic content is very low in these upland soils. A few areas in the park do have soils that contain some level organic material; these include the wetland where there are organic mucky soils that are poorly drained and in the lower levels of small gullies where a small amount of organic material has collected.

Typical soil characteristics at the park favor dry upland plant species that have adapted to dry, drought-like conditions. For optimal plant survival and success, planting projects should use species that are adapted to the existing microclimates where the planting will take place (see Appendix B). Soil moisture and canopy closure (e.g. sun or shade) will be the most important indicators influencing species selection for a particular management area.

Even with careful attention to choosing species that have a greater tolerance for the dry conditions at the park, the well-drained sandy soils necessitate special attention to provide and retain moisture for new plantings. While all projects will require irrigation to ensure that new plants survive (see section 2.8), organic soil amendments will greatly help hold moisture near the plant's root ball to increase its chance of survival given the rugged conditions at the park. Amendments that can perform this function include high-quality compost, starch-based irrigation supplements and polymer hydrogel granules. Each of these is discussed in detail below.

In the case where compost amendments are part of a planting project, the best results are attained by amending the soils throughout the planting area, rather than only amending the soils within the planting hole. Generally, the best way to add soil amendments is to clear the area of invasive plants, aerate or scarify the soil if they have become compacted, and then spread the amendment (compost or the equivalent) on the surface throughout the planting area. In some cases, the compost can be tilled into the top 6 to 12 inches of the soil. In areas that had been overgrown by dense thickets of invasive species, tilling in the compost is not recommended as it will bring the weed seeds to the surface and will allow for easy germination of weeds. Tilling of the compost can be done where the topography is relatively level and there were few invasive species. If any area is to be tilled, care must be taken to avoid the root zones of mature trees. New information

about tree root systems shows that tree roots can be relatively shallow and extend well beyond the drip line of the tree. Seasonal timing of tilling in amendments should be such that bare soils are not exposed to winter rains. Therefore, if done in the fall after summer weed removal, exposed soil and compost will need to be seeded or covered with wood chips (in level areas), straw or Wood Straw™ (in steeper areas) whether or not the site is planted that season. It should be noted that straw often includes weed seeds and can introduce unwanted, non-native plants to the restoration area.

For logistical reasons such as cost, access, steep slopes, or lack of machinery, amending in this way may not be feasible. In this case, limiting the plant palette and planting into existing soil, or choosing a different technique are recommended. Ample opportunity exists to experiment with soil amendments in the different Landscape Zones and slopes at the park in order to explore other ways to improve soil health and thereby increase planting success. A few examples are given below.

Starch based irrigation supplements are containers of water combined with small amounts of food-grade starch to turn it into a gel. The container is opened and buried upside down next to new plants at the time of planting (or in the spring if the plants were installed during the early winter). As soil temperature warms during the summer, soil microbes decompose the starch, releasing the water contained in the gel. These supplements are used in roadside planting projects by several state highway departments. They are expensive on a per-plant basis, but may be effective where no other solution is feasible.

Polymer hydrogel is a powder that is mixed in small amounts with native soil during planting. The polymer granules absorb water and swell exponentially. They hold water in gel form and keep moisture available to plant roots that come in contact with the wet granules. They have a mixed reputation, partly because they are easy to overuse.

A simple application of Wood Straw™ (or a more traditional mulching material, like leaf mulch, wood chips, and/or straw) spread onto the soil surface is also a good way to effectively get organic content back into the soil and hold moisture in the ground. The Wood Straw™ is designed to allow plants to establish via seed as opposed to more traditional mulch material that functions to suppress the growth of plants from seed. This function of the traditional mulch material is useful to suppress weeds, but also can retard the germination of native plants from seeds. If wood chips are used they must be composted to avoid spreading decay fungi to living, mature and healthy trees.

2.7 WATERING

Watering is the key to maximizing survival and establishment of new plantings. The greater Seattle area gets an average of 39 inches of rain each year, but only 13 of those inches typically fall during the growing season. Plants grown in a nursery are acclimated to exactly the opposite condition: they receive regular watering to facilitate rapid growth. For these reasons, summer watering during the first three years is critical to help the plants acclimate to the radically different moisture regime present throughout most of the park. They must grow an entire new root system before they can survive in the summer dry season. This is why summer watering for new plants, even drought-tolerant natives, is important. For most efficient watering, establishment of an irrigation infrastructure for areas that require regular watering is recommended.

Planning for temporary or permanent irrigation should be part of all restoration projects. The University of Washington Restoration Ecology Network found that the plants that received

irrigation survived; however, the plants that did not receive water died within several months. Given the steep slopes and few water supply lines at the park, water delivery to planting sites will require good planning during the design of restoration projects and extra labor to install an efficient and cost-effective irrigation system. Some areas will be close to quick couplers so that hoses can be attached for irrigation. Other areas may be close to a road or a path where a truck with a water tank can spray water onto the planting areas. The preferred method will be to set up a temporary irrigation system to deliver water throughout the restoration area, with special attention paid to making sure that the higher elevation portions of the restoration site are well covered. Down slope areas will also need to receive adequate water coverage. In addition, down slope areas will receive some irrigation from upslope areas as the water moves down slope via surface and groundwater runoff.

Hand watering is another option, but one that must be weighed against the dedicated labor required. Missing a watering on the sunny, west-facing slopes on a hot summer day can be the difference between healthy, surviving plants and the failure of the restoration area. In addition, the repeated foot traffic can cause damage to plants and encourage erosion. This is of particular concern where steep slopes and/or cryptobiotic soils are present. Cryptobiotic soils take a relatively long time to develop and are quite fragile. Repeated foot traffic can easily destroy these soils and the slope stabilization function they provide.

Spray heads can be used on level ground and areas where slopes are less than 30%. The spray heads need to be raised at least 3 feet above ground to allow for adequate head-to-head coverage as grasses become established and the new plantings grow during the 3-year establishment period. On slopes that have an incline greater than 30%, using numerous heads that deliver in water in small fan spray patterns or soaker hoses buried beneath mulch is preferred over fewer spray heads that deliver large streams of water. The repeated, percussive force of water sprays on steep slopes can cause erosion. The resulting gullies and rills can unearth new plantings and undermine the success of the restoration area. When using smaller fan-spray heads or soaker hoses, planning is imperative to make sure that all plants receive irrigation water. Drip lines are not recommended on the sandy soils at the park because the emitters tend to deliver water in a vertical column directly below the emitter and miss the roots of the new plants.

General irrigation guidelines:

- Water new trees and shrubs thoroughly at the time of planting.
- Water new trees and shrubs at the equivalent of 1" of rainfall weekly during the first two summers after planting, tapering watering (to ½") weekly in the third year.
- Begin watering at the beginning of June to prevent drought stress, and earlier if spring rains do not occur in May.
- During years of extreme drought, water highly visible, natural planting areas along roads and trails and along the top of slopes.
- See sections 2.3 and 2.1 in this appendix for additional instructions on watering newly installed trees and shrubs.

2.8 WEEDING AND INVASIVE SPECIES CONTROL

[Information in this section is adapted from articles by The Nature Conservancy (2004), the University of California Integrated Pest Management Program (2003), Sound Native Plants (2006), The Seattle Times (2006), Jonathon Soll (2004), King County Natural Resources and Parks (2006 and 2007); University of California (2003), and from Golden Gardens Park Vegetation Management Plan (2003).]

APPENDIX C
IMPLEMENTATION PRACTICES

All restoration projects at the park will include initial removal of invasive species prior to planting native vegetation. Continuing control of weeds and invasive plants is also an important part of the 3-year establishment care (see section 2.1) for all newly planted areas. The most commonly occurring and problematic non-native invasive species in the Park are listed below with a brief description of their characteristics and recommended eradication and control methods for that particular species. Recommendations and protocols in this plan (including herbicide use) are intended to be used in accordance with the PRCS's best management practices and policies regarding park maintenance and public safety and health.

All projects where dense thickets of invasive species need to be removed will benefit from thorough planning prior to starting the project. Each project will need to include selecting from a combination of control and removal methods, implementing one or more of those methods, monitoring results, conducting on-going weed and invasive removal, evaluating the success in reducing the unwanted species, and determining whether additional actions are needed to achieve the goal of reducing competition with native plantings.

In general, weeds and invasives should be cleared from the entire restoration area. If the restoration site is very large and weeding the entire area is not feasible, then weeding should be done in at least a 6-foot diameter around each native tree, shrub, grass, and groundcover. This will need to be done throughout the 3-year establishment period (or until the woody native plants are at least 4 feet tall). Weeding once a month for this purpose is optimal. Where weeds are very aggressive, cardboard can be laid out as sheet mulch (that is, a continuous layer over the entire restoration site). Cardboard serves as a good temporary deterrent to weed re-emergence and works well where there is no slope.

Woody debris from invasive plant removal that does not sucker or sprout from cuttings or branches can be used to create habitat features (see section 2.5).

The most effective long-term control of invasive shrub species can be achieved by using a combination of control methods, reducing site disturbance, and establishing healthy native plant communities. All control efforts should be directed over time towards establishing and maintaining native plant communities, which will create the shady conditions that are not conducive to invasive species. Invasive species infestations that pose the greatest threat to desirable plant communities are those populations that should be targeted first. In addition, to keep the weed control workload at the most reasonable level possible, new infestations that re-emerge after the initial removal effort should be targeted for control before they, once again, become widespread or well established. Invasive control should focus on those species and infestations that are 1) the fastest growing, 2) the least established but potentially threatening, 3) the most disruptive to functional habitat, and 4) listed noxious weeds with mandated control.

The science of removal and control of invasive species is always evolving. The information in this plan provides the latest up-to-date methods of controlling the invasive species that have been observed at the park. It may also be useful to check the King County Noxious Weed Best Management Practices website at http://dnr.metrokc.gov/wlr/LANDS/Weeds/bmp.htm as this website is continually up dated with new information. Recently, goats have been used in the greater Seattle area as a method to control invasive species. However, because goats will eat everything – both native and non-native species – and their hoofs tear up the ground, this method is not recommended for the park.

The following text describes in detail how to remove each of the identified non-native invasive plants or noxious weeds found in the Park. Non-native invasive species that are not specified below can be removed as needed and appropriate.

APPENDIX C
IMPLEMENTATION PRACTICES

An important safety issue to note is that all work with herbicides must be done by landscape professionals licensed to apply herbicides by the Washington State Department of Agriculture. **Volunteers should not work with herbicides**.

2.8.1 ENGLISH IVY (*HEDERA HELIX*)

English ivy is a broad-leaved evergreen non-native invasive found in the Forest Zone-Upland Forest Management Area next to the beach access trail. Occurring on the forest floor and climbing up tree trunks, this species is one of the biggest threats to forest health. It has no natural predators or pests, does not provide beneficial habitat for native wildlife and reduces native plant diversity.

Growth Habitat

English ivy spreads locally through vegetative growth (that is, any stem that touches the ground can root and form a new plant and/or new shoots can form from the existing root system) and new plants can grow from cut or broken pieces of stems that fall onto and root in the soil. Ivy growing on the ground is a relatively slow growing. Seeds are produced during the vertical phase of ivy growth. The ivy seed disperses over longer distances by being carried to new areas by birds. Thus, preventing the ivy from climbing trees and other surfaces is a priority level of control.

Ivy is shade tolerant and attaches to the bark of trees, by way of small rootlike structures. Older ivy vines have been reported to reach 1 foot in diameter. As the ivy climbs in search of increased light, it engulfs and kills branches by blocking light from reaching the host tree's leaves. Branch dieback proceeds from the lower to upper branches, often leaving the tree with just a small green "broccoli head." The host tree eventually succumbs entirely from this steady weakening. In addition, the added weight of the vines makes infested trees much more susceptible to wind throw during high rain and wind events and heavy snowfalls. Trees heavily draped with ivy can be hazardous if near roads, walkways, and other peopled areas. On the ground, English ivy forms dense and extensive monocultures that exclude native plants.

Recommended Control Treatment:

Tools needed:

- 1"-diameter cutting-capability hand pruner
- Pruning saw
- Work gloves
- Heavy duty yard waste bags

Hand-pulling appears to be the most effective removal method for this plant. Any efforts to control ivy should initially target vines climbing into trees. Vines should be cut at the ground level at the base of the tree and then again at shoulder height; all the way around the circumference of the tree. Cut vines should not be pulled down out of trees, as they die they will loosen their hold on the tree and loose mass, relieving the tree of the stress. Pulling the vines from the tree will result in further stress to the tree. A radius of 5 feet all the way around the base of the tree should also be cleared of ivy – called a 'tree lifesaver'.

Patches of ivy on the ground are best removed by hand pulling and rolling the vines into a mat or ball. Rolled up mats or balls can be left on site on large blue tarps until they dry; making it easier to transport offsite without the risk of leaving any live plant pieces behind. Rooted portions left in the ground will remain alive and should be pulled or repeatedly cut to the ground as they re-sprout. Because cutting will likely result in vigorous regrowth, vigilance is required to ensure long term control. More extensive instructions for manual ivy removal can be found at www.ivyout.org .

If conditions warrant, ivy can also be controlled using glyphosate herbicide. This process requires careful material handling and patience and should only be a licensed applicator. This method may be a preferred strategy on slopes where ground disturbance is undesirable.

Removal of dense mats in the ground layer where there is still a fairly intact native shrub layer can be done without replacement planting. Removal of dense mats in the ground layer lacking native shrubs and herbs should only be done if subsequent re-planting using native species is an option. On slopes less than 40 percent, it may be productive to leave the ground bare and unplanted for one growing season. This gives the area a chance to recruit native plant regeneration from the existing seed bank in the soil. If this technique is used, it is important to leave the soil surface scarified (lightly raked) and fence the area to prevent foot traffic. During the following three growing seasons, regeneration of ivy and/or other invasive species must be carefully weeded from the desirable native regeneration. This takes a discerning eye and sensitive touch; and is an ideal strategy for sites being maintained by volunteer groups.

If native recruitment is not successful, high density planting and intensive maintenance should be provided so that 100% cover by native plants is achieved within three years.

On slopes greater than 40 percent, placing fascines and immediate re-planting and sheet mulching are recommended to guarantee adequate foliar coverage under critical slope conditions. Any newly planted areas should have an additional 10-foot wide buffer between the plantings and any adjacent ivy patches.

2.8.2 HIMALAYAN BLACKBERRY (*RUBUS ARMENIACUS*)

This species is prevalent throughout the Park in large thickets on sunny, steep, west-facing slopes. Blackberry is shade-intolerant and opportunistic on disturbed sites, so long-term control is linked to successful establishment of healthy native plant communities that create undesirable conditions for the blackberry.

Growth Habit:

Blackberries spread via seed and vegetative reproduction (that is, any stem that touches the ground can root and form a new plant and/or new shoots can form from the existing root system). While it does provide good wildlife habitat value as food, refuge and cover for birds and small mammals, Himalayan blackberry competes with native shrubs, herbs, and grasses for water and sunlight. It out-competes desirable native vegetation through dense canopy formation and high water sequestration. Over time, it can completely engulf native vegetation and form a solid thicket up to 10 feet tall or higher.

Recommended Control Treatment:

Tools needed:

- 1 ½”-diameter cutting-capability two-handed lopping shear
- 1”-diameter cutting-capability hand pruner
- Work gloves
- Heavy duty yard waste bags
- weed wrench (see http://www.weedwrench.com/)
- shovel
- Mulch that is designated to be free of weed seeds

Small areas of Himalayan blackberry, or blackberries around trees or shrubs, can be controlled through manual removal of the plant by first cutting the stems back to 6 inches tall using hand pruners or two-handed loping shears; preferably as the plants begin to flower. Because the plants

will still send out new sprouts from the root crown, the root mass of each plant (the bulbous, gnarled mass of the crown that is visible just a few inches below ground) can be hand removed with a weed wrench, claw mattock, pulaski or shovel. The entire root mass should be removed and all parts of the plant need to be bagged immediately and removed from the site. After removing the root mass, the resulting hole should by mulched to at least 6 inches deep to discourage germination of Scots broom; another invasive species that also occurs in the Park and will sprout aggressively wherever there is exposed, disturbed soil. Because blackberry can re-sprout from roots left in the ground, continuing maintenance is necessary to make sure this species does not become re-established.

Blackberry can be chemically controlled where thickets are very dense or where total root removal is not possible. The UW Restoration Ecology Network program found that Roundup gave poor results; however, Crossbow did have the desired results. With any application of herbicide, always read and follow the label instructions. The best results were obtained by cutting the canes back to about 6 inches above the ground and applying the herbicide after the new leaves emerged. Use of this method in late spring when new growth occurs involves cutting each cane and immediately brushing the cut surface with the herbicide. If this method is used in late summer (August to September), herbicide can be applied to the leaves following seed set and while the plants are still actively growing. If applying herbicide to the leaves, care must be taken to avoid direct spray or overspray onto adjacent desirable native species' leaves or stems. Subsequent treatments, if needed, should occur in early fall (if weather permits) and before the first frost. Using a lower concentration of herbicide allows the individual plant to continue functioning long enough to translocate the chemical to the roots. Several treatments may be necessary. This chemical should be used following the manufacturers recommendations. Plants treated chemically need to be monitored to determine if another treatment is necessary.

The method(s) chosen for control of blackberry depend mainly on how extensive the infestation is and the available labor resources. Removal, other than in areas with sparse occurrences and a relatively intact healthy existing plant community, should not be done unless subsequent replacement native planting is planned. Replanting cleared areas will serve to shade out invasive seedlings. In areas of steep slopes, the Bradley method described in section 6.3 Planting is recommended to avoid disturbing large sections of unstable soil. In addition, bioengineering techniques described in section 6.5 should be implemented immediately to stabilize the slopes.

The timing for native woody plantings will be site dependant and must be determined at the time of project planning. In some instances, planting in the fall immediately after summer removal work is desirable. In other cases, re-planting in areas where dense thickets were removed may not be done until control of re-sprouts over a 2 year period is complete. If this occurs on steep slopes, it is important to implement bioengeered slope stabilization (see section 6.5) and hydroseed using native grasses and forbs (see section 6.3). Whether the area is planted immediately or planted later, regeneration of any invasive species in the cleared area must be carefully weeded. If native plants have been installed or are regenerating on their own, weeding out invasives must be done with a discerning eye and sensitive touch.

2.8.3 SCOTS BROOM (CYTISUS SCOPARIUS)

Scots broom is prevalent throughout the Park occurring in large thickets in sunny slopes and on the beach. It is shade-intolerant and opportunistic on disturbed sites, so long-term control is linked to successful establishment of healthy native plant communities that create undesirable conditions for this species. Because Scots broom seeds remain viable for many years, a focused invasive species maintenance program for this species will need to be conducted for at least 7 years. After that, annual removal of Scots broom seedlings will still need to be conducted each

spring in areas dominated by native grass and shrubs to ensure the long-term health of these native communities.

Growth Habit:

Scots broom is very efficient at spreading and out-competing native plants. Spreading via seeds, Scots broom can produce hundreds of seedpods per bush. The pods often open explosively and the seeds can widely scatter over long distances. The seeds are long-lived and, over time, it can form 100 percent cover and spread into adjacent areas.

Recommended Control Treatment:

Tools needed:

- Heavy duty yard waste bags
- Heavy work gloves
- weed wrench (see http://www.weedwrench.com/)
- Mulch that is designated to be free of weed seeds

Removal of seed-producing age plants is the most labor intensive, but it important to reduce spread and seed accumulation. Removal can be done incrementally as resources are available. Proven strategies include hand clearing, mowing, and hand cutting. It is important to keep soil disturbance to a minimum during these control activities as bare soils and mixing of the surface soils encourages germination of the existing seed bank of this and other invasive species. In addition, long-term management will be needed to exhaust the seed bank and prevent re-colonization in cleared areas due to seedlings or roots left in the soil that have re-sprouted.

Hand clearing permits the removal of weeds without damage to surrounding native vegetation. Root removal is important as young plants tend to re-sprout from roots left in the ground. Young plants up to 3 ft. in height growing in moist soil can be easily pulled out by hand, roots and all. A recommended tool for removing more mature plants is the Weed Wrench (http://www.weedwrench.com/) or some similar device.

The best timing for hand pulling is in the late spring (May) just before the plants go to flower. Unless the pulled plant is to be used to create fascines for slope stabilization, all parts of the plant need to be bagged immediately and removed from the site. Wherever a plant is pulled from the ground, weed-free mulch should be placed 6 inches deep over any exposed soils. This step is imperative to reduce seed viability as Scots broom will sprout aggressively wherever there is exposed, disturbed soil.

Scots broom can also be cut back as an effective control measure. Plants should be cut below the basal node (that is, near or below the ground level) where the stem is more yellow than green. Old plants in dry soil have a nearly zero re-growth rate if cut correctly. About half of young plants that have been cut back will re-sprout. For this reason, two to four passes through the area to be cleared should be done in May and June before seed set to make sure all flowering plants have been removed; with a follow-up visit in July to cut down any plants that were missed and have gone to seed. All plants with flowers or seeds must be immediately bagged and removed from the site.

On level ground, mechanized equipment can be used to remove Scots broom using a tractor-mounted mower. Because these cuts are higher than the recommended basal cuts, the plants have a greater tendency to re-sprout. Using this method, broom plants typically require several cuttings before individual plants die. The best time for the first cutting is when the plants begin to flower (late May-June) when root reserves are lowest and new seeds haven't been produced.

Follow-up mowing on a regular basis throughout the summer is necessary to remove re-sprouted plants. All plants with seeds must be bagged and removed from the site.

Native plantings should be installed in cleared areas to shade out invasive seedlings. In areas of steep slopes, the Bradley method described in section 6.3 Planting is recommended to avoid disturbing large sections of unstable soil. In addition, bioengineering techniques described in section 6.5 should be implemented immediately to stabilize the slopes.

The timing for native woody plantings will be site dependant and must be determined at the time of project planning. Regeneration of any invasive species in the cleared area must be carefully weeded. If native plants have been installed or are regenerating on their own, weeding out invasives must be done with a discerning eye and sensitive touch.

2.8.4 FIELD BINDWEED (CONVOLVULUS ARVENSE)

Bindweed is a pervasive and very invasive perennial vine that winds around and overtops woody vegetation, forming a strangling mat over low shrubs and groundcover. It thrives in disturbed sites, especially sunny locations with moderately dry soils. It is most prevalent at the Park to the east of the Wetland/Stream Management Area.

Growth Habit:

Field bindweed spreads by seeds, an individual plant can produce 500 seeds. This species can also spread via vegetation reproduction from any small fragment of stem or root, and by an extensive root system. Most parts of the bindweed roots can produce buds, which then create new roots and shoots. Roots capable of budding are found to depths of 14 feet. By this means a single field bindweed plant can spread more than 10 feet in a growing season.

Recommended Control Treatment:

Tools needed :

- Heavy duty yard waste bags
- Roundup™ in a spray bottle

If herbicide is to be painted onto leaves (method #2):

- Glyphosate (non-selective) commercial brands: Aquamaster™, AquaPro™, Aqua Neat™, Glypro™, Rodeo™
- Small paint brush

Hand cutting or pulling does not serve to control field bindweed and only results in the spread of this species. Two different methods tried-and-true methods are described below. When using herbicides, treat the bindweed plants before they are drought stressed and preferably at the flowering stage of growth. Re-treatments will be necessary to control both established plants and seedlings.

Because of the dense extent of the morning glory infestation to the east of the wetland/stream Management Area, the most efficient way to remove the bindweed will likely be to initially hand pull the bind weed. Then revisit the area in four to six weeks and use a method that has been used successfully in the Pacific Northwest (Seattle Times 2006). This method calls for unwinding the bindweed from other plants and gathering up the runners without pulling them out of the ground. Stuff the runners into a plastic bag and use a twist tie to gently close off the bag near the ground (including as many leaves as possible). Poke a small hole in the bag, insert the spray tip of a pump sprayer and soak the bindweed with Roundup. The bindweed, roots and all, should be dead

after a few days and can be pulled up, placed entirely in the plastic bag, removed off site and disposed of appropriately.

A second method that can be used is to paint the leaves of bindweed using a 2 to 4% solution (volume to volume) of glyphosate. Be sure not to allow the herbicide to touch mature leaves or green bark of nearby native shrubs or trees or injury/death may result. To reduce the chance that glyphosate will contact desirable plants, place the bindweed vines on newspaper before painting the leaves with glyphosate. Once the glyphosate solution has dried on the bindweed leaves, the newspaper can be removed. Any regrowth of the field bindweed must be retreated.

Drought tolerance is a characteristic of field bindweed. So watering the mitigation area during the dry months of the year can assist desirable native species in competing better with bindweed.

2.8.5 JAPANESE KNOTWEED (*POLYGONUM CUSPIDATUM*)

Japanese knotweed s a semi-woody, bushy perennial that is persistent and aggressive in the landscape. At least one patch of Japanese knotweed occurs in the Upland Forest – Forest Zone near the beach access trail. It can tolerate a variety of adverse conditions including full shade, high temperatures, high salinity, and drought. Once sprouted, it is a rapidly colonizing invasive pest in natural areas and poses a significant threat to riparian areas. Rapid spring growth and deep extensive root systems enable this species outcompete most other plants – including trees and shrubs. It lowers the quality of riparian habitat and, dispite its large rhizome mass, it provide poor erosion control.

Growth Habit:

Japanese knotweed spreads rapidly from stout long rhizomes (spreading roots). While it does spread from seeds, this does not appear to be the primary source of spreading. Knotweed typically starts growing in April, although stems from deeply buried roots can emerge in late summer. It grows extremely fast in the spring and can reach heights of up to 10 feet. When it is cut or damaged, it vigorously and rapidly re-sprouts from the roots and rhizomes. Rapid upward growth slows in July and is greatly reduced after August. It dies back to the ground after the first hard frost and returns each spring from the same root system.

Its extensive roots can spread 20 feet from the parent plants and can penetrate 7 feet down into the soil. It spreads rapidly via vegetative reproductions: roots and stem fragments as small as ½" can form new plant colonies, cut or broken stems will sprout if left on moist soil or put directly in water, fragments are spread by animals, earthmoving equipment, careless clearing, and high water. It takes advantage of freshly disturbed soil and grows faster than native species and most other weeds; suppressing or killing the other species.

Recommended Control Treatment:

Tools needed :

- Heavy duty yard waste bags
- Glyophsate
- Jk injection tool (jkinjectiontools.com)
- Paint marker or marker tool
- Aquamaster or Roundup Pro Concentrate

Numerous methods of control have been tried on this insidious invasive plant. Prior to the injection method, a combination method using manual and mechanical tasks was used. The manual/mechanical method combined covering and cutting the knotweed. However, this method

requires a committed effort of twice per month treatments for at least 3 years and, due to the tenacious tendencies of this plant, even then does not always succeed.

Herbicide injection method is more time and labor intensive than foliar spray sinve every cane over ½" in needs to be treated. However, use of this method in King County resulted in 95% success rates in killing the knotweed in the first year of treatment and injection of the knotweed has not affected surrounding desirable native plants. Another advantage is that there are no cut stems to deal with (eliminating the possibility of further spreading the plants).

Start by inspecting the Japanese knotweed canes closely, you'll see that it is segmented. Where one segment ends and another begins, you will find a node. Between the nodes is a hollow tube, the same as occurs with bamboo. The injection needs to be done close to the ground between the first and second nodes (or between the second and third nodes if the stem is too woody lower down). The herbicide must be applied to every cane that is ½" and larger in diameter, injecting into the hollow section between the nodes. There will always be small stems, less than ½" in diameter, that must not be injected. In many cases, these stems will die after the application, but not always. Injections will need to be repeated in future years as necessary.

Although it's certainly possible to use the injection method at other times of the year, it is best to inject the plants is from mid-June to the end of September. Waiting till late summer or early autumn takes advantage of the plant's transfer of nutrients down through the canes into the rhizomes before the first frost. Currently, only Aquamaster and Roundup Pro Concentrate are labeled for stem injection. Follow the directions on the stem injection gun, especially for calibration and cleaning. Inject 3 to 5 ml into the stems (following directions provided on your herbicide label). Make sure the herbicide is delivered into the hollow section of the stem

2.8.6 ENGLISH HOLLY (*ILEX AQUIFOLIUM*)

English holly is a broadleaf evergreen tree/shrub that is grown ornamentally in the northwestern United States and Canada but is also commonly found escaping into forests where it can dominate the tall shrub layer and suppress germination and growth of native tree and shrub species. English Holly saplings were observed in the Upland Forest (Forest Zone) at the Park. In King County, English holly is classified as a Weed of Concern and its control is recommended in natural areas that are being restored to native vegetation and in protected forest lands.

Growth Habit:

This species prefers at least partial shade and is generally found in the understory of upland forests or along forest edges. I grows in shade or sun in well-drained soil and spreads via seeds distributed by birds. Trees and saplings also sucker and re-sprout vigorously when disturbed.

Recommended Control Treatment:

Tools needed :

- Heavy work gloves
- weed wrench (see http://www.weedwrench.com/)
- shovel
- pruning saw

Small seedlings and saplings can be pulled or dug up when soil is moist. Mature trees have deep and extensive roots so digging is labor-intensive and results in considerable soil disturbance if all of the roots are removed. Instead, the mature trees can be controlling by cutting or frilling (girdling the trunk by making a series of downward overlapping cuts all the way around the trunk and leaving the chips attached to the trunk at the base of the cut) the tree. Applying herbicide

with the cut stump or frilling method is most effective. Foliar herbicide treatment is not very effective due to the thick, waxy leaves. This technique should be used before fruit production so that standing plants do not have fruit on them. Treated cut stumps should be checked for re-sprouts every 2 to 6 months for the first year after cutting and re-treated as necessary. Where no herbicide is used, repeated cutting will be required to weaken and eventually kill the tree over time. This requires diligent follow-up visits over a period of at least several years to remove suckering growth that resulted from the initial cutting.

2.8.7 REED CANARYGRASS (*PHALARIS ARUNDINACEA*)

Reed canarygrass has not been observed at the park. However, as invasive species in the wetland and riparian areas are removed and soils are disturbed, it is likely that this species will appear at the Park. This grass

Growth Habit:

Reed canarygrass can readily form monocultures given adequate sun and moisture. Due to its vigorous growth, relatively tall habit and heavy seed production, it out-competes many native species available for sun and water. It also spreads vegetatively by rhizomes (an underground stem that sends out roots and new plant shoots).

Recommended Control Treatment:

Tools needed:

For mulching method:

- Cardboard
- Hand shears
- Weed free mulch
- shovel
- 2-gallon container native plants (see list below)
- Seed for meadow barley (see specifications below)

For herbicide method:

- Hand shears
- Glyphosate (non-selective) commercial brands: Aquamaster™, AquaPro™, Aqua Neat™, Glypro™, Rodeo™
- Backpack sprayer

Since reed canarygrass requires full sun, dense plantings of shrubby vegetation provides a fairly successful defense against reed canarygrass. The reed canarygrass will not disappear all together, but will be controlled to the point that it cannot form a monoculture and displace native species. The recommended native plantings in the Wetland/Stream Management Area will eventually create the shade needed to control the reed canarygrass. Initially, however, there will be enough sun to warrant the need to control this species.

If the reed canarygrass occurs only in small, scattered patches mulching is recommended to control it. This method uses cardboard laid out on top of the reed canarygrass around the new and existing native plantings to create shade. The cardboard should be overlapped and covered with a 6-inch layer of weed-free mulch so that no grass can grow up between the pieces of cardboard. If necessary, the reed canarygrass can be cut down to 4 inches tall using a hand shear, but extreme care must be taken to make sure that no native plants are cut down or injured. All cut grass must be either bagged and removed from the site to avoid spreading the seed. The area will

need to be checked periodically to make sure that the reed canarygrass is not growing up around the edges of the cardboard or coming up in additional areas.

For larger patches of reed canarygrass the herbicide method may be more appropriate. For this method, the grass should be cut back to 4 inches in height in the spring. This must be done with hand tools and prior to seed set to avoid spreading any seeds. Grass clippings need to be immediately bagged and removed from the site. Once the reed canarygrass has re-grown to 12 inches tall, herbicide can be applied using glyphosate at a rate of two percent. It should be sprayed again in the fall, with or without cutting. In areas where the reed canarygrass is near new or previously existing native plants, care must be taken to avoid spraying (either directly or by over-spray) the adjacent desired native vegetation.

2.8.8 LISTED NOXIOUS WEEDS

Currently, four of the five invasive species discussed above fall into King County's 2007 Non-Designated Noxious Weed List; including English ivy, field bindweed and Scots broom. Control of these species is recommended, but not required in King County. Japanese knotweed is a class B noxious weed listed on Washington State's noxious weed list. Control of this species is highly recommended but not required in King County. No other listed weeds were observed at the Park.

2.9 CRYTOBIOTIC SOILS

Cryptobiotic soils were discovered by the UW Restoration Ecology Network students on the steep sandy slopes at the Park. Formed by a network of sandy soil and living filaments, including lichens and mosses, these soil crusts increase the stability of otherwise easily eroded soils, increase water infiltration in regions that receive little precipitation, and increase fertility in soils often limited in essential nutrients (Belnap 2004). Cryptobiotic crusts are important for the restoration and stabilization of sandy slopes.

Biological soil crusts can assist in protecting highly erodible soils from wind and water erosion. The soil-binding action of this crust can extend down to 6 inches below the soil surface. Crustal cover is not reduced in drought, compared with vascular plants and these organic crusts are present year-round. Plants growing on crusted soil often show higher concentrations and/or greater total accumulation of various essential nutrients when compared to plants growing in adjacent, non-cryptobiotic crusted soils.

These soils are extremely susceptible to disturbance by trampling and take a very long time to recover. In the UW restoration site it was difficult to both remove the extensive Scots broom thicket and protect the crust. Restoration participants were aware of maintaining the crust and made every attempt to replace the disturbed crust or refrain from trampling the crust. Given the importance of the crust at the restoration site, the UW group set up an experiment to determine the most advantageous method of re-establishing this crust. Monitoring of this experiment results will hopefully yield information to aid in crust re-establishment in areas of disturbance.

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Appendix D

APPENDIX D
RESTORATION MONITORING FORMS

Transect Establishment Form

Restoration Site Location/Name: _____ Page ____ of _____

Date: _____ **Crew: _____**

Baseline Length: _____ **Baseline Bearing: _____**

Rationale for Transect Placement (such as the presence or absence of unidirectional slope, nearby road, etc.):

Rough Sketch of Restoration Site:

(include transect lines, photographic stations, notable nearby structures such as roads, parking areas. Indicate north arrow)

APPENDIX D
RESTORATION MONITORING FORMS

Photographic Record Form

Restoration Site Location/Name: ______________________________ Page ____ of _____

Date: _________ Crew: ____

Weather:____

Include photographs of surroundings, overview of restoration site, representative vegetation, evidence of animal activity, evidence of disturbance, evidence of stress, the view down the length of each transect (label by number), and other features of interest and importance. Indicate vantage point and bearing for Site Record Photos.

Use a new record sheet for every roll of film and/or each individual restoration site.

Digital: ______ Non-Digital: ______ Film Roll #: ______________________

Compass Reading	Photographic Description	Photo Frame #
________	____	__________
________	____	__________
________	____	__________
________	____	__________
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APPENDIX D
RESTORATION MONITORING FORMS

Plant Survival Form

(page 1 of 2)

Restoration Site Location/Name: _____ Page ____ of _____

Date: _____ **Crew: _____**

Weather:_____

Species Planted	Number of Plants	Number Observed	Total Observed	% Live	Comments
1.		**Live -** **Dead -** **Stressed -**			
2.		**Live -** **Dead -** **Stressed -**			
3.		**Live -** **Dead -** **Stressed -**			
4.		**Live -** **Dead -** **Stressed -**			
5.		**Live -** **Dead -** **Stressed -**			
6.		**Live -** **Dead -** **Stressed -**			
7.		**Live -** **Dead -** **Stressed -**			
8.		**Live -** **Dead -** **Stressed -**			
9.		**Live -** **Dead -** **Stressed -**			
10.		**Live -** **Dead -** **Stressed -**			

General Comments: _____

_____

_____

APPENDIX D
RESTORATION MONITORING FORMS

Plant Survival Form

(page 2 of 2)

Volunteer Vegetation:

Page ____ of _____

1. Are there volunteer species? YES/ NO

2. Are there invasive species present? YES / NO

Circle species: Scots broom, Himalayan blackberry, field bindweed, English ivy, Japanese knotweed, reed canarygrass, other _____

3. Are they overtaking the planting areas? YES / NO

4. List the common or scientific names of as many of the volunteer speces as you know that are present and write in the cover class:

Cover Class	
0 = Trace	3 = 26-50%
1 = 0.5-5%	4 = 51-75%
2 = 6-25%	5 = 76 – 95%
6 = 96%+	

Common Name	Scientific Name	Cover Class

Comments: _____

_____

_____

APPENDIX D
RESTORATION MONITORING FORMS

Vegetation Assessment Form

Restoration Site Location/Name: _____ Page ____ of _____

Date: _____ **Crew: _____**

Weather:_____

QA/QC: _____

Community Type: Circle One: Forest / Shrub / Herbaceous / Beach Dune

Tree		**Shrub**		**Herb**	
Species Name:		**Species Name:**		**Species Name:**	
Common	**Scientific**	**Common**	**Scientific**	**Common**	**Scientific**

Community Type: Circle One: Forest / Shrub / Herbaceous / Beach Dune

Tree		**Shrub**		**Herb**	
Species Name:		**Species Name:**		**Species Name:**	
Common	**Scientific**	**Common**	**Scientific**	**Common**	**Scientific**

Comments:

APPENDIX D
RESTORATION MONITORING FORMS

Vegetation Percent Cover Form

Restoration Site Location/Name: _____ Page ____ of _____

Date: _____ **Crew: _____**

Weather:_____

QA/QC: _____

Transect Sample #:			
Strata Type:			
Bare Soil Cover Class:			

Species Name:	Cover class:	Species Name:	Cover class:	Species Name:	Cover class:

Comments:

Strata Types: HERBaceous = 1 m radius SHRUB = 5 m radius FOREST: = 10 m radius
Cover Class: 0 = Trace 1 = 0.5-5% 2 = 6-25% 3 = 26-50% 4 = 51-75% 5 = 76-95% 6 = 96-100%

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Appendix E

APPENDIX E

RESTORATION PERFORMANCE TARGETS

Table E-1. Year 1 Performance Targets

	Landscape Zones			
Parameter	**Erosion**	**Scrub**	**Forest**	**Beach**
Native Plant survival[1]	At least 80 percent	At least 80 percent	At least 90 percent	At least 80 percent
Native Woody Plant cover	At least 5 percent	At least 5 percent	At least 5 percent	At least 5 percent
Ground cover	At least 15 percent	At least 15 percent	At least 15 percent	At least 15 percent
Invasive species cover	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of ivy in trees, field bindweed & Japanese knotweed. Up to 15% cover all other invasive species combined	0 tolerance of mature flowering Scots broom. up to 15% cover all other invasive species combined
Native species diversity[2]	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 7 native species.
erosion	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.

1- Percent survival can be figured using the planted native species and any native volunteer species.
2- Appropriate volunteer native species will be allowed to count toward richness quantities.

Table E-2. Year 2 Performance Targets

	Landscape Zones			
Parameter	**Erosion**	**Scrub**	**Forest**	**Beach**
Native Plant survival[1]	At least 75 percent	At least 75 percent	At least 85 percent	At least 75 percent
Native Woody Plant cover	At least 10 percent	At least 10percent	At least 10 percent	At least 10 percent
Native Ground cover	At least 30 percent	At least 30 percent	At least 30 percent	At least 30 percent
Invasive species cover	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of ivy in trees, field bindweed & Japanese knotweed. Up to 15% cover all other invasive species combined	0 tolerance of mature flowering Scots broom. up to 15% cover all other invasive species combined
Native species diversity[2]	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 7 native species.
erosion	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.

1- Percent survival can be figured using the planted native species and any native volunteer species.
2- Appropriate volunteer native species will be allowed to count toward richness quantities.

APPENDIX E

RESTORATION PERFORMANCE TARGETS

Table E-3. Year 3 Performance Targets

	Landscape Zones			
Parameter	**Erosion**	**Scrub**	**Forest**	**Beach**
Native Plant survival[1]	At least 70 percent	At least 70 percent	At least 80 percent	At least 70 percent
Native Woody Plant cover	At least 20 percent	At least 20percent	At least 20 percent	At least 20 percent
Native Ground cover	At least 60 percent	At least 60 percent	At least 60 percent	At least 60 percent
Invasive species cover	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of ivy in trees, field bindweed & Japanese knotweed. Up to 15% cover all other invasive species combined	0 tolerance of mature flowering Scots broom. up to 15% cover all other invasive species combined
Native species diversity[2]	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 7 native species.
erosion	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.

1- Percent survival can be figured using the planted native species and any native volunteer species.
2- Appropriate volunteer native species will be allowed to count toward richness quantities.

Table E-4. Year 5 Performance Targets

	Landscape Zones			
Parameter	**Erosion**	**Scrub**	**Forest**	**Beach**
Native Plant survival[1]	At least 65 percent	At least 65 percent	At least 75 percent	At least 65 percent
Native Woody Plant cover	At least 50 percent	At least 50 percent	At least 50 percent	At least 50 percent
Native Ground cover	At least 90 percent	At least 90 percent	At least 90 percent	At least 90 percent
Invasive species cover	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of ivy in trees, field bindweed & Japanese knotweed. Up to 15% cover all other invasive species combined	0 tolerance of mature flowering Scots broom. up to 15% cover all other invasive species combined
Native species diversity[2]	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 7 native species.
erosion	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.

1- Percent survival can be figured using the planted native species and any native volunteer species.

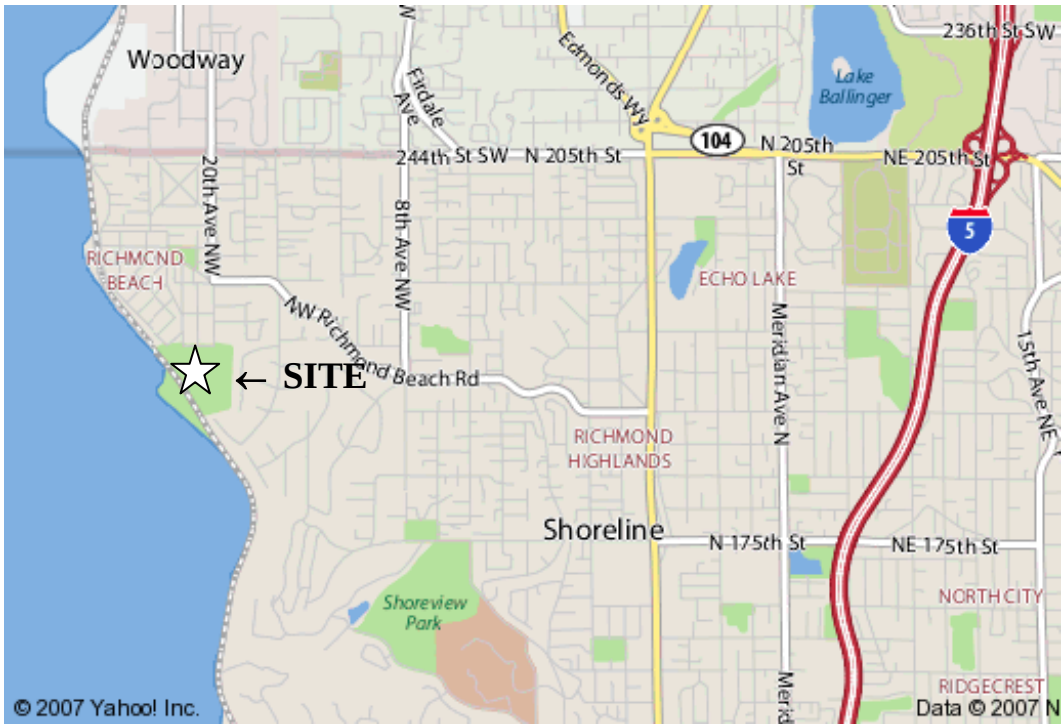
2- Appropriate volunteer native species will be allowed to count toward richness quantities.

Table E-5. Years 10, 15, and 20 Performance Targets

	Landscape Zones			
Parameter	**Erosion**	**Scrub**	**Forest**	**Beach**
Native Plant survival[1]	At least 60 percent	At least 60 percent	At least 70 percent	At least 60 percent
Native Woody Plant cover	At least 80 percent	At least 80 percent	At least 80 percent	At least 80 percent
Native Ground cover	At least 50 percent	At least 50 percent	At least 50 percent	At least 50 percent
Invasive species cover	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of mature flowering scots broom. up to 15% cover all other invasive species combined	0 tolerance of ivy in trees, field bindweed & Japanese knotweed. Up to 15% cover all other invasive species combined	0 tolerance of mature flowering Scots broom. up to 15% cover all other invasive species combined
Native species diversity[2]	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 3 native tree and 4 native shrub species.	A minimum of 7 native species.
erosion	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.	No signs of surface erosion or failure of bioengineered slope stabilization.

1- Needs to be done only in Year 10 monitoring. Percent survival can be figured using the planted native species and any native volunteer species.

2- Appropriate volunteer native species will be allowed to count toward richness quantities.



Not to Scale

N

source: Yahoo.com 2007

TES TOUCHSTONE ECOSERVICES	Richmond Beach Saltwater Park City of Shoreline, WA	**Vicinity Map**	**Figure** 1.1

LEGEND

- COMMUNITY ACTIVITY LANDSCAPE ZONE
- EROSION LANDSCAPE ZONE
- FOREST LANDSCAPE ZONE
- SCRUB LANDSCAPE ZONE
- SHORE LANDSCAPE ZONE

Figure 4.1 -
LANDSCAPE ZONES

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LEGEND

- COMMUNITY ACTIVITY LANDSCAPE ZONE
  - 1 Built and Ornamental Mangement Area
- EROSION LANDSCAPE ZONE
  - 2 Upland Forest Management Area
  - 3 Non-native Shrub Management Area
  - 4 Steep Slope Hazard Management Area
- FOREST LANDSCAPE ZONE
  - 5 Upland Forest Management Area
  - 6 Wetland Management Area
- SCRUB LANDSCAPE ZONE
  - 7 Non-native Shrub Management Area
- SHORE LANDSCAPE ZONE
  - 8 Non-native Shrub Management Area
- BNSF RIGHT-OF-WAY

NORTH

HEWITT

Figure 4.2 -
MANAGEMENT AREAS