Golden Gardens Park
Vegetation Management Plan

Prepared for
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EXECUTIVE SUMMARY

The Golden Gardens Vegetation Management Plan addresses the forest resource of Golden Gardens Park. This includes both the forested hillside east of the Burlington Northern Railroad and also areas along the beach that contain trees and associated vegetation. The plan provides Seattle Parks and Recreation staff and allied citizens long-term goals and intermediate (20 year) objectives for managing the park's vegetation. The plan is based on related planning documents, including the Seattle Parks COMPLAN, the Urban Wildlife and Habitat Management Plan, and the Seattle Parks and Recreation Tree Policy. It extracts long-term goals from these sources and develops related objectives based on the condition of the forest resource, historical context, ecological trends, and the potential of the community and management resources.

In Chapter 4, the plan reviews the known issues about park vegetation. It discusses the geology of the hillside, the history of slides in the park and the limited role that vegetation plays in these events. It describes the general forest character and conditions. It reviews hazard tree conditions and characterizes the trees with greatest hazard potential. It evaluates the habitat potential and limitations found in the park. It describes the impacts of human use on the park's vegetation.

In Chapter 5, the plan analyzes the data that the consultants collected from 17 sample plots distributed throughout the hillside and the 100 trees identified for potential hazard. The data show that the hillside forest consists primarily of bigleaf maple, except in the slide-affected portions in the north end of the park where alder is more prevalent. Tree health is generally good, with certain exceptions as noted. English ivy is the most common understory species, which represents a widespread problem with non-native, invasive plants. Tree regeneration and decaying wood features are below optimal levels.

In Chapter 6, the plan divides the park into several six management area types that correspond to stands of trees with similar canopy composition and condition. The plan then superimposes this analysis with an overlay that refers to five understory issues. The result is a map of the park that illustrates the fundamental forest conditions found there. The plan identifies two quality habitat areas found in the South and Central portions of the hillside, which have minimal invasive species present and high wildlife habitat value. Priorities in project implementation for the forested hillside are centered on expanding these areas with reforestation efforts in proximity. Hazard tree management assigns the 100 identified trees into three action categories: removal/replacement, pruning/monitoring, and further inspection.

In Chapter 7, the plan details recommended management practices for implementing the projects outlined in Chapter 6. These include not only horticultural prescriptions, but also planning and evaluation protocols to improve project implementation with each successive generation of projects. Chapter 8 proposes that priority for project work should focus on the South and Central Sections of the hillside, as well as the north end of the Beach Section. All projects are planned around maximizing volunteer partnerships between Seattle Parks and Recreation and community volunteers. A 20-year implementation budget for the critical forest management priorities is estimated using this approach. The consultants estimate that work in the priority areas outlined in Chapter 6 would require 33,000 hours of volunteer labor, combined with 5,700 hours of staff time, $112,000 in contractor costs and $242,000 in materials (in 2003 dollars). The total value of this work is estimated at $947,000 (in 2003 dollars).

CHAPTER 1: OVERVIEW

1.1 Introduction

Since 1994, Seattle Parks and Recreation (hereafter referred to as “Parks”) has been at work enhancing the beauty, sustainability and safety of publicly-owned urban forest. City parks cover approximately 10% of Seattle's land, and urban forest extends over much of that area, in both formal and natural park landscapes. As open land shrinks and population grows, pressure on this resource increases. Meanwhile, tree planting has not kept pace with the trees that have been lost to storms, age and disease. Aggressive non-native species like English ivy, holly, laurel and blackberry have smothered native undergrowth and halted establishment of new tree generations. With positive intervention we can overturn this trend.

Citizens of all ages and walks of life have given abundant time and talent toward helping us meet this great challenge. Parks’ Urban Forest Restoration Program develops - and with community support - implements vegetation management plans for individual Seattle parks. The department selected Golden Gardens Park as an important site that would benefit from a vegetation management plan. The plan was funded from the City's Cumulative Reserve Fund as part of the department's Major Maintenance Program. Consultants from Sound Tree Solutions and Arboriculture and Restoration were selected to develop this plan. Plan development began in August of 2003 and was completed in December of 2003.

1.2 Site Location and Context

Golden Gardens Park is a City-owned property located in the northwest part of Seattle along the Puget Sound shoreline, just north of Shilshole Bay Marina. The park is approximately 67 acres and could be acclaimed as one of the most diverse public spaces for its size in the Seattle parks system. It includes almost every feature possible for an urban green space: sandy and rocky beaches with tidelands, dunes, a bathhouse, a recreational grass field, streams, wetlands, miles of trails through native forest, and an off-leash dog area. The Burlington Northern railroad right-of-way bisects the park property with underpasses for both pedestrian and vehicular traffic.

Golden Gardens has been a highly used park since before its designation as a public space back in 1923. The area of most intensive use has been in beach area in the west part of the park. Logically, the most improvements have been in that area, including a recent wetland planting, the current bathhouse renovation, and well-maintained picnic and sports facilities. Nothing extensive has been done for the forested hillside of the park. Being a natural open space dominated by a passive use trail system, the upper Golden Gardens Park area is in need of a Vegetation Management Plan (VMP) and proactive efforts to ensure the conservation and safety of the site.

There have been an increasing number of tree failures along Golden Gardens Avenue that runs along the east edge of the park. While the main focus of this VMP is the upper, forested portion of the park, assessment of hazard trees in all high-target areas of Golden Gardens has been included also.

CHAPTER 2: GOALS, OBJECTIVES AND POLICIES RELATING TO VEGETATION AT GOLDEN GARDENS

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

2.1 Overall Goals

There are several documents and manuals developed by the Seattle Parks and Recreation Department (hereafter referred to as "Parks") that provide the policy framework for all aspects of park management, ranging from overarching departmental level goals to specific objectives for particular elements or resources. It is important that these pieces are considered throughout the vegetation management planning process to ensure consistency and compliance with Parks protocol.

2.1.1 Seattle Parks COMPLAN (2000)

The COMPLAN is the comprehensive plan developed by Seattle Parks to guide policy and decision-making for parks and recreation facilities. The original 1993 COMPLAN was updated in 2000 and is to be " a living document through which changing conditions as well as ongoing public involvement can be considered in decisions affecting the future of Seattle's park and recreation system." The revision also includes a six-year action plan for specific tasks to be accomplished.

Parks revised their mission statement in COMPLAN 2000 to state that they "will work with all citizens to be good stewards of our environment, and to provide safe and welcoming opportunities to play, learn, contemplate and build community."

Among the policy statements and action plan elements in the COMPLAN, the Steward of Park Resources and specifically Park Management & Environmental Stewardship are the appropriate sections that apply to the Golden Gardens VMP. The management strategies easily support all the primary roles and responsibilities, with focus on the following policy statements:

- Tree management and maintenance will include consideration of tree health, long-term reforestation needs such as the role of trees in providing wildlife habitat and other environmental benefits, historical context, and tree impacts such as public safety, views, aesthetics, street or sidewalk damage, and maintenance requirements.
- Park horticulture practices and maintenance procedures will include consideration of the following:
    (a) Integration with natural and historic resource management
    (b) Replanting with native species for wildlife habitat enhancement and/or drought-resistant plants for water conservation.
    (c) Other factors related to water conservation.
    (d) Pruning or thinning for safety, utility lines, and views from private property, consistent with more specific policies for such pruning or thinning.
    (e) Coordination with the community and Seattle police for security visibility.

- Provide for forest community restoration in Seattle's parks and open spaces with appropriate, site-specific reforestation projects. Undertake restoration and enhancement of grasslands, wetlands and other natural landscape types as appropriate. Involve the use of volunteers and other community organizations in such efforts.

In the Six-Year Action Plan, specific activities relevant to the Golden Gardens VMP are as follows:

- Foster a feeling of community ownership and pride, focusing on community participation in planning, design development, programming, and maintenance.
- Maintain the living park inventory of plants and trees, focusing on reforestation, enhancement and restoration of natural communities, plant replacement, turf restoration, control of nuisance plants, and provision of proper conditions for growth.
- Designate and protect natural and historic resources (including wildlife habitat) within parks, focusing on sensitive resource management, public information, staff training, and maintenance procedures.

2.1.2 Urban Wildlife and Habitat Management Plan (2000)

Parks developed the Urban Wildlife and Habitat Management Plan (UWHMP) in 1994 and updated in 2000. The plan provides a "framework and guidelines for integrating natural and human systems in Seattle's parks and open spaces." The first and main goal of the UWHMP is "to continue and increase wildlife protection and enhancement efforts" which will be basis for the vegetation management objectives of the forested area of Golden Gardens. The following sub-goals are considered in this VMP:

- Protect existing habitats from degradation
- Allow human use and enjoyment of park natural resources while protecting wildlife and habitat
- Maintain habitat and species diversity
- Protect critical, sensitive, and rare habitats
- Promote protection of existing yet unprotected habitat

As outlined in the UWHMP, actions to strive toward these goals in this VMP include:

- Removal of non-native vegetation (where appropriate)
- Planting native vegetation
- Possible designation of park habitat areas as wildlife areas
- Vegetation management to prevent trail and slope erosion
- Closing unauthorized informal trails
- Restricting certain uses (e.g., bicycles and off-leash dogs) on trail system

The goals of the UWHMP that are indirectly addressed in this VMP are protecting and enhancing wildlife populations and developing, and maintaining a wildlife resource inventory. The management recommendations of this do incorporate the other goals of environmental education, volunteer involvement, internal education and consistent departmental actions, and interdepartmental and interagency cooperation.

2.1.3 Seattle Department of Parks and Recreation Tree Policy (2001)

The purpose of the Parks Tree Policy is as follows:

- To maintain, preserve, and enhance the urban forest within parks;
- To increase overall tree canopy, tree health, and tree longevity within parks; and
- To ensure that parks trees are managed in a manner that is consistent with other departmental and municipal policies.

Canopy - the uppermost layers of foliage in the forest overstory.
Overstory - any plants that have achieved a height greater than 15 feet, usually comprised of trees, but can also include large shrubs.

There are two distinct areas of Golden Gardens to which the Tree Policy applies and are discussed in this VMP: the developed landscape of the beach area and around facilities and the undeveloped landscape of the native forested areas which has limited access by a trail system.

The Tree Policy provides detailed criteria in which tree and vegetation removal, pruning, and replacement may occur on park property. Overall vegetation management as recommended in management plans such as this one, must also follow certain threshold and performance criteria as well as several management objectives including pertinent topics as:

- Extent and Phasing of Vegetation Management
- Public Safety
- Soil and Water Conservation
- Potential Slide Areas
- Habitat Improvement
- Native Vegetation
- Control of Invasive Exotic Vegetation
- Retention of Vegetation
- Replacement and Maintenance of Vegetation

2.1.4 Seattle Parks and Recreation Best Management Practices Manual (2002)

The recommended actions in a vegetation management plan for a park should not counter any identified Best Management Practices (BMPs) assembled in the Seattle Parks and Recreation BMP Manual. The appropriate resource area in the Manual for the Golden Gardens VMP is the "Natural Area – Forest" where the guide provides best practice for forest cover, canopy regeneration, erosion control, steep slopes, organic debris and fire prevention. Other sections of the Manual that are referred to in this VMP are BMPs for Trees and Integrated Pest Management (IPM) in Natural Areas.

Regeneration - the long-term process of replacing mature trees that are in decline with younger trees that grow nearby. Regeneration can occur naturally and can be augmented by planting sapling trees.

2.2 Golden Gardens Park Related Plans

2.2.1 Planting Plan for Golden Gardens Wetland (2001)

This recent planting plan was developed for the wetland area in the northern end of the Beach Area of the Park. Areas of the east pond were stabilized with large woody debris. In this area, the plan calls for planting wetland emergent and adaptable woody shrubs. Willow (*Salix hookeriana*) was excluded because of height restrictions in this area. In the north edge of the west pond area, there is a wide mud gradient where wetland would be planted. Along the south edge, a wider range of plants were selected, including a variety of wetland emergents, adaptable woody shrubs, and two small tree species, hawthorn (*Crataegus douglasii*) and crabapple (*Malus fusca*).

Emergent - a wetland plant that lives with roots in standing water but produces stems and leaves that protrude above the water surface.

2.2.2 North Salmon Bay Community Forestry Strategic Plan (1997)

Document developed for a larger community forest unit but includes discussion of the upper portion of Golden Gardens Park contiguous with Sunset Hill Greenbelt as the "closest thing to a significant 'natural' environment in the area." Strategies outlined in the strategic plan that pertain to this area are incorporated where appropriate into this VMP.

2.3 Golden Gardens Vegetation Management Plan Goals and Objectives

Goal 1: Manage hazard trees for public safety

Objectives:

1.a. Remove or lower high hazard trees

1.b. Inspect and monitor other trees on a regular basis

Goal 2: Improve overall forest health

Objectives:

2.a. Control invasive plant species (where appropriate)

2.b. Reduce human impacts to vegetation (encampments, trail compaction, social trails and party areas, topping, dumping)

2.c. Stabilize eroding areas with vegetation

2.d. Increase native species richness in the shrub and tree layers

Goal 3: Manage toward a mixed deciduous/coniferous forest

Objectives:

3.a. Increase conifer density throughout the forested area

3.b. Manage canopy openings to allow diversity of conifer species to be planted

3.c. Increase species diversity of deciduous trees in the forested area

Goal 4: Improve wildlife habitat quality

Objectives:

4.a. Increase snag density

4.b. Increase quantity of down wood

4.c. Increase native plant species richness and structural complexity of forest

4.d. Ensure no degradation of water quality for downstream wildlife

Goal 5: Achieve plan goals through effective collaboration of staff, contractors, and community-based volunteers on forest management projects.

Objectives:

5.a. Empower front-line staff to lead project planning, implementation and evaluation ("adaptive management")

5.b. Coordinate project planning, implementation and evaluation protocols among Parks units

5.c. Foster community stewardship of project sites by organizing appropriate tasks/activities for interested volunteer groups and individuals.

5.d. Utilize City BMPs and project specifications to hire qualified contractors for technical segments of project work

CHAPTER 3: PLAN CONTEXT

3.1 Site Character

The upper portion of Golden Gardens Park consists of 36 acres of predominantly bigleaf maple and mixed deciduous coniferous forests covering a significantly sloped hillside. The upper parking lot, grass, and the off-leash dog area are an open meadow.

The Golden Gardens Avenue snakes through the upper hillside portion of the park connecting with View Avenue to the northeast and Seaview Avenue NW to the southwest direction. Private residences are located opposite (uphill from) the park along the upper portion of Golden Gardens Avenue.

Upper Golden Gardens experiences a high volume of use in certain areas. The relatively new off-leash area, the stairway connection to the beach, and the roadway are the places with the high activity. With the ever-increasing issues of trail stability, forest health, and tree failure in these areas, this VMP is mainly devoted to this upper portion of Golden Gardens Park.

In contrast, lower Golden Gardens Park is 25 acres of developed, mostly level landscape. The lawn and beach areas are defined and bordered by plantings of wind and salt-resistant shade trees. In the north part of the beach area a wetland and dune area provide passive park use in important shoreline habitat.

3.2 Park History

The Puget Sound shoreline in the Ballard area was a highly coveted "port" for the Native American people (the Shilshole-amish) for hundreds of years. The sandy beach area was used to shore canoes and transfer to freshwater boats for traveling inland.

It was in 1908 when entrepreneur Harry Whitney Treat wanted to promote the Loyal Heights area for development and opened an amusement park on 30 acres of beach and lowland property naming it Golden Gardens. An automobile trail, now known as West 85th Street and 32nd Avenue Northwest, connected the park to the rest of the world.

One of the major features promoted by Treat and other developers of the area was the beauty of the upper area of Golden Gardens.
"A long trail leads down to the park, which abounds in pretty rustic bridges and winding trails. A number of springs from a pretty brook which falls down the steep ravine and as the ravine has been left in its natural beauty, the effect is very pretty."

An article in the Seattle Post Intelligencer in 1909 described plans to preserve the woodland "absolutely as it is today as Seattle's first zoological garden… the wild things of the wood still roam as they do in their natural habitat."

After strong urging to make the area a municipal park for at least a dozen years, the City Council purchased the 52-acre beach and park-like uplands from the Treat Estate for the "ridiculous" some of $37,000 in 1923.

Early on, several local groups, such as the Ballard Commercial Club, Sunset Hill Improvement Club and Lions, participated in the master planning, creation, and services for the park as we know it today.

In May of 1929 the Park Engineer reported to the Ballard Commercial Club, "the upper park area has a number of nice groups of trees, but a great many large trees were cut down before Parks took over the land." Furthermore, the steep slope of the upper area was not conducive to an amenable pedestrian way to the beach. In 1931 additional upland property was purchased in order to construct the Golden Gardens Avenue to make a connection.

According to Sherwood Historical photo file on Golden Gardens, the WPA embarked on some improvement projects in 1936. The concentration of the work was between the upper meadow downhill to Golden Gardens Avenue and included a stairway with "waterway" feature, a stone wall along the Avenue, and slide control features along the slope. The area was denuded of vegetation during construction, save the group of conifers at the top of the slope next to the parking lot.

Not much other significant cultural history of the upland area is available. As seen in earlier photos, a caretaker's residence was in the approximate location of the upper parking lot, and was torn down in the early 1960's.

The natural history of the area is highlighted with much slide activity particularly in the 1970's. A slide that damage three homes along View Avenue in 1974 set park neighbors to hire engineers to design and install an effective drainage system. Parks gave permission for these drains to be installed in Golden Gardens Park and has maintained the drains that were installed there.

The activity of service groups through the decades is evident with plantings of Norway spruce around facilities in the upper meadow, a lombardy poplar or two and other non-natives along the east side of the middle parking lot, and intermittent maturing coast redwoods found along the north trail system.

3.3 Citizen Activities and Concerns

The two major activities in the hillside area of Golden Gardens are the Off-Leash Area (OLA) in the upper meadow and trail use throughout the greenspace. The OLA was installed in 1999, and appears to be a very popular site for dogs and owners alike.

Unfortunately, there has been great concern about the use of the north forest (and beach area) as an unofficial extension of the off-lease area, resulting in off-trail damage to vegetation and alleged cause for erosion and compaction of the soils.

Other concerns were made known to the consultants at various times throughout the data collection time of the plan process. Park users, Park staff, and citizens attending the September 30, 2003 public meeting provided these other issues:

- Lost views due to maturing park trees
- Illegal tree cutting on park property
- Hazard trees along trail system
- Brush, yard waste and debris dumping in park
- Mountain beaver activity on hillside
- Noise from park activity in beach area
- Fragile slopes and trail erosion
- Safety along railroad tracks
- Invasive plants threatening native forest

3.4 Interested Organizations

There have been numerous community and service groups involved in Golden Gardens in the past then years. Park staff identified several potential or recently active partners in park projects:

- Community
  - Seattle Pacific University
  - Seattle Works
  - Groundswell Northwest
  - Woodland Park Zoo Corps

- Schools
  - Hamilton Middle School
  - Salmon Bay School
  - NOMS (New Options)
  - University Prep
  - The Bush School
  - UW WashPIRG
  - UW Botany Club

- Youth
  - Golden Gardens Teen Center
  - Brownie Troop 547
  - Cub Troop 135
  - Boy Scouts
  - City Year
  - Americorps

Groups who participated in particular projects in Golden Gardens include the North End Flower Club for the beach turnaround circle, Friends of Golden Gardens Wetlands for the Wetland Planting Plan, and Coalition for Off-Leash Areas (COLA) for the upper meadow OLA. Other community partners noted are the Sunset Hill Park Association and the Audubon Society.

Contact information for each of these groups should be kept current, and Park staff is to ensure they are aware of the development of this VMP and any volunteer opportunities for implementation.

3.5 Vegetation-Related Uses

There are a limited number of human uses of the upper Golden Gardens area: trail use, vehicular and bicycle traffic on Golden Gardens Avenue, and the enclosed off-leash dog area. The placement of the off-leash dog area at this site was not because of the forest setting, but rather the open-meadow space had the capacity to service the community need. The unfortunate result has been the "creeping" of the off-leash activity onto the adjacent trail system causing damage to the native forest vegetation and the trails.

The trail use is basically for two purposes: passive enjoyment of the forest setting particularly to the north and the connection between NW 85th Street, the upper parking lot, and the beach area. The most heavily used portion of the trail system is the stairway from the upper parking lot to the "trail" and tunnel to the beach area. Safety of the higher use trails above and below the meadow area is sought with the hazard tree assessment.

Golden Gardens Avenue experiences a rather high volume of traffic being a major connection to Loyal Heights and Shilshole Bay Marina (Seaview Avenue) and to the ever-popular beach area of the park. Since the majority of tree failures have occurred along the Avenue, the hazard tree assessment also includes this area.

CHAPTER 4: ASSESSMENT OF EXISTING CONDITIONS

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

This chapter provides a brief qualitative overview of the conditions in the Golden Gardens. A more detailed quantitative summary of forest conditions is provided in the Findings and Description of Management Areas Chapter 5.

4.1 Geology and Soils

Golden Gardens Park is a coastal bluff located on the eastern shore of Puget Sound. The topography of the hillside is characterized by moderate (15-40%) to steep (>40%) slopes, most of which are west facing. The hillside contains upper layers of sand over silt and clay layers that occupy middle and lower elevations of the hillside. See Figure 1. Erosion and downward movement of these layers has caused accumulation of sandy deposits called *colluvium* on the bluff face.

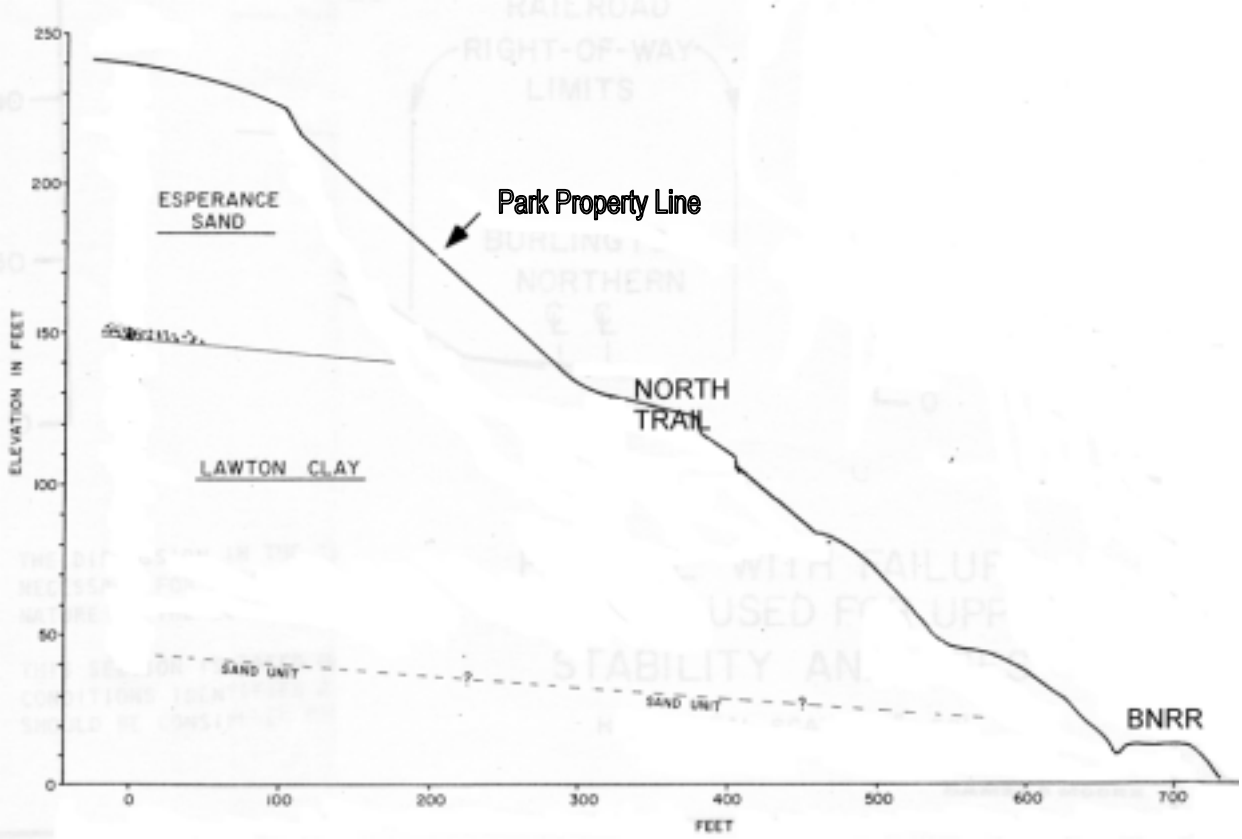


Figure 1. Profile of the northern hillside of Golden Gardens (adapted from Ford (1979)

Generalized soil data is available on the City of Seattle's Geographic Information System (GIS). This data was reviewed (see Appendix J-2). Information on soil type was collected in the field for this project. These data indicate that soil type is fairly uniform throughout the greenspace. Most areas were characterized as having mineral soils with either sand or loamy sand. Silt and clay substrata were observed on the lower slopes of the northern portion of the park, with corresponding soil textures ranging from sandy loam to loam. No organic soils were found.

With the exception of wetlands and stream corridors, soils in the area tend to be excessively well drained.

4.2 Slope Stability and Erosion

The northern portion of the park has a history of slope instability. Colluvium on the bluff face forms the soil that the hillside vegetation grows upon. Trees and shrubs cover this colluvium and protect it from further erosion. The roots of these plants also reinforce the soil and improve its ability to hold together as a single mass. However, as illustrated in Figure 2, roots are usually unable to penetrate the dense, highly compacted strata underneath the colluvium. Therefore, the vegetation has very little ability to attach the soil mass to the hillside. This counters the common impression that trees can “prevent” slides. If a soil mass becomes weakened because of groundwater and geological conditions, the vegetation will offer only minor resistance to that instability. Managing vegetation cannot prevent landslide activity in Golden Gardens Park. To the extent it is possible, this VMP will not exacerbate existing unstable conditions or create new instability.

Until the development of the railroad, wind and wave action was eroding the shoreline in the north portion of the park. Similarly, onshore currents have been depositing sand on the shoreline in the south portion of the park. Erosion of the shoreline in the north portion of the park previously caused the bluff to slide and retreat to the east. Development of the railroad involved placement of rip-rap (large rocks) along the north shoreline, as well as cutting into the toe of the slope for the rail grade. The rip-rap contributed to stability of the bluff by stopping wave erosion along the toe of the slope. The rail grade introduced new instability to the bluff. In the report, Ford (1979) suggested that the original cut and the continued removal of slide material from the rail grade have "contributed to the instability of the lower slope and thus, overall retreat of the entire slope."

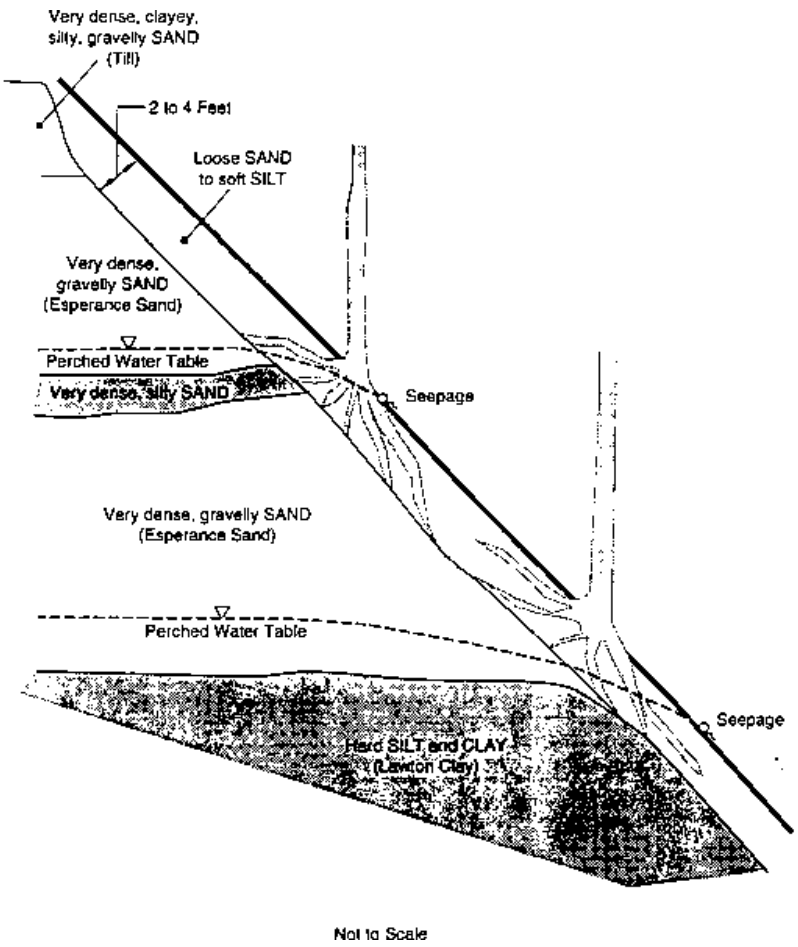


Figure 2. Generalized Seattle Bluff Profile, from *Magnolia Boulevard Vegetation Management Plan*, adapted from Tsukamoto and Kusaba, 1984.

According to the Seattle Landslide Database, there have been eight recorded landslides in or adjacent to Golden Gardens Park. Seven of these have been surface colluvium slides. See Appendix B for a summary of these slide events. The southern portion of the park has no recorded history of slides. The northern portion of the hillside has experienced repeated sliding in certain areas. The area to the west of Golden Gardens Drive approximately 100 yards south of View Avenue NW has three recorded slides. These were caused by a combination of factors, including groundwater, surface water and fill soils. The construction of Golden Gardens Drive placed a substantial overburden of fill on the existing slope in this location. Further north, an area west of 9037, 9039 and 9043 View Avenue NW experienced a massive slope failure in 1974. This event followed a winter of rainfall that exceeded the 40 year average. This event was the only slide event that involved deep-seated instability and was not primarily a movement of surface colluvium. The remaining four slides were located at 9125 View Avenue NW, to the north of the park. Evidence of other, unrecorded landslides were observed during site assessment, including stands of dense, sapling alders that indicate an area of prior disturbance, presumably from slide activity.

Erosion is a significant process in Golden Gardens Park. The sandy soils on slopes above 15 percent are vulnerable to sloughing if disturbed. In contrast to mass movements of soils (slides)

discussed above, erosion can be controlled by managing vegetation. Maintaining vegetative cover and preventing disturbance are key strategies in preventing further erosion of the hillside.

4.3 Streams and Wetlands

Numerous small streams originate in the hillside of Golden Gardens Park and flow into Puget Sound (Appendix J-1). In several places, streams have been placed in rock-lined channels or collected into pipes and conducted down the hillside, while minor flows have remained in natural channels. These flows are collected at the bottom of the hillside, piped under the railroad right-of-way, and eventually discharged into the beach area. Some are identified in the existing GIS database. Others were mapped during the data collection process. The most prominent stream is the one that flows from the upper parking lot down a steep ravine adjacent to the stairway. It is piped under Golden Gardens Drive, the railroad right-of-way and outlets into Puget Sound at the south end of the beach. To the north, another stream originates to the west of the upper curve in Golden Gardens Drive south of View Avenue. This stream flows to the parking lot and enters a storm drain. Further north, numerous seeps and flows can be found that drain into the drainage swale along the railroad grade. Some of these are piped along the surface to reduce erosion and slide risk incurred by the overland flow of water.

The toe of the hillside is punctuated with wetlands. These range from the large open water wetlands at the north end of the beach area, to numerous small wetlands, some less than 250 square feet, along the forest edges along the railroad right-of-way and Golden Gardens Drive. Understory species richness is high in the wetlands in comparison to surrounding upland forest areas. Wetland understory dominants include elderberry (*Sambucus racemosa*), salmonberry (*Rubus spectabilis*), and lady fern (*Athyrium filix-femina*). Directly to the southeast of the underpass at Golden Gardens Drive, a sizeable wetland is dominated by pacific willow (*Salix lasiandra*). Directly north, near the hairpin turn, another wetland contains an extensive patch of Himalayan blackberry (*Rubus procerus*). Despite the extent of invasive plant species in the wetlands, native species richness is high. There are also a few wetlands perched on the hillside. One is just uphill from the hairpin turn. Another is further north associated with the stream that originates west of the upper curve in Golden Gardens Drive.

The primary functions provided by the wetlands in the greenspace include wildlife habitat, natural system support (e.g., organic export), water quality improvement, and groundwater recharge. The wetlands are on public lands and therefore have the potential to provide passive recreational (e.g., bird watching) and educational values.

4.4 Forest Character and Condition – Qualitative Description

4.4.1 Forest Greenspace

Golden Gardens is dominated by second- and third-growth forest that was logged presumably through the late 1800s and early 1900s. The general condition of this area indicates that it has received no large-scale forest management over the years (e.g., extensive replanting or thinning). However, the sporadic presence of tree species such as spruce, pine and redwood are evidence of periodic efforts of reforestation. Mostly, the re-growth of the forest has been strongly influenced by the coastal bluff setting and the urban

context of this park. As the surrounding area has undergone rapid and extensive urban development since logging, re-growth has been shaped by factors that include:

- fragmentation into small forest blocks by roadways, railroads parking lots and other landscape development;
- development that has resulted in restricting much of remaining forest remnants to slide-prone slopes;
- disturbance along forest edges for construction of roads, housing, landscaping, etc.;
- invasion of non-native plants progressing from the disturbed edges into forest interiors; and
- tree topping or clearing for utility corridors, railway corridors, or (private) view corridors, and accompanying invasion of non-native plants.

As forest fragmentation increased due to the spread of urban development in the area, the extent of forest edges increased. All forest edges differ in common ways from the forest interior. There is an increased potential for wind throw, more open tree canopy, decreased shading, decreased moisture in soil and microclimate, and encroachment by non-native plants. Forest edges in urban areas tend to have an even greater extent of disturbance, the effects of which are seen further into the forest interior than in more rural areas.

Types of urban-related disturbances may include:

- selective tree clearing, planting or encroachment of non-native species from landscaped areas
- encroachment of invasive and noxious weeds from disturbed areas
- networks of social paths
- predation of wildlife by domestic pets
- piping creeks and storm water runoff both above and below ground or diverting flows thus eliminating or decreasing riparian corridors, and
- increase of storm water flows triggering slides of steep slopes.

This higher level of disturbance, when combined with the extensive fragmentation and smaller forest blocks of urban areas, results in the degraded condition of the forest edge extending further into the forest and greatly reducing the effective forest interior. In Golden Gardens, for example, invasive plant species are not just limited to the more disturbed forest edges, but occur and even dominate the understory throughout most forest stands. The urban nature of the greenspace is reflected in the following description of the forest condition in the area.

Golden Gardens includes mostly forested areas that are exclusively dominated by deciduous species. Areas of turf also occur in the landscape. Vegetation Zones were defined for this project using existing vegetation data mapped by the Seattle Urban Nature Project (SUNP, 2000) that was verified by a ground-truth process in the field and checked against data collected during the course of developing this VMP. SUNP assessments were made by qualitative visual estimates made using a dichotomous key to determine vegetation type during a site walk-through. Vegetation classes used are consistent with those used by the Washington State Gap Analysis Project and the Interagency Committee for Outdoor Recreation, as well as the Seattle Parks UWHMP and SUNP. Golden Gardens consists of

six Vegetation Zones based on vegetation type: Pole deciduous forest, immature deciduous forest, mature deciduous forest, mature mixed forest, mature conifer forest and shrubland. These are defined in Table 1.

Vegetation Type	***Definition***
Pole Deciduous Forest	• 5-15" diameter at breast height (dbh) • Trees greater than 30 ft in height • Dominated by alder • Some bigleaf maple
Immature Deciduous Forest	• 15-20" diameter at breast height (dbh) • Trees greater than 30 ft in height • Dominated by big-leaf maple • Some alder, Douglas fir, cedar
Mature Deciduous Forest	• 20-30" diameter at breast height (dbh) • Trees greater than 30ft in height • Dominated by bigleaf maple • Some cedar, Douglas fir, grand fir
Mature Mixed Forest	• 20-30" diameter at breast height (dbh) • Trees greater than 30ft in height • Dominated by bigleaf maple • Some cedar, Douglas fir, grand fir
Mature Conifer Forest	• 20-30" diameter at breast height (dbh) • Trees greater than 30ft in height • Dominated by Douglas fir • Some maple regeneration
Shrubland	• Greater than 25% shrub cover • Less than 10% tree cover • Dominated by Himalayan blackberry

Table 1. Vegetation Types in Golden Gardens Hillside

4.4.2 Hazard Trees

Due to the frequent number of tree failures near popular areas in the park, particularly along Golden Gardens Avenue, one of the priorities of this VMP is hazard tree assessment. This type of evaluation is done on trees of significant size with contributing defects that are in proximity of high-use targets to potentially cause damage and/or injury.

Nearly a hundred trees were included in this VMP fitting these criteria. Qualitatively, the significant trees are in good condition for their age with relatively few, requiring complete removal. Aging, "pioneer" trees such as the big leaf maple and alder situated on a significant slope, are pre-disposed to a higher incident of failure and therefore, need attention. The signs of a root rot pocket found in the upper forest also is a cause for further assessment of the conifers in that area since such a pathogen can have a devastating effect on trees and result in unsafe conditions for human use.

4.5 Wildlife Habitat

The location of Golden Gardens on the eastern shore of Puget Sound makes it an important forest habitat. It is a prominent stopover spot for migratory bird species. It represents potential perching and nesting habitat for bald eagles, osprey, other raptors and even heron. Resident bird species find thermal cover in the evergreen understory of the park. Small mammals utilize the area for shelter and foraging. Connectivity to the forested hillside immediately to the east and south and to Carkeek Park to the north increases the viability of certain species that need forest cover.

The structure of the forest determines, to a great degree, the type and quality of the habitat. The vertical structure of the forest – overall height, layers of canopy, species composition – correlates with the maturity of the forest. Young forests are typically even-even aged, single-species dominated habitats. Mature forests contain greater vertical heterogeneity. Golden Gardens exhibits evidence of maturation in the overall size of trees and the presence of large conifers. The complexity of the vertical strata is limited by the dominance of bigleaf maple as the primary canopy species and the lack of strong conifer populations. Conifer species provide thermal cover and wind protection in winter, two important qualities for habitat with a western exposure.

Another limitation of the habitat structure is the relative dearth of decomposing wood, both as standing "snags" and as fallen logs. In the Pacific Northwest, over 100 species of birds use snags during some point of their lifecycle. Bats and other small mammals also rely on snags, and hollow logs provide refuge for shrews, chipmunks, voles, skunks and some weasel species. The invertebrates that live in decomposing wood are an essential part of the forage for many native bird species. Amphibians, such as terrestrial salamanders make extensive use of downed logs for nesting and refuge. Rotting woody debris is essential to soil development, which correlates with forest productivity.

Snag - a dying or dead tree that remains standing. As the standing tree decays, insects and fungi provide food for other wildlife, while cavities and loose bark plates provide shelter for birds and mammals.

However, field assessment discovered that the Golden Gardens hillside is lacking substantial decomposing wood, especially in the larger diameter classes that are most valuable to wildlife. Forest soils reflected this condition, with relatively thin organic surface horizons (the "duff" layer in forest soils).

4.6 Human Impacts

Human impacts to the hillside are evident throughout the area. The following activities are visible impacts to vegetation in the forested area of the park:

- encampments where people have either short or long-term dwellings
- social trails weaving throughout the greenspace and traversing the slope
- bare soil areas from vehicular, pedestrian and pet traffic
- dump areas where garbage and yard waste have been piled, primarily near roads
- trees cut and topped for views from adjacent residential properties.

A number of encampments were noted near or in sample plots during the data collection process, but no systematic inventory of camps was undertaken. Some of the social trails found in the hillside appear to be associated with the encampment locations. The trails are generally narrow and the entrances to them are somewhat obscure. Dumped refuse was infrequently observed in the greenspace, only in areas adjacent to and downhill from roads where there is room enough to pull out from traffic. As expected, the amount of refuse observed generally decreases in the forest interior, as one gets further from roads. However, where encampments are located in the forest interior, concentrations of refuse also occur.

The eastern edge of the park has several areas where trees have been cut down or topped to enhance the view from adjacent private property. Historically, Parks allowed citizens to obtain a permit to prune or remove trees on park property under certain conditions. In some cases, trees have also been cut without a permit. This past practice has impacted the canopy condition in these areas of the park. In 2001, Parks adopted a revision to its policies concerning the management of trees. This revision specifically prohibits removal of park trees solely for private views. It does allow for trees to be removed as part of a VMP that provides overall benefit to the vegetation resource as defined by the criteria in the policy.

More indirect human impacts to the hillside greenspace include the appearance of non-native invasive species and the presence of storm water drainage pipes from private properties at top of slope. Being adjacent to urban and cultivated landscapes, the hillside forest receives seeds and runners of non-native invasive plants that escape onto public land. Birds and wind most likely assist in the "natural" introduction with more thoughtful plantings occurring near facilities such as the eastside of the middle parking lot.

While the drainage pipes along the slope in the north part of the park were installed to conduct water to the bottom of the slope, another fairly new drainage system in the southeast corner of the park was identified and all may contribute to erosion and water quality issues there. The drainage systems are not addressed in this VMP since they are not a direct impact to the vegetation nor are there vegetative solutions to the problem of hillside drainage.

CHAPTER 5: FINDINGS – QUANTITATIVE DESCRIPTIONS OF THE VEGETATION

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

This chapter summarizes the data collected for this study. Data collection methods for forested vegetation and hazard trees are described. Quantitative descriptions of the existing conditions are defined for the overall hillside and management areas, with condition descriptions for identified hazard trees in this VMP.

5.1 Geographic Division of Park Areas

As a way to orient readers and users of this VMP to the discussions that follow, the consultants have divided the Park into six geographic areas so they can identify general locations (see Figure 3).

5.1.1 Beach

The Beach section is the portion of the Park west of the railroad tracks. This area is the most familiar to park users.

5.1.2 South

The South section is the portion of the hillside that is south of the middle curve in Golden Gardens Drive where the Parks Maintenance Yard is located. It also contains the narrow, triangular hillside north and west of the curve as well.

5.1.3 Central

The Central section is the portion of the hillside north of the middle curve in Golden Gardens Drive extending approximately 1100 feet northward, to its northern limit two hundred feet north of the dog off-leash area. It contains the upper parking lot and the dog off-leash area. This section is the most heavily used part of the hillside.

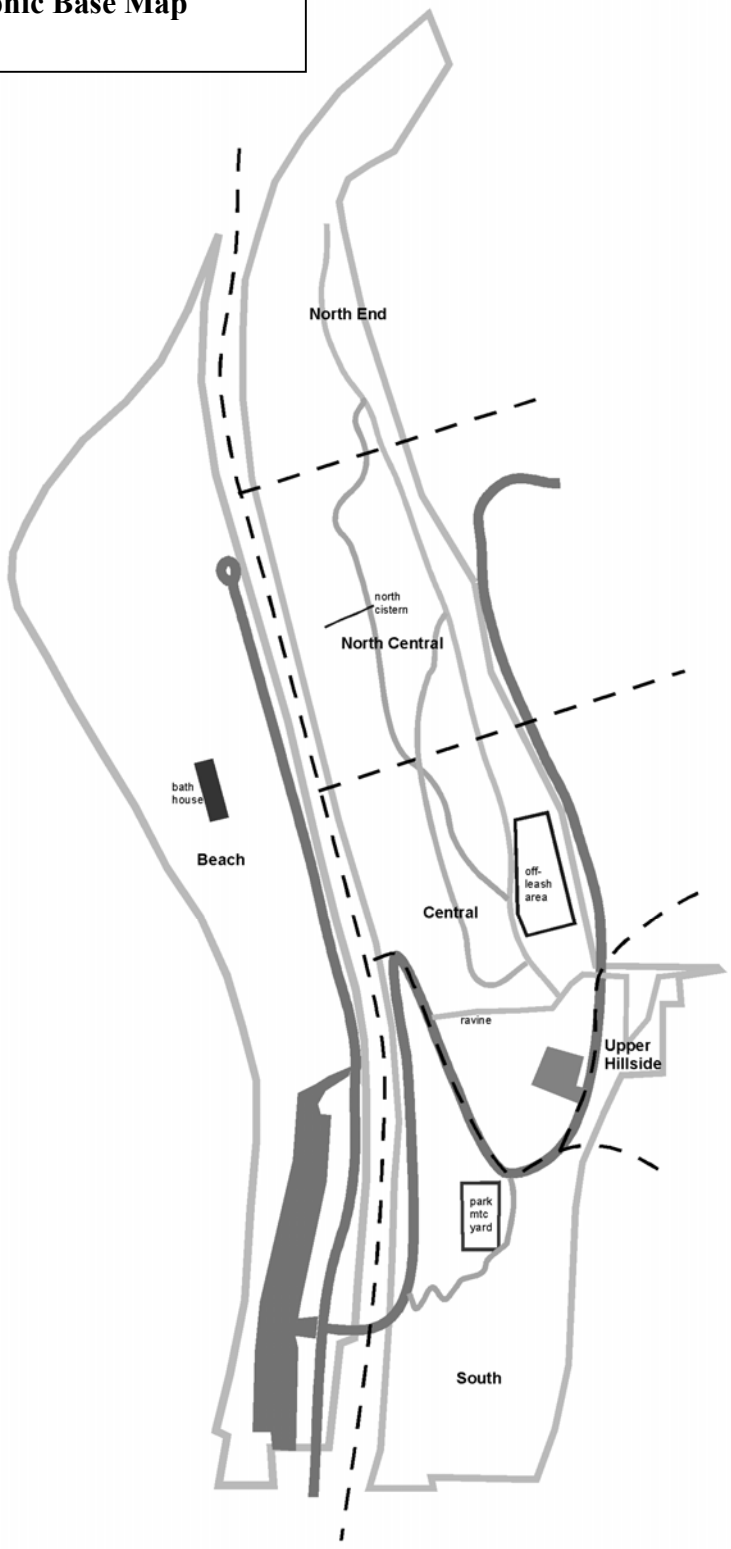
5.1.4 North Central

The North Central section is the portion of the hillside extending from 200 feet north of the dog-off leash area approximately 700 feet to its northern limit 350 feet north of the north cistern and spillway. This area is centered on the north cistern and the area surrounding it.

5.1.5 North End

The North End section is the portion of the hillside extending beyond the North Central section, starting 350 feet north of the north cistern and spillway. This area consists mostly of the area that is served by a single trail running along the top of a steep, slide-prone hillside.

Figure 3
Golden Gardens Park
Geographic Base Map



5.1.6 Upper Hillside

The Upper Hillside section is the portion of the hillside east of Golden Gardens Drive, starting from the NW 85th Street stairway and extending southward to the middle curve in Golden Gardens Drive just east of the Parks maintenance yard entrance.

5.2 Data Collection Methods

5.2.1 Forested Hillside

In order to assess existing conditions in Golden Gardens accurately, consultants collected data on the forest conditions. Sample plot locations were chosen by ground survey to collect data representative of typical vegetation groups. The field team located the plots on maps by using LIDAR hill-shade base maps with trails and pavement overlays. This provided fine-scale topographic detail that was useful for locating plots off-trail. Data were collected during September and October of 2003.

The sample plot size selected for the inventory was 1/10th acre, each plot having a diameter of 74.5 feet. A total of 17 plots were sampled. The area of the hillside, excluding right-of-ways that cross the hillside, is 36 acres. Since each plot represents 1/10th acre, 17 plots would cover roughly 1.7 acres, or 5% of the total area. To be able to identify on-the-ground the exact area in which to sample, field teams located and staked the center of the sample plot and then measured out 37.5 feet from the center in all four cardinal directions.

The following data were collected at each sample plot*:

- team and plot identifiers
- aspect and slope
- percent canopy closure
- occurrence of saturated soils or standing water
- soil texture/type
- occurrence of special features – power lines, slides, encampments, creeks, wetlands, erosion, refuse, trails, roads, and others
- occurrence of snags of varying decay classes
- occurrence of large woody debris of varying decay and size classes
- percent cover by woody debris
- tree species present
- height, diameter and stem count for each tree
- rating of tree health
- occurrence of tree seedlings or saplings indicating regeneration
- shrub and herb species present and percent cover
- Indication of whether species are native or not

* See Appendix A-1 for example data form

Visual estimates were used for determining dominant plant species, species percent cover and canopy closure. Tree diameter and height were determined by either a measuring tape or visual estimates. Tree health was based on a subjective assessment of extent of canopy cover and any evidence of tree decay.

The consultants transferred data that were recorded in the field into a Microsoft Excel™ spreadsheet, which was used to sort and analyze the data. Maps in this chapter represent existing conditions and data trends in the greenspace and were prepared by the consultants using ArcView™.

5.2.2 Hazard Trees

There are three components to a hazard tree: a tree or part of tree of significant size to do damage, a tree defect attributing to a high probability of failure of tree or part, and a target for that failure.

Defects

The Standards and Procedures for assessment and management of hazard trees are outlined in the Seattle Parks and Recreation Tree Policy. Evaluations are to be based on guidelines set forth in the Albers, Hayes (1996) publication and supported further by Hayes (2002) in which visible defects upon inspection are noted and influence the hazard rating for each tree. Such defects include:

- Lean
- Root problems
- Cracks or structural weaknesses
- Poor limb attachment or tree architecture
- Extent of decay/canker
- Amount of deadwood

Each of these areas is rated as High, Medium or Low risk for each tree on the field form found in Appendix A-2. Aggravating factors as noted in the Tree Policy (8.3) are also noted and may greatly influence the hazard rating. Only trees that had some notable defect(s) near the agreed-upon targets were included in this assessment.

Assumptions for the hazard tree assessment are:

- No invasive methods of decay detention were made
- Root condition was assessed on surface or with minimal soil disturbance
- Trees with enough signs and defects will be tagged for further inspection (outside of the scope of this VMP)

Targets

The areas of Golden Gardens Park where hazard tree assessments were performed were the beach/bathhouse area, all parking lots, along Golden Gardens Avenue (adjacent to park property), formal trails and stairways, and around facilities in upper park area (comfort station and off-leash dog area). Assessments were not methodically made on trees along the more informal trail system, however trees of particular concern were noted.

5.3 Findings - General Forest Conditions

5.3.1 Overstory

Golden Gardens includes mostly forested areas that are dominated by deciduous species. Fifty percent (50%) of the trees measured were big-leaf maple, 25% were red alder, and 19% were Douglas fir. These numbers do not include young sapling trees, including the large number of sapling alders found in the slide areas of the north hillside. These areas contain as many as 1500-1800 stems per acre of small (one-inch diameter or less) alder.

The remaining 11 tree species found at Golden Gardens represent 6% of the individuals, with no individual species accounting for more than 2% of the total trees. Non-native trees were less than 1% of the total trees that were recorded. These were sycamore maple, horse chestnut, common hawthorn, and mountain ash species. Planted non-natives observed elsewhere on the hillside also included coast redwood, Norway spruce, Colorado blue spruce, and several pines, including Japanese red pine, Scots pine and Eastern white pine.

Calculation of total cross-sectional trunk area (basal area) for each tree species reveals their relative bio-mass and potential contribution to canopy. Maples account for 74% of the forest's basal area, while Douglas fir make up 16% and alder 7%, respectively. This more accurately reflects the relative importance of these species for habitat in the Park. Maple is clearly the dominant species. For example, two multi-stem maples in plot #2 have a basal area of 5000 square inches. This would be equivalent to two trees each 57 inches in diameter (or 15' in circumference) in the same 75-foot area. The data corroborates the observation of large, multi-stem maple trees throughout the hillside.

Health of these maples is generally good. Of the 60 maples recorded, 38 were rated "Good", 11 rated "Fair" and 11 rated "Poor" in overall health. The average diameter equivalent (diameter of a single-stem tree with the same basal area) of the "Good" class was 29 inches, while the "Fair" class was 19 inches and the "Poor" class was 13 inches. This illustrates that the large, dominant maples are doing well. If the population was in decline from old age, one might expect to see the largest trees exhibiting poorer health, but this is not the case at Golden Gardens. The trees that were poorer health were also subordinate in height to the larger maples. Competition, not disease or age is the cause of individual trees being in decline.

The longevity of bigleaf maples is highly variable, ranging from 75 years to several hundred, depending on site conditions. The largest maples at Golden Gardens are approximately100 years old. It is likely that they will continue to do well if environmental conditions do not change radically. Mature trees are thought to be vulnerable to changes in soil condition or exposure. It is important that all project work around mature maples avoid disturbing the root systems of these trees.

Douglas fir is well represented in the south portion of the hillside. They are concentrated in a grove west of the upper parking lot, mixed in with maples on the hillside to the east of Golden Gardens Drive, and interspersed with non-native conifers at the toe of the hillside along the lower parking lot. They are also found sporadically throughout the south hillside

as individuals. Of the 23 Douglas firs surveyed in sample plots, 18 were rated "Good", 3 rated "Fair" and 2 rated "Poor" in overall health based on surface visual inspection. The well-drained soils and western exposure of Golden Gardens presents favorable growing conditions for Douglas fir. The consultants observed the cut stump of a recently removed Douglas fir along the eastside of Golden Gardens Drive. This stump exhibited signs of laminated root rot (*Phellinus weirii*). This is an endemic disease that attacks native conifers, especially Douglas fir. The presence of this disease makes surface visual inspection a less reliable indicator of tree health. More discussion of this disease can be found in Section 7.2.

Data on canopy height and closure also reveal the relative health of the forest habitat. Canopy closure is the observation from one ground-level point of the percentage of the sky hemisphere that is obscured by tree crown foliage. In the mature maple forest, canopy closure is typically over 80% and canopy height averages slightly over 100 feet. In areas where forest is regenerating from disturbance, either one or both of these values is significantly reduced. Figure 4 shows plots in the slide areas (# 9, 11,12,13, 16, and 17) exhibit either reduced canopy height, low canopy coverage, or both. Similarly, plots in areas where trees have been cut (# 3 and 11) exhibit reduced canopy height.

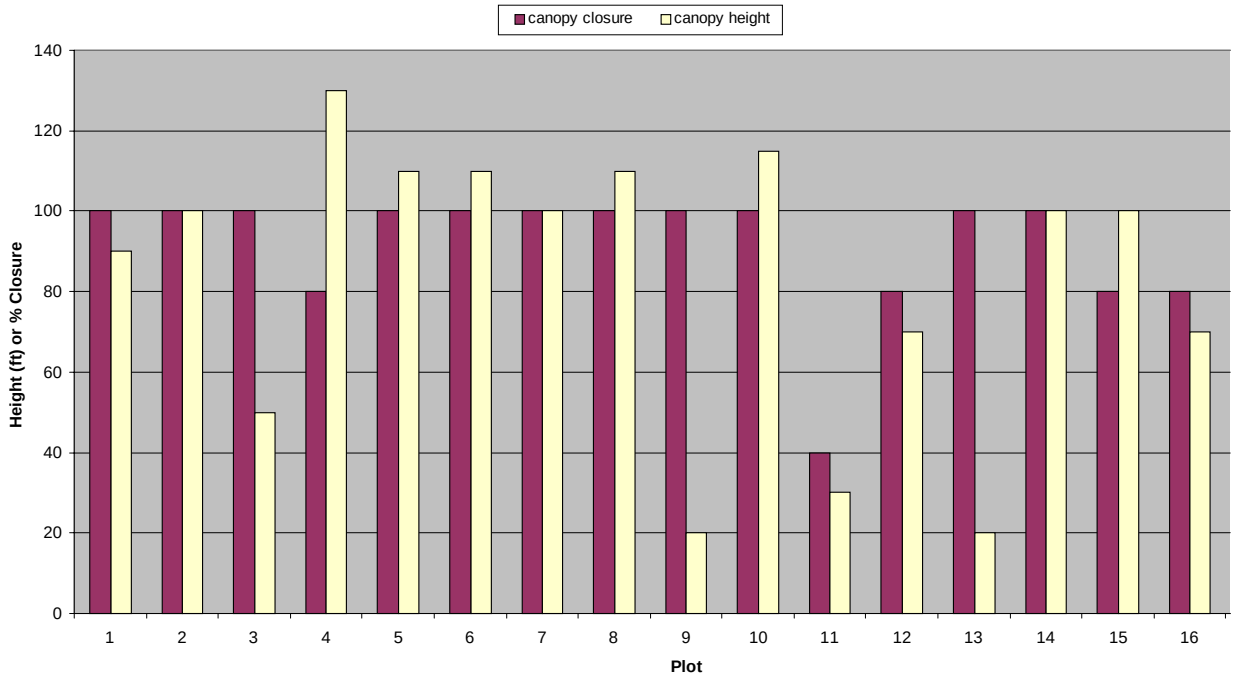


Figure 4: Canopy Closure and Canopy Height for each Sample Plot

5.3.2 Understory

A broad diversity of understory and groundcover species is represented at Golden Gardens. A total of 44 shrub, herb and vine species were noted. Figure 5 provides a prevalence of species with 1% or greater coverage. Note that the majority of the 44 species were observed infrequently. Among the top ten most common species, seven are native and

three are non-native. English ivy is the most common, with coverage averaging 27% across the hillside. By far, this is the single biggest threat to forest vegetation in the park.

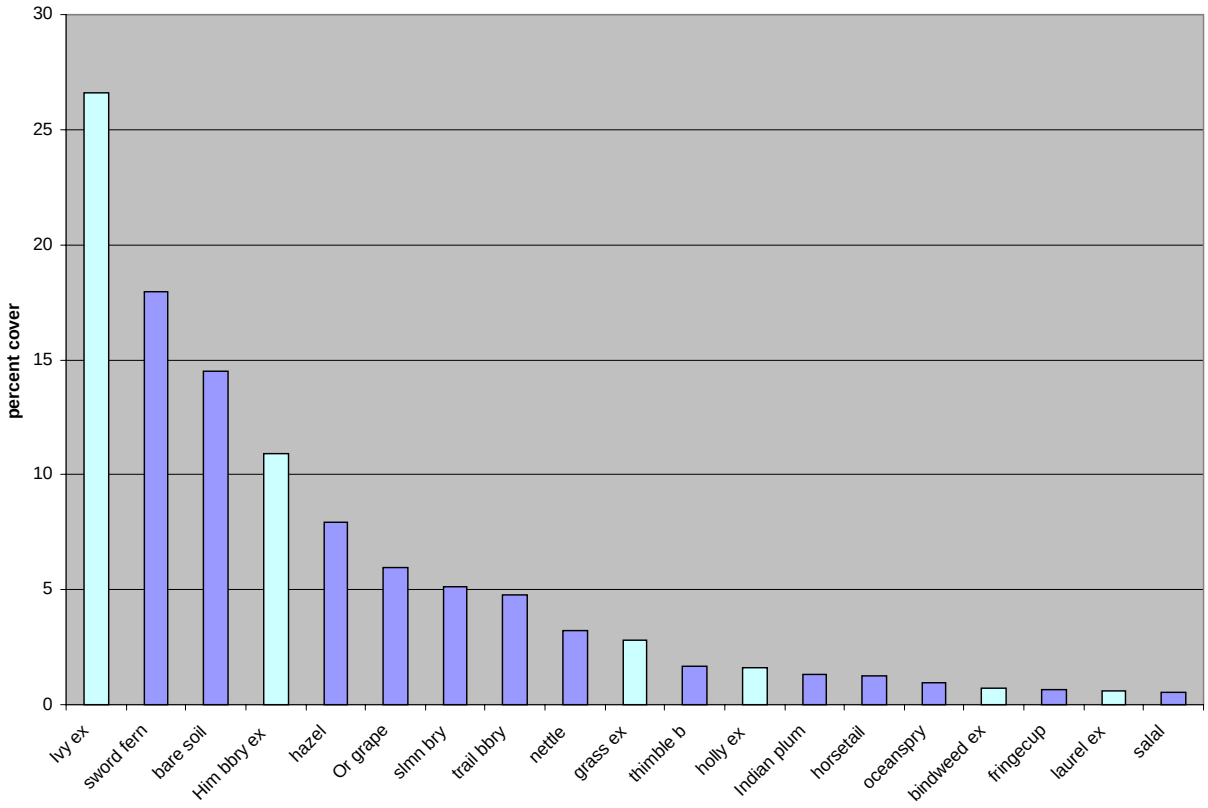


Figure 5: Understory Species Prevalence

5.3.3 Decaying Wood Features

The data shows that decaying wood features are in short supply at Golden Gardens. Snags are important features for native birds and small mammals for foraging and nesting. Three of the seventeen plots contained snags with total of four recorded, which represents 2.3 snags per acre. Washington State Department of Natural Resources recommends three standing snags (min. 10" dbh) per acre, but these are minimum standards. Cavity nesting birds need snags at minimum 15" in diameter. Also, more snags in various stages of decomposition would offer each wildlife species the conditions particular to its needs. Also, urban natural areas can compensate for the lack of habitat in the surrounding landscape if habitat is increased there. Therefore, snag density of 3 per acre is a desirable minimum goal. Additional snags can be fostered where the opportunities exist. Snags should be both conifer and deciduous species to increase habitat diversity, and should be 15" dbh or greater.

Down woody debris (DWD) was also found to be in short supply at Golden Gardens. Decaying branches and logs replenish soil organic matter. They also provide foraging and nesting habitat for small mammals and some bird species as well. Some native plants (hemlock, red huckleberry, salal, licorice fern) seed into down woody debris. In wetlands,

wood features are important for amphibians and aquatic insects. A benefit of DWD in urban natural areas is to inhibit off-trail use by park users. This functions to protect valuable native habitat.

In Golden Gardens, only 9 of the 17 plots contained noticeable down woody debris. Material in the 8-20" diameter range was relatively abundant, in contrast to small material (4-8" diameter), which was surprisingly scarce. This material is typically the most common because it comes from dead branches that fall from the trees. Material greater than 20" diameter was found in only four plots. In all plots, woody debris cover fell into the lowest range of 0-5%. One study in Douglas fir forests has determined that DWD cover should be 15-20% for small mammal populations. Based on the data collected, DWD cover and volume is low at Golden Gardens. Opportunities to increase DWD should be utilized whenever possible.

5.3.4 Tree Regeneration

Tree regeneration at Golden Gardens is important for the long-term preservation of tree canopy. Sapling trees that are established in the forest understory are positioned to take over when mature trees decline. They also function as habitat by providing cover at intermediate canopy levels. Bigleaf maple was the most frequent species found regenerating in the understory. It was found in eight plots, with an average count of 4.5 stems per plot. The higher counts were found in plots with less canopy cover or edge conditions. Alder regeneration was limited to areas with recent disturbance. There it was abundant, totaling 180 stems in one plot. Native conifers were scarce in the understory. Two plots contained Douglas fir seedlings, while one other plot had red cedar. The remainder of tree regeneration found at Golden Gardens was scattered among five non-native species. Sycamore maple in particular was identified as undesirable for canopy regeneration, as it has displaced native forests elsewhere.

While maple and alder regeneration appear strong, it is unlikely to produce viable trees for canopy regeneration in closed canopy conditions. Conifer regeneration is more likely to establish and succeed in closed canopy forest. Forest management in Golden Gardens should include establishing conifer regeneration.

5.4 Classification of Vegetation Units and Management Areas

The quantitative plot analysis above was accompanied by mapping the boundaries between areas of different forest types represented by the sample plots. The hillside was divided into 33 vegetation units of relatively uniform forest composition. Wetlands and slide areas were considered separate units because of the special management considerations for them. These units were then grouped into six classes of management areas based on similar characteristics of the unit's vegetation that bear upon the vegetation management goals outlined in Chapter 2. These management areas are described below in Table 2 and represented in Appendices J-5 and J-6.

Management Area	*Definition*	*Extent of Hillside (acres)*
Maple MA	• >75% of the trees are bigleaf maple and average dbh (or equivalent) >20"	19.2
Erosion control MA	• past history of slides in the vicinity and ongoing instability predicted	7.6
Conifer MA	• Douglas fir makes up at least 25% of the tree composition, or conifers compose at least 70% of the trees	3.9
Resprouted Maple MA	• >50% of trees have compromised form from past topping or cutting	2.7
Wetland MA	• understory vegetation indicates soils are saturated during the growing season	2.1*
Border MA	• trees are predominantly non-native, planted to define an edge or area	1.3**

*Includes 0.5 acres of forested wetland at the north end of the beach area.
**Includes 0.9 acres of black locust north of the bathhouse in the beach area.

Table 2. Management Areas within Golden Gardens Hillside

Management areas were primarily defined by condition of the trees found in them. Other management considerations for the forest understory, such as disturbance or invasive plant conditions were mapped as an overlay. For example, areas with significant cover of ivy and/or other invasives on the ground and in the trees were placed in the Invasives Overlay. Areas that were of relatively high quality with good canopy cover and low invasive cover were assigned to the Quality Habitat overlay. Table 3 lists the overlays and provides the defining characteristics. Appendices J-5 and J-6 show the locations of the overlays within Golden Gardens.

Management Overlay	*Definition*	*Extent of Hillside (acres)*
Invasive MO	• Invasive cover >25% in any area >10,000 sq ft	26.6
Gap MO	• canopy cover <60% in any area >3,000 sq ft.	3.7
Bare Soil MO	• >50% bare soil in any 1,000 sq ft	1.8
Quality Habitat MO	• <25% ivy cover on the ground ***and*** • <25% cover by Himalayan blackberry ***and*** • wide bands of interior habitat >.5 acre	3.9
Edge MO	• within 50' of the perimeter of the hillside as well as interior edges along roads, parking lots, railroad ROW, and Parks maintenance yard	NA

Table 3. Management Overlays within Golden Gardens Hillside

5.4.1 Maple Management Area

The Maple Management Area (MA) covers 19.2 acres of the 36-acre hillside. This MA is characterized by large, mature (20-30"dbh) maple trees as the dominant canopy. Canopy heights in these areas are 100 feet, and canopy closure is greater than 80%. Lesser amounts of mature alder, Douglas fir, cedar, hemlock and grand fir can be found as well. Overall tree health is good. Snag density and down woody debris cover is low. Canopy regeneration is weak.

5.4.2 Erosion Control Management Area

The Erosion Control Management Area (MA) covers 7.6 acres of the 36-acre hillside. Slopes in this area exceed 40% and approach 100% (1:1) along the eastern edge of the unit. This MA is characterized by immature (<20" dbh) even-aged alder stands that represent slide events on these slopes. Patches of maple and mature alder forest are interspersed on the lower slope and on upper slopes. The periodic slide regime of this area has prevented widespread development of mature forest. Soil moisture increases down slope. Canopy closure is moderate to low in this MA. Canopy regeneration is strong in recently disturbed areas. Decaying wood features are not prominent in this MA.

5.4.3 Conifer Management Area

The Conifer Management Area (MA) covers 3.9 acres of the 36-acre hillside. This management unit is characterized by mature (20-30" dbh) Douglas fir trees in either pure stands or intermixed with maple and other conifers. Canopy heights in these areas are 100 feet or more. Canopy closure is typically between 60 and 80 percent. Overall tree health is good, except where laminated root rot (*Phellinus weirii*) is present. Canopy regeneration is generally weak. Snag density can be high where Douglas firs have died, but is otherwise low. Down woody debris is low or absent, except in root rot centers.

5.4.4 Re-sprouted Maple Management Area

The Re-sprouted Maple Management Area covers 2.7 acres of the 36-acre hillside. This management area is characterized by bigleaf maple stumps that were previously cut down or topped and have re-sprouted from the cut surface. These trees consist of many stems,

ranging from one to ten inches in diameter. Canopy height ranges up to 50 feet, depending on the time lapse since the last cutting event. Canopy closure is also highly variable for the same reason. Tree health is fair to poor. Down woody debris can be abundant in an area of recent cutting. Canopy regeneration can be strong in open canopy situations.

5.4.5 Wetland Management Area

The Wetland Management Area covers 1.6 acres of the 36-acre hillside, and also 0.5 acres of forested wetland east of the ponds at the north end of the beach area. This management area is characterized by forest cover and understory vegetation indicative of saturated soils at least during the growing season. Otherwise, the vegetation composition of these units is highly variable.

5.4.6 Border Management Area

The Border Management Area (MA) covers 0.5 acres of the 36-acre hillside and also 0.8 acres of the beach area north of the bathhouse. This unit is characterized by native or non-native trees that provide definition to the high-use areas of the landscape. The trees in these areas were planted in groups for this purpose. In the beach area, root suckers of the black locusts have spread the tree canopy to encompass a significant portion of the shoreline habitat. These areas are intended as transitions to native habitat, and non-native species will be replaced by appropriate natives.

5.4.7 Invasive Management Overlay

The Invasive Management Overlay (MO) covers 26.6 acres of the 36-acre hillside. This overlay is an area where major forest "weeds" are found at significant levels that require management. Invasive species include: English ivy, English holly, English laurel, Himalayan blackberry, wild clematis, garlic mustard, Japanese knotweed, Scots broom, reed canarygrass, field bindweed, sycamore maple, horse chestnut, hawthorn, and mountain ash. The most important weed is English ivy, which is found throughout the hillside. Descriptions and control methods for each species can be found in Chapter 7.10.

5.4.8 Gap Management Overlay

The Gap Management Overlay (MO) covers 3.7 acres of the 36-acre hillside. This overlay consists of areas where tree canopy is weak or absent. These areas have dense understory vegetation and higher levels of invasive plants. Canopy gaps provide habitat diversity and increase the productivity of the understory vegetation. They offer an opportunity for canopy regeneration, but also favor the growth of invasive species. Individual canopy gaps may also represent disease centers for certain types of fungal organism that colonize native trees.

5.4.9 Bare Soil Management Overlay

The Bare Soil Management Overlay covers 1.8 acres of the 36-acre hillside. This overlay consists of areas where bare soils are exposed and plant re-colonization is weak or occurring with non-native grasses and forbs. In some instances, this condition is the result of traffic from Parks vehicles, humans and pets. In other locations, it is the result of invasive plant control projects. Garlic mustard and English laurel have been removed from large areas of the Park north of the dog run. These areas are now remaining bare because of foot traffic and compacted soils.

5.4.10 Quality Habitat Management Overlay

The Quality Habitat Management Overlay covers 3.9 acres of the 36-acre hillside. This overlay contains areas where trees are mature, canopy is closed, invasive cover is low, species diversity is high, and interior forest conditions are thereby represented.

5.4.11 Edge Management Overlay

The Edge Management Overlay is a non-specific coverage for the hillside. This overlay is located anywhere within 100 feet of the forest edge, including roadways, railroad right-of-way, parking lots, turf areas, the Parks maintenance yard, and private property where tree canopy is absent. Edge exposure increases light levels, wind speeds, and movement of wildlife. As a result, edges have high species diversity and high habitat value. However, they are susceptible to tree blow down, invasive plant colonization, and loss of interior forest plant species.

5.5 Hazard Trees Assessment Areas

The assessments for hazard trees were performed at six "management areas" based on location, targets, and site parameters contributing to the potentially hazardous situation. For purposes of discussion, the focus areas are as follows:

5.5.1 Beach Area

Majority of the trees west of the railroad is a part of a designed and highly managed landscape. The popularity of the area with picnic shelters, fields, paths, parking, and beach, and wetlands requires evaluation of the trees.

5.5.2 South: Wetland Area

All the significant trees in this area are bigleaf maples. The wet slope appears to accelerate crown dieback in the trees requiring special attention for safety along lower part Golden Gardens Avenue.

5.5.3 South and Central: Middle Golden Gardens/Parking Lot Area

The edge trees east of the middle parking lot (just east of railroad right-of-way) and east and south of the Avenue near the maintenance yard constitute a group of mixed native and non-native species. The trees along the eastside of the road and parking lot appear to have been recently maintained and pruned, resulting in no identified hazard trees in the area.

5.5.4 Central: Upper Meadow/Main Stair Area

The upper parking lot and comfort station are surrounded by a conifer stand with a more mixed deciduous forest along the stairs and the Off-Leash Area (OLA). This area is well-used requiring assessment of the health and stability of the trees.

5.5.5 Central: Upper Hillside Conifer Area

There is a history of failure of large conifers in the area that indicates a root rot pocket requiring special attention and management techniques.

5.5.6 North Central: Upper Golden Gardens Avenue Area

The steep down slope to the west of the upper part of the Avenue supports a mixed coniferous/deciduous stand of trees Historical failures here warrant continuing inspection.

5.5.7 North End: Trail Area

The informal trail system in the North End of the hillside has individual tree hazard situations related to trail use.

CHAPTER 6: VEGETATION MANAGEMENT RECOMMENDATIONS

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

6.1 Vegetation Management Overview

6.1.1 Management Objectives

There are four general vegetation management objectives for Golden Gardens that are based on the character and locale of the major areas of the Park: the south hillside, the north hillside, the beach area, and the hazard trees.

Recruit - to identify a young plant for protection and preferential treatment so that it becomes a mature specimen and a significant feature of the landscape.

The south hillside of Golden Gardens is to remain a bigleaf maple forest, intermixed with groups and individuals of other tree species to provide habitat diversity. Bigleaf maple is particularly suited to this hillside, as evidenced by the remarkably large and healthy specimens found there. However, regeneration of conifer seedlings in the understory will provide additional canopy layering that will enhance the habitat value of the forest. Conifer regeneration will also establish a population of younger trees that can be recruited immediately should any of the existing maples decline. A multi-layered native understory dominated by sword fern, hazel, Oregon grape and other shade-tolerant species will be maintained or restored.

The north hillside of Golden Gardens will retain healthy, diverse and dense vegetative cover. Significant ecological restoration of these slopes would be difficult to achieve because of their unstable nature. Therefore, goals for the north hillside are limited to achieving functional erosion control. While vegetation cannot control sliding as previously discussed in Section 4.2, vegetation can significantly limit erosion of the hillside. Tree health will be maintained by cutting ivy vines that grow into trees. Trees in decline and likely to fail at the roots will be cut down to minimize slope disturbance. Understory vegetation will be left intact as much as possible, managing only so that native species are not displaced from the slopes.

The beach area of Golden Gardens will retain groups of trees that define the public spaces and provide shoreline habitat. Linear rows of wind- and salt-tolerant trees will continue to define the parking areas, while less formal lines of trees will provide a backdrop to the picnic areas and visually buffer the park from the railroad tracks. As trees are replaced in this area, species will be selected that will not become ecological weeds in adjacent natural areas. (Avoid sycamore maple, Norway maple, black locust and horsechestnut.) Naturalized groves north of the bathhouse will continue to function as shoreline habitat and frame view of Puget Sound for beach strollers. Non-native tree species in this area will be gradually replaced with native trees.

The management of the hazard trees in identified areas of the park is guided by the rating of the hazard based on probability of failure and location. Removal was prescribed for only a high hazard in which no other alternative (pruning, move target) is feasible. The majority of the management prescriptions for the hazard trees are pruning and monitoring. A few

require further investigation using invasive methods to determine the extent of decay in the trees.

6.1.2 Adaptive Management Approach

A cornerstone of the strategy for Golden Gardens involves a system of experimentation, monitoring and decision-making to develop techniques that work best for the conditions in the park and the goals we are trying to achieve. Until now, techniques for planting or invasive plant control have been tried in various areas of the park with various results. However, there is no systematic way of tracking and evaluating these results to learn from them. A system of *adaptive management* will allow Parks staff to evaluate results of management strategies and create new strategies for future projects.

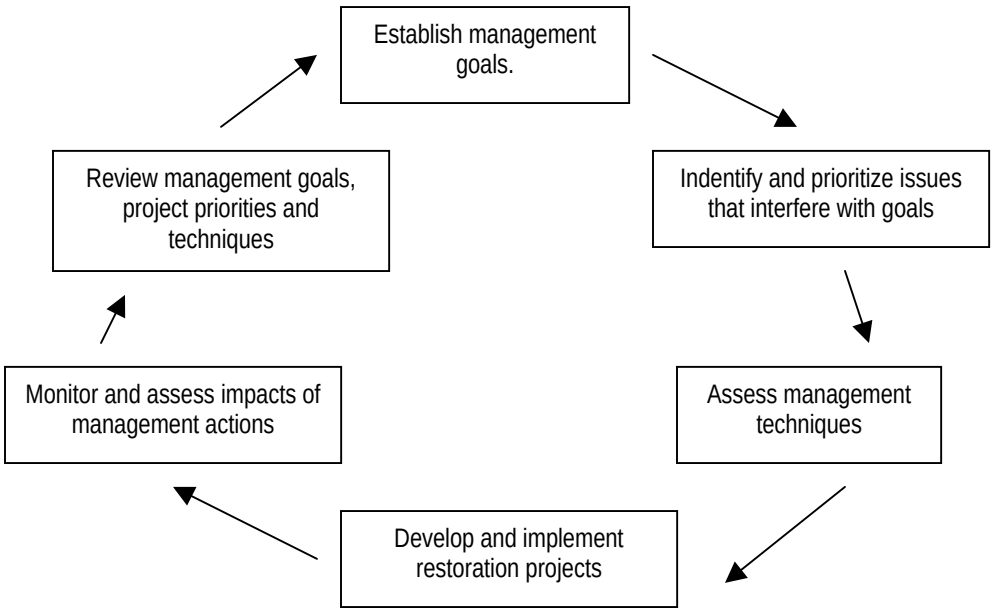


Figure 6. **Adaptive Management Flowchart (adapted from Schwartz and Randall (1995) in Luken and Thieret (1997)).**

As illustrated in the chart above, the cycle begins with establishing management goals, which is done here in Chapter 2. The assessment in Chapter 4 and the analysis in Chapter 5 provide the issues that interfere with goals. In Chapters 6 and 7, we assess the management techniques we believe are needed to achieve the VMP goals. Implementation begins with a written project plan so that the objectives are clearly communicated and documented. The implementation of this VMP is found in Chapter 8. After a project is executed, of these techniques will be followed by monitoring, which is discussed in Chapter 9. The project plan and the monitoring reports can then be compared to evaluate the results of the project. Modifications in objectives or techniques may result from this evaluation and should be published as an addendum to the original plan. After 20 years, approximately four generations of projects should have been completed and evaluated. At that time, it will be useful to update the plan with the information generated by this process.

6.1.3 Project Prioritization

The conditions found in each management area and overlay can be measured against the goals and objectives outlined in Chapter 2. Where there is a shortfall in a goal, one or more of the related objectives can be applied to that management area or overlay. This has been done in Section 6.3.

These objectives were then considered against the objective of efficient resource utilization (Goal 5). Several key strategies have resulted from the experience gained in the nine years of the Parks Forest Restoration Program:

- Work to preserve quality habitat. For example, a plant kept healthy in the ground gets more for the effort spent than a new plant installed in an area cleared of invasives.

- Project selection should maximize the use of volunteer and community resources. Accessibility and visibility are preferred in project selection.

- Project selection should include smaller "adopt-an-area" projects for neighborhood groups (especially schools) as well as larger one-time projects for event-based groups.

- Fund expenditures should leverage volunteer efforts. Professional services should be used to set up and follow up tasks that can be carried out by available volunteers.

These strategies point to focusing projects around the Quality Habitat Management Overlays and working outward from those areas. They happen to be centrally located, with accessible terrain in the surrounding area, making these areas conducive to projects that utilize volunteers.

The steep, slide-prone hillsides in the north end of the park were assigned a lower priority for restoration project work. These areas exhibit the typical vegetation of a disturbance landscape. Future slide events are anticipated, and these would destroy plantings and invasive control projects in such areas. Investment in restoration is better made where the soils are more stable. Nevertheless, maintaining vegetation health should remain a priority to prevent erosion and maintain soil strength as much as possible.

As a result, the majority of forest restoration project work will occur in the South, Central and North Central Areas of the park. This is where forest health, habitat and user safety can be most effectively addressed. However, significant work will also occur in the Beach Area north of the Bathhouse and with hazard tree pruning and removals throughout the identified areas. The upper hillside has a root disease infecting the conifers that will require management according to the strategy outlined in Chapter 7.2.

6.2 Long-term Targets for Each Management Area

The targets shown in Tables 4 and 5 below were developed to provide some measurable targets for vegetation management activities in Golden Gardens. To be useful, targets must represent achievement or progress towards stated goals, and must be attainable with reasonable implementation of recommended actions and tasks. Targets were assigned based on current conditions within each MA, and projected reasonable benchmarks that could be achieved within 20 years if VMP activities are implemented as described. Ultimately the long-term targets for each MA should represent a native, self-sustaining and regenerating, diverse, healthy urban forest. Such a forest would have a mixture of self-sustaining coniferous and deciduous canopy, a structurally and species diverse native ground layer and sub-canopy, numerous snags and down wood in all stages of decay, and low invasive cover. There would be few if any detrimental human impacts such as dumps and encampments, and good forest health would extend all the way from the forest interior to the outer edges. These are achievable goals, but only over a long timeframe on an order of magnitude of time to mature tree growth. However, a shorter timeframe of twenty years is suggested as a starting place that is reasonable for the life span of this VMP as a working document. After 20 years, it is hoped that conditions will have changed enough to warrant updating and revising of this VMP.

	Management Areas					
	Maple	***Erosion control***	***Conifer***	***Re-sprouted Maple***	***Wetland***	***Border***
Canopy diversity	Between 20-40% coniferous	NA	between 40% - 60% coniferous	at least 20% coniferous	at least two species each >10% cover	At least 70% native tree species
Canopy closure	>80%	>80%	>80%	>80%	>80%	>80%
Canopy ht	100'	NA	100'	>60'	100'	60'
Tree size class	>30"	NA	20-30"	15-20"	15-20"	15-20"
Tree density	40-60 trees/acre	NA	80-100 trees/acre	>100 trees/acre	80-100 trees/acre	80-100 trees/acre
Snags per acre	3 each >15" dbh	NA	3 each >15" dbh	3 each >15" dbh	NA	0
Down wood per acre	15-20% cover and min. 2 logs 20' long and >15" dia.	NA	15-20% cover and min. 2 logs 20' long and >15" dia.	15-20% cover	2 logs 20' long and >15" dia. Or equivalent biomass	0

Table 4. Long-term Management Targets for Golden Gardens Management Areas

	Management Overlays				
Parameter	***Invasive***	***Gap***	***Bare Soil***	***Quality Habitat***	***Edge***
Ground cover	100%	100%	100%	100%	100%
Invasive cover	in trees: 0 on the ground: <20%	in trees: 0 on the ground: <20%	in trees: 0 on the ground: <20%	in trees: 0 on the ground: <15%	in trees: 0 on the ground: <5%
Native species diversity (shrub, herb)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg. within unit)
Native species cover	>80%	>80%	>80%	>90%	>90%

Table 5. Long-term Management Targets for Golden Gardens Management Overlays

6.3 Prescriptions for Each Management Area and Overlay

This section outlines the management goals, key strategies, and identified priority areas for each management area and overlay in Golden Gardens. Details of the practices associated with these key strategies are located in Chapter 7.

6.3.1 Maple Management Area

Main Goals

- Maintain tree health
- Maintain canopy closure
- Establish advance regeneration of conifers
- Increase quantity of snags and down wood

Key Strategies

- Protect maples by maintaining soil conditions and preventing root disturbance.
- Prevent the introduction of disease-containing wood products (logs, chips).
- Remove ivy from all trees and clear it from at least three feet from the base of the trees, taking care not to cut or disturb the tree's root system.
- Plant shade-tolerant native conifers among maples where there is at least 30' between trees.
- Create snags and downed logs from trees greater than 15" dbh and rated in "poor" condition. Targets are minimum three snags and two logs per acre.

Priority Locations

- Central-North Central (Unit 5)- North and west of upper meadow
- South (Unit 23) – North and west of Parks maintenance yard
- South (Unit25) – South of Parks maintenance yard

6.3.2 Erosion Control Management Area

Main Goals

- Maintain tree health and tree cover on slopes
- Maintain vegetative cover on slopes.
- Minimize disturbance to soil surfaces.
- Prevent displacement of native vegetation by invasive species.

Key Strategies

- Monitor declining trees for potential root failure.
- Remove ivy from trees and prevent re-growth.
- Control blackberry and ivy in areas of high native plant cover.
- Foster native plant cover on bare soil locations
- Delineate native vegetation areas and selectively apply herbicide to invasives found there.

Priority Locations

- North Central Unit 12 – Mixed maple and alder forest east of the northern part of the middle parking lot
- North End Unit 16 – Alder forest east of beach wetland area
- North End Unit 27 – BNRR cut area east of beach wetland area

6.3.3 Conifer Management Area

Main Goals

- Maintain conifer population health.
- Increase canopy closure
- Increase conifer regeneration and recruitment.
- Manage hazards from laminated root rot.
- Increase quantity of snag and down wood

Key Strategies

- Monitor conifers for symptoms of laminated root rot.
- Remove ivy from all trees and clear it from at least three feet from the base of the trees, taking care not to cut or disturb the tree's root system.
- Recruit conifer saplings in the understory and protect from competition.
- Plant and maintain rot-resistant native conifers among Douglas fir where there is at least 30' between trees.
- Create snags and downed logs from trees greater than 15" dbh and rated in "poor" condition. Targets are minimum two snags and two logs per acre.

Priority Locations

- South and Upper Hillside Unit 2 – mixed Douglas fir and maple hillside east and south of upper parking lot
- Central Unit 3 – Douglas fir stand west of upper parking lot

6.3.4 Re-sprouted Maple Management Area

Main Goals

- Improve tree health
- Increase canopy closure and canopy height
- Establish regeneration of conifers
- Increase the quantity of snag and down wood

Key Strategies

- Remove declining and diseased maple clumps that have no potential to mature into trees.
- Subordinate stems in remaining maple clumps to encourage development of 3-5 strong leaders at each stump.
- Remove ivy from all trees and clear it from at least three feet from the base of the trees.
- Control other invasives as needed to protect canopy.
- Plant native conifers among maples where there is at least 25' between trees.
- Plant bigleaf maples and native conifers in gap areas to restore canopy.

Priority Locations

- South Unit 26 – Upper hillside south and east of Parks maintenance yard
- North Central Unit 45 – Upper hillside east of north hillside wetland (Unit 44)

6.3.5 Wetland Management Area

Main Goals

- Improve tree health and tree cover
- Protect water quality and bio-filtration functions
- Improve aquatic habitat where it exists
- Increase native species richness.

Key Strategies

- Remove ivy from trees and prevent re-growth.
- Control blackberry, reed canarygrass and other invasives.
- Foster native plant cover on bare soil locations
- Protect areas from foot traffic.

Priority Locations

- South Unit 40 – northwest of Parks maintenance yard
- North Central Unit 44 – northern cistern area west of the upper curve on Golden Gardens Drive

6.3.6 Border Management Area

Main Goals

- Maintain spatial definition using vegetation
- Maintain salt and wind-tolerant non-native trees in parking lot and picnic areas
- Convert to native tree species in habitat areas through planting and thinning.

Key Strategies

Upper Meadow

- Selectively thin existing non-native trees at the edges of the upper meadow to improve tree health
- Interplant native trees selected for ornamental quality

North Beach area

- Remove (in phases) root suckering black locust grove on the beach.
- Establish new groves of native trees north of the bathhouse to provide framed views of Puget Sound.
- Periodically thin additional trees to allow native regeneration to establish and dominate.

Priority Locations

- Beach Unit 32 – Black locust grove north of the bathhouse

6.3.7 Invasive Management Overlay

Main Goals

- Reduce invasive plant cover
- Increase native plant cover
- Maintain total vegetative cover to control erosion

Key Strategies

- Selectively remove invasive plants from locations with established natives. Allow
- Clear invasive plants from areas where they have displaced natives.
- Use erosion control BMPs and bioengineering to minimize soil loss during clearing projects
- Replant cleared areas densely with appropriate native groundcovers and shrubs to re-establish vegetative cover.

Priority Locations

- Central - ravine stairway area west of the upper meadow (S. end MA 5)
- Central - extending north from the ravine around Quality Habitat MO T
- North Central – area surrounding Quality Habitat MO AF
- South - south of Golden Gardens Drive in areas around Quality Habitat MO AC

6.3.8 Gap Management Overlay

Main Goals

- Increase canopy cover with native trees
- Prevent or control invasive plant establishment

Key Strategies

- Recruitment of regenerating native saplings by reducing competition from other plants
- Planting of native conifer species where laminated root rot is not detected
- Selective control of invasive species to maintain or increase native shrub cover

Priority Locations

- South Units X, Y, Z - south and west of Parks maintenance yard
- North Central Units N, O - north of the upper meadow
- North End Unit B - northern cistern area west of the upper curve on Golden Gardens Drive (coincident with Wetland MA Unit 44)

6.3.9 Bare Soil Management Overlay

Main Goals

- Establish multi-layered native understory cover

Key Strategies

- Prevent compaction and disturbance by installing signs and/or barriers
- Improve soil fertility with broadcast compost amendment
- Plant native shrub species densely to achieve ground coverage
- Maintain plantings to ensure rapid establishment

Priority Locations

- Central MO's P, Q, S - north of upper meadow
- Central MO R - west and north of upper meadow comfort station
- South MO AB - south of Parks maintenance yard

6.3.10 Quality Habitat Management Overlay

Main Goals

- Maintain high quality forest habitat

Key Strategies

- Employ only high-skill horticultural personnel in project work
- Prevent disturbance and trampling to understory using signs and barrier if necessary
- Limit digging activities to protect tree roots.

Priority Locations

- Central MO T - west of upper meadow
- North Central MO AF - upper hillside
- South MO AC - south and east of Parks maintenance yard

6.3.11 Edge Management Overlay

Main Goals

- Maintain interior forest habitat elsewhere in the park by reducing edge effects

Key Strategies

- Foster dense evergreen native vegetation along forest edges
- Control invasive plants in edge areas to prevent spread into interior areas

Priority Locations

- South – West edge of MA 23, 25 Golden Gardens Drive from the middle parking lot to Seaview Avenue
- Central – West edge of MA 5 eastern edge of the middle parking lot.

	Beach Section	**South Section**	**Central Section**	**North Central Section**	**North End Section**	**Upper Hillside Section**
Maple MA		23, 25	5	5		
Erosion Control MA				12	16, 27	
Conifer MA		2	3			2
Re-sprouted Maple MA		26		45		
Wetland MA		40		44		
Border MA	32					
Invasive MO		Surrounding QH MO AC	Surrounding QH MO T, Ravine in S. end MA 5	Surrounding QH MO AF		
Gap MO		W, X, Y		N, O	B	
Bare Soil MO		AB	P, Q, R, S			
Quality Habitat MO		AC	T	AF		
Edge MO		West edge of MA 23 & 25	West edge of MA 5			

Table 6. Priority Units in Management Areas and Overlays

6.4 Other Management Prescriptions

6.4.1 Vegetation Work on Slopes

Working on slopes is challenging. It can result in injury to workers and can also cause erosion of surface soil. Soils at Golden Gardens are typically sandy and very prone to sloughing when they are on a slope greater than 40%. Therefore, the following guidelines, in Table 7 have been developed as a way to reduce risk of injury to workers and damage to slopes. They set limits where volunteers can work and also provides for additional erosion control measures where warranted. It also provides for greater latitude for utilizing native regeneration where slopes do not require rapid vegetation cover.

SLOPE	Re-vegetation Guidelines	Bioengineering Guidelines
0-15%	Immediately 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; no restrictions on volunteer involvement
16-40%	Use above strategy or immediate planting to provide 100% foliar coverage within 3 years of first clearing.	Install facines, wattles or native woody debris fastened perpendicular to the slope at intervals <10'; no restrictions on volunteer involvement
41-60%	planting or recruitment of native plants to provide 100% foliar coverage within 3 years of first clearing	Above requirements, plus coverage of bare soil by mulches within 30 days of clearing; geo-technical review of project required prior to any work; geo-textile coverage of bare soils strongly recommended; non-professional volunteers must be supervised by qualified professionals
>61%	Seeding with sterile annual grasses recommended; planting or recruitment of native plants to provide 100% foliar coverage within 3 years of first clearing; tree species are limited to shorter species (<30 feet mature height) on unstable slopes	Geo-technical design of project required with departmental review; geo-textile coverage of bare soils strongly recommended; non-professional volunteer labor not permitted

Table 7. Guidelines for Clearing of Ground Vegetation (>750 square feet in any 10,000 square feet area in any one year)

6.4.2 Hazard Tree Management

There are three main management prescriptions for the hazard trees in Golden Gardens: removal, inspection, and pruning/monitoring. Table 8 identifies the trees for each action with special recommendations of note.

For the 99 trees assessed, they were put into one of the following categories:

Activity	Applicable Trees	Recommendations
Removal/ Replace	Beach: 6, 27 South: 55 Central: 44, 80, 83, 84, 85, 86, 88 Central Upper Hillside: 91, 92, 96 North Central: 32, 36 North End: 99	Beach: In the maintained landscape, stump grind and replace with good-size caliper tree. Hillside: Due to the slope and erosion issues, consider keeping stump and replanting adjacent Root disease pocket: replace with resistant species North End fir: create a snag
Inspection	Beach: 1, 10, 11, 30 South: 52, 56, 57, 59, 62, 65, 73 Central: 38, 47, 48, 77 Central Upper Hillside: 51	Several defects but could not resoundingly recommend removal; may need invasive inspection of the tree to determine extent of decay; utilize resistograph, drill or corer for this type of assessment; others may need discussion with maintenance staff.
Pruning/ Monitoring	Beach: 2-5, 7-9, 12-26, 28, 29, 31 South: 53, 54, 58, 60, 61, 63, 64, 66-72, 98 Central: 37, 39, 40-43, 45, 46, 74-76, 78, 79, 81, 82, 87, 89 Central Upper Hillside: 49, 50, 90, 93, 94, 95 North Central: 33, 34, 35	Either remove deadwood or one or more stems or scaffold branches due to decayed attachments; may need to prune live branches away from target to lighten load on scaffolds; Annually monitor all trees to document changes or decline requiring other action.

Table 8. Hazard Tree Management Prescriptions by Location and Tree Number (Refer to Appendix J-7)

Beach Area

The two removals involve a dead maple (27) and a declining poplar with severely compromised root system and lean over path (6).

Three trees requiring more inspection have several or significant defects in the trunk or root system (1,10,11). The extent of decay must be determined in order to make decisions about the trees. A pine in the south end of the parking lot (30) is included for more discussion with maintenance staff. It is leaning severely over the path though is a smaller tree in stature which may allow it to be retained.

The rest of the "beach" trees will need to be monitored regularly. There is evidenced of recent pruning on the poplars, and they could benefit from another pruning to remove dead, dying branches. Most of the hornbeams along the path and parking lot are doing well. There is no sign of recent limb failure or significant decline in the trees.

South Area

The only removal in this area is a spruce near the maintenance yard (55) with several injuries to the base.

There are two groups of trees requiring additional inspection: the conifers around the maintenance yard and on the road and the maples in the wetland slope. The conifers (and one maple 52) have damage defects either at the trunk or at the top (56,57,59). The extent of decay will need to be determined for any further discussion on the fate of these trees.

The steep, wet conditions of the wetland along the lower slope have caused several of the maples to start decaying at the base. Typical of bigleaf maple, all the trees are multiple-stemmed supporting a wide canopy, and in this case, mostly over the road. The trees appear to acclimate to the decay process, balancing well on the slope though decline is evident with major stems completely dead. The progression of the decay in three of these trees (62,65,73) will need to be assessed.

Pruning of dead wood and major dead and decayed stems and scaffold branches will significantly lower the failure potential of the rest of the trees. It is recommended that one maple in the sound end (70) have selective pruning done on the branches over the road to decrease the load on the scaffold branches and stems. Frequent monitoring of the progression of decline in all the maples is critical.

Central Area

The steep slope adjacent to the main stairway and on the west side of Golden Gardens Avenue have some trees with serious defects and undermining of root systems that removal of the trees is advised (44,80). Two trees in the OLA are either dead (86) or have insufficient canopy to sustain the whole tree (88). In the dense conifer area west of the comfort station, a couple trees are leaning significantly and pose a threat of failure on several targets (84,85). One smaller fir north of that area has significant decay in the trunk requiring its removal (83).

Only four bigleaf maples in this area require inspection. They either have signs of decay at critical parts (38,48), structural issues of seams, cracks (77), or ivy needs to be removed to determine if there is any decay issues (47).

The majority of the trees in the area only require pruning of dead wood and annual monitoring.

Central Upper Hillside Area

A standing dead fir (92) and an uprooted, leaning hemlock (91) need to be removed from the hillside. A topped and sprouted maple sitting precariously over the upper stairs and trail is being undermined by an eroding slope and should be removed (96).

The large alder across the street from the upper parking lot is leaning significantly and has decay evident at the base (51). Inspection is required to determine if it is safe to retain that tree, though alders are not known to be long-lived or solid at such a large size.

The trees requiring monitoring are the conifers in or near the root rot pocket (50,90,93) and maples on the steep slopes (49,94,95).

North Central Area

One very large bigleaf maple has significant decay at the base and extreme undermining of the root system, classifying it as a high hazard to the road above and the trail below (32). The other removal is of declining native cherry tree(s) (34), a normal sight in the park.

The rest of the trees exhibiting any issues will benefit from removal of dead wood and frequent monitoring.

North End Area

There is a very large Douglas fir in the north part of the trail system (99) that has several fungal conks on its trunk and decline in the upper canopy. The conks are fruiting bodies of a decay pathogen and their presence indicates an advance stage of decay. This tree should be lowered in height and turned into a snag for wildlife habitat.

6.5 Other Park Management Issues

Several issues surfaced during the development of this VMP. While all are real concerns, many cannot be addressed or resolved with vegetation. In order to develop a comprehensive plan, we felt it was important to acknowledge the issues and provide some direction, whether or not it is in the scope of the VMP.

6.5.1 View Obstruction with Trees

In 2001, Parks adopted a revision to its policies concerning the management of trees. Its previous policies allowed for citizens to obtain a permit to prune or remove trees on park property to enhance their private views. The revision specifically prohibits removal of park trees solely for private views. It does allow for trees to be removed as part of a VMP that provides overall benefit to the vegetation resource as defined by the criteria in the policy.

For the areas where maples have been topped (Re-sprouted Maple MO), the management recommendation is to plant more trees, including conifers, to increase the tree cover and enhance forest structure. This recommendation is supported by the tree policy's goals and the objectives outlined previously in this VMP. Adjacent property owners are encouraged to be involved in the reforestation efforts in these areas, particularly when it comes to discussing tree locations that may provide corridor or framed views. As indicated above, residents are able to develop and submit vegetation plans for park areas, as long as it follows the goals, objectives, policy and management plan recommendations for the park.

6.5.2 Off-Trail Damage to Slope and Vegetation

Utilizing vegetation as the sole method of discouraging off-trail activity is impractical. It will be difficult to curb off-trail use without education and enforcement of park and trail rules. Before any concerted reforestation is implemented near the trail system, official or otherwise, Parks should develop a trail plan. Components of such a plan should include trail design, repair, methods to discourage unwanted pathways, and signage. When new plantings are installed anywhere close to trail traffic, barriers will be necessary to discourage trampling by curious humans and dogs. Brush, logs, fence and reforestation signage should be employed as conditions warrant.

6.5.3 Railroad Corridor Safety

Access to the railroad right-of-way through the park is a very serious concern. Vegetation can play only a small role in discouraging people from trespassing. Unfortunately, a tall, sturdy structure, such as fencing or a wall is the only effective barrier in this situation. Where people are accessing the tracks at the north end of the beach and near the over pass, there is little opportunity to establish effective vegetation because there is not adequate soil to support plant growth.

6.5.4 Encampments/Party Sites

This type of activity has a great impact on the forest vegetation. Constant surveillance and speedy removal of structures are the most effective ways to manage such activity. Only after cleanup and evidence of no recurrence should reforestation efforts be considered for these areas.

6.5.5 Noise from Park Users

Residents above the park express concern about the noise travelling uphill from the upper meadow and beach area. The only effective noise barrier are made of very dense material such as the acoustic walls along the freeway. Research shows that vegetation, even densely planted, does not effectively attenuate noise, but rather provides a good visual barrier that helps disassociate the noise from its source. As the improvements get underway around the bathhouse, it was suggested that orientation of the concert and activity venues be considered to minimize acoustic impact uphill.

6.5.6 Dumping

While dumping is often an issue in parks and green spaces, the problem appears to be minor at Golden Gardens. Much of the upper hillside is private property providing a good buffer for yard debris in the park.

6.5.7 Mountain Beaver Activity

In a few areas along the forested hillside of Golden Gardens, mountain beaver burrows were observed. The impact of the animal activity to the stability of the slope would require a geo-technical assessment of the area. Apparently the mountain beaver population is concentrated along the entire slope area including Sunset Hill. The mammal falls under the jurisdiction of the State. For more information and any available control programs, contact Washington State Department of Fish and Wildlife.

6.5.8 Adjacent Private Property Management

The trees along the upper slope of the north part of Golden Gardens Avenue are on private property. There is some history of tree failure in that area. If a tree fails across the road, the situation becomes a public safety issue. Most likely the property owners are unaware of the liability and could certainly benefit from any information on hazard trees for which they need to mitigate. The City Department of Transportation may wish to assess the situation to identify any obvious tree hazards to the road, and then inform the property owner of the liability. This assessment could be coordinated with Parks when the annual monitoring is performed on the park trees along the westside of the road.

CHAPTER 7: VEGETATION MANAGEMENT & MAINTENANCE PRACTICES

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

The practices described in this chapter are referenced in the management recommendations found in the previous Chapter. These two chapters are meant to be used together to describe what is to be done, when, and where (recommendations) and specifically how to do it (practices). The discussion below is to provide the level of detail needed to carry out maintenance and project-specific work outlined in this VMP.

The practices described have been adapted from *Cheasty Greenspace Vegetation Management Plan* (2003), which was adapted from *Sand Point Magnuson Park VMP* (2001), *Seattle Parks Landscape, Horticulture and Urban Forestry Best Management Practices Manual* (1999) and *City Among the Trees* (1998). These practices include maintaining, improving, and restoring vegetation and habitat, as well as establishing or removing vegetation and have been written in this VMP to address the conditions present in Golden Gardens. Specific emphasis has been placed on the major issues of control of non-native, invasive species and effective methods to establish and maintain native vegetation in restoration and enhancement projects in the hillside area.

7.1 Project Planning

All projects, whether initiated by Parks' Horticulture Unit, District staff, or a community group, should provide the department as whole basic information on the proposed project in a standard format. This assures that the project will meet the goals for vegetation management according to this VMP, and adequate resources (labor, funding, and materials) are in place to complete the project. This step also facilitates basic communication between Parks' work groups that may not have daily contact. When a project is monitored and evaluated, the project plan can be used to measure how well the work met the project objectives. A proposed form for this purpose is found in Appendix F and should be reviewed by the necessary work groups before a project is executed. Ideally, the essential data on the form should be entered into a spreadsheet that keeps track of projects in the park.

7.2 Managing Laminated Root Rot

Laminated root rot (*Phellinus weirii*) is the biggest challenge to the goal of increasing conifer composition in the park's tree canopy. Most native conifers are at least somewhat susceptible. Edmonds (1999) offered options for controlling the disease that involved highly invasive techniques, including logging and digging out stumps. These are not appropriate for a forested area where habitat and erosion control are primary goals.

Edmonds outlined the symptoms of laminated root rot and the trees that are most susceptible to laminated root rot. They are as follows:

7.2.1 Symptoms (tree responses)

- Reduced height growth
- Formation of root disease centers (canopy gaps)

- Wind thrown trees with distinctive root balls lying in many directions
- Standing dead trees
- Excessive cone crop
- Thinning and yellowing foliage
- Wood in roots and butt of tree delaminating at annual rings
- Incipient decay stain in butt of tree
- Hollow internal tree butts

7.2.2 Signs (pathogen parts)

- Buff colored ectotrophic hyphae growing on the outside of the roots
- Red setal hyphae growing in the wood
- Annual fruiting bodies on upturned roots with brown pore surface (very rare)

Some conifers are more susceptible than others. Douglas fir, a species otherwise ideal for the dry coastal bluff conditions at Golden Gardens, is highly susceptible to laminated root rot. So is grand fir, another prominent species in the park. Most other native conifers are alt least somewhat susceptible to the disease. Western red cedar is considered resistant to the disease, although not immune. A cedar that blew over in the south hillside exhibited signs of laminated root rot. The only trees that are immune are deciduous trees. Table 9 provides a list of susceptible and more resistant tree species to the pathogen.

Highly susceptible	Douglas fir Grand fir Mountain hemlock Pacific silver fir White fir
Intermediately susceptible	Western hemlock Giant sequoia Noble fir California red fir Pacific yew Sitka spruce Subalpine fir Western larch
Tolerant	Lodgepole pine Western white pine Ponderosa pine
Resistant	Western red cedar Yellow cedar Incense cedar Redwood
Immune	Bigleaf maple Red alder Vine maple

Table 9. Susceptibility of tree species to *Phellinus weirii* in lowland Puget Sound adapted from Common Tree Diseases of British Columbia

The disease spreads by root grafts, which usually occur between trees of the same species. Therefore, groups of a conifer species are more vulnerable to infection than single conifers interspersed among deciduous trees. This is useful knowledge when looking for trees that might be infected.

In order to manage root rot, additional investigation will be needed. Stumps of trees that died or failed from laminated root rot should be considered disease centers. Conifer trees within 50' of a disease center should be monitored on an annual basis, especially if they are the same species as the one in the disease center. Visual inspections of conifer tree crowns should be made in late spring from an appropriate vantage using a pair of high-powered binoculars. Any symptom of the disease warrants a root crown inspection using some form of internal investigation (increment corer, drill, or Resistograph®). Conservative management in these situations may require removing trees that appear normal and healthy.

Immune trees are preferred for stand regeneration in and adjacent to root rot pockets. These would be native deciduous species, such as bigleaf maple, red alder and Oregon ash. If a conifer species is essential in these situations, red cedar should be considered first. If the area is unsuitable for red cedar because of low soil moisture, certain species that are native to the Pacific Northwest but not indigenous to this area should be considered for planting. These include western white pine, incense cedar, coast redwood, and yellow (Alaska) cedar.

7.3 Amending Soils

The soils in Golden Gardens are generally well-drained, mineral soils with sandy textures. Organic content is very low in these upland mineral soils. No organic soils were found except in the wetland areas, where there are limited areas of organic mucky soils that are poorly drained. These soil characteristics favor dry upland species throughout the majority of hillside except in riparian corridors and wetlands. Planting projects should reflect this in the choice of species. Plant species choices should be selected for the existing micro-site conditions for optimal plant survival and success. Soil moisture and degree of canopy closure (e.g. sun/shade) will be the most important indicators influencing species selection for a particular site.

However, the well-drained sandy soils of Golden Gardens require special attention to the moisture requirement of any plant that has been transplanted. Extra soil moisture must be supplied for the first three years after planting. Regular irrigation is the preferred alternative (see Section 7.9). A project plan that does not include irrigation must include soil amendments that will help hold moisture near the plant's root ball to increase its chance of survival. Amendments that can perform this function include high-quality compost, starch-based irrigation supplements and polymer hydrogel granules.

In the case where compost amendments are part of a planting project, amending should be done throughout a planting area, not only by adding nutrient-rich soil to each individual plant pit. Generally, the best way to add soil amendments to an area is to clear the site of invasives, aerate or scarify the soil if necessary, and then spread amendment (e.g. compost or equivalent) on the surface throughout the planting area. If tilling is possible, this should be done to incorporate amendments into existing topsoil layer, avoiding the root zones of mature trees. Seasonal timing of this should be such that bare soils are not exposed to winter rains. Therefore, if done in the

fall after summer weed removal, soil should be seeded or covered with wood chips whether or not site is planted that season.

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 at the time of planting. As soil temperatures warm 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 the water in gel form and keep moisture available to plant roots that come in contact with the gel granules. They have a mixed reputation, partly because they are easy to overuse.

Simple application of wood chips and leaf mulch onto the soil surface are also a way to effectively get organic content back into the soil and hold moisture in the ground. Wood chips must be composted to avoid spreading decay fungi to living, mature and healthy trees.

7.4 Creating Snags and Down Woody Debris

[*Adapted from U.S. Army Corps of Engineers" Snags as Ecosystem Components" and the Canadian Ministry of Forestry's (2000) "Short Term Strategy for Coarse Woody Debris Management in British Columbia's Forests"*]

Two interrelated elements of increasing habitat structural complexity at Golden Gardens are involved in this section: creating snags, creating canopy gaps as a result, and scattering downed wood in the greenspace to increase availability of down woody debris as habitat for wildlife.

The recommendation for snag retention in managed forests is three large snags per acre. Larger snags are more valuable for wildlife, and 10" dbh is a recommended minimum in order to provide greater habitat value for wildlife. Potential snag trees in Golden Gardens should therefore be as large as possible, but no smaller than 10" dbh. However, candidate trees will be selected from trees that are already suppressed or in decline. Canopy dominants will not be recruited for snag creation. Trees should be girdled at about 2-3' above the ground, with a 4" strip of bark removed in the process. Cuts into the sapwood should then be made. Roosting slits (small 1- to 2-in.-wide by 8-in. slits that are angled upward into the cambium) can be added when the trees are first girdled to provide roosting habitat for bats and certain birds. In addition, small (6-in. x 6-in.) sections of bark at the base of a suitable tree can be chopped out during snag creation. Disease-causing pathogens will enter the wound and start the decay process, eventually creating cavities that may be used by various birds and mammals. Temporary nest boxes may also be deployed at the time of snag creation, in order to attract cavity nesters to areas with newly created snags.

Canopy gaps will result from snag creation. The girdling associated with snag creation disrupts vascular flow to the upper bole and canopy, and gradually kills the tree (usually within 1-2 years). The loss of leaves from the tree canopy will allow for a greater amount of light to reach the forest floor, and additional removal of nearby smaller trees may allow for a larger canopy gap, if desired. Canopy gaps will only be created in dry to mesic areas with controlled invasives, and on a trial basis initially.

Down woody debris (DWD) currently available at Golden Gardens can be supplemented with additional DWD generated by snag creation. Some guidelines for DWD selection and placement follow. Spies and Franklin (1991) suggest that 15%-20% DWD cover and at least two large logs per acre (12"-17" in diameter and greater than 20' in length) within the total DWD cover for that area be retained for wildlife purposes. Larger pieces of DWD are more valuable than smaller pieces — they last longer, hold more moisture, and are useable structures for a greater number of organisms. Ecologically, it is advantageous to maintain the full range of decay and diameter classes of DWD on every site — different functions and ecosystem processes require DWD in different stages of decay. Coniferous material lasts many times longer than deciduous material and therefore remains part of the useable structure of a stand for a much longer period of time. However, the faster decay rate of deciduous DWD likely provides significant short-term ecological benefits. Retention of a diversity of species is advantageous. A more even distribution of DWD across the landscape, rather than a clumped distribution, is considered to provide greater habitat value for wildlife.

7.5 Planting

[Planting Instructions are adapted from Seattle Parks and Recreation Landscape, Horticulture and Urban Forestry BMPs (1999) and King County Water and Land Resources Bulletin titled "Live Stake Cutting and Planting Tips"]

Planting of trees and shrubs in Golden Gardens will consist mainly of installing upland species. Typical scenarios are new understory planting in the forest and planting after invasive plant or hazard tree removal. Planting may also occur in conjunction with restoration of known wetlands and riparian corridors. In all cases species selection will be critical to planting success and meeting project goals. The forest of Golden Gardens should have a species composition and distribution typical of the Puget lowland forests.

Planting instructions below are followed by Table 10 that specifies planting densities and plant spacing. Appendix D has recommended plant communities according to the two dominant microhabitat features in Golden Gardens – soil moisture and canopy closure/light conditions.

7.5.1 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.

- Ideal planting hole is 2-3x the diameter of the root spread or the root ball (depending on existing soil conditions)
- Minimum planting hole is 12" wider than root spread or root ball
- Hole shall be no deeper than the ball and the ball shall sit firmly on the undisturbed subsoil
- Native soil shall be used to backfill the planting hole except as recommended in Section 7.3
- Trees shall not be fertilized at the time of planting
- Balled-and-burlapped trees shall be placed in the hole and plumbed vertically. All rope shall be removed from around the trunk of the tree and the top 1/3 of the burlap shall 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. Do not remove any B&B

packaging material until the tree is placed in the hole and securely plumbed into its final position.

- Trees in wire baskets shall have all of the basket removed, using bolt cutters
- Backfill soil in lifts of 4-6" 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 project scope allows, watering soil rather than compacting is preferred. Backfill ½ the soil in the tree pit and thoroughly drench with water to settle. 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.
- Trees planted in sandy or loamy soils should have a 3" 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 on heavily compacted sites.
- Stake only in situations where normal planting procedures does not provide a stable plant; otherwise, staking is not generally required.
- Staking is sometimes recommended as a vandal deterrent device or to prevent mechanical injury from mowers or trimmers. Ties for stakes should be some biodegradable or flexible fastener that precludes collaring of the trunk if the ties are not removed in a timely fashion.
- Stakes shall be removed at the end of the first year.
- Plant trees at the depth they were growing in the nursery.
- Do not wrap tree trunks.
- Remove tree trunk wrapping materials, tags, and all ties at the time of planting.

7.5.2 Shrubs *(refer to general guidelines for trees, above)*

- If needed, incorporate amendment into soil before adding plants.
- Wait until plants are established before adding chemical fertilizer.
- Plant at proper depth taking into consideration room for mulch.
- Plant shrubs with proper spacing to allow for spread at mature size.
- Plant bare root stock at the same grade as grown in the nursery.

Planting density and spacing depend on existing site conditions, existing vegetation, and the plant community that is desired. Bare areas completely cleared of invasive (e.g. blackberry thickets) will be planted more densely than project sites that already have exiting native vegetation. Recommended density ranges and general spacing guidelines are given below. These are meant to be guidelines that are to be adjusted according to the specifics of a project.

7.5.3 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, and red osier dogwood. Stakes should be planted in areas that will be consistently moist through out the growing season, such as riparian and wetland areas. 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.

Stakes can be harvested from an appropriate site or purchased. They should be installed as soon as possible after harvesting – ideally within 24-72 hours – and kept wet in a bucket and in the shade until installation. Stakes should be at least 2-3' in length and >¾" diameter for willows and cottonwood, and >½" diameter for red osier dogwood. If harvesting your own stakes, no more than 5% of the parent plant should be removed at any one time.

Stakes should be installed with a rubber mallet if the ground is soft enough, or by using a planting bar to create the hole in more compacted soils. The stake should be installed with no more than 3-6" remaining above the ground, and there should be good soil contact below ground for the length of the stake.

Table 10. Recommended Planting Densities for Projects in Golden Gardens

Vegetation layer	***Spacing***	***Density***
Tree		
Conifer	8-15' on center (o.c.)	150-200 per acre
Deciduous	5-10' o.c.	200-400 per acre
Tall Shrub	4-8' o.c.	700-1800 per acre
Short Shrub	2-4' o.c.	1200-2500 per acre
Live Stake	3-5' o.c.	1000-2000 per acre

7.6 Mulching

[*Adapted from Sand Point Magnuson Park VMP, by Sheldon & Associates, Inc. (2001); and Seattle Parks Landscape, Horticulture and Urban Forestry BMPs (1999) and 'City Among the Trees' (1998)]*

Mulching is one of the easiest and most important maintenance practices for protecting and nurturing all vegetation types. When site access is possible, mulching is an essential component of any natural area planting project for suppressing weeds/invasives and thereby reducing root competition, to conserve soil moisture and keep soil cool, and to add organic matter to the nutrient-deficient soils.

However, in some areas of Golden Gardens it may not be feasible to transport mulch into interior areas where planting will occur. Moreover, wood chip mulch must be composted to prevent the accidental spread of pathogenic fungi to park trees. This later constraint may be addressed by composting wood chips on-site. The north end of the middle parking lot next to the railroad right-of-way has been proposed for an enclosed maintenance yard. This would be an ideal spot for composting wood chips.

In natural areas such as Golden Gardens, the most desirable mulch material is 2-3" of composted wood chips. Compost, GroCo, or leaf mulch can be added either on top of or underneath the chip layer if soil amendments are desired. Where large areas of invasives have been removed

(e.g. blackberry thickets), and there is good site access, the entire planting area should be sheet mulched with a combination of cardboard sheet mulch overlain by 4-6" of wood chips to minimize re-invasion. However, this should not be done in the vicinity of mature trees. In most cases, wood chips of recycled Parks Department plant material are available at no cost. Plastic, landscape fabric or inorganic mulch should be avoided in most cases, except as specified for highly invaded areas, where it may be the most effective strategy.

In cases where specific plants or groups of plants are to be mulched, use guidelines below. This scenario will most likely be the case when conifers or groups of shrubs are being planted in dry uplands and follow-up watering is not feasible.

7.6.1 Trees (newly planted or recruited)

- Clear weeds and grass from under the tree, in a circle out to the drip line at the tips of the branches.
- Where weeds are very aggressive, use a "sheet mulch" of thick layers of newspaper or cardboard.
- Spread 2-3" deep layer of organic mulch in a circle out to the tree's drip line or in a 3' diameter circle (whichever is greater).
- Keep mulch away from the tree trunk to prevent crown rot or insect damage.
- Maintain mulch annually (during 3-year establishment period or beyond as needed).

7.6.2 Shrubs

- Follow similar procedures as for trees, above.
- Spread layer of organic mulch 2-3" deep and 2-3' in diameter around shrub.
- Cover entire planting area with mulch where applicable.
- Keep mulch away from contact with crown of plant.

7.7 Watering

[*Adapted from Sand Point Magnuson Park VMP, by Sheldon & Associates, Inc., (2001)]*

Watering is an important component of establishing new plantings with maximum success. Seattle gets an average of 39 inches of rain each year, but only 13 of those inches 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. Summer watering the first three years is critical to help the plants acclimate to the radically different moisture regime. 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. However, water delivery to the planting sites will require good planning and extra labor, as the hillside has few water supply lines.

The project manager will determine what is most feasible and efficient for the project being planned. Some areas will be close to quick couplers so that hoses can be attached for overhead irrigation. Other areas may be close to a road or a path where a truck can deliver water with a water tank. In these situations, either hand watering from the tank or hook up to an irrigation system may be preferred, depending on the personnel available for the work.

Many areas will be away from reasonable water access. In these cases, soil amendments (7.3) should be considered. Watering may be done with portable containers to each plant, but this must be weighed against the cost of labor and the damage that repeated foot traffic can cause to the site.

In general:

- Water new trees and shrubs thoroughly at planting if possible.
- Water new trees and shrubs (weekly at least 1") during first two summers, tapering watering (to ½" weekly) in the third year.
- Begin watering at the beginning of June to prevent drought stress.

See Planting (Section 7.5), and 3 Year Establishment Care (Section 7.8) for instructions on watering newly installed trees and shrubs.

7.8 Three Year Establishment and Care

[Adapted from Sand Point Magnuson Park VMP, by Sheldon & Associates, Inc., (2001)]

Typically, all new plantings should have follow-up care for a period of three years that is intensive and frequent. At a minimum, the components of this three-year care program are mulching, watering, and weeding. A three-year calendar for these actions is shown below. Detailed instructions on how to perform these maintenance actions can be found in this chapter under the title of the specific practice, i.e. "Mulching" (Section 7.6). Once the three-year period is over and the plantings have established, care of these planted areas should be incorporated into any regular ongoing maintenance that occurs within the management area that they are located.

In Golden Gardens, new plantings should receive regular watering because of the western exposure and the sandy soils. Site access can make this labor-intensive. A means of conveying water to plants, such as a temporary irrigation system, water tank or hand-carried containers should be developed for each project. Many other areas will not even receive mulching for the same reason. If a site that has been planted will not receive watering during the three-year establishment period, mulching heavily at the time of plant installation should be done if at all possible. Weed control should absolutely be done with diligence at any planted site – in many cases it may be the only part of three-year establishment care that is performed. Adjustments to the calendar, in terms of actions taken, should be made depending on the particular project site conditions.

Figure 7. Three Year Establishment Care Calendar

	Month											
Action	J	F	M	A	M	J	J	A	S	O	N	D
At Time of Installation												
Mulching												
Watering												
Year 1												
Mulching												
Weeding												
Watering												
Year 2												
Mulching												
Weeding												
Watering												
Year 3												
Mulching												
Weeding												
Watering												
Removing Inorganic Mulch												

Indicates time period when action may be taken, timing and frequency to be determined by site conditions

Indicates specific time to perform action

Mulching: See 7.6 "Mulching"

Weeding: See 7.10 "Weeding and Invasive Control"

Watering: If site access allows, all new plantings should be watered in at the time of planting. Regular three year watering, if given, should consist of at least 1" weekly for first two growing seasons, then taper to ½" weekly for plantings in natural areas. See 7.7 "Watering".

Removing Inorganic Mulch: Inorganic sheet mulch used in areas of severe invasive species problems should be removed during the dormant season after 3 years and entire area should be mulched with 4-5" layer of wood chips. Depending on site conditions and concern about re-invasion by weeds, entire planting area can be sheet mulched with a double layer of cardboard underneath the wood chips. Application of these techniques is not typically advised and would probably be limited to planting areas with severe invasion problems that are around the edges of the hillside and therefore accessible for this intensive action.

7.9 Pruning and Removal

Pruning is not a common practice of forest management in natural areas, but can be important for achieving safety and forest health goals. Trees in Golden Gardens may be pruned or removed when it is necessary to mitigate risk to park users, right-of-way or adjacent properties as explained in Section 7.11. Otherwise, tree work will be restricted to instances where it directly achieves a project objective. Such instances might include:

- A mature tree may be pruned or removed to encourage nearby sapling trees to grow. Wherever possible, the preferred technique for reducing competition will be pruning. If a tree is removed, it should be converted to a "snag", essentially a branch-less trunk. This reduces costs and increases habitat features in the park.
- A group of 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 be thinned in the future for this same reason.
- Low branches on trees along a trail or street may be pruned to provide overhead and side clearance.

Pruning 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 the hillside will not be pruned, except along street or trail edges for reasons given below.

All trees must be pruned or removed according to the Parks and Recreation Tree Policy (2001)). Except for the purposes of snag creation, Parks and Recreation Tree Policy prohibits 'topping' of trees.

7.10 Weeding and Invasive Control

[Adapted from Sand Point Magnuson Park VMP, by Sheldon & Associates, Inc., (2001)]

Weeding and controlling invasives are necessary as an ongoing maintenance action throughout the hillside. Many planting projects will include initial removal and ongoing control of invasives as a major component of the project. Invasive control is also an important part of 3-year establishment care for all newly planted areas. The most commonly occurring and problematic non-native invasive species in Golden Gardens are listed below with a brief description of their characteristics, some information about where each species is typically found, and some recommended eradication and control methods for that particular species. Recommendations and protocols (including herbicide use) are intended to be used in accordance with Parks' Landscape, Horticulture, and Urban Forestry BMPs (2002). These "best management practices" focus on using an integrated pest management approach (IPM) characterized by establishing goals, determining thresholds for control, selecting from a combination of control and removal methods, implementing one or more of these methods, monitoring results, and evaluating outcomes.

Generally, the most effective long-term control of invasive species is 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 more sustainable native plant communities. To this end, weedy species and infestations that pose the greatest threat to healthy desirable plant communities are those populations that should be targeted. In addition, to keep the weed control workload at the most reasonable level possible, new infestations should be targeted for control before they become widespread or well established, and the extent of current invasion should be controlled at or below existing levels for those species that threaten to spread. Thus, invasive control should focus on those species and specific 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 following text describes in detail how to remove each of the identified non-native invasive plants or noxious weeds identified as a significant presence in Golden Gardens. Non-native invasive species that are not specified in these tables can be removed as needed and appropriate. All work with pesticides must be done by landscape professionals licensed to apply pesticides by the Washington State Department of Agriculture. In wetland areas, the operator must have an aquatic endorsement on his or her license. In accordance with state law, records of all chemical applications must be kept by the applicator.

7.10.1 Tree Species (canopy species >20' tall at maturity)

Sycamore maple *(Acer pseudoplatanus)* Norway maple *(Acer platanoides)* black locust *(Robinia pseudoacacia)* and horse chestnut (*Aesculus hippocastanum*)

Sycamore maple is the most prevalent invasive tree species in Golden Gardens. It is found as saplings sporadically in the hillside. This, horse chestnut, and Norway maple are known for their ability to establish in a variety of conditions from wet to dry soils, and from full sun to deep shade. In forests of the Eastern U.S., invasive maples, particularly Norway maple, have naturalized readily into urban woodlands with great success due to their shade-tolerance and adaptability. Black locust is less shade tolerant, but becomes invasive in any highly-disturbed or dry environment, such as slide areas or beaches.

Removal of existing seedlings within the hillside is a high priority. Seedlings smaller than 2" caliper can be removed with their roots using a weed wrench. Maples and black locust resprout if cut, so removals of trees>2" caliper may include the use of an herbicide if IPM protocols warrant this action. Cutting alone may be sufficient in heavy shade conditions.

The recommended method for treatment of trees >2" caliper is using a low volume-high concentration basal application of Garlon 3A mixed in mineral oil or diesel. The mineral oil or diesel will draw the herbicide into the bark. The herbicide mixture should be applied directly to the tree trunk 2-3' up from the base around the entire circumference of the tree with a sponge applicator or squirt bottle. Squirt bottles must have oil-resistant o-rings or gaskets. This process requires careful material handling and patience and should only be done by licensed pesticide applicators. In the case of the black locust grove, stump treatment should be avoided near other black locusts that are going to remain. Since the trees are likely root-grafted together, herbicide treatment of nearby trees will also affect untreated trees.

All treated trees should be painted or flagged to indicate herbicide use, and to allow follow-up monitoring of treatment effectiveness 2-8 months after treatment. Standing dead trees can be left for wildlife snags, or cut and left as down wood as desired.

7.10.2 Shrub and Vine Species (<20' tall at maturity)

English ivy *(Hedera helix)*

English ivy is a broad-leaved evergreen non-native invasive found throughout Golden Gardens in the forest ground layer and climbing up tree trunks in the forest. It is one of the biggest threats to forest health. It has no natural predators or pests. Ivy is shade-tolerant, and forms dense mats on the ground. In addition it climbs trees, weighing down the limbs, reducing air and nutrient flow, and creating a heavy sail in the canopy that increases the wind resistance of an already weakened tree making it susceptible to wind throw. English ivy is not a beneficial habitat for native wildlife, and reduces native plant diversity.

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 shoulder-height, and again at the base of the tree all the way around the circumference of the tree. Cut vines should not be pulled down out of trees. A radius of at least 5' from the base of the tree all the way around 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. Removal of ground layer ivy 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 replanting 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 project manager a chance to recruit native plant regeneration from the existing seed bank in the soil. If this is executed, 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 invasive species must be carefully weeded from the desirable native regeneration. This takes a discerning eye and a sensitive touch. However, this is an ideal strategy for "adopt-an-area" sites.

On slopes greater than 15 percent, if native recruitment is not successful, high-density planting and intensive maintenance should be provided as a backup strategy so that 100% foliar coverage is achieved within three years. In addition, facines, wattles or woody debris should be fastened perpendicular to the fall line to intercept surface water flow and prevent erosion on slopes between 15 and 40 percent. On slopes greater than 40 percent, immediate replanting and broadcast mulching are recommended to guarantee adequate foliar coverage under critical slope conditions.

New planting areas should have an additional 10'-wide cleared strip around the edge. More extensive instructions for manual ivy removal can be found at www.ivyout.org. If adaptive management and IPM protocols warrant, ivy may also be controlled by glyphosate herbicide with added surfactant selectively applied to new leaf growth in June by wiper applicator. This process requires careful material handling and patience and should only be

done by licensed pesticide applicators. However, it may be a preferred strategy on steep slopes where ground disturbance is undesirable.

Laurel *(Prunus laurocerasus, Prunus lusitanica),* English holly *(Ilex aquifolium)*

Laurel and holly are broad-leaved evergreen shrubs that are spread readily by birds due to their prolific and tasty fruit. They also sucker and re-sprout vigorously. They prefer at least partial shade and are generally found in upland forest in the understory, or along forest edges. These species are found throughout Golden Gardens.

Although laurel and holly do not pose as immediate of a threat to forest health as other invasives in the hillside such as ivy, removal of these species is important to prevent further spread. Fortunately, they occur mostly as individual plants rather than large thickets. Young plants that are small enough can be hand-pulled or weed-wrenched, but most removals of larger plants that cannot be removed with the roots intact will probably be done most effectively by IPM strategy that includes a combination of mechanical means and herbicide. A 25% solution of Garlon 3A is recommended in upland areas away from aquatic resources e.g. shoreline, wetlands. Within 100' of aquatic resources, a 50% solution of Rodeo in a water base (no surfactant) is recommended. Herbicide should be mixed with a water-soluble dye. Several cut and paint methods can be used. Any of these require careful material handling and patience and should only be done by licensed pesticide applicators.

1. Cut shrub to a stump at or near ground level and paint entire cut surface immediately with herbicide.
   OR
2. Cut shrub to a stump at or near chest level and with a portable drill, make 1/8" diameter holes 1" deep into the stump from the outer sides all the way around the circumference of the stump every 2". Then inject herbicide with syringe directly into each hole. If standing dead brush is desired, this method can be used without cutting the plant to a stump.
   OR
3. Girdle the standing plant by making a series of downward overlapping cuts all the way around the trunk (also called frilling), leaving the chips attached to the trunk at the base of the cut. Then paint herbicide onto fresh cuts. This technique should be used before fruit production so that standing dead plant does not have fruit on it.
   OR
4. For larger plants >2" caliper, use a low volume high concentration basal application of Garlon 3A mixed with mineral oil or diesel fuel and apply it to the bark of the plant 2-3' up the trunk from the base around its entire circumference. Use a sponge applicator or squirt bottle to apply herbicide mixture. Squirt bottles must have oil-resistant o-rings or gaskets.

Treated cut stumps should be checked for resprouts every 2 to 6 months for the first year after cutting and re-treated if necessary. If no herbicide is used, repeated cutting will be required to weaken and eventually kill the plant over time. This is a more labor-intensive method and will require diligent follow-up visits over a period of at least several years to

remove suckering growth resulting from initial cutting. However, IPM protocols may favor this method in certain situations.

Non-native hawthorn *(Crataegus sp.)* and mountain ash *(Sorbus aucuparia)*

Non-native hawthorn and mountain ash are large tree-like shrubs that spread by prolific fruit production that is excellent bird forage. It is distributed irregularly throughout the hillside. It occurs most frequently as seedlings that are small enough to remove by hand-pulling or weed-wrenching.

Because hawthorn is a suckering species, the most effective removal technique is to remove the entire plant with the roots intact. On larger plants, an IPM approach may include the use of an herbicide if IPM protocols warrant this action. Individual shrubs would be cut and herbicide would be applied directly to the cut surface to prevent re-sprouting. A 25% solution of Garlon 3A is recommended in upland areas away from aquatic resources e.g. shoreline, wetlands. Within 100' of aquatic resources, a 50% solution of Rodeo in a water base (no surfactant) is recommended. Herbicide should be mixed with a water-soluble dye. Several cut and paint methods can be used. Any of these require careful material handling and patience and should only be done by licensed pesticide applicators.

1) Cut shrub to a stump at or near ground level and paint entire cut surface immediately with herbicide.

   OR

2) Cut shrub to a stump at or near chest level and with a portable drill, make 1/8" diameter holes 1" deep into the stump from the outer sides all the way around the circumference of the stump every 2" or one hole for every 1" dbh. Holes should be drilled at a slight downward angle. Then inject herbicide with syringe directly into each hole. If standing dead brush is desired, this method can be used without cutting the plant to a stump.

   OR

3) Girdle the standing plant by making a series of downward overlapping cuts all the way around the trunk (also called frilling), leaving the chips attached to the trunk at the base of the cut. Then paint herbicide onto fresh cuts. This technique should be used before fruit production so that standing dead plant does not have fruit on it.

Treated cut stumps should be checked for re-sprouts every 2 to 6 months for the first year after cutting and re-treated if necessary. If no herbicide is used, repeated cutting will be required to weaken and eventually kill the plant over time. This is a more labor-intensive method and will require diligent follow-up visits over a period of at least several years to remove suckering growth resulting from initial cutting.

Himalayan blackberry and Evergreen blackberry *(Rubus procerus, R. laciniatus)*

Both of these non-native blackberries are found in the hillside, though Himalayan blackberry is by far most prevalent. Eradication and control methods for these two species are the same. Blackberry is found in large thickets where there is low canopy closure – along hillside edges and interior areas where there is available sunlight caused by development or canopy gaps. Blackberry is shade-intolerant and opportunistic on disturbed sites, so long-term control is linked to successful establishment of healthy native plant communities that will create undesirable conditions for this species.

IPM control methods may include hand grubbing with root removal, repeated cutting, mowing, or grazing, cutting and dabbing stubs with herbicide (cut and dab), or combinations of two or more of these techniques with monitoring between treatments. Hand-grubbing is generally only a reasonable method for small areas, or for maintenance around trees or shrubs. If herbicide is used, a glyphosate herbicide is recommended – Roundup for upland areas and Rodeo for areas within 100' of an aquatic resource. The method(s) chosen depend mainly on how extensive the infestation is and the available labor resources. Grazing by goats is a method being used in trials by natural area managers in other areas (including here in King County), and may be promising as a method where blackberry is monotypic in thickets without native vegetation.

Removal, other than in areas with sparse occurrences and a relatively intact healthy existing plant community, should not be done unless subsequent replacement planting is planned. In many cases, re-planting of a site may not be done until control of re-sprouts over 2-3 years is complete. In other instances, planting in the fall immediately after summer removal work may be desirable. This will be site dependent, and must be determined at the time of project planning. On slopes less than 40 percent, it may be productive to leave the ground bare and unplanted for one growing season. This gives the project manager a chance to recruit native plant regeneration from the existing seed bank in the soil. If this is executed, it is important to leave the soil surface scarified (lightly raked) and fence the area to prevent foot traffic. During the subsequent three growing seasons, regeneration of invasive species must be carefully weeded from the desirable native regeneration. This takes a discerning eye and a sensitive touch. However, this is an ideal strategy for "adopt-an-area" sites.

On slopes greater than 15 percent, if native recruitment is not successful, high-density planting and intensive maintenance should be provided as a backup strategy so that 100% foliar coverage is achieved within three years. In addition, facines, wattles or woody debris should be fastened perpendicular to the fall line to intercept surface water flow and prevent erosion on slopes between 15 and 40 percent. On slopes greater than 40 percent, immediate replanting and broadcast mulching are recommended to guarantee adequate foliar coverage under critical slope conditions.

For sparse occurrences, hand-grubbing is recommended. In general if herbicide is used, timing of its application should coincide with the time of year that the target plant is most actively growing and trans-locating resources to its roots to maximize herbicide effectiveness. For Himalayan blackberry, this is generally considered to be mid-summer during flowering. For removal of denser stands or thickets the following methods are recommended: Any herbicide application requires careful material handling and patience and should only be done by licensed pesticide applicators.

1) Mow, graze, or cut the plants to the ground repeatedly during the growing season (May-Oct) to reduce plant vigor. If combining with an herbicide treatment, do a late summer (July) cut and dab (herbicide) treatment on re-sprouts. Herbicide should be applied to fresh cuts immediately (within 30 min.) for most effective treatment. In fall, after final mowing, plant and apply double layer of cardboard sheet mulch covered with 4-6" of mulch.

OR

2) Mow, graze, or cut to the ground late in the growing season (after July 31st), and immediately cover entire area with heavy weed fabric firmly stapled to the ground. In fall, cut slits in the fabric to install plants. After 2-3 years, remove fabric, hand-pull any re-sprouts, and apply double layer of cardboard sheet mulch covered with 4-6" of wood chips.

OR

3) Mow, graze, or cut to the ground late in the growing season (after July 1st) and either dab cut ends at that time, or cut and dab resprouts late in the summer when they appear.

Scot's broom *(Cytisus scoparius)*

Scot's broom is not found on the hillside, but occurs sporadically along the railroad right-of-way. It produces large quantities of self-dispersed, and long-lived seed. Removal of seed-producing age plants is the most labor intensive, but is important to reduce spread and seed accumulation. Removal and control of younger plants is easier because they can be hand-pulled or mowed, and is also important to keep the seed-producing population from expanding and becoming more widespread.

Removal can be done incrementally as resources are available. IPM strategies may include mowing, grazing, hand-cutting individual plants, or manual grubbing with shovels, weed wrenches or machinery. Methods involving grubbing may be the least desirable due to the soil disturbance and opportunity for improved broom seed germination and seedling emergence it causes.

Cutting should be done early in the summer when flowering has just started and may either be followed up by continued subsequent annual (or more often) cutting or by herbicide treatment (Roundup with water soluble dye) of cut stumps. Any herbicide application requires careful material handling and patience and should only be done by licensed pesticide applicators. Hand-pulling of smaller infestations of young plants (3' tall and smaller) should be done when soil is moist and loose (spring).

Scots broom that is not dense enough to be a monotypic thicket can be part of invasive control along edge habitat. In edge habitat where invasion is low and coverage is sparse it may be advisable to replant with native species to prevent re-colonization. This determination should be made on a site- specific basis.

Clematis *(Clematis vitalba)* and grape *(Vitis sp.)*

Clematis is a woody vine that climbs trees. It was observed mostly along the eastern edge of the hillside. Grape is another woody invasive vine that was not observed in Golden Gardens but is likely to occur in the future. Control of these species involves cutting the vine at the base near the ground in early summer before seed production occurs, and either grubbing out the root, or applying herbicide (Roundup with water soluble dye) directly onto the surface of the cut stump. Choice of method will determined by IPM protocols. Any herbicide application requires careful material handling and patience and should only be done by licensed pesticide applicators. Dead top growth can be removed in fall or winter when vines have become brittle. Cut vines should be flagged for follow up monitoring, as several treatments may be necessary.

7.10.3 Herbaceous Species

Japanese knotweed *(Polyganum cuspidatum)*

Knotweed, or false bamboo, is an herbaceous perennial that forms large monotypic clumps upwards of 6-8' in height. It reproduces by seed and by rhizomes, which are very large and impossible to remove effectively by grubbing. It prefers moist soil conditions, and is typically found around wetlands, along stream banks, and in ditches. It was not observed at Golden Gardens, but any new presence of it should be immediately eradicated. The most effective removal method is to exhaust its root reserves by repeated cutting during the growing season (at least 3 times between April and August), and then burying the entire area after the last cutting under well stapled heavy duty weed fabric or double layer industrial strength cardboard, overlain by a deep (8-12") layer of wood chips.

If warranted, selective application of Rodeo can be used on re-growth in late summer, and fabric/mulch installation can be delayed until late winter. Any herbicide application requires careful material handling and patience and should only be done by licensed pesticide applicators. Planting should not be done until after 2-3 years so that the fabric/mulch is not compromised while roots are still viable.

Reed Canarygrass (*Phalaris arundinacea*)

Reed canarygrass is a rhizomatous perennial grass that can reach three to six feet in height. The sturdy, hollow stems can be up to 1/2 inch in diameter, with some reddish coloration near the top. Leaf blades are flat and hairless, 1/4 to 3/4 of an inch wide. Reed canarygrass forms dense, highly productive single species stands that pose a major threat to many wetland ecosystems. The species grows so vigorously that it is able to inhibit and eliminate competing species. In addition, areas that have existed as reed canarygrass monocultures for extended periods may have seed banks that are devoid of native species. Unlike native wetland vegetation, dense stands of reed canarygrass have little value for wildlife. Few species eat the grass, and the stems grow too densely to provide adequate cover for small mammals and waterfowl. The species is considered a serious weed and is listed as a Class C weed by the State of Washington.

IPM strategies will involve hand-pulling alternated and may include alternating this with application of glyphosate herbicide. Any herbicide application requires careful material handling and patience and should only be done by licensed pesticide applicators. Maximum control depends on the timing of application. Herbicides provide control for up to two years at the most. After this period, reed canarygrass recolonizes a treated area from adjacent stands or from seed bank recruitment. Only glyphosate (Rodeo®) is licensed for use in aquatic systems in Washington.

Field bindweed *(Convolvulus arvensis)*

Bindweed is a pervasive and very invasive perennial vine that winds around and overtops woody vegetation, and forms strangling mats over the top of low shrubs and understory. It thrives in disturbed sites, especially in sunny locations with moderately dry soils. It can be a particular problem in areas that have been newly cleared of other invasives (e.g. Himalayan blackberry) and replanted. Control of this species will mostly be required in the course of carrying out 3-year maintenance care for newly planted sites. IPM strategies may involve combination of regular hand-pulling, spot treatment with Roundup, and/or mulching with wood chips during the 3-year establishment period to suppress this weed

adequately. Less frequent follow-up weeding may also be needed after the three-year period.

7.10.4 Listed Noxious Weeds

Currently one noxious weed is found in Golden Gardens that is listed as Class A weeds by King County. Garlic mustard *(Alliaria petiolata)* has been identified at Golden Gardens and control actions are being taken by Parks. Class A weeds are defined as follows: "*Class A weeds are non-native species which have a limited distribution in Washington. Because the infestations of these plants are small in number and limited in density, preventing new infestations and eradicating existing infestations is the highest priority.* Control and eventual eradication of Class A weeds is required by law in all of King County and Washington State." (King County). Listed noxious weeds will be controlled as required by County Regulations and in accordance with Parks BMPs.

7.11 Hazard Tree Management Practices

Approved methods in which to manage hazard trees in parks are located in the Department Policy and Procedure for Tree Management, Maintenance, Pruning and/or Removal (Tree Policy, 2001). As outlined in the previous chapter, there are four recommended actions for hazard trees in Golden Gardens:

7.11.1 Removal

For the hazard trees identified in the park, removals were only recommended when there were no other actions in which to lower the probability of failure to a safe and acceptable level. Removal can include lowering the tree to a safe height creating a snag for wildlife habitat. Tree removal on a steep slope should only be done leaving the stump and root ball intact and avoiding any soil disturbance. The root system can continue to perform well in binding to the soil and help stabilize the slope.

With all removals, replacement planting should be considered. If the area is to be minimally disturbed, planting adjacent to the removal is an option. In root disease pockets, planting disease resistant tree species is essential. For areas where thinning of the stand is beneficial, planting shrubs and groundcover can be the best option.

7.11.2 Inspection

In some trees, the extent of decay could not be detected by visual inspection, and therefore, no determination of the trees' condition was made. Other more invasive evaluation methods, such as the Resistograph®, increment borer, or a small-gauge bit drill, should be utilized to assess the amount of sound wood present in strategic parts of the tree. The type of assessment is usually performed by a certified arborist or forester equipped with that kind of instrumentation.

Other trees, indicated as needing "inspection" in this VMP, may need only a visual assessment by the Maintenance Staff and discussion of whether the situation requires a more extensive evaluation using the above methods. Removal or retention could be decided without additional fancy tools.

7.11.3 Pruning

Most of the pruning prescribed for hazard trees in Golden Gardens is crown cleaning, but limited to removing only dead, dying, and diseased branches. The removal of dead or decayed portions of the tree can include larger parts such as stems and scaffold branches in order to retain the rest of the tree. Because several of the maples are decayed at the base, it may be impossible to make a pruning cut without exposing the interior of the tree. This is unavoidable but the preferred choice over complete removal of a tree.

For some trees, the healthiest part of the tree is in the upper branches, and the areas of concern are decayed trunks at branch attachments or at the base and root system. If the branches are over targets, reducing the branch length and weight with thinning cuts is recommended. As with all pruning, frequent monitoring is required to detect any change in tree health or a negative response to the work.

7.11.3 Monitoring

There are several targets in Golden Gardens, and trees can change in health and stability over a relatively short period of time. It is essential for Parks Maintenance Staff performs annual monitoring of all trees near the identified target areas. The list of hazard trees created in this VMP can be used as a baseline, but it is important that staff observes any changes to adjacent trees that did not appear to have issues at the time of this assessment. The components of high-level hazard tree assessment are outlined in Section 5.2.2 of this VMP (Form in Appendix A-2). These methods should be useful tools for staff to utilize in the field at any time.

CHAPTER 8: PLAN IMPLEMENTATION

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

8.1 Implementation Priorities

Project priorities for Golden Gardens Park consist of addressing tree condition, conserving high-quality habitat, and expanding that habitat utilizing community volunteer resources as described in Chapter 6. Within the projects outlined above, the priorities are to address user safety and critical habitat conservation needs. The majority of project work will take place in the South and Central Sections of the hillside, as these areas contain the highest quality habitat and greatest potential for habitat enhancement.

Table 11 lists the first priority management projects of the ones proposed in this VMP for Golden Gardens. They are minimum management needs to maintain park user safety and forest health. They consist primarily of hazard removal and invasive control. The remainder of the project scope outlined in Chapter 6 represents second priority. However, these should not be considered optional activities, but additional needs that can be addressed concurrently or following the projects listed below.

	Beach Section	**South Section**	**Central Section**
Hazard Trees	Removals, inspections	Removals, inspections	Removals, inspections
Maple MA		Ivy removal from trees	Ivy removal from trees
Conifer MA		Remove ivy from trees, monitor for laminated root rot	
Wetland MA		Control invasives, foster native plant cover on bare soils	Control invasives, foster native plant cover on bare soils
Border MA	Replace black locust grove		
Invasive MO		Selectively remove invasives from native plants	Selectively remove invasives from native plants
Gap MO		Control invasive plant establishment, recruit regenerating saplings	
Bare Soil MO		Replant with natives and protect from traffic	Replant with natives and protect from traffic
Quality Habitat MO		Selectively remove invasives from native plants	Selectively remove invasives from native plants
Edge MO		Control invasive plants and reinforce edge with evergreen natives	Control invasive plants and reinforce edge with evergreen natives

Table 11. Priority Management Projects in Golden Gardens

8.2 Implementation Strategies

The rate of implementation will depend on a number of factors – community stewardship, available funding, and the interest of the larger community of volunteers in the city. The majority of the work will likely be done by volunteers and youth, environmental training groups. Parks' Natural Area crews and tree crews may be involved in some portions of the work in Golden Gardens. Contractors will be needed for some of the work on steeper slopes where volunteer involvement is not prudent. Establishing and maintaining a strong volunteer stewardship network in the community will be critical to the implementation success of this VMP. Often community stewardship 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 but are not limited to the following:

- Coordinate with local school and youth groups to adopt portions of the forest. Several past or previously identified school and youth partners are noted in Section 3.4.

- Establish community relationships through EarthCorps Leadership Grant activities.

- Involve local university students who need practicum/projects for ecological restoration courses (University of Washington Restoration Ecology Network, UW Center for Urban Horticulture Sustainable Community Landscapes Courses).

- "Re-animate" a "Friends of Golden Gardens" or promote a focus group like "Friends of Golden Gardens Forest" in a similar fashion to the organized Carkeek Park interest group. Be sure to include adjacent property owners, neighboring Sunset Hill Community members, OLA steward, Audubon, and other organizations listed in Section 3.4.

8.3 Budget Estimate

The table below summarizes the rough estimated cost of implementation of key tasks described in Chapter 6 in 2003 dollars. Costs are based on 2003 labor estimates for contracted partnerships with youth environmental training groups. Competitive public works contracts for equivalent scope would be somewhat higher. If volunteer labor is valued at $12 per hour and Parks staff labor is valued at $35 per hour, the total value of implementation would be $946,710 in 2003 dollars.

Task	Approach	Volunteer Hours	Staff Hours	Contractor Costs	Materials
Hazard Trees					
Remove	Tree crew	0	238	0	0
Inspect	Tree crew	0	75	0	0
Prune/Monitor	Tree crew	0	201	0	0
Maple MA					
remove ivy from trees	volunteer event	676	68	0	0
interplant with conifers	volunteer event	2,027	203	0	10,135
create snags & DWD	tree crew	0	162	0	0
Erosion Control MA					
monitor for root failure	Tree crew	0	320	0	0
remove ivy from trees	contractor	0	0	4,083	0
contain blackberry and ivy	contractor	0	0	32,666	0
foster native plant cover	contractor	0	0	8,893	0
Conifer MA					
Monitor for lam. root rot	annual inspection	0	120	0	0
remove ivy from trees	volunteer event	174	17	0	0
recruit conifer saplings	volunteer event	35	3	0	0
interplant with conifers	volunteer event	870	87	0	4,348
create snags & DWD	tree crew	0	42	0	0
Re-sprouted Maple MA					
remove trees w/low potential	tree crew, senior gardener	0	120	0	0
prune trees to correct form	tree crew, senior gardener	0	28	0	0
remove ivy from trees	contractor	0	16	6,487	0
control invasives to protect canopy	contractor	0	35	14,128	0
interplant with conifers	contractor	0	5	32,434	2,703
replant trees in gaps	contractor	0	0	2,913	1,456

Task	Approach	Volunteer Hours	Staff Hours	Contractor Costs	Materials
Wetland MA					
remove ivy from trees	adopt an area	60	6	0	0
remove invasives	adopt an area	583	58	0	0
foster native plant cover	adopt an area	2,614	261	0	5,228
protect area from foot traffic	adopt an area	516	52	0	25,799
Border MA					
remove non native trees	tree crew	0	48	0	0
plant native trees	adopt-an-area	360	36	0	2,500
Invasive MO					
Selective invasive removal	volunteer event	4,172	417	0	0
invasive clearing	volunteer event	2,293	229	0	0
bioengineering	volunteer event	158	16	0	1,582
replanting natives	volunteer event	4,088	409	0	54,509
Gap MO					
recruit regeneration saplings	volunteer event	33	3	0	0
Plant conifers	volunteer event	99	10	0	494
Selective invasive removal	volunteer event	0	0	0	0
Bare Soil MO					
Install signs and barriers	adopt an area	774	77	0	38,675
amend soil	adopt an area	499	50	0	6,928
plant native shrubs	adopt an area	3,741	374	0	49,882
Quality Habitat MO					
Selective invasive removal	high-skill volunteers	1,683	337	0	0
Install signs and barriers	high-skill volunteers	65	7	0	3,268
Edge MO					
foster dense evergreen veg	adopt-an-area	6,125	613	0	12,250
remove invasives	adopt-an-area	1,225	123	0	0
	Subtotal	32,868	4,865	101,604	219,755
	Total with project management @ 10%	1% staff	5,680	111,764	241,730
	annual expenditure @ 20 years	1,643	284	5,588	12,087

Table 12. Budget Estimate by Activity and Management Area & Overlay

Assumptions

- Parks Tree Crews will perform tree removal, pruning, snag creation.
- Parks Senior Gardener will perform project planning, project leadership, and monitoring
- Parks staff will provide project management at 10% resource expenditure
- Parks seasonal staff will provide watering and support volunteer weeding projects in adopt-an-area projects
- Parks Adopt-a-Park coordinator will provide volunteer recruitment and tool lending
- Contractor will perform invasive removal using herbicides, on slopes >60% and in wetlands
- Volunteers will provide selective invasive removal, adopt-an-area activities, planting
- Volunteers will maintain volunteer-installed plantings
- Staff time on regular volunteer project = 10% of total volunteer hours
- Staff time for high-skill volunteers = 20% of total volunteer hours (close supervision, training, & coaching provided)

Volunteer time estimates:

- Primary invasive removal 30 hr/1000 SF; secondary invasive removal 10 hr/1000 SF
- Planting (dense) 15 hr/1000 SF; planting (moderate) 10 hr/1000 SF
- Volunteer planting and maintenance is 5 times the hours for the planting over three years of watering and weeding
- Inter-planting occurs at the rate of 50 trees per acre
- $25 per 5-gallon tree planted includes miscellaneous supplies, watering equipment, delivery, and tax

Contractor rates:

- Contractor rates for planting projects based on contracted partnerships with environmental career training programs. Competitive public works contracting would cost more.
- $5 per square foot for heavy invasive removal and replanting, $4 for heavy removal only,
- $3 for moderate removal or maintenance of plantings
- 50% surcharge for slopes >40%
- $40 per hour for all other activity, inclusive of tax, profit and overhead

Horticultural Assumptions

- In Invasive MO, selective removal will cover 75% of the area, clearing will cover 25%
- Plant costs are $1 per square foot for dense shrub planting
- Evergreen edge plants cost $0.10/SF

	Volunteer Hours	Staff Hours	Contractor Costs	Materials
Beach	360	202	0	2,500
South	13,318	1,811	45,345	65,035
Central	13,115	1,651	0	113,196
North Central	5,726	895	30,267	37,613
North End	0	185	25,992	0
Upper Hillside	350	121	0	1,410
Subtotal	32,868	4,865	101,604	219,755
w/ project mgmt	1% staff	5,680	111,764	241,730
annual @ 20 years	1,643	284	5,588	12,087

Table 13. Resource estimates for Plan Projects by Park Section.

CHAPTER 9: MONITORING

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

9.1 Project Monitoring Plan

Monitoring is a critical component to implementation of adaptive management, a cornerstone of the VMP. Monitoring allows evaluation of whether or not VMP and project goals are being accomplished. Monitoring also ensures that a project or task that has been implemented receives follow-up care. This will help overall implementation success. Successful monitoring that produces usable and informative data is the key. The most important parameters of concern must be identified, measured, and documented in a format that is simple and understandable.

Monitoring should be done before a project is implemented (baseline data), and then is recommended at the 1 year, 3 year, and 5 year post-implementation intervals. Monitoring is best done by a person who is qualified to perform the monitoring and is uninvolved with project management at the site. This provides valuable peer evaluation for the project manager and Parks' staff. Open discussion of results should be used to refine management techniques.

The key parameters to measure at Golden Gardens relate to the 20 year targets established for each of the management areas and overlays. They are reproduced here from Chapter 6.

	Management Areas					
	Maple	***Erosion control***	***Conifer***	***Re-sprouted Maple***	***Wetland***	***Border***
Canopy diversity	Between 20-40% coniferous	NA	between 40% - 60% coniferous	at least 20% coniferous	at least two species each >10% cover	At least 70% native tree species
Canopy closure	>80%	>80%	>80%	>80%	>80%	>80%
Canopy ht	100'	NA	100'	>60'	100'	60'
Tree size class	>30"	NA	20-30"	15-20"	15-20"	15-20"
Tree density	40-60 trees/acre	NA	80-100 trees/acre	>100 trees/acre	80-100 trees/acre	80-100 trees/acre
Snags per acre	3 each >15" dbh	NA	3 each >15" dbh	3 each >15" dbh	NA	0
Down wood per acre	15-20% cover and min. 2 logs 20' long and >15" dia.	NA	15-20% cover and min. 2 logs 20' long and >15" dia.	15-20% cover	2 logs 20' long and >15" dia. Or equivalent biomass	0

Table 14. Vegetation Management Areas Targets (20 Year Outlook)

	Management Overlays				
Parameter	***Invasive***	***Gap***	***Bare Soil***	***Quality Habitat***	***Edge***
Ground cover	100%	100%	100%	100%	100%
Invasive cover	in trees: 0 on the ground: <20%	in trees: 0 on the ground: <20%	in trees: 0 on the ground: <20%	in trees: 0 on the ground: <15%	in trees: 0 on the ground: <5%
Native species diversity (shrub, herb)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg.within unit)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg. within unit)	minimum of 9 species present (avg. within unit)
Native species cover (shrub, herb)	>80%	>80%	>80%	>90%	>90%

Table 15. Vegetation Management Overlay Targets (20 Year Outlook)

Appendix G contains a sample monitoring form adaptable for each Management Area. The location of a specific project determines which targets should be used for monitoring. A series of five randomly located 10 square meter plots (70.25 inches in radius) would be sampled for the data parameters listed in the form. These plots would not become permanent sample points. Instead, new sample points would be randomly selected at each monitoring interval. This avoids skewed results by preferential management in known plot locations. Completed monitoring forms should be submitted to Parks Urban Forestry staff.

Appendix A-1. VEGETATION PLOT DATA SHEET *from Cheasty Greenspace Vegetation Management Plan (2003)*

Park		**Date**	
Map Name		**Recorder**	
Plot #		**Team**	

GENERAL SITE CHARACTERISTICS:

Aspect	N	NE	E	SE	S	SW	W	NW		Flat		
Slope	0 - 15%	15% - 40%	over 40%									
Canopy Closure	0 - 20%	20% - 40%	40% - 60%	60% -80%	over 80%	(estimate at center of plot)						
Soil Water	Standing	Saturated	Damp	Dry								
Soil Type	Sand	Loamy sand	Sandy loam	Silt loam	Loam	Sandy clay loam	Silty clay loam	Clay loam		Sandy clay	Silty clay	Clay
	Organic	Gravel	Bedrock	Hardpan	Eroded	Fill / rubble						
Special Features	Trail	Camp	Dump	Power line	Road	Mntn. beaver presence						
	Stream	Seep	Wetland	Gully	Slide	Other:						
Snags	Declining	Dead	Loose bark	Clean upright	Broken	Decomposed	Down mat'l	Stump				
(enter count by stage)												
Large Woody Debris	Log Class 1	Log Class 2	Log Class 3									
4 - 8"												
8 - 20"												
>20" diam												
Woody Debris Cover	0 - 5%	5% - 10%	10% - 25%	25% - 50%	over 50%							
Comments												

Soil Type: Circle one on first line if soil is mineral. If soil is organic, do not circle a texture on first line. Can also circle one on first line and one on second line if both apply.

Special Features: Circle as many as are present in the plot.

Snag: Enter count under each category of snag that occurs in plot

Large Woody Debris: Enter count for each class and diameter that occur in the plot.

VEGETATION PLOT DATA SHEET

Park		**Date**	
Map Name		**Recorder**	
Plot #		**Team**	

TREES: Use a separate line for each tree in plot. For trees that are less than 15 ft tall, use one line per species and enter count for each species under regen column. Also enter average height, dbh, and condition.

Name (Common or Botanical)	**Species Code** (4 letters)	**Height** (feet)	**Stems** (number)	**Diameter** (inches)	**Core Taken** (**Y** or **N**)	**Condition** (**G**ood, **F**air, **P**oor, **D**ead)	**Regen-eration** (**P**lanted or **N**atural)	**Regen-eration** (Count)	**Crown Class** (**O**verstory, **U**nderstory, **R**egen.)	**Ivy up Tree Trunk** (**Y** or **N**)

VEGETATION PLOT DATA SHEET

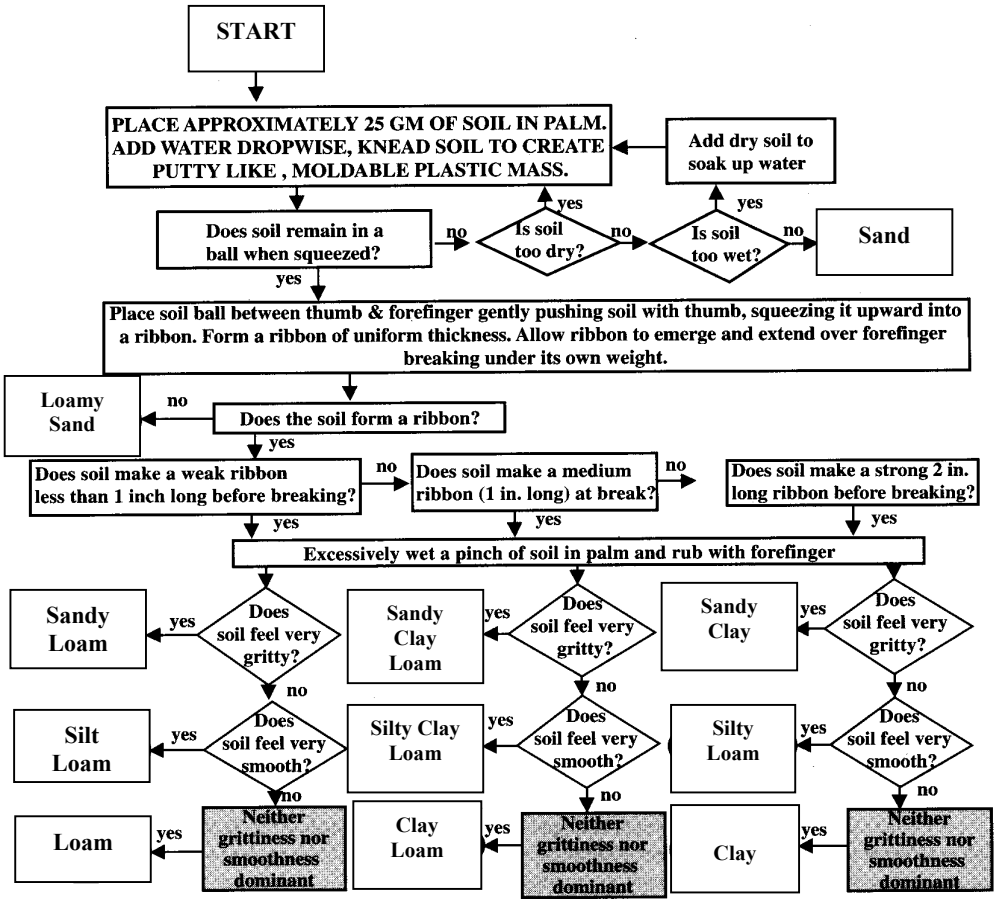
Park		**Date**	
Map Name		**Recorder**	
Plot #		**Team**	

SHRUBS & HERBS:

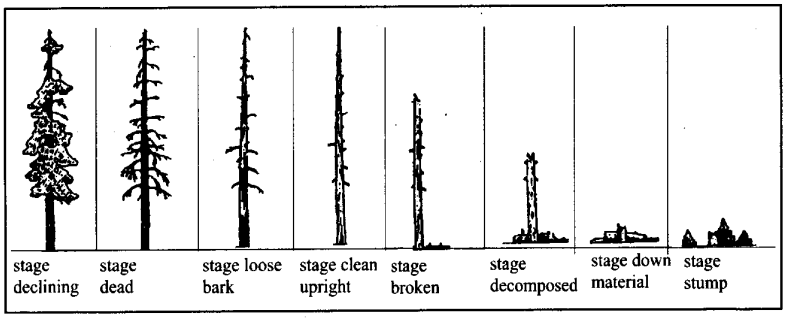
Name (Common or Botanical)	**Species Code** (4 letter)	**% Cover** (quarter 1)	**% Cover** (quarter 2)	**% Cover** (quarter 3)	**% Cover** (quarter 4)	**Total Plot % Cover**	**Plant Size*** (**TS, SS**, or **H**)	**Native** (**Y** or **N**)

* TS = Tall shrub, SS = Short shrub, H = Herbaceous species, grasses, sedges, rushes, ferns, fern allies (see crib sheet for designation)

MINERAL SOIL TEXTURES



SNAGS and DWD



Log Class I Log Class II Log Class III

Diameter
10-20 cm (4-8”)
21-50 cm (8-20”)
>50 cm (>20”)

PLANT SPECIES CODES

Trees/Saplings

Native species		Non-native species	
bigleaf maple (*Acer macrophyllum*)	ACMA	English hawthorn *(Crataegus laevigata)*	CRLA
bitter cherry *(Prunus emarginata)*	PREM		
black cottonwood (*Populus balsamifera*)	POBA		
cascara *(Rhamnus purshiana)*	RHPU		
Douglas fir (*Pseudotsuga menziesii*)	PSME		
Pacific dogwood *(Cornus nuttallii)*	CONU		
Pacific madrone (*Arbutus menziesii*)	ARME		
red alder (*Alnus rubra*)	ALRU		
western hemlock (*Tsuga heterophylla*)	TSHE		
western red cedar (*Thuja plicata*)	THPL		

Shrubs

Native species	Size		Non-native species	Size	
black twinberry *(Lonicera involucrata)*	T	LOIN	common laurel (*Prunus laurocerasus*)	T	PRLA
hardhack (*Spiraea douglasii*)	T	SPDO	English holly (*Ilex aquifoliu*m)	T	ILAQ
hazelnut (*Corylus cornuta*)	T	COCO	Scot's broom (*Cytisus scoparius*)	T	CYSC
Indian plum (*Oemleria cerasiformis*)	T	OECE			
mock orange *(Philadelphus lewisii)*	T	PHLE			
oceanspray *(Holodiscus discolor)*	T	HODI			
Oregon grape (*Mahonia nervosa*)	S	MANE			
red elderberry (*Sambucus racemosa*)	T	SARA			
red flowering currant *(Ribes sanguineum)*	T	RISA			
red osier dogwood *(Cornus sericea)*	T	COSE			
rose, baldhip *(Rosa gymnocarpa)*	S	ROGY			
rose, Nootka *(Rosa nutkana)*	S	RONU			
rose, peafruited *(Rosa pisocarpa)*	S	ROPI			
salal (*Gaultheria shallon*)	S	GASH			
salmonberry (*Rubus spectabilis*)	T	RUSP			
snowberry (*Symphoricarpos albus*)	S	SYAL			
thimbleberry (*Rubus parviflorus*)	T	RUPA			
trailing blackberry (*Rubus ursinus*)	S	RUUR			
vine maple (*Acer circinatum*)	T	ACCI			
willow, Pacific *(Salix lasiandra)*	T	SALA			
willow, Scouler *(Salix scouleriana)*	T	SASC			
willow, Sitka *(Salix sitchensis)*	T	SASI			

Herbs, Vines, Ferns, Grasses

All species in this category are designated "H' for size on data form

Native species		Non-native species	
bracken fern (*Pteridium aquilinum*)	PTAQ	bindweed *(Convolvulus arvensis)*	COAR
deer fern *(Blechnum spicant)*	BLSP	clematis (*Clematis* sp.)	CLSP
false lily-of-the-valley *(Maianthemum dilatatum)*	MADI	climbing nightshade (*Solanum dulcamara)*	SODU
false Solomon's seal *(Mainthemeum racemosa)*	MARA	English ivy (*Hedera helix*)	HEHE
field horsetail (*Equisetum arvense*)	EQUA	evergreen blackberry (*Rubus laciniatus*)	RULA
foamflower *(Tiarella trifoliata)*	TITR	herb Robert (*Geranium robertianum)*	GERO
fringecup *(Tellima grandiflora)*	TEGR	Himalayan blackberry (*Rubus procerus*)	RUPR
lady fern *(Athyrium filix-femina)*	ATFI	grasses	GRAS
Pacific bleeding heart *(Dicentra formosa)*	DIFO	Japanese knotweed (*Polygonum cuspidatum*)	POCU
Pacific waterleaf *(Hydrophyllum tenuipes)*	HYTE	reed canarygrass (*Phalaris arundinacea*)	PHAR
Piggy-back plant *(Tolmiea menziesii)*	TOME		
skunk cabbage *(Lysichiton americanum)*	LYAM		
stinging nettle (*Urtica dioica*)	URDI		
sword fern (*Polystichum munitum*)	POMU		
water parsley *(Oenanthe sarmentosa)*	OESA		

Appendix A-2: Hazard Tree Evaluation Form

ID#	Botanical name	DBH	Dom	Lean	Roots	Cracks	Attach	Rot	Deadwd	Target	Recommendations

L=low M=medium H=high D=dominant C=codiminant S=subordinant P=Suppressed

Appendix B- Recorded Slides in the Golden Gardens Vicinity

	Slide Identification		Slide Characteristics			Trigger Mechanisms			
Slide #	Address	Date	Height of slope	Type of slide	Debris flow	Natural	Groundwater	Surface water	Cut or fill
602	9125 View Av NW	2/6/63	45	surface colluvium	N	Y	N	Y	N
1277	3282 NW Esplanade	1/16/74	80	surface colluvium	Y	Y	Y	Y	N
1121	9039 View Av NW	6/26/74	120	deep seated	N	Y	Y	N	N
1437	Golden Gardens Av NW and Golden Gardens Dr NW	12/8/77	50	surface colluvium	N	Y	Y	Y	Y
1438	Golden Gardens Av NW and Golden Gardens Dr NW	8/2/84	50	surface colluvium	N	Y	Y	Y	Y
1439	Golden Gardens Av NW and Golden Gardens Dr NW	3/30/87	50	surface colluvium	N	Y	Y	Y	Y
611	9215 View Av NW	1/1/97	30	surface colluvium	N	Y	Y	Y	Y
613	9125 View Av NW	3/9/97	60	surface colluvium	Y	Y	Y	Y	Y
Source: http://www.seattle.gov/dclu/Research/gis/webplots/legend.pdf									

Appendix C. Existing Plant Species & Sample Vegetation plot data sheet

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

Below is a list of the plant species occurring in data plots used in developing this VMP. It is not a comprehensive list of all species found in the park.

Plant Species Occurring in Golden Gardens Park

Scientific Name	Common Name	Native	Non-Native	Invasive
Trees				
Acer macrophyllum	Bigleaf maple	X		
Acer palmatum	Japanese maple		X	
Acer pseudoplatanus	Sycamore maple		X	X
Acer platanoides	Norway maple		X	
Aesculus hippocastaneum	Horse chestnut		X	
Alnus rubra	Red alder	X		
Carpinus caroliniana	Hornbeam		X	
Cornus nuttallii	Pacific dogwood	X		
Fraxinus latifolia	Oregon ash	X		
Picea abies	Norway spruce		X	
Picea pungens	Colorado spruce		X	
Pinus contorta var *contorta*	Shore pine	X		
Pinus densiflora	Japanese red pine		X	
Pinus strobus	Eastern white pine		X	
Pinus sylvestris	Scots pine		X	
Populus balsamifera	Black cottonwood	X		
Populus simonii	Weeping poplar		X	
Populus nigra 'Italica'	Lombardy poplar		X	
Prunus emarginata	Bitter cherry	X		
Prunus sp.	Cherry		X	
Pseudotsuga menziesii	Douglas fir	X		
Robinia pseudoacacia	Black locust		X	
Salix lasiandra	Pacific willow	X		
Sequoia sempervirens	Coastal redwood		X	
Sequoiadendron giganteum	Giant sequoia		X	
Sorbus aucuparia	European mountain ash		X	
Taxus brevifolia	Pacific yew	X		
Thuja plicata	Western red cedar	X		
Tsuga heterophylla	Western hemlock		X	
Shrubs and Vines				
Acer circinatum	Vine maple	X		
Amelanchier alnifolia	Serviceberry	X		
Clematis vitalba	Wild clematis		X	X
Cornus sericea	Red osier dogwood	X		
Corylus cornuta var californica	Beaked hazelnut	X		
Crataegus sp	Common hawthorn		X	
Cytisus scoparius	Scot's broom		X	X
Daphne sp.	Spurge		X	?
Gaultheria shallon	Salal	X		

Scientific Name	Common Name	Native	Non-Native	Invasive
Hedera helix	English ivy		X	X
Holodiscus discolor	Oceanspray	X		
Ilex aquifolium	English holly		X	X
Mahonia nervosa	Oregon grape	X		
Oemleria cerasiformis	Indian plum	X		
Philadelphus lewisii	Mock orange	X		
Prunus laurocerasus	Cherry laurel		X	X
Rhamnus purshiana	Cascara	X		
Rosa gymnocarpa	Baldhip Rose	X		
Rosa nutkana	Nootka Rose	X		
Rubus parviflorus	Thimbleberry	X		
Rubus procerus	Himalayan blackberry		X	X
Rubus ursinus	Trailing blackberry	X		
Rubus spectabilis	Salmonberry	X		
Salix scouleriana	Scouler's willow	X		
Salix sp.	Willow	X		
Sambucus racemosa	Red elderberry	X		
Sorbus aucuparia	Mountain ash		X	?
Symphoricarpos albus	Snowberry	X		
Vaccinium parvifolium	Red huckleberry	X		
Herbs (note: timing of the survey hindered detection of many woodland herb species)				
Adenocaulon bicolor	Pathfinder	X		
Alliaria petiolata	Garlic mustard		X	X
Athyrium filix-femina	Lady fern	X		
Convolvulus arvensis	Bindweed		X	X
Digitalis purpureum	Foxglove		X	
Equisetum arvense	Horsetail	X		
Equisetum hymenale	Horsetail	X		
Erigeron philadelphus	Pink fleabane	X		
Galium sp.	Bedstraw/ Cleaver	X		
Geranium robertianum	Herb robert		X	
Hydrophyllum sp.	Waterleaf	X		
Lonicera sp.	Honeysuckle	X		
Lysichiton americanum	Skunk cabbage	X		
Oenanthe sarmentosa	Water parsley	X		
Petasites frigidus	Coltsfoot		X	X
Phalaris arundinacea	Reed canarygrass		X	X
Plantago lanceolata	English plantain		X	
Polypodium glycirrhiza	Licorice fern	X		
Polystichum munitum	Sword fern	X		
Pteridium aquilinum	Bracken fern	X		
Ranunculus repens	Creeping buttercup		X	
Rumex obtusifolius	Broad-leaved dock	X		
Solanum dulcamara	Deadly nightshade		X	X
Smilacia racemosa	False solomon seal	X		
Taraxacum officinale	Dandelion		X	
Tellima grandiflora	Fringecup	X		
Urtica dioica	Stinging nettle	X		

Appendix D: Suggested Plant Communities for Re-vegetation and Enhancement Projects in Golden Gardens

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

Instructions:

1. Assess soil moisture (in spring-early summer).
2. Assess light conditions (canopy closure) during growing season at full leaf-out of trees.
3. Determine which plant community is desired within those listed under the appropriate soil moisture and canopy closure.
4. Plant all dominants listed for that plant community and choose any or all of the sub-dominants as desired.
5. If any of the suggested species are already present, then adjust plant species selection accordingly. e.g. If hazelnut is already present on a site as a dominant and it is listed in the plant community you are going to plant at that site, do not plant additional hazelnut.

Note: Assumes mineral soils (sand-dominated textures) in all cases but saturated or standing water situations (wetlands). Species italicized in bold with asterisks are designated as dominants in the plant community; species in plain type are sub-dominants.

Soil Moisture	Canopy Closure	Vegetation Layer		
		TREE	**TALL SHRUB**	**SHORT SHRUB**
DRY	◯ **SUN**	**PLANT COMMUNITY A**		
		Acer macrophyllum - bigleaf maple	****Holodiscus discolor - oceanspray***	****Mahonia nervosa – Oregon grape***
		****Pseudotsuga menziesii – Douglas fir***	****Corylus cornuta var californica - hazel***	****Symphoricarpos albus - snowberry***
		Abies grandis – grand fir	Philadelphus lewisii – mock orange	Rubus parviflorus - thimbleberry
		Arbutus menziesii – Pacific madrone		Rosa gymnocarpa - wood rose

DRY	**SUN/SHADE**	**PLANT COMMUNITY B**		
		***Abies grandis – grand fir**	***Holodiscus discolor - oceanspray**	***Mahonia nervosa – Oregon grape**
		***Pseudotsuga menziesii – Douglas fir**	***Corylus cornuta var californica - hazel**	***Polystichum munitum - sword fern**
			Sambucus racemosa - elderberry	Rubus parviflorus - thimbleberry
			Philadelphus lewisii – mock orange	Symphoricarpos albus - snowberry
				Rosa gymnocarpa – wood rose
DRY	**SHADE**	**PLANT COMMUNITY C**		
		***Thuja plicata – red cedar**	***Corylus cornuta - hazelnut**	***Polystichum munitum - sword fern**
		***Tsuga heterophylla – western hemlock**	***Oemlaria cerasiformis – indian plum**	***Mahonia nervosa – short Oregon grape**
		(watering required for establishment)		Rosa gymnocarpa – wood rose
				Gaultheria shallon - salal
				Vaccinium parviflorium – red huckleberry
MESIC	**SUN**	**PLANT COMMUNITY D**		
		***Acer macrophyllum - bigleaf maple**	***Holodiscus discolor - oceanspray**	***Mahonia nervosa – Oregon grape**
		***Pseudotsuga menziesii – Douglas fir**	***Corylus cornuta var californica - hazel**	***Polystichum munitum - sword fern**
		Abies grandis – grand fir	Philadelphus lewisii – mock orange	Rubus parviflorus - thimbleberry
		Thuja plicata – red cedar	Sambucus racemosa – red elderberry	Symphoricarpos albus - snowberry
				Rosa gymnocarpa – wood rose

MESIC	 **SUN/SHADE**	**PLANT COMMUNITY E**		
		Pseudotsuga menziesii – Douglas fir	***Corylus cornuta – hazelnut***	***Mahonia nervosa – short Oregon grape***
		Thuja plicata – red cedar	***Rhododendron macrophyllum – rhododendron***	***Rubus parviflorus – thimbleberry***
		Tsuga heterophylla - western hemlock	Philadelphus lewisii - mock orange	***Polystichum munitum - sword fern***
		Rhamnus purshiana – cascara	Oemlaria cerasiformis – indian plum	Vaccinium ovatum – evergreen huckleberry
			Sambucus racemosa – red elderberry	Gaultheria shallon - salal
			Lonicera involucrata - twinberry	
MESIC	 **SHADE**	**PLANT COMMUNITY F**		
		Thuja plicata – red cedar	***Corylus cornuta – hazelnut***	***Gaultheria shallon – salal***
		Tsuga heterophylla – western hemlock	***Rhododendron macrophyllum – rhododendron***	***Mahonia nervosa – short Oregon grape***
		Taxus brevifolia – Pacific yew	Acer circinatum – vine maple	***Polystichum munitum - sword fern***
			Oemlaria cerasiformis – indian plum	Symphoricarpos albus - snowberry
			Sambucus racemosa – red elderberry	Vaccinium ovatum – evergreen huckleberry
				Vaccinium parviflorum – red huckleberry
SATU-RATED	 **SUN**	**PLANT COMMUNITY G**		
		Alnus rubra – red alder	***Cornus sericea – red osier dogwood***	Rosa nutkana – Nootka rose
		Fraxinus latifolia – Oregon ash	***Rubus spectabilis – salmonberry***	Rosa pisocarpa – clustered rose
		OR		

		PLANT COMMUNITY H		
		***Populus balsamifera – black cottonwood**	***Salix lucida var. lasiandra – Pacific willow**	Oplopanax horridus – devil's club
		***Picea sitchensis – Sitka spruce**	***Salix sitchensis – Sitka willow**	Ribes bracteosum – stink currant
			Acer circinatum – vine maple	Ribes lacustre – prickly currant
			Lonicera involucrata - twinberry	
			Rhamnus purshiana – cascara	
			Sambucus racemosa – red elderberry	
SATU-RATED	**SUN/SHADE**	**PLANT COMMUNITY I**		
		***Alnus rubra – red alder**	***Cornus sericea – red osier dogwood**	Oplopanax horridus – devil's club
		***Fraxinus latifolia – Oregon ash**	***Rubus spectabilis – salmonberry**	Ribes bracteosum – stink currant
		***Populus balsamifera – black cottonwood**	***Salix lucida var. lasiandra – Pacific willow**	Ribes lacustre – prickly currant
		Picea sitchensis – Sitka spruce	***Salix sitchensis – Sitka willow**	Rosa nutkana – Nootka rose
			Acer circinatum – vine maple	Rosa pisocarpa – clustered rose
			Lonicera involucrata - twinberry	
			Malus fusca – western crabapple	
			Rhamnus purshiana – cascara	
		PLANT COMMUNITY J		
		***Picea sitchensis – Sitka spruce**	***Cornus sericea – red osier dogwood**	Oplopanax horridus – devil's club
		***Thuja plicata – red cedar**	***Rubus spectabilis – salmonberry**	Ribes bracteosum – stink currant
			Acer circinatum – vine maple	Ribes lacustre – prickly currant
			Malus fusca – western crabapple	
			Rhamnus purshiana – cascara	

SATU-RATED	● SHADE	PLANT COMMUNITY K		
		***Thuja plicata – red cedar**	***Acer circinatum – vine maple**	Oplopanax horridus – devil's club
			***Cornus sericea – red osier dogwood**	Ribes bracteosum – stink currant
			***Rubus spectabilis – salmonberry**	Ribes lacustre – prickly currant
			Lonicera involucrata - twinberry	Rosa nutkana – Nootka rose
				Rosa pisocarpa – clustered rose

APPENDIX E: RESTORATION PLANT LIST FOR GOLDEN GARDENS

	BOTANICAL NAME	COMMON NAME	LOCATION	EXPOSURE	SPACING
	Abies grandis	Grand Fir	M>U	FSn - Sh	>= 15' o.c.
	Arbutus menziesii	Madrona	U>M	FSn	>=10' o.c.
	Pinus contorta v. contorta	Shore pine	U>W	FSn	>=10' o.c.
	Pinus monticola	Western white pine	U>M	FSn	>=15' o.c.
EVERGREEN	Pseudotsuga menziesii	Douglas Fir	M>U	FSn - PSh	>= 15' o.c.
TREES	Thuja plicata	Western Red Cedar	W > U	FSn - Sh	>= 15' o.c.
	Tsuga heterophylla	Western Hemlock	W > U	FSn - Sh	>= 15' o.c.
	Taxus brevifolia	Pacific Yew	W>M	FSn - PSh	>= 10' o.c.
	Alnus rubra	Red Alder	W>U	FSn - PSh	>= 10' o.c.
	Acer circinatum	Vine Maple	W, U	PSh	>= 6' o.c.
BROADLEAF	Acer macrophyllum	Bigleaf Maple	M>U	FSu - PSh	>= 10' o.c.
TREES	Amelanchier alnifolia	Serviceberry	U > W	FSn - PSh	>=6' o.c.
	Arbutus menziesii	Pacific madrone	U>M	FSn	>=10' o.c.
	Betula papyrifera	Paper birch	M>W	FSn	>=10' o.c.
	Craetegus douglasii	Pacific Hawthorn	M	FSn	10' o.c.
	Fraxinus latifolia	Oregon Ash	W>U	FSn - PSh	>= 10' o.c.
	Cornus nuttalii	Pacific dogwood	U.M	FSn – PSh	10’ o.c.
	Prunus emarginata	Bitter Cherry	M>U	FSn	10' o.c.
	Quercus garryana	Oregon oak	U	Fsn	10' o.c.
	Rhamnus purshiana	Cascara	W>M	FSn - PSh	10' o.c.
	Cornus stolonifera	Red Osier Dogwood	W>M	FSn - PSh	4' o.c.
	Corylus cornuta californica	Hazelnut	U > W	FSn - Sh	>= 6' o.c.
	Gaultheria shallon	Salal	M>U	FSn - Sh	18" o.c.
	Holodiscus discolor	Oceanspray	U>M	FSn	4' o.c.
	Lonicera ciliosa	creeping honeysuckle	U	FSn-PSh	4' o.c.
	Lonicera involucrata	honeysuckle	W>U	FSn-PSh	3' o.c.
	Mahonia aquifolium	Tall Oregon Grape	U	FSn - PSh	4' o.c.
	nervosa	Cascade Oregon Grape	U >M	PSh - Sh	18" o.c.
	Oemlaria ceraciformis	Indian Plum	W>U	PSh - Sh	6' o.c.
	Oplopanax horridum	Devil's Club	W	PSh	4' o.c.
	Pachistima myrsinites	Oregon Box	M>U	PSh - Sh	2' o.c.
	Philadelphus lewisii	Mock Orange	M>U	FSn - Psh	6' o.c.
SHRUBS	Physocarpus capitatus	Pacific Ninebark	W, U	FSn - Psh	8' o.c.
	Rhododendron macrophyllum	Pacific Rhododendron	M>U	PSh	random
	Rosa gymnocarpa	baldhip rose	U	FSn-PSh	4' o.c.
	Rosa nutkana	Nootka Rose	M > U	FSn - PSh	5' o.c.
	Rubus parviflorus	Thimbleberry	W>U	FSn - PSh	4' o.c.
	Rubus spectabilis	Salmonberry	W>M	fSn - Sh	4' o.c.
	Salix scouleriana	Scouler's willow	W>M	FSn	2' o.c.
	Salix hookeriana	Hooker's willow	W>M	FSn	2' o.c.
	Salix lasandra	Pacific willow	W	FSn	8' o.c.
	Sambucus racemosa	Red elderberry	M>W	FSn-PSh	4' o.c.
	Spiraea douglasii	Hardhack	W>U	FSn	3' o.c.
	Symphoricarpos alba	Snowberry	M > U	FSn - PSh	4' o.c.
	Vaccinium ovatum	Evergreen huckleberry	U>M	FSn - PSh	4' o.c.
	Vaccinium parvifolium	Red Huckleberry	W>M	PSh	4' o.c.
	Viburnum edule	Moosewood	W	FSn - PSh	6' o.c.
	opulus (trilobum)	High Bush Cranberry	W > U	FSn - PSh	6' o.c.

	BOTANICAL NAME	COMMON NAME	LOCATION	EXPOSURE	SPACING
	Adiantum pedatum	Maidenhair Fern	W	Sh	random
	Athyrium filix-femina	Lady Fern	W>M	PSh-Sh	random.
	Blechnum spicant	Deer Fern	U > W	PSh - Sh	random
FERNS	Dryopteris expansa	Wood Fern	U	PSh-Sh	random
	Gymnocarpium dryopteris	Oak Fern	W, U	Sh	18" o.c.
	Polystichum munitum	Sword fern	W, U	FSn - Sh	3' o.c.
	Achlys triphylla	Vanilla Leaf	W, U	PSh - Sh	12" o.c.
	Aquilegia formosa	Red Columbine	W, U	FSn - PSh	random
	Aruncus diocus (sylvester)	Goat's Beard	W	FSn - PSh	random
HERB-	Circaea alpina	Enchanter's nightshade	U, M	PSh-Sh	12" o.c.
ACEOUS	Claytonia siberica	Miner's lettuce	M,U	FSn-Sh	12" o.c.
PERRENIALS	Dicentra formosa	Western Bleeding Heart	W, U	PSh - Sh	12" o.c.
	Fragaria vesca	Wood strawberry	U	FSn-PSh	12" o.c.
	Geum macrophyllum	Large-leaf avens	U	PSh-Sh	random
	Maianthemum dilatatum	False Lilly-of-the-Valley	W > U	PSh - Sh	18" o.c.
	Osmorhiza chilensis	Sweet Cicely	U	PSh-Sh	random
	Tellima grandiflora	Fringecup	U	FSn-PSh	random
	Tiarella trifoliata	Foamflower	W>U	FSn - PSh	18" o.c.
	Tolmiea menziesii	Piggyback Plant	W>M	PSh	18" o.c.
	Trientalis borealis latifolia	Starflower	U	PSh	12" o.c.
	Trillium ovatum	Western Wake Robin	U	PSh	random
	Vancouveria hexandra	Inside-out flower	M>U	PSh-Sh	12” o.c.
	Carex obnupta	Slough Sedge	A	PSh - Sh	18" o.c.
WETLAND	Lysichitum americanum	Skunk Cabbage	A, W	PSh - Sh	random
	Juncus ensifolius	Dagger Leaf Rush	A, W	FSn - PSh	12" o.c.
	Oenanthe sarmentosa	Water Parsely	W	FSn - PSh	18" o.c.
	Sagittaria latifolia	Arrowhead, Wapato	A, W	FSn - PSh	12" o.c.
	Scirpus microcarpus	Small Fruited Bullrush	W>A	FSn - PSh	18" o.c.
FSn = Full Sun	PSh = Part Shade	Sh = Shade	o.c. = on center	>= greater than or equal to	
W = Wetland	M=Mesic U = Upland A = Marsh (Aquatic)				

APPENDIX F - GOLDEN GARDENS VEGETATION PROJECT PLANNING FORM

Name of Project_____

Project Manager:_____ Contact Phone_____

Dates of Project:_____ Duration of Project_____

Location: Address or Area:_____ *show on attached map*

Size of Project (sq ft)_____ Number of trees being removed_____

Describe Project:_____

_____

_____

Is this project identified in the Golden Gardens Vegetation Management Plan? Yes/No

If yes, what project number? _____ Page number in plan _____ Phase _____

If no, does this project conform to the goals and objectives of the Plan? Yes/No
Explain:

Project was reviewed by Horticulture staff on _____date

Project was reviewed by District staff on _____date Approved? Yes/No

Who will perform the project? Please give names and contact information

Contractor_____

City Staff_____

Volunteers_____

Costs for the project installation_____Fund source _____

Public notification for the project _____

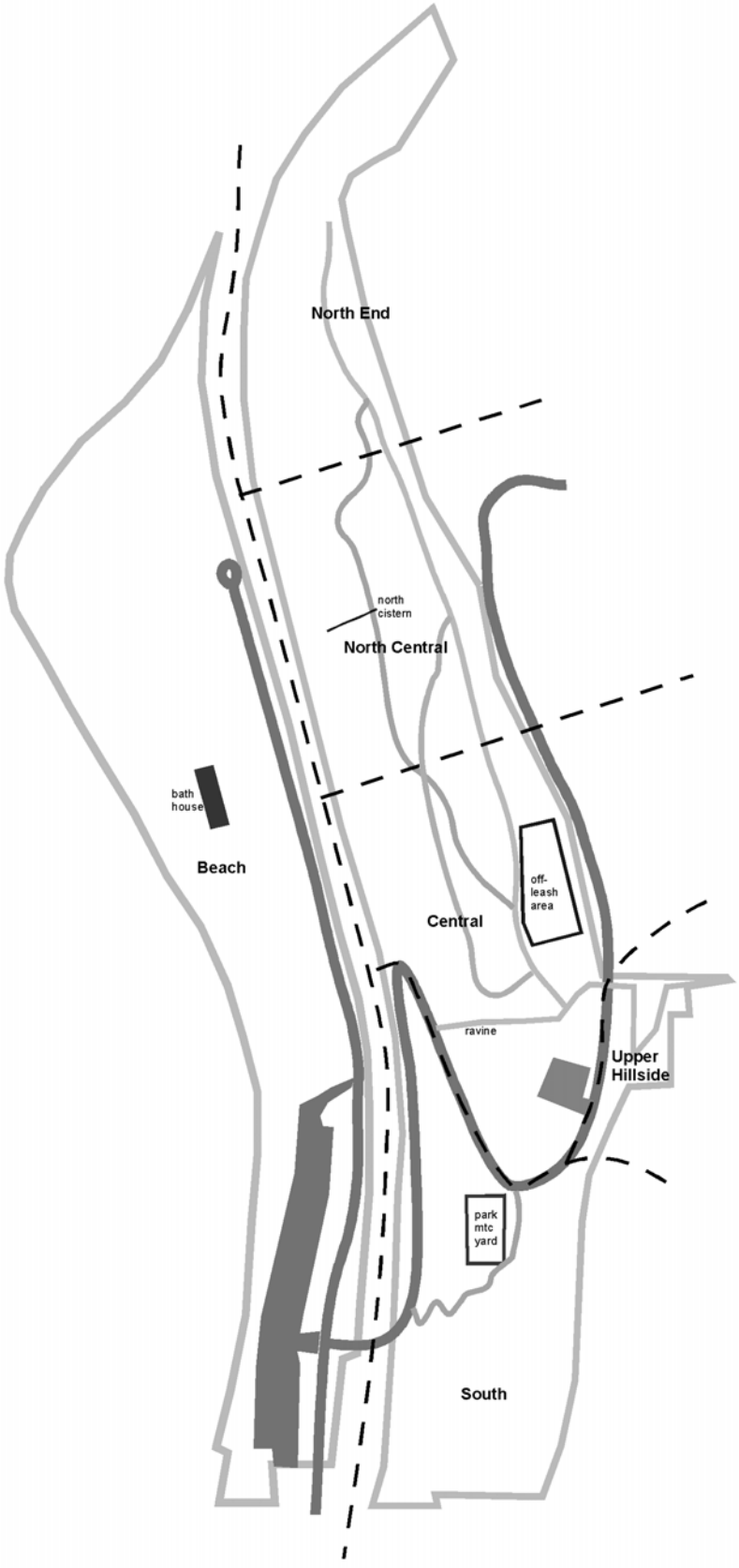
Signs will be located where?_____

Cost of maintenance_____ For how many seasons?_____

Will Parks staff perform any of this work?_____

Who will evaluate the project?_____ At what intervals?_____

On the following page, please list project tasks in the order they will be performed. Include premonitoring, volunteer recruitment and coordination, maintenance and monitoring tasks as separate items. This form is available at (insert directory path here).


North End
north cistern
North Central
bath house
Beach
off-leash area
Central
ravine
Upper Hillside
park mtc yard
South

		Staff	Contractor	Volunteers	Materials
Project Task and Description	**Dates**	**Hrs/Who**	**Cost/Who**	**Hrs/Who**	**Quantity/Cost**

Appendix G - <u>Monitoring Form for Vegetation Management Projects</u>

Adapted from Cheasty Greenspace Vegetation Management Plan (2003)

Name:
Date:
Site Description Location:

Monitoring Year: Pre-Installation Year 1 Year 3 Year 5 Other___
(circle one)

Parameters	***Plot 1***	***Plot 2***	***Plot 3***	***Plot 4***	***Plot 5***
% cover invasives (list by species and cover class for each plot) ***Cover Class:*** ***1 0-25%*** ***2 26-50%*** ***3 51-75%*** ***4 76-100%*** ***5 >100%***					
Ivy in trees (count of trees with ivy in each plot)					
Native species diversity (list species and total for each plot)					
% cover native understory (list shrubs and herbs by species and cover class for each plot) ***Cover Class:*** ***1 0-25%*** ***2 26-50%*** ***3 51-75%*** ***4 76-100%*** ***5 >100%***					
Canopy closure (check correct range for each plot)	0-20% >20-40% >40-60% >60-80% >80%	0-20% >20-40% >40-60% >60-80% >80%	0-20% >20-40% >40-60% >60-80% >80%	0-20% >20-40% >40-60% >60-80% >80%	0-20% >20-40% >40-60% >60-80% >80%

Parameters	*Plot 1*	*Plot 2*	*Plot 3*	*Plot 4*	*Plot 5*
Canopy diversity (list tree species and # of each in plot)					
Snags (count per plot)					
Down Wood (count per plot)					
Plant Survival (count and list by species)					
Plants installed (list totals by species)					

20 Year Targets for _____MA							
Invasive cover	***Native species diversity (shrub, herb)***	***Native species cover (shrub, herb)***	***Canopy diversity***	***Canopy Closure***	***Trees per acre***	***Snags per acre***	***Down wood per acre***
Target Met?	***Target Met?***	***Target Met?***	***Target Met?***	***Target Met?***	***Target Met?***	***Target Met?***	***Target Met?***
Yes ***No***	***Yes*** ***No***	***Yes*** ***No***	***Yes*** ***No***	***Yes*** ***No***	***Yes*** ***No***	***Yes*** ***No***	***Yes*** ***No***

APPENDIX H – PUBLIC INVOLVEMENT & CITIZEN COMMENT

Golden Gardens Vegetation Management Plan
Community Meeting – September 30, 2003 at Ballard Community Center

Summary of Attendee Comments & Concerns:

Tree Hazard

To what extent will park trails be assessed and managed for hazard trees? There is heavy usage on many trails and it looks like many potentially hazardous trees.

Hazard tree inventory for VMP is focusing on highest use areas of the park: roads, parking, picnic, playground and dog off leash areas. We will include obvious hazard trees evident from highest-traffic trails but will not inventory the entire trail system. Intermittent use and individual responsibility to avoid forest trails during windstorms reduces target potential in such less frequented areas. Park district resource staff is versed in hazard tree monitoring and periodically alerts Urban Forestry to problems for mitigation. As appropriate, hazard trees will be removed, pruned, or turned into wildlife snags.

Road & Slides

What about road slides? The road is in poor condition.

Upper Golden Gardens Drive was constructed on a fill bench cut from the unstable slope. It was not originally built to high engineering standards and will continue to fail until more permanent redesign and reconstruction occur. Although arguably needed, this work lies outside the scope of the VMP, and will require primary Seattle Transportation Department involvement.

Does Seattle Transportation have responsibility for roads and use?

Seattle Transportation does maintain the road through the park.

What about the trees (maples?) dying on the hillside near the big upper curve?

Tree damage has in the past sometimes accompanied road slides. In this location it's likely slope failure has moved or piled earth against trees, resulting in death or decline.

Critical Area Status

Is SEPA designation a factor at Golden Gardens?

Yes, much of the forested slope and adjacent lands are in know or potential slide areas, with slope over 40%. Limited wetland areas and protected eelgrass tidelands also exist at the park.

Trails

A trails plan is needed.

Trails relate to vegetation management but trail planning is not part of this VMP. Some community groups have procured grants to hire consultants and develop park trail plans. Much trail improvement work has occurred recently in the park, and an overall evaluation of park trails by EarthCorps is getting underway; its intent is for program planning not to scope near-term Parks-funded improvements.

Lots of trampling of vegetation is evident in the north end of the park by dogs, off-trail users, etc. Need to address this in VMP.

VMP will acknowledge and address this situation, but ability of document to eliminate these difficult problems will be limited.

Neighboring properties

Whose responsibility is right of way below View Avenue?

Right of way is responsibility of adjacent property owners, to center line: abutting residents and Parks, in this case.

Are homeowners allowed to finance a plan to replace the maples with "native trees"?
The existing bigleaf maples are native trees, although many have suffered damage from past cutting and pruning. Other species might be an option for replacing areas of degraded canopy; the VMP will lay out desired forest composition for this area consistent with adopted tree policy. Homeowners can definitely help implement recommendations via financial donation, volunteering, procuring grants, etc Past private plan & permit experience here has met limited success due to limited establishment care.

Parks should communicate with property owners living adjacent to Golden Gardens and get them to plan for their private forest restoration and management simultaneously – a coordinated effort.
The VMP likely will encourage private land stewardship consistent with the Park's VMP and its goals. This should yield greater habitat protection and reduce damage to park and private forested land.

<u>*Dogs*</u>
Need to enforce dog rules in north part of park where understory has been removed.
Parks has no legal authority to enforce these rules; staff encourages Animal Control to police the park as frequently as possible but they are extremely spread thin. NW District shares the public's frustration and tries to remind pet owners of the rules on a regular basis when encountering individuals in the park.

Signage is needed about off leash dogs rules.
Vandalism is a constant problem; dozens of signs have been posted and lost this year alone.

Should recruit deputy dog-enforcement volunteers for the park.
This interesting idea could be taken up with Animal Control; volunteers might face endangerment or legal obstacles.

Should contact the Off leash Area Steward.
The OLA contact has been informed of the VMP meetings; participation in stewardship for park vegetation by this group would be most welcomed.

<u>*Railroad*</u>
What's available of the Burlington Northern RR settlement money?
Unfortunately for Golden Gardens, the funds compensating for illegal cutting here have been exhausted, all spent in Carkeek Park, which proceeded with forest stewardship actions sooner than Golden Gardens.

<u>*Vegetation*</u>
Should do something about the sticker bushes (blackberries).
The VMP will address invasive species management; in areas, eradication of blackberry will be a target. On extreme, unstable slopes this may not be feasible or desirable.

Maples weren't blocking views forty years ago; was park once logged?
Yes, the park land presumably was at least partly logged in the late 19th Century or early 20th. Maples have grown to replace conifers in much of the forest.

<u>*Implementation*</u>
Is there a "Friends of" group active at Golden Gardens?
There's not a "Friends of Golden Gardens Forest" group, although many interest groups exist which have volunteered in the park (beach and wetland restoration, Salmon Bay School students, etc.).

Where's the money going to come from?
Implementation will rest primarily on volunteer effort and grant funding, although Parks' resources will be brought to bear on maintenance, tree work and possible future capital projects. The VMP project itself will cover primarily plan development.

Golden Gardens Vegetation Management Plan
Community Meeting – November 17, 2003 at Loyal Heights Community Center

Summary of Attendee Comments & Concerns:
What about replacements for Simon Poplars removed in beach bbq area? Really miss.

Upper stairway down from 85th is subject to sloughing. Volunteering to repair toe at bottom of upper slope at own expense – Larry Zundel (immediate & lifelong park neighbor).

Drainage is needed along the lower road.

What is the role of vegetation as regards slides, slope stabilization and water in hillside? Parks isn't taking adequate responsibility for drains placed in 1975 and worried more sliding will result.

What about coppicing trees like bigleaf maple and alder on slopes for slide control? Root network really holds soil together.

Wasn't it a good idea from a safety & slope stabilization standpoint for Burlington-Northern to cut down hazardous alders above the tracks?

As regards idea of thinning resprouted maples to single stem to regenerate canopy, stems rot when others are removed, This seems an inappropriate restoration/management approach to use. [Paul West disagreed about the rotting]

Priority should be to spend the money where slides and tree hazards are.

Where's the implementation funding coming from?

Beach and park overall are in the best shape they've been in 45 years he's been living here: BRAVO to district staff for doing such a great job. How best to advocate for better funding?

Carkeek Park activist Lex Voorhoeve recommends reanimating a FOGGP group to act as "burr under the saddle" – a strategy that has proven very effective for them in bringing restoration$ to Carkeek.

Could a hedge effect help reduce drumming noise coming from beach? Paul notes that foliage isn't a very effective sound barrier, that solid walls are. Suggestion to create drumming zone immediately west of bathhouse would be more effective.

Get rid of the OLA – the broader devegetation and constant noise are terrible impacts to the park and neighbors. It should be rescinded.

What is the current and potential wildlife value of the park?

Is mountain beaver tunneling destabilizing trees and disturbing slopes? Evidence of activity seen in several spots on the upper slope.

Golden Gardens Drive – trees right above are hazardous, regardless of whether Parks or private residents own them. They are posing a public risk. [Elizabeth Walker notes: Seattle Transportation and Parks have an obligation to notify adjacent property owners upslope of the problem and their potential liability should a failure occur.

Draft plan copies should be placed at 3 community centers and Ballard Library.

Golden Gardens Vegetation Management Plan
Other Citizen Comment received as of 12/30/03

Lex Voorhoeve:
I have been involved with starting up a similar process in Carkeek Park and it is interesting to see similar problems emerge, but also the differences. Golden Gardens has a greater challenge with the public, especially with the off-leash area. … A well-defined network of trails tends to concentrate the public…and the "social trails" … get the chance to overgrow. This will reduce the number of dog/owner combinations criss-crossing the woods. … trails provide a nice access grid for vegetation management. … give priority to trails.

Our experience with very steep slopes is that we had to cover the slope with burlap after Ivy removal. The result is now that resprouting Ivy is …very difficult to reach and pull out of the burlap. I wish we had followed a different system, e.g. clearing 10 ft wide strips, following the contour lines, and waiting another season before replanting. That way we would have been able to pull out resprouting Ivy and also observe what natives come back spontaneously. … This system would also at least partly contain erosion…. After 2 years the left over strips can be cleared. By that time the previously cleared strips may have at least some vegetation to reduce erosion. …VMP might be not only about what should be done but also HOW it should be done…. "Best Management Practices" do not cover all situations.

A similar remark about the erosion/slide control areas… pilot area where coppicing would be tried out as a management practice. If you can keep the woody vegetation low and dense, with well developed root systems, that may postpone sloughing, or -once the slopes do slide - may reduce the impact. …Golden Garden would be a good place for such an trial.

… recommend that a "Volunteer body" is formed in GG, … in order to solicit and organize volunteer input. Such recomendations in an official report carry some weight and may help to establish such a body.

Davidya Kasperzk:
Groundswell NW might be a local sponsor/ally -I'm the former Prez....now its Sam Star (7889-3483) -they are a ballard non-profit (www.groundswellnw.org) who would help publicize and draw people to public meetings.

Tina Cohen (re-Draft VMP):
Invasive species. Resources would be better spent on ivy removal than on cutting down large caliper (over 2 inch) Hawthorn, Sorbus, Aesculus, and Acer pseudoplatanus. …conifers will eventually shade out the sprouting invaders (except ivy). This is not a pristine native area.
Restoration. The impacts from social paths and dogs are casually mentioned…include fencing and education/signage as part of the planting/restoration process. It's pointless to restore an area if it isn't
protected.
Pruning. …bigleaf maple do not respond well to pruning. They are poor compartmentalizers and tend to decay at pruning cuts. …if Parks is going to prune the maples, …must monitor them (as recommended).

Doris Katagiri (re-Draft VMP):

A significant part of the report…deals with invasive vegetation. …The report's action plan combines both mechanical and chemical means for dealing with invasive plants. …I question the advisability of using …herbicides, particularly if the invasive vegetation is both in unusable areas of the park and of insignificant size. The danger of pesticides getting in the many natural streams in the area and eventually to the Sound is all too real. …I urge you to…make changes to ensure a more sustainable solution for future generations.

I would also urge you to circulate this report among the many concerned citizens'groups in the area after it has become finalized. This report is a great action tool that can be studied by those of us who love living so close to Golden Gardens and who wish to seize the opportunity to begin making more positive changes so that our grandchildren and their grandchildren will be able to continue to enjoy this priceless asset.

APPENDIX I - BIBLIOGRAPHY

Allen, Eric, Duncan Morrison, and Gordon Wallis, 1996. ***Common Tree Diseases of British Columbia***. Canadian Forest Service, Victoria, BC.

Albers, Jana and Ed Hayes. 1993. ***How to Detect, Assess and Correct Hazard Trees in Recreational Areas.*** State of Minnesota, Department of Natural Resources.

Anderson, Charles. 1996***. A Manual of Native Plant Communities for Urban Areas of the Pacific Northwest.*** Cascade Biomes, Inc. Seattle, WA.

ANSI A300-2001 for Tree Care Operations-Tree, Shrub and Other Woody Plant Maintenance-Standards Practices. 2001. American National Standards Institute.

British Columbia Ministry of Forests. 2000. ***A Short-term Strategy for Coarse Woody Debris Management in British Columbia's Forests***
http://www.for.gov.bc.ca/hre/deadwood/dtgui3.htm

Clark, James R., Nelda P. Matheny, Genni Cross and Victoria Wake. 1997***. A Model of Urban Forest Sustainability***. Journal of Arboriculture 23(1)17-30.

Clewell, Andre, John Rieger, and John Munro. 2000. ***Guidelines for Developing and Managing Ecological Restoration Projects***. Society for Ecological Restoration.

Edmonds, Robert L. 1999. ***Management Plan for Tree Diseases in Pioneer Park, Mercer Island***. University of Washington for Mercer Island Parks and Recreation.

Fischer, Marcia, Kim Harper, and Kevin O'Brien. 2003. ***Cheasty Greenspace Vegetation Management Plan.*** Sheldon and Associates for Seattle Parks and Recreation.

Ford, Paul S. 1979. ***Report of Slope Stability Study, Golden Gardens Park, Seattle, Washingon.*** Dames and Moore for Seattle Parks and Recreation.

Gilman, Edward F. and Sharon Lilly. 2002. ***Best Management Practices: Tree Pruning***. International Society of Arboriculture, Champaign, IL.

Hayes, Ed. 2000. ***Evaluating Tree Defects***. Safetrees.com, Rochester, MN.

Jones, E. J., K. S. Karriker, and M. A. Megalos. 1995. ***Snags and Downed Logs.*** Working with Wildlife Note #14. NC State University Cooperative Extension.

Kissman, Ellen, *et. al.* ***A City Among the Trees: an urban forestry resource guide***. Arai/Jackson for City of Seattle Urban Forest Coalition.

Knutson, K. L. and V. Naef. 1995. ***SNAGS: Management Recommendations for Washington's Priority Habitats***. Draft document. Washington Department of Fish and Wildlife.

Kruckeberg, Authur R. 1991. ***The Natural History of Puget Sound Country***. University of Washington Press, Seattle, WA.

Kruckeberg, Arthur R. 1996. ***Gardening with Native Plants of the Pacific Northwest***, 2nd Edition. University of Washington Press, Seattle, WA.

Link, Russell. 1999. ***Landscaping for Wildlife in the Pacific Northwest***. University of Washington Press, Seattle, WA.

Lukens, James O. and John W. Thieret, eds. 1997. ***Assessment and Management of Plant Invasions.*** Springer-Verlag. New York.

Kirkland, Thomas E. and Michael N Witter. 1997 ***Review of Magnolia Boulevard Vegetation Management Plan***. Shannon and Wilson for Seattle Parks and Recreation.

Matheny, Nelda R., and James R. Clark. 1994. ***Evaluation of Hazard Trees in Urban Areas 2nd Edition***. International Society of Arboriculture, Champaign, IL.

McPherson, E.G., S.E. Maco, J.R. Simpson, P.J. Peper, Q. Xiao, A.M. VanDerZanden and N. Bell. March 2002. ***Western Washington and Oregon Community Tree Guide: Benefits, Costs, and Strategic Planting.***

Miller, Gregg. 1994. ***Urban Wildlife and Habitat Management Plan.*** Seattle Parks and Recreation.

Miller, Gregg. 2000. ***Urban Wildlife and Habitat Management Plan 2000 update***. Seattle Parks and Recreation.

Miller, Robert W. 1996. ***Urban Forestry: Planning and Managing Urban Greenspaces***, 2nd Edition. Prentice Hall, Englewood Cliffs, NJ.

Myers, Rian D. 1993. ***Slope Stabilization and Erosion Control Using Vegetation. A manual of practices for coastal property owners***, Publication 93-30. Washington State Department of Natural Resources, Olympia, WA.

Nietro, W. A., et. al. 1985. ***Snags (wildlife trees).*** In Brown, E. R. ***Management of Wildlife and Fish Habitats in Forest of Western Oregon and Washington***. US Forest Service, Pacific Northwest Region, United States Department of Agriculture.

Richter, D. J. 1993. ***Snag Resource Evaluation***. Cal`ifornia Department of Fish and Game, Environmental Services Division.

Rose, Robin; Caryn E. C. Chachulski, and Diane L. Haase. 1998. ***Propagation of Pacific Northwest Native Plants***. Oregon State University Press, Corvallis, OR.

Sauer, Leslie J. 1998. ***The Once and Future Forest: a guide to forest restoration strategies***. Island Press, Washington, DC.

Seattle Parks and Recreation. 2001. ***Tree Policy: Tree Management, Maintenance, Pruning And/Or Removal.***

Seattle Parks and Recreation. 2000. ***COMPLAN 2000***.

Seattle Parks and Recreation. 1999. ***Landscape, Horticulture and Urban Forestry Best Management Practices.*** Seattle Parks and Recreation.

Seattle Urban Nature Project. 2000. ***Habitats on Seattle's Public Lands – 1st Edition: Golden Gardens and Vicinity***. Seattle Urban Nature Project.

Sheldon and Associates. 2001. ***Sandpoint Magnuson Park Vegetation Management Plan.*** Sheldon and Associates for Seattle Parks and Recreation.

Sherwood, Don. Date unknown. ***History: Golden Gardens Park.*** City of Seattle.

Spies, T. A. J. F. Franklin and T. B. Thomas. 1988. *Coarse Woody Debris in Douglas-fir Forests of Western Oregon and Washington*. ***Ecology*** 69: 1689-1702.

Stevens, Victoria. 1997. ***The Ecological Role of Coarse Woody Debris: an overview of the ecological importance of CWD in B.C. Forests***. B.C. Ministry of Forests.

Swanson, F. J. and J. F. Franklin. 1992. *New Forestry Principles from Ecosystem Analysis of Pacific Northwest Forests.* ***Ecological Applications*** 2(3) 262-274.

Thomas, J. W. ed. 1979. ***Wildlife Habitats in Managed Forests: the Blue Mountains of Oregon and Washington***. US Forest Service, United States Department of Agriculture.

United States Army Corps of Engineers. 2000. ***Snags as Ecosystem Components.*** In Ecosystem Management and Restoration Information System: http://www.wes.army.mil/el/emrrp/emris/emrishelp3/snags_as_ecosystem_components_pac.htm

Weikel, J. M. and J. P. Hayes. ***Habitat Use by Snag-associated Species: a bibliography for species occurring in Oregon and Washington***. http://www.fsl.orst.edu/cfer/snags/bibliography.html

APPENDIX J – VEGETATION MAPS

J-1: Existing Conditions
J-2: Soils Map
J-3: Habitats on Seattle Public Lands (SUNP) Jor Golden Gardens and Vicinity
J-4: Vegetation Sampling Plots
J-5: Vegetation Management Areas & Overlays North
J-6: Vegetation Management Areas & Overlays South
J-7: Hazard Tree Assessment