Greenbelt Survey
Port Ludlow North Bay

ArborWise, LLC
PO Box 27585
Seattle, WA 98165

September 28, 2003

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The greenbelt areas within the Port Ludlow, North Bay community are a forest remnant of a historic hemlock climax forest. This area has been logged twice and is now in 40 years of third generation regrowth.

The forest is developing as a single-aged stand in some locations and a multi-aged stand in others. Both forest types reflect natural occurring conditions. Large sections of the greenbelt are in good condition with little to no weed infestation. On the other hand, some areas are severely weed infested, to the point of stalling natural succession. These areas are often coincident with areas managed for views, or along rights-of-way.

In general dominant tree species in the larger class size are red cedar, big-leaf maple, Douglas-fir and hemlock. Regeneration appears to be occurring predominantly in sunny areas. Species regenerating in these areas are typically alder, big-leaf maple, and bitter cherry. However, regeneration occurring in shadier environments is dominated by red cedar. Trees are overwhelmingly in good condition. There are relatively few snags, although this may change as trees are excluded from the forest interior.

The dominant weed species is Himalayan blackberry. This weed covers several acres in some of the larger greenbelt spaces. Other weeds of importance include Japanese knotweed, English ivy and Scot's broom. Many of these infestations are only just beginning.

Fire risk in Port Ludlow is similar to the risk of all forested communities across the west. That is fuel loads are high in the greenbelt and, if a fire occurs, the likelihood that it will spread to the canopy via tall shrubs, brush and other vegetation is relatively high. Individual homeowners have access to information through the fire district that can help them reduce risk to their structures.

The five year maintenance plan divides projects into high, medium, and low priority, and focuses on weed removal. High priority projects include eliminating the most threatening weeds at locations where they are not yet out of control. Medium priority tasks target weeds that are not as menacing and include easier tasks that if addressed soon will save time and money in the future. Low priority projects are large and will require significant resources of time, money and man power. These sites are beyond standard control measures.

Four locations are recommended for potential trail sites. Two are a continuation of the existing trail. Two new locations will require expertise in trail engineering and building.

1.0 INTRODUCTION

Port Ludlow is a master-planned resort community located in Jefferson County on the east side of the Olympic Peninsula. The North Bay of Port Ludlow has an extensive greenbelt area set aside in perpetuity for the common use and benefit of the homeowners. The North Bay area was last logged in the 1960's and in the past 30 years, the community has developed, trees have grown, and the Greenbelt is now reforested as a third growth of mixed conifer and hardwood forests. The Greenbelt is under the control of the Ludlow Maintenance Commission (LMC) and managed by the LMC Greenbelt Committee (GBC). Very little forest management has taken place within the Greenbelt.

The goal of the GBC is to preserve and maintain the greenbelt for the future community. Maintenance goals of the GBC include: minimizing dead and diseased trees; minimizing hazards to personal and public property; approval of any modifications or infringements to the greenbelt; oversight of work that takes place inside the greenbelt; and to maintain a balance between view protection and forest protection. A baseline survey and maintenance plan for the greenbelt area is needed to assist the GBC in their mission. A survey containing an inventory of tree species and health, invasive species extent, fire hazard potential, trail site recommendations, and a five-year maintenance plan was contracted between the LMC and ArborWise, LLC, in June 2003.

During the months of July and August 2003, ArborWise, LLC collected data to best represent the diverse structure of the greenbelt. This Vegetation Survey and Maintenance Plan is a report on the results of that data collection. It should be used as a baseline to mark progress on work as it is performed in the greenbelt. Section 2 discusses the natural and cultural history that has influenced current forest development. Section 3 is the summary of data collected and a statement of current conditions in the greenbelt. Section 4 is a summary of the findings that begins with a brief discussion, in the broadest terms of forest dynamics and moves to comments on tree health, weed infestation, insect pests and fire risk in general and as it relates to the greenbelt. Section 5 is the 5-year maintenance plan. Section 6 discusses potential trail locations as were noted during data collection. The appendices include a weed inventory table that refers to specific locations of weed problems. It is to be used in conjunction with the color coded weed map. A complete species list of those plants noted during data collection is provided as the final appendix.

2.0 HISTORY

In order to understand the current conditions of the North Bay of Port Ludlow, it will be helpful to know the natural processes and man-made changes that have formed this area. A brief overview follows.

2.1 Natural History

2.1.1 Geology

Port Ludlow's geologic character is due to events which began during the last Ice Age. Glacial advances brought major sediment movement through the Puget Lowlands while excavating long narrow channels, which became the north-south

oriented bays such as Hood Canal (Downing 1983). Distribution of sediments varies greatly within the Lowlands due to the ice and meltwater streams that came off the glaciers. The area along the north edge of the Olympic Peninsula is a complex of sandstone, imbedded with siltstone and conglomerates (Franklin and Dyrness 1988). This layer is apparent in the bluffs along the eastern shoreline and road-cuts around the northern Peninsula. These glacial events strongly influenced the nature of the soils and consequently the vegetation composition in Port Ludlow.

The major soil group in the Port Ludlow area is in the Alderwood series. Technically defined, the Alderwood series is moderately well drained soils with a very slowly permeable cemented layer at depths of 20 to 40 inches. Alderwood soils are used mainly for tree production. This type of soil usually has a top layer (1 inch) of very dark, gravelly sandy loam, a layer yellowish of gravelly loam (12 inches), and continuing to a depth of 30 inches where soil structure transitions into impermeable hard pan. Roots grow through the easily draining soil and flatten out as they reach the poorly drained cemented layer. Erosion in this soil type can range from moderate to severe where terraces merge with ravines and steep drainage ways (USDA 1969). What this means within the Port Ludlow area is that trees in the greenbelt are generally shallow rooted and the roots are wide spreading. The root structure plays a large role in holding soil and preventing erosion on the steep slopes of the area.

2.1.2 Forest Type Ecology

The Port Ludlow, North Bay is nestled in a successionally intermediate mixed conifer/hardwood forest. The forest was most-likely composed of a climax hemlock/sword fern/salal association prior to the first logging in the area. Hemlock and western red cedar are the major components in this secondary forest development, while Douglas-fir is abundant in drier, inland areas.

The shrub layer in the more mature forests of the greenbelt closely follows this description of a hemlock zone described in Franklin and Dyrness (1988), as sparsely populated by low Oregon grape, salal, and an abundance of sword fern. In the younger stands of the greenbelt, the shrub layer is composed of red huckleberry, salmonberry, and salal, a representation of an early seral community. Large openings in the canopy, or highly disturbed areas show more of a shrub/scrub community of salmonberry, blackberry, bitter cherry, willow, and alder.

The forest type of Port Ludlow, if allowed to continue to its climax associations, will again be dominated by hemlock with cedar and Douglas-fir playing a role from their current locations. Hemlock is able to reproduce in the shade while Douglas-fir cannot. It is unlikely that the current population of Douglas-fir will expand without planting the trees into open areas. The alders will age and decline, or will become overtopped and shaded out by conifer species.

2.2 Recent History

2.2.1 Logging

Initial logging of this area probably took place in the mid to late 1800s for ship building operations in Port Gamble. By the turn of the century the local lumber mill turned out many board feet of lumber from the immediate area to supply the growing city of Seattle. It is estimated that the North Bay area was logged during that time. Pope & Talbot, the land owner and timber industry employer, continued to log the Peninsula, and when the Hood Canal Bridge was built, the Port Ludlow area became potentially valuable real estate. The area was again logged in the 1960s to make way for the planned community of Port Ludlow. The last logging and clearing disturbances have resulted in the establishment of alder stands that are at mid to late life-span in many places.

Aerial photos of the Port Ludlow area from 1957 show a well forested region. It is clear, however, that the steep ridges had open gaps where it appears that trees have had difficulty becoming established. These gaps are evident on a 1983 aerial as well. (Available on line through a variety of mapping websites and from the Maps and Special Collections library at the University of Washington Seattle Campus.) One feature on the 1983 aerial shows a recent clearing on the southeast slope from Machias loop to Oak Bay Road, through what is now Drew and Phinney Lanes. While much of this area has been developed, the greenbelt areas on this slope have been slow to recover.

3.0 CURRENT CONDITIONS

The total greenbelt area within the Port Ludlow, North Bay community, including the 1.5 acres in Kehele Park, is approximately 57 acres. The greenbelt varies from roadside buffers to larger undeveloped sections. The continuities of the greenbelt make Port Ludlow, North Bay a private woodland and a haven for wildlife. To best determine the character of the greenbelt we used three methods of data collection. The roadside right-of-ways were walked and the vegetation was counted. The inner blocks of greenbelt were characterized by one-tenth acre plot samples, and the long, continuous tracts were sampled by using transect based data collection.

3.1 Right-of-Way Surveys

The Port Ludlow Greenbelt includes both sides of roughly 4.5 miles of roads. These Right-of-Way (ROW) portions of greenbelt were inventoried by a ‘windshield’ survey in eight sections. A windshield survey involves a tally of vegetation species, and an estimate of size and conditions of the trees. Estimates of tree size are made based on size categories of the trunks at 4.5 feet above the soil (diameter at breast height or DBH), a standard measure of trees. Ground cover, shrub, and weed species are noted and the overall characteristics of the portion of road are described qualitatively. The windshield survey included the following roads:

- Osprey Ridge Drive from Oak Bay Road to Walker Way
- Walker Way from Osprey Ridge Drive to Oak Bay Road
- Talbot Drive From Walker Way to Swansonville Road

- Swansonville Road from Talbot Drive to Oak Bay Road
- Oak Bay Road from Walker Way to the Northern Boundary of Port Ludlow
- Pioneer Drive East From Keefe Lane to Jackson Lane
- Fleet Drive From Rainier Lane To Pioneer Drive East
- Pope Way from Condon Lane to Oak Bay Road

In addition, a windshield survey was performed in three narrow inter-lot portions of greenbelt. These portions of greenbelt are east to west trending and are between 35 and 70 feet wide and 450 to 750 feet long. The portions of greenbelt that were inter-lot included:

- The 'Machias Bisect'
- The 'Cascade Bisect'
- The 'Montgomery Bisect'

The Machias Bisect and the Cascade Bisect are on either side of, and parallel to Walker Way. The Montgomery Bisect is half-way between Baldwin and Pope and from Oak Bay Road on the west to the water on the east.

The ROW portions of greenbelt vary in width between 17 feet in the narrowest places along Osprey Ridge Drive and over 100 feet in the widest portion west of Talbot Drive. The total area of the greenbelt adjacent to ROWs is approximately 17.3 acres. The total area of the inter-lot portion of greenbelt is approximately 2.5 acres. Combined, these long narrow spaces represent one-third of the total greenbelt in Port Ludlow, North Bay.

Because it is adjacent to roads, the ROW portion of the greenbelt is accessible and receives a higher level of scrutiny than the other parts of the overall greenbelt. Though the native species mix is generally the same on the ROW as in the larger areas of forested greenbelt, it is a mistake to assume that the characteristics of the ROW are typical of the forest areas as well.

The defining character of the portion of greenbelt along the rights-of-way is that it is all 'edge habitat'. The plant species mix and the characteristics of growth are strongly influenced by higher light penetration as compared to the forest areas, where the tree canopy excludes most light from the forest floor. Vegetation along the ROW edges tends to grow thicker and the species mix tends towards those plants recognized as 'early succession' species. Simply stated, early succession is a term that refers to an ecological age of a forest. Early succession species generally require higher light conditions, grow faster and have a shorter life span than species that are considered late succession. They are the first species that re-colonize a forest after clear cutting or other events that remove the majority of the forest canopy. Early succession species in western Washington forests include alder, bitter cherry, and big-leaf maple and sun tolerant species such as salal.

Additionally, because the roadside is frequently associated with a ditch designed to catch surface water runoff from the roads and to divert natural drainages, plants that typically require more shade but are capable of growing in high light environments with adequate

water also may grow successfully along the ROW. These plants include salmonberry, red huckleberry, and the native trailing blackberry.

An unfortunate consequence of the exposed condition of the ROW is that it is subject to infestation by noxious or invasive weeds. The most common weed along the roads in Port Ludlow is Himalayan blackberry, but one also finds other sun loving invasive weeds such as Scot's broom, tansy ragwort, bull thistle, and Canada thistle. Japanese knotweed, a particularly execrable weed found typically in shadier environments is found in one sunny, presumably moister, location along the ROW on Swansonville. The following sections are summaries of the data on each ROW surveyed. A Table of statistis follows each description

3.1.1 Osprey Ridge Drive

Most of this portion of the ROW is small caliper trees. The understory species are typical ditch species creating thickets. Most the species are berries, dominated by the native salmonberry and thimbleberry, but there are certainly Himalayan blackberry and evergreen blackberry in the mix to varying degrees.

Length	0.6 miles
Area of Greenbelt	0.7 acres
Average Width	18 feet
Narrowest point	17 feet
Widest point	35 feet
Primary tree species	Alder, Bitter cherry, Douglas-fir
Tree size class	2% greater than 12 inches DBH, nearly 90% is less than 6 inches DBH, 25% is regeneration (0-1 inch DBH)
Primary weed issues	Himalayan blackberry
Other concerns	Possible adjacent property owners intrusion into the ROW at lots 10 and 14 Sparrow

3.1.2 Walker Way

Overall the south side of Walker Way has an open understory. Though thicket-like, the species are predominately native species. In a small area near Puget Loop Himalayan blackberry and English ivy are beginning to invade. From Gamble to Oak Bay Road on the south side significant amounts of blackberry grows in a thicket. However this portion of the ROW is a part of a larger block of greenbelt, and is more appropriately discussed as part of that larger greenbelt (see Plot One – Junction of Walker Way and Oak Bay Road).

The north side of Walker Way generally has more of a weed problem, in part due to the southern exposure and higher light conditions. Himalayan blackberry is significantly invading the portion of the ROW from Oak Bay to Cressey, and it continues beyond Cressey all the way to Rainier. Blackberry will continue to become thicker in this section of road unless action is taken to limit the expansion into new

areas. The north side of Walker Way near Talbot is one of the few areas in which we found Scot's broom.

Length	0.9 miles
Area of Greenbelt	2.5 acres
Average Width:	
North side	25 feet
South side	18 feet
Narrowest point:	
North side	17 feet
South side	17 feet
Widest point:	
North side	70 feet
South side	60 feet
Primary tree species	Red cedar, Douglas-fir, Big-leaf maple
Tree size class	23% greater than 12 inches DBH, 60% greater than 6 inches DBH.
Primary weed issues	Himalayan blackberry, English ivy, Canadian thistle, bull thistle, Scot's broom

3.1.3 Talbot Drive

A large portion of this part of the ROW greenbelt has a thick conifer overstory that excludes all but the most shade tolerant groundcover species. The west side of this road is the widest of the ROW greenbelt sections; we did not inventory understory species at any distance away from the road, though shrub species were noted. As a consequence there may be weed invasions in sections of this part of ROW greenbelt that are not recorded, particularly in the section on the west side where the tree canopy opens between Tyee and Sayward. A scrub-shrub landscape dominates in this location. The area has less canopy cover, and consequently more sunlight penetration. Judging by the species mix, this area appears to be wetter than the other portions of this side of Talbot. Higher light conditions combined with additional water availability are attractive conditions for weed establishment.

Length	0.5 miles
Area of Greenbelt	3.4 acres
Average Width:	
East side	35 feet
West side	90 feet
Narrowest point:	
East side	20 feet
West side	64 feet
Widest point:	
East side	70 feet
West side	130 feet
Primary tree species	Red cedar, Douglas-fir, section of Alder
Tree size class	25% greater than 12 inches DBH, and 50% greater than 6 inches DBH
Primary weed issues	No significant weeds
Other concerns	Understory in areas away from the road was not inventoried

3.1.4 Swansonville

On the north side of Swansonville close to Pioneer this portion of the ROW greenbelt is thicket-like, but primarily due to sheared native tree species. Behind the thicket of sheared trees is typical native groundcover under a native canopy. Camano to Rainier is the section with the largest weed problem, particularly a patch of Japanese knotweed just west of Camano.

On the south side of Swansonville from Talbot to Camano is thicket-like, but mostly contains native salmonberry. The overall thicket-like nature of this portion of the ROW is also due in part to small caliper tree regeneration and the lack of significant large caliper tree canopy. Close to Oak Bay, the average tree size increases and the quality of the understory also increases and appears to be more consistent with what one would expect to find in a Northwest forest, with sword fern and salal dominant.

Length: 0.8 miles	0.8 miles
Area of Greenbelt	3.65 acres
Average Width:	
North side	42 feet
South side	25 feet
Narrowest point:	
North side	25 feet
South side	20 feet
Widest point:	
North side	85 feet
South side	25 feet
Primary tree species	Red cedar, Douglas-fir, Big-leaf maple, Alder, patches of Cherry and Willow regeneration
Tree size class	23% greater than 12 inches DBH (excluding regeneration), 40% are 1 – 6 inches DBH
Primary weed issues	Japanese knotweed, Himalayan blackberry

3.1.5 Oak Bay Road

Many of the weed problems along the west side of Oak Bay are located near Walker Way. Of particular significance is English ivy growing into the canopy of several trees. Blackberry is also thicker in this location than in other areas along Oak Bay. After Swansonville, stinky Bob is invading the native understory. Stinky Bob, or herb Robert as it is commonly known is shade tolerant and capable of invading a diverse area of forest understory, where is pushes out native understory species and reduces the quality of wildlife habitat.

Across from Baldwin where a four-foot conduit has been installed, is a larger area of greenbelt than the typical areas adjacent to ROW. This area is approximately 0.6 acres. We observed trees cut, evidently for view enhancement. This area is also significantly invaded by Himalayan blackberry in large patches of robust canes. Several large Scot's broom shrubs in this area are not evident from the road side.

Erosion appears to be an issue here (conduit was installed), which can affect native plant establishment and increase the spread of weeds.

After Baldwin is typical ditch vegetation and at the top of the slope arising from the road is sheared vegetation. It appears brushy and unkempt, but most of the brush is native salmonberry and regenerating alder and willow.

On the east side of Oak Bay the greenbelt drops down slope. From Montgomery to Baldwin, Himalayan blackberry is in patches and mixed in the scrubby vegetation along the roadside. Occasionally a non-native tree such as mountain ash (*Sorbus acuparia*) can be found mixed in with the native hardwoods.

Along Lots 14 – 16 or 17 Oak Bay, the owners appear to be maintaining the greenbelt and are landscaping up to the county ROW line, planting non-natives such as *Escalonia* and Lawson's cedar. At entrances to the Conference and Condominium areas English ivy has been allowed to grow into the trees.

Length	1.0 miles
Area of Greenbelt	2.9 acres
Average Width:	
East side	20 feet
West side	20 feet
Narrowest point:	
East side	60 feet
West side	50 feet
Widest point:	
East side	10 feet
West side	16 feet
Primary tree species	Red cedar, Douglas-fir, Big-leaf maple, with regeneration patches of Bitter cherry, Alder and Willow regeneration
Tree size class	30% greater than 12 inches DBH (excluding regeneration), 25% are between 1 and 6 inches DBH (excluding regeneration)
Primary weed issues	Himalayan blackberry, tansy ragwort, Canada thistle, bull thistle, English ivy, stinky Bob

3.1.6 Pioneer Drive East

In areas along this portion of the ROW that are not absorbed by adjacent property owners, the space is basically unkempt small caliper trees or sheared native trees that create a native hedge for a portion of the ROW.

Length	.2 miles
Area of Greenbelt	.75 acres
Average Width:	
North side	25 feet
South side	25 feet
Narrowest point:	
North side	20 feet
South side	20 feet
Widest point:	
North side	35 feet
South side	35 feet
Primary tree species	Alder, Bitter Cherry, Red Cedar, Douglas-fir
Tree size class	10% greater than 12 inches DBH, 67% are less than 6 inches DBH
Primary weed issues	Himalayan blackberry
Other concerns	ROW is absorbed by adjacent property owners from Pioneer to Keefe on the south side.

3.1.7 Fleet Drive

Along Fleet the adjacent property owners have landscaped through the ROW from Pathfinder to Trader and Explorer to Pioneer on the north side, and Pioneer to Seafarer on the south side. Where not totally landscaped by the adjacent property owner, there is simply grass and/or a large native hedge maintained by the adjacent property owner. There are few weeds, as one would expect in a landscaped area.

Length	0.3 miles
Area of Greenbelt	1.35 acres
Average Width :	
North side	25 feet
South side	25 feet
Narrowest point:	
North side	20 feet
South side	20 feet
Widest point:	
North side	35 feet
South side	35 feet
Primary tree species	Bitter cherry, Alder, Red cedar, Willow
Tree size class	Primarily regeneration (0 – 1" DBH), and less than 6 inches DBH (98%).
Primary weed issues	Himalayan blackberry, Scot's broom, English ivy
Other concerns	ROW almost entirely absorbed by adjacent property owners

3.1.8 Pope Way

The north side of this portion of the ROW greenbelt is raised slightly over the road bed and aside from the ditch, which collects surface water runoff, the area is dominated by drought tolerant plant species. The south side the greenbelt drops off into a drainage dominated by species that are typical of moist sites. This side has a more significant blackberry problem than the north. It also has a native thicket of alder, salmonberry and horsetail characteristic of swampy ground.

Length:	0.1 miles
Area of Greenbelt	.37 acres
Average Width:	
North	20 feet
South	25 feet
Narrowest point:	
North	20 feet
South	25 feet
Widest point:	
North	20 feet
South	25 feet

Primary tree species	Red cedar, alder, willow
Tree size class	18% greater than 12 inches DBH. 42% are small alder and cedar, 1 – 6 inches DBH
Primary weed issues	Himalayan blackberry, *Cotoneaster*
Other concerns	North side adjacent property owners may be intruding on greenbelt on either side of Montgomery.

3.2 The Inter-lot Portions of Greenbelt

The inter-lot portions of greenbelt vary from the ROW portions of greenbelt primarily because the portions of the greenbelt that are inter-lot typically do not have the high light penetration that many sections of the ROW do. Therefore, the understory species are predominately shade tolerant natives. Only where the inter-lots are exposed to high light conditions, such as the portion of Montgomery Bisect just to the east of Montgomery, does one find significant blackberry and "aesthetically less desirable hardwood" regeneration (i.e., willow, bitter cherry). Consequently weeds, though present, are less of an issue in the inter-lots than they are along the ROW portions of greenbelt.

3.2.1 Machias Bisect

Over half the trees in Machias Bisect are big-leaf maple. Almost all of the largest trees are maple or red cedar. Few weeds are significant, except for Himalayan blackberry in the eastern most portion.

Length:	750 feet (0.15 miles)
Area of Greenbelt	0.78 acres
Average Width	45 feet
Primary tree species	Big-leaf maple, Alder, Red cedar
Tree size class	14% greater than 12 inches DBH, 37% are 1 – 6 inches.
Primary weed issues	Himalayan blackberry

3.2.2 Cascade Bisect

Cascade Bisect is basically a regenerating hardwood forest area with several large conifers. It has enough of a canopy to prevent weeds from becoming established in the understory.

Length:	500 feet (0.09 miles)
Area of Greenbelt	0.4 acres
Average Width	35 feet
Primary tree species	Red cedar, maple, alder, bitter cherry, willow
Tree size class	5% greater than 12 inches DBH, 41% are 1 – 6 inches DBH
Primary weed issues	No significant issues

3.2.3 Montgomery Bisect

The property owners adjacent to this bisect maintain the greenbelt from the water on the east almost to Montgomery Lane. There is a small area of impenetrable blackberries, but after Montgomery Lane, and the rest of the way to Oak Bay Road, this bisect is typical moist Northwest understory, dominated by sword fern in the drier locations and sparse salmonberry in the moister areas.

Length:	625 feet (0.12 miles)
Area of Greenbelt:	0.85 acres
Average Width:	55 feet
Primary tree species	Alder, red cedar
Tree size class	10% greater than 12 inches DBH, 50 % are 1 – 6 inches DBH
Primary weed issues	Himalayan blackberry

CHARTS

CHART 1 illustrates the total number of tree species in all size categories for each section of ROW Survey. It is important to note that willow and bitter cherry are almost always in small class sizes (often they are less than 1 inch DBH and they tend to grow clumped in often thicket-like groves. Red cedar is the dominant conifer in all of the ROW portions of the greenbelt. Douglas-fir occurs in somewhat smaller numbers. Species that are inconsistently present along the ROW include hemlock and big-leaf maple.

CHART 1

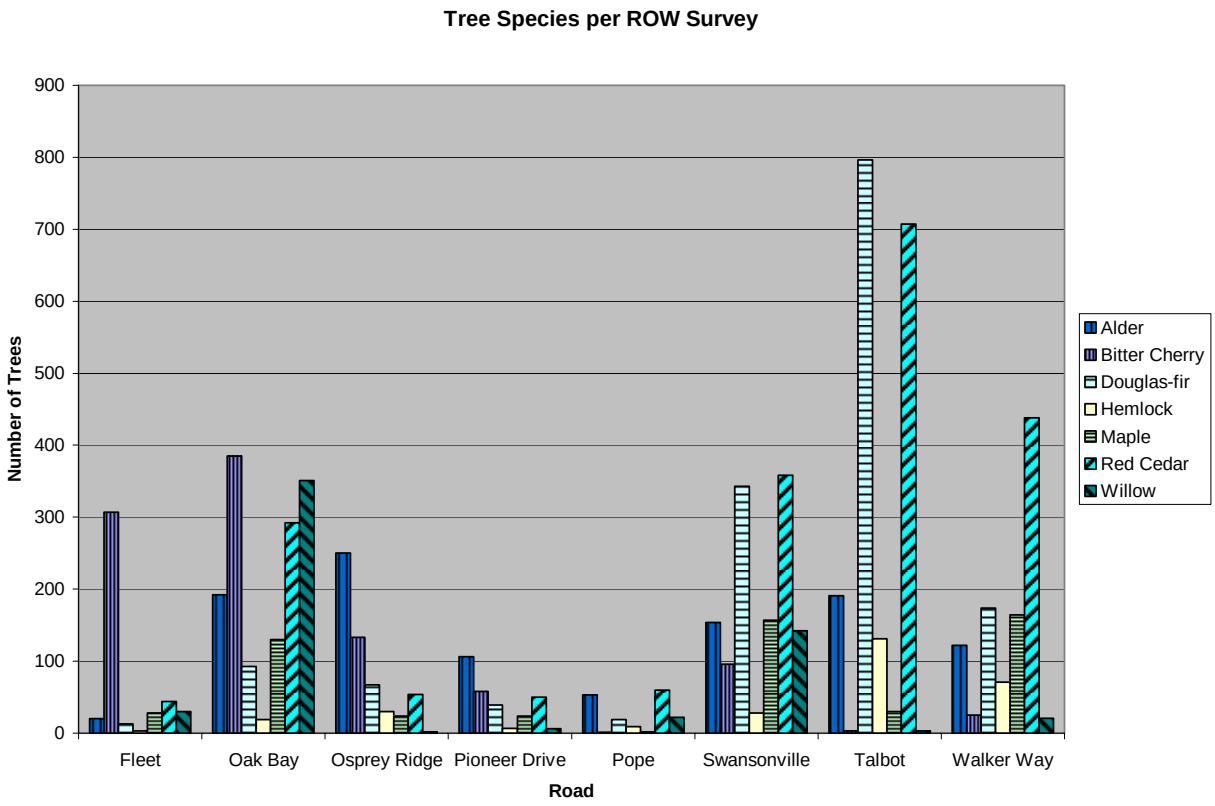


CHART 2 illustrates the size class for each tree species over the entire ROW portion of the greenbelt. The size distribution for red cedar and maple are what we might expect to see for a single-aged stand. The trees are mostly in the same middle sized class, which is likely to mean that the majority of trees began growing at the same time and are maturing through the size classes at a similar rate. Compare the red cedar curve to the curve demonstrated by the Douglas-fir and hemlock size distribution. The Douglas-fir curve starts with many small sized trees and then has fewer and fewer trees as one goes up in class size. This is more typical of a multi-aged stand. This difference in size class distribution between the species makes sense if one considers the logging history of the Port Ludlow Bay area. This forest is a third growth forest. Logging of the largest trees occurred just before the turn of the century. A second round of logging was completed in the late 1960's. Only small trees or those of low timber value were left to grow into what is today, the largest trees in the area.

The large quantity of alder, willow, bitter cherry, and Douglas-fir in the smaller size classes reflects the conditions of the roadside greenbelt. These species of tree frequently grow as regeneration in thick groves of small caliper trees in sunny edge environments such as can be found along the roadsides.

CHART 2

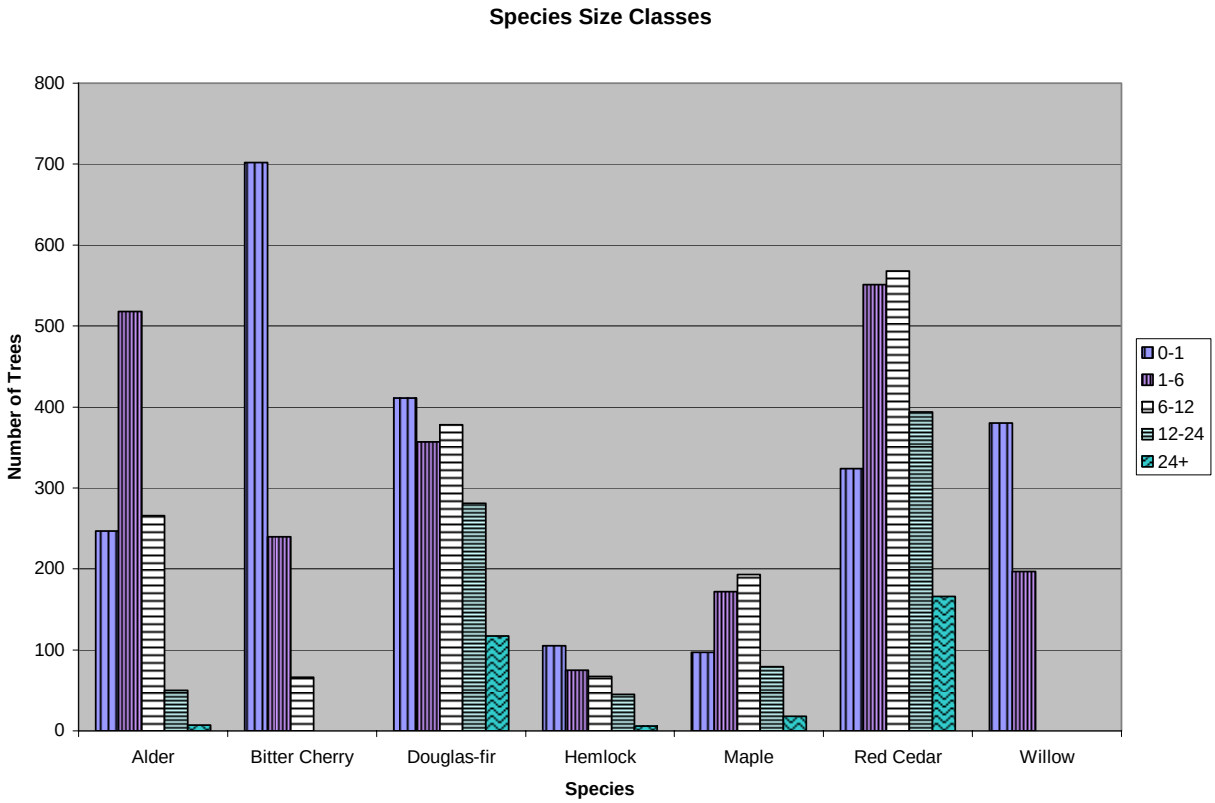


CHART 3 demonstrates that the large majority of trees greater than 6 inches in diameter are conifers. In general, areas with larger conifers have fewer weeds. They also tend to have fewer shrubs and less groundcover in the understory. Areas with larger trees often have an understory dominated by native sword fern, or salal.

CHART 3

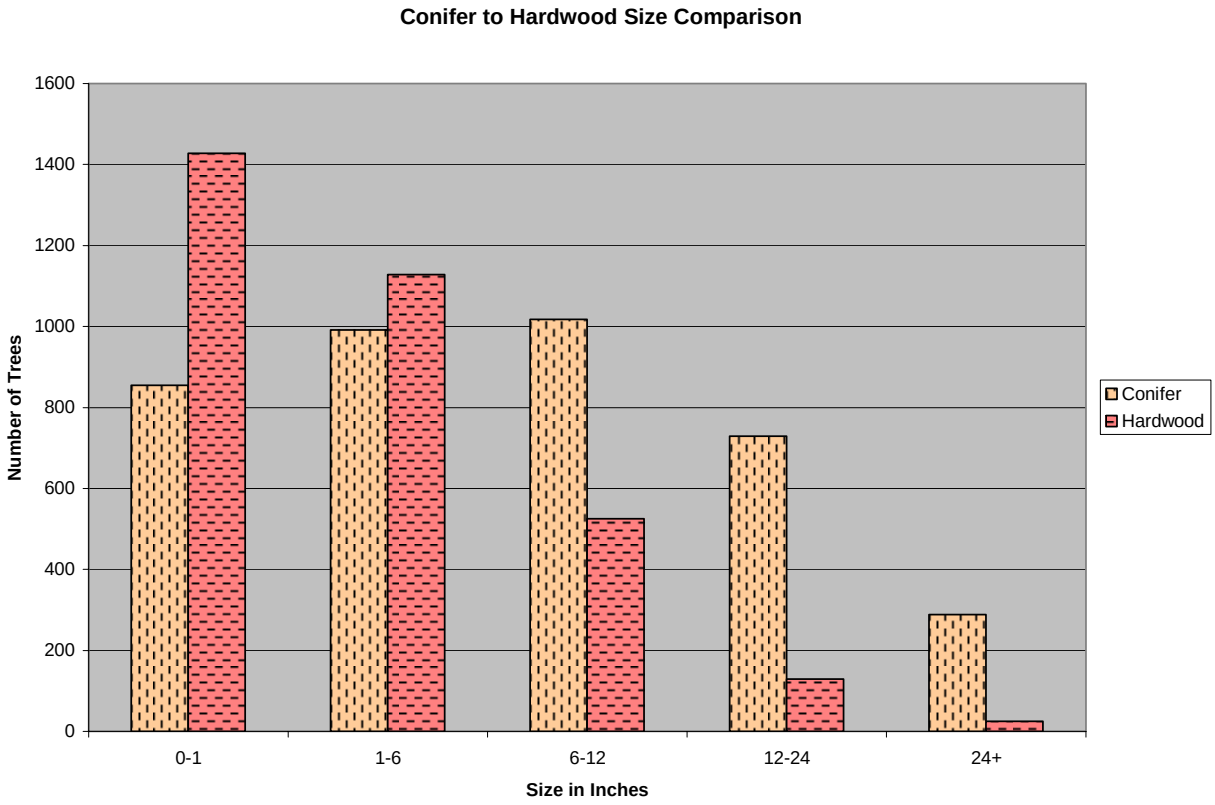


CHART 4. The vast majority of hardwoods are less than 12 inches in diameter. The larger trees are typically older and declining alder and maple. This chart is provided to demonstrate how few over-mature maple and alder exist along the right-of-way, and to alleviate concerns regarding falling tree damage. In over 5 miles of roadway, only 25 alders and maples exceed 24 inches DBH. With regard to the aesthetics of the roadside portions of greenbelt, the smaller alders, along with willow and bitter cherry regeneration (not pictured in this graph) represent a category we call “aesthetically less desirable hardwood trees”. The areas where these trees are abundant tend to appear unkempt and may contribute to the perception of unhealthy and dying trees that may pose a risk.

CHART 4

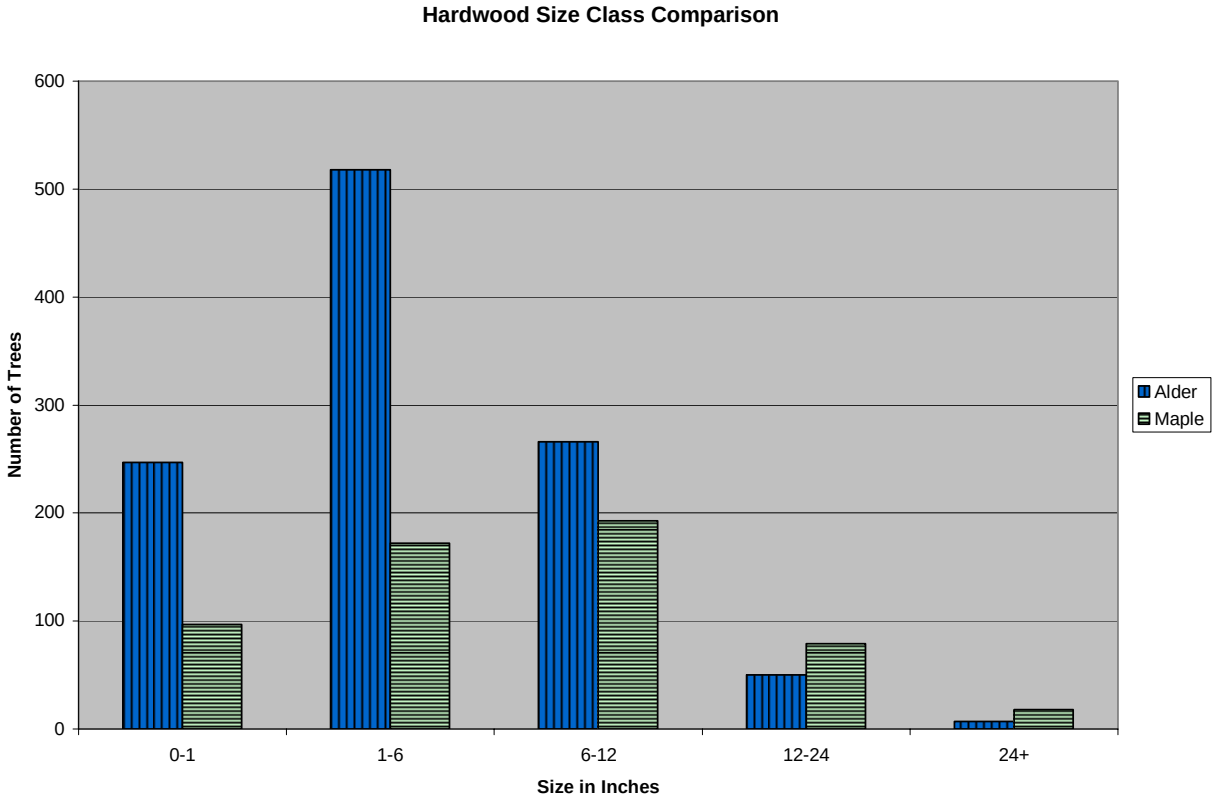


CHART 5 (Following page) represents species of weeds in the ROW portion of greenbelt that are shrubby, highly visible, and often difficult to remove once they become established. The weeds in this category found in Port Ludlow are Himalayan and evergreen blackberry, English ivy, Scot's broom, holly, mountain ash, and Japanese knotweed. They are quantified as an average index over each section of road. The index is a product of the severity (scale 1 – 3; 3 is more severe) of the weed problem and the overall extent to which it can be found along that road (scale 0 – 1; 1 is a larger infestation). For instance, if a patch of blackberry is very thick, it receives a rating of 2.5 or 3. However, if this patch covers only a small portion of the ROW at a particular location it receives and extent rating of 0.1. By multiplying these factors together the weed index for the hypothetical blackberry patch is 0.25 or 0.3. The categories of the weed index are listed below:

- **Less than 0.5:** The weed is present as individual plants, and is easily eliminated using proper strategy. Or, this weed covers a relatively small area.
- **0.5 – 1.0:** the weed is either present in moderate numbers or as individuals over larger distances. Eliminating it will require more work, and may require some repeat efforts, but eradication is still reasonably easy in these locations using proper strategy.
- **1.0 – 2.0:** The weed is present in amounts that make elimination difficult in a single effort. Repeat efforts for eradication are likely to be necessary.
- **Greater than 2.0:** The weed is present in monocultures over large areas, or it is a particularly difficult or dangerous weed to remove

As is clear from this chart, blackberry is present in all sections of the ROW greenbelt, occasionally in large quantities. Other significant weeds are English ivy which is in relatively few locations in large quantities, but has climbed trees and is growing in thick, patches in some locations along Oak Bay Road. The highest priority weed for eradication, and the one that will require the most revisits to eliminate is a small patch of Japanese knotweed on Swansonville. This weed is presented in the graph with an index of 3.0 due to the potential ecological damage it can do to invaded areas, and the difficulty eradicating it.

Chart 5

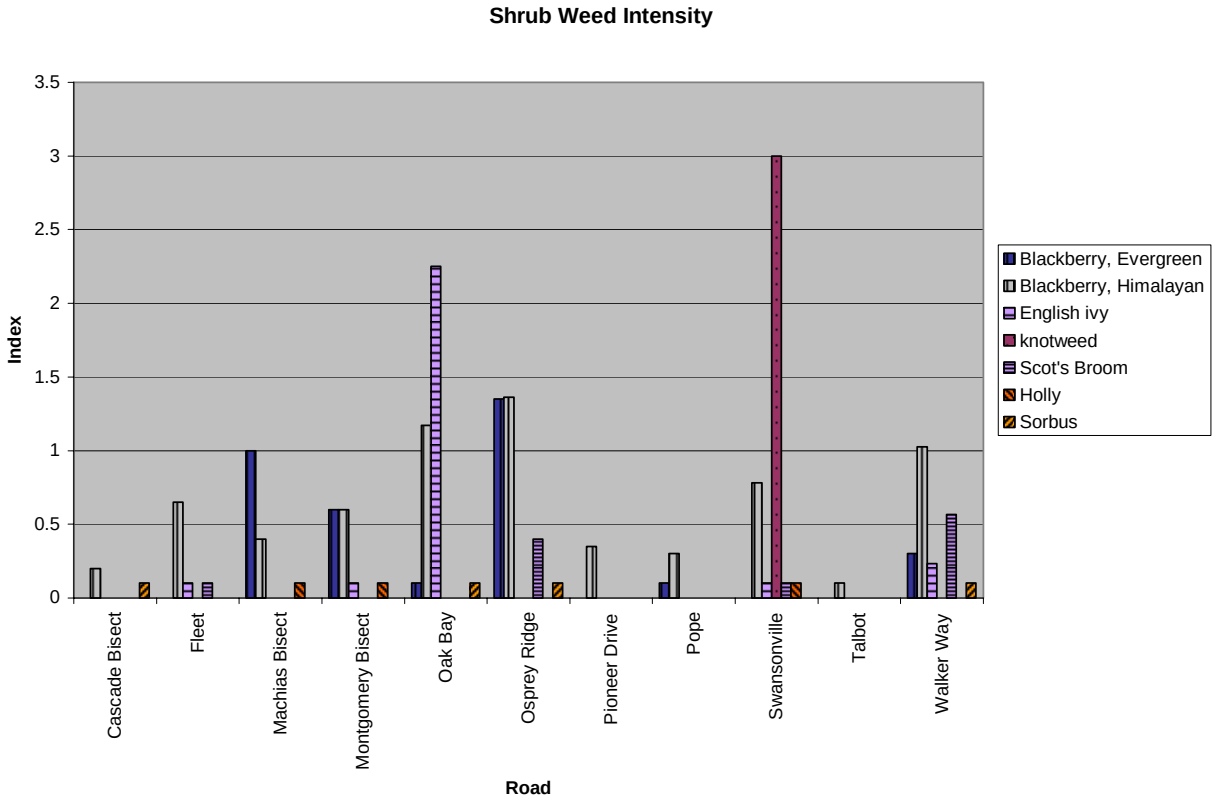
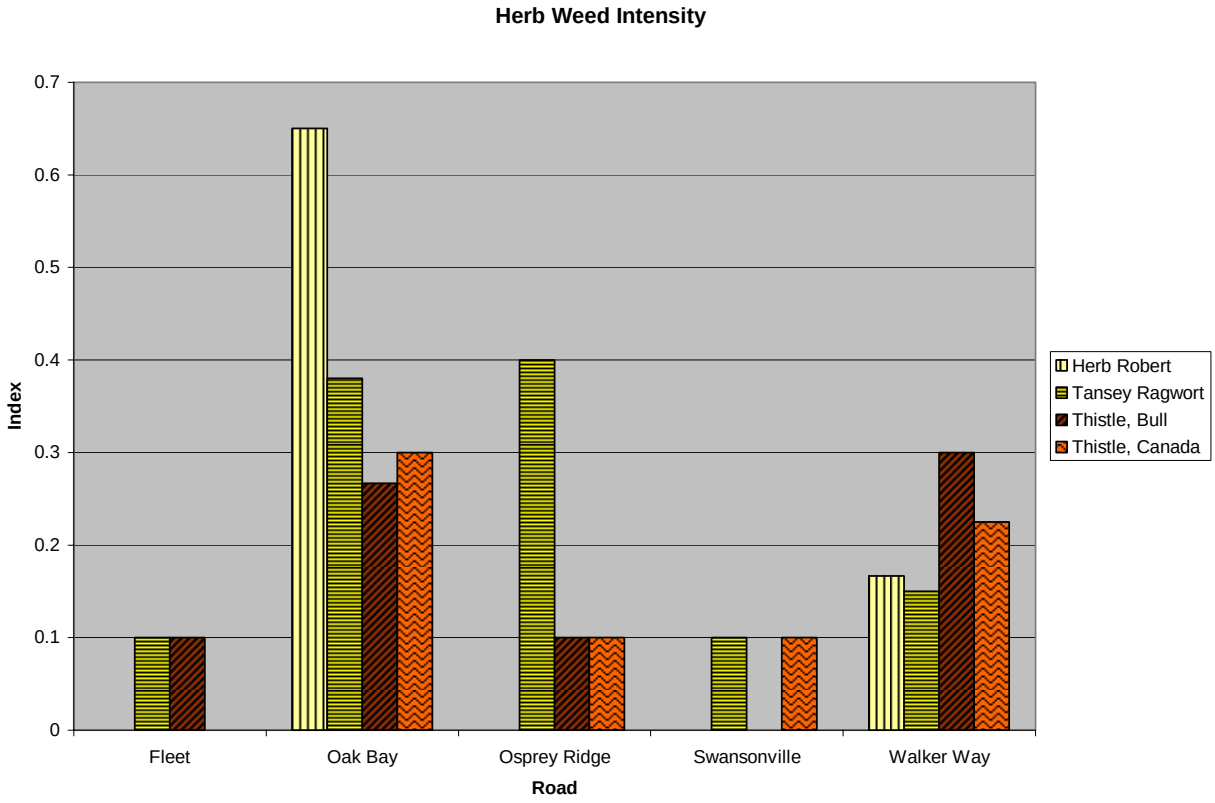

Shrub Weed Intensity
Index
3.5
3
2.5
2
1.5
1
0.5
0
Cascade Bisect
Fleet
Machias Bisect
Montgomery Bisect
Oak Bay
Osprey Ridge
Pioneer Drive
Pope
Swansonville
Talbot
Walker Way
Road
Blackberry, Evergreen
Blackberry, Himalayan
English ivy
knotweed
Scot's Broom
Holly
Sorbus

CHART 6 (Following page) represents the species of herbaceous weeds found along the ROW greenbelt. Most these weeds are simply opportunistic species typical of ditches and abandoned fields. Some are considered Class A noxious weeds in other counties in Washington state due to damage they can cause to livestock or agricultural fields. Most are present at low levels that are easy to manage. The index for the herbaceous weeds is modified from the shrub weeds as described above.

- Less than 0.2: The weed is present as individuals, and will not be difficult to manage using correct strategy.
- 0.2 – 0.5: The weed is present in moderate numbers relative to other herbaceous weeds, but still should not be difficult to manage.
- Greater than 0.5: The weed is present in large numbers, but usually not over large distances, or it is a significant threat to some limited areas and removal should be a higher priority.

Tansy ragwort and thistle are the two most ubiquitous herbaceous weeds in the ROW portion of the greenbelt, though neither are present in extremely high numbers. The herbaceous weed of most concern along the ROW portion of the greenbelt is stinky Bob, also known as herb Robert. It is present in high numbers, and is beginning to invade the interior forest greenbelt just north Swansonville along Oak Bay. Once this weed invades a forest area, it can exclude all other groundcover species. It may be present in numbers as high as 250 plants per square meter.

CHART 6


Herb Weed Intensity
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Index
Fleet
Oak Bay
Osprey Ridge
Swansonville
Walker Way
Road
Herb Robert
Tansey Ragwort
Thistle, Bull
Thistle, Canada

3.3 Transects in Greenbelts

The long continuous strips inside the greenbelt were sampled using transects. Along each transect, 10-foot diameter plots were established every 50 feet. Transects were selected to run from upslope to downslope. An attempt was made to sample both uplant and ravine portions of the greenbelts where slopes are steep and drainages are present.

3.3.1 Walker Way South to Oak Bay Road (T1)

Transect One ran north and south through a ravine from Walker Way to Oak Bay Road. This area is approximately 6.9 acres. The transect line was 2,100 ft in length and moved from the west slope to the east slope across the ravine. This greenbelt consists of a healthy conifer forest dominated by western red cedar and western hemlock. Most of these conifers are greater than 24 inches in diameter. Alders and maples are found in gaps in the conifer canopy where light penetration is higher, and along the bottom of the ravine where the soil conditions are probably too moist to support most conifers. The alder, noted to be in fair or poor condition, tended to be at or near the end of its expected life. Large alders have fallen in areas creating essential habitat for birds and small mammals. Regeneration of cedar and hemlock is found throughout the area.

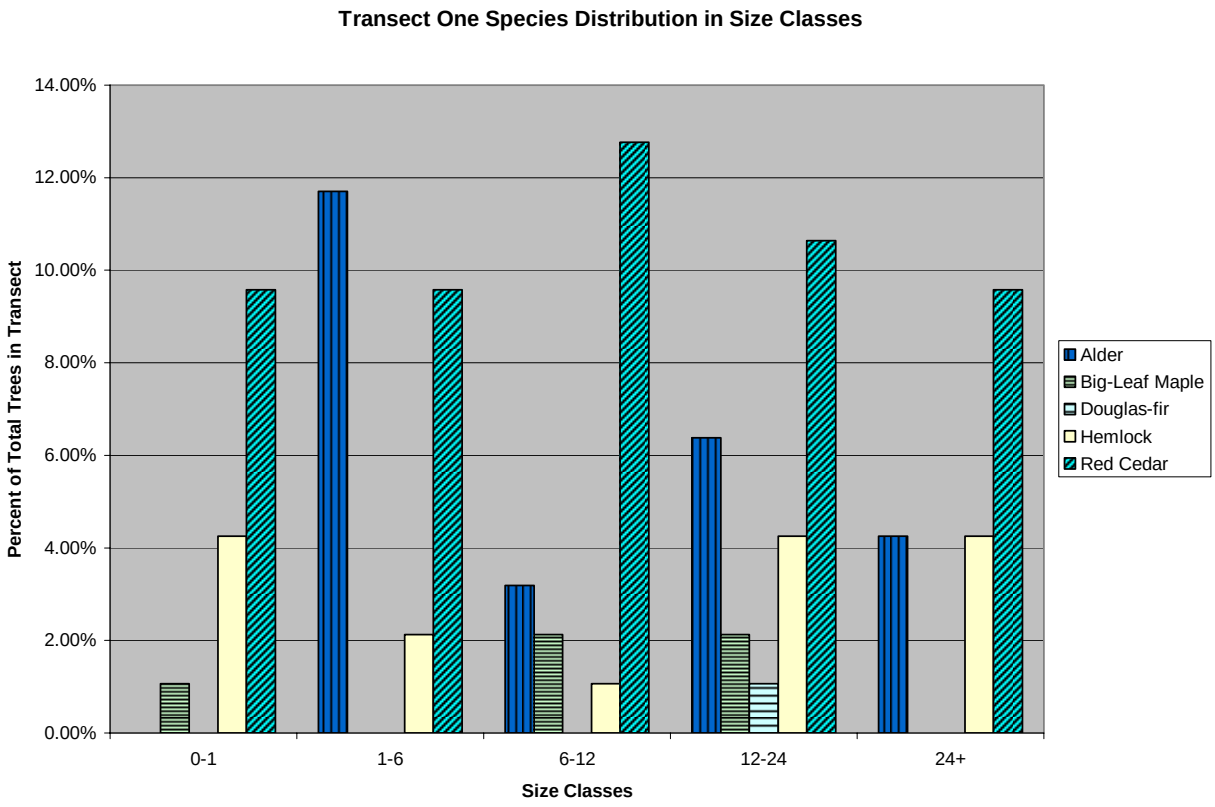
Much of the understory on the west side of the ravine was sparse due to the predominately conifer overstory and the subsequent low light levels at the forest floor. The understory on the east side of the ravine was dominated by large sword fern. The bottom of the ravine had many species adapted to higher moisture, including salmonberry and red elderberry.

Few weeds were found in this area of the greenbelt.

Length	1,760 feet
Area	6.9 acres
Average Width	128 feet
Narrowest Point	43 feet
Widest Point	1,445 feet
Primary Tree Species	Red cedar (53%) Alder (25%)
Tree Class Sizes	49% of the trees greater than 12 inches DBH are red cedar.
Weed Issues	Holly

CHART 7 shows that Transect One is dominated by red cedar in all size classes except the 1 – 6 inches diameter size class in which there are slightly more alder. Regeneration (0-1 size class) is predominately red cedar and hemlock, with several big-leaf maples also part of the understory. The distribution of tree species and sizes is diverse and reflects, in part, the diversity of the growing conditions in this steep sloped environment.

Chart 7



3.3.2 Rainier Court South to Oak Bay Road (T2)

Transect Two was located in the area south of Rainier Court and Machias Loop and north of Oak Bay Road. This is the largest open space of the greenbelt. The northwestern portion of this area is open with a southeastern, downslope view of thickets of alder and cherry. Conifers grow along the ridge tops. Around the perimeter to the east and north are large conifers, hiding the drainages that contain alder, salmonberry, and blackberry thickets. The transect over which we collected data covered most of the southwestern portion of the greenbelt area. We were also able to explore the eastern section, bordering Machias Loop, Puget Loop, and Drew Lane. The eastern portion is more densely forested with conifers, and has fewer weed problems and sparser understory than the western portion of this area.

This portion of greenbelt is one of the most weed infested areas of greenbelt. Patches of blackberry up to an acre in size exclude any regeneration of tree or native shrub species. At least four discrete and large patches of blackberry were found. Often the blackberry was not growing in monocultures, but rather was interspersed with the native shrub and ground cover. Single canes could be found beginning to colonize new areas of the greenbelt. In all instances, where conifers dominate the canopy, even if it is only a few trees, the weed populations are significantly decreased, or non-existent. A thick conifer canopy inhibits growth of all but the most shade tolerant understory plants.

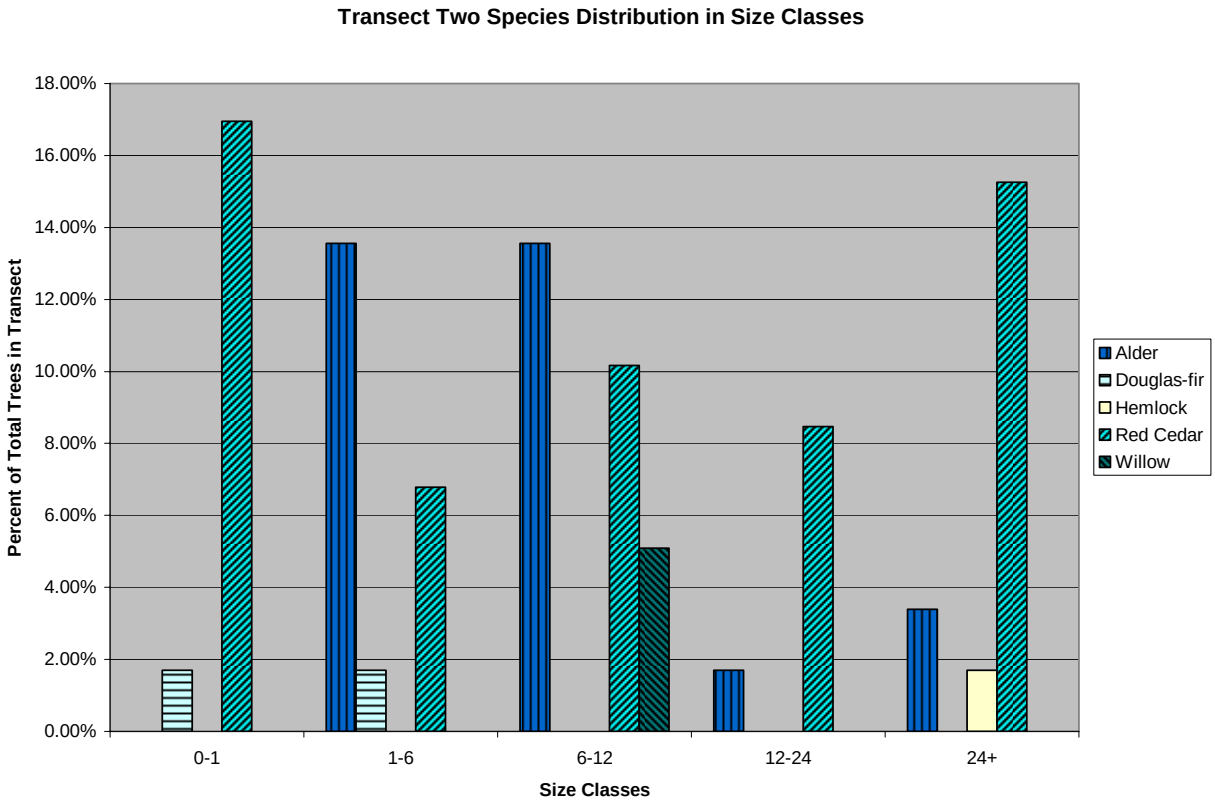
The utility easement “road” through the southern portion of the greenbelt is another severely weed infested area. The hillside above and immediately below this easement consists entirely of blackberry, Scot’s broom, and alder regeneration. The largest infestation of Scot’s broom in the entire greenbelt is found here.

Between the utility easement and Oak Bay, the understory remains in good condition with surprisingly few weeds. This is probably due, in part to the healthy conifer overstory. We were surprised and impressed to find a very large Pacific yew and a small shore pine as part of this overstory.

Length	893 feet
Area	11.4 acres
Average Width	NA
Narrowest Point	NA
Widest Point	NA
Primary Tree Species	Red cedar (58%), alder(32%)
Tree Class Sizes	The majority of alder is found in the 1 – 12 inch size classes; most of the regeneration is red cedar (90%) and 75% of the largest trees are red cedar
Weed Issues	Blackberry, Scot’s Broom
Other Concerns	Utility easement

CHART 8 Red cedar is abundant in all size classes. While alder is dominant in mid-size classes, it is not well represented in the 12-24 inch classes. Douglas-fir regeneration is found where alder is abundant indicating areas of high light, necessary for both species to thrive.

Chart 8



3.3.3 RV Trailer Storage to Walker Way (T3)

The third transect went from Rainier Lane at Rainier Court, through Walker Way and continued north to exit at the RV storage on Swansonville. This area of the non-ROW surveys had the greatest population of large Douglas-firs (DBH greater than 18 inches). Suppressed and small diameter hemlock and red cedar are part of the overstory. The forest floor south of Walker Way is mostly bare conifer needle duff with few understory plants.

In the area to the north of Walker Way the terrain is quite hummocky and the duff is especially thick. The trees all appear to be the same age. This area of the greenbelt is a single cohort (forest succession is discussed in a later section on forest health) that began to grow after a wind event caused large scale blowdown. (A windthrow event would be consistent with typical stress occurrences in edge environments after surrounding forests have been clearcut.) The trees that began growing after that wind event are now the same age. Now in the stem exclusion phase of forest succession, suppressed trees in the lower part of the overstory are beginning to die, and drop out of the canopy; thus, the profusion of fallen trees. This area had a higher number of snags than of any of the other greenbelt areas.

Shrubs and groundcovers, when present, are limited to sword fern, salal, and evergreen huckleberry. One interesting understory plant found only here during our survey was a small orchid that survives on dead decaying wood debris, coral root (*Corallorhiza maculate*) Holly, a shade resistant tree weed species, was the only weed noted in the understory. A small percentage of alders were found in this area (7%), mostly located at the northern end and on the perimeter of the greenbelt where the conifer canopy transitions to a higher light, edge environment at the RV storage. The terrain was mostly flat.

Length	1,827.5 feet
Area	2.2 acres
Average Width	127.5 feet
Narrowest Point	38.3 feet
Widest Point	263.5 feet
Primary Tree Species	Red cedar (49%), Douglas-fir (33%)
Tree Class Sizes	Red cedar and Douglas-fir make up the majority of larger trees
Weed Issues	Holly

CHART 9 shows clearly that alder is present as a small percentage of the total tree species in this forest area. Douglas-fir is present in the largest size classes, but non existent as regeneration. Red cedar and hemlock are by far the most significant regenerating tree species, as one would expect in this thick canopied environtment.

Chart 9

3.3.4 Rainier Lane to Oak Bay Road (T4)

This section of greenbelt is the location of the recently developed trail, installed by the volunteer trails committee of the GBC. The terrain of this section is relatively flat, but generally sloping to the east. The forest is generally young but maturing. The forest composition of this portion of greenbelt contains large red cedars and big-leaf maples. Larger hemlock and Douglas-fir are scattered throughout. Red cedar and maple are the primary regenerating species. Shrubs and groundcovers include mostly sword fern and salmonberry. Red huckleberry is also present.

Weeds were sparse but noted. Of particular interest were several newly germinated ivy seedlings. These seedlings indicate a potential future weed problem.

We noted that alder in this section was more likely to be in fair, poor, or dead condition in the 12-24 inch diameter size class. Alder in this size class might be

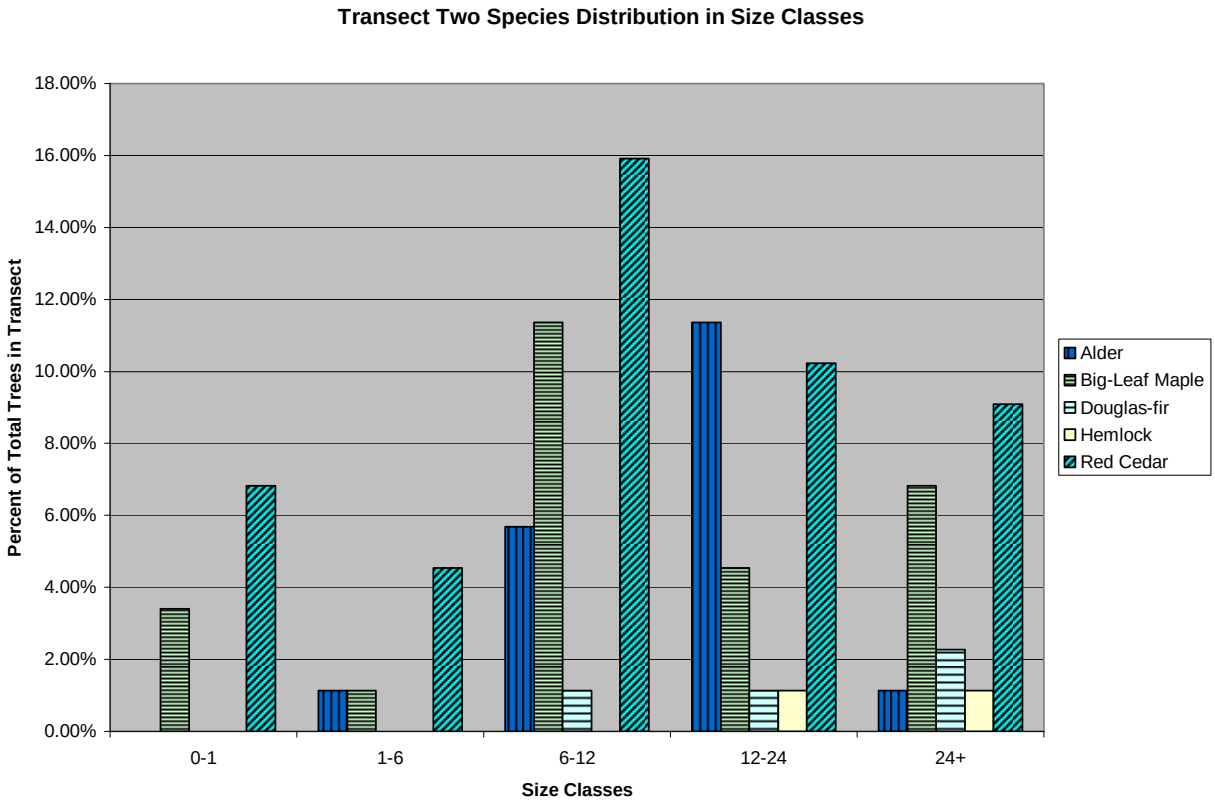
considered at or near the end of its life-span. But, the ding trees could also be declining due to crowding by large cedar and big-leaf maple. It should be noted that trees in less than ‘good’ condition are not necessarily an indicator of forest health. Trees declining because of age or damage are serving an important role in a forest system.

Dead and declining trees that may be considered hazardous were noted next to and overhanging the trail. Verbal recommendations for removal of specific trees were made to Adele Govert of the trails committee.

Length	1,879 feet
Area	5.5 acres
Average Width	128 feet
Narrowest Point	68 feet
Widest Point	553 feet
Primary Tree Species	Red cedar
Tree Class Sizes	Red cedar, big-leaf maple, and alder make up the 6-24” trees that are most abundant.
Weed Issues	Ivy
Other Concerns	Overhead dangers to trail users

CHART 10 illustrates that alder has, for the most part become mature and on average may be 30 to 50 years old. A very small amount does appear to be regenerating. Big-leaf maple and red cedar are the dominant overstory species. In the Chart they are clearly the primary trees in the largest class sizes.

Chart 10



3.4 Inner-block Greenbelt

Six one-tenth-acre plots were placed in the inner blocks of the greenbelt to sample a representation of each open space. Plants per plot were recorded as tree (above 15 ft), shrub (2-15 ft), and groundcover (below 2 ft) species. Species, diameter at breast height, and health were recorded for each tree in the plot. Shrubs and groundcovers were identified by species and estimated by percent cover. Tree species measured in the shrub or groundcover class were calculated as regenerating forest tree species.

Overall, these areas are diverse. The 'inner-block' greenbelt areas range form 1.0 acres to 4.3 acres and represent habitats from scrub/shrub to hardwood forest to conifer forest to wetland. Because of this variability, data from individual plots cannot be meaningfully grouped for analysis. The individual plots do, however, represent the forest areas in which each was placed. Each area is discussed separately here.

3.4.1 Junction of Walker Way and Oak Bay Road (P1)

This greenbelt space is at Walker Way and Oak Bay Road. The south side of the area is a ravine, and is populated with primarily big-leaf maple and alder, with a few young western red cedar. Shrubs and ground cover species include sword fern, red huckleberry, red elderberry, salmonberry, and gooseberry. Invasive weeds were primarily holly, several of which were well established large shrubs, and blackberry which is beginning to invade from the northern portion of this space. Several newly germinated ivy seedlings were found.

The north side of the area has been cleared of trees except for several large maples and cedars that have been limbed up for views. The majority of this area is salmonberry, sword fern, and regenerating maple overtopped by blackberry. In the southeast portion of this space ivy is climbing the trees and beginning to spread across the ground. A large, road size cut has been made through the berry thicket from the top to the bottom of the slope for unknown reasons.

Length	425 feet
Area	1.5 acres
Average Width	125 feet
Narrowest Point	40
Widest Point	235 feet
Primary Tree Species	alder 47%, big-leaf maple 41%
Tree Class Sizes	Most trees are alder and maple in the mid to large class size
Weed Issues	Ivy, holly, blackberry
Other Concerns	Recent access into greenbelt by motorized vehicle

CHART 11 illustrates a forest composition of mostly hardwoods of the same age group. The appearance of this chart is due to the location of the plot within this portion of the greenbelt. Data was collected from the ravine where we could access the site, thus, the trees on which data were collected are all adapted to moist soils. Half of this area contains almost no trees and is entirely covered by berry scrub.

Chart 11

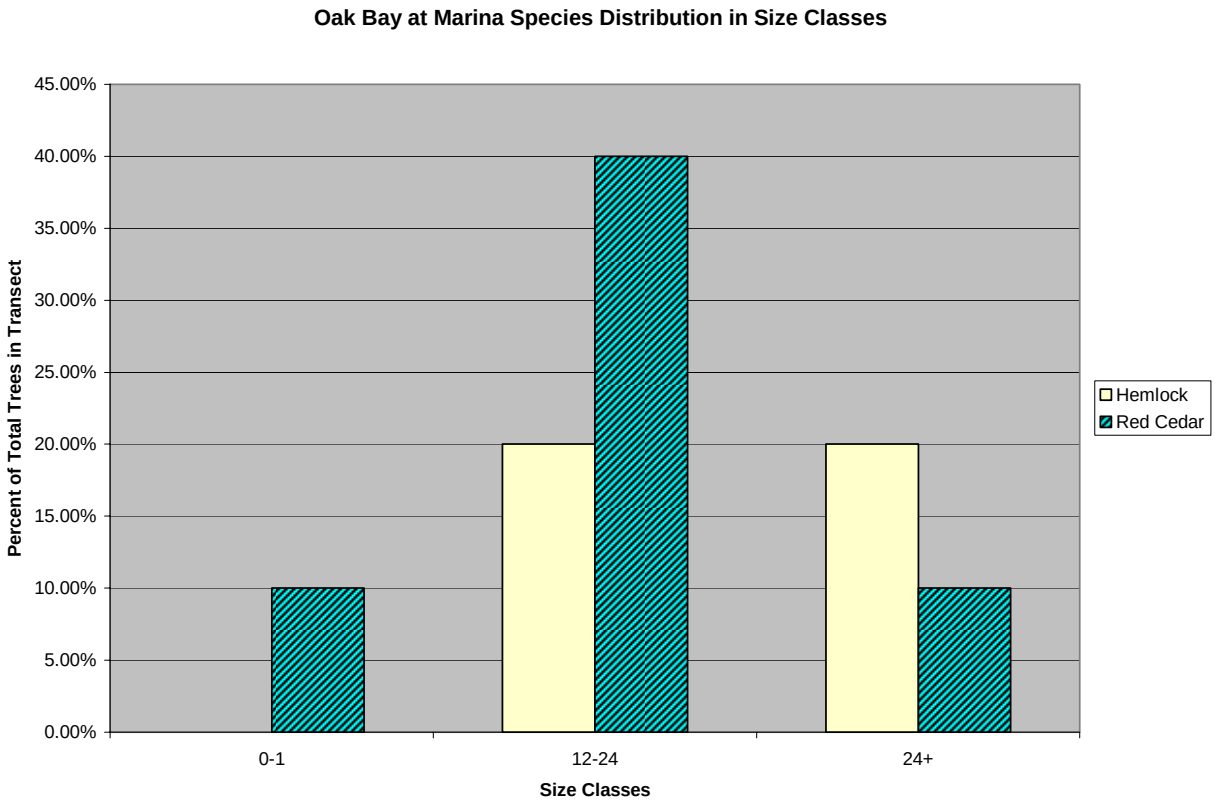
3.4.2 Oak Bay Road Across From Marina (P2)

The large trees in this area are predominantly red cedar and hemlock. The understory is dominated by sword fern, salal and evergreen huckleberry. Significant amounts of dull Oregon grape and salmonberry are also present. Weeds are invading this area primarily from the adjacent heavily infested space to the north, though the closed canopy nature of the area seems to be preventing further colonization of blackberry from the right-of-way area on Oak Bay, or the larger patch in the main part of the greenbelt to the north.

Length	782 feet
Area	1.7 acres
Average Width	130 feet
Narrowest Point	70 feet
Widest Point	200 feet
Primary Tree Species	Red cedar 55%, hemlock 36%
Tree Class Sizes	Red cedar > 12” (50%), hemlock >12” (40%)
Weed Issues	Holly

CHART 12 illustrates a roughly even-aged stand climax community of hemlock and red cedar. The exclusion of hardwood species may be the result trees having been left in this location, rather than being cleared during the last logging event. The distribution of trees in the largest class size supports this idea.

Chart 12



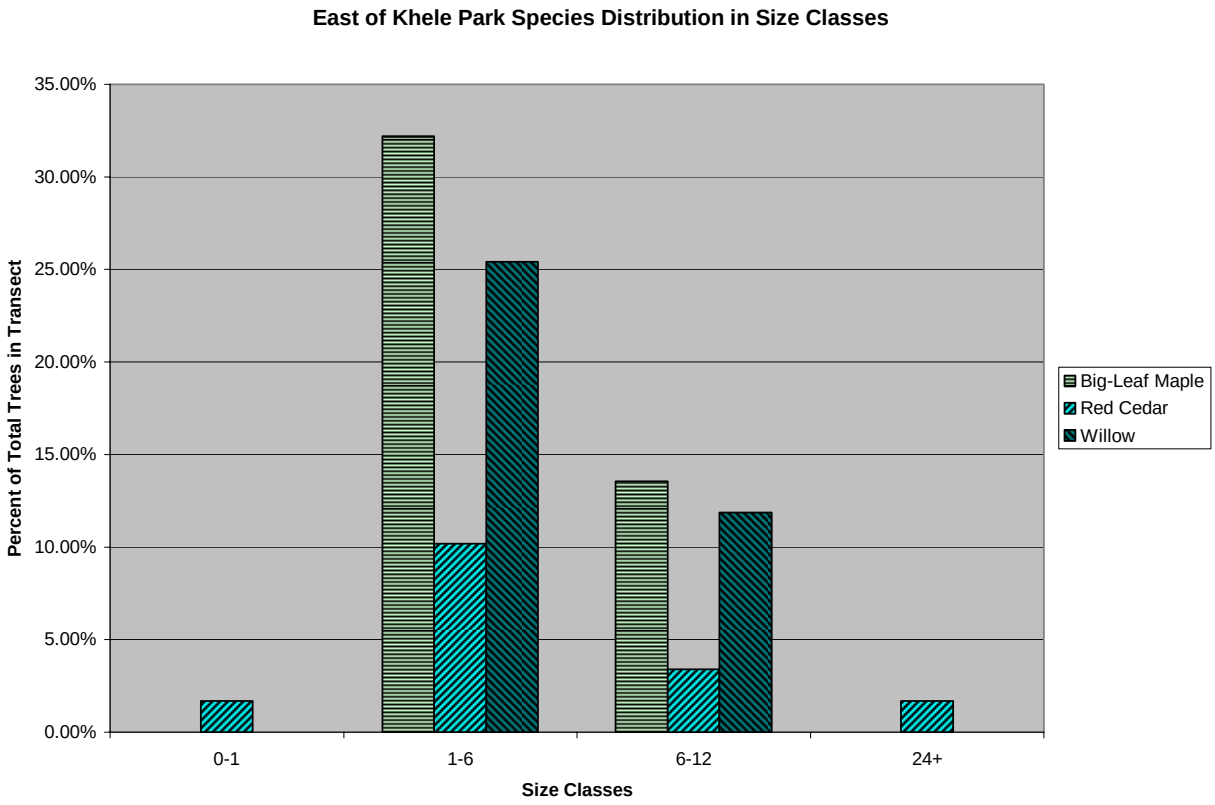
3.4.3 East of Kehele Park, between Pioneer and Oak Bay (P3)

This one-acre block is mostly hardwood forest with open scrub-shrub patches. The trees are either very large or very small; most of the trees in the upper slope of this portion of greenbelt are in the 2-12 inch size range, while closer to Oak Bay on the lower slope many red cedar reach sizes well above 24 inches DBH. Salmonberry blackberry, and thimbleberry form large thickets where the conifers no longer provide shade. The upper part of this greenbelt is dominated by regenerating willow, cherry, alder, and cedar. An 8-foot deep trench appears to be cut for some distance between the Wheeler Lane and Jackson Lane cul-de-sacs, but may be a natural slump of soil caused from drainage issues and vegetation removal in the past.

Length	263.5 feet
Area	1.0 acre
Average Width	150 feet
Narrowest Point	130 feet
Widest Point	215 feet
Primary Tree Species	Big-leaf maple 45%, willow 36%
Tree Class Size	Alder and willow in the 1-12” size class
Weed Issues	Blackberry
Other Concerns	Large trench hidden by shrubs

CHART 13 shows a very young forest regenerating after logging. Almost all the trees are very small and an indicate there is probably regular cutting of this area, possibly for view maintenance. The sunny conditions caused by the elimination of an overstory also support an impenetrable thicket of blackberry.

Chart 13



3.4.4 Northern Boundary Section Near Fire Station (P4, P5)

Three plots were selected randomly within the greenbelt south and west of the fire station. While this greenbelt area is approximately 4.3 acres, the topography is variable with depressions and steep ridges, presenting different habitats. Generalizations from the plot data are difficult to attribute to the entire area.

A depressional wetland is located south of the fire station and just west of Oak Bay Road. The wetland sits within steep slopes and few trees are present within the wetland. Alder grows near the wetland on the slopes, but if submerged with seasonal flooding, they will die sometimes forming snags or large woody debris in the wetland, both of which are excellent wildlife habitat.

The northern part of this portion of greenbelt is primarily steep slopes of greater than 40%. The terrain consists of southwest/northeast trending ridges. The forest is patchy in this overall greenbelt area, with big-leaf maples dominating some ridge tops, and

conifers dominating other slopes and ridges. Alder forests with salmonberry shrub layers dominate the lower ravine portions. Upslope and just below the Pioneer view point the vegetation is predominately salmonberry and blackberry thicket with a few large trees limbed up for view enhancement.

Large sword fern, red elderberry, and red huckleberry grow under a broad big-leaf maple canopy, but other areas of forest floor are relatively open. Under the conifer overstory the ground may be bare or, in the case of fewer conifers, blackberry is beginning to invade.

Weeds (mostly blackberry) are beginning to invade under the hardwood forest canopy, and down the ravines, primarily where gaps appear in the overstory, or where alders dominate. They are interspersed to greater and lesser extents throughout the native species, but with the exception of large patches of shrubby berry upslope, no significant large patches were found in this part of the greenbelt. In the very southwest corner of this space, English ivy is climbing several trees adjacent to private property.

Length	650 feet
Area	4.3 acres
Average Width	NA
Narrowest Point	NA
Widest Point	NA
Primary Tree Species	Hemlock, big-leaf maple, alder
Weed Issues	Blackberry, ivy, holly

No chart is presented for this area because the diversity of this part of the greenbelt was not well represented by the data collected.

3.4.5 Junction of Swansonville and Oak Bay Roads (P7)

The central portion of this greenbelt is a seasonally wet alder grove with salmonberry and sword fern in the shrub and groundcover. On both sides of the alders are large red cedars that surround the perimeter of this area. The red cedar understory is generally sparse. The southern tip of this portion of the greenbelt has been landscaped with horticultural perennials and some native Douglas-fir.

Length	435 feet
Area	1.7 acres
Average Width	127 feet
Narrowest Point	42 feet
Widest Point	255 feet
Primary Tree Species	Alder 71%, western red cedar 27%
Weed Issues	Holly, stinky Bob

CHART 14. As noted, this part of the greenbelt is seasonally wet. The trees in this graph reflect that wet environment. The trees in this area are generally widely spaced red cedar and alder that grows in slightly denser patches.

Chart 14

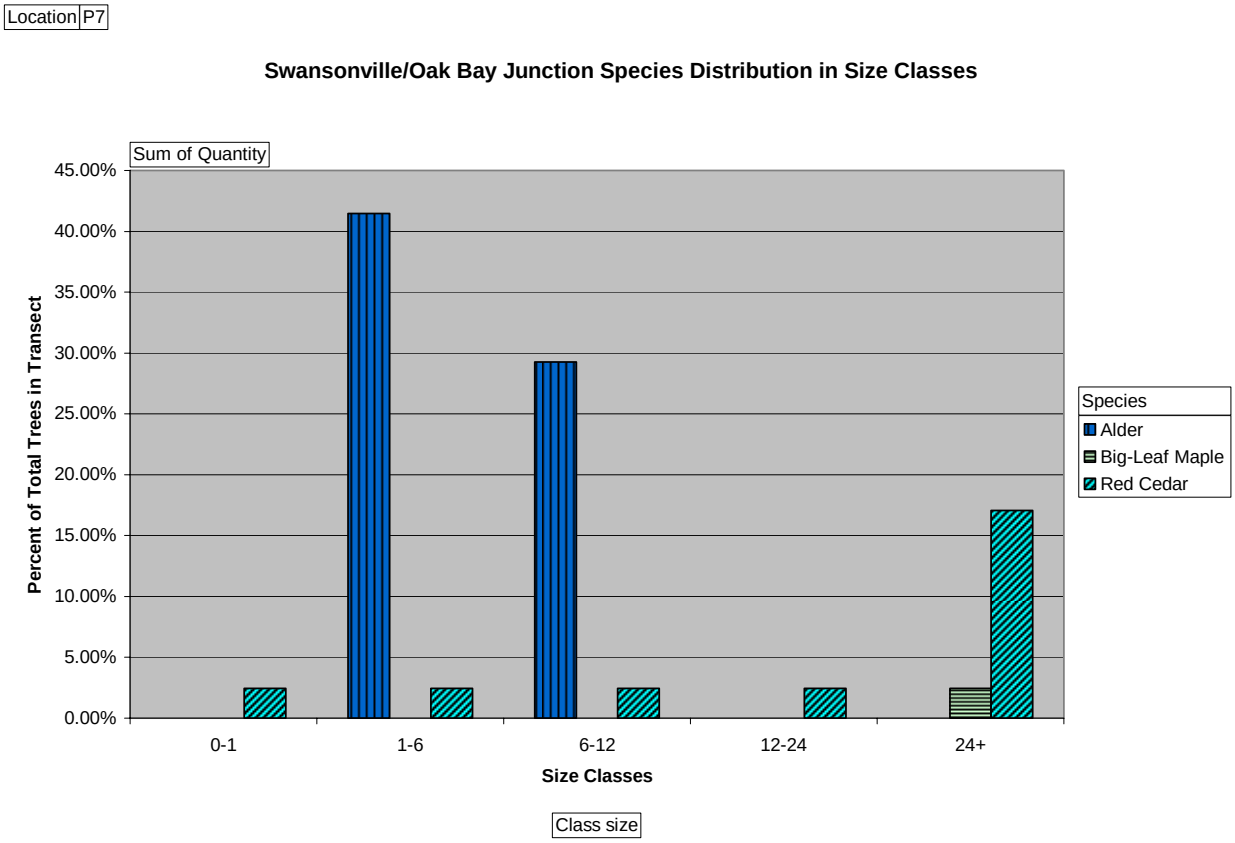


Chart 15 illustrates the dominance of conifers in the interior greenbelts similar to the ROW data. This size distribution is consistant with the logging history of Port Ludlow. That event removed most of the canopy but left a few large conifers, which is why there appear to be so many in the over 24" size class. Most trees in this size class are cedars (see Chart 17).

Chart 15

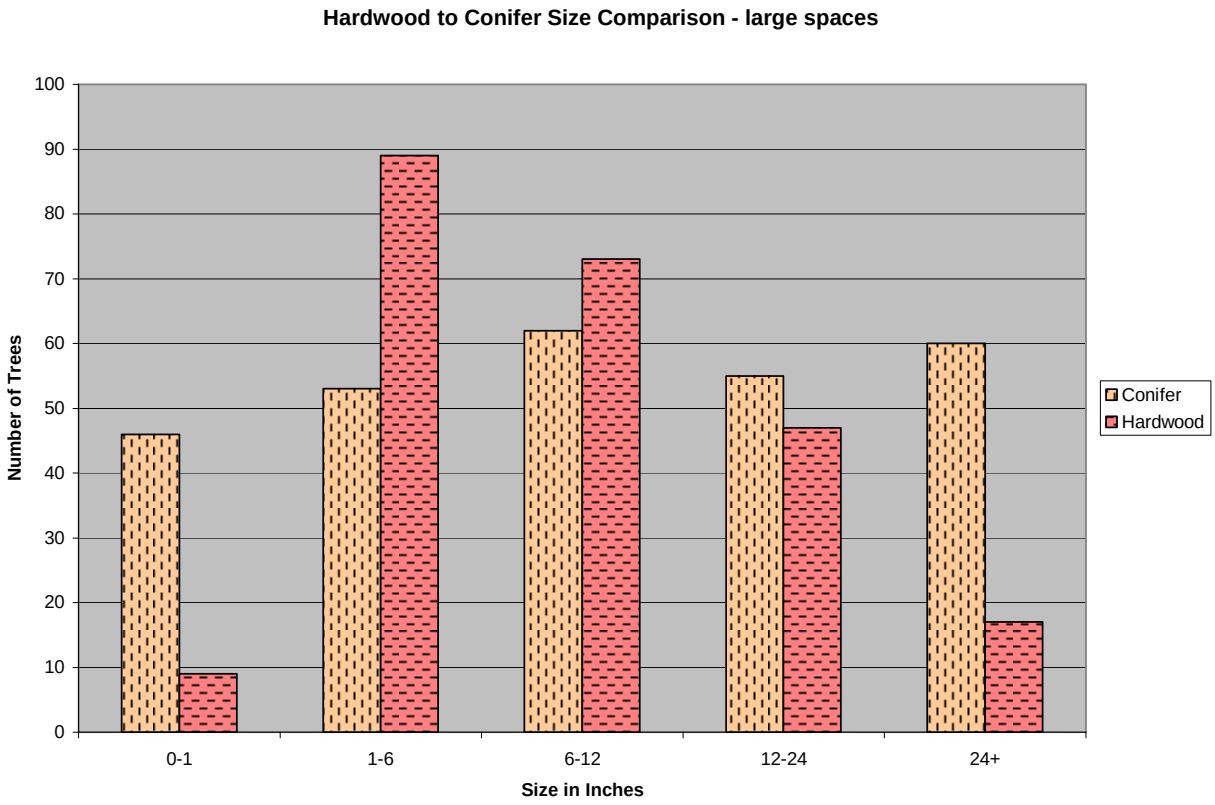
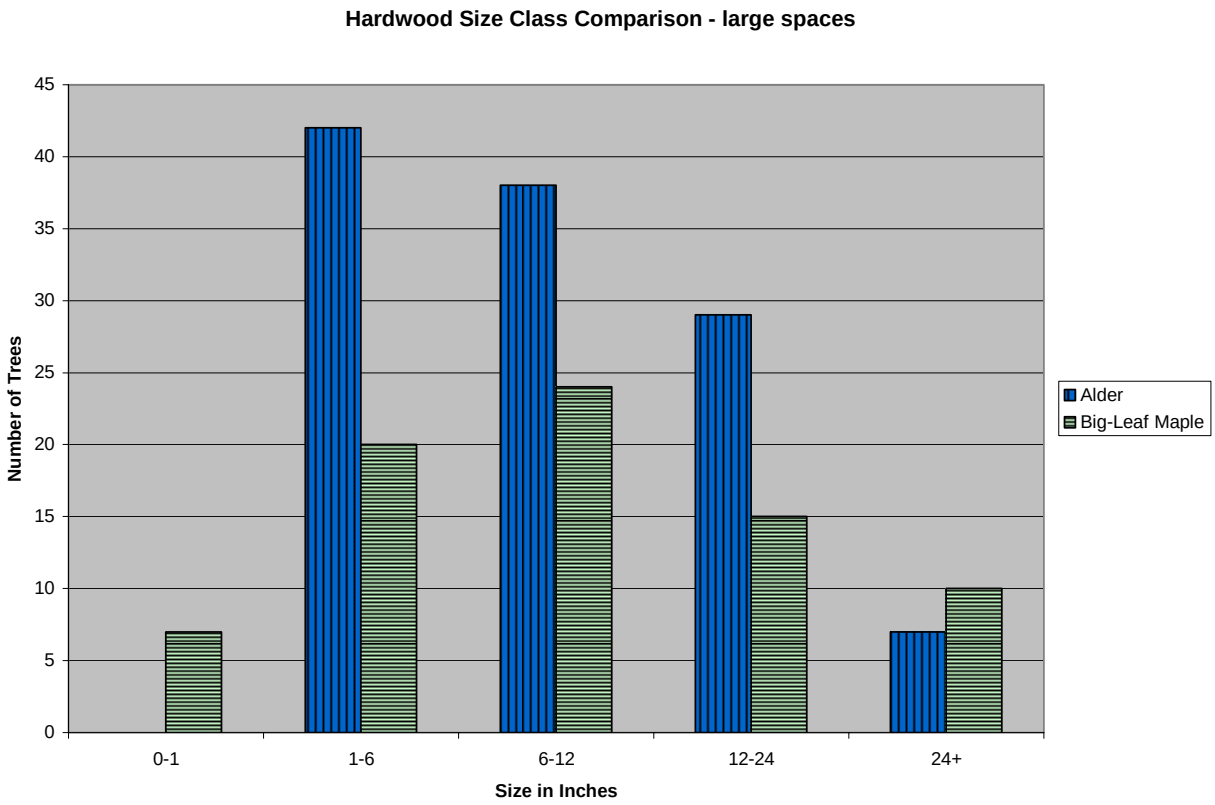


Chart 16. Similar to the ROW portion of the greenbelt, the majority of hardwoods are less than 12" in diameter, indicating they are likely young and vigorous. Only six percent of alder are over the 24" class size. These alders may be approaching the end of their life span, but when they die they will create snags that are essential for wildlife, particularly birds such as wood peckers, and small cavity nesting mammals. Since they are mostly in the interior spaces of the greenbelt, they are unlikely to be a hazard to people or structures

CHART 16



4.0 SUMMARY OF FINDINGS

4.1 The Forest's Health in General

The Port Ludlow greenbelt is a forest remnant, part of which is following one trajectory of development and part of which is following another trajectory. Forest remnants may begin as a 'single cohort' or a 'multiple cohort' forest. A single cohort is a forest in which all of the trees germinated and grew to maturity at the same time. It goes through four identifiable stages:

- Regeneration of a stand of single aged trees

- Stem exclusion in which slower growing trees are overtopped by faster growing trees, and eventually die.
- Understory reinitiation in which some single dominant trees or small groups of trees die, allowing light to reach the forest floor and understory species germinate from an existing seed bank, along with some germination of shade tolerant tree species.
- Steady state, often thought of as "old growth" conditions. New plant germination is determined by the occasional gaps that open in the canopy as overstory species die and permit more sunlight to reach the forest floor.

At least two areas of the greenbelt, (the long narrow portion that runs parallel to Talbot and terminates at the RV storage, and the ROW greenbelt to the west of Talbot) represent a single cohort successional pattern, and are currently in the stem exclusion phase.

A multiple cohort is one in which the disturbance that eliminated the majority of trees left some variable-aged trees intact as one might see from fire or wind disturbance. New, fast growing, early successional trees such as alder, and willow begin to grow. As these short lived trees begin to die, they permit shade tolerant species to grow into their place in the overstory, creating a multi-aged stand. Forests remnants that begin as multiple cohorts often initally have a high proportion of 'edge environments'.

Trees in edge environments are subject to different pressures than trees growing in the forest interior. These pressures include damage from wind in the form of windthrown trees, or broken damaged branches. Additional light reaches the forest floor encouraging regrowth of understory species. The larger portions of the Port Ludlow greenbelt, particularly those growing on slopes with drainages running through them, are this type of forest remnant.

Normal successional patterns as described above, can be interrupted by invasive weeds dominating the understory to the exclusion of all other plants. Conversely, by attempting to move a forest more quickly through one phase – say by removing small, suppressed trees to move the forest more quickly through the stem exclusion phase – one may actually move the forest stand into a phase in which some risk increased. For example, by reducing the stems competing in the overstory, in order to move the stand more quickly towards a steady state, growth is increased in the understory. The understory reinitiation phase would create fuel ladders, thereby increasing the risk that a fire will get into the crowns of the trees and move more rapidly through the entire stand.

It is important to note the long time frame necessary for either the single cohort, or the multiple cohort to go through the phases described. Management actions that attempt to change the trajectory of a particular forest stand's succession will not have many immediately noticeable effects. Moreover, an attempt to move a forest stand's succession into a new phase or stop its movement will require and intensive hands-on approach. Nature will not "take care of itself". If a change is desired in the forests, it will require a lot of work over a long period of time to effect that change.

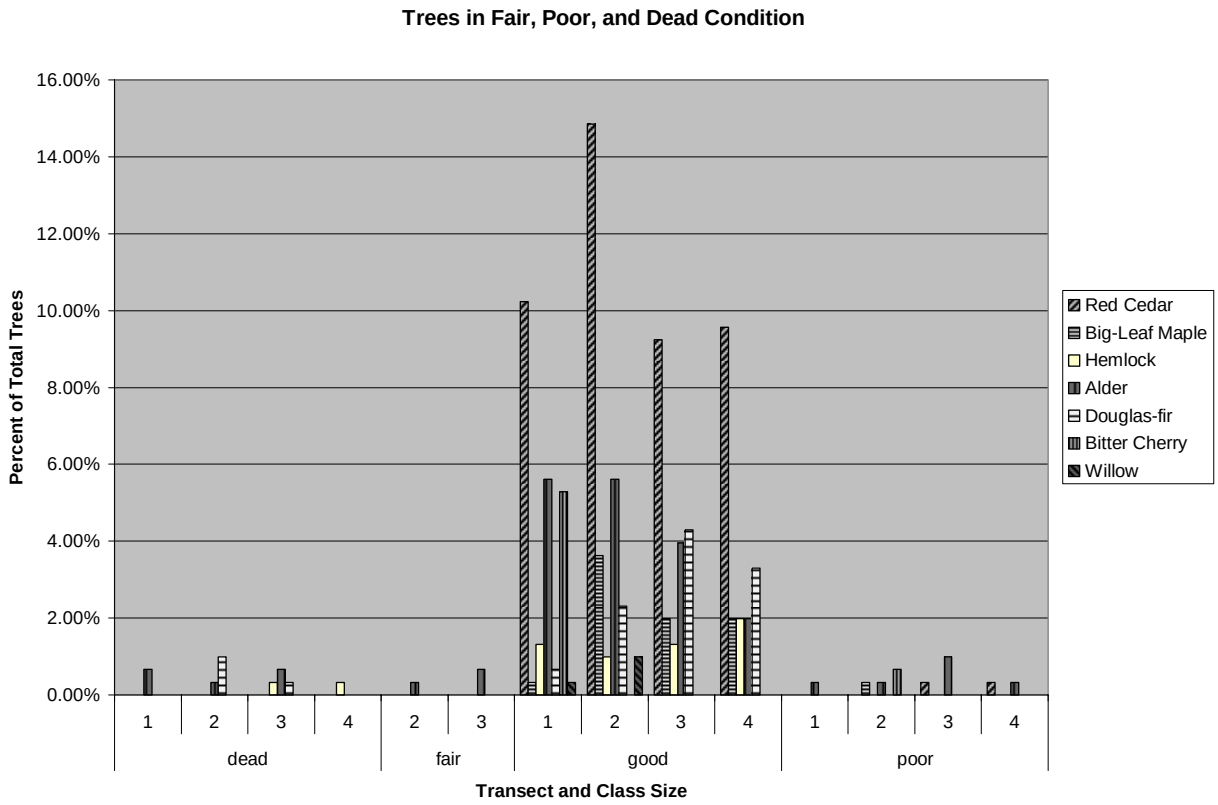
4.2 Tree Health

Overall the tree health inside the Port Ludlow North Bay greenbelt is good. Tree health was measured as good, fair, poor, and dead. A fair rating was defined by a reduced canopy, low vigor, and leaning. A poor rating was defined as having dead major limbs, significant lean, and evidence of disease. Dead trees were defined as standing snags. All other trees were given a rating of "good."

No obvious disease pockets were found in the greenbelt. Fungal decay was present in dead and declining trees, but was probably not the cause of the initial decline. Fungus plays an important role in the decomposition of woody debris. Trees in decline in the greenbelt tended to be at or near the end of their live span, rather than killed by disease as younger trees.

Chart 17 illustrates that throughout the greenbelt the trees are in good condition. Poor condition trees are more likely to be in the larger DBH category, indicating that they may have been at the end of their lifespan. Fair condition trees are mostly willows and big-leaf maples. Willows are short-lived and seldom grow larger than 12 inches DBH. There are more fair condition willows than those in good condition. Big-leaf maples commonly lose large limbs which may be contributing to their "less than good" ratings.

CHART 17



4.3 Weed Control Strategies

The weeds, severity, and their locations found in the Port Ludlow North Bay area are listed in Appendix A. This section is meant to provide information regarding the removal of those plants defined as a risk to the ecosystem and identified as non-native invasive plants. These strategies are adapted from Sheldon & Associates Sand Point Magnuson Vegetation Management Plan, 2000.

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. Weedy species and infestations that pose the greatest threat to healthy desirable plant communities are those 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.

Thus, invasive control should focus on those species and specific infestations that are: 1) the fastest-growing (e.g., ivy and Scot's broom), 2) the least established but potentially threatening (e.g., the Japanese knotweed on Swansonville Road and the ivy climbing trees in the greenbelt at Walker Way and Oak Bay Road), and 3) the most disruptive to functional habitat (e.g., blackberry growing over the native shrub/scrub areas in the greenbelt on Oak Bay south of Drew Lane).

It should be noted that while blackberry thickets prevent the establishment of native trees and groundcovers, they are also preventing trees from growing to obscure views. Managing areas for views will invite blackberry by reducing canopies and increasing light conditions. Blackberry patches that are severe, such as the greenbelt at Oak Bay south of Drew Lane, are better left as a low priority for removal because of the extensive work necessary for site recovery, but also because by establishing a healthy forest, views will be disrupted.

4.3.1 English holly *(Ilex aquifolium)*

Holly has separate male and female plants. The female plants will flower and fruit. This fruit is eaten by birds and seeds are deposited over great distances. Holly is one of the only shrub weeds that can grow in the full shade of PNW forests.

Removal of these species where densities are still low should be a high priority because it will be easier to prevent establishment than to eradicate the shrubs once they are grown. Thickets can be addressed as resources become available. Young plants that are small enough can be hand-pulled, with roots intact. Most removals of larger plants that cannot be removed with the roots intact will probably be done most effectively by 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. Cut the shrub to a stump at or near ground level and paint entire cut surface immediately with herbicide. Treatment

should occur during the growing season, April through August. Herbicides should be used only after careful consideration, and only after reading the label and carefully following the instructions.

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.

4.3.2 English ivy *(Hedera helix)*

Ivy is in a groundcover form for most of its life. When the opportunity allows for it to climb any tree, object, or mound on itself, the plant will become the adult form which is evident by a different leaf shape and the ability to flower and fruit. Fruit is eaten by wildlife and seeds are spread throughout the forest. Ivy is shade-tolerant, and forms dense mats on the ground. 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 its circumference. 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. Patches of ivy on the ground are best removed by hand-pulling and rolling into a mat. Dispose of the ivy or place in a location where it cannot root. Planting should only be done if removal of dense mats in the ground layer is successful. Ivy control can take place any time of the year.

4.3.3 Himalayan Blackberry *(Rubus discolor aka R. procerus)*

Himalayan blackberry was introduced to the US as a horticultural specimen. It has since escaped cultivation and has become a severe weed problem in the PNW. Blackberry’s fruit is carried by wildlife and is easily spread. It also has the ability to tip root as it grows, creating large masses of vine spreading in girth and height. Once established, it out-competes all native groundcovers, shrubs, and young trees.

Blackberry is shade-intolerant, so long-term control is linked to successful establishment of healthy native plant communities that will create undesirable conditions (shade) for this species. Removal methods include hand grubbing and root removal, repeated cutting or mowing, cutting and dabbing stubs with herbicide (cut and dab), or combinations of two or more of these techniques. Hand-grubbing is generally only a reasonable method for small areas, or for maintenance around trees or shrubs. However, care should be taken to prevent disruption of soil on slopes. 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 depends mainly on how bad the infestation is, and the available labor resources.

For sparse occurrences, hand-grubbing is recommended. If herbicide is used, timing of its application should coincide with the time of year that the target plant is most actively growing and translocating 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 we suggest mowing or cutting to the ground numerous times during the growing season (May to Oct) to reduce plant vigor. If combining with an herbicide treatment, perform a late summer (August) cut and dab (herbicide) treatment on resprouts. Herbicide should be applied to fresh cuts immediately (within 30 min.) for most effective treatment.

4.3.4 Japanese knotweed *(Polyganum cuspidatum)*

Knotweed, or false bamboo, is an herbaceous perennial that forms large monotypic clumps upwards of 6-8' in height. Reproduction is primarily by vegetative regeneration of rhizomes and fresh stems. The rhizome system may extend from a parent plant over 20 feet laterally and to a depth of 6 feet, and is impossible to remove effectively by grubbing. Fragments of rhizome as small as ¼ ounce give rise to new plants. Fresh stems produce shoots and roots when buried in a soil medium or floated in water. Stems in water may produce viable plants within 6 days. Because the risk is great for movement of small pieces via the stream system, grubbing should, in fact, be avoided.

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.

Japanese knotweed is susceptible to glyphosate containing products. Selective applications of Rodeo or Roundup can be used on re-growth in late summer, and fabric/mulch installation can be delayed until late winter. Good results have been achieved by injecting glyphosate into hollow stems immediately after cutting. Japanese knotweed requires a number of herbicide treatments over several years before it is completely eradicated.

Unless specifically trained in Japanese knotweed removal, volunteers should be discouraged from disturbing patches. Contractors may be the most appropriate individuals to eradicate this species. Planting should not be done until after 2 to 3 years while roots may still be viable.

4.3.5 Scot’s Broom *(Cytisus scoparius)*

Scot’s broom is a woody, nitrogen-fixing shrub that colonizes disturbed sites. The shrub can grow to 10 feet tall and the seeds remain viable in the soil for at least 30 years. Removing the plants with weed wrenches will result in the growth of many seedlings in the following year due to the soil disturbance and germination of

seeds from the seed bank newly exposed to light. These seedlings, however, are easy to remove by hand-pulling. Cutting and painting the stem of Scot's broom with a glyphosate containing product such as RoundUp is effective for killing mature plants, but regeneration of seedlings will occur. Because of the long-lived seed bank in the soil, revisits to the control site must take place every year to keep the population from growing to seed producing adults. Scot's broom seed needs light to germinate so planting trees that will provide dense shade is a long-term solution for control. Chemical treatment of Scot's broom should take place during the growing season, April through August.

4.3.6 Stinky Bob *(Geranium robertianum)*

Stinky Bob is a winter and spring annual groundcover that spreads vigorously from seed and root. The seeds are ejected ballistically and may reach 15 to 20 feet. Stinky Bob is capable of living in both sun and shade and in rocky soils and forest floor duff. It has been found to grow in densities up to 250 plants per square meter. Shallow roots make removal by hand relatively easy; however, soil disturbance allows for the seed bank in the soil to generate more plants. Stinky Bob is susceptible to pre-emergent herbicides and glyphosate. Where possible, the chemical method of removal should be considered.

4.3.7 Tansy Ragwort *(Senecio jacobaea)*

Tansy ragwort is a taprooted biennial (flowers every other year) or short lived perennial that can grow as high as six feet tall. Because tansy ragwort is toxic to humans and livestock, it is listed as a noxious weed in many counties in the western US (though not in Jefferson County, Washington). Tansy ragwort colonizes disturbed sites and roadsides by seed and fragments from root disturbance.

Hand-pulling can be effective on small populations, which is typical in Port Ludlow. Plants that are pulled should include the roots. Plants should also be pulled before setting seed. If plants have set seed, they should be bagged and disposed of properly (i.e. not composted). Chemical treatment is more difficult in that it is most susceptible to 2,4-D herbicides, which must be applied while the plant is in the rosette stage. Given the location of the tansy, we cannot recommend chemical treatment as a viable option. 2,4-D is persistent in the environment and will travel in the runoff water on the roadsides.

4.3.8 Thistle *(Circium sp.)*

Bull thistle is a biennial with a short, fleshy taproot and stems 2-5 feet tall. Canada thistle is a colonizing perennial with deep, extensive horizontal roots. Canada thistle is smaller, however, both are difficult to control. Disturbance of the roots of Canada thistle can increase the number of plants, however, grubbing and mowing are moderately successful if applied for several years. Bull thistle will die if the taproot is destroyed below ground. Grubbing is immediately effective for Bull thistle, and mowing will reduce the population size within five years. The location of the thistles, in the ditch of the right-of-way where runoff water can be

contaminated by chemical control methods, limits the removal strategies to physical methods. Chemical control is similar to tansy ragwort and not appropriate to most locations where thistle grows in Port Ludlow.

4.3.9 Monitoring for Weeds

Monitoring for invasive weeds requires frequent, diligent surveys throughout the greenbelt. Using the weed location map provided in this document as a baseline, locations should be "visited" each year to assess the spread of the population, if they will not be targeted for immediate removal. Weed populations that are reduced or dispatched by volunteers or contracted workers will need occasional follow up to prevent the re-establishment.

Weed Identification

Weed identification skills are most important for weed removal and monitoring. Educating the trail users and residents of the community of the weeds to watch for and remove if seen will provide a valuable service for weed control. Being aware of new weed introductions to western Washington and quick action will help prevent new weed populations from becoming established as well. While some weeds such as Scot's broom and ivy are easy to identify, other weeds such as Himalayan blackberry and thistles may have similar looking native counterparts or may be difficult to identify and have different treatment requirements. Weed identification services are available at the WSU County Extension office.

Weed Pathways and Establishment

Weed introduction pathways that are possible in the Port Ludlow North Bay include wind, water, wildlife, and people. While these are natural processes and difficult to control, an understanding of weed behavior will aid in the reduction of new invasions. These pathways suggest where monitoring should occur.

Weed monitoring should focus on trail pathways and off trail disturbances, canopy openings, creeks and run-off pathways, recent weeding and restoration sites, and boundaries between the greenbelt and private property. New trails into the greenbelt are pathways for weeds, but luckily the trail makes it easier to explore the interior of the greenbelt. Wildlife paths, such as the well-worn deer trails, are pathways for weeds as well. Following these paths into the interior of the greenbelt will give the person responsible for monitoring a view not easily obtained from the perimeter. Canopy openings expose the forest floor to light that will stimulate the growth of some weed species such as blackberry and Scot's broom. New openings created by storm events, tree removal, or natural decline should be monitored when noticed and semi-annually while the gap exists. Drainage ditches and pathways throughout the greenbelt should be monitored for weeds annually to determine if existing weed populations are expanding or if previously clear areas are becoming newly invaded. Weed locations should be recorded on a map that is accessible to the GBC and any workers removing such weeds. This map should be updated annually as volunteers remove weed

populations, and to allocate time and expenses to the most appropriate weed locations.

4.4 Insects

No specific damaging insect pests were noted in the Port Ludlow greenbelt.

Port Ludlow, like much of Northwestern Washington, has had large numbers of western tent caterpillars (*Malacasoma californicum*) infesting the alders, cherries, and willows. Remnants of tents are visible in the trees, foliage is chewed and missing, and cocoons litter the forest floor. This pest is native in Washington and populations are typically endemic, with periodic outbreaks.

The insect overwinters as an egg. Egg masses are laid by the adult female moth in mid summer. The egg masses encircle twigs and stems, or are laid flat on the bark of trees, buildings, or lawn furniture. The eggs hatch in the early spring, about the same time the crab apple flower buds are swelling. The caterpillars are black and fuzzy and often have orange or small bluish white markings. The caterpillars spend most of their time feeding gregariously (in groups), protected by a silken 'tent' spun, often at the ends of branches of alder, willow or cherry. After several molts the caterpillars begin to wander, looking for a place to pupate. They pupate in grayish white cocoons protected by leaf litter, folded leaves, or even on the bottom of lawn furniture. Adult moths emerge around July. They are day flying, fat bodied, brown and fuzzy.

Populations exist in usually low numbers, but every 10 years or so, the populations begin to build to epidemic proportions. Large populations defoliate native hardwood trees such as birch, alder, or cherry for several summers, then after two to four years, through a variety of natural control mechanisms, the population crashes and remains at endemic levels until the next outbreak.

While these insects may be considered a nuisance by people who live in forested environments, and they make the trees appear tattered and unsightly, they usually do no lasting damage. In fact the periodic defoliation of overstory trees may benefit understory species by allowing increased light to the forest floor. Additionally, the insect droppings, or frass, provide a nutrient input to the plants below. The trees are generally capable of withstanding this early spring defoliation and will typically refoliate later in the summer.

Tolerance during outbreaks is recommended. Spraying the caterpillars or burning the tents is completely unnecessary, and may be dangerous. One may protect landscape plantings by pruning the tents from the branches early in the season when most of the caterpillars are feeding in them. Property owners may also monitor their trees and property in the winter and remove the egg masses they find.

The Kitsap Peninsula and other areas west of the Puget Sound have been experiencing an outbreak of tent caterpillars for several years. If the current epidemic is like those of the past, we should see populations decrease in the next two years.

4.5 Fire

This document provides the results of a greenbelt survey as well as vegetation management recommendations to obtain goals defined by the Port Ludlow Greenbelt Committee. It is not an in-depth analysis of risk associated with fire. However, certain observations were made during the survey of the greenbelt that can be used to help residents ascertain the general risks associated with living in a forested environment. Port Ludlow is a forested community, and as such, it bears an increased risk as compared to more suburbanized or urbanized communities. The risk in Port Ludlow is similar to other communities we have seen threatened by fire this summer in Washington, Oregon and Canada. All forests are at risk of burning, particularly in the long dry summers experienced in the West.

Two related questions included in the issue of fire risk in Port Ludlow are

1. What is the specific risk a fire will begin and spread in the greenbelt?
2. What is the risk to structures once a fire does start?

What is the specific risk in Port Ludlow?

Fire in forested communities is influenced by

- Weather, including temperatures, humidity and wind conditions
- Topography. Fires move significantly more quickly up a slope than along flat terrain
- Fuel availability. Fire moves in a lateral pattern along the ground when fuel is continuous. It also move is a spotting pattern if it gets into the crown of a tree. Fire brands and embers can move long distances on the wind and begin burning vegetation and structures in a discontinuous pattern
- Fires require an ignition source.

The northwest is subject to long dry summers. High pressure systems lingering over the area bring low humidity, dry winds and warmer temperatures. A fire, if it were to begin along the highway, could easily and quickly move upslope in this hillside community. Fuels are plentiful in the form of thick duff material on the forest floor, brushy forest areas and plentiful trees growing in close association with structures. Ignition sources may include house fires, car fires, burning debris piles not fully extinguished, or arson. Moreover, Port Ludlow is a community in which much of the traffic is passing through. A carelessly discarded cigarette from a moving vehicle could easily begin a roadside brush fire that could move into the greenbelt. A dozen brush fires along the highways in the Seattle area this summer have started due to this irresponsible behavior. The residents in Port Ludlow would have very little control over passing motorists who disregard basic safety considerations and litter in this way.

Fuel loads in the greenbelt are high. Specific conditions that could increase the severity of fire are:

- Some areas with thick duff layers that would easily burn
- Large amounts of shrubs and brush, allowing lateral movement of a fire along the ground to occur.
- Smaller trees growing into the low hanging crowns of larger older trees that would provide 'fuel ladders' and allow a fire to 'crown' – that is get into the crown of a tree where it would spread more rapidly by jumping to new tree via embers caught in the wind.

As a population center, Port Ludlow is a more likely ignition source, than a fire moving in from the forests outside the community. Residents often do not consider the risk of vegetation growing adjacent to chimneys or barbecues. A house fire that begins inside of a structure could easily move to the vegetation surrounding it, particularly if that vegetation is overhanging the house. Sparks from cars or mechanical equipment during construction have been known to start fires in grasslands of Idaho and Montana, and could also begin fires in the dry duff material of the forest floor in Port Ludlow.

What is the risk to structures once a fire does start?

What can resident do to alleviate this risk? The only element in which individuals have a certain degree of control is the available fuel. This is not to say that all the trees in the greenbelt should be cut. In fact, one of the attractive features about Port Ludlow is the forested areas that create the greenbelt. This type of forest can provide a home to more than 150 animal species, including over 20 species of mammals. The goal of reducing fire risk to the greenbelt should include maintaining wildlife habitat by retaining features of the forest that provide food and shelter to animals. This includes retention debris piles in the form of forest litter or deep duff, maintaining a forest overstory of primarily coniferous tree species, and retaining some areas of brushy species such as native salmonberry, ocean spray and salal. Specific actions a resident can take to help reduce their risk to fire include recommendations presented in the "Fire Free" brochure provided by Port Ludlow Fire and Rescue and Safeco Corporation. Recommendations focus on limiting flammable trees and brush around the home. Primary in reducing fire risk to structures is defining your defensible space.

Defensible space is a buffer zone between structures and forest vegetation. A minimum 30 foot distance is standard, but if conditions allow, recommendations for a buffer often go as high as 100 feet. Defensible space alone will not necessarily protect a structure, and the importance of fire retardant roof materials cannot be overstressed. According to research cited by James Clark of HortScience, Inc (1995), structures with roofs untreated for fire retardation still have nearly a 20% chance of burning due to fire in the adjacent forest area as compared to a 2% chance for structures with treated or fire resistant roofs when a buffer is as wide as 100 feet. When the defensible space buffer is reduced to 30

feet, structures with untreated roofs experience a 35% chance of burning, while those with treated roofs still have less than 10% chance of being destroyed.

Homeowners can create defensible space by

- Removing or pruning trees, shrubs and other brush form within at least 30 feet of the house
- Removing overhanging limbs from within 15 feet of the roof
- thinning dense vegetation within 100 feet of the structure
- Providing 10 feet of vertical clearance between the ground and branches or vegetation
- Clearing all vegetation within 10 feet of a chimney
- Relocating wood piles and building materials

Some properties do not allow for creation of wide buffers to create defensible space because of the proximity of houses to property lines, and ownership issues of the vegetation across that line. The larger community can enhance fire risk reduction efforts by adapting regulations and standards permitting for the removal of some brush and small trees from the adjacent greenbelt by property owners who present the managing authority with a specific fire risk reduction plan. Following some recommendations within this document for removal of weeds and small shrubby regenerating trees will also help to reduce fire risk within the greenbelt.

Important points to remember when designing fire safe landscape are (as adapted by Clark (1995)):

- Separate vegetation from structures
- Reduce overall amount of fire fuels on the property
- Prevent vertical spread by eliminating fire ladders
- Reduce contintinuity of fire through fuel breaks
- Integrate fire management across both landscape and structures (i.e. use fire retardant building materials in addition creating defensible space)
- Be familiar with fire potential in the community

As noted by Clark, a fire safe landscape is often incompatible with other landscape goals, and a community is required to balance competing goals:

- Communities such as Port Ludlow wish to preserve remnant forests as a way to retain the values and economic benefits associated with natural forests. Such remnant forest create inherent fire risk.
- Erosion on steep hillsides requires thick vegetation. Fire safe landscapes require removal of such vegetation, particularly on slopes.
- Energy conservation often involves placement of trees close to structures. Fire Safe landscapes calls for removal of such vegetation.

- Water conservation also becomes difficult in fire safe landscapes which call for well irrigated vegetation and lawns rather than allowing such vegetation to dry out as is recommended for conservation.

5.0 FIVE YEAR MAINTENANCE PLAN

Maintenance projects that should occur in the next five years are listed in the following table. Projects have been divided into high, medium, and low priority. High priority projects include eliminating the most threatening weeds at locations where they are not yet out of control. Medium priority tasks target weeds that are not as menacing and include easier tasks that if addressed soon will save time and money in the future. Low priority projects are large and require many resources. These sites are beyond standard control measures. The specific year to perform each task is not noted because a time-line requires knowledge of the human and other resources available for the projects that we do not possess.

The five-year plan focuses on weed reduction and in some instances elimination. This is tedious, hard work, and volunteers can quickly become burnt-out. Keep up hope! Even a few people working a few hours a month will eventually gain tangible results over several years.

Over a six-year period, 2 to 3 people in a Seattle park have worked to reduce weeds over 30 acres. They work roughly 6 hours a month and have successfully cleared ivy and blackberry from 25 acres of the second growth forest that is the park.

Weed reduction is the single most important thing that can be done in the Port Ludlow greenbelt to increase the ecological and aesthetic value of this land.

5.1 High Priority Projects

Area	Focus area	Projects	Est. Area	Performed by
Swansonville ROW	North side, east of Camano	Remove Japanese Knotweed	600 ft^2	Trained individuals
All healthy greenbelt patches	North portion, Montgomery Bisect, Three long narrow spaces, Corner of Swansonville and Oak Bay, Talbot ROW	Monitor for new weeds and remove them as they are discovered	25 Acres	Volunteers
Recommended Trail Locations	Through North portion, Montgomery bisect, transect from Walker to Oak Bay, corner of Swansonville and Oak Bay	Determine Desirability and feasibility of trail construction in recommended sites	1 linear mile through 10 acres	Port Ludlow Trails committee, and Port Ludlow Greenbelt Committee
Oak Bay	Triangular space north of Swansonville	Remove Stinky Bob from forest area	10,000 ft^2	Volunteers
North Greenbelt	At Pioneer overlook, North of Foster	Remove English ivy	700 ft2	Volunteers
Walker way	Below Phinney cul-de-sac	Remove English ivy	2500 ft2	Volunteers
Oak Bay	North side of Walker	Remove English ivy	700 ft2	Volunteers
Walker Way	West of Gamble	Remove English ivy	400 ft2	Volunteers
Oak Bay	East side entrance to Conference center	Remove English ivy	300 ft2	Volunteers
ROW space	Swansonville East of Fleet, Walker, both sides of Talbot, Fleet west of Pioneer, Osprey Ridge at corner of Oak Bay	Remove Scot's broom	1500 ft2 (combined)	Volunteers

5.2 Medium Priority Projects

Area	Focus area	Projects	Est. Area	Performed by
Entire Greenbelt	ROW and large, contiguous spaces.	Annual monitoring plan	58 Acres	Port Ludlow Greenbelt Committee or designee
North Greenbelt	Above fire station and to South of wetland	Blackberry reduction, and other weed removal	4 acres	Volunteers
Entire area	Identified on weed map	Removal of Tree weed species such as Holly and Sorbus	A dozen individuals	Volunteers
ROW	Primarily Swansonville, Walker Way, Oak Bay	Remove ragweed and thistle from ditches	½ linear mile spread throughout ROW areas	Volunteers
ROW	Primarily Walker Way, Swansonville, Oak Bay	Remove blackberry growing singly or interspersed with native ground covers	2 linear miles spread throughout ROW areas	Volunteers
Entire area	Adjacent to built properties	Identify specific risks to buildings of greenbelt vegetation, provide for creation of defensible space that may extend into the greenbelt in CCRs, and other regulations, if not already present in codes	Depends upon individual property owners landscaping desires	Port Ludlow Maintenance Commission, Fire department

5.3 Low Priority Projects

Area	Focus Area	Project	Est. Area	Performed By
Larger Contiguous Areas	South Greenbelt, utility easement at retention pond Space; West of Oak Bay at Montgomery	Remove or thin regenerating tree thickets, replant with Conifer, if necessary, and understory species (consider views)		Specific plan by trained individual or group, removal work by volunteers or professional crew, restorative planting by volunteers
ROW	Swansonville south side, Resolute to Goliah; North side, Pioneer to Resolute; Oak Bay, west side, Baldwin to North end;		2 acres	Specific plan by trained individual or group, removal work by volunteers or professional crew, restorative planting by volunteers
Larger Contiguous areas	South Greenbelt; North greenbelt, near view point; Walker at Oak Bay; Oak Bay, between Drew Lane and Village, West of Oak Bay at Baldwin; West of Oak Bay at Montgomery	Removal of Blackberry thickets, and areas where blackberry is heavily interspersed with native plants restoration of landscape	6.5 acres	Specific plan by trained individual or group, removal work by volunteers or professional crew, restorative planting by volunteers
ROW	Primarily Walker way, Swansonville, Osprey Ridge, and Oak Bay, West side	Removal of Blackberry thickets and restoration of road side	0.2 linear mile spread throughout ROW	Volunteers
Entire Area	Undeveloped private lots	Monitor lots for weed populations acting as seed sources	4 miles of ROW	Community members

6.0 TRAIL RECOMMENDATIONS

Four locations were determined to be candidates for new trails. Two locations are technically difficult and on steep slopes. Two locations are essentially a continuation of the trail build during the summer of 2003, they provide some challenges, but should be able to be completed with all volunteer labor and expertise.

6.1 Location 1

Through the triangular greenbelt area on the north side of Swansonville at Oak Bay. From south to north, parallel to Oak Bay.

Advantages:

1. Continuation of existing trail.
2. Level terrain
3. Rudimentary deer trail already exists
4. Attractive location
5. Provides pedestrian bypass of highway
6. Should be possible to build with volunteer labor and expertise

Disadvantages:

1. Will exit on to highway requiring pedestrians to cross it before joining with another potential trail through the Montgomery Bisect
2. Seasonally wet. Trail construction will need to accommodate potentially wet soils and not hinder natural drainages

6.2 Location 2

Through Montgomery Bisect form Oak bay to Condon Lane

Advantages:

1.Final connector for safe route to beach club for pedestrians walking from Pioneer, down existing trail (assuming Swansonville/Oak Bay Junction trail is established)
2. Attractive area
3. relatively flat terrain
4. Final portion between Montgomery and Condon is essentially already maintained as grass

Disadvantages:

1. Section between Oak Bay and Montgomery is seasonally wet. Trail design needs to accommodate potentially muddy soils and not interfere with natural drainages
2. Trail head is on highway, which needs to be crossed to connect with existing trail at Swansonville.

3. Large patch of blackberry and scrub needs to be bushwhacked. Maintenance of opening will require long term commitment.

6.3 Location 3

Down long ravine surveyed as "Transect 1" from Walker Way to Oak Bay, and parallel to Osprey Ridge.

Advantages:

1. Rudimentary trail already exists for long portions
2. Beautiful habitat
3. Provides pedestrian access from top of North Port Ludlow to the public areas such as the Beach Club 4. Has potential to be expanded when feasible and desirable

Disadvantages:

1. Extremely steep slopes. Trail will require professional design and engineering expertise.
2. May not be able to complete with all volunteer labor
3. Will be expensive
4. Currently terminates at highway, which pedestrians will need to cross

6.4 Location 4

In northernmost portion of the greenbelt, from fire station up to ridge top just to south; following ridge for several hundred feet, crossing ravine towards the South; exiting at Southeastern corner at Pioneer, just north of Foster.

Advantages:

1. Interesting and diverse habitat, unlike any other recommended trails
2. Peek-a-boo views
3. provides pedestrian access to Oak Bay and other potential trails that may eventually lead to safe and direct access to the Beach Club
4. Creates accessibility and provides opportunity to monitor this space for new invasions of noxious weeds, preventing degradation of a still reasonable healthy forest area.

Disadvantages:

1. Will require professional design and trail engineering expertise to prevent erosion
2. Entrance will need to accommodate wet soils and allow for natural drainage
3. Terminates in fire station parking lot
4. May not be able to be completed with all volunteer labor and expertise
5. May be expensive.

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Appendix A

Weed Survey
(to be used with Weed Map)

Road or section	Location	Weed species	Priority	Severity	Comments
Fire station section	Adjacent to Pioneer	Ivy	High	Small patch climbing trees	Remove all ivy found in greenbelt ground or climbing trees
Fire station section	SW trending ridge above fire station	Holly, Sorbus	High	Singles	Remove all holly and *Sorbus* found
Fire station section	Varies within entire greenbelt	Blackberry	Low to medium	Singles to large monocultures	Contain large patches to extent cur Eliminate smaller sparse patches in natives and single stems invading l
Fleet	Between Pioneer and Adventurer	Scot's broom	High	Singles to several	Patch fairly well established. Remo larger seed bank establishes.
Large south end greenbelt	East of Pioneer and north of Oak Bay	Blackberry	Low	Severe to singles	Contain large patches to area alrea Begin reduction of patches interspe natives, and singles invading healt
Montgomery Bisect	Between Oak Bay and Montgomery	Ivy	High	Trace amounts	This space has almost no weeds, w out by monitoring twice a year and appears as new plants
Oak Bay Road	North end east side	Sorbus	High	Singles	Remove all *Sorbus* from greenbelt
Oak Bay Road	North of Swansonville and in the triangle greenbelt	Stinky Bob	High	Widespread in forested understory	This is the only location that Stink as significantly moving into the for Its spread should be stopped before unmanageable amount
Oak Bay Road	North of Walker	Ivy	High	Climbing trees and covering a small patch of ground	Remove all ivy found in greenbelt ground or climbing trees

Oak Bay Road	On East side at Conference entrance	Ivy	High	Climbing trees and covering small patch of ground	Remove all ivy found in greenbelt ground or climbing trees
Oak Bay Road	South of Walker	Ivy	High	Climbing trees and covering ground	ROW ivy arises from within the in triangular shaped greenbelt, and fr property. These locations will cont source, for infestation
Oak Bay Road	Around retention pond	Several	Low	Severe throughout area	Area at base of large GB area on th requires significant restoration. Co large patches to extent already cov able to be protected are higher prio
Oak Bay Road	Above village	Blackberry	Low	Severe throughout area	Will require significant restoration existing large patches to extent alr Areas still in good condition are hi
Oak Bay Road	Most of length	Blackberry	Low to medium	Varies. Singles to small or sparse patches	Contain spread of blackberry by el areas of infestation.
Oak Bay Road	North end, east side	Blackberry	Med	Small patch	Not too severe to control before it
Oak Bay Road	At Montgomery and south to Baldwin	Blackberry	Med	Singles and a small patch	Not too severe to control before it
Osprey Ridge	At Oak Bay	Scot's broom	High	Several to many stems	Well established but young plants. before seed bank builds
Swansonville	On North side, west of Camano	Japanese Knotweed	High	20 x 30 foot patch	This weed is pernicious. Eradicatio priority. Refer to removal instructi
Swansonville	On north side between fleet and pioneer	Scot's broom	High	Singles	Remove single stems as they are fo seed bank building.
Swansonville	Both sides between Fleet and Talbot	Holly	High	Singles	Remove all holly from greenbelt

Swansonville	Both sides	Several	Low to med	Singles to small areas interspersed with natives	Blackberry, tansy ragwort and this beginning to move into the ROW s several places. Stopping advance w further degradation of entire green patches are higher priority
Trail head	In forest area where new trail emerges west of Oak Bay	Ivy	High	Trace	Small new ivy plants are growing t area. New ivy plants should alway immediately upon discovery to pre establishment
Walker way	Triangular greenbelt in drainage to North of Phinney	Ivy	High	Trace	Larger patches within greenbelt ar source for new plants
Walker Way	Triangular section at Oak Bay	Holly	High	Several stems	Remove all holly from greenbelt
Walker Way	North side, to east and to west of Talbot	Scot's broom	High	Singles to many	This is a new infestation with man plants germinated along road. Han spring
Walker Way	North side to west of Gamble	Ivy	High	Small patch and growing into trees	Remove all ivy found in greenbelt ground or climbing trees
Walker Way	Triangular section at Oak Bay	Blackberry	Low	Large monoculture	Contain patch to current extent, eli they spread to new parts of this spa
Walker Way	Both sides between Cressey and Rainier	Stinky Bob	Low to med	Singles to several	Capable of invading shaded forest roadside. Eliminate plants to keep
Walker Way	Both sides	Several	Low to med	Singles to small areas interspersed with natives	Blackberry, tansy ragwort and this beginning to move into the ROW s several places. Stopping advance w further degradation of entire green patches are higher priority

This table was created to be used with the weed map. It is to help provide guidance for prioritizing weed removal efforts as part of the 5-year maintenance plan. Priority is established based on likelihood that the weed will further degrade of healthy greenbelt areas. Some areas of greenbelt that are already severely degraded receive low priority ratings. Species of weeds that always receive high priority for removal are Japanese knotweed, English ivy, English holly, and Scot's broom when it is not associated with an area severely infested with another type of weed such as blackberry. Stinky Bob is high priority in instances in which it is invading adjacent forest understory. Not all areas pictured on the map are cited explicitly in this table. However, ArborWise has attempted to define all areas where removal of weeds will maximize benefits to the greenbelt and will minimize future costs for control.

Appendix B

Plant Species List

Tree Species List

Common name	**Latin name**
Bitter Cherry	*Prunus emarginata*
Cascara	*Rhamnus purshiana*
Cedar, Alaska yellow	*Chamaecyparis nootkatensis*
Cedar, western red	*Thuja plicata*
Douglas-fir	*Pseudotsuga menziesii*
Fir, grand	*Abies grandis*
Fir, Pacific silver	*Abies amabilis*
Madrone	*Arbutus menziesii*
Red Alder	*Alnus rubra*
Shore Pine	*Pinus contorta var. contorta*
Sitka Spruce	*Picea sitchensis*
Western Hemlock	*Tsuga heterophylla*
Western Yew	*Taxus brevifolia*
Willow, Pacific	*Salix lasiandra*
Willow, Sitka	*Salix sitchensis*

Species List for Shrubs, Groundcovers, and Weeds*

Common name	**Latin name**
Bedstraw	*Galium ovatum*
Bedstraw, sweet-scented	*Galium triflorum*
Blackberry, evergreen	*Rubus laciniata*
Blackberry, Himalayan	*Rubus discolor*
Blackberry, trailing	*Rubus ursinus*
Common St. John's Wort	*Hypericum perforatum*
Coral root	*Corallorhiza maculata*
Cotoneaster	*Cotoneaster sp.*
Dock	*Rumex sp.*
English Holly	*Ilex aquifolium*
English Ivy	*Hedera helix*
False Lily-of-the-Valley	*Mianthemum dilatatum*
False Solomon's-Seal	*Smilacina stellata*
Fern bracken	*Pteridium aquilinum*

Fern, deer	*Blechnum spicant*
Fern, lady	*Athyrium filix-femina*
Fern, licorice	*Polypodium glycyrrhiza*
Fern, sword	*Polysticum munitum*
Fern, spiny wood	*Dryopteris expansa*
Foxglove	*Digitalis purpurea*
Fringecup	*Tellima grandiflorum*
Goat's Beard	*Aruncus dioicus*
Hardhack	*Spiraea douglasii*
Horsetail Rush	*Equisetum arvense*
Huckleberry, evergreen	*Vaccinium ovatum*
Huckleberry, red	*Vaccinium parvifolia*
Indian Plum	*Oemleria cerasiformis*
Japanese Knotweed	*Polygonum cuspidatum*
Large-leaved Avens	*Geum macrophyllum*
Low Oregon Grape	*Berberis nervosa*
Miner's Lettuce	*Montia perfoliata*
Mountain Ash	*Sorbus acuparia*
Ocean Spray	*Holodiscus discolor*
Orange Honeysuckle	*Lonicera ciliosa*
Oxeye Daisy	*Chrysanthemum leucanthemum*
Pathfinder	*Adenocaulon bicolor*
Pea vine	*Lathyrus latifolius*
Piggyback Plant	*Tolmiea menziesii*
Pink Wintergreen	*Pyrola asarifolia*
Raspberry, black	*Rubus leucodermis*
Red Elderberry	*Sambucus racemosa*
Rose	*Rosa sp.*
Rose, bald-hip	*Rosa gymnocarpa*
Salal	*Gaultheria shallon*
Salmonberry	*Rubus spectabilis*
Scot's Broom	*Cytisus scoparius*
Slough Sedge	*Carex obnupta*
Stinging Nettle	*Urtica dioica*
Stinky Bob	*Geranium robertianum*
Swamp gooseberry	*Ribes lacustre*
Tansy Ragwort	*Senecio jacobaea*
Thimbleberry	*Rubus parviflorus*
Thistle, bull	*Cirsium vulgare*
Thistle, Canada	*Circium arvense*
Twinflower	*Linnaea borealis*
Vetch	*Vicia sp.*
Western Starflower	*Trientalis latifolia*
Western Trillium	*Trillium ovatum*

*Weeds are shaded