Island Center Forest
Site Management Guidelines

April 2006

King County
Department of Natural Resources and Parks
Water and Land Resources Division

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King County Water and Land Resources Division

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Executive Summary

Island Center Forest (ICF) is a 363-acre complex of working forest and ecological lands owned by King County and managed by the King County Department of Natural Resources and Parks in collaboration with the Vashon-Maury Island community. [1] ICF is managed to protect the ecological values of the site, to demonstrate ecologically sustainable forest management, and to provide opportunities for low-impact recreation.

Current conditions:

The forest/wetland complex is comprised of three adjacent properties:

- 80 acres in the northwest is managed by the King County Solid Waste Division as a buffer to the Vashon Transfer Station.
- 200 acres that form the bulk of the property were transferred to King County by Washington State Department of Natural Resources (WADNR) and are managed by the King County Water and Land Resources Division (WLRD) as "working resource lands."
- 83 acres on the east end of the property were acquired by King County and the Vashon Maury Island Land Trust (VMILT) and are managed by WLRD as "ecological lands."

The Forest is relatively flat and comprises eight different "eco-types"; six unique forest stands, wetland, and meadows. The site forms the headwaters of Judd Creek, and there are four tributary streams that flow south from the site into Judd Creek.

Island Center Forest provides habitat for a variety of wildlife species. In particular, over 70 bird species have been identified in the vicinity of the wetland complex in the northeast corner of the site. The wetlands themselves are home to several amphibian species, including non-native bullfrogs that are threatening the quality of the wetlands.

There is a great deal of public use on Island Center Forest. Over nine miles of trail are used by hikers, equestrians and mountain bikers, and the wetlands are popular for bird watching and wildlife photography. Historically, hunting has occurred on the WADNR parcels, and illegal off-road vehicle driving has been a problem. Garbage dumping and illegal camping have also occurred with some regularity.

There are currently seven locations where people are able to access ICF. However, some of these are not technically legal access points, and none of them provide adequate parking, particularly for horse trailers.

Recommendations:

The planning process for Island Center Forest involved the input of all of the constituent groups with an interest in the site, including the Vashon Maury Island Land Trust, the Vashon Forest stewards, the Equestrian Trails Club, Vashon Audubon, Vashon Community Council, Vashon Sportsmen, local mountain bikers, and neighboring landowners. Input from these groups resulted in a variety of recommended management actions that include the following.

With regard to forest management, ICF will be managed to develop interior forest habitat with older forest structural complexity. This condition is defined as having:

- an overstory cohort of large trees (>36" dbh) with complex crowns
- multiple canopy layers, including shrub and herbaceous layers

[1] As of April 2006, 30 of these 363 acres are still owned by the Vashon Maury Island Land Trust (VMILT). However, the intention is that King County will purchase the lands from VMILT in the near future.

- horizontal patchiness, including gaps
- wildlife trees: live trees with decadence and/or habitat structures
- large snags (>10" dbh)
- large course woody debris (CWD) (>12" larger end diameter and >15' in length)
- a diverse plant community including hardwood and conifer trees, tall shrubs, low shrubs, herbs, epiphytes, lichens, fungi, herbs, etc. Tree layers will contain a majority of conifers, but also contain a healthy component of hardwoods.

Implementation of these goals will be undertaken in consultation with the Vashon-Maury Island community. To the maximum extent possible, implementing the management actions necessary to achieve these goals will be undertaken in collaboration with the Vashon Forest Stewards or a similar island-based forest stewardship organization.

The management actions needed to achieve these goals depend on the current condition of each stand, but in general, variable density thinning (VDT) is the preferred method. VDT thins the forest in patches of various sizes in an effort to mimic natural disturbances. It ensures that the forest will maintain the above listed characteristics in a mosaic of age classes, thereby providing wildlife habitat for a broad range of species.

The streams on ICF will be treated as fish-bearing streams, and as such, there will be large riparian buffers where any forest management will focus on restoration rather than revenue generation. Buffers will also be placed around the wetlands.

There is a need for restoration of the wetlands and meadows as well as the forests. Both of the ponds on the property, Mukai Pond and Meadow Lake, are home to large populations of bullfrogs that are threatening the survival of birds and other amphibian species. The wetlands and meadows are also infested with Reed Canary Grass and scot's broom, invasive species that are cause for concern.

Many of the trails on ICF are not in good condition and are in need of repair. These site management guidelines include recommendations for repairing and maintaining the trail system, as well as closing some of the trails that are not heavily used and/or are in poor condition. In addition to general trail maintenance, several additional trails are proposed, as well as directional trail signs, an ADA accessible trail near Mukai Pond, and an entrance structure that notifies users that dogs are not welcome near Mukai Pond.

While there are sufficient access points for ICF, there is a need for a developed parking area that can accommodate horse trailers. Staff is investigating the possibility of several sites; including the end of the road near Mukai Pond, the Scott's Broom meadow off of 188th/107th, and the area north of the Transfer Station. Development of this parking area is a high priority in the management of the site.

Management of ICF will be adaptive to new information as it becomes available. To that end, monitoring plots have been established throughout the site to monitor changes in vegetation as a result of management actions. These plots will be visited on a regular basis, and information gathered will be used in making decisions regarding management of the site.

Funding for the management of ICF will come from a variety of sources. The King County Natural Lands Program will continue to fund the general maintenance of the site through its arrangement with the King County Parks Division resource coordinators. Capital projects, including habitat restoration, will be accomplished largely through volunteer efforts by the various groups with an interest in the site, working in cooperation with King County staff. In addition, revenue from timber harvest will be used to accomplish many of the capital and restoration projects recommended in this plan.

One of the fundamental objectives of this plan is that King County staff and representatives from the various groups establish one or more formal agreements that would facilitate community management of the site. This is a high priority coming out of this planning process, and these agreements should be in place before any significant management activity occurs.

Island Center Forest Site Management Guidelines

Introduction

Island Center Forest (ICF) is a 363-acre complex of working forest and ecological lands owned by King County and managed the King County Department of Natural Resources and Parks in collaboration with the Vashon-Maury Island community.[2] ICF is managed to protect and enhance the ecological values of the site, to provide opportunities for low-impact recreation, and to demonstrate ecologically sustainable forest management.

This document provides general property and acquisition information, a description of existing site conditions, a chronology of recent events and management actions, and a list of management objectives and recommendations for Island Center Forest. These site management guidelines were developed using guidance established in the King County Water and Land Resources Division Ecological Lands Handbook (King County 2003) and the Programmatic Plan for Management of King County-owned Working Forest Properties (King County 2003).

Planning process, Vision and Goals

Due to the significant amount of community interest in Island Center Forest, as well as the diversity of adjacent properties that comprise the Forest, the King County Natural Lands Program decided to conduct a comprehensive planning process for the site. As a first step, staff held a public meeting in January 2005 and subsequently formed a working group of Vashon Island residents representing the various constituent groups with an interest in the site. These groups include the Vashon Maury Island Land Trust, the Vashon Forest Stewards, Vashon Audubon, Vashon Equestrian Trails, Vashon Community Council, Vashon Parks District, Vashon Sportsmen, the Vashon mountain biking community, and neighboring landowners. This working group met six times between March and November of 2005.

In addition to the efforts of the working group, the King County Natural Lands Program coordinated several inventory efforts to better understand the ecological and physical characteristics of the site. With the approval of the working group, NRL hired Derek Churchill, a recent MS graduate of the UW College of Forest Resources and board member of both the Vashon Forest Stewards and Vashon Maury Island Land Trust to conduct a forest inventory, install a system of long term monitoring plots, and make recommendations regarding silvicultural activities on the site. NRL also worked with the WLRD Science group to conduct preliminary assessments of the riparian areas and wetlands.

As a first step in the planning process, the working group developed a 50-year vision for Island Center Forest. The vision reads as follows:

> Comprising a total of 363 acres, Island Center Forest is the largest tract of public open space on Vashon Island. All 363 acres of ICF will be managed as a single unit to sustain and enhance community and environmental benefits; to demonstrate forest management that is a model of ecologically oriented, community forestry and to provide opportunities for low-impact recreational activities. The community will play an integral role in managing the land to achieve these goals.
>
> In 50 years, ICF will continue to provide clean water to Judd Creek. The forest will contain a diversity of tree species and age classes, and, in conjunction with the non-forested areas, will provide habitat for a variety of native wildlife species. Timber will be harvested from the forest in a manner that protects the environmental integrity of the site while providing revenue to cover a portion of management costs. There will be a system of trails that links the site to other sites on the Island and is used responsibly by hikers, equestrians and mountain bikers. There will be several access points

[2] As of April 2006, 30 of these 363 acres are still owned by the Vashon Maury Island Land Trust (VMILT). However, the intention is that King County will purchase the lands from VMILT in the near future.

that enable safe parking while not posing a burden to neighboring landowners. The site will also be used to educate visitors about the natural resources on the site and about responsible forest management. Deer hunting has traditionally been allowed on much of the site, and King County staff is working with the Vashon community to evaluate the feasibility of continued deer hunting in the future.

From this vision, the working group established the following management goals:

1. Involve the community in managing ICF; management activities on ICF will be undertaken in collaboration with the community.

2. Protect and restore the wetlands, riparian areas, and other sensitive or unique habitats.

3. Conserve and restore wildlife habitat for a diversity of species; especially sensitive, threatened, or rare species.

4. Conduct ecologically sustainable forest management that recognizes and enhances habitat and recreational values while producing a sustainable flow of wood products.

5. Provide opportunities for low impact recreation and natural resource education.

6. Manage the land within the ecological and human context of the surrounding landscape.

7. Use any revenue produced through ecologically sustainable management of the site to support the stewardship of King County Natural Resource Lands.

8. Review this plan every ten years, adding ten years to the planning horizon.

Central to the 50-year vision for Island Center Forest is the desire to manage all of Island Center Forest as a single unit. As discussed below, ICF comprises three adjacent properties that are not only categorized differently within the King County Natural Lands Program, but, in the case of the 80 acres in the NW quadrant of the site, managed by a different Division of the Department of Natural Resources and Parks. As a result of this varied ownership, this plan is somewhat of a test case in attempting to meet the goals of both the King County Ecological Lands Handbook, the Programmatic Plan for the Management of King County-owned Working Forestland, and the King County Solid Waste Division. As such, the format of this plan differs slightly from a typical Site Management Guidelines for an NRL ecological land or a Forest Stewardship Plan for a working forest.

General Property Information

ICF is located in the north-central part of Vashon Island and is the largest piece of publicly-owned open space on the Island (Map 1). The 363-acre forest/wetland complex is comprised of three adjacent properties (Map 2):

- 80 acres in the northwest is managed by the King County Solid Waste Division as a buffer to the Vashon Transfer Station.
- 200 acres that form the bulk of the property were transferred to King County by Washington State Department of Natural Resources (WADNR) and are managed by the King County Water and Land Resources Division (WLRD) as “working resource lands.”
- 83 acres on the east end of the property were acquired by King County and the Vashon Maury Island Land Trust (VMILT) and are managed by WLRD as “ecological lands.”

With the exception of one parcel zoned Rural Area (RA) 10, all of ICF is zoned RA-5, meaning that one residence is allowed per 5 acres (King County, 2004). To the north and south are rural residential properties ranging in size from 5 to 40 acres. To the west is the Vashon Transfer Station, and to the east is a combination of rural residential and industrial-zoned land. In the recent past, most of ICF has been managed as a working forest by the Washington State Department of Natural Resources.

Table 1. Island Center Forest General Information

Best Available Address	115th Ave SW between Bank Rd and Cemetery Rd.
Thomas Guide Map Location	Pages 653 and 683
Legal Description	NE corner, SW corner S36T23R02; SE corner, SW corner S36T23R02; SE corner S36T23R02; W half, SW corner S31T23R03; NE corner, SW corner S31T23R03
Acreage	363 acres
Drainage Basin	Judd Creek
WRIA	WRIA 9
Council District	8
King County Sensitive Areas	Wetlands

Table 2. Island Center Forest Parcel Information (Map 3)

Parcel Number	Acreage*	Purchase Date	Ownership type/price	Previous Names	Zoning	Funding Source	Recording Number
3623029009	80	1960	Owned in fee	Solid Waste piece	RA-5	Unknown	Unknown
3623029012	40	2004	Owned in fee	WADNR Trust lands	RA-5	Trust land transfer	20050202001614
3623029013	40	2004	Owned in fee	WADNR Trust lands	RA-5	Trust land transfer	20050202001614
3623029015	40	2004	Owned in fee	WADNR Trust lands	RA-5	Trust land transfer	20050202001614
3623029016	40	2004	Owned in fee	WADNR Trust lands	RA-5	Trust land transfer	20050202001614
3123039023	40	2004	Owned in fee	WADNR Trust lands	RA-5	Trust land transfer	20050202001614
3123039019	30.4	2004	Easement (VMILT owns)	Mukai Pond	RA-10	CFT, NAWCA, RDP and individuals	20030812002451
3123039021	20.5	2004	Owned in fee	Meadowlake	RA-5	CFT and RDP	20040311001458
3123039038	11.25	2004	Owned in fee	Meadowlake	RA-5	CFT and RDP	20040311001458
3123039116	2.3	2005	Owned in fee	Meadowlake	RA-5	CFT and RDP	20050406001386

Continued…

3123039119	4.4	2005	Owned in fee	Meadowlake	RA-5	CFT and RDP	20050406001386
3123039120	2.3	2004	Owned in fee	Meadowlake	RA-5	CFT and RDP	20050926003379
3123039121	2.3	2005	Owned in fee	Meadowlake	RA-5	CFT and RDP	20050406001386
3123039122	4.15	2004	Owned in fee	Meadowlake	RA-5	CFT and RDP	20040311001458
3123039123	2.3	2004	Owned in fee	Meadowlake	RA-5	CFT and RDP	20050926003379

*acreage from King County Assessor's data.

Acquisition History, Funding Source and Deed Restrictions

As discussed above, Island Center Forest is comprised of three parts; the Trust Land transfer parcels, the Mukai Pond/Meadowlake parcels, and the Solid Waste property. Each property is discussed separately below in terms of acquisition history, funding source and deed restrictions.

The WADNR Trust Land transfer properties were transferred to King County by WADNR through the Trust Land transfer program. This program establishes a source of funding for WADNR to dispose of lands managed under the trust mandate that are determined to be ecologically sensitive and/or are not appropriate to manage for large-scale revenue generation. The effected Trust is reimbursed with the allocated funds. Prior to the transfer, the property was managed by WADNR primarily for timber production as an even-age working forest. The most recent harvest occurred in 1994. A variety of groups on Vashon Island, including the Vashon Maury Island Land Trust, the Vashon Forest Stewards, Vashon Audubon, the Vashon equestrian community, and the Vashon mountain biking community, advocated the transfer and worked with King County and WADNR to make it happen.

Lands that are transferred through the Trust Land Transfer program cannot be developed and must be managed as open space. Timber harvest is not precluded on lands that are transferred through this process.

The Mukai Pond and Meadowlake properties were acquired between 2002 and 2005 in a collaborative effort involving King County and the Vashon Maury Island Land Trust. These lands were purchased to protect the wetland habitat, aquifer recharge areas, and the headwaters of Judd Creek. Two separate acquisitions occurred, both using a combination of Conservation Futures and Rural Drainage Program funds. The Vashon Maury Island Land Trust raised $335,000 from individual donors and $50,000 from the North American Waterfowl Conservation Program (NAWPA) for these purchases. At this point, the Mukai Pond property is owned by VMILT, with a conservation easement held by King County. However, it has been the intention from the outset that King County will reimburse VMILT for the property and take ownership. Properties purchased with Conservation Futures funds cannot be developed and must be managed as open space, although forest practices that are designed to improve habitat are not specifically excluded. The 2004 application to Conservation Futures stated that the purpose of the project was "to conserve 2 open water ponds, wetlands, and forest that are key headwaters elements of the Judd Creek watershed and provide critical habitat, hydrologic and open space functions". In light of the conservation focus of this acquisition history, as well as the "ecological lands" designation of these properties, all management actions will clearly enhance wildlife habitat, public safety, and/or ecologically oriented forest health objectives. While revenue may be derived from management, it will not be a primary goal.

The Solid Waste property was acquired by King County in 1960 to serve as a buffer for the Vashon Transfer Station. Additional information about the acquisition of this property is not available.

Ecological and Physical Setting

This section describes the existing natural resources and ecological processes associated with Island Center Forest. Additional analysis is presented in Part 6 below.

Topography and Soils

Island Center Forest is located at an elevation between 280 and 380 feet (Map 4). The Forest is relatively flat with the high point in the north-central part of the property. The topography is typical of the rest of Vashon Island.

All of the soils on the site are Alderwood Gravelly Sandy Loam with the exception of the northern part of the Mukai Pond parcel, which is Everett Gravelly Sandy Loam (Map 5) (Washington State Department of Natural Resources).

Alderwood soils consist of very dark grayish brown gravelly sandy loam 20 to 40 inches deep, underlain by compacted till. They are moderately well drained with moderately rapid permeability down to the till layer and then very slow permeability. This soil can become saturated in the substratum during the rainy season. The low available water capacity creates drought potential in the dry months. Alderwood soils are relatively stable with low to moderate surface erosion potential. The main considerations for this soil type are its medium compaction and puddling potential and the tendency for severe plant competition. There is potential for wind throw of exposed trees due to the rooting depth restricted by the till layer. Alderwood soils are site class III (108 for 50-year site index).

Everett Gravelly Sandy Loam is a very gravelly, sandy soil occurring on glacial outwash terraces. It is excessively drained, with low available water capacity, leading to potential for drought conditions. It averages 60 inches in depth and is generally quite stable with little erosion potential. Everett soils are site class III (100 for 50-year site index).

Hydrology

Island Center Forest forms the headwaters of Judd Creek (Map 6), a three-mile creek that drains the largest watershed on Vashon Island, covering 5.1 square miles. There are two tributaries that originate in the central part of the property, to the west of Mukai Pond.

There are several mapped wetlands on the Mukai Pond/Meadowlake properties (King County Department of Parks, Planning and Resources, 1990). The largest of these are two class I wetlands with open water; wetland #1 (Mukai Pond complex) in the north central part of parcel 3123039021 and wetland #3 (Meadow Lake) in the northern part of parcel 3123039019. In addition to these two class I wetlands, during wet winters, low-elevation areas of the site are covered by extensive and continuous wetlands which later in the spring and summer become hydrologically isolated and dry.

Three visits were made to Island Center Forest to collect information about the stream/riparian and wetland systems within the forest. The first visit occurred on August 16th, 2005 and was mainly a visual reconnaissance of the site and the stream network. Stream crossings were noted, stream courses were confirmed, and limited observations were made of the two main wetland systems. Other than location information, very little data was collected during this visit. The second visit occurred on August 24th, 2005 and included the collection of specific

riparian, stream, and wetland data. This information was used to complete an ecological assessment using the King County Natural Lands Summary forms for stream, riparian, and wetland systems. The 3rd site visit occurred on 1/23/06 with the goal of assessing winter hydrology (flooding) and identifying other sites that might be flooded and considered wetlands. The goal was to get an overview of the maximum winter flooding and possibly identify some of the interconnections between these wetlands, other ponded areas and the stream system.

The goal of the three visits was not to identify, delineate or otherwise characterize the wetlands of the property. Beyond the above information, the number of different wetlands and their extent (jurisdictional/ecological boundaries) on the site has not been determined. More detailed studies of the wetlands, drainage, hydrology, and aquifer recharge are needed.

Streams

The streams originating in Island Center Forest form the northwesterly-most headwaters of Judd Creek (WRIA # 15-0129), the largest stream on Vashon Island and home to coho and chum salmon, rainbow and cutthroat trout, and a small but persistent population of freshwater mussels. Of these, the limited observations suggest that only cutthroat trout penetrate the streams within ICF. Some further observations during late April and May could confirm the presence of other salmonids using the small streams as nursery areas.

The streams originate in long, shallow swales in the flatter north central and western portions of the site, probably from shallow groundwater; the eastern-most tributary may have had an intermittent connection to Meadow Lake via a constructed channel that is now obscured except in the uppermost reaches. These swales should be considered variable source areas (VSA) and extend considerable distances through the forest. At their uppermost extent, these areas show no signs of surface flow, and soil observations showed only weak evidence of saturation at 18 inches below the surface. Given that the major soil type of these areas is Alderwood, which has little summer water capacity, the absence of late season flow evidence is understandable. Further observations should be made in late February or early March to determine the extent of these VSAs and the uppermost extent of stream flow. Stream flow analysis should consider any anomalous weather conditions that may affect data.

During the field visits, flowing water was observed in three stream courses just before they exited ICF. The upper extent of flow appeared to lie at a similar elevation for all streams, about 90 meters above sea level, emanating from hillside seeps in the case of stream “D” and from in-channel seeps in the case of streams “A” and “B” (Map 6). Clearly defined channels were observed for varying distances above the origin of flow: approximately 25 meters for stream “A” out of an extensive forested wetland (full extent unknown); about 150 meters for stream ”B” where the stream course became undefined in a wooded area; and approximately 25 meters for stream “D” as the channel gains the head of a ravine. Flow was small at all three sites; field estimates were 0.25 gallons per second (gps) for segment A2, 0.25 gallons per second for segment D, and 1.25 gps for segment B1. Channel and valley characteristics for each of the stream reaches are as follows:

Segment A1:

This segment consists of a forested wetland of unknown length (>200 feet) and width (>100 feet) that lies in a relatively flat area of the forest. The surface was cracked and the soil moist at 3 inches depth indicating relatively recent standing water. Skunk cabbage, salmonberry, ladyfern, water parsley, and small-fruited bulrush were present, and the wetland was edged with western red-cedar. This area should be visited again in late winter to more accurately delineate the wetland.

Segment A2:

Stream A crosses the abandoned haul road through a 36” diameter round culvert and quickly enters the head of a steep-sided ravine. A series of short “steps” through gravel and inter-bedded clays comprise the channel profile downstream for some 150 feet. Flow begins at approximately this same downstream point. The stream valley for

the segment length is very steep-sided, the walls rising some 100 feet above the stream at the confluence with stream "B", approximately 750 feet downstream. Although mapped as Alderwood, the valley walls are mainly fine to medium-fine sand and are easily disturbed by walking. Sword ferns dominate the understory here, with medium to large Douglas Firs forming the forest.

The riparian corridor of the stream is quite narrow—some 15 to 20 feet—and occupies the entire floodplain of this stream. Vine maple, salmonberry, and a few alder dominate this zone, anchored by several large western red-cedar immediately along the stream edge; the vegetation forms a closed canopy over the stream. On the field day, the temperature in the stream channel was approximately 4^{o} Centigrade cooler than the temperature in the forest atop the ravine. In places, the stream tumbles over the red cedar roots and around the trunks, suggesting, by the shape and form of the channel, that abnormal peak flows both widened and deepened this stream some time ago. Given the box-like form of some channel sections and the presence of numerous mid-channel sediment bars, the stream has not yet attained a new equilibrium.

The stream averages about 5 feet in width—widening up to 8 feet in places and narrowing to 4 feet in others. Pools are relatively small (most < 3 sq. ft.) and shallow (< 3 inches) throughout the upper, steep section of this segment (about 300 feet), deepening to < 8 inches and approximately 4 sq. ft. in area in the lower, flatter sections above the confluence with stream B. Even so, few pools span the stream channel and their depth is shallower than expected, even for so small a stream. Evidence of pool-filling sediment is apparent in the wider portions of the stream; the source is likely the valley walls and the channel, itself, from incision. Generally, the streambed is dominated by small gravel and sand. Woody debris—some pieces are > 30 inches in diameter--forms a tangle over the small stream but little has come to rest in the channel or in contact with the streambed. Only the roots and trunks of the streamside cedars slow and channel the flow.

Aquatic life was sparse throughout this stream, dominated by caddisflies and a few mayflies. No fish were observed during these field visits.

Segment B2 (upstream of point B1) is divided into 2 sub-segments:

Sub-segment B2a:

This is the uppermost segment of stream B from the trail crossing to the point where the surface channel loses definition (about 150 feet upstream of the trail crossing at point B2). Even so, the channel is barely visible here, poorly defined due to the intermittency of flows, and obscured by brush and leaf litter. The channel, where it can be found in this segment, is approximately 0.5 feet deep and from 1.5 to 3 feet wide and lies in a broad swale some 15 to 25 feet wide and 4 to 6 feet deep. The vegetation is mainly sword fern, evergreen huckleberry, salmonberry and alder. A soil core to 15 inches revealed gravelly, sandy soil, but no sign of moisture. This swale area should be considered a VSA for stream B and be re-visited during late winter or during a rainstorm to determine the boundaries of the contributing area.

Sub-segment B2b:

Downstream of the trail crossing at point B2 and upstream of point B1, a well-defined channel lies in a continuation of the upstream swale. The swale here is deeper and broader than upstream - some 15 feet from top to bottom - and from 40 to 60 feet wide. The channel is about 0.5 feet deep and from 2-4 feet wide and gravel-bedded in places with ½" to 2" material. There is no evidence of recent flow or of any incision. A narrow riparian zone is emerging here, about 6 feet wide, composed mainly of red alder and salmonberry. The channel and riparian zone become more well-defined downstream, and the swale deepens to a well-defined ravine some 50 to 75 feet deep and 150 feet wide at point B1. The stream picks up flow from seeps along the channel edge until the flow at point B1 is approximately 1 to 1.5 gps.

The side slopes of this ravine are similar in composition to slopes of Segment A2—sandy, but densely vegetated with salmonberry, swordfern, some alder, and small Douglas Fir. The vegetation here binds the sandy soil more firmly than in Segment A2 but the slopes are still quite sensitive to disturbance.

In the lower portions of this segment, the stream is from 4 to 6 feet in width and occupies a relatively broad, flat floodplain some 20 feet wide. The stream meanders and splits here, around mid-channel bars and point bars, and

abandoned channels lie adjacent to the current channel, evidence of a sediment-rich past. Riparian vegetation, while dense, consists mostly of salmonberry and small alder, with an occasional fir or cedar, and the low canopy does not completely enclose the stream. Little woody debris can be found here, but most that is present is in contact with the streambed, forming gravel patches and small pools. Even so, pools are shallow and riffles dominate this moderate gradient stream.

Caddisflies are common here but mayflies make up a larger proportion of the benthic fauna than in stream A; a 2" cutthroat trout was observed just upstream of point B1 during this visit.

Segment B1 (downstream of point B1):

At the trail crossing of point B1, the stream flows through a 36" culvert with virtually no drop to the downstream bed, and little lateral scour is evident. The absence of a drop and of scour indicates a culvert sufficiently sized to convey large flows. Slope on the pipe appears to be consistent with the stream grade but the length could be a passage problem for upstream migrating fish.

The ravine here is >200 feet wide at the top and some 50 to 60 feet deep. Side slopes are steep throughout and the predominantly sandy soil slides with each footstep. Near the top of the ravine, the sandy sub-soil has fallen away from the surface layer forming a 2-3 foot high escarpment. Sword fern dominates the vegetation on these slopes but they remain quite sensitive to disturbance. On the floor of the ravine, accumulated sediment has formed a flat, broad floodplain some 20 to 40 feet in width; a riparian zone of ladyfern, salmonberry, and vine maple occupies almost this entire area. Within the floodplain, scars of old, abandoned channels are common and the present channel meanders and splits around numerous mid-channel bars, evidence of considerable sediment input sometime in the recent past. Nevertheless, the riparian vegetation provides dense cover for virtually the entire stream. Up the side slopes to the ravine top, western red-cedar and alder dominate the tree species, and upper canopy closure is approximately 80% at this time (maximum leafout).

The stream channel averages about 8 feet in width and is quite shallow (see sediment discussion above), averaging about 3 inches at riffles. Pools, though expansive (6-8 sq. feet in area), are shallow, somewhat less that 0.3 feet in depth, and are rare. Side channels, backwaters, and small eddies are common, however, and could provide considerable habitat heterogeneity during moderate flows. Bed sediment consists mainly of small gravel (1/2 inch to 3 inch) and sand, but a small fraction (< 10%) is in the 3-6 inch range. Some patches appear suitable for cutthroat spawning. Woody debris is common throughout but tends to be small; there are a few large trunks, though, that have re-directed flow and caused local scouring of the bed, creating pools nearly twice as deep as the average. The combination of pool depth and woody cover may provide secure habitats for juvenile salmonids, but none were observed here during the field visit.

The benthic fauna is similarly dominated by caddisflies and mayflies, both common but neither abundant. Flow at the downstream end of this segment is estimated at between 1.5 and 2.0 gps.

Segment C1/C2:

Another small channel was observed in the extreme SW corner of the ICF. This channel carried no water at the time of the visit but showed signs of earlier flows, probably from late winter storm events. The channel is gravel-bedded, about 2-3 feet wide and about 0.5 feet deep. At its upper crossing with an ICF trail, the stream enters a 24-inch diameter culvert. Some 500 feet downstream, at the property boundary, an 18 inch diameter culvert carries the flow. Neither culvert is obstructed nor is there any scour or drop. The stream channel exits the property in a SSW direction, connecting with a tributary of Judd Creek south of Cemetery Road, in about 0.3 miles.

Segment D:

At the southern border of the property, just as stream B exits the ICF, a small stream enters on the left bank from a short, east-trending ravine. Flow in this stream is estimated to be about 0.25 gps, robust for so small a stream at this time of the season. The ravine carrying this stream is approximately 400 feet long, some 40 to 60 feet deep at its lower end, and about 100 feet wide. Side slopes are mostly gravel and sand—well-vegetated with

salmonberry and fern--and exhibit some small failures where the gravel lies atop a consolidated layer. These same areas are sources of seeps.

Wetlands

Wetland #1: Mukai Pond Complex

Wetland #1 is an approximately 5 acre wetland complex that obtains its flow from the surrounding basin. The wetland consists of three physiographically and structurally distinct wetland subunits, a "lower elevation" permanently flooded depressional, ponded area (Mukai Pond), a "mid' elevation seasonally flooded field/meadow, and a "higher" elevation forested wetland bench south of Mukai Pond. The three subunits are contiguously flooded in the winter during extended periods of precipitation and isolated during the remainder of the year when flood waters recede.

Mukai Pond: In the summer, Mukai Pond consists of at least three ecologically distinct flooded and upland areas: flooded open water areas separated by constrictions by upland, several benches, and an island, all of which vary in size with precipitation and flooding through the season. The wetland morphometry is further characterized by a series of manmade benches.

The pond exhibits a dramatically declining, seasonal hydroperiod that draws down significantly from a winter high of 5 acres and 10+ ft in depth to a late summer and early autumn low of less and 0.5 acres and 1.0 -2.0 ft. depth. The wetland is diverse in that it exhibits five habitat classes in the Cowardin Palustrine System. These include open water, aquatic bed (algae), unconsolidated bottom (i.e. mud), emergent wetland, scrub-shrub, and forested wetland areas. The seasonal drawdown initially exposes a thick flooded scrub shrub shoreline of willows, then a mosaic of open, unvegetated shoreline habitat and emergent vegetation, and finally an unvegetated mud flat. Growing within the summer flooded area was a green filamentous alga. The emergent vegetation habitat is an especially well structured community in that the major species, including Spikerush, Sedge, small-fruited bulrush, bur reed and even Reed canary grass were distributed as nice interspersed mosaic clumps, none of which appeared "aggressive" or dominated the community.

Meadow: In summer, the upper unit NE of Mukai Pond is a densely covered monoculture of reed canary grass that owes its wetland characteristics to extended spring time flooding, other seasonal hydrological characteristics and its physical isolation from Mukai Pond due to a roadway along its southern boundary that functions as a berm. The berm essentially backs up and contains winter precipitation in the unit causing it to remain flooded during the spring after potentially high water levels that top the berm and connect it to Mukai Pond recede. This hydroperiod of fall-spring flooding in conjunction with summer drying provides the conditions for reed canary grass to out-compete other aquatic or terrestrial species at the site with the exception of certain tree species which may colonize the site if they get a foothold. In particular, a stand of aspen borders the southeast edge of the wetland, and young saplings and offshoots are encroaching into the meadow from these mature trees.

Forested Wetland: Adjoining the southern edge of the pond is a forested component to this wetland complex. In winters of high precipitation, Mukai Pond flooding extends into this higher elevation forested wetland area dominated by red alder.

Wetland # 2: Meadowlake Complex

Meadowlake Pond is a large, permanently flooded, deep pond exhibiting numerous Cowardin Palustrine habitat classes, including aquatic bed, unconsolidated bottom, emergent wetland, scrub-shrub, and forested wetland areas. In summer, ninety percent or more of the aquatic bed habitat is totally comprised of floating-leaved pondweed. On one side, deciduous forest and shrubs overlap the shore whereas the other shore is almost entirely fringed by 20-30 ft of cattail interspersed by small clumps of small-fruited bulrush and small clumps of other herbaceous wetland species. Water levels at this wetland (app. 50 cm) do not change dramatically from summer to winter, suggesting subsurface flows or groundwater discharge to the pond.

Wetland #3 (Flooded area south of Meadowlake Complex)

South of Meadowlake Pond, and joined to the pond by a surface stream, lies an extensive seasonally-flooded wetland complex consisting mainly of alder, willow thickets, and red-osier dogwood, interspersed with sedges and other emergents. This wetland complex occupies a broad swale (30 to 50 meters wide) trending north-south for at least 100 meters although the total extent has not been determined. During the January, 2006 site visit, pools of standing water were common over thick, dark brown to black soils, soft to the step. The wetland extends to the south of where the stream exits the complex through twin black corrugated plastic culverts. Further visits should be made to determine the winter area of this complex.

South of Meadowlake Pond, and joined to the pond by a surface stream, lies an extensive seasonally-flooded wetland complex consisting mainly of alder, willow thickets, and red-osier dogwood, interspersed with sedges, rushes, and other emergents. This wetland complex occupies a broad, uneven swale (30 to 50 meters wide) that trends north-south for at least 100 meters, although the total extent has not been determined. During the January, 2006 site visit, pools of standing water were common over thick, dark brown to black organic soils, soft to the step and some 12 to 18 inches deep. These muck soils overlay more typical Alderwood soils but may serve to hold moisture for a considerable time after the end of the rainy season, perhaps into the early summer, thereby aiding streamflow long after the outlet from Meadowlake Pond has ceased to flow. The flooding of this swale may have been abetted by the past construction of a logging road that forms one edge the complex and impounds water in the swale. The wetland extends to the south of where the stream exits the complex through twin black corrugated plastic culverts under this logging road. Further visits should be made to determine the maximum winter area of this complex and its minimum area during late summer.

Wetland Grouping #4 (A, B, C &D) (Riparian wetlands associated with intermittent streams and low lying areas)

Although not all swales and shallow ravines have been evaluated during the winter, four areas that have been visited may be typical of winter hydrology for the ICF. During the January, 2006 field visit, four sites were briefly examined where trails intersected obvious swale features. Lettered A through D, each of these sites showed both intermittent flow and saturation extending beyond the immediate flow boundaries. In fact, where the swales flattened, pooled water and vegetation typical of seasonally saturated conditions dominated the plant communities: salmonberry, some water parsley, and occasional sedges. These same areas, visited last summer, exhibited *unsaturated* soils to a depth of 18 inches, indicating a rather rapid seasonal change in conditions.

Wetland #5 (Off 115th Ave SW)

At the 115th Avenue entrance to the ICF, the road, just before entering the property, crosses a broad swale that extends some 750 feet from Mukai Pond to the west. The road nearly bisects this swale. During the site visit in January, 2006, no water was observed to the east of 115th while considerable standing water was observed to the west of the roadway. Combined with the slight topographic rise to the west, this suggests that the swale was once continuous, and a likely source of water to Mukai Pond. The road now acts as a barrier to eastward flow. Our field investigation revealed standing water across the rather flat bottom of the swale for some 250 feet to the west of the road, up to 2 feet deep at its deepest and some 50 to 75 feet wide along the length of the swale. Salmonberry dominates the shrub layer while alder and Big Leaf Maple comprise the upper canopy. Occasional patches of sedge can be found throughout. There is no outlet from this area, either to the west or to the east.

Vegetation

Based on ortho-photos and GPS ground truthing, Island Center Forest can be divided into 17 vegetation management units called eco-units (Map 7). Eco-units are based on a scale that is practical for restoration and forest management activities. They are contiguous areas that contain the same ecosystem type (eco-type) and will need similar management approaches, but also may include small areas with different eco-types or special ecological features. Eco-types are classified according to the successional stage and type of the dominant vegetation present. Successional stages from Franklin et al (2002) were used. Eight distinct eco-types were identified within ICF. In order to provide concise and practical information, the summary of ecological conditions, timber resources, and management recommendations is based on the eight ecotypes. All of the monitoring plots within each eco-type are pooled together to generate averages of forest characteristics. The eco-units within each ecotype are listed and any unique features noted. Further analysis at the eco-unit scale can be generated for any management needs.

Ecotype A: Douglas-fir-hardwood-mature

The units within this ecotype are dominated by 60-90 year-old Douglas-fir. In general, stocking levels are high, and in some areas intense competition is causing high height-to-diameter ratios, low crown ratios, self thinning, and even stagnation. In other areas, dominant and co-dominant trees have differentiated, competition is not as intense, and self-thinning is almost over. Scattered pockets of red alder exist, and some western red cedar, western hemlock, and big leaf maple are present, primarily in the understory. Understory vegetation is dominated by salal and evergreen huckleberry. Invasive species are relatively uncommon and consist primarily of English Holly and Himalayan Blackberry. These units are at the end of competitive exclusion and entering maturation. Self-thinning mortality has created a moderate amount of small diameter snags and course woody debris (CWD). Mortality from other causes is beginning to occur, primarily from laminated root rot, and is creating some larger diameter snags and CWD. These stands are structurally simple and low in plant diversity, although the development of an understory tree layer is beginning. They currently do not have high habitat value for many wildlife species.

Table 3: Summary data for Ecotype A (see Appendix 2 for forest characteristic abbreviations)

Unit #	Unit name	Acres	# of Plots	TPA[1]	BA[1] (ft^2)	Total Volume (mbf)	Origin Year DF	Origin Year RA	Site Index
2	Solid Waste-E	39.3	2[2]	220	269	45.1	1905-1920	unknown	120
4	DNR-NE	18.9	4	140	235	45.6	1925-1945	1955	120
6	DNR-W2	16.8	3	137	273	56.7	1910-1915		109
11	DNR-E1-ValleyDF	31.0	0[2]	166[3]	249[3]	46.8[3]	1926-1940	unknown	117
	Unique features for each Eco-unit								
2	Some root rot, DF very dense in places								
4	Some root rot, DF very dense in places								
6	Some root rot								
11	Lot of root rot along slope, DF very dense on western flat area								

Notes: See Appendix 2 for code definitions and specifics on forest characteristics

[1] Based on trees >3" dbh

[2] Additional plots will be installed during winter of 2005-2006

[3] Data from cruise done by Forest Stewards in 2003.

Table 4: Totals for Ecotype A

# of Plots	TPA[1]	95% CI +/-	BA[1]	95% CI +/-	D_q[1]	Rel. Density[1]	95% CI +/-	Total Volume	95% CI +/-	Vol. DF	Vol. RA	Vol. RC
9	168	42	256	35	17	62	9	49.2	8.5	48.3	0.9	0.0

Notes: See Appendix 2 for code definitions and specifics on forest characteristics

[1] Based on trees >3" dbh

Figure 1: Stand Table for Ecotype A (see Appendix 2 for species codes)

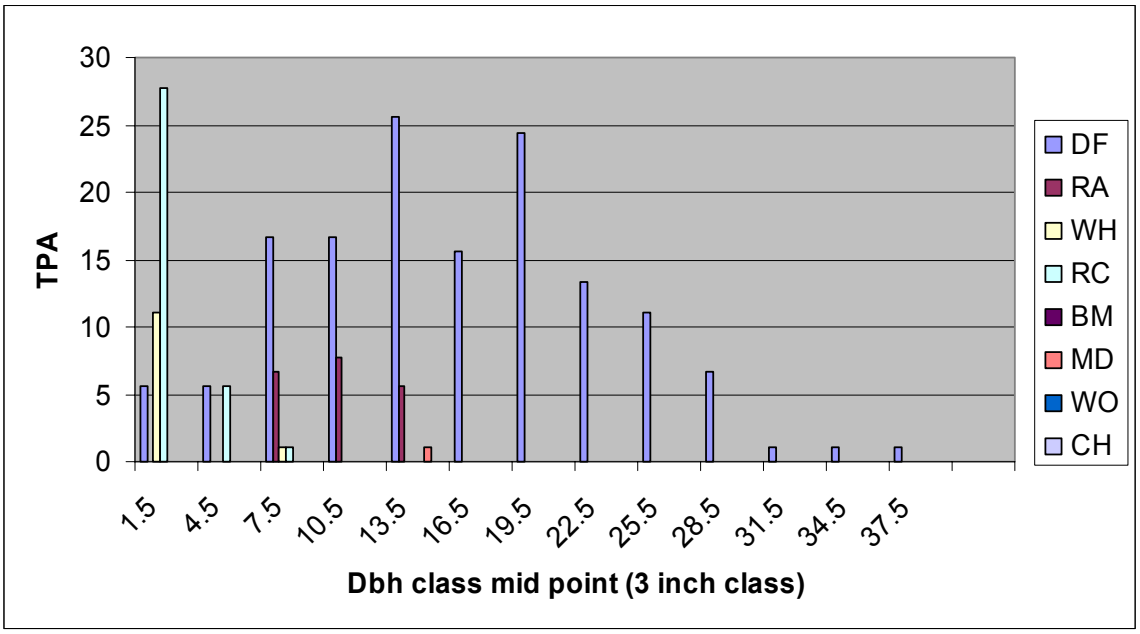

Table 5: Shrub cover, snags, and course woody debris (CWD) for Ecotype A

Shrub Species	Percent Cover	Mean Height (ft)
Evergreen Huckleberry	43.6	6.1
Salal	33.9	4.1
Trailing Black Berry	7.8	0.3
Braken Fern	5.6	3.3
Sword Fern	3.1	0.8
Nettle	1.4	0.5
Hazlenut	0.3	1.7
Red Elderberry	0.3	1.1
Red Huckleberry	0.1	1.2
Unknown	2.5	0.0

Decay Class	Snags (per acre)			
	<12" Dbh	12-24" Dbh	>24" Dbh	CWD (ft^3/acre)
1-2	21	6	0	189
3	1	0	0	539
4-5	2	1	1	1130
Total	24	6	1	1858

Ecotype B: Douglas-fir-Hardwood-Canopy-Closure

The 2 units within this ecotype were harvested in 1986 and replanted with Douglas-fir. They appear to have been pre-commercially thinned to stocking levels where competition is moderate. Live crown ratios are between 45-60% and height to diameter ratios are between 50-65%. Thickets of red alder and willow are scattered through the units and some western hemlock, madrone, and big leaf maple are present in the overstory. Canopy closure has shaded out most shrubs, except in small gaps. Invasive species are relatively uncommon and consist primarily of Himalayan Blackberry in gaps. Almost no snags exist and a low amount of CWD from the pre-1986 stand is present. No forest health issues were found. These plantation stands are very uniform, have little species or structural diversity, and have low habitat value. However, gaps and hardwood thickets do provide some diversity.

Table 6: Summary data for Ecotype B

Unit #	Unit name	Acres	# of Plots	TPA[1]	BA[1] (ft^2)	Total Volume (mbf)	Origin Year DF	Origin Year RA	Site Index
5	DNR-W1	38.6	4	220	112	3.5	1986		140
7	DNR-W3	17.3	0[2]				1986	Unk	Unk

	Unique features for each Eco-unit
5	Pockets with dense red alder and willow thickets
7	North-south riparian corridor in middle of stand with red alder and willow

Notes: See Appendix 2 for code definitions and specifics on forest characteristics

[1] Based on trees >3" dbh

[2] Additional plots will be installed during winter of 2005-2006

Table 7: Totals for Ecotype B

# of Plots	TPA[1]	95% CI +/-	BA[1]	95% CI +/-	D_q[1]	Relative Density[1]	95% CI +/-	Total Volume	95% CI +/-	Vol. DF	Vol. RA	Vol. RC
4	245	57	115	21	9	38	7	3.5	1.1	3.5	0.0	0.0

Notes: See Appendix 2 for code definitions and specifics on forest characteristics

[1] Based on trees >3" dbh

Figure 2: Stand Table for Ecotype B

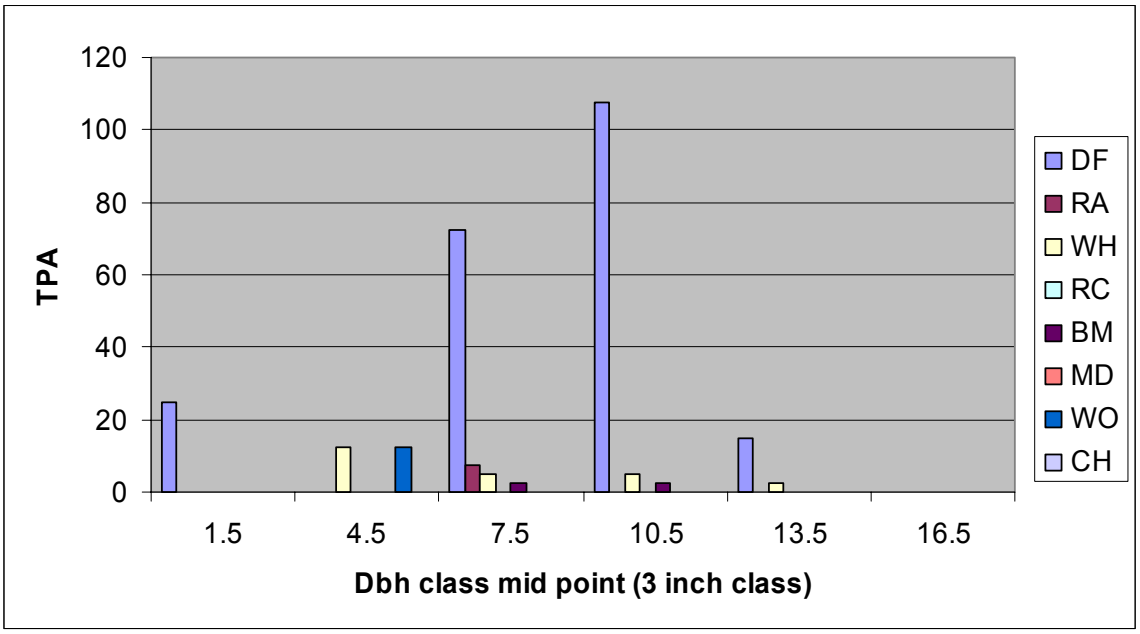

Table 8: Shrub cover, snags, and course woody debris (CWD) for Ecotype B

Shrub Species	Percent Cover	Mean Height (ft)
Salal	6.9	1
Evergreen Huckleberry	4.4	3
Sword Fern	4.1	2
Willow	2.0	6
Hazlenut	1.3	5
Cascara	0.6	5
Red Huckleberry	0.6	2
Service berry	0.6	2
Braken Fern	0.1	0
Himalayan Blackberry	0.1	3

Decay Class	Snags (per acre)			
	<12" Dbh	12-24" Dbh	>24" Dbh	CWD (ft^3/acre)
1-2	0	0	0	0
3	0	0	0	0
4-5	0	1	0	933
Total	0	1	0	933

Ecotype C: Douglas-fir-Hardwood-Cohort-Establishment

The 2 units in this ecotype were harvested in 1994 and have not been pre-commercially thinned. They were planted at wide spacing with Douglas-fir and some western red cedar. Natural regeneration of red alder, big leaf maple, madrone, willow, bitter cherry, and other hardwoods is moderately abundant and very dense in some places. Red alder and willow dominate portions of the northern unit and have overtopped the planted conifers. Shrub abundance and diversity is high and many shrubs are receiving enough light to produce large berry crops. Invasive species are moderately abundant, especially Himalayan Blackberry and Scots Broom. Snags, wildlife trees, and a few residual dominant trees were left after the harvest and provide some structural diversity. These stands are currently very diverse and provide high quality food sources and early seral habitat for many species. Inventory data for these units is not available as monitoring plots were not installed. Trees are not over 6"dbh and travel through the dense shrubs is extremely difficult and time consuming. Plots will be installed in the next 5 – 10 years.

Table 9: Summary data for Ecotype C

#	Unit	Acres
3	DNR-NW	20.3
10	DNR-S2	28.0

Ecotype D: Hardwood-Conifer-Mature

These units are mixed stands of red alder with Douglas-fir, western red cedar, western hemlock, big leaf maple, and madrone scattered throughout. The units are 60-80 years old. The red alder suffered significant mortality and top die back in the last few years and is in decline. In general, the units are low to moderately stocked with other

species and the remaining live alders. The conifers that are above the alder tend to be large and growing vigorously. In many areas, alder mortality has opened up the canopy and the diverse shrub layer is tall and dense. Invasive species are moderately common and consist primarily of English Holly, English Laurel and Himalayan Blackberry. Snags and CWD are moderate to highly abundant, and consist primarily of red alder. Red alder snags and CWD provide important foraging and cavity habitat, but they decompose quickly. Overall these stands are currently high in plant diversity and habitat value.

Table 10: Summary data for Ecotype D

Unit #	Unit name	Acres	# of Plots	TPA[1]	BA[1] (ft^2)	Total Volume (mbf)	Origin Year DF	Origin Year RA	Site Index
1	Solid Waste-W	33.4	2[2]	90	136	21.4	1925-1950	unk	Unk
9	DNR-S1	11.5	3	170	176	21.8	1940-1955	1944	97-RA
12	DNR-E2	8	0[2]	52[3]	113[3]	9.1[3]	unknown	1944-50	87-RA

	Unique features for each Eco-unit
1	High RA mortality, moderate conifer stocking
9	High mortality in places, high merch. RA stocking in others, moderate conifer stocking
12	High RA mortality in places, little conifer stocking, wet soils during winter months

Notes: See Appendix 2 for code definitions and specifics on forest characteristics

[1] Based on trees >3" dbh

[2] Additional plots will be installed during winter of 2005-2006

[3] Data from cruise done by Forest Stewards in 2003.

Table 11: Totals for Ecotype D

# of Plots	TPA[1]	95% CI +/-	BA[1]	95% CI +/-	D_q[1]	Relative Density[1]	95% CI +/-	Total Volume	95% CI +/-	Vol. DF	Vol. RA	Vol. RC
5	138	61	160	43	15	42	13	21.6	5.9	15.5	6.1	0.0

Notes: See Appendix 2 for code definitions and specifics on forest characteristics

[1] Based on trees >3" dbh

Figure 3: Stand table for Ecotype D

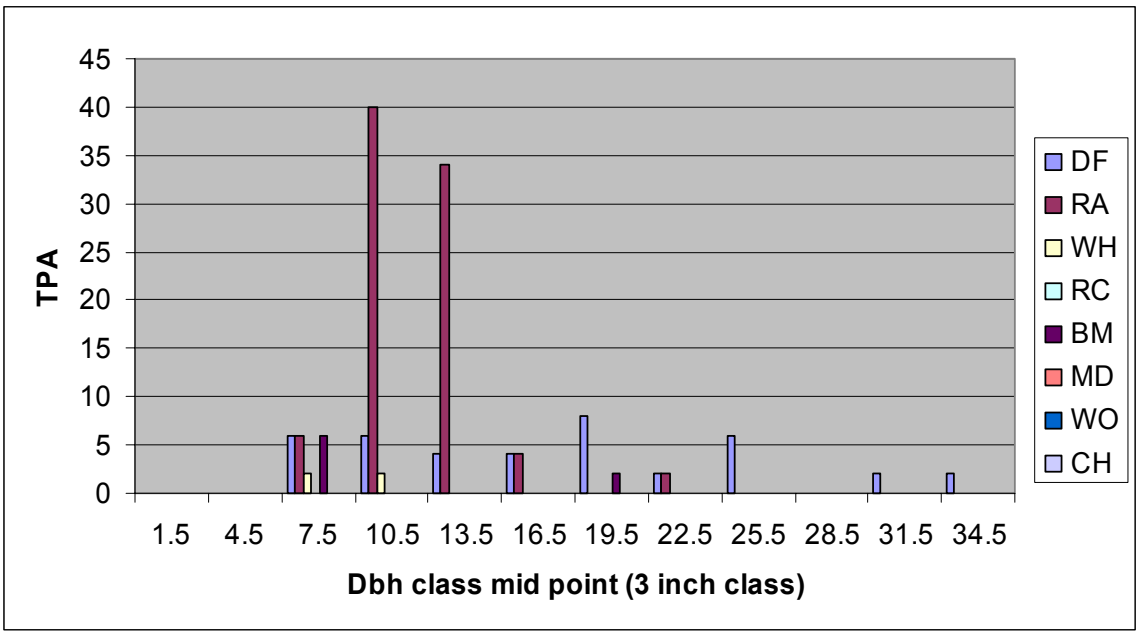

Table 12: Shrub cover, snags, and course woody debris (CWD) for Ecotype D

Shrub Species	Percent Cover	Mean Height (ft)
Trailing Black Berry	38.5	2
Salal	19.5	2.3
Salmon Berry	15.5	5.9
Braken Fern	13	4.3
Evergreen Huckleberry	11.5	3.3
Sword Fern	7.1	2.8
Hazlenut	5.7	7.1
Cascara	3	9
Indian Plum	3	5.8
Red Huckleberry	2.5	2.9
Oceanspray	2	3
Nettle	1.5	1.1
Red Elderberry	1.1	1.4
Deer Fern	1	0.4
Holly	0.1	0.4

Decay Class	Snags (per acre)			
	<12" Dbh	12-24" Dbh	>24" Dbh	CWD (ft^3/acre)
1-2	10	9	0	266
3	2	0	0	54
4-5	6	2	0	1680
Total	18	11	0	2000

Ecotype E: Mixed-Douglas-fir-Hardwood-Biomass Accumulation

This unit is similar to ecotype D, but it is younger and the alder has not begun to decline. Stocking is moderate and comprised of roughly equal proportions of red alder and Douglas-fir, with western red cedar, western hemlock, big leaf maple, madrone, and other early seral hardwoods scattered throughout. The Douglas-fir that are above the alder tend to be large and growing vigorously, while the overtopped Douglas-fir are suppressed and declining. In wet areas, quaking aspen and lodge pole pine are present. The unit is patchy and contains patches of dense Douglas-fir, numerous shrubby gaps, moderately stocked mature alder, and thickets of young willow and alder. Shrub diversity is high and invasive species are moderately common, consisting primarily of English Holly, English Laurel, English ivy and Himalayan Blackberry. Snags and CWD are moderate to highly abundant, and consist mostly of red alder with some large diameter conifer legacies from the previous stand. Overall this unit is currently high in plant diversity and habitat value.

Table 13: Summary date for Ecotype E

Unit #	Unit name	Acres	# of Plots	TPA[1]	BA[1] (ft^2)	Total Volume (mbf)	Origin Year DF	Origin Year RA	Site Index
14	Meadowlake	58.4	8	159	144	12.0	1955-65	1975-85	120-DF
Notes: See Appendix 2 for code definitions and specifics on forest characteristics [1] Based on trees >3" dbh									

Table 14: Totals for Ecotype E

# of Plots	TPA[1]	95% CI +/-	BA[1]	95% CI +/-	D_q[1]	Relative Density[1]	95% CI +/-	Total Volume	95% CI +/-	Vol. DF	Vol. RA	Vol. RC
8	159	57	144	36	13	40	11	12.0	3.5	7.7	4.3	0.0
Notes: See Appendix 2 for code definitions and specifics on forest characteristics [1] Based on trees >3" dbh												

Figure 4: Stand table for Ecotype E

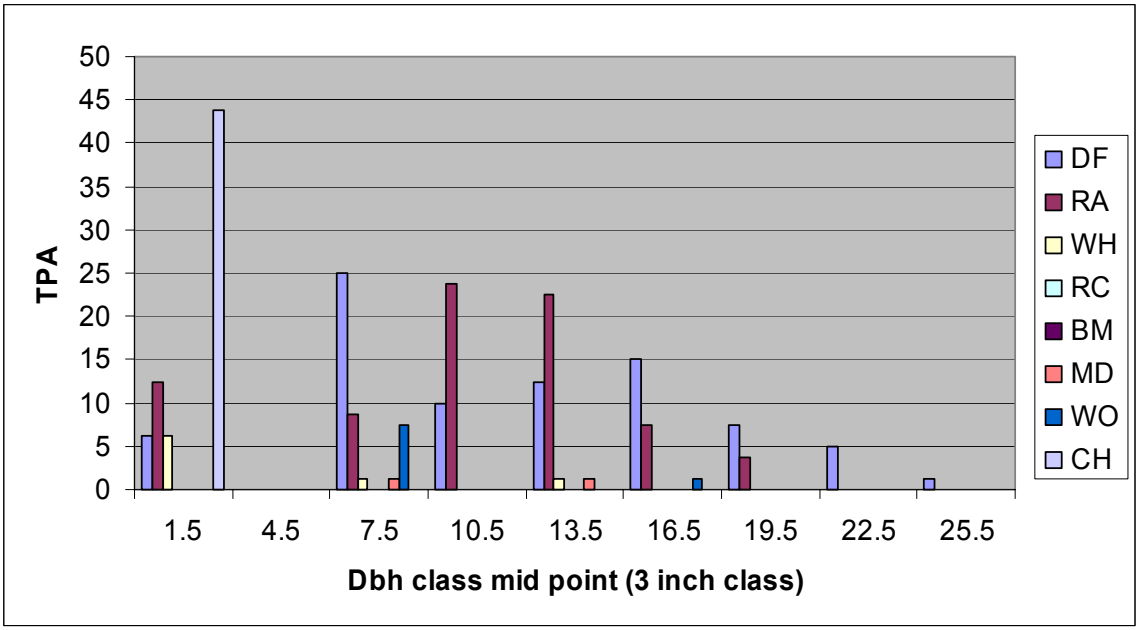

Table 15: Shrub cover, snags, and course woody debris (CWD) for Ecotype E

Shrub Species	Percent Cover	Mean Height (ft)
Trailing Black Berry	43	1
Indian Plum	22	6
Salal	21	2
Sword Fern	18	3
Salmon Berry	16	2
Braken Fern	9.4	3
English Hawthorne	9.4	4
Nettle	6.9	2
Cascara	5.9	6
Holly	4.1	4
Red Elderberry	3.8	3
Evergreen Black Berry	3.4	1
Himalayan Blackberry	2.9	1

Decay Class	Snags (per acre)			
	<12" Dbh	12-24" Dbh	>24" Dbh	CWD (ft^3/acre)
1-2	14	2	0	88
3	4	1	0	119
4-5	0	0	1	2475
Total	18	3	1	2682

Evergreen Huckleberry	2.5	1
Red Osier Dogwood	2.2	1
Hazlenut	1.3	1
Cutleaf blackberry	1	0
Red Huckleberry	0.6	1
Black Cap raspberry	0.3	1
Service berry	0.3	1
Bull Thistle	0.1	1
Unknown	0.9	0

Ecotype F: Conifer-Hardwood-Complex

This unit is situated along the main creek flowing out of the Island Center Forest and contains a diverse, structurally complex forest dominated by large diameter western red cedar. Douglas-fir, western hemlock, big leaf maple, and red alder are also present. The unit is well stocked and contains both understory and mid-story tree layers. Although the basal area is very high, competition is not intense due to the vertical distribution of the multi-layered red cedar canopy. Shrub diversity and abundance are moderate. The unit is patchy and contains dark areas with little understory vegetation and other areas with dense shrubs. Snag and CWD abundance are high and the stand provides high quality habitat for some species. Holly is abundant.

Table 16: Summary date for Ecotype F

Unit #	Unit name	Acres	# of Plots	TPA[1]	BA[1] (ft^2)	Total Volume (mbf)	Origin Year DF	Origin Year RA	Site Index
8	DNR-Riparian	11.2	1	130	335	45.4	1900 ?		unk
Notes: See Appendix 2 for code definitions and specifics on forest characteristics [1] Based on trees >3" dbh									

Table 17: Totals for Ecotype F

# of Plots	TPA[1]	95% CI +/-	BA[1]	95% CI +/-	D_q[1]	Relative Density[1]	95% CI +/-	Total Volume	95% CI +/-	Vol. DF	Vol. RA	Vol. RC
1	130		335		22	72		45.4	3.5	15.7	2.3	27.4
Notes: See Appendix 2 for code definitions and specifics on forest characteristics [1] Based on trees >3" dbh												

Figure 5: Stand table for Ecotype F

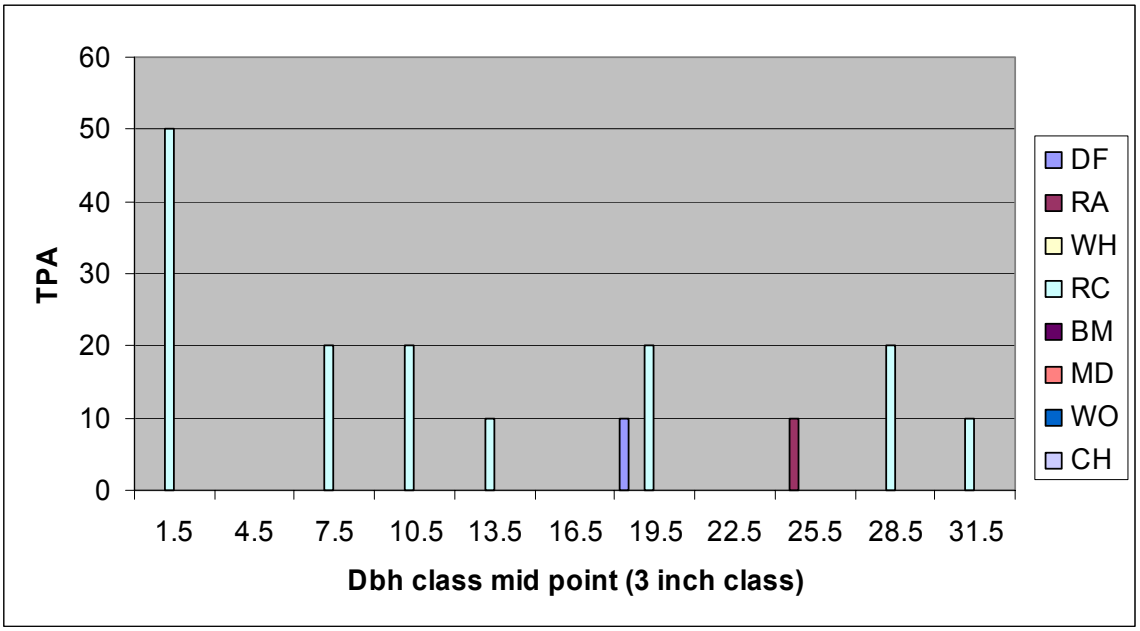

Table 18: Shrub cover, snags, and course woody debris (CWD) for Ecotype F

Shrub Species	Percent Cover	Mean Height (ft)
Deer Fern	13	1
Sword Fern	13	3
Holly	8	2
Red Huckleberry	5	8
Trailing Black Berry	5	1

Decay Class	Snags (per acre)			
	<12" Dbh	12-24" Dbh	>24" Dbh	CWD (ft^3/acre)
1-2	0	10	0	183
3	0	5	0	0
4-5	0	5	6	0
Total	0	20	6	183

Ecotype G: Grassland meadows

Aside from the meadow associated with Mukai Pond, there are two dry meadows in Island Center Forest, both the result of past clearing for fields or structures. One area lies approximately 100 meters south of Mukai pond at the end of the access road from 115th Avenue. The other is at the end of the access road entering from 188th and 107th. Neither meadow is large—one roughly 4 acres in area and the other less than 2 acres.

The meadow south of Mukai Pond was cleared early in the 20th century; 1936 aerial photos show the area already re-growing with shrubs. The maintenance of the open fields may have been the result of livestock given the fallen stock fences that surround the area. However, by the 1950s, trees had started invading the once-open area and had become established. The areas beneath the trees remained open, possibly the result of intense deer

browsing, although this is speculation. Today, the area is being invaded by scot's Broom and the Vashon Maury Island Land Trust has mounted a strong control effort coupled with tree re-planting to return the meadow to a forested condition. Grass species include velvet grass and orchard grass, with some Reed Canary grass in the wetter areas.

The meadow at the 188th/107th access is mainly the result of ground disturbance—clearing plus earth moving for road construction—and apparently has been maintained by constant vehicle traffic and refuse dumping in the area. Scot's broom and tansy ragwort dominate the disturbed area.

Table 19: Summary date for Ecotype G

Unit #	Name	Acres
15	Mukai_Meadow	3.8
17	188th_Meadow	1.8

Ecotype H: Wetland Scrub

The characteristics of this eco-type are described above in the wetlands section.

Table 20: Summary date for Ecotype H

Unit #	Name	Acres
13	Mukai_pond	13.6
16	Meadowlake_wetla	5.3

Table 21: Summary of inventory data for all units

Unit #	Eco-Type	Unit name	Acres	# of Plots	TPA	BA	Total Vol	Origin Year DF	Origin Year RA	Site Index
1	Hwd-Cnf_Mature	SLW-W	33.4	2	90	136	21.4	1925-1950	Unknown	Unknown
2	Df-Hwd_Mature	SLW-E	39.3	2	220	269	45.1	1905-1920	Unknown	120-DF
3	Df-Hwd_Cohort-Est	DNR-NW	20.3	0				1995	Unknown	Unknown
4	Df-Hwd_Mature	DNR-NE	18.9	4	140	235	45.6	1925-1945	1955	120-DF
5	Df-Hwd_Can-Close	DNR-W1	38.6	4	220	112	3.5	1986		140-DF
6	Df-Hwd_Mature	DNR-W2	16.8	3	137	273	56.7	1910-1915		109-DF
7	Df-Hwd_Can-Close	DNR-W3	17.3	0				1986	Unknown	Unknown
8	Cnf-Hwd_Complex	DNR-Riprn	11.2	1	130	335	45.4	1900 (est)	Unknown	Unknown
9	Hwd-Cnf_Mature	DNR-S1	11.5	3	170	176	21.8	1940-1955	1955-60	97-RA
10	Df-Hwd_Cohort-Est	DNR-S2	28.0	0				1995	Unknown	Unknown
11	Df-Hwd_Mature	DNR-E1-ValleyDF	31.0	0	166	249	46.8	1926-1940	Unknown	117-DF
12	Hwd-Cnf_Mature	DNR-E2	8.0	0	52	113	9.1	unk	1944	87-RA
13	Wetld Scrub_Cohort-Est	Mookai_pond	13.6	0				2005		
14	Mix-Df-Hwd_Biom-Acum	Mdwlk	58.4	8	159	144	12.0	1955-1965	1975-85	120-DF
15	Grassland_Cohort-Est	Mookai_Meadow	3.8	0				2000	2002	Unknown
16	Wetld Scrub_Cohort-Est	Meadowlake_wetla	5.3	0				2005		
17	Grassland_Cohort-Est	Mdwlake_Meadow	1.8	0				2000		Unknown

Fish and Wildlife

Island Center Forest provides valuable habitat for a variety of species mostly due to its large size relative to other forested blocks on Vashon Island and the presence of five significant wetlands. As discussed in the above section on vegetation, some of the forested eco-types are more valuable as habitat than others, due primarily to their seral stage and structural complexity. While formal wildlife surveys are not available, the presence of snags and coarse woody debris with evidence of foraging and cavity formation in some of the forest types suggests that various bird and mammal species likely use the site. Black-tailed deer are common throughout Vashon Island, and they likely inhabit Island Center Forest.

Mukai Pond is a high quality fresh water wetland that supports one of the island's few populations of Marsh Wrens. The brush immediately surrounding the pond is extensively used by a wide variety of thrush, warbler and sparrow species. Wood Duck, Mallard and Hooded Merganser are known breeders on the pond during the nesting season. Common Yellowthroat utilize shrubs growing in the canary grass and on the edge of the canary grass for nest sites. In spring migration and throughout the summer, several shorebird species forage in the exposed mud of the pond or wade in its shallow waters. Osprey, Great blue herons, eagles, and Red-tailed hawks are frequently seen hunting here. Surrounding forests support waxwings and four species of woodpecker. Vashon Audubon has recorded an extensive list of birds at Meadowlake, totaling over 70 different species (Appendix 3).

Mukai Pond and the Meadowlake Wetland have not been surveyed for amphibians, but it is assumed that a variety of amphibian species live in these water bodies. Of particular concern is the presence of bullfrogs in all of the wetlands, which are non-native and abundant. The bull frogs are likely having a negative impact on native bird and amphibian species. Localized concentrations ($1000/ft^2$) of less than 1/2" clams were seen in sections of recently dried and exposed muddy shoreline at Mukai Pond.

As mentioned, ICF forms the headwaters of Judd Creek, and the streams flowing off of the property provide habitat for several species of salmonid, including coho, chum and occasionally Chinook salmon, and cutthroat trout.

Existing Public Use and Infrastructure

This section describes public use, access points, and site infrastructure such as trails, roads, and utilities at Island Center Forest.

Public Use

As the largest publicly-owned open space on Vashon Island, Island Center Forest receives a great deal of public use. There is an extensive trail system that is used by hikers, equestrians, and mountain bikers. The ponds and wetlands are home to a variety of bird species and are a popular site for birdwatchers and wildlife photographers. There is also evidence of "paint-ball" activity on parts of the property.

In addition to allowed activities, there is a history of off-road vehicle (ORV) use, and this activity continues today, albeit sporadically. Hunting has traditionally been allowed on the former WADNR lands and occurred to a limited extent. Garbage dumping, and illegal camping also occur at times.

At present there are no facilities to support recreational use.

Access

There are several access points to Island Center Forest, but all of them lack sufficient parking. The access points are as follows (Map 8):

SW 184th St.: SW 184th St runs parallel to the north property line of the Solid Waste property in the NW corner of the site. There is a trail before the intersection with 125th Ave SW that heads south along the boundary of the transfer station and the Solid Waste property and then enters the forest before the beginning of a fence that separates the two. SW 184th St. is a private road along this stretch, so this is not technically a legal public access. However, it is used quite frequently by people accessing the trail system from the NW.

Two lots east of 125th Ave SW: It is possible to access the trail system at the south end of a private road off of SW Bank Rd, two lots to the east of 125th Ave SW. The properties on either side of the road where it meets the property are in the Public Benefit Rating System (PBRS), and the owners receive a tax credit for allowing use of the trails that cross their properties.

115th Ave SW (North side): At the south end of 115th Ave SW, two trails enter the property, but there is no parking at this point. Rather, a dirt road continues south east across a privately owned parcel before entering the Mukai Pond parcel. There is a dirt parking area at the end of the road just south of the pond. Technically, this is not a legal access, because it crosses private property. However, it is possibly the most used access point and provides a turn-around for horse trailers.

107th Ave SW: At the south end of 107th Ave SW, there is a trail that heads south into the NW corner of the Meadowlake property. However, the trail crosses a very wet area and thus does not receive a great deal of use.

SW 188th St./107th Ave SW: From the east, SW 188th St. abuts the SW corner of the Meadowlake property. There is a small pull-off where the road turns south and becomes 107th Ave SW. This pull-out is a popular point for accessing the trail system.

115th Ave SW (South entrance): 115th Ave SW heads north off of Cemetery Rd. and dead-ends at the property (legally, it passes through the property and continues to the north, but there is no road that actually does this). There is a small dirt parking area at this access point, but technically, it is on the neighboring privately-owned parcel. Furthermore, entering Cemetery Road from 115th is quite dangerous due to the difficulty of seeing approaching traffic on Cemetery Road. Regardless, this is a popular access point and one of the few that provides any parking, albeit not legal parking. There is a legal parking area across Cemetery Road from the property that can accommodate a couple of cars.

Cemetery Rd.: There is a trail that passes through a privately-owned parcel onto the former WADNR property one lot east of the western boundary of the property. This property is in the PBRS program, and the landowners are accepting of the equestrian use that occurs.

Trails and Roads

King County Parks staff conducted a detailed trail inventory in June 2005 (Appendix 4). There are 9.36 miles of gravel and dirt roads and trails on the site (Map 8). The width and condition of the roads and trails varies substantially. The gravel roads that were built by the WADNR in the 1980s and 90s have grown in somewhat but are generally in good shape, especially for recreational use. Several older roads have had their roadbed eroded by water flow and are in poor condition. Many of the trails are old logging roads, and some of these are in fairly good condition. Other trails have been created over time by recreational users, and many of these trails need attention - they are rutted and muddy, and there are numerous depressions that accumulate water in the rainy season. In addition, many of the trails created by recreational users are steeper than desired for reasons of safety and erosion. There are also many areas along the trails where invasive species have taken over, but these are addressed in the section on vegetation.

The Island Center Forest Working Group analyzed the trails inventory and rated the trails based on their level of use. The trails were categorized as Priority 1, Priority 2, or "Close". Priority 1 trails are those that receive the most use and should be prioritized for maintenance and repair. Priority 2 trails get used, but not as heavily, and are not high priorities for maintenance. "Close" trails receive minimal use and can be abandoned. Of the 9.36 miles of trail, 5.98 miles were categorized as priority 1, 2.06 miles were categorized as priority 2, and 1.36 miles were categorized as "close".

The assessment by Parks staff determined the maintenance needs for all of the trails. These needs include applying gravel to muddy and wet spots, applying 2" – 4" rock (underneath gravel) or constructing turnpikes in especially wet spots, and re-routing trails that were deemed to be too steep. Several culverts are recommended as well. Maintenance needs are summarized in the table below.

Trail work will not drive the need to generate forestry revenue from the site. The use of wood chips generated from forestry on the site instead of gravel will be considered to see if it is practical or economical.

Table 22: Trail maintenance needs

Priority	Gravel	2" – 4" rock	Turnpike	Re-route	Culverts
1	6777'	250'	392'	1177'	3
2	250'	0'	90'	3526'	4

Cultural Uses

It is reasonable to assume that Island Center Forest was used by Native American tribes for foraging, farming, harvesting wood resources, hunting, and other cultural uses.

Aesthetics

Because it is flat, Island Center Forest is not visible from any point on Vashon Island. The aesthetic values of the property are encompassed in the recreational use section above, as many of the recreational uses rely on the pleasing aesthetic of the forest environment.

Site Management Chronology

As mentioned above, the former WADNR property was owned and managed by WADNR until it was transferred to King County in 2005. WADNR is the only recorded owner in the history of the property. WADNR managed the land as a working forest, with the most recent harvest being 20 and 30-acre clearcuts that occurred in 1995.

With tacit approval from WDNR, the Vashon-Maury Island community has historically been quite active in managing the site. For example, members of the Vashon equestrian community have expended significant resources to maintain the trail system in ICF for use by equestrians, hikers and bikers. Other community members have installed barriers to vehicle access to help preserve the ecological values of the site. While the ad hoc nature of these community efforts has led to gaps in management and stewardship, it has also led to a strong community link to management of these lands. Maintaining that community link, through collaboration between the community and King County, is one of the fundamental objectives of this plan.

According to current Vashon residents the Meadowlake and Mukai parcels were managed as agricultural land up until the middle of the 20th century (Verbal communication with Craig Harmeling). Both Meadowlake and Mukai Pond were man-made in an effort to provide water for crops. At some point in the latter half of the 20th century, it became uneconomical to farm these parcels and the land was allowed to revert to forest. There were several attempts to develop the properties in the late 20th century, but development never occurred, and

eventually the money was raised by the Vashon Maury Island Land Trust and the island community to acquire the parcels and preserve them in their current state in perpetuity.

Analysis

The purpose of this section is to assimilate the information gathered through the inventory process and assess the input of the various constituencies with an interest in the site. This analysis provides a context and foundation for developing recommendations that meet the NRL program mission of protecting the ecological value of land and practicing sustainable forestry at Island Center Forest.

Ecological and Physical Setting

Forest and Meadows

As part of the planning process, King County staff convened a forest/ecology committee of the working group to discuss the desired future conditions of the forest on ICF from both an ecological and aesthetic standpoint. This group agreed that ICF should be managed to develop interior forest habitat with older forest structural complexity. This condition is defined as having:

- an overstory cohort of large trees (>36" dbh) with complex crowns
- multiple canopy layers, including shrub and herbaceous layers
- horizontal patchiness, including gaps
- wildlife trees: live trees with decadence and/or habitat structures
- large snags (>10" dbh)
- large course woody debris (CWD) (>12" larger end diameter and >15' in length)
- a diverse plant community including hardwood and conifer trees, tall shrubs, low shrubs, herbs, epiphytes, lichens, fungi, herbs, etc. Tree layers should contain a majority of conifers, but also contain a significant component of hardwoods.

ICF is one of the largest contiguous blocks of forest on Vashon Island. As the forested landscape surrounding ICF and on most of Vashon is fragmented and contains open, early-seral and edge habitats, the need for such habitats within the ICF is low. This does not mean that no early seral habitats will be created within the next 50 years. A significant proportion of ICF contains maturing red alder, which will result in early seral habitats as it dies off or is harvested. Also, canopy gaps are common in old forests and will be included in thinning prescriptions.

Using an ecologically oriented mix of variable density thinning, uneven-age management strategies, pre-commercial thinning, partial retention alder harvests, and managing for diverse stands, these desired future conditions can be achieved while producing a sustainable revenue stream.

The revenue projections listed in Table 20 (and in greater detail in Appendix 1) are based on these desired future conditions. This revenue is lower than what would be generated under a more traditional, even-age harvest regime, it is an acceptable and appropriate amount given the multiple goals and public benefits that ICF provides.

Specific analysis for each of the different ecotypes is as follows (Map 7):

Ecotype A - Existing natural processes will likely create desired older forest structures and habitat over time in these 60-90 year old Douglas-fir dominated units. These processes include: natural disturbance agents (laminated root rot, wind, etc); and natural stand development processes: self-thinning, crown class differentiation, and understory re-initiation. However, competition from high stocking, elimination of historical low and moderate intensity fires that periodically opened up the understory, and reduced seed sources for shade tolerant tree species will slow the pace of natural forest development and diversification. The timeframe required for older forest

habitats to develop can be accelerated significantly through thinning. As older forest habitats are in short supply on Vashon, accelerating their development is ecologically desirable from both a stand and landscape perspective.

Ecotype B - These 20 year old Douglas-fir plantation units will remain uniform and structurally simple for many decades to come if left alone. They will enter the competitive exclusion stage in 5-10 years, where most of the smaller Douglas-fir and many of the remaining tall shrubs will be shaded out and die off. Live crown ratios will recede and diameter growth will slow on the remaining trees. If thinned in the next 8-10 years, however, growth rates can be maintained, further loss of species diversity can be prevented, habitat value can be improved, and the development of older forest structures can be greatly accelerated. Dense red alder thickets would also benefit from pre-commercial thinning in the next 1-2 years. This will lead to more vigorous, healthier trees that can better withstand drought and outbreaks of tent caterpillars. Thinning will also ensure the development of merchantable trees in the next 15-20 years.

Ecotype C - Without intervention, these 10 year old plantation stands will undergo canopy closure in the next 10 years. Much of the shrub and tree diversity will be shaded out, and the habitat value of these units will significantly decrease. High density in patches of red alder, which comprise a significant percentage of these units, will lead to low-vigor trees with small crowns that are more susceptible to mortality from drought and tent caterpillars. An ecologically oriented pre-commercial thinning entry designed to create horizontal patchiness and prevent the loss of shrubs and hardwood species will shift these units onto a development path that more closely resembles a natural stand recovering from a major forest fire.

Ecotype D - These mature, hardwood dominated units contain few understory trees. Without disturbance to the shrub layer, natural regeneration will be very slow. As the alder continues to die off, the units will open up further and become sparsely to moderately stocked stands of large conifers and big leaf maples over a dense, tall shrub layer. While this forest type provides high quality habitat, it will be relatively common on Vashon as maturing alder declines across the island. By harvesting a portion of the alder before it dies, some revenue can be generated and an understory tree layer can be established through planting and natural regeneration. Sufficient alder should be left for soft snags, CWD, and aesthetic values. As the conifer overstory is already approaching the size and structure of older forests and the shrub layer is high in diversity, older forest structure will be achieved relatively quickly as the planted understory tree layer develops. As these units contain forested wetlands and seasonally wet areas, special care will be needed when designing restoration and harvesting activities.

Ecotype E - As this unit is a similar, but younger version of the previous ecotype, the management recommendations are also similar. By harvesting a portion of the alder before it dies, some revenue can be generated, and older forest structure can be achieved much more quickly by planting an understory tree layer. These units also contain forested wetlands and seasonally wet areas, so the same considerations apply.

Ecotype F – This unit is along the riparian corridors and is already developing old-growth characteristics. Thinning and planting are not necessary and should be avoided in this ecotype.

While most of ICF is forested, there are three areas of meadow in the northeast part of the site, north and south of Mukai Pond, and north of the SW 188th St. access point. The forest/ecology committee discussed the desired future conditions of the meadows and made recommendations as to their future management.

The meadow to the north of and adjacent to Mukai Pond likely provides habitat for various amphibians, small mammals and open grassland birds. Although the reed canary grass is dense, small mammal tunnels are easily found and Savannah sparrows are a common sight during late spring. There is a desire among constituents, particularly Vashon Audubon, to maintain the meadow as a meadow, and prevent it from becoming forested. However, the existing dense mat of reed canary grass coupled with the seasonal inundation of the area by overflow from Mukai Pond favors the continued growth of reed canary grass and tends to exclude other wet meadow grasses. If a more diverse plant composition in the meadow area is desired, the reed canary grass will have to be controlled by mowing, and possibly even by some removal. The King County Parks Resource Coordinator for Vashon Island agreed that it would be possible to mow the meadow once a year in order to

achieve this goal. However, mowing will destroy the encroaching aspens and shrubs from the northern border, so this issue needs more thought in order to determine the appropriate management actions.

The meadow to the south of Mukai Pond is less valuable as bird habitat because it is not adjacent to the pond/wetland. This meadow has trees scattered throughout it and is gradually becoming forested. It is also infested with scot's broom, a non-native weed. The forest/ecology committee agreed that it would be very difficult to prevent the succession of this forest to meadow and at the same time eradicate the scot's broom, as the most practical way to eradicate the scot's broom is to plant trees in the area and shade it out. All agreed that it would be acceptable to pursue eradication through a combination of hand removal and tree planting, and thereby allow the meadow to become forested over time.

Re-forestation efforts have already been initiated by the Vashon Maury Island Land Trust, and new plantings can be seen throughout the area. Nevertheless, scot's broom is a constant problem in this meadow since there are many seed sources in nearby areas. As the trees reclaim the meadow, invasion by the broom will become less of a problem, but source plants along the meadow and in the forest edge should be targeted for removal along with those in the meadow proper. If seed sources occur on adjacent properties, owners should be contacted to assess their willingness to join in the eradication effort. In the meantime, removal of invasives must be a constant management activity. A possible management tool is the use of various native shrubs and young trees to create a less porous edge between the forest and surrounding land uses. "Sealing the edge" restores a more natural and less invasion-prone boundary between the forest/meadow and the adjacent road/trail and between the forest/meadow and adjacent land uses.

Deer are common visitors to this meadow and can be seen grazing throughout the day, most frequently at dawn and dusk. Their preference for the new growth on newly planted conifer seedlings will also require diligent management to reduce the mortality of seedlings to acceptable levels. As the young forest matures, this grazing area will gradually be eliminated.

The meadow north of SW 188th St. is also infested with scot's broom, and all agreed that it would be prudent to let this meadow become forested as well. Mechanical removal of the scot's broom followed by planting of native tree species is recommended. Such an opening is a clear pathway for non-native plant invasions into the forest and should be "sealed" by creating a less porous edge and closing the gap in the forest. Alternatively, this area is being considered as a possible location for a parking lot, which would eliminate the scot's broom but convert the meadow into a gravel surface.

Streams

The major tributaries on the ICF site have their headwaters in mostly shallow, broad swales of the uplands that may be saturated during late winter and early spring, acting as variable source areas through the early to mid-summer. Further hydrologic evaluation of these headwater areas, particularly during the rainy season, is necessary to fully evaluate these functions. The downstream portions of these swales, prior to entering the ravines, generally have wetland characteristics to some degree, and tributary A flows through a large forested wetland before descending into the ravine at A2. The side slopes of the major ravines tend to be very steep and sandy, a combination that makes the slopes quite erodable. In one or two cases, the ravine edge has developed a shallow escarpment at the top as the sandy soil layer has separated from the duff layer. Certain of the stream channels show signs of degradation in the form of vertical incision and widening, possibly due to the hydrologic effects of past land uses and the modification of water courses due to road construction. Sedimentation is common in the lower reaches of the ravine channels, particularly in the flatter sections of the streams; the material may originate from erosion of the channel itself, from past road-based erosion, and from sideslope erosion. The results are shallow pools, high concentrations of fine sand in gravel bed material, and split channels in segment B2b. This sedimentation has the effect of spreading the already small flow across a broad wetted area, limiting the volume of summer rearing habitat for cutthroat trout and possibly juvenile coho salmon.

Given the susceptibility to erosion of the stream banks and the possibility of fish use, streams on ICF should be buffered from management activities. While exact buffer widths will depend on site specific circumstances, forest harvest should be limited in these areas. In addition, use of equipment should be avoided in the VSAs

during the wet season to avoid soil compression and the accidental re-direction, impoundment, and concentration of surface water. Culverts should be maintained unobstructed to avoid inadvertent impoundments upstream and the rapid release of flow into sensitive downstream channels.

Additional analysis is needed during a typical wet season to get a better understanding of the streams and their value as fish habitat. Sediment sources to the stream channels during late winter flows should be evaluated. Roadway and trail erosion, impoundments and culvert capacity should be identified. If necessary, a road/trail management plan that addresses sediment inputs to the small streams should be developed. These plans should include the possibility of retiring roads or trails where chronic sediment inputs are observed, re-routing trails away from stream courses, converting some current roads to trails, and re-grading road and trail crossings to eliminate standing water and overflow.

The channels should be visited in late April or early May to determine the extent of fish penetration into the streams on ICF.

Wetlands

Wetland #1: Mukai Pond Complex

The basin morphometry, hydrologic characteristic, floristic structure and diversity of wetland # 1, Mukai Pond, as well as its proximity to adjoining upland undeveloped forest, suggest it provides considerable wildlife value. Specifically, its open water component, mosaic of emergent shoreline vegetation and protected shoreline scrub-shrub and forest habitats most likely provide ideal habitat for a wide variety of amphibians, several reptiles (e.g., garter snakes, alligator lizards), a wide diversity and abundance of waterfowl, passerines (e.g., warblers, flycatchers and finches), shorebirds (e.g., sandpipers, killdeer), numerous furbearers (e.g., raccoons, weasels), and numerous species of voles, shrews and mole species. In winter the pond is a staging area for a considerable number of bufflehead prior to their continued migrations.

Native breeding amphibians in chronological seasonal breeding order most likely include long-toed salamanders, northern red-legged frogs, Northwestern salamanders, and Pacific treefrogs.

The meadow sub-unit provides overall low functions as a typical wetland in that the hydrology (and groundwater recharge), water quality enhancement, and habitat functions are minimal when compared against reference wetlands of equal area. Nevertheless, this wetland provides unique function as wintering and spring bird habitat when the area is totally flooded. Waterfowl especially find food in the shallower areas. Protected meadows of such size in proximity to forests and permanently flooded aquatic areas such as Mukai Pond are relatively rare and therefore may warrant management.

Wetland # 2: Meadowlake Complex

The Meadowlake wetland complex is a large palustrine (lake-like) wetland protected on all sides by forest and therefore most likely providing secluded habitat for a large variety of vertebrates that find water at the lake to drink and food and shelter within its buffer and nearby forests. Although habitat functions seem to be best represented by this wetland, its size, structure and position on the landscape suggest it also serves important hydrological and perhaps water quality functions.

Wetland #3: Flooded areas south of Meadowlake Complex

This extensive area is the result of overbank flooding from the small stream that exits Meadowlake Pond into this broad, shallow swale. The hummocky topography of the area suggests that areas of shallow water may persist into the breeding season of many amphibians that occupy ICF. In particular, northern red-legged frogs, Northwestern salamanders and Pacific treefrogs are likely to use this area for breeding and rearing. In winter, juvenile salmonids, particularly coho and cutthroat may occupy the flooded areas outside of the streamcourse as

over-wintering areas. Such backwaters and flooded flats require less energy to occupy and may have ample food supplies during the normally food-poor winters. However, no formal surveys for either amphibians or salmonids have been conducted.

Because of the large area subject to overbank flooding and saturation, this area probably provides some late season return flow to the small stream that flows through the swale. This flow support may continue even into early summer in some years and thus provide feeding and rearing habitat for emerging young salmonids, especially cutthroat trout that occupy the stream. Observers noted two large cutthroat in pools at the upper end of the complex in late 2005. The stream is certainly large enough to support these fish, and this overbank area would provide excellent habitat for rearing.

Wetland Grouping #4 (A, B, C &D): Riparian wetlands associated with intermittent streams and low lying areas

These areas tend to be confined to the bottomlands of the many ravines that cross the Island Center Forest. Their soils do not reflect permanent saturation and any streamflow is probably confined to a few days after rain events. In the flatter portions of the areas, vegetation indicative of wetland areas is present but never dominates the plant communities. The role of these streams as habitat for salmonids is unknown although, at least for the ones surveyed, surface flow was insufficient to create a continuous path to a larger stream in any but the largest rain events. Even during large rain events, surface flow connectivity probably does not last long—on the order of a few hours to a few days. However, as mentioned above, these intermittent flowages often provide habitats for overwintering amphibians, and occasionally for breeding groups.

Wetland #5 (Off 115th Ave SW)

This wetland is formed atop Alderwood soils in the moderately deep (approximately 30 to 45 feet), east to west trending swale. The water source appears to be shallow groundwater movement from the surrounding catchment that collects in the now-closed depression. There may be shallow groundwater movement beneath the road but no surface water was visible in the continuation of the swale to the east of 115th SW. Since the hydrologic inputs to the wetland are strongly seasonal, the appearance of standing water in the wetland is also seasonal; a visit to the wetland in early April of 2006 revealed an area of standing water much diminished from the earlier visit. The wetland likely provides breeding ground for long-toed salamanders and pacific treefrogs, and perhaps moist environments for metamorphs and adults of a variety of amphibian species during the spring and early summer depending on when this area dries up. It also provides some unique habitat in this area and therefore most likely attracts bird and mammalian wildlife as well.

Given the dependence on the surrounding small catchment for its source of water, the wetland's hydroperiod will be very sensitive to changes in land cover over even a small percentage of the catchment. For that reason, rather than buffering the wetland according to the FPA rules or KC CAO rules, activities that diminish the forest cover should be kept completely out of the catchment. Furthermore, trails should be kept off the steep southern and northern slopes.

Installing a culvert under 115th Ave SW could provide a hydrologic connection with Mukai Pond, but the benefit of this is uncertain.

Wildlife

While there are clearly information gaps regarding wildlife use of ICF, it is also clear that providing wildlife habitat is an important goal for members of the working group. In particular, Mukai Pond is highly valued by birdwatchers and provides important habitat for a wide variety of bird species, some of which are relatively uncommon on Vashon Island.

The rest of the forest is less of a focus from a habitat standpoint, but it is important nonetheless, as it provides a large tract of open space in a relatively developed area. The management of the forest, using primarily variable density thinning techniques, will improve the habitat value of the forest over time.

As discussed above, wetland areas likely provide habitat for a variety of species. However, it is clear that the abundance of non-native bullfrogs in Mukai Pond is a problem that needs to be addressed.

Public Use and Infrastructure

Existing Uses

The vast majority of the recreational use at Island Center Forest is on the trail system by hikers, equestrians and mountain bikers. All of these trail uses are acceptable and encouraged. In addition to these uses, the following activities are also common on ICF:

Bird watching – the areas around the wetlands are popular for birdwatchers, as they attract a large variety of birds. This activity is encouraged, and all agree that efforts to preserve the bird habitat around the wetlands are appropriate. It was suggested that a bird blind be constructed on the shores of Mukai Pond.

Paintballing - The area known as the Valley of the Firs is used by groups of "paintballers".

ORV riding - In the past, many of the trails have been used by ORV riders, and at least one area has traditionally been used for "mud bogging". ORV use is prohibited on King County Natural Lands, and the working group supports this prohibition. Efforts are underway to put a stop to it. Gates have been installed at several of the entrances, and King County Parks staff is monitoring the site for ongoing use by ORVs.

Hunting - ICF has also traditionally been used by hunters. As the largest publicly owned piece of forestland on the Island, it is the logical place for hunting to occur. Hunting is prohibited on King County Parks and Natural Lands, but exceptions to this rule are possible in special circumstances. NRL staff is exploring the possibility of allowing a limited amount of hunting on the site, pursuant to Washington State laws. The working group supports limited hunting if safety concerns can be addressed. However, the details of any hunting plan should be vetted and coordinated with the working group.

Camping/squatting – There have been several illegal camps found on ICF. Camping is not permitted on King County Parks and Natural Lands except under special circumstances. King County Parks staff will continue to monitor the site for illegal camps and remove them when they are found.

Garbage dumping – There have been several occurrences of garbage dumping at the end of 115th Ave SW off of Cemetery Road. King County Parks staff will continue to monitor this location and work to address the problem. In the future, offenders will be reported to the sheriff's office.

Trails

As stated in the vision and management goals developed by the ICF Working Group, passive recreational use is a high priority on Island Center Forest. The trails system is used frequently by hikers, equestrians and mountain bikers, and there is no conflict among the different user groups. In general, the local community is happy with the existing trail system, although all agree that there are places that are quite wet during the rainy season.

The trail inventory completed by King County Parks staff suggests that parts of the trails system are in need of repair, and some trails should be closed or re-routed. When Parks staff discussed their results with the trail users on the Working Group, there was consensus on the priorities and repair recommendations shown in Map 8 and outlined in detail in Appendix 4. One note is that while all agreed that there should be a dry route along all of the trails, the equestrian representatives expressed interest in having at least one or two wet areas on the site in which to train their horses.

Other concerns and desires regarding the trail system include the following:

There should be one or two small loop trails that are ADA accessible. The most likely place for one of these is next to Mukai Pond.

While people are generally accepting of dogs on the rest of the site, there is concern that dogs are disruptive and potentially damaging to the wildlife habitat in and around Mukai Pond and Meadowlake, particularly the bird life. Given that the Meadowlake property was purchased to preserve its natural attributes, all agreed that it would be appropriate to develop a formal entry way at the head of the trail leading to the pond. This entryway would be posted with signs stating that dogs are not welcome and giving the reasons that dogs can be damaging to the habitat.

There is a need for trail signs throughout the site. These signs should be posted at trail intersections and include distance and directions that coordinate with a published trail map. Their main purpose is to help people avoid getting lost. They should be as unobtrusive as possible.

Access

While members of the working group are generally satisfied with the trail system, they are not satisfied with the access to the site. As stated above, there are seven locations where the general public is able to access the site. However, all of these locations lack adequate parking, particularly for horse trailers.

The Working Group strongly encouraged the development of at least two parking areas, one on the west and one on the east side of the site. Ideally, there would be four parking areas, one on each side of the site. On the west end of the site, the group encouraged the establishment of a parking area on the already developed part of the Vashon Transfer Station, which is adjacent to ICF on its west side. However, after several discussions with staff in the Solid Waste Division, it is apparent that this is not a feasible option for several reasons, including liability, environmental concerns associated with the landfill, and the practicality of managing the gate for open and closed hours. What may be an option is the development of the northern part of the Transfer Station site, which is outside the fenced area. This part of the site can be accessed off of SW 184th St or Westside Hwy SW. NRL staff is assessing the feasibility and cost of establishing a parking area at this location.

On the north side of the site, the obvious location for a parking area is at the end of 115th Ave SW. Where the pavement ends, a dirt road heads southeast across a privately owned parcel before entering the Meadowlake parcel. There is a dirt parking area at the end of the road just south of the pond. As mentioned above, technically, this is not a legal access, because it crosses private property. NRL staff is looking into the possibility of establishing a legal public access along this road, as development of a gravel parking area at the end of it would be very easy.

On the east end of the property, SW 188th St. abuts the SW corner of the Meadowlake property. There is a small pull-off where the road turns south and becomes 107th Ave SW. This pull-out is a popular point for accessing the trail system, but the parking is limited to one or two cars along the side of the road. From the site boundary, there is an existing road that heads north into the property and is used as a trail. The entrance is currently gated, so vehicular access is prohibited. However, it might be feasible to develop a parking area about 300 feet up that road in what is now a small clearing in the forest. NRL staff is assessing the feasibility of developing a parking area at this location.

On the south side of the site, 115th Ave SW heads north off of Cemetery Rd. and dead-ends at the property. There is a small dirt parking area at this access point, but technically, it is on the neighboring privately-owned parcel. This is a logical place to develop a more formal parking area on the site. However, where 115th enters Cemetery Road, there is not good visibility, which makes this a dangerous place for trucks with horse trailers to pull out.

NRL staff will continue to pursue the development of at least one, and possibly more than one, parking area. This is a high priority in the development of the site.

Other Infrastructure

Aside from parking areas and trails, there are relatively few infrastructure needs at ICF. The Working Group discussed the following:

Signs – In addition to the trail signs mentioned above, trail maps should be posted at all access points and on the web, along with signs that state the site rules and any other interpretive information. King County staff will also post signs that have the name of the site and identify it as a King County Natural Land, along with site-specific rules. Additional signs should be posted when timber harvest is occurring. These signs should warn the public of the potential danger of harvest operations and any trail closures, as well as any educational information about forest management.

Bathrooms – All agreed that bathrooms are not necessary at parking areas or other access points. Indeed they would likely be vandalized, so should not be installed.

Wetland "entrance" – As mentioned above, the Working Group discussed the need for a formal "entrance" at the head of the path that leads to the wetlands. The "entrance" would inform visitors that they are entering a sensitive area and state that dogs are prohibited.

Bird blind – It was suggested that a bird blind be constructed at Mukai Pond for use by birders. One member of the working group thought this would be a good Eagle Scout project.

Information Gaps

While a great deal of field work has been accomplished at Island Center Forest, there remain several gaps in the collection of information. Filling these gaps will inform the decision making process when this plan is adapted in future years. The gaps are as follows:

Forest inventory: time limitations and the difficulty of entering one of the young forest stands prevented the establishment of several inventory and monitoring plots. In particular, no plots were established in ecotype 3, and fewer plots than proposed were established in some of the other stands. The Vashon Forest Stewards plan to install 12 more plots in various stands in the summer of 2006, and an additional 7 plots in ecotype 3 once canopy closure occurs and the understory becomes less dense.

Mammal and amphibian inventory: while Vashon Audubon has developed a long list of bird species observed at ICF, there is relatively little information about mammals and amphibians. Formal inventories, particularly of birds and amphibians, are important factors in determining forest management and restoration activities, particularly in the wetlands.

Steams and wetlands: King County ecologists completed a cursory analysis of the streams and wetlands on ICF in both August and January, but there is a need for more in depth study. Additional analysis will determine the extent to which some of the streams contain flow and the precise extent of the wetlands.

Legal access: some questions remain about the legality of several of the access points that the public currently uses to access ICF. In particular, the access off of SW 184th St. and that off of 115th Ave SW on the north side of the property. Additional property research is needed to determine what steps might be needed to comply with any restrictions.

Information from this list should be included in each ten-year revision of this plan, and a new list of research needs should be added if necessary.

Management Goals, Objectives, and Recommendations

The objectives and recommendations in this section are based on the information gathered to date and the input of the various constituents involved in the planning process. Natural Lands Program staff will revise the recommendations for Island Center Forest as new information from ecological inventory, site monitoring programs and other initiatives becomes available for use in land management decisions.

Management Goals

As listed at the beginning of this document, the management goals for ICF are as follows:

1. Involve the community in managing ICF; management activities on ICF will be undertaken in collaboration with the community.

2. Protect and restore the wetlands, riparian areas, and other sensitive or unique habitats.

3. Conserve and restore wildlife habitat for a diversity of species; especially sensitive, threatened, or rare species.

4. Conduct ecologically sustainable forest management that recognizes and enhances habitat and recreational values while producing a sustainable flow of wood products.

5. Provide opportunities for low impact recreation and natural resource education.

6. Manage the land within the ecological and human context of the surrounding landscape.

7. Use any revenue produced through ecologically sustainable management of the site to support the stewardship of King County Natural Resource Lands.

8. Review this plan every ten years, adding ten years to the planning horizon.

The objectives and recommendations that follow are designed to support these goals.

Management Objectives and Recommendations

Collaboration with the Community

Various organizations and individuals in the Vashon-Maury Island Community have worked for years to have ICF transferred out of WDNR school trust land status to allow more local control and management of the property. Community organizations and individuals feel strongly about how the property should be managed. While King County is the owner of the property, the County recognizes that successful management of ICF can only occur through collaboration with the local community.

In furtherance of this objective, King County will collaborate with the local community to manage ICF. The Vashon community is evaluating the formation of a "Friends of Island Center Forest" group that would serve as an advisory body and collaborate with King County staff in the decision making and implementation of this plan. This group would consist of representatives from the groups involved in the planning process and possibly additional members. An agreement between King County and the Friends of ICF will be formalized before significant management activities (*e.g.* timber harvests or trail re-alignments) occur on the site. Revenues from timber harvest activities undertaken on the site should be used to fund this collaborative management effort.

Preserve and Protect

Perhaps the top priority in the management of Island Center Forest is to maintain the site in its relatively healthy condition. As mentioned above, the site has a history of garbage dumping, off-road vehicle driving and squatting. The King County Parks Resource Coordinators are responsible for addressing these activities when they occur and, as funding allows, they will continue to monitor the site on a regular basis and respond to complaints of this nature. The cooperation of local citizens, neighboring landowners, and the many individuals who use the site will greatly assist this process.

Specific recommendations to protect the property include the following:

- Place a gate near the end of 115th off of Cemetery Road that prohibits people from dumping garbage in this area. The exact location of a gate will depend on whether or not a more formal parking area is established at this location.
- Place a gate at the entrance to the Mukai Pond parking area. This area receives a great deal of use and has been used recently for four-wheeling. It is a possible location for a more established parking area that could accommodate horse trailers. The logistics of placing a gate at the entrance will need to be addressed and may be difficult to resolve.
- Post identification and rule signs. King County has established standard signs that identify parks and natural areas as being owned by King County and also communicate rules for the sites that are mandated by law.
- Establish a "No Dogs" entryway along the path leading from the Mukai Pond parking area to the pond itself. The entryway would create a visual boundary beyond which dogs would be discouraged.

Forest Management

Management within ICF will be guided primarily by natural forest restoration, aesthetic, and wildlife habitat objectives. However, this management will also factor in the goal of harvesting trees on an ongoing basis to generate revenue and high quality logs for local processing. While general goals and projections regarding harvest levels and revenue generation are incorporated into this plan, harvest levels will be not be driven by the need to meet specific dollar revenue targets. Rehabilitation and restoration projects associated with impacts of harvest activities will be factored into harvest costs and thus directly funded from harvest proceeds. These may include planting, trail rehabilitation, road decommissioning or improvements (i.e. stream crossings); as well as periodic invasive species removal, seedling maintenance (shrub and browse control) and monitoring for a period of up to 5 years post harvest.

Thinning prescriptions and harvest levels will also be guided by monitoring, adaptive management, and continuing community involvement. Data from the system of monitoring plots will be used to ensure that the forests are not being over-cut and that the total standing volume is not declining over time, although some short term dips and fluctuations will occur. Results from vegetation, aquatic, and wildlife monitoring, and new scientific knowledge will be incorporated into harvest decisions and thinning prescriptions to ensure they are indeed resulting in older forest structure and not simplifying stands, removing too much biomass, or resulting in widespread invasion by non-native weeds. All major management decisions will be conducted in an open manner in collaboration with Vashon-Maury Island community.

Riparian areas, wetlands, and other sensitive areas will be identified prior to any management activities and appropriate strategies will be designed to protect or restore hydrological function at both the stand and watershed scales. All roads will be brought to required standards for harvest activities and then be allowed to grow in. New roads will not be constructed, except in limited cases where existing, erosion-prone old road beds or wide trails need to be improved. All forestry operations will be done with machinery that is appropriate for the site and does not significantly damage soils. In general, this will mean processors and forwarders. On soil types that are not prone to compaction when wet, operations will be done in winter months to minimize disturbance to wildlife and conflicts with recreational users. Other soil types will require that operations be conducted during the dry season. Major operations will occur every 2-4 years and typically last 3-6 weeks. They will be concentrated in one or two eco-units that are close together so that only a small portion of the entire site will need to be closed to recreation. Neighbors will be informed of operations and noise will be kept to a minimum. Minor operations such as planting, shrub control, invasive removal, trail re-habilitation, and pre-commercial thinning will take place more frequently, but will not require trails to be closed for more than a few days, if at all.

New information from forest monitoring will be analyzed and factored into each forest prescription. In general, the existing gravel roads built by the WADNR combined with county and private roads that access the edges of

ICF will provide adequate access for forestry operations. The DNR roads will need to be cleared to at least 8' in width to allow for access by logging trucks and possibly gravelled in some areas. Keeping these roads open will allow for vehicle access in the case of a hiking or riding accident and also greatly facilitate fire suppression in the event of a forest fire. Shrubs will quickly grow back and make these roads more aesthetically appealing.

During thinning operations skid trails will be created, and existing hiking/riding trails will be damaged. After operations are finished in a unit, the trail system will be re-habilitated. At this time, old, low priority trails can be closed and new trails can be created easily on former skid trails.

Management objectives for the forests on ICF vary by eco-type and are discussed below.

Ecotype A: Douglas-fir-hardwood-mature

Variable density thinning (VDT) is the recommended management strategy. This thinning approach was used in a similar forest type in 2004 at Agren Park. VDT works with natural stand development processes to mimic natural disturbances like low intensity fires or windstorms by thinning at different densities through the stand to create horizontal patchiness that is similar to the spatial complexity found in old growth forests. VDT prescriptions should include:

- Creation of patches of different densities with a range, size, and pattern that is appropriate for habitat goals, operationally efficient, and based on the existing forest structure of each unit. In general, 4-5 densities should be created: no-entry areas, light thin, moderate thin, heavy thin, and gaps.
- No-entry areas to protect sensitive areas and for high density patches (5-15% of unit).
- Gaps up to ½ acre in size covering 5-15% of each unit. Existing gaps from laminated root rot or other causes may preclude the need for gap creation.
- Protection & release of minor conifer species (i.e. - western red cedar, western hemlock) and long lived hardwoods (i.e. big leaf maple, madrone).
- Protection and creation of snags, wildlife trees, and coarse woody debris (CWD). Pulp wood, especially large diameter pulp logs, should be left on-site, and where needed, merchantable saw logs should be left on the ground as well. Existing snags should be protected unless operational safety is a concern. High stumping can be used in some places to create short snags, and high girdling can be used to create tall snags and wildlife trees where needed.
- Laminated root rot pockets should be treated on a case by case basis. Small pockets in units with few gaps or snags may be left for 1-2 thinning entries to naturally create structural diversity. Large pockets in units that are heavily infected should be thinned heavily to slow or contain the spread of root rot to prevent loss of large areas of dominant conifers. Pockets should be planted with resistant species after treatment.
- Slash and tops should be left in the forests to recycle nutrients and used on skid trails to minimize soil compaction.
- Planting of under-represented conifer and hardwood tree species and shrubs to supplement natural regeneration. Shade tolerant tree species should be planted in patches of moderate overstory stocking (25-45 Curtis RD or 20-40% full sunlight) and shade intolerant species in gaps or patches of heavy thinning (<25 RD or >40% full sunlight). Planting densities should be based on creating forest structure that mimics natural forest development as well as ensuring adequate stocking for future thinning entries and take into account natural regeneration, especially by red alder, maple, and other hardwoods.
- Ongoing monitoring and control of invasive species after thinning.

Thinning entries should remove 15-30% of the standing volume and occur every 10-15 years in each unit. The first entry will look similar to the thinning project at Agren Park. In some cases, an entry may need to remove up

to 40% of standing volume to open up the overstory sufficiently to allow for development of an understory tree layer. Subsequent entries would then be between 15-30%. As there are 3 of these units owned by KC-DNRP and 1 owned by KC Solid Waste, 1 unit should be harvested every 2-4 years. This will provide a more even revenue stream, work flow, and source of logs for local processing on Vashon, and allow for adaptive management as new information and learning can be applied to subsequent thinnings.

Average overstory stocking should be gradually reduced over multiple thinning entries towards overstory densities found in old growth stands: 10-30 large (>36"dbh), overstory trees per acre (15-30 Curtis relative density). This will decrease the likelihood of thinning shock and wind damage and allow for trees to respond and re-occupy the available growing space. As the overstory is slowly opened up, understory and mid-story layers will develop and overall stand density will be much higher. These multi-layered, diverse stands will provide older forest structure and opportunities for uneven-age management in the future.

During the first several thinning entries, the thinning pool should include trees from all but the upper quartile of diameter classes, unless necessary to release minor species. Douglas-fir and some red alder should be the only species removed, unless forest health concerns demand otherwise. This should generate 10-15 mbf (thousand board feet) per acre for each entry. As road construction costs will be low, net revenue will depend on logging costs and log prices. At current (August 2005) prices, net revenue would be $250-350/mbf or $2500-$5000 an acre (logging and trucking costs @ $300-350/mbf and log prices @ $500-650/mbf). Planting, trail rehab, ongoing invasive species removal, and shrub control around seedlings after thinning entries will be necessary. Over time, the understory tree layer may need some pre-commercial thinning if natural regeneration creates dense thickets.

In later thinning entries, thinning strategies may need to shift towards thinning other species and removing some larger diameter overstory trees to release mid-story trees. These multi-species stands will be more resistant to climate change, pathogens, and insects, and be less vulnerable to price fluctuations of particular species. A greater emphasis on regenerating Douglas-fir and recruiting it into the mid-story through gap creation may be necessary as it becomes under-represented. Some gaps may need to be larger than ½ acre for this purpose.

Ecotype B: Douglas-fir-Hardwood-Canopy-Closure

Variable density thinning is recommended. Prescriptions should follow the description of VDT explained for Ecotype 1 with the following modifications:

1. Gaps and heavy thin patches should be located around existing gaps and hardwood thickets. Existing wolf trees (trees with lots of large limbs) on the edges of gaps should be left in most cases when expanding gaps to grow into large diameter trees with complex crowns.
2. Planting of understory trees should be concentrated in gaps and heavy thin patches for the first several thinning entries. Other patches will remain too dark for seedlings to maintain sufficient growth. Planting densities will thus be lower than in Ecotype 1.

Thinning entries should remove 15-40% of the standing volume and occur every 10-15 years in each unit. Average overstory stocking should be kept between 30-45 Curtis RD for the first several thinning entries to prevent intense competition, ensure the development of large diameter trees, and also maintain sufficient density for future thinning entries. Once these units reach maturity, they should then be gradually reduced towards overstory densities found in old growth stands: 10-30 large (>36"dbh), overstory trees per acre (15-30 Curtis relative density). Mid-story layers of shade tolerant species will develop after the first few thinning cycles and thus overall stocking will be higher. During the first several thinning entries, the thinning pool should include trees from all diameter classes. Some dominant and co-dominant trees can be removed to release smaller Douglas-fir that have sufficient live crown to respond to thinning. Douglas-fir and red alder should be the only species removed, unless forest health concerns demand otherwise. In later thinning entries, thinning strategies will likely include thinning other species and some thinning from above to release mid-story trees.

These thinning strategies should generate 3-4 mbf per acre for the first entry and 8-10 mbf for the second entry. At current prices, net revenue would be $600-1000/acre for the first entry. Planting, trail rehabilitation, ongoing invasive species removal, and shrub control around seedlings after thinning entries will be necessary.

Ecotype C: Douglas-fir-Hardwood-Cohort-Establishment

Pre-commercially thinning the red alder/willow patches in the next 1-2 years to 150-200 TPA is recommended. Removing some willows and smaller diameter alders will improve vigor and resistance to dry summers and tent caterpillars, and allow trees to develop into merchantable size classes by age 25-30. If thinning is delayed, the rapid diameter growth of red alder during its early years will be lost. Thinning the red alder will also allow the over-topped conifers to persist in the understory and maintain adequate live crown ratios and release potential. Once the red alder reaches merchantable size, it can be harvested to generate significant revenue and release the over-topped conifers. This harvest can be done in one entry or over several entries and should be combined with the first commercial thinning of the conifers in the rest of the units. Some alder should be left for habitat and to continue to add nitrogen and organic matter to the soil.

In addition, some Douglas-fir should be thinned to prevent complete canopy closure and loss of shrub and tree diversity, and set the units on a trajectory towards a diverse, structurally complex forest. In both units combined, 10-15 patches, 1/20th – 1/6th acre in size, should be selected that contain a high diversity and abundance of native shrubs and only Douglas-fir trees. All the Douglas-fir within these patches should be removed to prevent the shrubs from being shaded out. If patches with few trees can be found, these should be selected. An additional 15-20 patches of the same size range should be left containing 1-2 vigorous conifers, preferably red cedar or hemlock. Finally, a target of 10-30 non-alder, vigorous hardwoods per acre should be pursued. Douglas-fir surrounding target hardwoods should be removed where necessary to prevent them from becoming overtopped and falling out of the stand in the next few decades.

Areas that are dominated by Himalayan Blackberry or Scots broom and contain few other shrubs or trees should be cleared and planted with a selection of conifers, including resistant western white pine, western red cedar, and western hemlock. Follow-up control of the invasives will be necessary until the trees are above shrub height and free to grow.

These units should be ready for their first commercial thin by age 25-30. A variable density thinning approach similar to that described in eco-types 1&2 should be used, although these stands will already be fairly patchy. Primarily red alder and Douglas-fir should be harvested. After that, the units can be thinned every 10-15 years and a variety of species can be selected for harvest.

Ecotype D: Hardwood-Conifer-Mature

A partial retention alder harvest is recommended that removes most of the merchantable alder. Alder snags and trees with little or no saw log value should be left standing for habitat. Openings of larger than ½ - 1 acre should be avoided for aesthetic reasons, especially near trails. This can be accomplished by creatively breaking up harvest areas with the remaining conifers, big leaf maples, and clumps of retained alders. As much of the alder has died or has suffered top die off, a large amount of alder will be left as wildlife trees, snags, and CWD. Similar to variable density thinning, snags, wildlife trees and minor species should be protected during harvests as much as possible. Some area should also be left as no-entry reserves.

After the harvest, units should be planted with a selection of conifers, including resistant western white pine and Douglas-fir in open areas and western red cedar, western hemlock, and grand-fir in shadier areas. Planting should complement natural regeneration, especially by red alder, maple, and other hardwoods, to ensure sufficient stocking. Planting under-represented, native shrubs is also recommended to increase plant diversity. Follow-up control of invasives and competing shrubs will be necessary until the trees are above shrub height and free to grow. Over time, the understory tree layer may need some pre-commercial thinning if natural regeneration creates dense thickets.

Unit #12 (DNR-E2) which is very wet during the winter months will need to be carefully evaluated to determine if and how a partial alder harvest can be done without damaging sensitive areas. It is possible that much of this stand is not appropriate for harvesting. It is also likely that any harvesting will need to take place during the dry season.

In 30-40 years after the partial alder harvest, the understory tree layer will have reached the mid-story and the units should be ready for a commercial thinning entry. Variable density thinning should be used. Thinning from all diameter classes and harvesting of multiple species is likely to be possible. Some overstory trees may be removed to release mid-story trees and produce large diameter saw logs. After this entry, variable density thinning of multiple species and across all diameter classes can occur on a 10-15 cycle.

Ecotype E: Mixed-Douglas-fir-Hardwood-Biomass Accumulation

In light of the conservation focus of this part of the site, as well as the "ecological lands" designation of this ecotype, all management actions will clearly enhance wildlife habitat, public safety, and/or ecologically oriented forest health objectives. While revenue may be derived from management, it will not be a primary goal.

A partial retention alder harvest is recommended that removes a portion of the alder in the next 10-20 years. To limit the visual impacts of harvesting, the unit should be divided into two parts treated 5-10 years apart. Alder snags, trees with little or no saw log value, and a portion of the merchantable alder, should be left standing for habitat and aesthetic buffers. Openings larger than 1/4-1/2 acre should be avoided. Dense patches of Douglas-fir should also be thinned to prevent stagnation and accelerate the growth of remaining trees. After the harvest, the unit should be planted in a similar fashion to the previous eco-type. This unit contains several wetlands and much of it is seasonally wet. Careful consideration will be necessary to determine appropriate areas for harvest. Areas with sensitive soils should not be harvested and left as reserves. Operations will need to take place during the dry season.

Similar to the previous eco-type, 30-40 years after harvest, the understory tree layer will have reached the mid-story and the unit should be ready for a variable density thinning entry. Although unlikely, it is possible that the Douglas-fir will be ready for thinning sooner than 30-40 years after the first harvest.

Ecotype F: Conifer-Hardwood-Complex

As these units are along riparian corridors and close to the desired future conditions, no thinning or harvest activities are recommended. The holly should be aggressively removed.

The timing of the various actions for all ecotypes is outlined in Table 20.

Ecological restoration

The forest management strategy discussed above is driven primarily by the desire to restore the forest to a more natural condition. The strategy will accelerate the development of mature forest conditions with a diversity of tree species and age classes, resulting in improved wildlife habitat. Invasive species will be removed, and the forest will thus be more resilient to fire and insect outbreaks.

Aside from the restoration associated with active management of the forest stands, there is a need for restoration actions in the meadows and wetlands, particularly with regard to the eradication of invasive species. The meadow south of Mukai Pond is infested with scot's broom. To date, the Vashon Maury Island Land Trust has initiated several volunteer work parties to mechanically remove the scot's broom and plant the area with conifers to shade out future invasive species. The active management of this meadow will need to continue into the future in order to successfully maintain the area free of invasive species.

The meadow north of the SW 188th St access point is also infested with scot's broom. King County Parks staff initiated an effort to eradicate the scot's broom in April 2006. The next steps will depend on whether or not a parking lot is constructed in this area. If not, planting is recommended to ensure that the scot's broom does not get reestablished.

As mentioned, there is a well-established population of bull frogs in Mukai Pond. The Vashon Maury Island Land Trust is the current owner of the parcel containing Mukai Pond, and they seined the pond in September 2005 in an effort to capture the bullfrogs. The project was deemed successful, but follow-up efforts will likely be needed. It may be necessary to pump the pond dry in order to capture all of the breeding frogs. A volunteer amphibian monitoring program involving egg mass surveys should be established as soon as possible to develop a more thorough inventory of the amphibian species present.

In an effort to increase the diversity of dabbling ducks, there may be an opportunity to increase emergent vegetation at some selected locations at this wetland, as diversity is often highest in hemi marshes in which there is a 50:50 ratio of open water to emergent vegetation

Reed canary grass is also an issue around Mukai Pond and Wetland #2, although it is not thought to be an urgent problem given the area impacted. It is recommended to establish monitoring plots to assess the spread of this invasive and take action using best available science in the future if it spreads substantially. The plots should be monitored every two years.

Recreational development

The most urgent improvement from a recreational standpoint is the development of a parking area that can accommodate horse trailers. Possible locations are discussed above in the analysis section. King County Natural Lands staff will continue to pursue this need and have made it a top priority in the implementation of this plan.

The majority of the recreational development recommendations pertain to trail improvement and access. As mentioned above, there are 8596 feet of high priority trail and 3866 feet of second priority trail that are in need of improvement. Map 8 shows the priorities for trail improvement, and Appendix 4 details the necessary actions. Trail improvements will be coordinated with the construction and decommissioning of roads used for thinning projects to the extent possible.

In addition to trail improvements, there is a need for trail signs throughout the site and the publication of a trail map. Members of the working group felt that the site would be used by more people in a positive way if they were not concerned about getting lost on the trail system.

Additional recommendations are summarized in Table 20.

Implementation

Implementation of this plan will require funding and the participation of several of the constituent groups involved in the development of the plan. While King County is the owner of the site, there is a great deal of interest in developing formal agreements that would allow non-profits and citizen groups to be involved in the decision making process and assist with the implementation of many of the actions called out above. Table 20 presents the time frame and the groups potentially involved in carrying out many of the recommendations discussed above.

While the formal agreements need to be established, they will likely be modeled after several King County Parks programs that are in place and enable volunteer maintenance and development of King County park sites. These programs include the Adopt-a-Park Program and the Community Partnerships and Grants (CPG) Program.

The Working Group that assisted with the development of this plan will continue to serve as an advisory body that will advise the King County Natural Lands Program on the management of ICF.

Funding

In the immediate future, King County will continue to provide funding for the ongoing management of ICF through the Natural Lands Program in the Department of Natural Resources and Parks. As is the case with all of the County-owned natural lands and working forests, Natural Resource Lands staff will work with the resource coordinators in the Parks Division of DNRP to ensure that ongoing maintenance issues are addressed.

There are also a large number of projects that are beyond the scope and budget of ongoing management. These activities include capital projects such as trail construction, parking lot development, and installment of interpretive signs and maps, as well as restoration projects such as invasive species removal not associated with harvesting activities (when not legally required), pre-commercial thinning, meadow conversion, and wetland restoration. King County will strive to provide funding for as many of these projects as possible, but it will be

necessary to rely on additional grant funds and volunteer efforts to accomplish all of them. Possible sources of funding are listed in Appendix 5.

Active forest management that sustains the ecological health of the forest while providing the opportunity to generate revenue is a primary tenet of this plan. Revenue generated from management activities will be used to provide revenue for the management of King County Natural Lands, which includes funding restoration and other non-revenue generating projects at Island Center Forest and other King County working forests.

In addition, the Vashon Forest Stewards have expressed a great deal of interest in being involved with the management of the forest on the site and in processing timber from the site at their local mill. While the details of such an arrangement need to be worked out, it is a priority for King County and the ICF working group to facilitate this model of sustainable forestry.

Monitoring

Monitoring the ecological health of ICF is a priority for King County and the ICF Working Group. As part of the forest inventory completed for this plan, the Vashon Forest Stewards established a system of monitoring plots at approximately 1 plot per every 10 acres. throughout the site. The plots are 1/10 acre in size, and baseline data has been gathered on the trees, shrubs, ground cover and wildlife habitat in each plot. Plots will be re-measured every 5-10 years during pre-thinning cruises and through volunteer efforts led by the Vashon Forest Stewards. Analysis of plot data and will be conducted by the Vashon Forest Stewards and NRL staff.

In addition to the forest plots, Vashon Audubon has expressed interest in tracking the bird population at Mukai Pond and throughout ICF. They intend to develop a database of bird sightings based on quarterly surveys along a predetermined route through the site.

Table 23. Matrix of Island Center Forest Management Recommendations*

Recommendation	Year	Cost/Revenue	Groups involved
Priority One			
General maintenance	All	($14,000/year)	King County Parks
Post identification and rule signs	2006	($2200)	King County Parks
Gate at end of 115th (south side) and rocks around parking lot at Mukai Pond	2006	($5500)	King County Parks
Develop parking lot	2006-2007	($65,000)	King County, Vashon Equestrians
Repair trails 1 West and 3 West (partial re-route)	2006	($10,000)	King County Parks, Vashon Equestrians
Close trails 1 South C and D	2006	($2500)	King County Parks, Vashon Equestrians
Repair trail 2 South A	2007	($9300)	King County Parks, Vashon Equestrians
Re-route trail 3 South	2007	($14,500)	King County Parks, Vashon Equestrians
Eliminate bull frogs from Mukai Pond	2006 and ongoing	($750)	VMILT
Establish amphibian monitoring program at Mukai Pond and Meadowlake	2006 and ongoing	($500)	VMILT
PCT Alder and some DF in units 3, 10, 5 and 7 (ecotypes B and C)	2006-2007	($2900)	King County NRL, Vashon Forest Stewards
VDT thin Unit #6 (ecotype A)	2006-2007	$45,475	King County NRL, Vashon Forest Stewards

Partial Alder harvest unit 9 (ecotype D)	2006-2007	$10,800	King County NRL, Vashon Forest Stewards
VDT thin unit 11 (ecotype A)	2009-2011	$82,925	King County NRL, Vashon Forest Stewards
Partial alder harvest units 12 and 1 (ecotype D)	2009-2011	$5125	King County NRL, Vashon Forest Stewards
VDT unit 4 and 2 (ecotype A)	2012-2016	$155,953	King County NRL, Vashon Forest Stewards
VDT units 5 and 7 (ecotype B)	2012-2016	$40,600	King County NRL, Vashon Forest Stewards
Partial Alder harvest & DF thin ½ unit 14 (ecotype E)	2012-2016	$22,500	King County NRL, Vashon Forest Stewards
Invasive control and PCT of all units planted to date and meadows	2012-2016	($48,450)	King County NRL, Vashon Forest Stewards
Compile monitoring results and update plan	2015	($2000)	King County NRL
VDT units 4, 6 11, and 2	2017-2020	$288,850	King County NRL, Vashon Forest Stewards
Partial Alder harvest & DF thin ½ unit 14 (ecotype E)	2017-2020	$40,625	King County NRL, Vashon Forest Stewards
VDT thin and partial alder harvest units 3 and 10 (ecotype C)	2017-2020	$58,800	King County NRL, Vashon Forest Stewards
Invasive control and PCT of all units planted to date and meadows	2017-2020	($37,500)	King County NRL, Vashon Forest Stewards
Partial Alder harvest & DF thin unit 14 (ecotype E)	2020-2030	?	King County NRL, Vashon Forest Stewards
Compile monitoring results and update plan	2025	($2000)	King County NRL
VDT thin unit 14 (ecotype E)	2030-2050	?	King County NRL, Vashon Forest Stewards
2 VDT thinnings in units 1, 2, 3, 4, 5, 6, 7, 9, 10, 11 and 12 (ecotypes A, B, C and D)	2020 - 2050	?	King County NRL, Vashon Forest Stewards
Priority Two			
Treat invasives and plant at 150 tpa units 3 and 10 (ecotype C)	2006-2007	($3000)	King County NRL, Vashon Forest Stewards
Repair trail 2 South D, install 2 culverts	2007	($600)	King County Parks, Vashon Equestrians
Re-route trail 3 East	2007	($39,000)	King County Parks, Vashon Equestrians
Construct trail connecting 7 North D and 8 North	2007	($25,000)	King County Parks, Vashon Equestrians
Construct trail connecting 2 North and 6 North	2007	($25,000)	King County Parks, Vashon Equestrians
Remove scot's broom and plant conifers in meadow south of Mukai Pond (unit 15) and	2006 and ongoing	($9,000)	VMILT

maintain for three years.			
Develop ADA trail near Mukai Pond	2007	($13,000)	King County Parks
Construct “No Dogs” entrance on path to Mukai Pond	2006	($250)	King County Parks, VMILT
Post trail junction signs at all junctions (34 total)	2006	($7000)	King County Parks, VMILT
Publish trail maps	2006	($1000)	VMILT
Remove scot’s broom from the 188^{tth} trail entrance (unit 17), plant with natives and maintain for three years.	2006 and ongoing	($15,680)	King County Parks, VMILT
Underplant conifers in the open and deciduous areas of the Meadowlake and Smythe properties (unit 14)	2006 and ongoing	($0) (Donated)	King County Parks, VMILT
Monitor Reed Canary Grass encroachment in the emergent and buffer areas of Mukai pond. Erradicate Reed Canary Grass within Mukai pond and buffer area	2006 and ongoing	($9,939)	King County Parks, VMILT
Priority 3			
Repair trail 5 West		($1300)	King County Parks, Vashon Equestrians
Repair trail 9 North		($2500)	King County Parks, Vashon Equestrians
Repair trails 1 East, 1 East A and 1 East B		($4300)	King County Parks, Vashon Equestrians
Repair trail 7 North C		($3300)	King County Parks, Vashon Equestrians
Construct bird blind at Mukai Pond		($4000)	Vashon Audubon

*Projected costs are rough estimates

Glossary

ADA – Americans with Disabilities Act

Aquifer recharge area – an area designated as being particularly important with regard to the recharge of the groundwater aquifer

Basal area – the cross-sectional area of the trunk of a tree 4 1/2 feet above the ground

Board foot (feet) - a unit for measuring wood volume in a tree, log, or board. A board foot is commonly 1 foot by 1 foot by 1 inch, but any shape containing 144 cubic inches of wood equals one board foot.

Benthic - of, relating to, or occurring at the bottom of a body of water

Class I (II) wetland – classification of a wetland based on size and vegetation characteristics, as determined by the Washington State Department of Ecology

Competitive exclusion – stage of forest growth whereby dominant trees shade out smaller trees and prevent their continued growth

Conservation futures – a King County source of funds used for the acquisition of open space properties. Conservation futures funds are generated through property tax.

Course woody debris – any standing or fallen dead wood with a diameter of at least 7 cm

Curtis relative density (RD) – see Relative Density

Crown - the uppermost branches and foliage of a tree

Eco-type – area within Island Center Forest classified according to the successional stage and type of the dominant vegetation present

Eco-unit - contiguous areas within Island Center Forest that contain the same ecosystem type (eco-type) and will need similar management approaches

Epiphyte - a plant that derives its moisture and nutrients from the air and rain and grows usually on another plant

Fauna – animal life

Filamentous - an elongated thin series of cells attached one to another or a very long thin cylindrical single cell (as of some algae, fungi, or bacteria)

Flora – plant life

Floristic – of or relating to flora

Forwarder – timber harvest machine used for removing cut trees from the forest

Girdling – a method of killing trees by cutting through the stem, thus interrupting the flow of water and nutrients

Hemi marsh - shallow water area that contains water throughout the year

Herbaceous (vegetation) - low-growing, non-woody plants, including wildflowers and ferns, in a forest understory

High stumping – harvesting a tree while leaving a tall stump to be used as wildlife habitat

Hydroperiod - the period of time during which a wetland is covered by water

Laminated root rot – a tree disease that affects the roots of conifers in the Northwest, particularly Douglas Fir.

Loam - a soil consisting of a friable mixture of varying proportions of clay, silt, and sand

Morphometry - measurement of external form

Overstory - the level of forest canopy that includes the crowns of dominant, codominant, and intermediate trees

Palustrine (wetland) - any inland wetland which lacks flowing water and contains ocean derived salts in concentrations of less than .05%.

Partial retention harvest – a timber harvest technique that involves leaving some trees standing

Passerine - of or relating to the largest order (Passeriformes) of birds which includes over half of all living birds and consists chiefly of altricial songbirds of perching habits

Passive recreation – form of recreation that generally encompasses less intensive outdoor activities compatible with preserving natural resource functions such as wildlife habitat

Processor – machine for harvesting timber that cuts the tree to a specified length, strips the limbs and stacks the logs

Pulp wood - wood suitable for use in paper manufacturing

Relative density - a mathematically derived forest stand parameter that indicates level of intra-stand competition between trees, and consequently, a theoretical optimum for thinning.

Riparian - relating to or living or located on the bank of a natural watercourse (as a river) or sometimes of a lake or a tidewater

Rural Drainage Program (RDP) – King County program that identifies, prevents and manages the impacts of development on water runoff such as flooding, erosion, pollution, and low stream flows.

Saw log - a log large enough to be sawed economically on a sawmill. Sawlogs are usually at least 8 inches in diameter at the small end.

Seine - a large net with sinkers on one edge and floats on the other that hangs vertically in the water and is used to enclose fish when its ends are pulled together or are drawn ashore. Verb – to use such a net

Seral stage – the stage of ecological succession of a stand of trees

Silviculture - the art and science of growing forest trees

Site class – see site index

Site index - a measure of the quality of a site based on the height of dominant trees at a specified age (usually 25 or 50 years), depending on the species

Skid trail – trail formed by the act of moving trees from the site of felling (harvest) to a landing or area where they can be transported.

Snag - a dead tree that is still standing. Snags provide important food and cover for a wide variety of wildlife species.

Soil core – a sample of soil taken to assess soil type and characteristics

Substratum - a layer beneath the surface soil

Swale - a low-lying or depressed and often wet stretch of land

Till - unstratified glacial drift consisting of clay, sand, gravel, and boulders intermingled

Turnpike – a type of trail construction that raises the trail slightly above the ground to keep it dry

Understory - the level of forest vegetation beneath the canopy

Variable density thinning (VDT) – a harvest technique that thins a forest stand, leaving groups of trees of various densities. The intention is to mimic natural disturbance and thus improve wildlife habitat and ecological health.

Variable source area - small area of the landscape, usually above the headwaters of a stream or along its margins, that is susceptible to becoming completely saturated during rainfall. Once the soils in the area saturate to the surface, any additional rainfall (irrespective of intensity) becomes overland flow. As rainfall continues, the saturated area grows in extent, increasing the area generating runoff.

WRIA (Water Resource Inventory Area) – a watershed or group of stream basins designated as a planning unit for the purposes of salmon habitat and watershed restoration

Wolf tree - a large older tree with a spreading crown and little or no timber value, but often great value for wildlife

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Appendix 1: Proposed forestry activities

Unit & Management Activity	Acres	Cost/ Revenue per acre*	Amount
Year 1-2			
Df-Hwd-Mature: unit # 6 (Ecotype A)			
VDT thin (10-15 mbf/acre)	17	$3,000	$51,000
Plant 25-75 trees/shrubs acre	17	($75)	($1,275)
Rehab Trails, invasives, shrub, & deer control	17	($250)	($4,250)
Hwd-conifer Mature: units # 9 (Ecotype D)			
Partial Alder harvest (4-6 mbf/acre)	12	$1,250	$15,000
Plant 50-100 trees acre	12	($100)	($1,200)
Rehab Trails, invasives, shrub, & deer control	12	($250)	($3,000)
Df-hwd Cohort Establish: units # 3 & 10 (Ecotype C)			
PCT red alder and selective PCT of Douglas-fir	48	($50)	($2,400)
Alder thickets in Df-Hwd Can.Closure: units # 5 & 7 (Ecotype B)			
PCT red alder and selective PCT of Douglas-fir	5	($100)	($500)
Df-Hwd Cohort Establishment: units # 3 & 10 (Ecotype C)			
Treat invasive patches and plant @ 150 tpa	5	($400)	($2,000)
Followup invasives removal & shrub control	5	($200)	($1,000)
Year 3-5			
Df-Hwd-Mature: unit # 11 (Ecotype A)			
VDT thin (10-15 mbf/acre)	31	$3,000	$93,000
Plant 25-75 trees/shrubs acre	31	($75)	($2,325)
Rehab Trails, invasives, shrub, & deer control	31	($250)	($7,750)
Hwd-conifer Mature: units # 12 & 1 (Ecotype D)			
Partial Alder harvest (4-6 mbf/acre)	41	$500	$20,500
Plant 50-100 trees acre	41	($100)	($4100)
Rehab Trails, invasives, shrub, & deer control	41	($275)	($11,275)
Year 6-10			
Df-Hwd-Mature: unit #4 & 2 (Ecotype A)			
VDT thin (10-15 mbf/acre)	58.3	$3,000	$174,900

Plant 25-75 trees/shrubs acre	58.3	($75)	($4,372)
Rehab Trails, invasives, shrub, & deer control	58.3	($250)	($14,575)
Df-Hwd Can.Closure: units # 5 & 7 (Ecotype B)			
VDT thin (3-4 mbf/acre)	56	$1,000	$56,000
Plant 25-50 trees/shrubs acre	56	($50)	($2,800)
Rehab Trails, invasives, shrub, & deer control	56	($225)	($12,600)
Mixed Hwd-cnf BiomAccum: 1/2 of unit # 14 (Ecotype E)			
Partial Alder harvest & DF thin (5-7 mbf/acre)	20	$1,500	$30,000
Plant 50-100 trees/shrubs acre	20	($100)	($2,000)
Rehab Trails, invasives, shrub, & deer control	20	($275)	($5,500)
All units planted in years 1-10 and wetland/grassland units			
Extra invasives control, shrub release & PCT	323	($150)	($48,450)
10 year revenue			$440,400
10 year costs			($131,372)
10 year net revenue projection			$309,028

Year 11-20

Df-Hwd-Mature: units # 4, 6, 11 & 2 (Ecotype A)			
VDT thin (10-15 mbf/acre)	106	$3,000	$318,000
Plant 25-50 trees/shrubs acre	106	($50)	($5,300)
Rehab Trails, invasives, shrub, & deer control	106	($225)	($23,850)
Mixed Hwd-cnf BiomAccum: 1/2 of unit # 14 (Ecotype E)			
Partial Alder harvest & DF thin (7-9 mbf/acre)	25	$2,000	$50,000
Plant 50-100 trees/shrubs acre	25	($100)	($2,500)
Rehab Trails, invasives, shrub, & deer control	25	($275)	($6,875)
Df-hwd Cohort Establish, units # 3 & 10 (Ecotype C)			
VDT thin and partial alder harvest (4-6 mbf acre)	48	$1,500	$72,000
Plant 25-50 trees/shrubs acre	48	($50)	($2,400)
Rehab Trails, invasives, shrub, & deer control	48	($225)	($10,800)
All units, including grassland and wetland units			
Extra invasives control, shrub release & PCT	250	($150)	($37,500)
10 year revenue			$440,000
10 year costs			($89,225)
10 year net revenue projection			$350,775

Year 21-50

Df-Hwd-Mature: units # 4, 6, 11 & 2 (Ecotype A)	106		

2 VDT thinning entries for each unit (10-15mbf acre) Follow up planting, trail rehab & invasives control	
Df-Hwd Can.Closure: units # 5 & 7 (Ecotype B) 2 VDT thinning entries for each unit (5-10mbf/acre) Follow up planting, trail rehab & invasives control	56
Df-hwd Cohort Establish, units # 3 & 10 (Ecotype C) 2 VDT thinning entries for each unit (8-12 mbf acre) Follow up planting, trail rehab & invasives control	48
Mixed Hwd-cnf BiomAccum: unit # 14 (Ecotype E) Partial Alder harvest & DF thin first 10 years (5-8 mbf) VDT thin in next 30 years, whole unit (8-12 mbf acre) Follow up planting, trail rehab & invasives control	55
Hwd-conifer Mature: units # 9, 12 & 1 (Ecotype D) 2 VDT thinning entries (8-12mbf) Follow up planting, trail rehab & invasives control	53

* Cost numbers are high end estimates

Appendix 2: Forestry abbreviations

Trees Species Codes

DF: Douglas-fir

RA: Red Alder

RC: Western Red Cedar

WH: Western Hemlock

BM: Bigleaf Maple

MD Madrone

WO Willow

CH Bitter Cherry

Forest Characteristic Codes

TPA: trees per acre

BA: Basal area in ft^2/acre

All Volumes are: mbf (thousand board feet). Scribner board feet, 6" top, 32' logs. This was chosen as a conservative estimate of volume.

Site Index: DF King 50 year; RA: 25 year

95% CI: 95% Confidence interval

D_q : Quadratic Mean Diameter

Relative Density: Curtis (1982)

Appendix 3: Bird List

Recorded as of 5/20/03 by Dan Willsie of Vashon Audubon

*asterisk denotes nesting on site

Grebes

Pied-billed Grebe

Ducks, swans, geese

Canada Goose
Wood Duck*
American Wigeon
Mallard*
Blue-winged Teal
Northern Shoveler
Ring-necked Duck
Bufflehead
Hooded Merganser*

Herons, Egrets, Bitterns

Great Blue Heron

Osprey

Osprey

Hawks, eagles, kites

Bald Eagle
Red-railed Hawk
Northern Harrier

Pheasants, Grouse, Quails, Turkeys

Ring-necked Pheasant*

Sandpipers

Solitary Sandpiper
Spotted Sandpiper

Plovers, lapwings

Killdeer*

Pigeons, doves

Band-tailed Pigeon

Owls

Barred Owl

Hummingbirds

Rufous Hummingbird*

Kingfishers

Belted Kingfisher

Woodpeckers

Red-breasted Sapsucker
Downy Woodpecker*
Northern Flicker*
Pileated Woodpecker*

Tyrant flycatchers

Olive-sided Flycatcher
Western Wood-Pewee
Willow Flycatcher*
Pacific-slope Flycatcher*

Crows, jays

Stellar's Jay*

Vireos and allies

Hutton's Vireo
Cassin's Vireo
Warbling Vireo

Waxwings and silky

Flycatchers

Cedar Waxwing

Thrushes

Varied Thrush
Swainson's Thrush*
American Robin*

Nuthatches

Red-breasted Nuthatch*

Creepers

Brown Creeper*

Wrens

Marsh Wren
Bewick's Wren*
Winter Wren*

Swallows

Violet-green Swallow
Northern Rough-winged Swallow

Barn Swallow

Kinglets

Ruby-crowned Kinglet

Chickadees, tits

Black-capped Chickadee*
Chestnut-backed Chickadee*

Siskins, crossbills and allies

Pine Siskin
American Goldfinch
Purple Finch*
House Finch
Red Crossbill

New World Warblers

Orange-crowned Warbler
Nashville Warbler
Yellow Warbler
Yellow-rumped Warbler
Black-throated Gray Warbler*
Common Yellowthroat*
Wilson's Warbler*

Buntings, Sparrows

Tanagers and allies

Song Sparrow*
White-crowned Sparrow
Golden-crowned Sparrow
Dark-eyed Junco*
Spotted Towhee*
Western Tanager
Black-headed Grosbeak*

Blackbirds, grackles, orioles

Red-winged Blackbird
Brewer's Blackbird
Brown-headed Cowbird

Total species seen to date: 72

Appendix 4: Trail Inventory

Trail Number: 2 North **Date: 5-31-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 1 North is 320 feet in length and is a 5' wide unimproved road with deep ruts

Recommendations:

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	167	167	INV	open field w/ scot's broom	Remove invasives
167				tree cover begins	
211				deep 4x4 ruts	
320				trail ends at pond	

Trail Number: 1 North	**Date: 5-31-05**
Site: Judd Creek	
Designated Use: Horse, Hiker, and Bicycle	
Land Manager: King County Department of Natural Resources and Parks	
Description: This trail runs due north from trail 1 West connecting to 107th Ave SW. The trail is a 10ft wide unimproved road mainly under coniferous forest and is 2520ft in length.	
Recommendations: Needs re-route to avoid large wetland at the north end of the trail. Three areas need to be hardened with rock and gravel. Two turnpikes one 60ft and the other 43ft. One culvert is also needed.	
Surfacing and Structural Additions: 227ft of Gravel , 103ft of Turnpike, and one culvert 10" diameter	

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	180		INV	8ft wide grass trail through meadow	invasive removal
180				0-5% grade 10 ft wide unimproved road	
268	316	48	GVL	muddy	gravel
316				ivy in trees and Holly Trees	invasive removal
575	1093	333	BSH	salmonberry closing in	brush back and maintain
760				heavily rutted	add rock and gravel to center of trail use ruts for drainage
814	871	57	TP	very muddy and lacks drainage	turnpike and animal track

871	1050	179	GVL	muddy	add gravel
1050	1093	43	TP		
1093			CVT	drainage	add culvert 10" diameter
1144	1475	331		wetland	Re-Route Needed. Possible Wetland restoration project.
1332				in the wetland	
1475				powerlines, ruts and invasives	invasive removal
1715	1840	125		ruts and seasonal wetland	Re-Route Needed
1934	2060	126		intersection w/ abandoned road, tansy	invasive removal
2060	2165	105		10% grade, blackberries	invasive removal
2230	2367	137		wet meadow, 2ft deep standing water	Re-Route needed
2520				flex rail @ 107th Ave SW	

Trail Number: 2 west **Date: 5-31-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

10' wide unimproved road into coniferous forest passing through possible intermittent stream. The trail is 436ft in length and is a bypass trail connecting to trail 1 west on both ends.

Recommendations:

Close Trail and Revegetate.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	100	100		overgrown trail edges 0-5% grade	
100				trail widens	
150	255	105		10% grade	
255	307	52		flowing water through large puddle, 20 fish	
307	436	129		12% grade	
436				junction with Trail 1 west	

Trail Number: 3 North **Date: 5-31-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 3 North is a old unimproved road running north from trail 1 West. It is 995' in length and is on average 8' wide.

Recommendations:

Gravel in muddy spots and one turnpike 70' long

Surfacing and Structural Additions:

70' Turnpike and 229' of gravel

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	77	77	INV	party circle w/ tansy & scot's broom	invasive removal, revegetate circle and establish trail through it
224	294	70	TNPK	deep muddy ruts crossing drainage area	Build 70' Turnpike
294	360	66		10% grade	
550	650	100	GVL	mud w/ lack of drainage	gravel 100'
750	785	35	GVL	mud w/ lack of drainage	gravel 35'
876	970	94	GVL	mud w/ lack of drainage scot's broom also	gravel 94'

Trail Number: 1 West **Date: 6-2-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 1 West is an old road bed that is 11' wide and is the main trail through the area known as Judd Creek. Trail 1 west starts at the end of SW 188th Street and is 3266' long. The trail travels west to intersect with Trail 2 South in the Island Center Forest Area.

Recommendations:

Add gravel to harden trail in muddy sections. Re-route 586' of trail to avoid a steep section of trail . The goal would be to lessen the grade to help prevent any further erosion problems that currently exisit. This would actually add distance to this trail and decrease the amount of sediment displaced.

Surfacing and Structural Additions:

339' of gravel

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Gate	
0	232	232		coniferous forest	
232	780	548	INV	scot's broom meadow	Invasive removal
500				Junction with Trail 1 North	
627				Junction with Trail 2 West	
780				Junction with Trail 2 North	
859				Existing culvert	
1020				Junction with Trails 2 West and 3 North	

1290				Junction with Trail 4 North	
1410	1440	30	GVL	muddy section	gravel 30'
1575	1600	25	GVL	muddy section w/ outlet	gravel 25'
1652				junction with old well	
1695	1860	165	GVL	deep ruts with standing water	gravel 165'
1860				Junction with Trail 1 West to PVT Property	
1860	2020	160	BSH	heavy salmonberry	brush and maintain
2010	2060	50	GVL+RCK	deep ruts with standing water	Gravel w/ 2-4" rock underneath 50'
2060				Junction with Trail 5 North	
2172	2190	18	GVL+RCK	deep ruts with standing water	Gravel w/ 2-4" rock underneath 18'
2200				Junction with Trail to old blind (not gps'd)	
2240	2260	20	GVL	muddy section	gravel 20'
2280				Junction with Trail 3 West	
2280	2340	60		26% grade to deep pool of water	re-route
2340	2393	53		deep pool 1-2' deep and 40' wide	re-route
2445				Junction with Trail 1 South	
2446	2651	205		15% grade w/ mod to severe drainage issues	re-route
2527				Junction with Trail 3 West	
2650	2792	142		20% grade	re-route
2792	2866	74		23% grade	re-route
2866	3155	289	BSH	heavy salmonberry	brush and maintain
3124	3155	31	GVL	muddy section	gravel 31'
3266				end of trail 1 West and Junction W/ 2 South	

2280	2866	586		to steep	re-route

Trail Number: 1 West Section A **Date: 6-2-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Very overgrown unimproved road leading to private property

Recommendations:

Close trail

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction with Trail 1 West	
154	220	66		deep ruts w/ muddy center	
233			INV	Junction with Trail 4 North Tansy present	Remove invasives
590				wetland w/ two 10" culverts under road	Remove culverts?
856				Trail ends	

Trail Number: 2 South: Section A **Date: 6-2-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 2 south section A is a old roadbed about 10' wide. It ends at 115th Ave SW (trail 5 north). This section is 1396' long and travels mainly through 80yr old douglas fir.

Recommendations:

Several long sections of gravel and one 95' turnpike are needed to eliminate wet areas

Surfacing and Structural Additions:

462' of gravel some with 2-4" rock to fill low areas and one 95' turnpike

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0		0		0-5% grade	
95	160	65	GVL	muddy section	gravel 65'
205	247	42	GVL	muddy section	gravel 42'
247				junction with un gps'd trail	follow trail and gps if needed
247	333	86		7% grade	
333	467	134	GVL	muddy section	gravel 134'
467	487	20	GVL+RCK	deep muddy section	gravel and 2-4" rock 20'
514	609	95	TP	long muddy section w/ no drainage	95' turnpike

609	736	127	GVL	muddy section	127' gravel
736	879	143	BSH	young alder and heavy salmonberry	brush and maintain
986	1060	74	GVL	muddy section	gravel 74'
1085				junction with un gps'd trail	
1168	1377	209		13-20% grade	unacceptable for horse travel: use un gps'd trail for horses
1396	END			junction with trail 3 south (115th Ave SW)	

Trail Number: 3 West **Date: 6-2-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 3 west begins and ends off of Trail 1 west. It is used as a bypass trail to avoid a large mud puddle with standing water on Trail 1 West.

Recommendations:

Re-route sections of trail to lessen grade.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	35	35		3' narrow foot trail	
35	92	57		22% grade	re-route to lessen grade
92	150	58	GVL	muddy section	gravel 58'
150	193	43	TP	wetland crossing	install 43' turnpike
193	407	214		10-15% grade	
495				junction with Trail 1 West	
Trail End					

Trail Number: 4 North	**Date: 6-2-05**
Site: Judd Creek	
Designated Use: Horse, Hiker, and Bicycle	
Land Manager: King County Department of Natural Resources and Parks	
Description: Very overgrown unimproved road leading Trail 1 West	
Recommendations: Close trail	

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	35	35		5-10% grade	
117	213	96		deep ruts with standing water	
391				junction with Trail 1 West	
Trail	End				

Trail Number: 5 North **Date:6-2-05**

Site: Judd Creek

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 5 North begins at the junction of Trail 2 South. The first 1054' of the trail is an active improved road 115th Ave SW that comes in off of Banks road. Then at the gate turns into a 10' unimproved road that leads to Trail 1 West.

Recommendations:

Remove scot's broom from meadow and brush back salmonberry 3-5' on each side.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	695	695		improved gravel road 10-15% grade	
695	824	129		parking area 0-5% grade	
964				shed covered in mud	
1054				gate	
1134	1188	54		5% grade	
1188	1259	71		17% grade	
1259	1601	342	INV	scot's broom meadow	remove invasives
1734	1909	175	BSH	heavy salmonberry	brush and maintain

1867				gate	
1909				junction with Trail 1 West	

Trail Number: 6 North	**Date: 6-2-05**
Site: Judd Creek	
Designated Use: Horse, Hiker, and Bicycle	
Land Manager: King County Department of Natural Resources and Parks	
Description: Trail 6 North starts at the parking area off of 115th Ave SW and travels North around a pond. The trail is in good condition and has potential for a bird watching blind.	
Recommendations:	
Surfacing and Structural Additions:	

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	155	155		Parking lot to gate	
155				gate	
680				junction with trail to private property	
850				large grass meadow	
1086				trail dead ends into meadow	

Trail Number: un-gps'd by 2 south	**Date: 6-2-05**
Site: Judd Creek	
Designated Use: Horse, Hiker, and Bicycle	
Land Manager: King County Department of Natural Resources and Parks	
Description: Short, steep and trenched trail that leads from Trail 2 South to Trail 5 North (SW 115th Ave)	
Recommendations: Gravel and install water bars or long steps to lessen erosion	
Surfacing and Structural Additions: 203' of gravel and water bars or steps for horses	

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	203	203	GVL+RCK	15% grade that is deeply trenched	gravel & rock (2"-4") 203' and install water bars or long steps

Trail Number: 3 East **Date: 6-21-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 3 East is 2994' in length and is 2' wide. It is a unimproved foot trail with several very steep sections. This trail makes a connection with trail 5 South and it also should be noted that a portion of the trail is not on King County property.

Recommendations:

This trail should be re-routed to avoid private property and to lessen grade.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				2' wide unimproved foot trail	
1285	1371	86		25% grade	
1432				hanging culvert	
1526				gps point (private property)	
2994				end of trail 3 East Junction w/ % South	

Trail Number: 4 West **Date: 6-21-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 4 west starts at the southern end of 115th Ave SW and ends near western border of the landfill. This trail is an old gravel logging road that is in good condition with adequate drainage for the majority of its length. The trail measures 4,615' from start to end. It goes through two forest types, 80 year old coniferous and 8-15 year old coniferous mixed with deciduous.

Recommendations:

Install waterbars on steep sections to control erosion. Add gravel to muddy areas. Brush back vegetation 5' back in noted areas to help increase sight distance and lessen annual brushing.

Surfacing and Structural Additions:

130' of gravel and approximately 12 waterbars

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
13	28	15		anti vehicle ditch	trail is all ready diverted around
67				vehicle entrance	block off w/ gate or ecology blocks
124				trail splits L to ditch R main trail	close & re-vegetate
221				unauthorized fire line	close & re-vegetate
302				intersects logging road, thick salmonberry	brush and maintain
685	810	125	DD or WB	16% grade	add waterbars or drainage dips to control erosion
875	1712	837	BSH	dense salmonberry and scot's broom	brush and maintain

967				junction w/ 4 South	
1072	1189	117	WB	10% grade	add waterbars or drainage dips to control erosion
1189	1454	265	WB	15% grade	add waterbars or drainage dips to control erosion
1454				0-5% grade 15 YR old conifer/deciduous	
1593				junction w/ 5 West	
1692	1712	20	GVL	muddy	gravel
1813				junction w/ 2 East	
2214	2339	125		8% grade	
2339	2364	25	GVL	muddy	gravel
2354				culvert	
2364			WB		install waterbar to control erosion and protect culvert
			WB		install waterbar to control erosion and protect culvert
2364	2584	220		13% grade	
2424			WB		install waterbar to control erosion and protect culvert
2487			WB		install waterbar to control erosion and protect culvert
2584				8% grade enter into 80YR old firs	
2906				junction w/ 9 North	
2976				junction w/ 5 South	
3254	3314	60	GVL	muddy	gravel
3500				15yr old firs	
3604				junction w/ 5 South	
3959				culvert	
3950	3975	25	GVL	muddy	gravel
3975				6% grade	
4093			INV	open area w/ invasive	remove invasives

4160	4183	23		grade 19%	
4255	4390	135	BSH	open area w/ blackberries	brush and maintain
4390	4500	110		dense forest w/ little undergrowth	
4500	4615	115	BSH	dense blackberries	brush and maintain
4615				end of 4 West	

Trail Number: 5 South **Date: 6-21-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 5 South is 1870' in length and 6' wide. It is an unimproved foot trail with fairly good rocky soil. This trail is a small loop trail that reconnects with trail 4 West.

Recommendations:

Gravel muddy sections and brush back encroaching salmonberry and stickerbush.

Surfacing and Structural Additions:

53' of Gravel

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 4 West	
400				junction w/ 3 East	
520	560	40	BSH	heavy salmonberry	brush and maintain
827	880	53	GVL	muddy	gravel
981				opens to 80YR old Conifers	
1193				end of 80YR old Conifers	
1261	1360	99		13% grade	
1650				older trees	

1870				junction w/ 4 West. End of Trail 5 South	

Trail Number: 5 West **Date: 6-21-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 5 West is 1945' in length and is a 3' wide unimproved foot trail. It leads to the southern end of 115th Ave SW

Recommendations:

Gravel muddy areas. Install 1- 10"culvert. Removal of scot's broom

Surfacing and Structural Additions:

142' of gravel. 1- 10" culvert and invasive removal

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				8' wide gravel road	
0	20	20	CVT+GVL	drainage ditch for road	install 10"culvert and fill over w/ gravel
135	160	25	GVL	muddy	gravel
231			INV	scot's broom	remove invasives
315	340	25	GVL	muddy 5-10% grade	gravel
543	615	72	GVL	muddy	gravel
855	940	85		grade 13%	
1016				junction w/ 2 South Section D	

1023				10-15% grade	
1120	1416	296		10% grade	
1416				end of King County property	
1416				switches to old logging road	
1945				end of 5 West and junction w/ 4 West & 1 South	

Trail Number: 7 North Section B **Date: 6-21-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

This section of trail 7 North is 1178' in length and is an unimproved road 6' wide to start and then narrows to 18" after 925'. The forest consists of 15YR old conifers densely planted with little undergrowth.

Recommendations:

The entire length may need to be graveled if current horse use increases as the trail bed is mainly loose native soils with little rock or drainage.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction with trail 4 West	
115	432	317	Ditch	6% grade bermed on both sides	outlet ditches
432				Dense conifers little undergrowth	
674	750	76	BSH	Dense Salmonberry	brush and maintain
785				10% Grade	
925	940	15	GVL + RCK	deep depression	rock & gravel to fill
1178				junction w/ trail 3 East	
End	Of	This	Section		

Trail Number: 1 South **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 1 South is 2833' in length and has an average width of 3'. This trail is travels through 80' year old conifers the entire length and ends at Trail 1 West. 595' of this trail are over 15% grade and should be considered for re-route to lessen grade and erosion.

Recommendations:

25% (725') of this trail are over 15% grade and should be considered for re-route.

Surfacing and Structural Additions:

281' of gravel.

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
83	107	24	GVL	low spot, muddy	Gravel
200	230	30	GVL	low spot, muddy	Gravel
480	530	50		12% Grade	
550	580	30	GVL	low spot, muddy	Gravel
640			Close	trail forks	close and revegetate left fork
702				junction w/ 5 West Section A	
920	940	20	GVL	low spot, muddy	Gravel
950	986	36	GVL	low spot, muddy	Gravel

1022				junction w/ 1 South Section A	
1045	1109	64		20% Grade	
1109				junction w/ 5 West Section B	
1109	1222	113		5-10% Grade	
1222	1350	128	INV	19% Grade Holly present	Remove Holly
1432				Junction W/ 5 West Section C	
1432	1504	72		15% Grade	
1504	1541	37		20% Grade	
1541	1634	93		27% Grade	
1720	1755	35	GVL	low spot, muddy	Gravel
1806	1862	56		32% Grade	
1862	1935	73		15% Grade	
1950	1970	20	GVL	low spot, muddy	Gravel
1970	2054	84		20% Grade	
2054	2080	26	GVL	low spot, muddy	Gravel
2097	2157	60		25% Grade	
2157	2230	73		17% Grade	
2235	2255	20	GVL	low spot, muddy	Gravel
2325	2390	65		19% Grade	
2390	2430	40	GVL	low spot, muddy	Gravel
2430	2495	65		20% Grade	
2833				Junction w/ 1 West	

Trail Number: 1 South Section A **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 1 South Section A is 430' in length and is a 3-5' wide unimproved foot trail with one steep "hill climb". It branches off of Trail 1 South and reconnects across Trail 5 West Section C to Trail 1 South.

Recommendations:

Close, block and re-vegetate

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 5 West Section C & 1 South	
0	141	141		34% Grade	
195	325	130		side trail to 1 South Section D (large rock)	
195	354	159		trail to junction w/ 1 South	
End	of	Trail			

Trail Number: 1 South Section B **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 1 South Section B is 150' in length and is a 3-5' wide unimproved foot trail. It is another "hill climb" that should be closed.

Recommendations:

Close, block and re-vegetate

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 5 West Section C	
0	150	150		34% grade and highly eroded	Close Trail
150				junction w/ 1 South Section A	

Trail Number: 1 South Section C **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

This trail is 780' in length and is a 3-5' wide unimproved foot trail. It is a series of 4 very steep "hill climbs"

Recommendations:

Close trail, block and re-vegetate.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	148	148		31% grade and highly eroded	CLOSE TRAIL
148				junction w/ 5 West Section C	
185	308	123		42-45% grade and highly eroded	CLOSE TRAIL
418				glacial erratic (large rock)	
454				junction w/ 1 South Section A	
500	660	160		33% grade and highly eroded	CLOSE TRAIL
660				junction w/ 5 West Section C	
660	780	120		38-45% grade	CLOSE TRAIL

End	of	Trail			

Trail Number: 1 South Section D **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

This trail is 289' in length and is a 3-5' wide unimproved foot trail. It is a series of 2 very steep "hill climbs" and 2 short connector trails. The connections are with 1 South Section E and 1 South Section A

Recommendations:

Close trail, block and re-vegetate.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
25	127	102		38% Grade	CLOSE TRAIL
158				junction w/ 1 South Section E	
158	290	132		38-45% Grade	CLOSE TRAIL
290				Junction w/ 1 South Section A	
290				paint ball barrier	remove structures (many in the area on side trails)
End	Of	Trail			

Trail Number: 1 South Section E **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Hill climb trail that has an existing wooden bike jump on it.

Recommendations:

Remove bike jump. Close and revegetate trail.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	74	74		5-10% Grade	
74	175	101		27% Grade	
119				Bike Jump	Remove hazardous structure
360				Junction w/ 1 South D	
775				Former camp site. End of trail.	

Trail Number: 2 South Section B **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 2 South Section B is 920' in length and is a 6' wide unimproved road. It is heavily overgrown with salmonberry, blackberry and thistle because it has no canopy to shade it.

Recommendations:

Close section C. Re-route steep section. Gravel muddy areas. Brush back 3-5' and maintain.

Surfacing and Structural Additions:

90' of Gravel

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
128	150	22	GVL	muddy	Gravel
182	195	13	GVL	muddy	Gravel
407				Junction w/ 2 South Section C	Close & revegetate Section C (very steep redundant trail)
450	521	71		25% Grade	
636				Junction w/ 2 South Section C	Close & revegetate Section C (very steep redundant trail)
690				Junction w/ 5 West Section C	
690	715	25	GVL	muddy	Gravel

805	890	85	TRD	uneven ground	treadwork
890	920	30	GVL	muddy	Gravel
End	of	Trail			

Trail Number: 2 South Section C **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Short connector trail that is extremely steep and rutted.

Recommendations:

Close and Re-vegetate

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
		0			
		0			

Trail Number: 5 West Section A **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 5 West Section A is 1036' in length and is a 3' wide unimproved foot trail that leads east to private property. The majority of the trail is steep and heavily bermed.

Recommendations:

If it is determined that this connection to private property is needed it should be re-routed to reduce grade and erosion.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 1 South	
196	340	144		16% grade	
262				junction w/ 5 West Section B	
340	410	70		29% Grade, heavily bermed	
410	750	340		10% Grade	
750	825	75		15% Grade	
825				existing culvert	
1036				fence to private property, end of trail	

Trail Number: 5 West Section B **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 5 West Section B is 173' in length and is a 3' wide unimproved foot trail. This trail is a connector trail from 5 West Section A to trail 1 South.

Recommendations:

If it is determined that this connection to private property is needed it should be re-routed to reduce grade and erosion.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 5 West Section A	
110	173	63		21% grade	
173				junction w/ 1 South	

Trail Number: 5 West Section C **Date: 6-22-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 5 West Section C is 661' in length and is a 8' wide unimproved road. It connects Trail 1 South to 2 South Section A. This is the area that has all of the steep hill climbs.

Recommendations:

Close off some of the Hill Climbs.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
62				Junction w/ 1 South Section A	
116				Junction w/ 1 South Section C (loop)	
232				Junction w/ 1 South Section C (loop)	
242				Junction w/ 1 South Section C (loop)	
290				Junction w/ 1 South Section D	
414				Junction w/ 1 South Section E	
661				Junction w/ 2 South Section B	

Trail Number: 1 East Section B **Date: 6-28-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: Vashon Landfill

Description:

Trail 1 East Section B is 217' long and is a 4'wide unimproved foot trail. This trail is one of two small connector trails to 1 trail 1 east.

Recommendations:

Surfacing and Structural Additions:

22' of gravel

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
28	50	22	GVL	low spot, muddy	
150	200	50		11% Grade	
217				junction w/ 1 East	
End	of this	Section			

Trail Number: 2 East **Date: 6-28-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Recommendations:

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
2640				Junction w/ 4 West	
2647			CVT	drainage ditch	Install 10" Culvert
2689	2715	26	GVL	muddy	gravel
2775	2795	20	GVL+RCK	very low spot, muddy	add 2-4" rock and gravel
2840	2910	70	GVL	muddy	gravel
3121				junction w/ 3 South	

Trail Number: 2 South Section D **Date: 6-28-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

This section of trail 2 South is 478' in length and connects from 4 West to 5 West. It is a 3' wide unimproved foot trail.

Recommendations:

29 % of this trail is over 20% grade. Re-route steep sections to reduce grade.

Surfacing and Structural Additions:

25' Gravel, Two culverts, 2' dia & 18" dia

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction w/ 4 West	
5	22	17		20% grade	
22			CVT	drainage ditch	2' culvert
22	47	25		30% grade	
47	145	98		25% grade	
145	260	115		20% grade	
205			CVT	drainage	18" culvert
195	220	25	GVL	muddy	gravel

355	478	123		13%- 16% grade	
478				junction w/ 5 West	

Trail Number: 3 South **Date: 6-28-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 3 South is 2182' in length and is a 3' wide unimproved foot trail. The trail starts at the northern end of 115th Ave SW and ends at the junction with trail 2 East.

Recommendations:

Re-route first 1111 feet uphill to the 80yr old conifers and connect trail to 4 South.

Surfacing and Structural Additions:

2182' of gravel, 2 turnpikes total 89', remove invasives, brush back 5' in selected locations

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0	60	60	GVL	muddy	gravel
110	165	55		10% Grade	
190	246	56	INV	14% Grade, Tansy Ragwort	remove invasives
246	382	136	GVL	muddy	gravel
283	338	55	TPK	deep mud no drainage	Turnpike
283					Turnpike
466	500	34	TPK	deep mud no drainage	Turnpike
490	650	160	GVL	muddy	gravel

900				15yr old deciduous and conifer mix	
1085				open area	
1111				junction w/ 4 South	
1157	1247	90	BSH	10% grade, narrow trail, heavy brush	brush back 5' and maintain
1157					heavy brush
1277	1340	63		14% grade	
1420	1540	120		12% grade	
1680	1700	20		15% grade	
1700	1766	66		18% grade	
2070				80yr Doug firs	
2182				junction w/ 2 East	
Note:	**Entire trail should be hardened with gravel in its present location.**				
End	of	Trail			

Trail Number: 4 South **Date: 6-28-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 4 South is 1550' in length and is a 3-6' wide old logging road. It connects to trail 4 West and 3 South. This trail is in good condition.

Recommendations:

One 2' culvert near junction w/ 3 South. Remove invasives & garbage.

Surfacing and Structural Additions:

One 2' culvert.

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction w/ Trail 4 West	
79			Garbage	TV set	Remove TV set
378			Garbage	Vehicle cut in 1/2	Remove Vehicle
615				enters 80yr old conifer, junction for re-route	
825	1190	365		10% grade	
1303	1317	14	CVT	drainage ditch	2' culvert
1317	1550	233	BSH & INV	5% grade, Dense Salmonberry, some invasives, scot's broom & tansy	brush and maintain, remove invasives

1550				junction w/ Trail 3 South	
End	of	Trail			

Trail Number: 9 North **Date: 6-28-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: King County Department of Natural Resources and Parks

Description:

Trail 9 North is 720' in length and is 3-5' wide unimproved foot trail. This trail connects to trail 2 East and to 4 West

Recommendations:

Surfacing and Structural Additions:

225' of Gravel, one 16" culvert

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 2 East	
33	63	30	GVL	low spot, muddy	Gravel
150	190	40	GVL	low spot, muddy	Gravel
240	285	45	GVL	low spot, muddy	Gravel
345				enters 80yr old conifers	
380	450	70	GVL	low spot, muddy	Gravel
560	600	40	GVL	low spot, muddy	Gravel
713			CVT	ditch	16" culvert

720				junction w/ 4 West	
End	of	Trail			

Trail Number: 1 East **Date: 6-29-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: Vashon Landfill

Description:

Trail 1 East is 2397' in length and is a 4'wide unimproved foot trail. This trail extends from trail 2 East and has junctions w/ 8 North and ends at 7 North Section C.

Recommendations:

Gravel 404'. One- 60' turnpike. Brush back 5' in select locations and maintain.
Since this trail is not on King County Parks land final decisions would have to be approved by the Vashon Landfill.

Surfacing and Structural Additions:

404' of gravel. One- 60' turnpike

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction w/ 1 East Section A & B	
0	35	35	GVL	muddy	gravel
85	150	65	GVL	muddy	gravel
205	230	25	GVL	muddy	gravel
329	350	21	GVL	muddy	gravel
405	425	20	GVL	muddy	gravel
650				junction w/ 8 North	
840	865	25	GVL	muddy	gravel

955				junction w/ 8 North	
970	999	29	GVL	muddy	gravel
999	1020	21	GVL	muddy	gravel
1087	1130	43	GVL	muddy	gravel
1165	1255	90		grade 14%	
1290	1335	45	GVL	muddy	gravel
1335	1607	272	BSH	heavy salmonberry, grade 5-10%	brush back 5' and maintain
1715	1765	50	GVL	muddy	gravel
1855	1880	25	GVL	muddy	gravel
1880	1940	60	TPK	deep mud	turnpike
1940	2397	457		grade 5-10%	
2397				junction w/ 7 North Section C	
End	Of	Trail			

Trail Number: 1 East Section A **Date: 6-29-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: Vashon Landfill

Description:

Trail1 East Section A is 146' in length and is a 5' wide unimproved foot trail.

Recommendations:

Since this trail is not on King County Parks land final decisions would have to be approved by the Vashon Landfill.

Surfacing and Structural Additions:

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction w/ 2 East	
146				Junction W/ 1 East & 1 East Section B	

Trail Number: 2 East **Date: 6-29-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: Vashon Landfill & King County Department of Natural Resources and Parks

Description:

Trail 2 East is 3271' in length and is a 3' wide unimproved foot trail. It has junctions with 9 North, 3 South, 4 West and 1 East Section A&B.

Recommendations:

Re-route 245' of steep trail. Gravel 764'. One-35' Turnpike. Two culverts, 10" & 3' Diameter.
Since this trail is not completely on King County Parks land final decisions would have to be approved by the Vashon Landfill.

Surfacing and Structural Additions:

Gravel 764'. One- 35' Turnpike. Two- Culverts 10" & 3' Diameter

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				Junction w/ 7 North Section C	
0	275	275		5% grade	
185	230	45	GVL	muddy	Gravel
275	450	175	GVL+WB	muddy, 17% grade	Gravel & Waterbars or re-route
450	615	165	GVL	muddy	Gravel
615	650	35	TPK	low spot, very deep mud	Turnpike
690	760	70	GVL	muddy	Gravel
925				opens into 80yr old conifer	

0	925	925	BSH	heavy brush	brush back 5' and maintain
1122	1200	78		9% grade	
1255	1290	35	GVL	muddy	Gravel
1500	1678	178		7% grade	
1715				junction w/ 9 North	
1768	1832	64		13% grade	
1880	1930	50		muddy	Gravel
1952	2015	63		17% grade, 2' deep trench	re-route
2015	2115	100		muddy	Gravel
2115			CVT	major drainage	3' culvert
2115	2185	70		25% grade	re-route
2210				junction w/ 1 East Section A	
2270	2325	55		20% grade	
2439				junction w/ 1 East Section B	
2440	2480	40	GVL	muddy	Gravel
2530	2570	40	GVL	muddy	Gravel
2640				junction w/ 3 South	
2921	2991	70	GVL	muddy	Gravel
2986	3006	20	GVL+RCK	very low muddy area	add 2-4" rock and Gravel
3072	3098	26	GVL	muddy	Gravel
3114			CVT	drainage ditch	install 10" culvert
3121				Junction w/ 4 West	

Trail Number: 7 North Section C **Date: 6-29-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: Vashon Landfill & King County Department of Natural Resources and Parks

Description:

Trail 7 North Section C is 2286' in length and is a 3' wide unimproved foot trail. It connects from SW 184th Ave (by the landfill) and has junctions with trails 1 East, 2 East, 4 West and 3 East once it turns into 7 North Section B.

Recommendations:

333' of gravel, brush back 5' and maintain noted areas

Surfacing and Structural Additions:

333' of gravel

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				SW 184th Ave	
700	765	65		10% grade	
765				junction w/ 1 East	
800	890	90	GVL	muddy	gravel
1025	1088	63	GVL	muddy	gravel
1176	1585	409		fence line (landfill's fence)	
1590	1610	20	GVL	muddy	gravel
1615				junction w/ 2 East	

1685	1715	30	GVL	muddy	gravel
1750	1770	20		7% grade, bermed on both sides	outlet ditches
1770	1825	55	GVL	muddy	gravel
1900	1940	40	GVL	muddy	gravel
1970	2005	35	GVL	muddy	gravel
2235	2286	51	BSH	open area heavy brush	brush back 5' and maintain
2286				junction w/ 4 West, 7 North Sect. B cont.	
End	of	This	Section		

Trail Number: 8 North **Date: 6-29-05**

Site: Island Center Forest

Designated Use: Horse, Hiker, and Bicycle

Land Manager: Vashon Landfill

Description:

Trail 8 North is 1673' in length and is a 4' unimproved foot trail. This trail is a loop trail that connects at both ends to Trail 1 East. There are also two trails at the northeast edge that lead to private property.

Recommendations:

Since this trail is not on King County Parks land final decisions would have to be approved by the Vashon Landfill.

Surfacing and Structural Additions:

135' of gravel. Three- turnpikes for a total of 90'. Boundary Signs at private property junctions.

Begin Station	End Station	Length in Feet	Unit Number	Description of Existing Condition	Proposed Remedy to Existing Problem
0				junction w/ 1 East	
130	165	35	GVL	muddy	gravel
165	450	285		grade 10%	
620	670	50		grade 10%	
670	715	45	GVL	muddy	gravel
715	745	30	TPK	deep mud	Turnpike
750				large dog barking at fence	
992			SIGN	junction w/ trails to private property	install KC Boundary Signs

1198	1220	22	GVL	muddy	gravel
1220	1240	20	TPK	deep mud	Turnpike
1390	1430	40	TPK	deep mud	Turnpike
1580	1635	55		grade 10%, bike jump	remove jump
1635	1668	33	GVL	muddy	gravel
1673				junction w/ 1 East	
End	Of	Trail			

Appendix 5: Possible Fund Sources

King County Grant Exchange. A clearinghouse of grant and technical assistance programs offered by the King County Department of Natural Resources and Parks with the goals of protecting and enhancing the environment, increasing community stewardship, and providing expertise and consultation to projects. http://dnr.metrokc.gov/wlr/pi/grants.htm

National Fish and Wildlife Foundation. Funds projects to conserve and restore fish, wildlife, and native plants through matching grant programs. http://www.nfwf.org/programs.cfm

Washington State Interagency Committee. http://www.iac.wa.gov/iac/grants.asp. Provides grants for outdoor recreation and habitat conservation, including:

- Washington State Salmon Recovery Funding Board. Administers grant programs for the protection and/or restoration of salmon habitat, and supports feasibility assessments for future projects and other activities. http://www.iac.wa.gov/srfb/grants.asp.
- Aquatic Lands Enhancement Account (ALEA) Grant Program. Provides grant-in-aid support for the purchase, improvement, or protection of aquatic lands for public purposes, and for providing and improving access to such lands. http://www.iac.wa.gov/iac/grants/alea.htm

Appendix 6: Ecological Assessment and Monitoring Plan

September 2005

The objectives of this plan are to provide a thorough and quantitative baseline assessment of ecological conditions within Island Center Forest and to set up a long term monitoring system. The plan is based on the management goals for Island Center Forest and developed to monitor progress toward desired future conditions. It is also designed as a basic framework for collecting inventory information for forest management activities. As involvement by the Vashon community is an integral part of stewarding ICF, the plan has been set up to involve community volunteers. The plan has the following components:

A. Vegetation and forest structure:

1. GIS Mapping and ecological classification of management units (eco-units) and special ecological features (rare habitats, vegetation types, diseased areas).
2. System of long term plots to inventory and monitor trees, snags, course woody debris, understory plants, invasive species, etc.
3. Implemented and maintained by the Vashon Forest Stewards in partnership with the King County Natural Lands Program.

B. Riparian & Wetland:

- General mapping, assessment, and periodic monitoring of physical and ecological conditions of wetlands and streams.
- Identification of sensitive areas.
- Implemented & maintained by King County staff ecologists.

C. Wildlife:

- Birds: periodic winter and spring breeding surveys to identify species presence. Implemented and maintained by Vashon Audubon.

- Amphibians: initial survey to determine species presence. Implemented by King County staff ecologists in collaboration with Vashon Maury Island Land Trust.

A. Vegetation and Forest Structure

1. Delineation of ecosystem units and special ecological features

Based on ortho-photos and GPS ground truthing, the entire ICF has been divided into 17 management units called eco-units. Eco-units are based on a scale that is practical for restoration and forest management activities. They are contiguous areas that contain the same ecosystem type (eco-type) and will need similar management approaches, but also may include small areas with different eco-types or special ecological features. Eco-types are classified according to the successional stage and type of the dominant vegetation types present. Most of eight eco-types identified within ICF are based on forest types, but others are wetlands or meadow.

GIS based maps of laminated root rot and invasive species were also created. These maps, along with the map of the eco-units, will be stored and updated by the Vashon Forest Stewards in partnership with the King County Forestry program.

II. Monitoring Plots

Assessment and monitoring of vegetation and forest structure is based on a system of long-term, permanent plots distributed on a systematic grid with a random start within each eco-unit. Plot frequency is generally 1 plot per 9 acres, but varies per eco-unit. Twenty-seven plots were installed during the summer of 2005 and provided sufficient data for a baseline ecological assessment. An additional 12 plots will be installed before the 2006 growing season begins. The remaining 7 plots, which are located in 10-year old stands, will be installed once canopy closure occurs. Additional plots may be installed in grassland units if desired. Plots were, and will continue to be, installed by a combination of volunteers from the Vashon Forest Stewards and King County Forestry staff. Plots will be re-measured every 5-10yrs and incorporated into cruises for harvest operations where possible.

The data from these plots were entered into a Microsoft Excel file and have been summarized in the ICF Site Management Guidelines. A GIS layer was created with the plot locations. All data will be maintained and updated by the Vashon Forest Stewards in partnership with the King County Forestry program. The Vashon Land Trust will also receive a copy of the data and all updates.

The protocol for the monitoring plots has been designed so that community volunteers could, with the assistance of a forestry professional or ecologist, install the plots. Most of the required equipment can be used accurately and efficiently by inexperienced field crew members after a brief initial training. Data sheets and an equipment list are included below. Classification information and tree species codes from WADNR sample designs were used and are also included below. The following protocol design was used and should be used during plot re-measurement. The design for sapling plots may need to be modified as few saplings were found during plot installment. Options include measuring 4 1/100th acre plots instead of 2, or sampling sapling in the entire 1/10th acre tree plot. Also, the classification of tall shrubs/mid-story trees such as Cascara may need to be changed from shrub to sapling. Bearing trees may need to be changed in some cases. Finally, 3'x3' herb plots may be added if herb information is desired.

1. Plot Center

- Locating plot center: Use GPS to navigate to plot center. If it is not possible to use the GPS for navigation (e.g., dense tree canopy precludes obtaining signals) use standard field methods from last GPS reading and map and compass. Base plot location off stand. Plots are 9 chains apart in most cases. Check the plot map for locations

- Monumenting plot center:

  - Place 1' length of PVC pipe over 2' rebar driven into the ground to mark plot center.

  - Label PVC monument with the appropriate plot identification number.

  - Bearing trees:

    - Locate 2 vigorous, dominant trees (no alder or willow if possible) that are roughly perpendicular to plot center. Change bearing trees at plot re-measurement if trees are dead, in decline, or are willow or alders.

- Paint ring of orange paint around tree as high as possible.
- Scrape off moss at base of tree facing plot center. Paint with spot of orange paint.
- Scratch into aluminum tags and note in data sheet. Staple tags to tree.
    - Plot #
    - Distance to plot center
    - Azimuth from tree to plot center
    - Tag # from tree plot (in notes only)

- Record multiple GPS points at plot center.

- Photographs: Take a digital photograph in each of the four cardinal directions, starting with due north, then proceeding east, south, and west. 35 mm zoom. Use widest angle possible. Note photo #'s on data sheet

- Topographic information: Record slope (%), aspect, and topographic position (wet areas, valley bottom, midslope, ridge, plane)

- General vegetation type description: Based on what can be seen from plot center, record forest type, Dominant tree & shrub species, & abundance, and age class. Note any special ecological or physical features seen from plot center. **Note any invasive species.**

- Age class:
    - Mt+ Breaking up (dying alder)
    - Mt: Mature (50 yr+)
    - Md: Md (20-50 yr)
    - Yng Young (0-20 yrs)

- Record any:
    - Invasive species
    - Special ecological features
    - Forest health issues found during travel from plot to plot (record location with GPS point or note on paper map).
    - Take photos if you see something cool!

2. Sapling and Shrub Plots

Plot Dimensions: 2 x 1/100th acre, fixed area circular plots (radius 11.8 ft). One based on a plot center 20' S and the other 20' W from plot center.

Label
- S: 20' South
- W: 20' West

Measurements

Shrubs: Visual estimate for each species (including ferns)

- Percent coverage (5% percent classes) (3'x3' = 2%; 5'x5'=5%)
- Mean height (inches)
- Species Codes:

BC Black Cap raspberry
BF: Braken Fern
BT Bull Thistle
CA Cascara
CB Cutleaf blackberry
DR Deer Fern
EB Evergreen Black Berry
EH:Evergreen Huckleberry
HB Himmal Blackberry
HW English Hawthorne
HY Holly
HZ Hazlenut
IP Indian Plum
MAMountain Ash
NR Nutka Rose
NT Nettle
OS Oceanspray
PC Pacific crabapple
RC Red Currant
RD Red Osier Dogwood
RE Red Elderberry
RH Red Huckleberry
SA Salal
SB: Salmon Berry
SC Scots Broom
SN Snow Berry
SV Service berry
SW: Sword Fern
TBB Trailing Black Berry

TH Thimble berry

WO Willow

UN Unknown

Saplings: For each species

- Count in each size class:

Class 1 — 6" - 4.5' tall

Class 2 — 4.5' tall – 2.99" dbh

Class 3 — 3.0" dbh – 5.9" dbh.

3 Tree Plot

Plot Dimensions: Fixed area, circular, 1/10th acre plot, 37.2 ft radius. If there's a question about whether a tree is in or out of the plot, measure to the tree with tape.

Measurements:

All trees >5.9"

- Tag with pre-numbered tag facing plot center. Tree Number 1 is the first tree east of due north (from plot center); proceed in a clockwise direction marking all remaining trees.

- Species

- Stratum & Crown class:

E	Emergent	SD	Super dominant
O	Overstory (A)	D	Dominant
M	Mid-Story (B)	C	Co-dominant
U1	Understory 1	I	Intermediate
U2	Under story 2	OT	Overtopped
		OG	Open grown

- dbh (to 0.1 inch). (See WADNR guidelines to get dbh on odd trees)

-Paint thin stripe where dbh is measured, use spray paint.

- Estimate percent live crown on each tree to nearest 10%, only for conifers that have 3 quadrants with live crown, or 2 live branches on small trees. Fill lopsided crowns.

- Presence of any damage/decadence of each tree: Type, Severity, Cause

Type	Location	Cause
LB: Lower Bole (<1/2 of tree)	Ht (estimate height)	AN: Animal (species?)
UB: Upper Bole (1/2+ of tree)	Extent (Percent)	IN: Insect (species?)
BT: Broken top		RR: Root rot (type?)
FK: Forked stem		CK: Canker
DT: Dead top (frost)		FG: Fungi (type?)
BR: Branch abnormality		WT: Weather (type)
FL: Foliage die-off		FL: Flooding
EB: Epicormic branching		MT: Mistletoe
RT: Roots		DR: Drought
WF: Wolf tree, excess limbs		ATV: All terrain vehicle
SW: Excessive lean/sweep		LG: Logging damage
CRK: Crook		
CNK: Conks (heart rot)		

- Determine if the tree is a current or potential wildlife tree (yes/no). Look for evidence of woodpecker activity, nest, platforms for nest, major defect entry points, etc. Note type of use if known:

- WP: woodpeckers	- SM: small mammals
- NS: Nest	- DR: deer rubbing

- Record % defect in terms of volume deduct (scaling)

Variable radius plot

- In mature eco-units, swing relascope with predetermined BAF (5-6 trees) factor and note which trees from fixed area plot are in. Occasionally a large tree not in the fixed area plot might be in, so measure its dbh and note on datasheet.

3-4 Intensive Measurement Trees. If only one species is present choose tallest, "site" tree and an average tree. If more than two species are present, choose tallest "site" tree for each species. Only core DF and Alder.

- Height & height to live crown (Consider live crown if there are 3 quadrants with live crown or 2 live branches on small trees. Fill lopsided crowns.)

- For 2 site trees, core tree at dbh to count age and radial growth of past 5 & 10 yr increments to nearest mm.

4. Snag Plot

Plot Dimensions: 1/5th acre circular, fixed area plot: shooting snags with laser is sufficient to determine if snags are in or out.

Photos: take photos of special snags: record in notes

Measurements for all snags >6.0" dbh: Snags must have more than a 45 degrees angle above the ground

- Estimate dbh, height
- Record quadrant and estimate distance to each snag from plot center. Do not tag snags.
- Record species, decay class, and wildlife usage for all snags ≥5.0 inches dbh.

Wildlife Usage codes:

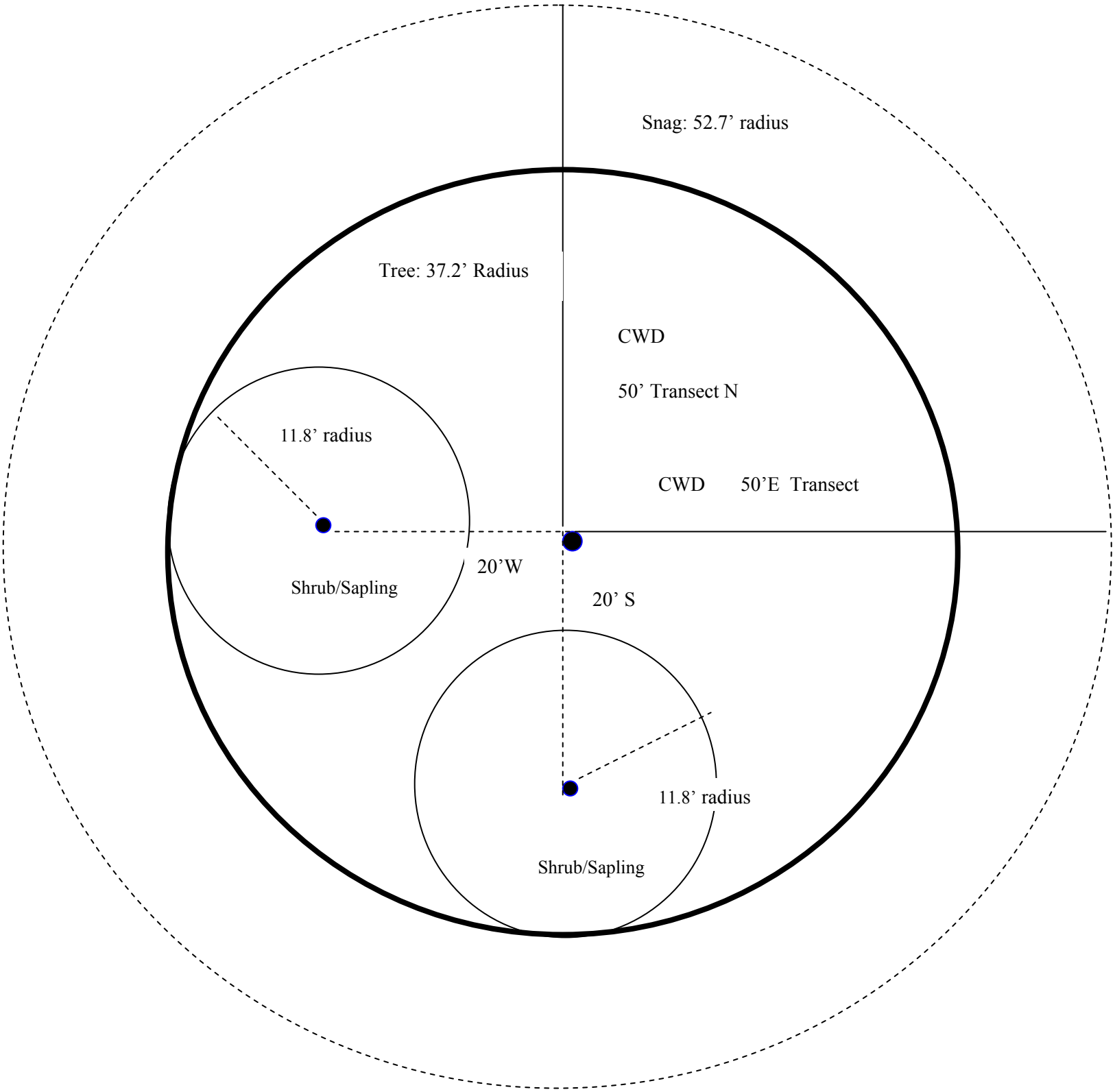
Type		Extent
FR:	Foraging	Percent of snag (10% classes)
CY:	Cavity	

5. Downed Woody Debris Plot

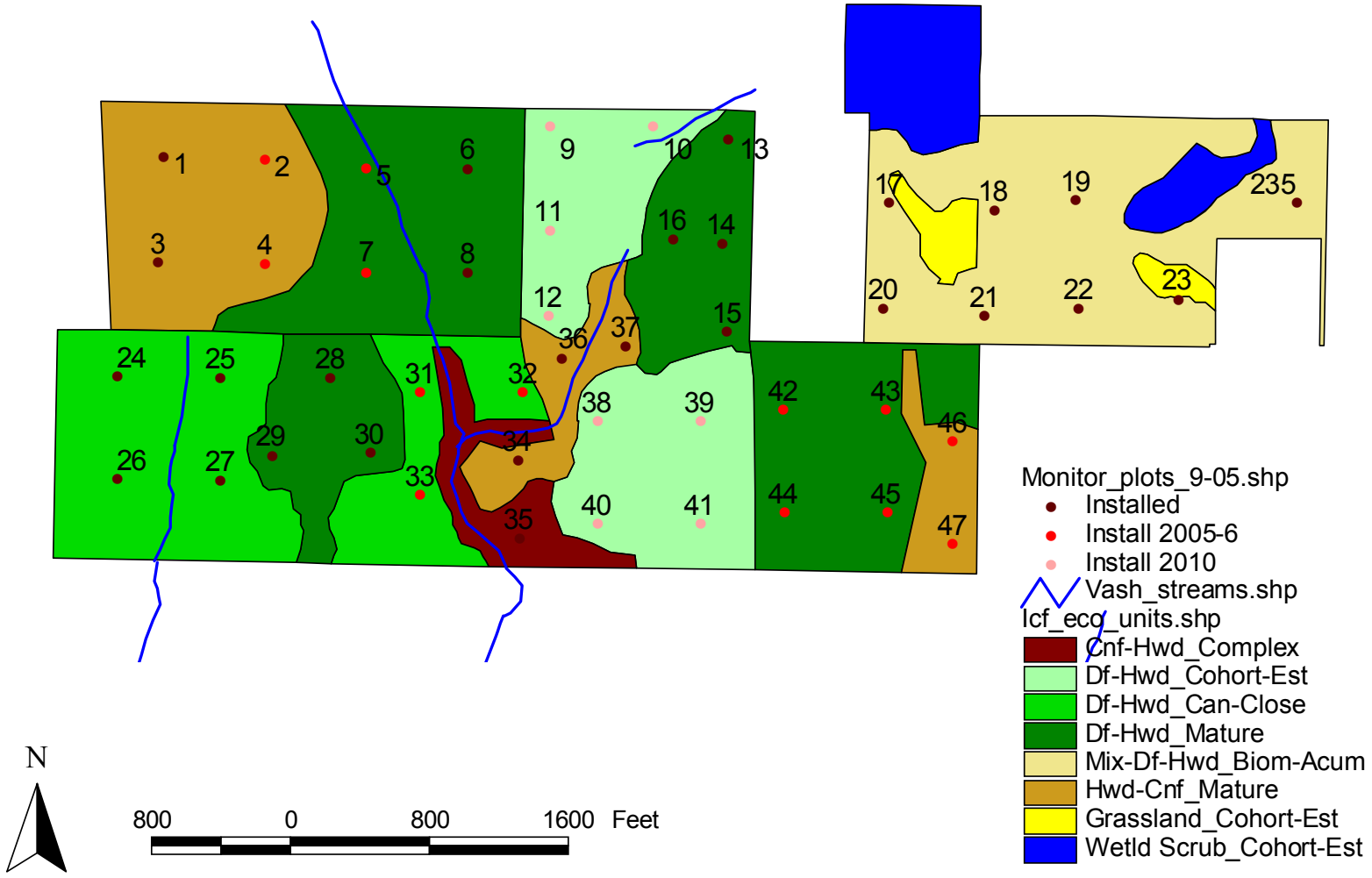
Plot Dimensions: Establish two, 50' perpendicular line intersects, heading due north and east from plot center.

Measurements

- Estimate intersect diameter (cross sectional diameter at point of intersect)
- Piece length
- Species, and decay class for all downed woody debris over 6"diameter at point of intersection. CWD must be at less than a 45 degree angle and the central axis must be above ground level. (see WADNR guidelines below for decay class).


Snag: 52.7’ radius
Tree: 37.2’ Radius
CWD
50’ Transect N
11.8’ radius
CWD
50’E Transect
20’W
Shrub/Sapling
20’ S
11.8’ radius
Shrub/Sapling

Island Center Forest
Monitoring Plots



Plot #	Comment	Northing	Easting
1	Installed	164615	1229070
2	Install 2005-6	164598.7	1229657
3	Installed	164008.2	1229038
4	Install 2005-6	164001.8	1229657
5	Install 2005-6	164552.2	1230239
6	Installed	164547.6	1230829
7	Install 2005-6	163955.3	1230239
8	Installed	163950.7	1230829
9	Install 2010	164790.9	1231299
10	Install 2010	164790.9	1231891
11	Install 2010	164194	1231299
12	Install 2010	163701.4	1231290
13	Installed	164718.9	1232328
14	Installed	164114.6	1232292
15	Installed	163608.4	1232319
16	Installed	164145.4	1232007
17	Installed	164349	1233256
18	Installed	164308.2	1233858
19	Installed	164370.3	1234333
20	Installed	163745.2	1233220
21	Installed	163703.1	1233807
22	Installed	163744.2	1234350
23	Installed	163797	1234919
23.5	Installed	164350.5	1235605
24	Installed	163346.9	1228810
25	Installed	163343.3	1229401
26	Installed	162755.2	1228809
27	Installed	162751.6	1229400
28	Installed	163343.6	1230034
29	Installed	162895.4	1229698
30	Installed	162905.5	1230263
31	Install 2005-6	163261.2	1230551
32	Install 2005-6	163261.2	1231142
33	Install 2005-6	162664.3	1230551
34	Installed	162866.3	1231116

35	Installed	162417.5	1231124
36	Installed	163454.8	1231368
37	Installed	163523.5	1231735
38	Install 2010	163093.8	1231574
39	Install 2010	163093.8	1232165
40	Install 2010	162496.9	1231574
41	Install 2010	162496.9	1232165
42	Install 2005-6	163158.2	1232648
43	Install 2005-6	163158.2	1233239
44	Install 2005-6	162564.3	1232649
45	Install 2005-6	162564.3	1233241
46	Install 2005-6	162977.6	1233622
47	Install 2005-6	162383.6	1233624

Island Center Forest Plot Installation Data Sheet

Version 9-05

Date	Plot #	Team Leader	Team members
		Note Taker	

Plot Center							BAF
Monument			Photos #	Dominant Tree & Shrub			Invasives:
GPS			N	Sp	%	Age	
Bearing Trees			E				
Tag#	Dist	Azmth	S				
			W				Topo Info & Notes

Tree Plot (>6" dbh, ***1/10 acre 37.2'*** radius)

Tag #	Species	Strata-Crn Class	dbh (0.1", **paint**)	LCRatio-10%	Dmage	W-Life Tree	% Defect	Var Radius Plot	Height (ft)	Ht LiveCr (ft)	Age	5yr radial (mm)	10yr radial (mm)

Snag Plot

(snags>6"dbh, >5' Ht >45 degrees, 1/5 acre, 52,7' radius)

Quadrant	Distance	Species	Dbh (", est)	Height (ft)	Decay Class	Wlife use:

CWD Transect (2x 50' N & E)

(CWD >4" Intersect dia, >45 degrees)

Transect	Inters. Dia (")	Length (ft)	Decay class	Species

Shrub Plot

(2x 1/100 ac, 11.8' radius)

Plot	Species	Mn Ht(1/2 ft)	% Cover (5%)	Plot	Species	Mn Ht(1/2 ft)	% Cover (5%)

Sapling Plot

(2x 1/100 ac, 11.8' radius)

Plot	Species	6"-4.5' tall	4.5' - 3"dbh	3"-6"dbh

Notes: GPS points of interest, Photos; Wildlife Use (type, intensity, species)

ICF Monitoring Plot Installation

Forestry Equipment List	**Number**
Sub-meter accuracy GPS unit (with plots loaded)	1
Laser Rangefinder	1
Reflectors for laser	1
Field Vests	1/person
Compass	1/person
75 or 100’ spencer tapes w/dbh tape	1/person
Hammer	
Digital Camera	2
Relascope	1
18” Increment Borer	2
Clipboard	1
Datasheets, Plot & trails map & ortho photos	2
Field protocol (including DNR guidelines)	1
Plant ID book (Pojar)	1
Bell & Dilworth	1
Machete	1
Heavy Duty Stapler & staples	1
Rulers (metric & English)	1
Calculator	1
Optional Items	
Pin flags to delineate plots	15
Staff: (re-bar works great for securing spencer tapes)	1
Tarp to pile stuff and prevent lost items	1
Binoculars	
3’ folding frame or two yard-sticks (for delineating herb plots)	

Materials List	
Numbered tree tags (check for numbers that have not been used)	200
Unmarked tree tags and imprint tools to replace missing tags	200
Unmarked bearing tree tags for scribing & Nails	30

Zip ties	250
Backup rite-in-rain notebook	2
8 x 11 rite in rain paper	10
Sample bags for unknown plants	20
Rebar & plastic pipes (for replacement if missing)	12
Tree paint (spray can): orange	2
Flagging	2
Pencils (some red)	2
Markers (pen)	
Extra staples	
Backup stapler	
extra batts for laser	

Coarse Woody Debris

CWD

Sample Method
Use the following procedure to establish the sample plane for sampling down dead woody material (DDWM).

1. Sample down dead woody material at each designated sample point.
2. From plot center establish a horizontal line 25 feet long and extend it in the direction of travel used to arrive at the sample point (Fig. 5-2).
3. Mark the end of this line with a piece of flagging.
4. Return to plot center and repeat this process at a right angle in a clockwise direction from the first line.
5. Define the sample plane as an imaginary vertical plane six feet high beginning at ground level and extending along these lines.

Fig. 5-2. Sample plane.

C. Identifying Down Dead Woody Material
Down dead woody material is defined as any bole, portion of a bole, or branch of a tree that died and fell to the ground. Use the following rules to determine if a piece of DDWM qualifies for tallying.

1. DDWM must be at least four inches in diameter at the point of intersection with the sample plane.
2. The central axis of the DDWM must be above ground level but no more than six feet above the ground.
3. If the sample plane intersects the end of a piece the central axis must be intersected. If the plane exactly intersects the central axis at the end of the piece tally every other such piece.
4. If the sampling plane intersects a curved piece more than once tally each intersection individually.
5. If a single piece intersects both legs of the sampling plane tally it as two seperate pieces with the diameters determined at the two points of intersection.

D. Recording Down Dead Woody Material Information
Record the following DDWM information on the sample point tally card, Form Res. MM-02 (Fig. 4-1) in the area labeled Down Dead Woody Material.

1. Plot Taken? (Check-off box).
Check YES if a DDWM plot is actually taken at the sample point. Check NO if no plot is taken at the sample point.

2. Record Number, (Col.21-22)
Record a sequential number beginning with '1' for each DDWM piece tallied.

3. Species, (Col. 23-24).
Specify if the DDWM is western red cedar or another species using the codes in Table 5-1.

Code	Species
OT	All other species
RC	Western red cedar

Table 5-1. DDWM Species.

4. Intersect Diameter, (Col. 25-26).
Estimate to the nearest inch and record the cross-sectional diameter of the DDWM at the point of intersection with the sample plane. If the piece is irregular in shape average the diameter between its widest and narrowest point.

5. Piece Length, (Col. 27-29).
Estimate the total continuous length of the DDWM piece and record it to the nearest foot. If the piece is broken, estimate only the length of the intact portion. If the piece becomes submerged below the ground, estimate the length to the point where it enters the ground.

6. Decay Class, (Col. 30).
For each piece tallied, identify its decay class using Table 5-2 and Figure 5-3 as guidelines. Record the corresponding decay class code.

Characteristic	Decay Class Code				
	1	2	3	4	5
Bark	Intact	Intact	Trace	Absent	Absent
Twigs < 1.2 in.	Present	Absent	Absent	Absent	Absent
Texture	Intact	Intact to softening	Hard, large pieces	Small, soft blocky pieces	Soft and powdery
Shape	Round	Round	Round	Round to oval	Oval
Color of wood	Original color	Original color	Original to faded color	Light brown to reddish brown	Red brown to dark brown
Portion on ground	Log elevated on support points	Log elevated on support points, but sagging slightly	Log sagging near ground	All of log on ground	All of log on ground
Invading roots	None	None	In sapwood	In heartwood	In heartwood

Table 5-2. Decay Class Codes.

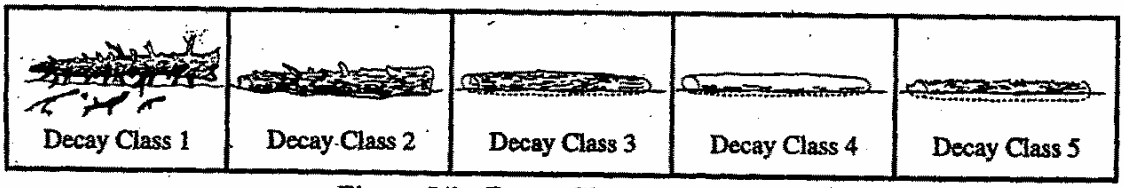


Figure 5-3. Decay Class Guidelines.

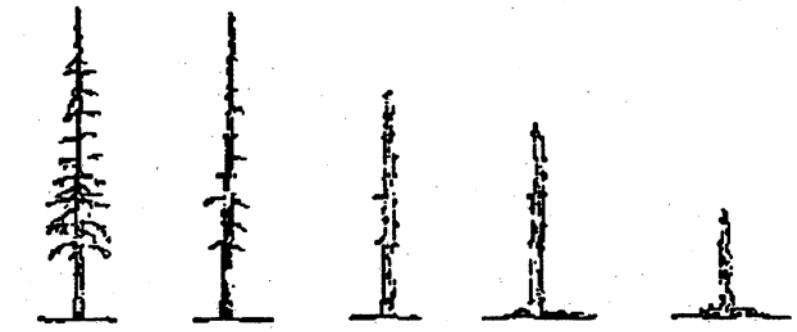
Condition codes provide descriptions of general physical conditions. Use the following descriptions and diagrams as an aid for determining the appropriate condition code of the dead tree or tree portion.

Use code's 1_ through 5_ to describe: Dead trees (and standing portions thereof) which are taller than 4.5' and which have the following general characteristics:

	Bark	Heartwood Decay	Sapwood Decay	Limbs	Top Breakage	Bole Form
Code 1_ Recent (1-5 yrs.)	Tight Intact	None to Minor	None to Incipient	Mostly present	May be Present	Intact
Code 2_ Loose Bark	50% loose or Missing	none to Advanced	None to Incipient	Small Limbs Missing	May be present	Intact
Code 3_ Clean	75%+ Missing	Incipient to Advanced	None to 25%	Few remaining	Usually 1/3	Mostly Intact
Code 4_ Soft	75% Missing	Incipient to Advanced	25%+	Few remaining	Usually 1/3-1/2	Starting to lose form
Code 5 Decomposed	75% Missing	Advanced to Crumbly	50%+ Advanced	Absent	Usually 1/2+	Form mostly lost

Recent mortality is represented by code 1.

Standing Dead Trees and Tree Portions



Use codes provide an indication of wildlife use based on the presence or absence of excavations' 1.0" in diameter or larger. This includes only excavations made by wildlife (denning, resting, feeding, etc.). Use the following codes as the second digit to record the presence or absence of wildlife use:

Tree Species

6. Data Type, (Col. 2).
Record the **live tree** data type code for each tree sampled on the plot using the code in Table 7-3.

Code	Data Type
1	Live tree
2	Dead tree

Table 7-3. Data Type Code.

7. Tree Number, (Col. 3-5).
Tally and record each tree beginning from true north, proceeding in a clockwise direction. If two trees have identical azimuths, record the tree that is nearest to plot center first. Give each tree a sequential number beginning with the first tree as "1".

8. Species, (Col. 6-7).
Record the two digit species code from Table 7-4 for each live tree sampled on the plot.

Conifer Species			
Code	Description	Code	Description
YC	Alaska yellow cedar	RJ	Rocky Mtn. juniper
DF	Douglas-fir	SP	Scotch pine
ES	Engelmann spruce	SQ	Sequoia
GF	Grand fir	SS	Sitka spruce
LP	Lodgepole pine	AF	Subalpine fir
MH	Mountain hemlock	WH	Western hemlock
NF	Noble fir	WL	Western larch
SF	Pacific silver fir	RC	Western redcedar
PY	Pacific yew	WP	Western white pine
PP	Ponderosa pine	WB	Whitebark pine
OC	Port Orford cedar		
Hardwood Species			
Code	Description	Code	Description
AS	Aspen	OA	Oregon ash
MA	Bigleaf maple	OO	Oregon oak
BC	Black cottonwood	MD	Pacific madrone
CA	Cascara	BR	Paper birch
CH	Cherry	RA	Red alder
AC	Crabapple	WA	White alder
DG	Dogwood	WO	Willow
HW	Hawthorn		

Table 7-4. Specie Codes.

DBH

9. Count, (Col. 8-9).
Record a "1" for each tree sampled. If the plot is an "edge plot" and the tree is tallied on a half plot, record a "2" for count. (Refer to Section VII-B-4).

D. Recording DBH, Quality, Defect and Bole Damage
Use the following procedures to measure and record tree information on the variable plot at each sample point.

1. DBH, (Col. 10-13).
Measure and record the diameter at breast height (DBH) to the nearest one-tenth inch of all live trees sampled. DBH is determined at a point 4.5 feet above the ground on the uphill side of the tree.

When branching, deformities or forking interferes with measuring DBH use the guidelines in Fig. 7-2 for determining where on the bole to measure DBH.

When measuring DBH, rounding diameters should follow standard mathematical rules (i.e.,round to the nearest even-numbered tenth inch). For example, round 8.18 inches to 8.2 inches; 5.65 inches to 5.6 inches; 5.75 inches to 5.8 inches.

Figure 7-2. Measuring Special Case DBH.