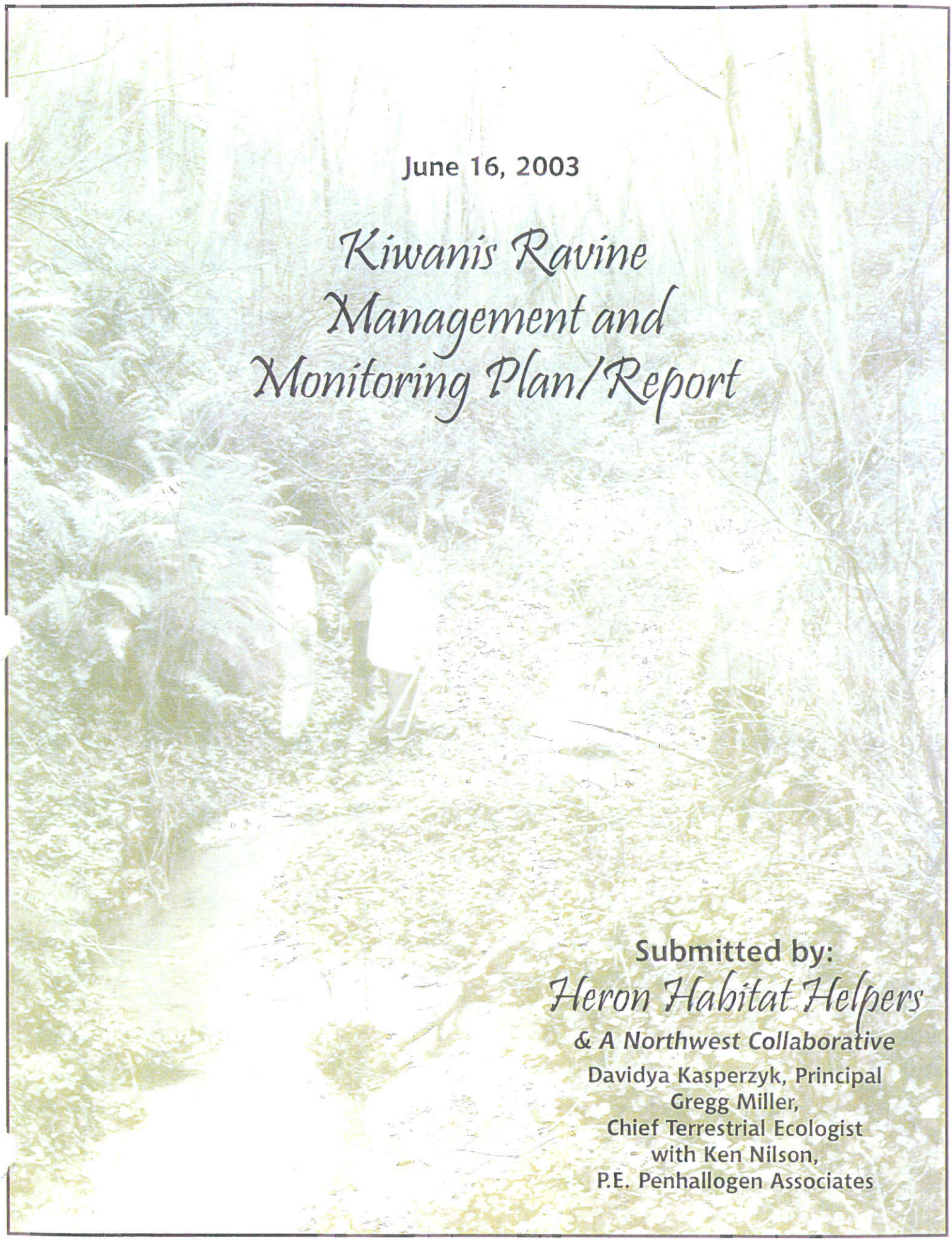
June 16, 2003

Kiwanis Ravine Management and Monitoring Plan/Report



Submitted by:

Heron Habitat Helpers

& A Northwest Collaborative

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SEATTLE PARKS AND RECREATION

June 24, 2003

To Whom It May Concern:

I have reviewed and have approved the "Kiwanis Ravine Management and Monitoring Plan/Report" for Seattle Parks and Recreation Department.

This document is now the final. If there are any questions concerning this document, please contact the Heron Habitat Helpers at info@heronhelpers.org or call me at (206) 233-3712.

Sincerely,

Charles Sablan, Manager
Environmental Learning Centers and Kiwanis Ravine

Table of Contents

Note to Readers

This Plan/Report provides general guidelines and templates for restoration work in Kiwanis Ravine and its wildlife corridor. Before any actual restoration work begins, these general guidelines and templates must be applied to a specific site.

A public meeting will be held to generate public interests and concerns regarding the specific site. If in good health, existing trees will be left in place. Landforms, structures, and utility lines (buried or overhead) will be taken into consideration.

After this information has been gathered, a conceptual design will be prepared that must meet the approval of Seattle Parks.

And in implementing management at Kiwanis Ravine, Seattle Parks will utilize best management practices.

Introduction

INTENT OF PROJECT

The Kiwanis Ravine Heron Habitat Helpers (HHH) was formed in February 2001 as a committee of Friends of Discovery Park. HHH continues the mission of the earlier Brygger Drive Alliance – which also worked closely with the Friends of Discovery Park. HHH is a member of the Associated Recreation Council, a 501-c-3 nonprofit organization.

HHH's mission is to help Seattle enjoy, learn about, and protect its Great Blue Herions in Magnolia's Kiwanis Ravine. HHH also is the official "adopt-a-park" sponsor of Kiwanis Ravine through Seattle Parks.

Kiwanis Ravine contains very steep slopes that wind through an urban neighborhood. Its mature trees and other native vegetation are being squeezed out by ivy and other invasives. Its Wolfe Creek currently runs into a culvert, transporting fresh water to the West Point Treatment Plant. But, the ravine was selected by Seattle's largest colony of Great Blue Herons for its nesting site.

In October 2001, HHH received notification from Seattle's Mayor Paul Schell that the Department of Neighborhoods had awarded HHH a $10,000 Small and Simple Grant for the preparation of a Kiwanis management plan. As plans progressed, HHH realized that planning work would have to be a larger effort than what could be accomplished under one $10,000 grant.

So, the planning work was divided in two phases. Phase 1 became the terrestrial portion of the Kiwanis Ravine Management and Monitoring Plan. And, in Fall of 2002, Mayor Greg Nickels notified HHH it had been awarded a second $10,000 grant to complete Phase 2 – the aquatic habitat/hydrology portion of the Plan. Both grants were from the Department of Neighborhoods Matching Fund..

Now complete, the Kiwanis Ravine Management and Monitoring Plan will be a long-range guide for Seattle Parks and its supportive citizenry.

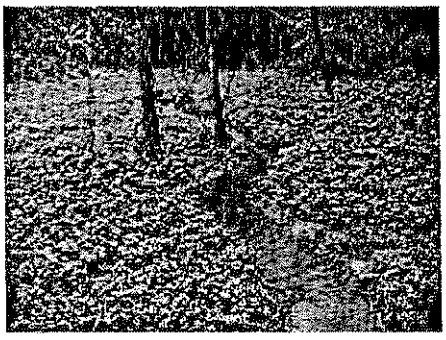
HHH hopes to create in Kiwanis Ravine a sustainable urban preserve for wildlife with restored stream and native vegetation – with human development along its edges that is in harmony.

A. Executive Summary

The intent of the Kiwanis Ravine Management and Monitoring Plan/Report is to provide a pragmatic and adaptive guide to the restoration of the Kiwanis Ravine. This Plan/Report is primarily a set of Kiwanis Ravine Habitat Management Principles which are:

- to provide contiguous, high-value, native wildlife habitat in Kiwanis Ravine from the headwaters of Kiwanis Ravine to Salmon Bay;
- to maintain the long-term viability of the existing great blue heron rookery;
- to protect and enhance native wildlife populations;
- to provide increased protection for wildlife habitat in the Ravine;
- to promote volunteer involvement in wildlife and habitat protection and enhancement;
- to promote interdepartmental and interagency cooperation to protect wildlife.

To achieve the successful strategic implementation of this Plan/Report, a number of issues need to be recognized and resolved. It is our hope that this document furthers a significant public policy conversation about how the City of Seattle and its Citizens will develop action strategies to accomplish the above goals. The following topical areas have emerged during our public and private deliberations about how to really get this work accomplished. They include:



- Explicit Support for the habitat restoration goals is needed from the Mayor and City Council, the Lead Departmental Agencies, and neighborhood sponsors,volunteer organizations and activists.
- A Pragmatic Approach to getting the work done is necessary. It is really not possible to tell who has the capacity in both funding and person-power to accomplish the restoration goals. This is a labor intensive, long-term action strategy which would work best with continuity amongst those accomplishing and monitoring the work. Variations on who actually does the restoration work include: volunteer and neighborhood-based action; City-based restoration and maintenance action; independent professional restoration; and a combination of the above.
- Clarification of the Administrative Authority and Responsibility is required to accomplish our habitat restoration goals. It seems that the City of Seattle has no specific adopted legal

framework for protecting habitat preserves. Initial discussions about this policy void suggest that Seattle Parks should seek designation of "preserve" status for Kiwanis Ravine, with appropriate rules. An additional idea would be to implement a "joint operating agreement" between the involved departments which include Parks, Public Utilities, City Light and Transportation. This agreement would clarify which is lead agency.

- *Complementary City Policies* may be needed to reduce current impacts upon the habitat. These include: improve public utilities maintenance practices which impact the Kiwanis Ravine; restore Wolfe Creek as a more complete watershed; and of course obtain adequate funding for the materials and staff required to accomplish and maintain the viability of the habitat.

- *Establish a Long-Term Partnership* between the lead agency, the local sponsor – HHH, and the surrounding neighborhood. Nothing succeeds like success. The most notable indicator of this project's success would be the long-term health and retention of the heron colony. The commitment of local government to public education, the leadership of the Heron Habitat Helpers, and the voluntary participation of the residential community in habitat-sensitive land management practices are all necessary. Seattle has the opportunity to become a national leader in the protection of critical wildlife habitat. Recommendations on access to Kiwanis public lands are proposed as well as "good neighbor" practices that support the conservation of the ravine.

A Shared Legacy

It is increasingly rare that within urban Seattle, Wolfe Creek and the Kiwanis Ravine are still capable of supporting a significant great blue heron colony. Building the local knowledge and respect for the integrity of this narrow riparian ravine is the responsibility of our generation. Over time, we should seek to reconnect the natural watershed with its native plant palette as it flows to its fresh water out-fall in Salmon Bay.

The lore of a dedicated local culture committed to the conservation of this multi-faceted resource should reach back to honor the Shill-Shohl, the pioneers and military engineers, and those citizens who envisioned a return of the native habitat such as Mary Hartnagel, Bob Kildall, Scott Grimes, Kathleen Wilkens, Terri Deir, Evelyn Barringham, Nancy Kroening, Val Cholvin and others.

The best legacy would be to conserve it as a dynamic living part of our everyday lives, so that today's and tomorrow's citizens who come to the Kiwanis Ravine from curiosity, leave in awe.

B. Management Plan Summary

Goal #	GOALS	OBJECTIVES	ACTIONS	WHO
1	Provide high-value, native wildlife habitat	Promote and enhance the integrity of native plant communities, wildlife habitats and ecosystems by removing non-native invasive plants	Remove ivy	VO, SP2
			Remove blackberry	VO, SP2
			Remove knotweed	VO, SP2
		Replant areas with species that are native to the Puget Sound lowlands	Add natives	VO, SP2
		Enhance habitats by increasing the structural diversity of plant communities	Plant over time	VO, SP2
2	Maintain the long-term viability of the existing Great Blue Heron Colony	Protect heron colony habitat from degradation	Watch for opportunities to improve the financial base and management attention for Kiwanis Ravine	VO, SP2
			Remove ivy	VO, SP2
			Replant native plants in the heron colony	VO, SP2
		Promote existing tall tree survivorship	Remove ivy	VO, SP2
		Promote growth of future replacement trees for heron colony	Plant native trees at outer edges of colony	VO, SP2
			Plant red alder and big-leaf maple	VO, SP2
			Survey tree regeneration in the Ravine	VO, SP2
		Prevent human activity in the public lands of Kiwanis Ravine from disrupting heron breeding	Conduct restoration in Kiwanis Ravine following access guidelines	VO, SP1
			Monitor colony each nesting season. Collect data on nest locations and productivity, as well as predation and other disturbances	VO, SP3

			Determine when all chicks have fledged	VO, SP1
		Prevent soil movement	Restore slopes in horizontal belts	VO, PRO
			Contract with professionals for restoration on slopes > 40%	VO
			Restore cleared areas within a few days	VO, PRO
			Plant cleared areas within 6-12 months	VO, PRO
3	Provide increased protection for wildlife habitat in the Ravine	Purchase unprotected land within the Ravine	Parks or other City departments purchase land from willing sellers	SP1
		Develop conservation easements to protect habitat on steep slopes	Make available information on conservation easements to willing sellers	SP1
			Work with local land conservancies to negotiate, if public lands are not immeditely available	SP1, VO
		Promote voluntary "good neighbor" practices near the public lands of Kiwanis Ravine	Share "Good Neighbor" Practices with neighboring community	VO, SP1
			Promote the "Backyard Wildlife Sanctuary" Program	VO, WDF[1]
			Develop wildlife observation points	VO, SP3
		Reduce erosion from water flow from street-ends	Install deadfalls to reduce energy of stormflows	SDOT,VO, PRO
			Establish native plants to reduce energy of stormflows	VO
4	Protect and enhance native wildlife populations	Protect sensitive species' habitats from degradation	Share "Good Neighbor" Practices with neighboring community	VO, SP1
			Build name recognition of the Kiwanis Ravine herons and their value to the community	SP2, VO
			Post "no dumping" signs at street ends	SDOT, VO
			Place fencing or barriers at street ends to prevent dumping	SDOT, VO
			Promote retention of mature trees on private land	VO, SPU
		Enhance sensitive species habitats when degradation is identified	See actions for goals 1 and 2	same

			Work toward adoption of "preserve" status for Kiwanis Ravine with appropriate supporting regulations	VO, SP2
		Enhance habitat structure and promote wildlife diversity	See actions for goals 1 and 2	same
5	Promote volunteer involvement in wildlife and habitat protection and enhancement	Encourage Parks' and other City Departments' support for volunteer enhancement projects	Support training for and activities of volunteers to protect and enhance wildlife resources	SP2, VO
			Provide logistic support, equipment, advice, meeting rooms, and other resources to volunteers	SP2
			Coordinate restoration activities with on-going Parks projects	SP2,VO
			Assist in initiating a volunteer "Adopt a Parcel" program and a volunteer restoration monitoring program	SP3
		Provide education programs on conservation and restoration of Kiwanis Ravine	Provide leadership to educating volunteers on Kiwanis Ravine natural history, conservation needs, and restoration. Train docents.	SP3, VO
		Provide restoration expertise to volunteer groups	Seek information from Washington Native Plant Society, King County native plant salvage program and other restoration groups	VO
6	Promote interdepartmental and interagency cooperation to protect wildlife and wildlife habitat.	Transfer management of City-owned property from other city agencies to the Parks Department	Continue current efforts to transfer surface jurisdiction of street and alley right-of-ways in and bordering Kiwanis Ravine	SP1
		Work with City agencies to assure projects that affect Kiwanis Ravine habitats provide habitat protection and enhancement	Take leadership in coordinating other Departments' work in Kiwanis Ravine during least sensitive times of years and providing oversight on slope protection, etc.	SP1
			Encourage "Good Neighbor" Practices to gain voluntary cooperation in avoiding exterior construction, demolition, tree cutting, and earth moving during most sensitive times of the heron breeding season	SP1, Depts

Encourage City ordinance and agencies to provide integrated land and resource management of property in Kiwanis Ravine.	Encourage unified wildlife habitat conservation and management practices across City departments	SP1, Depts
	Assist in a cooperative effort to reconnect Wolfe Creek to Salmon Bay and daylight the creek's mouth to assist salmon habitat	SP2, VO

KEY:

Depts. — Other City Departments can assist
PRO - Professionals
SDOT - Seattle Department of Transportation
SP1 - Seattle Parks can do now or in the next few years
SP2 - Seattle Parks can assist now or in the next few years
SP3 - Seattle Parks can do or assist in the future if budget and priorities allow
VO - Voluntary organizations like the Heron Habitat Helpers, Seattle Audubon, or others

WDFW - Washington Department of Fish and Wildlife

C. Kiwanis Ravine Management and Monitoring Plan/Report

I. INTRODUCTION

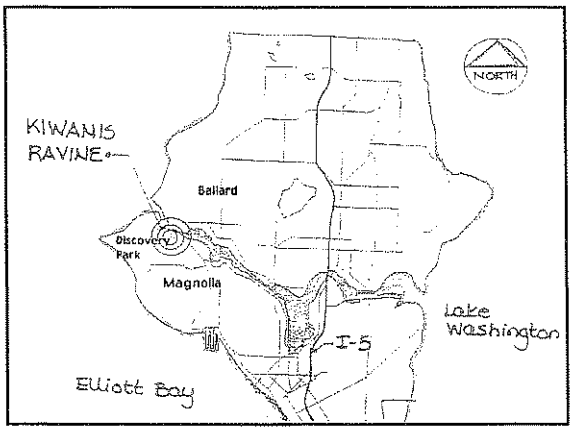
This Management and Monitoring Plan describes goals, guiding principles, and objectives for habitat management in Kiwanis Ravine. This Plan also describes existing ownership and land use, current habitat conditions, and recommended restoration and enhancement methods. A restoration monitoring program is included as part of the Plan.

The goals of habitat management in Kiwanis Ravine are: to provide contiguous, high-value, native wildlife habitat and wildlife corridor in Kiwanis Ravine from the north Magnolia headwaters of Kiwanis Ravine to Salmon Bay; to maintain the long-term viability of the existing great blue heron colony; and to provide increased protection for wildlife habitat in the ravine.

This plan also covers the aquatic biology and hydrology of Kiwanis Ravine with a goal of returning Wolfe Creek to a natural confluence with Salmon Bay and improving the natural hydrology of the Creek.

Kiwanis Ravine is located in Seattle on the north side of the Magnolia Neighborhood, immediately south of Salmon Bay and the Ship Canal, east of Discovery Park, and north of Emerson Street West. (See the Vicinity Map Figure 1). Kiwanis Ravine consists of Wolfe Creek and adjacent slopes, and includes a complex mosaic of public and private property. Kiwanis Ravine contains approximately 10 acres of natural and semi-natural vegetation that provide wildlife habitat. The habitats in Kiwanis Ravine provide a corridor from Discovery Park through Kiwanis Ravine, across the Gilman Ave. W. right-of –way to Salmon Bay. Then the corridor extends north to the Cascades along the Burlington Northern Santa Fe Railroad.

Much of the land in the Ravine is public property including Kiwanis Memorial Preserve Park, Kiwanis Ravine Natural Area, the former Ohman property, undeveloped street right-of-ways, and other City-owned property. (See Figure 8 -Parks Property, Parcels and Public Right-of –Way). Management responsibility for public land in the Ravine is spread among numerous City Departments including: Seattle Parks and Recreation (Seattle Parks), Seattle City Light, Seattle Department of Transportation (SDOT), Seattle Public Utilities (SPU), and Department of Design-Construction-Land Use (DDCLU). As manager of the Kiwanis Memorial Preserve Park, Kiwanis Ravine Natural Area, and the former Ohman property, Seattle Parks is responsible for managing most of the land in Kiwanis Ravine.



Vicinity Map Figure 1

SDOT is in the process of transferring surface management for land along the Gilman Avenue right-of way to Seattle Parks. This is for the purpose of improving habitat and use as a wildlife corridor leading to Kiwanis Ravine. The City is also working to transfer surface land management responsibilities for other public land in Kiwanis Ravine to Seattle Parks.

II. GOALS AND OBJECTIVES

The goals and objectives of this Plan were developed in consultation with the Heron Habitat Helpers (HHH) and Seattle Parks, and are consistent with Seattle Parks Urban Wildlife and Habitat Management Plan (Miller 1994, 2000).

The goals for wildlife habitat management in Kiwanis Ravine are:

- Provide contiguous, high-value, native wildlife habitat and a wildlife corridor in Kiwanis Ravine from the headwaters of Kiwanis Ravine to Salmon Bay
- Maintain the long term viability of the existing great blue heron colony
- Provide increased protection for wildlife habitat in the Ravine
- Protect and enhance native wildlife populations
- Promote volunteer involvement in wildlife and habitat protection and enhancement
- Promote interdepartmental and interagency cooperation to protect wildlife and wildlife habitat.

These goals are overlapping and thus efforts to achieve one will serve to achieve others. In this they form an integrated vision for the future of the natural resources of Kiwanis Ravine as a sustainable urban preserve that supports native wildlife.

The following objectives are intended to achieve these goals.

Goal 1: Provide contiguous, high-value, native wildlife habitat and a wildlife corridor in Kiwanis Ravine from the headwaters of Kiwanis Ravine to Salmon Bay.

Objectives:

- Promote and enhance the integrity of native plant communities, wildlife habitats and ecosystems by removing non-native invasive plants from the Ravine
- Replant areas with species that are native to appropriate Puget Sound lowlands plant communities
- Enhance habitats by increasing the structural diversity of plant communities
- Restore an open, natural connection from Wolfe Creek to Puget Sound

Goal 2: Maintain the long-term viability of the existing great blue heron colony.

Objectives:

- Protect the habitat of the heron colony from degradation
- Promote existing tall tree survivorship
- Promote growth of future replacement trees for the heron colony
- Keep human activity in the public lands of Kiwanis Ravine from disrupting heron breeding
- Work with Seattle Parks to strengthen Parks Policy, including specific Park Rules for Kiwanis Ravine

Goal 3: Provide increased protection for wildlife habitat in the Ravine.

Objectives:

- Purchase unprotected land within the Ravine from willing sellers
- Develop conservation easements to protect habitat on steep slopes in and near the Ravine
- Promote voluntary "good neighbor" practices near the public land of Kiwanis Ravine
- Reduce erosion from water flow from street-ends and storm water overflows.

Goal 4: Protect and enhance native wildlife populations.

Objectives:

- Protect habitats used by sensitive species from degradation
- Enhance sensitive species' habitats when degradation is identified
- Protect and enhance complex habitat structure to increase wildlife habitat niches and promote wildlife species diversity
- Retain the wildlife corridor from Discovery Park to Puget Sound and the railway corridor

Goal 5: Promote volunteer involvement in wildlife and habitat protection and enhancement.

Objectives:

- Encourage Seattle Parks' and other City agencies' support for volunteer habitat enhancement projects
- Provide education programs on conservation and restoration of Kiwanis Ravine
- Provide restoration expertise to volunteer groups

Goal 6: Promote interdepartmental and interagency cooperation to protect wildlife and wildlife habitat.

Objectives:

- Transfer surface management of City-owned property from other city agencies to Seattle Parks.
- Work with City agencies to assure projects that affect Kiwanis Ravine habitats provide habitat protection and enhancement and protection of nesting herons from disturbance
- Encourage City agencies to provide integrated land and resource management of property in and around Kiwanis Ravine
- Work with City and County Departments to restore an open, natural connection from Wolfe Creek to Puget Sound (See Figure 10)

III. EXISTING HABITATS AND CONDITIONS

The inventory information in this Plan is based on existing information, and brief site visits. The Seattle Urban Nature Project (SUNP) has surveyed and mapped the habitats in Kiwanis Ravine. No floral surveys to determine all of the plants in all of the habitats in Kiwanis Ravine have been conducted.

Existing Habitat Types

There are nine habitat types in Kiwanis Ravine: shrubland, tree savannah, deciduous forest five to fifteen inches diameter, deciduous forest fifteen to twenty inches diameter, conifer/deciduous mixed forest twenty to thirty inches diameter, palustrine scrub-shrub, palustrine forest, riverine unconsolidated, and developed (SUNP 2000). These are shown on Figure 3, Habitat Types on Public Lands. These habitat types are defined by structural characteristics of the habitat, and are based on the habitat classification system in the Seattle Department of Parks and Recreation's Urban Wildlife Habitat Management Plan (Miller 1994, 2000).

The classification system is used by the Washington State Gap Analysis Project and the Interagency Committee for Outdoor Recreation (IAC 1993). The Gap Analysis Project and the IAC based the system on work done by the United Nations Educational Scientific and Cultural Organization (UNESCO 1973). The classification and mapping system is consistent with the national vegetation-mapping program being developed and conducted by numerous federal agencies and many state natural heritage programs. A brief description of these habitats in Kiwanis Ravine follows. The habitat classification system and the technical definitions of each habitat type are provided in Appendix A. Appendix B contains a list of plant species known to occur in Kiwanis Ravine.

Shrubland habitat is dominated by shrubs. Although there may be some trees or open grass areas, they are not dominant. Because shrub species are often colonizers on disturbed sites, and many non-native species are aggressive colonizers, shrublands in the Puget Sound region are often dominated by non-native invasive species. In Kiwanis Ravine shrubland habitat is dominated by two invasive species: Himalayan blackberry (Rubus discolor) which forms 50% to 75% of the cover and Giant Knotweed (Polygonum sachalinense) forms between 5% and 10% of the cover. Although there are some native species in the shrublands, including Stinging Nettle (Urtica dioica) and Giant Horsetail Rush (Equisetum telmatiea), they generally form less than 10% of the cover.

Tree Savannah habitat is an open habitat with scattered, sparse tree cover. Within Kiwanis Ravine tree savannah contains Bigleaf Maple (Acer macrophyllum) and Red Alder (Alnus rubra) in the tree canopy, with Willow (Salix sp.), Oceanspray (Holodiscus discolor), Giant knotweed (Sachalinense), Scot's Broom (Cytisus scoparius), Bindweed (Convolvulus arvensis) and Himalayan Blackberry in the understory. The non-native invasives Himalayan Blackberry and Bindweed form 75% to 95% and 10% to 25% respectively of the shrub layer (SUNP 2000).

Tree savannah habitat impacted by catch basin for new development

Deciduous forest habitats have a greater tree canopy than tree savannah, and the canopy is dominated by deciduous trees. There may be coniferous or evergreen hardwoods in the canopy but they are not dominant. There are two types of deciduous forest in Kiwanis Ravine based on the diameter of the trees: the smaller sized habitat generally contains trees five to fifteen inches in diameter at breast height (dbh), while the larger size generally contains trees fifteen to twenty inches dbh. Within Kiwanis Ravine these habitats predominantly contain Red Alder and Bigleaf Maple in the overstory, with a few Western Red Cedar (Thuja plicata). The age, health, and overall condition of the trees are not currently known. Currently there appears to be sufficient tree reproduction in the understory of the deciduous forests to maintain the forests.

Deciduous forest habitat

A varying mix of native and invasive species are found in the deciduous forest understory. Natives in the understory include Beaked Hazelnut (Corylus cornuta), Indian Plum (Oemleria cerasiformis), Salmonberry (Rubus spectabilis), Snowberry (Symphoricarpos albus), and Swordfern (Polystichum munitum) (SUNP 2000). The main invasives in the deciduous forest understory are Himalayan blackberry and English ivy (Hedera helix) (SUNP 2000). Additional native species in the forest include Bedstraw (Galium aparine), Licorice Fern (Polypodium glycyrrhiza), Ocean Spray (Holodiscus discolor), Red Elderberry (Sambucus racemosa), Red Huckleberry(Vaccinium parvifolium), Stinging Nettle(Urtica dioica), and Pacific Blackberry (Rubus ursinus) (Tabscott 1992).

Himalayan Blackberry and English Ivy are found throughout the deciduous forests with their cover varying widely. There are some pockets with almost no blackberry or ivy while other areas contain 100% cover of one or the other species. English ivy is growing on many of the trees in the Ravine that are used by great blue herons for nesting.

Conifer/deciduous mixed forest is found in one area of the Ravine. The mixed forest is not strongly dominated by either coniferous or deciduous trees; rather the forest canopy contains a mix of both. In the Ravine the mixed forest canopy contains Western Red Cedar, Western Hemlock (Tsuga heterophylla), Red Alder, and Bigleaf Maple. The understory contains Beaked Hazelnut, Salmonberry, Stinging Nettle, Red Elderberry, Piggy-back Plant (Tolmiea menziesii), and Swordfern. The invasive English holly (Ilex aquifolium) covers between 10 and 25% of the shrub layer.

Mixed conifer-deciduous forest habitat

Palustrine habitats include freshwater wetlands and have traditionally been called marshes, bogs, swamps, or fens. Many palustrine habitats do not have standing or open water; rather the water that is present saturates the soil. There are two palustrine habitat types in Kiwanis

Ravine: palustrine scrub-shrub wetland and palustrine forested wetland.
Both are dominated by woody vegetation such as shrubs and trees. The scrub-shrub is dominated by plants that are lower in stature while the forested wetland is dominated by plants twenty feet or greater in height.

Palustrine scrub-shrub in the Ravine is dominated by Red Alder and Willow in the canopy, while the invasive Reed Canary Grass (Phalaris arundinacea) forms over 75% of the understory. Other understory species include: Red Alder, Willow, Cascara (Rhamnus purshiana), Beaked Hazelnut, and Salmonberry.

Palustrine forest in the Ravine is dominated by Red Alder, Bigleaf Maple and Western Red Cedar in the forest canopy. The shrub canopy contains Willow, Red Alder, Salmonberry, English Holly, Himalayan Blackberry, and Indian Plum. There are dense patches of Himalayan Blackberry scattered through the palustrine forest.

Wolfe Creek and its tributary comprise the riverine habitat in Kiwanis Ravine. Wolfe Creek is a year-round stream, likely subject to storm surges due to surrounding impervious surfaces, steep slopes and absence of associated wetlands. These surges can lead to unnatural erosion, slope instability and slides. The creek is largely open water with areas along the banks containing Salmonberry and Himalayan Blackberry (SUNP 2000). There are numerous seeps in the Ravine, but they have not been thoroughly inventoried or mapped. The seep areas may indicate areas with clay lenses in the soil and may indicate potential slide areas.

Wolfe Creek flanked by Donna Kostka and Ken Nilson

The only developed habitat in the Ravine is the paved path that leads uphill from the south side of the railroad footbridge to 32nd Avenue West.

Habitat Conditions

The habitats in the Ravine have been strongly influenced by human activity and exhibit varying amounts of degradation and reduced wildlife habitat value.

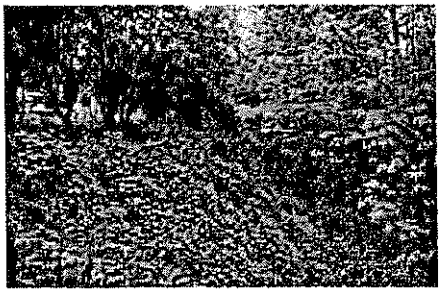
Inventory work for this plan found that all habitats in the Ravine contain invasive plant species. Invasive ivy is found growing up the trunks of many trees, including trees near the heron nest trees. These trees are potentially future nest trees for the herons. There is a carpet of ivy on the ground below the heron colony. Additionally, holly occurs in close proximity to heron nest trees.

Numerous areas of the Ravine contain introduced non-native plant species. Introduced plant species (exotics) generally support fewer wildlife species than native plants (CNPS 2003, NWF 2003, Swearingen and Diedrich, 2003). Exotics are often aggressive invaders, taking over a site, dominating the vegetation community, excluding native plant species, and reducing the habitat value of the plant communities. Non-native invasive species can shade out and choke out native plant species such as wildflowers that are of benefit to wildlife. Some exotic plants such as En-

glish ivy can even kill and help topple trees (Swearingen and Diedrich, 2003). This occurs by ivy shading and killing the growing tops of the trees and the weight of the ivy causing the weakened tree to fall. Thick stands of invasive species interfere with normal ecological functions by preventing regeneration of natives, eliminating pollen sources, and chemically inhibiting the growth of other plant species.

As noted, invasive plant species are found throughout the habitats in Kiwanis Ravine. The major invasive species include English Ivy, Himalayan Blackberry, English Holly, Giant Knotweed, and Reed Canary Grass. European Ash (Fraxinus excelsior) has been observed in the Ravine and may become an invasive species. While some areas of the Ravine are relatively free of invasives many areas are very densely covered.

There is an unauthorized path ("social path") along a portion of the Gilman Avenue West right-of-way. The social path allows human access that may disturb nesting herons, introduce garbage, increase erosion and contribute to habitat degradation. However it also provides the benefit of being the only way to walk around the ravine, thereby being an important link for humans and wildlife to Salmon Bay.



An illegal dump site covered with invasive Himalayan blackberry

Illegal dumping of garbage and yard waste occurs in the Ravine and degrades habitat by introducing pollutants and exotic species. Illegal dumping of yard waste is largely confined to the areas immediately adjacent to residences and street-ends that border the Ravine. Norway rats (Rattus norvegicus) occur in the area and illegally dumped garbage can provide them a readily available food source. Generally garbage dumping is restricted to street ends that are accessible by vehicle. Controlling these activities is difficult because they occur at the border of the Ravine where there is private land, public parkland and easily accessible street ends.

An "Illegal Dumping Hotline" has been established by the Seattle Police Department. That number is: 911 then, 684-7587.

A few unauthorized encampments also occur in the Ravine and can negatively affect wildlife and wildlife habitat by removing vegetation, introducing domestic dogs and cats, building fires, and polluting waters with untreated and uncontrolled sewage.

All of these environmental insults degrade the habitats and work against the goal of providing contiguous, high-value, native wildlife habitat throughout Kiwanis Ravine.

IV. EXISTING WILDLIFE

The inventory information in this Plan is based on existing information, observations of local residents, and brief site visits. No complete surveys have been conducted to determine all wildlife species that occur in Kiwanis Ravine.

The plant communities form the basis of the wildlife habitats of Kiwanis Ravine. They provide the primary plant productivity upon which animals depend, along with nesting and denning sites, escape cover, and protection from adverse weather. Most of the wildlife species that occur in the Ravine use several of the habitats to obtain all their life-history needs. Very few species are restricted to one habitat.

In general, more complex plant communities with more vegetation layers and more plant species provide higher-value wildlife habitat than less complex vegetation communities. More complex plant communities have more niches for wildlife and usually support more animal species than less complex communities. Bird species' diversity in wooded habitats increases with increasing structural habitat diversity. Habitats with more canopy layers, greater foliage volume, and greater total percent vegetative cover support greater bird diversity than habitats with fewer layers, less foliage volume, and less vegetative cover (Beissenger and Osborne 1982). Mammal species richness (a measure of diversity and abundance), especially for small mammals such as rodents, increases markedly with a well-developed herbaceous vegetation layer (Dickman 1987). Increasing vegetation density in the 8- to 20- inch height range has been found to increase the number of mammal species in urban habitats (Dickman 1987).

Sixty-eight bird species have been reported to occur in Kiwanis Ravine (Harmon pers. comm.). Additional species are likely to occur and more systematic and thorough surveys are expected to document a greater number of wildlife species in the Ravine. Appendix C contains a list of wildlife species reported to occur and potentially occurring in Kiwanis Ravine.

One Priority Species, the Great Blue Heron, uses Kiwanis Ravine extensively. The Great Blue Heron is a long-legged wading bird that eats frogs, small fish and aquatic insects, which are captured in shallow water (Butler 1997, Roderick and Milner 1991). Great Blue Herons are year-long residents of Puget Sound and are commonly seen along shorelines and wetland areas. They roost and nest in tall trees. They usually nest in groups of trees, and nesting areas are called colonies. Breeding locations for the Great Blue heron are listed as habitat priority areas by the Washington Department of Fish and Wildlife (WDFW) (WDFW 1993, 2002).

Great blue heron in Carkeek Park

There is a Great Blue Heron colony in Kiwanis Ravine. (See Figures 8, 9, 10, 11). The colony is the largest within Seattle and contained approximately 35 nests in 2001, and 36 nests in 2002 (Cahn pers. comm.). It has been used for about thirty years (Adams and Steil 1992). The colony has grown larger over the years, there were 11 nests reported in 1992. The number of active nests is expected to normally vary somewhat from year to year. The colony is considered by WDFW to be a significant nesting site both in the City of Seattle and in the Puget Sound region (Penland 1991, Thompson 2001).

The heron colony has been regularly monitored by dedicated volunteer observers for several years. Their observations have contributed to a greater understanding of the ecology of the Kiwanis Ravine herons, including nest success, predation and disturbance factors, and nest locations. The volunteer observers have also provided education on heron ecology, behavior, and breeding to Kiwanis Ravine visitors.

Great blue herons exhibit an annual cycle of nest building, egg laying, hatching, rearing young, fledging, and post-breeding dispersal.

The Great Blue Heron breeding season in Kiwanis Ravine generally extends from February to late July or mid-August (Cahn pers. comm.). Herons arrive and establish nest sites during February, and courtship occurs during February and March. Egg laying occurs in early March and continues into early April. Incubation begins once eggs are laid in a nest. Eggs generally hatch during April and May and the adults feed the young in the nests. Feeding of young in nests generally continues through June, with the young fledging in late June and into July. Occasionally eggs or young will die or be eaten by predators (termed nest failure), and the adults lay a second set of eggs (second clutch). Young from second clutch nests fledge in August and sometimes as late as early September (Cahn pers. comm.).

Great Blue Herons are sensitive to disturbance during the nesting season. Disturbance can be loud unusual noises, humans approaching the colony, low flying airplanes, or harassment from crows or eagles. Adult herons are most sensitive to disturbance during the early part of the season, when they have invested fewer resources in breeding, than later in the season. Adults are most likely to take flight due to disturbance during courtship and nest building. If disturbance causes both adults to leave the nest unguarded, predators may eat the eggs or young. Young birds are also sensitive to disturbance and may jump or fall from the nest when disturbed. Once out of the nest young are susceptible to predators and injury.

During the 2002-breeding season over 90 young successfully fledged from 36 nests in the Kiwanis Ravine colony (Cahn 2002). During the 2001 nest season, bald eagles were seen perched in trees in the colony, often within a few feet of active heron nests. The eagles disturb the adult herons and disrupt normal breeding activity. About one-third of the heron nests were affected by Bald Eagles in 2001 (Cahn pers. comm.).

The heron nests in Kiwanis Ravine are in Red Alder and Bigleaf Maple trees. Over time heron nesting contributes to death of nest trees. In colonies that have been observed for many years, herons build nests in trees farther from the core of the colony as trees decay and die in the central portion of the colony. This leads to a roughly donut shaped colony. Although serious tree decay has not been observed in the Ravine, tree decay is expected. Additionally Red Alders are considered to have about a 60-year life span. The Bigleaf Maples have a life span of several hundred years and are expected to survive much longer than the Red Alders.

A survey of trees near the colony that could eventually serve as replacement nest trees found over 50 potential replacement trees. The potential replacement nest trees are Red Alder and Bigleaf Maple, and range in size from five to fifteen inches dbh. Many of the potential replacement trees have ivy growing up their trunks. Future replacement trees are very important for the long-term viability of the heron colony. As the current nest trees age and die, replacement nest trees will be required so that the herons can continue nesting in the Ravine.

Although a civil survey (land survey) of the colony location has not been done, it appears that most of the nests are located on public land.

The heron colony is termed the "jewel of Kiwanis Ravine" by local volunteers, and is a focal point of the Ravine due to its uniqueness and its special focus for wildlife viewing. The north end of the railroad footbridge provides a good view of the colony where observers do not disturb the herons.

Nesting herons are sensitive to disturbance from human activities such as construction, and have abandoned nest areas because of disturbance (Roderick and Milner 1991). Low-flying aircraft can significantly disturb nesting herons, as the nests are usually in the tops of tall trees.

Natural predation of heron eggs and chicks also occurs. Bald eagles and crows will eat eggs or young if the opportunity occurs. In recent years bald eagles have perched close to active heron nests, and crows regularly frequent the colony. Both eagles and crows will prey on unguarded nests, and any disturbance that causes adults to leave the nest provides an opportunity for predation.

As noted, bald eagles use Kiwanis Ravine. Previously bald eagles were listed under the Federal Endangered Species Act, but have been delisted due to increasing populations. Bald eagles are large birds of prey, that eat fish, waterfowl, and carrion (Verner and Boss 1980). The bald eagle is a fish- and waterfowl-eating predator that occupies habitats adjacent to large lakes, streams, or rivers (Verner and Boss 1980), nesting in large trees. Bald eagles frequent Kiwanis Ravine and are suspected to prey upon young great blue herons. Eagle presence in the heron colony disturbs herons and may lead to predation of young herons by crows. There is an active eagle nest near Discovery Park, but eagles do not nest in the Ravine.

Norway rats are expected to occur in Kiwanis Ravine as this species is regularly found near human habitation. Norway rats are a non-native pest species. Refuse from illegal dumping in the Ravine provides a food source for rats, and dense stands of English ivy and Himalayan blackberry afford shelter.

V. HABITAT MANAGEMENT

The following habitat restoration, enhancement and protection actions are intended to meet the objectives of this Plan. The actions are designed to be conducted on publicly owned and managed land. Although these actions are designed for public lands they may also be employed on private lands by cooperating property owners.

Goal 1: Provide contiguous, high-value, native wildlife habitat and wildlife corridor in Kiwanis Ravine from the headwaters of Kiwanis Ravine to Salmon Bay.

Objectives:

- Promote and enhance the integrity of native plant communities, wildlife habitats and ecosystems by removing non-native invasive plants from the Ravine
- Replant areas with species that are native to appropriate Puget Sound lowland plant communities
- Enhance habitats by increasing the structural diversity of plant communities
- Restore an open, natural connection from Wolfe Creek to Puget Sound

To achieve these objectives English Ivy, Himalayan Blackberry, English Holly, Giant Knotweed, Reed Canary Grass and other invasive non-natives should be removed from areas where they occur and those areas should be replanted with native plants of the Puget Sound lowlands. This plan focuses on ivy, blackberry and knotweed as these species present the largest threat to habitat in Kiwanis Ravine, and controlling these species represents a significant task. The removal of dense stands of invasive exotic plants will also serve to reduce the available cover for pest animals such as Norway rats.

The following invasive plant removal methods can be used by volunteers on areas with slopes up to 40%. On slopes steeper than 40% invasives removal and revegetation should only be done by recognized professional staff. This slope figure is the same as the City of Seattle standard for "critical areas" designation.

Prior to each restoration project the restoration site should be surveyed to clearly flag the boundaries of public and private property. This should be done with sufficient accuracy so that those conducting the restoration activities do not inadvertently trespass on private land. The restoration site should then be flagged to mark the boundaries of the site and the areas where work will occur.

A civil survey (land survey) of the property lines in Kiwanis Ravine should be conducted to denote public and private property ownership.

ENGLISH IVY

An important priority for ivy removal is killing the ivy growing on trees. Ivy does not produce seed until it is growing vertically, such as on trunks. Additionally the ivy growing on trees can engulf and kill the trees (Swearingen and Diedrich, 2003). The following ivy removal and revegetation technique was provided by Earthcorps and it is currently being used successfully in Seattle (Bohen pers. comm.). Ivy should be eradicated by cutting and removing ivy vines from ground level up to approximately six feet (to about head height is a good field measure). All the vines must be removed as even a small, thin vine can provide sufficient water and nutrients for the ivy to survive. A complete gap of this distance will prevent the ivy from reconnecting and surviving. Removing ivy from potential replacement nest trees near the heron colony should be a priority.

Following the cutting of vertical vines, ivy covering the ground should be pulled out for a ten-foot distance around the tree. In areas away from trees, a 30-foot diameter area should be cleared of ivy. This is a manageable-sized area (approximately 700 square feet). It is important to remove as much of the roots as possible because the roots contain a reserve of nutrients and energy that will allow the ivy to resprout. Where there is a dense carpet of ivy on the ground, a successful removal technique is rolling up the ivy like a carpet. Any native plants can be pulled through the roll. The rolled ivy can be tied and stored on site awaiting removal (see below).

Ivy removal is most easily done between October and March because the ivy remains green and easy to see, while many other species are dormant. In areas where restoration activity would disturb nesting herons, restoration work should occur between October and late January.

The Seattle Parks has requested that the volunteer "invasives out" activities implement a "Clean Green" practice of bundling ivy, and other invasives and leave them at the removal site. Moving the material out of the Kiwanis Ravine will be accomplished through professional restoration workers utilizing techniques such as portage, or winch and rope vertical removal to designated collection areas on the perimeter of the ravine. Sponsoring volunteer organizations will seek funding to hire the required workers.

HIMALAYAN BLACKBERRY

Himalayan blackberry should be cleared from areas by removing the above-ground portions, then pulling roots from the ground. It is important to physically separate the blackberry roots from the above-ground vines and canes in order to prevent resprouting.

The cut, pulled, and rolled ivy and blackberry can be mulched on site by piling it on thick cardboard (rated at least 250-pound test) (Bohen, pers. comm.). On-site composting eliminates the effort and expense of removal, and keeps nutrients on site. Off-site composting is not recommended due to nutrient removal, effort to remove plant material from the Ravine, and expense of hauling removed materials to an approved green-waste site. Although cardboard may be used as nest material by pest animals such as Norway rats, the overall reduction in habitat for rats is expected to be greater than that provided by cardboard for nest material.

Following ivy and blackberry removal, the ground should be covered with three layers of thick cardboard, then covered with six to eight inches of arborist's mulch. This will prevent light from reaching any remaining ivy and blackberry. Resprouting should be controlled by pulling any sprouts in subsequent years. It is estimated that for every 100 hours of invasive removal the first year, ten hours of sprout removal is needed the second year, and one hour the third year for successful eradication (Bohen, pers. comm.).

GIANT KNOTWEED

Giant Knotweed is best controlled by repeated stem cutting during the growing season to exhaust the energy and nutrient reserves in the root system. This requires regular monitoring and multiple cutting during the growing season. Herbicides can also be applied directly to the cut stems to maximize control (WSNWCB 1998, Seiger 1991). Herbicides must be used very carefully as knotweed generally grows near water and many herbicides are toxic to aquatic organisms. Only trained and certified Park staff or licensed applicators should use herbicides, after appropriate notification of the public. Seattle Parks' policy prohibits use by volunteers.

The social path through a tunnel of giant knotweed

Giant Knotweed forms dense underground rhizomes up to 30 feet long that can produce shoots from as deep as 6 feet below ground (WSNWCB 1998, Seiger 1991). Even small fragments of the rhizomes can produce new sprouts. For this reason digging and removing roots is not recommended to control knotweed; this serves to spread knotweed and further aggravate the invasive problem.

OTHER RECOMMENDATIONS

Specific removal and eradication methods designed for each of the other invasive species, such as European Ash, English Holly, English Laurel, and Honey Locust must be researched and developed in the future. It is likely that substantial information already exists for certain invasive species, either in published reports or in the working knowledge of restoration ecologists. Incorrect removal techniques can actually increase the cover of certain invasive species. For example, simply cutting English holly stimulates the roots to sprout above ground shoots, thus spreading the holly further (Bohen, pers. comm.).

Areas that have been cleared of invasives should be planted with appropriate native plants. Two or three larger trees and shrubs should be planted in each thirty-foot diameter area. Smaller plants, intended to be understory species, should be planted ten inches or less from one another. A mixture of plant species should be used in order to provide species and structural diversity. Recommended native plant species are listed in Appendix D. Landscaping for Wildlife in the Pacific Northwest (Link 1999) provides excellent detailed information on native plants that are beneficial to wildlife. Following the planting, the number of each species planted should be recorded so that survival rates can be determined. Planted trees should be marked with long lasting tags to help the monitoring program determine survival rates.

Local residents, volunteer, and conservation organizations should develop partnerships with the Seattle Parks and other City and County Departments to restore an open, natural connection from Wolfe Creek to Puget Sound. Currently Seattle Public Utilities (SPU) is conducting a study of the feasibility of connecting Wolfe Creek to Puget Sound. Phase II of this Plan will provide greater detail.

Goal 2: Maintain the long-term viability of the existing Great Blue Heron colony.

Objectives:

- Protect the habitat of the heron colony from degradation
- Promote existing tall tree survivorship
- Promote growth of future replacement trees for the heron colony
- Keep human activity in the public lands of Kiwanis Ravine from disrupting heron breeding

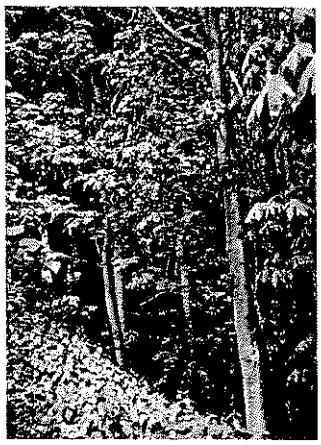
The techniques described for ivy and blackberry removal, and subsequent replanting with native plants should be used in the existing heron colony. This will halt further degradation of the colony habitat, improve existing tree survival, and provide for the replacement of existing trees as they mature and die. Ivy should be removed from trees near the colony that do not contain heron nests to provide future nest trees. Trees should be planted at the outer edges of the colony to provide future nest trees in a similar pattern to the natural progression of heron colonies. Because herons in Kiwanis Ravine appear to favor deciduous trees, Red Alder and Bigleaf Maple should be planted.

In order to avoid potentially disrupting nesting herons, habitat restoration and enhancement in the colony area should be conducted outside the active breeding season. This will provide a constraint on restoration activities and will require detailed planning and preparation for restora-

tion efforts. Although the breeding season generally occurs from mid-February through the end of August, using calendar dates should be a guide, not a rigid rule in determining when restoration activity could occur without affecting heron nesting. Direct observation of the herons is the best method to determine the appropriate time to begin restoration activities. The colony should be monitored each year to determine when the young have fledged. After the young have fledged, restoration activities in the vicinity of the colony should begin.

Steep and potentially unstable slopes in the Ravine present another constraint to habitat restoration. It is difficult to conduct habitat restoration on steep slopes, and can be hazardous to those conducting the restoration. Additionally, removing vegetation that protect slopes from rain, and helps stabilize soils may contribute to erosion and landslides during rainstorms. Other factors independent of restoration efforts, such as leaking water and sewer pipes, poor building construction methods, uncompacted or incorrectly compacted soil on building sites and earthquakes, may also contribute to slides in the Ravine.

In order to prevent soil movement, restoration on slopes should be done in belts that run across the slope. Each belt should be about 20 feet wide and 100 feet in length. Larger areas on slopes should not be cleared and restored unless recommended by an experienced restoration ecologist following an on-site inspection. The belts should be spaced at least 50 feet apart to assure sufficient plant cover to maintain soil stability. Belts may be started at the top or bottom of slopes. Restoration work should not be done on slopes greater than 40% by volunteers. Restoration work on steeper slopes should be done by trained professional restoration personnel. The heron nest trees are generally on slopes that are less than 40%. These steep slope avoidance areas are illustrated in a hypothetical sectional image in Figures 5 and 6.



A steep edge condition at the perimeter of Kiwanis Ravine

Where non-native plants are removed on slopes, the areas should be immediately covered; soils should not be left exposed for longer than one week. Cleared areas on slopes should be covered with heavy cardboard, woven coconut fabric (such as Koir cloth), or other products, and staked with wooden stakes. Appropriate material will be selected for each particular use. This will protect the soil from direct rain and help stabilize the slope. These areas should be planted in six to twelve months. This allows planting personnel to easily determine if the invasives have resprouted. Native species should be planted in clumps to allow weeding, maintenance and monitoring without damage to the newly planted natives.

It is important to note that although ivy is not a deep-rooted plant and thus it provides a minimum of soil stability, ivy cover protects soil from the direct impact of rain.

In areas where soil stability is questionable, a geotech consultant should assess the slope stability. All work and efforts to avoid destabilizing slopes should be documented and photographed. Adjacent property owners should be fully informed of restoration work and efforts to assure slope stability prior to conducting restoration activities.

Property owners adjacent to the Ravine should be encouraged to retain tall trees. Tall trees will help shield heron nests from visual disturbance, serve as perch sites for herons, eagles, and other raptors, and help maintain forest structure during windstorms. Mechanisms to ensure protection of mature trees should be developed; these may include voluntary conservation, regulation, or conservation easements. Providing incentives for protection of mature trees may assist regulation.

Naturally-damaged trees at the perimeter can expose the heronry to disturbance.

In addition, the sponsoring volunteer organizations should coordinate ongoing educational forums and encourage neighbors active participation in environmental programs such as those of the Seattle Audubon Society and the Washington Department of Fish and Wildlife's "Backyard Wildlife Sanctuary" program.

Human activity in the public lands of Kiwanis Ravine should not be allowed to disrupt heron breeding. Trails below or near the colony should not be developed. Unofficial "social" trails near the colony should be closed off preferably with natural materials such as logs or plantings.

Goal 3: Provide increased protection for wildlife habitat in the Ravine.

Objectives:

- Purchase unprotected land within the Ravine
- Develop conservation easements to protect habitat on steep slopes in and near the Ravine
- Promote voluntary "good neighbor" practices near the public lands of Kiwanis Ravine
- Reduce erosion from water flow from street-ends and storm water overflows

Areas of habitat in Kiwanis Ravine that are under private ownership and that are not being actively managed for wildlife habitat should be protected. Protection methods include: direct purchase by the City of Seattle with management for wildlife habitat under the Parks Department; development of conservation easements in perpetuity; encouraging habitat conservation on private lands.

As funds become available through Parks, other City departments, public agencies and other funding sources, private land can be purchased from willing sellers. Priority should be given to land that will buffer the heron colony from disturbance, and land that will connect separate (fragmented) areas of public ownership. The primary goal for management of public land in Kiwanis Ravine should be wildlife habitat conservation. Other goals, such as protecting and improving water quality, are consistent with habitat conservation.

Conservation easements can be a useful mechanism for habitat protection in urban areas, and may be valuable for Kiwanis Ravine. Conservation easements allow an existing landowner to provide dedicated habitat conservation for a portion of their land, while retaining ownership and continuing to reside on the property. In many instances, conservation easements lessen the taxes on property, which provides an economic incentive for the landowner. As with direct purchase, priority should be given to land on steep slopes, land that will buffer the heron colony, and land that will connect fragmented areas of protected habitat. Local organizations such as the Cascade

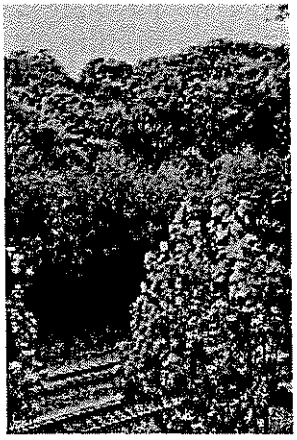
have successfully used conservation easements to provide habitat protection in Seattle. Efficiency can be achieved when easements are developed for several properties at the same time. Land trusts and land conservancies are an excellent source of information on the details of developing successful conservation easements.

Voluntary conservation can be promoted through education of local residents in the Kiwanis Ravine area. This can occur during neighborhood meetings, and through individuals discussing conservation with their neighbors. Interested landowners can enroll in the Washington Department of Fish and Wildlife's "Backyard Wildlife Sanctuary" program. This program is voluntary and provides information on wildlife habitat, conservation, and enhancement efforts that are valuable in backyard settings. Enrollment in the Backyard Wildlife Sanctuary Program should be encouraged especially for residents adjoining the Ravine, as this would help provide a habitat buffer between the Ravine and adjoining development. The National Wildlife Federation also has a Backyard Wildlife Habitat Program. The Seattle Audubon Society also has a "Gardening for Life" workshop.

Information on conservation easements and the Backyard Wildlife Sanctuary Program can be provided to local residents through seminars, public education events and at community meetings.

Written permission should be obtained from private landowners that allow volunteer work parties to conduct restoration on their private lands. Volunteers need to register with the Seattle Parks Central District Volunteer coordinator to obtain proper access privileges and insurance coverage.

Accessible viewpoints for natural history and ecological education should be developed. An observation platform at the north end of the railroad footbridge would allow observation of the heron colony without disturbance to the herons. Coordination with City Departments, Burlington Northern/Santa Fe Railway, and private landowners will be required to develop an observation platform on the north end of the pedestrian bridge. Another observation area with interpretive information could be developed on the west fork of Wolfe Creek. Information on the natural history and conservation needs of the herons could be posted. Volunteer nature talks could be provided by Seattle Parks' docents, Audubon Society members, or volunteer heron observers. (See Figure 10 for potential observation sites)



The view from the pedestrian bridge to the main heron nesting sites.

Stormwater from street-ends can cause erosion within the Ravine due to the high energy of the stormwater flows. To reduce the energy and erosive power of the flows, deadfalls and native plantings should be installed. Deadfalls should employ natural materials such as logs and boulders.

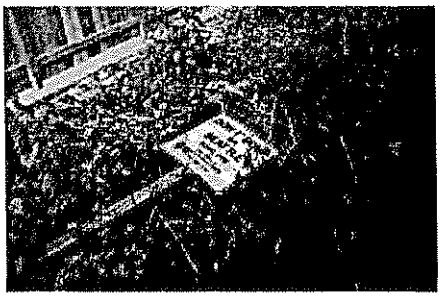
Please refer to Goal 6 for additional wildlife enhancement recommendations.

Goal 4: Protect and enhance native wildlife populations.

Objectives:

- Protect habitats used by sensitive species from degradation
- Enhance sensitive species habitats when degradation is identified
- Protect and enhance complex habitat structure to increase wildlife habitat niches and promote wildlife species diversity
- Retain the wildlife corridor from Discovery Park to Puget Sound and the railway corridor

The previously recommended actions to restore habitat in the Ravine will significantly help meet the objectives of protecting sensitive species habitat from degradation and enhancing these habitats. Additional actions will further meet this objective. A campaign to reduce illegal dumping in the Ravine should be instituted. Eliminating or reducing yard waste disposal in the Ravine will reduce the introduction and spread of invasive plants. Residents that live adjacent to the Ravine should be provided with information on the ecological degradation caused by dumping yard waste, and beneficial ways of composting and disposing of yard waste. The information can be provided by the Seattle Parks Discovery Park Environmental Education Center, SPU, WDFW or neighborhood groups. (Also, the Seattle Police Departments Illegal Dumping Hotline can be reached by calling 911, then 684-7587) Information can be distributed door to door, at neighborhood meetings, through the WDFW Backyard Wildlife Program, and through neighbor to neighbor discussions.



Street end right of ways have historically been used for dumping.

Additional signage that briefly describes the ecological harm from dumping should be posted at street ends where illegal dumping has occurred. Signs should also list the penalties for illegal dumping. Additional fencing or barriers should be placed at street ends and other illegal dumping locations if it is deemed fencing or barriers would be effective. (See Figure 9 for Illegal Dumping sites)

Retention of mature trees on private lands and rights-of-way that border Kiwanis Ravine will help buffer wildlife in the Ravine from disturbance. Mechanisms to ensure protection of mature trees should be developed; these may include voluntary conservation, regulation, or conservation easements. Providing incentives for protection of mature trees may assist regulation. Incentives can include tax reduction or recognition of conservation efforts.

The wildlife corridor from Discovery Park and Kiwanis Ravine to Puget Sound and the railway corridor should be retained. Habitats along the railroad corridor connect to habitats in ravines to the north along Puget Sound, and eventually connect to the Cascades.

Railroad corridors act as wildlife habitat connectors

Goal 5: Promote volunteer involvement in wildlife and habitat protection and enhancement.

Objectives:

- Encourage Seattle Parks' and other City agencies' support for volunteer habitat enhancement projects
- Provide education programs on conservation and restoration of Kiwanis Ravine
- Provide restoration expertise to volunteer groups

Volunteers and community organizations are one of the greatest assets Seattle Parks has for wildlife habitat enhancement and protection. Seattle Parks has supported the efforts and leadership that volunteers and volunteer groups bring to the protection and enhancement of the wildlife resources of the parks. Seattle Parks should strive to be a catalyst to stimulate neighborhood involvement in the protection of natural resources. Seattle Parks provides logistical support, equipment, staff assistance, meeting rooms, and other resources to volunteers for restoration efforts. Seattle Parks is involved in development of this Plan and intends to assist in its implementation. All restoration efforts, particularly invasive removal and native planting work, should be carefully coordinated with Seattle Parks.

Additionally Seattle Parks could assist in providing leadership and coordination for a volunteer "Adopt a Parcel" program in Kiwanis Ravine. A volunteer restoration monitoring program should also be supported by Seattle Parks. A model for such programs already exists at Discovery Park.

Seattle Parks could assist in training docents to develop education and interpretive programs describing the natural history, conservation needs, and restoration of Kiwanis Ravine. These should be held in Discovery Park, at established viewpoints around the Ravine, and at community meetings. The programs should encourage attendance from across the City, as the heron colony is a valuable citywide natural resource.

The Department of Neighborhoods (DON) has provided funds and staff assistance for development of this management plan. These efforts should continue utilizing the DON Neighborhood Matching fund and other regional and national resources.

There are groups and organizations that can provide experienced supervision and education for volunteers working on restoration projects. This allows motivated volunteers to become involved in their local Parks, helps educate volunteers on restoration techniques, increases the efficiency of the restoration efforts, and improves the quality of restoration efforts. The Washington Native Plant Society is very active in restoration projects in Seattle parks, and can provide excellent information on native plant biology and ecology, propagation, maintenance, restoration techniques and local sources for native plants. Additionally, King County operates a native plant salvage program that can provide native pants and information on native plant care and restoration.

Goal 6: Promote interdepartmental and interagency cooperation to protect wildlife and wildlife habitat.

Objectives:

- Transfer management of City-owned property from other city agencies to the Seattle Parks Department
- Work with City agencies to assure that projects that affect Kiwanis Ravine habitats provide habitat protection and enhancement and protection of nesting herons from disturbance
- Encourage City agencies to provide integrated land and resource management of property in and around Kiwanis Ravine
- Work with City and County Departments to restore an open, natural connection from Wolfe Creek to Puget Sound

As noted in the Introduction, SDOT is transferring surface management for right-of way along Gilman Avenue W. right-of -way to Seattle Parks. The City is also working to transfer surface land management responsibilities for other public land in Kiwanis Ravine to the Parks Department. These efforts should be encouraged and monitored by Seattle citizens to assure a timely completion of these efforts. Transfer of management should be done with the primary goal of providing unified wildlife habitat conservation and management for Kiwanis Ravine.

Fort Street right of way is both a transportation and a utility corridor

Seattle Parks and neighborhood groups should work with other City Departments to assure that wildlife habitat conservation and enhancement is a major component of all projects that affect natural resources in Kiwanis Ravine. This includes projects conducted by City Departments, and projects that require permits from City Departments. Projects in the Ravine should provide slope protection and habitat buffers, as well as protect the heron colony from disturbance during the breeding season. Work projects in Kiwanis Ravine should follow recommendations on page 77. Noise from construction, demolition, vegetation modification, and earth moving should be scheduled so that the heron colony is not significantly disturbed during the breeding season. (See Figures 10, and 11 and the Section F –Access Recommendations)

The habitat on the Ohman parcel or immediately below should be enhanced as a pilot project. The area currently contains a mix of native and invasive species. The slope is not overly steep, and the site is easily accessible from 36th Avenue West.

Local residents, conservation organizations and the Parks Department should work with City and County Departments to restore an open, natural connection from Wolfe Creek to Salmon Bay. Currently Seattle Public Utilities (SPU) is conducting a study of the feasibility of connecting Wolfe Creek to Salmon Bay. Phase II of this Plan will provide greater detail.

VI. RESTORATION MONITORING

In order to assure success of restoration projects in Kiwanis Ravine the following monitoring program should be implemented. The monitoring is intended to be conducted in the field for a 5-year period after completion of each restoration project. The monitoring program uses measurable criteria to assess restoration success. The monitoring will measure specific factors in the field at each restoration site. These factors include number of invasives, percent cover of invasives, percent of trees free of invasives, percent survival of planted trees and shrubs, and percent cover of planted herbaceous species. Meeting the 5-year criteria is expected to establish native plants that will mature to become the habitats projected for 15 and 50 years hence. (See Figures 4, 5, and 6 for hypothetical 15 yr., and 50 yr. restoration progress images)

Detailed records will need to be kept in order to determine the success of restoration efforts. Both hard copy and electronic records should be maintained. Following planting of a restoration site, the number of each species planted should be recorded so that survival rates can be determined. Planted trees should be marked with long lasting tags to help the monitoring program determine survival rates.

After planting has been completed, the restoration site should be qualitatively monitored following guidelines in the Section F Access Recommendations. Qualitative evaluations should include a general assessment of overall fitness and health of the native plants, resprouting of invasive plants, pest infestations, and drought stress. Any significant problems encountered, such as unsuitable site planting conditions, invasive resprouting, and pest infestation, are to be recorded.

Quantitative surveys are best conducted after all herons have fledged, and should begin the first year following restoration. Consideration should be given to inviting the University of Washington's Urban Horticulture Program to participate in these monitoring and evaluative actions. Spring is the ideal time to monitor plant health and growth, as spring is the active growth period for plants. However, activity in the Ravine in early spring may adversely influence heron nest selection, courtship, and egg laying. Limited monitoring of flowering herbs, adhering to the Section F Access Recommendations may be possible after May 1 of each year. Restoration monitoring of shrubs and trees, and data collection for biological inventories will be performed after all nests have either fledged young or failed.

Monitoring restoration sites near heron nests should be done after nest observations have indicated that the young have fledged. Data collection during the fall may not properly assess native plant growth, as some species are not identifiable outside the spring growth and flowering period. The guidelines of the Section F Access Recommendations should be followed to prevent disturbing the Great Blue Heron colony.

The quantitative monitoring surveys should cover at least 10 percent of the total of each restoration site. The surveys should be done along transect lines with sample points spaced along each transect. The transect locations should be selected randomly in each restoration site. The collected information will be used to determine restoration success relative to the success criteria. Permanent stations for photodocumentation should be established at the transect locations within the restoration site to photographically record restoration progress for the five-year monitoring period. A five-year monitoring period using transects is generally used for restoration projects to determine whether restoration has met established goals and is successful, or whether further effort is necessary to meet success goals.

The transects should be permanently marked with a steel rebar stake driven in flush with the ground at each end, and if possible Global Positioning System (GPS) coordinates should be recorded. This will allow the transects to be readily located.

Based on the monitoring surveys, necessary remedial actions should be developed to help achieve the success criteria. Replanting may be recommended as necessary during the appropriate planting period to ensure that success criteria are achieved.

The following success criteria for restoration sites are recommended:

Success criteria for ivy removal from trees:
90% of trees free of living ivy after 1 year
95% of trees free of living ivy after 2 years
100% of trees free of living ivy after 3 years

Success criteria for ivy removal from ground:
90% of ground area free of ivy after 1 year
95% of ground area free of living ivy after 2 years
100% of ground area free of living ivy after 3 years

Success criteria for blackberry removal from ground:
90% of ground area free of blackberry after 1 year
95% of ground area free of blackberry after 2 years
100% of ground area free of blackberry after 3 years

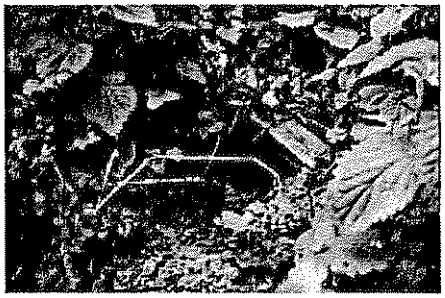
Success criteria for planted native trees and shrubs:
95% survival after 1 year
80% survival after 2 years
75% survival after 3 years
65% survival after 4 years
60% survival after 5 years

Success criteria for planted native herbaceous species:
50% cover after 1 year
60% cover after 2 years
70% cover after 3 years
75% cover after 4 years
75% cover after 5 years

The above criteria have been developed to provide measurable goals to assess the success or restoration efforts, and to provide a mechanism to determine if additional actions are needed. (G. Miller, pers. exp.)

Should the monitoring indicate that a restoration site is not meeting the success criteria, then remedial actions should be developed and implemented. These may include further removal of invasives, additional planting of native species, or pest control measures.

Mountain beavers occur in Kiwanis Ravine and may consume freshly planted native plants. Mountain beavers are a native species and have been a problem in the region on reforestation and restoration sites. Mountain beavers consume new plantings and will girdle and kill small trees (Campbell 1994). Mountain beavers also girdle the roots of saplings, which may kill the sapling directly or allow pathogens to enter and kill the sapling (Campbell 1994). Mountain beavers leave angular rough cuts about 1/4-inch deep on stems of woody plants; they will also completely cut small trees near ground level. They cut the bark cleanly and do not leave pieces of bark on the ground (Campbell 1994).



A mountain beaver burrow tucked into English ivy and Himalayan blackberry

Mountain beaver control methods fall into three categories:

- Exclusion
- Planting methods
- Repellants
- (Live Trapping and Killing are not allowed in Seattle Parks)

All of these methods have had various levels of success and cost on different sites.

Exclusion is usually done with fencing and plastic plant protectors. Wire mesh fencing can be effective but should extend into the ground to limit mountain beavers from digging under the fencing (Campbell 1994). Exclusion is the recommended method for mountain beaver control in Kiwanis Ravine.

Planting methods have shown some success in establishing reforestation sites. Planting larger diameter saplings and trees can improve tree survival (Campbell 1994). Planting a greater numbers of plants than is desired for restoration success, and accepting some mortality of the excess plants is a second method. When possible, restoration projects in Kiwanis Ravine should use larger size plantings and plant a greater number of plants than are ultimately desired to achieve success.

Repellants placed on or around plants have limited effectiveness and often require repeat applications. Repellents have not proven consistently effective but some researchers have had fair results with 36% putrescent egg solid based products while others have found Thiram-based repellents of some value (Pehling 1991). One repellant, 36% Big Game Repellant Powder (BGR-P) is registered in Washington for use with mountain beavers (Campbell 1994). Repellants must be carefully applied to assure that the plant stems near the ground are treated. Placing treated plant material in active burrows has increased the effectiveness of overall repellant use, in some cases this has been effective for up to a year (Campbell 1994). The use of repellants to minimize mountain beaver may be useful in Kiwanis Ravine.

Current mountain beaver population levels in the Ravine are not known. Thus a preventive/adaptive approach to potential mountain beaver pest problems is recommended. Fencing and protectors should be used in heavily infested areas. In areas with lower populations, a "wait and see" can be utilized, and if grazing by mountain beavers causes excessive mortality then protective measures should be instituted. Protective measures include the use of fencing around plant species favored by mountain beaver, protective collars around plants, or other methods that have been shown to be effective.

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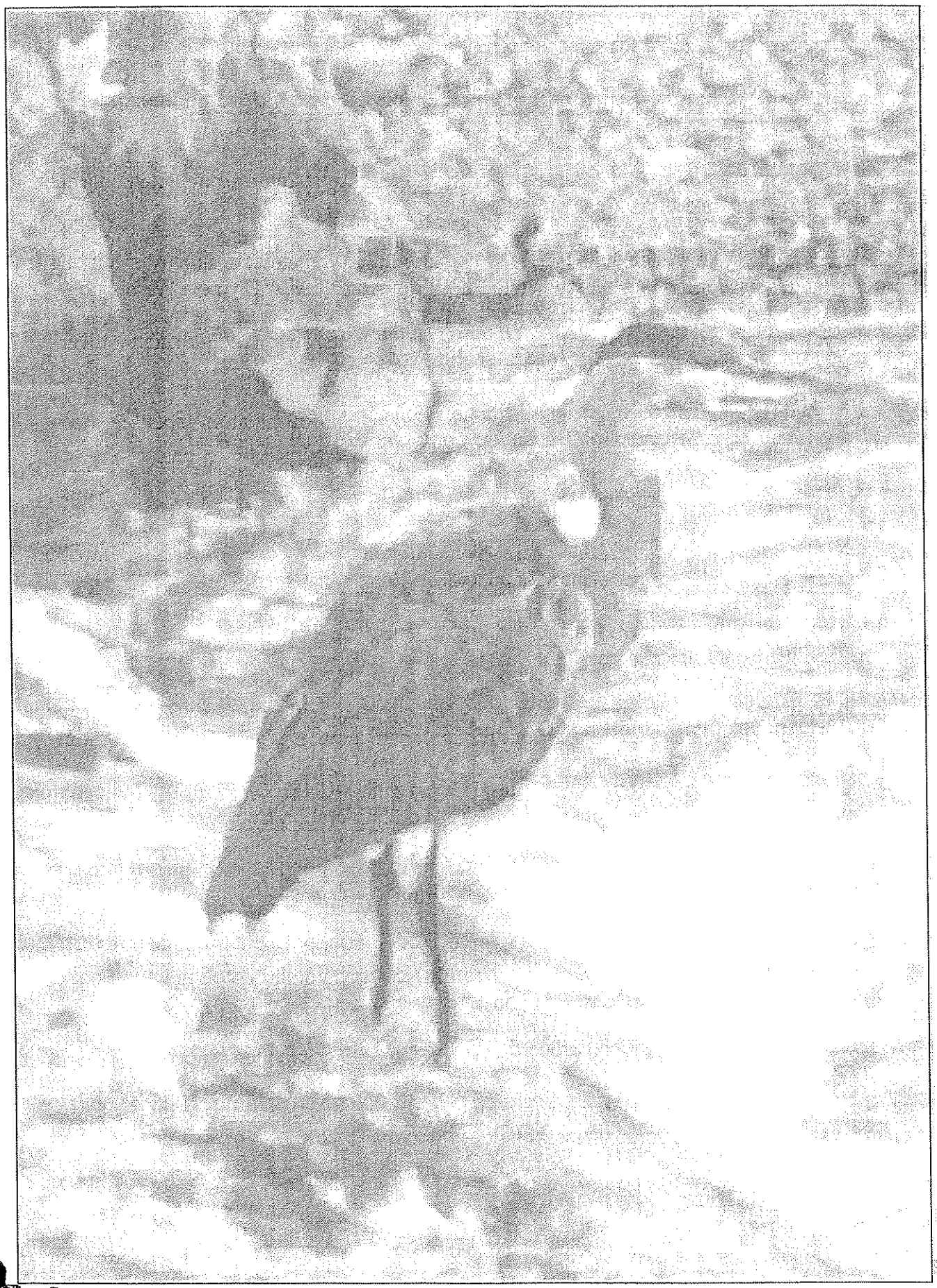

FIGURES 4 & 4 PT ERRATA:

Errors can be found on Figures 4 and 4 PT:

1. Wolfe Creek will not be rerouted and daylighted going through this corridor. Subsequent to the drawing of these figures, it was learned that the elevations are too high at that location to make daylighting there feasible.

2. Approximately only one-fourth or less of the trees shown on these figures will actually be planted in this corridor. Subsequent to the drawing of these figures, it was learned there are 3 buried utility lines going through the corridor over which trees should not be planted, and that it is important to identify and save certain important overlooks/views.

Way

To Locks ->

Commodore Park

Locks

Fish Ladder

Figure 4
Tree Savannah

Army Reserve

Figure 5
Deciduous Forest

Figure 6
Mixed Conifer Deciduous Forest with Forested Wetland

Kiwanis Ravine

Wolfe Creek

Discovery Park

36th Ave. W.

East Parking Lot

Environmental Education Center

Undeveloped Rights-of-Way

Seattle Urban Nature Project
info@SeattleUrbanNature.org

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Kiwanis Ravine - Habitat Types On Public Land

FOREST TYPES
- Conifer Forest
- Madrone Forest
- Conifer-Deciduous Mixed Forest
- Deciduous Forest
- Riparian Forest

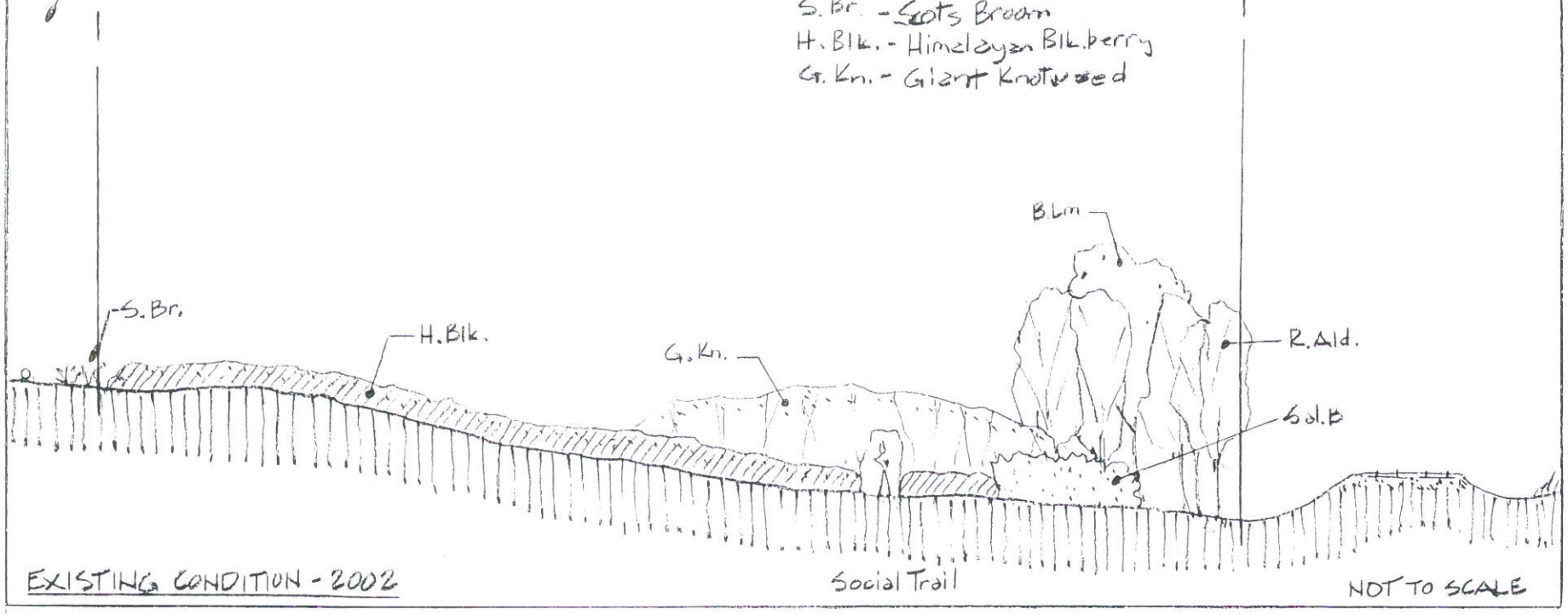
FOREST SIZE CLASSES
- < 5" diameter
- 5 - 15" diameter
- 15 - 20" diameter
- 20 - 30" diameter
- > 30" diameter

- Sparsely Vegetated
- Grassland
- Shrub Savannah
- Shrubland
- Tree Savannah
- Forested Wetland
- Scrub-Shrub Wetland
- Emergent Wetland
- Deep Water Vegetated Wetland
- Open Water Wetland

NORTH

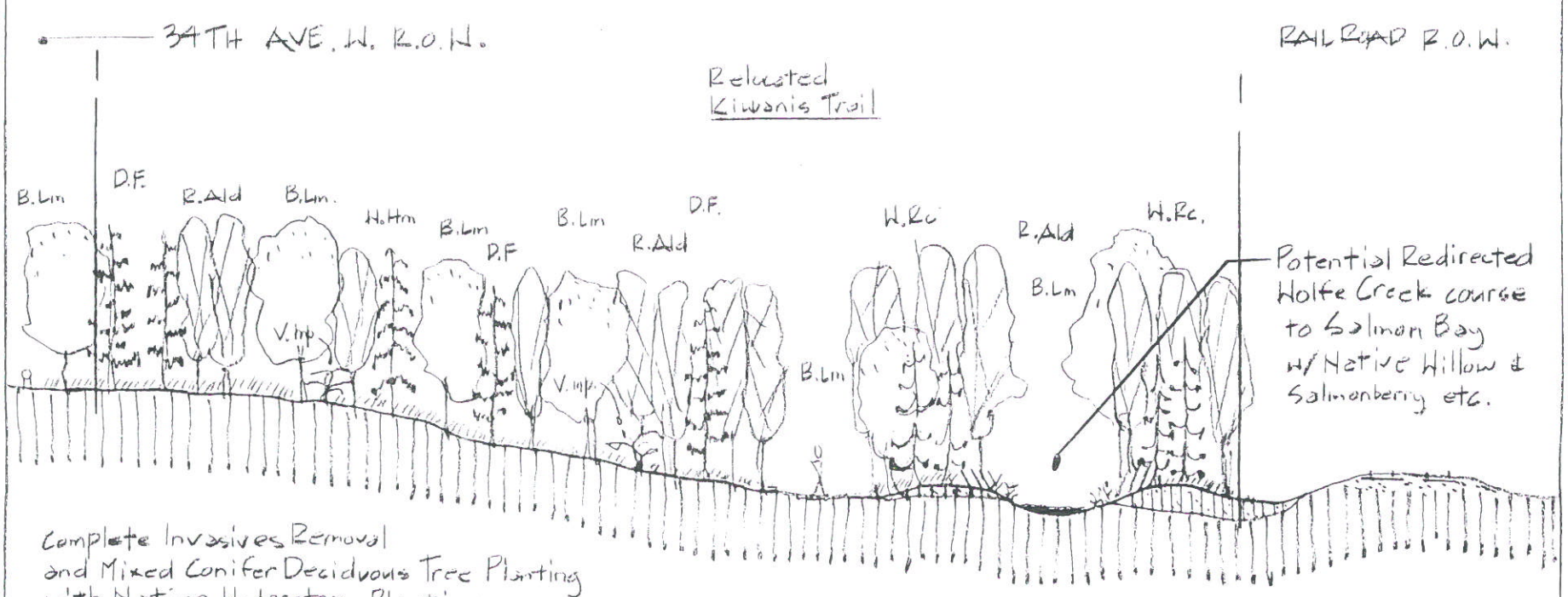
Figure 3
Habitat Types

Key: B.Lm. - Bigleaf Maple
R.Ald - Red Alder
DF - Douglas Fir
W.Rc. - W. Red Cedar
W.Htm. - W. Hemlock
S.Br. - Scots Broom
H.Blk. - Himalayan Blk.berry
G.Kn. - Giant Knotweed



EXISTING CONDITION - 2002

NOT TO SCALE

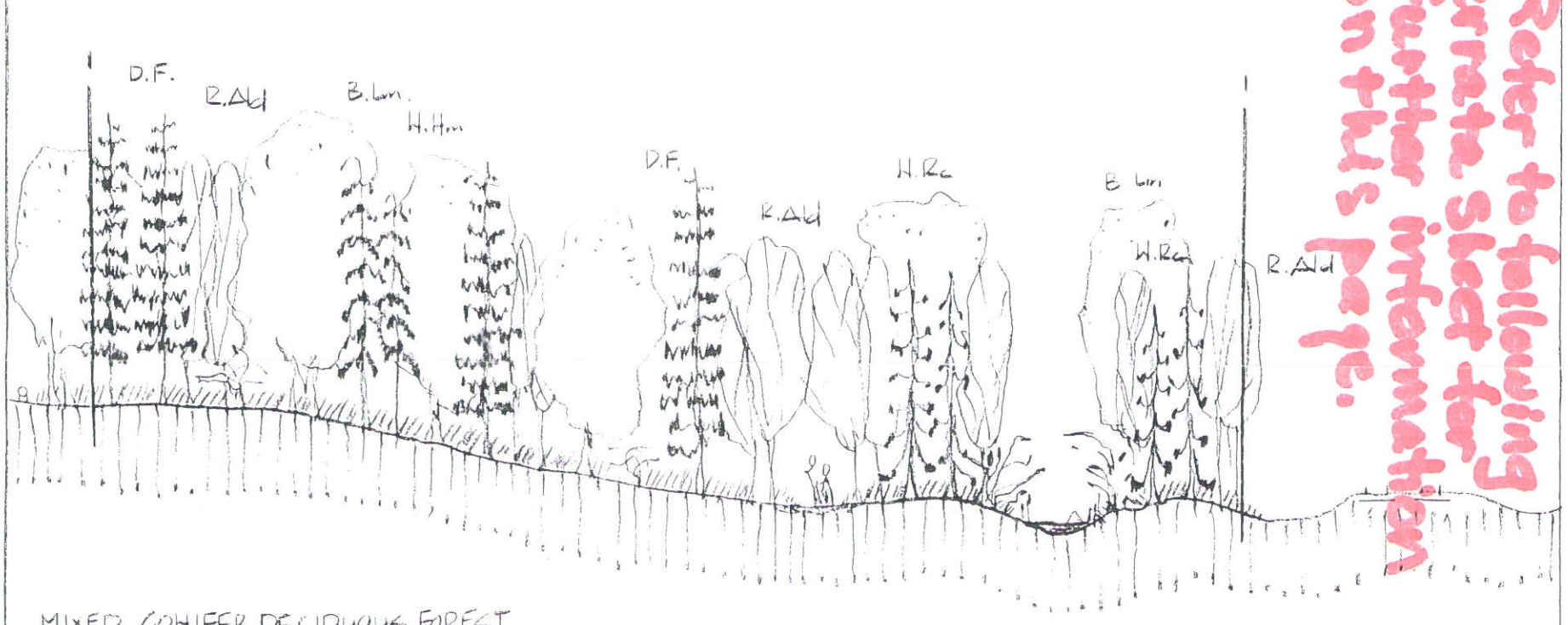


Complete Invasives Removal
and Mixed Conifer Deciduous Tree Planting
with Native Understory Planting
- Ongoing Maintenance & Monitoring

15 YR. RESTORATION ACTIVITY - 2017

NOT TO SCALE

Refer to following
separate sheet for
further information
on this page.



MIXED CONIFER DECIDUOUS FOREST
WITH A NATIVE UNDERSTORY

50 YR. RESTORATION GOAL - 2052

HEN RIPARIAN CORRIDOR

NOT TO SCALE

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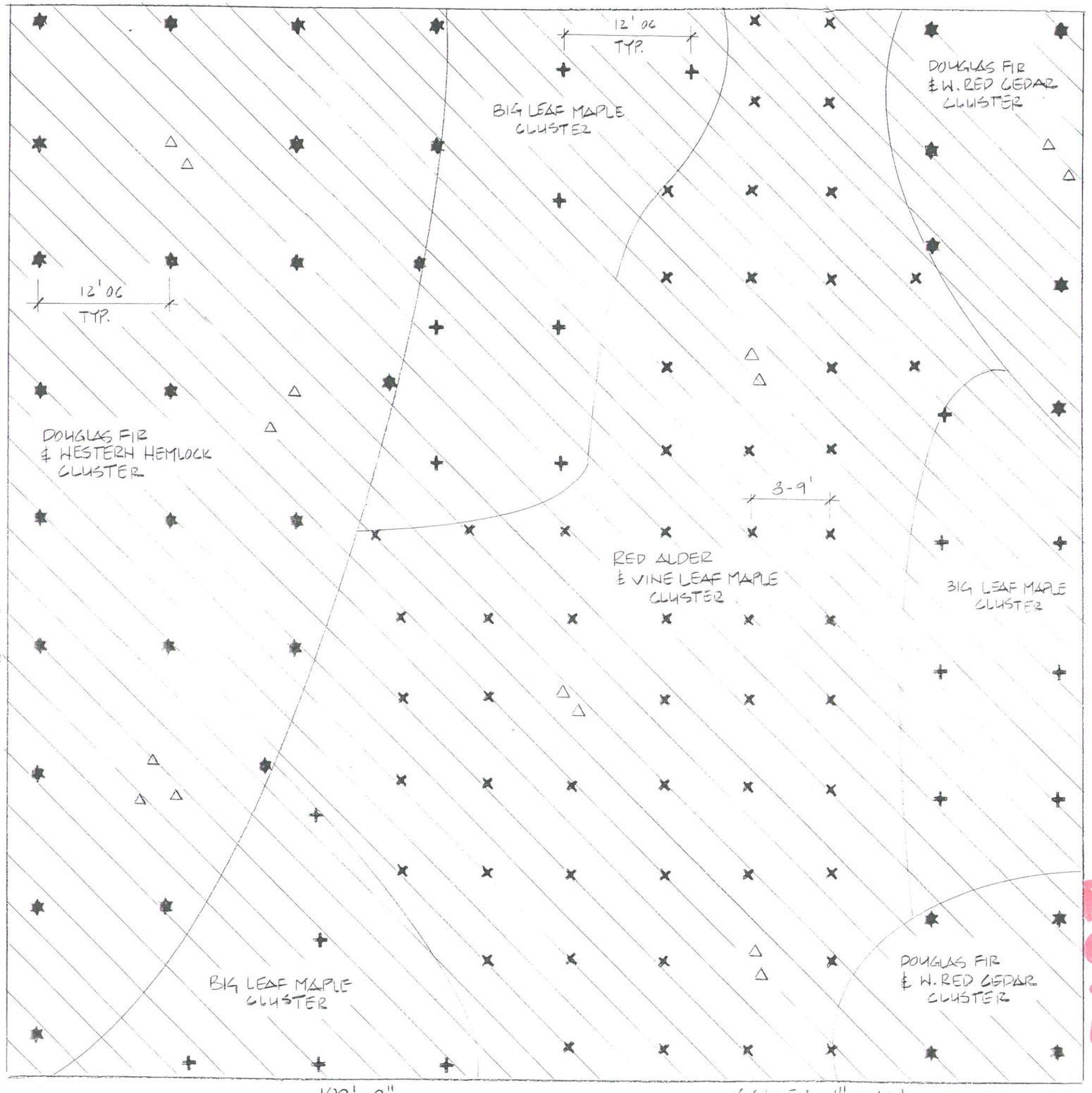
Kiwanis Ravine Habitat Section - Tree Savannah

Inventory Analysis: Tree Savannah has between 11% and 25% tree cover and may have a dense or sparse shrub layer. In Kiwanis Ravine it contains Big leaf Maple and Red Alderwith a shrub layer with Willow, Oceanspray, Japanese Knotweed, Scots Broom, Bindweed, and Himalayan Blackberry of 75 -90%

Figure 4
Tree Savannah
Habitat Section



SCALE: 1" = 10'

SYMB.	COMMON NAME	SIZE	SPAC.
	TREES (CONIFER 40-50%)		
✱	DOUGLAS FIR WESTERN HEMLOCK WESTERN RED CEDAR	4'	12' OC
	(DECIDUOUS 40-50%)		
+	BIG LEAF MAPLE	4'	12' OC
×	RED ALDER	4'	9' OC
	VINE MAPLE	4'	3' OC
▨	SHRUBS		
	SALAL	1 GAL.	3' OC
	LOW OREGON GRAPE	1 GAL.	3' OC
	SWORD FERN	1 GAL.	3' OC
	NOOTKA ROSE	2 GAL.	3' OC
	(MAY SUBSTITUTE OTHER PUGET LOWLAND SHRUBS BASED ON AVAILABILITY)		

NOTES:

△ - EXISTING & HEALTHY NATIVE TREE, SHRUB & EMERGENT PLANTS SHOULD BE RETAINED & GIVEN COMPLEMENTARY NEW NATIVE PLANTINGS.

- EACH RESTORATION PLANTING MUST ANALZE THE EXISTING MICRO-SITES FOR THEIR OPTIMUM GROWTH POTENTIAL. MATCH SITE CONDITIONS TO SELECTED SPECIES USING SEATTLE PARKS REFERENCE GUIDES. APPENDIX E
- ADAPTIVE MANAGEMENT STRATEGIES BASED ON FIELD OBSERVATION MAY BE REQUIRED.

Refer to following errata Sheet for further information on this page.

Fig. 4 PT
Tree Savannah Planting Template

Kiwanis Ravine Planting Template - Tree Savannah

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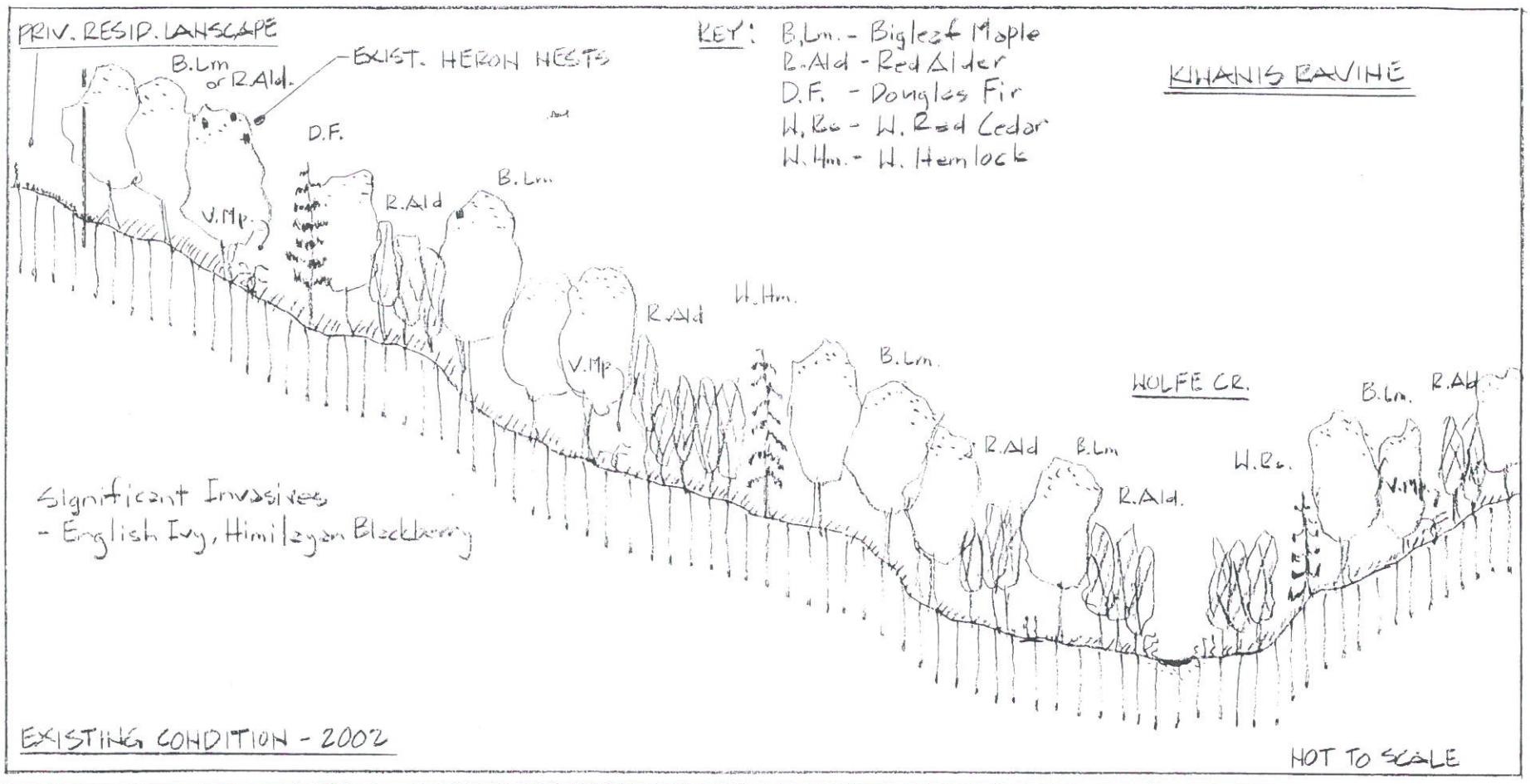

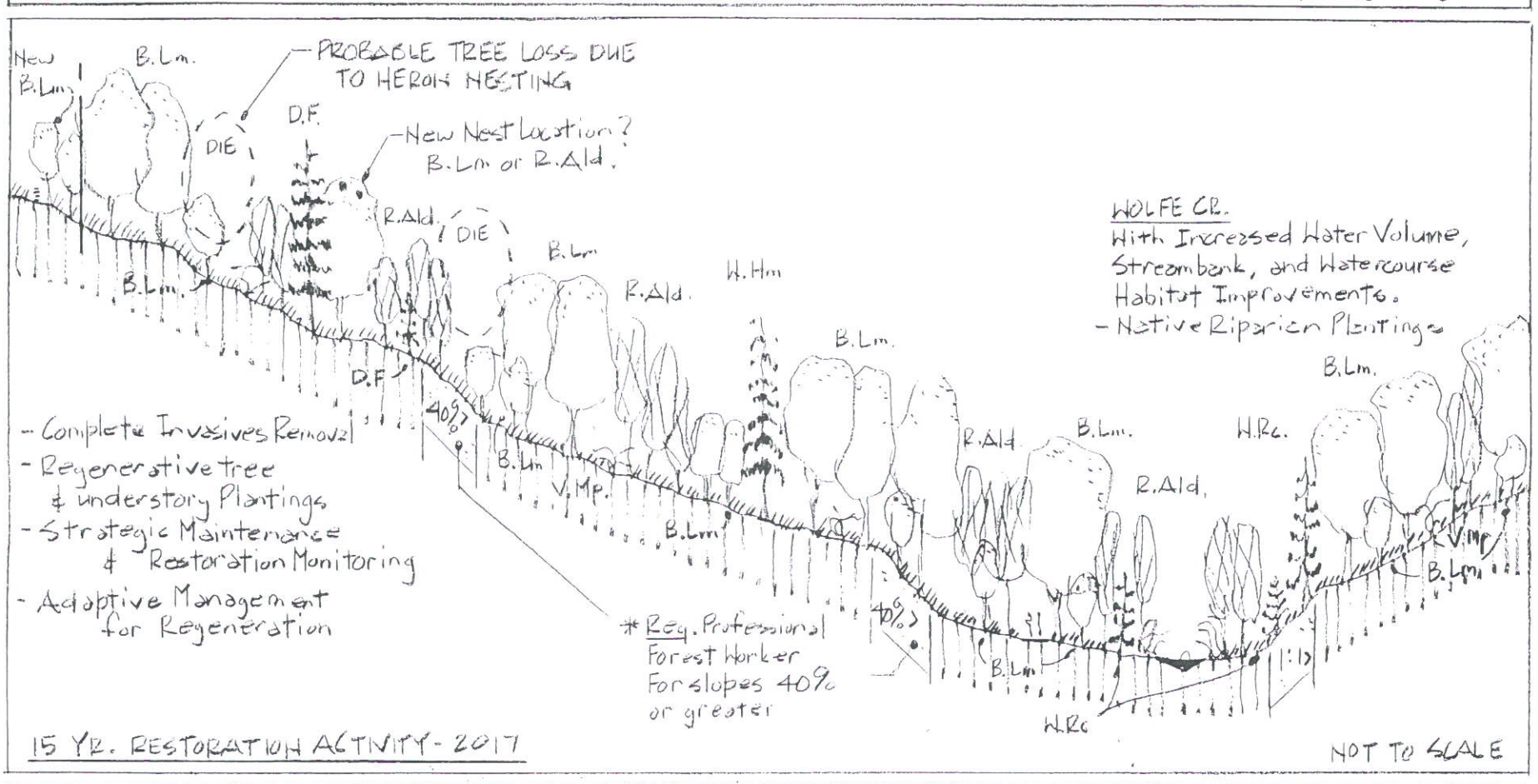

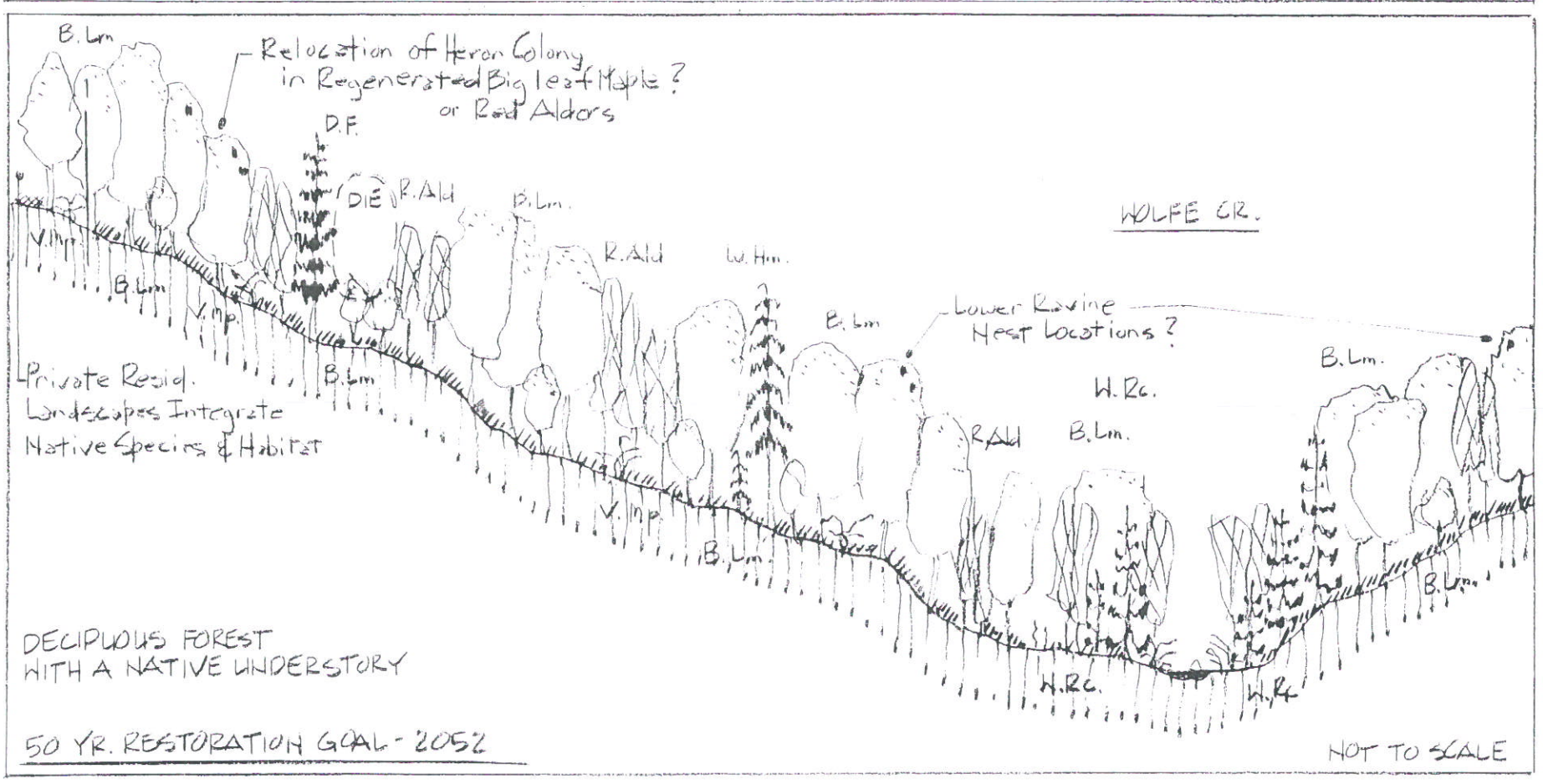

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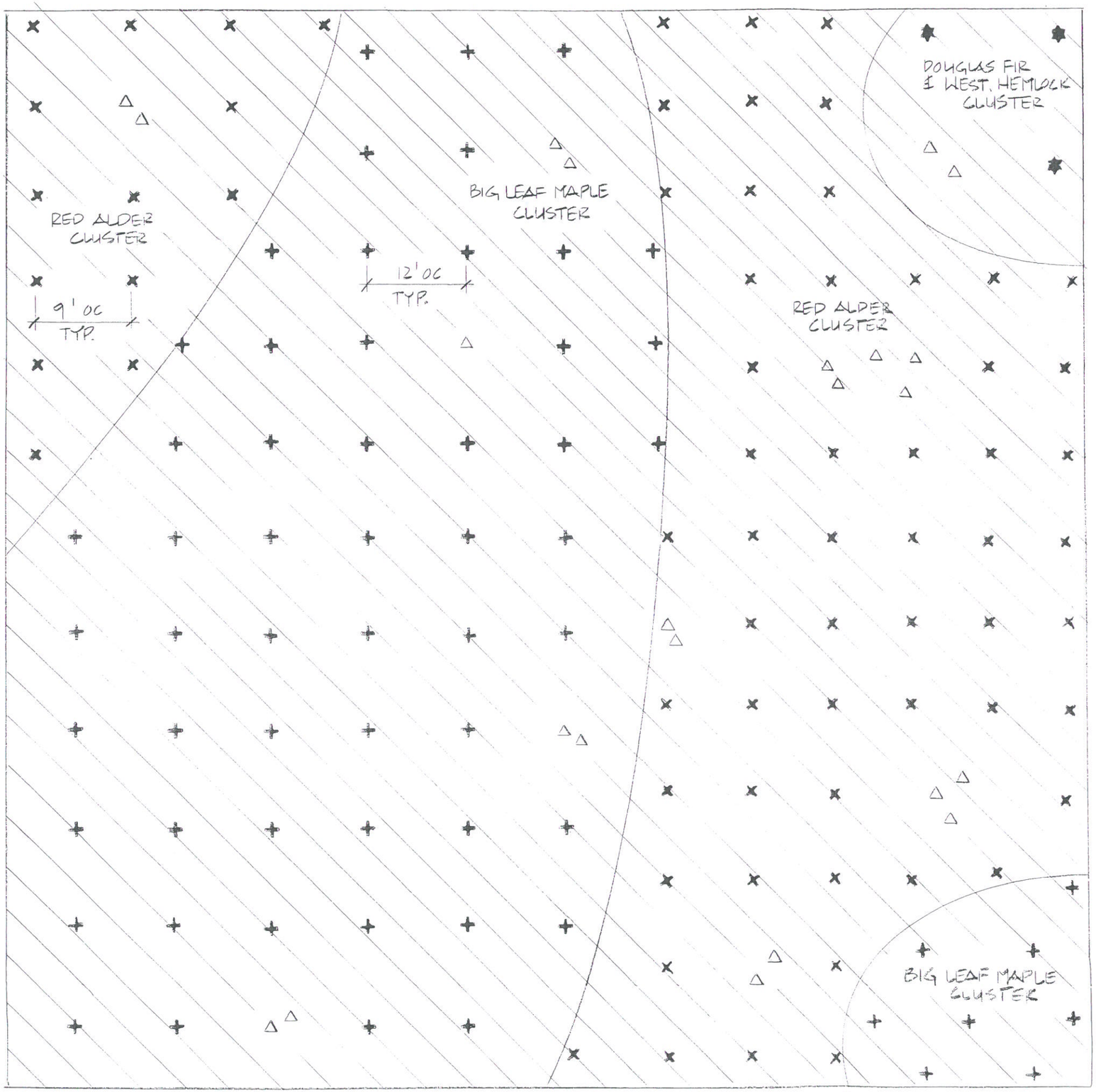
Kiwanis Ravine Habitat Section - Deciduous Forest

Inventory Analysis: Forest canopy is 70 - 90% dominated by deciduous trees (> 70%) 15 to 20 inches diameter at breast height (dbh). The understory contains natives such as Sword Fern, Ocean Spray, with invasives (0 -90%) English Ivy and Himalayan Blackberry. Red Alder and Big leaf Maple are the primary trees.

Figure 5

Deciduous Forest Habitat Section



SCALE: 1" = 10'

SYMB.	COMMON NAME	SIZE	SPAC.
	TREE'S (CONIFER - 10-20%)		
✱	DOUGLAS FIR	4'	12' OC
✱	WESTERN HEMLOCK		
✱	WESTERN RED CEDAR		
	(DECIDUOUS 70-90%)		
+	BIG LEAF MAPLE	4'	12' OC
+	RED ALDER	4'	9' OC
×	VINE MAPLE	4'	3' OC
▨	SHRUBS		
▨	SALAL	1 GAL.	3' OC
▨	LOW OREGON GRAPE	1 GAL.	3' OC
▨	SWORD FERN	1 GAL.	3' OC
▨	NOOTKA ROSE	2 GAL.	3' OC
▨	(MAY SUBSTITUTE OTHER PUGET LOWLAND SHRUBS BASED ON AVAILABILITY)		

NOTES:

△ - EXISTING & HEALTHY NATIVE TREE, SHRUB & EMERGENT PLANTS SHOULD BE RETAINED & GIVEN COMPLEMENTARY NEW NATIVE PLANTINGS.

- EACH RESTORATION PLANTING MUST ANALZE THE EXISTING MICRO-SITES FOR THEIR OPTIMUM GROWTH POTENTIAL. MATCH SITE CONDITIONS TO SELECTED SPECIES USING SEATTLE PARKS REFERENCE GUIDES. APPENDIX E
- ADAPTIVE MANAGEMENT STRATEGIES BASED ON FIELD OBSERVATION MAY BE REQUIRED.

Fig. 5 PT
Deciduous Forest Planting Template

Kiwanis Ravine Planting Template - Deciduous Forest

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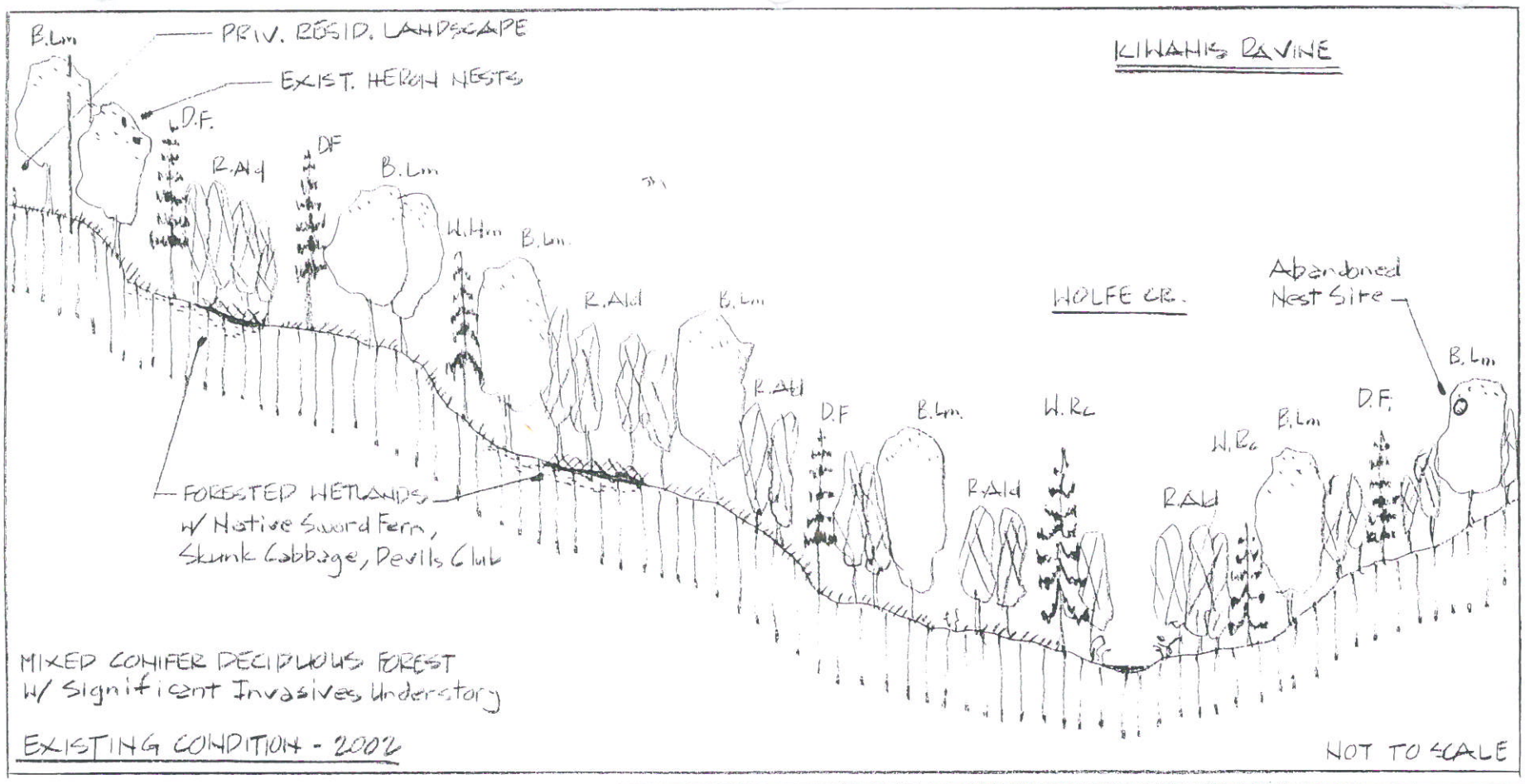

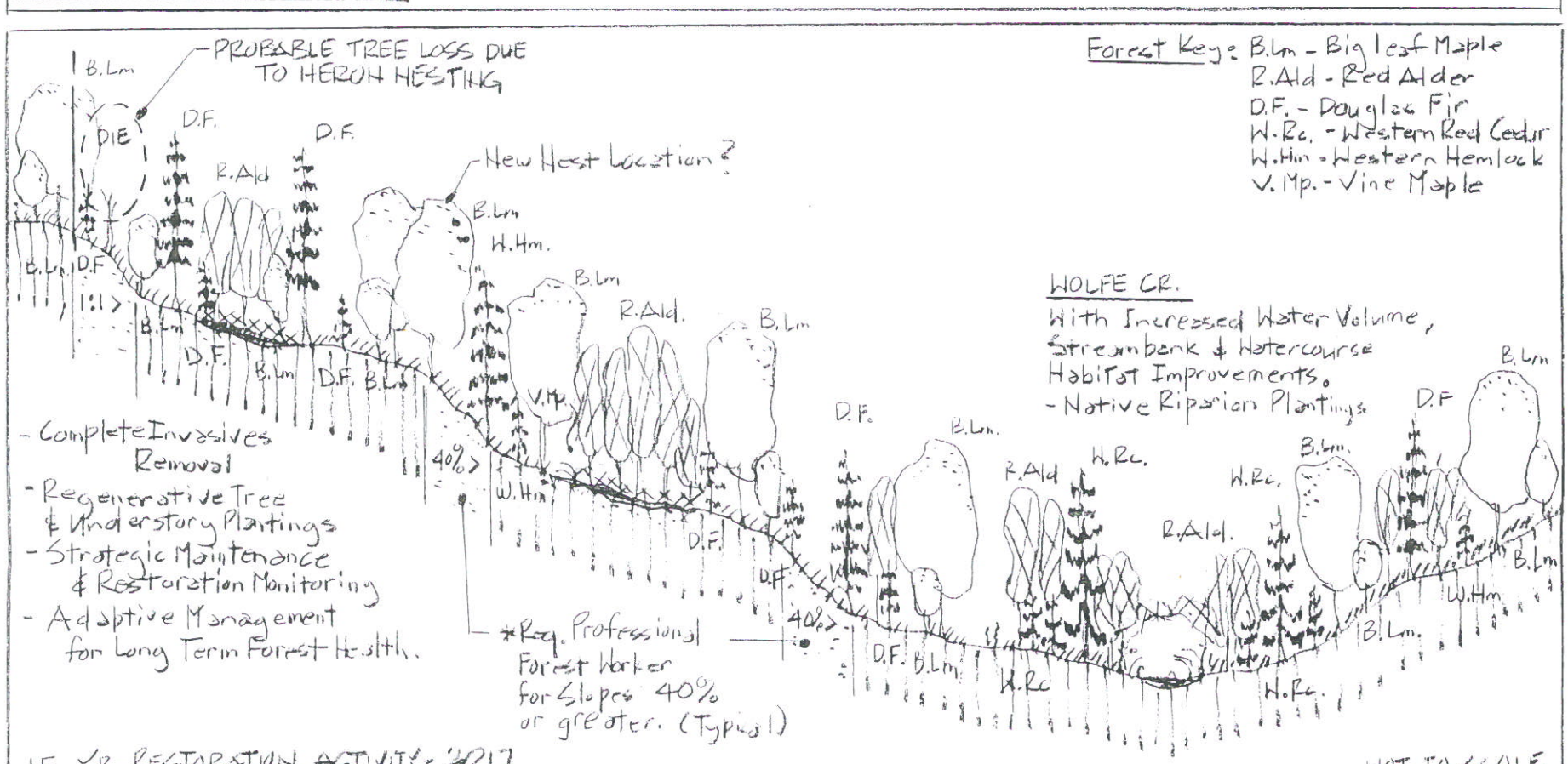

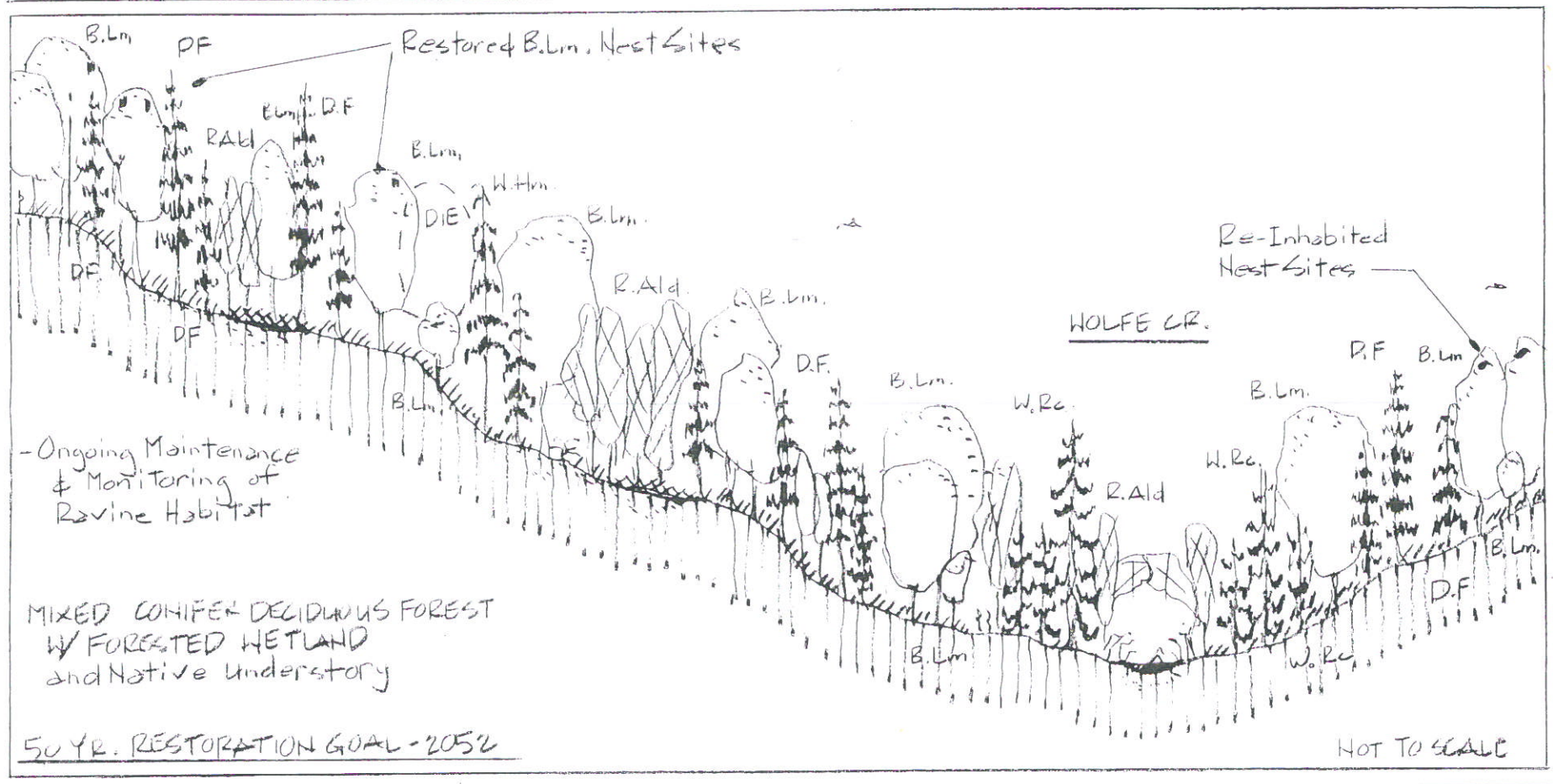

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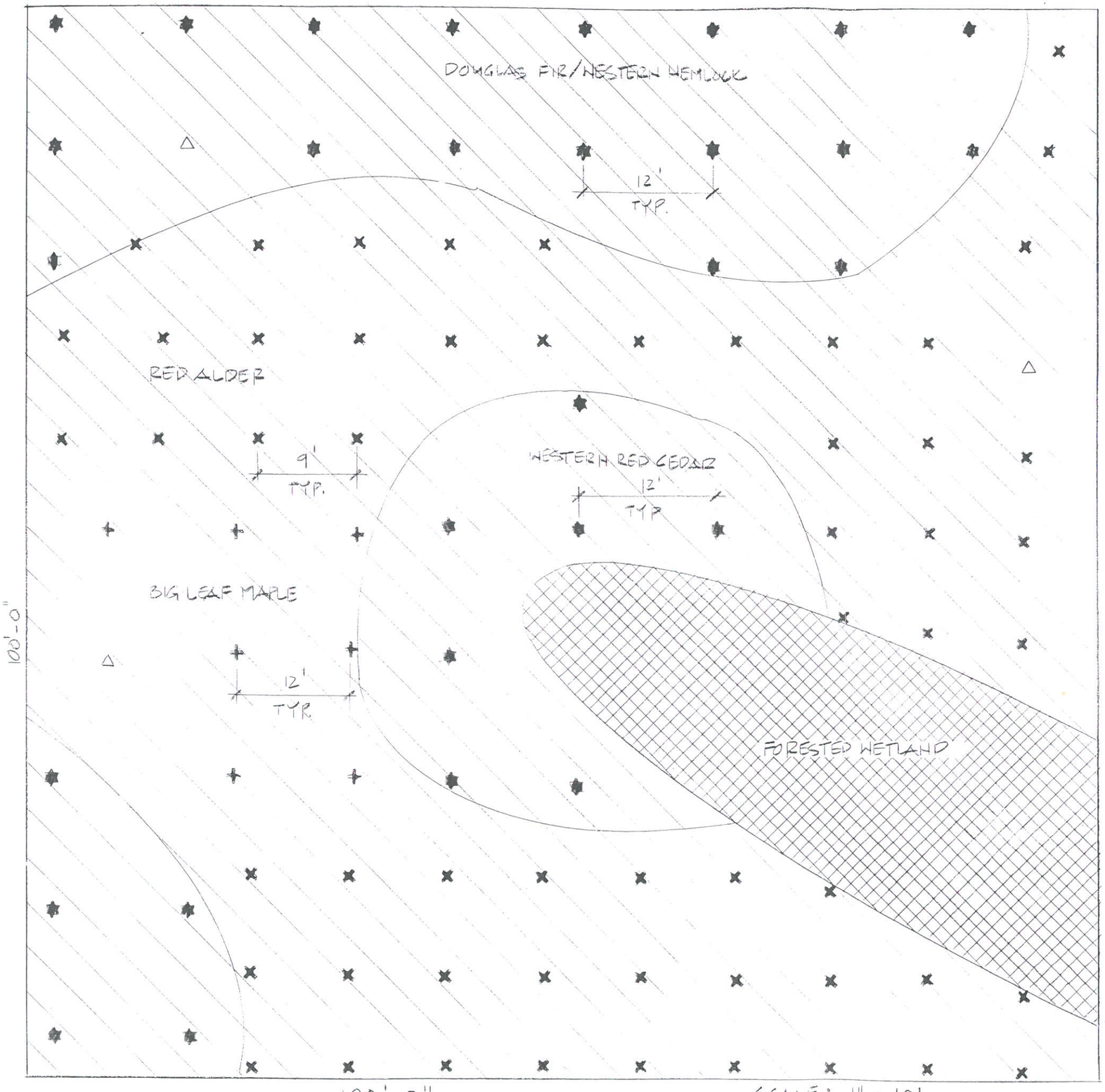
Kiwanis Ravine Habitat Section - Mixed Conifer Deciduous Forest with Forested Wetland

Inventory Analysis: Forest canopy is a mix (>30%) conifer and deciduous trees between 20 to 30 inch diameter at breast height (dbh). The understory contains natives Horsetail and Devils Club and variable (10 - 44%) invasive Himalayan Blackberry and English Ivy.

Figure 6
Mixed Conifer Deciduous Forest with Forested Wetland Habitat



SYMB.	COMMON NAME	SIZE	SPAC.
✱	TREES (CONIFERS)		
	DOUGLAS FIR	4'	12' OC
	WESTERN HEMLOCK		
	WESTERN RED CEDAR		
	(DECIDUOUS)		
+	BIG LEAF MAPLE	4'	12' OC
×	RED ALDER	4'	9' OC
	VINE MAPLE	4'	8' OC
▨	SHRUBS		
	SALAL	1 GAL.	3' OC
	LOW OREGON GRAPE	1 GAL.	3' OC
	SWORD FERN	1 GAL.	3' OC
	NOOTKA ROSE	2 GAL.	3' OC
	(MAY SUBSTITUTE OTHER PUGET LOWLAND SHRUBS BASED ON AVAILABILITY)		
▩	EMERGENTS		
	SOUGH SEDGE	PLUGS	18" OC
	CREEPING SPIKE-RUSH		18" OC
	SMALL FRUITED BULRUSH		18" OC
	PACIFIC WILLOW	LIVE STAKES	GR. OF 3 @ 10' OC
	SITKA WILLOW		

NOTES:

△ - EXISTING & HEALTHY NATIVE TREE, SHRUB & EMERGENT PLANTS SHOULD BE RETAINED & GIVEN COMPLEMENTARY NEW NATIVE PLANTINGS.

- EACH RESTORATION PLANTING MUST ANALZE THE EXISTING MICRO-SITES FOR THEIR OPTIMUM GROWTH POTENTIAL. MATCH SITE CONDITIONS TO SELECTED SPECIES USING SEATTLE PARKS REFERENCE GUIDES. APPENDIX E
- ADAPTIVE MANAGEMENT STRATEGIES BASED ON FIELD OBSERVATION MAY BE REQUIRED.

Fig. 6 PT
Mixed Conifer Deciduous Forest

Kiwanis Ravine Planting Template - Mixed Conifer Deciduous Forest with Forested Wetland

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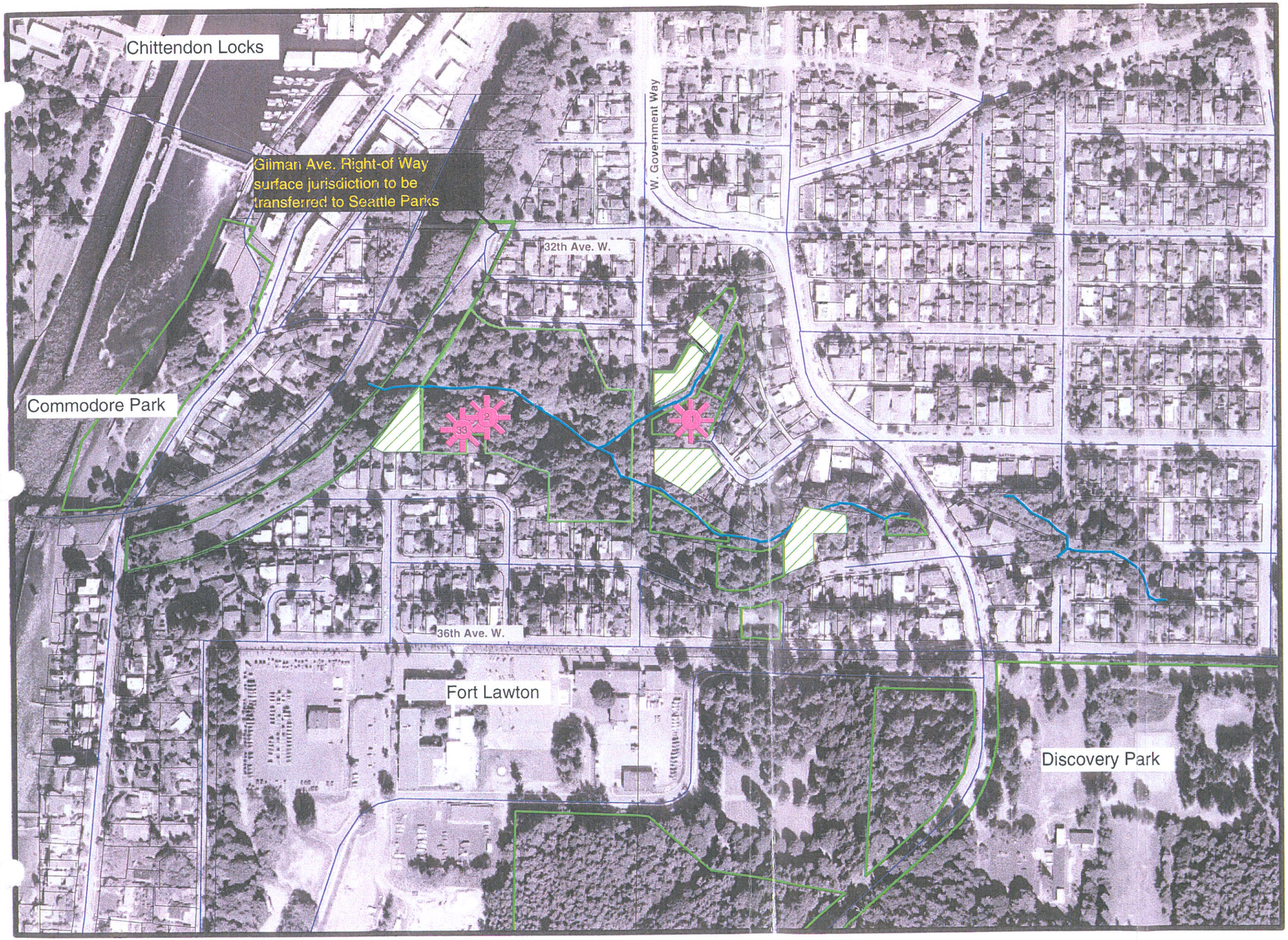

Figure 8

Parks Property, Parcels and Public Right of Ways

NORTH

Kiwanis Ravine - Parks Property, Parcels and Public Right of Way

- Great Blue Heron Nests - 2002
- Existing Park Property
- Wolfe Creek Surface Course
- Seattle Parks Acquisition Interest

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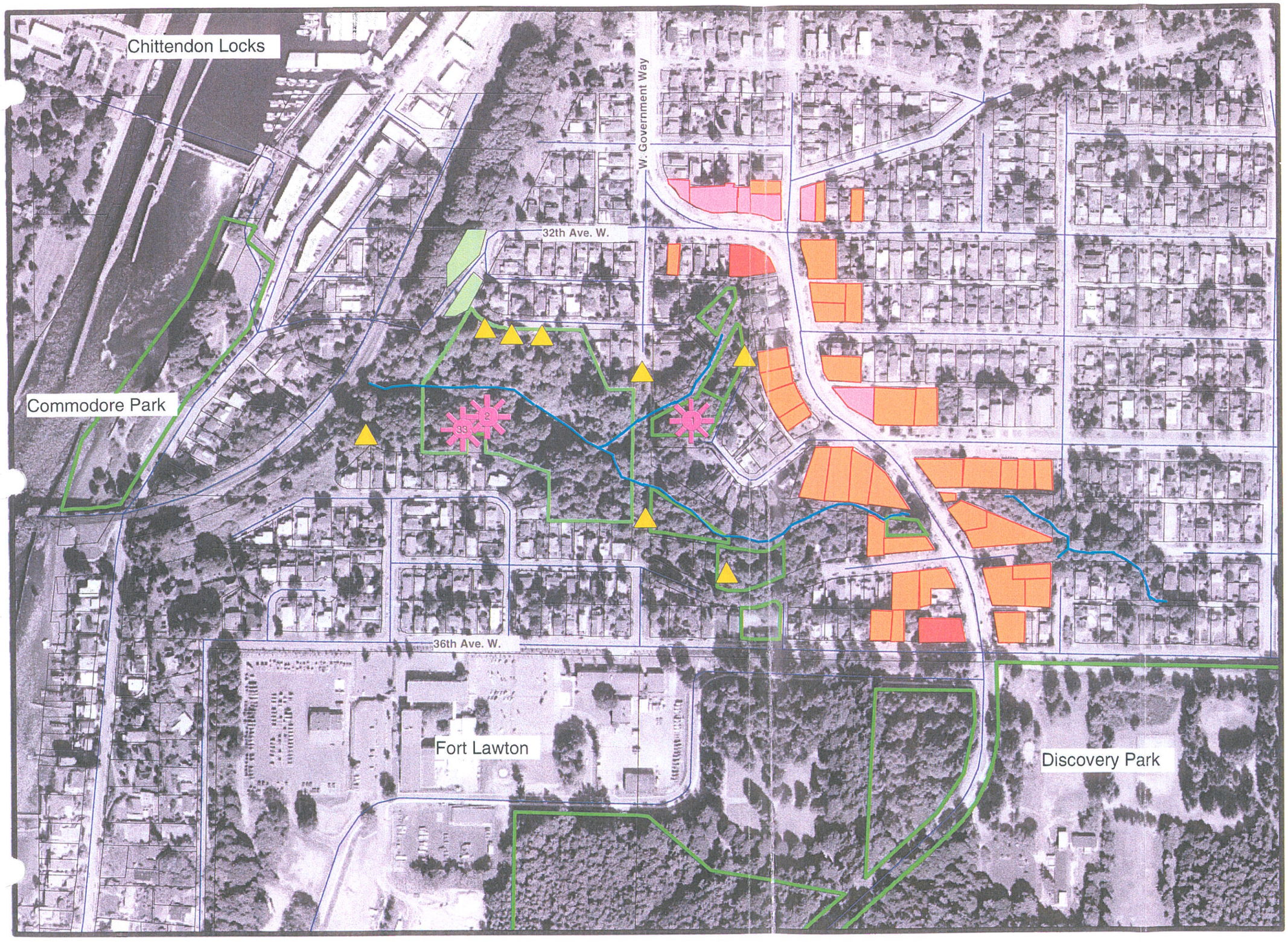
Figure 9

Urban Impact Locations



NORTH

Kiwanis Ravine - Urban Impact Locations

- Great Blue Heron Nests - 2002
- Wolfe Creek Surface Course
- Dump Site
- Unauthorized Tree Topping
- Existing Park Property
- Multi-Family Zoning Parcels

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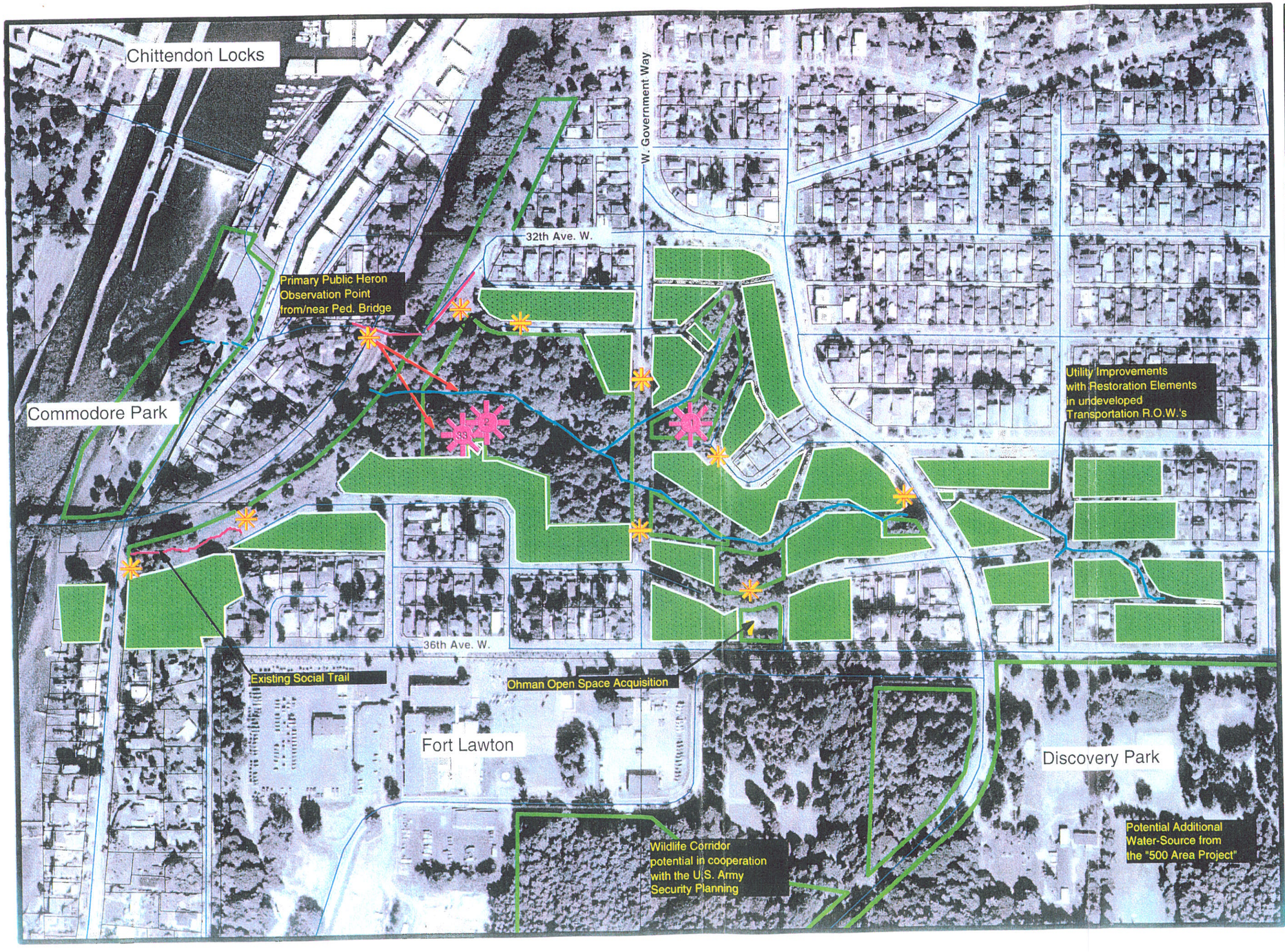
Figure 10

Conservation Actions and Opportunities



NORTH

Kiwanis Ravine - Conservation Actions and Opportunities

- Contiguous Residential Blocks to the Heron Habitat
- Possible Sites for Interpretation and Observation of the Heron and Kiwanis Ravine.
- Great Blue Heron Nests - 2002
- Wolfe Creek Surface Extension being studied

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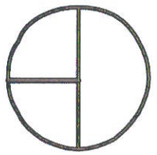
Figure 11

Public Land
Heron Colony
Protection Zones



Chittendon Locks

Abandoned Nests (3) 2001

32th Ave. W.

W. Government Way

Commodore Park

36th Ave. W.

Fort Lawton

Discovery Park

Public Land Heron Colony Protection Zone

- Existing Park Property
- Public Land
- Private Property not applicable to rules
- Great Blue Heron Nests - 2002
- Wolfe Creek Surface Course

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APPENDIX A

WILDLIFE HABITATS TECHNICAL DEFINITIONS

The habitat classification system used in this management plan is based on the vegetation and land cover classification systems used in the Seattle Department of Parks and Recreation's Urban Wildlife and Habitat Management Plan (Miller 1994, 2000). This system was developed from the system used by the Washington State Gap Analysis Project and the Interagency Committee for Outdoor Recreation (IAC). The system used by the IAC defines about 70 habitats.

The Gap Analysis Habitat Classification System is based on numerous terrestrial vegetation classification systems including: UNESCO's A Physiognomic Classification System for Mapping Purposes, An Ecological land Classification Framework for the United States by Driscoll et. al., Natural Vegetation of Oregon and Washington by Franklin and Dyrness (1988), Classification of Wetlands and Deepwater Habitats of the United States by Cowardin (1979), and Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington (1985) edited by Brown and used by the U.S. Forest Service.

The IAC classification system was developed by the Washington Department of Fish and Wildlife (WDFW) and is used by the IAC for defining wildlife habitats in Washington (IAC 1993). The system is largely based on the Gap Analysis Habitat Classification System. The aquatic habitat portion of the IAC classification system is based on A Marine and Estuarine Habitat Classification System for Washington State used by the Washington Department of Natural Resources.

Nine of the habitats defined in the Urban Wildlife and Habitat Management Plan system occur within Kiwanis Ravine. These nine habitats are:

- shrubland,
- tree savannah,
- deciduous forest five to fifteen inches diameter,
- deciduous forest fifteen to twenty inches diameter,
- conifer/deciduous mixed forest twenty to thirty inches diameter,
- palustrine scrub-shrub,
- palustrine forest,
- riverine unconsolidated, and
- developed.

The technical definitions for each of the nine habitats are provided below.

Shrubland habitat is defined as a terrestrial habitat having greater than 25 percent shrub cover and having 10 percent or less of tree cover.

Tree savannah habitat is a terrestrial habitat that has between 11 and 25 percent tree cover. This habitat may have dense or sparse shrub layer.

Deciduous forest is defined as forest is defined as having greater than 25 percent tree cover, with more than 70 percent of the forest canopy containing deciduous tree species. There can be conifer trees in the forest canopy but they form less than 30 percent of the forest canopy. Deciduous forest is subdivided into five habitats based on tree size, age, and forest structure. Two deciduous forest habitats occur in Kiwanis

Ravine: deciduous forest five to fifteen inches diameter, and deciduous forest fifteen to twenty inches diameter. Deciduous forest fifteen to twenty inches diameter is defined as dominated by deciduous trees greater than thirty feet tall, and between five and fifteen inches diameter at breast height (dbh). Deciduous forest fifteen to twenty inches diameter habitat is defined as dominated by deciduous trees greater than thirty feet tall, and fifteen to twenty inches dbh.

Conifer/deciduous mixed forest is defined as as having greater than 25 percent tree cover with the tree canopy containing 30 to 70 percent coniferous and 30 to 70 percent deciduous tree species. Conifer/deciduous mixed forest is subdivided into five habitats based on tree size, age, and forest structure. Conifer/deciduous mixed forest habitat twenty to thirty inches diameter is defined as dominated by trees greater than thirty feet tall, and twenty to thirty inches dbh.

Palustrine habitats include freshwater wetlands (salinity less than 0.5 ppt). These areas have greater than 30 percent cover of trees, shrubs, or emergent plants, or they are smaller than 20 acres in size. Palustrine scrub-shrub wetland habitat is dominated by woody vegetation that is less than twenty feet in height. The woody vegetation may be shrubs, young trees, or trees that are stunted due to environmental conditions. It is important to note that these wetlands often have no open water. Vegetation height distinguishes scrub-shrub from forested wetland. Palustrine forest wetland habitat is dominated by woody vegetation that is greater than twenty feet in height. The palustrine forest vegetation has a forest overstory and may have a scrub-shrub understory.

Riverine habitat consists of waters flowing within a physically defined channel. The waters flow continuously with relatively high velocity, distinguishing them from lakes with water slowly flowing through. Riverine unconsolidated has a substrate formed of sand, silt, gravel, or cobble.

Developed habitat is defined as areas which contain more than 10 percent of the land surface covered by buildings, structures, or pavement.

References

Brown, E.R. tech editor, 1985. Management of Wildlife and Fish Habitats in Forests of Western Oregon and Washington. U.S Forest Service Pacific Northwest Region.

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Franklin, J.F., and C.T. Dyrness, 1988. Natural Vegetation of Oregon and Washington. Oregon State Univ. Press, 452pp.

Miller, G., 1994. Urban Wildlife And Habitat Management Plan. Prepared for the Seattle Department of Parks and Recreation, Seattle Washington.

Miller, G., 2000. Urban Wildlife And Habitat Management Plan Year 200 Update. Prepared for the Seattle Department of Parks and Recreation, Seattle Washington.

United Nations Educational Scientific and Cultural Organization (UNESCO) 1973. A Physiognomic Classifi-

APPENDIX B

PLANT SPECIES KNOWN TO OCCUR IN KIWANIS RAVINE

This list is presented twice: first arranged in alphabetic order by English name, then in alphabetic order by scientific name.

I. Arranged by English name.

English Name	Scientific Name
Alaska brome	**Bromus sitchensis**
American holly	Ilex opaca
Apple	Malus domestica
Avens	Geum macrophyllum
Bedstraw	Galium aparine
Big-leaf maple	Acer macrophyllum
Bindweed*	Convolvulus arvensis
Bitter cherry	Prunus emarginata
Black locust	Robinia pseudo-acacia
Blackcap	Rubus leucodermis
Black mustard	Brassica niger
Bleeding heart	Dicentra formosa
Blue currant (Stinking currant)	Ribes bracteosum
Bracken	Pteridium aquilinum
Brittle bladder-fern	Cystopteris fragilis
Cascara	Rhamnus purshiana
Cheatgrass	Bromus tectorum
Climbing nightshade*	Solanum dulcamara
Colt's foot	Petasites frigidus
Common dandelion	Taraxacum officinale
Common horsetail	Equisetum arvense
Common velvetgrass	Holcus lanatus
Cow-parsnip	Heracleum lanatum
Creeping buttercup	Ranunculus repens
Crisped starwort	Stellaria crispa
Curly dock	Rumex crispus
Deer fern	Blechnum spicant
Devils club	Oplopanax horridum
Douglas-fir	Pseudotsuga menziesii
English holly*	Ilex aquifolium
English Laurel(Cherry laurel) *	Prunus laurocerasus
English ivy*	Hedera helix
European mountain ash	Sorbus acuparia
Fireweed	Epilobium angustifolium
Foxglove	Digitalis purpurea
Fringecups	Tellima grandiflora
Geranium	Geranium sp.

Hazelnut	**Corylus cornuta**
Himalayan blackberry*	Rubus discolor
Horse chestnut	Aesculus Hippocastanum
Indian plum	Osmaronia cerasiformis
Japanese knotweed*	Polygonum cuspidatum
Kentucky bluegrass	Poa pratensis
Lady fern	Athyrium filix-femina
Licorice fern	Polypodium glycyrrhiza
Mayflower	Cardamine pratensis
Miner's lettuce	Montia sibirica
Money plant	Lunaria annua
Morning glory*	Convolvulus sepia
Oak fern	Gymnocarpium dryopteris
Ocean spray	Holodiscus discolor
Orchardgrass	Dactylis glomerata
Oregon grape	Berberis nervosa
Pacific blackberry	Rubus ursinus
Pacific waterleaf (Slender-stemmed waterleaf)	Hydrophyllum tenuipes
Pacific willow	Salix lasiandra
Pennsylvania bittercress	Cardamine pennsylvanica
Piggyback plant (Youth-on-age)	Tolmiea menziesii
Poison-hemlock	Conium maculatum
Red alder	Alnus rubra
Red elderberry	Sambucus racemosa
Red huckleberry	Vaccinium parvifolium
Reed canarygrass*	Phalaris arundinacea
Rose	Rosa sp.
Salal	Gaultheria shallon
Salmonberry	Rubus spectabilis
Scot's broom*	Cytisus scoparius
Scouler willow	Salix scouleriana
Skunk cabbage	Lysichiton americanum
Small-flowered woodrush	Luzula parviflora
Small-fruited bulrush	Scirpus microcarpus
Smooth Willow-herb	Epilobium glaberrimum
Stinging nettle	Urtica dioca
Swordfern	Polystichum munitum
Tansy ragwort	Senecio jacobæa
Thimbleberry	Rubus parviflorus
Water cress	Rorripa nasturtium-aquaticum
Water parsley	Oenanthe sarmentosa
Western hemlock	Tsuga heterophylla
Western maidenhair-fern	Adiantum pedatum
Western redcedar	Thuja plicata
Wild lettuce	Lactuca muralis

* Indicates non-native species which are often aggressive invaders of native ecosystems.

II. *Arranged by scientific name.*

Acer macrophyllum	Big-leaf maple
Aesculus Hippocastanum	Horse chestnut
Adiantum pedatum	Western maidenhair-fern
Alnus rubra	Red alder
Athyrium filix-femina	Lady fern
Berberis nervosa	Oregon grape
Blechnum spicant	Deer fern
Brassica niger	Black mustard
Bromus tectorum	Cheatgrass
Bromus sitchensis	Alaska brome
Cardamine pennsylvanica	Pennsylvania bittercress
Cardamine pratensis	Mayflower
Conium maculatum	Poison-hemlock
Convolvulus arvensis	Bindweed*
Convolvulus sepia	Morning glory*
Corylus cornuta	Hazelnut
Cystopteris fragilis	Brittle bladder-fern
Cytisus scoparius	Scot's broom*
Dactylis glomerata	Orchardgrass
Dicentra formosa	Bleeding heart
Digitalis purpurea	Foxglove
Epilobium angustifolium	Fireweed
Epilobium glaberrimum	Smooth Willow-herb
Equisetum arvense	Common horsetail
Galium aparine	Bedstraw
Gaultheria shallon	Salal
Geranium sp.	Geranium
Geum macrophyllum	Avens
Gymnocarpium dryopteris	Oak fern
Hedera helix	English ivy*
Heracleum lanatum	Cow-parsnip
Holcus lanatus	Common velvetgrass
Holodiscus discolor	Ocean spray
Hydrophyllum tenuipes	Pacific waterleaf
Ilex aquifolium	English holly*
Ilex opaca	American holly
Lactuca muralis	Wild lettuce
Lunaria annua	Money plant
Luzula parviflora	Small-flowered woodrush
Lysichiton americanum	Skunk cabbage
Malus domestica	Apple
Montia sibirica	Miner's lettuce
Oenanthe sarmentosa	Water parsley
Oplopanax horridum	Devils club
Osmaronia cerasiformis	Indian plum

Petasites frigidus	Colt's foot
Phalaris arundinacea	Reed canarygrass*
Poa pratensis	Kentucky bluegrass
Polygonum cuspidatum	Japanese knotweed*
Polypodium glycyrrhiza	Licorice fern
Polystichum munitum	Swordfern
Prunus emarginata	Bitter cherry
Prunus laurocerasus	English Laurel (Cherry laurel) *
Pseudotsuga menziesii	Douglas-fir
Pteridium aquilinum	Bracken fern
Ranunculus repens	Creeping buttercup
Rhamnus purshiana	Cascara
Ribes bracteosum	Blue currant (Stinking currant)
Robinia pseudo-acacia	Black locust
Rorripa nasturtium-aquaticum	Water cress
Rosa sp.	Rose
Rubus discolor	Himalayan blackberry*
Rubus leucodermis	Blackcap
Rubus parviflorus	Thimbleberry
Rubus spectabilis	Salmonberry
Rubus ursinus	Pacific blackberry
Rumex crispus	Curly dock
Salix lasiandra	Pacific willow
Salix scouleriana	Scouler willow
Sambucus racemosa	Red elderberry
Scirpus microcarpus	Small-fruited bulrush
Senecio jacobæa	Tansy ragwort
Solanum dulcamara	Climbing nightshade*
Sorbus acuparia	European mountain ash
Stellaria crispa	Crisped starwort
Taraxacum officinale	Common dandelion
Tellima grandiflora	Fringecups
Thuja plicata	Western redcedar
Tolmiea menziesii	Piggyback plant (Youth-on-age)
Tsuga heterophylla	Western hemlock
Urtica dioca	Stinging nettle
Vaccinium parvifolium	Red huckleberry

* Indicates non-native species which are often aggressive invaders of native ecosystems.

Sources:

Adams and Steil 1992, Seattle Urban Nature Project (SUNP) 2000, Slettebak 1992, Tabscott, 1992.

APPENDIX C

VERTEBRATE ANIMAL SPECIES KNOWN OR POTENTIALLY OCCURING IN KIWANIS RAVINE

This list is arranged in taxonomic (phylogenetic) order.
The list follows the order of the most commonly used field guides.

Common Name	Scientific Name	Observed	Potential
AMPHIBIANS			
Long-toed salamander	Ambystoma macrodactyla		X
Northwestern salamander	Ambystoma gracile		X
Rough-skinned newt	Taricha granulosa		X
Western redbacked salamander	Plethodon vehiculum		X
Pacific tree frog	Hyla regilla		X
Northern red-legged frog	Rana aurora aurora		X
REPTILES			
Northern alligator lizard	Gerrhonotus coeruleus		X
Common garter snake	Thamnophis sirtalis		X
Northwestern garter snake	Thamnophis ordinoides		X
Western terrestrial garter snake	Thamnophis elegans		X
BIRDS			
Double-crested cormorant	Phalacrocorax auritus	X	
Great blue heron	Ardea herodias	X	
Canada goose	Branta canadensis	X	
Mallard	Anas platyrhynchos	X	
Turkey vulture	Cathartes aura	X	
Sharp-shinned hawk	Accipiter striatus	X	
Cooper's hawk	Accipiter cooperii	X	
Red-tailed hawk	Buteo jamaicensis	X	
Bald eagle	Haliaeetus leucocephalus	X	
Merlin	Falco columbarius	X	
Peregrine falcon	Falco peregrinus	X	
Gyrfalcon	Falco rusticolus		X
Osprey	Pandion haliaetus	X	
Glaucous-winged gull	Larus glaucescens	X	
Herring gull	Larus argentatus	X	
Caspian tern	Sterna caspia	X	
Killdeer	Charadrius vociferus	X	
Rock dove*	Columba livia	X	
Band-tailed pigeon	Columba fasciata	X	
Vaux's swift	Chaetura vauxi	X	
Anna's hummingbird	Calypte anna	X	
Belted kingfisher	Ceryle alcyon	X	
Northern flicker	Colaptes auratus	X	
Hairy woodpecker	Picoides villosus	X	

Common Name	Scientific Name	Observed	Potential
Downy woodpecker	Picoides pubescens	X	
Western wood-pewee	Contopus sordidulus	X	
Willow flycatcher	Empidonax traillii	X	
Violet-green swallow	Tachycineta thalassina	X	
Barn swallow	Hirundo rustica	X	
Steller's jay	Cyanocitta stelleri	X	
American crow	Corvus brachyrhynchos	X	
Black-capped chickadee	Parus atricapillus	X	
Chestnut-backed chickadee	Parus rufescens	X	
Bushtit	Psaltriparus minimus	X	
Red-breasted nuthatch	Sitta canadensis	X	
Brown creeper	Certhia americana	X	
Bewick's wren	Thryomanes bewickii	X	
Winter wren	Troglodytes troglodytes	X	
Golden-crowned kinglet	Regulus satrapa	X	
Ruby-crowned kinglet	Regulus calendula	X	
Swainson's thrush	Catharus ustulatus	X	
Hermit thrush	Catharus guttatus	X	
American robin	Turdus migratorius	X	
Varied thrush	Ixoreus naevius	X	
Cedar waxwing	Bombycilla cedrorum	X	
European starling*	Sturnus vulgaris	X	
Solitary vireo	Vireo solitarius	X	
Hutton's vireo	Vireo huttoni	X	
Warbling vireo	Vireo gilvus	X	
Yellow warbler	Dendroica petechia	X	
Yellow-rumped warbler	Dendroica coronata	X	
Townsend's warbler	Dendroica townsendi	X	
MacGillivray's warbler	Oporornis tolmiei	X	
Wilson's warbler	Wilsonia pusilla	X	
Western tanager	Piranga ludoviciana	X	
Evening grosbeak	Coccothraustes vespertinus	X	
Black-headed grosbeak	Pheucticus melanocephalus	X	
Spotted towhee	Pipilo maculatus	X	
Fox sparrow	Passerella iliaca	X	
Song sparrow	Melospiza melodia	X	
Golden-crowned sparrow	Zonotrichia atricapilla	X	
White-crowned sparrow	Zonotrichia leucophry	X	
Dark-eyed junco	Junco hyemalis	X	
Brown-headed cowbird	Molothrus ater	X	
House finch	Carpodacus mexicanus	X	
Red crossbill	Loxia curvirostra	X	
Pine siskin	Carduelis pinus	X	
American goldfinch	Carduelis tristis	X	
House sparrow*	Passer domesticus	X	

Common Name	Scientific Name	Observed	Potential
MAMMALS			
Opossum	**Didelphis marsupialis**		X
Vagrant Shrew	Sorex vagrans		X
Dusky Shrew	Sorex obscurus		X
Masked Shrew	Sorex cinereus		X
Shrew-mole	Neurotrichus gibbsii		X
Townsend's Mole	Scapanus townsendi		X
Pacific Coast Mole	Scapanus orarius		X
Little Brown Bat	Myotis lucifigus		X
Big Brown Bat	Eptesicus fuscus		X
Domestic Rabbit	Oryctolagus cuniculus		X
Eastern Cottontail	Sylvilagus floridanus		X
Mountain beaver	Aplodontia rufa	X	
Townsend's Chipmunk	Eutamius townsendi		X
Eastern Gray Squirrel*	Sciurus carolinensis		X
Northern Flying Squirrel	Glaucomys sabrinus		X
Deer Mouse	Peromyscus maniculatus		X
Oregon Vole	Microtus oregoni		X
Norway Rat*	Rattus norvegicus		X
House mouse*	Mus musculus		X
Red Fox	Vulpes vulpes		X
Coyote	Canis latrans		X
Domestic Dog	Canis familiarus	X	
Raccoon	Procyon lotor	X	X
Long tailed Weasel	Mustela frenata		
Cougar	Felis concolor		X
Feral Cat	Felis cattus	X	

* Indicates non-native species which are often aggressive invaders of native ecosystems.

Sources:

Discovery Park Mammal List (current), Harmon 2002, Seattle Urban Nature Project (SUNP) 2000, Slettebak 1992, Tabscott, 1992.

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Tabscott, R., 1992. Kiwanis Ravine Wildlife Management Plan. Prepared for the Seattle Department of Parks and Recreation.

APPENDIX D

NATIVE PLANTS OF THE PUGET SOUND LOWLANDS RECOMMENDED FOR WILDLIFE

TREES

Scientific name	Common name	Max. Ht.	Sun	Water	# Birds
Abies grandis	Grand Fir	>60'	f/p, p	m	6
Acer circinatum	Vine Maple	15-30'	f/p	a,m	8
Acer macrophyllum	Bigleaf Maple	>60'	f	a,m	9
Alnus rubra	Red Alder	>60'	f	a,m	6
Arbutus menziesii	Pacific Madrona	>60'	f/p	m,l	3
Betula papyrifera	Paper Birch	>60'	f	m	12
Cornus nuttalli	Pacific Dogwood	30-80'	p	m,l	25
Crataegus monogyna	Washington hawthorn	25'			
Fraxinus latifolia	Oregon Ash	40-100'	f/p	a	5
Quercus garryanna	Oregon white oak, Garry oak	>60'			
Picea sitchensis	Sitka Spruce	>60'	f/p	a,m	13
Pinus contorta contorta	Shore Pine	15-30'	f	a,m,l	17
Pinus monticola	Western White Pine	>60'	f	m	21
Populus trichocarpa	Black Cottonwood	>60'	f	a	0
Prunus emarginata	Bitter Cherry	30-100'	f/p	m	28
Pseudotsuga menziesii	Douglas fir	>60'	f/p	m	2
Rhamnus purshiana	Cascara Buckthorn	30-40'	f/p	m	13
Salix spp.	Willow	variable	f	a	0
Taxus brevifolia	Western Yew	15-30'	f/p	m	4
Thuja plicata	Western Red Cedar	>60'	f/p	a,m	5
Tsuga heterophylla	Western Hemlock	>60'	f/p	m	7

Sun Codes
f = full sun
f/p = full sun – part shade
p = part shade
d = deep shade

Sources:
Washington Department of Wildlife
Washington Native Plant Society

Water Codes
a = ample
m = moderate
l = little

Notes

Needles are two-ranked (in one plane). Best in deep moist alluvial soils. Also sold as Christmas trees.

Large shrub to small tree; often multi-stemmed. Best suited to woodland plantings with ferns and conifers. Excellent fall color. All maples produce winged seeds that are eaten by wildlife.

Best suited for large plantings. Stumps will produce sprouts resulting in a dense mass of stems. Fast growing.

Tolerates brackish soil. Good for restoration of disturbed sites; add nitrogen to soil. Birds eat seeds.

Choice form, especially against an ocean view. Constant litter from peeling bark and leaves can be a problem. Wildlife eat the flowers and orange-red, berrylike fruit.

Hardy, fast growing. Smooth white bark (on older trees) is very attractive. Good fall color. Seeds especially valued by goldfinches, siskins, juncos. Less common commercially, but should be more preferred than European Birch.

Intolerant of frequent watering and fertilizing. Protect young bark from sun and mechanical damage. Effective against background of darker conifers. Flowers in spring and again in late summer. Wildlife eats fruit clusters.

Deciduous,, open crown, white flowers, red fruit in fall

Dioecious (female trees produce winged seeds). Good for revegetation of wet, low-lying areas; will grow in standing water in winter. May be hard to find in nurseries.

Deciduous, many animals consume acorns

Does best in foggy, moist atmosphere. Very important coastal tree, especially on Olympic Peninsula. Wildlife eats 1/8" seeds in 2-4" cones that drop in late fall. Fast growing, needs large area.

Short, contorted trunk and dense, irregular crown. Tolerant of poor soil conditions. Serotinous cones (open only after exposure to fire), so wildlife value is reduced.

Best in large gardens. 1/3" seeds with 1" wings are in 8-11" cones. Good root system makes it especially wind-firm. Susceptible to white pine blister rust.

Massive, fast-growing, good for reclamation of wet sites. Not suitable for smaller landscapes. Offers cover and nesting, but seeds not suitable for most wildlife.

Many other non-native varieties available, usually smaller in stature. Avoid sterile types that don't produce fruit.

Most important of our native conifers in western Washington. Fast growing. Wildlife eats 1/4" seeds in 2-4" cones; heaviest cone crops occur every 5-7 yrs. Provides shelter, nest sites, insects.

Also known as bitter-bark. Grows in a variety of soils; moist is best. Does not do well in highly urbanized areas. Bark used by Indians as a laxative, still used commercially today. Wildlife eats the round, bluish-black fruit.

Many species from small shrubs to medium trees. Provides cover and insects but no seeds or fruit. Good for reclaiming wet sites; ponds, streams, wetlands. Roots invasive; don't plant near sewer or septic lines.

Grows as a shrub or small tree. Wildlife eats seeds and scarlet, berrylike cup (aril). Doiecious (only female plants produce seeds.) May be hard to find in plant nurseries.

Important PNW species. Generally found in moist flats and slopes, and along water margins. Shade tolerant; attractive bark. Foliage sprays are drooping, often fernlike. Wildlife eats the small 1/8" seeds in 1/3" - 1/2" cones.

Graceful, pyramidal tree. Protect from drying wind and sun. Faster growth and larger size make it less suitable than the Mtn. Hemlock for small landscapes.

SHRUBS

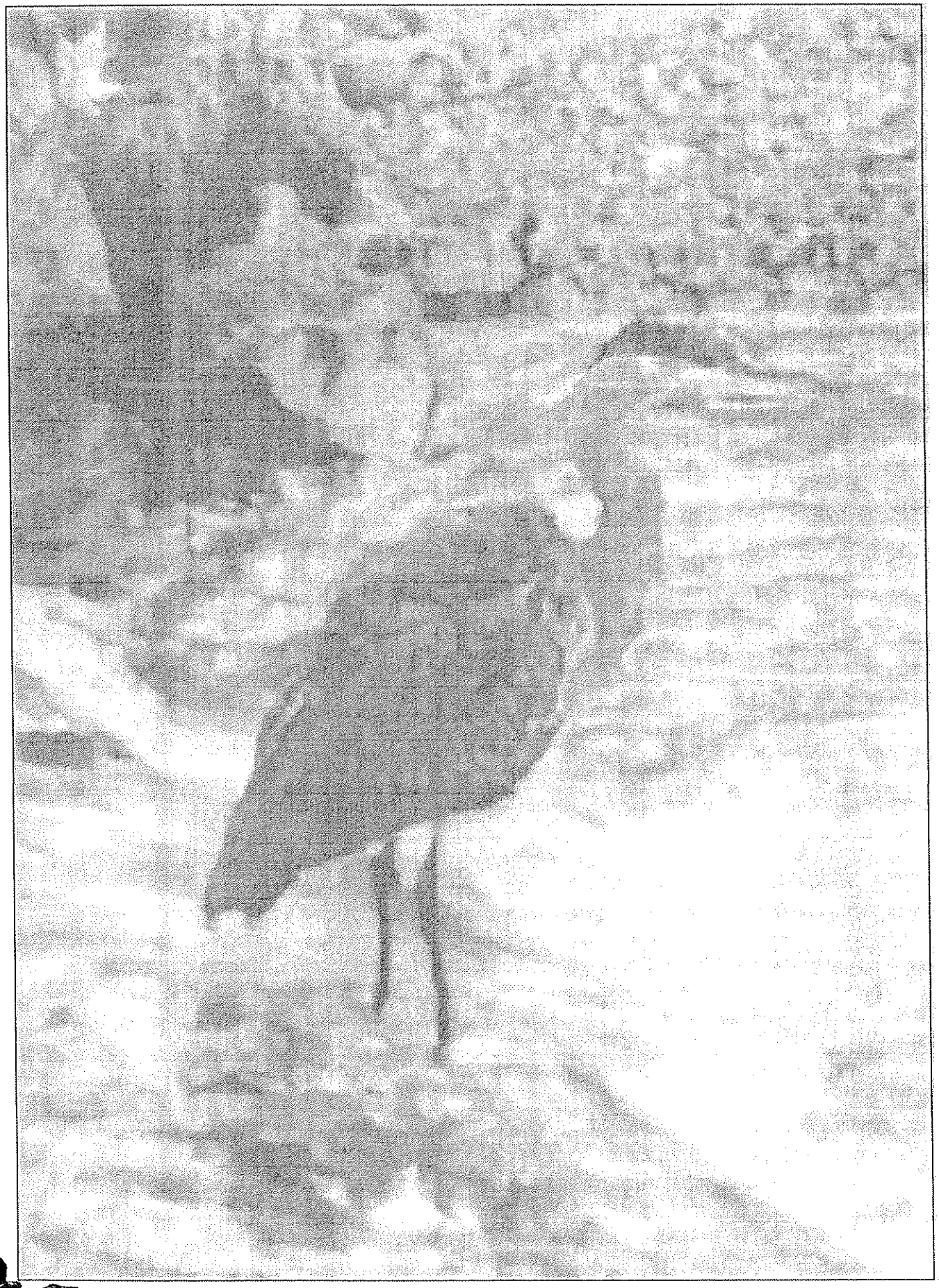
Scientific name	Common name	Max. Ht.	Sun	Water	# Birds
Amelanchier alnifolia	Serviceberry	15'	f		
Arctostaphylos uva-ursi	Bearberry, Kinnikinnik	<1'	f	m,l	3
Aronia arbutifolia	Chokeberry	6'	f		
Betula glandulosa	Scrub Birch, Bog Birch	6-15'	f	a	9
Cornus canadensis	Bunchberry	<1'	p,d	a,m	18
Cornus stolonifera	Red Osier Dogwood	6-16'	f	a,m	24
Gaultheria shallon	Salal	3-8'	f/p	m	2
Holodiscus discolor	Ocean spray	6'	f		
Lonicera ciliosa	Trumpet Honey-suckle		f	m	15
Lonicera involucrata	Twinberry	6-15'	f	m	15
Osmaronia cerasiformis	Indian Plum, Oso Berry	6-15'	f/p	m	6
Philadelphus lewisii	Mock-orange	7'	f		
Physocarpus capitatus	Pacific ninebark	6'	f		
Ribes sanguineum	Red-flowering Currant	6-10'	f/p	m	10
Rosa spp.	Wild Rose	3-8'	f/p	m,l	12
Rubus parviflorus	Thimbleberry	3-6'	f/p	a,m	25
Rubus spectabilis	Salmonberry	6-15'	f/p	a,m	25
Sambucus racemosa	Red Elderberry	6-15'	f	a,m	29
Symphoricarpos albus	Snowberry	3-6'	f/p	m	10
Vaccinium ovatum	Evergreen Huckle-berry	6-15'	p	m,l	
Vaccinium parvifolium	Red Huckleberry	6-15'	p	a,m	13
Viburnum opulus	High-bush Cranberry	6-15'	f/p	m	11

Appendix D

Sun Codes
f = full sun
f/p = full sun – part shade
p = part shade
d = deep shade

Water Codes
a = ample
m = moderate
l = little

Notes
Deciduous flowering shrub, white flowers, red fall color.
Good groundcover for steep hillsides and other reclaimed land. Useful in rock gardens. Small, pink, bell-shaped flowers are attractive. Wildlife eat the red berries.
Native evergreen shrub, white flowers, red fruit
Found in wetlands of the Pacific N.W. Wildlife eat the small seeds in woody cones.
Deciduous groundcover with attractive white flowers. Rich, moist acid soil needed. Will spread. Best in native garden. Wildlife eat the red berries in fall.
Also called creek dogwood. Valuable for habitat reclamation, especially in moist areas. Multi-stemmed red branches are attractive all year; red autumn foliage. Wildlife eat the white to bluish berries.
Fruit not readily consumed, but provides good cover. Small pink urn-shaped flowers are attractive. Lower growing in full sun. Best in native landscape in massed plantings.
Deciduous flowering shrub, white flowers
Groundcover or climbing vine. Has tubular red flowers in clusters used by hummingbirds. Wildlife eat the reddish-orange fruit in fall. Others are available in nurseries.
Found in moist areas of the PNW. Dense foliage. Yellow twin flowers. Wildlife eat the purplish-black fruits.
~~Good for woodland garden, native plantings in open spaces. Produces showy white flowers in early spring. Dioecious~~ (only female plants produce the olive-sized bluish-black berries eaten by wildlife).
Deciduous flowering shrub, white flowers
Deciduous flowering shrub
Spring flowers are attractive to hummingbirds. Wildlife eat the round blue-black berries..
Several species and varieties available, both native and introduced. Nootka, multiflora, and rugosa roses are most common. Wildlife eat hips that are persistent into winter.
Unkept appearance is best in wild, natural garden. Large white flowers. Wildlife eat the mealy fruit.
Best in natural garden. Reddish-purple flowers attract both bees and hummingbirds; wildlife eat the red fruits.
Prune to avoid leggy appearance. Best in natural garden. Blue elderberry (Sambucus cerulea) is similar, but best in eastern WA. Raw berries may be toxic to humans.
Will spread to form a thicket that provides good shelter. White fruit persists into winter, although it is not highly valued by wildlife.
Abundant blue fruit highly prized by humans and wildlife . Does best in part shade, open woods; grows large and leggy in deep shade. Attractions are new bronze foliage, pink flowers, abundant fruit.
Best in moist, coniferous woodland setting. Often grows on top of tree stumps. Has bright red, semi-translucent berries.
Fruit stays on plant into winter but is not highly valued by wildlife. Other non-native viburnums are common in nurseries; some do not bear fruit; none have highly valued fruit.



APPENDIX E
PLANTING

The basic procedure of plant installation is essentially the same whether in a developed landscape or in a natural area. Site preparation, species selection, and planting layout are site-specific and depend on the goals of the project as well as the micro-site conditions. Instructions for planting trees, shrubs, and herbaceous material are given below. Because the broad goals of any natural area planting include restoration of a functional native plant community, information about species choices and plant palettes for planting in natural areas is given in Tables 6.1-6.5 immediately following. Plant selection for use in developed landscapes can have a wider range of options, in particular including non-native species, and should also be informed by historic information when relevant. Section 5 provides some guidance with regard to species choices in these types of settings, by Landscape Zone and Management Area.

Trees

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

- Ideal planting hole is 2-3x the diameter of the root spread or the root ball (depending on existing soil conditions)
- Minimum planting hole is 12" wider than root spread or root ball
- Hole shall be no deeper than the ball and the ball shall sit firmly on the undisturbed subsoil
- Native soil shall be used to backfill the planting hole except in situations where the existing soil is contaminated or filled with rubble or pure clay
- Trees shall not be fertilized at the time of planting
- Balled-and-burlapped trees shall be placed in the hole and plumbed vertically. All rope shall be removed from around the trunk of the tree and the top 1/3 of the burlap shall be folded back down into the hole. Whenever possible complete removal of the top third of burlap by cutting it away with a sharp knife is preferred. Do not remove any B&B packaging material until the tree is placed in the hole and securely plumbed into its final position.
- Trees in wire baskets shall have <u>all</u> of the basket removed, using bolt cutters
- Backfill soil in lifts of 4-6" at a time with compaction of each layer. Do not compact muddy backfill. Water thoroughly after backfilling to settle the soil, eliminate air pockets and re-wet the root system.
- If project scope allows, watering soil rather than compacting is preferred. Backfill _ the soil in the tree pit and thoroughly drench with water to settle. Complete backfilling and then thoroughly drench with water again. This method is preferred for removing air pockets and settling soil, but can be impractical on big jobs or jobs using volunteers.
- Trees planted in sandy or loamy soils should have a 3" high berm erected just past the perimeter of the planting hole to funnel water to the root ball and wet the hole/sidewall interface.
- Berms should not be constructed in clay soils or on heavily compacted sites.
- Stake only in situations where normal planting procedures does not provide a stable plant, otherwise, staking is not generally required.
- Staking is sometimes recommended as a vandal deterrent device or to prevent mechanical injury from mowers or trimmers. Ties for stakes should be some biodegradable or flexible fastener that precludes collaring of the trunk if the ties are not removed in a timely fashion.
- Stakes shall be removed at the end of the first year.
- Plant trees at the depth they were growing in the nursery.

- Do not wrap tree trunks.
- Remove tree trunk wrapping materials, tags, and all ties at the time of planting.

Shrubs (refer to general guidelines for trees, above)

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

Herbs

- Plant ground cover and floral plantings to provide adequate coverage to compete with weeds.
- In landscaped beds, plant to provide effective display.
- Do not crowd.
- Remove containers prior to placement in the planting pit.
- Tease pot-bound roots with hands or tools prior to final placement in planting pit.
- Protected bare root plants from root drying prior to and immediately after planting.
- Cleanly prune exceptionally long roots to create a uniform root mass.

Live Stakes

Live stakes are cuttings harvested from live native plants. Stakes are cut from the parent plant, and then installed directly into the soil where they establish roots and grow to maturity. The best species to use for live stakes are willow species, black cottonwood, and red osier dogwood. Stakes should be planted in areas that will be consistently moist through out the growing season, such as along the waterline at the lakeshore and in wetland areas. Although live staking can be done throughout the year, to maximize survival the best time for taking cuttings and installing them is during the dormant season, between early November and late February.

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

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

Adapted from DPR's Landscape, Horticulture and Urban Forestry BMPs (1999) and King County Water and Land Resources Bulletin titled "Live Stake Cutting and Planting Tips"

Table 6.1. Recommended Species List for Planting Forest Areas - Xeric/Shady Palette

	Species	Common Name
OVERSTORY		
Early seral	Abies grandis	grand fir
	Acer macrophyllum	bigleaf maple
	Alnus rubra	red alder
	Pseudotsuga menziesii	Douglas fir
	Rhamnus purshiana	cascara
Later seral	Cornus nuttallii	Pacific dogwood
	Taxus brevifolia	western yew
	Tsuga heterophylla	western hemlock
UNDERSTORY		
Early seral	Acer circinatum	vine maple
	Corylus cornuta	beaked hazelnut
	Holodiscus discolor	oceanspray
	Lonicera ciliosa	orange honeysuckle
	Mahonia aquifolium	tall Oregon grape
	Mahonia nervosa	low Oregon grape
	Philadelphus lewisii	mock orange
	Polystichum munitum	sword fern
	Ribes sanguineum	red flowering currant
	Rosa gymnocarpa	baldhip rose
	Rubus parviflorus	thimbleberry
	Symphoricarpos albus	snowberry
Later seral	Gaultheria shallon	salal
	Oemleria cerasiformis	Indian plum
	Rhododendron macrophyllum	Pacific rhododendron
	Vaccinium ovatum	evergreen huckleberry
	Vaccinium parvifolium	red huckleberry
GROUND COVER	Achlys triphylla	vanilla leaf
	Aruncus dioicus	goat's beard
	Dicentra formosa	bleeding heart
	Linnaea borealis	twinflower
	Pteridium aquilinum	bracken fern
	Trillium ovatum	western trillium

Table 6.2. Recommended Species List for Planting Forest Areas - Mesic/Shady Palette

	Species	Common Name
OVERSTORY		
Early seral	Abies grandis	grand fir
	Cornus nuttallii	Pacific dogwood
	Fraxinus latifolia	Oregon ash
	Prunus emarginata	bitter cherry
	Rhamnus purshiana	cascara
	Thuja plicata	western red cedar
Later seral	Tsuga heterophylla	western hemlock
	Taxus brevifolia	western yew
UNDERSTORY		
Early seral	Acer circinatum	vine maple
	Cornus sericea	red-osier dogwood
	Gaultheria shallon	salal
	Lonicera ciliosa	orange honeysuckle
	Lonicera involucrata	black twinberry
	Mahonia nervosa	low Oregon grape
	Polystichum munitum	sword fern
	Rosa nutkana	Nootka rose
	Rubus parviflorus	thimbleberry
	Rubus spectabilis	salmonberry
	Sambucus racemosa	red elderberry
Later seral	Vaccinium ovatum	evergreen huckleberry
	Vaccinium parvifolium	red huckleberry
GROUND COVER		
	Aruncus dioicus	goat's beard
	Asarum caudatum	wild ginger
	Athyrium filix-femina	lady fern
	Blechnum spicant	deer fern
	Claytonia perfoliata	miner's lettuce
	Clintonia uniflora	queen's cup
	Cornus unalaschkensis	bunchberry
	Corydalis scouleri	Scouler's corydalis
	Dicentra formosa	Pacific bleeding heart
	Hydrophyllum tenuipes	Pacific waterleaf
	Linnaea borealis	twinflower
	Maianthemum dilatatum	false lily-of-the-valley
	Smilacina racemosa	false Solomon's seal
	Streptopus amplexifolius	clasping twisted stalk
	Tellima grandiflora	fringecup
	Tiarella trifoliata	foam flower
	Tolmiea menziesii	youth-on-age
	Trillium ovatum	western trillium
	Viola sempervirens	trailing yellow violet

Table 6.3. Recommended Species List for Planting Open Areas - Xeric/Sunny Palette

	Species	Common Name
OVERSTORY		
Early seral	Abies grandis	grand fir
	Arbutus menziesii	Pacific madrone
	Pinus contorta var. contorta	shore pine
	Pseudotsuga menziesii	Douglas fir
	Quercus garryana	Garry oak
Later seral	Cornus nuttallii	Pacific dogwood
UNDERSTORY		
Early seral	Acer douglasii	Douglas maple
	Amelanchier alnifolia	western serviceberry
	Arctostaphylos columbiana	hairy manzanita
	Ceanothus velutinus	snowbrush
	Corylus cornuta	beaked hazelnut
	Holodiscus discolor	oeanspray
	Lonicera ciliosa	orange honeysuckle
	Philadelphus lewisii	mock orange
	Prunus virginiana	chokecherry
	Rosa gymnocarpa	baldhip rose
	Sambucus cerulea	blue elderberry
	Symphoricarpos albus	common snowberry
Later seral	Gaultheria shallon	salal
	Oemleria cerasiformis	Indian plum
	Polystichum munitum	sword fern
	Ribes sanguineum	red flowering currant
	Vaccinium ovatum	evergreen huckleberry
GROUND COVER	Achillea millefolium	yarrow
	Anaphalis margaritacea	pearly everlasting
	Arctostaphylos uva-ursi	kinnikinnick
	Epilobium angustifolium	fireweed
	Linnaea borealis	twinflower
	Pteridium aquilinum	bracken fern

Identify Canopy Openings

Initially this will be an easy task. Openings in the crown can be found simply by walking the trails and forest of the Park and looking for gaps in the overhead canopy that have the following characteristics.

The opening is wider then the width of the closest overstory trees canopy.
Measure this by estimating one edge of closest tree's canopy, then walk to the opposite edge of the canopy of the closest tree.
Measure from inside edge of canopy to opposite edge of canopy inside the opening at the widest portion along an east-west line.

The distance from the center of the gap to any canopy tree trunk is at a minimum 40 feet.
Measure from the center of the gap to the trunk of the closest tree.
Measure the distance from the trunk of the tree to the edge of the canopy of the tree.

The opening is not facing North on a North slope. The closer the gap faces the South the better. Use a compass to determine which way is south. Stand in the center of the opening, look directly south, and answer the following questions:

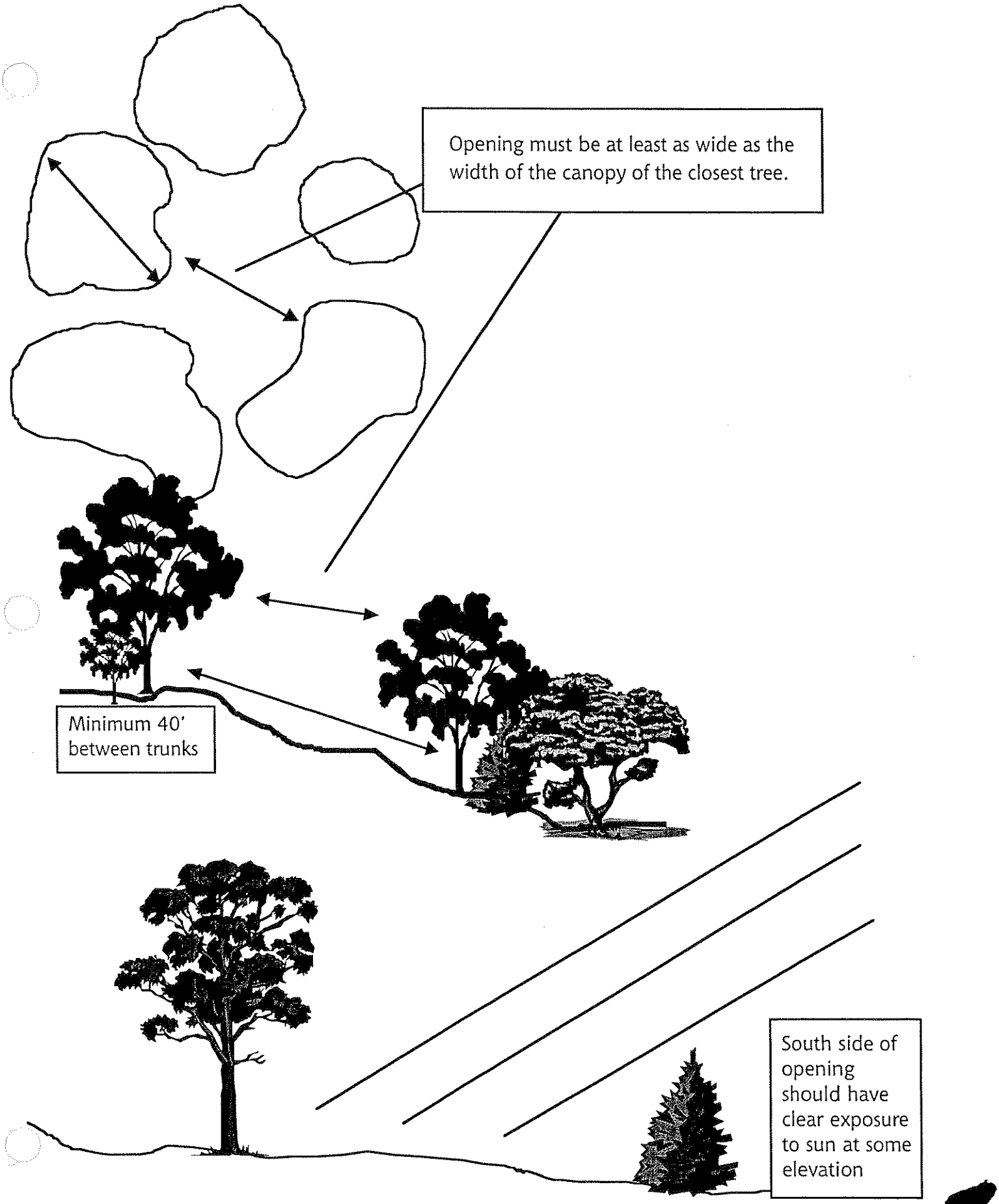
When you look at the top of tallest tree on the south edge of the opening, is your head or eye:
1. Level with the ground
2. Looking down
3. Hurting the back of your neck

What type of vegetation is in the opening?
1. Invasive
2. Low ground cover
3. Saplings of tree species.

What is the species of the surrounding trees?
Alder, Maple, Douglas Fir, Cedar, Maple, Maple , Maple

To the best you can, estimate the location of the opening on the aerial photo.

Number the Map with your crew name and approximate location off the grid coordinates on the map.


Opening must be at least as wide as the width of the canopy of the closest tree.
Minimum 40' between trunks
South side of opening should have clear exposure to sun at some elevation

PLANTINGS

Dry/Partial Shade

Species	Common Name	Spacing Between Plants (Ft.)
OVERSTORY		
Abies grandis	grand fir	20
Cornus nuttallii	Pacific dogwood	12
Prunus emarginata var. mollis	bitter cherry	15
Pseudotsuga menziesii var. menziesii	Douglas-fir	20
Rhamnus purshiana	cascara	12
Thuja plicata	western redcedar	15
UNDERSTORY		
Acer circinatum	vine maple	12
Berberis aquifolium - Mahonia aquifolium	tall Oregon-grape	4
Berberis nervosa - Mahonia nervosa	low Oregon-grape	2
Corylus cornuta var. californica	beaked hazelnut	2
Gaultheria shallon	salal	2
Holodiscus discolor	oceanspray	5
Oemleria cerasiformis	Indian-plum	5
Philadelphus lewisii var. gordonianus	mock-orange	5
Rhododendron macrophyllum	Pacific rhododendron	3
Ribes sanguineum var. sanguineum	red flowering currant	5
Rosa gymnocarpa var. gymnocarpa	baldhip rose	5
Vaccinium ovatum	evergreen huckleberry	3
Vaccinium parvifolium	red huckleberry	3
GROUND COVER		
Achlys triphylla ssp. triphylla	deerfoot vanilla-leaf	1.5
Gaultheria shallon	salal	2
Linnaea borealis ssp. longiflora	twinflower	1.5
Polystichum munitum	sword fern	5
Symphoricarpos albus var. laevigatus	common snowberry	10
Trillium ovatum ssp. ovatum	western trillium	1

Dry/Sun

OVERSTORY		
Abies grandis	grand fir	20
Arbutus menziesii	Pacific madrone	25
Cornus nuttallii	Pacific dogwood	12
Pinus contorta var. contorta	shore pine	15
Prunus emarginata var. mollis	bitter cherry	15
Pseudotsuga menziesii var. menziesii	Douglas-fir	20
UNDERSTORY		
Acer circinatum	vine maple	12
Amelanchier alnifolia	western serviceberry	10
Arctostaphylos columbiana ssp. columbiana	hairy manzanita	4
Ceanothus velutinus var. hookeri	snowbrush	1
Corylus cornuta var. californica	beaked hazelnut	2
Holodiscus discolor	oceanspray	5
Lonicera ciliosa	orange honeysuckle	1
Oemleria cerasiformis	Indian-plum	5
Philadelphus lewisii var. gordonianus	mock-orange	5
Ribes sanguineum var. sanguineum	red flowering currant	5
Rosa gymnocarpa var. gymnocarpa	baldhip rose	5
Sambucus cerulea var. cerulea	blue elderberry	10
Symphoricarpos albus var. laevigatus	common snowberry	10
Vaccinium ovatum	evergreen huckleberry	3
Vaccinium parvifolium	red huckleberry	3
GROUND COVER		
Arctostaphylos uva-ursi ssp. uva-ursi	kinnikinnick	1.5
Gaultheria shallon	salal	2
Linnaea borealis ssp. longiflora	twinflower	1.5
Polystichum munitum	sword fern	5

Wet/Shade

Species	Common Name	Spacing Between Plants (Ft.)
OVERSTORY		
Thuja plicata	western redcedar	15
Tsuga heterophylla	western hemlock	15
UNDERSTORY		
Acer circinatum	vine maple	12
Berberis aquifolium - Mahonia aquifolium	tall Oregon-grape	4
Berberis nervosa - Mahonia nervosa	low Oregon-grape	2
Cornus sericea ssp. occidentalis	red-osier dogwood	1
Lonicera involucrata var. involucrata	black twinberry	1
Polystichum munitum	sword fern	5
Rubus parviflorus var. parviflorus	thimbleberry	3
Rubus spectabilis var. spectabilis	salmonberry	3
Sambucus racemosa ssp. Pubens var. arborescens (formerly called S. racemosa var. arborescens)	red elderberry	10
Vaccinium ovatum	evergreen huckleberry	3
Vaccinium parvifolium	red huckleberry	3
GROUND COVER		
Asarum caudatum	wild-ginger	1.5
Athyrium filix-femina var. cyclosorum	lady fern	1.5
Blechnum spicant	deer fern	2
Cornus unalaschkensis (formerly called C. canadensis var. intermedia, but see note under Propagation)	bunchberry	1.5
Dicentra formosa ssp. formosa	Pacific bleeding-heart	2
Gaultheria shallon	salal	2
Linnaea borealis ssp. longiflora	twinflower	1.5
Maianthemum racemosa ssp. Amplexicaulis (formerly called Smilacina racemosa var. amplexicaulis)	false Solomon's seal	1
Polystichum munitum	sword fern	5
Trillium ovatum ssp. ovatum	western trillium	1

Wet/Sun

OVERSTORY		
Alnus rubra	red alder	15
Cornus nuttallii	Pacific dogwood	12
Crataegus suksdorfii (formerly called Crataegus douglasii var. suksdorfii)	black hawthorn	12
Fraxinus latifolia	Oregon ash	25
Malus fusca (formerly called Pyrus fusca)	Pacific crabapple	12
Populus balsamifera ssp. trichocarpa	black cottonwood	25
Prunus emarginata var. mollis	bitter cherry	15
Thuja plicata	western redcedar	15
UNDERSTORY		
Acer circinatum	vine maple	12
Lonicera involucrata var. involucrata	black twinberry	1
Physocarpus capitatus	Pacific ninebark	3
Rosa nutkana	Nootka rose	5
Rosa pisocarpa	clustered wild rose	5
Rubus parviflorus var. parviflorus	thimbleberry	3
Rubus spectabilis var. spectabilis	salmonberry	3
Salix lucida ssp. lasiandra	Pacific willow	10
Salix sitchensis	Sitka willow	10
Sambucus racemosa ssp. Pubens var. arborescens (formerly called S. racemosa var. arborescens)	red elderberry	10
Symphoricarpos albus var. laevigatus	common snowberry	10
GROUND COVER		
Athyrium filix-femina var. cyclosorum	lady fern	1.5
Dicentra formosa ssp. formosa	Pacific bleeding-heart	2
Maianthemum dilatatum	false lily-of-the-valley	1
Polystichum munitum	sword fern	5
Scirpus microcarpus	small-fruited bulrush	0.5
Viola species	violets	1

Wet Site Palette

This palette is designed to maintain or re-introduce a native vegetation character to areas considered to be wet sites. The goal is to eliminate invasive species from these wet areas. Emphasis is on providing over-story and a dense, aggressive native shrub layer to compete with invasive species and buffer runoff. All trees/plants listed perform very well on wet sites.

RECOMMENDED TREES FOR WET SITES

Botanical Name	Wet	Sm	Med	Lge	Decid	Conif	Br Ev	Common Name
Acer circinatum		X			X			Vine Maple
Acer rubrum			X		X			Red Maple
Alnus rubra	X			X	X			Red Alder
Betula papyrifera				X	X			Paper birch
Fraxinus latifolia	X			X	X			Oregon Ash
Nyssa sylvatica			X		X			Sour Gum
Populus tremuloides	X	X			X			Quaking Aspen
Salix lasiandra	X		X		X			Pacific Willow
Salix scouleriana	X	X			X			Scouler's Willow
Salix sitchensis	X	X			X			Sitka Willow
Salix hookeriana 'Clatsop		X			X			Hooker's Willow
Taxus brevifolia		X				X		Western Yew
Thuja plicata	X			X		X		Western Red Cedar

RECOMMENDED UNDERSTORY PLANTS FOR WET SITES

Botanical Name	Wet	Low	Med	Tall	Decid	Conif	Br Ev	Common Name
Athyrium filix-femina		X					X	Lady fern
Blechnum spicant		X					X	Deer fern
Carex obnupta	X	X					X	Slough Sedge
Cornus canadensis		X					X	Bunchberry
Cornus stolonifera				X		X		Red-osier dogwood
Ledum groenlandica	X	X					X	Labrador Tea
Lystichicum americanum	X	X				X		Skunk cabbage
Myrica gale			X			X		Sweet Gale
Oemlaria cerasiformis				X		X		Indian Plum
Oplopanax horridus	X		X			X		Devil's Club
Physocarpus capitatus				X		X		Ninebark
Ribes bracteosum		X				X		Stink currant
Rubus spectabilis	X		X			X		Salmonberry
Sambucus racemosa				X		X		Red Elderberry
Spirea douglasii	X		X			X		Hardhack
Tolmiea menziesii		X				X		Piggyback Plant
Viburnum edule			X			X		Highbush Cranberry

Sm	Mature height <30'	Low	<3' tall	Decid	Deciduous
Med	Mature height 30'-50'	Med	3'-6' tall	Conif	Conifer Evergreen
Lge	Mature height >50'	Tall	>6' tall	Br Ev	Broadleaf Evergreen
Wet	Wetland Restoration				

Native Planting Palette

The goal for this palette is to establish and maintain a diverse, multi-layered canopy, consisting of mature trees, regenerating saplings, tall shrubs, low shrubs and herbaceous material. Where no overstory currently exists, the focus of restoration should be primarily on establishing new canopy.

RECOMMENDED TREES FOR NATIVE PLANTINGS

Botanical Name	Hab	Sm	Med	Lge	Decid	Conif	Br Ev	Common Name
Acer circinatum		X			X			Vine Maple
Acer macrophyllum				X	X			Big-leaf Maple
Alnus rubra	X			X	X			Red Alder
Arbutus menziesii			X				X	Pacific Madrone
Betula papyrifera	X			X	X			Paper Birch
Chamaecyparis nootkatensis	X			X		X		Yellow Cedar
Malus fusca		X			X			Pacific Crab-apple
Myrica californica		X					X	Pacific Wax Myrtle
Pseudotsuga menziesii	X			X		X		Douglas Fir
Quercus garryana	X			X		X		Garry Oak
Rhamnus purshiana		X			X			Cascara
Taxus brevifolia		X				X		Western Yew
Thuja plicata	X			X		X		Western Red Cedar
Tsuga heterophylla	X			X		X		Western hemlock

RECOMMENDED UNDERSTORY PLANTS FOR NATIVE PLANTINGS

Botanical Name	Low	Med	Tall	Decid	Conif	Br Ev	Common Name
Amelanchier alnifolia			X	X			Serviceberry
Arctostaphyllos columbiana		X			X	Hairy Manzanita	
Arctostaphyllos uva-ursi						Kinnikinnik	
Asarum caudatum	X					X	Wild Ginger
Athyrium filix-femina	X					X	Lady Fern
Blechnum spicant	X					X	Deer Fern
Ceanothus velutinus			X			X	Buckbrush
Cornus canadensis	X					X	Bunchberry
Cornus stolonifera			X	X			Red-osier Dogwood
Corylus cornuta var. californica			X	X			Hazel
Gaultheria shallon		X				X	Salal
Holodiscus discolor			X	X			Oceanspray
Juniperus communis	X	X			X		Juniper
Lonicera involucrata		X	X	X			Black Twinberry
Mahonia aquifolium		X				X	Tall Oregon-grape
Mahonia nervosa	X					X	Dull Oregon-grape
Maianthemum dilitatum	X			X			False Lilly-of-the-Valley
Myrica gale		X				X	Sweet Gale
Oemlaria cerasiformis			X	X			Indian Plum
Oplopanax horridus		X		X			Devil's Club
Pachistima myrisnites		X				X	Oregon Box
Philadelphus lewisii			X	X			Mock Orange
Physocarpus capitatus			X	X			Ninebark

Polystichum munitum	X					X	Sword Fern
Rhododendron macrophyllum		X				X	Pacific Rhododedron
Ribes sanguineum		X		X			Red Currant
Rosa gymnocarpa		X		X			Bald-hip Rose
Rosa nutkana		X		X			Nootka Rose
Rubus leucodermis	X			X			Blackcap
Rubus parviflorus		X		X			Thimbleberry
Rubus spectabilis		X		X			Salmonberry
Sambucus racemosa			X	X			Red Elderberry
Smilacena racemosa	X			X			False Solomon Seal
Spirea douglasii		X		X			Hardhack
Stachys cooleyi	X			X			Hedge nettle
Symphoricarpos albus	X			X			Snowberry
Tolmiea menziesii	X			X			Piggyback Plant
Vaccinium ovatum		X				X	Evergreen Huckleberry
Vaccinium parvifolium		X		X			Red Huckleberry
Viburnum edule		X			X		Highbush Cranberry

Sm	Mature height <30'	Low	<3' tall	Decid	Deciduous
Med	Mature height 30'-50'	Med	3'-6' tall	Conif	Conifer Evergreen
Lge	Mature height >50'	Tall	>6' tall	Br Ev	Broadleaf Evergreen
Hab	Wildlife Habitat canopy				

Soil Erosion Palette

These plants were chosen for their ability to protect soil on steep slopes and limit the effects of soil erosion. The primary goal would be to establish a diversity of tall and low shrub vegetation that would provide a dense and competitive root system. Where possible, overstory establishment should be pursued as well.

RECOMMENDED TREES FOR SOIL EROSION CONTROL

Botanical Name	Shl	Med	Deep	Decid	Conif	Br Ev	Common Name
Acer macrophyllum			X	X			Big-leaf Maple
Arbutus menziesii			X			X	Pacific Madrone
Pseudotsuga menziesii			X		X		Douglas Fir
Salix spp.	X	X		X			Willow
Taxus brevifolia		X			X		Western Yew
Thuja plicata		X			X		Western Red Cedar
Tsuga heterophylla	X	X			X		Western hemlock

RECOMMENDED UNDERSTORY PLANTS FOR SOIL EROSION CONTROL

Botanical Name		Shl	Med	Deep	Decid	Conif	Br Ev	Common Name
Acer circinatum		X		X				Vine Maple
Amelanchier alnifolia			X		X			Serviceberry
Arctostaphyllos columbiana		X				X		Hairy Manzanita
Arctostaphyllos uva-ursi	X							Kinnikinnik
Ceanothus velutinus			X				X	Buckbrush
Cornus stolonifera		X	X		X			Red-osier Dogwood
Corylus cornuta var. californica	X	X		X			Hazel	
Gaultheria shallon		X					X	Salal
Holodiscus discolor			X		X			Oceanspray
Juniperus communis		X	X			X		Juniper
Lonicera involucrata		X			X			Black Twinberry
Mahonia aquifolium		X	X				X	Tall Oregon-grape
Mahonia nervosa		X					X	Dull Oregon-grape
Oemlaria cerasiformis		X			X			Indian Plum
Pachistima myrisnites		X					X	Oregon Box
Polystichum munitum		X					X	Sword Fern
Ribes sanguineum		X			X			Red Currant
Rosa gymnocarpa		X	X		X			Bald-hip Rose
Rosa nutkana		X	X		X			Nootka Rose
Rubus parviflorus		X			X			Thimbleberry
Rubus spectabilis		X	X		X			Salmonberry
Sambucus racemosa			X		X			Red Elderberry
Spirea douglasii		X			X			Hardhack
Symphoricarpos albus		X			X			Snowberry
Vaccinium ovatum		X					X	Evergreen Huckleberry

Shl	Shallow rooting system	Decid	Deciduous
Med	Medium depth rooting system	Conif	Conifer Evergreen
Deep	Deep rooting system	Br Ev	Broadleaf Evergreen

D. Perimeter Issues and Impacts

Past years developments have extended into the ravine.

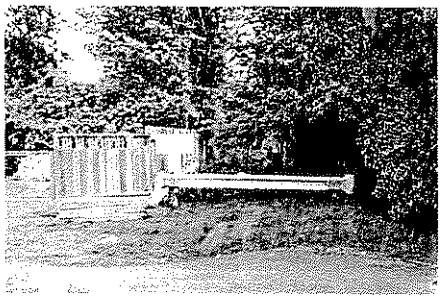
It became very clear that in addition to the need for an ecological restoration to protect the long-term habitat value of the Kiwanis Ravine, the "urban perimeter" of the Ravine created a variety of deleterious impacts. A separate committee was initiated at the Public Meeting of April 23rd, 2002 to attempt to delineate these issues and impacts. A full analysis of the "perimeter" is beyond the scope of this project, but we felt it extremely important to identify the issues and suggest potential response alternatives to be considered by the City of Seattle and the Kiwanis Ravine Community.

These Issues and Impacts include:

Development – Zoning around the perimeter of the Kiwanis Ravine includes single family housing, various multi-family types, and neighborhood commercial zoning. The latter two including NC1 30 allow "by right" extensive lot coverage and minimal or no setbacks. These zoning types contiguous with park and "habitat" sensitive properties are considered to degrade the long-term potential for the ecological health of the Ravine.

Response:

- These issues are not under the purview of Seattle Parks; however Parks encourages "Good Neighbor Practices on page 79.



Education and natural barriers might inhibit dumping.

Dumping – The Ravine has served historically as an illegal dump site. Refrigerators, tires, and seasonal vegetation were thrown over the side at various access points and from back yards. The negative impact of the consumer materials include danger to restoration workers, environmental contamination from a variety of materials when they decompose, and visual blight. The grass clippings and other yard wastes when accumulated present the danger of impeding natural slope vegetation from evolving, which could exacerbate water runoff and retention – contributing to slope instability.

Response:

- Develop an educational campaign in a partnership of Seattle Parks and HHH, to inform perimeter residents and neighbors about the dangers and issues of dumping. Brochures, workshops or door to door outreach might be ways to share this information and attempt to change the cultural acceptance of ravine dumping.

- Develop natural barriers to key dump access sites, like unimproved street-ends. Keeping "dumpers" from having easy access to the edge could work with ideas of street end enhancements and habitat improvements.

Encroachments – In some locations around the perimeter of the Kiwanis Ravine the street right-of-way has an edge against the park, or a street end cross-ravine right-of-way dead ends into the Ravine. Beyond the permitted use of parking, additional public lands have been used for materials storage, and private improvements. The public interest should place the natural habitat edge "integrity" as a primary goal, with public uses, including conservation, having a higher legal status than private leaseholds. This may require additional penalties to the Parks Department 2001 encroachments policy.

Response:

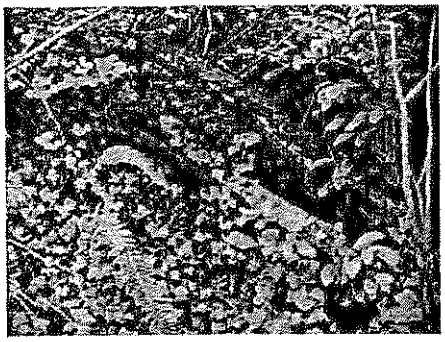
- The Seattle Department of Parks and Recreation has developed policy concerning encroachment upon Park lands that should be applied to these properties. The partnership between the Heron Habitat Helpers and Seattle Parks should work effectively to redefine the park's edge as a public habitat resource.
- An educational campaign to develop "good neighbor" practices at the habitat's edge could be developed. HHH and Seattle Parks are natural partners in this effort.

This location on West Government Way is a prime site for the public to learn about Kiwanis Ravine.

Observation Sites and Interpretive Signage – The heron colony is an incredible natural event and potential environmental education highlight. The issue is how to provide visual access to the colony while not disturbing the colony in any way. The consensus seems to be that the North edge of the Great Northern Railroad Pedestrian Bridge (Northeast of the primary colony) is the right spot to locate an observation area. The issues here would be the location and design of an observation deck on public property, or some easement or conditioned use from the railroad, with the participation of local property owners. There also is the goal of developing interpretive signage describing the ecological dynamics of the Kiwanis Ravine and its Heron Colony. (please see Figure 10 for the primary observation site, other priority sites for interpretation and observation, and some provisional sites)

Response:

- The HHH could seek a Department of Neighborhoods matching grant, or public/private grants to delineate the property ownerships, desired sight-lines and a schematic design of an observation area in the desired location. The impact of increased public use upon the nearby neighbors should be considered and factored into the design alternatives.
- In addition to the permanent interpretive signage, the idea of active educational programming is a favored idea. Suggestions were made that HHH tours or Discovery Park docent programs could be held at the observation site (e.g. weekly Saturday morning guided observation during the fledging period). Another idea was to include durable telescopic viewers at the observation site for public viewing.
- Other locations where the colony is visible should be reviewed over time, as the primary colony may migrate to another location. Similarly, distance and protection of the colony and other native habitat and species should always be at the forefront of any additions to this plan.



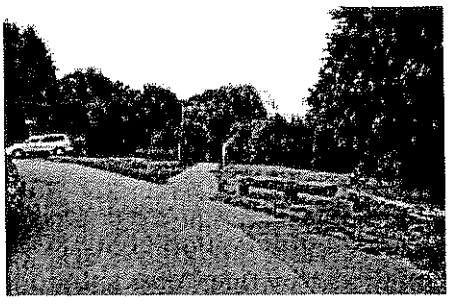
This image shows a water conduit from private property into the ravine.

Water and Steep Slopes: The perimeter of the Kiwanis Ravine has a variety of slope and soil conditions which have historically proven fragile and subject to glacial sluffing. With the construction of West Government Way as a land bridge interrupting the headwaters flow of Wolfe Creek there was a disruption of the natural surface water runoff and springs of the aquatic headwater. Similarly, the historic out-fall of Wolfe Creek into Salmon Bay was captured and piped to the West Commodore Way combined sewer overflow (CSO) system and routed to the West Point Metro Waste Water Facility. The proponents of the Kiwanis Ravine restoration suggest that serious consideration be given to re-engineering the aquatic habitat/riverine functions of Wolfe Creek.

Response:

- Seattle Public Utilities has commissioned a civil engineering feasibility analysis of the potential for "daylighting" Wolfe Creek from its present lowland ponding/culvert north of the Burlington Northern Santa Fe Railroad to Salmon Bay. Together with a sewer line improvement south of W. Government Way SPU has the ability to incrementally mitigate previous decisions that have impacted the natural dynamics of Wolfe Creek.
- Any restoration work on slopes, or near surface and seeping water must employ the highest caution. No work on any slope of 40% or more should be undertaken by volunteers. It is the responsibility of the lead agency and work sponsors to guarantee that this standard is maintained. The credibility of the project is dependant on its not causing harm to the existing slopes and its private landowners. Field work by the HHH should require its restoration leader to "flag off" any restoration site deemed too steep for volunteer workers. (Please see Habitat Sections; Figures 5, 6)
- Phase II of this project is intended to address improvements to the aquatic habitat of Wolfe Creek. It is key that the partnerships begun in Phase I between the Heron Habitat Helpers, Parks, and Public Utilities be a success to forge a working relationship for any future project expansions.

Access to Ravine: Numerous street-ends and parallel right-of–ways enable the public to arrive at the edge of the Kiwanis Ravine. These have the potential to be safe public places with enhanced habitat value. Most participants in our public meetings have not favored any trail access to the Ravine. However a few have thought that there could be some trail possibilities on the east bank of the Ravine from street-end to street-end , and to the natural point of land that looks west from the RR Pedestrian Bridge on the Gilman Street right-of way. This is the access point for previous "homeless encampments". There will need to be access to the Ravine for restoration workers.



The 32nd Street W trail demjonstrates a controlled access corridor.

Response:

The existing pedestrian bridge serves as the primary heron observation area.

- Any consideration of public trail access must first determine its relationship to the heron colony, and the comfort of adjacent property owners. The "small and simple" grant program of the Department of Neighborhoods would be a resource that could provide schematic design ideas to test the viability of particular trail access points and routes. The existing "social trail" from 34th Ave. W. to W. Commodore Way is a treasured community amenity and should be retained and possibly expanded south to its natural terminus (See Figure 10). The potential for "daylighting" Wolfe Creek along the newly integrated "Gilman right-of-way has excited citizens. This idea is illustrated in Figure 10 and in the Shrubland Habitat Section (Figure 4). Whether it is feasible is the subject of an SPU initiated study, and Phase II of this project.
- There are other means to allow the public "access" to the ravine. Specific edge locations like the bare north bank of West Government Way between 34th and 35th Ave. W. could be the site for interpretive signage. Such a dramatic public amenity could describe the Kiwanis Ravine and its great blue heron colony and the restoration work within –while not impacting the habitat. Public education and engagement is the long term vehicle for support for the Ravine Project.
- Restoration workers through their repeated entry into the Ravine will create de-facto trails. The lead agency and the sponsors need to anticipate other users of these trails and have a strategy to minimize, or restrict their usage. The conventional wisdom on homeless encampments is that public use and visibility decreases their use. Together with an active Parks management program, and the support of public and private social support organizations this larger social problem can be mitigated. Neighbors should inform the Discovery Parks Manager of any encampments.

This back yard blends into the forest and places native plants in the private landscape.

<u>Private Property and Landscape Transitions</u>: Existing private land parcels in many places go over the top of the slope and extend into the perceived public Ravine. Most property owners have chosen to live on the Ravine's edge because of their affinity for its natural character. There have been the historical practices of edge dumping and encroachment which were discussed earlier that can be engaged with public education, and neighborly encouragement. Aesthetic landscape tastes vary wildly, with some creating a hardened, or simplified edge, and others attempting to mimic the native forests habitat qualities. Another issue is the cutting of public habitat trees to enhance private viewsheds or access.

This native planting in the parkway extends the habitat character into the neighborhood.

Response:

- The Public Education Program of Discovery Park together with the Heron Habitat Helpers and the Parks Department would be the natural leaders in an educational effort to explain and model the value of the more natural transition to the health of the habitat. Over time a community standard could emerge and those who do not wish to participate may select to sell to others who would pay a premium for the opportunity.
- Specific informational brochures, public displays and workshops, "backyard tours," and block party slide programs of successful landscape designs would be a few ways to model and inform the perimeter property owners about preferred backyard practices in a sensitive habitat location.
- Destroying public native forest habitat is a very serious offense and should be treated as such. Public notice of the issue should be made through the local news mediums, and neighborhood flyers as a cautionary method of informing potential violators and enlisting observant neighbors.
- Recent violations of private landholder cutting trees on public property to enhance their viewsheds has highlighted an important issue. Within the Kiwanis Ravine Management Area (See Figure 9 –Unauthorized Tree Topping) we also have this practice. HHH and the Parks Department should apply all legal and educational remedies possible to stop this practice.

E. Wolfe Creek Stream Characterization

Background

Kiwanis Memorial Preserve Park unofficially known as Kiwanis Ravine is approximately 10-acres in size located east of Discovery Park and south of the Ship Canal. This ravine is home to one of the largest colonies of great blue herons in the Seattle area. As development continues to encroach into the outer limits of this preserve, impacts are beginning to be observed within the ravine.

According to City records, the Kiwanis Ravine watershed is approximately 30-acres in size. Wolfe Creek which flows through the ravine, is primarily groundwater fed but does receive some surface water runoff. At the north end of the park, the creek enters a culvert that conveys the flows under the railroad right-of-way, past several residential homes prior to connecting to the 12-foot diameter sanitary sewer trunk line located under West Commodore Way. This clean surface water is then combined with sanitary sewer flow and conveyed to the West Point Sewage Treatment Plant.

Wolfe Creek's seasonal pond enters the Metro surface water culvert at the railroad tracks.

The Kiwanis Ravine Heron Habitat Helpers (HHH) retained a team of consultants led by, A Northwest Collaborative (ANC) to prepare a management plan for the protection of this ravine and associated habitat. Penhallegon Associates Consulting Engineers, Inc (PACE), was retained by ANC to provide a characterization of the stream channel and riparian corridor through Kiwanis Ravine. The scope of work for PACE included the following items:

- Review existing information provided by HHH
- Conduct a field reconnaissance of the ravine
- Review the draft report of Wolfe Creek prepared by SvR Design
- Prepare a summary report of the Findings

Findings

On January 14, 2003, Ken Nilsen of PACE staff walked Kiwanis Ravine with Davidya Kasperrzyk of ANC and Donna Kostka of HHH. The weather on this day was overcast with no measurable rain within the previous 5 days. The following is a summary of our observations based upon that field reconnaissance.

Looking south, Wolfe Creek is a meandering channel with large amounts of sedimentation.

Stream Characterization

Wolfe Creek can be broken into 4-distinct reaches.

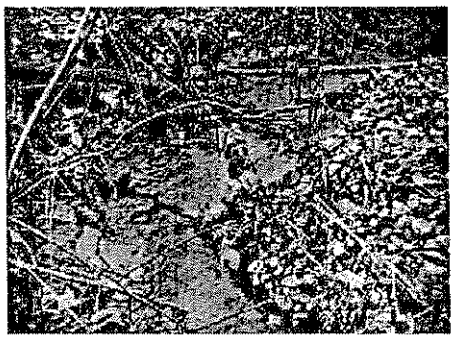
Reach 1

This reach of Wolfe Creek within Kiwanis Ravine extends from the culvert under the railroad-right-of-way upstream approximately 420 feet. This stream in this reach is a low gradient, meandering channel. It was estimated that the stream flow on this day was approximately 0.5 cfs. Due to the low gradient channel and restricted inlet capacity at the culvert, during

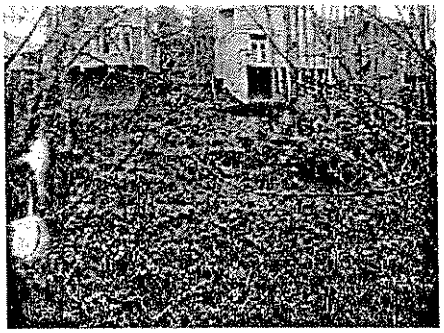
higher flows this area becomes a backwater depositional zone. This is substantiated by the large amounts of sediments within the channel and floodplain. As human impact encroaches further into the riparian corridor additional erosion is likely. This erosion will further increase the deposition. This lower reach is also lacking woody debris not only within the channel but also within the floodplain.

Reach 2

This reach of Wolfe Creek is located in the middle portion of Kiwanis Ravine and includes the east fork. This section of the ravine is relatively undisturbed and has good in-stream and riparian habitat but it is beginning to see some impacts associated with development. There is a significant increase in the amount of woody debris in this reach from reach 1and with the higher stream gradient, some nice pool/riffle complexes have been formed. During our reconnaissance it appeared that 2/3 of the flow was coming from the main stem and 1/3 of the flow from the east fork. This section also contains the majority of the heron nests.



In Reach 2 Wolfe Creek is relatively undisturbed and is good riparian habitat.

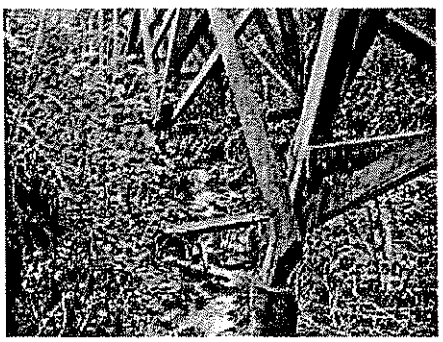


Adjacent development has caused significant impacts on the riparian habitat.

Reach 3

This reach of Wolfe Creek is located in the upper section of Kiwanis Ravine extending north approximately 780 feet. This section of the ravine is experiencing significant impacts to the riparian habitat and to a much less degree the in-stream habitat, as a result of the adjacent developments. The adjacent developments have resulted in extremely steep slopes often devoid of significant vegetation other than ivy. This has led to isolated cases of slope failures that further steepen the stream bank slopes, which leads to erosion and downstream deposition. There is also a significant amount of yard waste dumping occurring in the area and to a lesser degree some dumping of garbage. Flow in this reach was estimated at 0.2cfs on the day of our reconnaissance.

This portion of the stream course lacks the complexity and native riparian flora found in Reach 2.



Past utility installations have caused significant riparian and in-stream impacts.

Reach 4

This reach of Wolfe Creek is located south West Government Way and is an inset parcel of 540 feet within the residential streets of W 36th and W. 34th. This section of stream has experienced significant riparian and in-stream impacts as a result of past utility installations, adjacent developments and easy human access into the ravine. This area also has significant dumping of garbage and yard waste. Of all the reaches of Wolfe Creek, this reach has suffered the most degradation.

Slope Stability

The stability of the slopes within Kiwanis ravine are directly related to the proximity of the development to the steep slopes. In the lower and middle reaches where there is a large buffer, the slopes appear to be very stable with one exception. Approximately 330 feet upstream of the railroad culvert on the west bank, there are some recent signs of bank erosion that appear to have been a result of clearing activities at the top of the stream bank. If this area is stabilized through restoration activities, this erosion should subside but the area should be monitored through the winter. In the areas where development has encroached into the steep slopes and buffer areas there is a much higher risk of slope instability. This risk is exasperated by the installation of yard and roof drains by residents along the top of the ravine. During our reconnaissance of the ravine we encountered 7 major seeps along the main stem (we did not walk the east fork). These seeps do not appear to be causing any instability within the ravine.

Review of SvR Wolfe Creek Diversion Feasibility Analysis

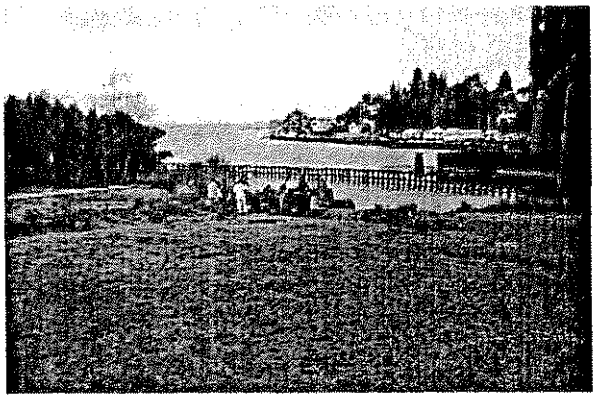
PACE has reviewed the SvR report and has the following comments:

1. We strongly support the idea of removing "clean water" from the sewage treatment plan and redirecting the surface water back to the ship canal to improve the estuary conditions.
2. We agree that routing the creek along the railroad right-of-way is not feasible due to the extremely deep cuts.
3. The proposed stream daylighting options A and B may create logistical problems for the Corps of Engineers in terms of loss vehicular access along the seawall. This should be explored in greater detail with the Corps of Engineers.
4. The cost/benefit ratio for constructing such a small section of new open channel as shown in options A and B is marginal, especially with the existing seawall in place. In terms of comment 3), piping the flow to the ship canal if this location is selected may make more sense.
5. A possible additional route that should be explored, extends the new pipeline down West Commodore Way to the west edge of the existing parking lot. From there the stream could be daylighted down the existing grass area to the waters edge. This could be done without having to deal with Corps of Engineers access issues or removal of the seawall. This option would add approximately 100 feet of pipe that could be placed within the existing landscape strip. It would also create a much longer reach of open channel of approximately 540 feet, than that shown in SvR options A and B.

Recommendations

Based upon our work PACE offers the following recommendations:

1. Reach 1 - A potential enhancement project for this reach could be to winch or pull some of the adjacent snags or blown down trees into the floodplain in order to provide additional floodplain habitat. This woody debris would have to be of sufficient size so as not to be carried downstream and plug the culvert at the railroad-right-of-way
2. Reach 2 – Work with the City to ensure that no new development encroaches further into the riparian corridor.
3. Reach 3 – Work with the City and property owners to ensure that no additional clearing, dumping of waste or redirecting of surface water onto the slopes will occur. HHH could also look at removing the ivy and replanting with native vegetation that would stabilize the slopes.
4. Reach 4 - Work with the City and property owners to ensure that no additional clearing or dumping of waste occurs in this area. This reach also has the greatest potential for riparian buffer enhancement projects.
5. Conduct a thorough investigation of all drain pipes extending down the slope to ensure that they are not contributing to an erosion or instability problem
6. Evaluate the new day-lighting option of redirecting Wolfe Creek to the open area west of the existing Commodore Park parking lot and down to the ship canal without crossing or breaching the seawall.



Daylighting Wolfe Creek should attempt to direct the stream course west to the natural shoreline.

F. Report Highlights

The purpose of the Kiwanis Ravine Management and Monitoring Plan/Report is to develop a set of conservation practices that will encourage the continuous long-term survival of the Great Blue Heron nesting colony in the ravine – and to set a course for the long-term sustainability of the ravine ecosystem as a home for other wildlife. The following conclusions and recommendations summarize our analysis.

Overall Conclusions and Recommendations

1. A large portion of Kiwanis Ravine has had little management attention for nearly half a century. However, recent events have begun to turn this around. Seattle Parks has designated a manager for Kiwanis Ravine and begun support activities through staff from Discovery Park, planning, etc. HHH has sought grants resulting in the preparation of this Plan/Report and initiation of restoration work through volunteer work parties.

A forested wetland site within Kiwanis Ravine.

Recommendation: Kiwanis Ravine should be the subject of an increasing number of ecological restoration efforts through Parks, HHH, and other volunteer organizations.

2. Kiwanis Ravine lacks sufficient financial and management resources. It is not yet a line item in Seattle Parks' budget, and the current City financial crunch means that Parks cannot delegate a large financial or management commitment at this time. However, recent allocation of a staff presence for key meetings, planning, and activities – and assistance in supplying water, picking up trash, etc. shows an intent to support Kiwanis. Also, HHH has raised money through grants, consulted the Washington Department of Fish and Wildlife, and watched over the preparation of this Plan/Report.

Recommendation: Kiwanis Ravine should receive a more solid financial basis and management attention from Parks as budget and priorities allow – and be the object of more grants and fund raising by HHH and other volunteer organizations.

3. Kiwanis Ravine is governed by the same rules and regulations as other City parks. Its steep slopes, landslide prone areas, soft riparian soils, and wildlife factors are included in the City's Environmental Critical Areas. As such, it is a prime candidate for designation as the kind of park that is not a walk-through area. However, the City of Seattle currently does not have a category of parks called a "preserve."

Recommendation: Seattle Parks should work toward designation of Kiwanis Ravine as a "preserve" with rules and regulations indicating which of its lands are accessible to the public and

which are reserved only for management activities. A later discussion in this section provides recommendations on access to the public lands of Kiwanis Ravine.

4. Some ravine lands still are in private ownership and not yet receiving active management. However, Parks has identified top-priority lands in the ravine for acquisition from willing sellers or for discussion of compensated conservation easements. Recent passage of the Pro-Parks levy is providing a large fund for greenspace acquisition in Seattle, and Kiwanis Ravine currently is listed in the top group to receive acquisition funds.

Recommendations: Parks should step up efforts to acquire priority lands or conservation easements for Kiwanis Ravine, working with willing sellers to achieve amicable agreements. Top priority lands identified for acquisition or conservation easements are identified in Figure 8.

5. Kiwanis Ravine is located in an urban setting, near a railroad track. It is subject to conditions far different from a "preserve" in a rural area. Therefore, these public lands are subject to varying degrees of impact from neighboring private lands, including noise, chemicals, water runoff, varying setbacks, bright lights, habitat destruction, etc.

Recommendations: Parks should take an active role in educating the public, other City departments, the railroad, and/or interest organizations about potential impacts — and encourage neighboring actions that protect Kiwanis' public lands and resources. HHH and other volunteer organizations should assist in this effort. Later in this section, there is a discussion of "good neighbor" actions that could help to protect Kiwanis' public lands and resources.

Kiwanis Ravine should be managed as one habitat management preserve.

6. The 10 acres of land in Kiwanis Ravine is not consolidated into one contiguous management area. It is crossed and bordered by public right-of-ways that are under the jurisdiction of Seattle Public Utilities, City Light, and Seattle Department of Transportation. In addition, the Department of Design, Construction and Land Use has interests in the ravine in regard to delineation of wetlands, buffers, etc. These City workers typically entered the ravine at will to handle their work – not considering impacts on ravine resources. Recently, the Kiwanis Ravine Manager, under Seattle Parks, requested observance of access guidelines and coordination through him.

Recommendations: Parks should consolidate its management of lands within and bordering the ravine. It should work with Seattle Department of Transportation to transfer the surface jurisdiction of SDOT's ravine-related right-of-ways to Parks and adopt regulations suitable for parkland. Entry to the ravine's areas should be governed by the same guidelines as for Parks and organized volunteer work parties described later in this section. In an emergency, City staff should coordinate work through the Kiwanis Ravine Manager.

7. Until recently, Kiwanis Ravine was a name recognized by few City officials or citizens of Seattle. However, actions by the City, Parks, HHH and other volunteer organizations have begun to raise consciousness about ravine land and resources. Not long ago, the City Council and Mayor approved a resolution naming the Great Blue Heron as Seattle's official city bird. The initiative to name a city bird was headed by Seattle Audubon and assisted by HHH. Increasing coverage by

the press also has assisted in highlighting Kiwanis Ravine and its Great Blue Herons, as well as HHH sponsored tours and work parties.

Recommendations: Kiwanis Ravine should become a "gem" of the Parks and Recreation system, generating pride throughout the entire City of Seattle. Increasing recognition should be encouraged to stimulate growing financial support from many sources and any additional safeguards for its lands and resources. Parks, HHH, and other volunteer organizations should work together toward this goal.

Long-term monitoring of the habitat resource is needed.

8. Kiwanis Ravine's Great Blue Heron colony in the midst of a city is watched by many people, and probably receives more monitoring than most other heron colonies. HHH's heron monitor has watched over this colony for approximately five years. However, there is no long-term assurance that monitoring will continue. Long-term data is needed on nest locations and productivity, as well as predation and other disturbances.

Recommendations: Parks should take the responsibility to ensure that consistent, long-term monitoring data is collected by a volunteer or a professional — and that data is reviewed and studied by outside heron experts, who may be able over time to provide a broader picture of heron requirements. If no trained volunteer is available, this could mean providing a Parks' budget item for this purpose.

Returning Wolfe Creek's natural outfall to Salmon Bay is an attainable goal.

9. Kiwanis Ravine was formed by Wolfe Creek as it flowed north into Salmon Bay. About a hundred years ago, the creek outflow was diverted into a culvert that carries the clean creek water into the West Point Sewage Treatment Plant. Recently, Seattle Public Utilities began a study of options for reconnecting Wolfe Creek to Salmon Bay, both to save the cost and effort of treating clean water and to encourage a fresh water refuge for migrating salmon.

Recommendations: Parks should take a co-leadership role with other entities in facilitating and funding the reconnection of Wolfe Creek to Salmon Bay and daylighting the mouth to benefit salmon.

Conclusions and Recommendations on Access to the Ravine's Public Lands

The colony of Great Blue Herons that nest in Kiwanis Ravine has increased in number during the past 20 or more years. It is a source of pleasure and inspiration to many residents and visitors in the area. The great blue heron is listed as a Species of Concern on the Washington Department of Wildlife's Priority Habitats and Species (PHS) list with relation to its breeding areas.

As wild creatures, Great Blue Herons must find food resources which more than meet their energetic requirements for growth, breeding, molting and daily feeding and maintenance. Any disturbance within or near their habitat requires more energy from the birds if they respond by moving

away or flying. Wild populations often live on a narrow energetic margin in which their normal activities require most or all of the food that they are able to find. Disturbances resulting in excessive activity, or in loss of an opportunity to capture food, may weaken the bird so that it is unable to breed successfully (lays fewer eggs, or does not nest at all).

Disturbance at the nest brings still more undesirable consequences, for when herons fly and leave a nest unguarded, predators and nest robbers may eat eggs or attack and eat the young in the nests (Butler, 1997). Loss of these young results in reduced reproductive success of the colony, and of the species population in the region, which may decline in numbers.

They are accustomed to the normal noises in the neighborhood, such as people talking in their yards, doors closing, or cars driving around. But, noises and activities that are sudden or unusual, or come from unusual places, in particular on the ground near or under the nest, may alarm the bird and cause it to fly from the nest. Herons are more sensitive to disturbance during the early stages of pair formation, courtship, nest building or re-building and egg laying. Such disturbance may cause the birds to seek a new site, or to abandon their breeding activities.

The table below is the result of discussions among biologists and Parks and Recreation Department staff, and in particular, of a "roundtable" meeting held July 16, 2002 to define adequate protective measures for this heronry. Attendees included biologists from Washington Department of Fish and Wildlife, Seattle Audubon, and a consulting group; by staff from Seattle's Departments of Transportation, Neighborhoods, Parks and Recreation, and Design, Construction and Land Use; and representatives of Earth Corps and Heron Habitat Helpers. Three topics were addressed in the discussion: the timing, the nature, and the location of disturbing activities.

The time of greatest sensitivity to disturbance is February through April, when pair formation and nest establishment occur, and when visibility (by the birds) is greatest because trees have not leafed out. No access to the steep, forested ravine should be allowed during this period.
Young birds typically fledge from late June through late July, but late nests may not fledge until late August. Access recommendations for May-August are limited as shown in the table below and are related to the herons' line of sight from known nests. Nest trees used within the last 5 years are regarded as active.

In the period from September 1 through January 31 the herons are not in the Ravine, and management activities can take place anywhere in the ravine.

Year-round public interpretative/overlook sites should be located only at selected perimeter areas. Possible locations are shown on Figure 10.
Good current information is needed each year to determine the presence and location of active nests so that buffers for the year can be established. Also, up to date information in the month of August can indicate when all chicks have fledged, which could permit an early beginning of management activity in and near the ravine.

Recommendations earlier in this section call for Parks to work toward "preserve" status for Kiwanis Ravine. "Preserve" status should include guidelines or rules for other departments. But, until "preserve" status is obtained, voluntary interdepartmental and interagency cooperation is encouraged to protect wildlife in Kiwanis Ravine. The Kiwanis Ravine Manager should regulate access to Kiwanis Ravine.

Table 1. Access Recommendations for the Public Lands of Kiwanis Ravine

Dates	Activity Advocated	Location
February 1 - April 30	no activity	within the steep, forested ravine
May 1 - Aug 30	no activity	within 500' when in herons' line of sight from known nests
	Inventory, Monitoring, Or Watering	beyond 500' when in herons' line of sight from known nests – or beyond 150' when not in herons' line of sight due to evergreens, landforms, or buildings
Sept. 1 – January 31	Inventory, Maintenance, Monitoring, Restoration, Or Watering	anywhere in ravine

Note: Seattle Parks is responsible for the health, safety and welfare of this property and its citizen users. It retains access authority with the advice and consent of the Manager of Kiwanis Ravine & Discovery Park, currently Charles Sablan. Any emergency access request should be addressed to him.

Butler, R. W. 1997. The Great Blue Heron. UBC Press

Quinn, Timothy, and Ruth Milner. Management Recommendations for Washington's Priority Species; Vol. 4, Birds; The Great Blue Heron. Washington Department of fish and wildlife. Website at http://www.wa.gov/wdfw/hab/phs/vol4/gbheron.htm

Conclusions and Recommendations for Neighboring Actions Close to Kiwanis's Public Lands

Kiwanis Ravine is not an island unaffected by its surroundings. It is a narrow corridor located in a populated urban setting and near a railroad track with the major north-south route to Canada. It is subject to conditions much different from a "preserve" in a rural setting. Therefore, Kiwanis' public lands are subject to varying degrees of impact from its neighboring private lands. These impacts include noise, chemicals, water runoff, varying setbacks, bright lights, habitat destruction, etc.

Parks, HHH, and other volunteer organizations should inform the land owners in the neighborhood close to Kiwanis Ravine about actions they can be take to support protection of the ravine's lands and resources. There is an education role for Parks also with other City departments, the railroad, and/or interest organizations.

The following is a list of recommendations on ways to be a "good neighbor" to ravine resources. Private land owners closest to the ravine are shown on Figure 10, but since the ravine's watershed covers a much larger area, many other neighbors could contribute toward conservation in the ravine.

Table 2. "Good Neighbor" Practices That Support Protection of Kiwanis Ravine Lands and Resources, With Description of Value to Ravine

Promote use of the "Backyard Wildlife Sanctuary" ideas of the Washington Department of Fish and Wildlife on part or all of landscaping — to add wildlife habitat to ravine's narrow corridor;

Keep steep slopes (if any) vegetated, preferably with native plants – to prevent soil erosion and slippage in the ravine;

Retain mature trees – to help hold soil on steep slopes; add to the ravine forest stability in high winds; provide perching spots and nest building materials for birds as well as food and cover for other wildlife; and provide an expanded greenbelt for birds' flyways to food resources;

Build fences and other structures with a safety buffer at the top edge of the ravine – to prevent natural soil erosion or slippage causing these structures to fall into the ravine, and to retain usual sunlight/shade in the ravine upon which many species of wildlife depend;

Encourage "Clean Green" (composting or hauling away excess yard vegetation) — to stop dumping of yard wastes into ravine

Encourage chemical-free landscaping – to make sure the surface runoff flowing into Wolfe Creek will be safe for wildlife and fish (when connected to Salmon Bay)

Remove ivy and other invasives – to keep these invasives from creeping into the ravine and reduce seed dispersal by birds

Be considerate of ravine wildlife neighbors and conduct noisy outdoor activities during least sensitive times of the year – to lessen predation on eggs/chicks, and reduce chances of the great blue herons abandoning their nesting location in Kiwanis Ravine,

If rooftop drainage runs toward ravine, either save drainage water in a rain barrel for watering landscaping or lengthen roof drainage extensions to the bottom of the ravine (don't discharge drainage at the top edge or mid-slope of the ravine) – to prevent additional slope erosion and soil slippage;

Discharge runoff from parking areas and paved services away from the ravine – to prevent oil and other chemicals from draining into the ravine;

Shield and direct lights downward – to allow ravine wildlife to maintain their natural day and night life patterns.