ER 390 FINAL REPORT

The Dead Wood Cycle and Forest Restoration in Cuthbert Holmes Park

Victoria, British Columbia

Carol Milo

3/31/2013

Instructor: Dr. Valentin Schaefer

TABLE OF CONTENTS

APPENDICES

TABLES

FIGURES

To Protect Your Rivers, Protect Your Mountains

EMPEROR YU (CHINA)

(cited in Montgomery 2007)

ABSTRACT

Urban parks provide us with many important ecosystem services, including storm water management, wildlife corridors and habitat, and protection of riparian areas. They also provide local residents with valuable recreational opportunities. However, the habitat in many urban parks has been degraded through historical logging and agricultural activities, trampling and soil compaction through off-trail use, and the spread of invasive species. Cuthbert Holmes Park, located in the District of Saanich, on Southern Vancouver Island, is no exception. In consultation with the Saanich Parks Department, an area of mature Douglas-fir forest, located near the Dysart Street footbridge, was selected as a site for an ecological restoration project. Due to heavy off-trail use, little of the understory vegetation remained, and the soil was severely compacted in some areas. A Ground Inspection Form was completed, and estimates were made of stem densities and basal areas, using the point-centered quarter system. Estimates were also made of the amount of course woody debris (CWD) on-site, and Tree Attributes for Wildlife were assessed. A restoration plan was developed in consultation with Saanich Parks staff, and public outreach activities were carried out. Soils on-site consist of well-drained clays belonging to the Saanichton soil series, which in some places have been worn away to the B horizon. The main forest canopy consists primarily of Douglas-fir (*Pseudotsuga menziesii*), while grand fir (*Abies grandis*), may be found in the sub-canopy and understory. Crown closure is 75-80%, while shrub and herb cover is patchy (20% and 30% respectively). Total stem density is 771.6 trees/ha, with a total basal area of 105.88 m^2/ha. The volume of CWD on-site was 53.1 m^3/ha. The forest stand at this time is generally healthy, with trees surveyed falling into Decay Classes 1 or 2. These trees are suitable for Open Nesters such as Osprey, Bald Eagles, and Great Blue Herons, or cavity excavators such as woodpeckers.

Due to the highly-compacted and eroded condition of some areas of the site, it was decided to delay planting for at least another year, and instead to condition the soil by spreading a thick (25 cm) layer of one-year old leaf mulch from Saanich's leaf collection program. Informational signage, and a two-rail split cedar fence were also installed. Public reaction has been generally positive.

It is important to balance any future additions of organic materials to the site with the annual rate of decay, in order to avoid creating a nutrient "sink". The physical condition and basic chemistry of the soil on-site should be periodically assessed. Ongoing monitoring of tree health would also provide a good indicator of site soil conditions. The planting program should be carried out as soon as feasible, as this will help to stabilize the site, and to discourage invasive species. Any invasive plants found growing on-site should be promptly removed. Educational and outreach activities should be expanded.

1.0 INTRODUCTION

1.1 Cuthbert Holmes Park

Cuthbert Holmes Park is a 25.7 hectare natural area park located in the District of Saanich on Southern Vancouver Island (48˚27′24″ N, 123˚24′8″ W; NTS Mapsheet 92 B/6). It lies within the traditional territory of the Lekwungen First Nation (Iredale 2000). The park varies from 0 to 10 meters in elevation, and includes mature and old Douglas-fir and mixed forest, wetlands, and riparian areas (Westland Resource Group 2011). It contains the lower reaches of the Colquitz River, and borders on its estuary, which empties into Portage Inlet (Figure 1).

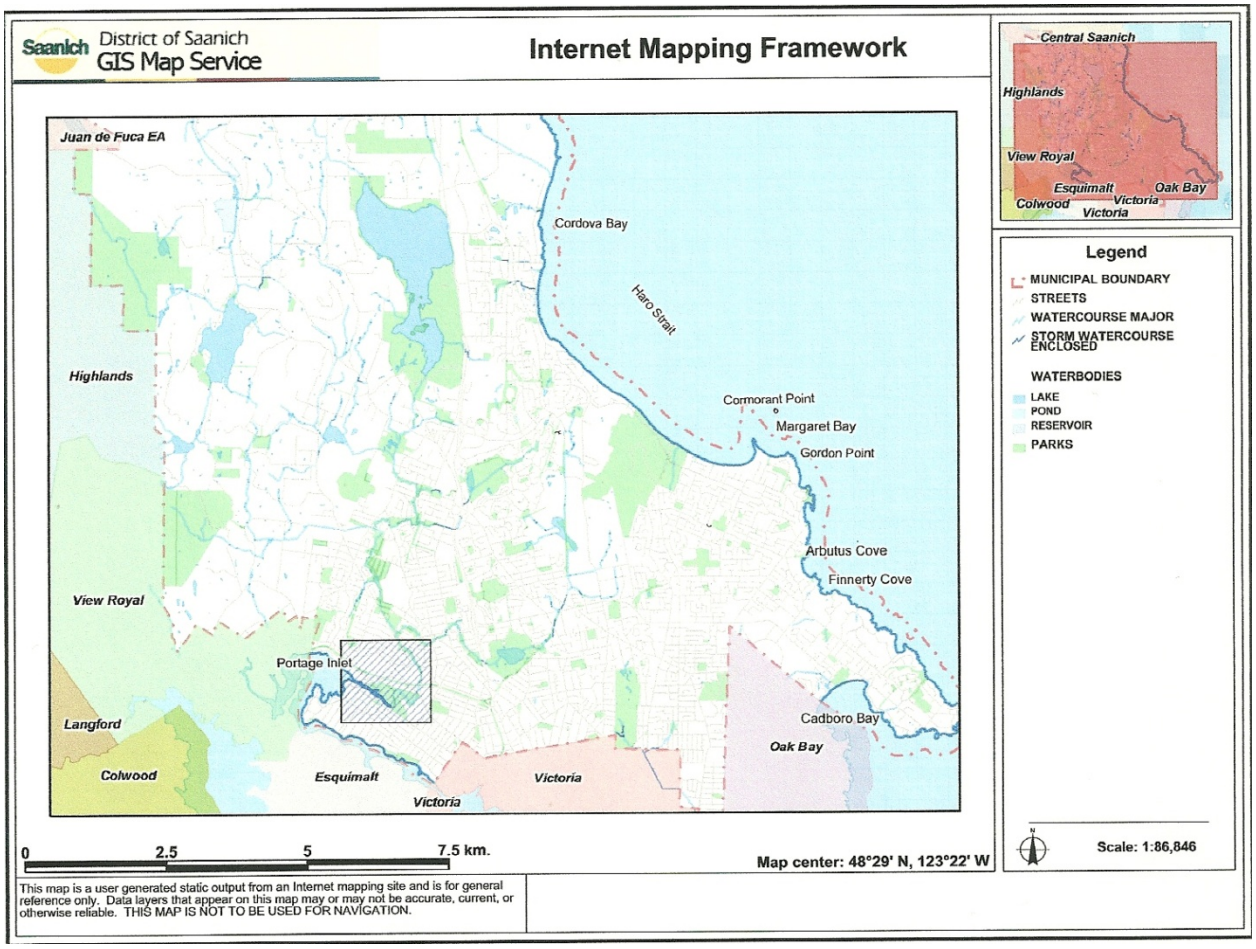


Figure 1. Location of Cuthbert Holmes Park (District of Saanich GIS Map Service 2012a).

The park was developed in the late 1960s and early 1970s, and is actually a combination of a municipal park (Cuthbert Holmes Park), and a community park (Tillicum Park). Cuthbert Holmes Park was officially designated in 1990. Approximately 12 ha are owned by the Provincial Capital Commission, and are leased to Saanich for 99 years (expiring in 2086). Right-of-ways for Admirals Road and the Trans Canada Highway are also included within the park, as well as a 0.05 ha parcel owned by the BC Transit Financial Authority. The park contains important local and regional trail connections (Saanich Parks 2011). The

park is named in honour of Major H. Cuthbert Holmes (1890 – 1968), who was an early advocate of regional planning, and who considered trees to be Victoria's greatest asset (Orchard 1962). He was especially interested in preserving and protecting land along the Colquitz River.

1.2 History

Coast Salish people have lived on the land around Gorge Waterway and Portage Inlet for more than 4,000 years. The Esquimalt and Songhees First Nations have used this waterway for gathering food such as salmon, herring, oysters and other shellfish, waterfowl, and eelgrass. Deer and elk were hunted on lands in the Craigflower Creek watershed (map), and a wide array of native plants was harvested. Periodic burning helped to maintain the area's Garry oak meadows, and enhanced the production of plants such as camas (*Camassia quamash* and *Camassia leichtlinii*). Prior to the 1700s, there were extensive settlements of Kosampson people (the ancestors of the Esquimalt and Songhees) near what is now the intersection of Admirals and Craigflower Roads. In 1994, an archeological dig revealed many interesting artifacts at this site, including middens that attested to the abundant shellfish and game nearby, and various stone and bone tools (Gorge Waterway Initiative 2008).

In 1854, a schoolhouse (Craigflower School) was built on the site at Maple Point, near the mouth of Portage Inlet. In 1856, a farmhouse (Craigflower Manor) was built on the adjacent Hudson's Bay Company Farm (Craigflower Farm). Today, this area on the south side of the Craigflower Bridge is designated as a Provincial Heritage Site (ibid.). In the 1850s, the forested land bordering the lower Colquitz River was owned by a variety of former Hudson's Bay Company employees. By 1890, much of this land was absorbed into the extensive Rowland farm. Up until the early 1960s, part of the park served as archery range (Archer's Meadow), and an orchard was located in the area bordering Admiral's Road. The Tillicum Drive-In Theatre (now the location of Silver City Cinema and Tillicum Mall) backed onto the southeast corner of the site (Minaker 1998; Minaker 2010).

Today, the park receives intensive use by local residents, nature enthusiasts, dog walkers, boaters, children from nearby daycares and schools, and visitors to Tillicum Mall. Unrestrained access and unauthorized trails have resulted in soil compaction, loss of soil and forest understory, and contributed to the spread of invasive species (Saanich Parks 2011). Some visitors have been discouraged by negative activities in certain areas of the park (Dickson 2007, Shaw 2008). These issues led to a review of the park under four general themes: Natural Areas Management, Trails, Recreational Opportunities, and Safety and Security (Saanich Parks 2011). Public consultation was an important part of the review process. Saanich Parks also hired Westland Resource Group to conduct an independent environmental review, and their results were published in January 2011 (Westland Resource Group 2011).

The results of the environmental review, Saanich's policy review, and community and stakeholder input were shared with the public at a Workshop held on June 18, 2011 (District of Saanich 2010). These results, along with additional input gathered at the Open House, were summarized in the Cuthbert Holmes Park Management and Direction Plan 2011 Discussion Paper (Saanich Parks 2011). A final Open House was held on June 13, 2012, at which information gathered to-date was presented, and a public survey was distributed (District of Saanich 2012a). Results were tabulated, and posted on the District of

Saanich website (District of Saanich 2012b). A final draft of the management plan will be completed. Once approved, the plan's recommendations will be implemented, beginning in 2013 (District of Saanich 2012a).

1.3 Concept and Management Direction Plan Discussion Paper (Saanich Parks 2011)

Saanich Parks solicited input from the Gorge Tillicum Community Association, the Friends of Cuthbert Holmes Park, Portage Inlet Sanctuary Colquitz Estuary Society (P.I.S.C.E.S.), Gorge Tillicum Urban Farmers, students at Colquitz Middle School and Spectrum High School, and members of the general public. A presentation was made at the Gorge Tillicum Community Association AGM (April 15, 2010), followed by a community mapping exercise in the park (May 2, 2010). Additional public input was sought at the Gorge Canada Day Picnic (July 1, 2010), at Music in the Park at Meadow Park (August 24, 2010), and at the RiverSong event in Cuthbert Holmes Park (September 26, 2010). Colquitz Middle School and Spectrum High School students hosted presentations and discussions in October and November 2010.

As a result of the public consultation process, the following stakeholder preferences emerged:

(1) Preserve and restore the park's natural environment,
(2) Continue to accommodate public access and increase the number of park users,
(3) Showcase the park's natural environment and enhance the recreational opportunities that it offers,
(4) Support only those activities that will not threaten the park's environmental health, and
(5) Address safety and security concerns.

A number of key documents contain policies and recommendations that apply to Cuthbert Holmes Park:

(1) Zoning Bylaw 8200,
(2) Saanich Official Community Plan 2008,
(3) 2011-2015 Saanich Strategic Plan,
(4) The Tillicum Local Area Plan,
(5) Parks and Recreation Master Plan 2001,
(6) Saanich Park Property Inventory 2010,
(7) Park Natural Areas Action Plan 2011-2016 (Draft), and
(8) Park Natural Areas Management Guidelines 2011 (Draft).

In addition, in November 2010 Saanich adopted an Urban Forest Strategy (LEES + Associates 2010), and the District is in the process of preparing an Invasive Species Management Strategy, with a draft report being released in September 2012 (Manton and Schaefer 2012). Saanich also has a tree preservation bylaw (Bylaw No. 7632), and an Animals Bylaw (Bylaw No. 8556).

1.4 Environmental Review (Westland Resource Group 2011)

The park is located in the Coastal Douglas Fir moist maritime (CDFmm) biogeoclimatic zone. This region is characterized by warm, dry summers, and mild, wet winters. It lies in the rainshadow of Vancouver Island and the Olympic Mountains (Meidinger and Pojar 1991). All natural plant communities located in the CDFmm are red or blue listed by the British Columbia Conservation Data Centre (CDC). A total of 36 plant species are listed as endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and 153 plant species are red and blue listed by the CDC. Many of these species occur in Garry oak ecosystems, coastal plant communities, rock out-crops, or riparian wetland habitats, all of which occur in Cuthbert Holmes Park. Historic uses of the area (agriculture, recreation, infilling, and development) have altered plant community composition. Invasive plants such as English ivy (*Hedera helix*), English holly (*Ilex aquifolium*), English hawthorn (*Crataegus monogyna*), and Himalayan blackberry (*Rubus discolor*), are now common throughout the park. Tree loss due to wind, disease, root saturation, and drought are evident. Also, increased average water levels in the Colquitz River, as a result of upstream development, has led to losses through undercutting of riverbanks.

Over 120 species of birds have been observed within the park. A pair of Great Horned Owls (*Bubo virginianus*) are frequently observed near the Dysart Street footbridge, and a pair of Cooper's Hawks (*Accipiter cooperii*) nest in the park. Cuthbert Holmes Park supports the largest breeding colony of Great Blue Herons on Vancouver Island. The Pacific subspecies of Great Blue Heron (*Ardea herodias fannini*) is provincially blue listed, and federally listed as "special concern" by COSEWIC. Reasons for the decline of this subspecies include declining reproductive success, human disturbance, and urban encroachment. The number of active nests in the park increased from 2008 through 2011. This increase appears to be related to the predation of herons by Bald Eagles (*Haliaeetus leucocephalus)* in Beacon Hill Park (Hawthorn 2012). In 2012, there were few active nests in Cuthbert Holmes Park; however, the heron colony in Beacon Hill Park appeared to be re-establishing (Holmen 2012). Within Cuthbert Holmes Park, human disturbance is likely the greatest factor affecting reproductive success. Gaps in the forest canopy created by fields and walkways may increase the risk of predation. The Colquitz River flows into Portage Inlet, which is part of the Victoria Harbour Migratory Bird Sanctuary. This sanctuary extends up to the high-water mark, and is governed by the *Migratory Birds Convention Act* (Gorge Waterway Initiative 2007a).

The Colquitz River is fed by Elk and Swan Lakes. Much of Saanich is included within its watershed. River flows are affected by tidal changes, and storm water influx. Flooding is common, and erosion of the river banks is apparent. Riparian habitat features are protected by a 30 m riparian buffer, as measured from the high water mark. Construction or changes in this area (including trail building) may be subject to local, provincial, and federal regulatory requirements e.g. B.C.'s *Fish Protection Act* and Riparian Areas Regulation or RAR. The Colquitz River is known to support coho salmon (*Oncorhynchus kisutch*), chum salmon (*Oncorhynchus keta)*, cutthroat trout (*Oncorhynchus clarkii*), threespine stickleback (*Gasterosteus aculeatus*), sculpin (Cottoidea Family), brown catfish (*Ameiurus nebulosus*) , bass (*Micropterus dolomieu*), herring (*Clupea pallasii*), and sunfish (*Lepomus gibbosus*). Both the herring and coho salmon are genetically distinct i.e. not introduced. Tidewater fisheries are governed by the federal *Fisheries Act* (Gorge Waterway Initiative 2007b).

During the salmon spawning season, the Victoria Fish and Game Protective Association (VFGPA) operate a fish counting fence on the Colquitz River, behind Tillicum Mall (VGFPA 2007). Although fish counts have been increasing in recent years, largely as a result of restoration efforts throughout the watershed (HAT 2006), three oil spills in the year 2011-2012 led to lower counts on the Colquitz in the fall of 2012. However, counts on Craigflower Creek, which also empties into Portage Inlet, have continued to rise (Chambers 2012, Lavoie 2012). While a total disaster appears to have been averted and restoration efforts are being extended, only time will tell what will be the long-term effects on fish populations.

1.5 Urban Parks and Ecological Restoration

Cuthbert Holmes Park is an urban park. It is bordered by housing, a shopping mall, recreation centre, movie theatre, Highway 1, and Admirals Road. It provides many important ecosystem services such as storm water management, riparian habitat protection, wildlife corridors and habitat, forest canopy (carbon sequestration, and mitigation of the urban heat island effect; Schaefer 2004), and fish habitat. Park wetlands also help to filter out contaminants present in run-off. However, most habitats in the park have been degraded by vegetation removal for agriculture, the introduction of non-native plants, soil compaction, and erosion. Off-trail use, by both dogs and humans, has contributed to soil compaction, invasive plant dispersal, trampling of vegetation, and disturbance of wildlife. Boating along the Colquitz River may disturb foraging wildlife, including Great Blue Herons, ducks, and other waterfowl. In addition, upstream developments and channel modifications have lead to increased water flow in the Colquitz River, and water fluctuations or "flashiness" after rain events.

Westland Resource Group consultants assigned a sensitivity rating to all areas of the park to indicate the degree of potential negative impact that human activity could have on the environment (Westland Resource Group 2011). Areas were rated as having "high", "medium", "low", or "very low" sensitivity. Their report recommends that these ratings be considered during the planning process, and that Best Management Practices (BMPs) be followed during construction and maintenance activities. Areas with high and medium sensitivity (such as the riparian corridor and the Great Blue Heron colony) should be avoided when selecting potential locations for additional recreational infrastructure in the park. A wider range of activities would be appropriate in low-sensitivity areas, which are located in the northeast corner of the park, and also to the northwest, adjacent to the Trans Canada Highway and Admirals Road. Opportunities exist for ecosystem restoration in all areas of the park, even those rated as having low to very low sensitivity.

Considerable habitat restoration has been undertaken in the park to-date by the District of Saanich and various community groups (Westland Resource Group 2011). As compensation for habitat disturbed by the Admirals Bridge reconstruction project in 2009, Saanich parks planted two areas with trees and shrubs appropriate to Garry oak woodland, and CDF riparian areas respectively. Through the efforts of the Friends of Cuthbert Holmes Park and the District of Saanich, invasive plants were removed from two areas near the centre of the park, and native species were planted. The Friends of Cuthbert Holmes and local residents have also undertaken to remove invasive ground cover from four additional areas near the centre of the park.

The ecological integrity of all areas of the park could be improved through additional restoration activities. In addition to invasive species removal, bank stabilization would help to reduce erosion along the Colquitz River. Establishing and maintaining wildlife trees and other features in mature and old forest communities in the park would increase available habitat for forest birds in an urban setting (Westland Resources Group 2011).

1.6 Park Vision and Management Goals

An over-arching theme or vision for the park emerged from the public consultation process:

Cuthbert Holmes Park is a rare urban refuge which promotes respectful and appropriate recreational use, while protecting its natural features and ecosystems. It showcases nature, encouraging respect and appreciation for the natural world, and is a model of current restoration techniques. (Saanich Parks 2011, p. 10)

Suggested management goals to achieve the park vision are:

1. **Protect and restore natural areas.**
2. **Define the trail system to meet the park's environmental, recreational and safety needs.**
3. **Provide the opportunity for a range of enjoyable, appropriate and enriching activities.**
4. **Increase the number of park users and bring problem isolated areas into the larger park experience to reduce negative activities.** (Saanich Parks 2011, pp. 10-11)

2.0 STUDY SITE

2.1 Site Selection

In response to an e-mail dated November 25, 2011, it was suggested by Jenny Eastman, Volunteer Co-ordinator with the Pulling Together Volunteer Program at Saanich Parks, that I contact Gary Darrah, Park Planning and Design Manager, regarding a possible project in Cuthbert Holmes Park (J. Eastman, personal communication, January 3, 2012). It was also suggested that I contact Julian Anderson, who is Lead Steward for volunteer and restoration activities in the park.

On January 24, 2012, a meeting was held at the Public Works Yard with Gary Darrah and Becky Goodall (Planner and Designer) from Saanich Parks, in order to discuss possible sites for a restoration project in Cuthbert Holmes Park. Two sites were identified: (1) an area of mature Douglas-fir (*Pseudotsuga menziesii*) forest near the Dysart Street footbridge, which is experiencing understory loss and soil compaction from off-trail use; and (2) a shrub community behind the Silver City Theatre, which is dominated by English hawthorn (*Crataegus monogyna*), and other invasive species.

On February 4, an initial reconnaissance of the park was conducted with Julian Anderson from the Friends of Cuthbert Holmes, and information from previous studies was shared (Anderson 2003a, 2003b; Thomson 1999; Tryon 2011). While three of the studies (Anderson 2003b, Thomson 1999, and Tryon 2011) included plots in the shrub community behind the Theatre, none of the studies included a survey of the site by the Dysart Street footbridge.

On March 13, an initial visit to the site near the Dysart Street footbridge was made with Gary Darrah and Becky Goodall. Project goals were established, and project responsibilities assigned. The location of the project site is shown in Figure 2.

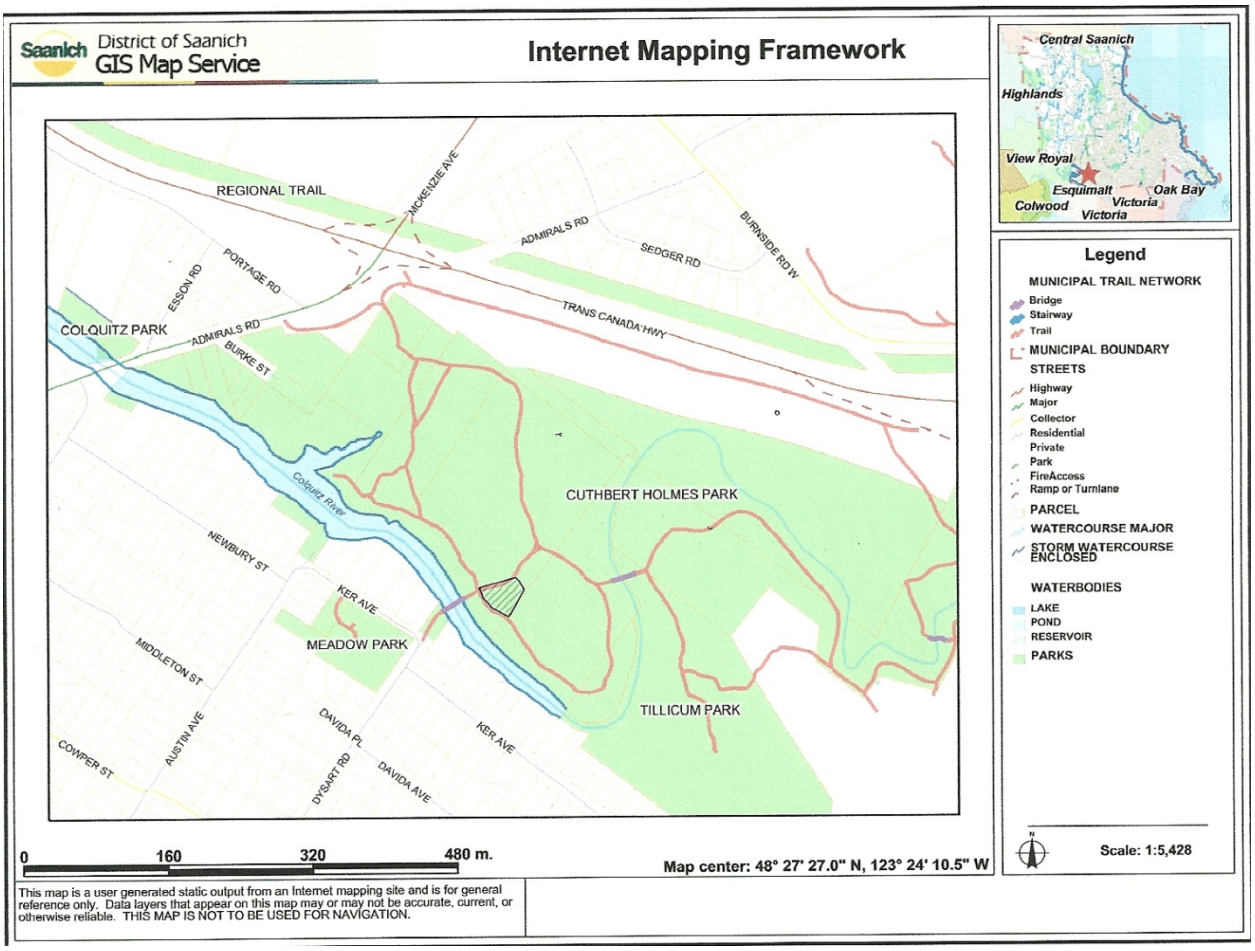


Figure 2. Location of project site (District of Saanich GIS Map Service 2012b).

2.2 Site Objectives

Off-trail use has led to loss of understory and soil compaction; therefore, **the Dysart Street site should be protected by installing signage and fencing** (Goal 1), in order to prevent any further damage. This will also serve to define the existing trails in the area (Goal 2). Soil compaction reduces the permeability of soil to air and water, and reduces the ability of roots to penetrate the soil (Brady and Weil 2008), so **it will be necessary to remediate the soil through appropriate treatments** (Goal 1). This will also help to decommission "outlaw" trails, and to cushion the soil from any further impacts (Goal 2). Once the soil on-site has been remediated, **a planting program should be undertaken to further stabilize the site, and replace native plant cover** (Goal 1). A densely-planted site will also help to discourage any further off-trail use (Goal 2). **Ensuring that the restoration is aesthetically appealing, along with public outreach and education programs,** will encourage appropriate use of the area (Goal 3), as well as bring

more visitors to the park (Goal 4). A more detailed site prescription will be developed, once a complete ground inspection is carried out.

3.0 METHODS

3.1 Ground Inspection

The sample plot was laid out using an orienteering compass and a 60 m fibreglass tape measure. Aspect was measured with the orienteering compass, and slope was determined with a Suunto clinometer. A Garmin GPS unit was used to record elevation and geographic co-ordinates, and these were checked against the base map. A soil pit was dug near the centre of the plot, and the soil was hand-textured. Soil moisture regime (SMR) and soil nutrient regime (SNR) were determined from Appendix 5 and 6 respectively, in Green and Klinka (1994). Plants on-site were identified according to layer, with the aid of Pojar and MacKinnon (1994). Site data were recorded on the Ground Inspection Form found in the Field Manual for Describing Terrestrial Ecosystems (Resources Inventory Committee 1998). The site series was identified using the edatopic grid for the CDFmm, as given in Green and Klinka (1994). Percent coverages by stratum were plotted, as well as the locations of compacted areas and coarse woody debris (CWD).

3.2 Estimation of Tree Density and Basal Area

A modification of the point-centered quarter method, as outlined on pp. 50-51 in the ER 312A (Field Study in Ecological Restoration I) course manual (Antos 1997), was used to estimate the total stem density and basal area for both the main canopy species (*Pseudotsuga menziesii),* and the sub-canopy trees (*Abies grandis*). As the study plot was an irregularly-shaped trapezoid, a transect was run from the midpoint of the 30 m baseline, and sample points were marked at 5 m intervals. A compass was used to divide the area around each point into 90˚ quadrants. For each quadrant, the tree nearest the sample point was identified, and the distance and diameter at breast height (DBH) were measured. Only trees greater than 1.3 m in height were sampled.

The density per hectare for all trees on site was calculated using the formula $10{,}000/D^2$, where D is the mean distance from the sample point, or Σ of distances/total number of trees sampled. The density of each species can then be determined by multiplying the density of all trees/ha by relative density (number of trees of species A/number of all trees sampled).

The basal area (BA) of each tree sampled was calculated from the DBH (m): $BA\ (m^2) = \pi(DBH/2)^2$. The mean basal area for each species is then calculated (ΣBA of species A/number of trees of species A), and then multiplied by the density/ha for that species (explained above), to obtain basal area/ha for each species. Total basal area for the site can then be obtained by adding the basal areas of each species.

3.3 Estimation of Coarse Woody Debris

To determine the volume of coarse woody debris (CWD) on site, transects were run from the baseline at 5 m intervals. The diameter of each piece encountered along the transects was measured (including 0 m

and 30 m). Only pieces having diameters > 7.5 cm were measured. Self-supporting pieces such as stumps and snags were excluded (Antos 1997).

The volume of CWD/ha was calculated by multiplying D by 10,000 m^2, where D is the estimated average depth (m) of CWD on the site. D is estimated using the formula $\pi^2(\Sigma d^2/8L)$, where d is the diameter of each piece encountered, and L is the total length of transects used.

3.4 Tree Attributes for Wildlife

Tree Attributes for Wildlife (TAW) were also assessed, following the procedure outlined in the Field Manual for Describing Terrestrial Ecosystems (Resources Inventory Committee 1998). Data were recorded on the form provided in this section of the manual. Where possible, DBH was measured using a diameter tape; otherwise, an estimate was made. An exact determination of tree heights was not made at this time. However, in a few cases where the ground was level, height was estimated by multiplying the distance from the base of the tree by the tangent (percent slope) of the angle to the top of the tree, as measured with a clinometer. This value is then corrected for eye level (1.6 m). Only trees taller than 1.3 m (breast height), and having a diameter greater than 15 cm were assessed for wildlife values.

3.5 Restoration Plan

On June 6, 2012, a meeting was held at the site with Gary Darrah and Cory Manton (Manager of Horticulture, Urban Forestry, and Natural Areas) to discuss possible approaches to restoration. Following their recommendations, Bernard Hopcraft, Supervisor of Parks Operations with the City of Victoria, was contacted by telephone on June 7 to discuss a restoration carried out in a similar area in Beacon Hill Park. An application for supplemental funding was submitted to the TD Friends of the Environment on May 11, 2012.

3.6 Public Outreach

On May 14, Jason Jones, Co-ordinator of Youth Services at Saanich Parks and Recreation was contacted by telephone, regarding the Summer Neighbourhood Playground Program held at Meadow Park every summer. This group utilizes the restoration area for some of their activities, and permission was requested to conduct a “hands-on” educational activity with the children.

On June 28, an e-mail was received from Jen Swaile, Summer Youth Leader at Meadow Park, requesting additional information. As the week of August 7-10 was “Nature Week”, it was agreed that this would be the most appropriate time for the activity. Jenny Eastman and Julian Anderson were also contacted regarding protocols for volunteer activities with children. A copy of the District of Saanich Informed Consent/Permission form was forwarded. During the week of July 30 – August 3, a brief meeting was held with Hovey Eyres, who was replacing Jen as Youth Leader. It was decided that an educational activity would be more consistent with the mandate of the Summer Program, and this was scheduled for the morning of August 10.

In addition, the third public open house on the future of Cuthbert Holmes Park, held on June 13 at the Pearkes Recreation Centre, was also attended. An article on the Dysart Street restoration site was submitted to the Gorge Tillicum Neighbourhood News, for publication in the Fall 2012 issue.

The sixth annual RiverSong Event (Sing the Salmon Home), hosted by the artists Carolyn Knight and Paula Jardine, was held in Cuthbert Holmes Park on Sunday, September 30 (Rivers Day). In previous years, this event was co-hosted by the Friends of Cuthbert Holmes, HAT, GWI, and the District of Saanich. However, participation was lower this year, due to lack of funding.

4.0 RESULTS

4.1 Ground Inspection

The study site is an irregular trapezoid of mature, second-growth Douglas-fir forest, approximately 600 m^2 in area, located near the Dysart Street footbridge (Figure 2). It is bordered along the southeast and northwest by chip trails, which receive heavy use. A 5 m strip along the southeast edge lies within the riparian buffer along the Colquitz River. The elevation of the site is 3-5 m, and it has a warm southwest aspect (210˚), with a gentle slope of 9-10%. It occupies a mid-slope position, and is well drained (Figure 3).

Surficial material is fluvial in origin, and consists primarily of clay. Coarse fragments are nearly absent. Distribution of topsoil is patchy: where present, it occurs at the base of tree trunks, beneath clumps of vegetation, and on the upslope side of larger pieces of coarse woody debris (CWD). The upper soil horizon is dark in colour, and has a loamy texture. However, in some areas it has been completely worn away, exposing the yellowish-brown clay subsoil. These areas are highly compacted (mainly as a result of foot traffic), and are diagrammed in Appendix A. A soil profile is shown in Appendix B. The humus form is moder. The SMR is 3 to 4, and the SNR is R. This is indicative of a site that is medium-dry, and rich or medium-rich, placing it into Site Series 4 on the CDFmm edatopic grid (FdBg-Oregon grape).

The main canopy consists primarily of Douglas-fir (*Psuedotsuga menziesii*), with 75-80% crown closure. Grand fir (*Abies grandis*) is found in the sub-canopy and upper shrub layer. The shrub and herb layers are patchy, with 20 and 30% cover respectively. Dominant species in the upper shrub layer are grand fir and snowberry (*Symphoricarpos albus*), while salal (*Gaultheria shallon*) and dull Oregon-grape (*Mahonia nervosa*). English ivy (*Helix hedera*) and Pacific sanicle (*Sanicula crassicaulis*) are abundant in the herb layer. Oregon beaked moss (*Kindbergia oregano*) and electrified cat's tail moss (*Rhytidiadelphus triquetrus*) are also present. Additional indicator plant species are listed on the Ground Inspection Form, which may be found in Appendix C. Percent cover by stratum is diagrammed in Appendix D.

Figure 3. Project site, southeast quadrant (March 16, 2012).

4.2 Tree Density and Basal Area

Data used in the point-centered quarter system calculations are summarized in Tables 1-6. A total of 24 trees were sampled; the mean distance from the sampling point (D) was 3.6 m, and the mean basal area was 0.138 m².

Table 1. Point 1.

Quadrant	Distance (m)	Species	DBH (cm)	Basal Area (m²))
A	2.62	*A. grandis*	8.3	0.00541
B	2.72	*P. menziesii*	37.3	0.109
C	1.20	*A. grandis*	24.0	0.0452
D	0.46	*P. menziesii*	38.8	0.118

Table 2. Point 2.

Quadrant	Distance (m)	Species	DBH (cm)	Basal Area (m^2)
A	1.17	*A. grandis*	43.4	0.148
B	6.53	*P. menziesii*	41.2	0.133
C	1.19	*P. menziesii*	31.0	0.0755
D	5.25	*P. menziesii*	44.0	0.152

Table 3. Point 3.

Quadrant	Distance (m)	Species	DBH (cm)	Basal Area (m^2)
A	4.98	*P. menziesii*	69.0	0.374
B	6.16	*P. menziesii*	53.9	0.228
C	4.52	*P. menziesii*	41.7	0.137
D	6.54	*P. menziesii*	41.5	0.135

Table 4. Point 4.

Quadrant	Distance (m)	Species	DBH (cm)	Basal Area (m^2)
A	3.44	*A. grandis*	14.8	0.0172
B	1.65	*A. grandis*	17.5	0.0241
C	3.26	*P. menziesii*	63.0	0.321
D	6.20	*P. menziesii*	52.0	0.212

Table 5. Point 5.

Quadrant	Distance (m)	Species	DBH (cm)	Basal Area (m^2)
A	3.09	*P. menziesii*	51.8	0.211
B	4.73	*P. menziesii*	41.9	0.138
C	2.50	*P. menziesii*	59.5	0.278
D	2.70	*P. menziesii*	38.4	0.116

Table 6. Point 6.

Quadrant	Distance (m)	Species	DBH (cm)	Basal Area (m^2)
A	3.81	*A. grandis*	21.9	0.0377
B	2.98	*A. grandis*	11.3	0.0100
C	5.30	*P. menziesii*	42.4	0.141
D	3.40	*P. menziesii*	41.8	0.137

The density of all trees on the study site was 771.6 trees/ha, while the relative density for Douglas-fir (*P. menziesii*) and grand fir (*A. grandis*) was 578.7 trees/ha and 192.9 trees/ha respectively. The basal area

of *P. menziesii* was 96.64 m²/ha, and of *A. grandis* 9.24 m²/ha, giving a total basal area of 105.88 m²/ha. These results are summarized in Table 7.

Table 7. Summary of point-centered quarter method results.

	Stem Density (trees/ha)	**Basal Area (m²/ha)**
Pseudotsuga menziesii	578.7	96.64
Abies grandis	192.9	9.24
Total	771.6	105.88

4.3 Volume of Coarse Woody Debris

The average depth (D) of CWD was 0.531 cm, giving a volume of 53.1 m³/ha. Data used in the CWD calculation are summarized in Table 8. Total transect length (L) was 205.3 m. Distribution of CWD on-site is diagrammed in Appendix E.

Table 8. Coarse woody debris determination.

Transect	**Length (m)**	**Diameter (m)**	**Diameter² (m)**
0	36.0	0.23	0.0529
5	33.2	0.25,0.22,0.20	0.0625,0.0484,0.0400
10	31.2	0.123,0.285,0.500	0.0151,0.0812,0.2500
15	28.7	0.195	0.0380
20	27.1	0.137,0.250	0.0188,0.0625
25	25.1	0.350	0.1230
30	24.0	0.077,0.080,0.280	0.00593,0.0064,0.0784

4.4 Wildlife Trees

All of the trees included in the wildlife tree assessment were Douglas-fir. (The grand firs on-site fell below the DBH cut-off). Most were standing live trees, in Decay Classes 1 or 2 i.e. healthy, or showing some initial decay or deformities. In one case, wildlife was actually observed using the tree (squirrel and nuthatches). This is an even-aged stand of approximately 80-100 years, as indicated by the historical records, and by counting the rings in the three stumps included in the wildlife assessment. Typical heights are 25-30 m. A copy of the Tree Attributes for Wildlife form may be found in Appendix F.

4.5 Restoration Program

Based on the results of the site inspection, which indicated that this area of the park fell into CDFmm Site Series 4, a planting program was developed, and e-mailed to Saanich Parks Staff on May 18 (Appendix G). As salal and dull Oregon-grape are the most common shrub species for this site series, as well as Site Series 1 (Fd-Salal), which is the zonal site, and slightly drier, these species would form the bulk of the plantings. Baldhip rose (*Rosa gymnocarpa)* and oceanspray (*Holodiscus discolor*), are also common on these sites, and should be included. Snowberry (*Symphoricarpos albus*), which is also

common, and occurs on the study site, is not recommended, as it can become invasive. The only herbaceous species recommended for planting at this time was sword fern (*Polystichum munitum*), which was found growing in the northwest corner of the site, slightly down slope from the crest. It is more tolerant of drier conditions than other fern species (Pojar and MacKInnon 1994), and would also help to stabilize the site. Cory Manton also suggested that *P. menziesii* be included in the planting program (C. Manton, personal communication, June 6, 2012), in order to provide for stand regeneration, as this is an even-aged Douglas-fir stand which is maturing, and undergoing stress. Plantings should be timed to take advantage of the onset of the fall rains, as it is not feasible to provide additional water to this site. Plant materials should be locally sourced, as much as possible. Browse protection may also be necessary. It was recommended to plant in clusters initially (Appendix G), in order to encourage natural recruitment, and to utilize the pockets of soil remaining on-site, such as those at the base of trees, or along large pieces of coarse woody debris.

As it will not be possible to plant in the compacted areas until soil remediation is carried out, it was also recommended to spread a thin layer of woodchips (1.5-2.5 cm thick) over the soil surface, so as to encourage the development of soil fungi (Sauer 1998).[1] This method leaves about 20 percent of the soil surface exposed.[2] If necessary, the area can be inoculated with small amounts of soil or woodchips from a healthy adjacent site (ibid.). Rather than hand or machine-excavating the more compacted areas, or utilizing an air gun, which would result in further disruption of the soil surface (and further loss of organic matter), it would be preferable to drive vertical stakes made from cut branches into the surface layers. As well as loosening the ground, this method would add lignin to the soil, and help to convey air and water downward. Alternatively, an erosion blanket could be staked over the woodchips in these compacted areas, which would help to stabilize the soil surface (ibid.) Similar recommendations were made by Anderson (2009).

Installing a split-rail fence along the northwest and southeast edges of the site (along the chip trails) would discourage shortcuts through the site, allowing both for passive recovery, and protecting any active restoration in progress. Dorothy Chambers (D. Chambers, personal communication, September 18, 2012) also encouraged the use of split-rail fencing, as temporary fencing would be detrimental to wildlife. Educational signage should be installed along with the fence. Table 9 provides a summary of the project schedule and budget.

[1] Fungi tend to foster acid soil conditions, which favour native species such as conifers, over invasive species such as grasses (Sauer 1998). .

[2] While a deep layer of woodchips can create a growth-suppressing mulch that later floods the area with nutrients, a very thin layer stimulates the development of more complex soil biota, while limiting the rate of nutrient addition. Wood provides a more durable ground cover than herbaceous materials, and promotes the development of a stable litter layer, as lignin has a slow rate of decomposition (Sauer 1998).

Table 9. Project schedule and budget (adapted from sample table in Hebda 2007, p. 120).

Stage	Task	Who	Resources	Budget	Schedule
Establish context	Read background studies Meet with stakeholders Determine site-specific objectives	Saanich Parks staff Friends of Cuthbert Holmes Park	Cuthbert Holmes Park Concept and Management Direction Plan Cuthbert Holmes Park Environmental Review	_____	Jan-Feb 2012
Site inspection	Initial site visit Detailed ground inspection	Julian Anderson Gary Darrah and Becky Goodall	Field guides, forms, tape measure, compass, clinometers, GPS, camera	$150	Mar-May 2012
Data analysis	Calculate stem density and basal area Determine CWD volume	_____	Maps, calculator	$20	May-Jun 2012
Develop plan	Locate funding sources Locate suppliers Visit reference site	Val Schaefer Saanich Parks staff Bernard Hopcraft	Phone, camera	_____	May-Jun 2012
Public outreach	Public open house Playground program RiverSong Event Newsletter articles Progress report	Saanich Parks staff Youth co-ordinator and youth leaders Paula Jardine and Carolyn Knight	Display panels and public questionnaire Room rental Refreshments Pictures, flash cards, Douglas-fir story Tablecloth, tea, cookies, musical instruments Computer	$250 $10 $10 _____ _____	May-Jun 2012 Jul-Aug 2012 Sep-Oct 2012 Sep-Dec 2012 Jan-Feb 2013

	Seminar		Room rental (2 hr) Projector Refreshments	$150	May-Aug 2013
Site restoration	Spread mulch	Cory Manton /Saanich Parks	150 m^3 composted leaves (200 yd)	$8800[1]	Oct-Dec 2012
	Erect sign(s)	Cory Manton /Saanich Parks	45x60cm aluminum sign	$75[2]	
	Erect fence	Cory Manton /Saanich Parks	24 sections two-rail split cedar	$3600[3]	
	Plant shrubs	?	Salal (20)	$200[4]	Oct-Dec 2013
			Oregon-grape(64)	$640[4]	
			Baldhip rose(12)	$120[4]	
			Sword fern(32)	$320[4]	
			Sinocast cones (100@$2.13)	$213[5]	
Monitoring	Plant surveys	?	Forms, measuring tape	$20	Jan-Dec 2013
	Soil testing	MB Labs	Sample containers, penetrometer	$200	
	TAW	?	Forms, clinometer	$20	
	Invasive species	Friends of Cuthbert Holmes	Gloves, loppers	$50	
	Mulch additions	Saanich Parks	75 m^3 composted leaves (100 yd)	$4400	

[1]Based on 2010 price of Super Compost ($44/yd) from Hillside Stone & Garden in Duncan (Milo 2010).

[2]Telephone quote from Alley Kat Signs, Victoria (May 2012).

[3]Based on 2010 price ($150/section) from Fencetera Contracting, Duncan (Milo 2010).

[4]From 2012 price list (1 gal containers), Fraser's Thimble Farms, Saltspring (Fraser and Fraser 2012).

[5]From project costs for Jack Main Quarry Spoil Site (Herriott 2009).

Following the site meeting on June 6, and discussion with Bernard Hopcraft at Victoria Parks on June 7, it was decided to utilize the Beacon Hill site, located near the Children's Playground, as a reference site (Figure 4). This is an area of mature Douglas-fir forest, which has interplantings of some exotic species such as horse chestnut (*Aesculus hippocastanum*), and *Rhododendron* spp. The ground layer consisted

of a sparse lawn, and was highly compacted. A thick layer (15-20 cm) of composted leaves from the City's collection program was spread over the site. Initially, it was necessary to mulch annually (B. Hopcraft, personal communication, June 7). The site was then planted with large sword ferns obtained from logging salvage. Other native species included in the plantings were Oregon-grape, oceanspray, and cascara (*Rhamnus purshiana*). Other than some watering while plantings were becoming established, no further treatments have been necessary, and there has been some natural recruitment at the site.

Figure 4. Reference site, Beacon Hill Park (June 25, 2012).

During the week of October 15-19, Saanich Parks staff spread approximately 25 cm of one-year old leaf mulch from Saanich's leaf collection program over the Cuthbert Holmes site (Figure 5). The mulch had a high concentration of Garry oak (*Quercus garryana)* leaves. Assuming an area of 600 m^2, this represents an addition of 150 m^3 of organic material to the site, or 2500 m^3/ha. It is anticipated that microbial activity occurring over the next 12 months will allow planting to begin in the Fall 2013 (G. Darrah, personal communication, October 24). The additional organic matter should also help to improve the structure of the compacted clay soils on-site.

Figure 5. Project site, northwest quadrant, following mulch application (October 21, 2012).

When utilizing thick mulches, care should be taken in piling it against tree trunks, or over feeder roots. This may interfere with aeration, and encourage disease. Therefore, on the weekend of November 4, and on following weekends, the mulch was pulled back from tree trunks, and away from feeder roots (Figure 6). This also exposed plants in the low shrub layer, which had been buried by the mulch. The Friends of Cuthbert Holmes assisted with this activity. However, the thick layer of mulch should provide an effective cushion from the impact of any foot traffic in the area.

Figure 6. Pulling mulch back from trunk and feeder roots (November 4, 2012).

On November 23, a 45 cm x 60 cm aluminum informational sign was installed on a 6.25 cm (2.5 in) diameter steel post, at the trail intersection on the southwest corner of the site (Figure 7). On December 14, a two-rail split-cedar fence was erected. Eleven sections of three-metre rails were installed along the northwest edge of the area, and 13 sections along the southeast edge. The fencing was zigzagged to enhance aesthetic value (Figure 8).

Figure 7. Informational sign (D. Chambers, November 23).

Figure 8. Split-rail fence, southwest corner, as seen from the footbridge (December 23, 2012).

4.6 Public Open House

The third public open house, hosted by Gary Darrah and Becky Goodall, was well attended. After viewing 16 display panels summarizing the planning process to-date, members of the public were invited to complete a questionnaire on the park vision and management goals. Eighty-seven people signed in, and eighty-four surveys were completed. The on-line survey was available from June 14 to July 18. The general results of the survey were as follows (District of Saanich 2012b):

- The 2012 draft vision for the park received 64% support (Cuthbert Holmes Park is a popular nature park that promotes and demonstrates respect for the natural environment through progressive management and nature-based recreational opportunities).
- Goals were generally supported (Natural Areas Management -86%, Trails-84%, Recreational Opportunities-64%, Safety and Security-87%).
- Voluntary compliance to keep walkers, bikes and pets to trails in sensitive areas was supported (83%, 83%, and 68% respectively).
- 37% supported an active recreation facility outside the sensitive areas (bike skills facility-53%, 44%-playground, informal play space-50%).

- The main reasons for visiting the park are: to walk a dog-67%, run-18%, walk-62%, to appreciate nature-60%, commute-23%, bike ride-24%, other-7%.
- 83% of respondents live within a 15-minute walk from Cuthbert Holmes Park.

However, the dog-walking lobby attempted to organize opposition, as they feared a leash requirement would be imposed in the park (Victoria Dogs 2011).

4.7 Other Outreach Activities

Samples of activities done with the children in the Summer Neighbourhood Playground Program in Meadow Park may be found in Appendix H. There were 12 elementary-aged children participating in the program on the morning of August 10, as well as two adult leaders. An introductory activity was done in Meadow Park (Who am I?), where the children had to guess the identity of various animals found in the park from verbal clues. They were then given pictures of the animals and placed into groups. Next, the groups walked over the bridge, and west along the river path. The habitat of the various animals was pointed out. At a clearing beside the river, the group sat down, and listened to the Fir Cone Story. This version is based on a traditional First Nations story, and was adapted by Lorna Lawson for the Cowichan Valley Docents (Lawson 2011). On the way back, they were given pictures of common trees and plants in the park, and asked to find examples. Before crossing the bridge, the children and leaders stopped at the restoration site. The group then returned to Meadow Park for lunch.

Although only four people attended the RiverSong Event this year, the talents of Paula Jardine and Carolyn Knight contributed greatly to the understanding and appreciation of this urban park, and the river which it borders. Dorothy Chambers reported that a barred owl (*Tyto alba*) had been seen in the area of the footbridge, and that the Cooper's hawks (*Accipiter cooperii)* were roosting in a tree adjacent to the restoration site. Therefore, temporary fencing in this area would be a hazard.

The article on the site (Appendix I), which was submitted to the Gorge Tillicum Neighbourhood News, was published in both the Fall Issue of the News (Milo 2012a), as well as in the Fall Issue of Our Backyard, the District of Saanich's newsletter on the natural environment (Milo 2012b).

5.0 DISCUSSION

5.1 The Dead Wood Cycle

The dead wood cycle refers to the process of tree death, tree fall, and decay in the forested ecosystem. It begins with live, healthy trees, and ends with their incorporation into the soil organic horizon (Lofroth 1998). As trees are the most significant structural features of forests, changes to trees during this process may affect many other forest components and functions. In coastal ecosystems, approximately 17% of all ecosystem organic matter is found within logs (CWD) and standing dead trees (snags). Recruitment of snags from CWD is influenced by slope, aspect, rooting substrate, site moisture and nutrient conditions, tree species, and causes of mortality. These factors also influence the longevity of snags and CWD. Deadwood has many important ecological functions. It provides habitat for

invertebrate, vertebrate, and plant species. It also affects soil erosion, slope movement, and nutrient capture and retention. It may also serve as a water reservoir in times of drought (Sauer 1998).

It is clear that the dead wood cycle has been disrupted at the Dysart Street site. Repeated trampling by people, dogs, and bicycles over the years has resulted in the loss of groundcover, and inhibition of natural recruitment, as evidenced by the patchy distribution of vegetation in the shrub and herb layers, and the exposure of mineral soil layers. The density of live trees at this site is relatively high: 771.6 trees/ha, or approximately 1 tree per 10 m^2. The basal area is somewhat lower than would be expected (105.88 m^2/ha), with the mean basal area being influenced being by the presence of younger grand firs having diameters of 15 cm or less. The volume of CWD is very low: 53.1 m^3/ha. Lofroth (1998) reports the volume of CWD is lower on drier sites, with 210 m^3/ha being typical for dry-site Douglas-fir stands. CWD volumes also vary with successional stage: volumes are lowest in 60-80 year-old forests (close in age to the study site, estimated at 80-100 years). Furthermore, most of the CWD on the restoration site originates elsewhere, having been brought to the Dysart Street location by the Friends of Cuthbert Holmes, in an attempt to slow runoff from the site. (D. Chambers, personal communication, September 28, 2012).

The Tree Attributes for Wildlife Assessment reveals that this stand is relatively healthy, most trees falling into Decay Classes 1 or 2. Trees in these classes are attractive to Open Nesters such as Ospreys (*Pandion haliacetus*), Bald Eagles, and Great Blue Herons, or cavity excavators such as woodpeckers (Wildlife Tree Committee of British Columbia 2001). All of these species utilize Cuthbert Holmes Park for nesting, roosting, and feeding. Some trees, however, are showing signs of stress; possibly as a result of soil erosion and compaction due to overuse of the area, and should be regularly monitored. Urban trees in general are subject to greater stress than elsewhere, and therefore tend to have shorter lifespans (Schaefer 2004). None of the trees included in this assessment could be classified as “danger” trees. The minimum DBH cut off for this assessment was 15 cm, although some species, such as osprey, require trees 50 cm DBH or greater (Fenger et al. 2006). Only three of the trees surveyed actually met this criterion. Several of the species in the open nesting guild, such as the Great Horned Owl, interact indirectly by utilizing the abandoned nests of other species such as the Great Blue Heron or Cooper’s Hawk. The hawks and owls that depend on wildlife trees perform a critical balancing function in forested ecosystems by preying on small animals that strip bark, and eat conifer seedlings and seeds. Open nesters are sensitive to disturbance during the courtship period (ibid.).

5.2 Compacted Soils

Soil compaction has resulted from unrestricted access to the site. Compacted soils serve as barriers to root growth, inhibit the exchange of atmospheric gases, and restrict the infiltration of water. In combination with airborne pollutants and hydrophobic substances, an impermeable surface crust is formed on compacted soils (Sauer 1998). Compacted soils may also aggravate fungal root diseases (Brady and Weil 2008), and encourage the growth of invasive species (Westland Resource Group 2011). The split-rail fence which has been installed should help to discourage “shortcuts” through the site. In addition, trails should be monitored and repaired on a regular basis, and any unauthorized trails should be decommissioned promptly. The desirability of constructing new trails to improve park access, and to

protect sensitive areas, should be determined through public consultation. Maintenance activities should be scheduled so as to minimize soil disturbance, especially to wet soils.

The soils of Cuthbert Holmes Park belong to the Saanichton and Cowichan series. These are clays and clay loams developed on fine-textured marine materials. Saanichton soils are well-drained, as is the case on the study site, while Cowichan soils are poorly drained. A profile of a Saanichton clay may be seen in Appendix B. Saanichton soils have a dark-coloured A horizon consisting of dark brown, permeable clay, overlying a B horizon of yellowish-brown, subangular blocky permeable clay. The C horizon is a pale brown, very slowly permeable marine clay. A moder humus layer is present on the soil surface (Milo 2012c). In some parts of the Dysart Street site, the yellowish-brown B horizon has been exposed. Since the organic horizon is typically 2-3 cm thick, and the upper mineral layers (A horizon and upper B horizon) are about 15 cm thick, this represents a loss of more than 15 cm of material. Insuring that the larger pieces of CWD on-site are oriented perpendicular to the slope can slow the loss of soil and organic materials from the area, and provide pockets for planting or natural recruitment.

Fine-textured soils such as the Saanichton and Cowichan series are subject to compaction, especially when wet. These soils tend to have low bulk densities: 0.5-1.00 g/cm^3 for the A horizon, 1.1-1.3 g/cm^3 for the B horizon, and 1.4-1.5 cm^3 for the C horizon. Soils with lower bulk densities have higher porosities, and therefore a greater ability to hold water. Ideal bulk densities for plant growth in clay soils are < 1.10 g/cm^3, while critical bulk densities (densities above which root growth is restricted) are in the 1.4-1.6 range. Soil bulk densities on the site should therefore be monitored, along with soil strength. Saanichton soils are among the most drought-resistant in the area, having relatively high moisture-holding capacities. However, soil strength is higher in dry soils, and soils are considered to be too dry for normal root growth when soil strength values exceed 2,000 kPa (Milo 2012c).

5.3 Use of Mulches

Mulch is any layer of protective material which is spread over the soil surface. It may or may not be biodegradable. Mulches may serve one or more of the following purposes: (1) reduce soil moisture loss through evaporation, (2) help to reduce and suppress weeds, (3) modify or stabilize soil temperature, (4) improve soil tilth, and (5) improve soil nutritional quality. Only biodegradable mulches can contribute to the last two functions. Spreadability, availability, and appearance may influence the choice of material (Lovejoy 2003). Leaf mulches are especially important in woodlands, which rely on the nutrients stored in foliage to maintain fungal dominance in the soil. Mulches containing pine needles can help to buffer alkaline soils. However, thick layers of needles form water-shedding mats that lead to bone-dry soils. Wood by-products are inexpensive and readily available. However, they have high C/N ratios, and can deplete soil nitrogen levels initially.[3] This is known as the nitrate depression period, and lasts until the C/N ratio falls; anywhere from a few days to several months.

[3] For example, spruce sawdust has a C/N ratio of 600:1, in contrast with maple leaf litter, which has a C/N ratio of 34:1. Young alfalfa hay has a C/N ratio of 13:1. Cultivated soils have C/N ratios near 12:1, while forest O horizons are commonly 30 or 40:1 (Brady and Weil 2008). The Saanichton Ah horizon C/N ratio is 20:1 (Day et al. 1959). Managing the large amounts of carbon stored in soil organic matter may be important in mitigating the global greenhouse effect (Brady and Weil 2008).

Planting should be delayed, or additional nitrogen added, in order to avoid chlorosis and stunting (Brady and Weil 2008).[4] In addition, wood products may increase the likelihood of many common root rots and fungal problems, especially in moist clay soils (Lovejoy 2003). Whatever the source of materials, care should be taken to avoid contamination by heavy metals and other toxins.

The addition of 25 cm of composted leaf mulch to the restoration site represents the addition of approximately 2500 m^3/ha of organic matter, or 50 times the amount present in the CWD on-site. In a natural setting, it is desirable to try to re-create, in both quantity and quality, the leaf and litter drop typical of local forests.[5] 25 cm is a very thick mulch: 10-15 cm would be more typical. It is preferable to err on the side of caution and use less material initially e.g. 4 or 5 cm. The rate and completeness of litter decomposition is largely the result of microbial activity, but is also influenced by the composition and activities of the soil fauna, which in turn are related to environmental (mainly climatic) conditions, and the chemical and physical properties of the litter. In British Columbia, moisture is more limiting than temperature for litter decomposition, likely as a result of the maritime influence, and considerable variation in topography (Prescott et al. 2004). The rate of decomposition should be monitored, and the annual addition of new materials adjusted accordingly.

In addition, thick mulches tend to be suppressive mulches, inhibiting the growth of existing vegetation on-site. In the case of invasive species this is desirable; however, this site still has an active seed bank of native species. For example, broad-leaved starflower (*Trientalis latifolia*) was observed near the northeast boundary of the site (Appendix D), and rattle-snake plaintain (*Goodyera oblongiolia*) has also been observed in the area (J. Anderson, personal communication, October 20, 2012). While neither of these species is considered to be at risk (Westland Resource Group 2011), it is desirable to maintain the existing native plant cover. It may be a good idea to include some of these species in the planting program. Also, invasive species and pathogens may be brought in with mulching materials, although composting kills most of these organisms. Where possible, it is preferable to use organic materials and woody debris recycled from on-site, or at least in-park (Sauer 1998).

5.4 Public Perceptions

The results of the third Public Open House and Survey confirm that the majority of local residents continue to value the natural attributes of Cuthbert Holmes Park, and support management efforts aimed at maintaining these values. However, a vocal minority fears any restrictions on park access, and there concerns will need to be addressed as the Park Concept and Management Plan is finalized.

Response from the children (and leaders) in the Meadow Park Summer Program to activities during Nature Week was enthusiastic. They especially enjoyed the story of the mice and the Douglas-fir cones.

---

[4] However, urban soils in general have higher rates of nitrogen mineralization, and higher rates of decomposition, most likely as a result of changes brought about by nitrogen deposition i.e. an increase in the abundance of bacteria in the soil and litter, combined with reductions in fungal and invertebrate populations (Sauer 1998). Therefore, extreme caution should be exercised in the use of inorganic fertilizers. As well as fostering bacterial and earthworm (*Lumbricus terrestris)* populations, high levels of nitrogen also favour the growth of invasive over native plant species, and the enriched runoff contributes to the eutrophication of watersheds (ibid.).

[5] This site is notable for its lack of deciduous trees, although some deciduous shrubs are present.

After a morning of being introduced to the park and its residents, they did not need any prompting to recognize that the area by the Dysart Street Bridge was not a complete forest. Positive activities relating to Cuthbert Holmes Park should be part of future Summer Neighbourhood Playground Programs, and ways should be found to involve the children (and their parents) in restoration events.

Although the RiverSong Event this fall was modest in scale, it is invaluable in fostering knowledge about, and a concern for, the Colquitz River and the communities that it connects. Many passersby that afternoon stopped to ask questions, and to share information. This event should be continued, if at all possible.

The articles in the Gorge Tillicum Neighbourhood News, and in Our Backyard, were well-read. There were many favourable comments from visitors to the restoration site, and fall restoration events sponsored by the Friends of Cuthbert Holmes Park were well-attended . Educational signage should be installed at this (and other) restoration sites in the park, and continued efforts should be made to involve the public in future restoration events.

5.5 Sources of Error

The standard plot area for field description and statistical analysis is 20 m x 20 m or 400 m^2 (Antos 1997). The study plot was approximately 50% larger (600 m^2), and irregular in shape. However, the area was relatively uniform in terms of biophysical properties, with gradation into adjacent Site Series along the northeast and southwest boundaries. It is also recommended that the soil pit be at least 40-50 cm deep, so as to access the C horizon (Resources Inventory Committee 1998). The soil pit used in this analysis was about half this depth (20-25 cm), which on this site would reach only to the lower B horizon (Milo 2012c).

A single transect was used for the point-centered quarter method, yielding 6 sample points, or 24 trees in total. It would have been preferable to use 3 or more transects (at 10 m intervals), which would provide a more even spacing of sample points, and more trees in the sample (> 50). Also, the point-centered quarter method is most applicable to species with random distributions: it should not be applied to single species in mixed stands, but only to all species at once (Antos 1997).

The volume of CWD was estimated by running transects at 5 m intervals from the baseline. CWD was unevenly distributed over the site, so it was difficult to get an accurate estimate of the actual amount present. An alternative sampling method is given in the Field Guide for Sampling Terrestrial Ecosystems (Resources Inventory Committee 1998).

The DBH cut-off for Wildlife Trees in this study was 15 cm. However, for some species, such as the Bald Eagle (*Haliacetus leucocephalus*), which require trees > 20 cm, this may be inadequate (Resources Inventory Committee 1998).

6.0 RECOMMENDATIONS

1. The planting program should be carried out as soon as is feasible. This will help to stabilize the site, and will contribute to nutrient cycling. It is also a good opportunity to involve the public in the restoration of the site. The addition of native herbaceous species should also be considered.
2. Annual site surveys should be carried out, in order to estimate rates of natural recruitment, as well as the success of planting programs (% mortality). Species composition also provides an indicator of soil conditions, as well as habitat quality.
3. Tree health (TAW) should also be assessed annually, as this is an important indicator of site health, as well as success of restoration activities. Wildlife trees identified in the annual survey should be marked (Fenger et al. 2006, p. 77). A useful guideline is to leave 3 to 5 standing dead trees per acre (7 to 12 trees per hectare) for wildlife (Sauer 1998).
4. Ensure that larger pieces of CWD remain on-site, and that they are oriented horizontally to the slope. This will assist in creating soil pockets for planting and natural recruitment, as well as serving as nutrient and water reservoirs. Large logs (greater than 30 cm in diameter, and greater than 6 m in length), are especially valuable to forest-floor creatures such as salamanders (Sauer 1998).
5. The volume of organic material remaining on the soil surface should be monitored. Although organic material provides a key source of nutrients, and contributes to moisture retention and soil structure, thick humus layers may actually function as a nutrient sink, competing with trees for this growth-limiting resource (Prescott et al. 2000). Also, greatly-increased nitrogen mineralization may lead to a shortage of other nutrients such as P and K, especially in acid soils (ibid.). Therefore, in addition to periodically assessing the physical condition of the soil on site (bulk density and soil strength), basic soil testing should be carried out to measure pH, and levels of essential nutrients such as N, P, and K. The A horizon pH range for Saanichton clays, which belong to the Acid Dark Brown, or Ortho Sombric Brunisol Soil Group (Soil Classification Working Group 1998), is typically 6.0-6.2, and for the B horizon, 5.3-5.8 (Day et al. 1959). These soils are also well-supplied in total phosphorous in both the A and B horizons (0.16 and 0.14 % respectively), while the nitrogen levels in the B horizon are slightly low (0.14% versus 0.34% in the A horizon). Microbial assays, and tests for the presence of toxins such as heavy metals, would also be helpful (Lovejoy 2003).
6. Schedule maintenance activities so as to minimize disturbance to the site i.e. confine vehicular traffic to established roads and trails, and avoid working on wet soils as much as possible.
7. Monitor site for appearance of invasive species, and remove promptly. This is another good opportunity to involve the public in park stewardship. Regular events are scheduled throughout the winter months by the Friends of Cuthbert Holmes Park.
8. Consider installing “boot brushes” at the main park entrances and exits to minimize transport of invasive species propagules in and out of the park (Sonflieth 2012).
9. Install educational signage at this site, and at other restoration sites in the park.
10. Continue and expand outreach activities to park user groups, such as the Saanich Summer Neighbourhood Program, and local schools. Special events such as RiverSong help to provide a focus on the park and its issues.

7.0 CONCLUSIONS

Cuthbert Holmes Park has traditionally been an area of majestic Douglas-fir forests, and rich natural resources. In recent times, it has been valued by local residents for its recreational opportunities. The public consultation process, leading up to the development of a Park Concept and Management Plan, has affirmed the need to preserve and restore the park's natural values, as well as ensure the safety and security of all park users.

The restoration site, situated at the Dysart Street footbridge, occupies a high-visibility location in Cuthbert Holmes Park. It is also a natural meeting-place, as two park trails intersect at the bridge. It was therefore important that the restoration approach chosen have aesthetic appeal (Goal 3), as well as being technically sound, and honouring the wildlife values of the park. This restoration has enhanced the function of the area as a meeting place (Goal 4). Comments received from the public have been favourable, regarding the appearance of the restoration site. Liability and maintenance issues are also of concern. No fence can totally restrict access to a given area. The leaf mulch and split-rail fence pose little or no risk to the public, and are resilient to disturbance. The area requires minimal attention from Saanich Parks staff, and the Friends of Cuthbert Holmes Park. It is hoped that this forested area will provide enjoyment for years to come, and shelter and protect the Colquitz River, as well as the many communities which depend on it.

ACKNOWLEDGMENTS

Jenny Eastman, Co-ordinator of Volunteers for Saanich's Pulling Together Volunteer Program, for pointing me in the direction of Cuthbert Holmes Park,

Gary Darrah, Becky Goodall, and Cory Manton, from Saanich Parks and Recreation, for their advice and guidance, and for making this project a reality,

Julian Anderson, Dorothy Chambers, and the Friends of Cuthbert Holmes Park, for generously sharing their knowledge of the park, and for their tireless efforts in protecting its ecological integrity,

Bernie Hopcraft, from Victoria Parks, for providing me with information on ecological restoration in Beacon Hill Park,

Hovey Eyres and the kids at Meadow Park, for welcoming me into their Summer Neighbourhood Playground Program, and Jason Jones and Jen Swailes, for making it possible,

Carolyn Knight and Paula Jardine, artistes extraordinaires, for inviting me to the RiverSong Event in the park,

Dr. Val Schaefer, and the other instructors in the RNS Program, for providing me with an abundance of learning opportunities!

Funding for this project was provided by the District of Saanich.

REFERENCES

Anderson, Julian. 2003a. *A Field Study in the Coastal Douglas-fir Ecosystem in Cuthbert Holmes Park.* Unpublished manuscript, ER 312 A, University of Victoria.

Anderson, Julian. 2003b. *A Terrestrial Ecosystem Mapping Exercise in Cuthbert Holmes Park.* Unpublished manuscript, ER 312B, University of Victoria.

Anderson, Julian. 2009. *Towards a Restoration Plan for Cuthbert Holmes Park.* Unpublished manuscript, ER 328, University of Victoria.

Antos, J. 1997. Plant ecology field lab. In V. Schaefer, ed., *Field Study in Ecological Restoration I: Course Readings*, pp. 48-53. Victoria, BC: UVic Printing Services.

Brady, N. C., and R. R. Weil. 2008. *The Nature and Properties of Soils.* 14th edition. Upper Saddle River, NJ: Pearson-Prentice Hall.

Chambers, D. 2012, Spring. Catastrophe in the Colquitz Watershed. *Gorge Tillicum Neighbourhood News,* pp. 1, 3.

Day, J. H., L. Farstad, and D.G. Laird. 1959. *Soil Survey of Southeast Vancouver Island and Gulf Islands, British Columbia.* Report No. 6 of the British Columbia Soil Survey 1959. Ottawa, ON: Canadian Department of Agriculture.

Dickson, L. 2007, October 25. Saanich police hit dealers in teen overdoses. *Victoria Times Colonist.* [online]. [cited January 10, 2013]. http://www.canada.com/victoriatimescolonist/news/capital_van_isl/story.html?id=eae427fb-415c-4e3a-9a4d-dfc6b5862494.

District of Saanich. 2008. Informed Consent/Permission Form.

District of Saanich. 2010. Current Projects: Cuthbert Holmes Park. [online]. [cited June 15, 2012]. http://www.saanich.ca/parkrec/parks/projects/current/cuthbert.html.

District of Saanich. 2011. *Saanich Pulling Together Volunteer Manual.* [online]. [cited February 6, 2013]. http://www.saanich.ca/living/environment/pdf/volunteer/PullingTogetherVolunteerProgramManual.pdf.

District of Saanich. 2012a. Current Projects: Cuthbert Holmes Park. [online]. [cited January 2, 2013]. http://www.saanich.ca/parkrec/parks/projects/current/cuthbert.html.

District of Saanich. 2012b. Cuthbert Holmes Park Open House Survey: June 2012. [online]. [cited January 2, 2013]. http://www.saanich.ca/parkrec/parks/projects/current/pdf/CuthbertHolmesSurveySummary.pdf.

District of Saanich. 2012c. Dogs in Parks. [online]. [cited January 2, 2013]. http://www.saanich.ca/parkrec/parks/parks/dog.html.

District of Saanich GIS Map Service. 2012a. Internet Mapping Framework. 1:86,846. [online]. [cited February 15, 2013]. http://www.saanich.ca/services/gis/index.html.

District of Saanich GIS Map Service. 2012b. Internet Mapping Framework. 1:5,428. [online]. [cited February 15, 2013]. http://www.saanich.ca/services/gis/index.html.

Fenger, M., T. Manning, J. Cooper, S. Guy, and P. Bradford. 2006. *Wildlife and Trees in British Columbia.* Edmonton, AB: Lone Pine Press.

Fraser, R., and N. Fraser. 2012. *Fraser's Thimble Farms 2012 Catalogue.* [online]. [cited May 18, 2012]. http://www.thimblefarms.com/2012fraserthimblefarmPDF.pdf.

Gorge Waterway Initiative. 2007a. *GWI Infosheet: Wings Over the Gorge.* [online]. [cited January 15, 2013]. http://www.gorgewaterway.ca/initiatives-projects/documents/BIRDSINFOSHEETfinal.pdf.

Gorge Waterway Initiative. 2007b. *GWI Infosheet: Fish of the Waterway.* [online]. [cited January 15, 2013]. http://www.gorgewaterway.ca/initiatives-projectsdocuments/FISHINFOSHEETfinal.pdf.

Gorge Waterway Initiative. 2008. *GWI Infosheet: First Peoples of the Waterway.* [online]. [cited January 15, 2013]. http://www.gorgewaterway.ca/initiatives-projects/documents/FIRSTNATIONSINFOSHEETPRINT.pdf.

Green, R. N. and K. Klinka. 1994. *A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region.* Victoria, BC: B.C. Ministry of Forests, Land Management Handbook No. 28.

Habitat Acquisition Trust. 2006. *Colquitz River Enhancement Project.* [online]. [cited January 16, 2013]. http://www.hat.bc.ca/attachments/2005%20HAT%20GNC%20final%report.pdf.

Hawthorn, T. 2012, July 8. Herons return to heart of Victoria. *The Globe and Mail.* [online]. [cited January 10, 2013]. http://www.theglobeandmail.com/news/british-columbia/herons-return-to-heart-of-victoria/article4398718/.

Hebda, R. 2007. *ER 311: Principles and Concepts of Ecological Restoration.* Victoria, BC: University of Victoria.

Herriott, D. 2009, February 11. Jack Main Quarry Spoil Site – Planting Plan. Victoria, BC: CRD Watershed Protection Division.

Holmen, R. 2012, July 8. Herons making a strong comeback in Beacon Hill Park. *Victoria News.* [online]. [cited January 10, 2013]. http://www.victorianews.com/news/161745935.html.

Iredale, J. 2000. *Coast Salish Collections: Archaeology and Ethnology of the Gulf of Georgia.* Victoria, BC: Heritage Branch, Ministry of Forests, Province of British Columbia. [online]. [cited January 14, 2013]. http://www.bcheritage.ca/salish/pH2/map/lekwungen.htm.

Lavoie, J. 2012, November 9. Colquitz River in Saanich hit by third oil spill in year. *Victoria Times Colonist.* [online]. [cited January 16, 2012]. http://www.timescolonist.com/news/colquitz-river-in-saanich-hit-by-third-oil-spill-in-year-1.8296.

Lawson, L. 2011. Fir cone story. Cowichan Valley Docents – adapted from a traditional First Nations story.

LEES + Associates. 2010. *Saanich Urban Forest Strategy.* Victoria, BC: District of Saanich.

Lofroth, E. 1998. The dead wood cycle. In R. Hebda, ed., *Forest Restoration and Sustainable Forestry: Course Readings,* pp. 137-152. Victoria, BC: UVic Printing Services.

Lovejoy, Ann. 2003. *The Ann Lovejoy Handbook of Northwest Gardening.* Seattle, WA: Sasquatch Books.

Manton, C., and V. Schaefer. 2012. *Invasive Species Management Strategy Draft.* Victoria, BC: District of Saanich.

Meidinger, D., and J. Pojar. 1991. *Ecosystems of British Columbia.* Victoria, BC: B.C. Ministry of Forests, Special Report Series, 6.

Milo, C. 2010. *Assignment 2: Design for a Schoolyard Native Plant Garden.* Unpublished manuscript, ER 332, University of Victoria.

Milo, C. 2012a, Fall. Restoration in Cuthbert Holmes Park. *Gorge Tillicum Neighbourhood News,* p.5.

Milo, C. 2012b, Fall. Restoration in Cuthbert Holmes Park. *Our Backyard,* p.7.

Milo, C. 2012c. *Soil Disturbance: Victoria Region Parks.* Unpublished manuscript, ER 334, University of Victoria.

Minaker, D. 1998. *The Gorge of Summers Gone: A History of Victoria's Inland Waterway.* Victoria, BC: Desktop Publishing.

Minaker, D. 2010, Spring. Of Days Gone By. *Gorge Tillicum Neighbourhood News*, p. 7.

Montgomery, D. R. 2007. *Dirt: The Erosion of Civilizations.* Berkley, CA: University of California Press.

Orchard, I. 1962, May. Henry Cuthbert Holmes Interview. *Imbert Orchard Collection* (BCARS T0337:0001). Ottawa, ON: Canadian Broadcasting Corporation (Sound Recording : Ian Stephen).

Pojar, J., and A. MacKinnon. 1994. *Plants of Coastal British Columbia.* Edmonton, AB: Lone Pine Publishing.

Prescott, C. E., D. G. Maynard, and R. Laiho. 2000. Humus in boreal forests: Friend of foe? *Forest Ecology and Management* 133: 23-36.

Prescott, C. E., L. L. Blevin, and C. Staley. 2004. Litter decomposition in British Columbia forests: Controlling factors and influences of forestry activities. *BC Journal of Ecosystems and Management* 5(2): 44-57.

Redpath Museum. 2012. Great blue heron. Montreal, QC: McGill University. [online]. [cited July 9, 2012]. http://redpath-museum.mcgill.ca/Qbp/Images/Birds/blue%20heronU.jpg.

Resources Inventory Committee. 1998. *Field Manual for Describing Terrestrial Ecosystems.* Victoria, BC: B.C. Ministry of Environment, and B.C. Ministry of Forests, Land Management Handbook No. 25.

Saanich Parks. 2011. *Cuthbert Holmes Park Concept and Management Direction Plan Discussion Paper.* Victoria, BC: District of Saanich.

Sauer, L. J. 1998. *The Once and Future Forest: A Guide to Forest Restoration Strategies.* Washington, DC: Island Press.

Schaefer, V., H. Rudd, and J. Vala. 2004. *Urban Biodiversity: Exploring Natural Habitat and Its Value in Cities.* Concord, ON: Captus Press.

Shaw, R. F. 2008, June 20. Saanich police use helicopters to spot homeless in parks. *Victoria Times Colonist.* [online]. [cited January 10, 2013]. http://www.canada.com/story_print.html?id=362318f6-3510-4a40-b9cf-60267c03c818&sponsor=.

Soil Classification Working Group. 1998. *The Canadian System of Soil Classification.* 3rd edition. Ottawa, ON: Agriculture and Agri-Food Canada, Research Branch, Publication 1646.

Sonflieth, T. (Videographer). 2012. Cattle drives, Gorge weeds, Timberline 75th [2403]. In J. Gilfillan (Producer), *Oregon Field Guide.* Portland, OR: Oregon Public Broadcasting.

Thomson, G. R. 1999. *Ecological Description of a Site in Cuthbert Holmes Park, Victoria, BC.* Unpublished manuscript, ER 312B, University of Victoria.

Tryon, Cory. 2011. *Ecological Evaluation of Cuthbert Holmes Park, Victoria, BC.* Unpublished manuscript, ER 312B, University of Victoria.

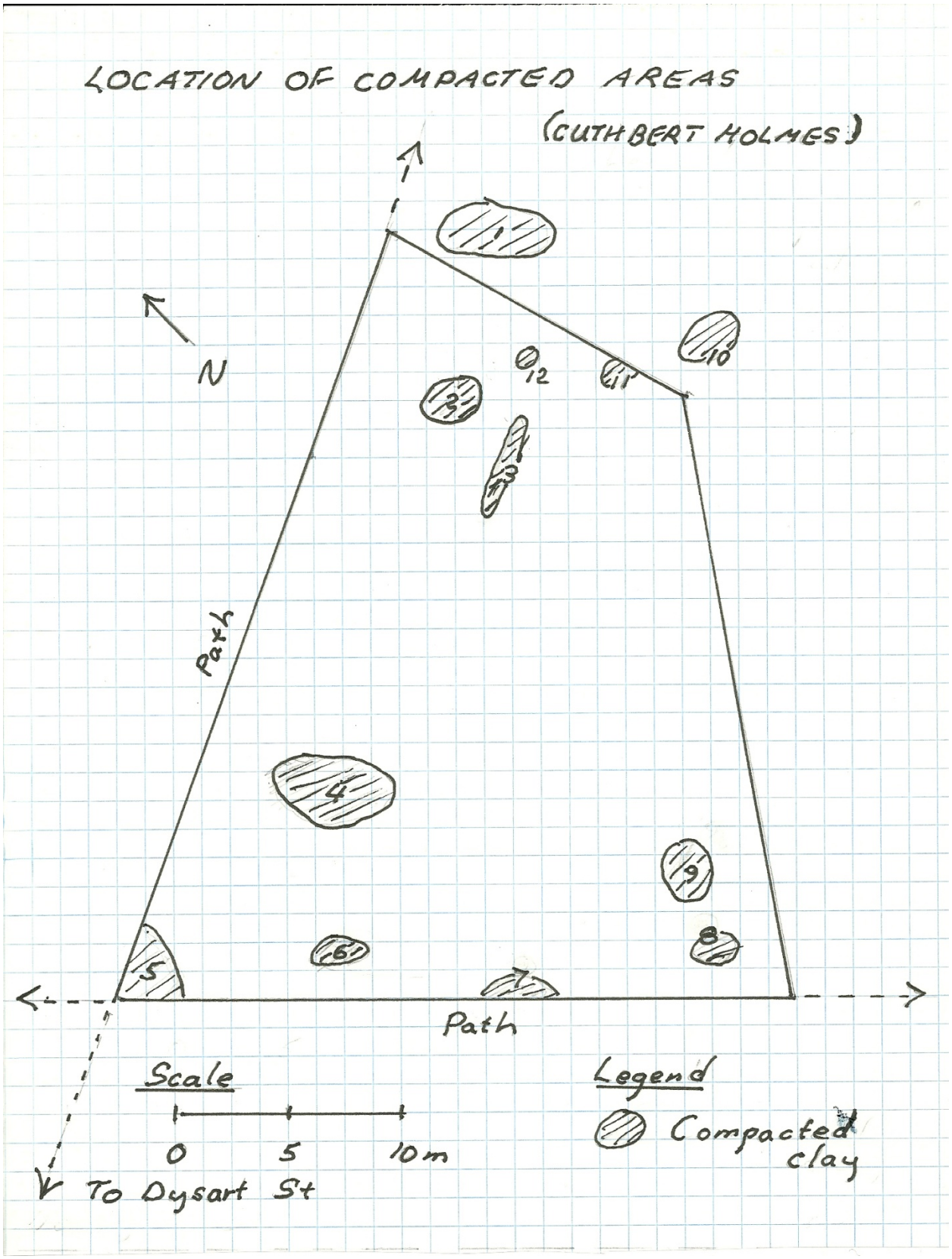
Victoria Dogs. 2011, June 12. Dogs in Cuthbert Holmes Park. [online]. [cited January 2, 2013]. http://victoriadogs.com/?p=2158.

Victoria Fish and Game Protective Association. 2007. *Colquitz River Counting Fence.* [online]. [cited January 16, 2013]. http://www.vfgpa.org/conservation.html.

Westland Resource Group. 2011. *Cuthbert Holmes Park Environmental Review: Final Report.* Victoria, BC: District of Saanich.

Wildlife Tree Committee of British Columbia. 2001, June. *Wildlife/Danger Tree Assessor's Course Workbook: Forest Harvesting and Silviculture Module.* Victoria, BC: Workers, Compensation Board of British Columbia, Forest Service of British Columbia, and B.C. Ministry of Water, Land and Air Protection.

APPENDIX A – LOCATION OF COMPACTED AREAS


LOCATION OF COMPACTED AREAS
(CUTHBERT HOLMES)
N
Path
Path
Scale
0
5
10m
Legend
Compacted clay
To Dysart St

APPENDIX B – SOIL PROFILE

(Milo 2012c)

FIGURE 4: SAANICHTON SERIES PROFILE
(Orthic Sombric / Gleyed Sombric Brunisol)

Horizons		Depth (cm)	Comments
A_0	LFH	2.54-0	Semi-decomposed layer - needles, twigs, leaves (pH 6.2)
A_1	Ah	0-5.08	V. dark gray br (10YR 3/2) clay loam, str to mod granular, worm casts. Friable, gravel (pH 5.9).
B_1	Bm	5.08-15.24	Brown (10YR 4/3 m) clay - mod med/coarse subangular blky, worm holes, concretions (pH 5.8)
B_2	(Bf; gj)	15.24-27.94	Yellowish br (10YR 5/4 m) clay - subang blky, friable, sl. hard. Many roots, gravel - iron oxides (pH 5.7)
B_3	(Bmgj)	27.94-48.26	Light br gray (2.5Y 6/2 m) clay. Amorphous to weak blky, firm, hard (pH 5.3)
C_1	C_g	48.26-76.20	Pale br (10YR 6/3 m) mottled clay, amorphous plastic, hard (pH 5.1).
C_2		76.20+	Pale br (10YR 6/3 m) amorphous clay, weak stratification (pH 5.3)

APPENDIX C – GROUND INSPECTION FORM

BRITISH COLUMBIA — GROUND INSPECTION FORM

G ☑ vs V ☐	PHOTO BCC9700/N0044	X: -	Y: -	DATE 12-03-16
PROJECT ID. CUTHBERT HOLMES		SURV. C. M:lo		
MAP SHEET 92B 043		PLOT # (1)		POLY. # (1)
UTM ZONE 10	LAT. / (NORTH) 5367084		LONG. / (EAST) 0470193	
ASPECT 210°		ELEVATION 3 m		
SLOPE 9-10 %	SMR 3-4		SNR R	

MESO SLOPE POSTION	☐ Crest	☒ Mid slope	☐ Depression	
	☐ Upper slope	☐ Lower slope	☐ Level	
		☐ Toe		
DRAINAGE - MINERAL SOILS	☐ Very rapidly	☒ Well	☐ Poorly	
	☐ Rapidly	☐ Mod. well	☐ Very poorly	
		☐ Imperfectly		
~~MOISTURE~~ SUBCLASSES - ORGANIC SOILS	☐ Aqueous	☐ Aquic	☐ Perhumid	
	☐ Peraquic	☐ Subaquic	☐ Humid	
MINERAL SOIL TEXTURE	☐ Sandy (LS,S)		☐ Silty (SiL,Si)	
	☒ Loamy (SL,L,SCL,FSL)		☐ Clayey (SiCL,CL,SC,SiC,C)	

~~ORGANIC SOIL TEXTURE~~ ☐ Fibric ☐ Mesic ☐ Humic	SURF. ORGANIC HORIZON THICKNESS ☒ 0–40 cm ☐ > 40 cm
HUMUS FORM ☐ Mor ☒ Moder ☐ Mull	ROOT RESTRICTING LAYER NONE Depth _____ cm Type _____
COARSE FRAGMENT CONTENT ☒ < 20% ☐ 20–35% ☐ 35–70% ☐ > 70%	

TERRAIN

COMPONENT: TC1 ☒ TC2 ☐ TC3 ☐

TERRAIN TEXTURE	SURFICIAL MATERIAL	SURFACE EXPRESSION	GEOMORPH PROCESS
1 C	1 F	1 j	1 I
2	2	2	2

ECOSYSTEM

COMPONENT: EC1 ☒ EC2 ☐ EC3 ☐

BGC UNIT CDFmm	ECOSECTION NAL
SITE SERIES 0G(04)	SITE MODIFIERS —
STRUCTURAL STAGE 6/tC	CROWN CLOSURE 75 %

ECOSYSTEM POLYGON SUMMARY

	%	SS	SM	ST
EC1	100	0G	—	6/tC
EC2				
EC3				

TERRAIN POLYGON SUMMARY

	%	Classification
TC1	100	cFj - I
TC2		
TC3		

DOMINANT / INDICATOR PLANT SPECIES

TOTAL %	A: 85	B: 20	C: 30	D: 5

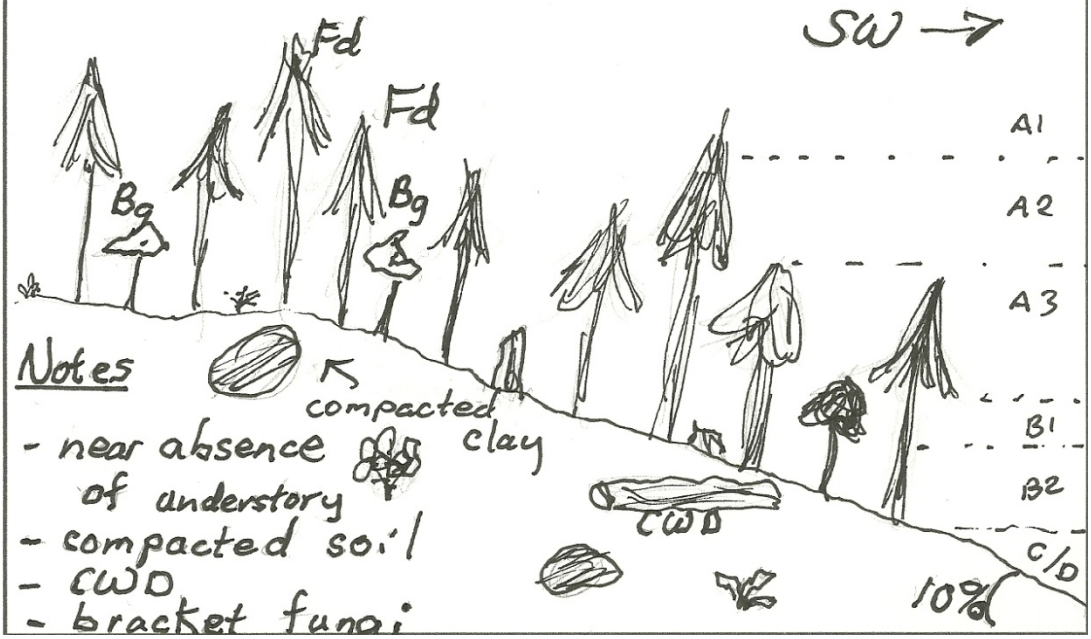
L.	SPECIES	%	L.	SPECIES	%	L.	SPECIES	%
A1	PSEUMEN	10	C	HELIHED	20	D	KINDORE	5
A2	PSEUMEN	80	C	SANICRA	10	D	RHYTRI	2
A3	ABIGRA	5	C	RUBURS	5			
			C	PTERAQU	2			
B1	ABIGRA	5	C	POLYMUN	<1			
B1	SYMPALB	5	C	GALIAPA	2			
B1	ROSAGYM	<1	C	CERAARV	2			
B1	CRATAMON	<1	C	LACTMUR	<1			
			C	LACTMUR	<1			
B2	GAULSHA	10	C	TARAOFF	<1			
B2	MAHONER	5	C	TRIGLAT	2			
B2	DAPHLAU	<1	C	POACEAE SPP	5			

COMPLETE ☒ PARTIAL ☐

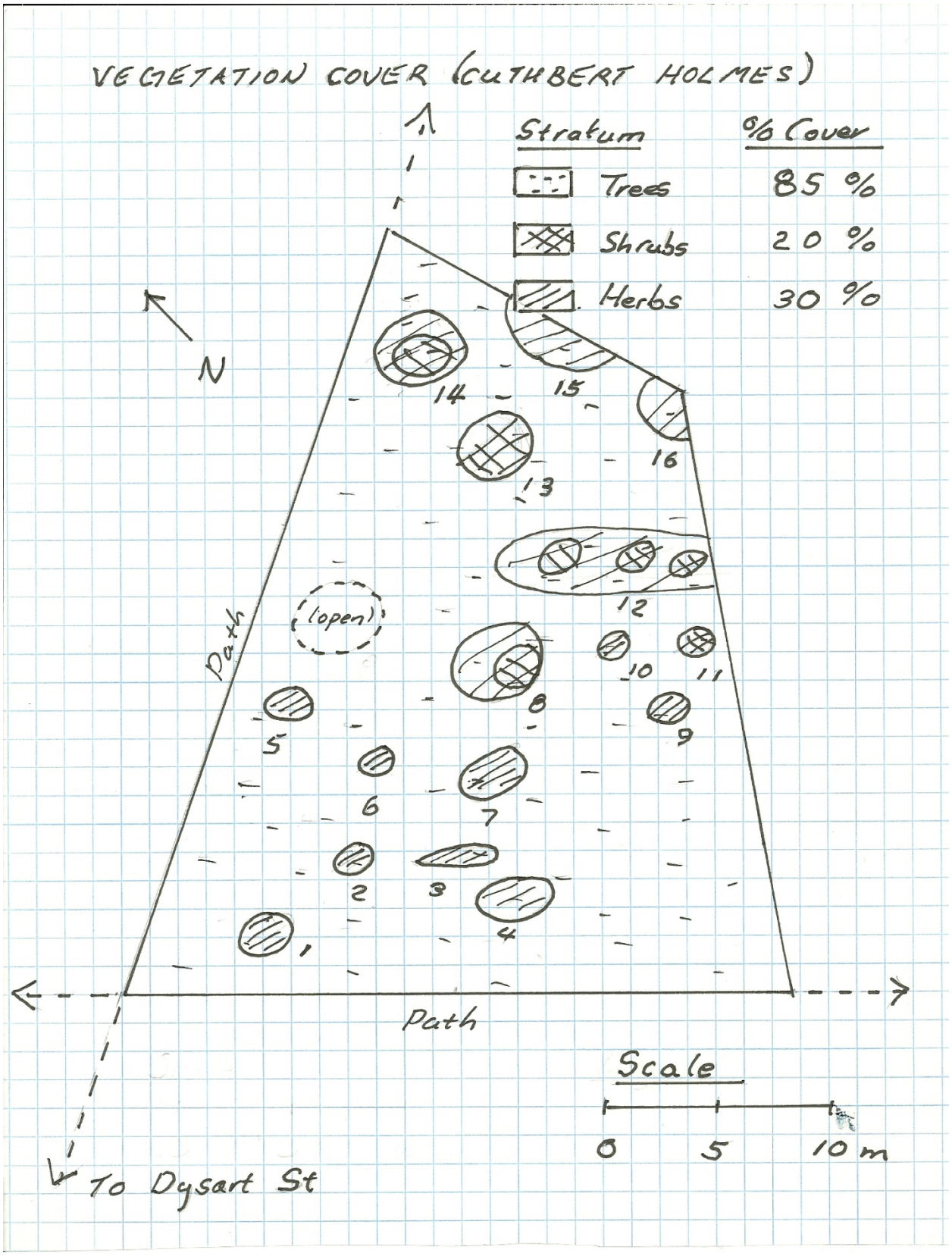
Tree Mensuration

Spp.	DBH	Ht. Calculation to DBH						Ht. to DBH	Total HT	BH Age	Path Y/N
		Top	Bot	SD	SL	HD	HT				

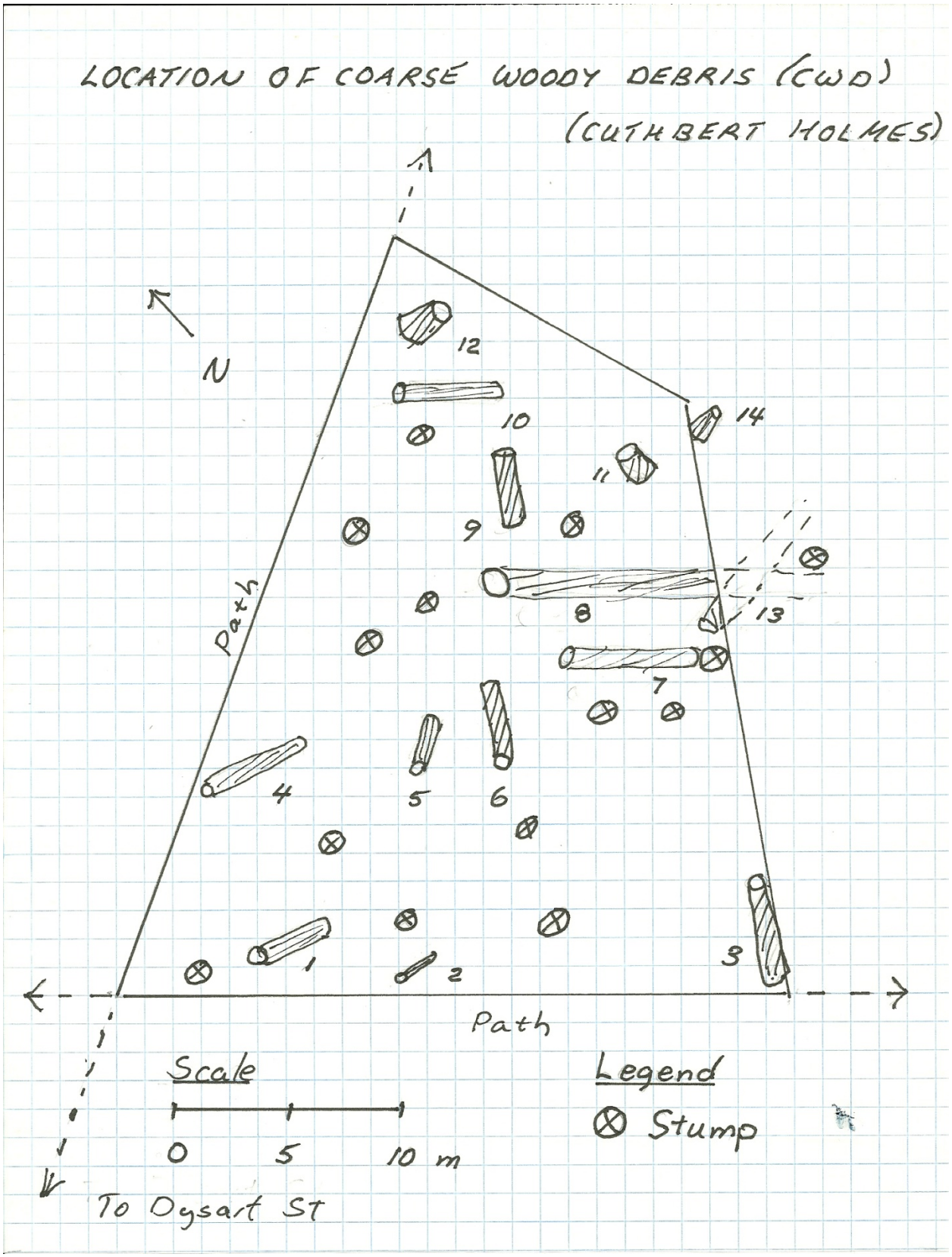
NOTES (site diagram, exposure, gleying, etc.)



APPENDIX D – PERCENT COVER BY STRATUM


VEGETATION COVER (CUTHBERT HOLMES)
Stratum
% Cover
Trees
85 %
Shrubs
20 %
Herbs
30 %
N
14
15
16
13
12
(open)
Path
10
11
8
9
5
6
7
2
3
4
1
Path
Scale
0
5
10 m
To Dysart St

APPENDIX E – DISTRIBUTION OF COARSE WOODY DEBRIS (CWD)


LOCATION OF COARSE WOODY DEBRIS (CWD)
(CUTHBERT HOLMES)
N
12
10
14
11
9
8
13
7
Path
4
5
6
1
2
3
Path
Scale
0
5
10 m
Legend
Stump
To Oysart St

APPENDIX F – TREE ATTRIBUTES FOR WILDLIFE FORM

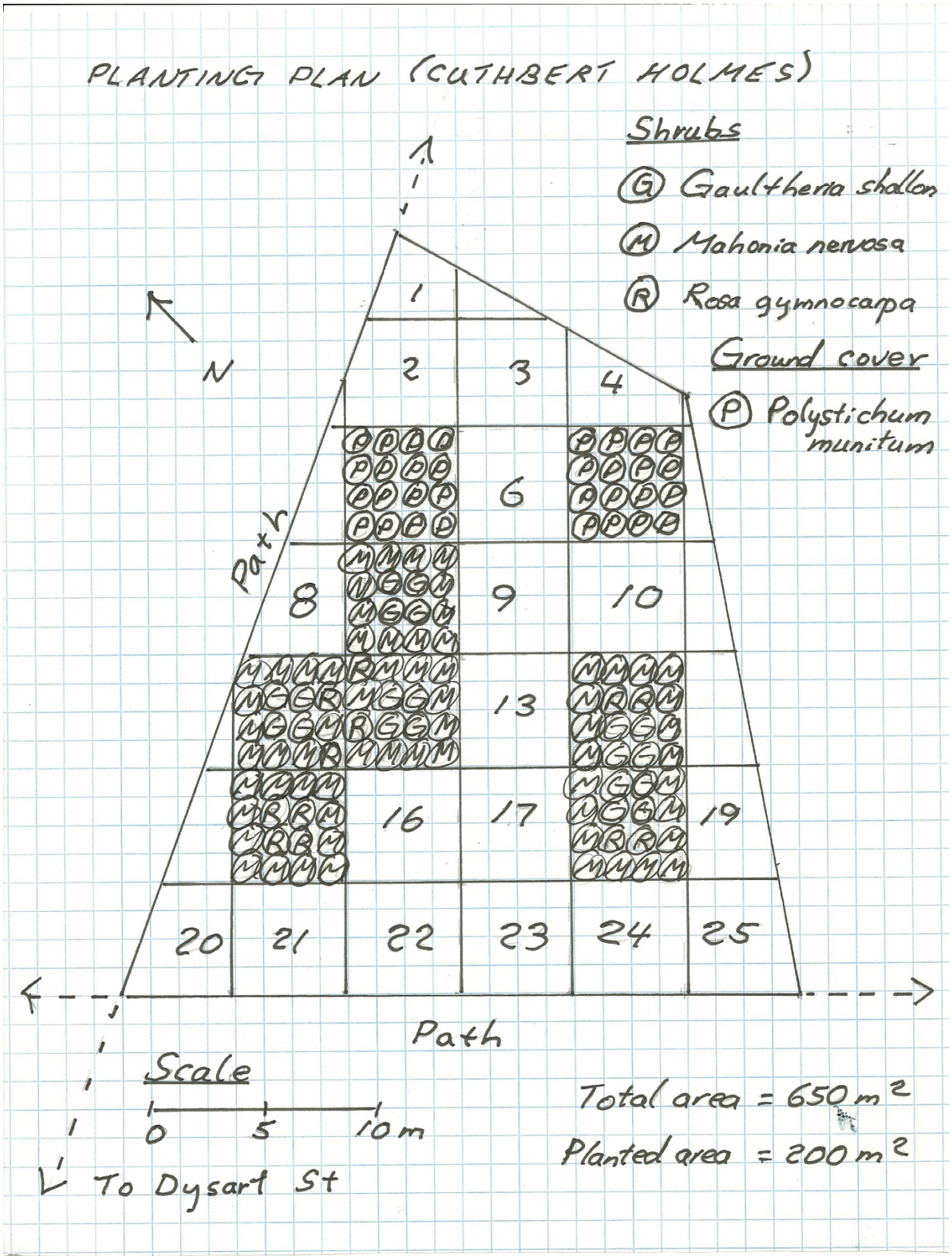
TREE ATTRIBUTES FOR WILDLIFE

Project id.: CUTHBERT HOLMES | Plot no.: 01 | Surveyor: C.M.Lo

B.A.F (m^2/ha): | Plot size (m^2): | Minimum DBH (cm): 15.0 | Date: y 12 m 03 d 24

Tree No.	Species	Stand/Fall	DBH (cm)	M or E	Rem. Bark (%)	Length: Top (%)	Length: Bot (%)	Length: Bot pos (m)	Length: Slope Distance (m)	Estimated length (m)	Cr. Class	Height to live crown (m)	Wildlife Codes: Appear	Crown	Bark	Wood	Lichen	Wildlife use		Comments
01	Fid	S	64.0	M	100						C	20	1	2	1	1	0			Compaction, exposed roots
02	Fid	S	31.0	M	100						C	22	2	2	1	1	0			Leaning (15°)
03	Fid	S	19.0	M	100					2			7		2	3	0	C		Round cavity (5cm) upper bole
04	Fid	S	42.0	M	100						C	24	2	2	2	1	0			Compaction, erosion (roots)
05	Fid	S	53.5	M	100						C	25	2	2	1	1	0			Curved trunk
06	Fid	S	31.0	E	100					1			7		1	1	0			Bevelled top, ivy
07	Fid	S	33.5	E	30								8		3	2	1	F		Bevelled top
08	Fid	S	43.6	M	100						C		1	1	1	1	0			
09	Fid	S	15.0	E	100					1			7		2	8				Hollow
10	Fid	S	43.5	M	100						C	10	1	1	1	1		F		Soil compaction, erosion
11	Fid	S	55.0	M	100						C	14	1	1	1	1	0	S	M	Squirrel, nuthatches (fungus)
12	Fid	S	37.5	M	100						C	15	1	1	2	1				Burls, leaning
13																				
14																				
15																				
16																				
17																				
18																				
19																				
20																				

APPENDIX G – PLANTING PLAN


PLANTING PLAN (CUTHBERT HOLMES)
Shrubs
G Gaultheria shallon
M Mahonia nervosa
R Rosa gymnocarpa
Ground cover
P Polystichum munitum
N
1
2
3
4
6
8
9
10
13
16
17
19
20
21
22
23
24
25
Path
Path
Scale
0
5
10 m
To Dysart St
Total area = 650 m²
Planted area = 200 m²

APPENDIX H – CHILDREN'S ACTIVITIES

Photograph: Redpath Museum 2012

Story: Lawson 2011

WHO AM I ?

Fir Cone Story

Based on First Nations Story and adapted by Lorna Lawson

A long, long, time ago, in our great, great, great, grandfathers time; there lived a family of mice on the edge of a meadow. Mother Mouse told her children, you must never go out onto the meadow at night or Mama Owl will swoop down and carry you off to her children and they will eat you up. So the mice played in the day and were always home at night. But one night in the summer, when the moon was full, it was so beautiful that they crept out to meadow to see. Then they started to play in the lovely moonlight and forgot all about what their mother had told them. Suddenly, there was a shadow overhead, and they remembered what Mother Mouse had said. They looked around, realized that they couldn't get home in time, so they ran to the edge of the meadow and up the nearest tree. Up, up, up, they went, and out on to the branches where they hid inside the cones hanging there. And, if you look today, you can see their back feet and tails hanging out of the cones still. That tree was a Douglas Fir Tree, and so you always know that this is a fir cone when you see the mice are still hiding in there.

APPENDIX I – ARTICLE ON RESTORATION PROJECT

(Milo 2012a)

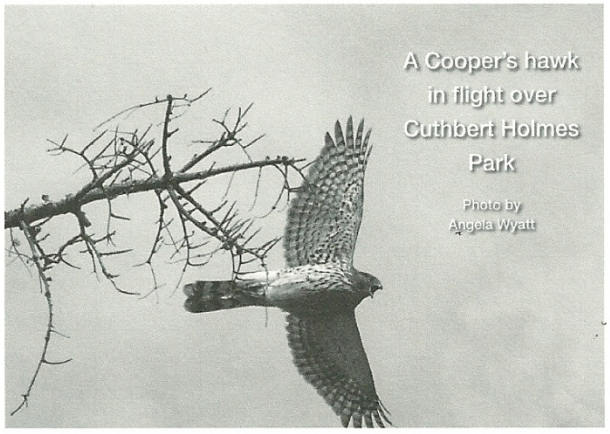
The Green Space

Restoration in Cuthbert Holmes Park

Did you know that even forests get tired? Cuthbert Homes Park, conveniently situated behind Tillicum Mall, enjoys extensive use by nature enthusiasts, dog walkers, and children from nearby school and out-of-school programs. Over the years, this intensive use has lead to the loss of ground cover, and resulted in soil compaction, especially in the area near the Dysart Street footbridge.

Why is this a problem? Pressure below ground in the compacted areas crushes tree roots, and prevents new roots from growing. Compacted soil typically has too little void space for air and water movement necessary for respiration and growth. In time, this could lead to the loss of the mature Douglas-fir forest in the area, which includes trees over 100 years old. The lack of understory means that this forest will not be regenerated, and the absence of an organic layer on the forest floor means that no nutrients are available for forest growth. This organic litter layer is also important in regulating water supply to the site, serving as a reservoir during times of drought, and preventing erosion from run-off during heavy winter rains.

Over the past 2 years, Saanich Parks has held three public open houses, with the goal of obtaining information necessary to develop a Park Management and Direction Plan.



A Cooper's hawk in flight over Cuthbert Holmes Park

Photo by Angela Wyatt

This plan will attempt to address the many complex and inter-related issues facing Cuthbert Holmes Park. These issues include, but are not limited to, natural areas management. With a view to implementing this plan, Saanich Parks will begin restoration of the Dysart Street site later this fall. Soil aeration and mulching will be utilized to help restore the soil composition.

This will be followed by a planting program in the fall of 2013, as well as mulching with recycled organic materials from the Park.

It may be necessary to temporarily close access to this area while restoration activities are underway.

Do stop by and observe work in progress on this site.

Also, **Julian Anderson and the Friends of Cuthbert Holmes have partnered with Saanich Parks and the Gorge Tillicum Community Association to host several work parties in the Park.** If you would like to be kept up-to-date on these activities, please send an e-mail to CuthbertHolmes@telus.net to be added to the contact list.

— Carol Milo