BIOLOGICAL INVENTORY OF STILL CREEK, BURNABY

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Abstract

The riparian corridor of Still Creek in Burnaby, BC was inventoried for relative abundance data on small mammals, birds and vegetation from September 2003 to April 2004. This study was conducted to assess differences in biodiversity along the corridor based on land use and buffer size, and to establish baseline data to monitor trends as restoration work takes place.

Still Creek, the largest tributary of the Brunette River watershed, originates in Burnaby's Central Park and drains into Burnaby Lake. Water quality has been affected by pollution from industry, sewage and stormwater drains; and industrial use continues along parts of the creek today. Still Creek is part of the Integrated Stormwater Management Plan (ISMP); restoration work will be completed to remove obstacles to fish passage, increase riparian buffer and native vegetation, improve habitat and connectivity for wildlife, and improve water quality.

Study sites were divided into sections based on land use and riparian buffer size, with Section 1 having a medium sized buffer and medium human and industrial use, Section 2 a narrow buffer and high industrial use, and Section 3 a wide buffer and low use.

In each section, Longworth live traps were used to inventory small mammals. Point counts from bridge crossings and by kayak were used to survey for passerines, raptors, and waterfowl. Percent cover of vegetation was estimated at each of the small mammal trapping stations. Species diversity was compared in each section by calculating Simpson's and Shannon-Wiener diversity indices.

Two species of small mammals were trapped in Section 1 – Townsend's vole (*Microtus townsendii*) and deer mouse (*Peromyscus maniculatus*) – this section had the lowest abundance and was the least diverse according to Shannon-Wiener, but the most diverse according to Simpson's index. Section 2 also had two species, but greater abundance, and had the highest diversity with Simpson's index, and medium diversity with Shannon-Wiener. In Section 3, four species were trapped: Oregon vole (*M. oregoni*), deer mouse, short-tailed weasel (*Mustela erminea*), and black rat (*Rattus rattus*), which gave this section the greatest species richness, abundance and highest Shannon-Wiener value, but the lowest Simpson's index.

Common bird species in all sections included: purple finch (*Carpodacus purpureus*), pine siskin (*Carduelis pinus*), black-capped chickadee (Poecile *atricapilla*), red-tailed hawk (*Buteo jamaicensis*), mallard (*Anas platymynchos*), and great blue heron (*Ardea herodias*). Bird species uncommon at Burnaby Lake, but recorded at Still Creek include Northern harrier (*Circus cyaneus*) and sharp-shinned hawk (*Accipiter striatus*) in Section 1, and Cooper's hawk (*A. cooperii*), pileated woodpecker (*Dryocopus pileatus*) and red-breasted nuthatch (*Sitta canadensis*) in Section 3. Section 1, though higher in species richness and abundance than Section 2, had lower diversity values. Section 3 had the greatest species richness and abundance and the highest diversity indices.

Trees, primarily red alder (*Alnus rubra*), and herbaceous vegetation like Kentucky blue grass (*Poa pratensis*) and Oregon beaked moss (*Kindbergia oregana*) were the dominant cover types in Section 1, at 36% and 37% cover, respectively. Section 2 was dominated by shrub cover (63%), primarily Himalayan blackberry (*Rubus discolor*) and percent cover of invasive species was highest here. Shrubs were the dominant cover type in Section 3 (44%), primarily hardhack (*Spiraea douglasii*) and salmonberry (*Rubus spectabilis*). In both biodiversity calculations and in species richness, Section 2 had the lowest values. Sections 1 and 3 were similar in biodiversity, but Section 1 had greater species richness.

Small mammal abundance was related more to percent of shrub cover than vegetation type, although species richness and abundance increased with size of riparian buffer. Bird diversity was greatest in Section 3, but birds were observed to migrate along the corridor and all sections are important habitat.

If future surveys take place at Still Creek, survey methods used in this study were considered effective, although the study could expand and the number of students involved could increase. For land use decisions it is recommended that trails be extended into Sections 1 and 2 only, and riparian buffers be increased in Section 1.

Table of Contents

ABSTRACT ..... **II**

LIST OF FIGURES ..... **V**

LIST OF TABLES ..... **VII**

ACKNOWLEDGEMENTS ..... **VIII**

1.0 INTRODUCTION **1**

1.1 PROJECT OBJECTIVES 1
1.2 LOCATION 1
1.3 HISTORY 2
1.4 CURRENT MANAGEMENT 4

2.0 STUDY AREA **6**

3.0 MATERIALS AND METHODS **9**

3.1 SMALL MAMMAL TRAPPING 9
3.2 BIRD COUNTS 10
3.3 VEGETATION SAMPLING 11
3.4 DATA ANALYSIS 11

4.0 RESULTS **12**

4.1 MAMMALS 12
4.2 BIRDS 14
4.3 VEGETATION 20
4.31 Section 1 ..... *21*
4.32 Section 2 ..... *22*
4.33 Section 3 ..... *22*
4.34 Species Diversity and Richness *24*

5.0 DISCUSSION **24**

5.1 SMALL MAMMALS 24
5.1.1 Small mammal habitat associations *25*
5.2 BIRDS 26
5.1.2 Bird habitat associations *27*
5.3 VEGETATION 29

6.0 RECOMMENDATIONS **30**

6.1 FUTURE SURVEYS 30
6.2 LAND USE DECISIONS 31

7.0 REFERENCES CITED **32**

List of Figures

Figure 1 - The Brunette River Watershed, outlined in black. The watershed drains into the Fraser River, the light blue water body (Hall et al., 2002). 1

Figure 2 - Still Creek watershed (AXYS Environmental Consulting, 2004). 3

Figure 3 - Aerial photo of Section One: Still Creek Drive to Westminster Avenue. 6

Figure 4 - Aerial photo of Section Two: Westminster Avenue to Holdom Avenue. 7

Figure 5 - Aerial photo of Section Three: Holdom Avenue to Sperling Avenue. 8

Figure 6 - Deer mouse leaving Longworth trap baited with oats, caught on January 25, 2004 (Laura Sampson photo). 9

Figure 7 - Short-tailed weasel caught in Section 3 in mixed deciduous/coniferous forest on January 25, 2004 (Marnie Watson photo). 13

Figure 8 - Shannon-Wiener function for small mammals along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004). 13

Figure 9 - Simpson's index values for small mammals along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004). 13

Figure 10 - Species richness for small mammals along Still Creek corridor (Oct. 1, 2003 - Mar. 3, 2004). 14

Figure 11 - Bird species richness and abundance by section (see Appendix C for definition of species codes). Northwestern Crow were not included in this table as they were extremely numerous and would have affected the layout of the table. 16

Figure 12 - Shannon-Wiener index for birds along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004). 17

Figure 13 - Simpson's index for birds along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004). 17

Figure 14 - Species richness for birds along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004). 17

Figure 15- Percent cover of trees, shrubs, herbs, coarse woody debris (CWD), trail and bare ground in Section 1. 20

Figure 16 - Percent cover of trees, shrubs, herbs and coarse woody debris (CWD) in Section 2. 20

Figure 17 - Percent cover of trees, shrubs, herbs and coarse woody debris (CWD) in Section 3. 20

Figure 18 - Red alder-dominated overstory, planted Western red cedar and trail in Section 1 (Marnie Watson photo). 21

Figure 19 - Newly planted Douglas fir and crab apple in Section 1 (Marnie Watson photo). 21

Figure 20 - Vegetation typical of Section 2. Himalayan blackberry, reed canary grass and paper birch (Marnie Watson photo) 22

Figure 21 – Cherry tree with licorice fern in Section 3 (Marnie Watson photo). _____23

Figure 22 – Hardhack and coarse woody debris in Section 3 (Marnie Watson photo). _____23

Figure 23 - Shannon-Wiener function for plants in Sections 1, 2 and 3 (Oct. 1, 2003 – Mar. 3, 2004). ___24

Figure 24 - Simpson's diversity index for plants in Sections 1, 2 and 3 (Oct. 1, 2003 – Mar. 3, 2004). ___24

Figure 25 - Species richness for plants in Sections 1, 2 and 3 (Oct. 1, 2003 – Mar. 3, 2004). _____24

Figure 26 - Oregon vole caught in Section 3, January 25, 2004. (Laura Sampson photo). _____ 25

Figure 27 - Beaver damage in Section 3._____ 26

List of Tables

Table 1: Mammal species observed along Still Creek corridor Oct. 1, 2003- Feb. 4, 2004. 12

Table 2: Bird species observed along Still Creek corridor Oct.1, 2003-Mar.20, 2004. 14

Table 3: Bird species recorded during our study vs. bird species recorded at Burnaby Lake. 18

Table 4: Trees, Shrubs and Herbs/Bryophytes surveyed in Section 1 and their percent cover listed from most to least abundant. Four species that could not be identified were used in diversity calculations but are not listed in the table..... 21

Table 5: Trees, shrubs, and Herbs/Bryophytes and their percent cover surveyed in Section 2 listed from most to least abundant. 22

Table 6: Trees, shrubs, and Herbs/Bryophytes and their percent cover surveyed in Section 3 listed from most to least abundant. 23

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1.0 Introduction

1.1 Project Objectives

The primary objective of this study was to collect and present baseline data for a biological inventory of the Still Creek Corridor in Burnaby, BC. To accomplish this, we:

- provided relative abundance indices for small mammals, birds (passerines, waterfowl and raptors) and vegetation,
- established a monitoring protocol and permanent sampling plots for future inventories and trends in wildlife diversity along the corridor,
- related variations in biodiversity along the corridor with land use patterns,
- described animal species using the Still Creek Corridor and their habitat associations.

Baseline data is an important step towards understanding the ecology of an area; in this case it will enable assessment of annual and long-term trends in population size and distribution of wildlife along the Still Creek Corridor. Effects of human activity on vegetation and animal species using Still Creek can also be monitored. We predicted that biodiversity would decrease with decreasing riparian buffer size and increased land use.

1.2 Location

Still Creek is the largest tributary of the Brunette River Watershed (Figure 1).

Figure 1 - The Brunette River Watershed, outlined in black. The watershed drains into the Fraser River, the light blue water body (Hall et al., 2002).

Headwaters of Still Creek begin in Burnaby's Central Park area; the creek crosses Boundary Road into Vancouver and travels approximately another 6.5 km to 29th Avenue and Renfrew Street, north along Renfrew Street to Grandview Highway and then east to Boundary Road between Grandview and Lougheed Highways before re-entering Burnaby (Nenninger et al., 1996). The Vancouver section is culverted, except for sections in Renfrew Ravine, Renfrew Community Park and around St. Judes Church and School (Vancouver City Engineering, 1995).

As part of the City of Burnaby's open watercourse policy, the Burnaby section of Still Creek is mainly unculverted. Its western section from Boundary to Holdom Avenue travels through mainly industrial and commercial land. This section varies from a minimum riparian buffer of 3 metres to riparian protection greater than 300 metres. East of Holdom Avenue, the land on either side of the creek is protected. The creek then drains into Burnaby Lake and provides over 40% of the water for the system (Figure 2).

1.3 History

Still Creek was excavated from 1933 to 1935 to function as a drainage area, and was used as a drainage ditch into the 1980's. In the past, combined storm water and sewage overflow systems polluted the creek with raw sewage. In addition, industrial effluents such as paint and other chemicals were leached into the creek. Widespread use of leaded gasoline combined with water runoff from roads resulted in high lead levels in the creek (Angelo, pers. comm.).

The sewer and stormwater system were fixed in the early 1990's, thus sewage is no longer pumped into Still Creek. Most point source pollution was eliminated, but some illegal or unintentional inputs from storm sewers, construction sites, spills or other activities still have effects on water quality (Nenninger et al., 1996, Angelo, pers. comm.).

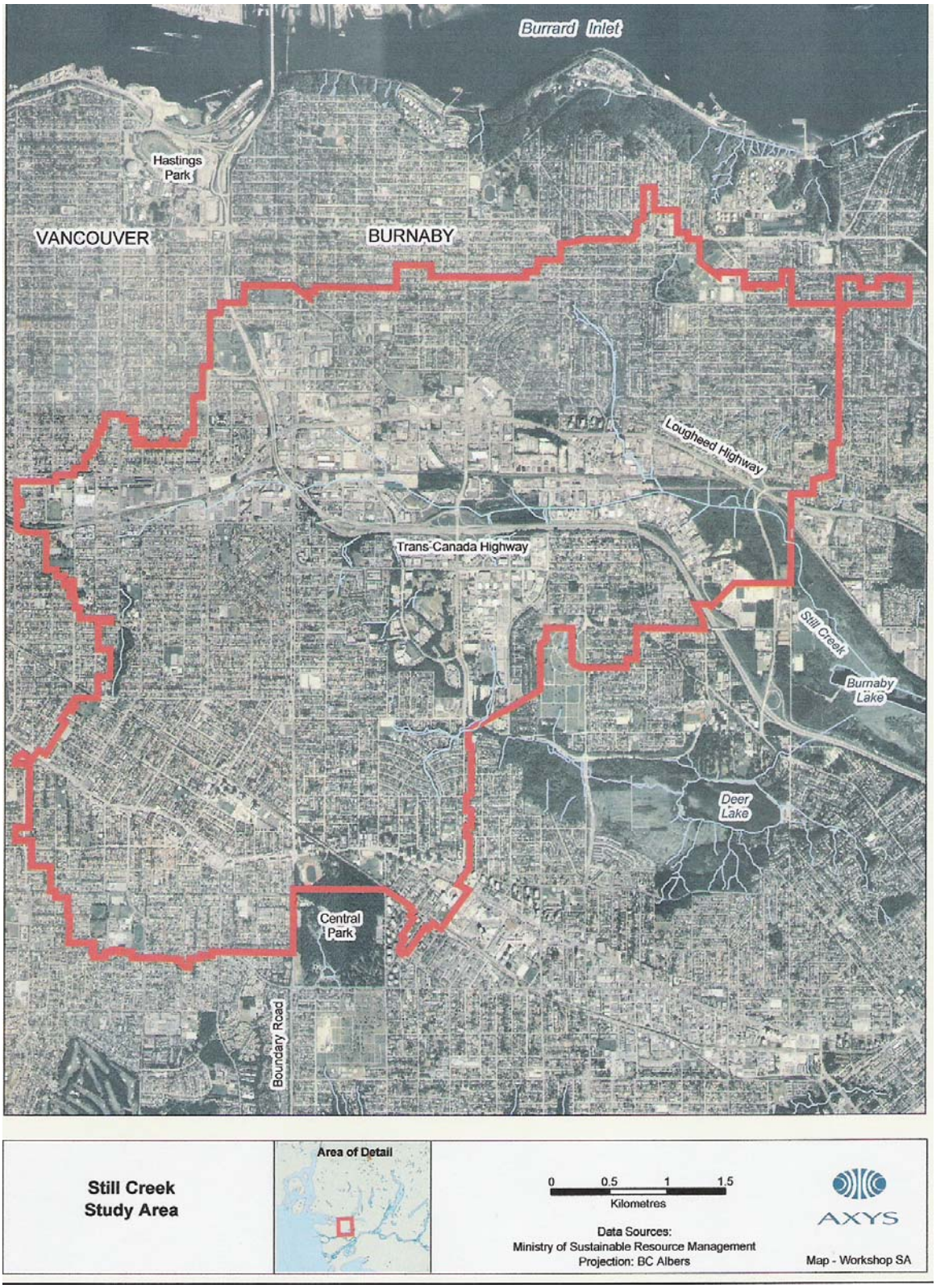

Figure 1 - Still Creek watershed (AXYS Environmental Consulting, 2004).

Presence of fecal material or pathogens in the water can be indicated by amount of bacteria known as fecal coliforms. Fecal coliform levels in Still Creek have decreased from one million milligrams per litre to less than one thousand milligrams per litre in the last 10 years (Angelo, pers. comm.). In addition, reduction of heavy industry along the creek, coupled with the ban on leaded gasoline, has resulted in a dramatic improvement in water quality. Another indicator of the presence of fecal material or other contaminants in the water is low oxygen levels, which are chronic in Still Creek (Nenninger et al., 1996).

The channel was straightened and sections adjacent to the creek were paved and modified by urbanization. Consequently, changes in land use patterns along the corridor have altered habitat significantly from its natural state. Mean annual discharge for Still Creek is 0.4 m^3/s, but the high percentage of impervious surfaces in the area combined with storm sewer inputs causes frequent flash floods in winter (Nenninger et al., 1996).

1.4 Current Management

Still Creek is included in the Greater Vancouver Regional District's Integrated Stormwater Management Plan (ISMP). Objectives of ISMP include: protecting or restoring stream and riparian habitat health, improving water quality problems, designating land use for watercourses, dealing with stormwater management, and enhancing suitability for recreation (MWLAP, 2002).

The City of Burnaby, in line with the objectives of the ISMP, has specific goals for the enhancement of the Still Creek watershed:

- Daylighting enclosed sections of Still Creek and its tributaries,
- Improving all culverts and removing obstacles to fish passage,
- Providing continuous, native riparian vegetation, maintaining existing forest patches, and controlling non-native vegetation,
- Encouraging watershed stewardship,
- Improving habitat quality for wildlife,
- Protecting and improving water quality.

As part of the Georgia Basin Action plan and the Biodiversity Conservation Strategy for Greater Vancouver, the Still Creek corridor has been identified as an area that can be used to apply regional strategies at a local level. To achieve this, three main goals have been proposed:

- To evaluate the status of biodiversity in the region
- To assess key issues regarding conserving biodiversity
- To establish a coordinated plan of action

Still Creek's riparian habitat has been protected from Holdom Avenue to Burnaby Lake. Up to 200 metres on either side has been protected, which is unprecedented in the Lower Mainland. Conservation covenants have been established along the rest of the corridor to provide incentives for businesses to protect 30 metres of riparian area along the creek. Additional lands adjacent to Still Creek will be purchased by the city of Burnaby over time to incorporate the corridor into the greenway plan for the Greater Vancouver Regional District. Still Creek was named part of Greater Vancouver's Green Zone in 1993 (Vancouver Parks and Recreation, 2002).

The Burnaby Lake section has been inventoried; however, no wildlife inventories have been conducted for Still Creek Corridor. This section was inventoried to evaluate its importance to year-round resident wildlife and migrating wildlife. Results will provide the City of Burnaby and public with information regarding the value of this corridor to urban wildlife, which may increase understanding of the ecology of Still Creek and help direct conservation plans for the area.

2.0 Study Area

The study area extends from the 4100 block of Still Creek Drive to Sperling Street (Figure 3). We have divided this area into three sections based on riparian width, plant community and land use:

- **Section 1 – Still Creek Drive to Westminster Avenue**

  The riparian width of Section 1 varied from approximately 5 meters to over 100 meters.

Figure 3 - Aerial photo of Section One: Still Creek Drive to Westminster Avenue.

This area has undergone recent development and is slated for development in the future. Habitat is patchy as a result of road crossings, trails and the hydro right-of-way. Vegetation is composed of mainly deciduous forest, with some landscaped sections and grassland areas. Red alder (see Appendix A for a list of scientific plant names) was the dominant tree species.

- **Section 2 – Westminster Avenue to Holdom Avenue**

The riparian buffer averages approximately 5 metres in Section 2, with some industrial use immediately adjacent to streambanks (Figure 4). Land use here is industrial and commercial. Dominant vegetation consists of Himalayan blackberry with patches of native deciduous trees (paper birch and black cottonwood).

Figure 4 - Aerial photo of Section Two: Westminster Avenue to Holdom Avenue.

- **Section 3 – Holdom Avenue to Sperling Avenue**

Section 3 has a wide riparian buffer zone, ranging from a few metres to 300 metres in places (Figure 5). This is protected land, and has minimal human use, although it is fragmented by Kensington Avenue and the Sperling pedestrian road. Dominant shrub species include hardhack and salmonberry, while dominant tree species include cherry and red alder.

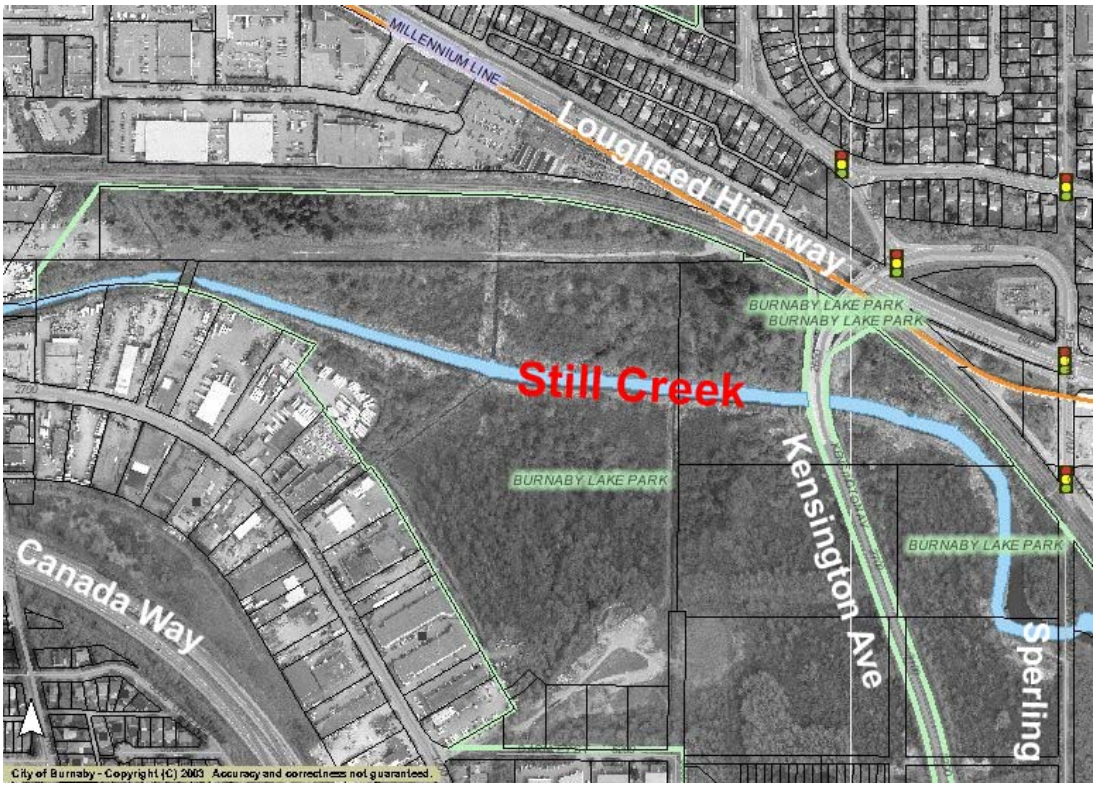

Figure 5 - Aerial photo of Section Three: Holdom Avenue to Sperling Avenue.

3.0 Materials and Methods

3.1 Small mammal trapping

Random transects were established in each section. In October 2003 fifteen trap stations per section, with one trap per station, were laid out. In Sections 1 and 3 three 75-m long transects with 5 stations placed every 15 m were set. In Section 2, due to a narrow riparian zone, two transects were set; one 105 m long with 7 traps, and one 120 m long with 8 traps. Flagging tape was used to mark each station, and pin flags were used to mark location of traps. Since 80% of the traps were full after the first trapping session, the number of traps at each station were doubled for the next trap period (i.e., 30 per section). All stations were flagged and their UTM coordinates recorded (Appendix B) to facilitate consistency among future inventories.

Each sampling area contained a total of 15 Longworth live traps (increased to 30 in 2004) and all traps were pre-baited with whole oats (Figure 6). Coarse cotton was provided for bedding; it was pulled apart and fluffed up to facilitate access for small mammals. Traps were left locked open for two weeks previous to trapping (in 2004 the traps were pre-baited for one week); they were then set on afternoon of day 1, checked in the morning of day 2 and removed. Soft cotton gloves were used for handling mammals; large ziplock bags were used to empty out the traps. All mammals were identified to species according to Sullivan (1998), and released at point of capture.

Figure 6 - Deer mouse leaving Longworth trap baited with oats, caught on January 25, 2004 (Laura Sampson photo).

3.2 Bird counts

Point counts were used to survey for passerines, waterfowl and raptors. An inflatable kayak was used to paddle the corridor starting from Still Creek Avenue, downstream to the Sperling Avenue bridge. Each section of the creek contained three point-count stations. Each station, with a 50-metre radius, had its plot centre located in the centre of the creek. Plot centers were marked by flagging the banks. Monthly point counts were done, with 10 minutes spent at each station, using sound or visual means to identify birds to species.

Waterfowl inventories conducted by kayak may overestimate abundance due to downstream displacement. Consequently, birds were also inventoried from bridges as a precautionary measure. Additional point counts of waterfowl were conducted from the bridges at Still Creek Avenue, Willingdon Avenue, Douglas Road, Westminster Avenue, Kensington Avenue and Sperling Avenue. All bird species observed or heard during a 10-minute period were counted at each bridge.

An owl call-playback survey was used to determine presence of owls in the Still Creek corridor. A presence/not detected survey was chosen to document initial species richness of owls in and adjacent to the Still Creek corridor. Surveys were completed after sunset at three different stations:

- west of Sperling Avenue on south side of the creek,
- west of Westminster Avenue on north side of the creek, and
- west of Willingdon Avenue on north side of the creek.

Following the methods outlined in the RISC (Resource Inventory Standard Committee) manual, automated calls for each owl were played for thirty seconds, we listened and looked for signs of owls for thirty seconds and repeated the process for each owl. We started with smaller owls, continuing with larger owls. We inventoried for northern saw-whet owl, western screech owl, long-eared owl, short-eared owl, barred owl and great horned owl (See Appendix C for a complete list of bird scientific names).

3.3 Vegetation sampling

Vegetation was inventoried using 25-m^2 sampling plots at each small mammal trapping station, (five vegetation plots per transect). Plots included a 5x5-m square plot for trees and coarse woody debris, a 3x3-m plot for shrubs and a 1x1-m plot for herbs. In each plot, percent cover was visually estimated and recorded for each species. In addition, total cover and species richness were calculated for each section. Only winter vegetation was inventoried.

3.4 Data analysis

Diversity of plant and small mammal species was estimated by calculating Simpson's and Shannon-Wiener diversity indices. Simpson's index uses probability to measure species diversity, with diversity being inversely related to the probability that two individuals picked at random will belong to the same species (Krebs, 1989). Simpson's index is defined as H=1-D, where D is the probability of picking two organisms at random that belong to the same species. D is calculated as $\Sigma\ (p_i)^2$, where p_i is proportion of species *i* in the community. The Shannon-Wiener Function relates diversity to the difficulty of correctly predicting the species of the next individual collected, calculated as:

$$H' = -\sum_{i=1}^{s} (p_i)(\log_2 p_i)$$

Where H = information content of sample (bits/individual)
= index of species diversity
S = number of species
p_i = proportion of total sample belonging to *i* th species

The Simpson's index can be calculated using the following equation:

$$H' = 1 - \Sigma\ (p_i)^2$$

Where H = index of species diversity
S = number of species
p_i = proportion of total sample belonging to *i* th species

4.0 Results

4.1 Mammals

All sections were trapped twice; once in the fall (November-December) and once in winter (January-February). Five species of small mammals were caught and identified (Figure 7); these and all other incidental mammal observations were recorded (Table 1).

Table 1: Mammal species observed along Still Creek corridor Oct. 1, 2003- Feb. 4, 2004.

Order and common name	Scientific name	Section 1	Section 2	Section 3	Total number
Rodentia					
Deer mouse	*Peromyscus maniculatus*	2	9	25	**36**
Oregon vole	*Microtus oregoni*	0	0	4	**4**
Townsend's vole	*Microtus townsendii*	1	5	0	**6**
Black rat	*Rattus rattus*	0	0	1	**1**
American beaver	*Castor canadensis*	0	4	1	**5**
Carnivora					
Coyote	*Canis latrans*	0	1	0	**1**
Short-tailed weasel	*Mustela erminea*	0	0	1	**1**

Figure 7 - Short-tailed weasel caught in Section 3 in mixed deciduous/coniferous forest on January 25, 2004 (Marnie Watson photo).

Shannon-Wiener and Simpson's diversity indices for each section are presented in Figures 8 and 9. Shannon-Wiener function was lowest for Section 1 and highest for Section 3 (Figure 8). Simpson's index value for Section 3 was lowest, and Section 2 highest (Figure 9). Species richness was highest in Section 3 (Figure 10).

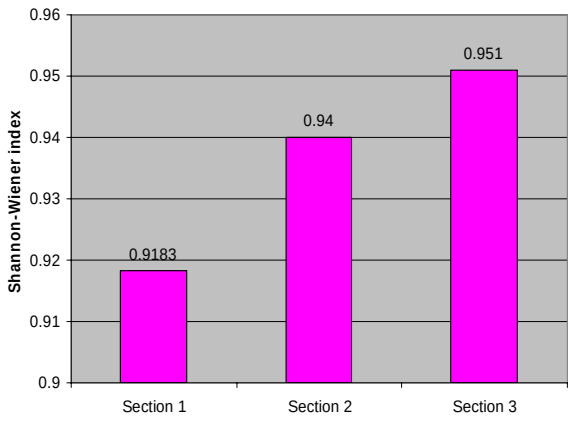

Figure 8 – Shannon-Wiener function for small mammals along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004).

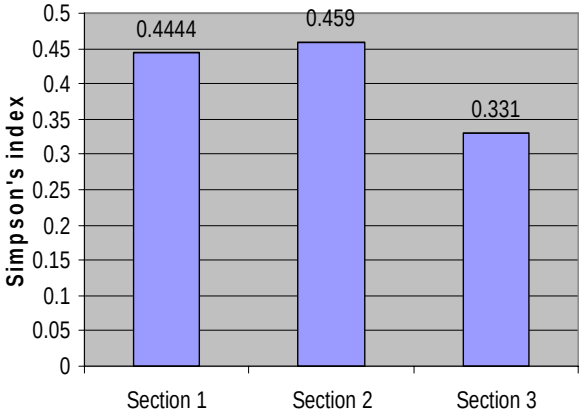

Figure 9 – Simpson's index values for small mammals along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004).

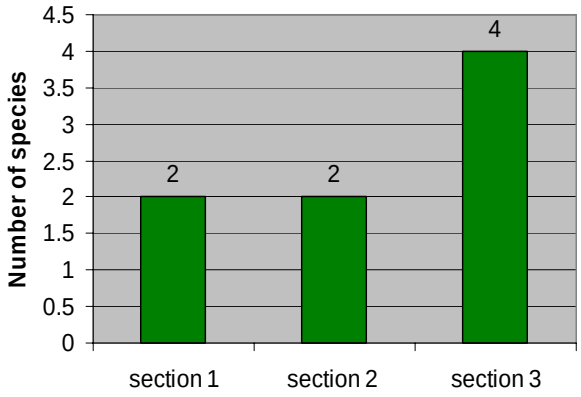

Figure 10 - Simpson's index values for small mammals along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004).

4.2 Birds

Twenty-six species of passerines, nine species of waterfowl and four species of raptor have been identified to date (Table 2).

Table 2: Bird species observed along Still Creek corridor Oct.1, 2003-Mar.20, 2004.

Order and common name	Section 1	Section 2	Section 3	Total
Podicipediformes				
Pied-billed Grebe	0	0	4	**4**
Pelecaniformes				
Double-crested Cormorant	0	0	2	**2**
Ciconiiformes				
Great Blue Heron	3	1	5	**9**
Anseriformes				
Bufflehead	0	0	6	**6**
Canada Goose	0	0	11	**11**
Green-winged Teal	30	0	0	**30**
Hooded Merganser	0	10	0	**10**
Mallard	83	15	11	**109**
Falconiformes				
Nothern Harrier	1	0	0	**1**
Cooper's Hawk	0	0	1	**1**
Sharp-shinned Hawk	1	0	0	**1**
Red-tailed Hawk	0	1	3	**4**
Unidentified Raptor	0	0	1	**1**
Gruiformes				
American Coot	0	6	4	**10**
Charadriiformes				
Unidentified Gull	3	1	2	**6**

Coraciiformes				
Belted Kingfisher	0	0	1	**1**
Piciformes				
Downy Woodpecker	0	1	0	**1**
Northern Flicker	1	0	1	**2**
Pileated Woodpecker	0	0	1	**1**
Passeriformes				
American Robin	3	8	30	**41**
Bewick's Wren	0	1	1	**2**
Black-capped Chickadee	48	10	49	**107**
Bushtit	0	0	12	**12**
Cedar Waxwing	12	7	75	**94**
Dark-eyed Junco	1	1	2	**4**
European Starling	30	1	0	**31**
Fox Sparrow	18	10	9	**37**
House Finch	0	38	0	**38**
Golden-crowned Kinglet	1	0	20	**21**
Northwestern Crow	>2,000	4	3	**>2,000**
Pine Siskin	70	32	100	**202**
Purple Finch	148	62	54	**264**
Red-breasted Nuthatch	0	0	1	**1**
Red-winged Blackbird	0	2	0	**2**
Ruby-crowned Kinglet	1	0	16	**17**
Song Sparrow	2	0	0	**2**
Spotted Towhee	3	5	9	**17**
Steller's Jay	0	0	3	**3**
Varied Thrush	0	0	1	**1**
Violet-green Swallow	0	0	1	**1**
Winter Wren	2	1	2	**5**

The most abundant birds were northwestern crows, which are known to roost in the Still Creek area. These birds were seen in Section 1; however, the number seen was very high (about 2,000) so it was not used in the biodiversity calculations as it would have influenced the results. Section 1 had the highest number of mallards and green-winged teals; these species were observed repeatedly at the north side of Still Creek Ave. Section 1 also had the highest number of purple finches, fox sparrows and European starlings, of which one flock was seen on only one occasion. Section 2 had the highest number of house finches. Section 3 had the most rare species, such as belted kingfisher, pileated woodpecker, pied-billed grebe, varied thrush, steller's jay, red-tailed hawk, red-breasted nuthatch and violet-green swallow. Raptors were seen more often in Section 3, and dabblers were seen more often in Section 1. Species richness and abundance for each section are compared in Figure 11.

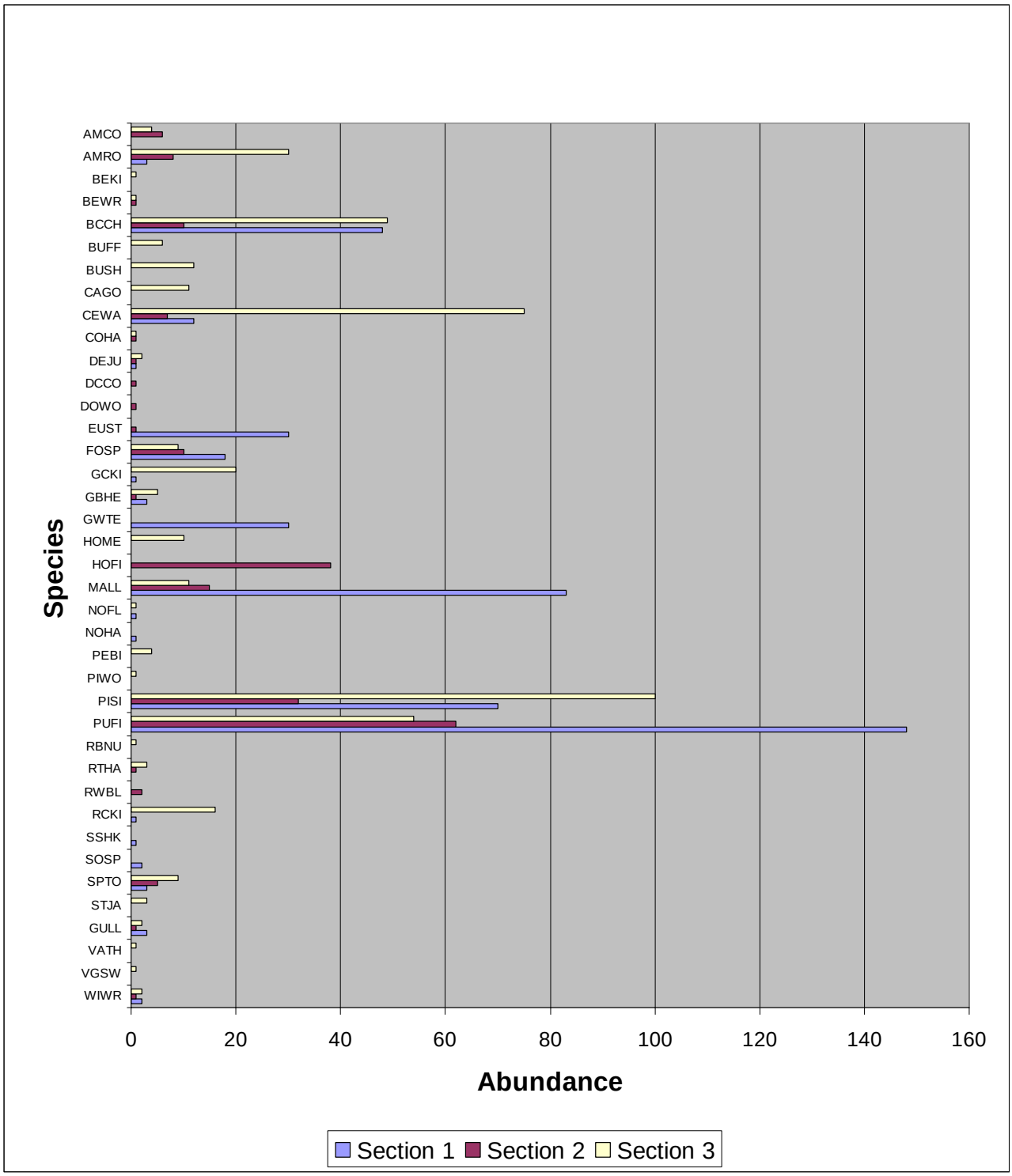

Figure 11 - Bird species richness and abundance by section (see Appendix C for definition of species codes). Northwestern Crow were not included in this table as they were extremely numerous and would have affected the layout of the table.

Simpson's diversity index and Shannon-Wiener function and species richness were highest for Section 3 and lowest for Section 1 (Figures 12, 13 and 14).

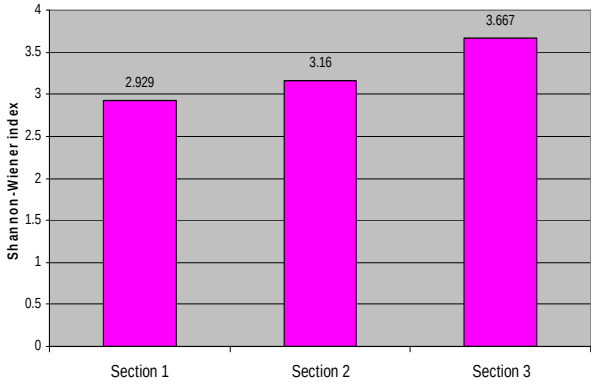

Figure 12 - Shannon-Wiener index for birds along Still Creek corridor (Oct. 1, 2003 – Mar. 3. 2004).

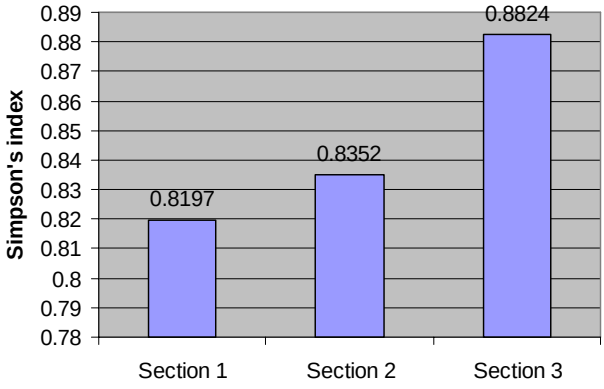

Figure 13 - Simpson's index for birds along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004).

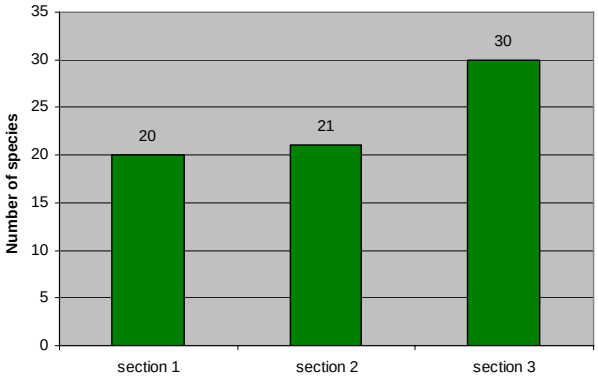

Figure 14 - Species richness for birds along Still Creek corridor (Oct. 1, 2003 – Mar. 3, 2004).

The Burnaby Lake Association has conducted bird surveys around Burnaby Lake and has compiled a list of birds seen around Burnaby Lake, categorizing them according to the frequency of observations. Bird species commonly and frequently seen in winter around Burnaby Lake were compared with results of our surveys (Table 3).

Species recorded during Burnaby Lake bird surveys were classified as common species (25 to 100 individuals recorded per day), fairly common species (5 to 25 individuals recorded per day), or uncommon species (1 to 5 individuals recorded per day). Species observed during this study were categorized as either present or not detected. Of the 46 species recorded during Burnaby Lake bird surveys,

39 were recorded in our study. 3 species recorded during our study have not been recorded during winter Burnaby Lake bird surveys.

Table 3: Bird species recorded during our study vs. bird species recorded at Burnaby Lake.

Order and common name	Occurrence within Burnaby Lake	Occurrence within our study
Podicipediformes		
Pied-billed Grebe	Fairly common[1]	Present
Pelecaniformes		
Double-crested Cormorant	Fairly common	Present
Ciconiiformes		
Great Blue Heron	Common	Present
Anseriformes		
American Wigeon	Fairly common	Not detected
Bufflehead	Common	Present
Canada Goose	Common	Present
Common Goldeneye	Fairly common	Not detected
Common Merganser	Common	Not detected
Gadwall	Fairly common	Not detected
Green-winged Teal	Common	Present
Hooded Merganser	Fairly common	Present
Mallard	Common	Present
Northern Shoveler	Fairly common	Not detected
Wood Duck	Fairly common	Not detected
Falconiformes		
Nothern Harrier	Uncommon	Present
Cooper's Hawk	Uncommon	Present
Red-tailed Hawk	Uncommon	Present
Sharp-shinned Hawk	Uncommon	Present
Gruiformes		
American Coot	Common	Present
Columbiformes		
Rock Dove	Common	Not detected

[1] Common = 25 to 100 individuals recorded per day; Fairly common = 5 to 25 individuals recorded per day; Uncommon = 1 to 5 individuals recorded per day; Present = recorded during this study; Not detected = not recorded during this study.

Coraciiformes		
Belted Kingfisher	N/A	Present
Piciformes		
Downy Woodpecker	Fairly common	Present
Northern Flicker	Fairly common	Present
Pileated Woodpecker	Uncommon	Present
Passeriformes		
American Robin	Common	Present
Bewick's Wren	Fairly common	Present
Black-capped Chickadee	Fairly common	Present
Bushtit	Common	Present
Cedar Waxwing	N/A	Present
Chestnut-backed Chickadee	Fairly common	Not detected
Dark-eyed Junco	Common	Present
European Starling	Common	Present
Fox Sparrow	Fairly common	Present
House Finch	Common	Present
House Sparrow	Common	Not detected
Golden-crowned Kinglet	Fairly common	Present
Northwestern Crow	Common	Present
Pine Siskin	Fairly common	Present
Purple Finch	Fairly common	Present
Red-breasted Nuthatch	Uncommon	Present
Red-winged Blackbird	Common	Present
Ruby-crowned Kinglet	Fairly common	Present
Song Sparrow	Common	Present
Spotted Towhee	Common	Present
Steller's Jay	Fairly common	Present
Varied Thrush	Fairly common	Present
Violet-green Swallow	N/A	Present
White-crowned Sparrow	Fairly common	Not detected
Winter Wren	Fairly common	Present

Presence of owl species along the Still Creek corridor was not detected.

4.3 Vegetation

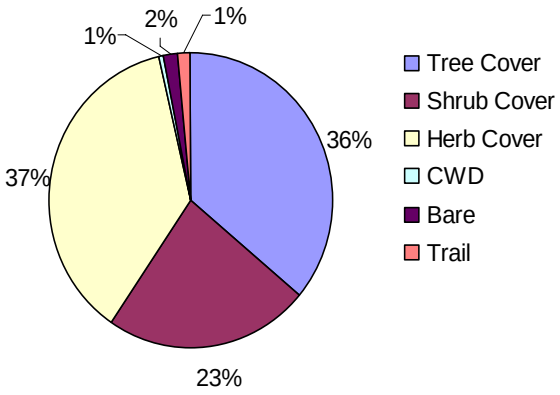

Figure 15 - Percent cover of trees, shrubs, herbs, coarse woody debris (CWD), trail and bare ground in Section 1.

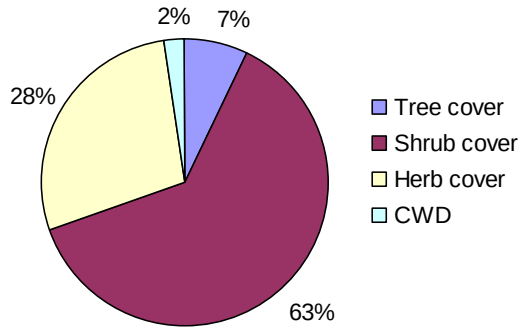

Figure 16 - Percent cover of trees, shrubs, herbs and coarse woody debris (CWD) in Section 2.

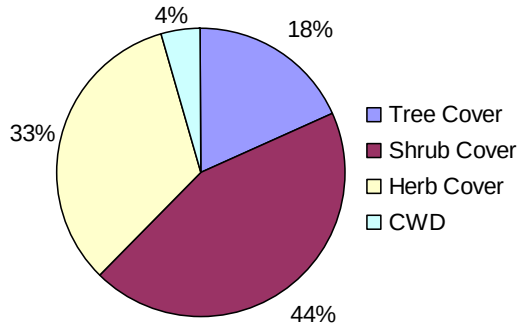

Figure 17 - Percent cover of trees, shrubs, herbs and coarse woody debris (CWD) in Section 3.

Vegetation surveys identified thirty-five plant species (including mosses, herbs, shrubs and trees) in Section 1, nineteen species in Section 2, and twenty seven in Section 3.

Section 1 had almost equal cover of herbs (37%) and trees (36%) and a shrub cover of 23%. Section 1 was the only section with trail (1%) or bare ground (2%) in the sample plots, and had the least amount of coarse woody debris (CWD) at 1% (Figure 15).

Section two was dominated by shrubs, (63% of total cover), and herb cover (28%). Section 2 had the least amount of tree cover (7%) of all three sections and had coarse woody debris cover of 2% (Figure 16).

In Section 3, shrub cover was dominant with 44% of total cover. Herb cover made up 33% and tree cover 18%. Section 3 had the greatest amount of coarse woody debris with 4% cover (Figure 17).

4.31 Section 1

Red alder was the dominant tree in this section, at 33% total cover. Western red cedar, at 2% cover, was the second most abundant tree and the most abundant coniferous tree. The most common shrub was salmonberry, at 9% cover, and red-osier dogwood made up 7% cover. Oregon beaked moss was the dominant bryophyte, at 11% cover, and Kentucky blue grass at 6% was the most common herb. Invasive species observed were Himalayan blackberry (4%) and reed canary grass (2%) (Table 4). Four percent of shrub and tree cover vegetation consisted of recently planted Western red cedar, Douglas fir, and crab apple (Figure 18 and 19).

Figure 18 - Red alder-dominated overstory, planted Western red cedar and trail in Section 1 (Marnie Watson photo).

Figure 19 - Newly planted Douglas fir and crab apple in Section 1 (Marnie Watson photo).

Table 4: Trees, Shrubs and Herbs/Bryophytes surveyed in Section 1 and their percent cover listed from most to least abundant. Four species that could not be identified were used in diversity calculations but are not listed in the table.

PLANT SPECIES INVENTORIED IN SECTION ONE			
Trees	**% Cover**	**Herbs and Bryophytes**	**% Cover**
Red alder	33	Oregon beaked moss	11
Western red cedar	2	Fire moss	6
Douglas fir	1	Kentucky blue grass	6
Sitka spruce (dead)	0.1	Slender beaked moss	2
Sitka spruce	0.04	Yellow moss	2
Ash	0.03	Reed canary grass	2
Shrubs		Chickweed	1
Salmonberry	9	Dandelion	1
Red osier dogwood	8	Cat's ear	1
Himalayan blackberry	4	White clover	0.3
Hardhack	2	Morning glory	0.1
Bitter cherry	0.3	Horsetail	0.1
Hawthorne	0.1	Venous cinquefoil	0.1
Crabapple	0.1		
English holly	0.03		
Evergreen blackberry	0.03		

4.32 Section 2

Paper birch (3%) and cottonwood (2%) were the most abundant tree species (Table 5). No coniferous trees were recorded on our survey. Himalayan blackberry was the dominant shrub, with 49% cover. In 6 of 15 samples done in this section, Himalayan blackberry exceeded 95% cover for the plot (Figure 20). Reed canary grass (17%) was the most common herb, and Oregon beaked moss (3%) the most common bryophyte. Policeman's helmet, a common invasive, makes up 6% cover. Japanese knotweed was another invasive observed in this section, but was not present in any sample plots (Table 5).

Figure 20 - Vegetation typical of Section 2. Himalayan blackberry, reed canary grass and paper birch (Marnie Watson photo).

Table 5: Trees, shrubs, and Herbs/Bryophytes and their percent cover surveyed in Section 2 listed from most to least abundant.

PLANT SPECIES INVENTORIED IN SECTION TWO			
Trees	**% Cover**	**Herbs and Bryophytes**	**% Cover**
Paper birch	3	Reed canary grass	17
Cottonwood	2	Policeman's helmet	6
Ash sp.	1	Oregon beaked moss	3
Red alder	0.8	Morning glory	1
		Few-seeded bitter-cress	1
Shrubs		Slender beaked moss	0.3
Himalayan blackberry	49	Bracken fern	0.3
Hardhack	11	Stinging nettle	0.3
Twinberry	3	Horsetail	0.2
Salmonberry	0.5		

4.33 Section 3

Cherry tree, with 6% total cover (Figure 21), and red alder with 5% were the most abundant trees in Section 3 (Table 6). Sitka spruce (1%) was the only conifer in our sample, but western red cedar and Douglas fir were also observed. Hardhack was the most abundant species, exceeding 25% of total plant cover, and comprised 100% cover in 4 of 15 plots (Figure 22). Salmonberry was also a significant shrub species with 13% cover. Invasive species present were Himalayan blackberry (2%) evergreen blackberry (2%) and policeman's helmet

(6%). The most abundant herb observed was false lily-of-the-valley (3%), and the most common mosses were slender beaked moss and Oregon beaked moss with 9% and 8% cover, respectively (Table 6).

Figure 21 – Cherry tree with licorice fern in Section 3 (Marnie Watson photo).

Figure 22 – Hardhack and coarse woody debris in Section 3 (Marnie Watson photo).

Table 6: Trees, shrubs, and Herbs/Bryophytes and their percent cover surveyed in Section 3 listed from most to least abundant.

PLANT SPECIES INVENTORIED IN SECTION THREE			
Trees	**% Cover**	**Herbs and Bryophytes**	**% Cover**
Cherry sp.	6	Fire moss	10
Bitter cherry	5	Slender beaked moss	8
Red alder	5	False lily-of-the-valley	3
Sitka spruce	1	Oregon beaked moss	2
Willow sp.	0.4	Bracken Fern	2
Oak	0.2	Policeman's helmet	2
Shrubs		Pipe cleaner moss	1
Hardhack	26	Spiny wood fern	1
Salmonberry	13	Step moss	1
Evergreen blackberry	2	Yellow moss	1
Himalayan blackberry	2	Licorice Fern	1
Red elderberry	2	Fireweed	1
Willow	0.04	False Solomon's Seal	0.4
		Cat-tail moss	0.4
		Flat Moss	0.2
		Lanky moss	0.2

4.34 Species Diversity and Richness

Sections 1 and 3 were similar in species diversity for plants, while Section 2 appeared to be the least diverse (Figures 22 and 23). Species richness was greatest in Section 1, with 35 species surveyed, compared to 27 in Section 3 and 19 in Section 2 (Figure 24).

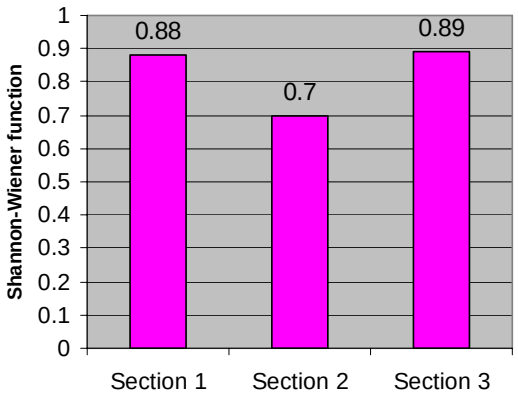

Figure 23 - Shannon-Wiener function for plants in Sections 1, 2 and 3 (Oct. 1, 2003 – Mar. 3, 2004).

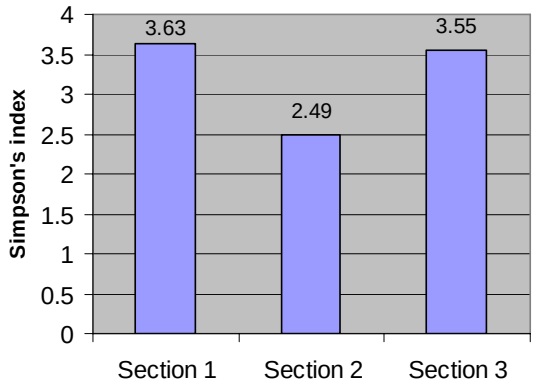

Figure 24 - Simpson's diversity index for plants in Sections 1, 2 and 3 (Oct. 1, 2003 – Mar. 3, 2004).

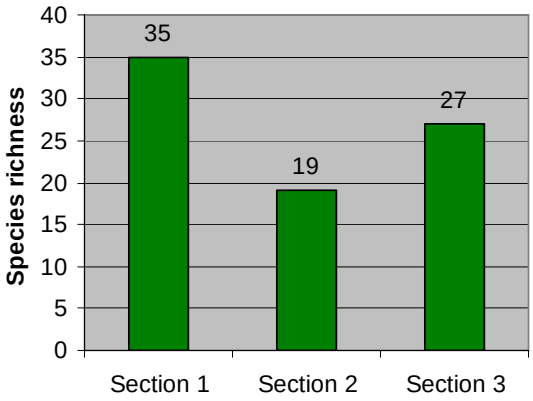

Figure 25 - Species richness for plants in Sections 1, 2 and 3 (Oct. 1, 2003 – Mar. 3, 2004).

5.0 Discussion

5.1 Small mammals

Small mammal use seemed to be determined more by the percent of shrub cover than by species of plants or riparian buffer size. Small mammal abundance was highest in Section 3, with its abundant shrub cover and large patches of unsegmented natural vegetation. Section 2 had the next most abundant small

mammal population despite its narrow riparian buffer and high percentage cover of invasive species (Himalayan blackberry, reed canary grass and policeman's helmet). Section 1 contained a diversity of native plant species and often had wide patches of vegetation, but had lower percentage of shrub cover. The only stations where small mammals were trapped in this section were those with 30% shrub cover or more.

There seemed to be a difference in species composition along the corridor, with Oregon voles present near Burnaby Lake and Townsend's voles present mostly in Section 2. Deer mice were present along the length of the corridor. Section 1 had very little shrub cover in winter for small mammals, as the dominant shrub was salmonberry, which provides little security cover when leafless.

5.1.1 Small mammal habitat associations

Oregon voles are habitat generalists, but prefer brushland and openings in moist coniferous forests (Eder and Pattie, 2001). Oregon voles were found in Section 3 of the Still creek corridor, in dense hardhack cover adjacent to deciduous forest (Figure 26). Townsends voles are associated with grassland and old field habitat (Eder and Pattie, 2001). Townsend's voles were caught in Sections 1 and 2, only at stations next to grassy areas with adjacent shrub cover. The area in Section 1 between Westminster Avenue was cleared of shrubs in December, and the grass that grew there likely improved Townsend's vole habitat.

Figure 26 - Oregon vole caught in Section 3, January 25, 2004 (Laura Sampson photo).

Deer mice are very common in many types of habitat, from grassland to forests, and they are habitat generalists (Eder and Pattie, 2001). Due to habitat

association deer mice were expected to be found in all sections of the Still Creek corridor, in mixed deciduous/coniferous forests, deciduous stands, and shrubland.

Black rats were introduced from Europe by ship, and are common at seaports around the world. They are typically found in or near human settlement, and in the wild in second growth forests (Eder and Pattie, 2001). One black rat was trapped in Section 3, in mixed coniferous/deciduous habitat, distant from any human settlement.

American beavers live anywhere there is fresh water and woody vegetation, like alder, willow, birch and aspen. Signs of beaver activity – cut down alder – in Section 1 west of Willingdon Avenue, and in Section 3 (Figure 27) were observed. Beavers were also sighted swimming in the creek in Section 3 near the Sperling pedestrian bridge and Section 2 at the Westminster Avenue bridge.

Figure 27 - Beaver damage in Section 3.

Coyotes are well-suited to areas of human development, and have increased in abundance and extended their range in North America with our population expansion (Catt, pers. comm.). A coyote was seen coming out of the shrubs near Westminster Avenue, and neighbours report that coyotes are quite common in the area.

5.2 Birds

A greater diversity of bird species were observed in Section 3 than in the other two sections, likely due to its large protected area and its proximity to Burnaby Lake. Sections 1 and 2 also had a high diversity of birds. It seems that all bird

species, even the rare ones like raptors and kingfishers, migrate along the corridor and use all sections of it. From these observations we believe that Still Creek is a valuable corridor for birds.

5.1.2 Bird habitat associations

Twelve species of birds were classified as common or fairly common by the Burnaby Lake bird survey, but were not recorded during our inventory. This variance in species detection can be explained by examining those species' habitat associations.

Species absent from Still Creek corridor due to lack of habitat

Waterfowl species including American wigeon, gadwall, Northern shoveller and wood duck have been recorded during Burnaby Lake bird surveys. American wigeons are dabbling ducks that eat aquatic insects, stems and leafy parts of aquatic plants, grasses and agricultural plants. They usually forage along shallow, freshwater wetlands, marshes, slow moving rivers and ponds, where emergent plant life is abundant (ADW, 2004). This type of habitat is found around Burnaby Lake, but is scarce along the portion of Still Creek that we surveyed, which would explain the absence of American wigeons on our surveys.

Gadwalls also prefer marshes and slews, ponds and small lakes with grasslands. In winter they prefer marshes with leafy aquatic vegetation and feed on aquatic invertebrates, aquatic vegetation and seeds. There are almost no aquatic plants in Still Creek that could support their diet (ADW, 2004). Northern shovelers feed by filtering out small particles from the water surface. They ingest crustaceans, mollusks, insects, seeds and pieces of leaves and plants, and usually feed where other birds are wading which brings up food to the surface. Wood ducks live near wooded swamps containing trees with cavities (ADW, 2004). Both species are more likely to be found in Burnaby Lake, where there are aquatic plants and wading birds, than on Still Creek.

Species absent from Still Creek corridor although habitat present

Key habitat features for a few species appeared to be present along the Still Creek corridor, but the species were not recorded. These species include rock doves, house sparrows, chestnut-backed chickadees and white-crowned sparrows.

Rock doves eat mainly seeds. They nest on rocky cliffs or skyscrapers in the city. House sparrows like areas modified by humans, they eat seeds and insects. Both species prefer habitats modified by humans (ADW, 2004). It is possible that the Still Creek corridor has not been modified enough for these species to occur.

Chestnut-backed chickadees nest on mature conifers near streams, they are omnivores. White-crowned sparrows need tall coniferous trees, grass and cover for nesting. They eat seeds, buds and grass, as well as some insects. The critical factor for these species is cover for foraging and nesting. The riparian areas along Still Creek might not provide enough cover for them. There are no exclusively coniferous areas along the corridor; although Section 3 has mixed woodland, it might not be large enough to support these species.

Species absent from only some sections of Still Creek corridor

Green-winged teals were recorded only in Section 1. This species prefers shallow areas with muddy bottoms, usually near beaver ponds. This is the kind of habitat provided by Section 1. In Sections 2 and 3 the creek is deeper and wider.

Varied thrush, pileated woodpecker and red-breasted nuthatch were recorded only in Section 3. Varied thrushes prefer forested areas and forage on the forest floor. Pileated woodpeckers nest near streams in coniferous or deciduous forest, eat mostly insects and are territorial. Red-breasted nuthatches inhabit mixed coniferous stands with a diverse tree structure, gleaning insects from branches and tree trunks, as well as seeds (ADW, 2004). Section 3 is the only section with enough forest cover that can provide habitat for these species. Woodpeckers and nuthatches are extremely territorial; this might explain why only one individual of each species was recorded.

Species present on Still Creek corridor but absent from Burnaby Lake

Species that were observed during this study but are uncommon or have not been observed on Burnaby Lake during winter surveys include belted kingfisher, pileated woodpecker, red-breasted nuthatch and cedar waxwing.

Belted kingfishers need clear water for fishing and perches near the water. They eat mainly small fishes, but will also take mollusks, crustaceans, insects, reptiles, amphibians and mammals (ADW, 2004). It is possible that the waters of Still Creek are clean enough to support prey species and clear enough for kingfishers

to see their prey. Cedar waxwings prefer open woodland and forest edges; they are social birds, traveling in groups looking for fruit (ADW, 2004). The flock recorded might be a migratory group that could use part of or the whole corridor for feeding.

5.3 Vegetation

Diversity values indicate that Sections 1 and 3 are very similar in biodiversity, but species types were quite dissimilar in the two sections, as Section 1 included both disturbed grassland and deciduous forest areas, while Section 3 consisted of relatively undisturbed forest and shrubland. The percentage of weedy grassland species likely gave Section 1 a higher richness value, but did not indicate superior habitat. Dominance of Himalayan blackberry in Section 2 and the narrow riparian buffer limit both species diversity and richness in this section.

Section 1 vegetation surveyed was at an earlier successional stage than the other Sections, with many of the plots (6 out of 15) containing recently planted conifers and woody shrubs. Both Sections 2 and 3 were in later successional stages with little abundance of understory seedlings.

Invasive species comprised a small percentage of total cover in Sections 1 and 3 (6.1% and 6%, respectively), compared to 72% cover of Himalayan blackberry, reed canary grass and policeman's helmet in Section 2. Forty percent of plots in Section 2 were almost Himalayan blackberry monocultures with no understory or overstory vegetation. In Section 3, 27% of plots were likewise dominated by hardhack. However, habitat quality is less affected in Section 3 than Section 2 because of connectivity to other native vegetation.

Japanese knotweed was observed outside the vegetation plots, primarily along the edge of trails, roads, and the creek. Transects did not sample edge habitat, where the percent cover of exotic species appeared to be much higher. Exotics were observed to continue into the forest for approximately 10 meters from a given edge (road, stream or pathway), and were absent from the central area. Policeman's helmet was observed to grow where small mammal transects were laid out. It is possible that disturbance caused by our movements in the area helped spread this weed.

6.0 Recommendations

6.1 Future surveys

Point counts appeared to push waterfowl down the corridor; bridge counts seemed more effective for waterfowl surveys because they did not appear to influence waterfowl behaviour. Great blue herons were disturbed by our paddling and tended to fly downstream ahead of the kayak. Passerines appeared undisturbed by our presence; therefore, paddle counts were considered effective for passerine and raptor surveys.

Despite increasing trap density in 2004, most traps in Section 3 were full. RISC standards indicate that a maximum of 80% trap occupancy provides an accurate estimate. Consequently, since Section 3 exceeded this percentage, abundance of small mammals may be underestimated here. However, Sections 1 and 2 had occupancy considerably lower than 80%, so 30 traps per section seemed to be an appropriate amount of traps in these areas.

Small mammal trapping could be expanded to include summer surveys targeting small mammals that hibernate during the winter, like chipmunks and Pacific jumping mice. Tomahawk traps could also be used in future to target Northern flying squirrels, Douglas squirrels and Eastern grey squirrels.

This year, our survey team consisted of two people, which may not be enough to gather all the data that this project was aiming to collect. It would be better in the future to divide the work between a small mammal/vegetation sampling team and a bird survey team.

We observed two high flood events during the time of our inventory. The creek rose approximately 1.5 m and flooded the banks completely. During the second flood event our traps were set to pre-bait; and when we collected them they were full of water. These flood events may have had an effect on small mammals living on the banks of the creek, possibly forcing them to move upland to avoid being drowned. It would be interesting in future years to study the effects these high flood events might have on resident species of small mammals.

6.2 Land use decisions

Section 3 should not be developed for recreation, as establishment of trails along this section would disturb the habitat and facilitate the spread of invasive species. This is one of the only untouched “wild” areas left in Burnaby that has no human access. Even though it is a small area, the abundance and diversity of species present shows that this is an important area for small mammals and birds.

Any trail development in Sections 1 and 2 should be encouraged because those sections have already been disturbed, the percentage of invasive plants is high, and a trail would encourage stewardship of the area. Currently, the riparian buffer in much of Section 2 is too narrow to support a trail, but as more land becomes available, a trail or other recreational access should be built here.

The buffer zone in Section 2 should be increased as land becomes available or cooperation with business owners is achieved. The blackberry that makes up most of the vegetation of this section should not be removed as the banks may become unstable and be affected by the floods that occur regularly.

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APPENDIX A

List of all plant species mentioned in this report

Ash sp.	*Sorbus sp.*
Bitter cherry	*Prunus emarginata*
Bracken fern	*Pteridium aquilinum*
Cat-tail moss	*Rhytidiadelphus triquetrus*
Cherry sp.	*Prunus* sp.
Chickweed	*Stellaria media*
Upright yellow wood sorrel	*Oxalis stricta*
Cottonwood	*Populus balsamifera trichocarpa*
Crabapple	*Malus fusca*
Douglas fir	*Pseudotsuga menziesii*
English holly	*Cardamine oligosperma*
Evergreen blackberry	*Rubus lacinaiatus*
False lilly-of-the-valley	*Maianthemum dilatatum*
False Solomon's Seal	*Smilacina racemosa*
Few-seeded bitter-cress	*Cardamine oligosperma*
Fireweed	*Epilobium angustifolium*
Flat Moss	*Plagiothecium undulatum*
Hairy cat's ear	*Hypochaeris radicata*
Dandelion	*taraxacum officinale*
Hardhack	*Spiraea douglasii*
Hawthorne	*Crataegus douglasii*
Hemp-nettle	*Galeopsis tetrahit*
Himalayan blackberry	*Rubus discolor*
Horsetail	*Equisetum arvense*
Kentucky blue grass	*Poa pratensis*
Lanky moss	*Rhytidiadelphus loreus*
Morning glory	*Convolvulus arvensis*
Oak sp.	*Quercus sp.*
Oregon beaked moss	*Kindbergia oregana*
Paper birch	*Betula papyrifera*
Pipe cleaner moss	*Rhytidiopsis robusta*
Policeman’s helmet	*Impatiens glandulifera*
Red alder	*Alnus rubra*
Red elderberry	*Sambucus racemosa*
Red osier dogwood	*Cornus stolonifera*
Red roof moss	*Ceratodon purpureus*
Reed canary grass	*Phalaris arundinacea*
Salmonberry	*Rubus spectabilis*
Shepherd's cress	*Teesdalia nudicalis*
Sitka spruce	*Picea sitchensis*
Slender beaked moss	*Kindbergia praelonga*
Small-flowered lupine	*Lupinus polycarpus*
Spiny wood fern	*Dryopteris expansa*

Step moss	*Hylocomium splendens*
Stinging nettle	*Urtica dioica gracilis*
Twinberry	*Lonicera involucrata*
Venous cinquefoil	*Potentilla canadensis*
Western red cedar	*Thuja plicata*
White clover	*Trifolium repens*
Willow	*Salix* sp.
Woolly vetch	*Vicia villosa*
Yarrow	*Achillea millifolium* var. *lanulosa*
Yellow moss	*Homalothecium fulgescens*

APPENDIX B

UTM coordinates for all trap stations

Section 1	Zone 10	
Line 1	Easting	Northing
STA 1	499429	5456332
STA 2	499451	5456342
STA 3	499390	5456357
STA 4	499318	5456370
STA 5	499364	5456387
Line 2	Easting	Northing
STA 1	499450	5456245
STA 2	499467	5456241
STA 3	499480	5456243
STA 4	499490	5456237
STA 5	499506	5456229
POC	499447	5456263

Section 3	Zone 10	
Line 1 (N)	Easting	Northing
STA 1	502236	5456280
STA 2	502169	5456338
STA 3	502185	5456321
STA 4	502180	5456345
STA 5	502159	5456353
Line 2 (S)	Easting	Northing
STA 1	502265	5456187
STA 2	502251	5456174
STA 3	502244	5456174
STA 4	502226	5456181
STA 5	502226	5456150
Line 3	Easting	Northing
STA 1	502589	5455793
STA 2	502533	5455827
STA 3	502529	5455853
STA 4	502527	5455853
STA 5	502503	5455855

APPENDIX C

List of birds mentioned in this report

ORDER AND COMMON NAME	SCIENTIFIC NAME	Species code
Podicipediformes		
Pied-billed Grebe	*Podilymbus podiceps*	PBGR
Pelecaniformes		
Double-crested Cormorant	*Phalacrocorax auritus*	DCCO
Ciconiiformes		
Great Blue Heron	*Ardea herodias*	GBHE
Anseriformes		
American Wigeon	*Fulica Americana*	AMWI
Bufflehead	*Bucephala clangula*	BUFF
Canada Goose	*Branta canadensis*	CAGO
Common Goldeneye	*Bucephala clangula*	COGO
Common Merganser	*Mergus merganser*	COME
Gadwall	*Anas strepera*	GADW
Green-winged Teal	*Anas crecca*	GWTE
Hooded Merganser	*Lophodytes cucullatus*	HOME
Mallard	*Anas platyrhynchos*	MALL
Northern Shoveler	*Anas clypeata*	NOSH
Wood Duck	*Aix sponsa*	WODU
Falconiformes		
Nothern Harrier	*Circus cyaneus*	NOHA
Cooper's Hawk	*Accipiter cooperii*	COHA
Red-tailed Hawk	*Buteo lagopus*	RTHA
Sharp-shinned Hawk	*Accipiter striatus*	SSHA
Gruiformes		
American Coot	*Fulica americana*	AMCO
Columbiformes		
Rock Dove	*Columba livia*	RODO
Strigiformes		
Saw-whet Owl	*Aegolius acadicus*	SWOW
Western Screech Owl	*Otus kennicottii*	WSOW
Long-eared Owl	*Asio otus*	LEOW
Short-eared Owl	*Asio flammeus*	SEOW
Barred Owl	*Strix varia*	BAOW
Great Horned Owl	*Bubo virginianus*	GHOW
Piciformes		
Downy Woodpecker	*Picoides pubescens*	DOWO
Northern Flicker	*Colaptes auratus*	NOFL
Pileated Woodpecker	*Dryocopus pileatus*	PIWO

Coraciiformes		
Belted Kingfisher	*Ceryle alcyon*	BEKI
Passeriformes		
American Robin	*Turdus migratorius*	AMRO
Black-capped Chickadee	*Poecile atricapilla*	BCCH
Bewick's Wren	*Thryomanes bewickii*	BEWR
Bushtit	*Psaltriparus minimus*	BUSH
Cedar Waxwing	*Bombycilla cedrorum*	CEWA
Chestnut-backed Chickadee	*Poecile rufescens*	CBCH
Dark-eyed Junco	*Junco hyemalis*	DEJU
European Starling	*Sturnus vulgaris*	EUST
Fox Sparrow	*Passerella iliaca*	FOSP
Golden-crowned Kinglet	*Regulus satrapa*	GCKI
House Finch	*Carpodacus cassinii*	HOFI
House Sparrow	*Passer domesticus*	HOSP
Pine Siskin	*Carduelis pinus*	PISI
Purple Finch	*Carpodacus purpureus*	PUFI
Red-winged Blackbird	*Agelaius phoeniceus*	RWBL
Red-breasted Nuthatch	*Sitta canadensis*	RBNU
Song Sparrow	*Melospiza melodia*	SOSP
Spotted Towhee	*Pipilo maculatus*	SPTO
Steller's Jay	*Cyanocitta stelleri*	STJA
Varied Thrush	*Ixoreus naevius*	VATH
Violet-green Swallow	*Tachycineta thalassina*	VGSW
White-crowned Sparrow	*Zonotrichia leucophrys*	WCSP
Winter Wren	*Troglodytes troglodytes*	WIWR