

Status of Wildlife in Burns Bog, Delta - 1999

Late Summer/Early Fall 1999 Survey Results and Review of Existing Information

Prepared For:

Delta Fraser Properties Partnership
and the Environmental Assessment Office
in support of the Burns Bog Ecosystem Review
Additional work on Publicly-owned lands conducted
for the Environmental Assessment Office in association
with the Corporation of Delta

Prepared By:

Martin B. Gebauer, M.Sc., R.P.Bio
Enviro-Pacific Consulting
12634 28th Avenue
Surrey, B.C. V4A 2P3

November 1999

EXECUTIVE SUMMARY

Existing information on wildlife utilization in Burns Bog and data from 1999 wildlife surveys was collected and reviewed, and comprehensive species lists for mammals, birds, amphibians, and reptiles were developed. For each listed species, status, distribution, and habitat preferences within Burns Bog are indicated. Rare and endangered species known or expected to occur within Burns Bog are discussed in detail.

The mammalian and amphibian faunas of Burns Bog are the most poorly studied and understood terrestrial vertebrate groups. Very few studies have investigated the occurrence of mammal species in the Bog, and of those that have, none have undertaken an intensive sampling and trapping program. As a result, there is considerable confusion as to the status of many species. Mammals once recorded regularly in Burns Bog, such as chipmunks, Snowshoe Hare (*Lepus americanus washingtonii*), Porcupine (*Erithizon dorsatum*), Red Fox (*Vulpes vulpes*), and Spotted Skunk (*Spilogale gracilis*) may now be extirpated, since no recent confirmed sightings have been reported. Voucher specimens of other reported species, such as Long-tailed Weasel (*Mustela frenata altifrontalis*), have yet to be verified by a qualified taxonomist. The bat fauna of Burns Bog is very poorly understood. None of the reviewed studies described the occurrence of any bat species, although it is likely that several species utilize the Bog.

The most common and widespread mammal species utilizing Burns Bog include, Black-tailed Deer (*Odocoileus hemionus columbianus*), Coyote (*Canis latrans*), Eastern Cottontail (*Sylvilagus floridanus*), Beaver (*Castor canadensis*), Muskrat (*Ondatra zibethicus*), Raccoon (*Procyon lotor*), Douglas' Squirrel (*Tamiasciurus douglasii*), and Deer Mouse (*Peromyscus maniculatus*). Several shrew species may also be common, but little effort has been made to determine the status of these species. Introduced species which have become established include, Eastern Gray Squirrel (*Sciurus carolinensis*), Black Rat (*Rattus rattus*), Norway Rat (*Rattus norvegicus*), and House Mouse (*Mus musculus*). Blue and red-listed species which are known to occur include, Pacific Water Shrew (*Sorex bendirii*), Trowbridge's Shrew (*Sorex trowbridgii*), and Southern Red-backed Vole (*Clethrionomys gapperi occidentalis*). The status of Snowshoe Hare, a red-listed species, is unclear.

Detailed information on the bird fauna of Burns Bog has been collected by Gebauer (unpublished records), Enviro-Pacific Consulting (1999), Perdichuk (1999), and the current study. To date, 175 bird species have been reported within Burns Bog (although not all have been confirmed by more than one observer), representing approximately 64% of bird species occurring regularly in the Vancouver area. Burns Bog is not only an important nesting area for many bird species, but is important to numerous migratory and wintering birds.

Common breeding birds include; American Robin (*Turdus migratorius*), Brown-headed Cowbird (*Molothrus ater*), Cedar Waxwing (*Bombycilla cedrorum*), Common Yellowthroat (*Geothlypis trichas*), Marsh Wren (*Cistothorus palustris*), Red-winged Blackbird (*Agelaius phoeniceus*), Savannah Sparrow (*Passerculus sandwichensis*), Song Sparrow (*Melospiza melodia*), Spotted Towhee (*Pipilo maculatus*), and White-crowned Sparrow (*Zonotrichia leucophrys*). Common migrants include, Orange-crowned Warbler (*Vermivora celata*), American Pipit (*Anthus rubescens*), Yellow-rumped Warbler (*Dendroica coronata*), and swallows. Although a number of rare and endangered bird species have been observed in the Bog, only Sandhill Crane (*Grus canadensis tabida*), Hutton's Vireo (*Vireo huttoni*), and American Bittern (*Botaurus lentiginosus*), all blue-listed species, are known or thought to breed.

The amphibian and reptile faunas of Burns Bog are not well understood. Current studies by Knopp and Larkin (1999), Rithaler and Corporation of Delta (1999), and observations by local naturalists have provided the best data. It is apparent that Green Frog (*Rana clamitans*) and Bullfrog (*Rana catesbeiana*) are extremely common in all wetland areas of the Bog. The aggressive, colonizing Bullfrog may have lead to the declines of native species such as Western Toad (*Bufo boreas*) and Red-legged Frog (*Rana aurora*), although the historical populations of these latter two species is not known. Native species that are relatively common in Burns Bog wetlands include, Pacific Tree Frog (*Hyla regilla*) and Northwestern Salamander (*Ambystoma gracile*). The red-listed, Oregon Spotted Frog (*Rana pretiosa*) has been reported by Klassen et al (1971), and more recently, Perdichuk (1999). The abilities of the observers in distinguishing between Oregon Spotted Frog and Red-legged Frog is not known, and voucher specimens were not kept to verify the identification of this extremely rare frog. The two garter snakes species known to occur commonly within the Bog are the Northwestern Garter Snake (*Thamnophis ordinoides*) and Common Garter Snake (*Thamnophis sirtalis*).

Burns Bog represents one of the largest, relatively undisturbed habitats in the lower Fraser River valley. Part of the value of Burns Bog is due to its large size, and limited and restricted access. Human disturbance of wildlife is very low because of tight restrictions on vehicle and pedestrian access. The large freshwater

wetlands, particularly in winter and spring, attract large numbers of waterbirds. These freshwater habitats appear to be particularly important in the fall, when winter rains have not yet flooded adjacent agricultural fields. The Bog not only provides important roosting habitats for raptors such as Barn Owl (Summers and Gebauer 1999a), but also roosting areas for waterbirds such as Mallard and Canada Goose (Summers and Gebauer 1999b). During the breeding season, the Bog provides nesting and foraging habitats for raptors not available in unforested and actively cultivated agricultural habitats of the Delta. Burns Bog clearly provides habitats for a wide diversity of wildlife species.

TABLE OF CONTENTS

1. INTRODUCTION

- 1.1 Background
- 1.2 Study Area
- 1.3 Objectives

2. METHODS AND INFORMATION SOURCES

- 2.1 Literature Review
- 2.2 Sandhill Crane, Waterbird, and Raptor Surveys in 1999
- 2.3 Other Wildlife Research Projects
- 2.4 Assessment of Corporation of Delta Properties
- 2.5 Anecdotal Wildlife Observations

3. STUDY LIMITATIONS

4. RESULTS AND DISCUSSION

4.1 General Wildlife - 1999 Surveys of Burns Bog

- 4.1.1 Mammals
- 4.1.2 Birds
- 4.1.3 Amphibians
- 4.1.4 Reptiles

4.2 Wildlife - Corporation of Delta Properties

- 4.2.1 Mammals
- 4.2.2 Birds
- 4.2.3 Amphibians
- 4.2.4 Reptiles

4.3 Rare and Endangered Wildlife

4.3.1 Confirmed Red-listed Mammals

- 4.3.1.1 Pacific Water Shrew (*Sorex bendirii*) - Red List
- 4.3.1.2 Southern Red-backed Vole (*Clethrionomys gapperi occidentalis*) - Red List

4.3.2 Confirmed Blue-listed Mammals

- 4.3.2.1 Trowbridge's Shrew (*Sorex trowbridgii*) - Blue List

4.3.3 Unconfirmed Red-listed Mammals

- 4.3.3.1 Townsend's Mole (*Scapanus townsendii*) - Red List
- 4.3.3.2 Keen's Long-eared Myotis (*Myotis keenii*) - Red List
- 4.3.3.3 Snowshoe Hare (*Lepus americanus washingtonii*) - Red List
- 4.3.3.4 Long-tailed Weasel (*Mustela frenata altifrontalis*) - Red List

4.3.4 Unconfirmed Blue-listed Mammals

- 4.3.4.1 Townsend's Big-eared Bat (*Corynorhinus townsendii*) - Blue List

4.3.5 Confirmed Red-listed Birds

- 4.3.5.1 Peregrine Falcon (*Falco peregrinus anatum*) - Red List
- 4.3.5.2 Purple Martin (*Progne subis*) - Red List

4.3.6 Confirmed Blue-listed Birds

- 4.3.6.1 American Bittern (*Botaurus lentiginosus*) - Blue List
- 4.3.6.2 Great Blue Heron (*Ardea herodias*) - Blue List
- 4.3.6.3 Green Heron (*Butorides virescens*) - Blue List
- 4.3.6.4 Trumpeter Swan (*Cygnus buccinator*) - Blue List
- 4.3.6.5 Peregrine Falcon (*Falco peregrinus pealei*) - Blue List
- 4.3.6.6 Sandhill Crane (*Grus canadensis*) - Blue List
- 4.3.6.7 Short-billed Dowitcher (*Limnodromus griseus*) - Blue List
- 4.3.6.8 Caspian Tern (*Sterna caspia*) - Blue List
- 4.3.6.9 California Gull (*Larus californicus*) - Blue List
- 4.3.6.10 Barn Owl (*Tyto alba*) - Blue List
- 4.3.6.11 Short-eared Owl (*Asio flammeus*) - Blue List

4.3.6.12 Hutton's Vireo (*Vireo huttoni*) - Blue List

4.3.7 Unconfirmed Red-listed Birds

4.3.7.1 Horned Lark (*Eremophila alpestris strigata*) - Red List

4.3.7.2 Vesper Sparrow (*Pooecetes gramineus affinis*) - Red List

4.3.8 Unconfirmed Rare and Endangered Amphibians

4.3.8.1 Oregon Spotted Frog (*Rana pretiosa*) - Red List

4.3.9 Unconfirmed Rare and Endangered Reptiles

4.3.9.1 Rubber Boa (*Charina bottae*) - Blue List

4.3.10 Occurrence on Corporation of Delta Properties

5. IMPORTANT HABITATS

5.1 General Description

5.2 Habitat Suitability Analysis

6. IMPACTS OF DISTURBANCE AND INVADING WILDLIFE SPECIES

6.1 Impacts of Disturbance

6.2 Invading Species

6.3 Indicator Species

7. REGIONAL SIGNIFICANCE OF BURNS BOG

8. GAPS AND LIMITATIONS

9. CONCLUSIONS

10. LITERATURE CITED

APPENDIX I

APPENDIX II

APPENDIX III

APPENDIX IV

APPENDIX V

APPENDIX VI

APPENDIX VII

LIST OF TABLES

Table 1: Mammal species recorded on wildlife surveys in August and September 1999 in Burns Bog (v = visual, f = feeding sign, c = call, t = tracks, l = beaver lodges, and s = scats or pellet groups).

Table 2: Twenty-five most common bird species encountered during Sandhill Crane surveys in Burns Bog - August/September 1999. Total number is a cumulative total of birds seen by observers during the surveys.

Table 3: Mammal species observed on Corporation of Delta properties during the October 1999 field surveys. Scat = 's'; tracks or vole runways = 't'; carcass = 'c'; and feeding sign = 'f'.

Table 4: Bird species observed on Corporation of Delta properties during the October 1999 field surveys. Nests = 'n'; roost sites = 'r'; feeding sign = 'f'.

Table 5: Amphibian species observed on Corporation of Delta properties during the October 1999 field surveys.

Table 6: Known or expected occurrence of rare and endangered species on properties owned by the Corporation of Delta.

LIST OF FIGURES

(Figures not available in electronic format, please visit our satellite repositories to view a hard copy)

Figure 1: Fall 1999 general wildlife survey points, transects and study area in Burns Bog.

LIST OF APPENDICES

Appendix I: Status, distribution and habitat preferences of mammals reported in Burns Bog, Delta. Red and blue-listed species are indicated with superscript 'B' and 'R', respectively.

Appendix II: Bird species and approximate numbers encountered during standwatch and transect surveys for Sandhill Cranes, raptors, and waterbirds in central areas of Burns Bog, Delta - August and September 1999. Blue and red-listed species are indicated with superscript 'B' and 'R', respectively.

Appendix III: Status, distribution and habitat preferences of birds recorded in Burns Bog, Delta. Superscript 'B' and 'R' indicate blue and red-listed species, respectively. Species known or expected to breed are

indicated in bold print. For species with only one source, further information is provided in footnotes at the end of the table.

Appendix IV: Bird species encountered during breeding Sandhill Crane surveys and traverses of Burns Bog, Delta - May 1999 (from Enviro-Pacific Consulting 1999). Blue and red-listed species are indicated with superscript 'B' and 'R', respectively.

Appendix V: Bird species encountered during surveys for Sandhill Cranes in central areas of Burns Bog, Delta - April to October 1993 (based on M. Gebauer field notes).

Appendix VI: Bird species encountered during surveys for Sandhill Cranes in central areas of Burns Bog, Delta - April to October 1994 (based on M. Gebauer field notes).

Appendix VII: Status, distribution and habitat preferences of amphibians and reptiles recorded in Burns Bog, Delta. Blue and red-listed species are indicated with superscript 'B' and 'R', respectively.

1. INTRODUCTION

1.1 Background

Enviro-Pacific Consulting was retained by 569244 British Columbia Ltd. to compile existing information on wildlife utilization of Burns Bog as part of the Burns Bog Ecosystem Review. Additional work on the Corporation of Delta owned lands around the periphery of the Bog was conducted for the Environmental Assessment Office in association with the Corporation of Delta.

ENKON (1999) had previously identified a need to conduct detailed studies and an assessment of wildlife utilization of the Bog. Although a few previous studies have attempted to document wildlife utilization of Burns Bog, no studies have undertaken comprehensive dedicated surveys of wildlife populations. TERA Planning Ltd. (1992, and 1993) conducted some preliminary breeding bird surveys and undertook a moderate small mammal trapping program in 1989. Additional small mammal trapping was conducted by D. DeMill and P. Perdichuk on behalf of the Burns Bog Conservation Society. Gebauer (unpublished records) and Enviro-Pacific Consulting (1999) provided detailed information on bird species occurrence between April and October. No bird surveys have been conducted during the winter period. Studies in the current year represent the greatest single year effort in documenting wildlife use of Burns Bog. Information collected in 1999 and in previous studies is summarized in this report.

1.2 Study Area

Burns Bog is located within the Corporation of Delta, and is bounded by industrial areas and River Road to the north, agricultural fields to the west (i.e., Crescent Slough area), Highway 99 and agricultural fields to the south, and the Burlington Northern Santa Fe Railway to the East (Figure 1). The majority of the Bog is

privately owned by Delta Fraser Properties Partnership (i.e., approximately 2,300 ha), however, the City of Vancouver owns and manages a 627 ha sanitary landfill site at the southwest corner of Burns Bog, and the Corporation of Delta owns 15 parcels around the periphery of the Bog (see Figure 1).

Species lists provided in the appendices of this report are relevant for central and peripheral areas of Burns Bog, including Delta-owned lands, and forested areas east of Highway 91 (see Figure 1). Species observed in agricultural areas, in urban environments, at the Vancouver Landfill, or along the Fraser River, were not included in species lists of Burns Bog.

1.3 Objectives

The primary objectives and terms of reference for this study were to:

- review and document existing rare and endangered wildlife species based on the Conservation Data Centre's Red and Blue lists for the Chilliwack Forest District (CDC 1999);
- assess and identify the status of rare and endangered wildlife species in Burns Bog;
- review published and unpublished background reports and other existing information;
- compile data from previous studies and those conducted in August/September in the Bog;
- describe wildlife observations, distribution and abundance information, and identify important habitats; and
- provide lists of terrestrial vertebrates.

2. METHODS AND INFORMATION SOURCES

2.1 Literature Review

Existing literature describing wildlife occurrence and habitat utilization within Burns Bog was reviewed. Primary references included: a) Biggs (1976); b) Beak Consultants Ltd. (1982); c) Barnard (1988); d) TERA Planning Ltd (1993); e) Gebauer and Bekhuys (1994); f) Enviro-Pacific Consulting (1999); g) Knopp and Larkin (1999); h) Materi and Blood (1999); i) Perdichuk (1999); and j) Smith (1999). Documents with preliminary data (e.g., draft reports) or limited wildlife information included, TERA Planning Ltd. (1991 and 1992) and Catherine Berris Associates Inc. (1993). Unpublished wildlife records of DeMill (1999), Denham (1992), Poynter (1989), and M. Gebauer (personal field notes) were also incorporated into this review. All literature was carefully reviewed to determine the validity of wildlife sightings. In several cases, either obvious errors in identification were made by an author, or unusual sightings were not substantiated by voucher specimens or photographs; however, all records were noted in this report and validity of

questionable occurrences discussed.

2.2 Sandhill Crane, Waterbird, and Raptor Surveys in 1999

Standwatch and transect surveys of Sandhill Crane (Gebauer 1999a), raptors (Summers and Gebauer 1999a), and waterbirds (Summers and Gebauer 1999b) were conducted on 15 days between 16 August and 20 September 1999. The standwatch survey was conducted by five observers, each standing for one hour at one of five locations distributed through the western and central portions of the Bog (Figure 1). Following the standwatch survey, each observer spent two hours walking along pre-selected transect routes to observe birds occurring around permanent ponds and other habitats not visible from the standwatch location. Survey points and transects were located to maximize the total area of the Bog covered (see Figure 1). Survey times alternated between evening (starting three hours before sunset), sunrise (starting at sunrise), and midday (1200 to 1500). Observers involved in the surveys included, Martin Gebauer, Ken Summers, Claudio Bianchini, Fred Simpson, Mark Wynja, and Rick Toochn.

Observers not only recorded detailed information on Sandhill Cranes, waterbirds, and raptors, but reported all incidental sightings of other bird species, mammals, amphibians, and reptiles. For birds, each observer estimated the total number of each species observed during the survey period. Results of the five survey areas were later compiled and summarized in tabular form to provide a general overview of bird species diversity and relative abundance within interior areas of Burns Bog. General wildlife information was also collected on raptor encounter transects conducted by three observers in three locations on 19 August, 31 August, and 14 September (see Summers and Gebauer 1999a for information on methodology and transect location) and during nocturnal waterbird surveys (see Summers and Gebauer 1999b for information on methodology and survey locations).

2.3 Other Wildlife Research Projects

Other researchers investigated the occurrence, abundance and distribution of amphibians and reptiles (Knopp and Larkin 1999), Black-tailed Deer and Black Bear (McIntosh and Robertson 1999), and small mammals (Fraker et al 1999). Preliminary results from these studies were incorporated into this general wildlife review.

2.4 Assessment of Corporation of Delta Properties

All 15 properties owned by the Corporation of Delta around the periphery of the Bog were visited in October 1999 to determine their relative value to wildlife utilizing Burns Bog.

2.5 Anecdotal Wildlife Observations

Reports of wildlife from other researchers (e.g., Terrestrial Ecosystem Mapping crew), naturalists, and other observers were also considered during development of species lists for Burns Bog. Several organizations and people were consulted during this review: however, an intensive interview process including all potential stakeholders in the Bog was not conducted. People and organizations consulted, included, Burns Bog Conservation Society (P. Perdichuk), Delta Environmental Advisory Committee (M. Taitt), Ministry of Environment, Lands and Parks (T. Barnard, D. Dunbar, T. Plath), Corporation of Delta (R. Rithaler), Vancouver Natural History Society (J. Denham), Scott Painter, and D.DeMill,

3. STUDY LIMITATIONS

Field work on Delta Fraser Properties, and portions of Corporation of Delta properties, was conducted between 13 August and 20 September 1999. Field work on properties owned by the Corporation of Delta was conducted in the latter two weeks of October. Wildlife observations in these time periods provide baseline information for a limited time of year during a single year and can not account for seasonal or yearly variations. Previous research has provided some data on bird species use of the Bog between mid-April and mid-October, but few dedicated studies investigated wildlife utilization of Burns Bog during the winter months. Voucher specimens have not been kept for some mammal species reported for the Bog, making it difficult to verify identification.

4. RESULTS AND DISCUSSION

4.1 General Wildlife - 1999 Surveys of Burns Bog

4.1.1 Mammals

Appendix I lists all mammal species reported as occurring within Burns Bog. Several mammal species, such as Coyote (see Appendix I for scientific names), Black-tailed Deer, Douglas' Squirrel and Eastern Cottontail are particularly common within and in the vicinity of the Bog. Sign or individuals of these species were generally observed on each visit to Burns Bog. Coyote sign (e.g., scats) was evident along roadways, boardwalks and trail. Several individuals were seen, and many were heard calling. Douglas' Squirrel was encountered frequently in all areas of the Bog with a coniferous tree component. Coniferous trees such as Lodgepole Pine (*Pinus contorta*) and Sitka Spruce (*Picea sitchensis*) have cones and seeds which are important foods for squirrels. Eastern Cottontail was generally seen in peripheral areas where it appears to be quite common (this study; Smith 1999).

Black-tailed Deer were observed regularly including females with up to two fawns. Tracks and pellet groups were evident throughout the Bog but particularly in deciduous and mixed forest habitats along the Bog margins. Deer sign was very abundant in dense mixed forest habitat east of Highway 91. McIntosh and Robertson (1999) provide a more detailed description of deer occurrence and habitat suitability within the Bog. The highest value wintering habitats appear to be east of Highway 91, in mixed coniferous-deciduous forests. Suitable spring and summer habitats are widespread throughout central and peripheral areas of the Bog.

Several other species, including Beaver, Raccoon, and Shrew-Mole were also encountered on a regular basis. Beaver appear to be well established in all deep water ponds of the Bog. Three large lodges and individuals were observed in Survey Area #3 at the northwest end of the Bog. Eastern Gray Squirrels appear to be established within the mixed coniferous forest habitats east of Highway 91 and several individuals were also observed in birch habitats just west of Highway 91. None of these species are on the provincial Red and Blue lists. Table 1 lists all mammals recorded by observers during the Sandhill Crane, waterbird, and raptor surveys.

Table 1: Mammal species recorded on wildlife surveys in August and September 1999 in Burns Bog (v = visual, f = feeding sign, c = call, t = tracks, l = beaver lodges, and s = scats or pellet groups).

Date (99)	SA# 1	SA# 2	SA# 3	SA# 4	SA# 5
16 Aug	<ul style="list-style-type: none"> • • doe & fawn (v) 	<ul style="list-style-type: none"> • coyote (c,t,s) • deer (v) 		<ul style="list-style-type: none"> • • coyote (v) • Dougl. Sq. (2) 	
18 Aug	<ul style="list-style-type: none"> • • Dougl. Sq. • cottontail (v) 	<ul style="list-style-type: none"> • Dougl. Sq. • cottontail (v) 	<ul style="list-style-type: none"> • bear (s) • deer (t) • Dougl. Sq. (v) 		<ul style="list-style-type: none"> • • coyote (v)
20 Aug	<ul style="list-style-type: none"> • • Dougl. Sq. (v) • fox ?? (t) 	<ul style="list-style-type: none"> • beaver (t) • coyote (t) 			<ul style="list-style-type: none"> • • coyote (t)

23 Aug		<ul style="list-style-type: none"> • • cottontail (2v) • Dougl.Sq. (v) 	<ul style="list-style-type: none"> • beaver (2v,3l,t) • deer (t) 		<ul style="list-style-type: none"> • • doe & 2 fawns • coyote (3v)
25 Aug	<ul style="list-style-type: none"> • • deer (t) 	<ul style="list-style-type: none"> • beaver (f) • Dougl. Sq. (2v) 	<ul style="list-style-type: none"> • coyote (2t) • Dougl. Sq. (1c) • deer (t) 	<ul style="list-style-type: none"> • Dougl. Sq. (2v) 	<ul style="list-style-type: none"> • bat (v)
27 Aug	<ul style="list-style-type: none"> • • deer (t) • Dougl. Sq. (v) 				<ul style="list-style-type: none"> • • cottontail (1v) • Dougl. Sq. (2v)
30 Aug	<ul style="list-style-type: none"> • • Dougl. Sq. (3) • doe & 2 fawns 	<ul style="list-style-type: none"> • Dougl. Sq. (1c) • coyote (1c) 	<ul style="list-style-type: none"> • Dougl. Sq. (2) 	<ul style="list-style-type: none"> • coyote (3c) 	<ul style="list-style-type: none"> • coyote (4c) • deer (t)
01 Sep	<ul style="list-style-type: none"> • • deer (1v) 	<ul style="list-style-type: none"> • Dougl. Sq. (2) 	<ul style="list-style-type: none"> • Dougl. Sq. (2) • coyote (1v) 	<ul style="list-style-type: none"> • bear(3s) • coyote (t,s-many) • deer (t-many) • Dougl. Sq. (1c) 	<ul style="list-style-type: none"> • coyote (10+s) • deer (2v)
03 Sep					<ul style="list-style-type: none"> • • bear (1s) • coyote (1s)

08 Sep	<ul style="list-style-type: none"> • • deer (1v,t-many) • coyote (t,s-many) 	<ul style="list-style-type: none"> • Dougl. Sq. (2) 	<ul style="list-style-type: none"> • • Dougl. Sq. (1v) • coyote (1v) 	<ul style="list-style-type: none"> • coyote (1v) • bear (1s)
10 Sep		<ul style="list-style-type: none"> • • Dougl. Sq. (2) • beaver (t) 	<ul style="list-style-type: none"> • • vole (1v) • coyote (1v) 	
13 Sep	<ul style="list-style-type: none"> • • Dougl. Sq. (c) 	<ul style="list-style-type: none"> • Dougl. Sq. (3) 	<ul style="list-style-type: none"> • Dougl. Sq. (2) 	<ul style="list-style-type: none"> • • coyote (s) • beaver (1 dam) • Dougl. Sq. (1c)
15 Sep	<ul style="list-style-type: none"> • • bear (s) • deer (t-many) 		<ul style="list-style-type: none"> • • Dougl. Sq. (4) • coyote (2c) 	<ul style="list-style-type: none"> • • Gray Sq. (1v) • coyote (2v)
17 Sep	<ul style="list-style-type: none"> • • Dougl. Sq. (3) • cottontail (1v) • coyote (2v) 	<ul style="list-style-type: none"> • coyote (2c) • bear (t-fresh) • Dougl. Sq. (v) 	<ul style="list-style-type: none"> • Dougl. Sq. (6) • coyote (3c) 	
20 Sep	<ul style="list-style-type: none"> • • Dougl. Sq. (1c) 	<ul style="list-style-type: none"> • Dougl. Sq. (1v) • deer (t-many) • coyote (t-many) 	<ul style="list-style-type: none"> • Dougl. Sq. (5) 	<ul style="list-style-type: none"> • • Gray Sq. (1v) • Dougl. Sq. (1v)

Several mammal species, reported historically, appear to have been extirpated from the Bog within the last 20 years; no recent confirmed sightings or voucher specimens are available. These species include, Snowshoe Hare, Townsend's Chipmunk, Yellow-Pine Chipmunk, Porcupine, Red Fox and Spotted Skunk; however, it was not possible to determine the reliability of all original records. The red-listed, Snowshoe Hare is described in more detail under Section 4.2 below. Unconfirmed sightings of Red Fox and Snowshoe Hare are still reported occasionally.

The blue-listed, Trowbridge's Shrew appears to be well established in Burns Bog, and recent specimens of immature Southern Red-backed Vole (Fraker et al. 1999), a red-listed species, indicates that a population of this species is established. A skull of a Pacific Water Shrew found in a Barn Owl pellet in the Bog suggests that a population of this species may also exist. Reports of red-listed Long-tailed Weasel and Townsend's Mole have not been verified, and voucher specimens have not been located or sent to D. Nagorsen, the Provincial Vertebrate Specialist, Royal B.C. Museum. Rare and endangered species are described in more detail in Section 4.3.

Although bats are observed regularly over Burns Bog habitats, bat species occurrence in the Bog has not been described. Possible rare and endangered bat species are described in more detail in Section 4.3 below. It is almost certain that several species of Myotis and others such as Big Brown Bat (*Eptesicus fuscus*) and Silver-haired Bat (*Lasionycteris noctivagans*) utilize Burns Bog habitats (D. Nagorsen, B.C. Royal Museum, pers. comm., 1999).

Black Bears still inhabit Burns Bog (Table 1). Although individuals were not observed by field crews during the 1999 field season, scats and tracks were noted in central and peripheral areas of the Bog, including the mixed forest habitats east of Highway 91. A field reconnaissance of Corporation of Delta properties found a high density of bear scats in Lots 1 and 15, on the west side of the Bog. Black Bears are described in more detail in a separate report (McIntosh and Robertson 1999). The authors noted that most bear sightings are reported in southern areas of the Bog, and in the pine and mixed coniferous-deciduous woodlands on the east side. Suitability mapping of Bog ecosystems indicated that there is relatively little high and moderately high rated habitat in the Bog, but that cover and forage habitat are not limiting factors in the population. The major factors affecting bears in the Bog appear to be: "increasing isolation from other populations of Black Bears, the relative absence of existing corridors, the proximity of a large human population, and the potential risks presented by nearby transportation corridors" (McIntosh and Robertson 1999).

Other mammal species that may inhabit the Bog, but have not been observed or confirmed to date, include River Otter (*Lontra canadensis*) and Mink (*Mustela vison*).

4.1.2 Birds

More than 100 bird species were observed during the fall 1999 surveys and site traverses in Burns Bog (see Appendix II). The 25 most common species encountered, in decreasing order of abundance, are listed in Table 2 (see Appendix III for scientific names). Total numbers represent a cumulative tally of all individuals reported on the surveys and traverses, thus, providing a crude measure of relative abundance within Burns Bog. Observation time was the same for each species. Of the common species, only Sandhill Crane is blue-

listed by CDC (1999). For further information on raptors, waterbirds, and Sandhill Crane, refer to Summers and Gebauer (1999a and 1999b), and Gebauer 1999a, respectively.

Table 2: Twenty-five most common bird species encountered during Sandhill Crane surveys in Burns Bog - August/September 1999. Total number is a cumulative total of birds seen by observers during the surveys.

Rank	Species	Total Number	Status
1	Mallard	2,520	Common resident
2	Glaucous-winged Gull	2,496	Common fly-over
3	Canada Goose	2,319	Common fall and winter resident
4	Barn Swallow	1,323	Common breeder and migrant
5	American Robin	956	Common summer resident and migrant
6	Common Yellowthroat	775	Common summer resident
7	Song Sparrow	610	Common resident
8	Cedar Waxwing	550	Common summer resident
9	Yellow-rumped Warbler	540	Common migrant
10	Black-capped Chickadee	519	Common resident

11	Dark-eyed Junco	429	Common migrant
12	Bushtit	396	Common resident
13	White-crowned Sparrow	344	Common resident
14	Marsh Wren	268	Common summer resident
15	Spotted Towhee	260	Common resident
16	American Pipit	210	Common migrant
17	American Goldfinch	191	Common summer resident
18	Green-winged Teal	176	Common resident
19	Savannah Sparrow	173	Common summer resident
20	Sandhill Crane	173	Common summer resident
21	Bewick's Wren	165	Common resident
22	Orange-crowned Warbler	158	Common breeder and migrant
23	Northwestern Crow	152	Common resident
24	Cliff Swallow	133	Common migrant

Nine species which were common during the May 1999 surveys (Enviro-Pacific Consulting 1999) occurred at very low densities in August and September. Common breeders such as Brown-headed Cowbird, Red-winged Blackbird, and Killdeer had vacated central areas of the Bog by mid-August. A few young Brown-headed Cowbirds were still being fed by host species including Spotted Towhee and Common Yellowthroat. Common spring migrants such as Long-billed Dowitcher, Least Sandpiper, Northern Shoveler, Tree Swallow, and Violet-green Swallow were either absent in the fall or present in low numbers. Many Tree and Violet-green swallows have already migrated south by mid- to late-August (Campbell et al 1997). Other migrants and winter residents such as Northern Shoveler have not yet arrived in any significant numbers (Butler and Cannings 1989).

Bald eagles were not reported in August and September. Bald Eagle numbers are known to increase dramatically in mid-winter after foraging opportunities on spawning salmon in northern areas decreases. Numbers of Bald Eagle generally stay quite high in the Lower Mainland until April and May when most birds begin returning to nesting areas (Butler and Cannings 1989). A Bald Eagle winter roost site is known to exist just northeast of the Highway 91 and 72nd Avenue interchange and is distributed on properties owned by Delta Fraser Properties and Corporation of Delta (TERA Planning Ltd. 1993).

Appendix III provides a compilation of all bird observations within central areas of Burns Bog (see delineated areas in Figure 1). Bird species occurring in adjacent urban, industrial, agricultural, riverine, marine, and landfill habitats were not included in this assessment. General information on status, distribution, habitat utilization, and sources is also indicated in Appendix III. Important sources of data included spring surveys by Enviro-Pacific Consulting (1999)(see Appendix IV), unpublished records by M. Gebauer between April and October in 1993 and 1994 (see Appendices V and VI, respectively), and observations by Poynter (1989), Denham (1992), DeMill (1999), Perdichuk (1999), and Smith (1999).

A total of 175 birds species has been recorded within central areas of Burns Bog (Appendix III); representing approximately 43% of all species (i.e., 406) reported within the Vancouver checklist area, and 68% of regularly occurring birds (i.e., 274) (Toochin 1998). Several other species, not yet documented in the Bog, are likely to occur on an irregular basis, particularly in winter. The winter period has been the most poorly studied in Burns Bog. Where only one source is available for a bird species (See Appendix III), further information is footnoted at the end of the appendix. Rare and endangered bird species encountered in Burns Bog are described in more detail in Section 4.3 below.

4.1.3 Amphibians

Amphibian species noted during the Sandhill Crane surveys and site traverses included, Bullfrog (see Appendix VII for scientific names), Green Frog, and Pacific Tree Frog. These species are not on the Provincial Red and Blue lists (CDC 1999). Recent work by Knopp and Larkin (1999) and Rithaler and Corporation of Delta (1999) has also confirmed the presence of Ensatina, and Long-toed, Western Red-backed and Northwestern salamanders in the Bog and adjacent areas. Ensatina and Western Red-backed Salamander were found in Cougar Creek Canyon but are expected to occur in mixed forest habitats east of Highway 91. DeMill (1999) photographed Northwestern Salamander and Rough-skinned Newt. Western Toad has been reported by Klassen et al (1971), and Rithaler and Corporation of Delta (1999). Several Red-legged Frogs were carefully described by M. Wynja in Survey Area #4, and several have been reported in areas adjacent to Burns Bog by Rithaler and Corporation of Delta (1999). Red-legged Frog and Western Toad may be impacted by the rapid increases in introduced Bullfrog and Green Frog populations and by increased human disturbance in preferred habitats, although this has not been documented. Knopp and Larkin (1999) have provided additional information on 1999 amphibian and reptile surveys at Burns Bog.

4.1.4 Reptiles

Several Common and Northwestern Garter snakes (see Appendix VII for scientific names) were observed during the field visits, and a sighting of Western Terrestrial Garter Snake was reported by Knopp and Larkin (1999). A specimen of Western Terrestrial Garter Snake needs to be captured so that lateral scales can be counted and species can be verified. Additional information on amphibian and reptile occurrence in Burns Bog is provided in Appendix VII, and in a separate report by Knopp and Larkin (1999).

4.2 Wildlife - Corporation of Delta Properties

4.2.1 Mammals

Sign and/or individuals of several mammal species were observed on Corporation of Delta properties during the October field surveys (Table 3).

Table 3: Mammal species observed on Corporation of Delta properties during the October 1999 field surveys. Scat = ‘s’; tracks or vole runways = ‘t’; carcass = ‘c’; and feeding sign = ‘f’.

Species	Corporation of Delta Properties											
	1	2	3	4	5	6	7-10	11	12	13	14	15
Beaver			f			f	f					

Black Bear	8s	1s					1s	3s
Black-tailed Deer	c,t,f		t	s,c	t		t,f	s,c
Coyote	t,s	s	t,s	t	t			s 9s
Douglas' Squirrel	f,1			5	1	3		1
Eastern Cottontail								1
Eastern Gray Squirrel						4		
Raccoon	s							
Townsend's Vole		t						

Each of the Lots has unique habitat characteristics that are attractive to a variety of mammal species.

Lot 1

Lot 1 is dominated by a Shore Pine and Labrador-Tea (*Ledum groenlandicum*) plant community. Small patches of mixed coniferous forest and birch woodland are present along the western boundary. Lot 1 appears to receive high use by Coyote, Black-tailed Deer, and Black Bear. Coyote tracks and scats were observed in several locations around the Lot. Deer also regularly utilize the site. Pellet groups, tracks, foraging sign, and bedding areas (under hemlock) were observed. The site also had the highest concentrations of Black Bear scats observed in Burns Bog with a total of eight noted during the October site reconnaissance. Lot 1 provides excellent cover for bears and is just north of a productive blueberry field. The pine forest also appears to provide good foraging and living opportunities for Douglas' Squirrel and Raccoon. The numerous Townsend's Vole skulls (identified by D. Nagorsen, B.C. Vertebrate Specialist) found in Barn Owl pellets likely originate from adjacent farm fields. The red-listed, Southern Red-backed Vole is expected to occur in this Lot.

Lot 2

Lot 2 is currently actively used for cranberry cultivation. Mammal use of this area is expected to be extremely low. Coyotes and deer are expected to wander on roads and trails around the periphery of the cranberry fields.

Lot 3

Although Lot 3 is isolated from other relatively undisturbed Bog habitats, and is surrounded by industrial developments and cranberry fields, sign of Coyote and Black Bear was observed. The deep ditches around the periphery of the Lot are utilized by Beaver. Lot 3 habitats may be suitable for the red-listed, Pacific Water Shrew, and blue-listed, Trowbridge's Shrew.

Lot 4

Lot 4 is also surrounded by deep ditches providing habitat for Beaver, and possibly the red-listed Pacific Water Shrew. The deep ditches prevented access to the central areas of the Lot, but some use by Coyote and Black-tailed Deer is expected since tracks and scats were observed along its margins.

Lot 5

Lot 5 consists primarily of a Shore Pine and Labrador-Tea community; however, birch -dominated forest and ditch habitats are also present. High numbers of Douglas' Squirrel were recorded, and Black-tailed Deer and Coyote sign was observed in cleared areas along the western ditch. This Lot is connected to central areas of Burns Bog, and is likely utilized by several other mammal species including the red-listed, Southern Red-backed Vole, Deer Mouse, and Vagrant Shrew.

Lot 6

Lot 6 is characterized by a high diversity of habitats including, pine forest, birch woodland, Hardhack (*Spiraea douglasii*) and Reed Canarygrass (*Phalaris arundinacea*) meadows, ditches, and mowed areas on a gas right-of-way. Birch forest with abundant Cascara (*Rhamnus purshiana*) and some Pacific Crabapple (*Malus fusca*) is unique. Many mammal species are known or expected to utilize the Lot. Coyote and Black-tailed Deer are likely common throughout, and Beaver is present along ditch habitats. Townsend's Vole is expected to frequent Reed Canarygrass and mowed areas and Eastern Cottontail is likely common in shrub habitats. Rare and endangered species such as Pacific Water Shrew and Trowbridge's Shrew may also occur.

Lots 7, 8, 9 and 10

These lots are described together because of their similarity in habitat composition. These areas have been described in detail in other sections of this report (see Appendix I for species occurrence). On the October site reconnaissance, Beaver sign was observed along Cougar Creek, and both Douglas' and Eastern Gray Squirrels were noted. Eastern Gray Squirrels appears to be quite common along the steep wooded slope on the eastern side of the properties. Habitats on the lots are structurally diverse and likely provide important living areas for many small mammals including shrews, Deer Mouse, and Pacific Jumping Mouse. Black

Bear, Coyote, and Black-tailed Deer are known to occur. These habitats are probably the most suitable habitats in Burns Bog for Northern Flying Squirrel.

Lot 11

Deciduous forest consisting of Red Alder (*Alnus rubra*), Black Cottonwood (*Populus balsamifera*) and Paper Birch (*Betula papyrifera*) is present on the majority of this Lot. A small strip cleared for a sewer main is present along the eastern boundary. Similar mammal species described for the previous lots are expected to occur in Lot 11. Black-tailed Deer sign was observed in this Lot during the October site reconnaissance.

Lot 12

This narrow Lot, consisting of a ditch and associated aquatic and herbaceous species, is immediately adjacent to Highway 91. The grassy nature of the Lot likely provides good habitat for Townsend's Vole, a favored prey species of many raptors. With the exception of Coyote, Eastern Cottontail, and Muskrat, few other mammal species are expected to utilize the Lot.

Lot 13

Lot 13 consists of a coniferous forest and shrubland isolated from central areas of Burns Bog. The Lot is bounded by blueberry fields to the south, Highway 91 to the northeast and a small woodlot to the west. Some use by small mammals such as Vagrant Shrew, Deer Mouse, and Eastern Cottontail is expected. Coyote and Black-tailed Deer may also occur.

Lot 14

This large Lot is dominated by pine forests with some openings in the north and birch-dominated habitats to the south, particularly along Highway 99. Sign of Black Bear, Coyote, Eastern Cottontail, and Douglas' Squirrel was observed during the October site reconnaissance. A diversity of other mammal species is also likely to occur, including, the red-listed, Southern Red-backed Vole and blue-listed, Trowbridge's Shrew. Most of the other common species recorded for Burns Bog (see Appendix I) are expected to occur.

Lot 15

Lot 15 consists of dense-canopied pine forest along the southern and western portions of the Lot, scrubby pine and open heathland habitats in central areas, and open wetlands created by peat mining activities in the northeast. Several Black Bear scats were noted during the October site reconnaissance, and deer and Coyote sign was noted. Pine-dominated forests on the western and southern portions of the Lot are expected to provide habitats for Southern Red-backed Vole, Douglas' Squirrel, Deer Mouse, and several shrew species. Permanent ponds are important for Beaver and Muskrat. A species such as Mink, which has not yet been documented in the Bog, is likely to be attracted to the complexity of permanent ponds and upland habitats in this Lot. Most other mammal species described in Appendix I are expected to occur in this Lot.

4.2.2 Birds

Many bird species were observed on Corporation of Delta properties during the October field surveys (Table 4). The total numbers of birds observed has been indicated in the table, however, since observer effort varied between Lots, bird numbers between lots can not be compared.

Table 4: Bird species observed on Corporation of Delta properties during the October 1999 field surveys. Nests = 'n'; roost sites = 'r'; feeding sign = 'f'.

Species	Corporation of Delta Properties												
	1	2	3	4	5	6	7-10	11	12	13	14	15	
American Goldfinch						2				2	2		
American Pipit						2							
American Robin	12	4		10	n,7	20	20			50	3	1	
Barn Owl	r											r	
Barn Swallow						5n							
Bewick's Wren	1				1	1				1	6	2	
Black-capped Chickadee	8		1	2	5	10	15			25	16	30	
Brown Creeper	1				2		1	1					
Bushtit	20				25	15	1				35	10	

Green-winged Teal		4	1					
Herring Gull								1
Hooded Merganser		1						
House Finch		2		1	2		2	2
Mallard		10						
Northern Flicker				1	1		3	1
Northern Harrier		1					2	3
Northern Pintail		1						
Northwestern Crow	1	2n	2				n	6
Pileated Woodpecker								1
Pine Siskin				2	5			
Red-breasted Sapsucker							f	
Red-tailed Hawk	1			1	n,1		r	1
Ring-billed Gull		1						

Rock Dove										1	
Ruby-crowned Kinglet	4	1		1						1	
Song Sparrow	5	4	6	8	10	15	4		39	5	
Spotted Towhee	1	1	1		4				3	15	2
Steller's Jay									2		1
White-crowned Sparrow			1								
Winter wren	n,1		1	1		4			1	9	2
Yellow-rumped Warbler	1										1

A general discussion on utilization of the lots by bird species is provided below. A more detailed discussion on the value of the lots to raptors and waterbirds is provided in Summers and Gebauer (1999a and 1999b, respectively). Further information on expected bird use of the lots can be extrapolated from Appendix III in which habitat utilization of all bird species recorded in Burns Bog has been indicated.

Lot 1

Extensive sign of Barn Owls was noted at several roost sites within the pine forest. Skulls found in the Barn Owl pellets were primarily Townsend's Vole, suggesting that Barn Owls fed in agricultural fields outside of the Bog. Lot 1 provides many opportunities for migratory passerines, and nesting habitat for species such as Song Sparrow and Spotted Towhee.

Lot 2

Because of the intensively managed nature of this Lot, little bird use is expected.

Lot 3

Ditches surrounding Lot 3 are utilized by a number of waterbirds (see Summers and Gebauer 1999b), and upland habitats may be important for foraging Northern Harrier and Red-tailed Hawk. Several passerine birds are expected to nest, including, Song Sparrow, Spotted Towhee, White-crowned Sparrow, and Willow Flycatcher.

Lot 4 and 5

Lots 4 and 5 provides ditch habitat for waterbirds, and upland pine forests for several breeding and migratory species. Great Horned Owl likely utilizes the pine forests for roosting.

Lot 6

The diversity of habitats on Lot 6 (see habitat description in Section 4.2.1 above) attracts a wide diversity of breeding, wintering and migratory bird species. Many bird species were seen on a site reconnaissance in October 1999, and an active Red-tailed Hawk nest was found in a birch. With the exception of some waterbird species, most bird species recorded within Burns Bog (see Appendix III) are expected to occur here at various times of the year.

Lots 7, 8, 9, 10, and 11

The high structurally heterogeneity of habitats on these lots (all east of Highway 91) provide numerous niches utilized by a wide diversity of bird species. The blue-listed, Hutton's Vireo is expected to nest, and the blue-listed, Barn Owl is known to roost. A detailed discussion of raptor use of these lots is provided by Summers and Gebauer (1999a). Smith (1999), Perdichuk (1999), and others have documented the wide diversity of species known to occur in this area. Appendix III highlights the high diversity of bird species occurring in these lots.

Lot 12

The highly disturbed nature of Lot 12, limits utilization by most bird species. Red-tailed Hawk is expected to hunt Townsend's Vole, and migratory species such as Savannah Sparrow may occur. Red-winged Blackbirds are expected to nest.

Lot 13

Although Lot 12 is small, many bird species were recorded during the site reconnaissance. Shrubland habitats are expected to be particularly important to passerine birds during the migratory period. Coniferous trees provide roosting and perching opportunities for Barn Owl, Red-tailed Hawk, and other raptors. Species such as Song Sparrow, American Robin, and Bewick's Wren likely nest.

Lot 14

The high diversity of Lot 14 habitats attracts many bird species (see Table 4). The deciduous-dominated

habitats are likely heavily used by passerines during migration, and species such as Black-headed Grosbeak, American Robin, Pacific-slope Flycatcher, and others likely nest. The hydro lines are utilized as roosting and perching habitat by thousands of European Starling in the fall.

Lot 15

Lot 15 represents a high diversity of habitats found in few other areas of the Bog. The high importance of this lot to raptors (Summers and Gebauer 1999a), waterbirds (Summers and Gebauer 1999b), and Sandhill Cranes (Gebauer 1999b) has been well documented. Peripheral pine forests provide nesting opportunities for Song Sparrow, Dark-eyed Junco, Spotted Towhee, and several other bird species.

4.2.3 Amphibians

Because of the late timing of the field surveys (October), few amphibian species were encountered. Green Frog and Pacific Tree Frog were the only species identified (Table 5).

Table 5: Amphibian species observed on Corporation of Delta properties during the October 1999 field surveys.

Species	Corporation of Delta Properties												
	1	2	3	4	5	6	7-10	11	12	13	14	15	
Green Frog		1			4	2							
Pacific Tree Frog							2						c

Lots such as Lot 7,8,9, and 10, east of Highway 91, are known to provide habitat for a number of amphibian species (see Appendix VII) such as Red-legged Frog and Western Red-backed Salamander (Rithaler and Corporation of Delta 1999). Lots with ditch or permanent pond habitat (i.e., Lots 3,4,5,6, 15) are important to amphibian species, such as Pacific Tree Frog, Green Frog, and Northwestern Salamander (Rithaler and Corporation of Delta 1999), which require standing water for breeding. Pine and birch wooded areas may provide dispersal habitats for species breeding in nearby ponds and ditches.

4.2.4 Reptiles

Only one garter snake (on Lot 15) was observed during the October field surveys. Common and Northwestern garter snakes are expected to occur regularly within all of the Lots. Status of the Western

Terrestrial Garter Snake is less certain.

4.3 Rare and Endangered Wildlife

Rare and endangered wildlife species in British Columbia are designated as either Red or Blue by the Conservation Data Centre (CDC 1999). The Red List includes any indigenous species or subspecies (taxa) considered to be extirpated, endangered or threatened in British Columbia, most of which do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction, whereas threatened taxa are likely to become endangered if limiting factors are not reversed. Species on the Blue List are taxa considered to be vulnerable or particularly sensitive to human activities or natural events.

Animal tracking lists provided by CDC (1999) were reviewed to determine potential rare and endangered species in Burns Bog. Species which have been reported or are expected to occur on or within the vicinity of the subject property are discussed below.

4.3.1 Confirmed Red-listed Mammals

4.3.1.1 Pacific Water Shrew (*Sorex bendirii*) - Red List

Pacific Water Shrew is not only red-listed in the province but is considered to be Threatened by COSEWIC (Committee on the Status of Endangered Wildlife in Canada)(Cannings et al 1999). A Pacific Water Shrew skull was recently identified from a Barn Owl pellet collected from pine forest at the north end of the Bog (Fraker et al 1999). The authors state, "we believe that the skull of a Pacific Water Shrew ... probably came from the Bog and not from nearby industrial or agricultural areas". Beak (1982) indicated that Pacific Water Shrews were present in the Burns Bog area based on its possible occurrence, and not on a identified specimen. A comprehensive survey of this species in the Lower Mainland in 1992 failed to locate any individuals in the Burns Bog area (Zuleta and Galindo-Leal 1994), and no previous records exist from the Corporation of Delta (Nagorsen 1996). It is also possible that Pacific Water Shrews occur along the better developed riparian areas (highly suitable habitats) east of Highway 91 and along Cougar Creek.

Habitat preferences of Pacific Water Shrews include sluggish low-elevation streams, marshes and other wetlands with associated riparian habitats in mature, old-growth forests, especially where the forest floor has abundant fallen and rotting logs as well as a good cover of fine litter (Nagorsen 1996; Cannings et al 1999). The rarity of this shrew throughout its range and difficulty in sampling makes determination of its status difficult. Its occurrence at Burns Bog is a significant finding. This species is of high management concern, because of its rarity and loss of habitats throughout its B.C. range. A habitat suitability map has been provided in Gebauer (1999b). Based on this analysis, peripheral Western Redcedar (*Thuja plicata*) forests in riparian areas and wetlands are of highest value to this species.

4.3.1.2 Southern Red-backed Vole (*Clethrionomys gapperi occidentalis*) - Red List

Southern Red-backed Voles were reported as occurring in Burns Bog by Beak (1982) based solely on range maps provided by McTaggart-Cowan and Guiguet (1965). During the 1999 field survey, G. Ryder, noted a

nest of this species under a plywood sheet in the northwestern portion of the Bog, and Fraker et al (1999) captured a total of seven red-backed voles in pine woodland during a snap-trapping program in 1999. Voucher specimens have been retained at the Royal B.C. Museum. Red-backed voles prefer cool, moist forests with dense shrub cover where they can build nests under logs, stumps and roots. According to Cannings et al (1999), this subspecies was previously known in the province from only two specimens, none of which were reported within the last 50 years.

Southern Red-backed Voles are red-listed in the province, and their presence in Burns Bog is of high management concern. Gebauer (1999b) provided a habitat suitability map for Southern Red-backed Vole in Burns Bog. Based on this analysis, most pine and mixed coniferous forests located primarily in peripheral areas are suitable for this species.

4.3.2 Confirmed Blue-listed Mammals

4.3.2.1 Trowbridge's Shrew (*Sorex trowbridgii*) - Blue List

Trowbridge's Shrew were reported as occurring in Burns Bog by Beak (1982), and D. Knopp (pers. comm., 1999) caught several individuals of this species in pit fall traps during the current field season. Fraker et al (1999) captured two Trowbridge's Shrews during their recent snap-trapping program; one shrew was captured in pine woodland and the other in mixed deciduous forest. Trowbridge's Shrews were one of the most common small mammals trapped by Zuleta and Galindo-Leal (1994) in the lower Fraser River valley in 1992. This species is known to live in a wide variety of lowland elevation coastal forests as far east as Hope, apparently preferring habitats with dry, loose soil and deep litter, where it feeds primarily on insects, spiders, worms, and centipedes (Nagorsen 1996).

Although this species is blue-listed, it appears to be relatively common in Burns Bog and the Lower Mainland. A habitat suitability analysis provided by Gebauer (1999b) suggests that many of the peripheral forests, particularly east of Highway 91, are suitable for this species. Trowbridge's Shrew is considered to be of moderate management concern in Burns Bog.

4.3.3 Unconfirmed Red-listed Mammals

4.3.3.1 Townsend's Mole (*Scapanus townsendii*) - Red List

Perdichuk (1999) and P. Perdichuk (pers. comm., 1999) described collecting a Townsend's Mole along the 72nd Street right-of-way near the Vancouver Landfill. Since this red-listed species is only known from a localized area around Huntingdon, Abbotsford and Clayburn near the International Border, more than 50 km from Burns Bog (Nagorsen 1996), identification of this specimen needs to be verified. Unfortunately, a voucher specimen has not been forwarded to D. Nagorsen, Provincial Vertebrate Specialist, Royal B.C. Museum for species verification. Sheehan and Galindo-Leal (1996) noted that all known locations of this species lie within a small area around Huntingdon and primarily within the Marble Hill soil type. Until the presence of this species is verified in Burns Bog, it is not considered to be of any management concern.

4.3.3.2 Keen's Long-eared Myotis (*Myotis keenii*) - Red List

The status, range, and biology of Keen's Long-eared Myotis in the province is poorly understood (Firman et al 1993). Most documented occurrences are from the Queen Charlotte Islands and northern Vancouver Island, although there is one record from the Abbotsford area (Nagorsen and Brigham 1993). A significant problem in documenting the occurrence of this species is its similarity to the more common Western Long-eared Myotis (*Myotis evotis*). Keen's Long-eared Myotis appears to be a solitary species associated with coastal forests, where tree cavities, rock crevices, and small caves are typical roosting habitats (Cannings et al 1999). The status of this species in the Burns Bog area is unclear, and will likely be very difficult to determine. This species is considered to be of low management concern.

4.3.3.3 Snowshoe Hare (*Lepus americanus washingtonii*) - Red List

Kucy (1976), Biggs (1976) and Beak (1982) all reported Snowshoe Hares as occurring in Burns Bog, particularly in the mixed forest habitats east of Highway 91. Since the early 1980s, only Perdichuk (1999) has reported sightings. Since no recent voucher specimens or photographs are available, this species may well be extremely rare or possibly extirpated in the Burns Bog area. Snowshoe Hares prefer the dense cover of coniferous and mixed forest habitats, with abundant understorey vegetation (Cannings et al 1999). Snowshoe Hares which occur outside the Lower Mainland, moult to a white pelage in early winter, whereas, the *washingtonii* subspecies remains brown year round. Loss of young rabbits to domestic and feral dogs, cats, and Coyotes that have recently colonized the Lower Mainland may be a major problem, and introduced cottontails may compete with hares (Cannings et al 1999). This species is of high management concern in the Lower Mainland. It has not been confirmed as occurring within Burns Bog in the last 10 years.

4.3.3.4 Long-tailed Weasel (*Mustela frenata altifrontalis*) - Red List

The Long-tailed Weasel occurs rarely in the lower Fraser River valley. The only recent confirmed occurrences in the Fraser River valley were reported by D. Knopp (pers. comm., 1999). Long-tailed Weasels are known to frequent a variety of habitats, especially where small mammals such as mice, voles and flying squirrels are in abundance, substantial coarse woody debris is present, and understorey vegetation is reduced (Wilson and Carey 1996; Cannings et al 1999). Perdichuk (1999) reported trapping three Long-tailed Weasels in the Delta Nature Reserve. Voucher specimens of these animals have not been located. An Ermine, similar in appearance to the Long-tailed Weasel, has been videotaped and photographed by DeMill (1999) in Burns Bog. Habitats and prey abundance on the study site may be suitable for Long-tailed Weasel; however, until a voucher specimen has been identified by a taxonomist, its occurrence in Burns Bog remains unconfirmed. Long-tailed Weasels are of high management concern in the lower Fraser River valley.

4.3.4 Unconfirmed Blue-listed Mammals

4.3.4.1 Townsend's Big-eared Bat (*Corynorhinus townsendii*) - Blue List

The Townsend's Big-eared Bat is distributed throughout the southern part of the province, although its status in many areas is unclear. The primary management concern is for protection of winter hibernacula and

summer roost sites which are generally in caves or cave-like roosts (Nagorsen and Brigham 1993; Cannings et al 1999). Townsend's Big-eared Bats may feed over habitats on the property, however, no direct evidence is available. Status within Burns Bog has not been determined, and it is considered to be of low management concern.

4.3.5 Confirmed Red-listed Birds

4.3.5.1 Peregrine Falcon (*Falco peregrinus anatum*) - Red List

Peregrine Falcons are observed flying over and chasing waterbirds regularly in Burns Bog (see Appendix II). Observers have not attempted to distinguish between the red-listed *anatum* subspecies or the blue-listed *pealei* subspecies. The *anatum* subspecies historically bred throughout the forested regions of North America. Preferred nesting habitats are typically inaccessible cliff ledges, often overlooking wetlands or other open areas (Firman et al 1999). Some falcons have adapted to urban centres by nesting on tall buildings, towers and bridges. These artificial and other suitable nesting habitats are not available within Burns Bog. Important foraging sites for Peregrine Falcons include the Fraser River foreshore areas such as Boundary Bay. Peregrine Falcons are not considered to be of significant management concern in Burn Bog.

4.3.5.2 Purple Martin (*Progne subis*) - Red List

Purple Martins were recorded on several occasions in fall 1999 feeding over Burns Bog (see Appendix II). These birds likely originate from the moderate-sized colony at Maplewood Flats in North Vancouver. The only other known breeding area in the Lower Mainland is at Blackie Spit, in South Surrey, where one or two pairs nested in 1999 (T. Plath, pers. comm., 1999). Purple Martins are not expected to nest within Burns Bog, and are therefore not of management concern.

4.3.6 Confirmed Blue-listed Birds

4.3.6.1 American Bittern (*Botaurus lentiginosus*) - Blue List

Male American Bitterns were heard on several occasions on spring surveys (Enviro-Pacific Consulting 1999) suggesting that this species may breed in some Burns Bog habitats. Areas dominated by Common Rush (*Juncus effusus*) and open water ponded areas are likely the most suitable habitat for this species. These habitats are most prevalent in southwestern peat-mined areas of the Bog. It is possible that one or more bitterns could overwinter within Burns Bog. Overall population densities are expected to be much lower than known breeding areas in foreshore areas of Westham and Lulu Islands (Butler and Campbell 1987).

A habitat suitability analysis conducted by Gebauer (1999b) indicated that only a few of the wetlands, primarily permanent wetlands, are of high value to American Bittern. Seasonal wetlands may be of moderate importance during migration and winter. Because of their low abundance and vulnerability to disturbance in the Lower Mainland region, American Bitterns breeding within Burns Bog may be an important component of the Lower Mainland population. This species is considered to be of moderate management concern.

4.3.6.2 Great Blue Heron (*Ardea herodias*) - Blue List

Great Blue Herons have been reported regularly by several authors (see Appendix III) and were observed many times during the current field season. Herons may have been foraging on the abundant Green Frog populations in the Bog. Although nesting has not been reported previously, and was not observed on the 1999 surveys, suitable nesting habitat exists in mixed and deciduous forests along the southern end of the Bog and east of Highway 91. Nesting colonies tend to be within eight kilometres of suitable foraging areas, and most are within three kilometres (Butler 1997). The nearest known colony sites, some of which are no longer active, are located: a) along the Nicomekl River in South Surrey; b) in Richmond, near the south end of No.7 Road; c) near the base of 80th Street at Boundary Bay; d) along River Road in North Delta (first gully east of Alex Fraser Bridge); and e) at Point Roberts, Washington (Moul 1998 and 1999). Great Blue Herons are of moderate management concern in the Lower Mainland region.

4.3.6.3 Green Heron (*Butorides virescens*) - Blue List

Green herons are at the northern end of their range in the Lower Mainland having first been observed in 1953 (Campbell et al 1990a). Since then, their populations have expanded, especially in areas where freshwater ponds, rivers and lakes are in abundance (Campbell et al 1990a). Perdichuk (1999) reported the only sighting of a Green Heron in Burns Bog, along the edge of a wetland in the Delta Nature Reserve. Although not observed in central areas of the Bog, Green Herons are expected to occasionally utilize ponds and ditches in this area. This species is considered to be of low management concern in the Burns Bog area.

4.3.6.4 Trumpeter Swan (*Cygnus buccinator*) - Blue List

Trumpeter Swans have been photographed in ponded areas of Burns Bog by DeMill (1999). Trumpeter Swans nest primarily in northeastern British Columbia (Fraser et al 1999), but occur in large numbers in the Lower Mainland in winter (Butler and Campbell 1987). Substantial increases in the Canadian population have been observed in the last 30 years. The sporadic occurrence of Trumpeter Swans within Burns Bog does not warrant specific management effort.

4.3.6.5 Peregrine Falcon (*Falco peregrinus pealei*) - Blue List

The *pealei* subspecies of Peregrine Falcon breeds along the coast of British Columbia. Vertical, rocky cliffs are the preferred nesting area. It is most likely the more common of the two subspecies observed at Burns Bog.

4.3.6.6 Sandhill Crane (*Grus canadensis*) - Blue List

Sandhill Cranes have nested within Burns Bog for many years (Gebauer 1995). Spring breeding surveys (Enviro-Pacific Consulting 1999) and current surveys have confirmed the presence of approximately 10 Sandhill Cranes during the breeding season. These birds are joined by an additional 10 or more birds in early September, possibly from breeding sites in the Pitt Meadows area. A status report of Sandhill Cranes in British Columbia has been recently prepared by Cooper (1996) and a report on Sandhill Cranes in Burns

Bog in 1999 is provided under separate cover (Gebauer 1999a). Sandhill Cranes breeding and staging at Burns Bog are considered to be of high management concern. Gebauer (1999b) has conducted a habitat suitability analysis based on the Terrestrial Ecosystem Mapping procedure. Highest value habitats are open beak-rush/sphagnum communities which are a result of peat-mining activities in the past.

4.3.6.7 Short-billed Dowitcher (*Limnodromus griseus*) - Blue List

A single Short-billed Dowitcher was observed during the spring migratory period (Enviro-Pacific Consulting 1999). Its blue-listed status in the province is due to a very localized breeding area in extreme northwestern British Columbia (Fraser et al 1999). This species is not of management concern in the Lower Mainland where it appears as a common migrant (Butler and Campbell 1987).

4.3.6.8 Caspian Tern (*Sterna caspia*) - Blue List

Caspian Terns were observed flying over Burns Bog on several occasions in 1999. Caspian Terns are not of management concern in the Burns Bog area since they have never been observed on the ground in Burns Bog and are not expected to nest. Typical nesting habitats include sandy or rocky islands in lakes or along the coast (Godfrey 1986). Foraging habitats include beaches, tidal mudflats, and sheltered bays (Campbell et al 1990b). Nesting has only been reported at three sites in British Columbia (Fraser et al 1999).

4.3.6.9 California Gull (*Larus californicus*) - Blue List

California Gulls are relatively common in the Lower Mainland throughout the year and several birds have been observed flying over Burns Bog. Their blue-listed status reflects the few breeding records in the province (i.e., only four locations in the B.C. interior)(Fraser et al 1999). Many of the California Gulls occurring in British Columbia have dispersed from large colonies on the prairies. California Gulls occurring in the Lower Mainland are not of management concern.

4.3.6.10 Barn Owl (*Tyto alba*) - Blue List

Barn Owls have been recorded in central areas of Burns Bog and along forested margins where they roost. Numerous roost sites were noted during raptor encounter transects in 1999, particularly in western and southern portions of the Bog, and several well-used roost sites were noted in Lot 1 owned by Corporation of Delta. Primary foraging areas are likely in fallow farm fields with a high abundance of Townsend's Vole. The Barn Owl is a recent colonizer of the Lower Mainland area. It was first recorded as breeding in 1941 (Campbell et al 1990b). Its preferred habitat is open agricultural land, especially old field habitats with some availability of barns and silos for roosting and nesting (Andrusiak 1992). The absence of suitable roosting and nesting structures such as barns and silos may limit their abundance in central areas of the Bog. Peripheral forested habitats of Burns Bog are of high value as roost sites, warranting some management concern. Gebauer (1999b) has provided habitat suitability mapping for Barn Owl which highlights the importance of peripheral pine and mixed coniferous forests.

4.3.6.11 Short-eared Owl (*Asio flammeus*) - Blue List

Short-eared Owls have been observed in central areas of Burns Bog by Biggs (1976), Enviro-Pacific Consulting (1999), and Perdichuk (1999). These individuals are likely visitors or migrants since suitable nesting habitat is limited within the Bog and prey populations are difficult to access because of dense shrub vegetation in many areas. Typical nesting habitats are open treeless areas such as grasslands, rangelands, dry marshes, farmlands and brushy fields. Most nests in British Columbia have been found adjacent to agricultural areas in shrubby grass fields with grasses 25-90 cm high (Campbell et al 1990b). Short-eared Owls in the Burns Bog area are considered to be of low management concern.

4.3.6.12 Hutton's Vireo (*Vireo huttoni*) - Blue List

Hutton's Vireos are expected to nest in mixed forest habitats east of Highway 91 and in the southwest corner of the Bog, where they have been observed (Smith 1999). Campbell et al (1997) described preferred habitats as being mid- to late-successional forests, particularly conifer-dominated woodlands, with a moderate to heavy shrub understorey at elevations below 250 m. Hutton's Vireos are uncommon but widely distributed throughout their Lower Mainland range. Gebauer (1999b) provided a habitat suitability analysis for Hutton's Vireo in Burns Bog. Deciduous-dominated forests in peripheral areas and forests east of Highway 91 are of greatest value. Hutton's Vireo is not considered to be of significant management concern in the Burns Bog area.

4.3.7 Unconfirmed Red-listed Birds

4.3.7.1 Horned Lark (*Eremophila alpestris strigata*) - Red List

Horned Larks were observed on several occasions during the 1999 fall migratory period (see Appendix II). The Lower Mainland breeding population of Horned Larks is only known from a few scattered locations at Vancouver International Airport, near Abbotsford and near Chilliwack (Campbell et al 1997). Preferred nesting habitats are open, generally barren areas that are sparsely vegetated or have very short vegetation. It was not possible to determine whether larks seen in 1999 were of the *strigata* subspecies or were of migrating individuals of the more common subspecies that breed in the north. Horned Larks would be of high management concern if nesting was confirmed within the Bog

4.3.7.2 Vesper Sparrow (*Pooecetes gramineus affinis*) - Red List

A single Vesper Sparrow was observed during the fall surveys in Burns Bog. The only known breeding locations of the *affinis* subspecies are on Vancouver Island at Nanaimo Airport and near Duncan. There are historic breeding records from the Fraser Valley, Fraser Delta, and other sites on southeastern Vancouver Island. It was not possible to determine whether the individual observed in Burns Bog was the local *affinis* subspecies or a migrating bird from stable interior populations. Typical nesting habitats are dry, open grasslands, in grassy clearings, in very open coniferous forest, or in burned forest (Fraser et al 1999). Apparently suitable habitats exist in burned habitats in northeastern areas of the Bog, and in beak-rush/sphagnum habitats scattered throughout central areas of the Bog. Vesper Sparrows would be of high management concern if nesting was confirmed within the Bog.

4.3.8 Unconfirmed Rare and Endangered Amphibians

4.3.8.1 Oregon Spotted Frog (*Rana pretiosa*) - Red List

Although Klassen et al (1971) reported Spotted Frog within Burns Bog and Perdichuk (1999) reported a recent observation, there has been no substantive evidence, such as voucher specimens or photographs, to confirm its presence in the Burns Bog area. Red-legged Frogs can easily be mistaken as Oregon Spotted Frogs by the untrained observer. This subspecies is extremely rare across its entire range, and only three very localized breeding areas are known from the Aldergrove, Seabird Island, and Agassiz areas (D. Knopp, pers. comm., 1999). Corkran and Thoms (1996) noted that Spotted Frogs often breed in flooded meadows near ponds or in water pooled on top of flattened, dead vegetation. Oregon Spotted Frogs would be of high management concern in Burns Bog if their occurrence was confirmed. Gebauer (1999b) provided a map depicting the potential habitat suitability of Burns Bog for Oregon Spotted Frogs. Permanent and seasonal wetlands are most suitable.

4.3.9 Unconfirmed Rare and Endangered Reptiles

4.3.9.1 Rubber Boa (*Charina*) - Blue List

Little is known of the habitat preferences of this species. The few records in the lower Fraser River valley suggest that it occurs in low numbers (Gregory and Campbell 1984). Rubber Boas are not commonly observed because they spend much of their time underground and are most active at night. They can be found in rotting logs or stumps, or under rocks, forest litter, bark or in rock crevices (Cannings et al 1999). The most suitable habitat for this species is in mixed forest habitats east of Highway 91. Unless a significant population of Rubber Boas is found in the Burns Bog area, it is not considered to be of management concern.

4.3.10 Occurrence on Corporation of Delta Properties

Some of the rare and endangered wildlife species confirmed as occurring in the Bog, are also known or expected to occur on properties owned by the Corporation of Delta. Table 3 summarizes potential occurrence of these species on the 15 Delta lots. Species known only to fly-over the site, including Caspian Tern, California Gull, and Purple Martin, are not included in the table.

Table 6: Known or potential occurrence of rare and endangered species on properties owned by the Corporation of Delta.

Corporation of Delta Properties

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
---------	---	---	---	---	---	---	---	---	---	----	----	----	----	----	----

Mammals

Pacific Water Shrew	4		4	4	4	4	4	4	4			4	4	4	
South. Red-backed Vole	4			4	4	4	4	4	4				4	4	4
Trowbridge's Shrew	4		4	4	4	4	4	4	4	4	4	4	4	4	4

Birds

American Bittern			4	4	4	4									4
Great Blue Heron		4	4	4	4	4	4	4	4		4			4	4
Green Heron			4	4	4	4	4	4	4						4
Trumpeter Swan															4
Peregrine Falcon			4	4		4						4	4	4	
Sandhill Crane						4								4	4
Short-billed Dowitcher															4
Barn Owl	4		4	4	4	4	4	4	4	4	4	4	4	4	4
Short-eared Owl			4	4		4						4			4

5. IMPORTANT HABITATS

5.1 General Description

All of the habitats within Burns Bog are important to some wildlife species (see Gebauer 1999b). Part of the value of Burns Bog is due to its large size, and limited and restricted access. Human disturbance of wildlife is very low because of tight restrictions on vehicle and pedestrian access. Mixed forest habitats, particularly east of Highway 91, are perhaps the most structurally diverse, and support the highest diversity of mammal species, including species such as Black Bear and Black-tailed Deer which are also widespread in other areas of the Bog. Open, previously disturbed, heathland areas in central areas of Burns Bog are extremely important to blue-listed, Sandhill Cranes, shorebirds, waterfowl, and raptors. Ponds and ditches are utilized by breeding waterbirds, Beaver, Muskrat, and amphibians. Deciduous forests, and hedgerows along existing access roads are particularly important to birds during the migratory season, but are also important to a number of mammal and amphibian species.

Peripheral pine forests are utilized by nesting Great Horned Owl, roosting Barn Owl, small mammals, including the red-listed, Southern Red-backed Vole, and a number of bird species; however, the undisturbed, pristine bog habitats in the southern third of the Bog have been underrepresented in surveys to date. There is a possibility that several birds occurring uncommonly in the Vancouver checklist area, such as Long-eared Owl (Materi and Blood 1999), and Chipping Sparrow and House Wren (this study), may nest or occur on a relatively regular basis.

5.2 Habitat Suitability Analysis

An analysis of the suitability of habitats for various species and species groups using the Terrestrial Ecosystem Mapping procedure has been provided by Gebauer (1999b). The species and species groups discussed include: a) small mammal diversity; b) rare mammals; c) Pacific Water Shrew; d) Southern Red-backed Vole; e) Trowbridge's Shrew; f) waterbirds; g) raptors; h) rare birds; i) American Bittern; j) Barn Owl; k) Hutton's Vireo; l) Sandhill Crane; m) amphibian diversity; and n) Oregon Spotted Frog. The following discussion is excerpted from Gebauer (1999b).

The most suitable habitats for small mammal diversity were peripheral forests, particularly east of Highway 91. Peripheral forests were again the most suitable for rare and endangered mammals such as the red-listed, Southern Red-backed Vole and blue-listed, Trowbridge's Shrew. Wet, riparian forests east of Highway 91 and permanent ponds in central areas of the Bog were considered to be suitable for Pacific Water Shrew .

Permanent ponds were depicted as being of moderately high suitability for waterbirds including, ducks,

geese, shorebirds, and rails. Seasonally flooded areas, including beak-rush/sphagnum and other herbaceous communities, were considered to be of moderate importance to waterbirds. Although most habitats within the Bog were considered to be of some value to raptors, habitats with the highest suitability were peripheral forests, particularly east of Highway 91. These habitats provided important nesting opportunities for species such as Cooper's Hawk, and roosting habitat for Barn Owl and Bald Eagle. Habitats considered to be of highest suitability (i.e., moderately high) for rare and endangered bird species were, the open disturbed heathland and beak-rush communities in the centre of the Bog (i.e., for Sandhill Crane and American Bittern), and mixed species forests east of Highway 91 (i.e., for Hutton's Vireo and Barn Owl).

Habitats considered to be of moderately high suitability for high amphibian diversity were the Yellow Waterlily ponds (i.e., breeding opportunities for several water-dependent species) in central areas of the Bog, and riparian mixed species forests east of Highway 91 (i.e., foraging areas for dispersing wetland-associated species, and terrestrial salamanders).

Habitat suitability mapping provides an overview of the habitats and areas of Burns Bog which are likely of highest suitability for a number of species and species groups. The analysis is limited, severely in some cases, by the lack of information on species distribution, biology, and habitat preferences. Additional research investigating these components of the life history of wildlife in Burns Bog would greatly improve the accuracy of the habitat suitability maps.

6. IMPACTS OF DISTURBANCE AND INVADING WILDLIFE SPECIES

6.1 Impacts of Disturbance

A detailed discussion of the impacts of human disturbance in the Bog and the impacts of invading wildlife species has been discussed in greater detail in the draft report, "The role of disturbance and regeneration of the Bog ecosystem - past and current ecosystem dynamics" (Madrone Consultants Ltd. 1999). A summary of the discussion as it relates to wildlife is provided here.

Many road and trails have been established in the Bog for a variety of purposes including, peat-mining, cranberry field development, hydro and gas lines, and recreational access (e.g., hunters). These human access routes have increased the degree of human disturbance within the Bog. The impacts that this disturbance has had on wildlife is difficult to determine, but larger species such as Sandhill Crane, Black Bear, and deer, have likely been negatively impacted. Roads and trails also increase access by terrestrial predators such as Coyote which historically may not have occurred in large numbers in the Bog. Deciduous-dominated habitats along road margins provide nesting and foraging opportunities for many species of birds, particularly in migration.

Peat-mining activities have created a greater diversity of habitats than existed prior to human activities in the Bog. Large, open beak-rush/sphagnum meadows are important habitats for Sandhill Crane, waterbirds, and raptors, and permanent ponds are used by numerous waterbird species, some of which nest. Although peat-mining activities may have resulted in declines of some species, the resulting complexity of habitats now

provides a greater number of niches for a greater number of wildlife species. Cranberry and blueberry farming has removed areas of native habitats and replaced them with single species habitats. Although some use of cranberry fields is anticipated by waterfowl when fields are flooded (i.e., during harvest period), few other wildlife species would be attracted to these areas. Blueberry fields, however, provide foraging opportunities for a number of wildlife species, including, Black Bear, Coyote, American Robin, and several other bird species.

The Greater Vancouver Landfill and industrial landfills at the north end of the Bog have resulted in permanent loss of native bog communities in these areas. Although scavenging species have likely benefited from the Greater Vancouver Landfill, nesting and living opportunities for species occurring in forested parts of Burns Bog have been lost. Construction of numerous ditch systems in central and peripheral areas of the Bog is likely leading to a drying-out of some areas. Forest succession in peripheral areas benefits some species (e.g., Douglas' Squirrel) but impacts others such as Sandhill Crane. Ditches have likely also facilitated the invasion of alien species such as Bullfrog.

Fire appears to have been a regular occurrence in Burns Bog. Although fire dramatically alters landscapes, new habitats and niches are provided as vegetation becomes established.

6.2 Invading Species

Exotic wildlife species which appear to have invaded the Bog include, Bullfrog, Green Frog, Eastern Gray Squirrel, North American Opossum, and Eastern Cottontail. Others, such as Black Rat, House Mouse, Norway Rat, Rock Dove, House Sparrow, and European Starling appear to be restricted to peripheral areas in association with landfills and human habitation.

Of the alien species, Bullfrogs may well have had the greatest impact on some native wildlife species. Native amphibian species such Red-legged Frog, may be displaced by Bullfrogs or the young heavily depredated. The actual impact that the Bullfrog invasion of Burns Bog has had on native amphibian populations is not clearly understood. Oregon Spotted Frogs, if present in Burns Bog, would also be expected to be severely impacted by the presence of Bullfrogs. Oregon Spotted Frogs are not known to occur sympatrically with Bullfrogs anywhere in the province (D. Knopp, pers. comm., 1999).

The potential impacts of alien species such as Green Frog, North American Opossum, Eastern Gray Squirrel, and Eastern Cottontail is also not known. Knopp and Larkin (1999) noted that where Green Frogs are abundant in the Fraser Valley wetlands, native amphibian species are rarely found. North American Opossums are known to be opportunistic feeders, and may have localized impacts on small mammals, birds, amphibians and reptiles. According to Nagorsen (1996), the reputation of this animal as a major predator of eggs and nestlings may be exaggerated. Eastern Gary Squirrels have apparently just recently colonized peripheral areas of the Bog (Smith 1999). Gary Squirrels may displace the native Douglas' Squirrel, and possibly some cavity-nesting birds such as woodpeckers. The interaction of the Eastern Cottontail with the native Snowshoe Hare, if any, is not known.

6.3 Indicator Species

Indicator species can be used in assessing sustainability needs and issues in the Bog. Madrone Consultants Ltd. (1999) described four species which may provide an indication of changing habitat patterns in Burns Bog: Sandhill Crane, Dark-eyed Junco, Southern Red-backed Vole, and Douglas' Squirrels. These species are described in detail in Madrone Consultants Ltd. (1999).

7. REGIONAL SIGNIFICANCE OF BURNS BOG

Burns Bog represents one of the largest, relatively undisturbed habitats in the lower Fraser River valley. The large, freshwater wetlands, particularly in winter and spring, attract high numbers of waterbirds. These freshwater habitats appear to be particularly important in the fall, when winter rains have not yet flooded adjacent agricultural fields. The Bog not only provides important roosting areas for waterbirds such as Mallard and Canada Goose (Summers and Gebauer 1999b), but is also important roosting habitats for raptors such as Barn Owl (Summers and Gebauer 1999a). During the breeding season, the Bog provides nesting and foraging habitats for raptors not available in unforested and actively cultivated agricultural habitats of the Delta.

Burns Bog clearly provides habitats for a wide diversity of wildlife species (see Appendices I, III, and VII). Most species occurring in the lower Fraser River valley, also occur, some seasonally, within the Bog. The Bog not only provides habitats for common wildlife species, but also species listed as Red or Blue by the CDC (1999). Burns Bog is the only known population of the red-listed, Southern Red-backed Vole (*occidentalis* ssp.) in British Columbia. Burns Bog is also likely the most important site for Sandhill Cranes in the lower Fraser River valley, providing both nesting habitat and a staging habitats for other birds breeding in the lower Fraser River valley. Other blue-listed species such as, Barn Owl, American Bittern, Trowbridge's Shrew, and Hutton's Vireo, also occur in Burns Bog. Although unconfirmed, a population of the red-listed, Pacific Water Shrew may exist in the Bog.

8. GAPS AND LIMITATIONS

The current studies on the wildlife of Burns Bog have contributed greatly to our existing knowledge of species occurrence and distribution; however, much of the data is restricted to specific habitats for certain seasons of the year. Some of the more significant data gaps are summarized below:

Mammals

- abundance, distribution, and habitat requirements of documented rare and endangered species (e.g., Southern Red-backed Vole, Pacific Water Shrew, and Trowbridge's Shrew)
- current status of species such as Snowshoe Hare, skunk, chipmunks, Red Fox, and others.
- status of bats
- seasonal variations in distribution and occurrence of most other mammal species
- impacts of terrestrial predators such as Coyote on native fauna
- population size and dynamics of Black Bear

Birds

- habitat utilization and occurrence of breeding species
- wintering species, numbers, distribution, and habitat utilization
- moulting use during potential waterfowl moulting period
- distribution of night-roosting species
- bird use of relatively undisturbed, native Bog communities in peripheral areas of the Bog
- populations size/densities of most bird species
- distribution and characteristics of nesting habitats utilized by Sandhill Crane

Amphibians and Reptiles

- distribution, seasonal occurrence, and habitat requirements of most amphibian species (except Green Frog and Bullfrog)
- winter hibernacula of garter snakes

9. CONCLUSIONS

Existing literature and studies in 1999 have provided extensive data on the occurrence of many wildlife species in Burns Bog. Of the four vertebrate groups, the bird fauna has been documented in the greatest detail. More than 175 bird species have been documented within the Bog, representing approximately 64% of regularly-occurring species in the Lower Mainland. One of the major data gaps is the occurrence of birds during the winter months (i.e., November to March), although some limited data exists (see Summers and Gebauer 1999b). Although current studies have provided some data on mammal use of the Bog, there are still many unanswered questions on mammal species occurrence, distribution, and habitat utilization. Bats, in particular, have not been described in any detail. It is uncertain whether some mammal species have been extirpated or occur at very low population levels. Reptiles and amphibians have not been well documented, with the status of species such as Ensatina, Rough-skinned Newt, Western Terrestrial Garter Snake, and Western Red-backed Salamander being uncertain.

With its diversity of habitats and vertebrate species, Burns Bog is an integral part of the Lower Mainland ecosystem. Terrestrial areas of Burns Bog not only provide habitat for rare and endangered species, such as the red-listed Southern Red-backed Vole, but also for common species that are more widespread in the Lower Mainland. Wetland habitats attract the blue-listed Sandhill Crane, and large flocks of migratory and wintering waterfowl. Canada Goose nest in summer and roost during the migratory period. Wetland areas of Burns Bog likely represent the most extensive freshwater wetland habitats available in summer and early fall, before agricultural fields are flooded by seasonal winter rains.

The viability of current populations in Burns Bog is difficult to assess; however, the apparent declines or extirpation of some species (e.g., chipmunks) suggests that one or more factors, such as, increased recreational disturbance, industrial development, increasing urbanization, invasions of alien animals, habitat alienation, free-running pets, or some other unidentified factors, are negatively impacting some species. Provision of large, undisturbed areas will increase the likelihood that viable populations of most existing

wildlife populations in Burns Bog are maintained.

10. LITERATURE CITED

AIM Ecological Consultants Ltd. 1983. Regional Landfill Delta ecological assessment. Prepared for Greater Vancouver Sewerage and Drainage District.

Andrusiak, L. 1992. Barn owls in the Fraser Valley. *Discovery* 21 (3): 99-102.

Barnard, T. 1988. Status of wildlife in the Burns Bog area: a preliminary review. Prepared for the Burns Bog Committee.

Beak Consultants Ltd. 1982. Annacis Highway Environmental Assessment. Prepared for N.D. Lea & Associates Ltd., Ministry of Transportation and Highways.

Biggs, W.G. 1976. An ecological and land use study of Burns Bog, Delta, B.C. M.Sc. Thesis, Plant Sciences Department, University of British Columbia.

Butler, R.W. 1997. Status report on the Great Blue Heron (*Ardea herodias*) in Canada. Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Ottawa, Ontario.

Butler, R.W. and R.W. Campbell. 1987. The birds of the Fraser River delta: populations, ecology and international significance. Occasional Paper No. 65, Canadian Wildlife Service.

Butler, R.W. and R.J. Cannings. 1989. Distribution of birds in the intertidal portion of the Fraser River delta, B.C. Technical Report Series No.93, Pacific and Yukon Region, Canadian Wildlife Service.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E.

McNall. 1990a. The birds of British Columbia: Volume I. Nonpasserines: loons through waterfowl. Royal British Columbia Museum and Environment Canada, Canadian Wildlife Service. 535 pp.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser, and M.C.E.

McNall. 1990b. The Birds of British Columbia: Volume 2. Nonpasserines: diurnal birds of prey through woodpeckers. Royal British Columbia Museum and Environment Canada, Canadian Wildlife Service. 636 pp.

Campbell, R.W., N.K. Dawe, I. McT.-Cowan, J.M. Cooper, G.W. Kaiser, M.C.E. McNall, and G.E.J. Smith. 1997. The birds of British Columbia. Volume 3. Passerines: flycatchers through vireos. Canadian Wildlife Service, Delta, and B.C. Ministry of Environment, Lands and Parks, Victoria, B.C. 693 pp.

Cannings, S.G., L.R. Ramsey, D.F. Fraser, and M.A. Fraker. 1999. Rare amphibians, reptiles, and mammals of British Columbia. Ministry of Environment, Lands and Parks, Wildlife Branch and Resources Inventory Branch, Victoria, B.C.

Catherine Berris Associates Inc. 1993. Burns Bog Analysis. Prepared for Ministry of Environment, Lands and Parks, Province of British Columbia.

CDC, Conservation Data Centre. 1999. Rare vertebrate animal tracking list, Chilliwack Forest District.

Cooper, J.M. 1996. Status of the Sandhill Crane in British Columbia. Wildlife Bulletin No. B-83, Ministry of Environment, Lands and Parks, Wildlife Branch, Victoria, B.C.

Corkran, C.C. and C. Thoms. 1996. Amphibians of Oregon, Washington and British Columbia. Lone Pine Publishing, Vancouver, B.C.

DeMill, D. 1999. Unpublished photographs, observations and video of several years within Burns Bog.

Denham, J. 1992. Unpublished bird surveys conducted between February and July 1992 in the western end of Burns Bog.

ENKON Environmental Ltd. 1999. Environmental inventory and issue identification of Burns Bog, Delta, B.C. Prepared for Delta Fraser Properties Partnership.

Enviro-Pacific Consulting. 1999. Status of the Greater Sandhill Crane (*Grus canadensis tabida*) in Burns Bog, Delta - 1999. Prepared for ENKON Environmental Ltd.

Firman, M., M. Getty, and R.M.R. Barclay. 1993. Status of Keen's Long-eared Myotis in British Columbia. Wildlife Working Report No. WR-59, Ministry of Environment, Lands and Parks, Wildlife Branch.

Fraker, M., C. Bianchini and I. Robertson. 1999. Ecosystem Review Burns Bog - Small Mammals. Draft report. Prepared for ENKON Environmental Ltd. on behalf of Delta Fraser Properties and Environmental Assessment Office.

Fraser, D.F., W.L. Harper, S.G. Cannings, and J.M. Cooper. 1999. Rare birds of British Columbia. Ministry of Environment, Lands and Parks, Wildlife Branch and Resources Inventory Branch, Victoria, B.C.

Gebauer, M.B. and T. Bekhuys. 1994. Status and habitat use of birds at Burns Bog, Delta, B.C. *Discovery* 23(2): 51-60.

Gebauer, M. 1995. Status, reproductive success and habitat requirements of Greater Sandhill Cranes (*Grus canadensis tabida*) in the lower Fraser River delta in 1993 and 1994. Unpublished report, prepared for Ministry of Environment.

- Gebauer, M.B. 1999a. Late summer/ early fall surveys of Greater Sandhill Crane (*Grus canadensis tabida*) in Burns Bog, Delta - 1999. Prepared for Delta Fraser Properties Partnership and the Environmental Assessment Office in support of the Burns Bog Ecosystem Review. Additional work on Delta-owned lands conducted for the Environmental Assessment Office in association with the Corporation of Delta.
- Gebauer, M.B. 1999b. Terrestrial Ecosystem Mapping, Burns Bog: Wildlife interpretations. Prepared for Delta Fraser Properties Partnership and the Environmental Assessment Office in support of the Burns Bog Ecosystem Review.
- Godfrey, W.E. 1986. The birds of Canada. National Museum of Natural Sciences, Ottawa, Ontario. 595 pp.
- Gregory, P.T. and R.W. Campbell. 1984. The reptiles of British Columbia. Handbook 44, British Columbia Provincial Museum.
- Klassen, H., L. Kodak, D. Van Nes, and I. Cowan. 1971. Final report for the Delta Nature Reserve, Sept. 29, 1971.
- Knopp, D.H. and L.L. Larkin. 1999. Delta Fraser Properties Herpetile Study. Draft report. Prepared for ENKON Environmental Ltd. on behalf of Delta Fraser Properties.
- Kucy, V.M. 1976. Delta Nature Reserve Evaluation Study. Delta Parks and Recreation, Corporation of Delta.
- Madrone Consultants Ltd. 1999. The role of disturbance and regeneration of the Bog ecosystem - past and current ecosystem dynamics. Draft report. Prepared for Delta Fraser Properties Partnership and the Environmental Assessment Office in support of the Burns Bog Ecosystem Review.
- Martin, A.P. 1999. Effects of wildfire on avian and plant communities of a raised peat bog. B.Sc. Thesis, Faculty of Science, University of British Columbia.
- Materi, J.J. and D.A. Blood. 1999. Burns Bog spring raptor study. Prepared for ENKON Environmental Ltd.
- McIntosh, A. and I. Robertson. 1999. Ecosystem Review Burns Bog - Status of Black Bears. Draft report. Prepared for ENKON Environmental Ltd. on behalf of Delta Fraser Properties and Environmental Assessment Office.
- McTaggart-Cowan, I. and C.J. Guiguet. 1965. The mammals of British Columbia. Handbook No. 11, British Columbia Provincial Museum.
- Moul, I.E. 1998. The location and status of heron colonies around the Strait of Georgia: Region 2, Lower Fraser River Valley, Sunshine Coast, and the Powell River area. Prepared for Ministry of Environment, Lands and Parks, Nanaimo, B.C.

- Moul, I.E. 1999. The location and status of heron colonies around the Strait of Georgia: Region 2, Lower Fraser River Valley, Sunshine Coast, and the Powell River area, 1998. Prepared for Ministry of Environment, Lands and Parks, Nanaimo, B.C.
- Nagorsen, D.W. 1996. Opossums, shrews and moles of British Columbia. Volume 2, The Mammals of British Columbia. Royal British Columbia Museum Handbook.
- Nagorsen, D.W. and R.M. Brigham. 1993. Bats of British Columbia. Royal British Columbia Museum. UBC Press.
- Owen, C. 1992. Burns Bog: an important conservation opportunity. Unpublished report.
- Poynter, A. 1989. Bird species identified during field visits to Burns Bog in 1989, 1990, and 1994.
- Perdichuk, P.W. 1999. A wildlife survey of Burns Bog, and adjacent areas including Delta Nature Reserve, Watershed Park, and Cougar Canyon. Prepared for Burns Bog Conservation Society.
- Rithaler, R.C. and the Corporation of Delta. 1999. Amphibian database summary records for Burns Bog area, Delta, B.C.
- Sheehan, S.T. and C. Galindo-Leal. 1996. Status report on the Townsend's Mole (*Scapanus townsendii*) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, Ontario. 45 pp.
- Smith, J.N.M. 1999. Preliminary report on the breeding songbirds of Delta Nature Reserve, Burns Bog, with notes on other terrestrial vertebrates. Unpublished report, Centre for Biodiversity Research and Department of Zoology, University of British Columbia.
- Summers, K.R. and M.B. Gebauer. 1999a. Burns Bog raptor study: late summer/early fall 1999 survey results and review of existing information. Prepared for Delta Fraser Properties Partnership and the Environmental Assessment Office in support of the Burns Bog Ecosystem Review. Additional work on Delta-owned lands conducted for the Environmental Assessment Office in association with the Corporation of Delta.
- Summers, K.R. and M.B. Gebauer. 1999b. Burns Bog waterbird study: late summer/early fall 1999 survey results and review of existing information. Prepared for Delta Fraser Properties Partnership and the Environmental Assessment Office in support of the Burns Bog Ecosystem Review. Additional work on Delta-owned lands conducted for the Environmental Assessment Office in association with the Corporation of Delta.
- TERA Planning Ltd. 1991. Waterfowl, shorebirds, and raptors within the property owned by Western Delta Lands Inc., Burns Bog. Draft report, prepared for Western Delta Lands Inc.

TERA Planning Ltd. 1992. Abundance and distribution of waterfowl, songbirds and other birds in Burns Bog. Draft report, prepared for Western Delta Lands Inc.

TERA Planning Ltd. 1993. 1993. Cougar Creek: a Western Delta Property Corporation development.

Toochin, R. 1998. Seasonal status of the birds of the Vancouver, B.C. checklist area: October 1998 edition. Vancouver Natural History Society.

Wilson, T.M. and A.B. Carey. 1996. Observations of weasels in second-growth Douglas-Fir forests in the Puget Trough, Washington. *Northwestern Naturalist* 77: 35-39.

Zuleta, G.A. and C. Galindo-Leal. 1994. Distribution and abundance of four species of small mammals at risk in a fragmented landscape. Wildlife Working Report No. WR-64, B.C. Ministry of Environment, Lands and Parks.

Appendix I:

Status, distribution and habitat preferences of mammals reported in Burns Bog, Delta. Red and blue-listed species are indicated with superscript 'B' and 'R', respectively.

LEGEND:

Status:

Abundance

Com = Common

Unc = Uncommon

Rar = Rare

Season

Su = Summer

Occurrence

Res = Resident

Distribution:

Faf = Reported flying and feeding

All = Reported inhabiting all areas

Cen = Reported in central areas

Per = Reported in peripheral areas

E91 = Reported east of Highway 91

Important Habitats:

All = Over or in all habitats

Pd = Peat cutting ponds and ditches

He = Open sphagnum heathland with limited open water

Sh = Shrubland

Pn = Shore Pine and Labrador Tea

Df = Deciduous-dominated forests

Mx = Mixed coniferous forests

Sources (see Literature Cited section for full reference):

Ku76 = Kucy 1976

Bi76 = Biggs 1976.

Be82 = Beak Consultants Ltd. 1982.

De99 = DeMill 1999.

En99 = Enviro-Pacific Consulting. 1999.

Fi99 = Fraker et al 1999.

Ow92 = Owen 1992.

TE93 = TERA Planning Ltd. 1993.

AI83 = AIM Ecological Consultants Ltd. 1983.

Zu94 = Zuleta and Galindo-Leal 1994.

Ge99 = Gebauer 1999.

Kn99 = Knopp 1999.

Pe99 = Perdichuk 1999.

Sm99 = Smith 1999.

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
Marsupials					
North American Opossum	<i>Didelphus virginiana</i>	UncRes	Per,E91	Df,Mx	Bi76,Be82
Shrews and Moles					
Coast Mole	<i>Scapanus orarius</i>	ComRes	Per,E91	Sh,Df,Mx	Bi76,Be82,Ku76,Ge99, Pe99,Sm99
Common Shrew	<i>Sorex cinereus</i>	UncRes	Per,E91	Pn,Df,Mx	Zu94,Fr99,Pe99
Dusky Shrew	<i>Sorex monticolus</i>	UncRes	All	Sh,Pn,Df,Mx	Zu94,Fr99,Kn99
Pacific Water Shrew ^R	<i>Sorex bendirii</i>	RarRes	Per	Unknown	Be82,Fr99
Shrew-Mole	<i>Neurotrichus gibbsii</i>	ComRes	All	All	Bi76,Ku76,Zu94,En99, Fr99,Ge99,Kn99,Ma99, Pe99

¹ Townsend's Mole ^R	<i>Scapanus townsendii</i>	Unknown	Unknown	Unknown	Pe99
Trowbridge's Shrew ^B	<i>Sorex trowbridgii</i>	ComRes	Per, E91	Pn,Df,Mx	Be82,Fr99,Ge99,Kn99
Vagrant Shrew	<i>Sorex vagrans</i>	ComRes	All	All	Bi76,Be82,Ku76,TE93, Fr99,Ge99,Kn99,Pe99
Bats					
² <i>Myotis</i> spp.	<i>Myotis</i> spp	ComSuRes	Faf	All	Ge99
Rabbits and Hares					
Eastern Cottontail	<i>Sylvilagus floridanus</i>	ComRes	Per,E91	Sh,Df,Mx	Bi76,Ge99,Ma99,Sm99
³ Snowshoe Hare ^R	<i>Lepus americanus washingtonii</i>	Extirpated?	Extirpated?	Pn,Df,Mx	Ku76,Bi76,Be82,Pe99
Small Rodents					
⁴ Black Rat	<i>Rattus rattus</i>	UncRes	Per	All	AI83,Sm99
Creeping Vole	<i>Microtus oregoni</i>	UncRes	Cen	He,Sh,Pn	Fr99
Deer Mouse	<i>Peromyscus maniculatus</i>	ComRes	All	All	Ku76,Bi76,Be82,TE93, De99,Fr99,Ge99,Pe99

⁴ House Mouse	<i>Mus musculus</i>	UncRes	Per	Mx	AI83
Long-tailed Vole	<i>Microtis longicaudis</i>	UncRes	Per,E91	Sh,Df	Bi76,Be82
¹ Meadow Vole	<i>Microtis pennsylvanicus</i>	Unknown	Unknown	Unknown	Pe99
COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
Small Rodents Continued					
¹ Northern Bog Lemming	<i>Synaptomys borealis</i>	Unknown	Unknown	Unknown	Pe99
Norway Rat	<i>Rattus norvegicus</i>	ComRes	Per	All	AI83,Ge99,Pe99
Pacific Jumping Mouse	<i>Zapus trinotatus</i>	UncRes	Per,E91	He,Sh,Df,Mx	Be82,Pe99,Sm99
Southern Red-backed Vole ^R	<i>Clethrionomys gapperi</i> <i>occidentalis??</i>	UncRes	Per,E91	Pn,Df,Mx	Be82,Fr99,Ge99
Townsend's Vole	<i>Microtis townsendii</i>	UncRes	Per	Sh	Bi76,Be82,Ge99
Squirrels and Chipmunks					

Douglas' Squirrel	<i>Tamiasciurus douglasii</i>	ComRes	All	Pn,Mx	Bi76,Ku76,De99,En99, Fr99,Ge99,Pe99,Sm99
Gray Squirrel	<i>Sciurus carolinensis</i>	UncRes	Per,E91	Df,Mx	En99,Ge99,Pe99,Sm99
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>	UncRes	Per,E91	Df,Mx	Be82,De99,Fr99
⁵ Townsend's Chipmunk	<i>Tamias townsendii</i>	Extirpated?	Extirpated?	Sh,Df,Mx	Ku76
Yellow-pine Chipmunk	<i>Tamias amoenus</i>	Extirpated?	Extirpated?	Sh,Df,Mx	Ku76,Bi76,Be82
Large Rodents					
Beaver	<i>Castor canadensis</i>	ComRes	All	Pd,Df	Ku76,Bi76,Be82,Ow92, De99,En99,Ma99,Pe99
Muskrat	<i>Ondatra zibethicus</i>	UncRes	Cen	Pd	Bi76,Be82,Ow92,Ge99, Pe99
Porcupine	<i>Erithizon dorsatum</i>	Extirpated?	Extirpated?	Pn,Df,Mx	Ku76,Bi76,Be82
Cats and Dogs					
Bobcat	<i>Lynx rufus</i>	Unknown	Unknown	Unknown	Anecdotal

Coyote	<i>Canis latrans</i>	ComRes	All	All	Bi76,Be82,Ow92,En99, Fr99,Ma99,Pe99,Sm99
Red Fox	<i>Vulpes vulpes</i>	Extirpated?	Extirpated?	Pn,Df,Mx	Ku76,Bi76,Be82,Ma99
COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
Bears and Raccoons					
Black Bear	<i>Ursus americanus</i>	UncRes	All	All	Ku76,Bi76,Be82,Ow92, Ge99,Pe99
Raccoon	<i>Procyon lotor</i>	ComRes	All	All	Ku76,Bi76,Be82,Ge99, Pe99,Sm99
Mustelids					
Ermine	<i>Mustela erminea</i>	UncRes	All	All	De99,Fr99,Ge99
¹ Long-tailed Weasel ^R	<i>Mustela frenata altifrontalis</i>	Unknown	Unknown	All	Pe99
Spotted Skunk	<i>Spilogale gracilis</i>	Extirpated?	Extirpated?	Df,Mx	Bi76,Be82

⁶ Striped Skunk	<i>Mephitis mephitis</i>	RarRes	Per,E91	Df,Mx	Ge99
Ungulates					
Black-tailed Deer	<i>Odocoileus hemionus columbianus</i>	ComRes	All	All	Ku76,Bi76,Be82,Ow92, De99,En99,Ge99,Ma99, Pe99,Sm99

1. Townsend's Mole, Meadow Vole, Northern Bog Lemming, and Long-tailed Weasel have only been reported by P. Perdichuk. Voucher specimens collected by P. Perdichuk have been sent to D. Nagorsen, Provincial Vertebrate Specialist, Royal B.C. Museum, for verification.
2. Small bats were seen several times during the 1999 field season by wildlife survey crews.
3. Although Snowshoe Hares have been reported in the early 1980s, only P. Perdichuk has observed them in the 1990s.
4. Black Rat and House Mouse were reported by AIM (1983) in their study of the Vancouver Landfill. Although not reported in recent years, these species are expected to occur in peripheral areas of Burns Bog.
5. Townsend's Chipmunk has only been reported by Kucy (1976).
6. Striped Skunk was identified from a scat observed by G. Ryder.

Shorebird spp.	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	8
Short-billed Dowitcher ^B	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2

COMMON NAME	16 Aug	18 Aug	20 Aug	23 Aug	25 Aug	27 Aug	30 Aug	01 Sep	03 Sep	08 Sep	10 Sep	13 Sep	15 Sep	17 Sep	20 Sep	Total
Sandpipers Continued.																
Solitary Sandpiper	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
Spotted Sandpiper	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3
Whimbrel	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Gulls																
Ring-billed Gull	0	0	0	2	0	0	1	0	0	2	0	0	1	0	0	6
Glaucous-winged Gull	245	155	108	65	110	71	430	105	6	275	287	50	280	239	70	2496

Grouse																
Ruffed Grouse	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Owls																
Great Horned Owl	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
Northern Saw-whet Owl	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Doves																
Mourning Dove	4	0	0	0	1	2	1	0	1	1	2	0	0	1	0	13
Rock Dove	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
Swifts																
Vaux's Swift	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	7
Nighthawks																
Common Nighthawk	2	0	0	2	1	0	0	0	1	1	0	1	0	0	0	8
Hummingbirds																

Rufous Hummingbird	0	0	0	0	0	0	1	2	1	0	0	0	0	0	4	
Kingfishers																
Belted Kingfisher	0	0	0	0	0	0	0	1	0	2	0	0	0	0	3	
Woodpeckers																
Downy Woodpecker	2	2	0	0	0	1	1	2	1	0	2	0	0	0	11	
Hairy Woodpecker	0	2	0	0	0	0	0	1	0	0	0	0	0	0	3	
Northern Flicker	8	3	0	4	5	0	3	15	1	13	5	6	6	13	11	93
COMMON NAME	16 Aug	18 Aug	20 Aug	23 Aug	25 Aug	27 Aug	30 Aug	01 Sep	03 Sep	08 Sep	10 Sep	13 Sep	15 Sep	17 Sep	20 Sep	Total
Flycatchers																
Ash-throated Flycatcher	2	2	0	1	1	1	0	0	0	0	0	0	0	0	0	7
Empidonax spp.	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1

Hammond's Flycatcher	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
Olive-sided Flycatcher	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Pacific-slope Flycatcher	0	0	0	0	0	1	3	1	0	0	0	0	0	1	0	6
Willow Flycatcher	3	5	2	0	4	4	12	12	6	0	0	0	0	0	0	48
Swallows and Martins																
Barn Swallow	58	106	258	131	62	119	55	49	304	41	38	70	6	3	23	1323
Cliff Swallow	13	23	22	0	30	21	16	3	4	0	1	0	0	0	0	133
North. Rough-winged Swallow	0	5	1	22	0	0	2	0	0	0	0	0	0	0	0	30
Purple Martin ^R	0	0	0	0	0	0	2	0	0	1	2	0	0	3	0	8
Tree Swallow	35	45	0	0	4	0	0	0	0	0	0	0	0	0	0	84
Violet-green Swallow	0	0	3	0	3	0	0	0	1	0	0	1	0	0	0	8
Crows, Jays, and Ravens																
Common Raven	1	0	2	1	2	0	0	0	0	2	5	0	1	0	0	14

Northwestern Crow	5	6	4	0	81	0	0	12	0	0	31	4	0	6	3	152
Steller's Jay	0	0	0	0	0	0	0	4	1	0	0	0	0	0	2	7
Chickadees, Nuthatches, and Bushtits																
Black-capped Chickadee	13	33	26	24	14	42	39	19	25	53	32	44	40	57	58	519
Bushtit	4	57	22	5	15	25	50	2	85	30	21	16	38	23	3	396
Chestnut-backed Chickadee	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Red-breasted Nuthatch	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	3
Wrens																
Bewick's Wren	3	20	9	4	5	5	11	25	2	19	20	12	10	12	8	165
House Wren	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Marsh Wren	27	58	17	19	16	16	7	11	2	9	18	17	12	34	5	268
Winter Wren	2	0	0	0	0	0	0	3	0	0	0	1	0	1	0	7

COMMON NAME	16 Aug	18 Aug	20 Aug	23 Aug	25 Aug	27 Aug	30 Aug	01 Sep	03 Sep	08 Sep	10 Sep	13 Sep	15 Sep	17 Sep	20 Sep	Total
Kinglets																
Golden-crowned Kinglet	0	0	0	0	0	0	1	2	2	0	0	2	0	23	12	42
Ruby-crowned Kinglet	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
Thrushes																
American Robin	73	72	13	58	26	9	26	89	19	42	111	34	44	266	74	956
Hermit Thrush	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	2
Swainson's Thrush	0	0	1	0	0	0	1	2	1	0	0	0	1	0	0	6
Varied Thrush	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	3
Pipits and Larks																
American Pipit	0	0	0	0	0	0	0	10	8	4	16	31	92	41	8	210
Horned Lark ^{R?}	0	0	0	0	0	0	0	2	3	0	6	0	0	4	0	15

Waxwings																
Cedar Waxwing	77	62	78	78	18	25	51	80	27	22	6	1	12	10	3	550
Vireos																
Red-eyed Vireo	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2
Warbling Vireo	0	0	0	0	0	0	0	15	5	0	0	0	0	0	0	20
Warblers																
American Redstart	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Black-throated Gray Warbler	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0	7
Common Yellowthroat	52	87	39	49	47	32	43	97	28	56	72	27	42	90	14	775
MacGillivray's Warbler	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	4
Nashville Warbler	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
Orange-crowned Warbler	2	2	0	3	4	3	18	63	12	20	10	12	4	2	3	158
Townsend's Warbler	0	0	0	0	0	0	0	5	2	0	0	0	0	0	0	7

Wilson's Warbler	0	0	0	0	0	0	2	0	4	0	0	0	0	0	6	
Yellow Warbler	0	1	0	1	0	0	0	60	21	0	5	0	0	0	88	
Yellow-rumped Warbler	6	0	3	0	2	1	1	12	5	50	45	69	47	134	165	540

COMMON NAME	16 Aug	18 Aug	20 Aug	23 Aug	25 Aug	27 Aug	30 Aug	01 Sep	03 Sep	08 Sep	10 Sep	13 Sep	15 Sep	17 Sep	20 Sep	Total
Sparrows																
Black-headed Grosbeak	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	4
Chipping Sparrow	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
Dark-eyed Junco	5	0	3	10	19	22	4	15	7	56	38	35	50	59	106	429
Fox Sparrow	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	3
Lapland Longspur	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	2
Lincoln's Sparrow	0	1	0	0	3	0	0	5	0	0	0	3	2	6	2	22

Savannah Sparrow	2	42	12	3	11	10	1	16	8	2	30	13	8	12	3	173
Song Sparrow	45	51	26	11	36	25	46	59	43	46	49	28	44	55	46	610
Spotted Towhee	16	35	1	17	21	9	15	29	15	17	17	21	8	26	13	260
Vesper Sparrow ^{R?}	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Western Tanager	0	0	0	1	0	0	1	2	0	0	0	0	0	0	0	4
White-crowned Sparrow	23	35	0	1	5	19	48	41	22	44	18	30	15	32	11	344
Blackbirds																
Brown-headed Cowbird	11	17	14	6	4	2	13	10	0	0	0	0	0	0	0	77
Red-winged Blackbird	0	0	0	0	0	0	0	2	0	0	0	0	2	0	0	4
Finches																
American Goldfinch	3	30	34	7	3	10	7	16	9	31	5	2	0	16	18	191
House Finch	0	10	1	0	0	0	0	3	4	1	0	0	0	2	3	24
Pine Siskin	0	2	0	0	0	2	3	5	3	0	1	0	0	0	5	21

Purple Finch	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	5
Red Crossbill	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
TOTAL	48	47	41	44	48	37	50	66	52	41	50	39	42	48	36	113

Appendix III

Status, distribution and habitat preferences of birds recorded in Burns Bog, Delta. Superscript 'B' and 'R' indicate blue and red-listed species, respectively. Species known or expected to breed are indicated in bold print. For species with only one source, further information is provided in footnotes at the end of the table.

LEGEND:

Status:

Abundance

Com = Common

Unc = Uncommon

Rar = Rare

Season

Wi = Winter

Su = Summer

Fa = Fall

Occurrence

Res = Resident

Mig = Migrant

Vis = Visitor

Fo = Flyover

Distribution:

Fo = Reported flying over the Bog

Faf = Reported flying and feeding

All = Reported inhabiting all areas

Cen = Reported in central areas

Per = Reported in peripheral areas

E91 = Reported east of Highway 91

Important Habitats:

All = Over or in all habitats

Pd = Peat cutting ponds and ditches

He = Open sphagnum heathland with limited open water

Sh = Shrubland

Pn = Shore Pine and Labrador Tea

Df = Deciduous-dominated forests

Mx = Mixed coniferous forests

No = For birds only flying over Bog

Sources (see Literature Cited section for full reference):

Bi76 = Biggs 1976.

Ku76 = Kucy 1976.

Be82 = Beak Consultants Ltd. 1982.

Ba88 = Barnard 1988.

Po89 = Poynter 1989, 1990, and 1994.

De92 = Denham 1992.

Ow92 = Owen 1992.

TE92 = TERA Planning Ltd. 1992.

Ge94 = Gebauer and Bekhuys 1994.

Ge95 = Gebauer 1995.

De99 = DeMill 1999.

En99 = Enviro-Pacific Consulting. 1999.

Ge99 = Gebauer 1999.

Ma99 = Materi and Blood. 1999.

Pe99 = Perdichuk 1999.

Sm99 = Smith 1999.

Mar99 = Martin 1999.

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
Loons and Grebes					
Common Loon	<i>Gavia immer</i>	RarFo	Fo	No	En99,Ge99
Pied-billed Grebe	<i>Podilymbus podiceps</i>	UncSuRes	Cen	Pd	En99,Ge99
Hérons and Bitterns					
American Bittern ^B	<i>Botaurus lentiginosus</i>	RarSuRes	Cen	Pd	Po89,De99,En99
Great Blue Heron ^B	<i>Ardea herodias</i>	UncVis	Fo,All	Pd	Bi76,Po89,De92,Ge94,De99,En99,Ma99,Ge99,Sm99
¹ Green Heron ^B	<i>Butorides virescens</i>	RarSuVis	E91	Pd	Pe99

Swans and Geese

Canada Goose	<i>Branta canadensis</i>	ComRes	Fo,Cen	Pd,He	Bi76,Ba88,Po89,De92,TE92,Ge94,En99,Ma99,Ge99,Pe99
Greater White-fronted Goose	<i>Anser albifrons</i>	RarMig	Fo,Cen	Pd	Ge94,Ge99
Snow Goose	<i>Chen caerulescens</i>	RarWiFo	Fo	No	Ge94,Pe99
² Trumpeter Swan ^B	<i>Cygnus buccinator</i>	RarWiRes	Cen	Pd	Ge94,De99

Dabbling Ducks

American Wigeon	<i>Anas americana</i>	UncMig	Fo,Cen	Pd	Bi76,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99
Blue-winged Teal	<i>Anas discors</i>	ComMig	Cen,Per	Pd	Bi76,Po89,TE92,Ge94,En99,Ma99,Ge99
Cinnamon Teal	<i>Anas cyanoptera</i>	ComMig	Cen,Per	Pd	Bi76,De92,TE92,Ge94,En99,Ge99
Eurasian Wigeon	<i>Anas penelope</i>	RarWiRes	Cen	Pd	Bi76,TE92,Ge94,Pe99
Gadwall	<i>Anas strepera</i>	ComWiRes; RarSuRes	Fo,Cen,Per	Pd	Bi76,Ge94,En99,Ma99,Ge99,Pe99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Dabbling Ducks Continued.

Green-winged Teal	<i>Anas crecca</i>	ComRes	Fo,Cen,Per	Pd,He	Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99
Mallard	<i>Anas platyrhynchos</i>	ComRes	Fo,All	Pd,He	Bi76,Be82,Ba88,Po89,De92,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99,Sm99
Northern Pintail	<i>Anas acuta</i>	UncWiRes	Fo,Cen,Per	Pd	Bi76,Be82,Ba88,Po89,TE92,Ge94,De99,En99,Ge99,Pe99
Northern Shoveler	<i>Anas clypeata</i>	ComWiRes	Fo,Cen,Per	Pd	Bi76,TE92,Ge94,En99,Ge99,Pe99
Wood Duck	<i>Aix sponsa</i>	UncRes	Fo,Cen	Pd	Bi76,Po89,De92,TE92,Ge94,De99,En99,Ge99,Pe99

Diving Ducks and Mergansers

¹ Barrow's Goldeneye	<i>Bucephala islandica</i>	RarWiRes	Per	Pd	Pe99
Bufflehead	<i>Bucephala albeola</i>	UncWiRes	Cen	Pd	Bi76,TE92,Ge94,De99,En99,Ge99,Pe99
Canvasback	<i>Aythya valisineria</i>	RarMig	Cen	Pd	Bi76,Pe99

Common Goldeneye	<i>Bucephala clangula</i>	RarWiRes	Cen	Pd	Bi76, Ge99
³ Greater Scaup	<i>Aythya marila</i>	RarWiVis	Cen	Pd	Bi76
Hooded Merganser	<i>Lophodytes cucullatus</i>	RarVis	Cen	Pd	Bi76,Ge94,De99,En99,Ma99,Ge99
Lesser Scaup	<i>Aythya affinis</i>	UncWiVis	Cen	Pd	TE92,Ge94,En99,Pe99
³ Redhead	<i>Aythya americana</i>	RarMig	Cen	Pd	Bi76
Ring-necked Duck	<i>Aythya collaris</i>	UncMig	Cen	Pd	Bi76,TE92,Ge94,En99,Ge99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Eagles and Vultures

Bald Eagle	<i>Haliaeetus leucocephalus</i>	ComWiRes	Fo,All	All	Po89,De92,TE92,Ge94,De99,En99,Ma99,Pe99,Sm99
Golden Eagle	<i>Aquila chrysaetos</i>	RarFo	Fo	No	TE92,Ge94
Turkey Vulture	<i>Cathartes aura</i>	RarFo	Fo	No	De92,Ma99,Pe99

Hawks

Cooper's Hawk	<i>Accipiter cooperii</i>	UncRes	Fo,All	All	Bi76,De92,Ge94,En99,Ma99,Ge99,Pe99,Sm99
Northern Harrier	<i>Circus cyaneus</i>	UncRes	Fo,Cen,Per	Pd,He,Sh,Pn	Bi76,Be82,Po89,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99
⁴ Osprey	<i>Pandion haliaetus</i>	RarFo	Fo	No	Ge99
Red-tailed Hawk	<i>Buteo jamaicensis</i>	UncRes	Fo,All	All	Ku76,Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99, Ma99,Ge99,Pe99,Sm99, Mar99
Rough-legged Hawk	<i>Buteo lagopus</i>	RarFo	Fo,Cen,Per	Pd,He,Sh,Pn	TE92,Ge94,De99,Pe99
Sharp-shinned Hawk	<i>Accipiter striatus</i>	RarWiRes	Fo,All	All	De92,Ge94,De99,Ma99, Ge99,Pe99,Sm99

Falcons

American Kestrel	<i>Falco sparverius</i>	UncMig	Cen,Per	He,Sh,Pn	Be82,Ge94,En99,Ma99,Ge99,Pe99
Merlin	<i>Falco columbarius</i>	RarVis	Fo,Cen	All	Po89,De92,De99,En99, Ma99,Ge99,Pe99
Peregrine Falcon ^R	<i>Falco peregrinus</i>	UncVis	Fo,Cen,Per	Pd,He,Sh	TE92,Ge94,En99,Ge99,Pe99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
Grouse and Pheasants					
⁵ Blue Grouse	<i>Dendragapus obscurus</i>	RarWiRes	Per	Df,Mx	Ge94
Ring-necked Pheasant	<i>Phasianus colchicus</i>	UncRes	Per	Sh,Df,Mx	Bi76,Be82,Po89,Ge94,Pe99
Ruffed Grouse	<i>Bonasa umbellus</i>	RarRes	Per,E91	Sh,Df,Mx	Ku76,Bi76,De92,Ge94,Ge99,Pe99
Rails, Coots and Cranes					
American Coot	<i>Fulica americana</i>	RarWiVis	Cen	Pd	Bi76,TE92,Ge94,De99,En99,Ge99,Pe99
Sandhill Crane ^B	<i>Grus canadensis</i>	UncSuRes	Cen	Pd,He,Sh,Pn	Bi76,Be82,Ba88,Po89,TE92,Ow92,Ge94,Ge95,De99, En99,Ma99,Ge99,Pe99
Sora	<i>Porzana carolina</i>	UncSuRes	Cen	Pd	Ge94,En99,Ma99,Ge99,Pe99
⁴ Virginia Rail	<i>Rallus limicola</i>	RarSuRes	Cen	Pd	En99
Plovers					

⁶ Black-bellied Plover	<i>Pluvialis squatarola</i>	UncFo	Fo,Cen	Pd	En99
Killdeer	<i>Charadrius vociferus</i>	ComSuRes	Cen	Pd,He	Be82,Po89,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99

Sandpipers

⁷ Baird's Sandpiper	<i>Calidris bairdii</i>	RarFaMig	Fo,Cen	Pd	Ge99
Common Snipe	<i>Gallinago gallinago</i>	UncRes	Cen	Pd	Bi76,De92,TE92,Ge94,En99,Ge99,Pe99
Dunlin	<i>Calidris alpina</i>	RarWiVis	Cen	Pd	Bi76,De99,En99
Greater Yellowlegs	<i>Tringa melanoleuca</i>	UncMig	Cen	Pd	Bi76,Be82,Ge94,En99,Ma99,Ge99
Least Sandpiper	<i>Calidris minutilla</i>	ComMig	Cen	Pd	Be82,Ge94,En99,Ma99,Ge99
Lesser Yellowlegs	<i>Tringa flavipes</i>	UncMig	Cen	Pd	Bi76,Ge94,En99,Ge99
⁶ Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>	ComMig	Cen	Pd	En99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Sandpipers Continued.

Pectoral Sandpiper	<i>Calidris melanotos</i>	RarMig	Cen	Pd	Ge94,Ge99
Short-billed Dowitcher ^B	<i>Linodromus griseus</i>	RarMig	Cen	Pd	En99,Ge99
Solitary Sandpiper	<i>Tringa solitaria</i>	RarMig	Cen	Pd	En99,Ge99
Spotted Sandpiper	<i>Actitis macularia</i>	UncMig	Cen	Pd	Be82,Ge94,En99,Ge99,Pe99
Western Sandpiper	<i>Calidris mauri</i>	UncMig	Cen	Pd	Bi76,Be82,En99,Pe99
Whimbrel	<i>Numenius phaeopus</i>	RarMig	Cen	Pd	En99,Ge99
⁸ Wilson's Phalarope	<i>Phalaropus tricolor</i>	RarMig	Cen	Pd	En99

Gulls and Terns

Black Tern	<i>Chlidonias niger</i>	RarMig	Cen	Pd	Ow92,Ge94,De99
⁹ Bonaparte's Gull	<i>Larus philadelphia</i>	RarMig	Fo	No	En99
⁹ California Gull ^B	<i>Larus californicus</i>	UncFo	Fo	No	Ge99
Caspian Tern ^B	<i>Sterna caspia</i>	UncSuFo	Fo	No	Ge94,En99

⁹ Herring Gull	<i>Larus argentatus</i>	RarWiFo	Fo	No	Ge99
Glaucous-winged Gull	<i>Larus glaucescens</i>	ComFo; UncSuRes	Fo,Cen	Pd	Be82,Po89,Ge94,En99,Ma99,Pe99,Mar99
Ring-billed Gull	<i>Larus delawarensis</i>	UncFo	Fo	No	Ge99,Pe99
Pigeons and Doves					
Band-tailed Pigeon	<i>Columba fasciata</i>	UncRes	Per,E91	Sh,Df,Mx	Ku76,Bi76,De92,Ge99,Pe99
Mourning Dove	<i>Zenaida macroura</i>	UncRes	All	Sh,Pn,Df	Bi76,Po89,Ge94,De99,Ma99,Ge99,Pe99,Mar99
Rock Dove	<i>Columba livia</i>	UncFo	Fo	No	Ku76,Ge94,Ge99,Pe99
Owls					
Barn Owl ^B	<i>Tyto alba</i>	UncRes	All	He,Df,Mx	Be82,Ge99,Pe99
Barred Owl	<i>Strix varia</i>	RarRes	Per,E91	Df,Mx	De99,Ma99,Ge99,Pe99,Sm99
Great Horned Owl	<i>Bubo virginianus</i>	UncRes	All	All	Bi76,De92,Ge94,De99,Ma99,Ge99,Pe99,Sm99
Long-eared Owl	<i>Asio otus</i>	RarRes	Per	Pn,Df	Bi76,Ma99,Pe99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Owls Continued.

Northern Saw-whet Owl	<i>Aegolius acadicus</i>	UncRes	All	All	Bi76,De92,Ge94,De99,Ma99,Ge99
Short-eared Owl B	<i>Asio flammeus</i>	RarMig	Cen	Pd,He,Sh	Bi76,En99,Pe99
Western Screech-Owl	<i>Otus kennicottii</i>	UncRes	All	Pn,Df,Mx	Ku76,Bi76,Ge94,Ma99,Pe99

Nighthawks

Common Nighthawk	<i>Chordeiles minor</i>	UncMig	Faf	All	Be82,Po89,De92,Ge94,Ge99,Pe99
------------------	-------------------------	--------	-----	-----	-------------------------------

Swifts

Black Swift	<i>Cypseloides niger</i>	UncSuVis	Faf	All	Be82,Ge94,En99,Pe99
Vaux's Swift	<i>Chaetura vauxi</i>	UncSuVis	Faf	All	Be82, Ge94,En99,Ge99,Pe99

Hummingbirds

¹ Black-chinned Hummingbird	<i>Archilochus alexandri</i>	RarSuVis	E91	Sh	Pe99
Rufous Hummingbird	<i>Selasphorus rufus</i>	ComSuRes	All	All	Ku76,Bi76,Be82,Po89,De92,Ge94,De99,En99,Ma99, Ge99,Pe99,Sm99
Kingfishers					
Belted Kingfisher	<i>Ceryle alcyon</i>	RarVis	Fo	No	Ge99,Pe99,Sm99
Woodpeckers					
Downy Woodpecker	<i>Picoides pubescens</i>	UncRes	All	Sh,Pn,Df,Mx	Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ge99,Pe99,Sm99
Hairy Woodpecker	<i>Picoides villosus</i>	UncRes	Per,E91	Df,Mx	Ku76,Bi76,Ge94,De99,En99,Ma99,Ge99,Pe99,Sm99, Mar99
Northern Flicker	<i>Colaptes auratus</i>	UncRes	All	All	Ku76,Bi76,Be82,Po89,De92,Ge94,En99,Ma99,Ge99,Pe99,Sm99,Mar99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Woodpeckers Continued

Pileated Woodpecker	<i>Dryocopus pileatus</i>	UncRes	Per,E91	Df,Mx	Ku76,Bi76,De92,Ge94,Ge99,Pe99,Sm99
Red-breasted Sapsucker	<i>Sphyrapicus ruber</i>	UncRes	Per,E91	Df,Mx	De99,Ge99,Pe99,Sm99
Flycatchers					
¹⁰ Ash-throated Flycatcher	<i>Myiarchus cinerascens</i>	RarFaVis	Cen	Pd,He,Sh,Pn	Ge99
¹ Eastern Kingbird	<i>Tyrannus tyrannus</i>	RarSuVis	Cen,Per	Pd,Sh,Pn	Pe99
Hammond's Flycatcher	<i>Empidonax hammondii</i>	UncMig	Per	Df,Mx	Bi76, De92,En99,Ge99,Pe99
Olive-sided Flycatcher	<i>Contopus cooperi</i>	RarMig	Per	Df,Mx	Bi76,Ge94,Ge99,Pe99,Sm99,Mar99
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>	ComSuRes	Per,E91	Df,Mx	Ku76,TE92,Be82,Po89,De92,Ge94,En99,Ge99,Pe99,Sm99
Western Wood-Pewee	<i>Contopus sordidulus</i>	UncMig	All	Pn,Df,Mx	De92,Ge94,De99,En99
Willow Flycatcher	<i>Empidonax traillii</i>	ComSuRes	Cen,Per	Sh,Pn	Bi76,Be82,De92,TE92,Ge94,De99,En99,Ge99,Pe99,Sm99,Mar99

Vireos

Cassin's (Solitary) Vireo	<i>Vireo cassinii</i>	UncSuRes	Per,E91	Df,Mx	Bi76,Po89,De92,Ge94,Pe99
Hutton's Vireo ^B	<i>Vireo huttoni</i>	UncRes	E91	Mx	Bi76,De92,Ge94,Ma99,Ge99,Sm99
Red-eyed Vireo	<i>Vireo olivaceus</i>	UncSuRes	Per,E91	Df,Mx	Ku76,Bi76,Be82,Ge94,Ge99,Sm99
Warbling Vireo	<i>Vireo gilvus</i>	UncSuRes	All	Df,Mx	Bi76,Po89,De92,Ge94,En99,Ge99,Sm99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Crows, Jays, and Ravens

¹ American Crow	<i>Corvus brachyrhynchos</i>	RarVis	E91	Sh,Mx	Pe99
Common Raven	<i>Corvus corax</i>	UncRes	Fo	No	Bi76,De92,Ge94,En99,Ge99,Pe99,Sm99
Northwestern Crow	<i>Corvus caurinus</i>	ComRes	All	All	Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ma99, Ge99,Pe99,Sm99,Mar99
Steller's Jay	<i>Cyanocitta stelleri</i>	ComRes	Per,E91	Pn,Df,Mx	Ku76,Bi76,Be82,Ge94,De99,Ge99,Pe99,Sm99

Larks

Horned Lark ^{R?}	<i>Eremophila alpestris</i>	RarMig	Cen	Pd,He	Ge94,En99,Ge99
---------------------------	-----------------------------	--------	-----	-------	----------------

Swallows and Martins

Barn Swallow	<i>Hirundo rustica</i>	ComSuRes	Fof,Cen	All	Ku76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ma99, Ge99,Pe99,Sm99,Mar99
--------------	------------------------	----------	---------	-----	---

Cliff Swallow	<i>Hirundo pyrrhonota</i>	ComMig	Fof	All	Be82,Po89,De92,Ge94,En99,Ma99,Ge99
---------------	---------------------------	--------	-----	-----	------------------------------------

Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	UncMig	Fof	All	Be82,De92,Ge94,En99,Ge99,Pe99
-------------------------------	-----------------------------------	--------	-----	-----	-------------------------------

Purple Martin ^R	<i>Progne subis</i>	RarMig	Fof	All	En99,Ge99
----------------------------	---------------------	--------	-----	-----	-----------

Tree Swallow	<i>Tachycineta bicolor</i>	ComSuRes	Fof	All	Be82,Ba88,Po89,De92,Ge94,En99,Ma99,Ge99,Pe99, Sm99,Mar99
--------------	----------------------------	----------	-----	-----	---

Violet-green Swallow	<i>Tachycineta thalassina</i>	ComMig	Fof	All	Po89,De92,Ge94,En99,Ma99,Ge99,Pe99,Sm99
----------------------	-------------------------------	--------	-----	-----	---

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
Chickadees, Nuthatches, Creepers, and Bushtits					
Black-capped Chickadee	<i>Parus atricapillus</i>	ComRes	All	Sh,Pn,Df,Mx	Ku76,Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99, Ma99,Ge99,Pe99,Sm99, Mar99
Brown Creeper	<i>Certhia americana</i>	UncRes	Per,E91	Df,Mx	Ku76,Bi76,Ge94,De99,Ge99,Sm99
Bushtit	<i>Psaltriparus minimus</i>	ComRes	All	Sh,Pn,Df,Mx	Ku76,Bi76,Be82,Po89,De92,Ge94,De99,En99,Ma99, Ge99,Pe99,Sm99
Chestnut-backed Chickadee	<i>Parus rufescens</i>	ComRes	Per,E91	Df,Mx	Bi76,Be82,De92,TE92,Ge94,De99,Ge99,Pe99,Sm99, Mar99
Red-breasted Nuthatch	<i>Sitta canadensis</i>	UncRes	Per,E91	Df,Mx	Bi76,Be82,Ge94,De99,En99,Ge99,Pe99,Sm99,Mar99
¹ White-breasted Nuthatch	<i>Sitta carolinensis</i>	RarVis	E91	Df	Pe99
Wrens					

Bewick's Wren	Thryomanes bewickii	ComRes	All	Sh,Pn,Df,Mx	Bi76,Be82,Po89,TE92,Ge94,De99,En99,Ge99,Pe99,Sm99,Mar99
House Wren	Troglodytes aedon	RarMig	All	Sh,Pn,Df,Mx	Ge99,Pe99,Sm99
Marsh Wren	Cistothorus palustris	ComSuRes	Cen	Pd,He,Sh,Pn	Ku76,Bi76,Po89,De99,Ge94,En99,Ma99,Ge99,Pe99,Sm99,Mar99
Winter Wren	Troglodytes troglodytes	ComRes	All	Sh,Pn,Df,Mx	Bi76,Be82,De92,Ge94,En99,Ge99,Pe99,Sm99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Kinglets

Golden-crowned Kinglet	Regulus satrapa	UncRes	All	Sh,Pn,Df,Mx	Bi76,De92,Ge94,En99,Ge99,Pe99,Sm99,Mar99
Ruby-crowned Kinglet	Regulus calendula	ComMig	All	Sh,Pn,Df,Mx	Bi76,Po89,De92,Ge94,En99,Ge99,Pe99,Sm99

Mimic Thrushes

³ Gray Catbird	Dumetella carolinensis	RarMig	Per	Sh,Df,Mx	Bi76
---------------------------	------------------------	--------	-----	----------	------

Thrushes

American Robin	<i>Turdus migratorius</i>	ComSuRes	All	All	Ku76,Bi76,Be82,Po89,De92,TE92,Ge94,En99,Ma99, Ge99,Pe99,Sm99,Mar99
Hermit Thrush	<i>Catharus guttatus</i>	ComMig	All	Sh,Pn,Df,Mx	Bi76,De92,Ge94,En99,Ma99,Ge99,Pe99
Swainson's Thrush	<i>Catharus ustulatus</i>	UncSuRes	Per,E91	Df,Mx	Bi76,Be82,De92,TE92,Ge94,En99,Ge99,Pe99,Sm99, Mar99
Varied Thrush	<i>Ixoreus naevius</i>	UncWiRes	All	Sh,Pn,Df,Mx	Bi76,De92,TE92,Ge94,De99,En99,Ge99,Pe99
¹ Veery	<i>Catharus minimus</i>	RarSuVis	E91	Df,Mx	Pe99

Shrikes

Northern Shrike	<i>Lanius excubitor</i>	RarWiRes	All	Pd,He,Sh,Pn	De92,De99
-----------------	-------------------------	----------	-----	-------------	-----------

Starlings

European Starling	<i>Sturnus vulgaris</i>	UncRes	All	He,Pn,Df	Po89,TE92,De92,Ge94,De99,En99,Ge99,Pe99,Sm99, Mar99
-------------------	-------------------------	--------	-----	----------	--

Pipits

American Pipit

Anthus rubescens

ComMig

Cen

Pd,He

Bi76,Ge94,En99,Ma99,Ge99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Waxwings

Bohemian Waxwing

Bombycilla garrulus

RarWiVis

Per

Sh,Df,Mx

Bi76,Pe99

Cedar Waxwing

Bombycilla cedrorum

ComSuRes

All

Sh,Pn,Df,Mx

Ku76,Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,
Ge99,Pe99,Sm99,Mar99

Warblers

⁸ American Redstart*Setophaga ruticilla*

RarFaMig

Per

Sh,Df,Mx

Ge99

Black-throated Gray
Warbler*Dendroica nigrescens*RarSuRes;
UncMig

All

Sh,Df,Mx

Bi76,De92,Ge94,En99,Ge99,Pe99,Sm99

Common Yellowthroat	<i>Geothlypis trichas</i>	ComSuRes	All	All	Ku76,Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99, Ma99,Ge99,Pe99,Sm99, Mar99
MacGillivray's Warbler	<i>Oporornis tolmiei</i>	RarSuRes	Per	Sh,Df,Mx	Bi76, De92,En99,Ge99,Sm99
Nashville Warbler	<i>Vermivora ruficapilla</i>	RarMig	All	Sh,Df,Mx	Bi76,Ge99
¹ Northern Waterthrush	<i>Seiurus noveboracensis</i>	RarMig	Cen	Pd,Pn	Pe99
Orange-crowned Warbler	<i>Vermivora celata</i>	ComSuRes	All	Sh,Pn,Df,Mx	Bi76,Be82,Po89,De92,Ge94,En99,Ma99,Ge99,Pe99, Sm99,Mar99
¹ Tennessee Warbler	<i>Vermivora peregrina</i>	RarMig	Cen	Pn,Df	Pe99
Townsend's Warbler	<i>Dendroica townsendii</i>	UncMig	All	Sh,Pn,Df,Mx	Bi76,De92,Ge94,En99,Ge99,Pe99,Sm99
Wilson's Warbler	<i>Wilsonia pusilla</i>	ComMig; UncSuRes	All	Sh,Pn,Df,Mx	Ku76,Bi76,Be82,Po89,De92,Ge94,En99,Ge99,Pe99,Sm99
Yellow Warbler	<i>Dendroica petechia</i>	ComMig; RarSuRes	All	Sh,Pn,Df,Mx	Bi76,Be82,De92,TE92,Ge94,En99,Ge99,Pe99,Sm99

Yellow-rumped Warbler	<i>Dendroica coronata</i>	ComMig; RarSuRes	All	Sh,Pn,Df,Mx	Bi76,Be82,Po89,De92,TE92,Ge94,En99,Ge99,Pe99,Sm99
-----------------------	---------------------------	---------------------	-----	-------------	---

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Sparrows

American Tree Sparrow	<i>Spizella arborea</i>	RarWiRes	Per	He,Sh,Pn,Df	Bi76,Pe99
Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>	UncSuRes	Per,E91	Df,Mx	Bi76,Be82,De92,TE92,Ge94,Ge99,Sm99
Chipping Sparrow	<i>Spizella passerina</i>	RarFaMig	All	Sh,Pn,Df	Po89,Ge99,Pe99
Dark-eyed Junco	<i>Junco hyemalis</i>	ComRes	All	Sh,Pn,Df,Mx	Bi76,Po89,De92,TE92,Ge94,En99,De99,Ge99,Pe99,Mar99
Fox Sparrow	<i>Passerella iliaca</i>	UncWiRes	All	Sh,Pn,Df,Mx	Ku76,Ge94,De99,En99,Ge99,Pe99
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>	UncWiRes	All	Sh,Pn,Df,Mx	Po89,De92,Ge94,En99,Pe99
¹¹ Lapland Longspur	<i>Calcarius lapponicus</i>	RarFaMig	Cen	He	Ge99

Lincoln's Sparrow	<i>Melospiza lincolni</i>	UncMig	All	Sh,Pn,Df,Mx	Po89,De92,Ge94,En99,Ge99
Savannah Sparrow	<i>Passerculus sandwichensis</i>	ComSuRes	Cen	He,Sh,Pn	Be82,Po89,De92,TE92,Ge94,En99,Ge99,Pe99
Song Sparrow	<i>Melospiza melodia</i>	ComRes	All	Sh,Pn,Df,Mx	Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99,Sm99,Mar99
Spotted (Rufous-sided) Towhee	<i>Pipilo macularia</i>	ComRes	All	Sh,Pn,Df,Mx	Ku76,Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99,Sm99,Mar99
¹² Vesper Sparrow ^{R?}	<i>Poocetes gramineus</i>	RarMig	Cen	He,Sh	Ge99
Western Tanager	<i>Piranga ludoviciana</i>	RarSuRes	All	Pn,Df,Mx	Ku76,Bi76,De92,Ge94,En99,Ge99,Sm99
White-crowned Sparrow	<i>Zonotrichia atricapilla</i>	ComRes	All	Sh,Pn,Df,Mx	Ku76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99,Sm99,Mar99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Blackbirds

Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	ComSuRes; RarWiRes	Cen,Per	Pd,He,Sh	Be82,Po89,Ge94,De99,En99,Pe99,Sm99
Brown-headed Cowbird	<i>Molothrus ater</i>	ComSuRes	All	Sh,Pn,Df,Mx	Be82,Po89,De92,TE92,Ge94,En99,Ma99,Ge99,Pe99, Sm99,Mar99
Bullock's (Northern) Oriole	<i>Icterus bullockii</i>	RarSuRes	Per,E91	Df,Mx	Bi76,Pe99
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	ComSuRes; RarWiRes	All	Pd,He,Sh,Pn	Bi76,Po89,De92,TE92,Ge94,De99,En99,Ma99,Ge99,Pe99,Sm99
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	RarFo	Fo	No	Bi76,En99,Ge99

Finches

American Goldfinch	<i>Carduelis tristis</i>	ComSuRes	All	Sh,Pn,Df,Mx	Ku76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ge99,Pe99,Sm99,Mar99
¹ Cassin's Finch	<i>Carpodacus cassinii</i>	RarSuVis	E91	Df,Mx	Pe99
Evening Grosbeak	<i>Coccothraustes vespertina</i>	RarVis	All	Pn,Df,Mx	Bi76,Po89,En99,Pe99,Sm99

House Finch	<i>Carduelis mexicanus</i>	UncRes	All	Sh,Pn,Df,Mx	Po89,De92,Ge94,De99,En99,Ge99,Pe99,Sm99,Mar99
¹ Pine Grosbeak	<i>Pinicola enucleator</i>	RarWiVis	Cen	Pn	Pe99
Pine Siskin	<i>Carduelis pinus</i>	UncWiRes; RarSuRes	All	Pn,Df,Mx	Bi76,Be82,Po89,De92,TE92,Ge94,De99,En99,Ge99,Pe99,Sm99
Purple Finch	<i>Carduelis purpureus</i>	RarRes	Per,E91	Df,Mx	Be82,De92,Ge94,Ge99,Pe99,Sm99,Mar99
Red Crossbill	<i>Loxia curvirostra</i>	RarRes	Per,E91	Df,Mx	Bi76,De92,Ge94,En99,Ge99,Sm99

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
-------------	-----------------	--------	----------	----------	---------

Old World Sparrows

House Sparrow	<i>Passer domesticus</i>	UncRes	Per	Sh,Df	Po89,Ge99,Pe99
---------------	--------------------------	--------	-----	-------	----------------

TOTAL 175

1. P. Perdichuk reported 11 species which have not been recorded by other observers. Nine of the species, Black-chinned Hummingbird, Eastern Kingbird, American Crow, White-breasted Nuthatch, Veery, Northern Waterthrush, Tennessee Warbler, Pine Grosbeak, and Cassin's Finch are extremely rare in the Lower Mainland. These records have not been accompanied with documentation such as a written record or photographs.
2. Trumpeter Swans have been photographed in the Bog by D. DeMill.
3. Gray Catbird, Greater Scaup, and Redhead have only been reported in Burns Bog by Biggs (1976). Winter surveys would likely confirm these and other wintering bird species as utilizing the Bog.
4. Osprey and Virginia Rail were observed by M. Wynja during the 1999 Sandhill Crane surveys.
5. Blue Grouse was observed by M. Gebauer in 1994.
6. Black-bellied Plover and Long-billed Dowitcher were observed on several occasions by several observers (e.g., M. Gebauer, R. Toochin, M. Wynja) during Sandhill Crane surveys in May 1999.
7. Baird's Sandpipers were seen by K. Summers and R. Toochin in May 1999 during Sandhill Crane surveys.
8. Wilson's Phalarope and American Redstart were observed by R. Toochin on Sandhill Crane surveys in 1999.
9. M. Gebauer observed a migrating flock of Bonaparte's Gull low over the Bog in May 1999. G. Ryder observed a flock of California Gull over the Bog in August 1999. M. Gebauer observed a single Herring Gull flying over the Bog in October 1999.
10. Ash-throated Flycatchers were observed by M. Gebauer, C. Bianchini, R. Toochin, and K. Summers in August 1999 during Sandhill Crane surveys.
11. Lapland Longspurs were observed by both R. Toochin and M. Wynja in September 1999 during Sandhill Crane surveys.
12. Vesper Sparrow was seen by C. Bianchini and D. Power in August 1999 during a Sandhill Crane survey.

Appendix IV: Bird species encountered during breeding Sandhill Crane surveys and traverses of Burns Bog, Delta - May 1999 (from Enviro-Pacific Consulting 1999). Blue and red-listed species are indicated with superscript 'B' and 'R', respectively.

COMMON NAME	07 May	12 May	13 May	14 May	17 May	18 May	19 May	20 May	21 May	25 May	26 May	Total
Loons and Grebes												
Common Loon	00	0	0	0	1	00	2	0	0	0	3	6
Pied-billed Grebe	0	2	1	1	1	3	2	2	2	1	2	17
Herons and Bitterns												
American Bittern ^B	0	1	0	0	0	0	1	0	1	0	2	5
Great Blue Heron ^B	1	3	0	2	2	0	4	0	5	2	0	19
Geese												
Canada Goose	6	18	10	40	41	0	40	5	58	38	78	334
Dabbling Ducks												
American Wigeon	0	2	0	0	0	0	2	0	3	0	0	7
Blue-winged Teal	0	5	0	0	20	3	3	0	3	19	10	63
Cinnamon Teal	0	7	0	0	2	0	0	0	5	7	4	25
Gadwall	2	11	0	8	10	3	8	3	8	10	21	84
Green-winged Teal	8	35	3	7	35	10	32	3	11	26	15	185
Mallard	25	63	15	29	51	25	76	30	47	95	77	533
Northern Pintail	0	0	0	0	0	4	0	0	0	0	0	4

Northern Shoveler	2	45	0	5	18	6	26	1	5	6	7	121
-------------------	---	----	---	---	----	---	----	---	---	---	---	-----

Wood Duck	0	2	1	0	5	1	0	0	1	5	6	21
-----------	---	---	---	---	---	---	---	---	---	---	---	----

Diving Ducks and Mergansers

Bufflehead	3	1	0	2	0	0	2	0	1	0	0	9
------------	---	---	---	---	---	---	---	---	---	---	---	---

Hooded Merganser	0	0	0	0	0	0	0	0	1	0	0	1
------------------	---	---	---	---	---	---	---	---	---	---	---	---

Lesser Scaup	0	0	0	0	0	0	0	1	0	0	0	1
--------------	---	---	---	---	---	---	---	---	---	---	---	---

Ring-necked Duck	3	7	0	0	2	0	0	0	0	1	0	13
------------------	---	---	---	---	---	---	---	---	---	---	---	----

Eagles

Bald Eagle	5	8	10	4	14	5	10	2	16	10	11	95
------------	---	---	----	---	----	---	----	---	----	----	----	----

COMMON NAME	07 May	12 May	13 May	14 May	17 May	18 May	19 May	20 May	21 May	25 May	26 May	Total
-------------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	-------

Hawks

Cooper's Hawk	0	0	1	0	0	0	0	0	0	0	1	2
---------------	---	---	---	---	---	---	---	---	---	---	---	---

Harlan's Hawk	1	0	0	0	0	0	0	0	0	0	0	1
---------------	---	---	---	---	---	---	---	---	---	---	---	---

Northern Harrier	5	6	1	3	5	2	7	0	3	7	2	41
------------------	---	---	---	---	---	---	---	---	---	---	---	----

Red-tailed Hawk	3	3	0	2	2	2	5	3	0	2	0	22
-----------------	---	---	---	---	---	---	---	---	---	---	---	----

Falcons

American Kestrel	2	0	1	1	1	2	2	1	4	0	0	14
Merlin	0	0	0	0	0	0	1	0	0	0	0	1
Peregrine Falcon ^R	2	0	0	0	0	1	0	0	0	1	0	4
Rails, Coots and Cranes												
American Coot	0	2	0	0	0	0	0	0	0	0	0	2
Sandhill Crane ^B	3	8	1	10	11	1	5	2	13	7	5	66
Sora	0	3	0	0	0	1	0	1	1	3	4	13
Virginia Rail	0	0	0	0	0	0	0	0	0	1	4	5
Plovers												
Black-bellied Plover	0	16	0	11	0	0	0	0	1	0	0	28
Killdeer	5	19	5	22	21	5	15	1	24	15	16	148
Sandpipers												
Common Snipe	0	2	0	0	1	0	0	0	3	0	0	6
Dunlin	0	0	0	0	0	0	1	0	0	0	0	1
Greater Yellowlegs	4	3	0	12	3	0	16	0	2	2	9	51
Least Sandpiper	50	29	2	4	22	0	1	0	2	0	0	110
Lesser Yellowlegs	2	1	1	1	1	1	10	0	1	0	0	18
Long-billed Dowitcher	0	253	4	1	0	20	2	0	0	4	0	284

Short-billed Dowitcher ^B	0	0	0	0	1	0	0	0	0	0	0	1
Solitary Sandpiper	0	2	1	0	0	0	0	0	0	0	0	3
Spotted Sandpiper	0	0	0	0	0	0	0	1	4	5	1	11

COMMON NAME	07 May	12 May	13 May	14 May	17 May	18 May	19 May	20 May	21 May	25 May	26 May	Total
-------------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-----------	-------

Sandpipers Continued.												
-----------------------	--	--	--	--	--	--	--	--	--	--	--	--

Western Sandpiper	0	2	0	5	0	0	0	0	34	8	0	49
-------------------	---	---	---	---	---	---	---	---	----	---	---	----

Whimbrel	0	0	0	0	0	0	0	0	2	0	0	2
----------	---	---	---	---	---	---	---	---	---	---	---	---

Wilson's Phalarope	0	0	0	0	2	0	0	0	0	0	0	2
--------------------	---	---	---	---	---	---	---	---	---	---	---	---

Gulls and Terns												
-----------------	--	--	--	--	--	--	--	--	--	--	--	--

Bonaparte's Gull	40	0	0	0	0	0	0	0	0	0	0	40
------------------	----	---	---	---	---	---	---	---	---	---	---	----

Caspian Tern ^B	0	4	0	2	3	0	2	0	3	1	8	23
---------------------------	---	---	---	---	---	---	---	---	---	---	---	----

Glaucous-winged Gull	50	216	10	147	192	50	189	10	108	172	41	1185
----------------------	----	-----	----	-----	-----	----	-----	----	-----	-----	----	------

Owls												
------	--	--	--	--	--	--	--	--	--	--	--	--

Short-eared Owl ^B	0	0	0	0	1	0	0	0	0	0	0	1
------------------------------	---	---	---	---	---	---	---	---	---	---	---	---

Swifts												
--------	--	--	--	--	--	--	--	--	--	--	--	--

Black Swift	0	0	0	0	3	0	1	0	0	0	0	4
-------------	---	---	---	---	---	---	---	---	---	---	---	---

Vaux's Swift	1	0	0	0	0	0	15	0	0	0	0	16
Hummingbirds												
Rufous Hummingbird	1	2	2	1	2	0	2	2	1	0	2	15
Woodpeckers												
Downy Woodpecker	1	0	0	0	0	0	0	3	0	0	0	4
Hairy Woodpecker	0	0	0	0	0	0	0	1	0	0	0	1
Northern Flicker	0	6	1	5	5	1	4	3	4	2	4	35
Flycatchers												
Hammond's Flycatcher	0	0	0	0	0	0	1	0	0	0	0	1
Pacific-slope Flycatcher	1	1	0	1	1	0	0	3	0	2	2	11
Western Wood-Pewee	0	0	0	0	0	0	0	0	0	2	0	2
Willow Flycatcher	0	0	0	0	0	0	0	0	0	2	3	5
Swallows and Martins												
Barn Swallow	10	59	15	13	18	10	26	6	26	35	30	248
Cliff Swallow	4	12	0	0	0	20	12	3	2	30	0	83
COMMON NAME	07 May	12 May	13 May	14 May	17 May	18 May	19 May	20 May	21 May	25 May	26 May	Total

Swallows and Martins Continued.

North.Rough-winged Swallow	0	1	0	0	0	0	1	0	0	1	0	3
Purple Martin ^R	0	0	0	0	0	0	1	0	0	0	0	1
Tree Swallow	30	30	2	13	21	5	26	10	18	25	12	192
Violet-green Swallow	75	68	1	0	3	2	9	2	1	1	0	162

Crows and Ravens

Common Raven	2	1	0	0	6	2	0	0	1	0	0	12
Northwestern Crow	15	21	2	11	17	10	32	2	22	20	22	174

Chickadees, Nuthatches and Bushtits

Black-capped Chickadee	0	8	2	7	5	2	4	2	2	3	1	36
Bushtit	2	5	2	1	6	7	4	3	3	4	4	41
Red-breasted Nuthatch	0	1	0	0	0	0	0	0	0	0	0	1

Kinglets

Golden-crowned Kinglet	0	4	0	0	0	0	0	0	0	0	0	4
Ruby-crowned Kinglet	2	4	0	0	1	0	2	0	0	0	0	9

Thrushes

American Robin	6	43	3	27	17	8	31	10	41	31	21	238
Hermit Thrush	3	2	1	0	0	1	6	8	1	0	0	22

Orange-crowned Warbler	3	14	2	8	10	6	23	8	21	18	8	121
Townsend's Warbler	0	0	0	0	0	0	0	0	1	1	0	2
Wilson's Warbler	5	10	1	0	6	2	28	8	19	4	3	86
Yellow Warbler	1	0	0	0	0	1	1	2	0	0	0	5
Yellow-rumped Warbler	10	9	0	3	0	0	4	1	2	0	0	29
Sparrows												
Dark-eyed Junco	2	13	3	9	9	7	15	6	11	3	3	81
Fox Sparrow	0	2	0	0	0	0	0	1	0	0	0	3
Golden-crowned Sparrow	5	0	0	3	0	0	8	10	3	0	4	33
Lincoln's Sparrow	2	2	1	0	1	0	1	0	0	1	1	9
Savannah Sparrow	15	16	0	15	11	8	35	3	20	12	18	153
Song Sparrow	7	15	5	11	21	7	30	10	17	12	13	148
Spotted Towhee	2	12	2	4	13	7	24	8	8	7	9	96
Western Tanager	0	0	0	0	0	0	1	0	1	0	2	4
White-crowned Sparrow	5	30	3	5	17	10	19	15	23	6	14	147
Blackbirds												
Brewer's Blackbird	1	3	5	6	6	5	12	5	12	23	10	88
Brown-headed Cowbird	20	47	5	34	52	15	60	6	28	31	34	332

Red-winged Blackbird	6	26	10	11	19	8	16	3	15	17	18	149
Yellow-headed Blackbird	0	0	0	0	0	0	0	0	0	0	1	1

COMMON NAME	07 May	12 May	13 May	14 May	17 May	18 May	19 May	20 May	21 May	25 May	26 May	Total
Finches												
American Goldfinch	7	24	5	15	5	1	19	10	15	8	12	121
Evening Grosbeak	0	0	0	0	0	0	0	0	0	0	7	7
House Finch	1	2	0	0	0	3	4	4	0	4	0	18
Pine Siskin	1	5	0	0	2	0	1	0	0	2	1	12
Red Crossbill	0	0	0	2	2	0	0	0	0	0	0	4
TOTAL	60	71	41	50	60	49	68	55	66	60	58	110

Appendix V: Bird species encountered during surveys for Sandhill Cranes in central areas of Burns Bog, Delta - April to October 1993 (based on M. Gebauer field notes).

	Apr	May				June	July					August	September					October		
COMMON NAME	30	07	14	20	09	15	02	06	22	27	05	23	02	08	15	21	29	06	18	27
Herons																				
Great Blue Heron ^B		1		1			1				1				1			1		
Geese																				
Canada Goose	12	1	5	10							3	5		10	75	30	7	30		
Great White-fronted Goose	44																			
Snow Goose																				40
Dabbling Ducks																				
American Wigeon				2											4					2

American Kestrel

1 1

2 1 1

Rails and Cranes

Sandhill Crane^B

1 2 3 3 3 2 6 10 1 10 4 16 4 21 2

Sora

1

Plovers

Killdeer

1 1 1 3 2 1 1 1 1 1 1

Sandpipers

Common Snipe

1 1 1

Greater Yellowlegs

2 1

Lesser Yellowlegs

1 2

Pectoral Sandpiper

3

Peep spp.

4 25 3

Spotted Sandpiper

1 1

Gulls and Terns																				
-----------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Caspian Tern ^B

1

5

Glaucous-winged Gull

1

2

Pheasants																				
-----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Ring-necked Pheasant

1

Owls																				
------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Great Horned Owl

1

	Apr	May				June	July					August	September						October	
--	-----	-----	--	--	--	------	------	--	--	--	--	--------	-----------	--	--	--	--	--	---------	--

COMMON NAME

30

07

14

20

09

15

02

06

22

27

05

23

02

08

15

21

29

06

18

27

Doves																				
-------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Mourning Dove

1

1

2

1

Rock Dove

1

Swifts

Black Swift

2

Vaux's Swift

5

Hummingbirds

Rufous Hummingbird

1

1

1

1

Woodpeckers

Downy Woodpecker

3

1

Northern Flicker

1

1

1

2

2

6

3

3

Flycatchers

Pacific-slope Flycatcher

1

1

1

Western Wood-Pewee

1

Willow Flycatcher

1

3

5

2

4

Swallows

Barn Swallow	3		3	7	4	5	10	8		4	120	6	6		2					
Cliff Swallow	1					5	20	18		5										
Tree Swallow	12		2	5		2	4													
Violet-green Swallow	5	25																		

Crows and Ravens

Common Raven			1											1	3					1
Northwestern Crow	5	1	3	5	3	35	10	10	25		3	1		2	1	2	20	2	14	

Chickadees and Bushtits

Black-capped Chickadee	2	1	5	2	2		10	5	10	5	5	20	15	25	5	10	15	5	15	10
Bushtit												20		15	10					

	Apr	May				June	July					August	September						October		
COMMON NAME	30	07	14	20	09	15	02	06	22	27	05	23	02	08	15	21	29	06	18	27	
Wrens																					

Bewick's Wren

1

1

Marsh Wren

4

1

1

2

4

1

4

3

2

3

Winter Wren

1

Kinglets

Golden-crowned Kinglet

3

1

2

6

5

15

10

Thrushes

American Robin

2

5

5

5

3

10

5

2

30

5

15

100

30

30

40

2

Hermit Thrush

1

2

Swainson's Thrush

3

1

1

1

2

Pipits

American Pipit

20 6 1 3

Starlings

European Starling

4 3 2 10 4

Waxwings

Cedar Waxwing

11 4 15 6 3 2 2 5

Warblers

Common Yellowthroat

1 1 10 5 10 15 10 10 5 5 9 5 14 25 10 1

Orange-crowned Warbler

4 2 2 1 2 3 1

Wilson's Warbler

1 1

Yellow Warbler

1

Yellow-rumped Warbler

9 25 5 40 30 1

Sparrows

Dark-eyed Junco

2 1 2 2 5 5 2 2 2 3 5 5 3 5 5 4 1

Lesser Yellowlegs

5 3

Spotted Sandpiper

3

Gulls

Glaucous-winged Gull

4

Owls

Great Horned Owl

1

1

Doves

Mourning Dove

2

2

2

1

6

1

1

1

1

1

1

2

Rock Dove

50

Woodpeckers

Downy Woodpecker

1

2

1

1

1

1

1

Northern Flicker

1

1

1

2

1

6

5

5

Black-capped Chickadee 7 2 1 2 3 3 6 7 10 1 40 30 10 5 20

Bushtit 1 2 3 8 1 15 10 5

Chestnut-backed Chickadee 1



Bewick's Wren 1

Marsh Wren 5 3 2 5 6 4 6 7 5 2 1 1 2

Winter Wren 1 1



Golden-crowned Kinglet 3 2 3 10 10

Ruby-crowned Kinglet 3 1



American Robin 5 10 3 3 1 7 20 20 1 30 5 15 3 20 50 20 5

Hermit Thrush 1



Yellow-rumped Warbler 10 3 3 1 5 8 5 25

Sparrows

Dark-eyed Junco 2 1 2 2 2 3 3 2 4 2 3 2 15 20 7

Golden-crowned Sparrow 1 5 1 21

Savannah Sparrow 3 5 3 3 5 2 2 3 5 5 2 1 1

Song Sparrow 4 3 5 4 5 1 3 3 3 3 2 4 1 2 1 15 10 10 10 20 25

Spotted Towhee 3 5 3 5 5 3 2 4 4 5 1 1 6 1 4 5 1

Western Tanager 1

White-crowned Sparrow 10 5 2 2 10 3 5 3 4 2 1 1 1 20 12

Blackbirds

Brewer's Blackbird 1 2 15 50 4 30

Brown-headed Cowbird 5 10 10 3 3 6 5 1 1

Red-winged Blackbird 2 10 5 10 4 3 3 7 1 2 1

Finches

Appendix VII

Status, distribution and habitat preferences of amphibians and reptiles recorded in Burns Bog, Delta. Blue and red-listed species are indicated with superscript 'B' and 'R', respectively.

LEGEND:

Status:

Abundance

Com = Common

Unc = Uncommon

Rar = Rare

Occurrence

Res = Resident

Distribution:

All = Reported inhabiting all areas

Cen = Reported in central areas

Per = Reported in peripheral areas

E91 = Reported east of Highway 91

Important Habitats:

All = Over or in all habitats

Pd = Peat cutting ponds and ditches

He = Open sphagnum heathland with limited open water

Sh = Shrubland

Pn = Shore Pine and Labrador Tea

Df = Deciduous-dominated forests

Mx = Mixed coniferous forests

Sources (see Literature Cited section for full reference):

Kl71 = Klassen et al 1971.

Bi76 = Biggs 1976.

Ba88 = Barnard 1988.

De99 = DeMill 1999.

En99 = Enviro-Pacific Consulting 1999.

Ge99 = Gebauer 1999b.

Kn99 = Knopp and Larkin 1999.

Ma99 = Materi and Blood 1999

Pe99 = Perdichuk 1999.

Sm99 = Smith 1999.

Ri99 = Rithaler and Corporation of Delta 1999.

COMMON NAME	SCIENTIFIC NAME	STATUS	DISTRIB.	HABITATS	SOURCES
AMPHIBIANS					
Salamanders					
¹ Ensatina	<i>Ensatina eschscholtzi</i>	RarRes	Per,E91	Df,Mx	Ri99
Long-toed Salamander	<i>Ambystoma macrodactylum</i>	UncRes	All	Pd,Pn,Df,Mx	Kn99,Ri99
Northwestern Salamander	<i>Ambystoma gracile</i>	ComRes	All	Pd,Df,Mx	De99,Kn99,Pe99,Ri99
Rough-skinned Newt	<i>Taricha granulosa</i>	RarRes	Per,E91	Pd,Mx	De99,Pe99
¹ Western Red-backed Salamander	<i>Plethodon vehiculum</i>	RarRes	Per,E91	Mx	Kn99,Pe99,Ri99

Frogs and Toads					
Bullfrog	<i>Rana catesbeiana</i>	ComRes	All	Pd,He	De99,En99,Ge99,Kn99,Pe99,Ri99
Green Frog	<i>Rana clamitans</i>	ComRes	All	Pd,He	De99,En99,Ge99,Kn99,Pe99,Ri99,Sm99
Pacific Tree Frog	<i>Hyla regilla</i>	ComRes	All	All	Bi76,Ba88,De99,En99,Ge99,Kn99,Ma99,Pe99,Ri99,Sm99
² Oregon Spotted Frog ^R	<i>Rana pretiosa</i>	Unknown	Unknown	Unknown	K171,Pe99
Red-legged Frog	<i>Rana aurora</i>	RarRes	All	Pd,Sh,Pn,Mx	Kn99,Pe99,Ri99
Western Toad	<i>Bufo boreas</i>	RarRes	Per,E91	Pn,Sh,Pn,Mx	K171,Bi76,Kn99,Ri99
REPTILES					
Snakes					
Common Garter Snake	<i>Thamnophis sirtalis</i>	ComRes	All	All	Bi76,Kn99,Pe99,Sm99

Northwestern Garter Snake	<i>Thamnophis ordinoides</i>	ComRes	All	All	Bi76,Ge99,Kn99,Pe99, Sm99
³ Western Terrestrial Garter Snake	<i>Thamnophis elegans</i>	RarRes	All	All	G. Ryder

Footnotes

1. Ensatina and Western Red-backed Salamander have not actually been observed within Burns Bog, but have been recorded commonly in Cougar Creek Canyon and Blake Drive Ravine (Rithaler and Corporation of Delta 1999). They are expected to occur in mixed forest habitats east of Highway 91.
2. Voucher specimens of the red-listed, Oregon Spotted Frog have not been kept. Occurrence of this species needs to be verified.
3. A single Western Terrestrial Garter Snake was reported by Knopp and Larkin (1999). A specimen needs to be captured and species verified.