THE TERRESTRIAL VERTEBRATES OF THE UNIVERSITY ENDOWMENT LANDS

by

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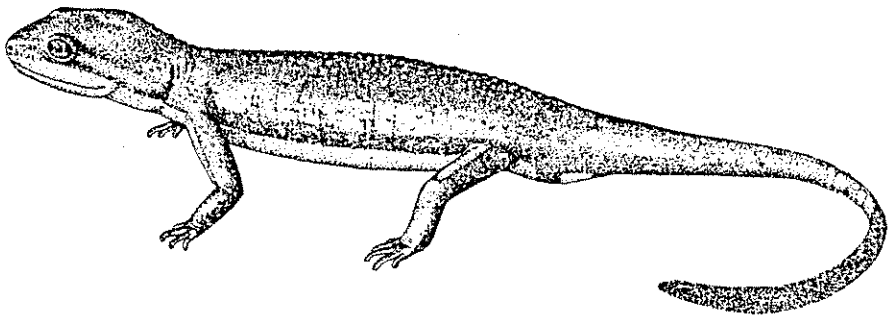

Rough Skinned Newt

ACKNOWLEDGEMENTS

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TABLE OF CONTENTS

		Page
INTRODUCTION		1
A NOTE ON SPECIES DIVERSITY		3
SECTION 1:	SPECIES LIST	4
SECTION 2:	SPECIES	
	Mammals	10
	Amphibians and Reptiles	20
	Birds	23
SECTION 3:	DISTRIBUTION MAPS	52
REFERENCES CITED		68

INTRODUCTION

The University Endowment Lands (U.E.L.) are home to many bird and mammal species, as well as a smaller number of reptiles and amphibians. This report is a review and classification of existing knowledge of the vertebrate fauna of the U.E.L. I have included only species that have been reported in the U.E.L. within the last twenty years. By this criterion there are 115 bird species, 33 mammals, 6 amphibians, and 4 reptiles. However, the status of several species on the U.E.L. is dubious, and there are conflicting reports; furthermore, many bird species are migratory and appear on the U.E.L. only at certain times of year. There are reports of accidental visitors such as the Palm Warbler (Dendroica palmarum) (30). I have tried to give an indication of the confidence with which each species is classed as an inhabitant of the U.E.L.

I have limited the contents of this report to information that pertains specifically to the U.E.L., although some general references have been used in organizing this specific information. More information might have been included by extrapolating from references on other areas, such as Westham Island, Marion Lake, and the U.B.C. Research Forest. I declined to include this information for three reasons. The U.E.L. is, in my opinion, sufficiently different from these other areas to throw suspicion on the validity of such extrapolations; also, the inclusion of outside information might disguise important holes in the body of U.E.L. specific information. Omitting such extrapolated guesses has helped to keep this report a reasonable length. Some information from references specific to the U.E.L. has been omitted because I considered it unreliable or too sketchy. A complete bibliography is provided to facilitate the checking of all sources.

The third section contains suggested distribution maps for some species. These maps have been constructed on the basis of habitat associations; for many species, information on habitat use on the Endowment Lands is either absent or too sketchy to draw useful maps. Furthermore, species which range throughout the U.E.L., for example the raccoon and robin, were not mapped.

As a "ready reference" to the information in this report, the first section is a complete species list with notes on status, distribution and general biology for each species.

For the sake of brevity I have not included any descriptions of individual species; an appendix to the bibliography contains appropriate references for description and identification.

The terms common, frequent, rare and casual refer to the frequency with which species may be observed. However, frequency of observation is not always an accurate reflection of abundance; some species are more conspicuous and some lead cryptic lives. Where the term 'abundant' is used it denotes a measurement of actual numbers or density.

After Campbell et.al.(5) the frequency terms are defined as follows:

Common: almost always found

Frequent: usually found

Rare: regular occurence but seldom seen

Casual: not occuring every year but reliable recent reports

A NOTE ON SPECIES DIVERSITY

The high primary production of the Fraser River estuary and its associated tidal areas rapidly finds its way into the Endowment Lands food web. The upland marshes and bogs contribute further to primary production and support large year round insect populations. These insects and the year round availability of vegetation (including tubers, seeds, and bulbs) support a high density of rodents and insectivores which, in turn, support many mammalian and avian predators. (8,42).

The extensive edge zones on the U.E.L. also contribute to the species diversity. According to Dooling (8) these zones support the highest species diversity on the Endowment Lands. The presence of decaying logs and dead trees is important to several amphibian species and cavity nesting birds, some of which are relatively rare. (8,42).

Section 1
Species List

SECTION 1 SPECIES LIST

+ = some information available - = no specific information on UEL available	Abundance	Habitat	General Biology	Map Page Number	Pages
MAMMALS					
Cinereus Shrew	? -	-	-		10
Bendire Shrew	+	+	-	53	10
Northern Water Shrew	+	+	+		10
Vagrant Shrew	+	+	+		11
Dusky Shrew	+	+	+	54	11
Shrew Mole	+	+	-	55	11
Pacific Mole	+	+	+		12
Western Big-eared Bat	-	-	-		12
Silver-Haired Bat	-	-	-		12
Big Brown Bat	-	-	-		12
California Myotis	-	-	-		12
Long-eared Myotis	-	-	-		12
Long-legged Myotis	-	-	-		12
Yuma Myotis	-	-	-		12
Little Brown Myotis	-	-	-		12
Raccoon	+	+	+		12
Short-tailed Weasel	+	+	+		13
Mink	+	+	+		13
Canadian River Otter	+	+	+		13
Spotted Skunk	-	-	-		14
Red Fox	+	+	+		14
Northwestern Chipmunk	+	+	-	56	14
Chickaree (Douglas Squirrel)	+	+	+	57	14
Northern Flying Squirrel	-	+	-	57	15
Deermouse	+	+	+	60	15
Townsend Vole	+	+	+	59	16
Oregon Vole	+	+	+	58	17
Western Redbacked Vole	+	-	+		18
Roof Rat	-	+	-		18
Norway Rat	-	+	-		18

+ = some information available - = no specific information on UEL available	Abundance	Habitat	General Biology	Map Page Number	Pages
House Mouse	-	+	+		18
Snowshoe Hare	+	+	-		19
Black-tailed Deer	-	-	-		19
AMPHIBIANS & REPTILES					
Pacific Coast Newt	-	+	+	61	20
Red-backed Salamander	-	+	+		20
Oregon Salamander	+	+	-		20
Western Toad	-	+	+		20
Pacific Tree Frog	+	+	+	62	21
Red-legged Frog	-	+	+		21
Common Garter Snake	-	+	+	62	22
Western Terrestrial Garter Snake	+	+	-		22
Northwestern Garter Snake	-	+	-	63	22
Northern Alligator Lizard	+	+	-		22
BIRDS					
Great Blue Heron	+	+	+		23
Canadian Goose	+	+	+		24
Mallard	+	+	+		25
Shoveller	+	+	-		25
Turkey Vulture	+	-	-		25
Goshawk	-	+	-		25
Sharp-shinned Hawk	+	+	-	77	25
Cooper's Hawk	+	+	-		25
Red-tailed Hawk	+	+	+		26
Rough-legged Hawk	+	+	+		26
Bald Eagle	+	+	-		26
Marsh Hawk	+	-	-		26
Osprey	+	+	-		26
Pigeon Hawk	+	-	+		26

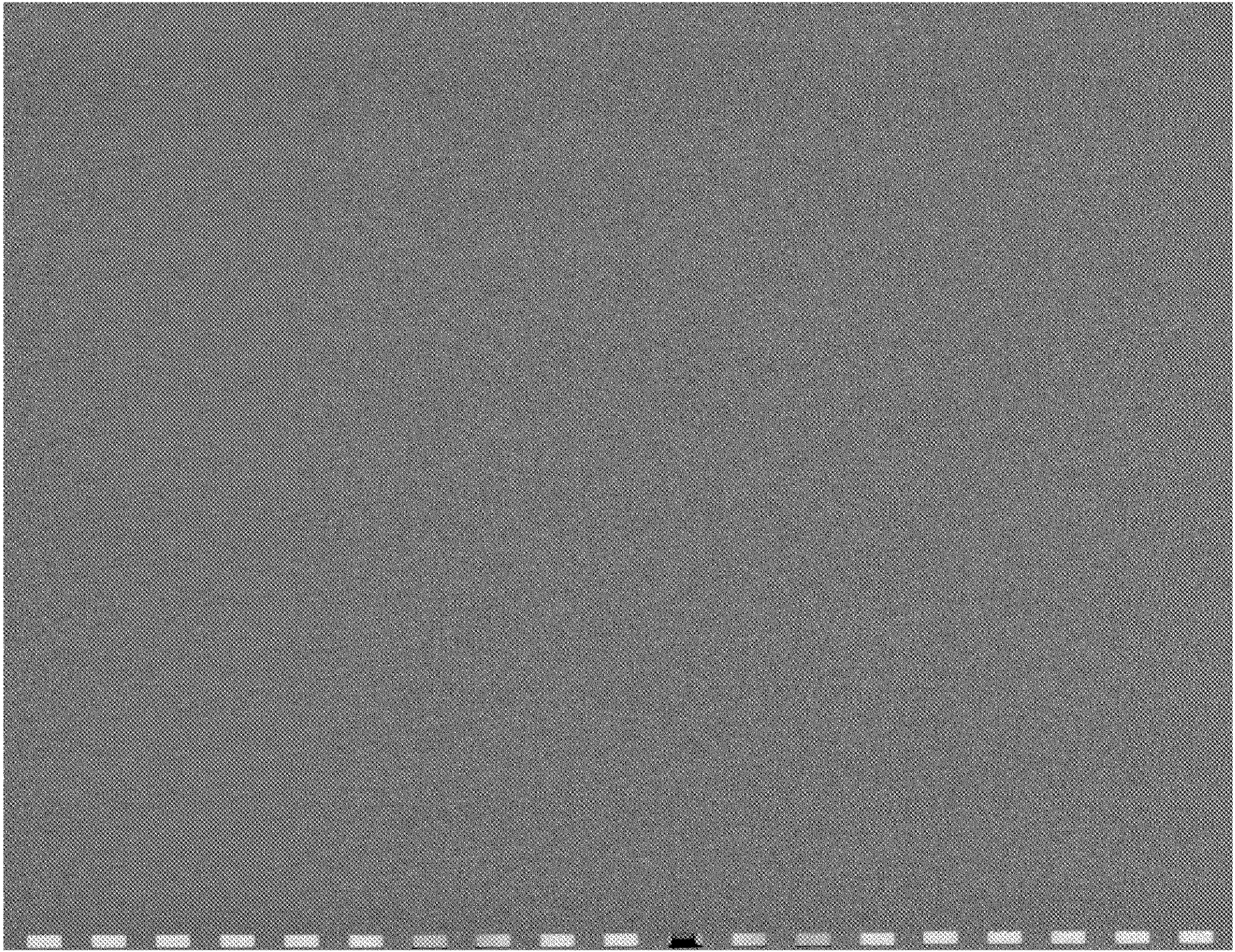
+ = some information available - = no specific information on UEL available	Abundance	Habitat	General Biology	Map Page Number	Pages
American Kestrel	-	+	+	65	27
Blue Grouse	-	+	+	68	27
Ruffed Grouse	+	+	+	67	27
Ring-necked Pheasant	+	+	-	66	27
Killdeer	+	+	+	64	27
Common Snipe	+	+	-	64	28
Spotted Sandpiper	-	-	-		28
Glaucus-winged Bull	+	+	+		28
Mew Gull	+	+	+		28
Bonaparte's Gull	+	+	+		28
Band-Tailed pigeon	+	+	+		29
Rock Dove	+	+	+		29
Mourning Dove	-	+	+		29
Screech Owl	+	+	+		29
Great Horned Owl	+	+	+		29
Saw-Whet Owl	+	+	+		30
Common Nighthawk	-	+	+		30
Black Swift	+	-	+		30
Vaux's Swift	+	+	+		30
Anna's Hummingbird	-	+	+		31
Rufous Hummingbird	+	+	+	70	31
Belted Kingfisher	+	+	+	64	31
Common Flicker	+	+	+		32
Pileated Woodpecker	+	+	+		32
Yellow-bellied Sapsucker	+	+	+		32
Hairy Woodpecker	+	+	+		32
Downy Woodpecker	+	+	+	69	33
Eastern Kingbird	+	+	-	71	33
Western Kingbird	-	+	-		33
Willow Flycatcher	+	+	-	72	33
Dusky Flycatcher	+	+	-	73	33

+ = some information available - = no specific information on UEL available	Abundance	Habitat	General Biology	Map Page Number	Pages
Western Flycatcher	+	+	-		34
Hammond's Flycatcher	+	+	-		34
Western Wood Peewee	+	+	-		34
Olive-sided Flycatcher	+	+	+	73	34
Violet-green Swallow	+	+	+		34
Tree Swallow	+	+	+		35
Rough-Winged Swallow	+	+	+		35
Barn Swallow	+	+	+		35
Cliff Swallow	+	+	+		35
Purple Martin	+	-	+		36
Steller's Jay	+	+	+	68	36
Common Raven	+	+	+		36
Northwestern Crow	+	+	+		36
Black-capped Chickadee	+	+	+	78	36
Chestnut-backed Chickadee	+	+	+	77	38
Common Bushtit	+	+	+	67	38
Red-breasted Nuthatch	+	+	+	77	38
Brown Creeper	+	+	+	68	39
House Wren	-	+	+		39
Winter Wren	+	+	+	75	39
Bewick's Wren	+	+	+		40
Long-billed Marsh Wren	-	+	+		40
American Robin	+	+	+		40
Varied Thrush	+	+	+	76	40
Hermit Thrush	+	+	+	75	41
Swainson's Thrush	+	+	+	74	41
Townsend's Solitaire	-	+	-		41
Golden-crowned Kinglet	+	+	-	77	41
Ruby-crowned Kinglet	+	+	+	77	41

+ = some information available - = no specific information on UEL available	Abundance	Habitat	General Biology	Map Page Number	Pages
Bohemian Waxwing	+	-	+		42
Cedar Waxwing	+	+	+		42
Northern Shrike	+	+	+		42
Starling	+	+	+		42
Crested Mynah	+	+	+		43
Hutton's Vireo	+	+	+	67	43
Solitary Vireo	-	+	-	80	43
Red-eyed Vireo	+	+	-	67	43
Warbling Vireo	+	+	+	67	44
Orange-crowned Warbler	+	+	-		44
Yellow Warbler	+	+	-		44
Yellow-rumped Warbler	+	+	-		44
Black-throated Gray Warbler	-	+	+	82	44
Townsend's Warbler	+	+	+		45
MacGillivrays' Warbler	+	-	-		45
Common Yellowthroat	+	+	+		45
Wilson's Warbler	+	+	+	81	45
Western Meadowlark	+	-	-		46
Red-winged Blackbird	+	+	+		46
Brewer's Blackbird	+	+	+		46
Brown-headed Cowbird	+	-	+		47
Western Tanager	+	+	-		47
Black-headed Grosbeak	+	+	+	79	47
Evening Grosbeak	+	+	-	68	48
Purple Finch	+	+	+	75	48
House Finch	+	+	+		48
Pine Grosbeak	+	-	-		49
Common Redpoll	+	-	-		49
Pine Siskin	+	+	+	75	49
American Goldfinch	+	+	+		49
Red Crossbill	+	+	-	68	49
Rufous-sided Towhee	+	+	-		49

+ = some information available - = no specific information on UEL available	Abundance	Habitat	General Biology	Map Page Number	Pages
Savannah Sparrow	+	+	-		50
Dark-eyed Junco	+	+	+		50
White-crowned Sparrow	+	+	+		50
Golden-crowned Sparrow	+	+	-		50
Fox Sparrow	+	+	-		50
Lincoln's Sparrow	+	-	-		51
Song Sparrow	+	+	+		51

Section 2
Species Mammals



SECTION 2 SPECIES

MAMMALS

Cinereus Shrew *Sorex cinereus*

Klassen and Teversham (22) list the Cinereus Shrew as an inhabitant of the U.E.L., which is within the range delineated by Cowan and Guiget (7). However, they do not specify their reasons for inclusion, and there is no corroborating evidence; consequently, the inhabitance of the endowment lands by this shrew is not definite.

Bendire Shrew *Sorex bendirei*

The Bendire Shrew is uncommon on the U.E.L. (42,16). Hawes (16) found it to be the least common of the three shrew species in the Douglas Fir forest. Similarly, small numbers are distributed throughout the endowment lands along streambanks and amongst beach debris.

Northern Water Shrew *Sorex palustris*

Urhahn (42) reports the Northern Water Shrew as being a rare inhabitant, found along stream and pond margins with well covered banks. However, according to Cowan and Guiget (7) the Northern Water Shrew does not occur in the Fraser Valley west of Hope. It is possible that the Bendire Shrew inhibits habitation by the Northern Water Shrew, as these two appear to be allopatric on a macrogeographic scale.

It seems reasonable to suggest that Urhahn's report is based on erroneous identification of the Northern Water Shrew as the Bendire Shrew which is notably similar (2).

Vagrant or Wandering Shrew Sorex vagrans

Hawes (16) found the Vagrant Shrew to be the second most abundant shrew species in the Douglas Fir forest; he gives no figure for the actual density in the Douglas Fir forest or elsewhere.

Eisenberg (9) found the life span of the Vagrant Shrew to be about one year, this is probably typical of the other shrew species on the U.E.L.. Eisenberg also found that if food is abundant the Vagrant Shrew may kill several food items and cache them in short term storage. Eisenberg also gives a brief description of the behaviour of the Vagrant Shrew captured on the endowment lands.

Dusky Shrew Sorex obscurus

There may be some confusion between the Dusky Shrew and the Vagrant Shrew as they are both occasionally called the "Wandering Shrew".

Hawes (16) found the Dusky Shrew to be slightly more abundant in the Douglas Fir forest than the Vagrant Shrew. Hawes trapped more Dusky Shrews than Oregon Voles, which he considered particularly abundant in this habitat; however, the higher capture rate of Dusky Shrews is probably due to their greater above ground activity and consequent "catchability".

The Dusky Shrew is commonly found in the Douglas Fir forest and Western Hemlock forest, it may also be found in marsh and thickets (42).

Shrew Mole Neurotrichus gibbsi

The Shrew Mole is moderately abundant on the U.E.L. though not as numerous as the Pacific Mole (42).

It has been documented in the Douglas Fir forest and Western Hemlock forest (16) but probably occurs in a much wider range of habitats. Like the Pacific Mole it is absent from poorly drained soils (42).

Coast or Pacific Mole Scapanus orarius

The Pacific Mole is somewhat more abundant than the smaller Shrew Mole. Hawes (16) failed to trap any in the diverse habitats he sampled on the U.E.L. and U.B.C. research forest; however, this is almost undoubtedly due to the Mole's subterranean lifestyle. Urhahn (42) states that the Pacific Mole is found everywhere on the U.E.L. except where the soil is very thin, gleyed (a property of poorly drained U.E.L. soils (25)), or excessively hard.

Interestingly, the U.E.L. is at the northernmost border of the Pacific Mole's range on the Pacific coast; Cowan and Guiget (7) found that the Pacific Mole had not crossed Burrard Inlet by 1973.

The following bats are listed as inhabitants or visitors to the U.E.L. by Urhahn (42). No other U.E.L. specific information is available on these bats.

Western Big-eared Bat Plecotus townsendi

Silver-haired Bat Lasionycteris noctivigans

Big Brown Bat Eptesiceus fuscus

California Myotis Myotis californicus

Long-eared Myotis Myotis evotis

Long-legged Myotis Myotis volans

Yuma Myotis Myotis yumanensis

Little Brown Myotis Myotis lucifugus

Raccoon Procyon lotor

The Raccoon is found in both deciduous and coniferous forest and in shrubs; it is partly arboreal. It may also be found at night along Point Grey beaches where it often feeds (42).

An omnivore, its food includes intertidal creatures, deermice, Townsend Voles, and garbage (42).

Numbers on the U.E.L. are not known. Burt (2) indicates that one animal per 15 acres is considered quite high; consequently, there are probably fewer than 100 raccoons on the endowment lands.

Short-tailed Weasel or Ermine *Mustela erminea*

Moderately abundant, the Short-tailed Weasel may occasionally be found in any habitat on the U.E.L. (42). One specimen was trapped in a copse on the University Golf Course (29).

It is known to prey on the Townsend Vole, Oregon Vole, and Deermouse.

Hall (15) found that the white portions of the pelage of endowment lands specimens was restricted to the chin and throat.

Mink *Mustela vison*

Mink are reported as a rare inhabitant of the U.E.L. (40) and the Vancouver Area (7).

Mink are semi-aquatic and may inhabit woodland and salt marsh areas (42). It is not known whether a breeding population exists on the endowment lands; small numbers may swim across the Fraser River from the delta islands.

Mink are known to prey on the Deermouse and Townsend Vole on the endowment lands (42).

Canadian River Otter *Lutra canadensis*

The River Otter is a rare inhabitant or visitor to the shorelines of the U.E.L. (42). Cowan and Guiget (7) considered the River Otter to be the most common aquatic mammal found in Vancouver Harbour and report specimens from Vancouver and Lulu Island. There may or may not be resident otters on the endowment lands but they undoubtedly visit the U.E.L. from other areas of the Fraser delta.

They may prey upon the Cutthroat Trout in Tin Can Creek.

Spotted Skunk, Civit, or Hydrophobia Cat *Spilogale putorius*

Klassen and Teversham (22) report the Spotted Skunk on the U.E.L. I am aware of anecdotal accounts of skunk scent on the endowment lands, but know of no other positive identifications.

Red Fox *Vulpes fulva*

No figure for the number of foxes inhabiting the U.E.L. is available. Its relatively large home range (3-5 km^2) (2) suggests that there are very few. Foxes probably swim the Fraser River from the delta islands.

The Red Fox frequents edge zones, open forest and streambanks and are known to prey on the Townsend Vole and Deermouse (42).

Yellow Pine or Northwestern Chipmunk *Eutamias amoenus*

The Northwestern Chipmunk is a rare inhabitant of the U.E.L. (41,42). Cowan and Guiget (7) state that it is not found on the Fraser delta but is in North Vancouver; therefore, the endowment lands appear to be the southernmost extension of the Chipmunk's range on the lower mainland.

It is found predominantly in the edge zones and in disturbed areas such as cuttings.

Chickaree or Douglas Squirrel *Tamiasciurus douglasi*

The Chickaree is the most commonly seen mammal on the U.E.L. (22). It is usually found in open coniferous forest, mixed forest or at the edges of dense coniferous forest. (42)

Despite its abundance, little documentation of the Chickaree's habits on the endowment lands is available, although it is known to feed heavily on Douglas Fir seeds (22).

The ranges of the Chickaree and the Red Squirrel (*Tamiasciurus*

hudsonicus) are mutually exclusive (2); it is probable that the occupation of the coastal Douglas Fir forests, including the U.E.L., by the Chickaree precludes the presence of the Red Squirrel.

Northern Flying Squirrel Glaucomys sabrinus

No estimate of the abundance of the Flying Squirrel on the U.E.L. is available, but Urhahn (42) and Fleck (13) report that it is found on the U.E.L. in coniferous or mixed forest in trees greater than fifty metres high.

Deermouse Peromyscus maniculatus

The Deermouse is by far the most abundant mammal on the endowment lands(16). Fairbairn (10) found that the U.E.L. population size fluctuates reaching a maximum in the fall and slowly declining over winter and spring. The density of mice may vary a great deal but two studies (9;29) trapped up to 100 mice per hectare (40/acre) in the coniferous forest in the fall and 40/hectare in the early spring, again in the coniferous forest. Considering that these figures are based on the number of mice trapped, the actual density may well be greater. Burt (2) gives a figure of 10 - 15 mice per acre in summer; therefore, the U.E.L. population density is significantly higher than the average for the Deermouse's range, although on Mandarte Island in the Gulf of Georgia deermouse densities may reach 600/hectare in prime habitat (J. Smith, pers, com.).

Deermice may congregate during the winter in the dense coniferous forest where snow cover is at a minimum. Concentrations as high as 400/hectare have been estimated (19).

The Deermouse is widespread on the U.E.L., occuring in all habitats to some extent. It is most common in the coniferous and mixed forest

areas. Healey (19) found no evidence that Deermice were attracted out of the forest to the edge zones.

Roads may play a major role in the distribution of Deermice; Healey (19) found that they seldom crossed roads. This finding almost undoubtedly has relevance to the other small mammals of the U.E.L., particularly those which live completely or predominantly underground.

Deermice nest in burrows or cavities in trees or stumps and occasionally in buildings (42). They are known to be preyed upon by owls, weasels, raccoons, and foxes on the U.E.L. and are probably prey to other raptors also.(42).

Hayward (17) found that U.E.L. Deermice had the greatest yearly weight fluctuations and the lowest fat and protein content of six geographically distinct races of Deermice. This may indicate relatively severe competition interspecifically and intraspecifically; it could be because the benign winter climate makes it unnecessary to store fat.

It should be noted that the Deermouse is sometimes mistakenly called the White-footed Deermouse (13); while members of the genus Peromyscus are commonly called White-footed mice, only P. leucopys bears this as a common name (2).

Townsend Vole Microtus townsendi

The Townsend Vole is the most common vole on the U.E.L. and probably the second most abundant mammal. There are no actual densities available but Urhahn (42) notes particularly high densities.

The Townsend Vole does not tunnel to the same extent as the Oregon Vole (16) and, consequently, is found in more moist habitats, particularly moist fields (42). It is not common in the Douglas Fir forest which is inhabited by the Oregon Vole (16) and possibly the

Western Redbacked Vole.

Hawes (16) found that the Townsend Vole was micrographically allopatric with the Longtail Vole (Microtus longicaudus) and the Western Redbacked Vole; it is possible that the density of Townsend Voles on the U.E.L. may prevent or severely curtail habitation of the endowment lands by these two species, both of which could potentially find suitable habitats.

Oregon Vole Microtus oregoni

The Oregon Vole is considered to be numerous on the U.E.L. being exceeded only by the Townsend Vole and Deermouse. The actual density is not known, however (6;16;42). It is noted as being particularly numerous in the Douglas Fir forest and edge zones (6;16), it may also be found at lower densities in such diverse habitats as grassy fields, riparian habitats, and Western Hemlock forest (16).

The Oregon Vole lives almost exclusively in shallow burrows or runways under forest litter and is consequently, rarely seen; it burrows in loose soil also and often uses the burrows of the Pacific Mole. It cannot burrow where the water table is high and is not found in marshy areas (21).

The food of the Oregon Vole consists of a variety of plant material including roots, small tubers, and rhizomes (16). It is known to be preyed upon by weasels, Rough-legged Hawks, and other raptors (16).

Where the Oregon Vole coexists with the Townsend Vole the body size is much smaller. This makes Oregon Vole burrows inaccessable to Townsend Voles, which may help to minimize the competition between these closely related species (16).

The Oregon Vole breeds from mid-March to mid-September although earlier matings occur occasionally (6).

Western Redbacked Vole *Clethrionomys occidentalis*

Klassen and Teversham (22) include the Western Redbacked Vole on their U.E.L. species list. Cowan and Guiget (7) place the U.E.L. within the range of this species and confirm that specimens have been taken in the past from Point Grey. Hawes (16) did not trap any Redbacked Voles on the endowment lands. This might indicate a relatively low density. As previously stated, Hawes (16) found the Western Redbacked Vole and the Townsend Vole to be micrographically allopatric.

Black or Roof Rat *Rattus rattus*

The Black Rat is listed by Urhahn (42) as a U.E.L. inhabitant, where it nests predominantly in buildings. Cowan and Guiget (7) state that it may live in a feral state in second growth forest or forest edge zones; therefore, it may be wild in the U.E.L. forests although its occurrence there is not documented.

The Black Rat is an old world rodent and is not, therefore, native to the endowment lands. Its arrival coincided with human colonization of the area.

Norway, Brown, or House Rat *Rattus norvegicus*

Listed as an inhabitant by Urhahn (42), the Norway Rat has a great affinity for sewers, low wet places, compost heaps, and refuse. Specimens have been periodically reported in buildings on the U.B.C. campus. Cowan and Guiget (7) report feral Norway Rats on Point Grey where they are probably found along beaches amongst debris.

House Mouse *Mus musculus*

The House Mouse is strictly associated with human habitation

around the U.E.L. (42). It is probably prevented from living in the feral state by the large numbers of small native rodents on the endowment lands.

Snowshoe Hare *Lepus americanus*

A rare inhabitant of the U.E.L. (42:7), the Snowshoe Hare inhabits open forest areas and thickets (42).

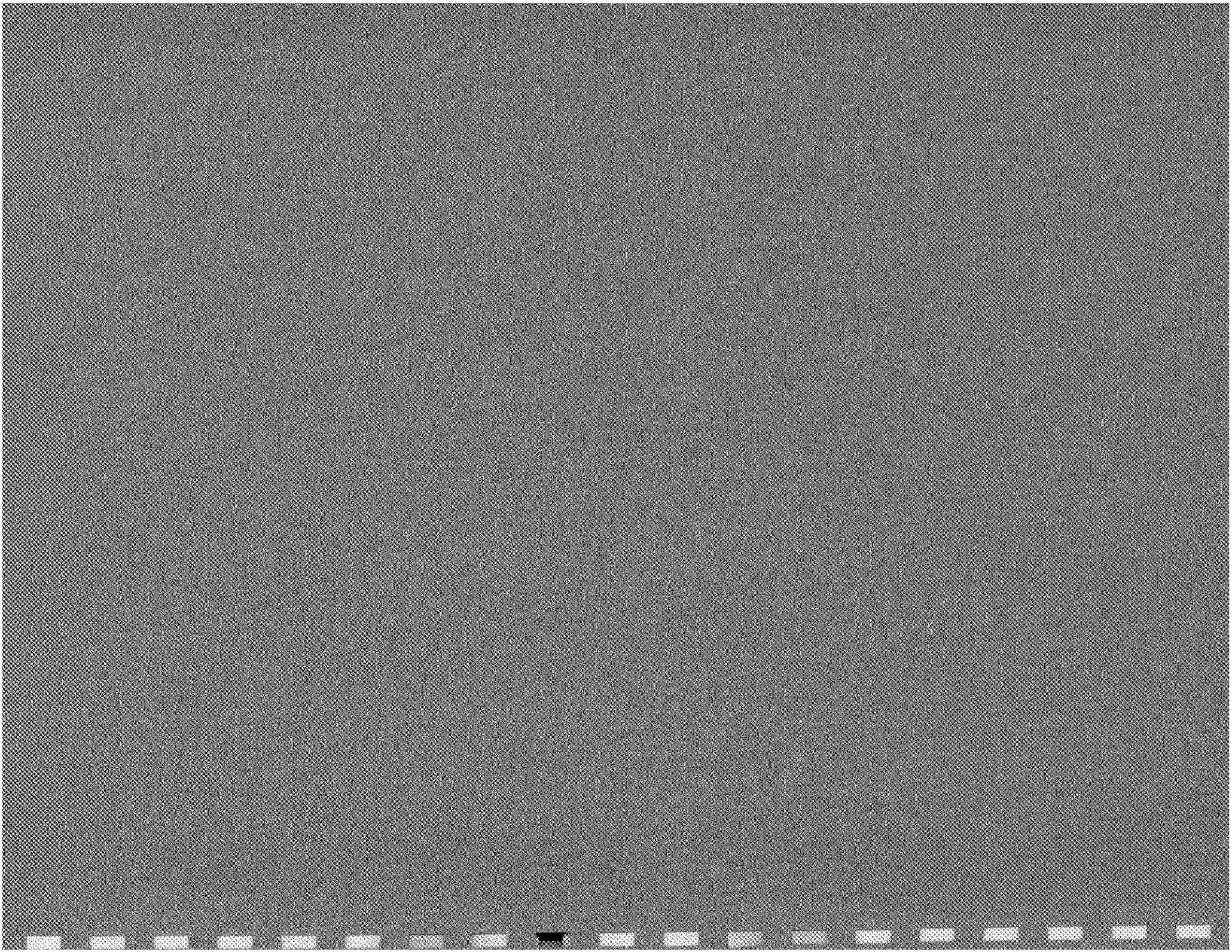
The subspecies *washingtoni* is not found north of the U.E.L. (except in Stanley Park); the North Shore is inhabited by the subspecies *cascadensis*.

Black-tailed Deer *Odocoileus hemionus*

Fleck (12) includes the Black-tailed Deer in a list of U.E.L. mammals. There are anecdotal accounts of deer and deer sign on the endowment lands particularly along 16th Avenue. (J. Smith, pers. com.)

The Black-tailed Deer is the largest animal on the endowment lands.

Section 2
Species
Amphibians & Reptiles



AMPHIBIANS and REPTILES

With the exception of the Pacific Tree Frog there is an almost complete lack of information regarding amphibians and reptiles on the endowment lands. The species listed were reported in Urhahn (42) and some of these were corroborated by Klassen and Teversham (22). The very small amount of habitat information is almost exclusively from Urhahn (42).

Rough-skinned or Pacific Coast Newt *Taricha granulosa*

The Rough-skinned Newt is found exclusively in wetlands and bog areas; it congregates in ponds to spawn (42).

Western Red-backed Salamander *Plethodon vehiculum*

This salamander is strictly terrestrial although it requires a moist environment. On the U.E.L. it is restricted to damp microhabitats (42) but is otherwise probably quite widespread. It has been found in decaying matter in underbrush and was first reported on the U.E.L. in an area of Alder Forest in 1938 (42).

Red or Oregon Salamander *Ensatina eschscholtzi*

The Oregon Salamander was noted as common on the U.E.L. in 1938 (44) and there is little reason to suspect that it is less so now. It is strictly terrestrial but like Plethodon vehiculum, is restricted to damp microhabitats such as rotting logs or vegetation.

Western Toad *Bufo boreas*

The only true toad (Bufonidae) on the endowment lands, *Bufo boreas* frequents areas around streams, reservoirs, ponds and swamps, although it may be found at a considerable distance from water (42).

It is strictly nocturnal and generally retires to a damp hollow or burrow during the day. In early spring it congregates in the ponds and swamps to spawn (42).

Pacific Tree Frog Hyla regilla

The Pacific Tree Frog is probably the most common amphibian on the U.E.L. and despite its name dwells chiefly on the ground or in low growth near water (42).

In the late winter and spring, males congregate around the margins of permanent ponds on the endowment lands. From March to May they also congregate around temporary ponds. The males call frequently from the pond edges; according to Whitney (44) these vocalizations mediate spacing out behaviour. The male frogs are not strictly territorial, but space out evenly around the pond margins. Up to 50 frogs may call from the periphery of a single pond (44).

Some suspected predators of Hyla regilla on the endowment lands are raccoons, weasels, and owls, especially the Screech Owl.

There are two distinct colour morphs of Hyla regilla present on the U.E.L., one green and one brown; these are further divided into two submorphs defined by the presence or absence of a broad reddish-brown mid-dorsal stripe. The striped submorph is the least common on the U.E.L (36).

Red-legged Frog Rana aurora

The only true frog (Ranidae) on the U.E.L., the Red-legged frog inhabits the slow parts of streams, ponds, marshes and other usually permanent water. While usually found in the water, it may also be found along stream banks and pond margins.

Some suspected predators of the Red-legged Frog on the endowment lands are: raccoons, Red Fox, weasels, feral housecats (Felis cattus), hawks and Screech owls. The Common Garter Snake, the larvae of the Rough-skinned Newt and the Belted Kingfisher are likely predators of Rana Aurora tadpoles (24).

Common or Puget Sound Red-sided Garter Snake Thamnophis sirtalis

This is the most common snake on the U.E.L. It is usually found in or near water or marshy areas (40).

Western Terrestrial or Wandering Garter Snake Thamnophis elegans

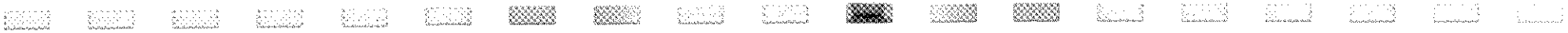
Most commonly found amongst beach debris but it may also be found along stream banks on the U.E.L. (42).

Northwestern Garter Snake Thamnophis ordinoides

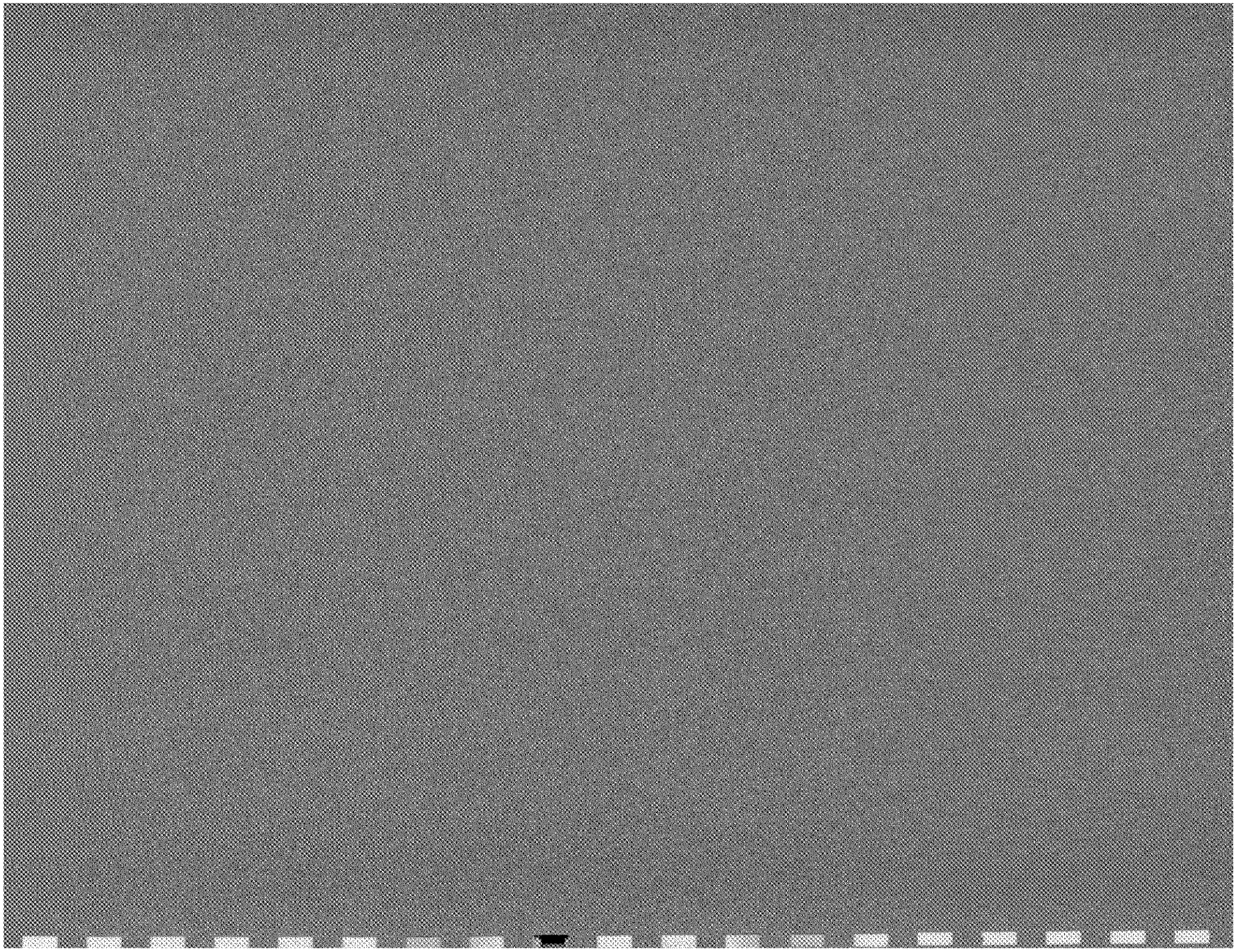
This snake occupies drier habitats than T sirtalis or T elegans. It may be found in thickets and edge zones, particularly along roadsides (42).

Northern Alligator Lizard Gerrhonotus coeruleus

The only lizard on the U.E.L. Gerrhonotus coeruleus is usually found in dry rocky areas or exposed bluffs. It is rare (42).



Section 2
Species Birds



BIRDS

Great Blue Heron *Ardea herodias*

A heron colony has been documented on the U.E.L. since 1970, when 120 nesting pairs were recorded (3). In 1971 the number of nesting pairs dropped to 78 and by 1972 had dropped even further to some 30 active pairs (24). This drastic reduction was initally attributed to the severe winter weather that occurred during these years; however, research conducted from 1970 to 1972 may have had a seriously detrimental effect on the heron population. Paine (28) noted that human activity caused several nest abondonments and was correlated with increased egg predation by corvids. In 1977 the number of active pairs had increased to 63, and in 1978 had further increased to 108 (3). This increase continued and in 1980 there were an estimated 130 active pairs out of a total of 147 nests (14).

In 1971 the original colony, found about 300 metres north of Marine Drive and 150 metres west of Salish Creek, split in two leaving the original colony and satellite colony some 350 metres away. Active nesting continued in the satellite colony but declined in the original one. In 1979 the herons moved to form a new colony in the easternmost section of the U.E.L. just south of 16th Avenue (14). Occupancy of this new location may have declined in 1982 (L.S. Forbes, pers. com.). These shifts in colony site are also common in other lower mainland heronries (K. Simpson, pers. com.).

The endowment lands herons are unique in their exclusive use of Alder trees for nesting (24). The first male herons begin occupation of the nests in late February and are followed by the females. Towards

the end of March the males establish territories, usually in existing nests but occasionally in tree forks appropriate for nest building, especially when the colony shifts (28).

One to four eggs are laid and they are incubated for about 28 days. During the early stages of incubation nest-sitting is erratic, but settles down later with the parents spending 4 - 6 hours at a time on the nest. The sitting adult does not leave the nest unless frightened but does not actively defend the nest against predators.

The young begin flapping their wings at about 25 days of age and leave the nest at around 40 days; however, fledglings are not able to secure sufficient food to maintain themselves, and their diet is supplemented by the parents (28). The herons feed predominantly on the tidal mudflats along the U.E.L. foreshore, Spanish Banks, and Iona Island. Secondarily, they feed in tidal areas of Sea Island, Lulu Island, Westham Island and Tsawwassen (28). During high tides they switch to fields, ditches and streams (24). They feed in small groups of 4 - 10; however, solitary herons or groups of up to 40 are not uncommon. The diet includes Sculpins, Pacific Sanddabs, Starry Flounders, Shiner Perch Penpoint Gunnels, Shrimp, small mammals and amphibians (24;28).

Canada Goose *Branta canadensis*

The Canada Goose is frequent on the endowment lands, especially on the salt marsh (42). It usually nests on the salt marsh along the foreshore but may occasionally make use of the old tree nests of large birds of prey (42).

Mallard *Anas platyrhynchos*

The Mallard is a common U.E.L. inhabitant. It is found on marshes and ponds and, in winter, predominantly on the salt marsh. It nests among reeds and marsh grass (8;42).

Shoveller *Spatula clypeata*

The Shoveller is common on the U.E.L. In the winter it is found predominantly on the salt marsh (8).

Turkey Vulture *Cathartes aura*

A frequent migrant on the endowment lands, the Turkey Vulture may also be seen as a casual winter visitor (D. Cannings, pers. com.).

Goshawk *Accipiter gentilis*

The Goshawk is found in forests and woodlands; however, its abundance is not known (42).

Sharp-shinned Hawk *Accipiter striatus*

This hawk is frequently seen on the U.E.L. during the winter, but is rare during the summer. It is usually found in coniferous forest, but may also be seen in deciduous and mixed forest (8;42).

Cooper's Hawk *Accipiter cooperii*

Rarely seen on the U.E.L., the Cooper's Hawk is generally found in broken woodland (8; D. Cannings, pers. com.)

Red-tailed Hawk *Buteo jamaicensis*

The Red-tailed Hawk is common in the winter and frequent in the summer. It is generally found in open areas and woodland (8;42). It nests on a stick platform, often an old crow or raven nest, in a forest tree, isolated low tree, or cliff (42).

Rough-legged Hawk *Buteo lagopus*

The Rough-legged Hawk is common on the U.E.L. during the winter. It hunts on the marshes along the foreshore, and is known to feed on the Oregon Vole and Townsend Vole (8;16).

Bald Eagle *Haliautus leucocephalus*

There is at least one breeding pair of Bald Eagles on the U.E.L. (3; pers. obs.) and there may be more. Eagles are frequently seen soaring in slope lift off the Point Grey cliffs, or perched in tall trees throughout the endowment lands.

Marsh Hawk *Circus cyaneus*

The Marsh Hawk is a rare migrant and casual winter visitor on the endowment lands.

Osprey *Pandion haliaetus*

The Osprey is frequently seen along the U.E.L. foreshore; it is known to forage on the Fraser delta (42).

Merlin or Pigeon Hawk *Falco columbarius*

The Pigeon Hawk is rarely seen on the U.E.L. (D. Cannings, pers. com.). It is known to prey on the Varied Thrush (42).

American Kestrel or Sparrow Hawk Falco sparverius

The Sparrow Hawk is found around wooded streams and along roadsides; however, its abundance on the U.E.L. is not known (42). It nests in cavities in old trees, cliffs, or occasionally buildings (42).

Blue Grouse Dendragapos obscurus

The Blue Grouse is found in coniferous forest where it feeds on Douglas Fir needles and salal (13:42); however, the abundance of the Blue Grouse on the U.E.L. is not known.

Ruffed Grouse Bonasa umbellus

The Ruffed Grouse is found at moderate densities (around 1 per 10 hectares) year round on the U.E.L. It is found in mixed or deciduous forest (25;42). The diet includes leaves, berries, aspen buds, and willow buds (13).

Ring-necked Pheasant Phasianus colchicus

The Ring-necked Pheasant is seen frequently on the U.E.L. in open and marshy areas (8;42). It was first introduced to B.C. near Esquimalt in 1883 and shortly afterwards on the lower mainland. The pheasant population increased rapidly and then declined in the 1930's and 1940's to a steady, fairly low population size (37).

Killdeer Charadrius vociferus

The Killdeer is common in the summer and frequent during the winter. It is found usually in fields, marshes, creekbanks, and open areas (8;42).

The Killdeer nests throught the endowment lands and U.B.C. campus; nests have been reported in parking lots, gardens, on the roofs of various buildings, the stadium, and other locations (3;5). The nest

is quite rudimentary, being little more than a shallow scrape in the ground, it is, however, very well camouflaged. The young are very precocious and leave the nest as early as an hour after hatching at which time they generally seek better cover (pers. obs.).

Common Snipe Capella gallinago

A rare inhabitant on the U.E.L., the Common Snipe may be found in ditches, streamsides, and bogs. (42).

Spotted Sandpiper Actitis macularia

Spotted Sandpipers were observed by temporary ponds at 16th Avenue and Wesbrook Mall in 1981 and 1982 where they were known to be breeding (J. Smith, pers. com.).

Glaucous-winged Gull Larus glaucescens

A common year round inhabitant on the U.E.L., the Glaucous-winged Gull is found predominantly along the shorelines surrounding the endowment lands (25;42). These gulls have been seen feeding on termites over the U.E.L. as a supplement to their diet (42).

The Glaucous-winged Gull does not nest on the endowment lands.

Mew Gull Larus canus

As Glaucous-winged Gull, though probably much less common in the summer (42; D. Cannings, pers. com.).

Bonaparte's Gull Larus philadelphia

The Bonaparte's Gull is frequently seen as a migrant in spring and fall (D. Cannings, pers. com.).

Band-tailed Pigeon *Columba fasciata*

The Band-tailed Pigeon is seen frequently in the summer but is rare in the winter (8;25). It is found in woodland and forest clearings (8;22;42). The diet of this pigeon includes elderberries (22); however the main diet in the autumn is acorns (D. Cannings, pers. com.).

Rock Dove *Columba livia*

The Rock Dove is a common inhabitant of the U.E.L. and the entire Vancouver area. Primarily an urban bird in the Vancouver area, it is found on the U.B.C. campus, in open areas, and around cliffs (8;42). It nests throughout the campus on buildings (3).

Mourning Dove *Zenaidura macroura*

The Mourning Dove is found in open woods, coastal scrub, and open areas (42). It nests in a tree, shrub, or open ground (42); however, the abundance of the Mourning Dove on the U.E.L. is not known.

Screech Owl *Otus asio*

A frequent inhabitant on the U.E.L., the Screeh Owl is found in woodlands, large decidious "shade" trees, and wooded ravines. It nests in a tree cavity or old woodpecker hole (8;42). It is known to prey on voles, shrews, Deermice, and Pacific Treefrogs (13;42;46).

Great Horned Owl *Bubo virginianus*

Although rare, the Great Horned Owl may be found in almost any habitat (42). There are probably fewer than ten individuals on the endowment lands (25). It nests in old heron nests, hawk nests, tree cavities, or even on the ground.

Saw-Whet Owl *Aegolius acadicus*

The Saw-Whet Owl is rare but may be found year round in forest areas, cliffs and groves. It nests in tree cavities in coniferous forest (8;13;42).

Common Nighthawk *Chordeiles minor*

The Common Nighthawk is absent during the winter, at other times it may be seen on the wing feeding on insects, but it may also be found in open woods (42). It is known to nest on buildings on the U.B.C. campus (3).

Black Swift *Cypseloides niger*

Large numbers of Black Swift frequent the U.E.L. and Point Grey area. As many as 400 in a single flock were reported on the campus in 1970 (5;42). The high insect population of the U.E.L. is probably a major factor in these large concentrations of swifts which probably accumulate from a wide area (40;42).

The appearance of swifts generally coincides with the passage of a cyclonic storm when they may be observed flying at high altitude. They are most easily seen when a lower cloud ceiling forces them to fly at lower altitudes (22;40).

Vaux's Swift *Chaetura vauxi*

As with the Black Swift, high insect populations probably have major significance in high concentrations of Vaux's Swifts on the U.E.L. (42). Most frequent in the summer, it may be seen in open sky under similar conditions to the Black Swift, or in cleared forest areas (8;42). It is known to nest in tree cavities in coniferous forest (8).

Anna's Hummingbird *Calypte anna*

The Anna's Hummingbird is generally found in broken woodland; its abundance on the endowment lands is not known. It is known to feed on jasmine flowers, particularly during the winter (5;42).

Rufous Hummingbird *Selasphorus rufus*

The Rufous Hummingbird is common in the summer but absent in the winter (25; D. Cannings, pers. com.). These hummingbirds arrive in early spring, at which time they feed heavily on the nectar of the Flowering Currant. If other plants blossom late, they may feed on leaf populations of insects on such plants as laurel, holly salal, and other evergreen plants; these insects include midges, ants and aphids. In the early summer the hummingbirds feed heavily on salmonberry nectar (22; D. Cannings, pers. com.).

The Rufous Hummingbird is found around flowering plants in edge zones. A typical nest incorporates moss, lichens and spider webs (3).

Belted Kingfisher *Megaceryle alcyon*

The Belted Kingfisher is a frequent inhabitant on the U.E.L. It is found along streambanks and around ponds; it nests in these areas as well as on the cliffs below the U.B.C. Museum of Anthropology (42; J. Smith, pers. com.).

The Kingfisher is probably a predator of the Cuttroat Trout in Tin Can Creek.

Common Flicker *Colaptes auratus*

The flicker is common in the winter and frequent during the summer. It is found in open forest, along streams, and semiopen areas (8;42). Primarily a ground feeder, it has also been seen to feed on fruit (discarded from a lunch) (17;25).

Pileated Woodpecker *Dryocopus pileatus*

There were at least two pairs of Pileated Woodpeckers breeding on the U.E.L. in 1976. In 1977 Klassen and Teversham (22) reported no more than a dozen individuals (8;22). There are only three known resident populations in the lower mainland: U.E.L., Point Roberts, and the North Shore mountains (5). It has an extensive home range, up to several kilometres; consequently, no specific area may be defined where it is found. This, in conjunction with strong territoriality, is a possible reason for its scarcity on the endowment lands (8;22). It nests in cavities in coniferous trees (42).

Yellow-bellied Sapsucker *Sphyrapicus varius*

A rare inhabitant in the winter, the Yellow-bellied Sapsucker is probably limited to a few individuals on the endowment lands (5;8; D. Cannings, pers. com.). It is found predominantly in coniferous forest (D. Cannings, pers. com.), particularly in Aspen groves (42). It is known to nest in tree cavities in the Vancouver area (5).

Hairy Woodpecker *Dendrocopus villosus*

The Hairy Woodpecker is a year round inhabitant on the U.E.L.; its abundance is not known, though it is less common than the Downy Woodpecker (8;5;22;42). It is generally found in forest areas and nests in tree cavities (8;13;42).

Downy Woodpecker *Dendrocopus pubescens*

The Downy Woodpecker is common year round on the U.E.L. and is the most abundant woodpecker (8;22;25). It is found in drier areas, particularly Cottonwoods, and edge zones. It may also be found in mixed forest (22;42). It is a cavity nester (8;13;42).

Eastern Kingbird *Tyrannus tyrannus*

A casual visitor to the U.E.L. in summer (D. Cannings, pers. com.), the Eastern Kingbird is found along woodland edges and roadways, parkland habitats, and streamside groves (42).

Western Kingbird *Tyrannus verticalus*

The Western Kingbird is found along roadsides and among scattered trees. A casual visitor (42; D. Cannings, pers. com.).

Willow Flycatcher *Empidonax traillii*

Frequently seen in the summer, the Willow Flycatcher is found in Willow and Alder thickets, usually on moist ground; it is most frequently found north of 16th Avenue (42).

Dusky Flycatcher *Empidonax oberholsteri*

The Dusky Flycatcher occurs casually during migration (D. Cannings, pers. com.) in brushy areas and open coniferous forest (42); however, it is normally an inhabitant of the dry interior.

Western Flycatcher Empidonax difficilis

The Western Flycatcher is common in the summer but absent in the winter (8;25;42). It is found throughout the U.E.L. in all wooded areas, but requires water and shaded area (8;5;42). It is known to nest on the U.E.L. (5).

Hammond's Flycatcher Empidonax hammondii

The Hammond's Flycatcher is seen frequently during the summer in coniferous forests (D. Cannings, pers. com.).

Western Wood Peewee Contopus sordidulus

The Wood Peewee is frequent in summer but absent in winter; it is found in most wooded areas of the U.E.L. (42;5;8).

Olive-sided Flycatcher Nuttalornis borealis

The Olive-sided Flycatcher is frequent in the summer but absent in the winter (5;8;25;42). Found primarily in coniferous forest areas around openings in the canopy, this flycatcher may be seen making short forays into the open in pursuit of insects. It prefers to perch on dead branches or tree tops (8;22;42). It is known to nest on the U.E.L. (5).

Violet-green Swallow Tachycineta thalassina

The Violet-green swallow is migratory, arriving in early to mid-May, remaining common through the summer and then departing in early August (5;8;25;42). It may be seen in open forest, along cliffs or around buildings where it frequently nests, particularly on the U.B.C. campus (3;5;42).

Tree Swallow *Iridoprocne bicolor*

The Tree Swallow is frequent throughout the spring and summer, and occurs as a casual visitor during the winter (D. Cannings, pers. com.; 8). It prefers open areas near water or marshy areas; often it is seen perched on telephone wires (42). It nests on the endowment lands in tree cavities, usually near water; however, it may also nest on buildings (8).

Rough-winged Swallow *Stelgidopteryx ruficollis*

Frequently seen in the summer, the Rough-winged Swallow, like the Tree Swallow, prefers to be close to water or marshy areas (42). Nests have been reported in drain pipes and sandbanks near Spanish Banks (3).

Barn Swallow *Hirundo rustica*

The Barn Swallow is a migratory species. It is common during the summer, having arrived around mid-May; however, it is absent after September (25). It is found in open or semi-wooded areas, and buildings, particularly on the U.B.C. campus.

Cliff Swallow *Petrochelidon pyrrhonota*

The Cliff Swallow is common during the summer but absent in the winter (42). It is found in open or semi-open areas near cliffs or streams (42). It nests extensively on university buildings. Some 269 nests on the Dentistry building were occupied annually until 1979 when the nests were scraped away by the university physical plant; this site has not been recolonized. Another 20 nests on the agriculture department barn have been occupied continuously since 1927; however, the barn is currently under threat of demolition (3).

Purple Martin *Progne subis*

Klassen and Teversham (22) report that the starling is responsible for the local extinction of the Purple Martin which is becoming progressively rarer in the Pacific Northwest (J. Smith, pers. com.). Urhahn (42) lists the Purple Martin as a rare inhabitant and in 1976 Lancaster (25) reported a single Purple Martin on the U.E.L.; however, it is considered essentially extinct locally (D. Cannings, pers. com.).

Steller's Jay *Cyanocitta stelleri*

The Steller's Jay is a frequent year round U.E.L. inhabitant. It is generally found in coniferous forest areas but is also found quite frequently in residential gardens surrounding the endowment lands (5;8;25;42). It nests in coniferous trees on the U.E.L. (42).

Common Raven *Corvus corax*

The Raven is rare but widespread on the U.E.L. It is found in wooded areas, particularly among conifers (5;8;42). It may also be found along the Point Grey cliffs where it nests (42). It is an omnivorous scavenger and Paine (28) reports a Raven raiding an abandoned heron's nest.

Northwestern Crow *Corvus caurinus*

The Crow is a common U.E.L. inhabitant (8;25;42). It is usually found along the shorelines or on the university campus (42). Like most corvids, it is an omnivore and a scavenger. On the U.E.L. its diet may include intertidal creatures and garbage. It has been reported to take a Robin nestling and, furthermore, a crow has been observed striking and killing an adult Robin (J. Smith, pers. com.).

Black-capped Chickadee *Parus atricapillus*

The Black-capped Chickadee is a common year round inhabitant on the U.E.L. It is the most predominant bird species during the summer

and fall reaching adult densities of 70 adults per 40 hectares; it is the second most predominant species in spring and winter (25). It may be found in almost any habitat on the U.E.L. but is most frequently seen in mixed or deciduous forests, particularly in the summer (42).

Flocks of 6 - 12 occur in the winter but individual territories are established in late February and early March at which time there is a sudden decrease in adult survival (34). Winter flocks often contain both Black-capped Chickadees and Chestnut-backed Chickadees as well as numerous other species such as the Golden-crowned Kinglet in 90% of the flocks, Ruby-crowned Kinglet, Brown Creeper, Red-breasted Nuthatch, Hutton's Vireo, and on at least one occasion a Warbling Vireo (32). Several other bird species have been observed feeding but not flocking with Chickadees, including Yellow-bellied Sapsucker, Hairy Woodpecker, Downy Woodpecker, Winter Wren, Orange-crowned Warbler, and Pine Siskin (32). Mixed Chickadee flocks are unstable conglomerations of two or more pure (species) flocks (35).

Smith (32) found that several ecological isolating factors minimize the competition between Black-capped and chestnut-backed chickadees in mixed flocks. The Black-capped Chickadees forage on the ground much more than Chestnut-backed, and they also feed more frequently on the trunk and inner branches of trees than the Chestnut-backs, which tend to forage on the outer branches. Perhaps more important is the difference in preference of tree species; the Black-capped Chickadee prefers to forage on Red Alder and maple trees (33%) and on Thimbleberry (22%), whereas the Chestnut-backed prefers to feed predominantly on coniferous trees such as Red Cedar (33%), Douglas Fir (25%) and Western Hemlock (17%). Overall 76% of Black-capped chickadees were found in deciduous trees and 83% of Chestnut-backs

were found in coniferous trees, in the winter.

The Black-capped Chickadee is omniverous. It has been seen to feed on caterpillars, bark insects, spiders, arthropod eggs, and confer seeds (32). It nests almost exclusively in mature alder and maple trees in the forested areas of the U.E.L. It may also nest in residential areas in Dogwood, alder, maple and the occasional fence post (3;33).

Chestnut-backed Chickadee *Parus rufescens*

A common inhabitant, the Chestnut-backed Chickadee is considerably less abundant than the Black-capped Chickadee. It is found in the coniferous forests of the U.E.L. but may also be seen in deciduous forest, particularly when in association with Black-capped Chickadee flocks (8;25;42;32). The complex relationship between the Chestnut backed and Black-capped chickadees is discussed in the previous section.

The Chestnut-backed Chickadee eats similar foods to the Black-capped. However, it nests more frequently in coniferous tree cavities (3;8;32;42).

Common Bushtit *Psaltriparus minimus*

The Bushtit is common year round on the U.E.L. It is often found in small flocks in deciduous and mixed forest, it has a particular affinity for juniper shrubs (25;42). It is known to nest on the endowment lands (3).

Red-breasted Nuthatch *Sitta canadensis*

The Red-breasted Nuthatch is frequent on the U.E.L., most common

in the summer and fall (8;25;42). It is usually found in coniferous forest but may be seen in association with winter flocks of chickadees (32). The Nuthatch rests in a hole in a dead conifer or stump; the entrance to the nest is smeared with pitch (42).

Brown Creeper *Certhia familiaris*

The Brown Creeper is a common inhabitant on the U.E.L. It is found in mature coniferous forests and may be seen in association with winter flocks of chickadees (8;32;42). It usually nests in an old dead tree behind loose strips of bark (3;8;42).

House Wren *Troglodytes aedon*

The House Wren is found in open woods, brush, thickets and around buildings as a rare summer inhabitant (D. Cannings, pers. com.). It is a cavity nester, using holes in tree stumps, or bird-boxes (42).

Winter Wren *Troglodytes troglodytes*

The Winter Wren is common year round on the U.E.L. The U.E.L. supports one of the highest densities of wintering Winter Wrens in southwestern B.C. (8;42). It is found in the underbrush of mixed and coniferous forest and in the brush along Point Grey cliffs (8;42).

Its diet is chiefly insects which may be obtained from decaying logs; it has been observed feeding with chickadees but it is not usually associated with chickadee flocks (32;42). The Winter Wren nests on the U.E.L. amongst the exposed roots of trees and other crevices (3;42).

Bewick's Wren *Thryomanes bewickii*

The Bewick's Wren is common year round on the U.E.L., although not as abundant as the Winter Wren (8;25). It is found in underbrush thickets and has affinity for juniper shrubs (42). The Bewick's Wren has been observed feeding with chickadees but it is not usually associated with winter flocks of chickadees (32). It nests on the U.E.L. in a hole, crevice or occasionally in a bird-box (3;8;42).

Long-billed Marsh Wren *Telmatodytes palustris*

The Marsh Wren is found only on the salt marsh habitat of the U.E.L. foreshore (8), where it probably breeds. The abundance of this wren on the U.E.L. is not known.

American Robin *Turdus migratorius*

The Robin is common on the U.E.L., particularly in the spring and fall when many migrants are found in open forest areas, streamside residential gardens, and throughout the U.B.C. campus (42). It also nests on the endowment lands (3). Its diet includes earthworms, thimbleberries, Mountain Ash berries, holly berries, cherries and apples (45).

Varied Thrush *Ixoreus naevius*

The Varied thrush is particularly common in the winter, and frequent at other times (8;22;45). It is found throughout the endowment lands, particularly in dense wet forest, thickets, and ravines (8;22;42). It is known to be preyed upon by the Pigeon Hawk (8). It breeds mainly at higher elevations (J. Smith pers. com).

Hermit Thrush *Hylocichla guttata*

The Hermit Thrush is frequently seen in the spring and fall, but is rare during the winter; however, it breeds at higher elevations such as the North Shore mountains (8;42;45). It is found predominantly on the floor of mixed or coniferous forest areas (8;42).

Swainson's Thrush *Hylocichla ustulata*

Like the Hermit Thrush, the Swainson's Thrush is frequent in spring and fall, but is absent during the winter (D. Cannings, pers. com.). It breeds at higher elevations also (8;42). It is found mainly in deciduous woods, particularly willow thickets and aspens, among forest undergrowth. It may also be occasionally found among conifers (42).

Townsend's Solitaire *Myadestes townsendi*

The Townsend's Solitaire is found throughout the forested areas of the U.E.L. during migrations, mainly in April (D. Cannings, pers. com.).

Golden-crowned Kinglet *Regulus satrapa*

The Golden-crowned Kinglet is the most abundant bird species in the winter and the third most abundant in the fall; it is a common year round inhabitant on the U.E.L. (8;22;25;42). It is found in coniferous woods; during the winter it may also be found in other forest areas and thickets (8;42).

Ruby-crowned Kinglet *Regulus calendula*

The Ruby-crowned Kinglet is frequent during the winter, and during migration; however, it is rare at other times (8;22;25; D. Cannings, pers. com.). It is found in similar habitats to the Golden-crowned Kinglet but more frequently in deciduous vegetation (8;42; D. Cannings, pers. com.). It is often seen in association with foraging winter

flocks of chickadees and flocks of Golden-crowned Kinglets.

Bohemian Waxwing *Bombycilla garrula*

The Bohemian Waxwing is a frequent, though irregular, visitor to the U.E.L. (8). It appears in large flocks (J. Smith, pers. com.)

Cedar Waxwing *Bombycilla cedrorum*

The Cedar Waxwing is frequently seen on the U.E.L. during the summer but is rare during the winter. It is seen almost invariably in flocks in open woodland and fruiting trees (8;22;25;42). It feeds on fruits such as elderberries, bitter cherries, and Dwarf Mistletoe (22). It is known to nest on the U.B.C. campus (J. Smith, pers. com.).

Northern Shrike *Lanius excubitor*

The Northern Shrike is seen frequently during the winter on the U.E.L. (8). It is found in semi-open areas with "look-out posts". Its diet includes voles, shrews, and House Sparrows (5).

Starling *Sturnus vulgaris*

The Starling is a common inhabitant on the U.E.L. and the entire Vancouver area. It is most common during the spring and fall when, in 1982, an estimated 4 million Starlings were present around Vancouver (8;22;25;42). It is not a native of North America, but spread across the continent after being introduced to the Eastern United States from Europe. It is a serious competitor for many native bird species. As previously noted, it has been held responsible for the local decline of the Purple Martin and the local extinction of the Western Bluebird (*Salia mexicana*) (22). The Starling is usually seen in flocks, and often roosts communally in flocks numbering in thousands or ten-thousands (25). Normally, starlings nest on the

urban perimeter of the U.E.L., but occasionally may nest in a snag or hollow tree (42).

Crested Mynah Acridotheres cristatellus

Another introduced species, the Mynah is primarily an urban bird but it is a rare inhabitant of the U.E.L. It is an opportunistic omnivore, often scavenging carrion or garbage (8;25;45). One or more pairs nested on the university campus in 1981; like its close relative the Starling, it is a cavity nester (8).

Hutton's Vireo Vireo huttoni

The Hutton's Vireo is a frequent U.E.L. inhabitant and is the only vireo, with the possibly casual exception of the Warbling Vireo found on the endowment lands year round. It is found in mixed and deciduous woods and adjacent brush (8;25;42). It is often associated with winter flocks of chickadees (J.Smith pers. com.). It is known to nest in the Vancouver area, and two nests were found on the U.B.C. campus in 1981 (5;J.Smith pers. com.).

Solitary Vireo Vireo solitarius

The Solitary Vireo is found in mixed forests; however, its abundance on the U.E.L. is unknown (25;42).

Red-eyed Vireo Vireo olivaceus

The Red-eyed Vireo is frequent on the U.E.L. in the summer, but absent during the winter (8;5;25). It is found in mixed and deciduous forests, and is known to nest on the endowment lands (3;8;42).

Warbling Vireo *Vireo gilvus*

Like the Red-eyed Vireo, the Warbling Vireo is frequently seen during the summer but is absent in the winter; however, it may occur casually in the winter (8;25). It has been reported in association with a winter flock of chickadees (32). It is found in mixed or deciduous forests (42), and is known to nest on the endowment lands (3).

Orange-crowned Warbler *Vermivora celata*

The Orange-crowned Warbler is frequent on the U.E.L. from the spring to fall, and a casual visitor during the winter (8;25;32). It is found in deciduous woods including aspens, clearings, and undergrowth (8;22;42). Small numbers are known to breed on the U.E.L. (3;22).

Yellow Warbler *Dendroica petechia*

The Yellow Warbler is seen frequently during spring and fall migration; it is most abundant during the spring (22). It is found in deciduous trees including willow, poplar, and alder (42).

Yellow-rumped Warbler *Dendroica coronata*

Common during spring and fall migration, the Yellow-rumped Warbler may also be a rare year round inhabitant of the U.E.L. It is found in coniferous forests, in winter it may also be found in mixed woods, brush, thickets and along beaches (8;22;25;42).

Black-throated Gray Warbler *Dendroica nigrescens*

The Black-throated Gray Warbler is seen during the spring and fall migrations; however, its abundance on the U.E.L. at these times is not known. It is found in mixed forest and brush (25;42).

Townsend's Warbler Dendroica townsendi

The Townsend's Warbler is seen frequently during spring and fall migration. It is a casual winter visitor (8;25). It is found in coniferous forests (8;42). This warbler is highly correlated with the presence of Wilson's Warblers and Chickadees (25).

MacGillivray's Warbler Opornis tolmiei

The MacGillivray's Warbler is a rare inhabitant of the U.E.L., usually seen during migration or during the summer (D. Cannings, pers. com.).

Common Yellowthroat Geothlypis trichas

The Yellowthroat is common on the U.E.L. during the spring and fall migrations. It may breed locally on the foreshore marshes (D. Cannings, pers. com.).

Wilson's Warbler Wilsonia pusilla

The Wilson's Warbler is commonly seen on the U.E.L. during spring and fall migrations. These warblers arrive in late April, and the majority depart in late May, although some may remain and probably breed. They arrive again in late August and depart once more in late October. In fact, during the fall it is the second most predominant bird species on the U.E.L. Outside of migratory transients the Wilson's Warbler may be a casual visitor (8;22;25; J. Smith, pers. com.).

The other Wood Warblers (Dendroica spp.; Vermivona spp.) all have similar migratory patterns to the Wilson's Warbler.

It is found in thickets, low shrubs, willows, and alders, particularly along streams (8;42).

Western Meadowlark *Sturnella neglecta*

The Meadowlark is a casual visitor, from the Delta meadows, to the U.E.L. (D. Cannings, pers. com.).

Red-winged Blackbird *Agalius phoeniceus*

The Red-winged Blackbird is common on the U.E.L. It may be found in swamp and bog areas and on the foreshore salt marsh (8;42). It is sometimes seen in association with Brewer's Blackbird flocks (43).

Brewer's Blackbird *Euphagus cyanocephalus*

The Brewer's Blackbird is a common year round inhabitant on the U.E.L. which has become progressively more important as a wintering area since the turn of the century as the Brewer's Blackbird's range has extended northward up the coast. However, it was notably absent on the endowment lands in the winter of 1982 which was more severe than ususal (8;25;39; J. Smith, pers. com.).

It is generally found in groves, thickets, and in the open, often around human habitation or agricultural areas of the university (8;42;43). Brewer's Blackbirds are most often seen in flocks which consist on average of 78% males and 22% females in the winter. Many other bird species may be among blackbirds; Redwinged Blackbirds may form a portion of a flock and Starlings are almost always associated with blackbird flocks in the winter (43). House Sparrows and House Finches have been observed flocking with Brewer's Blackbirds when attacked by avian predators such as the Cooper's Hawk (43).

Brewer's Blackbirds may mob predators such as the Sparrow Hawk; they have been observed chasing many birds including Glaucus-winged Gulls, Killdeer, Flickers, House Finches, Goldfinches, House Sparrows, Robins and Starlings. (43).

Brown-headed Cowbird *Molothrus ater*

The Cowbird has colonized the Pacific Northwest in the last century and is now frequently seen in spring and summer (22;25). It was first noted on the U.E.L. around 1957 (20). The Cowbird is a nest parasite; at least two cases of cowbird parasitism on the Song Sparrow have been recorded on the endowment lands and U.B.C. campus (3;22;42; J. Smith, pers. com.).

Western Tanager *Piranga ludoviciana*

The Western Tanager is frequent during spring and summer but absent during the winter. It is found in mixed or coniferous forest but may be found in most habitats during migration (8;22;25;42). Klassen and Teversham (22) report that there are several breeding territories aroung the plains of Abraham.

Black-headed Grosbeak *Pheucticus melanocephalus*

The Black-headed Grosbeak is seen frequently on the U.E.L. during the spring and summer, but generally it leaves the area at the end of August (22;25). It is found in mixed forests, along streamsides and in parkland (42). It is known to breed on the U.E.L. (5).

Evening Grosbeak *Hesperiphona vespertina*

The Evening Grosbeak is common in the winter but only frequent in the summer (8;22;42). During the summer it is found in coniferous forests, and in the winter it may be found in both coniferous and mixed forests (8:42). It has been observed feeding on berries and alder seeds (45; J. Smith pers. com.).

Purple Finch *Carpodacus purpureus*

The Purple Finch is frequent in the summer but absent in winter (8;25). Small numbers of the Purple Finch are widespread over the lower mainland with notable concentrations in Stanley Park and the University Endowment Lands (5). It is found in mixed and coniferous forests (8;42). It has been observed feeding on berries and alder seeds (45; J. Smith pers. com.

House Finch *Carpodacus mexicanus*

The House Finch is common on the U.E.L.; however, in the winter it tends to leave the endowment lands in order to take advantage of the quantities of "bird seed" to be found in the residential areas bordering the endowment lands. It is found in open woods or brush, edge zones, and around buildings with shrubbery (22;25;42). It nests in small trees, shrubs and among climbing vines on buildings (J. Smith, pers. com.).

The diet includes "bird seed" from feeders, birch seeds, weed seeds, Broom seeds, Mountain Ash berries, and apples (45).

Pine Grosbeak *Pinicola enucleator*

Large flocks of up to 50 Pine Grosbeak have been seen on the U.E.L. in the spring of 1982 (J. Smith, pers. com.). No other information is available.

Common Redpoll *Acanthis flammea*

The Common Redpoll is a rare winter inhabitant of the U.E.L. (8:45).

Pine Siskin *Spinus pinus*

The Pine Siskin is common year round on the U.E.L. although its occurrence is irregular; it is the third most abundant bird species during the winter (8;25;D. Cannings, pers. com.). It is found in mixed and coniferous forests, often in flocks (8). Its diet includes birch seeds, and maple buds. It has been observed feeding but not flocking with chickadees (32).

American Goldfinch *Spinus tristis*

The Goldfinch is common in the summer but rare during the winter (8;22). It is found in low deciduous growth and feeds on such seeds as thistle and birch (45).

Red Crossbill *Loxia curvirostra*

Seen irregularly year round on the U.E.L., the Red Crossbill may be common or absent (D. Cannings, pers. com.). It is found in coniferous forest areas (8).

Rufous-sided Towhee *Pipilis erythrophthalmus*

The Towhee is a common year round inhabitant on the U.E.L. It is the third most abundant bird species during the summer (8;25). It is

found along the forest edge and in undergrowth (8). It is known to breed on the endowment lands (3).

Savannah Sparrow *Passerculus sandwichensis*

Common during migration, small numbers of the Savannah Sparrow probably remian on the U.E.L. during the summer to breed in grassy areas (D. Cannings, pers. com.).

Dark-eyed Junco *Junco hyemalis*

The Dark-eyed Junco is common year round on the U.E.L., although it may be somewhat less common during the summer. It is found in coniferous and mixed forest (8;25). The Junco's diet includes birch seeds, "bird seed" from feeders, grass seed, and maple seeds (45).

White-crowned Sparrow *Zonotrichia leucophrys*

The White-crowned Sparrow arrives on the U.E.L. in late April to early May, remains through summer and departs around early October. It may be seen as a rare visitor in the winter (8;25). It is generally found in open brush (8). The White-crowned Sparrow's diet includes thistle and grass seeds (45). It is known to nest on the endowment lands and U.B.C. campus (3).

Golden-crowned Sparrow *Zonotrichia atricapilla*

The Golden-crowned Sparrow is common during spring and fall migrations, and rarely inhabits the U.E.L. year round (8;25). It is found in open brush and shrubbery (8).

Fox Sparrow *Passerella iliaca*

A frequent year round inhabitatnt on the U.E.L, the Fox Sparrow is found in forest undergrowth and open shrubbery (8).

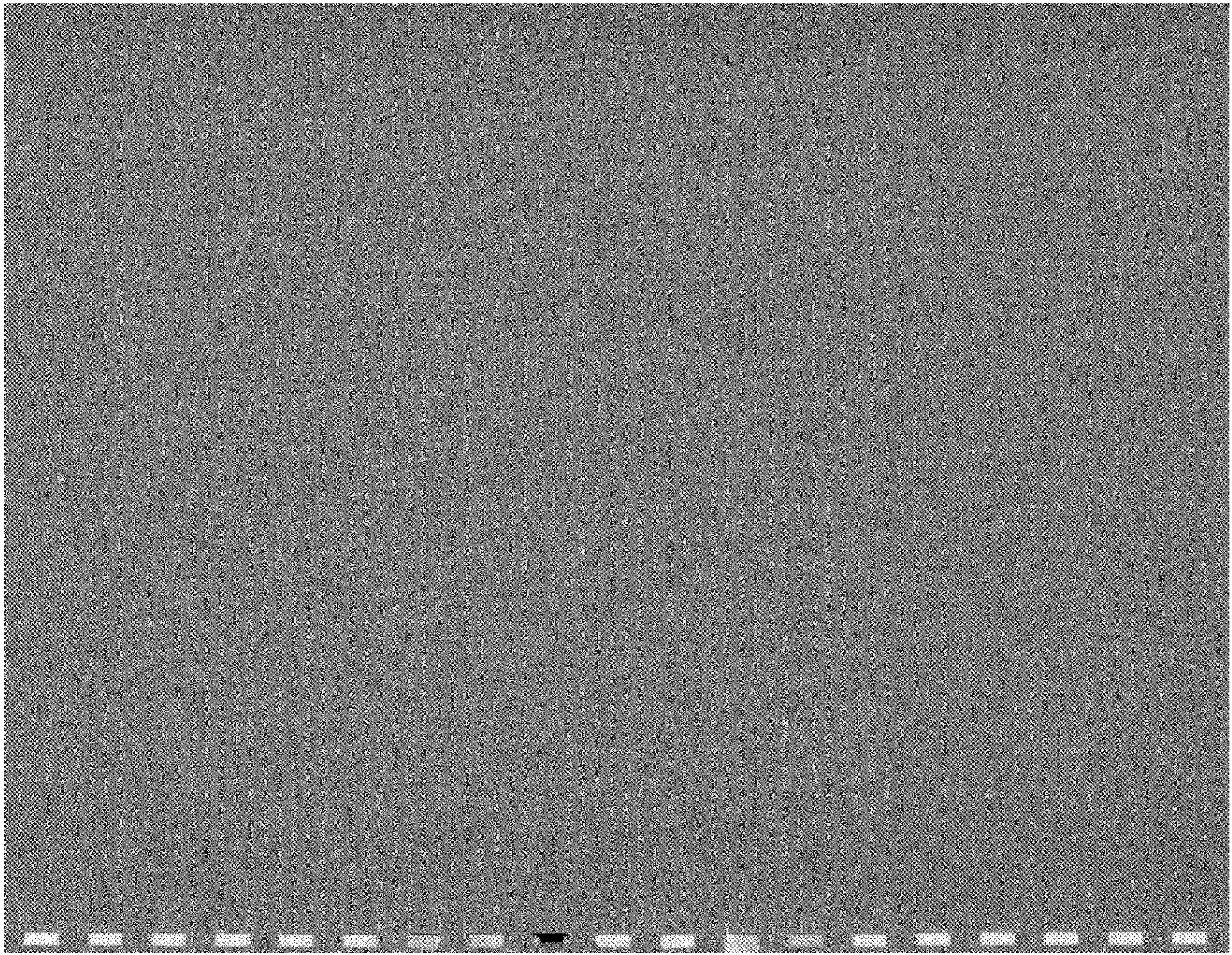
Lincoln's Sparrow *Melospiza lincolnii*

A frequent spring and fall migrant through the Vancouver area and U.E.L. (5).

Song Sparrow *Melospiza melodia*

The Song Sparrow is common year round and is most abundant in winter (8;25). It is found in brush, along the seashore, and in saltmarsh areas. It is known to nest on the U.E.L. in brush and woodland, around the shorelines, and on the U.B.C. campus. Incidents of nest parasitism by the Brown-headed Cowbird were reported in 1979 (3) and 1981 (J. Smith, pers. com.).

Section 3
Distribution Maps

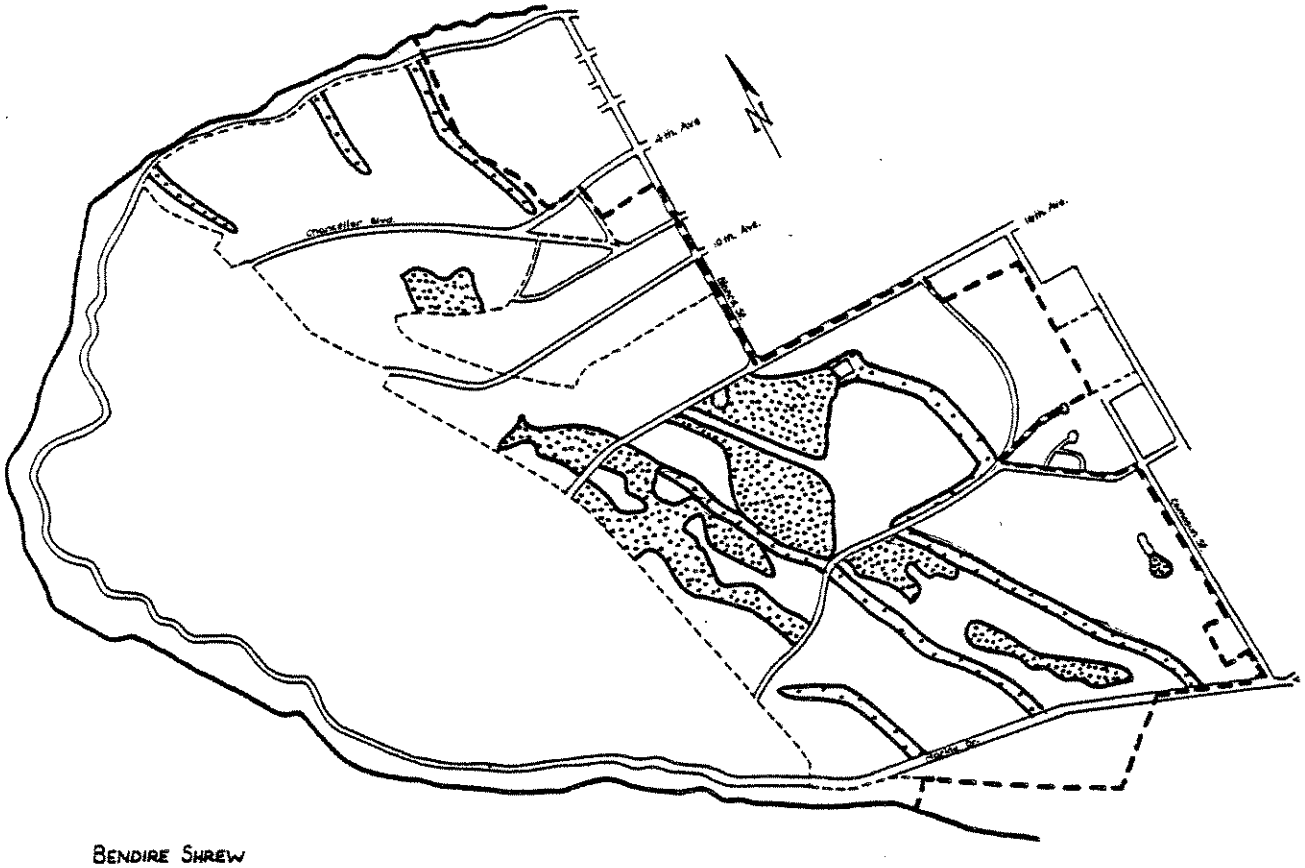


SECTION 3 DISTRIBUTION MAPS

The distribution maps are based on the habitat preferences and associations of various species. The distribution of habitat types was drawn from diverse sources (8;21;22;27;41;42). Maps were drawn only for those species for which there is sufficient habitat information specific to the U.E.L. For some species, habitat information is available but the distribution of the habitat type is not known; consequently, maps could not be drawn.

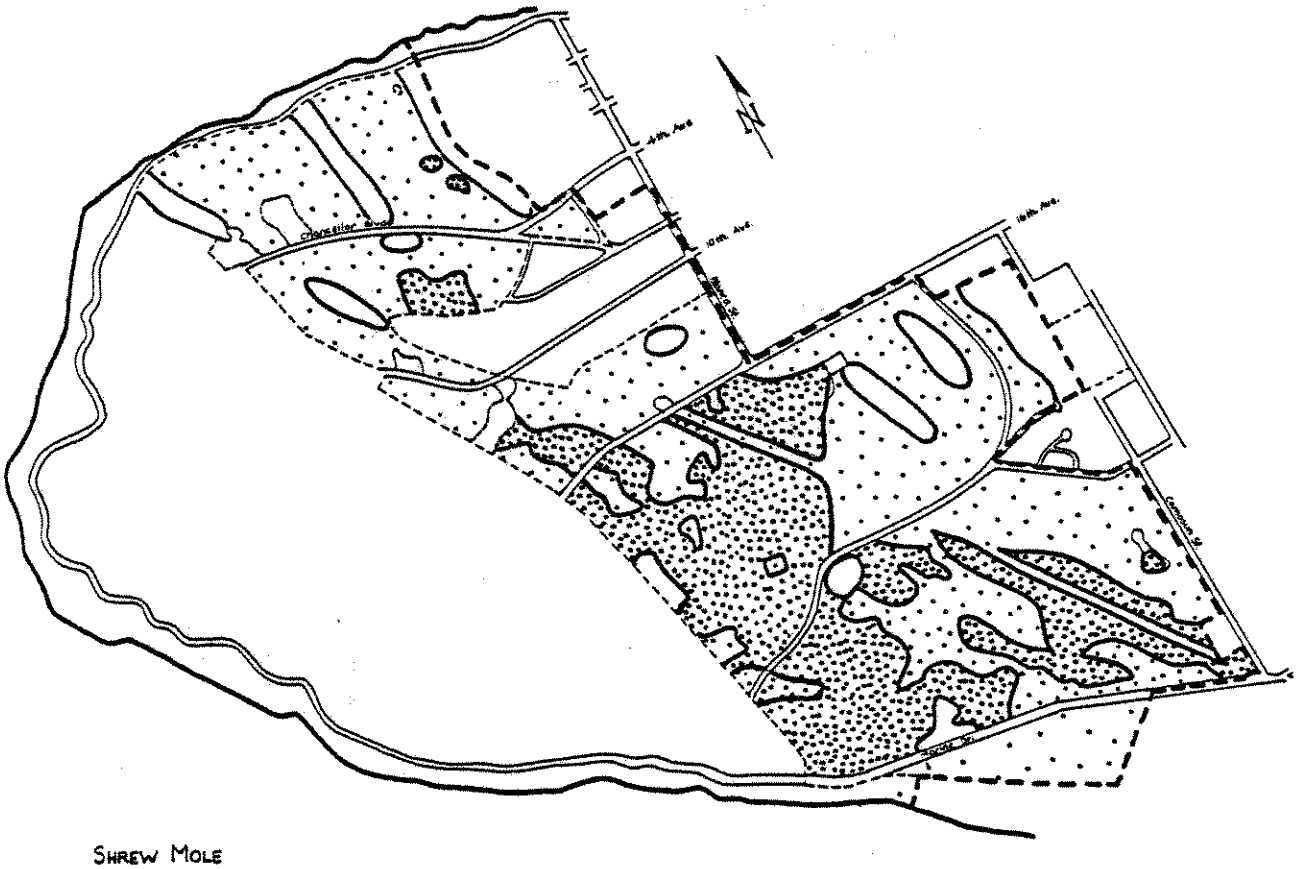
The maps are by no means absolute delineations of a species' distribution; rather, they should be considered as approximations. Areas of heavy stippling indicate the areas where a particular species is most likely to be found. Light stippling indicates areas of lesser probability. Areas without stippling are least likely to be inhabited by the species in question. The degree of stippling is relative only to other areas on the same map and does not imply equivalence of abundance or density between species. The relative abundance of different species may be ascertained from the Section 2 text.

The habitat types used for drawing the maps were taken from references 22 and 41. The following habitat types were delineated: Young deciduous woods (22); Older deciduous woods (22); Open coniferous forests (22), Bog (22); Edge zones (41); Wetlands (41); Closed Canopy forest (41). Details of plant species composition of these types is given in Klassen and Teversham (22).

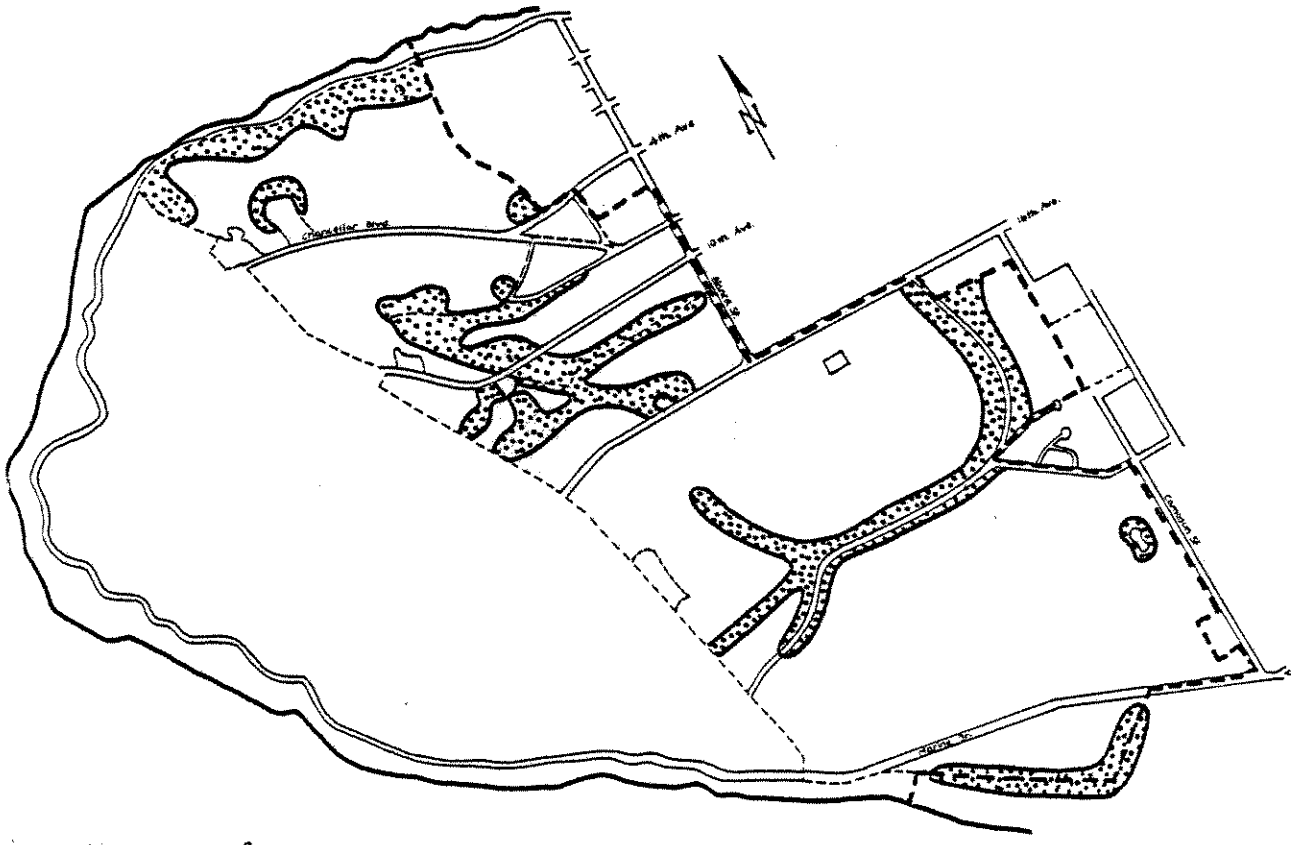


BENDIRE SHREW

DUSKY SHREW

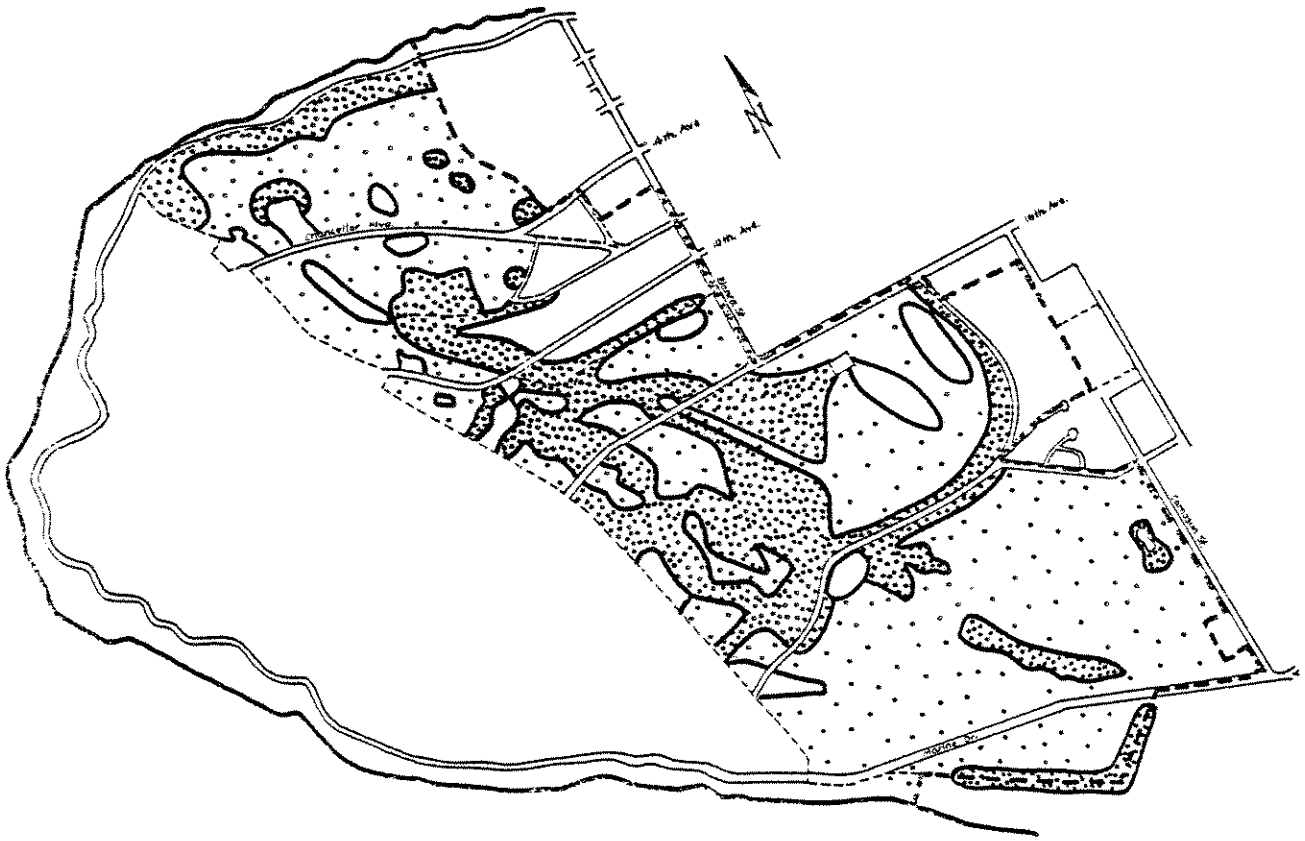


SHREW MOLE

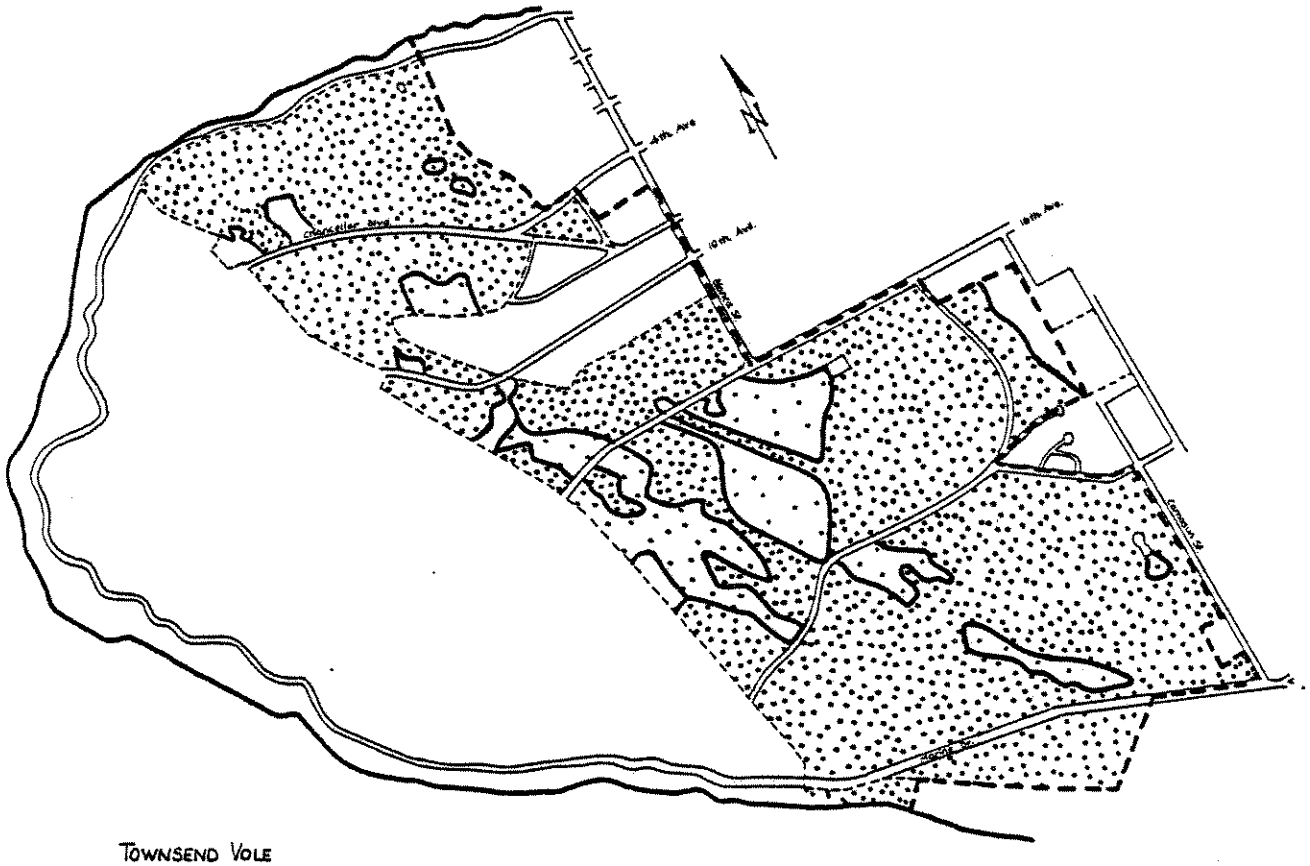


NORTHWESTERN CHIPMUNK

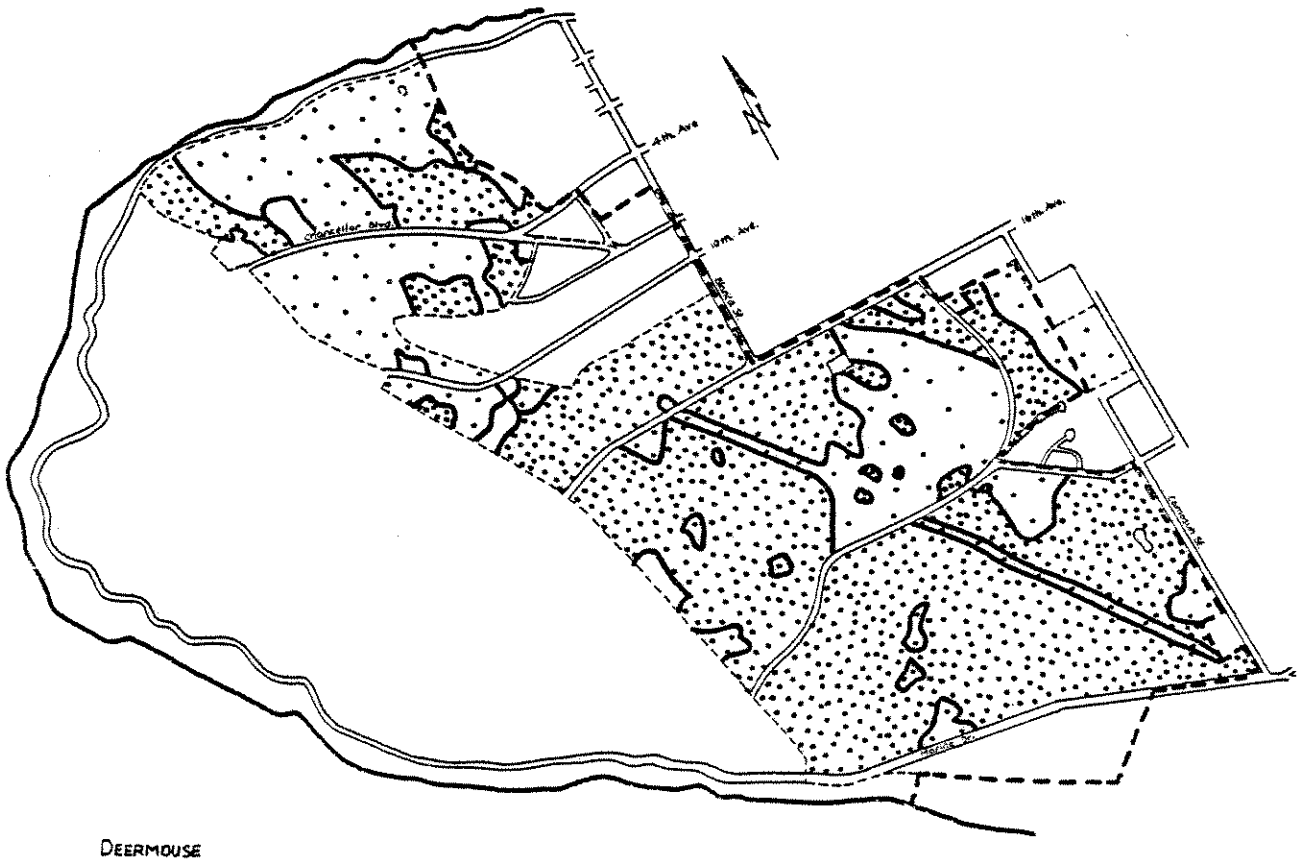
CHICKAREE
NORTHERN FLYING SQUIRREL



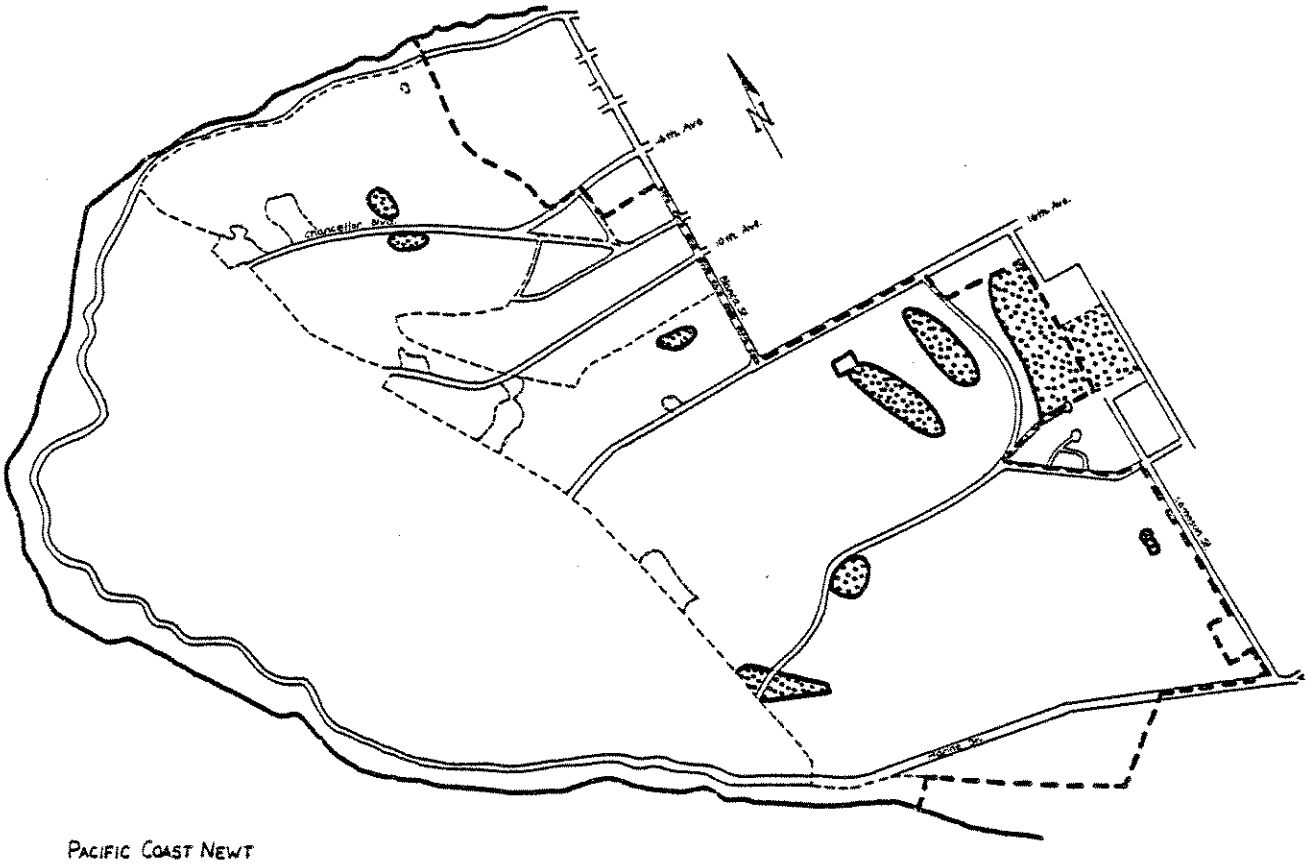
OREGON VOLE



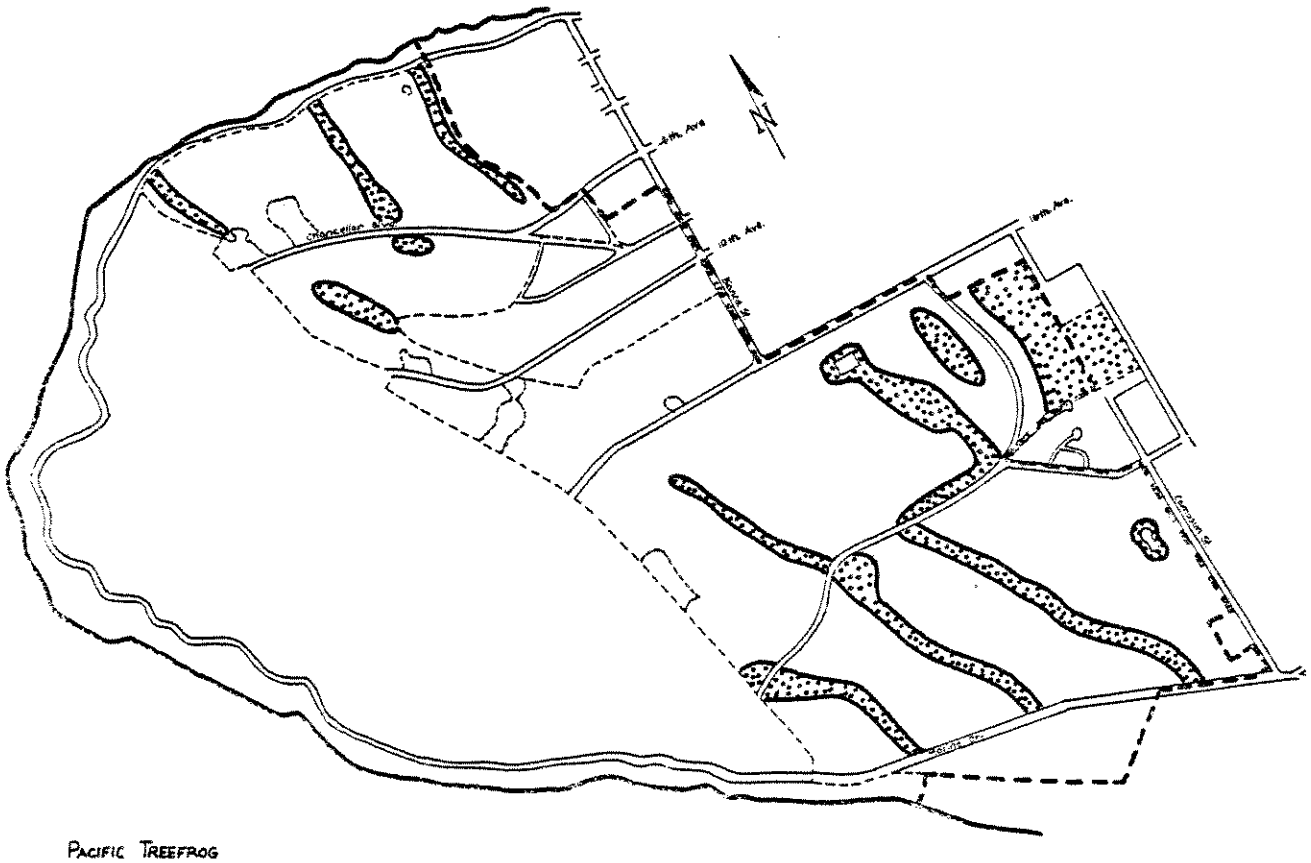
TOWNSEND VOLE



DEERMOUSE

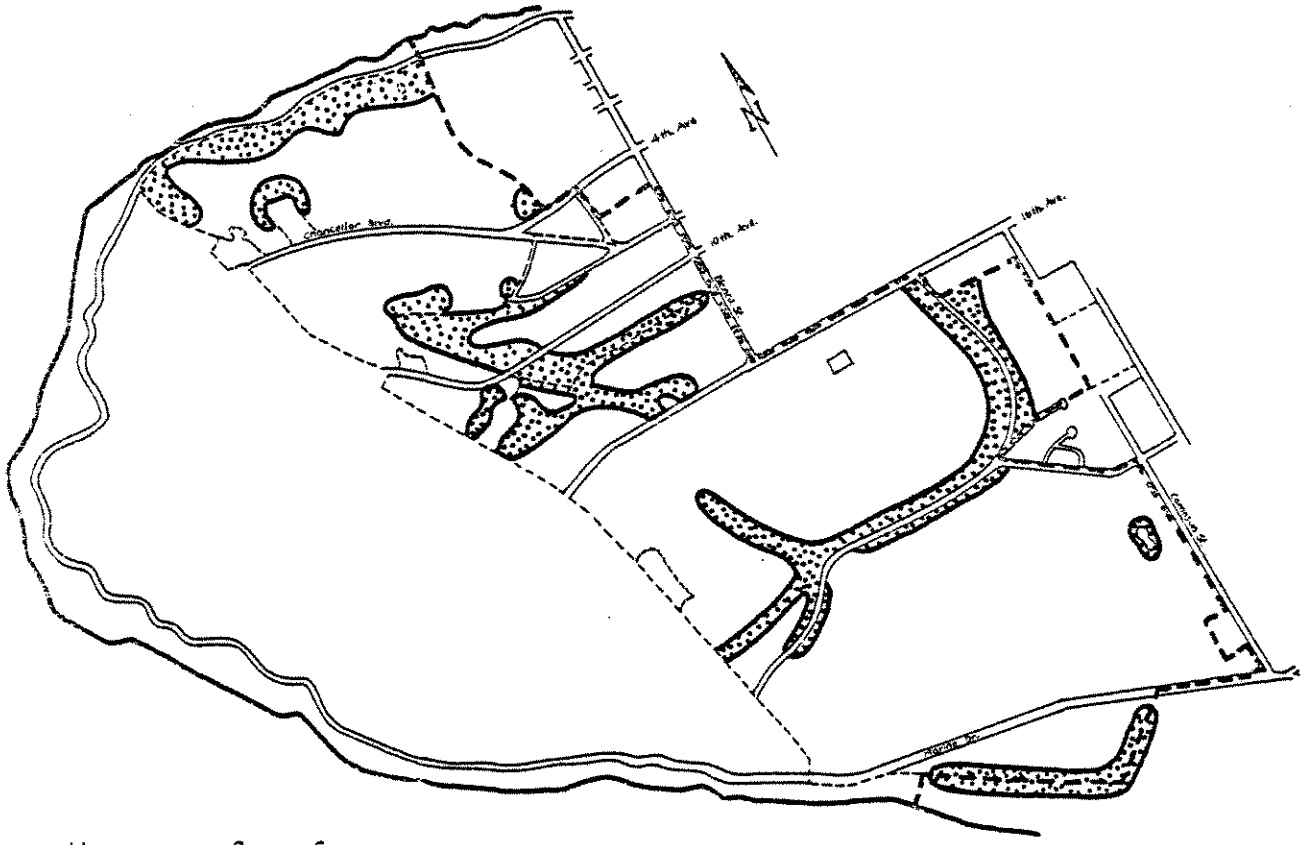


PACIFIC COAST NEWT

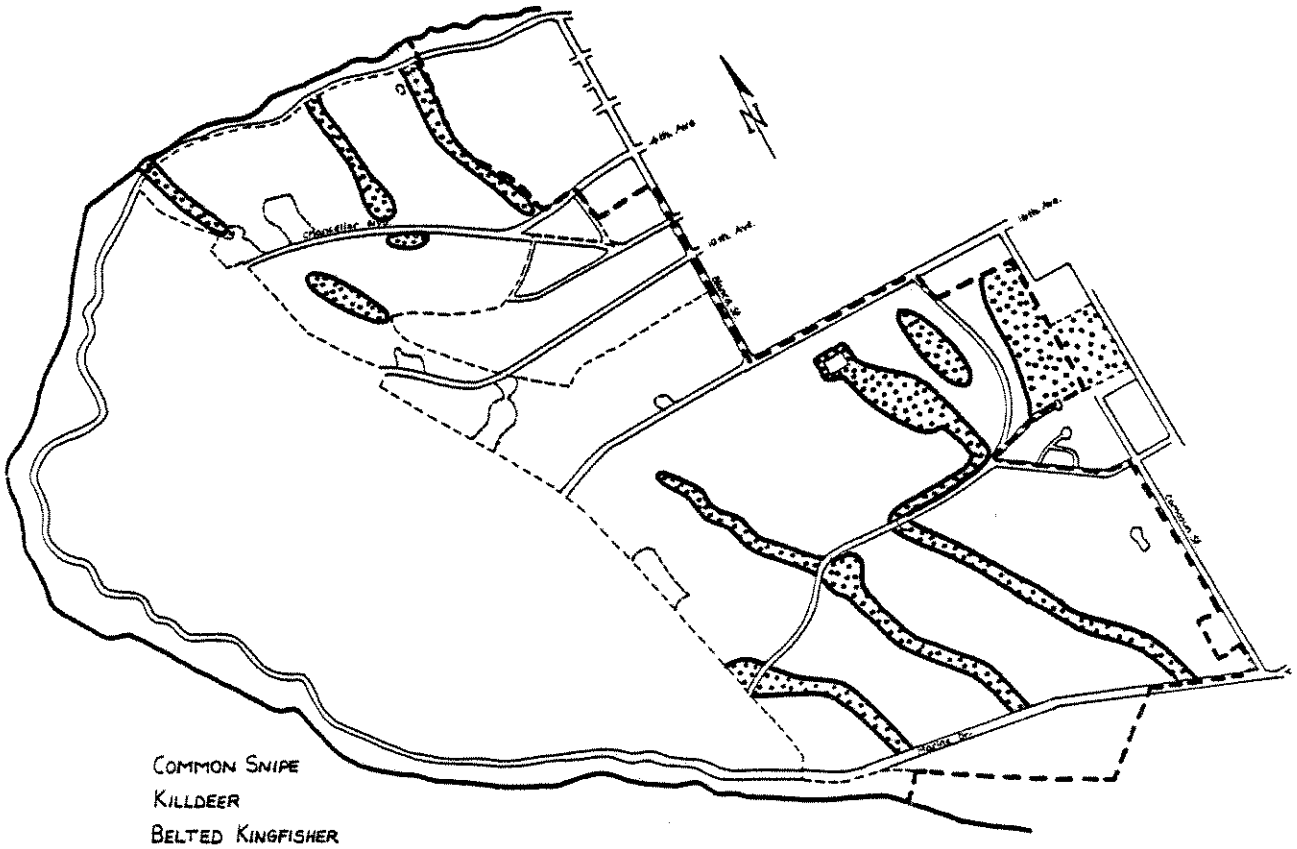


PACIFIC TREEFROG

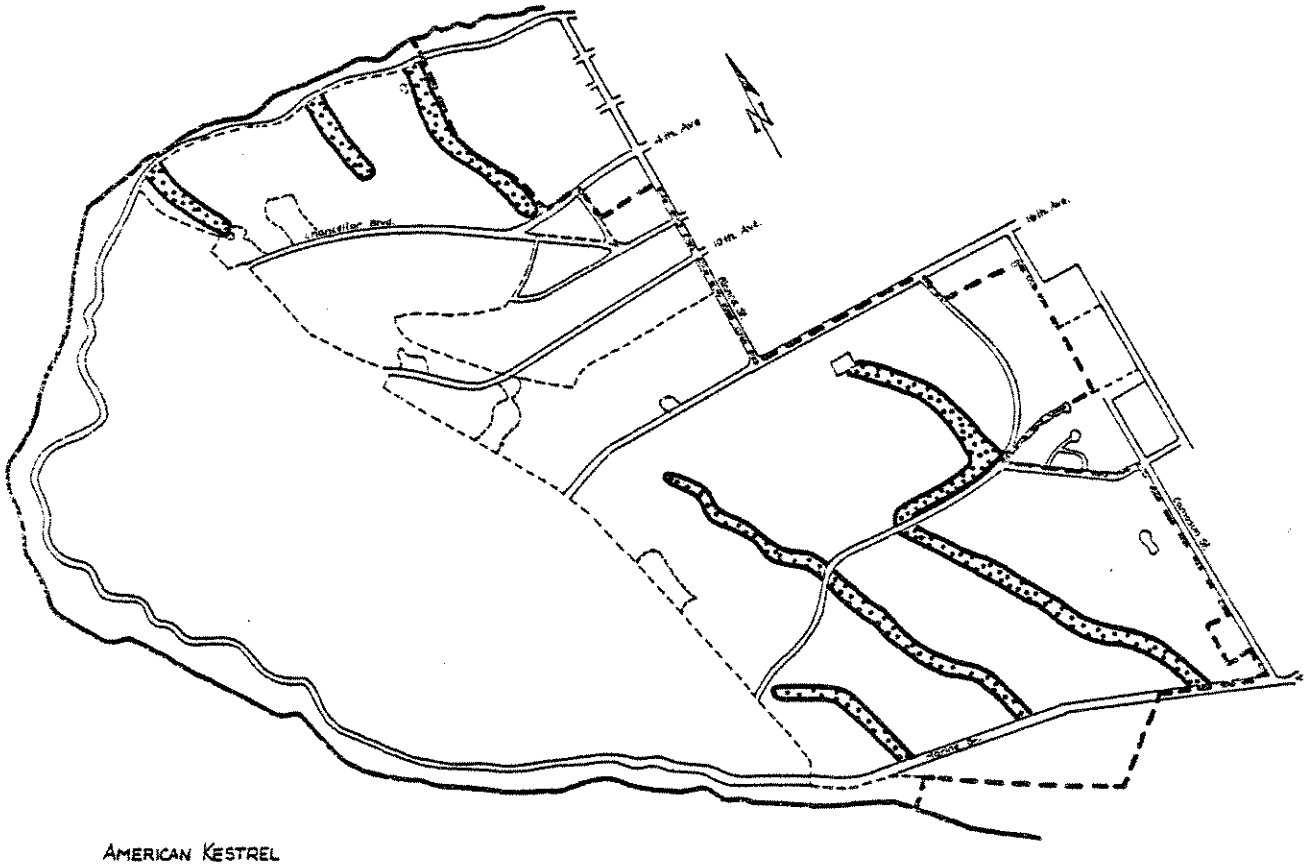
COMMON GARTER SNAKE



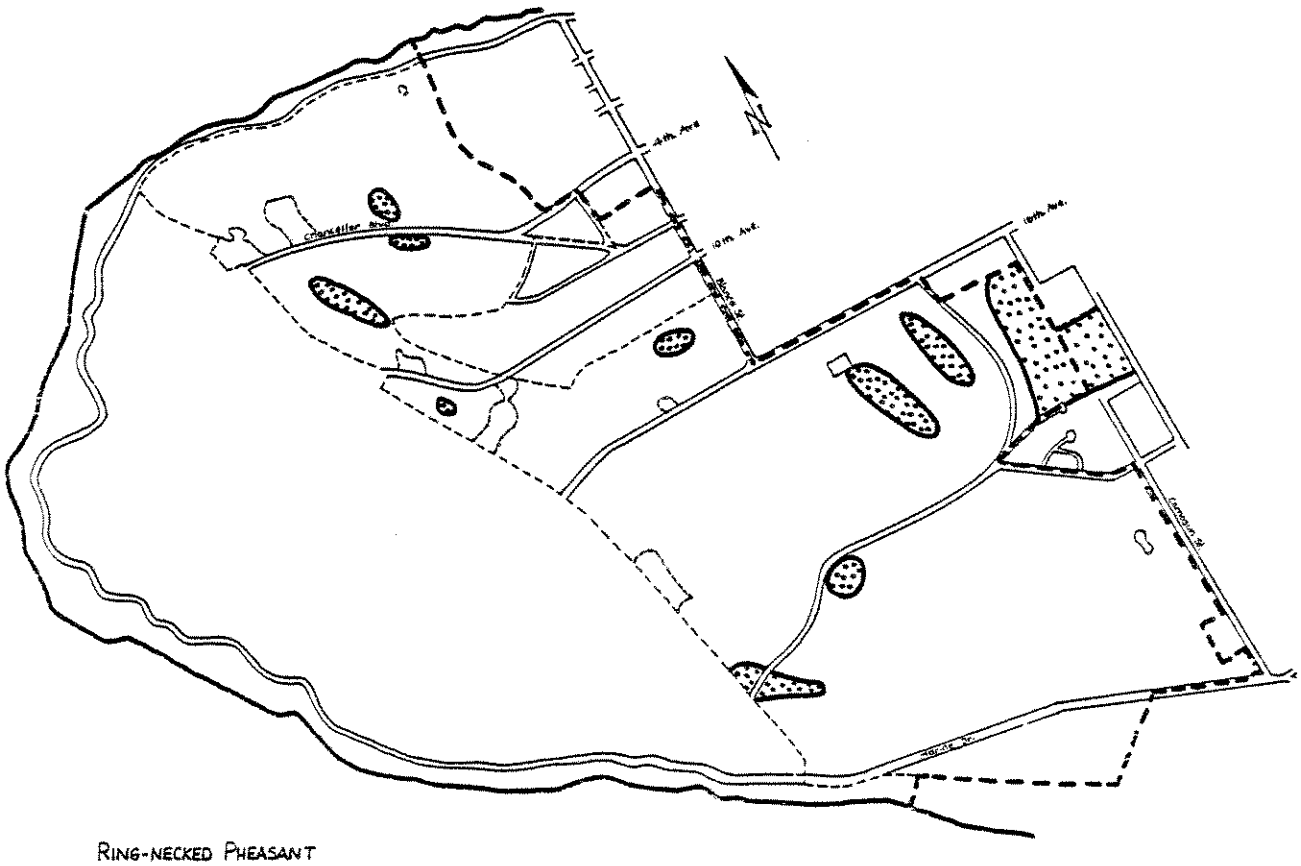
NORTHWESTERN GARTER SNAKE



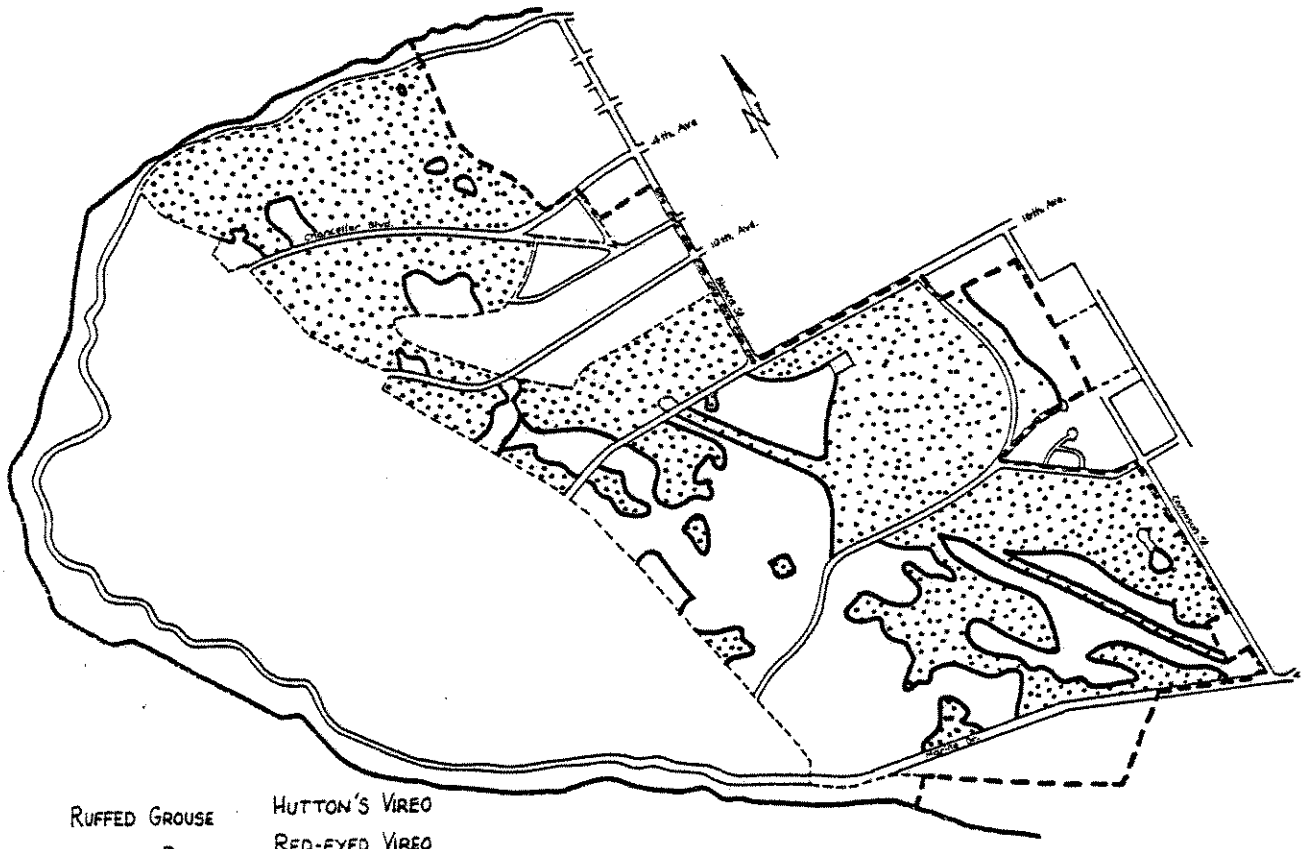
COMMON SNIPE
KILLDEER
BELTED KINGFISHER



AMERICAN KESTREL

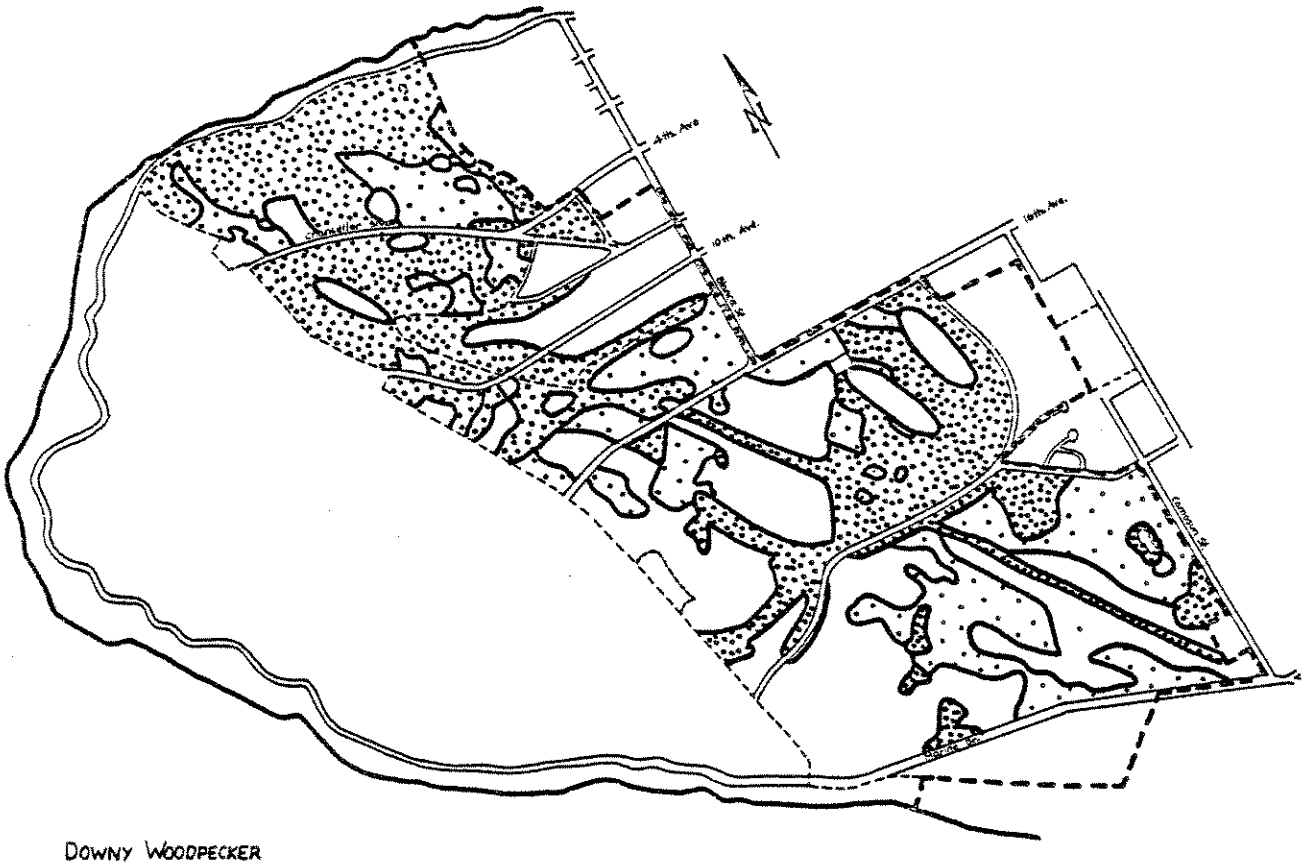


RING-NECKED PHEASANT

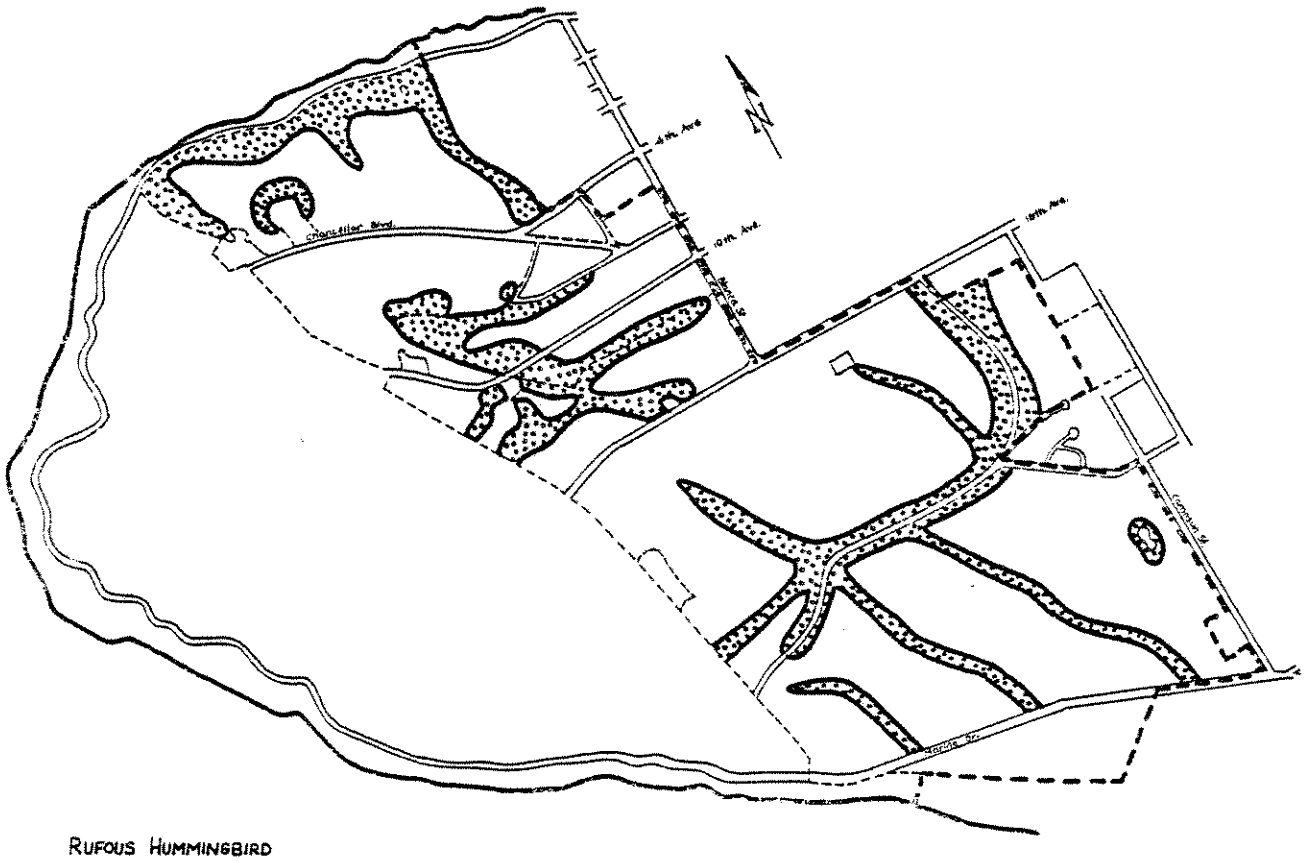


RUFFED GROUSE
COMMON BUSHTIT
HUTTON'S VIREO
RED-EYED VIREO
WARBLING VIREO

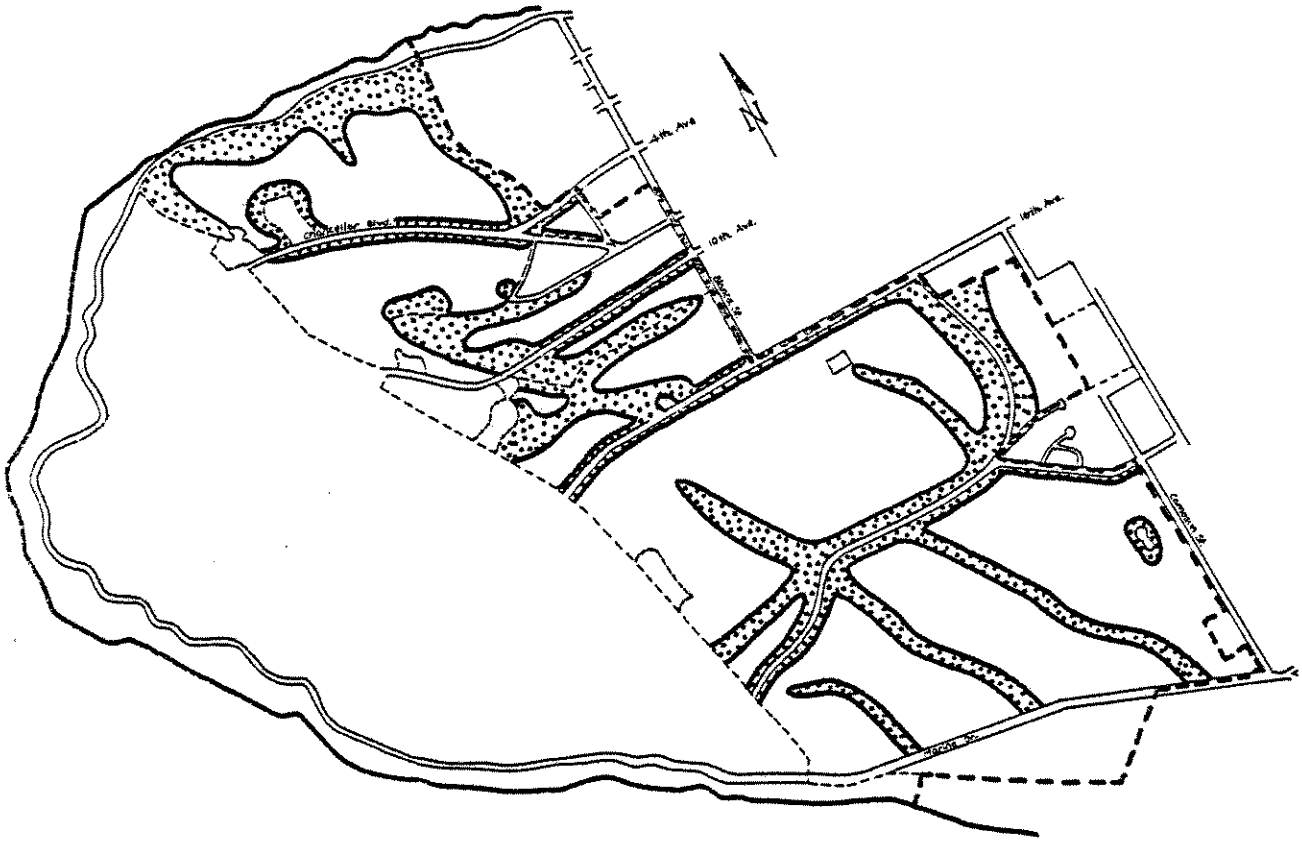
BLUE GROUSE
STELLER'S JAY
BROWN CREEPER
EVENING GROSBEAK
RED CROSSBILL



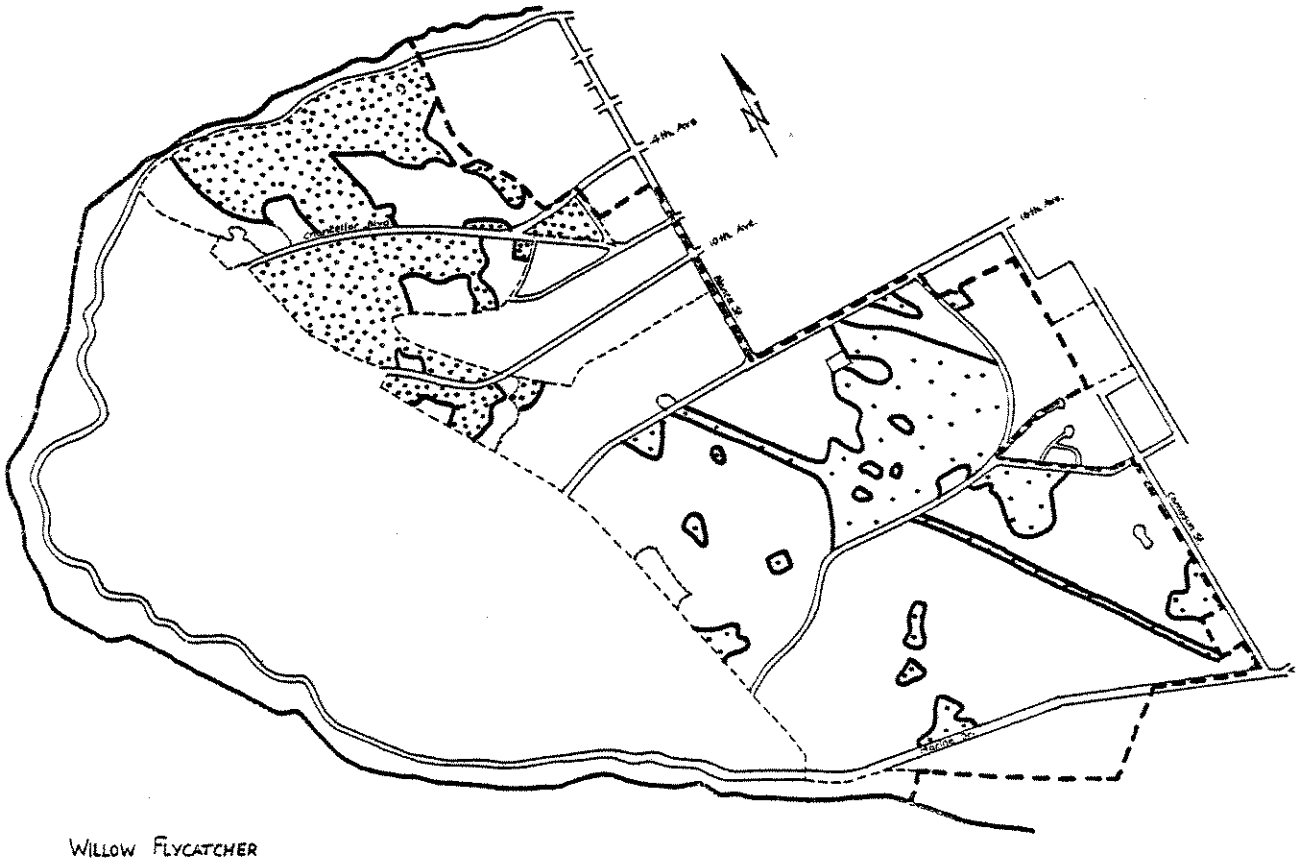
DOWNY WOODPECKER



RUFOUS HUMMINGBIRD



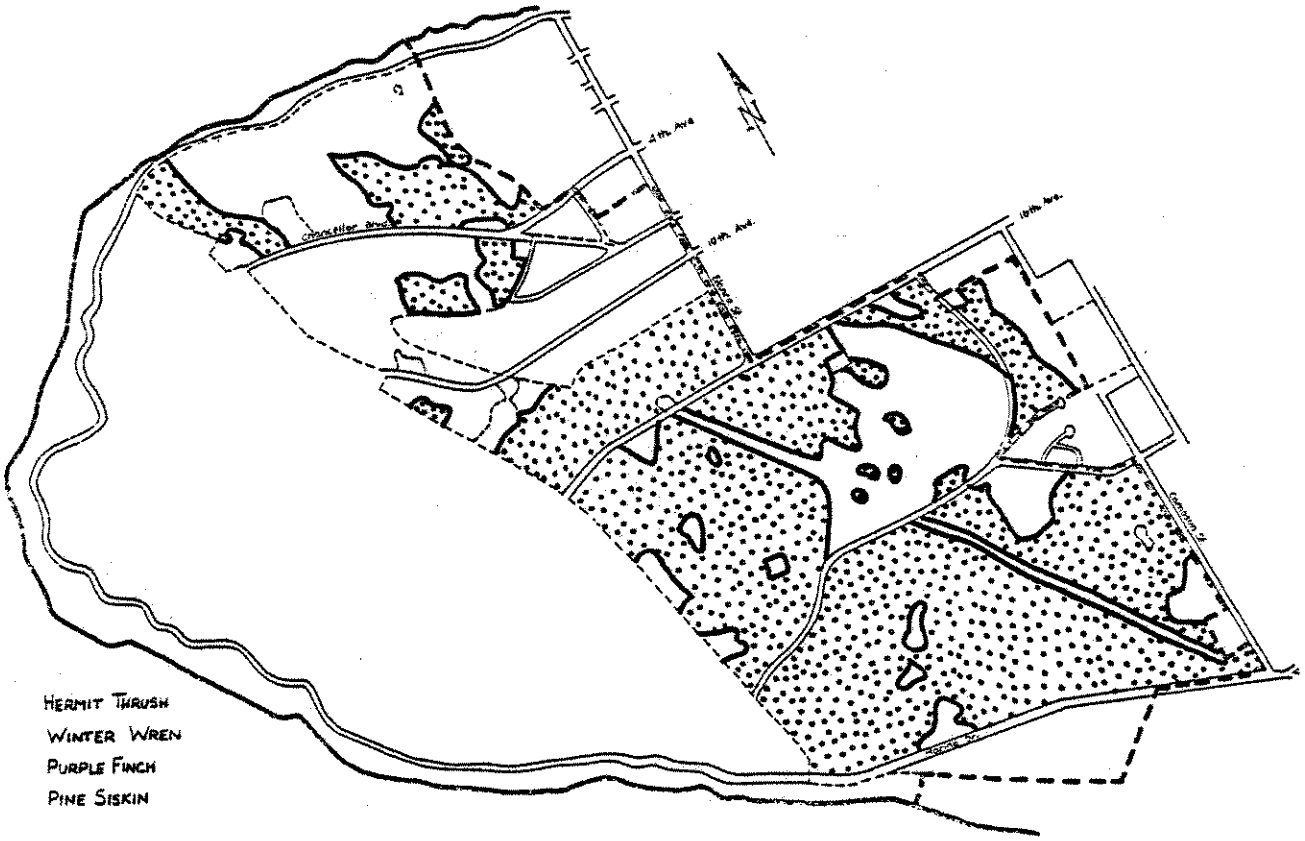
EASTERN KINGBIRD



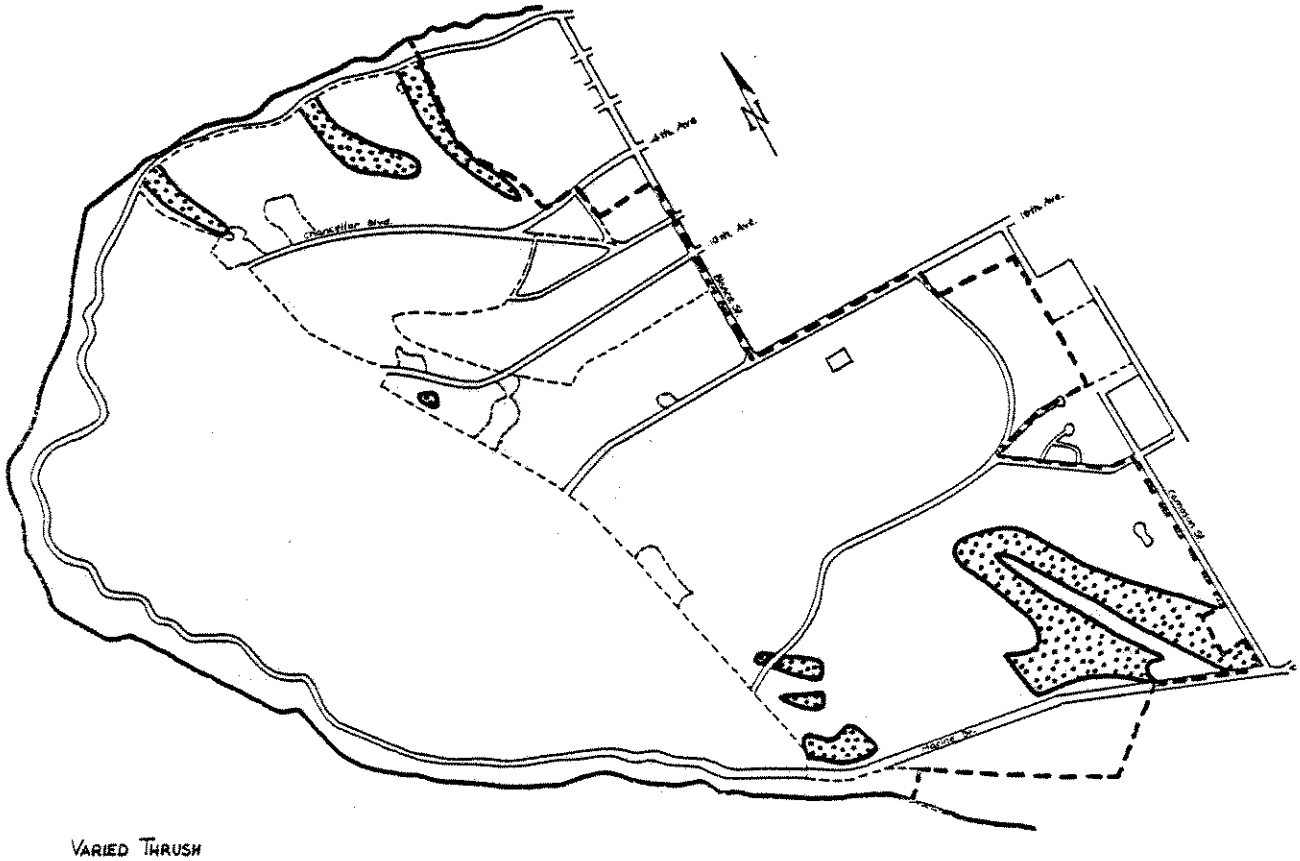
WILLOW FLYCATCHER

DUSKY FLYCATCHER
OLIVE-SIDED FLYCATCHER

SWAINSON'S THRUSH



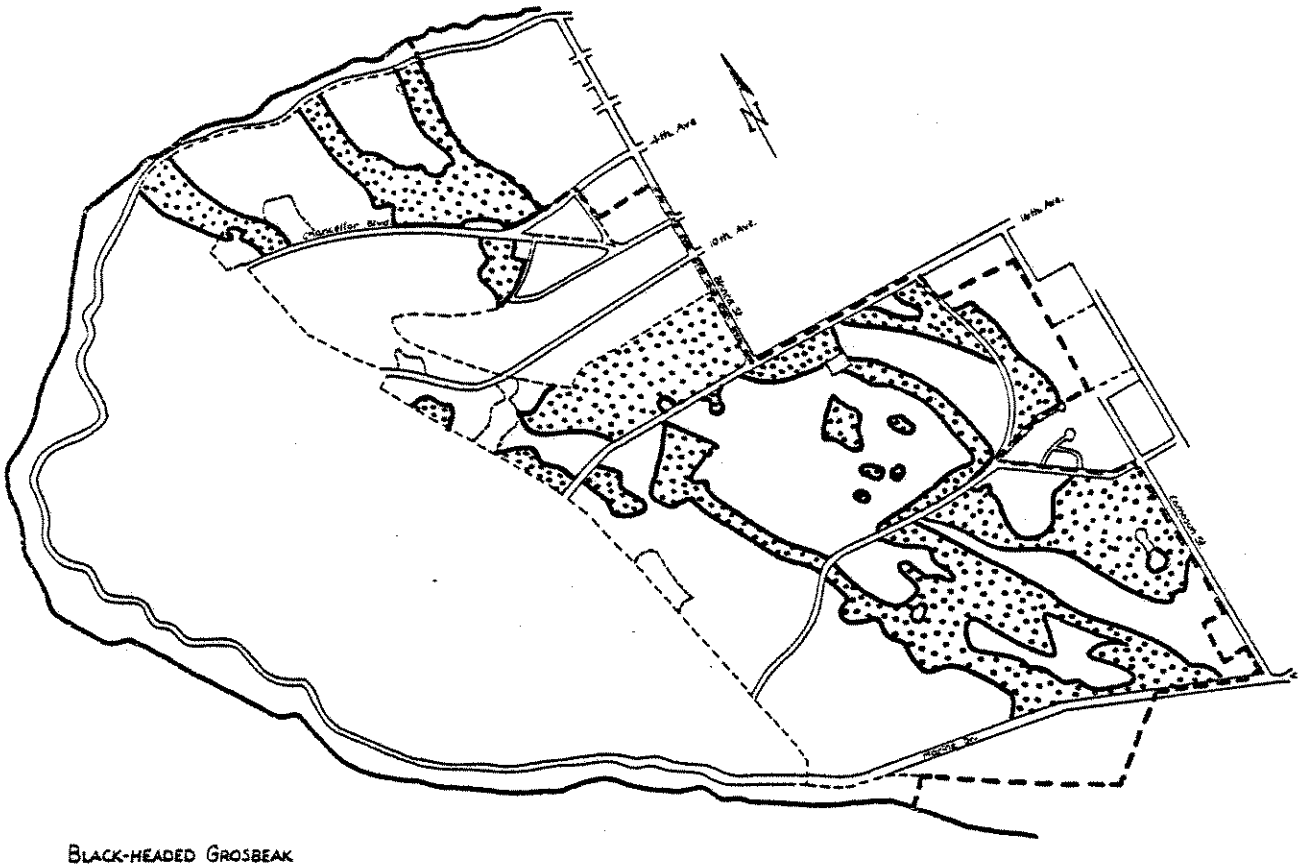
HERMIT THRUSH
WINTER WREN
PURPLE FINCH
PINE SISKIN



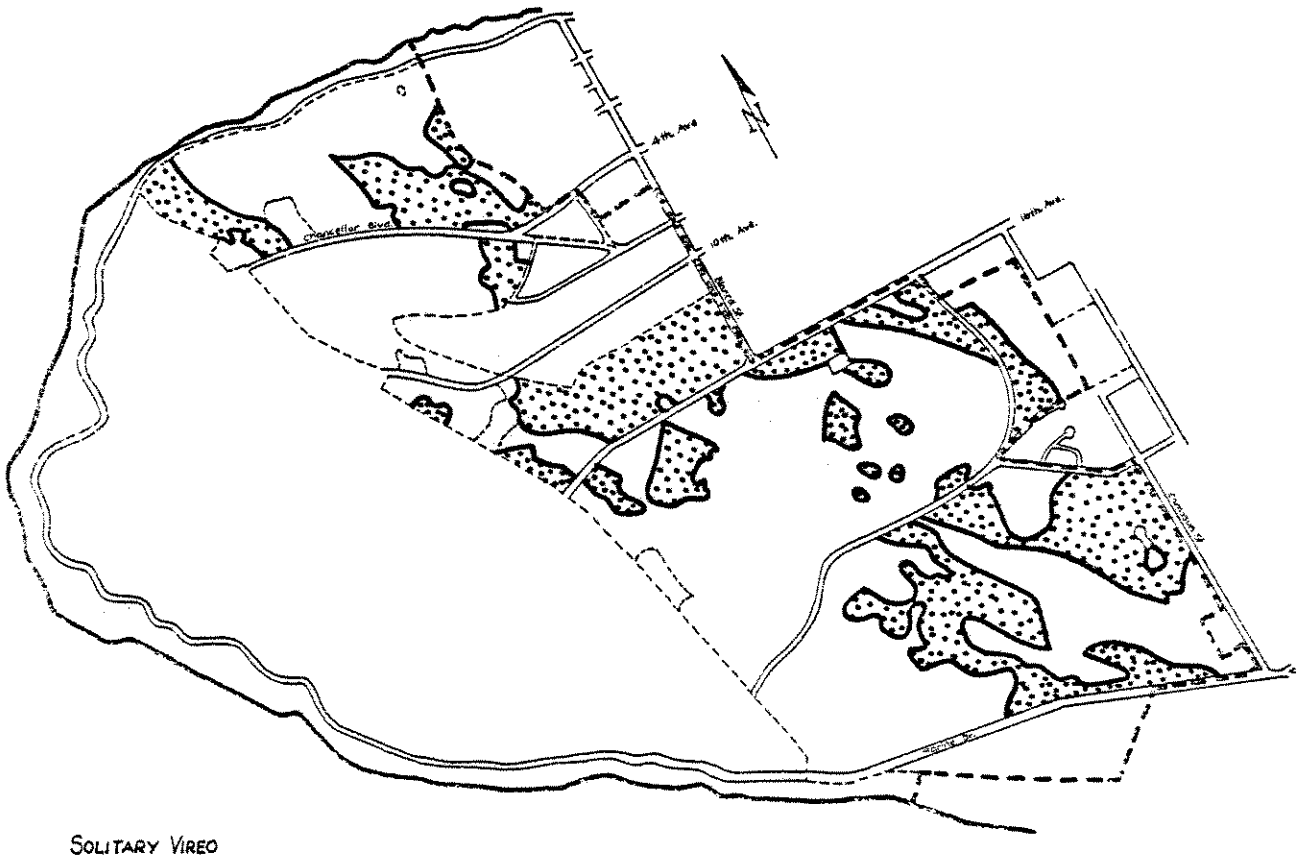
VARIED THRUSH

GOLDEN-CROWNED KINGLET
RUBY-CROWNED KINGLET
CHESTNUT-BACKED CHICKADEE
RED-BREASTED NUTHATCH
SHARP-SHINNED HAWK

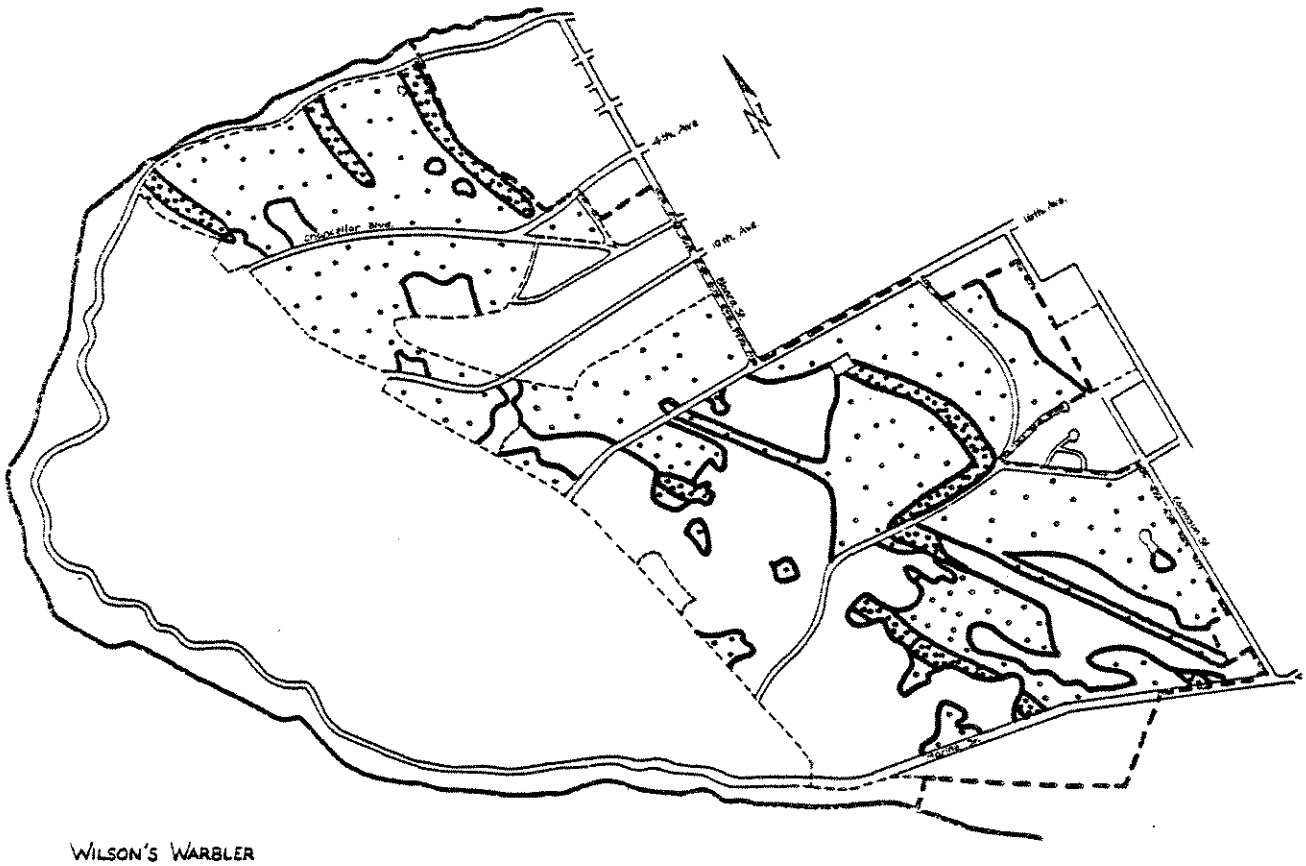
BLACK-CAPPED CHICKADEE



BLACK-HEADED GROSBEAK

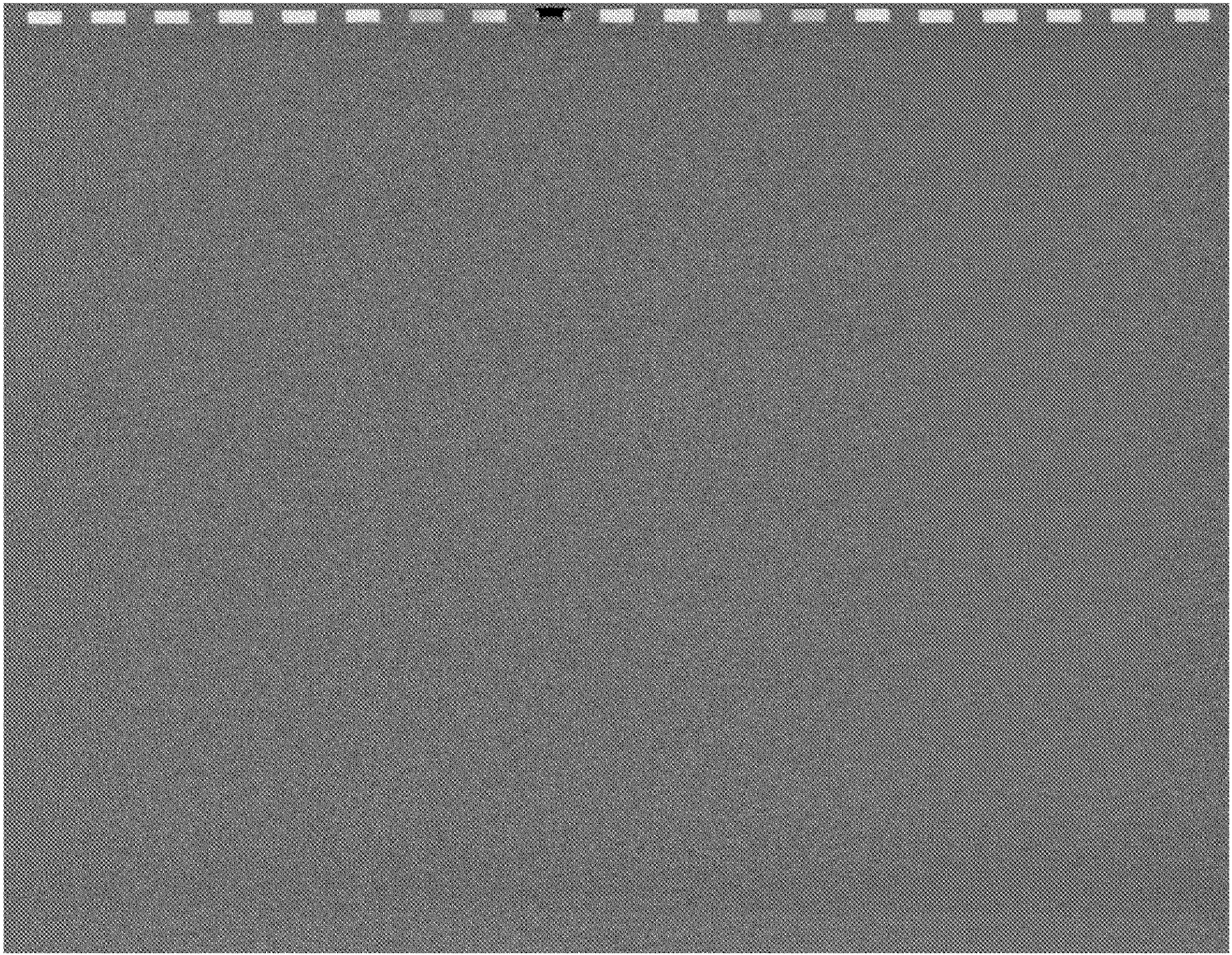


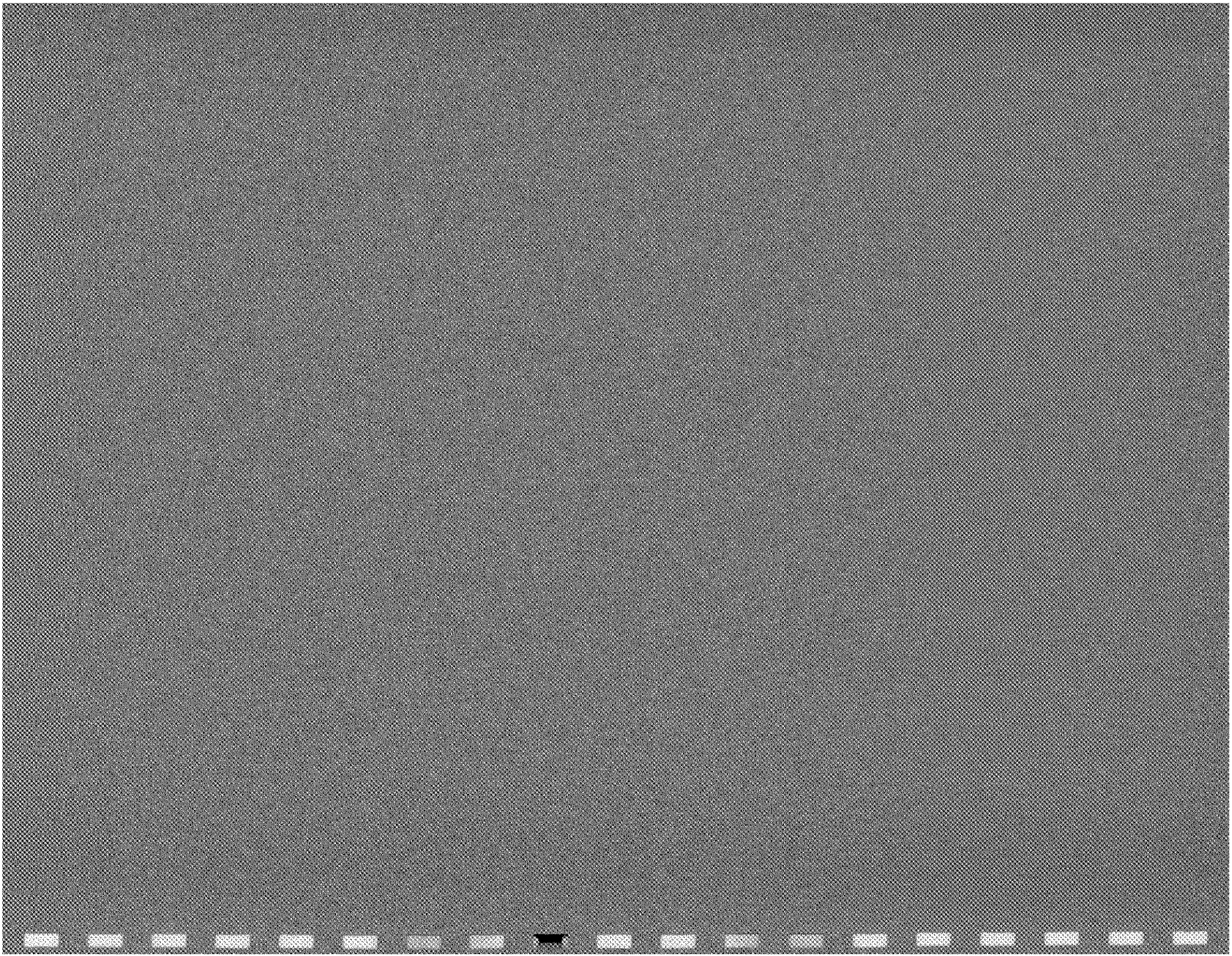
SOLITARY VIREO



WILSON'S WARBLER

BLACK-THROATED GRAY WARBLER





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APPENDIX: SPECIES IDENTIFICATION REFERENCES

Mammals

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