

Drizzle Lake

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ECOLOGICAL RESERVES COLLECTION  
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SEASONAL AND DIURNAL ABUNDANCE OF BIRDS AT DRIZZLE  
LAKE ECOLOGICAL RESERVE, QUEEN CHARLOTTE ISLANDS

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INTRODUCTION

The Ecological Reserves Program in British Columbia was established, in part, to provide benchmark areas for assessing long-term trends in terrestrial and aquatic ecosystems (Krajina et al. 1978). Recognition of changes ~~if present~~ will depend on retrieval of comprehensive historical data for each Reserve. To provide some baseline information on birds of Drizzle Lake Ecological Reserve, Queen Charlotte Islands, we have documented the numbers, habits and movement of all species associated with the lake over a period of 5 consecutive years. Although the results deal principally with the aquatic habitat, seasonal and nesting data for species observed in the bog and coniferous forest within the Reserve boundaries are also included.

are  
always  
changes

As well as providing baseline data, this study examines the extent to which coastal lakes are utilized by either marine or migrant species in different seasons. In summer, non-breeding loons (Gavia immer and G. stellata) show regular diurnal and seasonal movement between marine waters and lakes in this region (Heimchen and Douglas 1980). This work was carried out concurrent with investigations into evolutionary interactions between avian piscivores and freshwater fish (Heimchen 1980, in press).

not mutually  
exclusive.

STUDY AREA AND METHODS

The Drizzle Lake Ecological Reserve (53°56'N, 132°05'W, 1836.5 ha) is located at the eastern edge of the Argonaut Plain, an expanse of

Sphagnum bog and coniferous forest in the northeast corner of the Queen Charlotte Islands (Figure 1). The Drizzle Lake watershed was established as a Reserve in 1971, principally for its unusual population of threespine stickleback (Gasterosteus aculeatus) (Krajina et al. 1978). The 112 ha lake is deeply stained from bog run-off and has a substrate of sand and pebbles, although organic ooze is present in the bays near inlet and outlet streams. Fish species include the threespine stickleback, trout (Salmo clarki and Salvelinus malma) and juvenile salmon (Oncorhynchus kisutch). Macro-invertebrates are uncommon, apart from trichopteran and odonate larvae, which are locally abundant in some areas. Aquatic vegetation (Eleocharis acicularis, Lilaeopsis occidentalis, Juncus oreanus, J. filiformis and Luphar luteum) is sparse along a narrow band in shallow water. Shoreline vegetation includes Polytrichum commune, Vaccinium uliginosum, V. oxycoccus, V. vitus-idaea, Agrostis aequivallis, Carex obtusa and Gaultheria shallon. Approximately 25% of the Reserve is Sphagnum bog, characterized by Empetrum nigrum, Scirpus cespitosus, Vaccinium spp. and dwarf Pinus contorta. Open coniferous forest, dominated by Thuja plicata, Tsuga heterophylla and Chamaecyparis nootkaensis, occupies a further 50%.

For all bird species associated with the lake, records were maintained on number, distribution on the lake, arrivals and departures and general behaviour (foraging, drinking, preening, resting, etc.). Fifteen minute observation blocks were made with spotting scopes near dawn, mid-day and dusk at least one day per week for some 40 weeks

per year from 1978 to 1982. Since fog or storms often limited visibility, especially in fall and winter, numbers of individuals may be underestimated for some species. We present here maximum monthly numbers averaged over the number of years that a species was observed. Data on weekly counts for this period were placed in the Depository for Unpublished Data, CISTI, National Research Council of Canada, Ottawa, Ontario, Canada K1A 0S2. Total monthly and yearly "bird-days" (number of individuals X number of days observed) were calculated for each species, based on weekly, or in some cases, daily records. As some species exhibit regular diurnal movement to and from the lake, we categorize each as day occupant (D), night occupant (N) or continuous day and night (DN), the latter applicable to species which arrive on the lake and remain continuously for 2 or more days. Foraging activity is described as (0) absent, (1) occasional, representing less than 10% of all sightings and (2) common, more than 10% of all sightings.

Bird species present in the bog and forest were noted throughout the year. Breeding activity was assessed by the presence of nests or flightless young. We have not estimated numbers or density for the terrestrial habitat, apart from the larger species such as Bald Eagle, Common Raven and Sandhill Crane.

## RESULTS

Summarized data for each species is shown in Table 1. From 1978 to 1982, 67 bird species were observed on the Reserve. Thirty-four of these were associated with the aquatic habitat: loons (3 species), grebes (4), cormorant (1), swan (1), geese (2), ducks (15), shorebirds (3), gulls (2), murrelet (1), dipper (1) and kingfisher (1). Breeding was confirmed for Red-throated Loon, Canada Goose, Mallard, Green-winged Teal and Hooded Merganser and suspected in Great Blue Heron and Marbled Murrelet. There were 33 species associated with the bog and forest surrounding the lake: hawk (2 species), eagle (1), grouse (1), crane (1), hummingbird (1), owl (1), woodpeckers (3) and perching birds (23). Breeding is confirmed or suspected in 25 of these.

### seasonal abundance

Most of the species observed on the lake, although non-breeding, generally exhibited a consistent seasonal occurrence and numerical abundance between years. Common Loons have a peak abundance in July, with maximum numbers ranging from 27 to 60 during the 5 years. Red-throated Loons are present daily from April to August inclusive, and maximum numbers ranged from 11 to 20 in different years. There were from 1 to 5 Red-necked Grebes, Horned Grebes and Hufflehead on the lake from October to April of each year, with numbers increasing slightly in April, prior to their departure from the lake. The Double-crested Cormorant occurred between February and April, with only 1 to 3 individuals present at any time. In early spring,

approximately 30 (range between years, 15 - 75) male and female Common Mergansers occupied the lake; in fall, maximum numbers ranged from 85 - 124 between years, the majority of the birds in immature plumage. Mallards had similar seasonal peaks, with November maximums of 100 - 200 birds over the 5 years.

Canada Geese associated with Erizzle Lake belong to several sub-groups, including breeding pairs, sub-adult congregations during molt, small resident flocks who move irregularly between the lake or bog and the ocean, and migratory flocks. Flocks are frequent from mid-September to the beginning of November in south-east migration over the lake. On 2 October 1981, 22 flocks (40 - 270 birds per flock) were observed between 1200 h and 1900 h, with additional flocks heard throughout the night. Similar peak movement was observed on 12 October 1978, 12 October 1980 and 15 October 1982. While flocks in September and early October never stopped at the lake, several flocks in late October and early November in 3 of the 5 years landed and remained for several days. Resident geese did not join any of these migrant flocks.

Species numbers were highest in April (Figure 1), due mainly to the presence of migrants, and lowest in December and January when the lake is occasionally frozen. Total numbers of individuals (bird-days) generally increased throughout the year, reaching a maximum in October, with minor modes in April and July (Figure 2). The major contribution to these seasonal changes are the 5 most common species: Mallard (7820 bird-days), Canada Goose (4858), Common

Merganser (3553), Red-throated Loon (1884) and Common Loon (1626). Large flocks of Mallards and Common Mergansers account for the increase in bird-days in late fall.

#### Diurnal occurrence

Some species show a regular daily movement between the lake and nearby marine waters. Red-throated Loons, Common Mergansers, and Glaucous-winged Gulls are primarily night residents, arriving on the lake near dusk and departing again the following morning, mergansers usually before dawn and loons 1 - 3 hours after sunrise. gulls? Common Loons and Mallards are principally day occupants; the former arrive near dawn, reaching peak abundance by mid-morning, while the latter generally arrive near mid-day. Other species, such as Double-crested Cormorant, Canada Goose, Lesser Scaup, White-winged Scoter, Bald Eagle and Belted Kingfisher, also make daily transits from ocean to lake, but arrive and depart at irregular times.

#### Foraging activity

Fourteen species foraged regularly, and 6 species, only occasionally, on the lake; 13 of these are piscivores. Bufflehead and Green-winged Teal commonly foraged in littoral zones; Canada Geese foraged on shoreline sedges (Carex spp., Juncus spp.) and on sedges and berries (Empetrum nigrum, Vaccinium spp.) in adjacent bogs. During summer low water, the lakeshore is also used by waders and by species normally found in the bog and forest, such as Hermit Thrush, Savannah Sparrow and Dark-eyed Junco. These take teneral damselflies and emerging caddisflies. During short periods in late July and early

August, up to 180 Common Ravens congregated on the lakeshore and were observed feeding on aggregations of winged ants which have washed ashore following a major emergence during this period. Bald Eagle is the only raptor commonly associated with the lake and on 2 occasions has been observed capturing Red-throated Loons.

#### Principal categories of lake utilization

Species which use the aquatic habitat can be separated into three categories: migrant stop-overs, which occur for short period (<5 days per year) during major migration, seasonal residents, both breeding and non-breeding, which remain on the lake for extended periods (1 week - 3 months) and daily itinerants, which travel to and from the ocean on a daily basis. Summarized data (Table 2) show that approximately half of the species (18/35) use the lake as a migratory stop-over, yet they rarely forage, and account for only 0.7% of the total yearly bird-days. The 12 species of resident birds forage regularly, contributing 20% to the yearly bird-days; of the daily itinerants, those which forage frequently (6 species) account for 21.0%. By far the greatest use of the aquatic habitat (57.9%) is made by non-foraging itinerants, principally Red-throated Loons, Mallards, Common Mergansers and Glaucous-winged Gulls.

#### DISCUSSION

The majority of the species observed on the Brizzle Lake Reserve are within their known breeding, migrating or winter ranges (Bellrose



1942, Godfrey 1966). One exception is the Green-winged Teal, which has not been previously reported as breeding on the Queen Charlotte Islands (Godfrey 1966). It is unlikely that this represents a recent extension of its breeding range, since juvenile teal were observed on an interior lake in 1919 (Patch 1922). The single Pied-billed Grebe at the lake, present for 2 weeks in 1 of 5 years, is north of its coastal summer and winter ranges.

Although this study is the first detailed survey of birds within the Argonaut Plain, many of the species observed on the Reserve were noted during early, primarily coastal, surveys on the Queen Charlottes (Osgood 1901, Patch 1922, Darcus 1930, Cumming 1931). The assemblage of bird species and their seasonal occurrence is probably representative of many of the bog lakes in the region. Most species were also observed on an 18 ha bog lake 30 km south (Heimchen 1980 and unpublished data). We have found that the diurnal movements of Common and Red-throated Loons at other lakes on the Argonaut Plain are comparable to those observed at Drizzle Lake (Heimchen and Douglas 1980). However, additional species or varying abundance may be expected in lakes with different shoreline characteristics, such as mud flats or more littoral vegetation. We have found Semi-palmated Plover breeding in an adjacent watershed.

The results of the study indicate that the lake is used extensively by foraging piscivores; threespine stickleback are the major prey for such of these species (Heimchen, in preparation). An unexpected result of the study, however, was that the major habitation of the lake, with respect to total bird-days, was by non-foraging birds which moved to and from the ocean on a daily basis. These species,

presumably, do the majority of their feeding on the ocean and in estuaries. That individuals return to freshwater rather than remain on their foraging habitat may suggest a requirement of freshwater in the diet or for plumage maintenance, since each of the species drinks and preens extensively following their arrival on the lake. Lakes also have the advantage of lack of disturbance from tidal movement and probably have lower densities of predators (mammals, raptors and large fish) than the coastline or open ocean.

While human disturbance of the habitats in the interior of the Argonaut Plain has been minimal, significant ecological changes have occurred over the past 50 years. Black-tailed deer (Odocoileus hemionus), introduced to the Queen Charlotte Islands near the turn of the century, are now abundant throughout the region, resulting in severe cropping of some shrubs (Vaccinium parvifolium, Gaultheria shallon) and conifer seedlings (Thuja plicata, Chamaecyparis nootkaensis) (Pojar et al. 19 ). Beaver, <sup>*(Castor canadensis)*</sup> introduced in 1949, occupy all watersheds in the Argonaut Plain (personal observation) and have greatly reduced already sparse numbers of deciduous trees (Alnus rubra, Pyrus fusca). Damming of streams and inundation of lake banks has altered limnological characteristics and distribution of fish species in some lakes (Reimchen 1982). The cumulative effect of these introduced species, while not yet observable with respect to bird diversity, can be expected to alter the existing species assemblages through time. The current survey on the Brizzle Lake Ecological Reserve indicated relatively consistent numbers and seasonal occurrence for many species and

provides a preliminary effort for assessment of long-term changes in these habitats.

Table 1. Seasonal abundance and occurrence of birds on the Drizzle Lake Ecological Reserve, Queen Charlotte Islands 1978-1982. For all aquatic species, figures show mean monthly maximum between years and maximum observed (in brackets). Non-aquatics indicated as present(+), not observed(-) or not observed but suspected(?) at monthly intervals. Yr- number of years present from 1978 to 1982; Ne- nesting activity indicated as present(+), not observed(-) or suspected(?); Di- diurnal occupation by aquatics, principally daylight(D), principally twilight and darkness(N), and full day and night occupancy(DN). <sup>V-variable</sup> Fo- foraging activity, not observed(O), occasional(1) and common(2). All data <sup>in</sup> ~~for~~ December limited to 1979 showing maximum observed.

Insert  
before  
Yr-

IBD- total individual bird days.

#	Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	IED	Yr	Sex	Age	FC
1	Common Loon <u>Gavia immer</u>	0	0.2 (1)	0.2 (1)	0.6 (1)	1.0 (3)	14.0 (24)	42.4 (60)	13.8 (24)	1.7 (3)	1.8 (5)	0.8 (2)	0	1626	5	-	D	2
2	Arctic Loon <u>G. arctica</u>	0	0	0	0	0	1	1	0	0	0	0	0	30	1	-	DN	2
3	Red-throated Loon <u>G. stellata</u>	0	0	0.4 (1)	8.4 (12)	11.8 (15)	11.0 (16)	14.6 (19)	13.2 (20)	2.6 (5)	0	0	0	1884	5	+	N	1
4	Red-necked Grebe <u>Podiceps grisegena</u>	0.2 (1)	0.2 (1)	0.4 (1)	1.8 (8)	1.6 (7)	0	0.2 (1)	0.4 (1)	1.8 (2)	3.0 (4)	0.8 (2)	1	341	5	-	DN	2
5	Horned Grebe <u>P. auritus</u>	0	0.2 (1)	0.2 (1)	0.6 (2)	0.2 (1)	0	0	0	0.4 (1)	1.2 (4)	0.2 (1)	0	91	5	-	DN	2
6	Western Grebe <u>Aechmophorus occidentalis</u>	0	0	0	0	0	0	0	0	1	0	0	0	2	1	-	DN	1
7	Pied-billed Grebe <u>Podilym. podiceps</u>	0	0	0	0	1	0	0	0	0	0	0	0	17	1	-	DN	2
8	Double-crested Cormorant <u>Phalacrocorax auritus</u>	0	0.3 (1)	1.5 (3)	1.0 (2)	0	0	0	0	0	0	0	0	85	5	-	V	2
9	Great Blue Heron <u>Ardea herodias</u>	0	0	0.6 (1)	0.2 (1)	0	0.4 (1)	0.2 (1)	0	0	0	0	0	43	4	?	N	1
10	Trumpeter Swan <u>Olor buccinator</u>	0.2 (1)	0	1.4 (5)	7.2 (22)	0	0	0	0	0	0	2.4 (9)	0	11	5	-	V	0
11	Canada Goose <u>Branta canadensis</u>	6.0 (12)	4.0 (12)	4.2 (12)	4.8 (12)	6.6 (13)	17.0 (47)	26.6 (52)	30.8 (52)	21.2 (32)	14.4 (24)	16.5 (33)	15	4858	5	+	DN	2
12	White-fronted Goose <u>Anser albifrons</u>	0	0	0	0	0	0	0	0	1	0	0	0	1	1	-	-	0
13	Mallard <u>Anas platyrhynchos</u>	0.6 (2)	15.8 (50)	1.6 (6)	6.0 (20)	2.5 (4)	6.8 (30)	0.2 (1)	1.0 (3)	7.4 (15)	56.8 (110)	112.5 (202)	100	7820	5	+	D	0
14	Pintail <u>A. acuta</u>	0	0	0	1.5	0	0	0	0	3	0	0	0	33	2	-	V	0
15	Green-winged Teal <u>A. carolinensis</u>	0	0	0	6.0 (20)	1.8 (2)	11.6 (8)	1.4 (7)	2.5 (6)	2.2 (4)	2.0 (6)	0	0	425	4	+	DN	2
16	American Widgeon ( <u>Mareca americana</u> )	0	0	0	7.5 (15)	0	0	0	0	2.0 (4)	2.5 (5)	0	0	31	2	-	V	0

	J	F	M	A	M	J	J	A	S	O	N	D	190	Yr	Ne	Di	Po
17 Shoveler <u>Spatula clypeata</u>	0	0	0	1.3 (4)	3.0 (6)	0	0	0	0	0	0	0	17	3	-	V	0
18 Ring-necked Duck <u>Aythya collaris</u>	0	0	1.0 (2)	3.5 (7)	0	0	0	0	0	0	0	0	14	2	-	V	0
19 Lesser Scaup <u>A. affinis</u>	0	0	0	0.4 (2)	6.0 (10)	3.6 (8)	0.3 (1)	0.3 (1)	1.6 (5)	0.3 (1)	1.6 (5)	2	208	5	-	V	1
20 Common Goldeneye <u>Bucephala clangula</u>	0	0	0.6 (2)	0	0	0	0	0	0.3 (1)	0	1.0 (3)	0	11	3	-	V	0
21 Bufflehead <u>B. albeola</u>	0.6 (2)	1.0 (2)	3.0 (5)	6.4 (12)	3.0 (5)	0	0	0	0	3.0 (6)	1.0 (2)	2	608	5	-	DN	2
22 Oldsquaw <u>Clangula hyemalis</u>	0.2 (1)	0.2 (1)	0.6 (1)	0.4 (1)	0.2 (1)	0	0	0	0	0	0.2 (1)	1	61	4	-	DN	2
23 White-winged Scoter <u>Melanitta deglandi</u>	0	0.2 (1)	0.2 (1)	1.0 (3)	2.0 (2)	0.4 (2)	1.0 (2)	0.4 (2)	0.6 (1)	11.4 (50)	3.2 (15)	0	207	5	-	V	
24 Surf Scoter <u>M. perspicillata</u>	0	0	0	0.7 <sup>20</sup> (1)	0	0	0.7 (1)	0	1.3 (3)	0	0	0	8	3	-	V	0
25 Hooded Merganser <u>Lophodytes cucullatus</u>	0	0	0	0.5 (2)	0.3 (1)	0.5 (1)	0.5 (1)	3.3 (7)	4.0 (6)	4.5 (4)	10	0	322	4	+	DN	2
26 Common Merganser <u>Mergus merganser</u>	0.8 (3)	1.2 (3)	6.8 (22)	10.2 (12)	30.0 (75)	0.5 (1)	0.2 (1)	0	56.5 (104)	88.5 (124)	0.8 (2)	4	3563	5	-	N	1
27 Red-breasted Merganser <u>M. serrator</u>	0	0	1	0	0	0	0	0	0	0	0	0	1	1	-	N	0
28 Sharp-shinned Hawk <u>Accipiter gentilis</u>	-	-	-	-	-	-	-	+	+	+	-	-	-	3	?		
29 Red-tailed Hawk <u>Buteo jamaicensis</u>	-	-	-	-	-	-	+	-	-	-	-	-	-	1	-		

	J	F	M	A	M	J	J	A	S	O	N	Yr	Yr	No	SI	FO	
34 35 } Spotted Sandpiper <u>Actitis macularia</u>	-	-	-	-	-	-	-	1	1	-	-	-	55	2	-	V	2
30 Bald Eagle <u>Haliaeetus leucocephalus</u>	+	+	+	+	+	+	+	+	+	+	+	+	-	5	-	V	1
31 Blue Grouse <u>Dendragapus obscurus</u>	+	+	+	+	+	+	+	+	+	+	+	+	-	5	+		
32 Sandhill Crane <u>Grus canadensis</u>	-	-	-	+	+	+	+	+	+	+	-	-	-	5	+		
33 Wandering Tattler <u>Numenius phaeopus</u>	0	0	0	0	1	0	0	0	0	0	0	0	2	1	-		2
35 Greater Yellowlegs <u>Totanus melanoleucus</u>	0	0	0	0	0	0	1	1	1	0	0	0	84	3	-	V	2
36 Glaucous-winged Gull <u>Larus glaucescens</u>	0	0	0.4 (2)	3.8 (5)	2.0 (2)	3.4 (8)	3.6 (6)	3.5 (5)	2.0 (2)	0	0.4 (2)	0	581	5	-	N	0
37 Bonaparte's Gull <u>L. philadelphia</u>	0	0	0	0	0	0	1	0	0	0	0	0	1	1	-	D	0
38 Marbled Murrelet <u>Brachyramphus marmoratum</u>	0	0	0	0	0	0	2	0	0	0	0	0	-	2	?	N	0
39 Saw-whet Owl <u>Aegolius acadicus</u>	-	-	+	+	+	+	+	+	+	+	-	-	-	5	+		
40 Rufous Hummingbird <u>Selasphorus rufus</u>	-	-	-	+	+	+	+	+	-	-	-	-	-	5	?		
41 Belted Kingfisher <u>Megaceryle alcyon</u>	0.2 (1)	0.5 (1)	1.2 (2)	1.8 (2)	1.2 (2)	1.0 (1)	1.2 (2)	1.0 (1)	1.0 (1)	1.2 (2)	1.3 (4)	2	353	5	?	D	2
42 Red-shafted Flicker <u>Colaptes cafer</u>	-	-	-	+	+	+	+	+	+	+	+	-	-	5	+		
43 Yellow-bellied Sapsucker <u>Sphyrapicus varius</u>	-	+	+	+	+	+	+	+	+	+	+	-	-	5	+		
44 Hairy Woodpecker <u>Dendrocopus villosus</u>	-	-	-	-	+	-	+	-	-	-	-	-	-	2	?		

	J	F	M	A	M	J	J	A	S	O	N	D	Yr	Ne	DA	No
45 Western Flycatcher <u>Empidonax difficilis</u>	-	-	-	+	+	+	+	+	+	-	-	-	5	+		
46 Tree Swallow <u>Iridoprocne bicolor</u>	-	-	-	+	+	+	+	+	-	-	-	-	4	+		
47 Barn Swallow <u>Hirundo rustica</u>	-	-	-	-	+	-	-	-	-	-	-	-	1	-		
48 Steller's Jay <u>Cyanocitta rustica</u>	-	-	-	-	-	+	-	-	-	-	-	-	1	-		
49 Common Raven <u>Corvus corax</u>	+	+	+	+	+	+	+	+	+	+	+	+	5	+		
50 North-western Crow <u>C. caurinus</u>	-	-	-	-	+	-	-	-	-	-	-	-	1	-		
51 Chestnut-backed Chickadee <u>Parus rufescens</u>	+	+	+	+	+	+	+	+	+	+	+	+	5	+		
52 Brown Creeper <u>Certhia familiaris</u>	-	-	+	+	+	+	+	+	+	-	-	-	4	+		
53 Dipper <u>Cinclus mexicanus</u>	0	0	0	0	0	0	0	0	0	0	1	0	1	-		
54 Winter Wren <u>Troglodytes troglodytes</u>	+	+	+	+	+	+	+	+	+	+	+	+	5	+		
55 Robin <u>Turdus migratorius</u>	-	-	+	+	+	+	+	+	+	+	-	-	5	?		
56 Varied Thrush <u>Ixoreus naevius</u>	+	+	+	+	+	+	+	+	+	+	+	+	5	+		
57 Hermit Thrush <u>Hylocichla guttata</u>	-	-	-	+	+	+	+	+	+	+	-	-	5	+		
58 Golden-crowned Kinglet <u>Regulus satrapa</u>	+	+	+	+	+	?	?	+	+	+	+	+	5	?		
59 Orange-crowned Warbler <u>Vermivora celata</u>	-	-	-	+	+	+	+	+	+	-	-	-	5	+		



	J	F	M	A	M	J	J	A	O	O	N	D	Yr	Ne	Di	Fo
60 Townsend's Warbler <u>Dendroica townsendi</u>	-	-	-	+	+	+	+	+	+	-	-	-	5	+		
61 Wilson's Warbler <u>Wilsonia pusilla</u>	-	-	-	?	+	+	?	?	?	-	-	-	1	?		
62 Pine Grosbeak <u>Pinicola enucleator</u>	-	+	-	-	-	-	-	-	-	-	+	-	3	-		
63 Pine Siskin <u>Spinus pinus</u>	+	+	+	?	?	?	?	?	?	+	+	+	5	?		
64 Red Crossbill <u>Loxia curvirostra</u>	+	+	+	+	+	+	+	+	+	+			5	+		
65 Savannah Sparrow <u>Passerculus sandwichensis</u>	-	-	-	-	+	-	-	-	-	+	-	-	2	?		
66 Dark-eyed Junco <u>Junco oreganus</u>	+	+	+	+	+	+	+	+	+	+	+	+	5	+		
67 Fox Sparrow <u>Passerella iliaca</u>	+	+	-	-	-	-	-	+	+	+	+	+	5	-		

Table 2. Principal utilization of aquatic habitat observed at Drizzle Lake 1978-1982. See Table 1 for species.

Category	Species	No. of Species	Total Bird Days	$\bar{x}$ Bird Day
Migrant Stopover ( $< 5$ d per year)	6, 10, 11, 12, 14, 15 16, 17, 18, 20, 23, 24, 27, 33, 34, 35, 37, 53	18	170	0.7
Seasonal Resident ( $> 15$ d per year)				
Breeding	3, 11, 13, 15, 25	5	1710	7.3
Non-Breeding	1, 2, 4, 5, 7, 11, 21	7	3068	13.1
Marine/Lake Daily Itinerants				
Foraging frequent	1, 8, 11, 22, 35, 41	6	4899	21.0
Foraging absent or uncommon	3, 9, 13, 19, 23, 24, 26, 36, 38	9	13537	57.9

Figure 1. Study area.

← Later

Figure 2. Seasonal abundance of species in aquatic habitat (dashed line), in aquatic and terrestrial habitat (continuous line) and total bird days in aquatic habitat (histogram).

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 Seasonal & diurnal abundance of  
 birds in the  
 winter

