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*Draft*

*Skagit  
F. Slaney*

SONG BIRD STUDY

ENVIRONMENTAL INVESTIGATIONS  
PROPOSED HIGH ROSS RESERVOIR IN CANADA

CITY OF SEATTLE  
DEPARTMENT OF LIGHTING

F. F. SLANEY & COMPANY LIMITED  
VANCOUVER, B.C.

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1972

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*Recd w/Slaney ltr 2-28-72*

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## PREFACE

### SONG BIRD STUDY IN RELATION TO OTHER ENVIRONMENTAL STUDIES

#### 1.1 SCOPE OF ENVIRONMENTAL STUDIES

The song bird study is an integral part of a comprehensive study on the environmental consequences of the High Ross Dam Project proposed by Seattle City Light on the Skagit River System in Canada and the United States. Application for approval of the project has been submitted to the Federal Power Commission for their consideration.

Some of the environmental studies are totally Canadian; others totally American. Most of the major studies are combined or co-operative Canadian-American studies. Canadian studies are designed to provide the Federal Power Commission with the basic data required to understand the environmental consequences in Canada of the proposed High Ross Project.

Studies and reports that are related to or co-ordinated with the song bird study in Canada include the following:

##### 1.1.1 Wildlife Studies: Lower Skagit Valley in Canada

1. Climate
2. Soils
3. Vegetation
4. Deer
5. Small Mammals
6. Game Birds
7. Songbirds

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8. Large Carnivorous and Furbearing Mammals  
(with anecdotal information on Amphibians, Reptiles and Insects).
9. Habitat Development and Enhancement.

### 1.1.2 Fisheries Studies

10. The Aquatic Environment, Fishes and Fishery, Ross Lake and the Canadian Skagit River.

### 1.1.3 Recreation Studies

11. Recreation: Present and Future, Lower Skagit Valley in Canada

### 1.1.4 Miscellaneous

12. Relocation of Public Road
13. Shoreline Stability Study of Ross Lake Reservoir (Canada)
14. Estimated Cost of Clearing Proposed Ross Reservoir Site in Canada.

Other similar studies have been undertaken in Washington State by teams of American scientists.

### 1.1.5 Other Reports

Several other reports, submissions and environmental newsletters concerning the Lower Skagit Valley and the Proposed High Ross Reservoir in Canada have been published over the past two years.

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Environmental publications include the following titles:

1. "Skagit Valley and Ross Lake Reservoir in Canada"
2. "Environmental and Development Programs - Skagit Valley and Ross Lake Reservoir in Canada"  
(submission to the Washington State Ecological Commission)
3. "Environmental Investigations, Skagit Valley in Canada and indications of Consequences from Raising the Level of Ross Lake"  
(Memorandum to the International Joint Commission)
4. "Supplementary Data Requested Concerning Ecological and Environmental Consequences in Canada of Raising the Level of Ross Lake"  
(Memorandum to the International Joint Commission)
5. "The Canadian Skagit"  
(Environmental newsletter, Volumes 1 to 7 as of February 1, 1972).

### 1.2 SKAGIT RIVER WATERSHED AND HIGH ROSS RESERVOIR SITE IN CANADA

#### 1.2.1 The Skagit River Watershed in Canada

The Skagit River drains an area of over 380 square miles in Canada. The main Skagit Valley in Canada extends from the United States-Canadian border some 24 miles to the Hope-Princeton Highway and then turns eastward for some 10 miles as an increasingly steeper and narrower valley.

The floor of the Skagit Valley in Canada is approximately 1575 feet in elevation at the International Border and the valley sides rise to over 7000 feet at the peaks of the larger mountains.

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### 1.2.2 The Proposed High Ross Reservoir Site

The Proposed High Ross Reservoir would attain a full pool level of 1725 feet and would extend about seven miles further into the Skagit Valley to inundate an additional 4300 acres of land. The total area of High Ross Reservoir at full pond would be about 5200 acres.

The Proposed High Ross Reservoir Site represents about two percent of the Skagit River Watershed in Canada. The environmental consequences of the Proposed Reservoir Site would be confined primarily to the lowlands of the Lower Skagit Valley which includes a total area of about 19,000 acres or eight percent of the watershed.

*often repeated statement!*

Therefore, except for the studies of fish that are found in Ross Lake and the upper tributaries of the Skagit River and monitoring of the migrating herd of deer that utilize parts of the reservoir site for a period in the spring, the detailed environmental studies were confined mostly to a Two Part Study Area comprising "Part A" ; the Proposed Reservoir Site of 5200 acres and "Part B"; the adjacent lowlands that would be indirectly affected, an area of some 13,800 acres.

The environmental effects of the Proposed High Ross Project on the remaining 92 percent of the Skagit River drainage in Canada is considered negligible.

In this report, the Lower Skagit Valley refers to the part of the Skagit Valley in Canada below 3000 feet in elevation and for a distance of about 12 miles north of the Canadian-United States border. This area coincides with the region of the Skagit Valley that is accessible by gravel and dirt roads and is

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utilized primarily for forestry, unorganized recreation, and as an access route by Americans intent on camping and fishing on Ross Lake on the United States side of the border.

The upper part of the Skagit Valley is accessible by paved highway and utilized primarily as a transportation corridor (the Hope-Princeton Highway) and as an area of organized recreation within Manning Park where camping and fishing but no hunting is allowed. The Hope Slide and the Silvertip Mountain Ski Resort are also part of the recreation and tourism aspects of the Upper Skagit Valley region.

The alpine regions of the Skagit River Watershed are used primarily for such recreational pursuits as hiking and wilderness camping. These areas are generally over 4500 feet in elevation and would not be affected by raising the level of Ross Lake to elevation 1725 feet.

### 1.3 SCHEDULE OF STUDIES

Environmental studies commenced in Canada during April, 1970. The initial work was to delineate the boundary of the Proposed Reservoir Site and to inventory the forest cover and define the lands and water bodies that would be affected by the project. An overview of the animal and human activities in the area was obtained during the spring and summer, and plans were formulated for the intensive environmental surveys that commenced in the fall of 1970.

During 1971, the intensive studies of the flora and fauna of the Lower Skagit Valley were continued on a large scale and the basic elements of environment were documented.

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Supplementary studies are continuing into 1972 to improve the data concerning certain elements of deer habitat use and fish migration patterns. Also specific habitat improvement and enhancement sites set-up during 1970 are being monitored and manipulated to obtain specific data on the most efficient and economical ways of developing and improving habitats for the benefit of both man and wildlife.

A scheduled radio tagging program for monitoring the movements of deer is a first for British Columbia and should yield more sophisticated information than has been available for analyzing the habits of deer. The results of the supplementary studies are scheduled to be ready for the anticipated Federal Power Commission Hearings.

At this stage of the environmental studies, the knowledge amassed about the Skagit Valley in Canada far exceeds the data base of any other such project in British Columbia and possibly Canada.

If permission to proceed with the High Ross Project is granted, Seattle City Light intends to follow-up the pertinent environmental studies to fully document the before and after effects of the Proposed High Ross Reservoir for future reference of those concerned with other similar developments.

## BIRDS OF THE LOWER SKAGIT VALLEY

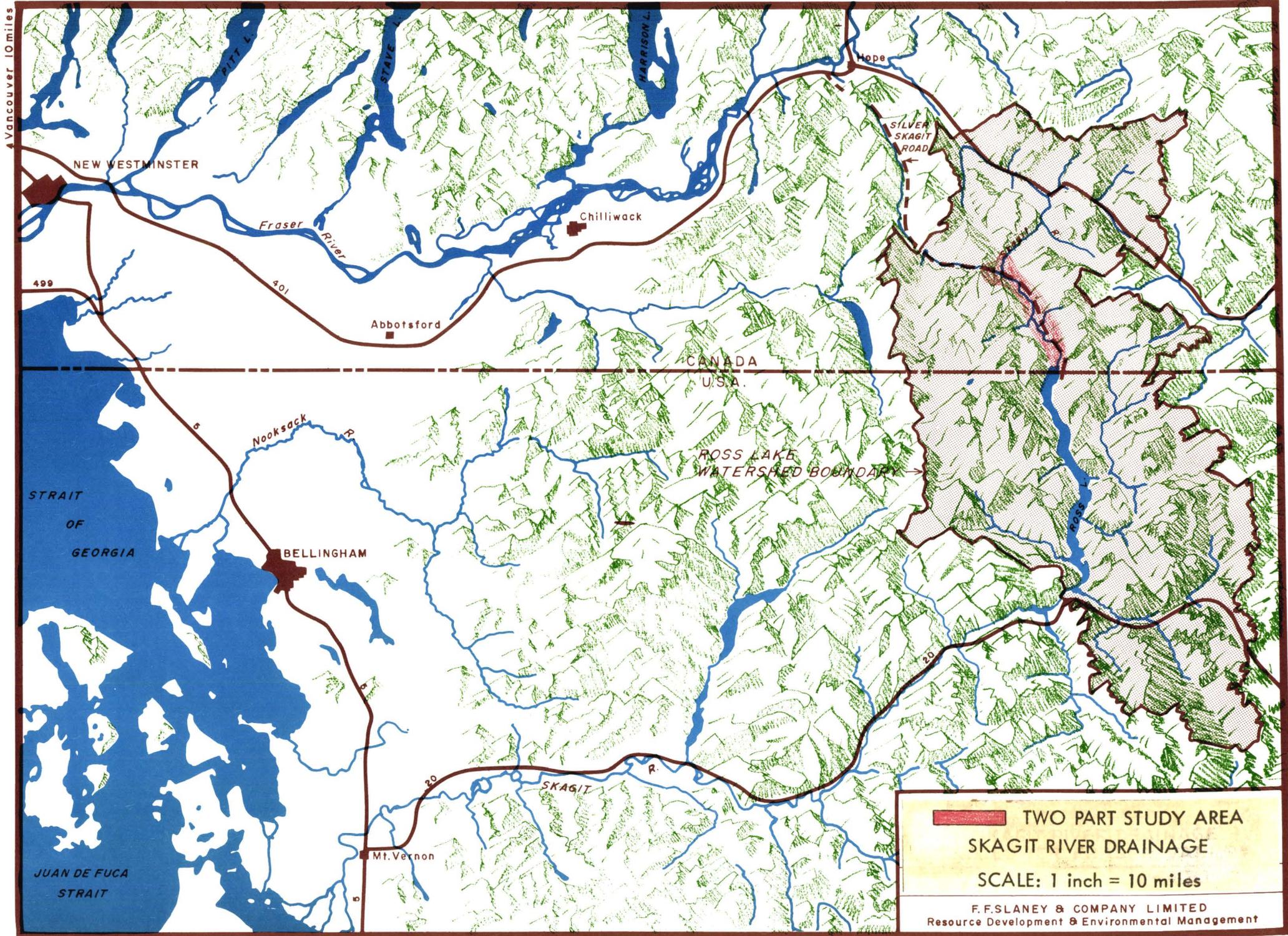
### 1.1 INTRODUCTION

A census of the bird fauna in the Two Part Study Area of the lower Skagit Valley in Canada was carried out to aid in the assessment of the effects of the High Ross Dam on wildlife. Prior to the current study, the bird fauna of the Study Area had not been well documented. The Two Part Study Area comprises an area of about 30 square miles, or less than ten percent of the Skagit River watershed.

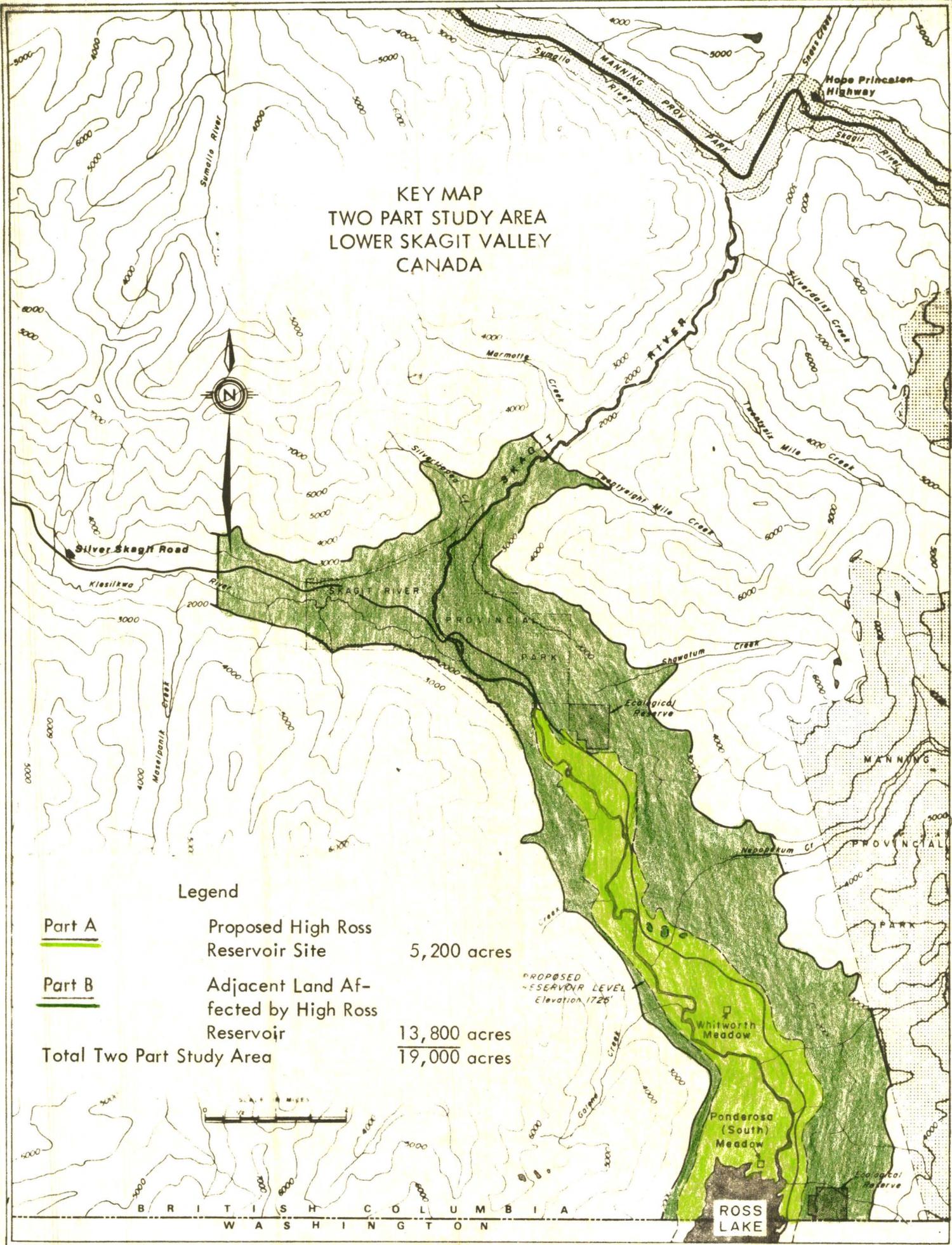
The Study Area includes the proposed High Ross Reservoir Site, Part "A", (5,200 acres) and the adjacent lands below elevation 3000 feet, Part "B" (13,800 acres).

The Skagit Valley has a north-south orientation and is well connected with other valleys to the north and south on both sides of the Cascades. Thus, it was of interest to determine the importance of the valley as a migration route. The valley appeared to be a suitable route for birds travelling between coastal and interior regions, or as a component of north-south interior flyways.

Check lists of birds have been prepared for some adjacent areas. The Manning Park list includes birds in the upper Skagit River (Edward, 1965; Beckett, 1969). A preliminary check list of birds for the North Cascade National Park and Ross Lake National Recreation Area was prepared by Douglas (1969). This list was expanded by Miller and Miller (1971) from observations made in 1969 and 1970 along Big Beaver Creek near the south end of Ross Lake. This list was further expanded by a team of biologists studying the wildlife around Ross Lake in 1971.



KEY MAP  
TWO PART STUDY AREA  
LOWER SKAGIT VALLEY  
CANADA



Legend

<u>Part A</u>	Proposed High Ross Reservoir Site	5,200 acres
<u>Part B</u>	Adjacent Land Affected by High Ross Reservoir	13,800 acres
Total Two Part Study Area		19,000 acres

PROPOSED RESERVOIR LEVEL  
Elevation 1726'



B R I T I S H C O L U M B I A  
W A S H I N G T O N

ROSS LAKE

Those species of birds that fall under the general title of "Game Birds" are included in this section although treated in greater depth in a separate report.

## 1.2 OBJECTIVES

Objectives of the study of bird fauna were to:

1. Inventory the species present by seasons.
2. Determine abundance, distribution, and habitat relationships by species.
3. Determine significance of the Skagit Valley as a migration route.
4. Assess the probable effects on birds of raising Ross Reservoir.

## 1.3 METHODS

Bird census periods include:

Spring (April 1 to June 15),  
Summer (June 15 to August 15),  
Autumn (August 15 to December 1),  
and Winter (December 1 to April 1).

The dates are approximate and serve mainly to delineate the periods of limited migration (winter and summer) from spring and autumn, the periods of large migrations. The term, "breeding season", as used in this report, includes both spring and summer.

During the winter period, bird abundance and distributions were determined from observations made on transect lines employed to census deer, carnivores, and furbearers.

The number, location and habitat used by each bird species observed along the transect lines was recorded. These observations were totalled for each species in Parts A and B of the Study Area. Species were rated by occurrence on a scale similar to the one used in the Vancouver (1969) and South Okanagan (1970-71) Bird Lists.

<u>Classification</u>	<u>Relative Occurrence</u>
A. Abundant -	Species observed daily and in large numbers.
F. Frequent -	Species observed daily but in low numbers.
R. Rare -	Species seen irregularly although resident.
C. Casual -	Species seen once or twice per season and in low numbers. Most were transients.
T. Transients -	Species either common or uncommon but apparently migrating through Study Area.

During the breeding season, 24 transect lines and two ponds were censused to collect data on the kinds and numbers of birds nesting in different habitat types. 14 transect lines and one pond were censused in Part "A", while 10 lines and one pond were located in Part "B" of the Study Area. Transects were located in all important and widespread habitats within the Two Part Study Area. The transect lines varied in length from 270 to 6000 feet, with an average of 14 acres. A description of the transect lines is shown in Appendix 101.

Transect lines were walked in early morning and all birds singing or sighted within 150 feet of the line were recorded. The birds were classified according to sex, migratory status, and breeding status.

Data from the transect lines were first analyzed in terms of the number of singing males per 100 feet of line and per acre. In this analysis, highly mobile species such as night hawks, ravens, swifts and birds of prey were omitted. These values were then ranked from highest to lowest and examined for habitat relationships. A map was drawn showing the habitats of the valley grouping into three arbitrary divisions; good, average and poor, according to the rank values of population densities.

Not all species recorded in the Two Part Study Area during the spring and summer were observed on the transect lines. Other species were largely evaluated from day-to-day observations made by biologists while carrying out other field work. Many migrant species were only noted in such observations.

A species was considered to be a breeder if its nest was found (21 cases), its young were positively identified (18 cases), or if it was resident throughout the breeding season and regularly observed singing (37 cases). Birds which were present throughout the breeding season although not observed singing were classed only as possible breeders (26 cases).

The distribution and numbers of waterfowl and grouse were evaluated from specific projects designed to census game birds.

In assessing the effects of the proposed High Ross Project on birds, several factors were considered. These included the distribution and abundance of each species in Parts A and B of the Study Area, distribution and abundance in southwestern British Columbia, the habitat preferences, the season of the year, and alternate habitats that may arise with the completion of the High Ross project. In addition, economic, aesthetic, and scientific values were considered.

#### 1.4 RESULTS OF SURVEY

##### List of Species

From October, 1970 to November, 1971, 173 bird species were positively identified in the Study Area (Appendix 102). Two additional species, the Tennessee warbler and the grey-cheeked thrush, were tentatively identified but need confirmation, as these observations are outside of their recognized ranges.

An estimated 57 additional species which have wide distribution in southern British Columbia and were not recorded in 1970 and 1971 may be expected to occupy other areas within the Skagit watershed and would appear occasionally as transients (Appendix 102). Six of these species were observed by American biologists working around Ross Lake in 1971 (Taber, 1972).

#### 1.5 SEASONAL DISTRIBUTION

33 species of birds were resident in the Study Area throughout the year.

At least 129 species utilized the valley as a migration route. 58 of these species were recorded only during migration. 72 species of migrating birds were recorded only in Part A of the reservoir site. Of the 72 species observed only in Part A, 43 were waterfowl or shorebirds attracted by Ross Lake. 17 others were recorded on grassy meadows or along the edge of the Ross Lake drawdown. The remaining 12 species were associated with the timbered areas.

#### 1.6 BREEDING SPECIES

79 species of birds are recorded as nesting in the Study Area. Eight of the

79 nesting species probably nested only in Part B and 12 species probably nested only in Part A (Appendix 105). The remaining 60 species nested throughout the Study Area.

#### Breeding Habitat and Densities of Singing Males

The singing male transect lines were grouped into nine habitat types based on site and canopy type. The density of singing males recorded in each type is summarized in Appendix 104. The nine habitats were further grouped as poor, fair and good on the basis of the singing male densities.

All habitats within each rating were identified on a map of the Study Area (Map 1) and acreages were computed (Table 1).

TABLE 1

Distribution of good, fair, and poor bird breeding habitat in Two Part Study Area. Part A and B. Areas of water not included.

<u>AREA</u>	<u>GOOD</u>	<u>FAIR</u>	<u>POOR</u>
	Acres	Acres	Acres
Part A	500	2500	1500
Part B	<u>200</u>	<u>3500</u>	<u>10000</u>
Total Study Area	700	6000	11500

The habitats with highest densities of singing males are the dense riparian and mixed habitats associated with the river, ponds and swamp.

Habitat with medium densities of singing males occurred on all mesic sites. The densities bore no obvious correlation with the type or age of the trees nor the amount of ground cover and understory which varied from light to dense.

Low densities of singing males occurred on the drier slopes. Ground cover and understory were generally light.

#### Discussion

175 species of birds were observed in the Two Part Study Area. This total compares with 166 species observed in Manning Park over more than 25 years (Beckett, 1969), 245 in the Southern Interior (South Okanagan Natural History Society, 1971), 295 in Greater Vancouver, (Campbell and Drent, 1969) and 156 in the North Cascade National Park and Ross Lake Recreation Area (Douglas, 1969; Miller and Miller, 1971; and Taber, 1971).

The habitat of the Ross Reservoir and the presence of interior forms contributes to the high number of species in the Study Area. 20 species, or about 11 percent of the species recorded in the Study Area, are rarely, if ever, observed on the coast.

Two species, the American redstart and the veery, are of particular interest, as breeding populations had not previously been recorded west of the Cascades in Washington State (Lorrison and Franca, 1962) or British Columbia (Pacific Nest Records, Vert. Museum, U.B.C.).

TABLE 2

Interior species observed in the Study Area which are very rare or absent in coastal areas:

Black-backed Three-Toed Woodpecker	Lark Sparrow
Yellow-bellied Sapsucker	Lazuli Bunting
Black-billed Magpie	Harris' Sparrow
Clark's Nutcracker	Bullock's Oriole

Poor-will	Bank Swallow
Veery	Franklin Grouse
Northern Waterthrush	Slate-coloured Junco
American Redstart	Vesper Sparrow
Bobolink	Western Flycatcher

The records of the poor-will, bobolink and long-billed curlew are of interest as these species are considered uncommon east of the Cascades. Significant also are the observations of the loggerhead shrike and Harris' sparrow, as there are few observations of either in the entire province of British Columbia.

### 1.7 MIGRATING SPECIES

The Skagit Valley is an important migration route in spring and autumn for at least 129 species. Some species such as thrushes, the hummingbirds, and most sparrows occurred in very large numbers.

The various species suggest that the main movement is between coastal areas to the south and central British Columbia. Interior species observed during migration suggest that there may be movement from central Washington via Lake Chelan to the Skagit and on into central British Columbia, particularly in spring. The presence of the Northwestern crow and gulls suggest that the Skagit Valley is a route between the Puget Sound lowlands and the mid-Fraser River Valley (Hope).

### 1.8 CONSEQUENCES OF THE HIGH ROSS PROJECT

The species of birds were divided into five groups on the basis of habitat relationships to assess the probable effects of High Ross Reservoir.

Group A	Water-based species such as waterfowl and most shore-birds (47 species).
Group B	Species associated with coniferous or mixed conifer/deciduous forest (47 species).
Group C	Species associated with meadowland or very open woodlands (24 species).
Group D	Species associated with the river and ponds and adjacent vegetation (16 species).
Group E	Species associated with deciduous woodlands of low elevation (35 species).
Group F	Species not observed in Study Area but known to occur in the region (57 species).

Appendix 102 identifies the grouping of species. The groups were derived from data collected on the singing male transect line, winter transect lines, special waterfowl census and numerous observations made at other times throughout the study period. A few species were present in different groups in different seasons. They were generally placed in the habitat they occupied in greatest number.

Species in Group A should be affected favourably, if at all, by the construction of Ross Reservoir. These species probably did not occur in the Skagit prior to the construction of the present reservoir except as occasional

transients. A few are now residents for one or more seasons.

Species in Group B associated with coniferous or mixed forest are expected to incur minor losses as a result of High Ross Reservoir. Losses are expected to be in the order of 10 to 20 percent of present population on the basis of habitat loss. Changes in aesthetic or scientific values are unlikely.

Species associated with the meadowlands (Group C), the river and ponds (Group D), and the deciduous woodlands (Group E) will sustain considerable loss in numbers and distribution as a result of High Ross Reservoir. Based on habitat reduction, these losses would range from 30 to 70 percent depending upon the species.

Species in Group F include birds from all habitat types. A few species would have enhanced aquatic habitats and a few would lose habitats. Most would not be affected.

Most of the open meadowland in the Study Area would be inundated by High Ross Reservoir. Most species observed in the meadows (Group C) were also observed in the drawdown. The question of whether the meadows are a preferred or a necessary habitat compared to the drawdown area is difficult to assess. Species that used the meadow and drawdown area included the bluebirds, kingbirds, poor-will, bobolink, meadowlark, several sparrows, and the sparrow hawk. The loss of the meadowlands may be of major importance to meadowlarks, bobolink and poor-will.

Within the Study Area, approximately 70 percent of the riparian habitat associated with ponds and the river would be inundated. Species (Group D) such as the harlequin duck, common merganser, dipper, yellow-throat, veery, song sparrow and the blackbirds would be most affected by the loss of habitat.

Approximately 60 percent of the lowland deciduous woodland will be inundated. This is the preferred habitat of a variety of warblers, flycatchers, ruffed grouse, vireos, thrushes, some finches, and some hawks and owls (Group E).

All species in Groups C, D and E would have a reduced aesthetic and scientific value in the Study Area. The degree will vary depending on the distribution and abundance of the species in the remainder of the Skagit Valley and in southwestern British Columbia. The loss to the Study Area would be of significance in such species as the veery and the redstart which have limited distributions in B. C.

As stated above, the chance that the very rarely occurring species shown in Group F would be adversely affected by High Ross Reservoir is considered remote.

All species of birds known to occur in the Two Part Study Area are expected to find an ecological niche within Part B of the Study Area. The remainder of the main Skagit Valley, the head waters of the Klesilkwa drainage, the Sumallo and the Upper Skagit System and the associated uplands, including parts of Manning Park, provide an interesting and diverse habitat for a wide

removed  
from later  
drafts.

variety of species. Thus, portions of the Skagit System would not be affected by the proposed High Ross Reservoir and were not surveyed. The Key Map shows the relative size of the Study Area compared to the entire Skagit drainage.

In addition, the adjacent upper Silver-Hope Valley contains an untabulated number of species. The main road into the Lower Skagit Valley, together with a network of logging roads, provides easy access to a diversity of song bird habitats.

SONGBIRD HABITAT - GOOD BREEDING HABITAT

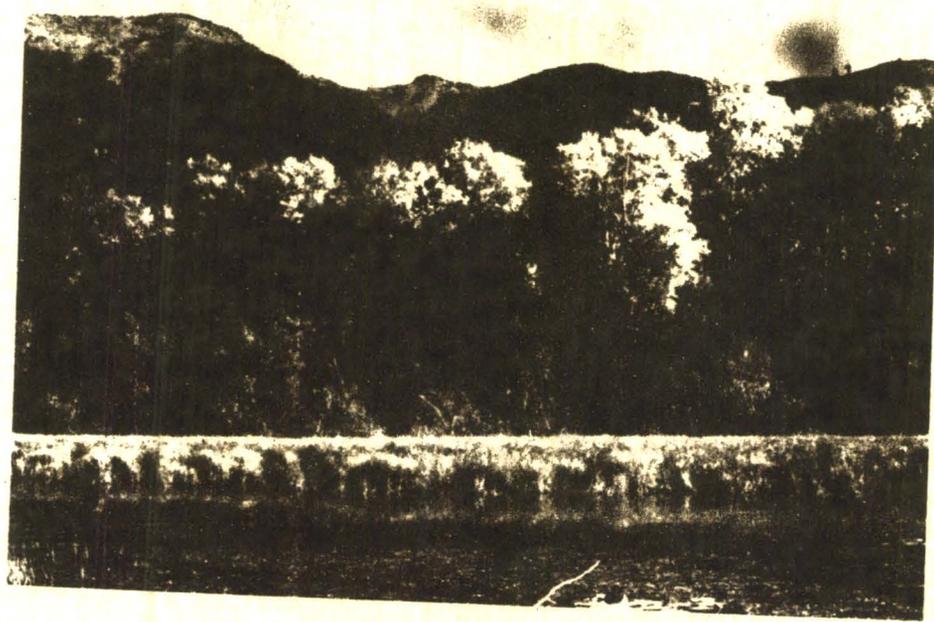
Whitworth Meadow Area - primarily breeding habitat



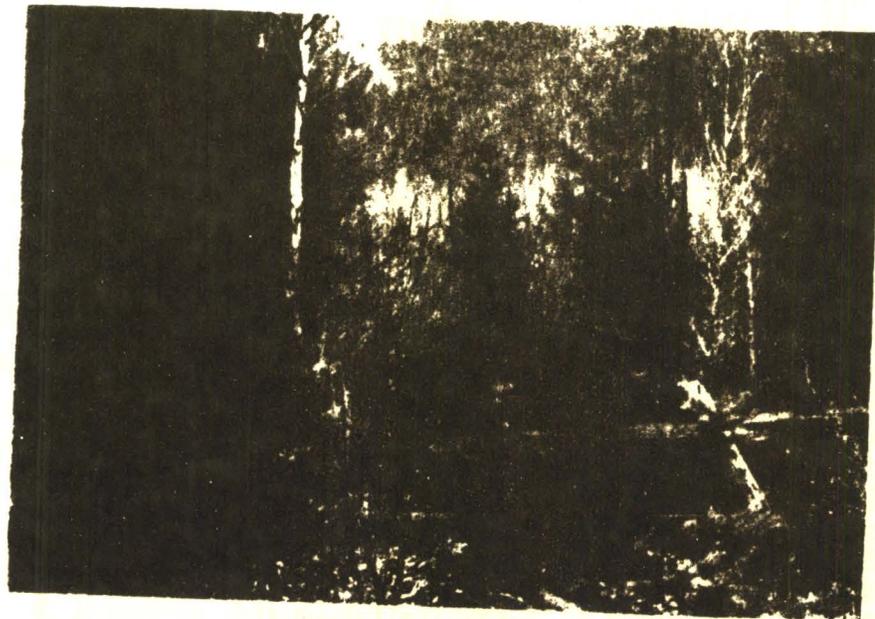
Top of Drawdown - Upper Shore of Ross Lake



Pond and Marsh Type - Whitworth Pond



Medium Type of Songbird Breeding Habitat - mixed deciduous/conifer  
in Klesilkwa Valley



Poor Songbird Breeding Habitat - conifer with light ground cover



Eastern Kingbird in South Meadow

N40-14



Chipping Sparrow in South Meadow

N40-7



APPENDIX 101

## APPENDIX 101

<u>LINE NO.</u>	<u>DATE OF CENSUS</u>	<u>LENGTH (Feet)</u>	<u>AREA (Acres)</u>	<u>HABITAT</u>
1	May 18, June 17, July 22	6000	22.9	Lodgepole pine; dense; falsebox, no understory
2	June 2, June 19, July 16	800	5.52	Immature and mature Douglas fir, light understory
3	May 27, June 19	2130	14.7	Conifer/deciduous mix, moderate shrub layer.
4	May 28, June 17	2370	16.3	Immature Douglas fir, dry-site, moderate understory
5	May 21, June 10	2930	20.2	Mixed conifer/deciduous, active logging
6	June 2, June 19, July 16	1600	11.0	Mixed conifer/pure Douglas fir, moderate understory
7 (a)	July 22	2130	17.4	Mixed mature conifer/deciduous, light to heavy understory
7 (b)	July 22	530	3.7	Mixed immature cottonwood/deciduous, moderate to heavy understory
8	May 18, June 15	2200	15.2	Immature cottonwood/willow, moderate understory
9	May 21, June 20	3500	24.1	Willow-birch-sedge, light to very dense understory
10	June 2, June 19, July 16	270	1.8	Mixed deciduous, Riparian very dense, river edge
11	July 14	--	13.0	Pond-Riparian, mixed deciduous, very dense
12	June 9, July 5	3400	11.7	Regular mixed deciduous/conifer, along lakeshore
13	May 20, June 19, July 22		25.8	Lodgepole pine, light understory
14	June 8, July 21	4540	31.3	Immature Douglas fir, light understory
15				

APPENDIX 102

APPENDIX 102

LIST OF BIRD SPECIES RECORDED IN THE TWO PART STUDY AREA OF THE LOWER  
SKAGIT VALLEY - GROUPED ON BASIS OF HABITAT RELATIONSHIPS

Group A  
Water Based Species

Common Loon	Ring-billed Gull
Red-necked Grebe	Sandhill Crane
Eared Grebe	Virginia Rail
Horned Grebe	American Coot
Western Grebe	Semipalmated Plover
Pied-billed Grebe	Killdeer
Great Blue Heron	
Whistling Swan	
Canada Goose	
White-fronted Goose	
Mallard	
Pintail	
Green-winged Teal	
Cinnamon Teal	
Blue-winged Teal	
American Widgeon	
Shoveler	
Wood Duck	
Ring-necked Duck	
Canvasback	
Greater Scaup	
Common Goldeneye	
Barrow's Goldeneye	
Bufflehead	
White-winged Scoter	
Ruddy Duck	
Hooded Merganser	
Red-breasted Merganser	
Bald Eagle	
Osprey	
Golden Plover	
Common Snipe	
Long-billed Curlew	
Spotted Sandpiper	
Greater Yellowlegs	
Lesser Yellowlegs	
Pectoral Sandpiper	
Long-billed Dowitcher	
Semipalmated Sandpiper	
Glaucous-winged Gull	
California Gull	

LIST OF BIRD SPECIES - Continued

Group B  
Species Associated with Coniferous  
or Mixed Conifer/Deciduous Forest

Goshawk	Black-throated Grey Warbler
Sharp-shinned Hawk	Townsend's Warbler
Cooper's Hawk	Olive-sided Flycatcher
Red-tailed Hawk	Bank Swallow
Golden Eagle	Cliff Swallow
Pigeon Hawk	Gray Jay
Band-tailed Pigeon	Steller's Jay
Rock Dove	Common Raven
Screech Owl	Fox Sparrow
Horned Owl	Purple Finch
Spotted Owl	Pine Grosbeak
Saw-whet Owl	Pine Siskin
Black Swift	Red Crossbill
Vaux Swift	White-winged Crossbill
Pileated Woodpecker	
Yellow-bellied Sapsucker	
Red-breasted Sapsucker	
Hairy Woodpecker	
Black-backed Three-toed Woodpecker	
Northern Three-toed Woodpecker	
Hammond's Flycatcher	
Blue Grouse	
Spruce Grouse	
White-tailed Ptarmigan	
Clark's Nutcracker	
Black-capped Chickadee	
Red-breasted Nuthatch	
Brown Creeper	
Townsend's Solitaire	
Golden-crowned Kinglet	
Ruby-crowned Kinglet	
Nashville Warbler	
Audubon's Warbler	

LIST OF BIRD SPECIES - Continued

Group C

Meadow or open Woodland Species

Marsh Hawk  
Sparrow Hawk  
Mourning Dove  
Poor-will  
Eastern Kingbird  
Western Kingbird  
Northwestern Crow  
Western Bluebird  
Mountain Bluebird  
Water Pipit  
Horned Lark  
Black-billed Magpie  
Common Crow  
Savannah Sparrow  
Vesper Sparrow  
Lark Sparrow  
Chipping Sparrow  
Harris' Sparrow  
Golden-crowned Sparrow  
Lincoln's Sparrow  
Snow Bunting  
Bobolink  
Western Meadowlark  
Lazuli Bunting

Group D

Species Associated with Rivers,  
Ponds, and Riparian Vegetation

Harlequin Duck  
Common Merganser  
Belted Kingfisher  
Trail's Flycatcher  
American Dipper  
Red-eyed Vireo  
Common Yellow-throat  
Western Wood Pewee  
Tree Swallow  
Rough-winged Swallow  
Barn Swallow  
Song Sparrow  
Yellow-headed Blackbird  
Red-winged Blackbird  
Brewer's Blackbird  
American Redstart

Group E

Species Found in Deciduous Wood-  
lands at Lower Elevations

Pygmy Owl  
Common Nighthawk  
Rufous Hummingbird  
Calliope Hummingbird  
Red-shafted Flicker  
Downy Woodpecker  
Dusky Flycatcher  
Western Flycatcher  
Ruffed Grouse  
House Wren  
Winter Wren  
American Robin  
Varied Thrush  
Hermit Thrush  
Swainson's Thrush  
Veery  
Cedar Waxwing  
Loggerhead Shrike  
Common Starling  
Hutton's Vireo  
Solitary Vireo  
Warbling Vireo  
Orange-crowned Warbler  
Yellow Warbler  
MacGillivray's Warbler  
Wilson's Warbler

LIST OF BIRDS - Continued

Group E - continued

Violet-green Swallow  
Rufous-sided Towhee  
Oregon Junco  
Slate-colored Junco  
Tree Sparrow  
Bullock's Oriole  
Black-headed Grosbeak  
Evening Grosbeak  
American Goldfinch

## LIST OF BIRDS - Continued

Group F      LIST OF POTENTIAL BIRD SPECIES WHICH MAY BE EXPECTED IN THE  
CANADIAN SKAGIT VALLEY.

Arctic Loon	
Double-crested Cormorant	
*Green Heron	
American Bittern	
Gadwall	
Redhead	
Surf Scoter	
Turkey Vulture	
Swainson's Hawk	
Rough-legged Hawk	
Peregrine Falcon	
Sora Rail	
Black-bellied Plover	
Solitary Sandpiper	
Baird's Sandpiper	
Least Sandpiper	Long-billed Marsh Wren
Dunlin	Catbird
Short-billed Dowitcher	Bohemian Waxwing
Western Sandpiper	Northern Shrike
Sanderling	Magnolia Warbler
Wilson's Phalarope	Myrtle Warbler
Northern Phalarope	Yellow-breasted Chat
Western Gull	House Sparrow
Herring Gull	Cassin's Finch
Mew Gull	House Finch
Bonaparte's Gull	Gray-crowned Rosy Finch
Common Tern	Common Redpoll
Arctic Tern	Lark Bunting
<sup>sp</sup> Caspian Tern	White-throated Sparrow
Black Tern	Lapland Longspur
Snowy Owl	
Hawk Owl	
Long-eared Owl	
Black-chinned Hummingbird	
Lewis' Woodpecker	
Say's Phoebe	
Purple Martin	
*Mountain Chickadee	
Boreal Chickadee	
Common Bushtit	
White-breasted Nuthatch	
Bewick's Wren	

\* Observed by U.S. biologists around Ross Lake in 1970-71.

APPENDIX 103

APPENDIX 103

LEGEND

SEASON

Fall - August 15 to December 1

Winter - December 1 to April 1

Spring - April 1 to June 15

Summer - June 15 to August 16

OCCURRENCE

A - Abundant, seen daily in large numbers

F - Frequent, seen daily but few in number

R - Rare, present but seen irregularly

C - Casual, seen only once or twice in season

T - Transient

\* = Seen only as migrant

HABITAT GROUP

C - Meadow based species

D - Pond, River and Riparian based species

E - Deciduous woodland species

B - Coniferous or coniferous-deciduous based species

A - Water based species

## APPENDIX 103

BIRD LIST - TWO PART STUDY AREA  
LOWER SKAGIT VALLEY, CANADA

Species (in A.O.U. Order)	Occurrence			
	Fall	Winter	Spring	Summer
Common Loon	-	-	CT	R
Red-necked Grebe	-	-	-	CT
Eared Grebe	RT	-	CT	-
Horned Grebe	CT	-	-	-
Western Grebe	AT	-	-	-
Pied-billed Grebe	CT	-	-	CT
Great Blue Heron	RT	R	R	C
Whistling Swan	CT	-	-	-
Canada Goose	RT	-	RT	-
White-fronted Goose	CT	-	-	-
Mallard	AT	F	RT	R
Pintail	RT	-	RT	-
Green-winged Teal	FT	F	RT	R
Cinnamon Teal	CT	-	CT	-
Blue-winged Teal	RT	-	CT	R
American Widgeon	FT	-	CT	-
Shoveler	RT	-	-	-
Wood Duck	CT	-	CT	-
Ring-necked Duck	AT	R	RT	-
Canvasback	RT	-	-	-
Greater Scaup	-	-	CT	-
Lesser Scaup	RT	R	CT	-
Common Goldeneye	RT	F	RT	R
Barrow's Goldeneye	-	-	CT	-
Bufflehead	FT	F	C	-
Harlequin Duck	-	-	R	R
White-winged Scoter	-	-	CT	-
Ruddy Duck	RT	-	-	-
Hooded Merganser	FT	R	-	-
Common Merganser	RT	CT	FT	R
Red-breasted Merganser	-	-	CT	-
Goshawk	-	R	R	R
Sharp-shinned Hawk	RT	-	R	R
Cooper's Hawk	RT	-	R	R
Red-tailed Hawk	RT	C	R	R

## APPENDIX 103

BIRD LIST - TWO PART STUDY AREA  
LOWER SKAGIT VALLEY, CANADA

Species (in A.O.U. Order)	Occurrence			
	Fall	Winter	Spring	Summer
Common Loon	-	-	CT	R
Red-necked Grebe	-	-	-	CT
Eared Grebe	RT	-	CT	-
Horned Grebe	CT	-	-	-
Western Grebe	AT	-	-	-
Pied-billed Grebe	CT	-	-	CT
Great Blue Heron	RT	R	R	C
Whistling Swan	CT	-	-	-
Canada Goose	RT	-	RT	-
White-fronted Goose	CT	-	-	-
Mallard	AT	F	RT	R
Pintail	RT	-	RT	-
Green-winged Teal	FT	F	RT	R
Cinnamon Teal	CT	-	CT	-
Blue-winged Teal	RT	-	CT	R
American Widgeon	FT	-	CT	-
Shoveler	RT	-	-	-
Wood Duck	CT	-	CT	-
Ring-necked Duck	AT	R	RT	-
Canvasback	RT	-	-	-
Greater Scaup	-	-	CT	-
Lesser Scaup	RT	R	CT	-
Common Goldeneye	RT	F	RT	R
Barrow's Goldeneye	-	-	CT	-
Bufflehead	FT	F	C	-
Harlequin Duck	-	-	R	R
White-winged Scoter	-	-	CT	-
Ruddy Duck	RT	-	-	-
Hooded Merganser	FT	R	-	-
Common Merganser	RT	CT	FT	R
Red-breasted Merganser	-	-	CT	-
Goshawk	-	R	R	R
Sharp-shinned Hawk	RT	-	R	R
Cooper's Hawk	RT	-	R	R
Red-tailed Hawk	RT	C	R	R

APPENDIX 103 - Continued

Species	Fall	Winter	Spring	Summer
Golden Eagle	CT	CT	CT	-
Bald Eagle	-	CT	CT	-
Marsh Hawk	RT	-	CT	-
Osprey	-	-	CT	-
Pigeon Hawk	RT	-	CT	-
Sparrow Hawk	RT	-	R	R
Blue Grouse	-	F	F	F
Spruce Grouse	-	-	-	C
Ruffed Grouse	F	F	F	F
White-tailed Ptarmigan	-	R	-	-
Sandhill Crane	CT	-	-	-
Virginia Rail	CT	-	C	-
American Coot	AT	-	CT	-
Semipalmated Plover	CT	-	-	-
Killdeer	C	R	F	R
Golden Plover	CT	-	-	-
Common Snipe	R	R	R	R
Long-billed Curlew	-	-	CT	-
Spotted Sandpiper	CT	-	FT	R
Greater Yellowlegs	-	-	CT	-
Lesser Yellowlegs	-	-	CT	-
Pectoral Sandpiper	CT	-	-	-
Long-billed Dowicher <sup>sp</sup>	CT	-	-	-
Semipalmated Sandpiper	-	-	CT	-
Glaucous-winged Gull <sup>sp</sup>	-	-	CT	RT
California Gull	-	-	RT	Rt
Ring-billed Gull	-	-	RT	-
Band-tailed Pigeon	CT	-	CT	R
Rock Dove	-	-	CT	-
Mourning Dove	CT	-	FT	R
Screech Owl	-	-	-	-
Horned Owl	-	R	R	R
Pygmy Owl	C	R	R	R
Spotted Owl	C	R	-	C
Saw-whet Owl	-	C	-	-
Poor-will	-	-	CT	-
Common Nighthawk	-	-	FT	F
Black Swift	-	-	AT	F
Vaux Swift	-	-	AT	F
Rufous Hummingbird	-	-	AT	F
Calliope Hummingbird	-	-	FT	F
Belted Kingfisher	FT	R	RT	R
Red-shafted Flicker	R	-	FT	R
Pileated Woodpecker	R	F	FT	F

APPENDIX 103 - Continued

Species	Fall	Winter	Spring	Summer
Yellow-bellied Sapsucker	CT	-	F	R
"Red-breasted" Sapsucker	C	-	R	R
Hairy Woodpecker	R	R	R	R
Downy Woodpecker	R	F	C	C
Black-backed Three-toed Woodpecker	-	-	CT	-
Northern, Three-toed Woodpecker	CT	-	R	C
Eastern Kingbird	-	-	RT	R
Western Kingbird	-	-	RT	R
Trail's Flycatcher	-	-	CT	C
Hammond's Flycatcher	-	-	AT	A
Dusky Flycatcher	-	-	R?	R
Western Flycatcher	-	-	R?	-
Western Wood Peewee	-	-	RT	R
Olive-sided Flycatcher	-	-	RT	R
Horned Lark	RT	-	RT	-
Violet-green Swallow	-	-	AT	F
Tree Swallow	-	-	AT	F
Bank Swallow	-	-	CT	-
Rough-winged Swallow	-	-	FT	R
Barn Swallow	-	-	R	R
Cliff Swallow	-	-	RT	-
Gray Jay	R	R	C	C
Steller's Jay	R	R	R	R
Black-billed Magpie	R	R	-	-
Common Raven	F	R	R	R
Common Crow	F	R	R	R
Northwestern Crow	R	R	-	-
Clark's Nutcracker	R	R	-	C
Chestnut-backed Chickadee	A	A	A	A
Red-breasted Nuthatch	F	F	F	F
Brown Creeper	R	R	R	R
American Dipper	FT	F	RT	R
House Wren	-	-	R	R
Winter Wren	FT	R	R	R
American Robin	FT	-	AT	A
Varied Thrush	FT	C	FT	R
Hermit Thrush	-	-	RT	-
Swainson's Thrush	-	-	FT	F
Veery	-	-	F	F
Western Bluebird	-	-	CT	-
Mountain Bluebird	RT	-	AT	-
Townsend's Solitaire	CT	-	RT	C
Golden-crowned Kinglet	AT	F	R	R
Ruby-crowned Kinglet	AT	-	FT	C
Water Pipit	FT	-	RT	-
Cedar Waxwing	-	-	-	F

APPENDIX 103 - Continued

Species	Fall	Winter	Spring	Summer
Loggerhead Shrike	-	-	C	C
Common Starling	R	-	R	R
Hutton's Vireo	-	-	CT	-
Solitary Vireo	-	-	RT	R
Red-eyed Vireo	-	-	R	R
Warbling Vireo	-	-	F	R
Orange-crowned Warbler	-	-	RT	C
Nashville Warbler	-	-	RT	R
Yellow Warbler	-	-	AT	A
Audubon's Warbler	FT	-	AT	F
Black-throated Gray Warbler	-	-	RT	R
Townsend's Warbler	-	-	RT	F
Northern Waterthrush	-	-	-	CT
MacGillivray's Warbler	-	-	R	F
Common Yellow-throat	-	-	R	R
Wilson's Warbler	-	-	RT	R
American Redstart	-	-	CT	R
Bobolink	-	-	CT	-
Western Meadowlark	RT	-	RT	-
Yellow-headed Blackbird	-	-	CT	R
Red-winged Blackbird	RT	-	F	R
Bullock's Oriole	-	-	CT	C
Brewer's Blackbird	RT	-	RT	R
Brown-headed Cowbird	-	-	FT	F
Western Tanager	-	-	FT	F
Black-headed Grosbeak	-	-	R	R
Lazuli Bunting	-	-	CT	-
Evening Grosbeak	F	F	R	R
Purple Finch	A	F	RT	R
Pine Grosbeak	-	C	C	-
Pine Siskin	F	A	A	F
American Goldfinch	-	C	RT	R
Red Crossbill	C	F	R	R
White-winged Crossbill	-	-	C	-
Rufous-sided Towhee	C	C	RT	R
Savannah Sparrow	-	-	CT	-
Vesper Sparrow	RT	-	RT	-
Lark Sparrow	-	-	CT	-
Slate-coloured Junco	CT	C	CT	-
Oregon Junco	RT	R	AT	F
Tree Sparrow	C	-	C	-
Chipping Sparrow	-	-	AT	F
Harris' Sparrow	CT	-	-	-

APPENDIX 103 - Continued

Species	Fall	Winter	Spring	Summer
White-crowned Sparrow	AT	-	FT	R
Golden-crowned Sparrow	-	-	FT	-
Fox Sparrow	-	-	CT	-
Lincoln's Sparrow	-	-	RT	-
Song Sparrow	R	F	F	F
Snow Bunting	CT	-	-	-

APPENDIX 104

## APPENDIX 104

## Singing males per acre and per 100 feet of transect line

<u>Line No.</u> (See Appendix 101)	<u>Per Acre</u>	<u>Per 100 Feet</u>
1	2.05	0.79
2	3.63	2.50
3	2.52	1.74
4	2.50	1.73
5	4.00	2.73
6	3.64	2.50
7 <sub>a</sub>	1.77	1.22
7 <sub>b</sub>	1.63	1.13
8	3.10	2.14
9	4.00	2.77
10	12.00	---
11	9.00	---
12	4.10	1.41
13	1.34	0.78
14	1.95	1.34
15	2.44	1.55
16 <sub>a</sub>	1.57	1.08
16 <sub>b</sub>	3.10	2.12
17	2.35	1.61
18	3.21	2.20
19 <sub>a</sub>	2.72	1.55
19 <sub>b</sub>	1.74	1.20
20	1.85	1.28
21	4.33	---

## APPENDIX 104

## SINGING MALE SONG BIRDS IN DIFFERENT HABITAT TYPES ON TWO PART STUDY AREA

Habitat	N No. of Lines	Average No. of Singing Males Per Acre	Average No. of Singing Males Per 100 Ft. of Line	Habitat Rating	Average No. of Species Per Line
A. Pond and river riparian	2	10.50	---	very good	18
B. Pond in conifer forest	1	4.33	---	good	12
C. Wet Site, Birch-Hawthorn	1	4.0	2.77	good	29
D. Mesic Site mixed conifer	8	2.85	1.94	fair	20
E. Mesic Site Regeneration deciduous and deciduous conifer (40 feet)	3	3.31	1.70	fair	16
F. Mesic Site mature deciduous- conifer mix	1	3.21	2.20	fiar	33
G. Semi-open hillside	1	3.10	2.12	fair	21
H. Dry Site regeneration-deciduous	2	1.74	1.20	poor	15
I. Dry Site, pure conifer and mixed conifer	5	1.74	1.04	poor	15

APPENDIX 105

APPENDIX 105

TABLE 4

List of species with restricted nesting distributions in the Study Area

Nesting in Part B only	Nesting in Part A only	Nest Mostly in Part A
Spotted Owl	Mallard	Harlequin Duck
Goshawk	Green-winged Teal	Common Merganser
Red-tailed Hawk	Common Goldeneye	Spotted Sandpiper
Blue Grouse	Killdeer	Common Nighthawk
Band-tailed Pigeon	Common Snipe	Starling
Raven	Sparrow Hawk	Yellowthroat
Clark's Nutcracker	Mourning Dove	Red-winged Blackbird
Gray Jay	Barn Swallow	Brown-headed Cowbird
	Common Crow	Verry
	House Wren	American Redstart
	Brewer's Blackbird	
	White-crowned Sparrow	

MAP I  
 CLASSIFICATION OF  
 BREEDING HABITAT OF SONG BIRDS  
 WITHIN A TWO PART STUDY AREA  
 OF THE  
 LOWER SKAGIT VALLEY  
 IN CANADA

CITY OF SEATTLE  
 Department of Lighting

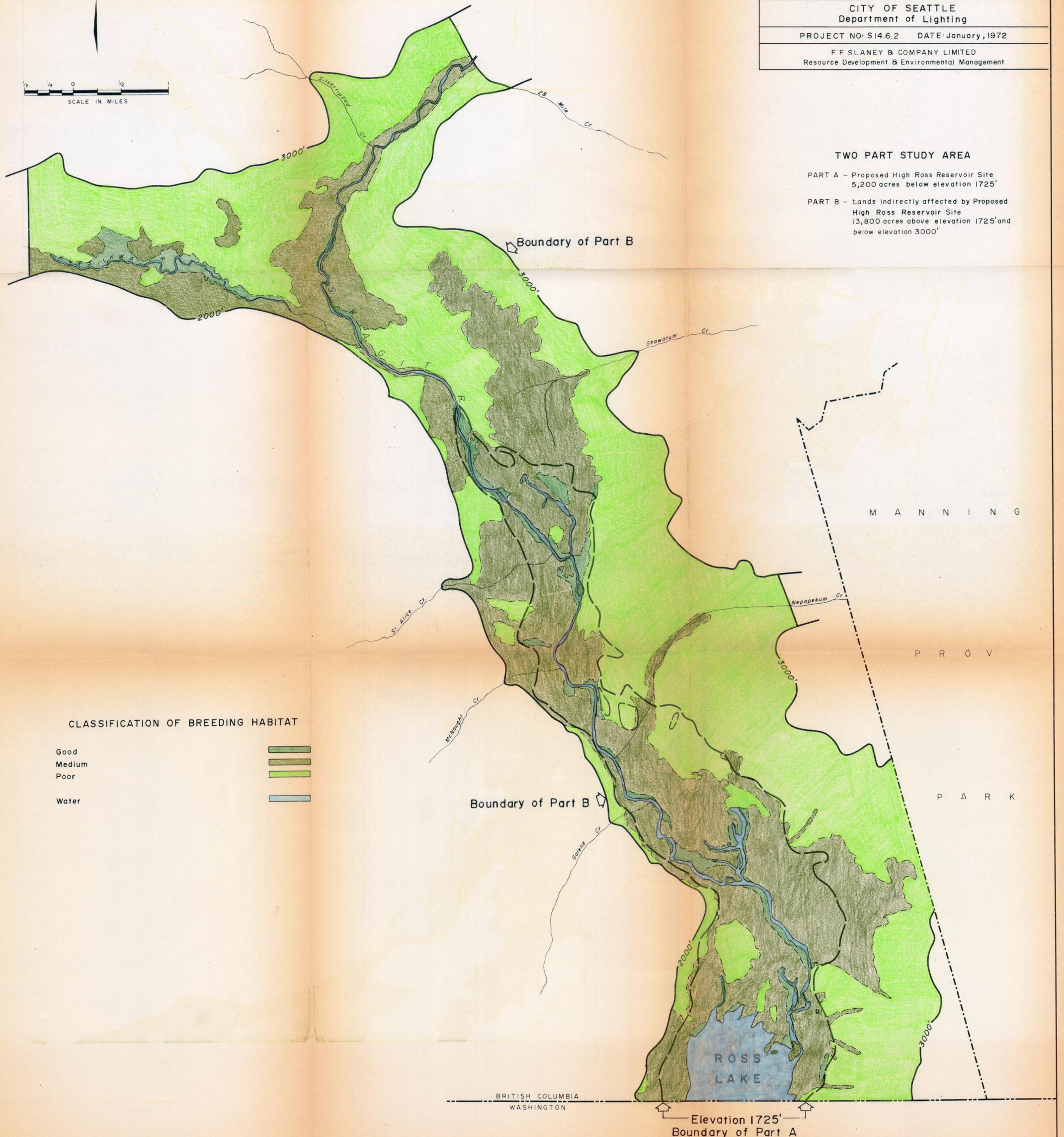
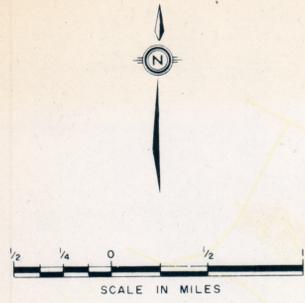
PROJECT NO: S14.6.2 DATE: January, 1972

F. F. SLANEY & COMPANY LIMITED  
 Resource Development & Environmental Management

TWO PART STUDY AREA

PART A - Proposed High Ross Reservoir Site  
 5,200 acres below elevation 1725'

PART B - Lands indirectly affected by Proposed  
 High Ross Reservoir Site  
 13,800 acres above elevation 1725' and  
 below elevation 3000'



CLASSIFICATION OF BREEDING HABITAT

- Good
- Medium
- Poor
- Water