

PARKS AND RESOURCE POLICY: THE ROLE OF  
BRITISH COLUMBIA'S PROVINCIAL PARKS, 1911-1945

PRICE LAKE MORAINES: NEOGLACIAL  
CHRONOLOGY AND LICHENOMETRY STUDY

PRICE LAKE MORAINES: NEOGLACIAL  
CHRONOLOGY AND LICHENOMETRY STUDY

by

Eric Michael Leonard

A.B., University of California, 1971

AN EXTENDED ESSAY SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF ARTS  
in the Department  
of  
Geography

© ERIC MICHAEL LEONARD 1974

SIMON FRASER UNIVERSITY

June 1974

All rights reserved. This essay may not be reproduced in whole or in part, by photocopy or other means, without permission of the author.

APPROVAL

Name: Eric Michael Leonard  
Degree: Master of Arts  
Title of Extended Essay: Price Lake Moraines: Neoglacial  
Chronology and Lichenometry Study

Examining Committee:

Chairman: L. J. Evenden

---

F. F. Cunningham  
Senior Supervisor

---

T/ O'Riordan

---

J. M. Ryder  
External Examiner  
Lecturer  
Department of Geography  
University of British Columbia

Date Approved:

## Abstract

A field study of neoglacial moraines at Price Lake, Washington, was undertaken with the aim of establishing a post-Pleistocene glacial chronology for the area and of developing, as far as possible, a generalized neoglacial chronology for the northern Cascade Range. In addition a field test was formulated to investigate the value of lichenometry for dating of features, and to determine which of several possible sampling methods would yield the most useful results.

Using dendrochronology and some extrapolation of tree growth patterns to establish dates, a chronology was developed for the Price Glacier. Maximum neoglacial advance took place in the mid-15th century A. D. destroying possible evidence of earlier advances. Advances culminated ca. 1600 and 1810 producing large moraines. Moraines were also built between the mid-19th and early 20th centuries. Since about 1910 the ice front has retreated approximately 750m., exposing the present Price Lake.

The chronology developed at Price Lake accords well with that established in several other areas of the Cascade Range and the neighboring Coast Mountains of British Columbia. On this basis a broad neoglacial chronology for the region is developed. Data from Mount Rainier, however, appear to be unique.

The lichen tests results seem to substantiate a basic assumption of lichenometry, i.e., the existence of an age/size relationship in crustose lichen, but indicate that this relationship may not be as close as has been thought. It was found that a sampling method based on the mean size of several largest individuals provided more reliable results than the more widely used methods which are based on use of the largest single individual. The substantial within age group variability found, even using the former technique, indicates that lichenometry may be a less accurate technique than heretofore assumed. Data collected also appear to indicate that the assumed shape of the lichen growth curve may be incorrect. It is suggested that a log/linear form may be more accurate than the generally used linear form. However, the potential error involved in plotting the curve precluded a definitive answer to this question.



Figure 1. Mount Shuksan from the northwest (U. S. Forest Service photograph)

va

vb

### Acknowledgements

I would like to express my gratitude to the U. S. Forest Service for the advice of its staff and for the use of its aerial photographs. I would also like to thank Dr. June Ryder of the University of British Columbia and Dr. Stephen Porter of the University of Washington for their suggestions and constructive criticism. Bob Horsfall and Tim O'Riordan provided useful criticism during the preparation of the paper.

Special thanks are extended to Lucy Lower and Matt Ross who braved the Cascade underbrush to provide valuable help in the field and to Tom Herbst and Paul Gafney for translation of Jochimsen's article.

Most of all, I am indebted to Frank Cunningham for his supervision, suggestions and criticism.

Table of Contents

	Page
Abstract . . . . .	iii
Acknowledgements . . . . .	vi
Table of Contents. . . . .	vii
Tables . . . . .	viii
Figures. . . . .	ix
Introduction . . . . .	1
Field Site . . . . .	6
Field Techniques . . . . .	10
Dendrochronology. . . . .	12
Volcanic Ash Stratigraphy . . . . .	17
Lichenometry. . . . .	18
Neoglacial Features. . . . .	18
Chronology and Correlation . . . . .	27
Lichenometry Test. . . . .	35
Test Results. . . . .	43
Conclusions . . . . .	50
Postscript . . . . .	52
Bibliography . . . . .	53

Tables

	Page
I. Sample calculations of age of moraine based on partial core and known age of trees on neighboring moraines. . . . .	24
II. Lichenometry test results obtained using three sampling techniques. . . . .	44
III. Results of analysis of variance test . . . . .	46

Figures

	Page
1. Mount Shuksan from the northwest. . . . .	v
2. Location map of Northwest Washington and Southwest British Columbia. . . . .	3
3. Location map of Mount Shuksan area. . . . .	7
4. Topographic map of Price Lake area. . . . .	9
5. Map of neoglacial moraines at Price Lake. . . . .	19
6. Price Lake moraines . . . . .	22
7. Fluctuations of the Price Glacier since 1400 A. D.. .	29
8. Correlation of neoglacial activity in the northern Cascades and southern Coast Mountains (excluding Mount Rainier). . . . .	31
9. Rhizocarpon geographica growth curves at Price Lake .	49

## Introduction

Glaciers in the Cascade Range of Washington, like those in other major mountain regions have a complex history of advance and retreat since the Pleistocene. The long held notion that glaciers have been in constant retreat since the end of the Pleistocene (ca. 10,000 years before present) and that present day glaciers are remnants of much larger glaciers was challenged by Matthes (1942). Drawing upon evidence from Alaska and California, he postulated a post-Pleistocene period of generally warm and dry climate during which all save the largest glaciers in the western United States disappeared. This was followed by an interval which Matthes called the "Little Ice Age" and believed to have begun ca. 4000 years ago; a period during which some alpine glaciers reappeared and existing ones expanded. This advance culminated only in the last few centuries, in some places as late as 1850.

Subsequent work by both glacial geologists and paleobotanists has born out Matthes' general conclusions while indicating a greater complexity. While post-Pleistocene history is extremely complex and by no means uniform throughout the world, a broad pattern has become clear. Following the final major glaciation (Wisconsin) there appears to have been a general, although not uninterrupted, warming trend. This culminated in the Hypsithermal period (Deevey and Flint 1957) a time of higher than present temperatures. This period was followed by a world wide period of "neoglaciation" (Matthes'

"Little Ice Age") marked by at least two, and in many areas several, periods of advance of alpine glaciers.

Porter and Denton (1967) define neoglaciation as the "climatic episode characterized by rebirth and/or growth of glaciers following maximum shrinkage during the Hypsithermal interval." (p. 205). The date of maximum shrinkage varies in different locations from 8000 to 5000 BP (6000 to 3000 BC).

There is evidence of three distinct periods of neoglacial advance in the North American Cordillera (Porter and Denton 1967, Denton and Porter 1970). These periods were not everywhere contemporaneous, and in some areas evidence of one or more is absent. The earliest and least documented phase appears to have taken place 5500 - 4500 BP (3500 - 2500 BC). The second, and somewhat better substantiated advance generally culminated ca. 2800 - 2600 BP (800 - 600 BC). This was followed by a general recession, and then by a third period of advance beginning in the 13th century AD (ca. 700 BP), and culminating in many areas only in the last two centuries. In many places the latest neoglaciation was the largest and has often obscured all evidence of earlier advances.<sup>1</sup>

Studies of neoglaciation have been undertaken in three areas of the Washington Cascades and in the Mount Garibaldi area of the adjacent Coast Mountains of British Columbia (see figure 2). Evidence has been uncovered of the three periods of

---

<sup>1</sup>In Colorado there is evidence of a period of advance somewhat earlier than the third period, 900 - 1000 AD (Benedict 1967, Mahaney 1973) but evidence of this advance in other areas is extremely scarce.

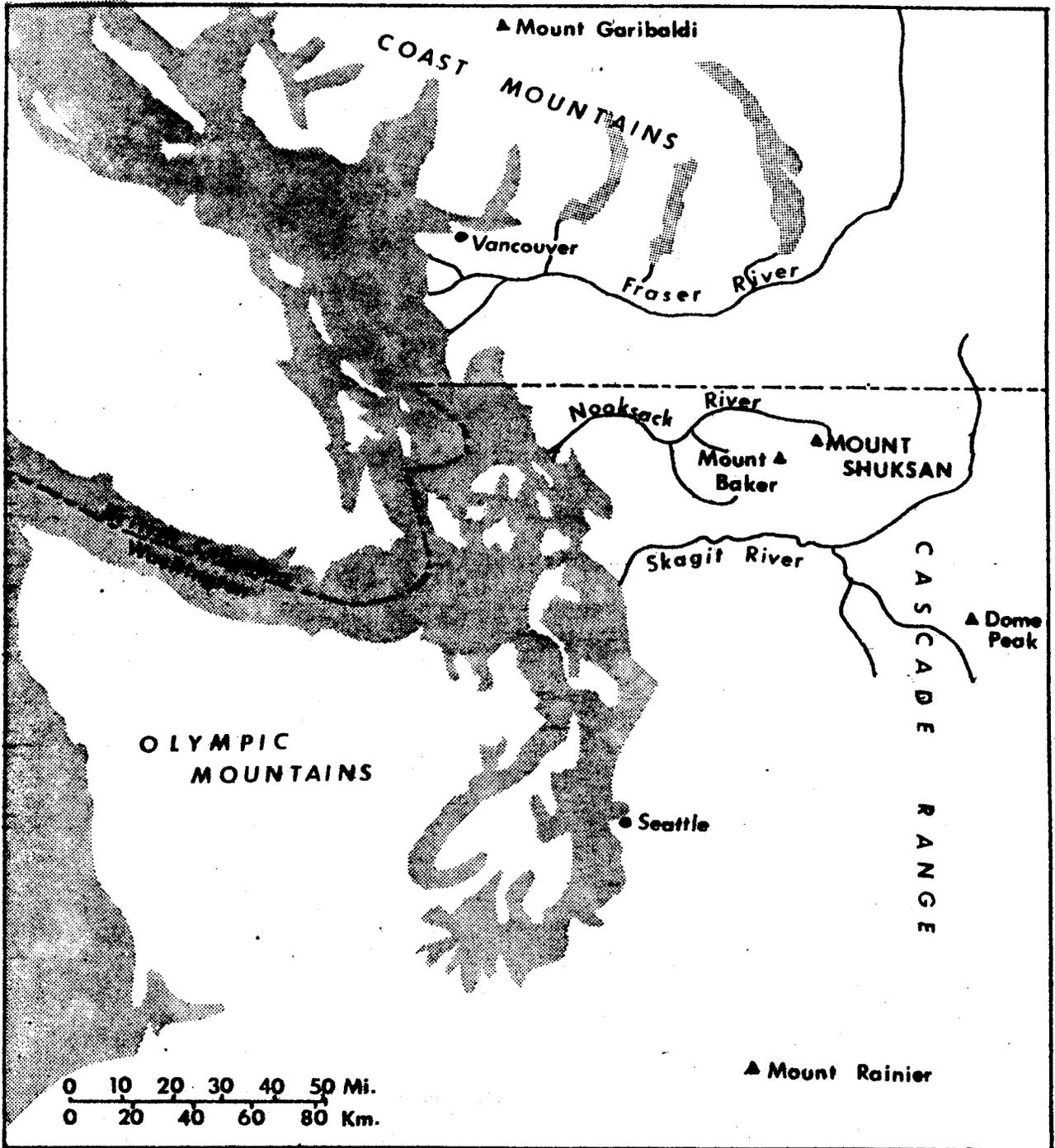


Figure 2. Location map of Northwest Washington and Southwest British Columbia.

neoglacial advance, but in no one area is evidence of all three present. A somewhat diverse pattern of fluctuations has emerged. Much of the work has been concentrated on Mount Rainier (Harrison 1956, Sigafos and Hendricks 1961, Crandell and Miller 1964). These studies have indicated a surprising lack of uniformity in fluctuation patterns. On Rainier no evidence has been found of advance during the early neoglaciation but ample evidence from the later two periods is present. At least one glacier, possibly at least three others, reached neoglacial maximum size during the middle period (Borroughs Creek Stade). Several other glaciers achieved their furthest advances during the final phase (Winthrop Mountain Stade). There is, however, very little consistency of advance and retreat patterns indicated by features dating from this later period.

While studies on Mount Rainier have shown almost no consistency, the three other study areas show somewhat less diversity. All show evidence of early and late neoglacial advances with no evidence of the middle period. In the Dome Peak area Miller (1969) found that all four glaciers studied reached maximum neoglacial positions during the most recent period of glaciation. All showed evidence of large advances in the late 16th to early 17th centuries and ones of almost equal magnitude during the 19th century. For three, the 16th century advance was the greatest since the Hypsithermal. The pattern of variation was not completely uniform, however, as the fourth had reached a maximum stand (by a few meters) during the 13th century, early in the

last neoglaciation.

In the Mount Garibaldi area all glaciers studied by Mathews (1950) had achieved maximum advances during the final stages of the most recent neoglaciation. Maximum positions were attained either during the early 18th century or in the mid 19th century. Subsequent work by Mathews (in Barendsen et al. 1957) has uncovered evidence of smaller advances during the three centuries preceding the final advances.

Evidence from Mount Baker (Easterbrook and Burke 1972) indicates a fairly similar pattern. Recent advances are generally the largest. Prominent terminal moraines mark two periods of maximum growth, about 500 years ago (15th century) and during the 19th century.

In both the Dome Peak area (Meier 1964) and the Garibaldi area (Stuiver et al. 1960) there is evidence of overridden glacial features which indicate an advance during the first neoglacial period of somewhat smaller dimensions than more recent advances. There is also evidence of early neoglacial deposits on Mount Baker.

In sum, while glaciers on Mount Rainier show a great diversity of fluctuations, other areas in the Cascades and southern Coast Mountains show general uniformity. An early neoglacial advance was followed by larger advances during the last neoglaciation, generally culminating in major advances during the last four centuries. Even ignoring the anomolous Rainier data however, the paucity of areas studied makes any generalization

problematic. The lack of correlation of the Rainier patterns reinforces the necessity of investigating other areas of the Cascades and Coast Mountains.

One of the best preserved sets of neoglacial moraines in the Cascade Range is found at Price Lake in North Cascades National Park. Field investigation of these moraines was undertaken with the aims of mapping and dating neoglacial features, establishment of a neoglacial chronology for the Price Glacier, comparison of this chronology with those from other areas in the Cascades, and, if possible, development of a general neoglacial chronology for the region. In addition, utilizing dates obtained by other methods, a test was undertaken at the field site to allow evaluation of the usefulness of lichenometry for dating recent glacial features. The technique has been employed widely for this purpose, although numerous objections have been raised to its use. Field work was carried out during June and July 1973.

#### Field Site

Price Lake is located in the cirque of the Price Glacier on Mount Shuksan (see figure 1). Along with Mount Baker (3285m.) to the west, Shuksan (2782m.) dominates the northwestern portion of the Washington Cascades (see figure 2). About fifty kilometers west of the range's watershed divide, the mountain is located approximately 150 km. NNE of Seattle, Washington and 120 km. ESE of Vancouver, British Columbia. The topography

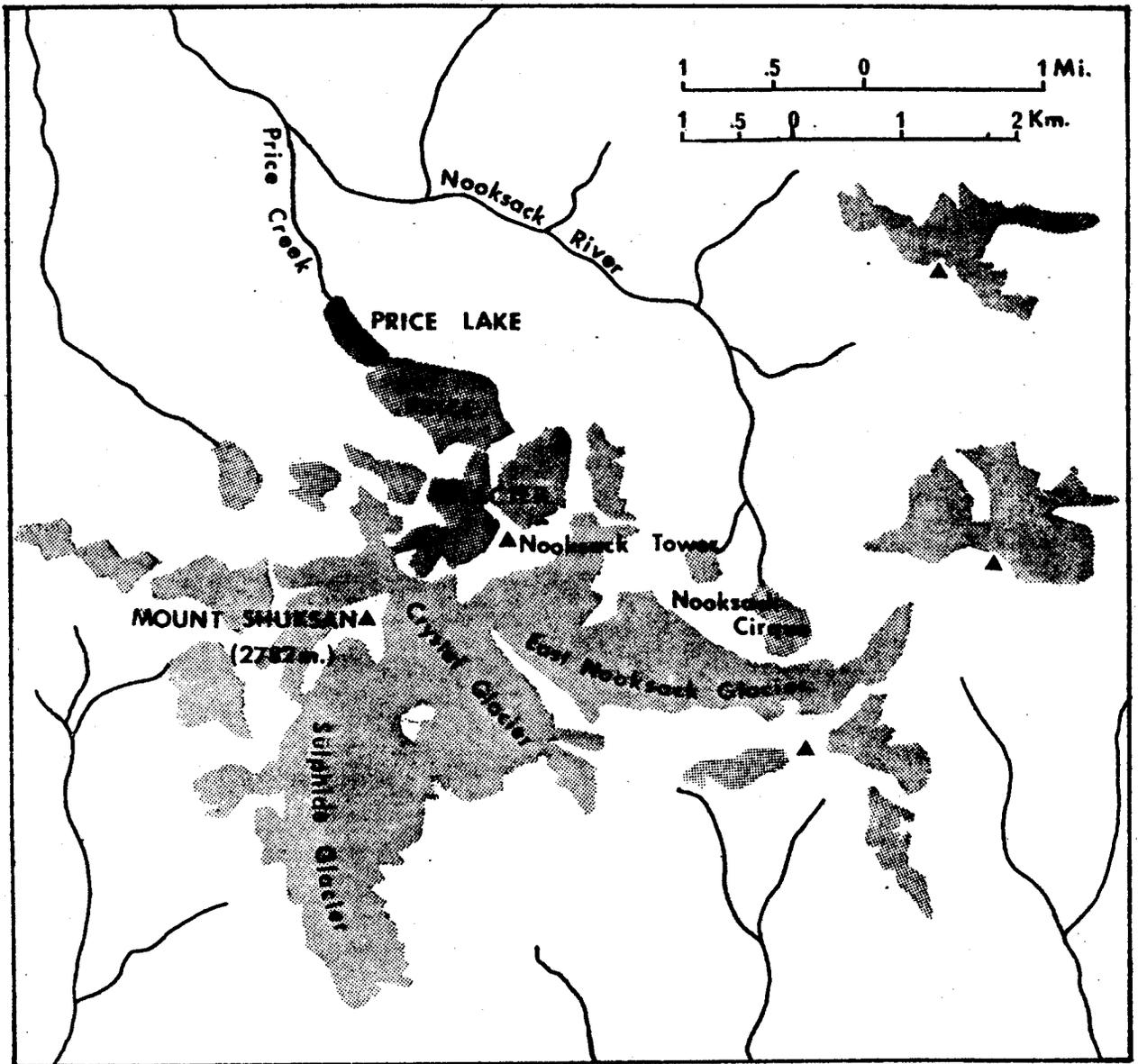


Figure 3. Location map of Mount Shuksan area.

of the region is rugged, and shows extensive evidence of Pleistocene and post-Pleistocene glaciation. Precipitation is heavy and most peaks above 2000m. support small glaciers.

Mount Shuksan presently supports fifteen glaciers, ranging in size from the 3.2 km.<sup>2</sup> Sulphide Glacier to six unnamed glaciers of .1 km.<sup>2</sup> or less (Post et al. 1971) (see figure 3). The Price Glacier, covering 1.6 km.<sup>2</sup> is the fourth largest on the mountain. Descending the north slope from near the summit to Price Lake at 1190m., the glacier has two separate accumulation areas located on opposite sides of the Nooksack tower. Each terminates at a cliff below which is a glacier remanie which descends gradually northwest to terminate by calving into Price Lake. The lake itself, 750m. long and 200 - 250m. wide, is impounded by recent terminal moraines of the glacier.

The cirque which both glacier and lake occupy is bounded on the south and southwest by the steep north face of Mount Shuksan. On the east and northeast a spur ridge, upon which numerous moraines are located, separates the cirque from the Nooksack River valley (see figures 1 and 4). Below the lake, Price Creek rounds the western end of this ridge and descends to the Nooksack. Topography in and around the cirque is extremely steep and rugged with maximum relief of over 2000m. occurring in less than four kilometers between the summit and the Nooksack River.

Bedrock geology of the area has been outlined by Misch (1952, 1966) and Staaz et al. (1972). Mount Shuksan and most

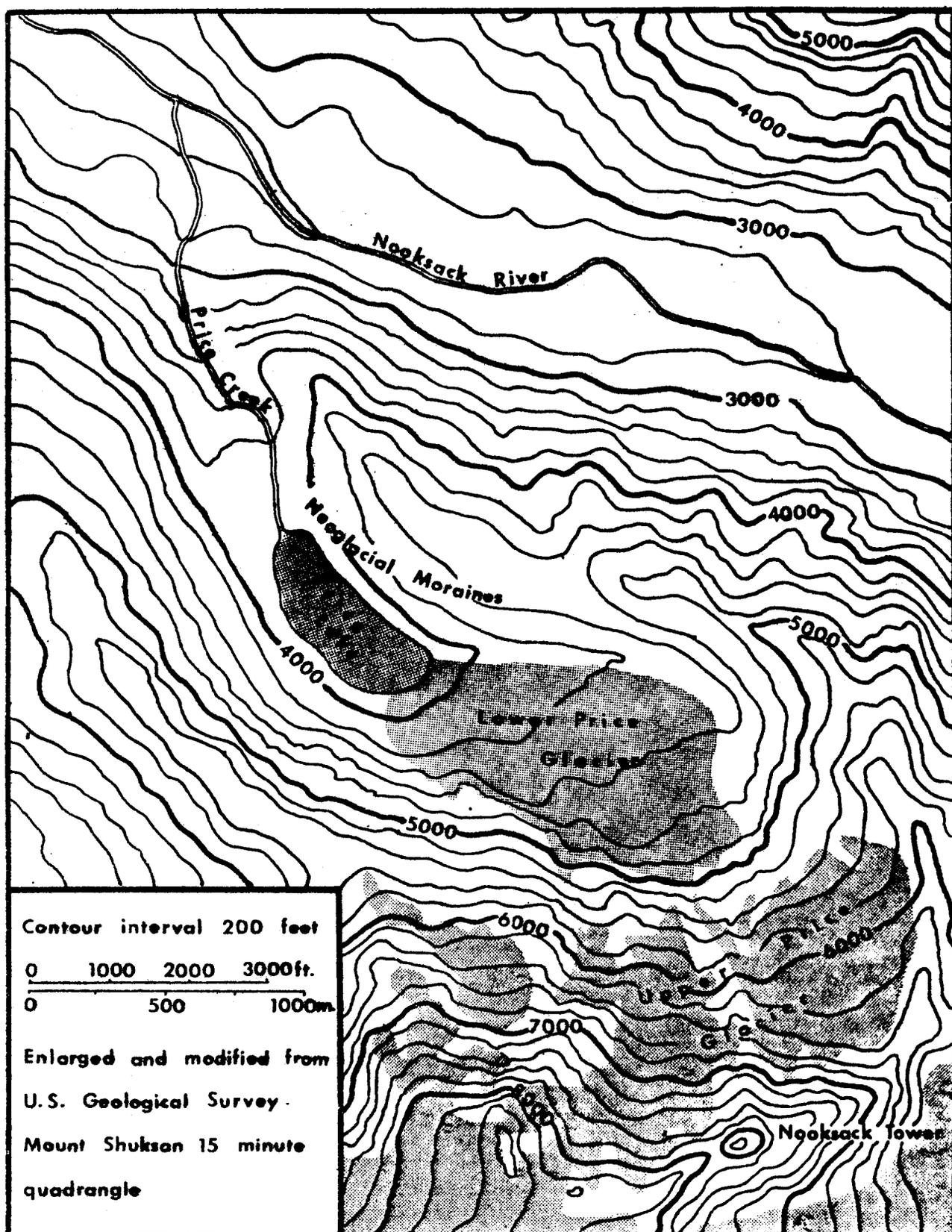


Figure 4. Topographic map of Price Lake area.

of the Price Glacier cirque is composed of metamorphic green-schist and phyllite. A small portion of the northeast corner the cirque, including one of the glacier's accumulation areas, is underlain by granodiorite of the Chilliwack batholith.

Timberline is located at approximately 1600m. In the vicinity of the lake the mature forest is composed mainly of Mountain Hemlock and Silver and Noble Fir. Dense thickets of Alder are found along the lakeshore.

A preliminary reconnaissance of neoglacial features in the Nooksack Cirque by Porter and Miller (S. Porter, per. com., 1973) uncovered evidence of an advanced position of the East Nooksack Glacier in the mid 18th century. No evidence of earlier advance was found. No other study of glacial activity has been undertaken on the mountain.

### Field Techniques

Dating at Price Lake, as virtually all other studies of neoglaciation, was based on analysis of moraines and trimlines<sup>2</sup>. Terminal and lateral moraines and trimlines indicate former position of glaciers. There is a major problem inherent in using trimlines or moraines for dating glacial activity. Subsequent advances will destroy all overrun trimlines and virtually all overrun moraines. Hence, the preserved record of glacial positions is most often incomplete, including features from only

---

<sup>2</sup>The break in forest age caused by the advance of a glacier into a forested area and subsequent glacial retreat and recolonization by trees. The same term has been applied in lichen studies.

those periods of activity after which no greater advance took place. In the Cascade Range where recent advances have tended to be of greater magnitude than those of earlier periods, evidence of the earlier advances is most often impossible to obtain. In addition, for the same reason, it is impossible to determine the extent and timing of any but the final recession.

Field techniques utilized in investigating the Price Lake moraines were aimed at providing both relative and absolute dates. The most important relative dating technique involved topographical relationships between the various moraines in relation to the present position of the glacier. Except in the rare case of a preserved overridden moraine (which would be morphologically very easy to distinguish), no moraine can be older than any moraine outside it nor younger than any inside. Other techniques which were utilized for relative dating include the stability of morainal material, the amount of moss and/or lichen cover, the amount, type, and size of vegetation, and the amount of soil development. All of these techniques have been employed previously in relative dating of glacial features (see for example Mahaney 1973). The amount of reduction of moraine crests by geomorphic processes was also a useful indicator of relative age.

Three techniques (in addition to radiocarbon dating of organic material) have been utilized in the North American Cordillera in attempting to assign absolute dates to neoglacial

features; dendrochronology, lichenometry and ash layer stratigraphy. These provide either minimum or maximum limiting dates and all involve a certain amount of approximation and problems of sampling. Dendrochronology, which is probably the most accurate of the techniques, proved to be the most useful at Price Lake, while lichenometry was of only very limited use. Ash stratigraphy could not be used at the field site.

#### Dendrochronology

Dendrochronology provides absolute minimum dates for glacial features. The technique has been outlined by Lawrence (1950) and utilized by Sigafos and Hendricks (1961), Miller (1969) and Easterbrook and Burke (1972) in the Washington Cascades. By use of an increment bore the age of vegetation may be established by counting annual growth rings. Once a trimline or moraine is located the oldest vegetation on or inside the feature may be dated. This establishes a minimum length of time since the final retreat of the glacier from this point. If the moraine appears morphologically fresh and if there is evidence that the present trees represent the first generation on the site (ie. apparent uniformity of age among the older trees and absence of larger and/or very well decayed downed trees) this age should give a fairly accurately date of the original recolonization by vegetation.

Dates provided by dendrochronology must however be regarded as minimum ages for the feature for three reasons (Lawrence

1950). 1) It is not always possible to obtain a core at the level at which the seed actually germinated. Hence, the first few years of growth may be overlooked. 2) On the older, more heavily forested, moraines it is impossible to sample all or any very substantial proportion of the trees on the feature. It is necessary to select trees which appear old on the basis of size and appearance. That size is not necessarily an accurate indicator of age, especially in a recently colonized area, was a fact continually impressed upon the writer in the course of field work. Use of a large sample reduces this problem, and a general uniformity of age among the oldest trees sampled likely indicates that these were among the original colonizers. Nonetheless, this problem introduces a potential for underestimation of age. 3) An undetermined amount of time passes between deglaciation and successful germination of trees. An additional amount of time may pass between the germination of the first, short lived, species (eg., alders) and the longer living evergreens. Both of these periods can vary greatly with local environmental conditions and seed source availability. The length of time involved has been observed to range from five years in an area of abundant seed supply and very fine glacial debris on Mount Rainier (Sigafos and Hendricks 1961) to thirty-five years in a rocky area distant from seed sources below the South Cascade Glacier (M. F. Meier, reported in Miller 1969). From these figures, Miller estimated a period of fifteen to twenty years in fairly rocky areas closer to seed

sources. In the Price Lake area, despite a relative abundance of nearby seed sources, the extreme rockiness of glacial deposits means that twenty to thirty years would probably be a reasonable estimate of the period required for the establishment of the first evergreens.<sup>3</sup> An additional minor source of potential error is the possibility that an annual ring may be missing or that two rings may develop in one year.

Because of the uncertainties involved, the actual tree ring counts are reported in this paper. In discussing the age of moraines a period of twenty-five years is added. It should be kept in mind that these ages include an error factor which may amount to a decade, perhaps more.

On each moraine increment bore samples were taken from approximately twenty trees. Choice of trees was based on general rules outlined by Sigafos and Hendricks (1961). Appearance rather than size seems to be the most accurate indicator of age. Trees with well weathered bark and gnarled and twisted trees were generally selected although several of the largest trees on each moraine were also sampled. Samples were counted in the field with the aid of a hand glass and the oldest several cores from each moraine and difficult to read cores were taken for closer examination under laboratory conditions.

---

<sup>3</sup>It had been hoped to investigate the question of germination and succession at Price Lake, but the scarcity of historical records of recession and the fact that recent recession has exposed only lake and slopes too steep and unstable to support vegetation made this impossible. The short lifespan of alders prevented dating of succession in areas exposed earlier.

An additional problem was involved in dating the oldest moraines. The larger trees on these had radii greater than the length of the increment bore (40 cm.). Hence ring counts obtained on the outer moraines represent only incomplete sections of trees. Thus, it is necessary to devise another method to date these features.<sup>4</sup> The most promising method available was to utilize the partial cores and attempt to project back on the basis of the uncored portion of the tree. It can be ascertained that at a known date in the past (determined by the partial ring count) trees of a particular species on the moraine were at least a certain size. It is then possible to examine younger, already dated, moraines and to determine how long after deglaciation trees of the same species first reached that size. By adding this figure to the number of rings in the incomplete core, an estimation of the minimum age of the older moraine may be calculated. Three aspects of this technique are crucial and need further elaboration.

1) The estimation of the age of a tree based on the known age of another tree of the same size is problematic. Environmental differences are crucial sources of potential error. Differences in microclimate, soil or slope stability may render such an estimation incorrect. To minimize these factors trees

---

<sup>4</sup>It had been hoped that in such a situation lichenometry might be used to date features. However in this instance a growth curve could not be plotted with any degree of certainty without knowledge of the age of the older substrate, the very features whose age the growth curve was intended to determine. Additionally, the lichenometry test results (see below) indicated potential problems with the technique.

which germinated in similar circumstances, as early colonizers of the moraines, were used. Additionally, only trees in close proximity to one another were compared. Trees growing in a peculiar environment (close to standing water or a streambed, etc.) were not considered.

2) The procedure will give an estimate of minimum age for the moraine rather than the tree. It is difficult to establish whether the tree on the undated moraine is in fact an original colonizer, a factor which would influence its early growth rate. Nor are the largest trees on the younger moraine necessarily the oldest. What is crucial is that a known number of years after deglaciation trees on the younger moraine first reached a certain size. It is assumed that it must have taken approximately the same length of time for trees on the older moraine to reach the same size.

3) The symmetry of rings is greatly distorted in trees growing on steep slopes and trees which have been bent during growth. Such trees were not sampled.

Age determinations arrived at through this process should be regarded as minimum both since it is impossible to know whether a particular tree was in fact the first to reach a given size and because the age of more recent moraines upon which calculations are based is also a minimum age. The error factor involved in this estimation is such that several decades, perhaps as much as forty years should be taken as a level of confidence rather than a decade as in standard dendrochronology. Two examples of the technique are shown in Table I on page 24..

## Volcanic Ash Stratigraphy

Ash stratigraphy has been widely utilized throughout the Northwest in investigation of neoglaciation and other recent events. The technique, outlined by Wilcox (1965), is facilitated by several widespread Holocene ash falls originating from Cascade volcanoes. If a glacial feature is overlain by an ash deposit, it can be inferred that the feature is older than the corresponding eruption. If an area is blanketed with ash it can similarly be inferred that it has not been glaciated since the eruption responsible for the ash. The converse of these deductions however is not necessarily true as ash may be removed by processes other than glaciation.

Using the parameters outlined by Wilcox, ash layers may be differentiated. Most Holocene ash falls in the Northwest have been radiocarbon dated. The only dated layer likely to be found in the study area is Mazama "O" ash from Crater Lake, Oregon which has been found throughout the North Cascades. This layer can be very useful since its age (6600 BP) probably corresponds closely to the date of maximum hypsithermal glacier retreat. Thus, it is extremely valuable in determining the extent of neoglacial advance, since any area overlain by Mazama ash cannot have been glaciated during the neoglacial interval. The failure to find Mazama ash and the implications of this will be discussed in a later section.

## Lichenometry

Lichen size has been used to determine substrate age in arctic and alpine areas where dating by other methods were not possible. The method has been subject to serious criticism in recent years. As indicated above, a test was formulated at Price Lake to evaluate lichenometric dating. The assumptions and criticisms of the technique and the field test are discussed below.

## Neoglacial Features

A well preserved set of lateral moraines runs approximately 1.5 km. along the ridge north and east of Price Lake (see figures 1 and 5). Nearing Price Creek these drop down the hillside and curve across the valley to link with former terminal positions of the glacier. Across the creek several of the moraines continue in extremely dense alder thickets but are soon buried in rock slides from the steep face above. Detailed field work was limited to the area east of the creek as the dense brush precluded tracing of the moraines on the west side.

At their extreme eastern end, high above the lake, the moraines are mainly bare rock with little vegetation, an area quite typical of those in which lichenometry has been used. This area (designated the "upper area" in figure 5) near the crest of the ridge is relatively flat with little apparent rockfall. To the west the moraines descend the steep hillside

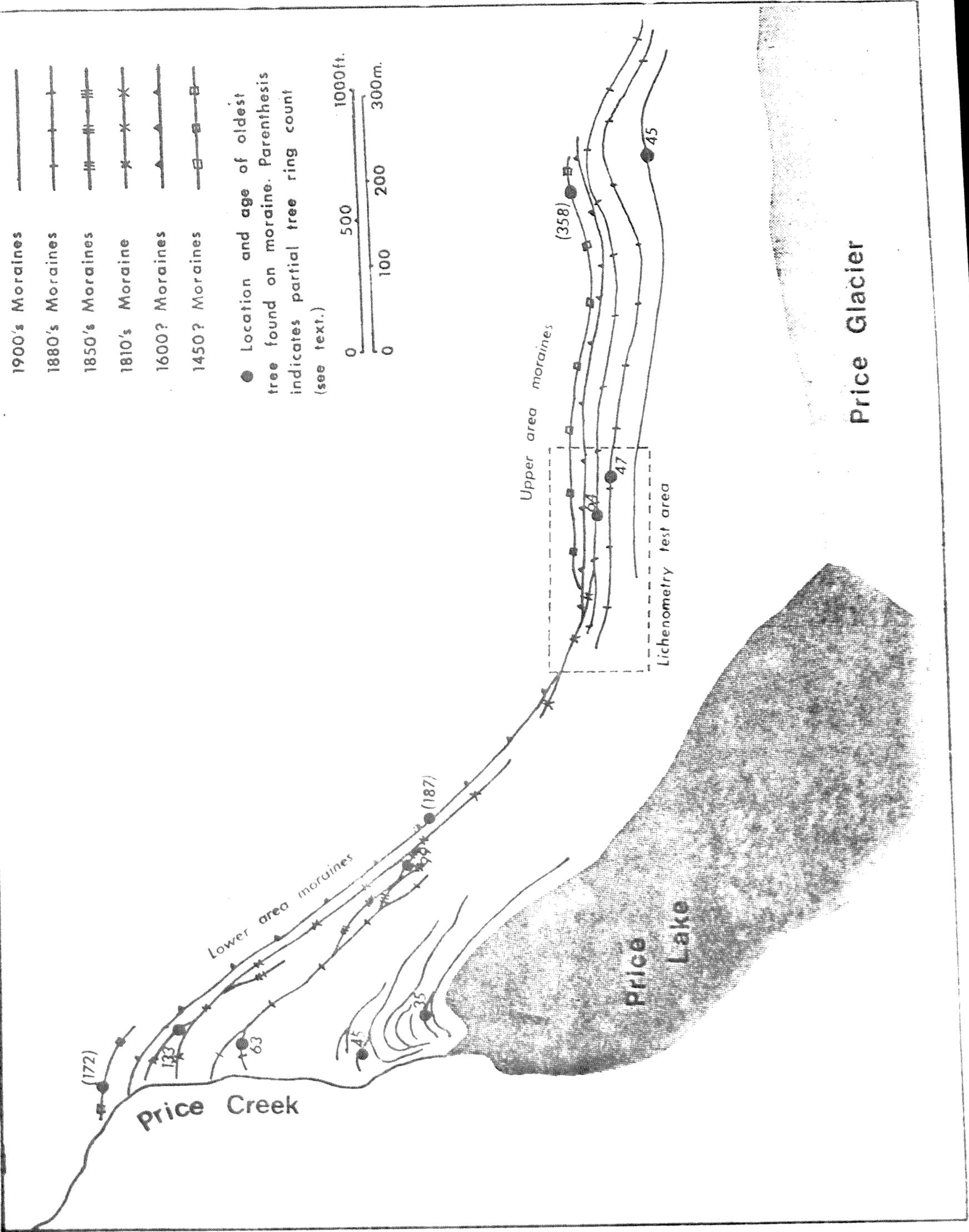


Figure 1. Map of neoglacial moraines at Price Lake.

towards Price Creek. In this area ("lower area" in figure 5) vegetation is much more abundant with alder and small evergreens growing on the inner moraines and progressively larger evergreens further from the lake. Progressive increase in occurrence and size of lichen and moss also occurs moving further from the lake. While the inner moraines are predominantly very rocky and unstable, the outer moraines are quite stable and many sections of them have considerable soil development. The outer moraines show much more evidence of reduction by geomorphic processes, crests are more rounded and generally smoother than those nearer the lake and the present terminus of the glacier.

At least sixteen moraines which represent six periods of glacial activity are preserved on or at the base of the hillside. Near the outlet of the lake are eight small moraines representing the most recent episode of glaciation. These are located 750 - 850m. beyond the present terminus at approximately the same elevation. Terminating further downvalley and running higher along the hillside are at least eight distinct moraines which apparently represent five periods of glacial activity. The outermost of these crosses Price Creek about 450m. beyond the outlet of the lake and less than 100m. lower in elevation. The height of this moraine on the hillside north of the lake indicates that when it was formed the glacier was approximately 150m. thicker than it is today. (Figure 5 shows the age groups of moraines and the oldest trees found on them. Figure 6 shows

several of the moraines.)

The most recent moraines of the Price Glacier are a complex set of at least eight crests near the outlet of Price Lake and a rather indistinct series far up the hill to the east. For the most part these moraines are quite small and appear to be the product of very short lived, perhaps annual, readvances during a period of general recession. Trees on the outermost crests of the group range up to 45 years old and numerous trees are found between 39 and 45 years. On crests nearer the lake trees are no more than 34 or 35 years old. From this it is estimated that the moraines representing the last evidence of glacial position were constructed starting around 1900 (45 + 25 years ago) and that around or shortly after 1910 the glacier began a retreat which exposed what is now Price Lake.<sup>4</sup>

Three periods of glacial activity during the 19th century are marked by groups of moraines progressively further from the lake and the present terminus of the glacier. The oldest trees found on the three groups of moraines were 64, 99 and 133 years old respectively. Again, as on the more recent moraines, there was within each group a general uniformity of age among the oldest trees. Based on the age of vegetation on these moraines it is estimated that periods of glacial activity probably culminated during the 1880's, around 1850, and during the

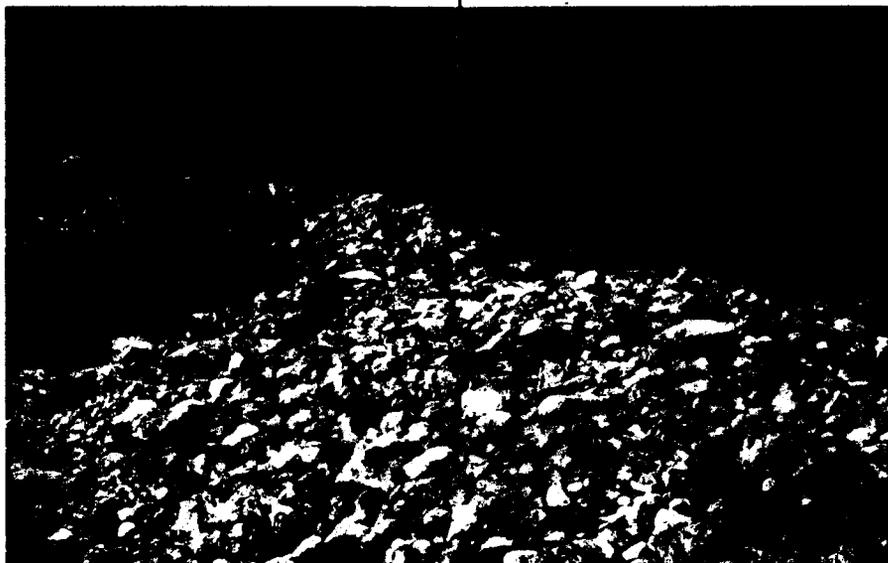
---

<sup>4</sup>It is possible that more recent moraines exist and are covered by the waters of Price Lake. Considering the rapidity of recession since 1910, and the absence of any evidence along the lakeshore, however, this is unlikely.

Figure 6. Price Lake Moraines.

- A) 1900's moraine looking northwest towards Price Creek. Moraine is composed of unstable, unweathered debris and is devoid of moss and lichen. Vegetation inside (to the left of) the moraine is alder with a few very small evergreens (not pictured).
- B) 1810's moraine looking towards Upper Price Glacier. Morainal material is much more stable, with more abundant vegetation and some soil development. Fir and Hemlock trees ranging up to 30 cm. in diameter are found on the segment of the crest pictured. Beyond the moraine, at the left edge of the photograph, are large trees on the 1600? moraine.
- C) Non-forested section of the 1450? moraine. The crest shows considerable reduction by geomorphic processes, being much more rounded than younger moraines. Most of the surface is soil covered and exposed rocks show considerable moss and lichen cover. Tree on the moraine in the rear of the photograph (in shade) range up to 125 cm diameter.

22b.



1810's. Along most of the length of the moraines, the 1880's readvance appears to have overridden the 1850 crests. The moraine of the 1810's advance is much more massive than other Price Lake moraines, ranging from 7m. or 8m. to over 15m. in height and it thus appears that ice must have stood for some time at this point.

Beyond the 19th century moraines are two groups of moraines which are distinctly different in appearance from those closer to the glacier. While the latter are generally unstable, quite rocky and sparsely vegetated, the outer moraines are completely stable, in many places solid covered to depths up to 15 cm. and, especially near Price Creek, support a dense Fir and Hemlock forest. Lichen and moss cover is much more conspicuous. In most of these respects the 1810's moraine is intermediate in appearance between the earlier and later moraines.

On the outer moraines it was not possible to obtain complete cores from the larger trees, and it was necessary to use the extrapolation method outlined above (Table I). As a result ages established for these moraines should be regarded as approximations.

Immediately outside the 1810's moraine are three rounded crests which date from a single period of glacial advance. Vegetation on these and on the single moraine beyond appears to be first growth as there are no large, well decayed downed trees and there is a uniformity of size and apparent age among the oldest trees. Several trees were dated using the extrapolation

Table I. Sample calculations of age of moraine based on partial core a known age of trees on neighboring moraine.

A) Oldest tree on 1450? moraine:

104 cm. diameter Mountain Hemlock was sampled. 38cm. core showed 358 annual growth rings. The uncored portion of the tree represents a tree of:  $104 - 76 = 28$ cm. diameter (29cm. making allowance for bark.)

On 1810's moraine (age ca. 158 years) in this vicinity Mountain Hemlocks are found up to 28cm. in diameter.

Based on these figures a minimum age was calculated for the moraine:  $158 + 358 = 516$  years.

B) Tree on 1600? moraine:

93 cm. diameter Mountain Hemlock was sampled. 37 cm. core showed 167 annual growth rings. The uncored portion of the tree represents a tree of  $93 - 74 = 19$ cm. diameter.

On 1810's moraine in the vicinity Mountain Hemlock appear to have first reached 19cm. diameter (not including bark) approximately 108 years after deglaciation.

Based on these figures a minimum age was calculated for the moraine:  $167 + 108 = 275$  years.

(Note: This was not the oldest tree on the moraine.)

technique and a minimum age of 360 years was established for the moraines. This would place recession of ice from the features during the first years of the 17th century. In figure 5 these are referred to as the 1600? moraines.

A single discontinuous crest is present about 25m. beyond the 1600? moraines. In some places erosion has removed all the fine material leaving only a line of boulders to mark the former ice margin. Using partial cores a minimum age of 516 years was established for the moraine. This figure was based on results from a tree which gave at once the oldest figure and probably the most accurate (involving the least amount of extrapolation). Two other trees sampled yielded ages between 450 - 500 years. An age of 516 years would place retreat of ice from this outermost Price Lake moraine during the mid 15th century. The moraine is identified as 1450? in figure 5.

Regarding the question of earlier neoglacial advance beyond the 1450? moraine, no definitive answer can be provided. Circumstantial evidence, however, strongly indicates not only that there was no greater advance during the most recent neoglacial period but that the 1450? moraine represent the glacier's most advanced position in several thousand years.

No topographical evidence (moraines, etc.) of any advance was found in the area beyond the 1450? moraine. A number of characteristics of the area indicate that it has not been glaciated for a substantial period. Exposed bedrock just

beyond the moraine shows no evidence of striations, evidence which would likely have been preserved from any recent advance. Weathering of the till material has progressed in places to over 1m. below the surface. This compares to a maximum of 15cm. inside the moraine.

The composition of the forest beyond the outermost moraine is indicative of a greater antiquity. While growing trees are generally not much larger than those on and inside the moraine, very large downed trees in all stages of decay are everywhere present. Much of the sub-surface is composed of well decomposed trees, some of which are soil covered. Lichen of several species were found to be almost twice as large outside the moraine as inside.

Differences in forest structure and lichen size might be explained by an additional few hundred years past since glaciation. The much greater amount of weathering beyond the moraines however indicates that the period which has passed since the last glaciation beyond the moraines is probably several times longer than the 500+ year period which has passed since the construction of the outermost moraine.

Certainly it can be concluded that no advance of greater extent than that represented by the 1450? moraine took place during the most recent phase of neoglaciation. The complete absence of any positive evidence, either morainic features or striations, combined with the large amount of soil development which has taken place, make it a reasonable, if unproven,

assumption that the 1450? moraine marks the neoglacial maximum of the Price Glacier.

The presence of Mazama ash would offer conclusive evidence that no neoglacial advance had taken place in a particular area. The fact that no Mazama ash was found in the area beyond the 1450? crest should not however be taken to mean that the area has been glaciated. Many agents of erosion other than ice may remove ash. Ash deposits are most likely to be retained in lakes or bogs or in other sheltered depressions (Wilcox 1965). All of these are notably absent from the area beyond the Price Lake moraines, an area of very steep topography and likely subject to rapid erosive processes. This meant that 1) retention of ash in the area was unlikely and 2) the search for ash could not be concentrated in a few especially promising sites, but rather was necessarily much more random. In short, the failure to find Mazama ash should not be taken as evidence of post-Hypsithermal glacial activity beyond the Price Lake moraines.

#### Chronology and Correlation

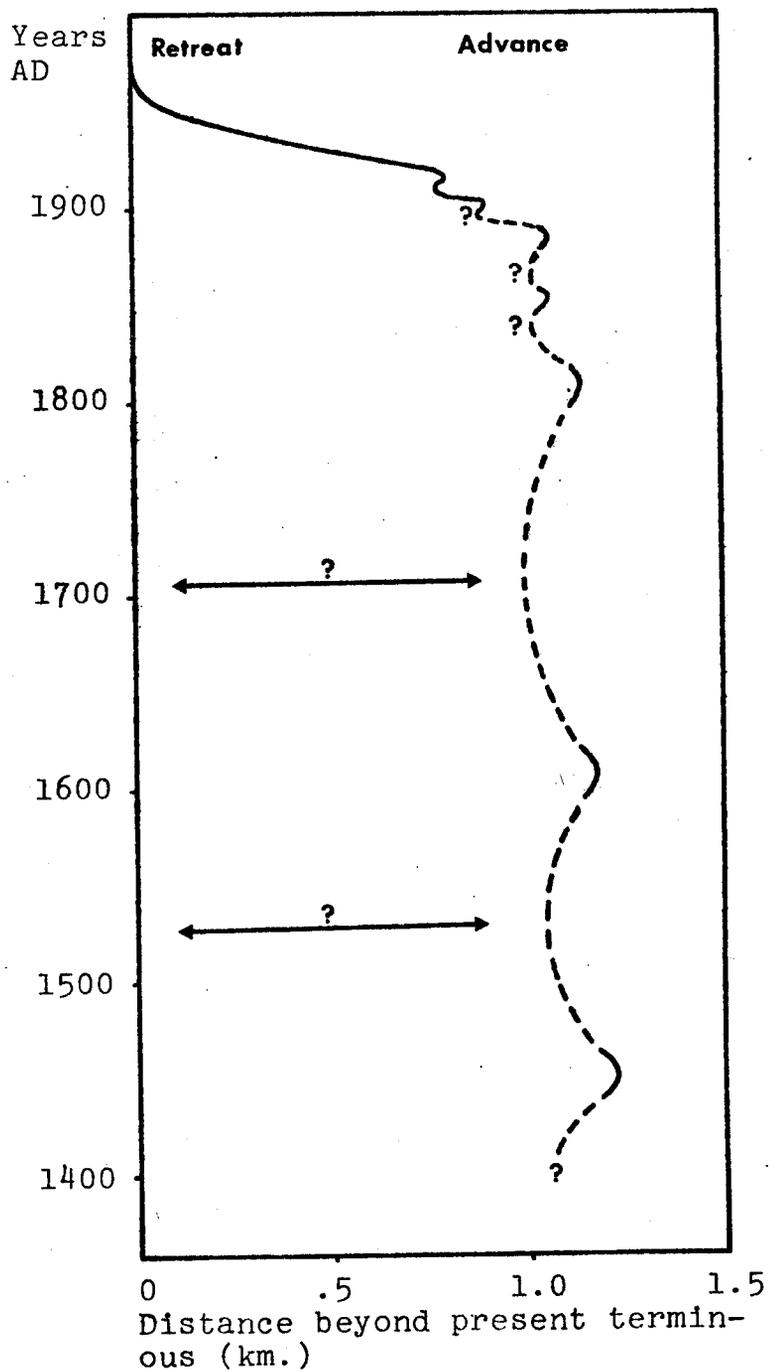
The moraines at Price Lake reveal a complex record of glacial fluctuations covering the last 500 years. The position of the glacier between the Hypsithermal period ca. 4000BC (6000 BP) and the 15th century AD is unknown. No evidence has been uncovered of any advances during the early or middle periods of neoglaciation, although it is possible that during either or both periods advances occurred which were of smaller

dimensions than those of the latest period.

During the 15th century the glacier advanced to what was apparently its greatest post-Pleistocene position. Subsequent major advances culminating ca. 1600 and ca. 1810 produced large moraines. During the 19th century the glacier remained in a relatively advanced position although it underwent gradual recession. Many small moraines represent pauses or readvances during the second half of the century. By 1900 the glacier had receded almost 300m. from its 1810 position. Around 1910 a major recession began and during the following 50 years, 750m. of recession took place and the present Price Lake was formed. Forest service photographs indicate that since 1962 very little, if any, recession has taken place. Because there is no way of determining the extent of former recessions, the magnitude of the present recession compared to earlier post-Pleistocene retreats is unknown. Figure 7 shows schematically the recent neoglacial chronology of the Price Glacier.

There are numerous difficulties in correlating patterns of glacial activity even within a single mountain range. Changes in glacier behavior occur as responses to climate but different glaciers may respond in diverse ways to the same climatic event. An extremely complex set of events leads from a climatic change to glacial response and finally to adjustment of the terminal position of the glacier (Meier 1965). Because the factors influencing these events differ from glacier to

Figure 7. Fluctuations of the Price Glacier since 1400AD.



glacier even in the same area, responses to a particular change in climate may be very different and occur many years apart on neighboring glaciers. The use of moraines as evidence of past activity further complicates correlation. Small differences in glacial response may cause great differences in morainic evidence if one glacier overruns an earlier moraine while another does not.

Nevertheless, while correlation of specific events and dates is not always possible, long term patterns of glacial activity tend to be uniform over large areas, often worldwide. This appears to be the case in the Cascades. Data from Price Lake is generally consistent with that from Mount Baker and Dome Peak as well as Mount Garibaldi in British Columbia. Correlation with activity on Mount Rainier is much less complete.

The Price Lake chronology is very similar to that established by Miller (1969) at Dome Peak. In both areas maximum positions were reached during the last period of neoglaciation although at Dome Peak there is some evidence of advance during the early period. One of the four glaciers studied at Dome Peak, the Chickamin, shows evidence of large advances during the 13th and at the end of the 15th centuries. On the other glaciers the earliest moraines date from the 16th century. While there is no evidence of the first Chikemin advance at Price Lake, the second probably corresponds to the 15th century moraine at Price Lake. All four Dome Peak glaciers like the Price advanced and built moraines between the mid 16th

and early 17th centuries. In both areas glaciers then retreated only to reach advanced positions again during the 19th century. (Dome Peak moraines are limited to the second half of that century and there is no moraine corresponding to the 1810 Price Glacier moraine.) Glaciers in both areas experienced large retreats during the first half of this century.

Data from Mount Garibaldi, though somewhat less complete, show a similar pattern. Radiocarbon evidence indicates the Spinx Glacier was advancing in the late 15th century (Barendsen et al. 1957). It is not known when this advance culminated. It may correspond to the mid to late 15th century advance in other areas or to the late 16th century advance or it may fall somewhere in between. The ensuing recession was followed by advances during the early 18th<sup>6</sup> and mid to late 19th centuries.

Evidence from Mount Baker is still fairly sketchy. Easterbrook and Burke (1972) report evidence of early neoglacial advance. Two late neoglacial advances are also reported. Late neoglacial moraines which support trees up to 500 years old appear to date from the same period as the greatest advance at Price Lake. Another group of moraines are found dating from the mid 19th to early 20th centuries, contemporaneous to the most recent moraines of the Price Glacier. During the early years of this century severe recession took place on Mount Baker (Matthes 1937).

---

<sup>6</sup>While there is no record of an 18th century advance at Price Lake, Porter (per. comm.) reports evidence of such an advance in the Nooksack Crique.

Limited evidence of early neoglacial activity, absent at Price Lake, has been found in the other three areas in the form of overridden features from an advance of dimensions smaller than those of recent centuries. The evidence that exists in each area is very sparse and the absence of such evidence at Price Lake does not necessarily imply a dissimilarity of histories.

While these areas present a generally consistent chronology, Mount Rainier does not. Not only does data from Rainier not correspond with that from other areas of the Cascades, but there is very little consistency between the various glaciers on the mountain itself. Crandell and Miller (1964) conclude their study of neoglaciation on Rainier by stating, "End moraines formed during the middle part of the 19th century have been recognized in front of six glaciers . . . Older moraines do not fall into a consistent pattern from glacier to glacier." (p. D114). Possible explanations for this anomaly might be found first in the extreme height (4392m) and bulk of the mountain which may create microclimates very different from each other and unlike any others in the Cascades, and second in the recent volcanic activity of the mountain. Rainier has produced at least ten ash layers in the last 9000 years (Easterbrook and Rahm 1970). The effect of this volcanic activity on glacier budgets through increased thermal heat is impossible to evaluate.

Thus, while the data from Mount Rainier cannot be ignored,

it should not be taken to invalidate the generally consistent chronology of other parts of the Cascades and southern Coast Mountains. Based on the other four areas which have been studied to date a tentative chronology may be established (see figure 8).

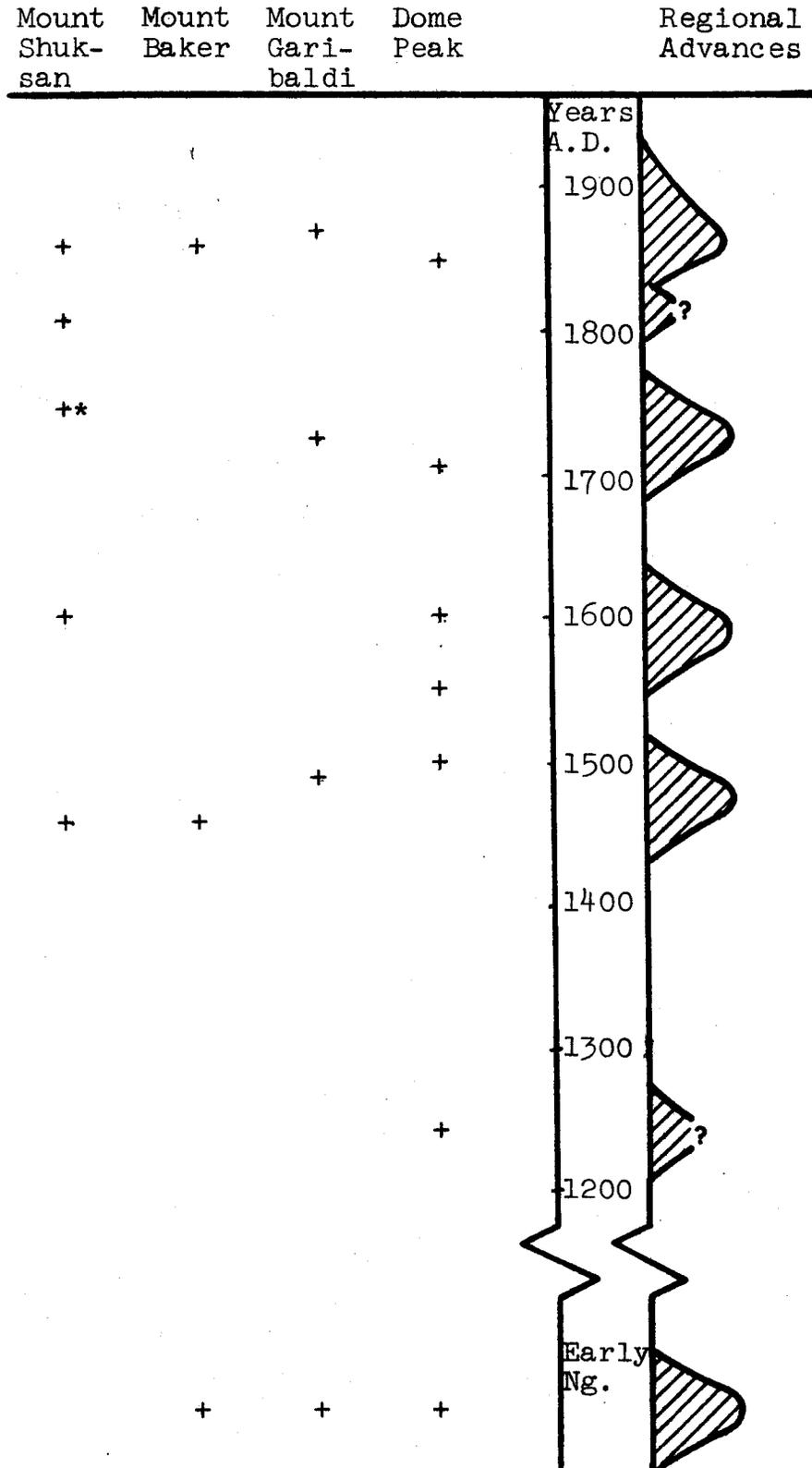
There is scarce but widespread evidence of glacial advance during the early neoglacial period. With the exception of Mount Rainier there is no evidence of advance between this time and the late neoglacial period. In general the late neoglaciation was the largest in the region, overrunning evidence of earlier periods. General advances of Cascade glaciers culminated in the mid to late 15 century, from the mid 16th to early 17th century, during the first half of the 18th century and most recently during the second half of the 19th century. There is some evidence, not widespread, of two other periods of advance during the late neoglaciation. The 13th century advance of the Chickamin Glacier may have been peculiar to that glacier or it may be that evidence there is the only remaining evidence of a more general advance. Corroborative evidence of the 1810's advance of the Price Glacier is similarly absent in other areas of the Cascades.<sup>7</sup>

While evidence of each major advance is considerable throughout the range, different microclimate and response patterns have caused variance in fluctuations and have often

---

<sup>7</sup>There is, however, substantial evidence of major advances culminating around this time in the Olympic Mountains of Washington, 200 km west of the Cascades (Heusser 1957, Long 1969).

Figure 8. Correlation of neoglacial activity in the northern Cascades and southern Coast Mountains (excluding Mount Rainier).



\*Advance in Nooksack Cirque (S. Porter, per. comm.)

caused glaciers to reach maximum extent during different periods. As a result, in no one area has evidence of all periods of advance been preserved and exact correlation of dates within periods is not always possible.

### Lichenometry Test

Lichenometry has been used to establish dates for neoglacial and other recent features. The technique, originally proposed by Beschel (1950), has been utilized widely in situations where dating by other methods (historical records, radiocarbon, dendrochronology) was not possible. Most commonly used in the Arctic and in Scandinavia, in recent years several lichenometric studies have been undertaken in the North American Cordillera.

The technique is based on the measurement of the diameters of crustose lichen and has been outlined by Beschel (1961) and Andrews and Webber (1964) in Arctic contexts while Benedict (1967) has done the same for alpine areas. The use of lichen size measurements for dating is based on a number of assumptions to which several serious objections have been raised.

Central to all lichenometry work is the assumption that within a particular local climate the size of an optimally developed lichen thallus will be directly related to its age. The precise nature of this relationship will vary with different species and local climate parameters. The investigator must control for microenvironmental factors which may influence growth such as rock type, exposure to abrasion, shading, moisture

and stability of substrate (Benedict 1967). Unless differences in each of these factors are minimized, accurate correlation and differentiation of age, based on size of thalli is impossible.<sup>8</sup> Methods which have been used to minimize these are discussed below.

The usefulness of lichenometry for dating of glacial features stems from observations which have led to the conclusion that lichen will not survive either glacial scouring or the transportation of the host rock by ice (Beschel 1961, Andrews and Webber 1964). At the time of deglaciation deposits will be devoid of living lichen. Only when such features begin to stabilize with ice retreat will successful recolonization begin. The size of optimally developed thalli will then bear a direct relationship to the time elapsed since retreat of the ice front from a feature.<sup>9</sup>

In an attempt to minimize the impact of site factors which may inhibit growth and prevent the achievement of optimal growth for a particular species in a particular local climate North American and Arctic lichenometric studies have been almost universally based upon the size of the largest thallus found in

---

<sup>8</sup>It is perhaps noteworthy in this context that in North America lichenometry has been most widely utilized in Arctic regions where many micro-environmental gradients are likely to be much less sharp than in alpine areas, thus reducing potential sources of error.

<sup>9</sup>More accurately the relationship will be to the time of recolonization which will follow deglaciation by a period varying from five to over twenty years (Stork 1963).

the sample area. In doing this care must be taken to control for the few site factors (especially excess wetness) which may stimulate "extraoptimal" growth. The use of the largest single thallus is based on the assumption that it will best represent optimal development within the local climate because, 1) growth inhibitive effects of microclimate are minimized by ignoring those individuals which have grown slowly, 2) successive colonizers after the original recolonization will not figure in the data.

In order to utilize lichen study to obtain absolute dates it is necessary to make assumptions regarding lichen growth patterns. According to Beschel (1961) the growth curve of lichen is initially sigmoidal (S-shaped), followed by a long linear phase. Growth begins slowly, gradually accelerating until at a certain point it begins to drop again to a slower but very constant rate. This constant rate may be maintained for a very long period.<sup>10</sup> At least two subsequent studies appear to substantiate the assumption of a long period of linear growth (Burrows and Lucas 1967, Anderson and Sollid 1971).

Given the assumption of a long linear phase of growth, it is possible, by measuring lichen on a few dated surfaces, to plot a linear age/size curve upon which thalli from features of unknown age can be located. In this way it is possible to

---

<sup>10</sup>In the Colorado Rockies Benedict (1967) estimated that the sigmoidal period lasts ca. 100 years while the linear period lasts ca. 3000.

provide dates for features which might otherwise be impossible to date.

All of the assumptions of lichenometry have been seriously challenged. The notion that there is a clear relationship between lichen size and age, even under optimal conditions, has been questioned by Jochimsen (1966) who maintains that growth is so individual and complex that no simple correlations can be drawn. There is also considerable question concerning how far away from the original site results can be used with any degree of accuracy.

The assumption that at the time of deglaciation substrate are totally devoid of lichen and the resulting assumption that the age of the oldest lichen is indicative of the age of the substrate have also been challenged. Recent work by Matthews (1973) indicates that lichen may survive transportation by ice. Jochimsen (1966) argues that rocks with lichen may fall onto the substrate without destroying the lichen. Advocates of the technique have admitted, at least tacitly, that this possibility exists. Benedit (1967) recommends treating "exceptionally large" thalli with skepticism as these may predate the substrate.

Use of the single largest individual thalli as indicators of age and optimal growth has been questioned in Scandinavia (Stork 1963, Matthews 1973), and merits further investigation. It is of critical importance to the technique that optimally-developed individuals be utilized while those whose site con-

ditions were not conducive to optimal growth be ignored. Certainly the use of the largest thallus has the advantage of minimizing the influence of growth inhibitive environmental factors as well as of later colonizers. On the other hand, this approach may well have the opposite disadvantage, putting a premium on either pre-substrate age individuals or individuals which for either environmental or genetic reasons grow unusually rapidly. The technique demands exclusion of sites obviously unusually conducive to growth (lakeshores, etc.) and of "exceptionally large" thalli, yet this introduces an additional problem of differentiating between optimal development and unusual development. It appears that even when obviously exceptional thalli are excluded, the technique will still tend to place an emphasis on unusual individuals which escape detection.

Two techniques have been employed to reduce this emphasis on very large individuals. The extremely time consuming method employed by Benedict (1967) at one site, and by Anderson and Sollid (1971), of measuring a random sample of 1000 - 15000 thalli and plotting a size/frequency histogram to determine the degree of continuity, may well be the most certain method of assuring that the largest individual is nonetheless representative. Stork (1963) reports that Scandinavian geomorphologists have employed a perhaps somewhat less precise but far less time consuming method of averaging the diameters of the largest thalli found in each of five separate sample areas on a deposit. Mottershed and White (1972) have refined this technique by

averaging the five largest thalli in each of the five sample areas. Averaging is aimed at minimizing the effect of single extraordinarily large thallus.

Finally, several workers, beginning with Jochimsen (1966), have questioned the existence of a long period of linear growth, an assumption critical to absolute dating. Andrews and Webber (1969), the leading North American exponents of lichenometry, have concluded from direct measurement of lichen growth that although the growth curve appears sigmoidal, a long linear phase may not exist. Recent work by Mottershed and White (1972) indicates that after the period of maximum growth rate the curve declines in an exponential fashion, and that the long final period of growth is defined by a log/linear rather than a linear curve. If further investigation substantiates these studies a re-evaluation of the technique and results obtained from it may be necessary.

A test of the lichenometric technique was carried out at Price Lake in an attempt to shed further light on some of the above questions. The test was formulated with three basic aims. The first was to examine whether standard lichenometric techniques do indeed indicate a direct relationship between age of substrate and size of lichen. Secondly, it was hoped to determine which sampling method will best insure that only those individuals reflecting optimal development will be sampled. This method should give the most consistent results on features

of the same age and the clearest distinction between features of different ages. In short, the aim is to determine which method is the most accurate for correlating and differentiating features. Finally, if possible, a growth curve for the species *Rhizocarpon geographicum* in the Price Lake area would be constructed. Determination of the degree of conformity to the assumptions made in lichenometry could be made.

Three different sampling methods were used and compared; the two standard methods based on the largest single thallus and a third method based on averaging:

1) The method utilized by Benedict (1969) and Mahaney (1973) of using the largest single thallus found on the whole of a feature.

2) The technique used by Beschel (1961) and Andrews and Webber (1964) using sample areas of a standard size on each feature and using the largest thallus found within these sample areas.

3) A technique in which an average is computed of the diameters of the largest ten thalli within a standard sized sample area on each moraine.<sup>11</sup>

In order to minimize the influence of site factors the procedures outlined by Benedict (1967) were followed controlling for rock type and not recording thalli in areas of excess moisture. Measurement was limited to metamorphic rocks of

---

<sup>11</sup>This is quite similar to the technique adopted by Mottershed and White (1972) whose article was received too late to be incorporated in design of the field project.

Phyllite type. No lichen measurements were recorded within 25m. of Price Lake, Price Creek, or of any small ponds.

Measurements were recorded for several types of lichen including species of Caloplaca, Lecanora and Rhizocarpon. Only two species, Rhizocarpon geographicum and a species of Lecanora which could not be positively identified, were present in sufficient numbers to give a fairly complete record on the moraines. R. geographicum was by far the more common. While some figures for Lecanora are shown in Table II the figures for R. geographicum are likely to be much more representative. Only R. geographicum data was considered in the test.

Data for technique (1) was collected during the whole course of field work. Large diameters were recorded on all moraines within the constraints outlined above. Data for techniques (2) and (3) were collected in 100m<sup>2</sup> sample areas (Beschel 1961) in an area in which site factor differences could be minimized. On each of four dated moraines four sample areas were used. In each sample area the diameters of the ten largest Rhizocarpon thalli were recorded.

Using these data it was possible, by employing analysis of variance and other comparative techniques to investigate the relationship of age and size and to determine which technique would be most useful for correlating and distinguishing moraines. Using the technique which proved most capable of this, a growth curve was plotted, with the hope that this would allow examination of the pattern of lichen growth in the Price Lake area and

comparison with the growth curve assumed in lichenometry.

In selecting sample areas for techniques (2) and (3) the upper area of the moraines appeared to offer the most micro-environmental uniformity in virtually every respect<sup>12</sup> and hence appeared to be the better area. The major problem was that one of the positively dated groups of moraines, that dated ca. 1850, was not present in this area. Thus, while all other results are from the upper area (see figure 5), the 1850 figures are from approximately 300m further west. In order to insure that microenvironmental differences between the two areas would not distort test results, a sample count was also made on the 1880's moraine adjacent to the 1850 moraine sample area. When compared to samples from the same moraine in the upper area a near identity of maximum thallus size and mean and standard deviation of the largest ten diameters was found. This is interpreted to indicate that microenvironmental differences over the 300m. were not sufficient to distort the test results.

#### Test Results

The three sets of measurements are shown in table II. Results for all three techniques clearly show a general age/size relationship although overlaps do occur. In order to examine the statistical significance of the relationship, an analysis

---

<sup>12</sup>The area is flat and sparsely vegetated, reducing the problem of rockfall and instability and insuring a similarity of aspect, exposure to sun and wind, temperature and precipitation.

Table II. Lichenometry test results obtained using three sampling techniques.

A) Technique (1). Diameter (mm.) of largest thalli on moraines of different ages.

	1900s	Date of Moraine		1810s	1600?	1450?
		1880s	1850 Inner Outer			
Rhizocarpon	36	58	68 60	85	122	126
Lecanora	42	66	80 69	100	114	—

B) Technique (2). Diameter (mm.) of largest Rhizocarpon geographica thalli in four sample areas on each of four moraines.

1900s	Date of Moraine		1810s
	1880s	1850	
15	31	50	60
18	34	58	69
16	31	54	57
17	30	61	70

C) Technique (3). Mean diameter (mm.) of ten largest Rhizocarpon geographica thalli in four sample areas on each of four moraines.

	1900s	Date of Moraine		1810s
		1880s	1850	
	10.6	29.6	44.2	57.0
	10.9	29.5	48.0	55.0
	12.4	29.2	49.6	51.0
	11.1	25.3	48.8	51.3
Mean	11.25	28.40	47.65	53.57
Range	16.0%	13.7%	11.3%	11.2%

of variance test was run on the data obtained through techniques (2) and (3). By comparing the amount of variance between samples from the same moraine with the amount between samples from moraines of different ages, this technique provides a measure of the validity of the assumed age/size relationship. Data obtained using both techniques proved to be statistically significant at .1% (see table III A and B). When an analysis of variance was run between the two moraines providing the least distinguishable sets of data (1850 and 1810's moraines), however, the result was a much lower level of significance (see table III C and D) indicating that the general age/size relationship may not be sufficiently accurate to distinguish with certainty between moraines of fairly similar ages.

Using the same sample areas and measurements, technique (3), that based on averaging lichen diameters, produced results of a greater degree of significance than did that based on the largest single individual. This indicates that technique (3) probably offers a closer approximation of age/size correlation and would thus be more useful in differentiating moraines. The fact that there is overlap between columns in table IIB while there is none in IIC is further indication of the greater usefulness of the averaging technique for establishing substrate age. This greater accuracy probably stems from the fact that by averaging several of the largest thalli, the effect of unique site and genetic factors is reduced.

The same type of comparative analysis was unfortunately

Table III. Results of analysis of variance test.

- A) Test of data from four moraines obtained using technique (2).

$f = 109.88$  For 12 degrees of freedom within groups and 3 degrees of freedom between, this is significant at .1%.

- B) Test of data from four moraines obtained using technique (3).

$f = 309.53$  For 12 degrees of freedom within groups and 3 degrees of freedom between, this is significant at .1%.

- C) Test of data from 1850 and 1810's moraines obtained using technique (2).

$f = 4.19$  For 6 degrees of freedom within groups and 1 degree of freedom between, this is not significant at 5%.

- D) Test of data from 1850 and 1810's moraines obtained using technique (3).

$f = 9.86$  For 6 degrees of freedom within groups and 1 degree of freedom between, this is significant at 5%.

impossible with technique (1).<sup>13</sup> However, there are indications that the technique provides less conclusive results than technique (3). For at least two pairs of moraines (one such case shown in table IIA) there were reversals of age/size relationships using technique (1), while no such reversals occurred on these or any other moraines using the averaging technique.

This indicates that, at least on the moraines sampled, averaging appears to give a clearer representation of the relationships.

This may be explained in part by the fact that averaging reduces the impact of extraordinary thalli and in part by the fact that technique (1) utilizes the whole moraine rather than a small, controlled, sample area. Microenvironmental gradients and site factors can be reduced greatly in the latter case, while such control is much more difficult in the former. Additionally, it is difficult to assure that the largest thallus is actually measured on features of any great extent.

While data collected do show statistically significant relationships between age groups and size, the results also indicate clearly that there are substantial problems involved in using these relationships for lichenometric dating. Even using the most accurate of the sampling techniques there is considerable variation between samples within each age group (ranging from 11% to 17%), which would make assignment of ab-

---

<sup>13</sup>As the technique demands the largest diameter found on a moraine, it is impossible to have more than one sample on each moraine.

solite age, particularly for older features, hazardous.<sup>14</sup> In the later stages of growth such a range in measurement could lead to an error in calculated age approaching  $\pm 50\%$  (Figure 9A). The near overlap between some columns in table IIC indicates the difficulties which may be involved, even in the use of relative lichenometry to differentiate features of different ages.

Based on the data in table IIC<sup>15</sup> and results obtained using the same technique (3) on the two outermost moraines, a growth curve was plotted for *R. geographica* at the test area (see figure 9A). Because the ages of the outermost two moraines are not as certain as those of the inner four, the growth curve beyond 160 years is necessarily approximate. The curve appears to be sigmoidal in shape, but from the available data, late stages of growth do not appear to conform to Beschel's (1961) assumption of linearity. Size was plotted against log of age as suggested by Mottershed and White (1972) and the fit seems to be much closer (see figure 9B).

While a log/linear plot appears to be more accurate, both linear and log/linear approximations of the later stages of growth show statistically significant correlations at .1% level of confidence (for linear approximation  $r = +.972$ , for log/linear  $r = +.985$ ,  $n = 10$ ). Because of this, and because the

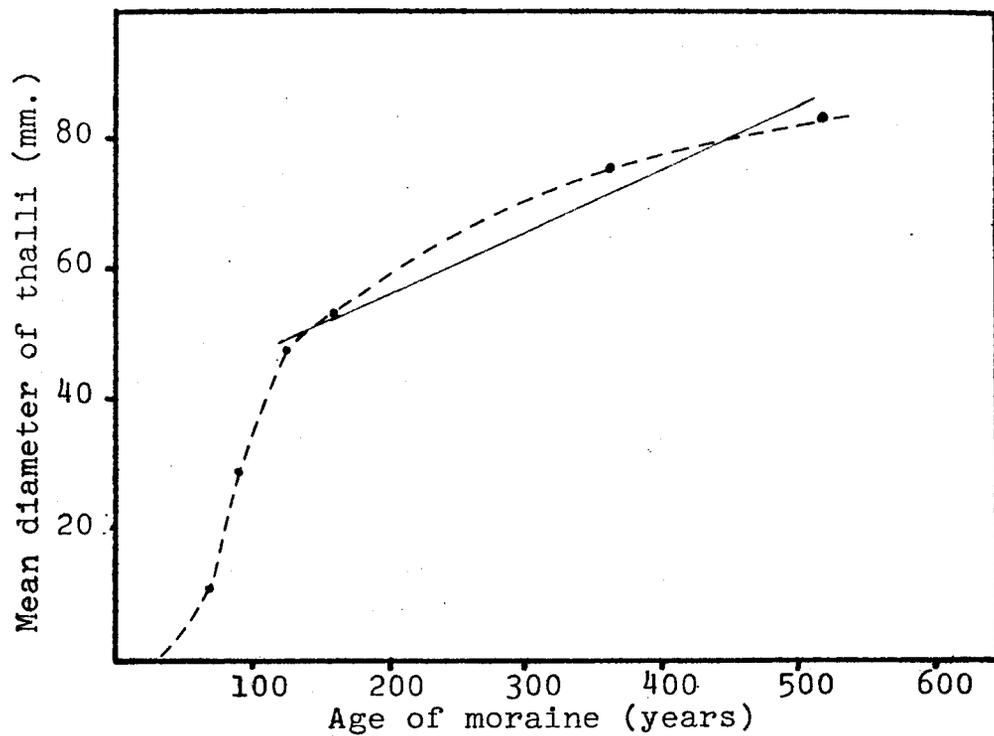
---

<sup>14</sup>With four sample areas on each moraine it is impossible to make meaningful statistical statements regarding confidence intervals, but the fact that there is such variability on each moraine indicates that rather large confidence intervals would probably be necessary.

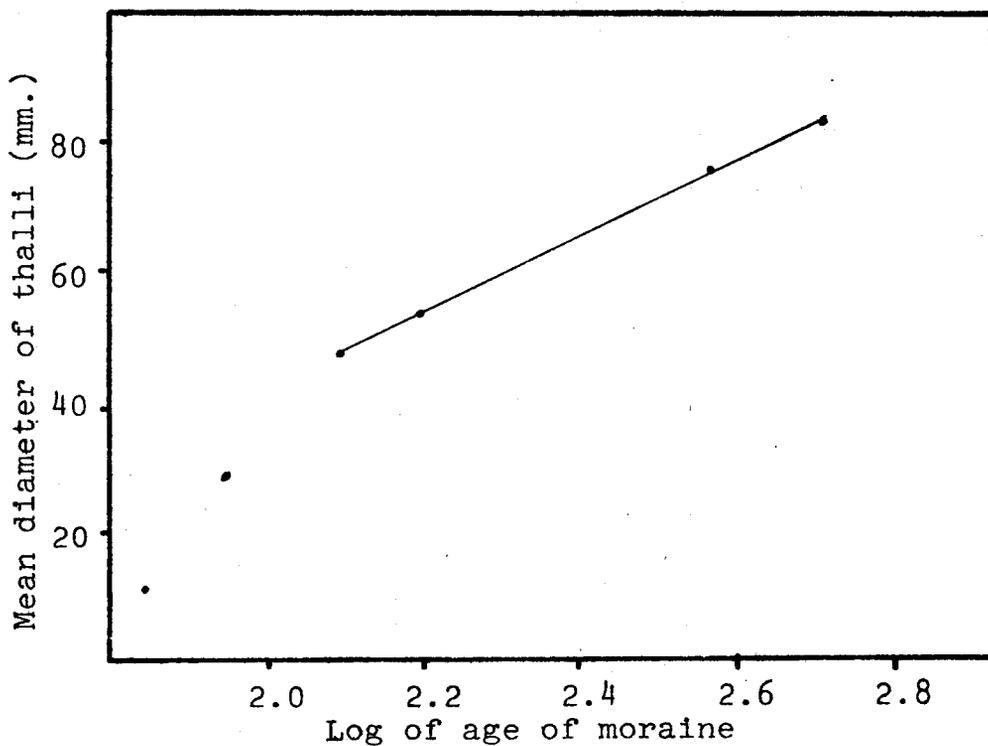
<sup>15</sup>The four values shown for each moraine in table IIC were averaged and this figure was used in plotting growth curves.

Figure 9. *Rhizocarpon geographica* growth curves at Price Lake.

## A) Diameter vs. age



## B) Diameter vs. log of age



paucity of dated surfaces limited sample size,<sup>16</sup> it is impossible to differentiate between the accuracy of the two approximations on a statistical basis. Hence, figure 9 cannot be advanced as definitive evidence of a log/linear growth relationship. Nonetheless, it does appear that a log/linear curve may be a closer approximation of the late period of lichen growth than the generally used linear form.<sup>17</sup> It is clear that there is need for more work on this question.

### Conclusions

The data obtained by all three lichenometry techniques indicates the existence of a broad age/size relationship. Analysis of the data obtained using techniques (2) and (3) shows that this relationship is of statistical significance. The results indicate that a technique based on averaging the largest several diameters within a sample area, by allowing more control of site factors, reduces the variability between samples on the same substrate and produces a clearer indication of age/size relationships. Hence, this method should be the most useful for lichenometric dating. Even using this technique, however, there still exists considerable variation

---

<sup>16</sup>This has been a major problem in all attempts to determine lichen growth curves and has made rigorous statistical treatment of the problem impossible.

<sup>17</sup>Data obtained using techniques (1) and (2) produce growth curves generally similar to that in figure 9A. Again the relative accuracy of linear and log/linear approximation cannot be determined statistically on the basis of the data available. The greater scatter of data using these two techniques precludes a visual evaluation.

between sample areas on a single moraine, indicating that lichenometric dating, at best, must be considered rough approximation.

Based on data obtained using the averaging technique, a growth curve for *R. geographicalis* was found to conform to the assumption of sigmoidality, but appeared to have a log/linear rather than linear form in later years. This could not, however, be established with any certainty.

It should be noted that while observations at Price Lake have addressed a number of questions regarding lichenometry, a number of others remain untested. The Price Lake data was collected in sample areas carefully selected to maximize micro-environmental homogeneity. The question of the extent to which results from one area may be applied in neighboring areas has not been investigated. As declining homogeneity reduces the accuracy of lichenometry, the whole notion of regional growth curves (Benedict 1967, Mahaney 1973) may be questioned. Certainly more study is necessary to determine the distance over which the technique may be applied.

Postscript

Subsequent to the completion of field work at Price Lake, during the final preparation of this manuscript, a special issue devoted to lichenometric studies was published by Arctic and Alpine Research (Volume 5 no. 4, Fall 1973). Several of the papers in the issue deal with questions discussed in this paper. However, the late date of publication precluded the incorporation of these papers into the research design and manuscript.

Bibliography

- Anderson, J. L. and Sollid, J. L. 1971 "Glacial Chronology and Glacial Geomorphology in the Marginal Zone of the Glaciers, Midtdalsbreen and Nigardsbreen, South Norway." Norsk Geografiska Tidsskrift, V. 25, p. 1-38.
- Andrews, J. T. and Webber, P. J. 1964 "A Lichenometric Study of the Northwest Margin of the Barnes Ice Cap: A Geomorphic Technique." Geographical Bulletin, V. 22, p. 80-104.
- Andrews, J. T. and Webber, P. J. 1969 "Lichenometry to Evaluate Changes in Glacial Mass Budgets: As Illustrated From North Central Baffin Island, N. W. T." Arctic and Alpine Research, V. 1, p. 181-194.
- Barendsen, G. W., Deevey, E. S. and Gralenski, L. J. 1957 "Yale Natural Radiocarbon Measurements III." Science, V. 126, p. 908-919.
- Benedict, J. B. 1967 "Recent Glacial History of an Alpine Area in the Colorado Front Range, U. S. A. Part I: Establishing a Lichen Growth Curve." Journal of Glaciology, V. 6, p. 817-832.
- Beschel, R. E. 1950 "Flechten als Altersmasstab" Zeitschrift für Gletcherkunde und Glazialgeologie V. 1, p. 152-161  
(Translated in Alpine and Arctic Research V. 5, p. 303-309).
- Beschel, R. E. 1961 "Dating Rock Surfaces by Lichen Growth and Its Application to Glaciology and Physiography (Lichenometry)." In Raash, G. O. (ed.) Geology of the Arctic, p. 1044-1062, University of Toronto Press, Toronto.
- Burrows, C. J. and Lucas, J. 1967 "Variations in Two New Zealand Glaciers During the Last 800 Years." Nature, V. 216, p. 467-468.
- Crandell, D. R. and Miller, C. D. 1964 "Post-Hypsithermal Glacier Advances on Mount Rainier, Washington." U. S. Geological Survey Professional Paper 501D, p. 110-114.
- Deevey, E. S. and Flint, R. F. 1957 "Postglacial Hypsithermal Interval" Science V. 125, p. 182-184.
- Denton, G. H. and Porter, S. C. 1970 "Neoglaciation." Scientific American, V. 222, p. 100-110.
- Easterbrook, D. J. and Burke, R. M. 1972 "Glaciation of the North Cascades, Washington." (abst.) Geological Society of America Abstracts, V. 4, p. 152.
- Easterbrook, D. J. and Rahm, D. A. 1970 Landforms of Washington. Union Printing Company, Bellingham, Washington, 156 p.

- Embleton, Clifford and King, C. A. M. 1968 Glacial and Periglacial Geomorphology. St. Martin's Press, N. Y. 608 p.
- Flint, Richard F. 1971 Glacial and Quarternary Geology. John Wiley and Sons, New York. 892 p.
- Harrison, A. E. 1956 "Fluctuations of the Nisqually Glacier, Mount Rainier, Washington, Since 1750." Journal of Glaciology, V. 2, p. 675-683.
- Heusser, C. J. 1957 "Variations of the Blue, Hoh and White Glaciers During Recent Centuries." Arctic, V. 10, p. 139-150.
- Heusser, C. J. 1960 "Late Pleistocene Environments of North Pacific North America." American Geographical Society Special Paper #35, 308 p.
- Howard, G. E. 1950 Lichen of the State of Washington. University of Washington Press, Seattle. 191 p.
- Jochimsen, vM. 1966 "Ist die Grosse des Flechtenthallus Wirklich ein Brauchbauer Masstab zur Datierlung van Glazialmorphologischen." Geografiska Annaler, V. 32, p.243-248.
- Lawrence, D. B. 1950 "Estimating Dates of Recent Glacial Advances and Recession Rates by Studying Tree Growth Layers." Transactions of the American Geophysical Union, V. 32, p. 243-248.
- Long, W. A. 1969 "Neoglacial Moraines in the Vicinity of Mount Deception." (abst.) Northwest Science, V. 43, p. 39.
- Mahaney, W. C. 1973 "Neoglacial Chronology in the Fourth of July Cirque, Central Colorado Front Range." Geological Society of America Bulletin, V. 84, p. 161-170.
- Mathews, W. H. 1950 "Historic and Prehistoric Fluctuations of Alpine Glaciers in the Mount Garibaldi Map Area, South Western British Columbia." Journal of Geology, V. 59, p. 357-380.
- Matthes, F. F. 1937 "Report of Committee on Glaciers." Transactions of the American Geophysical Union, V. 18, p. 293-294.
- Matthes, F. F. 1942 "Glaciers." in Meinzer, O. E. (ed.) Hydrology, p. 149-219, Dover Publishers, New York.

- Matthews, J. A. 1973 "Lichen Growth on an Active Medial Moraine, Jotunheimen, Norway." Journal of Glaciology, V. 12, p. 305-313.
- Meier, M. F. 1964 "The Recent History of Advance Retreat and Net Budget of South Cascade Glacier." (abst.) Transactions of the American Geophysical Union, V. 45, p. 608.
- Meier, M. F. 1965 "Glaciers and Climate." in Wright, H. E. and Frey, D. G. (eds.) The Quaternary of the United States p. 795-805, Princeton University Press, Princeton, N. J.
- Miller, C. D. 1969 "Chronology of Neoglacial Moraines in the Dome Peak Area, North Cascade Range, Washington." Arctic and Alpine Research, V. 1, p. 49-66.
- Misch, P. 1952 "Geology of the Northern Cascades of Washington." Mountaineer, V. 45, #13, p. 1-22.
- Misch, P. 1966 "Tectonic Evolution of the North Cascades of Washington State." in Symposium on Tectonic History and Mineral Deposits of the Western Cordillera in British Columbia and Neighboring Parts of the United States Canadian Institute of Mining and Metallurgy Special Volume 8, p. 101-148.
- Mottershed, D. N. and White, I. D. 1972 "The Lichenometric Dating of Glacier Recession, Tunsbergdal, Southern Norway." Geografiska Annaler, V. 54A, p. 47-52.
- Porter, S. C. and Denton, G. H. 1967 "Chronology of Neoglaciation in the North American Cordillera." American Journal of Science, V. 265, p. 177-210.
- Post, A., Richardson, D., Tanborn, W. V. and Russelot, F. L. 1971 "Inventory of Glaciers in the North Cascades." U. S. Geological Survey Professional Paper 705A, 26 p.
- Sharp, R. P. 1969 "Semiquantitative Differentiation of Glacial Moraines Near Convict Lake, Sierra Nevada, California." Journal of Geology, V. 77, p. 68-91.
- Sigafoos, R. S. and Hendricks, E. L. 1961 "Botanical Evidence of the Modern History of the Nisqually Glacier, Washington." U. S. Geological Survey Professional Paper 387A.

- Staatz, M. H., Tabor, R. W., Weis, P. L., Robertson, J. F., van Noy, R. M., and Pattee, E. C. 1972 Geology and Mineral Resources of the Northern Part of North Cascades National Park, Washington. U. S. Geological Survey Bulletin 1359, 132 p.
- Stork, A. 1963 "Plant Immigration in Front of Retreating Glaciers, With Illustrations from the Kebnekajse Area, Northern Sweden." Geografiska Annaler, V. 45, p. 1-22.
- Stuiver, M., Deevey, E. S., Gjalenski, J. L. 1960 "Yale Natural Radiocarbon Measurements." American Journal of Science Radiocarbon Supplement, V. 2, p. 49-61.
- Wilcox, R. E. 1965 "Volcanic Ash Chronology." in Wright, H. E. and Frey, D. G. (eds.) The Quarternary of the United States p. 807-816, Princeton University Press, Princeton, N. J.

PARKS AND RESOURCE POLICY: THE ROLE OF  
BRITISH COLUMBIA'S PROVINCIAL PARKS, 1911-1945

by

Eric Michael Leonard

A.B., University of California, 1971

AN EXTENDED ESSAY SUBMITTED IN PARTIAL FULFILLMENT  
OF THE REQUIREMENTS FOR THE DEGREE OF  
MASTER OF ARTS  
in the Department  
of  
Geography

© ERIC MICHAEL LEONARD 1974  
SIMON FRASER UNIVERSITY  
June 1974

All rights reserved. This essay may not be reproduced in whole or in part, by photocopy or other means, without permission of the author.

APPROVAL

Name: Eric Michael Leonard  
Degree: Master of Arts  
Title of Extended Essay: Parks and Resource Policy: The Role  
of British Columbia's Provincial Parks,  
1911-1945

Examining Committee:

Chairman: L. J. Evenden

F. F. Cunningham  
Senior Supervisor

---

T. O'Riordan

---

R. H. Ahrens  
External Examiner  
Director  
Parks Branch  
Victoria, B. C.

Date Approved:

## Abstract

The existence of parks and the development of park policy are linked intimately to a society's view of land and resources. In late 19th century Canada, rapid utilization of seemingly inexhaustible resources was regarded as the key to national development. Land was viewed overwhelmingly in terms of its usefulness, defined largely in tangible economic terms. The early 20th century adoption of resource conservation policies served to rationalize, but did little to alter, the overwhelmingly use-oriented approach to the landscape. The early Canadian national park system was largely a product of this general resource philosophy. Parks were established much more with the intent of creating economically valuable "tourist resources" than with that of preserving nature, and early park management policies were clearly aimed in the former direction.

Such a situation prevailed in British Columbia as well as the rest of Canada. The province's low population density and abundance of resources have promoted a belief in superabundance of the land, which, combined with an extremely heavy economic dependence on primary resource exploitation, has resulted in a provincial policy of encouragement of very rapid resource utilization. Because the destructive consequences of this became apparent much more slowly in B. C. than in eastern Canada, it was only much later that conservation thought began to influence provincial resource policy. The development of a strong movement for preservation of natural and wild areas appears to have

been similarly retarded.

British Columbia's provincial parks like the national parks were regarded initially as economic assets, and were established in an attempt to foster tourism. Early park plans and policies clearly reflect this orientation. The first provincial parks, established in the early years of this century, were modelled after the national parks, conceived of as developed resorts rather than wilderness reserves. Initially park areas were reserved from commercial resource development in the belief that increased tourist revenues would offset the marginal sacrifice of industrial revenue involved. In later years, with their failure to produce expected tourist revenues, the parks became increasingly difficult to justify in economic terms. Resource depletion in the province raised the value of resources in the parks and there was pressure for repeal of restrictive legislation to allow the park "resource" to be utilized in a more economically efficient fashion. In the late 1930's this movement reached fruition when legislation effectively stripped the parks of their earlier protection.

Throughout the period prior to the Second World War, a few groups had called for a park policy based upon aesthetic and preservationist, rather than economic, values, but by-and-large, before the War this view had little impact on policy. However, since the late 1930's, particularly with the development of a separate parks administration, the resort concept of parks and the purely functional approach to policy has declined slowly, and increasingly concern with preservation and other

"non-economic" values has entered policy considerations. This transition has been anything but smooth in post-war years and remains today far from complete.

## Acknowledgements

This essay has had a long, and occasionally tortuous, history, and along the way I have incurred a good number of debts to people who have made substantial contributions. Initial thanks must go to Mary Barker, under whose guidance (and straightforward criticism) this essay was begun.

Several members of the provincial Parks Branch staff were of great assistance in making material available. Mr. Robert Ahrens, Director of the Branch authorized the use of file material, and Mr. J. B. L. Walter, Public Information Officer and Ms. E. M. Woodward, the Branch Librarian, tracked down long buried files and papers. Mr. D. L. MacMurchie, retired Executive Officer, provided invaluable information in the form of personal observations and recollections on park development. Mr. Kent Hlaworth of the Provincial Archives also was of great assistance, watching for park-related material during the cataloguing of the Patullo Papers.

Throughout the past two years, discussions with Jerry Fagerlund and Frank Cunningham have been the source of many ideas on parks, conservation and perception of the landscape.

Primarily, I am indebted to Tim O'Riordan for his guidance, ideas and criticisms, and his willingness to work his way through numerous drafts abounding in spelling errors.

## TABLE OF CONTENTS

	Page
Abstract. . . . .	iii
Acknowledgements. . . . .	vi
Table of Contents . . . . .	vii
List of Maps. . . . .	viii
Preface . . . . .	ix
Introduction. . . . .	1
National Parks and Resource Policy in Canada. . . . .	3
The Genesis of the Canadian National Parks . . . . .	8
Resources and Conservation in British Columbia. . . . .	10
The Evolution of the British Columbia Park System . . . . .	18
An Overview of Early Park History. . . . .	18
The Establishment of the First British Columbia Parks. . . . .	21
Park Development and the Question of Transfer to the Dominion . . . . .	30
Industrial Encroachments of the Late 1920's. . . . .	33
Multiple Use and Park Values - Policy in the Late 1930's and After . . . . .	36
Conclusions . . . . .	47
Selected Bibliography . . . . .	50

List of Figures

	Page
1. Large British Columbia Provincial Parks 1911-1945	20

## Preface

Any historical study of British Columbia is of necessity archival in nature. Secondary sources are few and generally of only limited usefulness. This is particularly true in the field of resource and park policies. General histories of the province by and large provide little information on these topics, and more narrowly focussed literature on the subject is extremely rare.

To date, there has been no study dealing specifically with development of resource attitudes and policies in the province, although Robin's (1972) political history does give useful insights and Haig-Brown (1961) provides some historical material. Several articles, particularly those in Shearer (1968a), discuss contemporary resource policies, but very little attention is paid to historical aspects.

Detailed study of provincial park history is limited to post-Second World War developments in two parks. Turner (1969) discusses the recent history of Strathcona Park, while Davies (1972) deals with recent events in both Tweedsmuir and Strathcona. General discussions of the history of the parks system are limited to brief chronologies, in papers by MacMurchie (1966) and Dooling (1970) and in a Parks Branch information paper (B. C. Parks Branch 1961). While useful, these were intended only as bare outlines and, as such, lack interpretive depth.

A range of primary source material is available through the Simon Fraser University and University of British Columbia libraries, the Provincial Archives and Library, and in the Parks Branch

files. The most useful source on the development of resource policies and of conservation thought in the province, is a series of forestry reports commissioned by the provincial government and published in 1910, 1923, 1937, 1945, and 1956. These not only discuss historical and contemporary policies, but give an indication of the evolution of resource thinking, at least among professional foresters.

A number of sources have been utilized by the writer in investigating parks history. The Parks Branch retains files on each park, and with other material in the Branch library, these provide a record of park proposals, plans, interdepartmental communications, etc., as well as of correspondence. Similar material, along with some correspondence at higher levels of government, is available in the Provincial Archives, particularly in the Patullo collection. Interviews with Parks Branch personnel provided first hand impressions of park development.

Certain gaps exist in primary source material. There is no record of cabinet discussions nor of legislative debates save what the newspapers chose to cover. File information on the park developments of the 1930's is somewhat sketchier than that concerning earlier and later periods. A few important files, particularly one relating to the early history of Tweedsmuir Park, have been lost. As a result, it has been necessary at certain points to make inferences from what material was available, with the recognition that these could not always be substantiated fully.

## Introduction

The provincial park system of British Columbia is one of the largest and oldest in Canada, and in many ways its history is the most enigmatic. Beginning in the early years of this century, the provincial government established a series of large wilderness parks which, by the end of the Second World War, encompassed over ten million acres. The creation and early history of the parks pose a number of questions which this study attempts to answer.

This essay grew initially from a previous study of more recent park history, specifically of the severe reductions of park area and industrial encroachment on previously wild park-land which took place in the 1950' and 1960's. The earlier study pointed out a lack of concern for wilderness values in recent government policy and the apparent absence of any organized support for parks strong enough to counter the land use changes which were taking place. Throughout, questions concerning the genesis of the pre-war park system continually arose. What was the nature of park policy in pre-war years, and why did early governments create over ten million acres of wilderness parks in the early years of the century when, elsewhere, certainly, notions of preservation and conservation were, less advanced and less politically sophisticated than was the case in post-war years?

Pursuing these questions led to the consideration of a number of other issues, particularly the economic and social

functions of the early parks and their relationship to broader provincial resource policies. The present study takes the form of an attempt to understand park history and the evolution of park policy in terms of these factors, during the period from the establishment of the first provincial park in 1911 until the Second World War. The latter is a convenient cut-off point as it can be taken to mark the end of the early period of park history and to presage radical changes in the parks system which have taken place in subsequent years.

This investigation concentrates on four interrelated topics; 1) the function of the large parks in the minds of advocates and of the government, 2) the conception of parks, particularly plans for park development, 3) the question of resource use within the parks and 4) the extent to which development and use actually took place.

While this is essentially an historical study, it is clear that the pre-1945 history of the parks has imparted a substantial legacy, in terms of both park areas and park policies, to the post-war system. Until 1972, the six large wilderness parks created prior to the war, although considerably reduced in size, still accounted for five-sixths of the province's park acreage (B. C. Parks Branch 1973). (In spite of substantial recent additions, the current (1974) figure remains above sixty percent.) The legacy of early policy is also clear, both in existing legislation and in policy questions which have arisen continually during the past thirty years.

### National Parks and Resource Policy in Canada

Park policy does not exist in a vacuum. Parks are social creations and as such reflect social values. Their history cannot be understood fully without reference to broader resource policies and the evolution of attitudes towards the land.

For a multiplicity of reasons, rooted partially in attitudes inherited from European culture and in the necessities of a pioneering existence in the New World (Nash 1967, White 1967), and partially in the priorities and structure of the national economy (Brown 1969, Smith and Witty 1970), 19th century Canada, along with the United States, adopted a largely functional approach to the natural landscape, with land and other resources viewed almost exclusively in terms of their contribution to economic development. Land was regarded basically as a commodity of value only in its utilization. Central to this approach was the desirability of development and use of resources. Brown (1969) calls this mode of thought, and the 19th century Canadian resource policy derived from it, a "doctrine of usefulness." In its earliest and crudest form this meant resource utilization governed purely by short-term economic considerations. In later years with the emergence of a conservation movement, it developed into a much more progressive and sophisticated approach to the land, without losing its basic functional bias.<sup>1</sup>

<sup>1</sup>There have been numerous studies of the development of land attitudes and the growth of conservation in the U. S. Perhaps the best are Huth's Nature and the American, Nash's Wilderness and the American Mind, and Hays' Conservation and the Gospel of Efficiency. The Canadian situation is unfortunately far less well documented. Short studies by Thorpe (1961), Brown (1969), Nash (1969), and Smith and Witty (1970) provide useful insights, as does Martin's (1938) study of land policies, but as yet there is no general study of Canadian developments.

The abundance of resources, combined with relatively small populations, produced in North America, particularly Canada, a belief in superabundance, virtual limitlessness of the resource base (Brown 1969). When combined with a functionally-oriented approach to the land, this led to a national resource policy aimed at rapid development with little concern for resource limitations. The outgrowth of this in the late 19th century, particularly in the more densely populated eastern provinces, was a rapid wastage, destruction, and depletion of accessible resources (Lambert 1967, Smith and Witty 1970). As a result, the notion of superabundance began to lose its persuasiveness and by the early years of this century conservation ideas began to gain currency in the East, much as they had a few years earlier in the more densely-populated United States.

Reaction to the developments of the late 19th century was by no means uniform, even among those who called themselves "conservationists." From the outset, a dichotomy existed within conservation thought, between those for whom conservation meant essentially rationalization of the dominant functional approach to the land, and those who rejected functionalism outright, replacing it with an aesthetically oriented approach to the landscape.

The dominant thrust of conservation in North America did not in any sense move away from the materialistic, development centered, view of the land. Rather, in view of increasing realization of limitations of the resource base, this movement,

generally associated with the name of Gifford Pinchot, represented an attempt to rationalize functionalism. Utility was defined in long-range terms, and planned and controlled development became the basic thrust of conservation policy. Certainly the movement did encompass a growing concern with the social value of resources, and an increasing concern with public control of resources for the public advantage, but the advantage was defined almost exclusively in material terms. The continued development and utilization of resources was central, and preservation of land for its own sake was regarded not only as a frivolous notion, but as a threat to "rational" resource development<sup>2</sup> (McConnell 1954, Hays 1957).

At the same time, the conservation movement encompassed a rather different approach to the landscape, an approach which might be termed land, rather than man, centered. This grew in part from the development and growing appreciation of natural sciences during the preceding hundred years, and in part from the reverent approach to landscape which characterized 19th century nature romanticism on both sides of the Atlantic. The importance of the wild landscape, both for its innate values and as part of the nation's heritage, and the necessity, even moral obligation, to maintain at least a major part of it for these values, were emphasized (McConnell 1954; Huth 1957, Nash 1967). This argument had been advanced by Catlin, Marsh

---

<sup>2</sup>The best discussion of this is in Hays' (1957) treatment of the Hetch Hetchy dispute in California in which Pinchot and John Muir clashed.

and Thoreau among others, throughout the 19th century, but enjoyed relatively little acceptance. The late 19th and early 20th century outgrowth of these ideas in the conservation movement of John Muir and the Sierra Club, though greatly strengthened by a reaction against 19th century destruction of the landscape, remained largely secondary to functional conservation even in the United States, where it enjoyed wider support than in this country.

The early Canadian conservation movement fell squarely in the functional camp (Brown 1969, Burton 1972, Lambert 1967). The influence of Pinchot on Canadian conservation appears to have been substantial and direct (Thorpe 1961, Lambert 1967). Illustrative of the general direction of conservation in this country is a statement of Clifford Sifton, probably the most important figure in Canadian conservation.

I have heard the view expressed that what Canada needs is development and exploitation, not conservation. This view, however, is founded upon an erroneous conception which it must be our work to remove. If we attempt to stand in the way of development our efforts will assuredly be of no avail, either to stop development or to promote conservation. It will not, however, be hard to show the best and most highly economic development and exploitation in the interests of the people can only take place by having regard to the principles of conservation.

(Quoted in Smith and Witty 1970, p. 61).

By contrast, preservationism was initially of only minor significance in Canadian thought (Brown 1969, Turner 1971, Burton 1972). Certainly there were individuals interested in preservation as early as the late 19th century, as there had

been in the U. S. throughout the century, but a concerted movement did not develop until much later<sup>3</sup>, and preservation ideas were not integrated into general policy considerations for many years. In spite of the few early voices, Canada remained too much a wilderness, at least in the minds of its citizenry, for wilderness preservation to become a serious issue (Nash 1969).

#### The Genesis of the Canadian National Parks

The establishment of large non-urban parks in North America has often been viewed as an outgrowth of a preservationist view of the landscape. Certainly in recent years it has been in the administration of such areas that this view has enjoyed its widest (although far from complete) acceptance. Nonetheless, at least in North America, numerous large parks predate the emergence of a strong preservation, or even functional conservation movement, and clearly predate a recognition of preservationist values by government policy makers. The early history of Canadian national parks and park policy indicates that the embryonic preservation movement played no significant role. Rather, the roots of Canadian parks must be sought in the 19th century functional view of the landscape.

Brown (1969) argues that the early national parks, begin-

---

<sup>3</sup>The National and Provincial Parks Association, the nearest Canadian equivalent to the Sierra Club, was not founded until 1964, sixty-eight years after its American predecessor.

ning with Banff in 1885, appear to have been conceived in terms of the same "doctrine of usefulness" which governed general resource policy. Policies were aimed at making parks economic assets. The primary motive for their establishment appears to have been the desire to stimulate a tourist trade in the West and to bring passengers to the then new Canadian Pacific Railway (Brown 1969, Turner 1971, Ahrens 1972). While certain sections of the original Rocky Mountain Park Act (1887) were preservationist in character, Brown argues convincingly that the main thrust of early policy was economic and that preservation was desirably only to the degree that it enhanced tourist appeal. In fact, preservation was far from the rule. Commercial resource use was allowed and encouraged well into this century. Mining developments, such as Anthracite and Bankhead near Banff, as well as logging and quarrying operations, date from this period (Bryan 1973).

The development of parks was aimed not at providing a "wilderness experience", something neither most Canadians nor most tourists desired in a park at this time, but rather at a much more developed form of recreation. The parks were to be pleasure resorts set against a natural background (Bryan 1973). At Banff and in several other areas, development took the form of large resort centres with developed recreational facilities, hotels, golf courses, tennis courts, and later, large ski areas. Town-sites were established which developed into major tourist centres.

The idea of parks as areas of preserved natural heritage

was not, however, totally absent, even in the early years of the national parks. The fact that preservation was seen as enhancing tourist values indicates that the government felt that tourists would view the preserved wild areas as a park asset. Legislation in 1930 prohibited commercial use of resources and stipulated that parks should be maintained unimpaired for future generations. Nonetheless, well into this century, the original theme of park policy remained dominant, and parks continued to be viewed primarily in functional terms.<sup>4</sup> Even with the prohibition of resource use, emphasis remained on tourism and mass recreational development, with townsite development continuing. In very recent years, this has begun to change, with preservation coming to the fore as a significant policy consideration, although, as Turner (1971) points out, this transition has taken place much more slowly in Canada than in the U. S. and Canadian parks still lag behind their American counterparts.

Resources and Conservation in British Columbia

Land attitudes and policies in British Columbia followed the same general pattern as those in eastern Canada, although in relation to the East there was a lag of several decades in the acceptance of conservation ideas. Under the terms of the British North American Act, control over land and in situ

---

<sup>4</sup>J. B. Harkin, the first National Parks Commissioner, apparently did have strong preservationist leanings (Williams 1957) but was generally unable to implement these since they ran contrary to general policy (Nash 1969).

resources rests with the provinces (LaForest 1969). As a result, resource policy in B. C. has been established at the provincial level, evolving in relation to regional conditions and priorities rather than as a part of a national policy.

The Eastern movement towards conservation around the turn of the century, thus, had relatively little direct impact on the province. This stands in direct contrast to the situation in the United States, where the Eastern dominated federal government effectively imposed conservation on the West, most often in the face of massive Western opposition (Hays 1957, Nash 1968).

The factors which caused North America generally to adopt materialistic and exploitative land-use policies, and which slowed the development of a strong conservation movement in Canada in the late 19th century, have operated more powerfully, and into more recent years, in British Columbia. The pressures which forced first the United States and subsequently eastern Canada to adopt conservation policies were not experienced until many years later in the province.

The province's size and great resource wealth, relative to its small and areally limited population, have probably been the central influences on resource policy. Even compared to the rest of Canada, British Columbia has always seemed extremely rich in resources. Consequently, belief in resource superabundance has been more enduring in B. C. than in the East. The newness of settlement has meant that, while direct confrontation with wilderness has diminished in recent years, pioneering attitudes towards the land remain strong.

The province's economic dependence on primary resource utilization is overwhelming. Logging, mining and fishing account for over eighty percent of its exports (Shearer 1968b), and the timber industry alone accounts for almost half of the provincial production (B. C. Department of Industrial Development, Trade and Commerce 1972). Agriculture and gas and oil make smaller contributions to the economy. Historically the dominant form of resource use has changed from fur trading to mining to forestry, but the wealth of the province has always rested on exploitation of one or more of its primary resources (Haig-Brown 1961). In this situation, any curtailment of resource utilization has been most commonly looked upon as a threat to prosperity, an argument which was advanced many times in opposing reservation of park resources. Primary resource development in the province has been mainly extractive, historically controlled by large companies, most often headquartered outside the province (Robin 1972), factors which have further reduced potential sources of husbanding attitudes towards the land.

In short, throughout much of its history, British Columbia has been too large, wild, and underpopulated to give serious consideration to the idea that resources are finite and must be conserved, and too dependent upon the utilization of wilderness resources for the notion that wilderness should be preserved for its inherent values to have enjoyed widespread support.

In this situation, provincial land and resource policies mirrored early federal policies. Beginning in the 19th century

government policies were aimed at promotion of rapid resource development for export markets. Not until the 1920's and 1930's did the physical limitations of the province's resources begin even to be perceived, and it was much later before provincial policies recognized the fact.

The development of resource attitudes in B. C. can be illustrated by reference to the lumber industry, which emerged around 1900 as the province's primary industry, a position it has maintained to this day. Between 1909 and 1956, the provincial government commissioned a series of studies of the industry which provide a good indication of the evolution of attitudes.

In the last years of the 19th century there was considerable giveaway of forest and other resources in B. C., particularly in the form of grants to railways, in an attempt to stimulate development (Robin 1972). While typically wasteful practices prevailed on the timber lands involved, the scale of operations was small, and the impact of wastage was limited. In the first decade of the present century, in an attempt to steady and stimulate the province's faltering economy, and to save the bankrupt provincial treasury, the Conservative government of Richard MacBride allowed wholesale alienation of the province's timber and other resources. In a three year period beginning in 1905, the rights to 9.6 million acres of crown timber were sold, an acreage ten times greater than that alienated prior to 1905 (Robin 1972). The effect was to stimulate the economy, which

enjoyed a considerable boom, and to fill the government coffers, but only at the expense of alienating almost three-fourths of the then merchantable crown timber (Fulton 1910) and encouraging rampant forest cut.

At the end of the decade a Royal Commission was established to examine the condition of forestry in the province. Its findings, published in 1909 indicate the beginning of a concern for conservation and of a move towards forest management. The report was critical of wasteful practices on alienated lands and greatly concerned with reduction of fire hazard. The establishment of a provincial forest service was advocated. The report, however, indicated that as yet there was only very limited awareness of the finite nature of forest resources. No consideration was given to depletion and regeneration rates and possible limits to cut were not discussed. In assessing the general position of the province's timber industry, the report was quite enthusiastic, emphasizing the growing world demand for timber and British Columbia's role as a supplier, and noting the affluence this would surely bring the province. "The profits from a permanent crown timber business should make British Columbia that phenomena of statecraft and good fortune -- a country of 'semi-independent means.'" (Fulton 1910, p. 20).

At the end of the First World War the forest industry, along with other resource industries in the province, experienced a boom unprecedented even at the height of the McBride years. The amount of timber cut increased tremendously. Every year from 1923 to 1930, the annual cut was double pre-war highs,

by 1930 almost triple (Mulholland 1937).

The effect of this boom was to put a strain on the province's accessible timber resources, particularly those of the Lower Mainland.<sup>5</sup> In the end, this had the effect of increasing awareness of resource limitations and encouraging the development of conservation policies. The province's 1923 report to the Imperial Forestry Conference (Patullo 1923) showed the beginning of those changes, but also indicated how limited their development was at that time. The report called for land classification and reservation of certain lands for timber production. Concern was expressed with determining growth increment and natural regeneration rates "as a basis for silvacultural practice," (Patullo 1923, p. 24), although it was concluded that present cut was only about one-sixth of the growth increment. In general, however, the report was little different in tone from earlier appraisals. The main thrusts of its recommendations were reduction of fire hazard and increased economic efficiency. There was no discussion of possible control or limitation of cut. The report ended with a reprint of an article by Minister of Lands T. D. Patullo, who shared the optimism of the 1910 report and showed little concern for limits of the forest resource. Patullo concluded,

The lumber industry in British Columbia is today in a very healthy condition as evidenced by the great activity of logging operations and sawmills, and the present prosperity is on a much sounder basis than

---

<sup>5</sup>According to the 1937 forestry report, the accessible sustained yield of the Coast forests was exceeded by cut every year between 1918 and 1931 (Mulholland 1937).

ever before. . . The future will no doubt see considerable expansion in the lumber industry in the province. (Patullo 1923, p. 26).

But this optimism was short lived. Within a few years the increasing drain of resources caused by continued economic boom led to increased consciousness of resource limits. In 1925 provincial forest reserves were created whose "primary object [was] to ensure continuous production of timber." (Sloan 1945, p. 84). By early 1928 the Vancouver Province spoke of the "increasing peril of famine in timber." (March 7, 1928, p. 1). Amid growing fears, a special legislative committee was established to investigate the situation and in turn this committee recommended the establishment of a full commission of inquiry (Vancouver Province February 24, 1928, p. 14).

At the end of the decade the advent of the Depression ended the boom and temporarily alleviated the pressure on resources. Not until 1937 was another major forestry report published (Mulholland 1937). Shaped by the experiences of the late 1920's, this report differed greatly from its predecessors. The spectre of a forest depletion and of its economic effect of this on the province, was raised. A discussion followed on the necessary evolution of forestry practices from those based purely on notions of superabundance to a policy of protection from wastage and fire, and finally to planned use based on sustained yield forestry and reforestation. The report investigated cut and sustained yield in some depth, and issued a clear call for a program of forest conservation along the lines Pinchot had

advocated in the United States thirty years earlier.

On the Coast not only is reforestation unsatisfactory, but the rapid expansion of industries is making it apparent that it will be impossible to avoid a conflict between the desire of private interests to utilize all the mature stands as quickly as markets can be found for the timber, and the public interest which requires that the great basic industries dependent upon natural resources should be regulated on a permanent basis. . . Management for sustained yield is essential for the permanent prosperity of British Columbia's greatest industry and it demands immediate attention.

(Mulholland 1937, pages unnumbered).

The authors of the report, however, were little impressed with preservationist and aesthetic values. "Forestry must be founded upon economic principles not upon sentiment in a country where it is a basic industry. It is a major prop of our civilization, not merely a contribution to aesthetic or recreational interests." (Mulholland 1937, pages unnumbered).

The 1937 report, then, marked the full emergence of forest conservation ideas of rational, long-range management, in British Columbia, at least among the professional foresters. The strain on resources of the preceeding decade initiated a breakdown of belief in superabundance among professionals, and increasingly government policies have reflected this. The transition has been slow, however, and some observers maintain that to this day a conservation-based resource policy has not been adopted fully (Black 1968, Simmons 1970).

While the discussion has been focussed specifically on forestry, the province's primary industry, the historical

development of other aspects of resource policy has been similar, with conservation ideas emerging only quite recently, during the 1930's or later (Haig-Brown 1961).

The development of a preservationist approach to wildlands in British Columbia is more difficult to document, as source material is scarce. The earliest roots of this approach are probably to be found in the writings of 19th century naturalists such as J. C. Hughes<sup>6</sup> and J. K. Lord (Lord 1886). The Natural History Society of British Columbia, founded in 1890, served as an early locus for preservation thought, although this was only a marginal concern of the organization. The B. C. Mountaineering Club, established in 1907 was more directly concerned with preservation. Although primarily a recreational organization, its constitution specified that one purpose of the club was "The preservation of the beauties of British Columbia's mountains through protective legislation." (Ford 1957, p. 10). The establishment of a park to preserve the Mount Garibaldi region soon became a major goal of the club (Bishop 1913, Ford 1957).

It is difficult to assess the strength of these groups and the degree of acceptance of their ideas in the early years of the century, although it appears that both were quite limited. The history of the parks, discussed below, illustrates this point. While the groups did play a role in the original establishment of some parks, their ideas were clearly of

---

<sup>6</sup>J. C. Hughes, Papers on the Natural History of British Columbia (unpub.), Vancouver Public Library, Vancouver.

little influence on policy makers and on park policy. While the events of the 1920's resulted in the development of a movement towards functional conservation in the province, there was no equivalent development of preservationism. Industrial encroachments into park areas did result in a brief flurry of support for preservation in the late 1920's, but this was short lived and had little effect on policy. At least regarding the parks, where one would expect notions of preservation to receive their earliest acceptance, it appears that before the Second World War, these ideas enjoyed little currency.

The delayed development of preservationism may be traced directly to the apparent abundance of wildlands in B. C., which, throughout the province's history has made the notion of deliberate wilderness preservation seem ludicrous. A 1967 statement by the then Minister of Recreation and Conservation, Ken Kiernan, is characteristic of a view which was dominant well into post-Second World War years.

After all, how much wilderness do you want? It is not as though we in this province were short of wilderness. . . . Forty percent of it will probably remain wilderness forever, for the simple reason that nobody can think of anything to do with it.

(Vancouver Sun, June 16, 1967, p. 14)

## The Evolution of the British Columbia Park System

### An Overview of Early Park History

It was within the general context of superabundance, of land policies based on rapid economic development, and of slow

and relatively late growth of conservation and preservation thought, that the British Columbia park system evolved. As much as any other aspect of resource administration, parks policy has reflected the dominance of functionalism.

The earliest B. C. parks date from the first decades of this century. As at the national level, development of tourism appears to have been the primary reason d'être of the early parks. While the parks were originally reserved from resource development, reservation appears to have stemmed more from a belief that it would enhance tourist value than in a desire for preservation per se. By the late 1920's industrial pressures on the parks, which had not developed into tourist assets as anticipated, led to a general loosening of protective legislation. In the late 1930's this culminated when new legislation established multiple-use as the rule for most of the large parks.

Throughout most of the pre-Second World War period, non-tangible values of the parks were largely overlooked, viewed as significant in their contribution to tourism, but neglected when they were in conflict with immediate economic values. By the end of the War, however, both the original resort-centered view of parks and the preoccupation with purely economic values were beginning to break down at lower levels of government and increasingly among the public. In the following years new notions about park values began to emerge, notions which were destined ultimately to clash with the

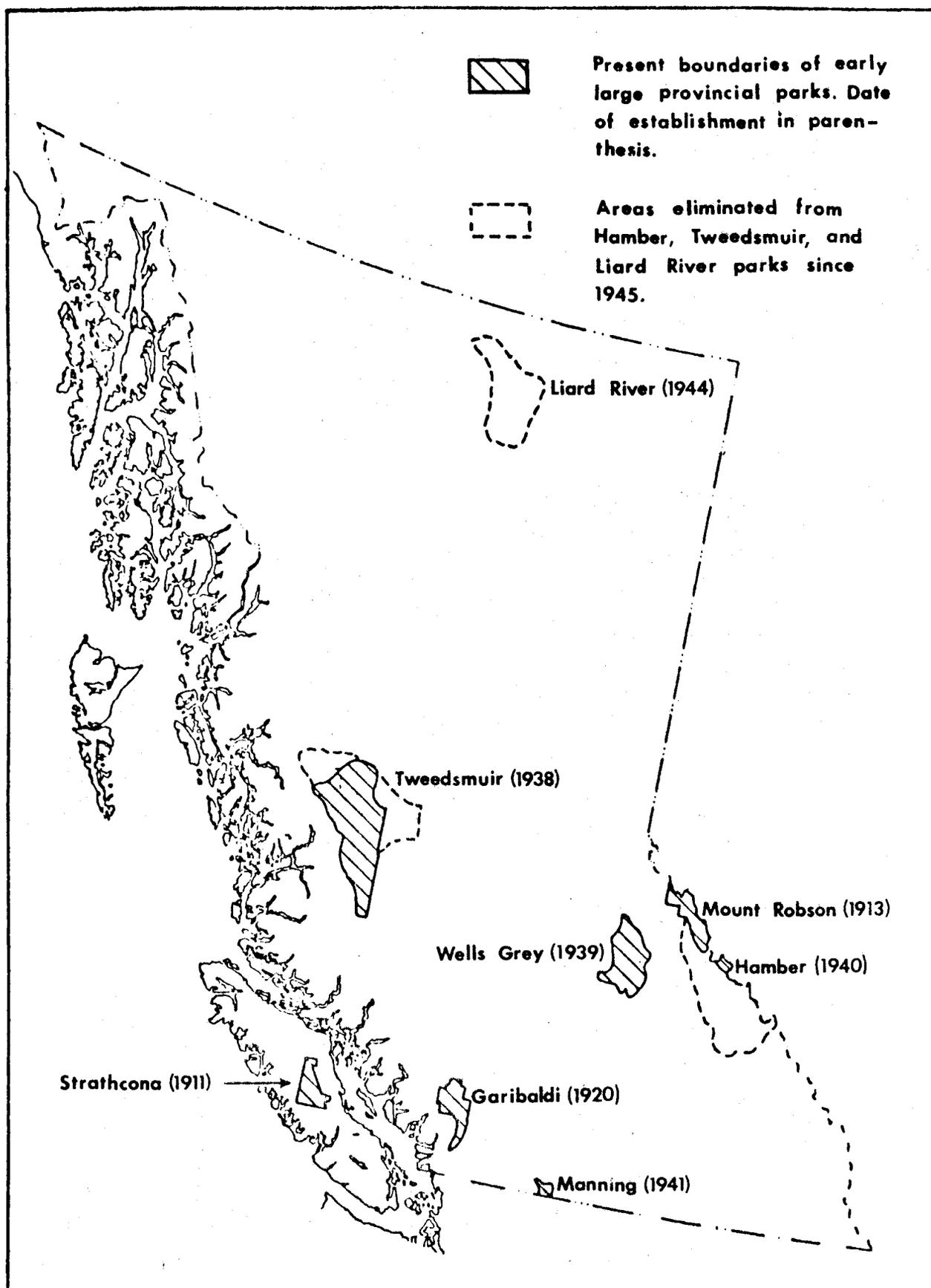


Figure I. Large British Columbia Provincial Parks, 1911-1945.

multiple-use conception of parks to which higher levels of government clung.

#### Establishment of the First British Columbia Parks

Provincial parks history began with the establishment of Strathcona Park in 1911. Thirty-five years earlier a Public Parks Act<sup>7</sup> had been passed which provided mechanisms for park administration but made no mention of reservation of land. The act, which was never utilized, was superseded by the Provincial Parks Act of 1908 (Statutes of B. C. 1908, c. 39) which did include a provision for reservation of crown land for parks. Lease, sale, or licence of such land was prohibited. The act established the power to create parks by order-in-council, and such power remains to this day. MacMurchie (1966) points out that these early acts appear to have been aimed at the establishment of local parks in small communities, although large parks were eventually set up under their authority.

The first provincial park in the province however was neither a community park, nor was it set up under the Parks Act. In 1911, six years after a park had first been proposed, and after a survey of the area by Minister of Lands Price Ellison, 500,000 acres on Buttle Lake in the center of Vancouver Island were reserved under a separate Strathcona Park Act (Statutes of B. C. 1911, c. 49). The area was reserved as a

---

<sup>7</sup>British Columbia, Legislative Assembly, Statutes of British Columbia (hereafter cited as Statutes of B. C.), 1876, c. 6.

"public park and pleasure ground for the benefit advantage and enjoyment of the people of British Columbia." Provision was made for leasing land for "habitation and accommodation" of users, but, beyond this, parkland was reserved from "sale, settlement, or occupancy under the provisions of the land act or any other act with respect to mining or any other matter." Pre-existing rights were excluded from this prohibition. A number of prior alienations which existed within the park boundaries (Economic Council of British Columbia 1936) were in later years at the root of numerous resource use controversies.

Two years after the establishment of Strathcona, an area of almost equal size adjoining Jasper National Park was set aside as Mount Robson Provincial Park (Statutes of B. C. 1913, c. 51). The Robson Park Act was almost identical to the Strathcona Act, although in Robson, exception to the prohibition on alienation could be made by order-in-council. Both parks were to be administered by the Minister of Lands.

In 1920, an area of 200,000 acres in the Coast Mountains north of Vancouver was reserved under the Parks Act as Garibaldi Park.<sup>8</sup> Later enlarged, the park was placed under the authority of a separate Garibaldi Park Act in 1927 (Statutes of B. C. 1926-7, c. 25). The park was to be administered by an independent board which was not appointed until 1927.

---

<sup>8</sup>British Columbia, British Columbia Gazette (Hereafter cited as B. C. Gazette) 1920, p. 1936.

The nature of the movement which led to the creation of the three parks is a first key to understanding their functions. Broadly speaking there were two distinct groups of advocates interested in the establishment of the parks for very different reasons, and holding different conceptions of the function of parks, but nonetheless often working together to promote their aims. On one hand there was a small collection of individuals and groups interested in park areas from an essentially preservationist perspective. On the other was a generally more vocal and influential group concerned primarily with the economic values.

Several groups, especially the Natural History Society, the Alpine Club of Canada and the B. C. Mountaineering Club, called for the establishment of Strathcona and Garibaldi Parks as nature reserves. The original Garibaldi Park proposal came from the Mountaineering Club, which advocated reservation of the region "so that its remarkable assemblage of glacial, volcanic and other natural features may be preserved unimpaired . . ." (Ford 1957, p. 10).

The most vocal, and likely most influential, support for the parks, however, came from a second group of advocates, namely, local business groups and newspapers. Beginning in 1905, the Vancouver Island Boards of Trade and the Victoria and Vancouver Island Development League made continual and ultimately successful representations to the government to establish a park on the Island. A decade later the Boards of Trade of Vancouver

and Squamish were similarly involved in the effort to establish a park in the Garibaldi area.

The interest of business advocates was clearly in the promotion of tourism. Strathcona was originally urged on the government as part of a "concerted and comprehensive tourist attracting plan" (Thomson 1914, p. 10). The park was seen as a key to developing the Island into a "tourist mecca. . . It will be of greater value to Victoria than even the Panama Canal." (Victoria Times, February 10, 1913). Throughout the 1910's and 1920's, the business groups made repeated pleas to the government to provide facilities capable of attracting tourists.

In the case of Mount Robson Park, far from any center of population and local business, a somewhat different situation prevailed. The original promotion came from Charles Walcott, former Director of the U. S. Geological Survey, and magazine writer Emerson Hogue<sup>9</sup> with strong backing from the Grand Trunk Railway. Formal proposal and plans were drafted by the tourist agent of the railway and company plans included the establishment of a townsite at Tete Jaune Cache at the proposed park boundary.<sup>10</sup> Clearly the railway was attempting to follow the very successful tourist scheme which Canadian Pacific had established at Banff.

From the preservationists' point of view, the coincidence

---

<sup>9</sup>Letters, Walcott to MacBride and Hogue to MacBride. December 8, 1912. British Columbia Parks Branch, Mount Robson Park File (hereafter cited as Mount Robson File) #1.

<sup>10</sup>Plans dated December 18, 1912. Proposal for townsite dated July 12, 1912. Mount Robson File #1.

of goals with those of local business and of the railroad was extremely fortuitous. It is unlikely that preservationist arguments alone would have sufficed to justify the creation of large provincial parks in British Columbia in the 1910's, particularly in the view of the development oriented MacBride government.

It is difficult to determine exactly why the government established the parks, as no statement of purpose, other than the acts themselves, was made, and there is no record of legislative debate. It appears, however, that the tourist argument was crucial. Ellison's report to MacBride, which led to the creation of Strathcona, mentions the value of wilderness for aesthetic, educational and recreational reasons in a single sentence, while devoting one and one half pages to potential tourist revenues.<sup>11</sup> Similar emphasis is found in early park planning reports (Thomson 1914). Contemporaries commented that the government's interest in Strathcona, and by extension in the other parks, grew from the province's experience of benefits accruing from the 1909 Seattle Exposition as well as a desire to attract visitors coming to the Pan-Pacific Exposition in San Francisco (Thomson 1914). McBride himself gave indication of government motivations stating, "You don't have to convince me of the value of tourist traffic. We were aware of it when we went into the parks scheme."

<sup>11</sup>Letter Ellison to McBride, October 8, 1910. Correspondence Relating to Strathcona Park 1910-1914. Provincial Archives, Victoria. (Hereafter cited as Correspondence Relating to Strathcona Park.)

(Victoria Times, November 19, 1915, p. 15.)

In 1912, Reginald Thomson, a Seattle planner and engineer, was commissioned with the development and implementation of a plan for Strathcona Park. His reports provide some of the very few clear statements of policy and planning in the early history of British Columbia Parks, and give an indication of the manner in which the new park was viewed by the government.

The initial report proposed a scenic railway as the first requisite, to be followed within four to five years by hotels and "recreation grounds".<sup>12</sup> The third report, in 1914, contained a more detailed set of proposals. The plan envisioned the park as a resort area located in a natural setting, much on the lines of Banff. Emphasis on a railway was replaced by plans for road access and scenic highways. The proposed centre of development was a large tourist lodge to be located on the shore of Buttle Lake. Constructed with the lodge would be a golf course, outlying tea house, and a children's play lake (with locks connecting it to Buttle Lake!). Riding and foot trails would radiate from the hotel and private cabin development was anticipated in the vicinity. A second hotel was to be located in the northern section of the park, along the proposed rail line to Nootka Sound, presumably involving the same type of development.

Throughout the reports emphasis was clearly on developing tourist facilities, generally of a type capable of attracting

<sup>12</sup>Letter, Thomson to T. Taylor, Minister of Public Works, December 15, 1911. In Correspondence Relating to Strathcona Park.

wealthy tourists who were the only people of sufficient means to reach the province in significant numbers at the time. An advertising campaign to attract foreign travellers was proposed. By contrast, the consideration of the role of the park in filling the province's recreation needs was very limited.

The proposed park design gives an interesting insight into the prevalent conception of a park. The lodge areas were envisioned as "pleasure grounds" set against a natural backdrop, areas of modified, civilized nature, rather than natural parks in a strict sense. This conception was very much on the lines of popular late 19th century American summer resort and park areas (Huth 1957) as well as of Banff and other Canadian parks. Such an approach is not surprising in a province which still had an abundance of "undeveloped" nature and was yet to express any strong desire to preserve wilderness. Brown's (1969, p. 89) statement regarding the national parks is equally applicable to the provincial parks. "The reservation in its "wilderness" state was not a park. . . With construction of roads and bridges, the establishment of a townsite, and the provision of tourist facilities from baths to elaborate hotels, the area would become a park." (Emphasis in the original.)

It appears from the limited documentation available that "Banff" type developments were anticipated at Robson and Garibaldi parks as well. Both the Grand Trunk and its succes-

son the Canadian National Railway intended to build a resort hotel and develop a related townsite in Robson Park.<sup>13</sup> In Caribaldi Park the initial plan appears to have included major development of the Black Tusk Meadows area, although the park board prudently limited its early requests to the provision of access. A 1932 study spoke of development of motor roads, cabins, and hotels in the meadows (Bell, et al., 1932) and a later preliminary plan called for resort hotel and cabin development in the area with club lodges and private cabins in the surrounding woods (Lyons and Trew 1945).

The same type of development was apparently planned for certain of the smaller parks. In the 1920's the province conducted unsuccessful negotiations with Canadian Pacific aimed at turning over Mount Assiniboine Park to the company for tourist development.<sup>14</sup>

What is perhaps most interesting about the early provincial parks is the degree to which they were legislatively protected from resource development, for this seems inconsistent with both government resource policies and the temper of the province. Indeed, the British Columbia's parks enjoyed a degree of protection unequalled in either the national or other pro-

---

<sup>13</sup>Letter, Ellison to Manager of Grand Trunk Railway, July 2, 1912. Telegram, Minister of Lands to Federal Minister of the Interior, February 24, 1923. Mount Robson File #1.

<sup>14</sup>Memorandum, Patullo to Premier J. D. MacLean, March 19, 1928. Patullo Papers File #27/5. Provincial Archives, Victoria. (Hereafter cited as Patullo Papers).

vincial systems. The act of 1908 under which Garibaldi Park was established and the Strathcona act both prohibited any alienation of park resources, although pre-existing rights were not to be impaired. In the case of Robson Park, while resource use could be authorized in particular cases by order-in-council, it is clear from interdepartmental and other correspondence that the assumption was that this provision would not be utilized and numerous requests for authorization were refused during the 1910's and early 1920's.<sup>15</sup> While these protective provisions were subsequently eroded under pressure of resource development, it is interesting to note their initial inclusion.

The reservation of parks areas from commercial resource use appears to have stemmed again less from a desire for preservation per se than from a belief that economic values sacrificed would be minimal and that these would be more than offset by increased tourist revenues.

By constant attention to one object, that of pleasing the travelling public, we can from the development of Strathcona park as a centre, secure for British Columbia a revenue which to the ordinary person would appear impossible to be derived even from the entire receipts of mining, lumbering, fishing and tourist travel.  
(Thomson, 1914, p. 16)

It seems likely that the idea may not have arisen that reservation of parklands might seriously hinder industry. Given the dominance of ideas of superabundance in the early years of this century, the reservation of 1.2 million acres

---

<sup>15</sup>See Mount Robson Park File #1.

of parkland may well not have been seen as any particular threat to industrial expansion. In addition, it appears that the government was not aware initially of the resource wealth of much of the parkland (MacMurchie, personal communication 1973). While by-and-large the areas reserved were believed to be of low resource value,<sup>16</sup> the information available was most often sketchy. With the exception of several timber cruises in Strathcona Park,<sup>17</sup> it appears that only cursory examination of park resources was undertaken.

#### Park Development and the Question of Transfer to the Dominion

In the years immediately following the creation of Strathcona the government undertook implementation of Thomson's plan for the park. Numerous trails and fifteen miles of road were constructed. By 1916 the Department of Public Works had spent over \$350,000 on these and other projects in the park.<sup>18</sup> (While the Department of Lands was responsible for the parks themselves, Public Works had the responsibility for most park development, a situation which compounded administrative difficulties greatly.) The war forced a halt in the work before the road reached Buttle Lake, and Thomson's scheme for

---

<sup>16</sup>See for instance the Surveyor-general's report to the Minister of Lands on Mount Robson Park, January 21, 1913. Mount Robson File #1.

<sup>17</sup>Letter, Ellison to McBride, October 8, 1910. Correspondence relating to Strathcona Park.

<sup>18</sup>Public Works Department Report on Expenditures in Strathcona Park for Exploration and Development, Undated, File on Parks' History, Parks Branch Library, Victoria.

the park was never realized. The road to the lake itself was not completed for forty years. In Mount Robson Park a small amount of trail construction had been undertaken but this too was stopped during the war.

After the war, in spite of repeated pleas from the same local groups which had originally advocated the parks and by some segments of the press (for example, Vancouver Province editorial, June 10, 1926, p. 6), the development projects were not renewed, and no plans or clear policy were developed for Robson and Garibaldi parks. The Liberal government which had succeeded McBride's Conservatives during the war was unwilling to provide financial support to the parks during its twelve year tenure. The government hoped perhaps that local interests would take over development but this was clearly beyond their means (MacMurchie, per. comm.). At the same time it became clear that the railroads, which had carried the burden of development in the national parks, could not do so in the provincial parks. Only Mount Robson was on a railway line, and that the line of the bankrupt Grand Trunk and Canadian Northern Pacific and their hardly more solvent successor the Canadian National, none of which undertook development. Financial problems prevented the construction of the projected Canadian Northern line across Strathcona Park. As a result, throughout the 1910's and 1920's the parks remained undeveloped and mainly inaccessible, unused by and virtually unknown to, the public.

In order to stimulate development and use, park supporters, again primarily business groups and alpine clubs, began to call for the transfer of the parks to the Dominion government. The provincial government supported the idea, hoping that Ottawa would underwrite rapid development, thereby producing tourist revenues for the province. To this end, discussions and negotiations were carried out between the two governments throughout the 1920's and into the 1930's. In every instance, however, the negotiations broke down over the province's insistence that it retain control over resources within the parks and the Dominion's refusal to accept the parks under that condition.<sup>19</sup> The constitutional principle of control of resources was certainly one issue, but also at issue was the province's desire to maintain a free hand on park resource questions. Minister of Lands, T. D. Patullo, quoted by the Vancouver Province on the question stated, "We don't want to tie up a Britannia or a Kimberly." (March 26, 1928, p. 13). This sudden concern of the provincial government, which has a decade earlier prohibited all resource development in the parks, was a direct consequence of the tremendous growth of British Columbia's resource industries during the period.

---

<sup>19</sup>One discussion of this question is found in a memo on the history of Mount Robson Park prepared for the Minister of Public Works by the Deputy Minister, January 14, 1931. (Mount Robson File #2)

### Industrial Encroachments of the Late 1920's

The industrial developments of the 1920's had immense and immediate impact on the provincial parks. The expansion of resource industries meant that accessible land, mineral resources and timber were at a premium, particularly in the southwestern portion of the province. The immediate response was to seek new areas for industrial expansion, and the parks represented some of the largest units of "unclaimed" land. Inaccessibility to tourists and lack of recreational use made the prohibitive clauses of the parks legislation difficult to defend on either economic or social grounds. As a result, industrial pressures ushered in a second period of provincial parks history, a period during which the earlier legislation was rewritten to allow increased resource development.

The first major reduction of park protection actually had taken place several years before the peak of the boom. In 1918, bowing to pressure from mining companies, the Legislature had amended the Strathcona act to allow staking and working of mineral claims and controlled timber cutting on these claims (Statutes of B. C. 1918, c. 85). Numerous substantial reductions of protective provisions followed in the mid and late 1920's. In early 1927 a Garibaldi Park Act was passed which removed Garibaldi from the strict provisions of the Park Act. The new legislation replaced the prohibition on alienation with provisions which allowed the acquisition of mineral

and water rights (Statutes of B. C. 1926-27, c. 25).<sup>20</sup>

Later in the same session the Strathcona act was again amended, this time to allow water storage and hydro development (Statutes of B. C. 1926-7, c. 65). In the same year, Mount Robson Park was opened to twenty-one year mining leases (B. C. Gazette 1927, p. 2223).

In its final legislative session in 1928, the Liberal government introduced two amendments to the Provincial Parks Act aimed at drastic reduction of park protection. The first authorized reduction or cancellation of any park by order-in-council (Victoria Times, February 13, 1928, p. 1), the second, the lease of any park area for commercial or industrial use (Victoria Times, February 23, 1928, p. 12). There was considerable legislative and press opposition and the already faltering Liberal leadership withdrew the first amendment. The second was amended to allow leasing for accommodation only (Statutes of B. C., 1928, c. 38). A year and a half before, similar opposition to logging scheduled to begin on Buttle Lake had forced the government to negotiate for purchase of the timber rights (Vancouver Province, August 5, 1926).

The lot of justifying the government position on each proposed policy change fell to the Minister of Lands, T. D. Patullo, and each time his reasoning was that of economic expediency and resource scarcity. "We cannot leave timber

<sup>20</sup>Logging was not permitted under the legislation, but a few years later, the Cheakamus River valley, the main route of access to the park, was eliminated from the park because of the timber included.

standing and expect to build a lumber economy." (Quoted in Victoria Times, May 20, 1926, p. 1). In a letter to Conservative House Leader R. H. Pooley, Patullo outlined the government's position on parkland.

In B. C. there is not the slightest doubt that there is plenty of room for both parks and industrial endeavor without either encroaching upon the other. . . . It is important however, that no likely mining prospect or any large water power should be tied up in perpetuity by reason of declaration of a park area.<sup>21</sup>

Patullo's statements in the legislature generally echoed this view.

We may rest assured that the public will always have plenty of park space, but we should not be afraid to allow some industry a tiny corner in which to carry on their operations.

(Victoria Times, February 23, 1928, p. 12).

Clearly, as land-use conflicts in the parks became increasingly common, and as notions of superabundance of resources, though not of parkland, began to be strained, functionalism remained at the center of government policies. Aesthetic values of the land were significant only so long as they did not conflict with resource development.

What is equally interesting was the sentiment expressed in favor of park preservation. Certainly the objections expressed by the opposition in the Legislature and the press

---

<sup>21</sup>Letter Patullo to Pooley, August 15, 1918, Patullo Papers, file 27/5.

were essentially political,<sup>22</sup> but the parks appear to have enjoyed wider support. Even the Victoria Times, the government's strongest press supporter, criticized the 1928 amendments.

Looking into the future we think it would be a mistake to give any government power to cancel any reservation made under the Provincial Parks Act. . . . Indeed we can easily conceive of a condition in boom times in which our parks would be invaded by powerful private interests. . . . to such a degree that they would be practically destroyed. Hence, instead of moderating the conditions of park control, we should tighten the law affecting it. (Victoria Times Editorial, February 14, 1928, p. 4).

Opposition was voiced on both aesthetic and economic grounds, at least as much press coverage given to the former as the latter. While there is no way of determining which argument was more convincing at the time, it is clear that there had developed, in response to the industrial expansion of the late 1920's a concern with the preservation, as well as the economic, function of the parks. While support for park protection (from both quarters) was not yet of sufficient strength to determine policy, it has succeeded for the first time, in blocking, at least temporarily, a further reduction of protective provisions.

The end result of the developments of the mid and late

---

<sup>22</sup>When the Conservatives came to power in late 1928, their park policy differed little from their predecessors. Beyond completing negotiations for the Buttle Lake Timber, they did nothing to reverse the weakening of park protection or to develop the parks. On the contrary, legislation was passed which allowed reduction of any park by order-in-council, something the Conservatives had opposed in 1928 (Statutes of B. C. 1933, c. 23, 45, 51). Interestingly, very vocal opposition to the 1933 legislation was led by the then opposition leader, T. D. Patullo.

1920's, however, was that in spite of a groundswell of support for the parks, the restrictive nature of much of the early park legislation was eliminated. At least in the thinking of the government, resource utilization took precedence over preservation of park areas. The failure of the parks to become economic assets as anticipated had eliminated what had formerly been the strongest argument in their defense.

#### Multiple Use and Park Values -- Policy in the Late 1930's and After

With the onset of the Depression the provincial parks passed rapidly from public notice once again. The decline of industry was so severe that for several years there was little industrial pressure on park resources.<sup>23</sup> At the time, more immediately pressing social needs and greatly reduced government funds precluded renewal of recreation developments and for several years the parks were virtually ignored by government and the public. The preservationist sentiment which had been voiced in the late 1920's was also dissipated, as the necessity to re-establish the province's economic base assumed paramount importance in all minds. In the late 1930's legislation as sweeping as the 1928 amendments was passed without significant opposition.

In 1933 the Liberals returned to power following five years

---

<sup>23</sup>Between 1929 and 1933 the value of B. C.'s total production dropped by 55% while those of timber and mineral production dropped 62% and 59% respectively (Robin 1972).

of Conservative government. The new government, headed by former Minister of Lands T. D. Patullo devoted somewhat more attention to parks than had its predecessor. The weakening of protective provisions which Patullo had pushed during the 1920's was completed as parks were opened to multiple use. At the same time, however, the park system was given new life and direction as a result of relief work projects and new park areas and legislation. Contradictions between these two facets of policy, which were not nearly so apparent at the time the policy was framed, were at the root of major recent park-use conflicts.

Perhaps the most important piece of legislation in the history of the B. C. park system was the Forest Act of 1939 (Statutes of B. C. 1939, c. 20). Among provisions concerning parks was a section on resource use which established a pattern which has been followed with only partial modification in all succeeding park legislation. The section embodied a position towards which government policy had been moving since the 1920's, namely that parks and park values should not stand in the way of resource development. Rather, park resources should be utilized to their full economic potential. Two park classifications were established, class A parks, in which land and timber was reserved, but mining claims were allowed, and class B parks in which timber and land claims were likewise allowed "except where, in the opinion of the chief forester, disposal of such timber or land would be detrimental to the recreational value

of the area." (Statutes of B. C. 1939, c. 20, s. 132).<sup>24</sup> In practice, this last provision, at least concerning timber, was interpreted liberally, effectively opening class B parks to broad resource development. Parks could be reclassified, as well as reduced in area or cancelled outright, by order-in-council under the provisions of the new act.<sup>25</sup>

That the government moved to reduce park protection and to establish multiple-use during the same period that it was beginning to appreciate the need for resource conservation is not as surprising as it might first appear. Preservation of the land for its innate values had no place in the utilitarian conservation thought of Pinchot and of the 1937 Forestry Commission, and it was this functional brand of conservation which the province was beginning to adopt. Multiple use of parkland was a logical outgrowth of the movement to "rationalize" resource policy. As long as rational use was defined in predominantly utilitarian terms, the reservation of park areas which were not producing tangible economic benefits, could not be considered rational in an era of increasing demand for resources.

---

<sup>24</sup>Class C, local parks, classification was added in 1940.  
(Statutes of B. C. 1940, c. 13)

<sup>25</sup>The 1939 legislation did not immediately effect the three original large parks which were still administered under separate acts which already allowed considerable resource development, but it did effect all subsequently established large parks.

Armed with the assurance that resources in the parks would not be locked up, thus preventing the repetition of the problems of the late 1920's, the government added vast new areas to the park system. Between 1938 and 1944 four huge parks were created totalling almost 9 million acres<sup>26</sup> (over 1400 square miles), increasing the total park acreage six-fold. By contrast, in the previous fifteen years less than ten square miles of new parks had been added (B. C. Parks Branch 1973). From the outset, it was clear that the new parks were not considered to be nature reserves in any strict sense. Tweedsmuir and Wells Grey were classified "B" as soon as the new legislation went into effect (Victoria Colonist December 18, 1940) and Hamber was made a class "B" park in 1945 (B. C. Forest Service 1946). Liard River Park was cancelled outright in 1948 (B. C. Forest Service 1949). Certain sections of the parks were reserved for resource use. In Wells Grey Park the areas surrounding several of the most spectacular waterfalls, the park's main attraction, were reserved from any recreational use because of their hydro-electric potential (Lyons 1941).

Why the government created the enormous, and large unprotected, parks during this period is an interesting question. Evidence of any great amount of public pressure for the establishment is lacking, although there had been some support for a park in the Wells Grey area. Recreational demand in

---

<sup>26</sup>Tweedsmuir Park 3.5 million acres was established in 1938, Wells Grey 1.2 million acres in 1939, Eric Hamber 2.4 million acres in 1940, and Liard River 1.8 million acres in 1944. Manning Park 180 thousand acres was created in 1941 (Sloan 1945).

in the province was hardly sufficient to warrant the large new parks. One may credit the government with remarkable, if uncharacteristic, foresight, but at the same time, additional explanations suggest themselves. By the mid-1930's the provincial tourist trade had made an impressive recovery from the bleak early years of the depression (Robin 1973). Like their predecessors, the new parks were conceived in large part in an attempt to stimulate this trade. A. Wells Grey, the Minister of Lands, explained the establishment of Tweedsmuir park in these terms.

It becomes more and more evident that if B. C. is to continue to attract the spending tourist we must begin to offer him something with a more definite appeal than the routine sights and scenes. . . We must have something to appeal to the discriminating tourist, the good customer. (Victoria Times, March 7, 1938, p. 1).

Within the framework of broader provincial policy another possible reason for creation of the parks appears. Promotion of development of northern sections of the province was an important facet of Patullo's policy (Ormsby 1962) and the new parks may have been established as part of this policy.

Interesting in this regard is the conclusion to Wells Grey's statement on Tweedsmuir,

Besides the tourist angle there are innumerable other aspects. The area is potentially rich in minerals and when it becomes better known, especially to people of means, a lively interest in mining possibilities will follow. . . Actually the government feels that in developing the area as a tourist resort, it is simply making that a means to a much greater end. (Victoria Times, March 7, 1938, p. 1).

There is not enough material available to determine the

extent to which the new parks were actually viewed as a potential stimulus to resource development and the importance attached to that function, although the fact that the parks were established during the same period that legislation was amended to allow resource use adds some credence to this interpretation. Be that as it may, it is clear that economic factors, rather than preservationism, were once again the primary motivations for park establishment.

At the same time that the provincial government was affirming the place of resource use in the provincial parks, it was also building the groundwork for recreational development and use, and ultimately for the forces both public and administrative which in later years were to oppose the multiple use principle. Patullo's 1933 campaign slogan, "Work and Wages," which was ill-defined at the time of the election, came to mean relief jobs and public works projects<sup>27</sup> (Ormsby 1962). Taking a leaf from the New Deal's Civilian Conservation Corps, the provincial government, through the Department of Lands, hired large numbers of unemployed men who had congregated in Vancouver. Ultimately some ended up working in the parks. The Young Men's Forestry Training Project of 1934 and the Forest Development Program of 1936 provided the first labor and funds for park development since work in Strathcona Park

---

<sup>27</sup>The largest of these projects were the Patullo Bridge across the Fraser River at New Westminster and part of the Alaska Highway.

had been halted in 1917 (Dooling 1970). Several parks were made accessible for the first time and rudimentary camping facilities were installed. As a result, a number of parks began to see their first use, use of a type very different from that originally anticipated.

The 1939 legislation provided for regular financing of the parks. Prior to that, money had been available only through special legislative action, which was rare indeed. Regular funding made possible increased recreational development, particularly in post-war years, and, combined with post-war increases in middle class mobility and leisure time made possible an increasingly large group of park users and supporters.

An important aspect of the new legislation was the delegation of responsibility for the parks to the Forest Service, ending the administrative chaos which had prevailed up to that time, with the Minister of Lands, Parks Boards and the Department of Public Works all sharing in management and development. A section within the service was established to administer the parks, and for the first time there existed a central agency, albeit a very small one, responsible for only the parks.<sup>28</sup> In subsequent years park administrators have increasingly viewed park issues more from the point of view of park values and less from consideration of general economic policy, than have

---

<sup>28</sup>The three original parks were de jure administered separately under their own acts until the 1950's and 1960's. De facto, however, they were administered by the Parks Division.

higher levels of government, a development which has been the source of numerous conflicts within the government (Leonard 1973).

The new section which was more immediately aware of changes in park use and users, began, more quickly than higher levels, to evolve new concepts of the parks quite different from the tourist-resort conception. A series of planning reports written during the early 1940's by C. P. Lyons and D. M. Trew give an indication of this change. In comparison to the Thompson reports and other early statements, these later reports show a greatly increased concern with the role of the parks in fulfilling the province's recreational needs and with non-tangible values of the parks, and less concern with development of tourism.

In some of the studies a resort-area conception does remain. Lodge and cabin developments were anticipated in both Manning and Garibaldi Parks (Lyons and Trew 1943, 1945) but even in these reports changing values are evident. The central concern of the Manning report is with the park's potential to provide recreation for the Vancouver area. While a lodge is included in the plans, the primary value of the area was felt to be its potential for automobile related campground and trail development. (It appears that the eagerness of the government to accept this new orientation of park use in Manning and other areas since the War may have been less a reflection of a cabinet level shift away from viewing parks as a source of tourist revenue, than of a realization that the bulk of

tourist money was now of middle class origin.)

In the Garibaldi Park report, concern was expressed with the impact of proposed developments on the surrounding area. Lake Louise in Banff Park was cited as a comparable area in which necessary care was not taken. It was concluded that the lodge and associated buildings must be "subordinated to natural attractions." (Lyons and Trew, 1945, p. 55).

Most interesting of all the reports was that regarding Tweedsmuir, which presented a view of the park strikingly different from that put forward by the Minister of Lands in 1938. The central conclusion was that the primary value of the area was its wilderness character, and because of this, no development should be undertaken which would infringe upon this character.

Tweedsmuir Park, with its immense acreage, its remoteness and freedom from present or contemplated commercial developments presents ideal conditions for a 'wilderness' park in the truest sense of the word. Its development and administration should be strictly in accordance with this classification. (Lyons and Trew 1944 p. 36).

The authors advocated strict control over the number and nature of buildings in the park and exclusion of commercial concessions and home sites. The report is particularly significant in that it represented the first official expression of wilderness preservation as a legitimate aim of the provincial parks.

The late 1930's and early 1940's clearly represented a transitional period in the history of the British Columbia park system, with the administrative and conceptual reordering

of the parks in the 1939 Forest Act being the crucial landmark. Implicit in the legislation and the development of the period was a policy dichotomy which has haunted the parks to this day, a dichotomy between, on one hand, an affirmation of the principle of multiple-use in the parks, and on the other, a growing conception of the value of wilderness preservation. Increasingly at the level of parks administration, the older concept of parks as tourist resort areas was breaking down and being replaced by a much more diversified view of their role, emphasizing social and aesthetic as well as economic functions. At higher levels of government, however, this change took place much more slowly, and well into post-war years a purely utilitarian view of the parks characterized policy at the cabinet level (Leonard 1973). The inevitable result, during the 1950's and 1960's, was a series of clashes between a growing group of park preservationists (both within and outside the parks administration) and the Social Credit government which attempted to implement the intent of the multiple-use provisions of the 1939 legislation.

The provincial park system entered the post-Second World War period characterized, as it had been since its inception, by a number of large, undeveloped parks, and in spite of major post-war reductions in some of the areas and industrial encroachments in others, to this day, large wilderness areas make up the bulk of the province's park acreage. Since the war, with the demise of the grand resort conception of parks,

smaller, automobile oriented, parks have come to the fore. The large parks have seen only limited post-war development. They remain for the most part inaccessible and seldom visited, parks more in name than in reality, providing only a very limited measure of protection to the areas included and of recreational opportunity to the province. From the early period of their history they have inherited a legacy of alienations and of multiple use legislation which still threaten their integrity as parks.

It is always tempting to end on a note of change, and in this case such an ending may be justified. In very recent years there appears to have been a slow shift at the cabinet level towards an increasing appreciation of the values of large parks wildernesses. The establishment of nature conservancy areas within the parks in 1964 was a first move in this direction. The more recent reclassification of Wells Grey Park from class B to class A (B. C. Parks Branch 1973) and the statutory protection accorded the large parks established in 1973, indicate that the movement continues. The degree to which these represent a significant break with past governments' policies, however, remains to be seen.

### Conclusions

The existence of large wilderness parks in British Columbia is something of a fortunate historical accident. It is clear that the governments which established the large parks were not

interested in preservation of wilderness per se, and that, had the parks been proposed on those grounds alone, they would never have been established. The intended function of the parks was something quite different and, in a sense, it was only because of the failure to fulfill their original function that they remained as wilderness areas.

From a preservationist point of view, the failure of the parks to become major tourist centres was at best, however, a mixed blessing. While it did allow the provincial parks to avoid the problems of intensive tourism and highly developed recreation which now plague the national parks, particularly Banff, it also made industrial encroachments much easier to justify.

What is significant in contemporary terms is that, in spite of the rather materialistic motives to which the parks owe their existence and of the severe industrial encroachments which have taken place, a substantial amount of the original parkland remains in a wilderness state. B. C. is probably unique among the provinces in the fact that it entered the recent period of increasing awareness of wilderness values with several million acres of wild parkland, much of it relatively near to centres of population. When Strathcona and Garibaldi Parks were created in the first decades of this century, the areas were at the fringes of development, and the same was true of the park areas created during the late 1930's and early 1940's. If the creation of wilderness parks had awaited the

development of a strong preservationist sentiment in the province, it is extremely doubtful that any areas so large and wild as the present-day remnants of the early parks could have been established in the southern half of the province, let alone as close to Lower Mainland population centres as are Strathcona and Garibaldi. While, from a historical perspective, the administrative policies to which the large parks were subject may certainly be criticized, recognizing the nature of prevalent attitudes and policies regarding resources, and the intended functions of the large parks, British Columbia should probably be considered extremely fortunate in the amount of park wilderness which remains.

Selected Bibliography

- Ahrens, R. H. 1973 "The Relationship Between Federal and Provincial Governments in Canada in Providing Parks." Unpublished paper for the 8th International Seminar on the Administration of National Parks and Equivalent Reserves, Victoria, 14p.
- Bell, F. C., Graves, H., and Foster, W. W. 1932 Report on Garibaldi Park and Contiguous Area for the Minister of Lands of British Columbia. Department of Lands, Victoria, 79p.
- Bishop, J. C. 1913 "A Romance of the Mountains." in British Columbia Mountaineering Club, The Northern Cordillera p. 9-19, Vancouver.
- Black, E. R. 1968 "British Columbia; The Politics of Exploitation." in Shearer, R. H. (ed.), Exploiting Our Economic Potential: Public Policy and the British Columbia Economy, p. 23-44, Holt, Rinehart and Winston, Montreal.
- British Columbia Department of Industrial Development, Trade and Commerce 1972 British Columbia Survey of Economic Activity - 1972, Victoria, 6lp.
- British Columbia Forest Service 1946 Report of the Forest Service. King's Printer, Victoria, 90p.
- British Columbia Forest Service 1949 Report of the Forest Service. King's Printer, Victoria, 116p.
- British Columbia Parks Branch 1961 Fifty Years of Provincial Parks: A History 1911-1961. Department of Recreation and Conservation, Victoria, 6p.
- British Columbia Parks Branch 1973 Provincial Parks List 1973. Department of Recreation and Conservation, Victoria, 19p.
- Brown, R. C. 1969 "The Doctrine of Usefulness: Natural Resources and Park Policy in Canada, 1887-1914." in Nelson, J. G. and Scace, R. C. (eds.) The Canadian National Parks: Today and Tomorrow p. 94-110, University of Calgary, Calgary, Alberta.
- Bryan, R. 1973 Much Is Taken, Much Remains: Canadian Issues in Environmental Conservation. Duxbury Press, North Scituate, Mass., 307p.

- Burton, T. L. 1972 Natural Resource Policy in Canada: Issues and Perspectives. McClelland and Stewart Ltd., Toronto, 174p.
- Davies, E. O. 1972 "The Wilderness Myth: Wilderness in British Columbia." Unpublished M. A. Thesis, University of British Columbia, Vancouver, 185p.
- Dooling, P. J. 1970 "History of the Provincial Parks of British Columbia." Unpublished paper, University of British Columbia, Vancouver, 3p.
- Economic Council of British Columbia 1936 An Appraisal of Seven Park Areas in the Province of British Columbia. Victoria, 155p.
- Ford, L. C. 1957 "The Story of Garibaldi Park." in British Columbia Mountaineering Club The Mountaineer: Fiftieth Anniversary. p. 10-11, Vancouver.
- Fulton, F. J. 1910 Final Report of the Royal Commission of Inquiry on Timber and Forestry 1909-1910. King's Printer, Victoria, 116p.
- Haig-Brown, R. 1961 The Living Land: An Account of the Natural Resources of British Columbia. MacMillan Co., Toronto, 269p.
- Hays, S. P. 1959 Conservation and the Gospel of Efficiency: The Progressive Conservation Movement. Harvard University Press, Cambridge, Mass., 297p.
- Huth, H. 1957 Nature and the American: Three Centuries of Changing Attitudes. University of Nebraska Press, Lincoln, Nebraska, 250p.
- La Forest, G. V. 1969 Natural Resources and Public Property Under the Canadian Constitution. University of Toronto Press, Toronto, 230p.
- Lambert, R. S. 1967 Renewing Nature's Wealth. Ontario Department of Lands and Forests, Toronto, 630p.
- Leonard, E. M. 1973 "Wilderness in the British Columbia Park System: The Social Credit Years." unpublished course paper, Simon Fraser University, Burnaby, British Columbia, 43p.

- Lord, J. K. 1886 The Naturalist in Vancouver Island and British Columbia. R. Bently, London, 2 vols.
- Lyons, C. P. 1941 Reconnaissance and Preliminary Recreation Plan for Wells Grey Park. British Columbia Forest Service, Victoria, 61p.
- Lyons, C. P. and Trew, D. M. 1943 Reconnaissance and Preliminary Recreation Plan for Manning Park. British Columbia Forest Service, Victoria, 56p.
- Lyons, C. P. and Trew, D. M. 1944 Reconnaissance and Preliminary Recreation Plan for Tweedsmuir Park. British Columbia Forest Service, Victoria, 120p.
- Lyons, C. P. and Trew, D. M. 1945 Reconnaissance and Preliminary Recreation Plan for Garibaldi Park. British Columbia Forest Service, Victoria, 63p.
- MacMurchie, D. L. 1966 "The Evolution of Provincial Parks in British Columbia." unpublished paper, Victoria, 5p.
- Martin, C. B. 1938 "Dominion Lands" Policy. Edited by L. H. Thomas (1973). McClelland and Stewart Ltd., Toronto, 259p.
- McConnell, G. 1954 "The Conservation Movement: Past and Present." in Burton, I. and Kates, R. (eds.) Readings in Resource Management and Conservation. p. 189-201, University of Chicago Press, Chicago.
- Mulholland, F. D. 1937 The Forest Resources of British Columbia. King's Printer, Victoria, 153 p.
- Nash, R. 1967 Wilderness and the American Mind. Yale University Press, New Haven, Conn., 256 p.
- Nash, R. 1968 "The Public Responds to Conservation: Opinion East and West." in Nash, R. (ed.) The American Environment Readings in Conservation. p. 64-67, Addison-Wesley Publishing Co., Reading, Mass.
- Nash, R. 1969 "Wilderness and Man in North America." in Nelson, J. G. and Scace, R. C. (eds.) The Canadian National Parks: Today and Tomorrow. vol. 1, p. 66-93. University of Calgary Press, Calgary, Alberta.

- Nelson, J. G. and Scace, R. C. (eds.) 1969 The Canadian National Parks: Today and Tomorrow. University of Calgary Press, Calgary, Alberta, 2 vol.
- Ormsby, M. A. 1958 British Columbia: A History. MacMillan Co., Toronto, 558p.
- Ormsby, M. A. 1962 "T. Dufferin Patullo and the Little New Deal." Canadian Historical Review v. 43, p. 277-297.
- Patullo, T. D. 1923 Forests and Forestry in British Columbia: Revised Report to the Imperial Forestry Commission. King's Printer, Victoria, 33p.
- Pearse, P. H. 1970 "Conflicting Objectives in Forest Policy: The Case of British Columbia." Forestry Chronicle v. 46, p. 281-287.
- Robin, M. 1972 The Rush For Spoils: The Company Province 1871-1933. McClelland and Stewart Ltd., Toronto, 318p.
- Robin, M. 1973 Pillars of Profit: The Company Province 1934-1972. McClelland and Stewart, Toronto, 351 p.
- Shearer, R. A. (ed.) 1968a Exploiting Our Economic Potential: Public Policy and the British Columbia Economy. Holt, Rinehart and Winston, Toronto, 152 p.
- Shearer, R. A. 1968b "The Development of the British Columbia Economy: The Record and the Issues." in Shearer, R. A. (ed.) Exploiting Our Economic Potential, p. 3-20. Holt, Rinehart and Winston, Toronto, 152p.
- Simmons, T. 1970 "The Poverty of Plenty: Conservation in British Columbia." Conifer, v. 16, p. 8-17.
- Sloan, G. M. 1945 Report of the Commissioners Relating to the Forest Resources of British Columbia. King's Printer, Victoria, 195p.
- Smith, C. R. and Witty, D. R. 1970 "Conservation, Resources, and Environment: An Exposition and Critical Evaluation of the Commission of Conservation, Canada." Plan, v. 11, p. 55-71.
- Thomson, R. H. 1914 Third Annual Report on Progress in Strathcona Park. British Columbia Department of Public Works, Victoria, 93p.

- Thorpe, F. J. 1961 "Historical Perspectives on the 'Resources For Tomorrow' Conference." Resources for Tomorrow, v. 1, p. 1-12, Queen's Printer, Ottawa.
- Turner, R. D. 1969 "Provincial Park Planning in British Columbia: Towards a Broader and More Comprehensive Approach." unpublished B.Sc. thesis, University of Victoria, Victoria, 50p.
- Turner, R. D. 1971 "A Comparison of National Park Policy in Canada and the United States." unpublished M. A. Thesis, University of British Columbia, Vancouver, 125p.
- White, L. 1967 "The Historical Roots of Our Ecological Crisis." Science, v. 155, p. 1203-1207.
- Williams, M. B. (comp.) 1957 The Origin and Meaning of the National Parks of Canada (extracts from the papers of the late J. B. Harkin, first Commissioner of the National Parks of Canada). H. R. Larson Publishing Co., Saskatoon, Sask., 16p.

#### Archival Sources

- British Columbia Parks Branch, Victoria Garibaldi Park File.
- British Columbia Parks Branch, Victoria Hamber Park File.
- British Columbia Parks Branch, Victoria Mount Robson Park File.
- British Columbia Parks Branch, Victoria Strathcona Park File.
- British Columbia Parks Branch, Victoria Tweedsmuir Park File.
- British Columbia Parks Branch, Victoria Wells Grey Park File.
- British Columbia Provincial Archives, Victoria Correspondence Relating to Strathcona Park 1910-1914.
- British Columbia Provincial Archives, Victoria Patullo Papers.

