PENTICTON AND ITS REGION

by

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A B S T R A C T

The Penticton region is part of the Okanagan Valley which is situated in the southern interior of British Columbia. During and after Pleistocene times, soil materials were deposited in the valley in the form of terraces and alluvial fans. The climate being warm and dry stimulated the growth of grasses which not only enriched the soils but provided good grazing for wild animals and, with the coming of the white man, for numerous cattle. But the soil and the climate held more promise. With irrigation they provided ideal conditions for the growing of fruit and it was not long before the cattle industry was replaced by a new economy based on fruit.

As transportation facilities increased, the region became more easily accessible from the outside and also permitted a freer flow of its produce to market. New settlers flocked in to take up the lands and put them into orchard. To supply the needs of the expanding region, Penticton grew from a small nucleus on the Okanagan Lake to a thriving town. Secondary industries largely based on fruit sustained the growing population.

Because it is now almost exclusively based on fruit, the economy of the region is extremely sensitive to the vagaries of outside market conditions and the need for diversification of industry has become increasingly apparent. The lumber industry shows little promise of future expansion because of the too distant sources of logs; manufacturing which is not based on fruit lacks a ready source of raw materials, cheap power, and is open to competition from more favored areas; the tourist industry shows

promise of considerable expansion, but has the disadvantage of coinciding in time with the growing season. There are no extensive mineral deposits close enough at hand to exert a significant effect on the regional economy. As a result, the region will have to depend on expansion of the fruit industry, the finding of new markets, and on a considerable increase in fruit processing. Too, some growth will doubtless result from Penticton's importance as a distributing and commercial centre; trade will be augmented as the populations of the South Okanagan and the various settlements to the east on the Kettle Valley Railroad continue to increase.

The problems facing the Penticton region's continued growth are various. There are, however, certain geographic advantages which, if properly used and developed, will go far in providing not only the things considered essential to modern living, but also a legacy, both bountiful and lasting, for the future.

PREFACE

I wish to thank the staff of the Geography Department of the University of British Columbia for their generous help with this thesis. I am particularly indebted to Dr. J. Lewis Robinson, my advisor, for his advice and criticism, and to Mr. R. I. Ruggles for his unfailing interest in the progress of my work. My thanks are due also the Penticton City Council and the Penticton Town Planning Commission who generously supplied me with maps and information. Mr. Walker, of Walker and Graham, Town Planners, made available the town plan for Penticton and discussed some of the problems with which Penticton was faced. Mr. M. P. D. Trumpour, Government Horticulturist at Penticton, gave unstintingly of his time and answered many questions on the agricultural aspects of the Penticton region. Unpublished data on the agricultural lands were released to me through the kindness of Mr. C. C. Kelley, Department of Agriculture, Kelowna, B.C. Finally, I am deeply grateful to Miss Loretta Parisien who gave most generously of her time to help with the map work, the proof reading, and who did the final typing of this work.

E.W.

University of British Columbia

March, 1955

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FRONTPIECE. Urban Penticton looking north. The large flat peninsula jutting into Okanagan Lake on the left (west) is the fan of Trout Creek. Opposite, on the east shore of the lake, is the fan of Naramata Creek on which the settlement of Naramata is situated. Urban Penticton is shown in the foreground. The main valley highway running into Main Street is prominent in the centre of the picture. Penticton Creek comes in from the east in the centre foreground. Part of Ellis Creek is shown in the immediate foreground.

PART I

THE PHYSICAL GEOGRAPHY

CHAPTER I

INTRODUCTION

This thesis has a threefold purpose: it will present and analyze the geographic aspects of the Penticton region; it will show how these aspects are interrelated to make this area a geographic unit; and, finally, it will attempt to evaluate all relevant data from the geographic point of view and, by means of this evaluation, suggest the most profitable course for the region's future development.

There has been a definite need for a study of this kind, for the development of most regions in British Columbia--and the Penticton region is no exception--has been haphazard at best. The lack of adequate planning for regional development has in some instances stemmed from the one-sidedness of view shown by those whose chief training is in a specialized field such as agriculture, forestry, economics, mining, engineering, etc. These "specialists", tending to see the region from the view-point of their own specialty,often forget that the region is made up of many interrelated facets which must be balanced one against the other for internal harmony and best overall development. To see the region as a whole, to understand the workings and interrelationships between its various parts, is the particular concern of the geographer. As all intelligent planning for the long-term development of the region's resources must be based on the geographer's "wholeness" of view, the need for the regional study is obvious; moreover, it is hoped that, insofar as Penticton is concerned, the study is timely as well.

A regional study such as this is limited in scope (a) because of the time factor involved which necessarily curtails the detailed research that is actually possible, and (b) because certain problems must of necessity be investigated by the specialist. However, an attempt has been made to explore all pertinent problems with enough thoroughness to provide firm foundations for the conclusions drawn. A number of the problems that might bear further investigation are listed in the concluding chapter.

This thesis consists of two main parts. Part One, devoted to the physical geography of the region, discusses the geomorphology, hydrography, climate, vegetation and soil, and points out the intimate interrelationships existing between them. Part Two, devoted to the human geography, shows how the physical region has been used in the past and present occupance, and, by analyzing the various geographic aspects, attempts to indicate the most profitable course for the region's future development.

Little of a purely geographic nature has been written on the Penticton region. The geology has been studied by G.E. Cairnes and H.S. Bostock who published their findings in various government reports (see Bibliography). The geomorphology was studied by R.F. Flint whose work included the entire Okanagan Valley and provided an important and authoritative source of information on the regional landforms. Soil Survey of the Okanagan and Similkameen Valleys by C.C. Kelley and R.H. Spilsbury, proved invaluable, not only as a source of information on soils, but also on the flora of the region.

Much of the material in the chapter on the Sequent Occupance was obtained from the B.C. Directories published since 1882, and the B.C.

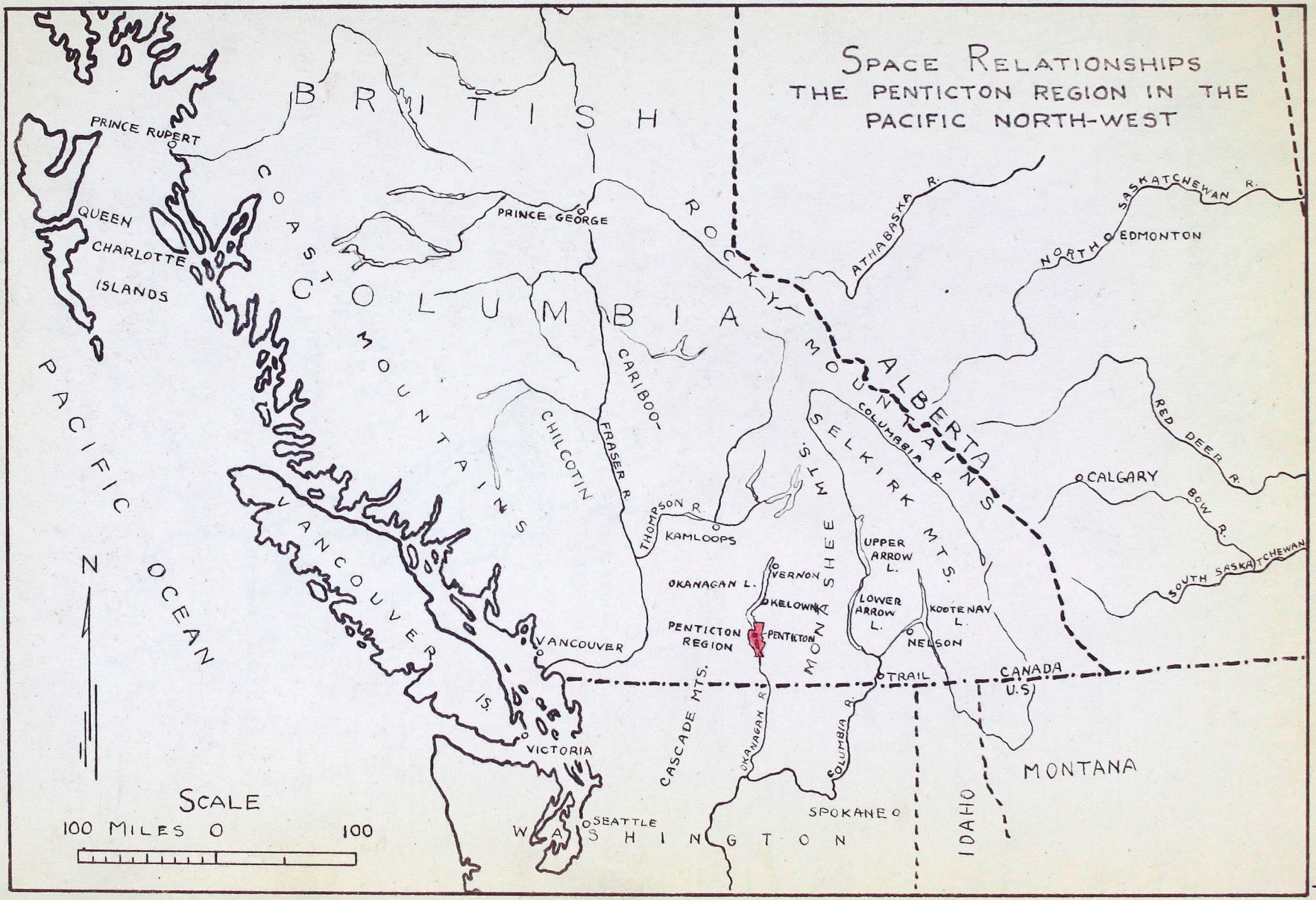
Department of Agriculture reports. The Town Plan for Penticton by Walker and Graham contains a valuable historical sketch of Penticton, and information on public utilities and transportation which would have been difficult to obtain elsewhere. Much of the material (unpublished) contained in the chapter on Rural Land Use was made available through the courtesy of Mr. C.C. Kelley of the B.C. Department of Agriculture at Kelowna.

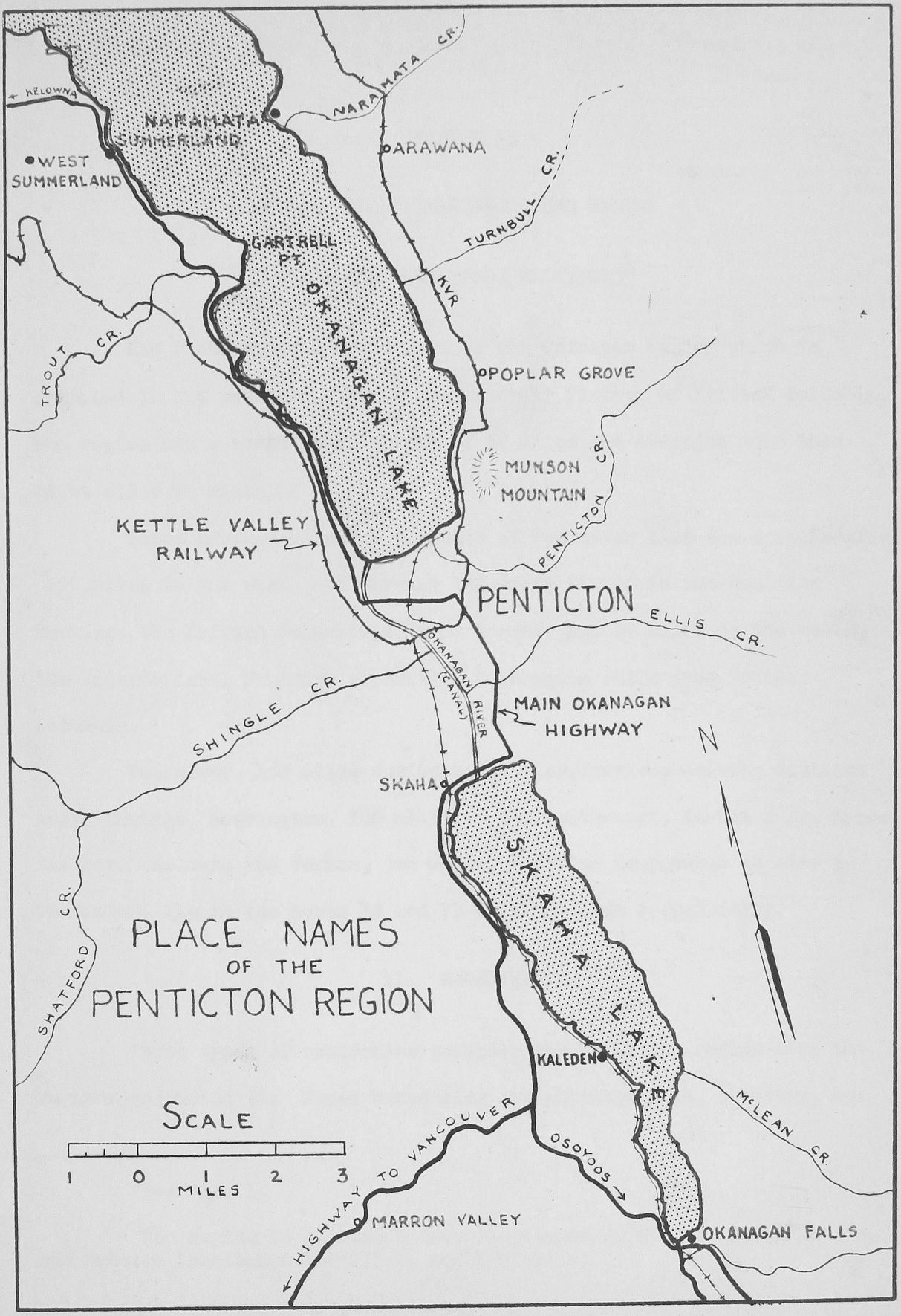
A great deal of current information on topics such as market conditions for fruit, tourism, labor, etc., was obtained through personal correspondence with various government and private agencies, and through personal interviews.

Finally, a total of about six weeks was spent in making land use studies of Penticton and the entire region. Part of this time was spent in making a survey of each industry in the city and information on the size of the industry, labor, raw materials, markets, and future prospects were obtained. B.C. Government maps and high- and low-altitude air-photo coverage of the entire region, as well as base and other maps of Penticton City proved invaluable aids to this study.

The maps, graphs,and diagrams were drawn and the various tables set up before the writing of any chapter was begun. This method of attack had several advantages: it obviated to some extent the tendency to draw a map or illustration to fit a preconceived theory; it assembled information of a diverse character and made it readily understandable and, where desired, more easily comparable; and it often brought out geographic relationships not otherwise easily discernible.

FIG. 1


SPACE RELATIONSHIPS
THE PENTICTON REGION IN THE
PACIFIC NORTH-WEST
BRITISH COLUMBIA
ROCKY MOUNTAINS
ALBERTA
PACIFIC OCEAN
COAST MOUNTAINS
CHILCOTIN
CARIBOO
FRASER R.
THOMPSON R.
SELKIRK MTS.
MONASHEE
COLUMBIA R.
ATHABASKA R.
SASKATCHEWAN R.
RED DEER R.
BOW R.
SOUTH SASKATCHEWAN
PRINCE RUPERT
QUEEN CHARLOTTE ISLANDS
PRINCE GEORGE
NORTH EDMONTON
CALGARY
KAMLOOPS
OKANAGAN L.
VERNON
KELOWNA
PENTICTON REGION
PENTICTON
UPPER ARROW L.
LOWER ARROW L.
KOOTENAY L.
NELSON
TRAIL
CANADA
U.S.
VANCOUVER
VANCOUVER IS.
VICTORIA
SEATTLE
WASHINGTON
CASCADE MTS.
OKANAGAN R.
COLUMBIA R.
SPOKANE
IDAHO
MONTANA
N
SCALE
100 MILES 0 100


← KELOWNA
NARAMATA
SUMMERLAND
NARAMATA CR.
WEST SUMMERLAND
ARAWANA
TURNBULL CR.
GARTRELL PT.
OKANAGAN LAKE
KVR
TROUT CR.
POPLAR GROVE
MUNSON MOUNTAIN
PENTICTON CR.
KETTLE VALLEY RAILWAY
PENTICTON
ELLIS CR.
OKANAGAN (CANAL) RIVER
SHINGLE CR.
MAIN OKANAGAN HIGHWAY
N
SKAHA
SKAHA LAKE
SHATFORD CR.
PLACE NAMES
OF THE
PENTICTON REGION
KALEDEN
McLEAN CR.
SCALE
1 0 1 2 3
MILES
HIGHWAY TO VANCOUVER
OSOYOOS
MARRON VALLEY
OKANAGAN FALLS

CHAPTER II

LOCATION AND BOUNDARIES OF THE REGION

I. LOCATION AND SPACE RELATIONS[1]

The Penticton region is part of the Okanagan Valley which is situated in the southern part of the Interior Plateau of British Columbia.[2] The region has a north-south extent of 22 miles and averages more than eight miles in width.

Three hundred miles to the west of Penticton lies the open Pacific; 225 miles to the east, and marking the Great Divide in the Canadian Rockies, the British Columbia-Alberta border; and 40 miles to the south, the International Boundary separating Washington State from British Columbia.

Vancouver, 160 miles due west, is a comfortable driving distance away; Seattle, Washington, 180 miles to the south-west, is but a few hours farther. Kelowna and Vernon, two Okanagan cities comparable in size to Penticton, lie to the north 39 and 73 miles by road respectively.

II. BOUNDARIES

Three types of boundaries separate the Penticton region from the regions adjoining it. These boundaries are physiographic, climatic, and

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[1] See Fig. 1.

[2] The region is located between latitudes 49°19' N. and 49°38' N., and between longitudes 120°27' W. and 120°42' W.

cultural in nature. The physiographic and climatic boundaries separate the entire Okanagan Valley from the surrounding plateau; the cultural boundaries separate the Penticton region from the remainder of the valley.

Thus the valley rim which forms the immediate drainage divides on both sides of the valley, is taken as the natural boundary between the valley and the plateau and is the most definitely fixed.[3] The climatic boundary is less definite and must be regarded as a zone where the valley and plateau climates merge. This zone of mergence corresponds to some extent with the valley rim[4] and justifies further the choice of the physiographic boundary in delimiting the Penticton region.

The cultural boundaries are the least definite for in a tenuous but very real sense they circumvent the globe. They are placed, however, around that area which considerable research has shown to be a hard core of direct and immediate influences--influences which the city exerts on the surrounding area, and reciprocal influences which the area exerts on the city. These influences may be broadly classified under (a) services which the city renders the region and which justify the city's existence in the region; and (b) resources which the region extends to the city for exploitation. Thus Penticton offers services in the form of goods supplied, processing, selling, recreation, administration, etc., and the

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[3] Penticton, Ellis, McLean, Shuttleworth, and Shingle Creeks drain extensive plateau areas and must be excluded from the qualification "immediate". The boundary has been taken across these streams where contour lines indicate that the valley rim has been breached (see Plate I).

[4] See discussion this thesis under Climate. See also John D. Chapman: "The Climate of British Columbia," Paper presented to the Fifth Brit. Col. Resources Conference, Feb. 27, 1952, map insert facing p. 2.

region directly dependent on these services can be delimited; the region offers opportunities in the exploitation of its resources--its soils, water, minerals, forests, scenic values, produce, etc., and again the exploited area can be delimited.

A boundary line can be drawn with fair accuracy to mark the limits of a single service or exploited resource within a region. But, as a cultural region is made up of many services and exploited resources whose boundaries do not necessarily coincide, any boundary that is drawn to delimit the region must of necessity represent a zone where boundaries for specific influences coincide, overlap, or approach one another.

Such a coalescing of boundaries is found, for example, at Naramata the most northerly area in the region under study. Here the limits of agriculture and of irrigation coincide; the road network fades at the agricultural limits, but not altogether for a road of sorts continues some miles north and several trails wander up the valley sides; the telephone network and electric power service stop with the occupance and the limits of the hard core of influences are reasonably definite. The northern boundary of the Penticton region is therefore a cultural boundary and is located just beyond the limit of occupance on the east side of Okanagan Lake. This boundary, beginning at the valley rim, runs eight miles due west then turns south passing down the lake centre to exclude the Summerland-Trout Creek area. About $2\frac{1}{2}$ miles north of Penticton it swings due west again till it reaches the western valley rim.

The argument that the Summerland area (including Trout Creek) should be included in the Penticton region is valid only to a limited extent. Many Summerland stores, for example, are dependent on Penticton wholesalers. But this is true only for groceries, to a lesser extent for

tools and machinery, and practically not at all for clothing.[5] Too, Summerland residents go to Penticton for recreation and for greater choice in shopping. Reciprocal influences represented by the Summerland Experimental Station and by the recreational attractions of the Summerland area for Penticton residents would further strengthen the argument.

However, the Summerland area is independent to such an extent that it may justifiably be called a region in itself. Urban West Summerland has, for example, a well-developed commercial core containing a bank, insurance and real estate offices, garages, recreational facilities, restaurants, bakeries, and a variety of stores including a supermarket. Local packing houses and fruit processing plants, a sawmill and box factory also serve the area. Six religious institutions, a hospital, a weekly newspaper, five service organizations, and independent school, administration, and irrigation districts add to the differentiation so that the Summerland area's relative independence is well enough established.

The southern boundary runs east-west through the north end of Vaseaux Lake and includes in the Penticton region the nucleated settlement at Okanagan Falls and the areas of occupance immediately to the south and east. The Okanagan Falls area lies half-way between Penticton and Oliver but has been included in the Penticton region because: (a) Okanagan Falls residents depend largely on Penticton as the larger center for recreation and supplies; (b) most Okanagan Falls produce is either packed,

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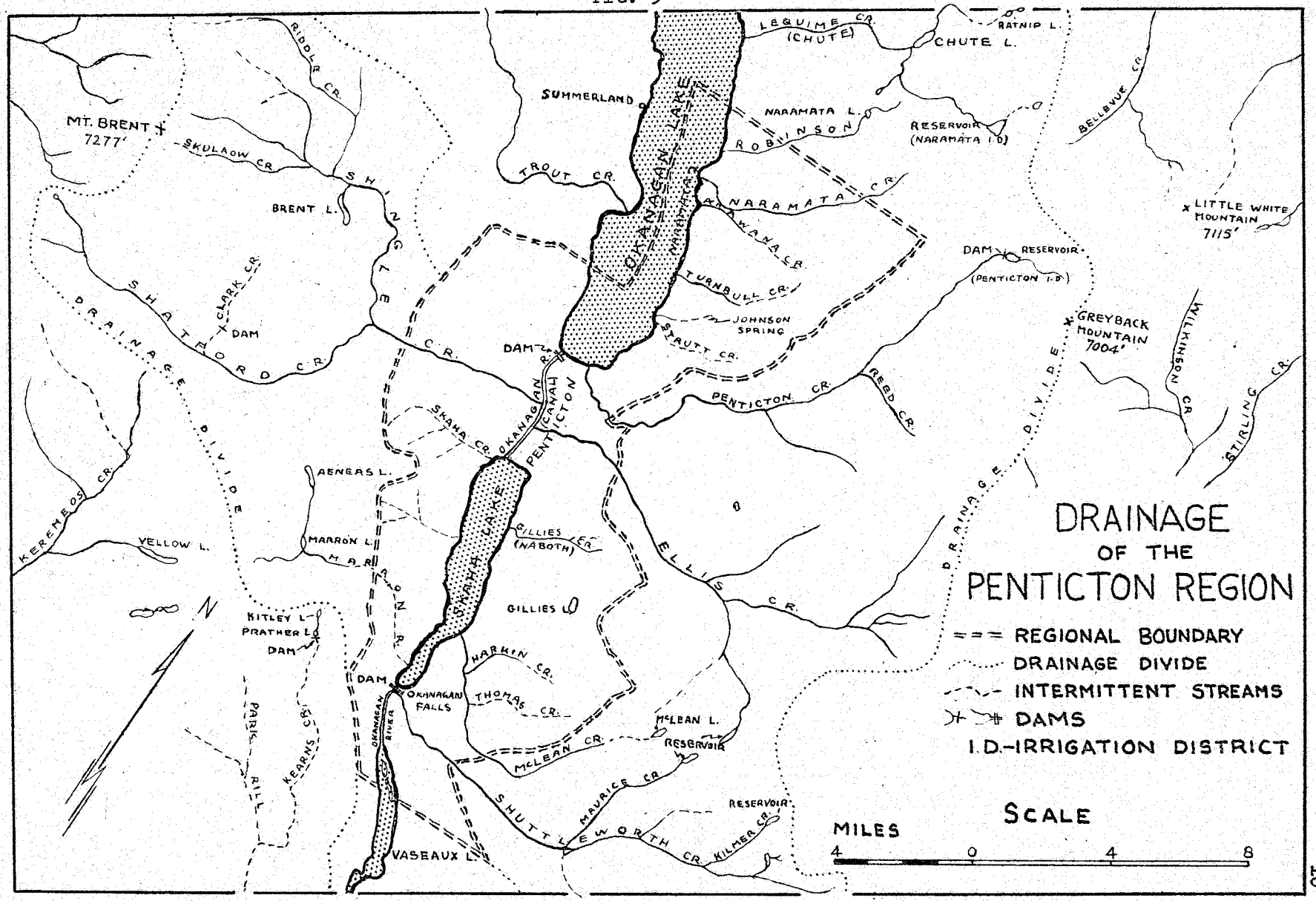
[5] B.C. Dept. of Trade and Industry, Economic Survey, Region Three, Industry and Markets in the Okanagan, Similkameen, and Kettle Valleys, Aug. 1951, pp. 56-71.

FIG. 3


DRAINAGE
OF THE
PENTICTON REGION
REGIONAL BOUNDARY
DRAINAGE DIVIDE
INTERMITTENT STREAMS
DAMS
I.D.-IRRIGATION DISTRICT
SCALE
MILES
4 0 4 8
MT. BRENT 7277'
SUMMERLAND
OKANAGAN LAKE
LEQUIME CR. (CHUTE)
RATNIP L.
CHUTE L.
NARAMATA L.
ROBINSON
RESERVOIR (NARAMATA I.D.)
BELLEVUE CR.
LITTLE WHITE MOUNTAIN 7115'
TROUT CR.
NARAMATA CR.
OKANAGAN R.
DAM
RESERVOIR (PENTICTON I.D.)
GREYBACK MOUNTAIN 7004'
WILKINSON CR.
STIRLING CR.
SKAHA L.
SHATFORD CR.
CLARK CR.
RIDDLE CR.
SKULAOW CR.
BRENT L.
SHINGLE CR.
TURNBULL CR.
JOHNSON SPRING
STRUTT CR.
PENTICTON CR.
REED CR.
SKAHA CR.
PENTICTON (CANAL)
AENEAS L.
MARRON L.
M.A.R.
GILLIES CR. (NABOTH)
GILLIES
ELLIS CR.
KEREMEOS CR.
YELLOW L.
KITLEY L.
PRATHER L.
DAM
HARKIN CR.
THOMAS CR.
OKANAGAN FALLS
OKANAGAN RIVER
McLEAN L.
RESERVOIR
McLEAN CR.
MAURICE CR.
SHUTTLEWORTH CR.
KILMER CR.
RESERVOIR
PARK HILL
KEARNS CR.
VASEAUX L.
DRAINAGE DIVIDE

sold, or shipped via Penticton; and, (c) Penticton is as easily accessible as Oliver,[6] and it is natural for Okanagan Falls to gravitate towards the larger center.

The use of the physiographic and climatic boundaries in delimiting the Penticton region has resulted in the exclusion from the area of one important adjunct: sources of water for irrigation and domestic use. The singular importance of irrigation to the region demands the addition of a secondary boundary which lies outside the hard core of influences. This boundary is shown in Figure 3 and is drawn around the watersheds of the five creeks[7] whose waters supply most of the region.

Other boundaries of importance are of necessity not included because they lie too far from the hard core of influences which define the region. A few such far-flung boundaries may be mentioned: the limits of logging, of grazing land, of radio advertising, of tourism, of newspaper circulation, of telephone service, of fuel and of power supplies. These and others will, however, be considered in the body of this thesis insofar as it is practicable to do so.

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[6]Although the road between Okanagan Falls and Penticton goes through hilly country, this road is first class highway and is preferable to the section between Okanagan Falls and Oliver which is in places narrow and winding, especially alongside Vaseaux Lake.

[7]Penticton, Ellis, Shuttleworth, McLean, and Shingle Creeks.

CHAPTER III

THE GEOMORPHOLOGY

General

The Interior Plateau is thought to be an old erosion surface which now lies at an elevation of from 4,000 to 6,000 feet. The general plateau surface is made up of strongly rolling hills but is locally steeply and deeply dissected by swift-flowing streams.

Within the plateau lies the Okanagan Valley, a singular trenchlike depression which zig-zags northward from the International Boundary. At Kelowna the trench splits in two, only to merge again beyond Vernon and continue, a broad valley, till it blends into the Valley of the Shuswap.

Although the origin of the Okanagan Valley has not been definitely established, two suggestions regarding its formation have been put forward. Cairnes in his geological report suggested that the valley marks a zone of faulting[1] and, although he does not specifically take exception to this concept, Schofield in a later report[2] attributed the valley's formation

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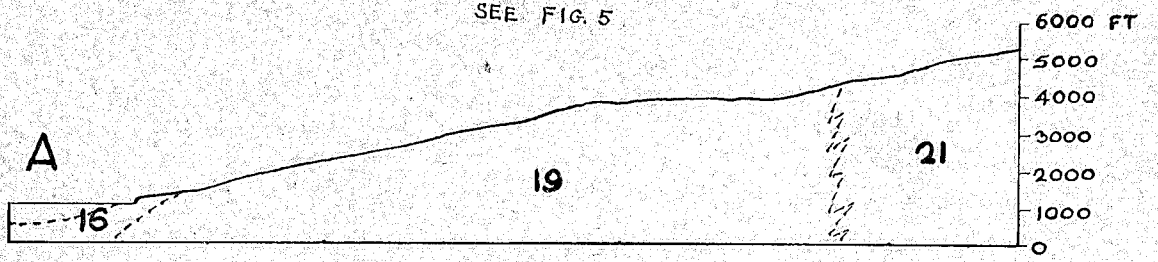
[1]Plate I, Map 538A, Kettle River (West Half) Similkameen and Osoyoos Districts, B.C., Canada Dept. of Mines and Resources, 1939. See last paragraph under Structural Geology. This concept is at least partially substantiated by H.S. Bostock, who showed the existence of major faults on both sides of the valley in the vicinity of Okanagan Falls. See Map 627A, Okanagan Falls, Similkameen and Osoyoos Districts, Brit. Col., Canada Dept. of Mines and Resources, 1938.

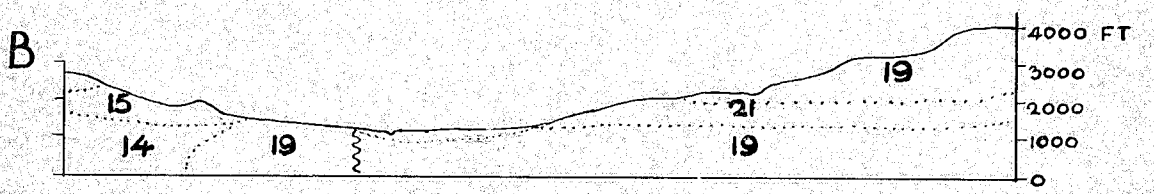
[2]S.J. Schofield, "The origin of Okanagan Lake," Royal Soc. of Canada, Trans. 3rd ser., Vol. 37, Sec. 4, 1949, pp. 89-92.

STRUCTURE SECTIONS IN THE PENTICTON AREA

SEE FIG. 5



STRUCTURE SECTION ALONG A-B



STRUCTURE SECTION ALONG C-D

LEGEND

MODERN

16	RECENT ALLUVIUM & GLACIAL DEPOSITS

TERTIARY EOCENE & OLIGOCENE

15	SHALE, SANDSTONE CONGLOMERATE, COAL SEAMS
14	BASALT, ANDESITE RHYOLITE, TUFF, ETC
13	TALUS DEBRIS, SHALE SANDSTONE, CONGLOMERATE TUFFACEOUS BEDS
12	GRANITE, SYENITE

JURASSIC &/OR LATER

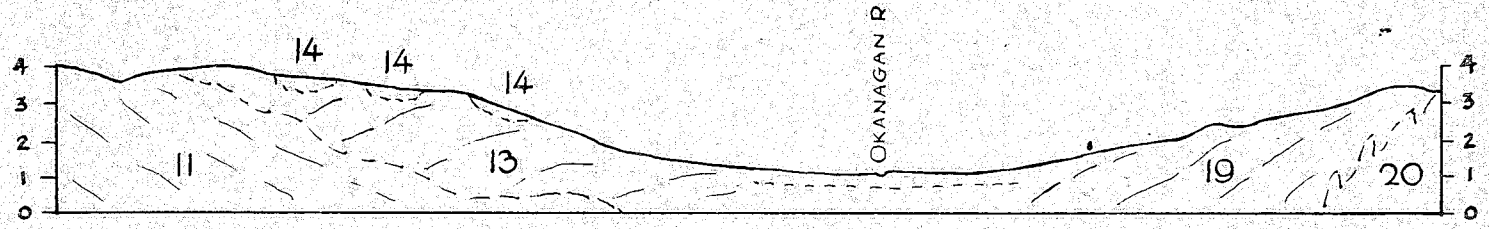
11	OKANAGAN INTRUSIVES MAINLY GRANODIORITE
8	MAINLY DIORITE AND QUARTZ DIORITE

SHUSWAP COMPLEX

21	BIOTITE GRANITE AND GRANODIORITE
20	HORNBLENDE & HORNBLENDE-BIOTITE, GRANODIORIT AND QUARTZ DIORITE
19	MAINLY GRANITE-GNEISS & GRANODIORITE-GNEISS

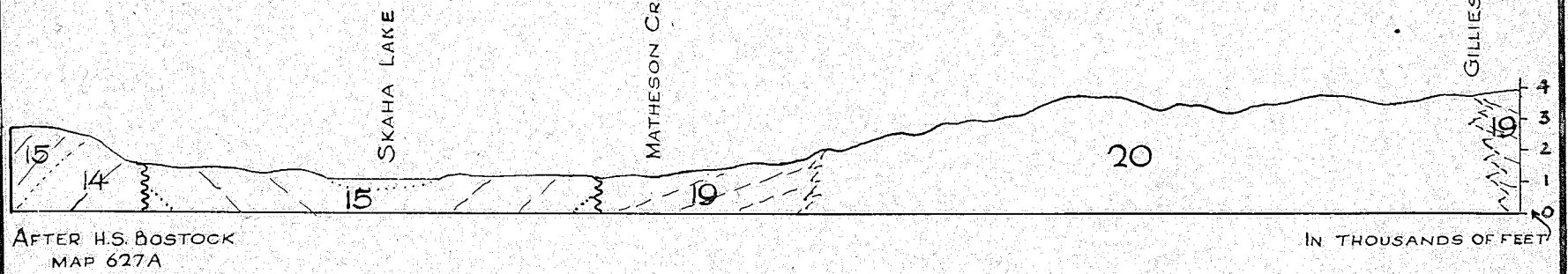
AFTER C.E. CAIRNES, 1936, MAP 538A, KETTLE RIVER

STRUCTURE SECTIONS



STRUCTURE SECTION ALONG E-F

SEE P1



AFTER H.S. BOSTOCK
MAP 627A

IN THOUSANDS OF FEET

STRUCTURE SECTION ALONG G-H

SEE FIG. FOR LEGEND

to the work of erosion. It is probably true that Cairnes and Schofield are both right in that the zone of faulting created the initial direction and slope along which drainage was established and that subsequent erosion played a major part in giving the valley its present form.

At the Okanagan Divide near Armstrong, the altitude of the valley bottom is 1,140 feet; at the International Boundary it is 913 feet. The valley bottom therefore has a gradient of a little more than two feet per mile and lies from 3,000 to 5,000 feet below the general plateau surface.

Measured from rim to rim (i.e. the immediate drainage divides) the Okanagan Valley between Naramata and Okanagan Falls averages about eight miles in width. This measurement differs considerably from the 3- to 6-mile width given in the British Columbia Department of Agriculture reports[3] which state the widths as measured from the upper limits of recent alluvial and glacial deposits. A cursory examination of the profiles in Plate II will show that the latter measurement is geomorphologically unsound and that the valley rim should be taken as the lateral valley limits.

Elevation of land surfaces and general slope conditions are shown by contour lines in Plate I, by profiles in Plate II, and by geological cross-sections in Figs. 4A, B, and C. The lowest elevations are occupied by the valley lakes, the adjacent lower slopes by drift materials which

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[3] Prov. of Brit. Col., Dept. of Agriculture, The Okanagan Valley, Circular No. 40, 1945, p. 5. Also, C.C. Kelley and R.H. Spilsbury, Soil Survey of the Okanagan and Similkameen Valleys, Brit. Col. Report No. 3 of Brit. Col. Survey, p. 7.

make up the fan and terrace complex and the higher slopes by rough mountainous land.

Fig. 5 shows the distribution of the various landforms in the Penticton region. These landforms fall roughly into two main classes: (1) those that are composed chiefly of bedrock and owe their form to the structure and innate characteristics of the bedrock, and (2) those which are made up of unconsolidated or lightly consolidated drift materials.

I. ROUGH MOUNTAINOUS LANDS

The rough mountainous lands fall into the first class. They are made up chiefly of two important rock complexes: (a) the Shuswap Complex which lies on the east side of the trench, and (b) the Okanagan Intrusives which lie on the west (see Plate I).

The Shuswap complex is marked by numerous north-trending faults which are responsible for directing drainage in a N-S direction and, therefore, the formation of N-S trending valleys and ridges. Only where slope conditions direct the drainage into the Okanagan Valley do the streams flow in a westerly direction. The major west-flowing streams such as Penticton and Ellis Creeks have carved deep, steep-sided valleys to which many of the north-south trending valleys on the plateau are tributary.

The Okanagan Intrusives on the west side of the trench have numerous faults and sheer zones which strike in all directions and, as a result, a structurally disorganized drainage has developed on these formations and no definite trend in direction is taken by the valleys and ridges. As in the Shuswap Complex, the valleys of the larger streams

FIG. 5

GEOMORPHOLOGY

OKANAGAN LAKE

NARA-MATA

NARAMATA CREEK

A

B

PENTICTON

PENTICTON CR.

SHINGLE CR.

ELLIS CR.

E

F

H

SKAHA LAKE

OKANAGAN FALLS

G

C

D

DISTRIBUTION OF
LAND FORMS

ROUGH MOUNTAINOUS LAND

STREAM CUT VALLEYS THROUGH ROUGH MOUNTAINOUS LAND

LANDFORMS IN DRIFT

TERRACES - EVEN GENTLY SLOPING SURFACE

TERRACES - ROUGH, UNDULATING - KETTLES & SLUMPING

ALLUVIAL FANS AND COALESCED ALLUVIAL FANS

PRECIPITOUS TERRACE FACES

UNDIFFERENTIATED ALLUVIAL DEPOSIT

N

SCALE

MILES

1 ½ 0 1 2 3 4

(e.g., Shingle Creek) are deep and canyonlike; the valleys of the smaller streams are shallower and less angular in cross-section and the ridges and hills are well rounded.

The streams having their sources on the main valley walls usually flow normal to the valley axis except where local structure or faulting causes them to flow in other directions. Because the streams are short and their flow is small, their valleys are neither as deep, nor as steep-sided as those of the larger streams. Their trend, however, being east and west, has an important influence on air drainage which will be discussed in the chapter on climate.

II. LANDFORMS IN THE DRIFT DEPOSITS

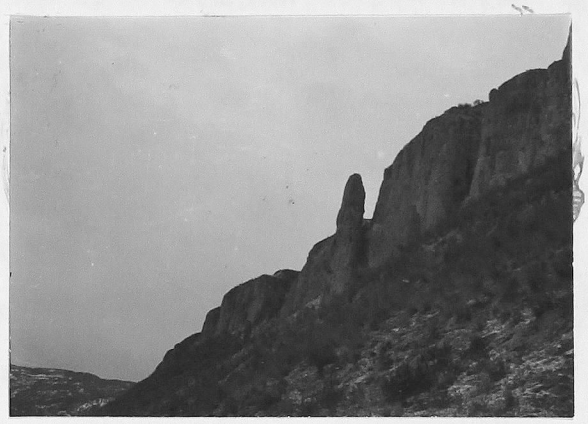
The landforms in the drift deposits are chiefly of two kinds: (1) the terrace formations and (2) the alluvial fans of the larger streams (see Fig. 5).

The Terrace Formations

The terraces are composed of silt with interbedded sand and gravel. They are found on both sides of the trench from Vaseaux Lake to Naramata (and north). They are widest near the mouths of streams tributary to the main valley and are continuous except where interrupted by some rocky promontory or breached by rejuvenated streams. The terrace apices (i.e. their highest parts) are located where the streams emerge from their canyon mouths, and from there the terraces slope gently towards the valley axis only to end in abrupt, cliff like drops to lake or valley floor. The range of elevation on the terrace surfaces is given in the following table:

Fig. 6A

Fig. 6B



Figs. 6A and B show terrace faces near Penticton. The precipitous silt "cliffs" have been carved into forms which are strikingly like badlands in appearance. The formation shown in Fig. 6A closely resembles a butte.

TABLE I[4]

No.	Terrace mass	Miles north of Vaseaux Lake	Elevation (feet)
1	Between Vaseaux Lake and Okanagan Falls	0 - 2	1200 - 1450
2	Near Kaleden	2 - 8	1250 - 1550
3	Penticton (both sides of trench)	10 - 16	1250 - 1600
4	Near Naramata	18 - 22	1250 - 1600

The elevations 1,450, 1,550, and 1,600 mark the terrace heights at the fan apices extant at the canyon mouths. From these extreme heights the terraces slope to elevations of 1,200 and 1,250 feet which mark the crests of the terrace faces. The drop from the crests to the valley floor or lake surfaces averages 120 feet.

The slope of the terrace surfaces is usually gentle (but may steepen locally to as much as 10 degrees) and is apt to fan out radially from the canyon mouths of the tributary streams. In many places, particularly along the faces of the silt cliffs and wherever running water has had a chance to carve the loosely consolidated sediments, striking formations like badlands stand out boldly from the terrace masses to form picturesque scenes along the highway (see Fig. 6). Especially is this true along the highway between Penticton and Summerland.

[4]R.F. Flint, "'White Silt' Deposits in the Okanagan Valley, British Columbia," Trans. Royal Soc. of Canada, Sec. IV, 1935, p. 110.

In Fig. 5 the terrace masses have been divided into two types according to the kind of surface each presents. The first type has an even, gently sloping surface; the second has a rough, undulating surface due to kettle holes and slumping of the terrace materials. Examples of the former are particularly prominent on the east side of the valley between Penticton and Naramata, and between Ellis Creek and half-way down the east shore of Skaha Lake; examples of the rough-surface type are prominent north of Vaseaux Lake, immediately north of Kaleden, and again north of Shingle Creek on the Indian Reserve. Flint describes the rough terraces as:

> . . . irregular, exhibiting a complex of sags and steep-sided closed depressions up to several hundred feet in diameter, and separated by irregular swells and ridges. Such complexes are most evident on the outer parts of a terrace, . . . Some of the depressions are typical ice-block kettles; others are broad and shallow with barely perceptible side slopes, like the swales characteristic of ground moraine.[5]

Where the streams have trenched the terraces, terrace materials and their manner of deposition can easily be studied. Silt composed of cream-white to pale buff rock flour is the chief component of the terrace masses.

> . . . [The silt is] delicately stratified in parallel laminations ranging from a fraction of an inch to several inches, less commonly several feet, in thickness. The fine sediments grade both laterally and vertically into sand and gravels, the gradations bearing a definite relationship to tributary streams. . . . As a stream is approached, sand and then gravel replaces silt, first at the surface, then gradually extending down in sections so that near the mouths of tributaries the entire upper part of the terrace section consists of sand and gravel, grading out laterally and down vertically into silt.[6]

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[5] Flint, op. cit., p. 109.

[6] Ibid., pp. 110-111.

The Alluvial Fans

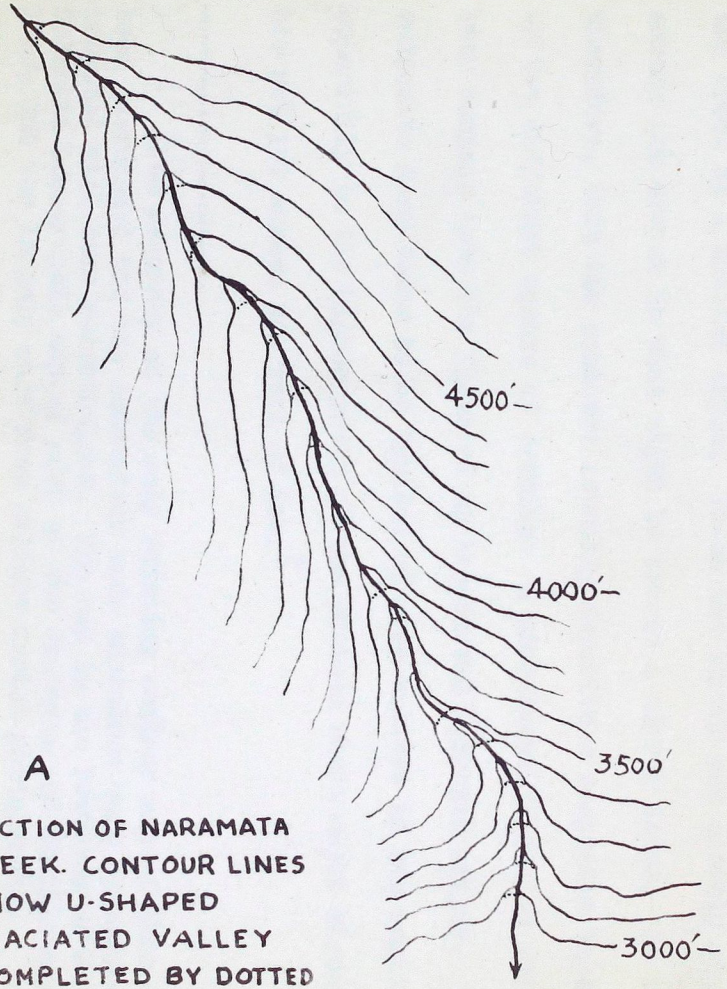
The second major landform in the drift deposits is the alluvial fan. This is found singly as at the mouths of Naramata and McLean Creeks, and in the "coalesced" forms as where the fans of Penticton and Ellis Creeks merge one into the other. All the fans have a typical arcuate shape, resembling somewhat a segment of a circular plain which is higher at the centre than at the periphery. Most streams crossing the terraces have entrenched themselves deeply into lightly consolidated drift but the major creeks--Penticton, Ellis, and Shingle--have gutted the terraces completely and have built fans whose apices lie well within the terrace walls. The fans of these creeks coalesce and, filling the trench to well above lake level, form the townsite for urban Penticton.

The material composing the alluvial fans grades typically from coarse to fine. Where the creeks emerge from their canyon mouths, the smaller grade suddenly slackens the speed of the currents. The less energetic currents immediately begin to drop their loads of debris, the rubble and coarse gravels first, then as the grade continues to decrease and the waters lose more energy, the finer gravels, then sands, then silts drop out. Thus, at Penticton, the soils nearer the fan apices are composed of rubble which grades into gravel, sand, silt, and finally into the bog soils near the Okanagan River.

The Development of the Landforms

As was mentioned in the introduction to this chapter, the Interior Plateau is thought to be an old erosion surface. During the Pleistocene period this surface was covered by a vast ice sheet to an altitude of

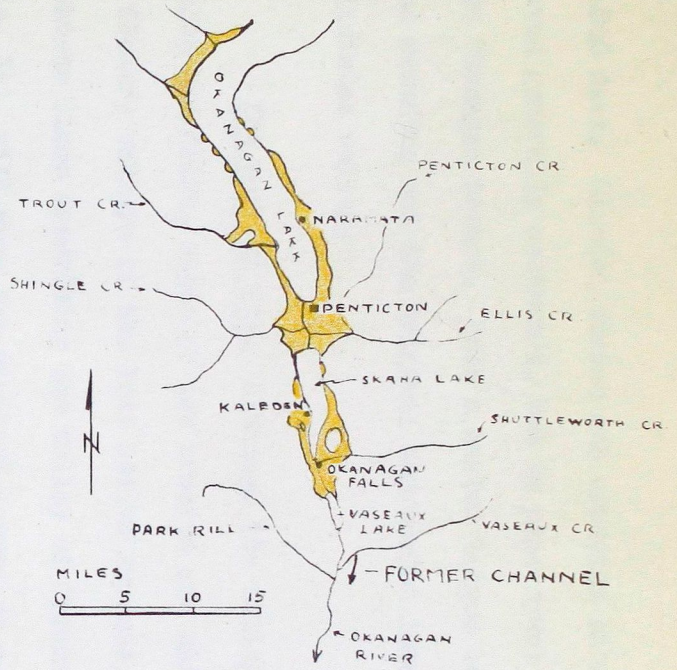
FIG. 7



A

SECTION OF NARAMATA CREEK. CONTOUR LINES SHOW U-SHAPED GLACIATED VALLEY (COMPLETED BY DOTTED LINES) INTO THE FLOOR OF WHICH A V-SHAPED, STREAM-CUT VALLEY HAS BEEN INCISED.

SCALE $\frac{1}{40,000}$



B

SECTION OF THE OKANAGAN TRENCH SHOWING TERRACE MASSES (IN YELLOW) WITH INTERBEDDED SAND AND GRAVEL (INCLUDING SOME MODERN FANS). ARROW SHOWS OLD VASEAUX CREEK CHANNEL.

(AFTER R.F. FLINT)

7,000 feet. Glacial striae and erratics show that the great ice mass moved generally southward, but in places was directed by topography into the Okanagan trench. Here a master tongue of ice collected, deepening and rounding out the original depression into a U-shape typical of the glaciated valley.

The work of ice. Although the valley profile is now obscured by lakes and drift, signs of ice erosion are still plainly evident in the tributary valleys of the less active streams. A close examination of the contour lines describing the valley of Naramata Creek, for example, (see Fig. 7A), will show two distinct curves on each contour as it approaches the stream. The first curve is well rounded and, if continued across the stream, would describe the typical U-shape of an ice-scoured valley; the second curve leaves the first one abruptly, running up-valley to intersect the creek at a smaller angle. These two curves are closely repeated across the stream in what might be termed a mirror image. It is evident, therefore, that the contours actually describe a composite valley shaped by two different agents of erosion: a stream-cut, V-shaped valley has been incised into the floor of an ice-carved U-shaped valley. This composite form seems to be typical of most valleys in the region, especially in the higher parts of the plateau where major stream action has not yet erased the work of ice.[7]

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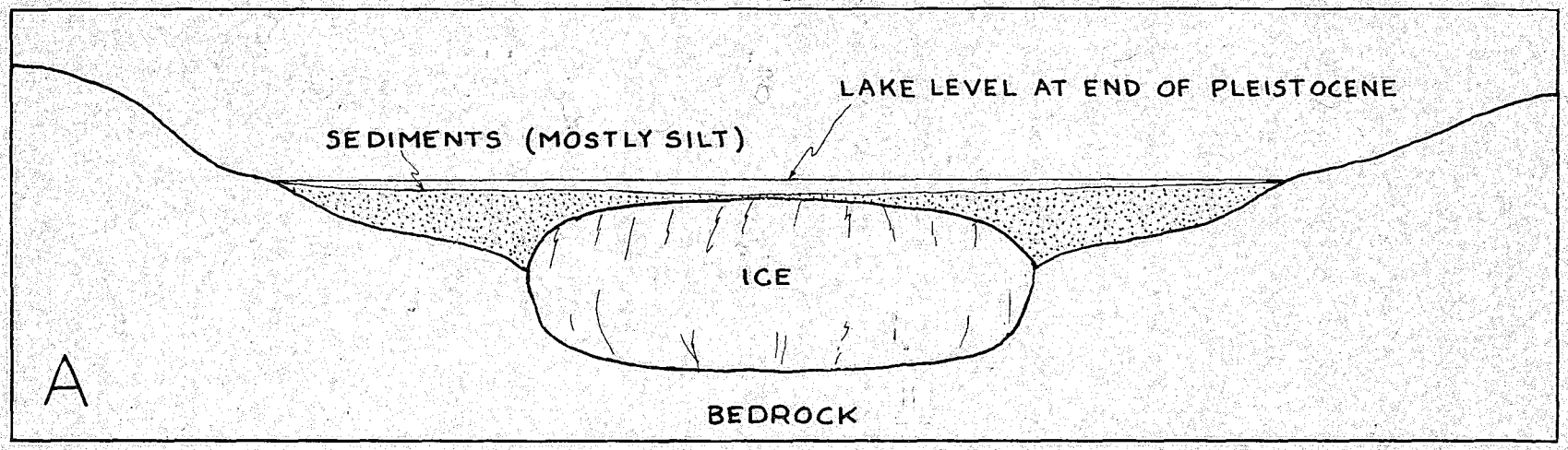
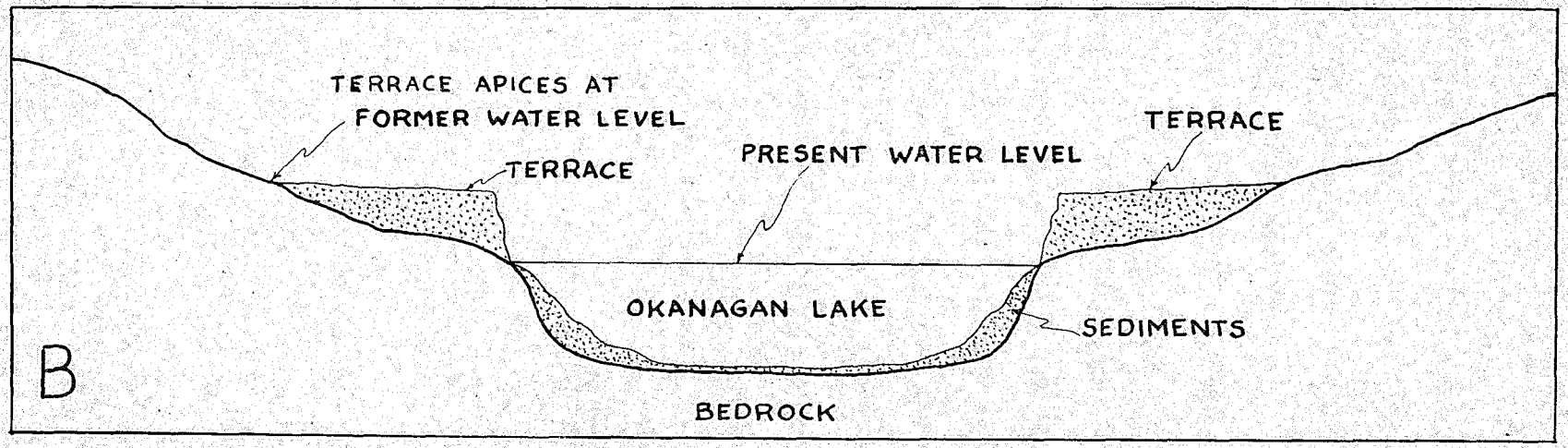
[7]The accuracy of the only existing contour map of this region has been questioned and the deductions made therefrom must therefore be accepted with some reservations. The map is the Province of British Columbia Topographic Map of part of the Okanagan and Similkameen Valleys, 1919, and was largely made from oblique aerial photographs.

FIG. 8



DIAGRAMS SHOWING PROBABLE METHOD OF TERRACE DEVELOPMENT



NOTE: DIAGRAMS HAVE BEEN GREATLY EXAGGERATED VERTICALLY

The Post-Glacial Scene

No picturing of conditions in the valley as they were at the end of the Pleistocene period is likely to be correct in all its details. Nevertheless, an attempt to show what the broad picture probably was will have its value in clarifying the geomorphology of the region.

To begin with, after the disappearance of the great ice sheet, a stagnant tongue of ice was left lying in the main valley and very probably small alpine glaciers remained in the higher parts of the plateau. To the south of Vaseaux Lake the valley was choked with ice and drift forcing the water of the glacial lake in the valley to spill through a channel hanging about 650 feet above present lake level.[8] Gravel, sand, and rock flour were disgorged from the tributary stream mouths into the valley lake and, grading coarse to fine according to the distance from the shore, settled thickly between the tongue of ice in the valley and valley walls, and, not inconceivably, burying the ice wholly or in part (see Fig. 8).

It is difficult to estimate the length of time during which these conditions prevailed, but Flint suggests that the ice in the valley, buried and insulated by the sediments poured onto it, lasted for several hundred years at least and perhaps much longer.[9] It is possible that the

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[8]Flint, op. cit., p. 113. (For location of channel see Fig. 7B.)

[9]This is made all the more believable on examination of the channel through which the waters spilled at this time. The channel hangs at an altitude of slightly more than 1,600 feet.* It is three miles long, about 500 feet wide, and is cut through a double spur of bedrock.

*An obvious discrepancy between the altitude of the channel and that of the terrace apices exists here (see Table I). If the terraces were laid down in the lake which drained through the channel, then the terrace apices should lie at the same altitude as the channel. The explanation

ice and drift dam at the south end of the post-glacial valley lake may have been breached perhaps during an exceptional flood; or the giving way of rotting ice may have lowered the dam sufficiently to enable the water to find a new channel. Whatever the cause, the waters now cutting through the unconsolidated material of the dam could easily deepen the new channel and with the deepening drain the shallow lake on top of the buried ice in the valley.

The changes occurring with the draining of the lake must have been direct and immediate. A sizable stream probably took the place of the lake in the valley to take care of the Okanagan (and perhaps Shuswap) drainage. Because the lacustrine sediments, as coalesced delta fans, tended to slope towards the valley axis, it is reasonable to suppose that the stream flowed down the valley center.

There are two reasons why this stream would at first expend its energies in down-cutting: first, the new outlet through the Vaseaux Lake gap lowered the local base-level and rejuvenated the stream;[10] and second,

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may be that the contour map of this area is inaccurate and that the channel actually hangs 150 feet lower than the map shows. (See footnote 7 explaining possible inaccuracy of this map.) Should the altitude of the channel have been fixed correctly, however, it must be assumed that some other channel of the same altitude as the terrace apices controlled the lake level and therefore the base level of the streams which brought the terrace materials into the trench. If the latter assumption is true, the discussion which follows is still pertinent, only a lower channel must be presumed.

[10]A projection of the curve of the terrace surfaces to the valley center indicates that the surface of the sediments was 60 feet, more or less, above present lake level, and that the stream bed was therefore that much higher than at present.

the stream flowing through unconsolidated sediments would have carried its maximum load leaving no surplus energy to expend in lateral corrosion. A rapid down-cutting was therefore to be expected and it must have taken only a short time before the sediments in the stream channel were carried away and the underlying ice exposed. However, as the stream worked its way into the ice, its load became less allowing it to expend more of its energies in lateral corrasion. And from here on the collapse of the sediments must have been very rapid indeed, as the stream, its meanders looping back and forth like a great chain saw, cut away the ice and undermined them.

The original stream channel was probably bordered by miniature cliff faces such as border the present-day terraces. It takes no great imagination to see these cliffs retreating shoreward under the attack of the stream, becoming higher and higher as greater thicknesses of sediment were undercut and broke away. At the same time the melt of the valley ice continued apace until a new base-level near that of the present outlet had been reached and the stream lost itself in the meltwater which gradually replaced the ice to form a new lake.

Flint makes the assumption that all terrace masses in the Okanagan Valley were built under the control of a single base level and probably during the same period of time on the evidence that no compound terraces are found anywhere and that the terrace apices are generally accordant.[11] An examination of Table I shows that the base-level

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[11] Flint, op. cit., p. 110

represented by the terrace apices differs by 150 feet in the Penticton region alone and by 300 feet with the north Okanagan. As this difference can hardly be termed accordance under a single base-level, the only assumption which satisfactorily explains the apparent discrepancy, and yet is in agreement with the facts, would seem to be that a gentle tilting from north to south has taken place in the area since postglacial times. This assumption is the more believable on evidence that a large thickness of ice was still in existence in the Shuswap (and may have extended to the north end of Okanagan Lake) when the terrace masses in the Okanagan were being laid down. When this ice melted, the release of its weight enabled the land to rise and cause the 3-feet-per-mile tilt now indicated by the terrace tops.

The draining of the old glacial lake and the rapid down-cutting of the stream which took its place had an important secondary effect: it rejuvenated tributary streams by lowering their base-levels. The larger creeks--Shingle, Penticton, Ellis, and Shuttleworth--brought down vast amounts of material from the plateau and, breaching the terraces, dumped the products of their vigor into the trench. Their fans grew, coalesced, and filled the trench at Penticton and Okanagan Falls, and divided the then continuous lake into the present-day Vaseaux, Skaha, and Okanagan Lakes. Without an accurate measurement of depth, it is decidedly risky to estimate the volume of material brought down from the plateau and deposited in the trench. Should the depth approximate the 760-foot figure for Okanagan Lake, however, the volume at Penticton would equal more than three fourths of a cubic mile!

Fig. 9 is an oblique airphoto looking northwest. In the background are the rough mountainous lands and terrace sections on the Indian Reserve. The new Penticton West Bench development is on the terrace section shown on the photograph. In the foreground is urban Penticton on the shore of Okanagan Lake. Penticton Creek appears on the right. The new Central Mortgage and Housing development is shown just above the reservoir. In the immediate foreground is the terrace section which separates the fan of Penticton Creek from that of Ellis Creek to the left (south) of the area shown on the picture.

The Rough and Smooth Terrace Surfaces

At least three theories have been put forward to explain the rough surfaces of some of the terraces and all three are probably right as far as they go. An understanding of the less obvious theories may be helpful in the study and practice of soil conservation and it is for this reason, as well as to supply a better understanding of the land forms, that they are outlined here.

One theory holds that the roughness was caused by slumping when the ice supporting a terrace section melted. An example of such slumping may be seen in Fig. 9. The upper section of the terrace can be seen as a generally level surface from which the treeless lower section has slumped away. Kettle formations are also caused by ice buried either wholly or in part by sediments--the subsequent melting of the ice leaving steep-sided, closed depressions typical of kettle topography.

Yet, the above theory is not a complete explanation. Cockfield and Buckham[12] offer the following explanation for sinkhole and gully formations in the white silts of the Thompson Valley, and their theory may well apply to the white silt terraces of the Okanagan. They suggest that water, finding access into the silts by way of animal burrows or possibly through a fissure, eventually reaches a temporary water table and, seeping along it, breaks out on the terrace cliff. The opening once made is quickly enlarged[13] into an underground channel by sudden and heavy

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[12] W.E. Cockfield and A.F. Buckham, "Sinkhole erosion in the white silts at Kamloops," Trans. of the Royal Soc. of Canada, Sec. IV, Ser. III, Vol. XL, May, 1946.

[13] See Fig. 10 for similar phenomena near Penticton.

Fig. 10A

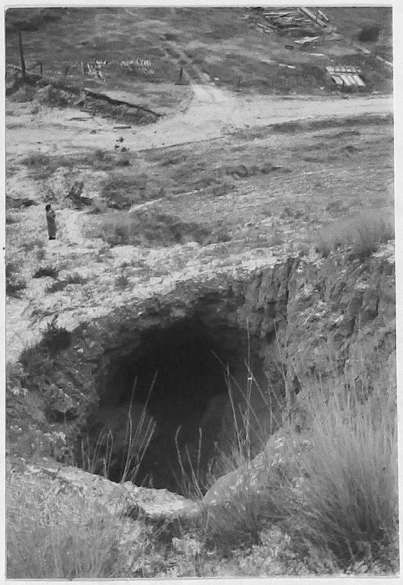

Fig. 10B

Figs. 10A and B are two caves in the terrace immediately west of the Okanagan Lake outlet at Penticton. The caves were at one time joined to form a continuous subterranean passage which was exposed when part of the "roof" collapsed to form a sinkhole such as is described by Cockfield and Buckham (see chapter on Geomorphology). Fig. 10A is taken from the edge of the sinkhole looking up the terrace slope, and Fig. 10B looking down the terrace slope.

run-off. The channel is enlarged to cave-size and the enlargement continues until the roof falls in to form the kettle-like, funnel-shaped depressions. A later stage sees the coalescence of a string of these funnel-shaped depressions along the underground channel to form the well-known, steep-sided gully of the terrace masses.

R.M. Hardy denies that underground erosion plays a part in the sinkhole development.[14] He found that a small per cent of calcium carbonate gives the silts an "artificial cohesion"[15] and that this cohesion is destroyed when water added to the soil dissolves the calcium carbonate. Once the cementing agent is removed, the silt consolidates under its own weight and forms the kettles Cockfield and Buckham attribute to erosion.

It appears that neither of the two theories just presented alone explains all the facts. Cockfield and Buckham present convincing evidence that underground erosion does take place.[16] On the other hand Hardy's contention that the silts consolidate upon removal of the cementing agent has been proved by experiment and by observation. It is highly probable that the two theories combined come nearest to explaining what really happens. Briefly, it could be that water obtains access to the subsoil by some means[17] and through solution of the calcium carbonate causes the

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[14] R.M. Hardy, "Construction Problems in Silty Soils," The Engineering Journal, Vol. 33, No. 9, Sept. 1950.

[15] It is doubtless this calcium carbonate cementing agent which enables the silts to stand up in bold, clifflike formations.

[16] Cockfield and Buckham, op. cit., Plate III, Fig. 2, shows soil outwash from cave mouth. See also Fig. 10 for similar evidence in the Penticton area.

[17] The question might be asked: How is it possible for the lightly cemented silts to exist for long at shallow depth without coming in contact with water? In answer to this Hardy says (op. cit., p. 778):

"First, the soil occurs in areas of comparatively low annual precipitation. . . . A second factor is that the natural

consolidation of silt along whatever channel the water may find. If silt consolidation makes the silt less impervious to water, or if a temporary water-table prevents the downward flow, hydrostatic pressure will force the in-coming water to seep horizontally along the paths of least resistance. Solution of the calcium carbonate along the paths of seepage will cause consolidation of silts horizontally and thus open up free channels in which water can flow. Once these channels reach the terrace face and the water is permitted free passage, underground erosion will begin, thus instituting the developments suggested by Cockfield and Buckham.

The importance of the above-described process of erosion has yet to be realized. Its bearing on effective, long-term soil conservation should be apparent--as apparent as the picturesque but useless, landforms it makes from the soils which nurture men's crops.

The description given in the preceding pages of landform development in the Penticton region is admittedly a simplification of what must have been a complex evolvement. Further studies of geological and geomorphological phenomena in the valley will undoubtedly add much detail to this picture of the physical region. The remainder of Part One of this thesis will be devoted to other geographic factors which influence and are influenced by this setting.

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topography develops with steep slopes, . . . so that the run-off is fast. Third, weathering breaks down the natural structure of the surface soil. It then becomes more dense and forms a comparatively impervious skin on the surface."

CHAPTER IV

THE HYDROGRAPHY

Water is so much a part of the landscape that most geographical regions are characterized by the presence or absence of it. In the last chapter, for example, water was shown as a builder and carver of landforms. On a less spectacular scale but of at least equal importance is water's indispensability to living things. Furthermore, it provides man with transportation routes and power. Man uses it in a host of manufacturing processes, for his comfort and welfare,--as in bathing, heating, cooking, sanitation, etc.,--and for his protection as against fire. Water is indispensable even to man's pleasures--as in water sports--and its scenic beauties in the landscape hold never-ceasing fascination for him. It may be safely said that there is no region on the earth's surface where the presence or absence of water is not a critical factor, not only to the region's appearance and physical development, but also to the life forms--particularly man--that make the region their home.

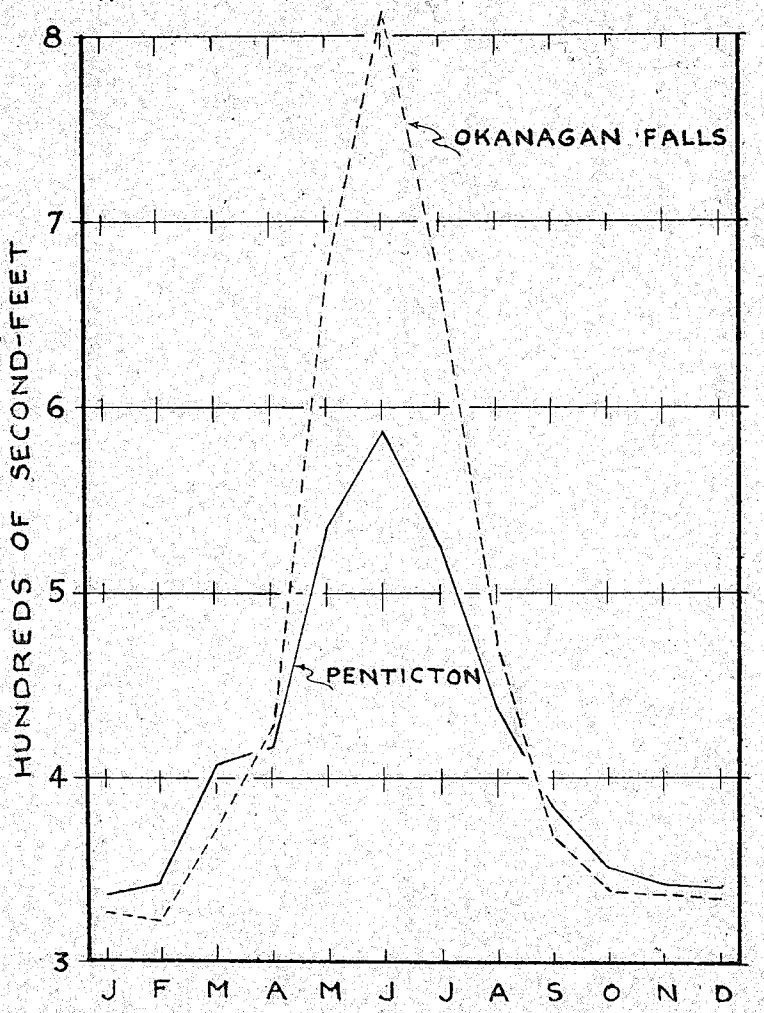
It is the purpose of this chapter to show briefly where and what the water resources of the Penticton region are. It will be left to following chapters to explain in more detail than is given here the importance of water to climate, vegetation, soils, industry, transportation, and recreation in the Penticton region.

General

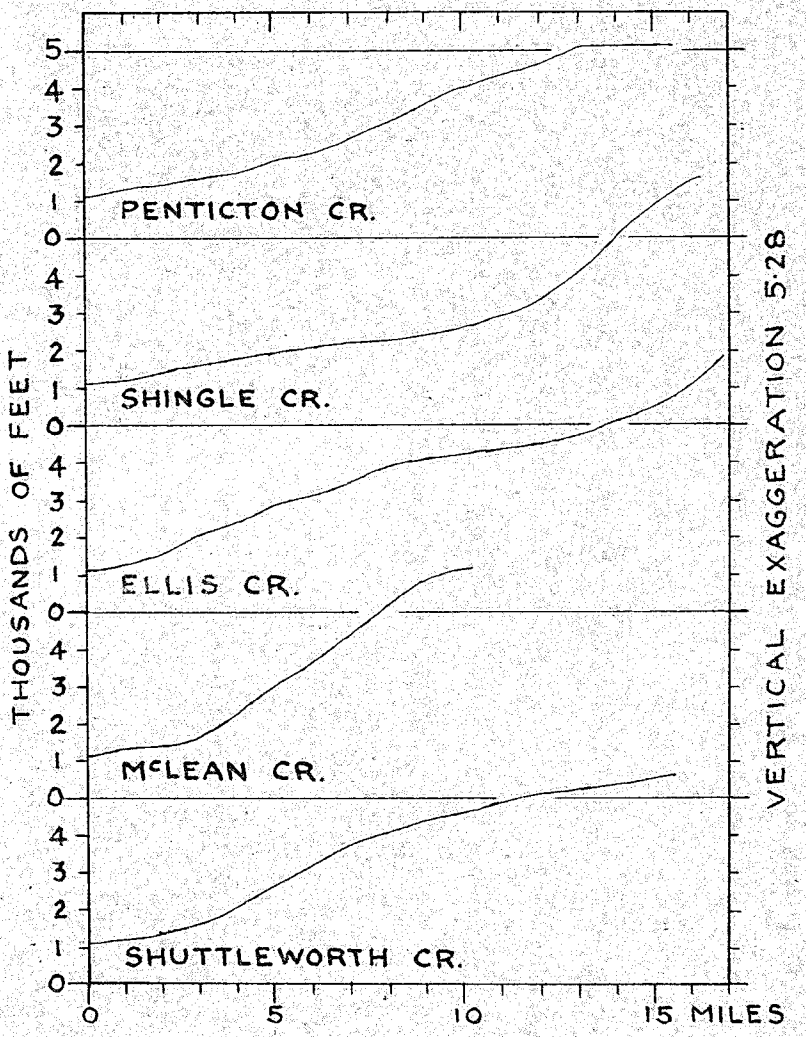
The hydrography of the Penticton region (see Fig. 3) consists of

FIG. 11

A. MEAN MONTHLY DISCHARGE OF THE OKANAGAN RIVER AT PENTICTON AND OKANAGAN FALLS. MEAN DISCHARGE 418 & 455 SEC.-FT., RESP.



B. PROFILES OF THE FIVE MAJOR CREEKS OF THE PENTICTON REGION.



perennial and intermittent streams which originate on the plateau and valley walls and flow into two large valley lakes. These lakes, Okanagan and Skaha, are drained by a fair-size stream, the Okanagan River, which, having its source in Okanagan Lake, flows south through a four-mile, man-made canal and empties into Skaha Lake. The river leaves the lake at Okanagan Falls and, continuing southward for three miles, flows into Vaseaux Lake where it leaves the Penticton region.

The Tributary Streams

The larger streams[1] entering the valley from the plateau have several characteristics in common. Their profiles in Fig. 11B show that (1) they are short, varying in length from 10 to 17 miles, (2) they have their sources at altitudes of from 5,000 to 7,000 feet, and (3) they are youthful streams having had little time to bring their beds to grade. These streams are able to maintain a continuous flow because their sources are at altitudes where precipitation is comparatively high, and their drainage basins are large as compared with those of the intermittent streams.

The smaller streams are mostly of intermittent flow. Because they have their sources largely on the valley wall, they are handicapped by having smaller drainage basins and lighter precipitation from which to draw their waters. These streams have their peak flow in the spring when the melt-waters come down and after heavy rains. But by mid-summer their

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[1]Penticton, Ellis, McLean, Shuttleworth, and Shingle Creeks.

Fig. 12 is an oblique airphoto looking southeast. The highly eroded terrace extends along the east shore of Skaha Lake and continues to the left (north). Above the orchards on the terrace are rough mountainous lands. Part of the new Okanagan River Canal is shown in the centre foreground; some of the old meanders are still clearly visible. The Penticton airport is in the foreground.

source waters have usually been depleted and the streams dry up leaving nothing but rubble and lighter drift in their beds.

The Valley Lakes

Okanagan Lake is 69 miles long, averages two miles in width, and has an extreme depth of 760 feet.[2] It is navigable and in the "early days" provided an easy means of transportation between Penticton and northern Okanagan centres. Even now it provides rail linkage by means of railway barges between Penticton and Kelowna. Skaha Lake is 7.3 miles long and averages one mile in width. It, too, is navigable but is no longer used for commercial transportation.

The Main Stream

The Okanagan River flows through four miles of fan materials which block the Okanagan trench at Penticton. Its grade is shallow and until recently the river almost lost itself in its meandering course (see Fig. 12). Although it is deep enough for small craft, the river is not used as a water link between the lakes because of the dam at the outlet of Okanagan Lake. South of Okanagan Falls the river flows through the fan of Shuttleworth Creek until it loses itself in the marshes at the north end of Vaseaux Lake.

The Problem of Spring Run-off and Flood Control

So extensive and unpredictable is the spring run-off that a major

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[2] W.A. Clemens, etc., A Biological Survey of Okanagan Lake, B.C., Bul. LVI, (Fisheries Research Bd. of Ottawa), 1939.

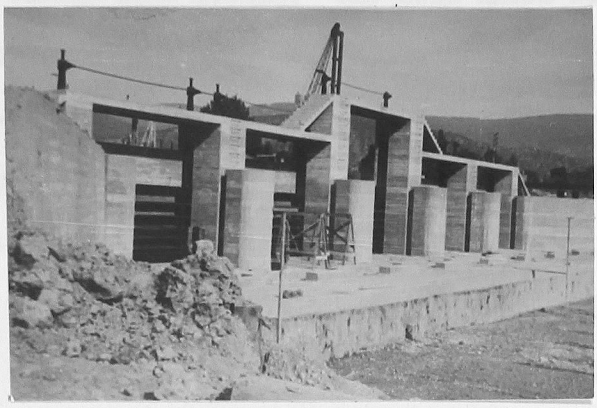

Fig. 13A

Fig. 13B

Fig. 13A. The new control dam on the Okanagan River near the outlet of Okanagan Lake at Penticton.

Fig. 13B. The Okanagan River Canal under construction. The small building on the left (west) bank is the pump house which supplies domestic and irrigation water to the new Penticton West Bench development.

flood control project has had to be inaugurated to regulate the streams and valley lake levels. The deep snows of the upper plateau begin to melt in April and usually reach their peak "melt" coincident with the May-June maximum of rainfall (see Climate). As a result, May and June are months of serious flood hazard. Even the smaller streams on the valley walls become a threat at this time. The light grass and forest cover of the valley slopes permit rapid melting and practically unimpeded run-off. The steep grades and large volumes of water augment enormously the destructive powers of the streams which tear at their valleys and gouge the terraces with relentless strength; they race from their canyons often flooding their banks and dump their debris and excess water into the main valley. The lake levels rise, the meandering Okanagan River is hard put to accommodate the surplus flow, and the threat of flood becomes imminent.[3]

It is to relieve this situation that the Okanagan Flood Control Project was begun. The 2½-million dollar project when completed proposes to do its task in two ways: (1) by regulating the lake-levels by dams at the outlets of Okanagan and Skaha Lakes and (2) by straightening the river bed, at Penticton and south to Osoyoos, to speed the flood waters on their way. The canal at Penticton and the dams have been recently completed (see Figs. 12 and 13).

In the spring before the heavy run-off, the lake levels are permitted to go down to a minimum of 1,119.2 feet in Okanagan Lake and 1,107.0 feet in Skaha Lake. Then, as the melt-waters come down they are

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[3]Fig. 11A will give some idea of the large seasonal fluctuation in the volume of water in the Okanagan River.

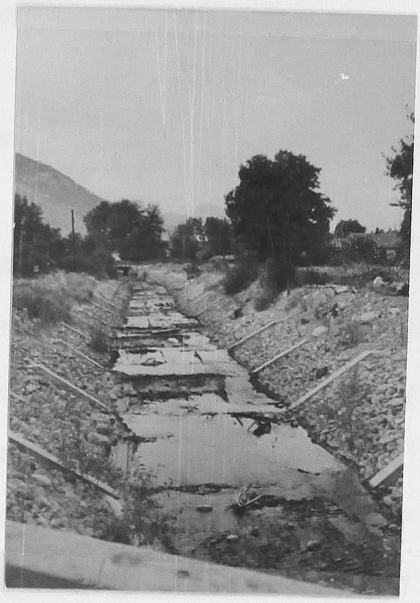

Fig. 14A

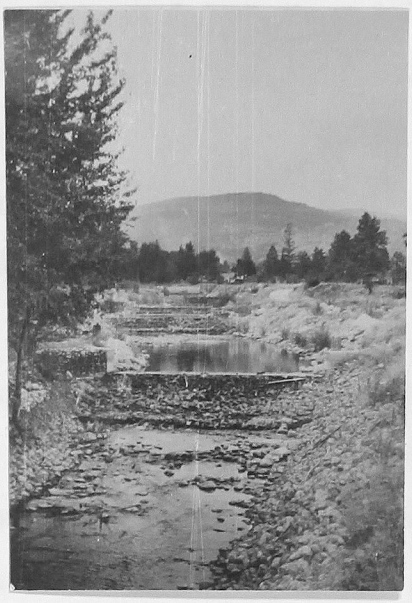

Fig. 14B

Figs. 14A and B show some of the completed flood control projects on Penticton Creek. Indicative of the stream's power when in flood is the coarse rubble which lines the banks.

controlled partly by letting them accumulate in the lakes and partly by passing them off through increased flow in the Okanagan River. The lake levels are permitted to rise to a maximum of 1,123.2 feet and 1,109.0 feet in Okanagan and Skaha Lakes respectively. Thus Okanagan Lake can safely store 393,800 acre-feet of water and Skaha Lake 10,240 acre feet.

Flood control has also been extended to Penticton Creek which, flowing through the built-up section of Penticton, has often caused serious flood damage. Fig. 14 shows the extensiveness of the work required in deepening, straightening, and grading the stream channel. Some idea of the flood water's power may be obtained by examining the size of the rubble rolled and carried down stream only to be dropped when the waters receded. Similar rubble is found at the mouths of Ellis, Shuttleworth, and Shingle Creeks.

Groundwater

Little is known about the water table within the region except as it fluctuates in the soils of the valley bottom. Because water for irrigation is brought to the farms and domestic water is also piped in, the necessity for wells does not arise, except where neither irrigation nor domestic water are supplied (see Fig. 42) and no research on the water table has been done. On the valley bottom the water table is high, frequently within a few feet of the soil surface, especially at the foot of the alluvial fans. During exceptionally high water, the water table may rise high enough to flood basements in low-lying areas, and to well above the soil surface in marshy areas.

Water Resources

Water resources of the Penticton region are adequate for present agricultural and domestic purposes. Most of the irrigation water comes from the plateau where it is stored in natural lakes and in reservoirs, but a small fraction is pumped from the Okanagan River. Although supplies of water from the plateau are limited, more could be made available[4] with increased storage facilities. Construction of storage dams requires a high initial outlay and because they are unable to finance construction, a number of irrigation districts are augmenting their water supply by pumping from the river instead.[5]

Water Power

As the average drop of the creeks is well over 300 feet per mile, development of water power seems at first glance to be a possibility. At least four important factors prohibit this, however. These are the large seasonal fluctuation in the volume of water, the small average flow, the necessary interference with irrigation, and the comparative cheapness of electrical power from the Kootenays.

The Recreational Possibilities

The recreational possibilities of the lakes and streams have yet to be fully realized. Both Okanagan and Skaha Lakes are notable for their

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[4] No data giving the actual possible increase are available.

[5] Notably Penticton which pumps 15 per cent from the Okanagan River, and Okanagan Falls which pumps 25 per cent of its water from the river.

irrigation districts?

scenic beauty, their inviting beaches, and their swimming, boating, and fishing attractions. Because the lakes are easily accessible by resident and tourist alike, they are much used for recreation as a result of which the Penticton region has become justly famous as a playground. The plateau lakes and streams with special attractions for the camper and fisherman can be reached only by trail or pontoon-equipped plane. Easy access by road will eventually bring the less hardy to these out-of-the-way places. But this must of necessity be left to the future.

The analogy between the bloodstream of a living organism and the hydrography of a region is well enough taken in the sense that water is the "life's blood" of a region. Indeed, the "life" of a region parallels that of a living organism in many respects: the region is young, it matures, and it grows into old age; furthermore, its "circulatory system" grows old with it. The hydrography of the Penticton region is still in the youthful stage and will remain so for many thousands of years to come.

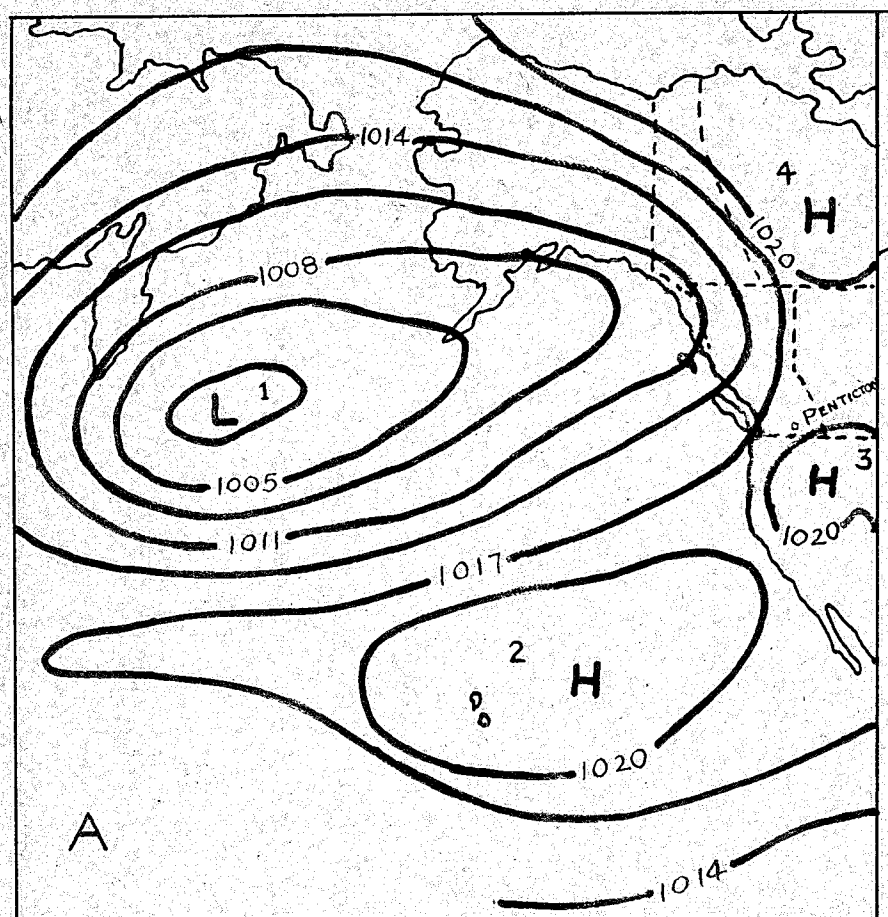
CHAPTER V

THE CLIMATE

Perhaps nowhere in the British Columbia Interior have the climatic controls combined to create such happy results as are reflected in the climate of the Okanagan Valley. Precipitation in the valley is light, but adequate supplies of water are available from the plateau for agricultural and domestic purposes; summer temperatures are kept within the range of comfort by the low humidity and by the influence of the valley lakes; and winter temperatures rarely sink to the killing point for the delicate fruit buds. The air is dry and bracing. The sun is a perpetual attendant during the summer, but in winter clouds cover the valley to seal its warmth against excessive loss by radiation. The climate has in its indirect way made the soils that nurture the valley. It influences the use to which the soils are put; and it brings on ever-increasing number of people to the Okanagan both to visit and to stay. All in all, there can be little doubt but that climate is the Okanagan's greatest resource and, as such, it merits the somewhat detailed attention which this chapter gives it.

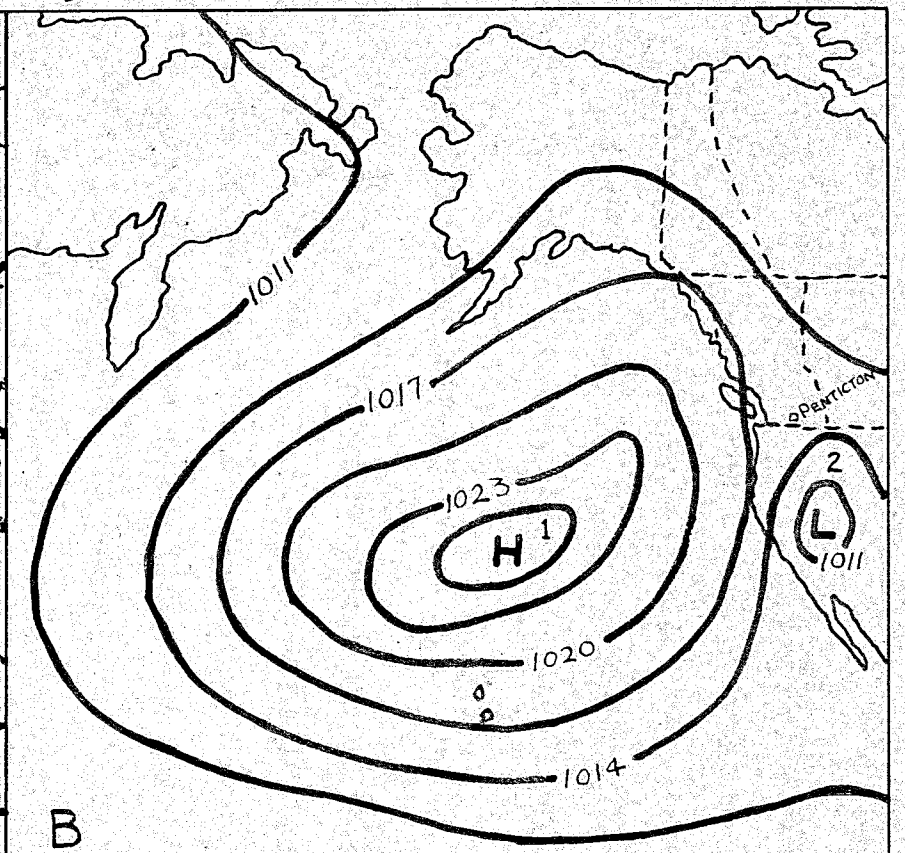
To understand the Okanagan climate, it will be necessary first, to examine briefly the factors which control the overall climate--i.e., the regional climate of the southern British Columbia Plateau--and in so doing, to glance at the elements which make up this climate; second, to examine the "local" controls which literally transform the regional climate into the subregional Okanagan climate, and then to study in some

FIG. 15



PRESSURE SYSTEMS AFFECTING BRITISH COLUMBIA IN JANUARY

1 - ALEUTIAN LOW
2 - HAWAIIAN HIGH
3 - GREAT BASIN HIGH
4 - MACKENZIE HIGH



PRESSURE SYSTEMS AFFECTING BRITISH COLUMBIA IN JULY

1 - HAWAIIAN HIGH
2 - GREAT BASIN LOW

(AFTER MINTZ AND DEAN)

FROM G.T. TREWARTHA, AN INTRODUCTION TO WEATHER AND CLIMATE.

detail the elements which make up the Okanagan climate. If in this chapter the "oneness"--the intimate relationship--between local controls and climate is demonstrated, it will not be due wholly to design: it is a oneness that is inherent in the concept of the true geographic region and that is recognized and exploited by modern geographic thought.

The Major Climatic Controls

Most climatologists recognize eight major controls of climate and of these eight the most important is air mass. It is the "condition" of the air mass overlying a region which makes that region's weather of the moment. If the air mass is warm, the weather will be warm; if temperature and humidity conditions within the air mass are such as to cause condensation, clouds will form and precipitation may result; if the air mass is in motion, the weather will be windy, and so forth. All climatic controls other than air mass are indirect controls and they are important only insofar as they influence the movements of the air mass and the conditions within it.

Air mass may be defined as "an extensive portion of the atmosphere whose temperature and humidity properties are relatively homogeneous in the horizontal direction."[1] A study of the source regions of air masses will show that they are closely associated with the semi-permanent high- and low-pressure systems (see Fig. 15). Thus Polar Continental (P/C) air, which pays fairly frequent visits to southern British Columbia,

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[1] Glenn T. Trewortha, An Introduction to Weather and Climate (New York and London: McGraw-Hill Book Co. Inc., Second Edition, 1943), p. 190.

is developed in the region of the Mackenzie High and, although somewhat modified in its passage southward, its temperature and humidity conditions are such as to leave little doubt that it brings winter with it. Tropical continental (T/C) air, having its source region in south-western United States, occasionally moves northward in summer, bringing with it the extremes of heat commonly called "heat waves." Tropical Maritime (T/M) air from the Hawaiian High brings warm, clear weather in summer.

Polar Maritime (P/M) air has its origin in the North Pacific and is the most important source of weather to southern British Columbia, especially in winter. But the winter and summer characteristics of this air differ considerably. In explaining this difference J.D. Chapman says:

> The winter surface temperatures of the north-east Pacific are high in relation to the temperature of the air fresh from its source . . . The result is a large transfer of heat and moisture from the water to the air . . . producing air temperatures averaging some 12°C (21.6°F) higher than might be expected for the latitude. In the summer the difference in temperature is less and, immediately off the coast of Vancouver Island, the air becomes cooled by the cold up-welling water. The net result is that the air becomes warmer and moister in winter and cooler and less disposed to precipitation in summer.[2]

The controls which affect the movements and internal characteristics of the air masses after they leave their source will be presented briefly in the following paragraphs.

The semi-permanent high- and low-pressure centres control the air masses' direction and speed of movement. Southern British Columbia lying in the "belt" of the "Westerlies" is most often influenced by air masses

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[2]John D. Chapman, "The Climate of British Columbia," Paper presented to the Fifth Brit. Col. Natural Resources Conference, Feb. 27, 1952, p. 5.

moving from west to east--from the ocean to the land--thus making the pressure centres and land-water relationships important climatic controls. Furthermore, P/M air is modified as it passes over waters warmed by ocean currents from the south or, as explained by Chapman above, cooled by upwelling waters. Once the P/M air reaches the mainland, it is forced to rise over the coast mountain barrier. Because the air mass is adiabatically cooled on ascent it is forced to drop most of its moisture on the western mountain slopes; then, warmed by the latent heat of condensation, the air mass descends the eastern slopes and is further warmed by compression. By the time it reaches the plateau, it is comparatively warm and dry and semi-arid to arid conditions follow in its wake. The British Columbia Interior is said, therefore, to lie within the "rain shadow" of the Coast Mountains. T/M air from the Hawaiian High is modified in the same way as P/M air, but the T/M air will of course be warmer.

Because latitude influences the intensity and seasonal duration of insolation, it is considered an important control of climate. P/C air from the McKenzie-Yukon area is considerably warmed by the greater amount of heat received by the lower-latitude land surfaces and returned to the air as it moves southward. As a result, the severest "sting" has usually been removed from P/C air by the time it reaches southern British Columbia.

Altitude affects climate in two ways, the most obvious of which is the decrease in temperature with increase in altitude. For example, the difference in temperature between Vancouver and Penticton due to altitude alone is 3.6°F and between Vancouver and Garmi (a plateau station

east of Penticton) it is 13.5°F. The other effect of gain in altitude is the decrease of water vapor and atmospheric impurities. This decrease permits both more intense insolation and greater loss of heat by radiation and hence, wider climatic extremes.

The remaining controls of British Columbia weather are the low-pressure or cyclonic storms and their high-pressure counterparts, the anticyclones. These pressure systems move over the land from west to east in haphazard procession. The cyclonic storms have their origins along the fronts of two different air masses--e.g., P/M and T/M air. It is to these low- and high-pressure systems that British Columbia weather owes its variability.

Briefly, then, the climatic controls act to direct and modify air masses in various ways before they reach southern British Columbia. Pacific air is warmed and dried; Polar Continental air is warmed; and infrequent Tropical Continental air is cooled during its northward journey. Indeed, much work has been done on the air masses before they reach the Penticton region; they have been readied, as it were, for further modification by the local controls to make the Okanagan climate.

But what specifically is the "state" of the air masses when they reach southern British Columbia? What are their average and extreme characteristics with which the local controls must cope? To answer these questions, a brief examination must be made of

The Elements of the Larger Climate[3]

Temperature: Temperature is one of the most important climatic

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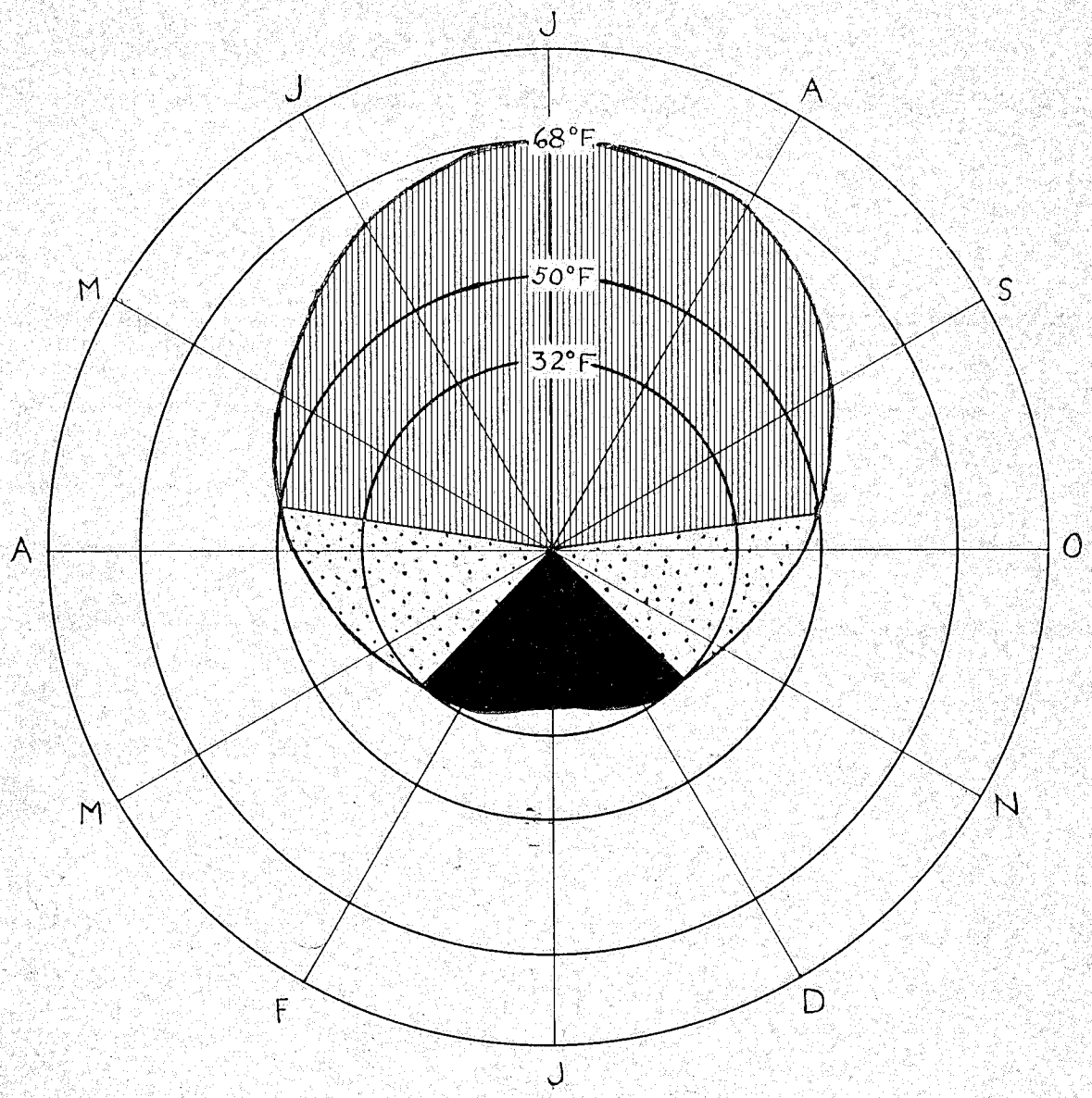
[3]Data presented are for Carmi and/or for Chute Lake which are representative plateau stations near Penticton. (See Plate I for location of these stations.)



CLIMATOGRAPH FOR PENTICTON
(AFTER E. N. MUNNS)

COLD
< 32°F

COOL
32°F TO 50°F

WARM
50°F TO 68°F

elements. A glance at Table II will disclose the following: The average annual temperatures at Chute Lake and Carmi are 37°F and 39°F respectively. The January-July range for both stations is 45°F. Five months of the year have mean temperatures well below freezing. All the rest of the year

TABLE II

MEAN MONTHLY AND MEAN ANNUAL TEMPERATURES (°F)

	J	F	M	A	M	J	J	A	S	O	N	D	YR.
Chute Lake (Alt. 3,916 ft.)	13	21	25	37	47	52	58	56	49	40	28	19	37
Carmi (Alt. 4,084 ft.)	15	23	28	39	48	53	60	59	52	40	28	20	39

at Chute Lake, and five months at Carmi are classified as cool; and only two months--July and August--at Carmi are classified as warm.[4] Neither of the two plateau stations have therefore a hot season.

The January and July mean maximum temperatures at Carmi are 23°F and 73°F, respectively; the mean minimum temperatures are 9°F and 47°F. The absolute maximums, that is, the lowest and the highest temperatures ever recorded are -31°F and 94°F.[5]

At Carmi the average last day of frost in the spring falls on May 31; the average first day of frost in the fall, on September 24. The frost-free season is, therefore, only 116 days. If the months of the

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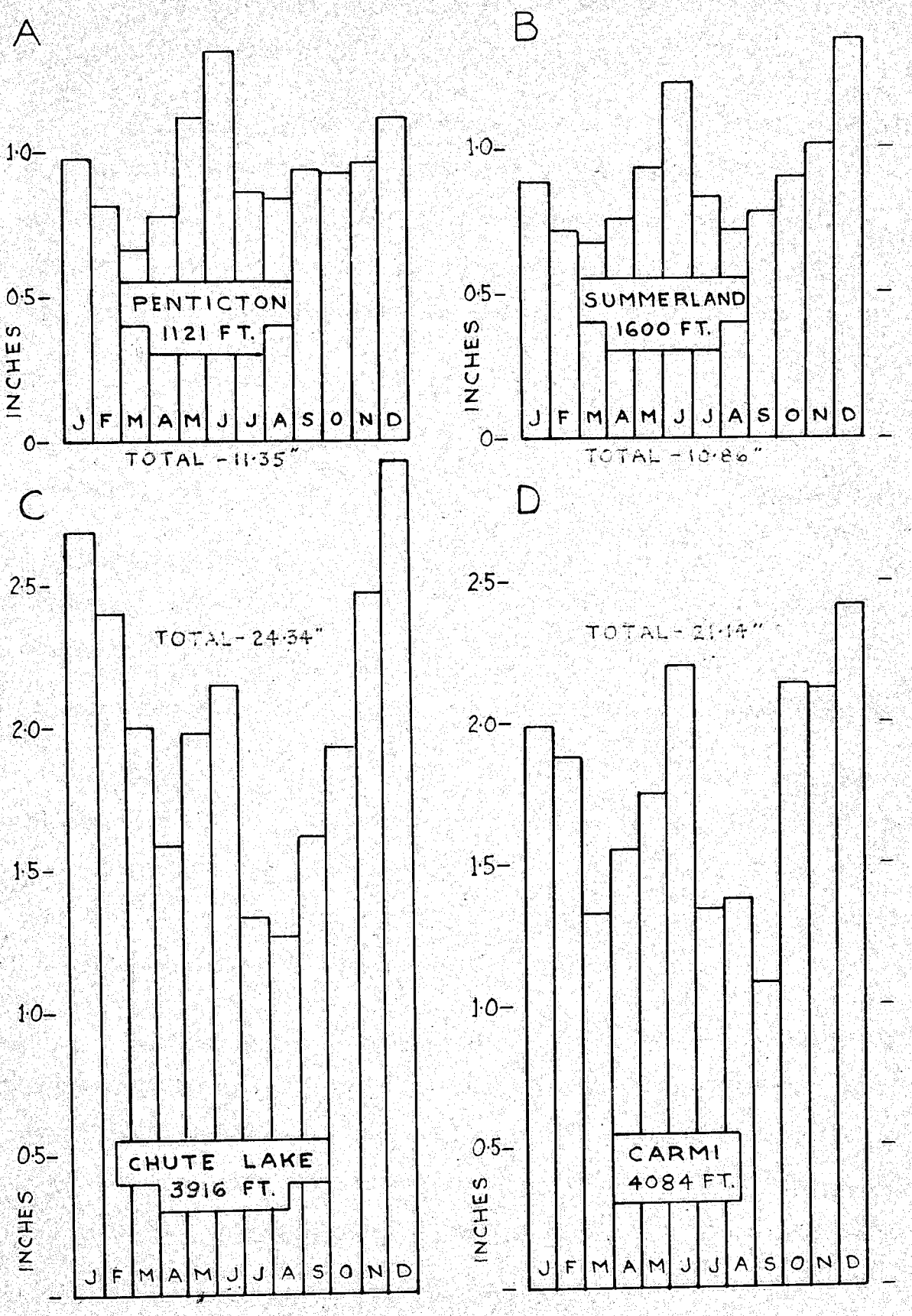
[4]For classification data see Fig. 16.

[5]Temperature data for Carmi are available for only ten years; for Chute Lake seven.

FIG. 17

AVERAGE PRECIPITATION FOR VALLEY AND PLATEAU STATIONS



growing season have mean temperatures of more than 43°F, then the growing season is four months long.

Precipitation. As may be seen from Fig. 17 both plateau stations have an annual precipitation of more than 20" per year. It is well distributed throughout the year, but the winter months have a decided maximum. A tendency towards a secondary maximum is noticeable in May and June. The average monthly and annual snowfall is shown in Table III.

TABLE III

AVERAGE MONTHLY AND ANNUAL SNOWFALL (INCHES)

	J	F	M	A	M	J	J	A	S	O	N	D	YEAR
Chute Lake	21.4	23.2	12.7	11.2	0.8	--	--	--	--	0.3	18.0	25.5	113.1
Carmi	17.3	18.3	9.8	7.9	1.8	--	--	--	0.2	5.1	18.4	22.0	100.8

Relative Humidity (R/H). In the winter months at Carmi the R/H is consistently high all day, averaging well over 90 per cent in January. In the summer months it is not only considerably lower, but it fluctuates from over 80 per cent in the early morning hours to just over 40 per cent in the hottest part of a July afternoon.

Cloud Cover. Throughout the year at Carmi the early mornings have the least cloud cover. The winter months average about 60 per cent cloud cover in the morning which increases to 80 per cent or more during the day. The summer months have about 25 per cent cover in the morning, which gradually increases to 40 per cent, more or less, during the hottest part of the day.

Winds. It is extremely difficult to tell at Carmi from which directions the regional winds actually come. High ridges are located one quarter mile to the east and south-east of the station and there are higher ranges and peaks in all directions from four to ten miles distant. The local topography, therefore, plays an important part in re-directing the regional winds. It will be sufficient therefore for the purposes of this study to say that in winter the winds are mostly from the south; in the spring they develop a westerly component which by mid-summer has swung almost completely to the north.[6]

In summarizing the data for the climatic elements, Chapman divided the climate of the southern plateau into two closely related types: the Dfb or Humid Continental-Cool summer, and the Dfc or Humid Continental-Cool short summer.[7]

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[6]Data for the elements is taken from Climatic Summaries and Daily Records, Meteorological Division, Department of Transport, (Toronto, 1948).

[7]Chapman, op. cit., Map accompanying "Climates of British Columbia." The meanings of the symbols are as follows:

D - Cold snowy forest climates. Average temperature of coldest month less than 26.6°F; average temperature of warmest month more than 50°F.

f - No distinct dry season--driest month of summer more than 1.2 inches.

b - Cool summer--average temperature of warmest month less than 71.6°F.

c - Cool short summer--less than four months with more than 50°F.

(After W. Koppen)

The Controls of the Okanagan Climate

The controls of the Okanagan climate are those features in the local setting which, acting on the large, overall climate, produce a distinct climate of their own. They are, in other words, those features of the landscape responsible for differentiating the Okanagan region from the plateau, not only physically, but climatically as well.

The Okanagan controls are of three kinds: the landforms, the valley lakes, and the various kinds of land surfaces.

Landforms have several characteristics which influence their effectiveness as controls. These characteristics are (a) size, (b) slope of the surface (or shape), and (c) trend with respect to the sun.

The lakes are effective controls depending on their (a) location (b) size (c) depth, and (d) temperature.

The kind of surface affects the heat-absorbing and heat-retaining ability of the land. Differential heating, as will be seen later, has marked effects on the temperature of the air above the land surface in question and is therefore a cause of wind and an indirect control of relative humidity.

The landforms of the Penticton region have been discussed in the chapter on geomorphology, and their distribution is shown in Fig. 5. It remains to be shown how they affect climate by modifying the elements. This will be done in the following paragraphs.

The Valley as a Control of Valley Climate

Effect of valley on temperature. The valley is the largest of the landforms. Its six- to eight-mile width, its 3,000- to 5,000-foot depth,

and its northward trend are major factors influencing the climatic elements. For example, difference in altitude alone is the cause of a 10-degree difference in temperature between Carmi and Penticton.[8] Too, because cold air is dense and flows downslope, extremely low temperatures might be expected on the valley bottom at night except that a certain ameliorating condition exists: the addition of heat to the air by compression. The farther the cold air moves down, the more it will be compressed and the more heat will be added to it so that air, which may be below freezing before it begins to move down from the plateau, may be warmed to above freezing by the time it reaches the valley bottom.

Because the valley trends north-south, the western valley wall will get more direct sunlight in the morning and the eastern wall in the afternoon. The western wall will therefore reach its maximum temperature sooner than the eastern wall and the latter will remain warm longest after the sun has set. This difference in the time of maximum temperatures on the valley walls may be a cause of cross-valley winds, it may make the eastern wall less susceptible to frost, and it may be an important factor in deciding the best time of day for irrigation.[9]

Effect of the valley on precipitation. Precipitation, like temperature, is greatly affected by the valley. Chute Lake receives more than twice as much precipitation as Penticton.[10] The reason for this is two-fold: first, the cooler air of the plateau is more disposed to

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[8]Compare Tables II and IV.

[9]Because temperature is a control of R/H.

[10]Compare graphs in Fig. 17.

precipitation than the warmer air in the valley; second, much rain that falls in the valley evaporates during the long drop to the valley floor.[11] The lowest parts of the valley therefore get the least rain, and the amount increases gradually with altitude along the valley slopes.

The valley stations have a much more pronounced maximum of precipitation during May and June than have the plateau stations. This is most likely due to the greater degree of convectional activity in the valley during the summer.[12]

Effect of the valley on Relative Humidity (R/H). Because of the lower temperatures and greater amount of precipitation on the plateau, the R/H is higher there than it is in the valley. It probably decreases[13] gradually from the plateau to a point near the valley bottom from where the R/H would begin to rise again because of evaporation from the lake surfaces.

Effect of the valley on cloud cover. Cloud cover data are not sufficiently detailed to make significant comparisons between the valley

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[11]It is a common experience to see dark rain falling from a cloud hovering over the valley; the darkness lightens and fades with the rain's descent only to vanish as the last drops are absorbed back into the atmosphere before having fallen half way to the ground.

[12]The maritime influence in winter follows naturally from the dominance over southern British Columbia weather of the Aleutian Low. The precipitation falling during this season is therefore mostly of frontal origin. In summer, the Hawaiian High holds sway over the southern half of the province with only occasional interruptions from the Great Basin Low. Most of the precipitation falling during May and June is therefore most likely convectional in origin. The driest months are March-April and August-September, the in-between periods when neither maritime nor continental influences predominate.

[13]No data are available for the valley walls.

and the plateau. However, it is probable that in the summer, more cumulus[14] clouds are formed over the valley than over the plateau because of the greater convectional activity over the valley during the warm season.

The valley and its cloud-cover do combine to create a significant contribution to the Okanagan climate in winter, however. The clouds provide a blanket--in the true sense of the word--to conserve heat by preventing escape of long-wave radiation from the earth. This phenomenon of heat conservation is known as the "greenhouse effect." But the valley walls also prevent loss of heat by convection in a horizontal direction and therefore help to create what might be termed a closed greenhouse effect. The importance of this closed greenhouse effect to the fruit industry of the valley can hardly be overestimated, especially when temperatures drop and danger to the delicate fruit buds becomes critical.

Effect of the valley on winds. Again the data for wind directions on the plateau are not detailed enough[15] to draw significant conclusions on the valley's effect on the regional winds. Whatever the true directions of the regional winds may be, however, the valley would tend to channel them between its walls and give them a greater north or south component (i.e., in the direction of the valley axis).

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[14] And, perhaps cumulo-nimbus cloud as well which would help to explain the valley's summertime maximum of precipitation.

[15] As has been explained above, the data from Carmi which are the only ones available for the plateau do not give the true directions of the regional winds because of interference from local landforms.

Winds caused by the differential heating of the valley slopes are, of course, a valley phenomenon. As the sun begins to warm the slopes of the main and tributary valleys, the neighbouring air will be warmed and begin to move upward along the slopes. The movement of this air constitutes the up-valley or south-wind. Later in the day the air in the upper slopes will cool first and, becoming denser, will flow down to lower levels, thus instigating the down-valley or north wind. The valley winds are therefore yet another phenomenon which the valley landform creates and which serves to differentiate the valley climate from the climate of the plateau.[16]

The Smaller Landforms as Controls of Valley Climate

The smaller landforms act on the valley climate as controls in exactly the same manner as the valley acts on the regional climate. Each landform, be it terrace, alluvial fan, ridge, or depression--be it even the smallest change in height, slope, or aspect of surface--has the power to modify the climate in its immediate vicinity. The modification may be considerable or infinitesimal, depending more or less on the size and shape of the landform acting as a control. Nevertheless, so intimately associated is each landform with the "micro-climate" of its own making, that the distribution of landforms is essentially the distribution of the micro-climates as well. The same may be said of the valley and the valley climate. Hence, the indivisibility, the "oneness" of the Okanagan climate and the Okanagan landforms.

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[16]It should be mentioned that the differentiation here is again one of degree. The many small valleys of the rough plateau surface also develop their local winds, but on such a limited scale that comparison with those of the main Okanagan Valley would show significant differences in magnitude.

What are some of the more important ways in which the smaller landforms affect climate?

Of great benefit to the orchardist are the gently sloping terraces because they have good air drainage. As a rule the cold air from the plateau discharges through the tributary valleys and tends to flow down the gullies cut through the terraces until it reaches the valley floor. The terrace surfaces are then like islands between streams of cold air. If, on occasion, the cold air spills on to the terraces, it will usually drain down their slopes before it gets deep enough to harm the fruit buds. Thus the terraces are important frost controls. The alluvial fans act much like the terraces in controlling frost but are not so effective because the cold air discharges through the gullies on to the fans. Once the air reaches the foot of the fan, it has descended as far as it can go. It will therefore deepen as its volume increases and cover the fans long before the higher terraces are affected.

Depressions such as exist on the rough terrace sections often form catchment basins for cold air and are known as "frost pockets". A farmer would be foolhardy to plant peaches in such depressions; he would, if he were wise, reserve such an area for hardier crops.

There are numerous other landforms--hills, swales, low lying levels, beaches, etc.--whose micro-climates are better suited to one use than to another. One landform may have a little more shade than another, or be somewhat better protected from the wind, or have its maximum temperatures in the morning, or, because of its position, receive slightly more rain. All factors which contribute to the climatic differentiation are important as they may be critical to the landform's potential use. A

beautiful sandy beach, for example, loses much of its recreational value if it falls into shade early in the afternoon; an airstrip set at right angles to a tributary valley embodies some risk to airplanes if a strong wind blows down the valley every late afternoon; and a shady portion of a hillside may be better suited to growing a certain variety of apples, whereas the sunny side may be better suited to growing another. The climatic variations are almost infinite, but the few examples cited should give some idea of the importance of the landform and its associated microclimate, an importance that can hardly be overestimated when studying the detailed workings of the larger region.

The Valley Lakes as Controls of Valley Climate

The valley lakes are important climatic controls because of their effect on temperature, humidity, and winds.

Because water gains and loses heat more slowly than the land, it will be warmer than the land at night and cooler during the day. Therefore, at night the air above the water will be warmer than the air above the land. The warmer, lighter air will rise and the colder air moving in to take its place will cause an off-shore breeze. These on- and off-shore breezes are never very strong in the valley and occur only when the more dynamic regional and up- and down-valley winds do not interfere.

The valley lakes are also moderators of air temperature, keeping the daytime temperatures cooler and the night-time temperatures warmer. Thus they are an important frost control especially for the lower parts of the valley between Okanagan and Skaha, and between Skaha and Vaseaux Lakes for the alluvial fans, and to a lesser degree for the terraces. In

addition the lakes are moderators of seasonal temperatures as well. The lakes add water vapor to the atmosphere thus increasing the relative humidity. The increased humidity makes the atmosphere more "receptive" to long-wave radiation; furthermore, the higher the humidity, the more heat-retentive the atmosphere will be, especially if clouds are formed by condensation.

The Natures of the Surfaces as Controls of Valley Climate

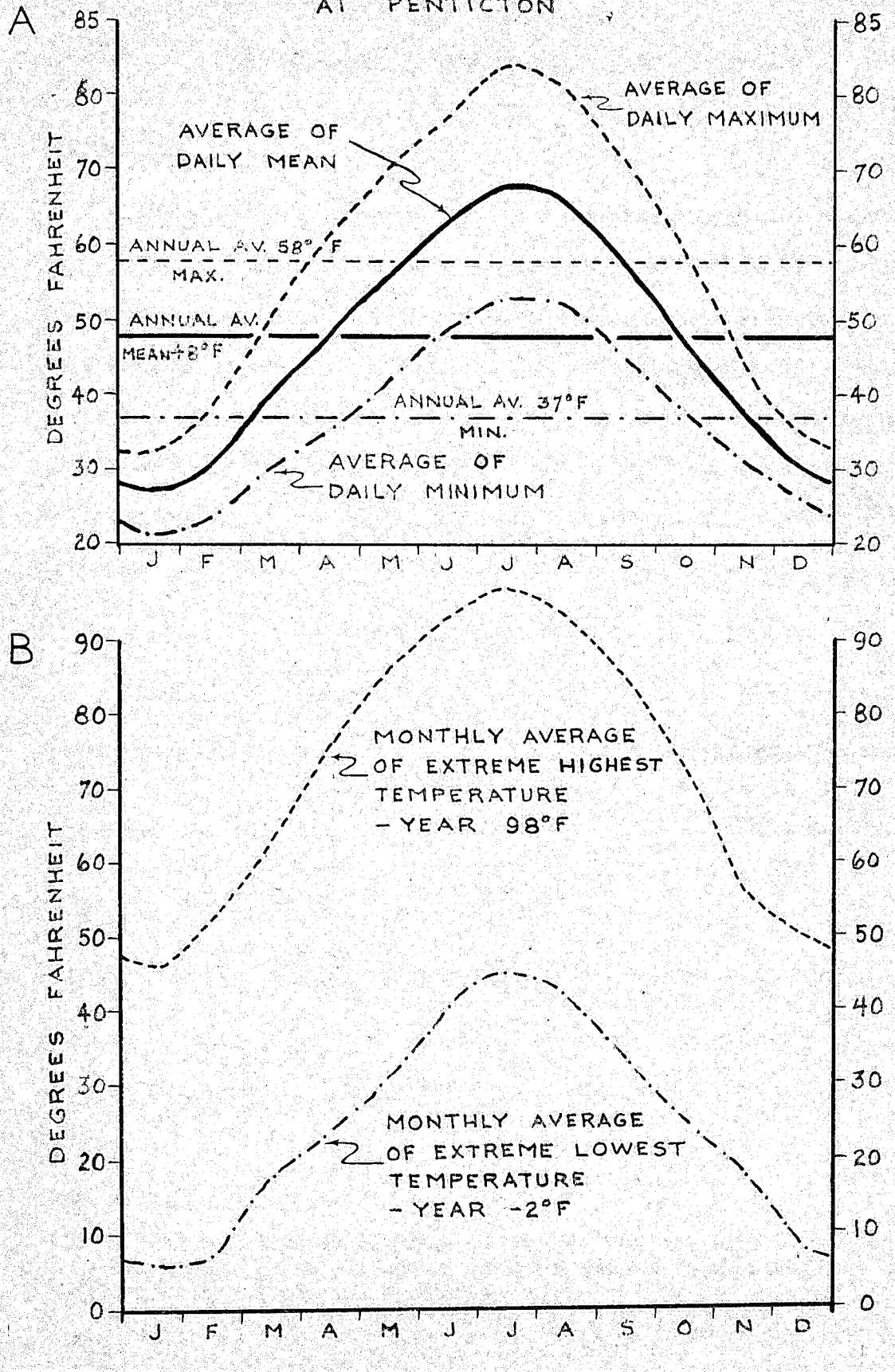
The effect of different surfaces on climate was touched upon under the preceding control--the valley lakes. There it was shown how unequal heating of land and water surfaces influenced air temperature and humidity, and was a direct cause of winds. The truth is that these phenomena are not restricted to land and water surfaces only. They occur whenever two different land surfaces which for varying reasons are able to absorb and retain different quantities of heat are found close together. Thus, a dry surface has different heat-absorption and heat-retaining properties than a moist surface; and like differences exist between dark and light and between grassy and bare surfaces, etc. The point to be re-iterated here is that unequal heating of land surfaces causes differences in temperature of the air in contact with those surfaces; the differences in temperature result in differences in R/H and also institute convection. In short each type of surface, like all the other controls, has the power to create a micro-climate.

These, then, are the controls of the Okanagan climate: landforms, valley lakes, and nature of land surfaces within the region. The effects

of the valley landform in the creation of the valley climate have been examined. The further modification of the valley climate--the creation of micro-climates--by the smaller landforms, valley lakes, and land surfaces has also been looked into. It remains now to show what the climate created by the Okanagan controls actually is, and in so doing, determine the extent to which it may be differentiated from the larger climate of the plateau.

FIG. 18

MONTHLY AND ANNUAL AVERAGES OF TEMPERATURE AT PENTICTON



THE CLIMATIC ELEMENTS OF THE PENTICTON REGION[17]

Temperature

Annual and monthly temperatures. The most significant temperature data for the valley stations will be found in Tables IV and V. For comparative purposes and to show temperature distribution throughout the year, the same data are shown in graph form for Penticton in Fig. 18. According to the data in Table IV, the average annual temperature at Penticton and Summerland is 48°F, whereas the annual range is 41°F and 45°F respectively. The smaller range at Penticton is probably due to the stronger moderating influence of the valley lakes. Three months of the year have temperature

TABLE IV

MONTHLY AND ANNUAL AVERAGES OF DAILY MEAN TEMPERATURE (°F)

Station	J	F	M	A	M	J	J	A	S	O	N	D	Yr.	No. of Years	Alt.
Penticton	27	31	39	48	56	63	68	66	58	48	38	31	48	43	1121'
Summerland	25	30	39	49	57	64	70	68	60	49	37	29	48	34	1300'

averages below freezing, but the degree of frost is small being only one to three degrees in December and February, and five to seven degrees in January.

[17] In some ways it is unfortunate that the weather station at Penticton is located on the valley floor where weather conditions often differ considerably from those on the terraces where most of the fruit is grown. Weather data from the Summerland station are doubtless more representative

The annual averages of daily maximum temperatures (see Table V) at Penticton and Summerland are 58°F and 57°F respectively; of the daily minimum 37°F and 38°F. Only at Summerland in January do the monthly maxima average less than 32°F; on the other hand, the monthly minima average less than 32°F for five months of the year. The extremes are

TABLE V

MONTHLY AND ANNUAL AVERAGES OF DAILY MAXIMUM AND DAILY MINIMUM TEMPERATURES

STATION	J	F	M	A	M	J	J	A	S	O	N	D	YRS.	ABSOLUTE	
Penticton	32	38	50	61	70	77	84	81	71	59	44	35	58	105	Max.
	31	23	30	35	42	49	53	52	45	38	31	26	37	-16	Min.
Summerland	31	36	46	59	68	75	83	80	70	58	42	33	57	104	Max.
	20	22	30	36	45	52	57	56	49	40	31	23	38	-22	Min.

uncomfortably high, averaging more than 80°F in July and August. That the average extremes do not tell the whole story is borne out by the absolute extremes which are 105°F and -16°F for Penticton, and 104°F and -22°F for Summerland. Temperatures during the summer often rise to the high eighties and rarely higher than 95°F. During the winter they frequently drop below 20°F, less frequently below 10°F and only rarely below 0°F. Winter temperatures below 20°F are considered very cold by the inhabitants of the Penticton region; below zero degrees they are considered ruinous especially if sustained over a considerable period of time when they do widespread damage to the fruit trees.

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for the terraces and will therefore be given where necessary with data from the Penticton station to "round out" the climatic picture.

The seasonal temperatures. Anyone living at Penticton and having experienced the high summer temperatures indicated in Fig. 16A and B would smile when confronted with the statement that Penticton has no hot season. A glance at the temperature climatograph (Fig. 16), however, shows that no month of the year has a mean temperature exceeding 68°F which is the upper limit of the season defined as "warm." But the warm season is long--over 5½ months--and adds greatly to the attractiveness of the climate. The cold season averaging less than 32°F lasts 3 months; and the cool seasons (spring and fall), having temperatures between 32°F and 50°F last 3½ months. All in all the year seems to be happily divided to make a stimulating variety of seasons whose duration is not too long to be tiresome, yet long enough to be of large benefit to the occupance of the region.

If the mean monthly temperatures for Summerland are a true indication for conditions on the terraces, then the terraces have a month-long hot season averaging 70°F.

The problem of frost. The delicacy of the fruit blossoms makes frost a major hazard to the fruit industry of the Penticton region. Although some damage may occur during light frosts, the real danger comes with frosts of 29°F and less which are called "killing frosts." The data for the killing frosts are much more meaningful to the farmers of the Penticton region and will therefore be stressed in this study.

There are two conditions which bring frost to the valley. The most serious frosts occur when the air mass overlying the valley and plateau is so cold that the valley controls cannot adequately cope with it. Neither the addition of heat by compression as the cold upper air descends into the valley, nor the moderating influence of the valley lakes is

sufficient to bring the air temperature above freezing. If the natural system of air drainage cannot alleviate the situation, the frigid air will overwhelm the valley bottom and terraces alike, and it is then that the most widespread frost damage occurs.

The second condition for frost entails air which is to begin with, near freezing, and is subsequently cooled to below freezing by contact with the ground which loses heat through radiation. The phenomenon is explained by A.J. Connor in the following manner:

> By nightfall the incoming energy from the sun having been cut off but the terrestrial radiation continuing at a rate proportional to the temperature of the soil, there will be a net loss of heat by the soil surface. A slight amount of heat will be recovered by conduction from the soil immediately below the surface, but after a time during the darkness the soil surface will have fallen to a temperature where it is now cooling the air in contact with it. With the lower layers of air cooling first, conditions will be reversed in that the coolest air is now at the bottom with the warmest air above. . . . If there is too little invisible water vapor and no cloud to absorb outgoing terrestrial radiation and to radiate back to the earth, the loss of heat will nullify the gain by day and if the average temperature of the air at moderate heights above the ground was sufficiently low when the air mass arrived in the region, frost may occur at or near the ground but not a few feet above the ground.[18]

It would seem then that radiation frosts are potentially not as harmful to tree fruits as are frosts caused by cold air descending from the plateau. They are, however, harmful to ground crops or to fruit that may be temporarily stored near the ground.[19]

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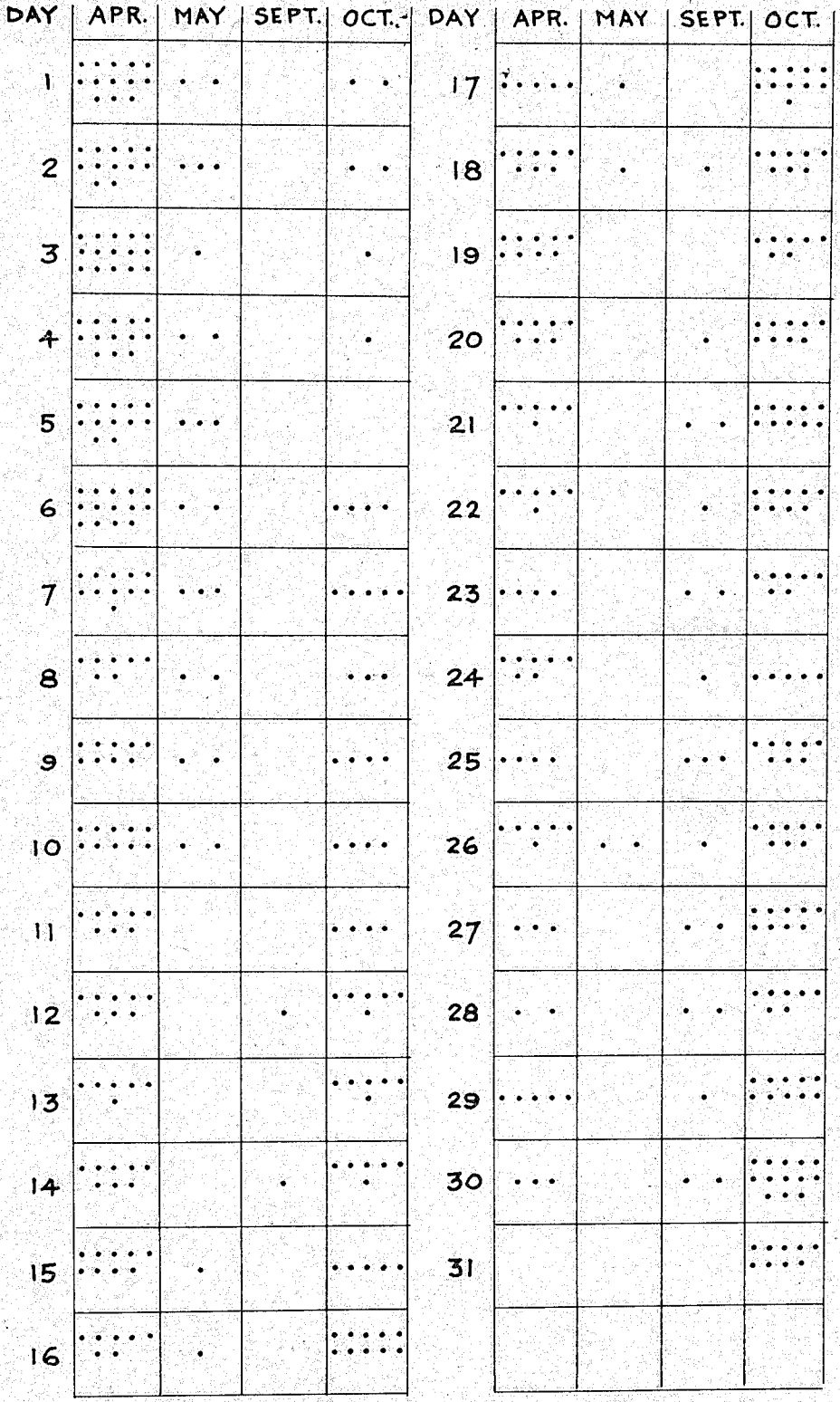
[18] A.J. Connor, The frost-free season in British Columbia, Meteorological Division, Dept. of Transport, (Toronto, 1949), p. 6

[19] A frost will sometimes damage the buds on the lower branches of a tree and leave intact those on the upper branches. This seemingly selective freezing is probably most often caused by radiation frosts. However, an inflow of frosty air into a depression must be considered a possible cause of selective freezing in more localized areas.

FIG. 19

FREQUENCY OF FROST (32°F AND LESS) OCCURRING OVER A PERIOD OF 24 YEARS DURING CRITICAL PERIODS FOR CROPS

– PENTICTON –

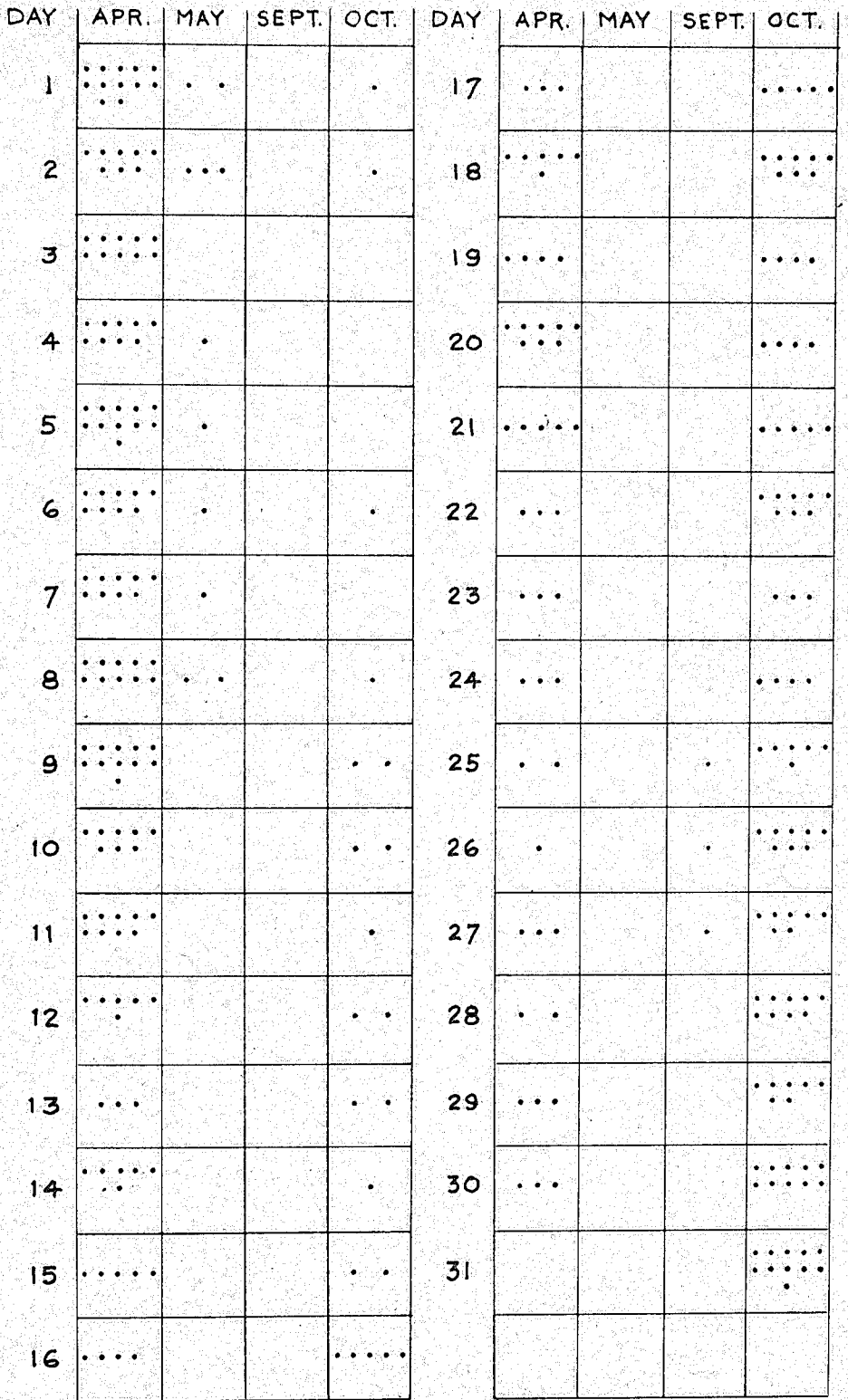


ONE DOT REPRESENTS ONE FROST OCCURRENCE OUT OF A POSSIBLE 24 OCCURRENCES

FIG. 20

FREQUENCY OF FROST (32°F AND LESS) OCCURRING OVER A PERIOD OF 28 YEARS DURING CRITICAL PERIODS FOR CROPS

– SUMMERLAND –

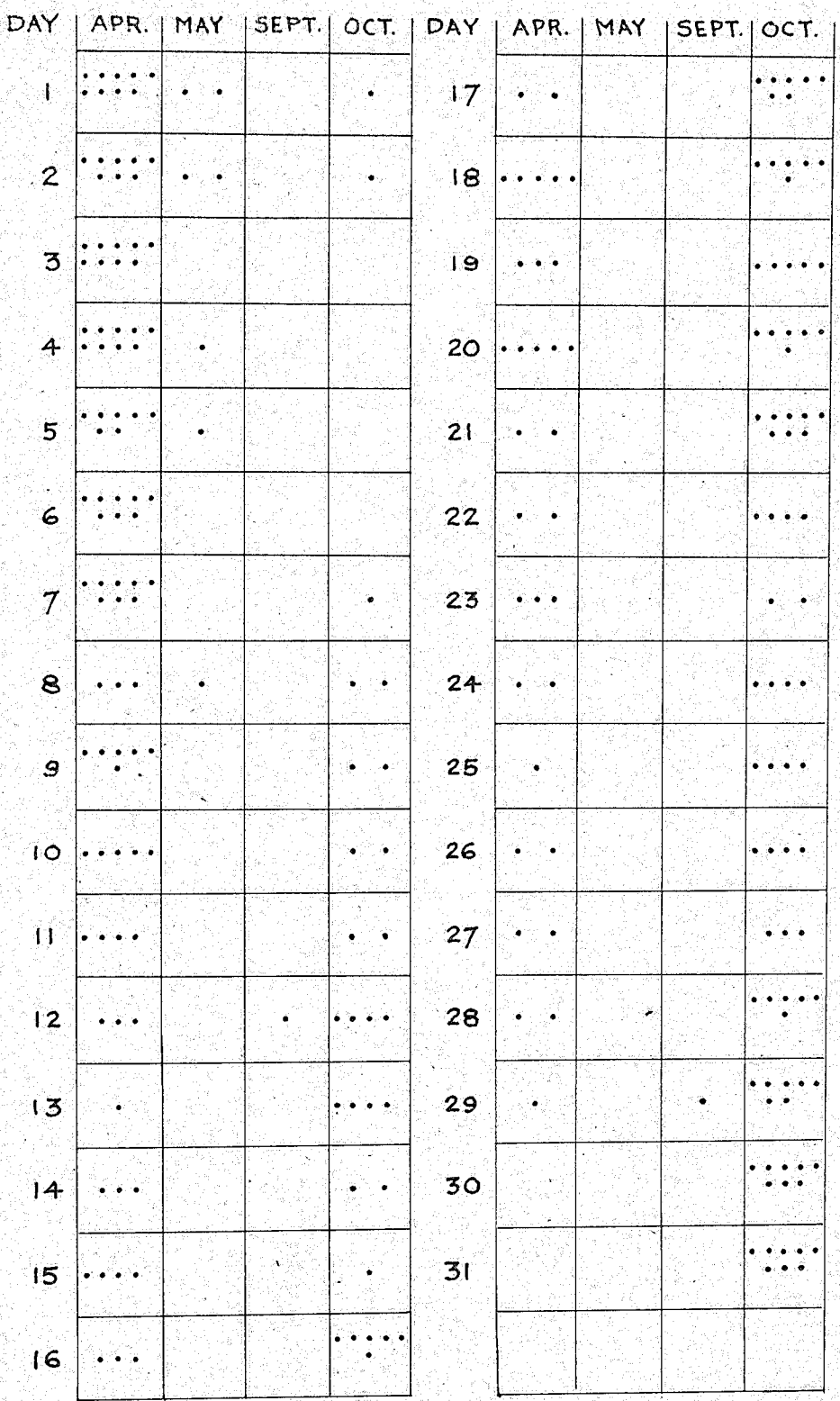


ONE DOT REPRESENTS ONE FROST OCCURRENCE OUT OF A POSSIBLE 28 OCCURRENCES

FIG. 21

FREQUENCY OF KILLING FROST (29°F AND LESS) OCCURRING OVER A PERIOD OF 24 YEARS DURING CRITICAL PERIODS FOR CROPS

- PENTICTON -



ONE DOT REPRESENTS ONE FROST OCCURRENCE OUT OF A POSSIBLE 24 OCCURRENCES

FIG. 22

FREQUENCY OF KILLING FROST (29°F AND LESS) OCCURRING OVER A PERIOD OF 28 YEARS DURING CRITICAL PERIODS FOR CROPS

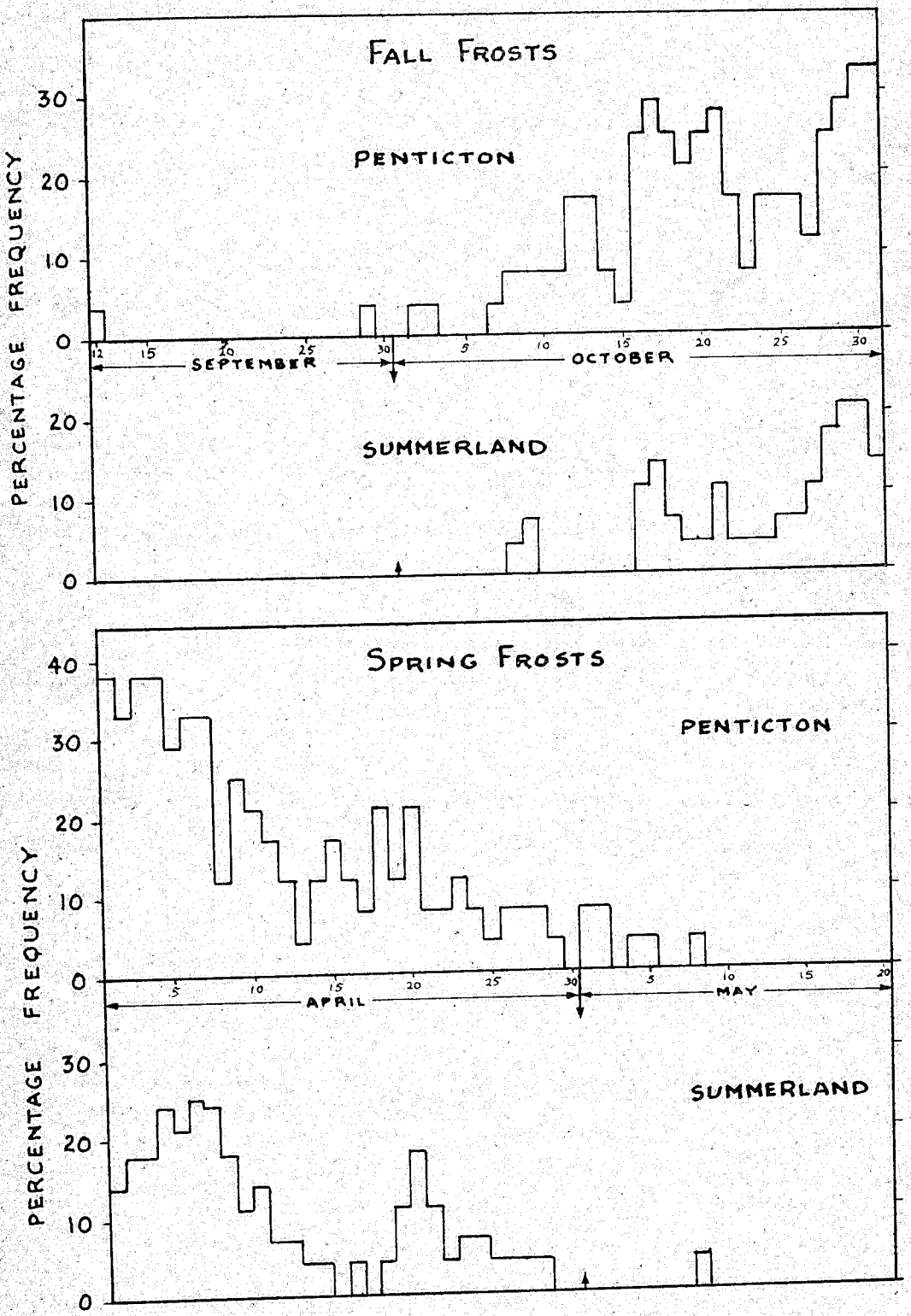
– SUMMERLAND –

DAY	APR.	MAY	SEPT.	OCT.	DAY	APR.	MAY	SEPT.	OCT.
1	••••				17				••••
2	•••••				18	•			••
3	•••••				19	•••			•
4	••••• •••				20	•••••			•
5	••••• •				21	•••			•••
6	••••• ••				22	•			•
7	••••• •••				23	••			•
8	•••••	•		•	24	••			•
9	•••			••	25	•		•	••
10	••••				26	•			••
11	••				27	•			•••
12	••				28	•			•••••
13	•				29				••••• •
14	•				30				••••• •
15					31				••••
16	•			•••					

ONE DOT REPRESENTS ONE FROST OCCURRENCE OUT OF A POSSIBLE 28 OCCURRENCES

FIG. 23

COMPARISON OF PERCENTAGE FREQUENCY OF KILLING FROST (29°F AND LESS)- OCCURRING OVER 24 YEARS AT SUMMERLAND AND 28 YEARS AT PENTICTON - DURING CRITICAL PERIODS FOR CROPS



The frequency of frost occurrence. The frequency of occurrence of both light and killing frosts is shown in Figs. 19, 20, 21, and 22; and a comparison of percentage frequency of killing frost at Penticton and Summerland is made graphically in Fig. 23. The comparison points out the considerably smaller frequency of frost occurrence at Summerland than at Penticton which does not have the advantage of natural air drainage.

The probability of a day with frost. The ratio of the number "r" days with frost to the total number "n" of days in the period in question

TABLE VI

THE PER CENT PROBABILITY OF A DAY WITH FROST FOR THE MONTHS SPECIFIED AT PENTICTON AND SUMMERLAND[20]

	ALL FROST				KILLING FROST (LESS THAN 29°F)			
	APR.	MAY	SEPT.	OCT.	APR.	MAY	SEPT.	OCT.
Penticton	100	48.5	46.6	96.9	96.8	16.1	6.7	87.0
Summerland	100	22.6	10.0	87.0	86.7	3.2	3.3	58.1

expressed as a percentage, is called probability "P" of a day with frost.[21] Thus, $P = \frac{r}{n} = 100 \times \frac{r}{n}$ %.

[20] Over a period of 24 years at Penticton and 28 years at Summerland.

[21] After V. Conrad and L.W. Pollack, Methods in Climatology, (Harvard University Press, 1950), p. 201.

LENGTH OF GROWING SEASON* AND FROST-FREE PERIOD FOR TEMPERATURES <32°F AND <29°F

	SUMMERLAND		PENTICTON	
	<32°F	<29°F	<32°F	<29°F
\ EARLIEST FINAL SPRING FROST	APR. 6	MAR. 12	APR. 8	MAR. 12
\ LATEST SPRING FROST	MAY 8	MAY 8	MAY 26	MAY 8
\ EARLIEST FALL FROST	SEPT. 25	SEPT. 25	SEPT. 12	SEPT. 12
\ LATEST FALL FROST	NOV. 5	NOV. 28	OCT. 22	NOV. 13
/ LONGEST FROST-FREE PERIOD	213 DA.	261 DA.	197 DA.	246 DA.
/ SHORTEST FROST-FREE PERIOD	140 DA.	140 DA.	109 DA.	127 DA.
/ AVERAGE FROST-FREE PERIOD	174 DA.	201 DA.	153 DA.	187 DA.
\ FIRST DAY OF GROWING SEASON	APRIL 1		MARCH 27	
\ LAST DAY OF GROWING SEASON	OCT. 31		OCT. 31	
\ LENGTH OF GROWING SEASON	214 DAYS		218 DAYS	

*GROWING SEASON DAILY MEAN TEMP. > 43° F.

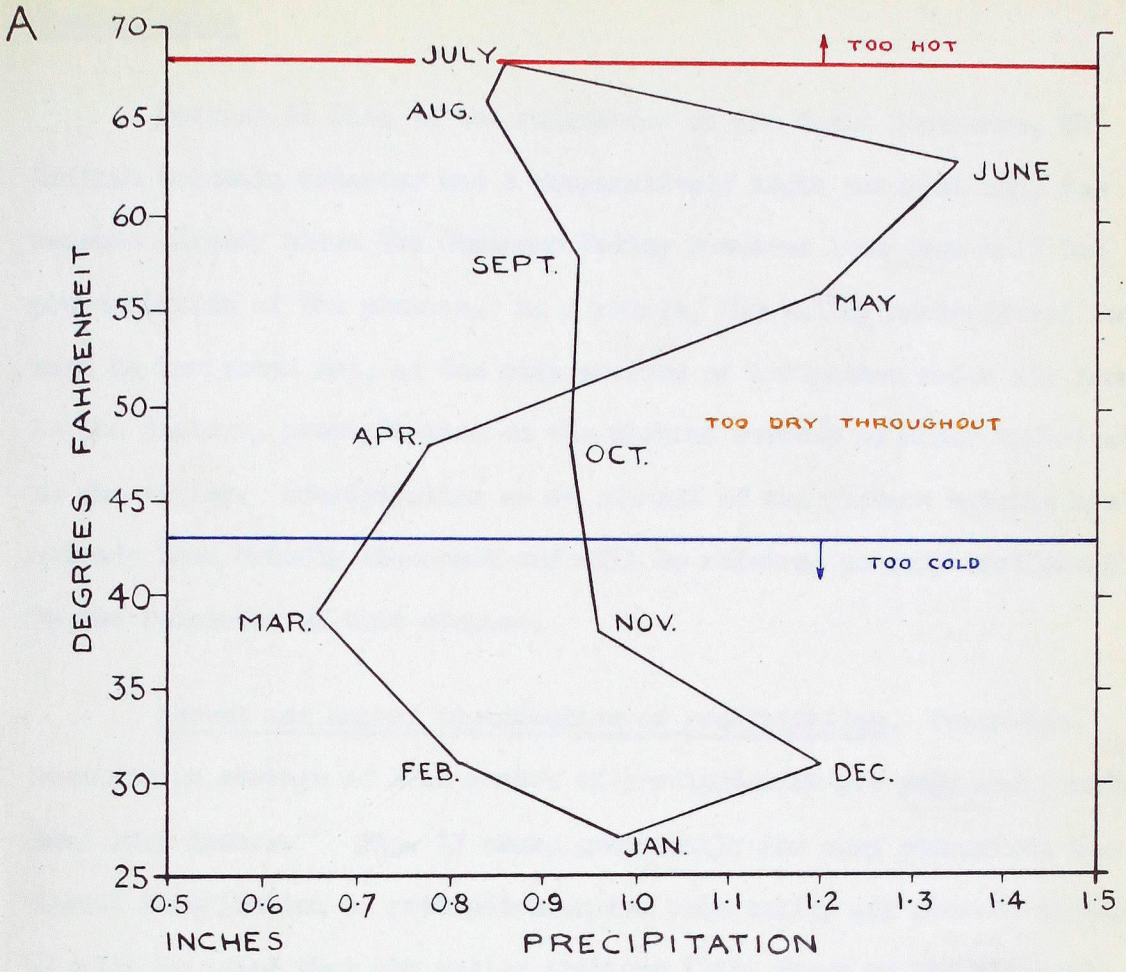
According to Table VI the probability of a day with frost in April is 100 per cent. That is, during the period of the temperature recordings frost has occurred at one time or another on every day in April at both Penticton and Summerland. In May, 15 out of 31 days in Penticton and 7 out of 31 days in Summerland have had frost during the periods of recording. It will be noted that the probability of a day with killing frost in May and September is considerably less than that of light frost.

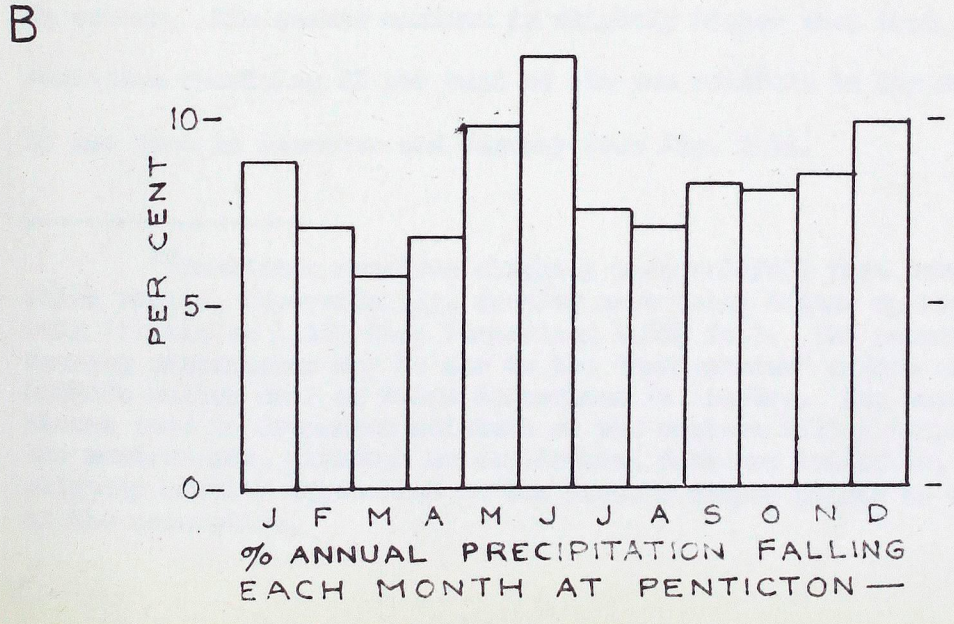
The frost-free season. The data for the frost-free period are given in Table VII. The lengths of the average frost-free season at Penticton and Summerland are 153 and 173 days, respectively; and the average killing frost-free season is 187 days and 201 days. The frost-free season is therefore three weeks longer at Summerland than at Penticton whereas the killing-frost-free season is only two weeks longer. This large variation again points out the importance of natural air drainage to the terraces.

The growing season. If the growing season is defined as the continuous series of days, beginning in the spring and ending in the fall, with mean temperatures of 43°F or higher, then the average length of the growing season at Penticton is 218 days and at Summerland 214 days. If the growing season starts very early, frosts may become critical during the first part of April. Conversely, if the growing season starts very late, even fairly sharp frosts during the latter half of April may do little damage to the undeveloped fruit buds.

FIG. 24

CLIMAGRAPH FOR PENTICTON





Precipitation

Because it lies in the rainshadow of the Coast Mountains, the British Columbia interior has a comparatively light rainfall and, for reasons already cited the Okanagan Valley receives less than half the precipitation of the plateau. As a result, the valley agricultural lands must be irrigated and, as the main sources of irrigation water are located on the plateau, precipitation on the plateau becomes of major importance to the valley. Precipitation as an element of the plateau climate has already been briefly discussed and will be referred to only incidentally in the remainder of this chapter.

Amount and annual distribution of precipitation. Penticton receives an average of 11.4 inches of precipitation per year and Summerland 10.9 inches.[22] Fig. 17 shows graphically for easy comparison the annual distribution of precipitation for both valley and plateau stations. It will be noted that the valley stations (like those on the plateau) have two decided maxima of precipitation, one in winter and the other in summer. The summer maximum is slightly higher than that of winter--Penticton receiving 22 per cent of its own rainfall in May and June and 18 per cent in December and January (see Fig. 2hB).

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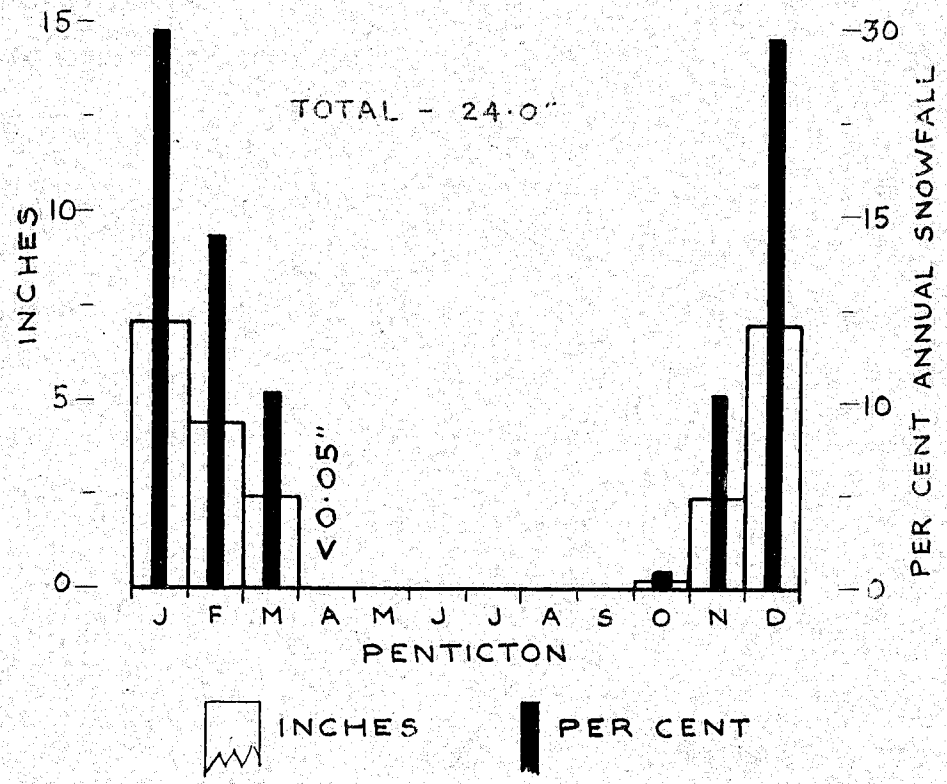
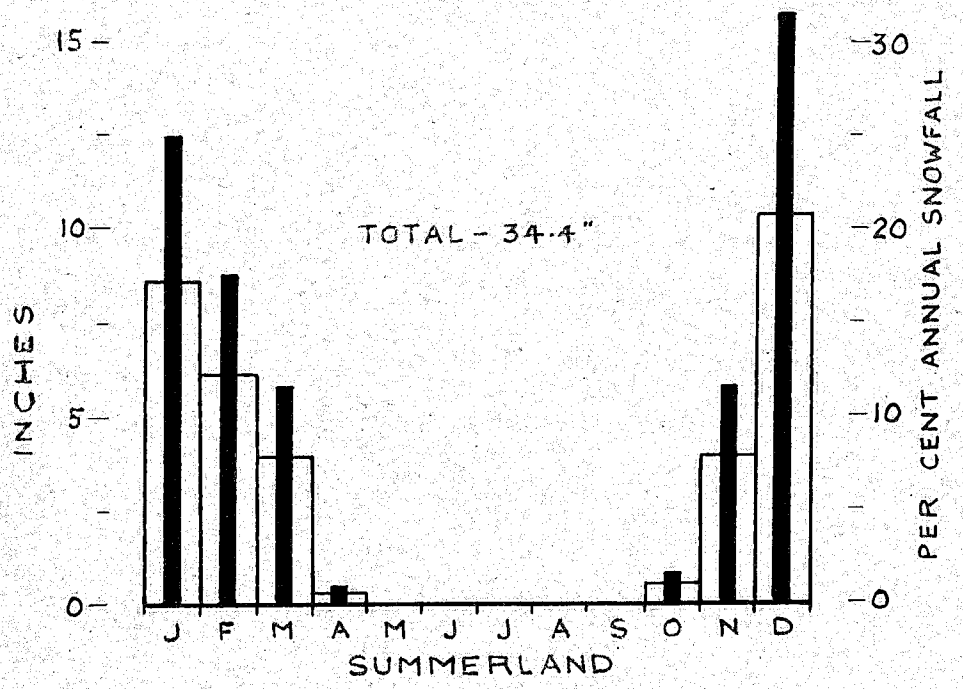
[22]Penticton receives slightly more rainfall than Summerland which should, theoretically, receive more being higher up the valley wall (Penticton 1,121 ft.; Summerland 1,600 ft.). The reason for the seeming discrepancy may be due to the "rain-shadow" effect of the western valley wall on which Summerland is located. The east-moving storms tend to drop more moisture on the eastern valley slopes than on the western and, although no statistical data are available, the slightly heavier vegetation on the eastern slopes points to the truth of the assumption.

FIG. 25
AVERAGE MONTHLY SNOWFALL

A



B



Snowfall. Snowfall in the valley is light compared to that on the plateau. Penticton receives 24 inches or about 21 per cent of its precipitation as snow; Summerland receives 34.4 inches or about 34 per cent as snow (see Fig. 25).[23,24]

Snowfall, because of its lightness, is rarely a problem to the valley. The roads are open and bare most of the winter, especially in the southern part of the valley and little need be spent on clearing the street in the towns and villages except on rare occasions when a single snowfall dumps more snow into the streets than the regular traffic can manage.

Hail and sleet, as forms of precipitation in the Okanagan are so rare that a discussion of them here is considered unnecessary.

An interesting climatograph combining temperature and precipitation is shown in Fig. 24A and is useful for comparative purposes. It gives a characteristic figure for all stations in the valley near Penticton.

Relative Humidity (R/H)

The importance of evaporation rate can hardly be over-estimated in the study of climate. It is vital to the farmer who depends on water for his crops, to forest growth and protection from fire hazard, to a host of manufacturing processes, and to humans and animals who depend upon it for a comfortable "sensible" temperature. No completely adequate system

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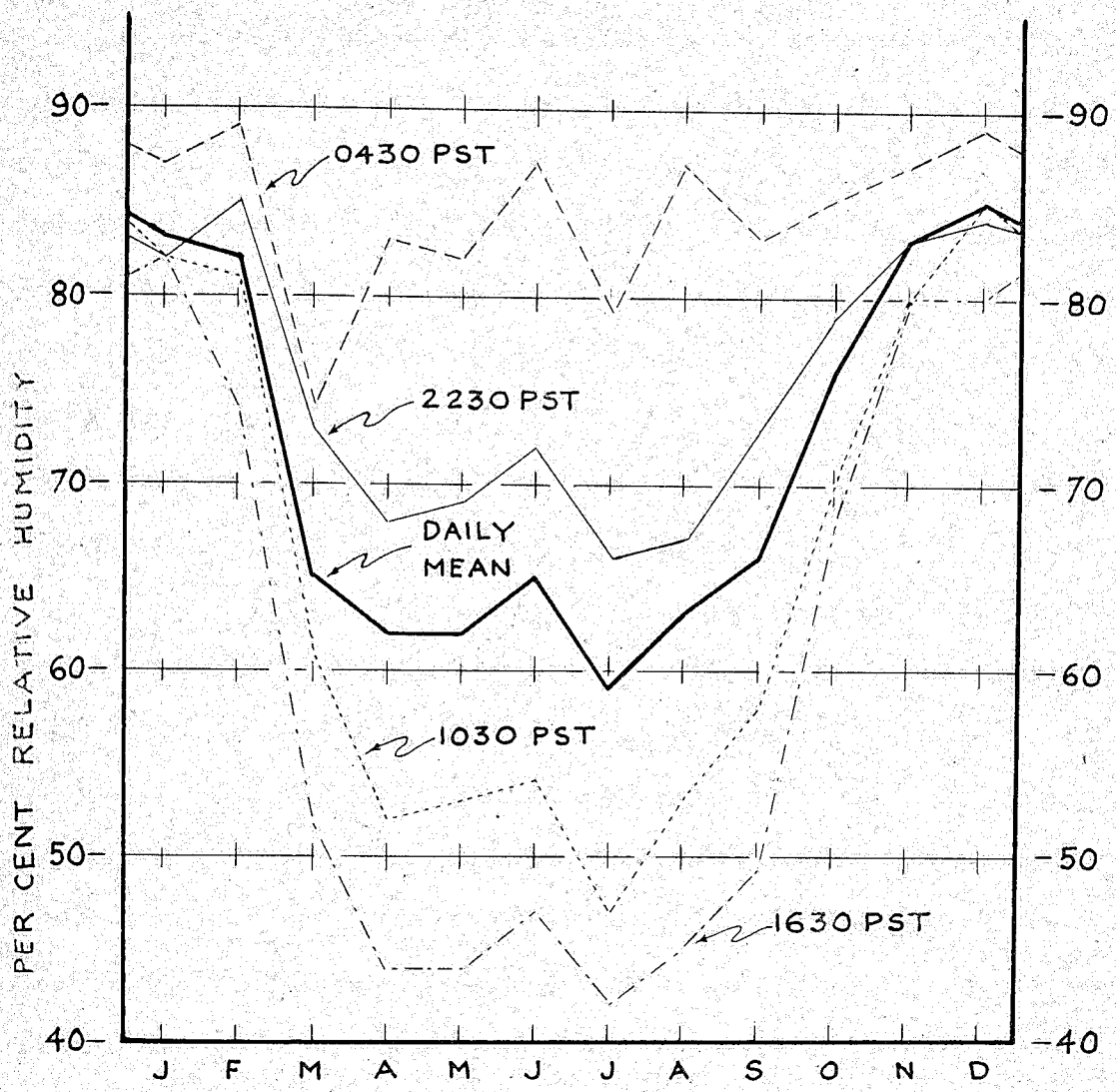
[23]Calculations made on basis of 10 inches of snow to 1 inch of rainfall.

[24]Here again are demonstrated the marked effect of altitude and the moderating effects of the valley lakes.

FIG. 26

AVERAGE RELATIVE HUMIDITY OVER A FIVE-YEAR PERIOD AT PENTICTON



VALUES DETERMINED FROM AVERAGE DEW-POINT AND AVERAGE AIR TEMPERATURE TAKEN AT FOUR SPECIFIED TIMES EACH DAY. PRESSURE-29".

for measuring evaporation rate has yet been devised and at best R/H can give only an approximation on the ability of the atmosphere to take up moisture. Such factors as wind speed and direction, amount of exposure, and kind of evaporating surface must also be taken into account. If, for example, a farmer decides to conserve water by irrigating at night when the R/H is high, his saving will be slight if he fails to take note of a strong wind. However, inadequate as R/H may be by itself, it is still a significant element when used in conjunction with the other factors mentioned above, and it is with this reservation that R/H is discussed as a climatic element in the following paragraphs.

Fig. 26 shows the average R/H taken at four specified times each day and the daily mean R/H. It will be noted that the early morning (0430 PST) R/H stays high, averaging well over 80 per cent, and it may be assumed that evaporation is at a minimum at this time. By late morning (1030 PST) the R/H has decreased--only slightly during the cold season, but more than 35 per cent during the warmer months. The late afternoon (1630 PST) readings are almost as high during the cold season as those taken in late morning but again they decrease rapidly to a minimum of 42 per cent as the mean temperatures rise. By late evening (2230 PST) the R/H has risen again generally to around 70 per cent in the warmer months.

Two important facts emerge from this graph: one, the R/H is extremely high throughout the day during the cold months; two, during the warmer months it fluctuates through a range of about 40 per cent during the day.[25]

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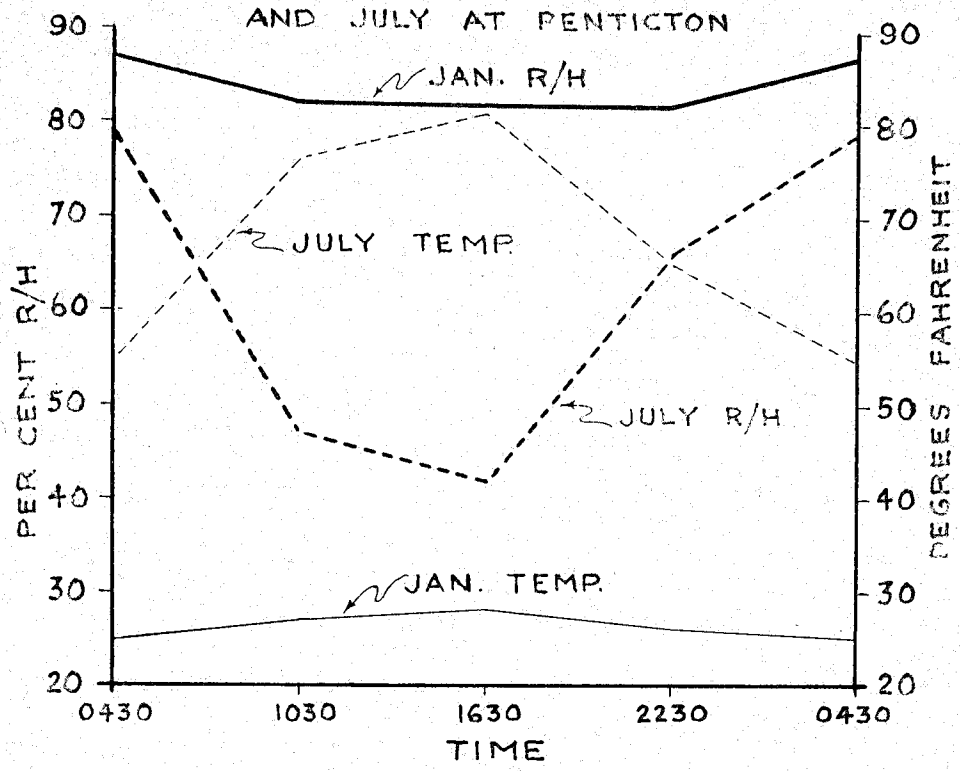
[25]It is probably the low daytime humidity in summer, combined with a strong wind, which often prevents rain from reaching the valley floor.

FIG. 27

R/H AND TEMPERATURE RELATIONSHIPS DURING A 24-HOUR PERIOD IN JANUARY AND JULY AT PENTICTON



The effect of temperature on R/H is made even more obvious in Fig. 27 which shows the change in R/H with change in temperature through one-day cycles in January and July. The very small average temperature fluctuation (only 3°F) during a January day is reflected by the small (15 per cent) inverse R/H change. The much larger 26°F fluctuation in July brings about an inverse change of 37 per cent in R/H.

But why, if temperature is a controlling factor, is the R/H higher in June than it is in May, a cooler month? The answer probably lies in the June maximum of precipitation (see Fig. 17) and the greater amount of water available to evaporation from the ground surface.

It is highly probable that R/H decreases with both vertical and horizontal distance from the valley lakes. The decrease probably continues up the valley sides to an altitude where lower temperatures and increased precipitation result in higher humidity thus nullifying the distance from the lakes.

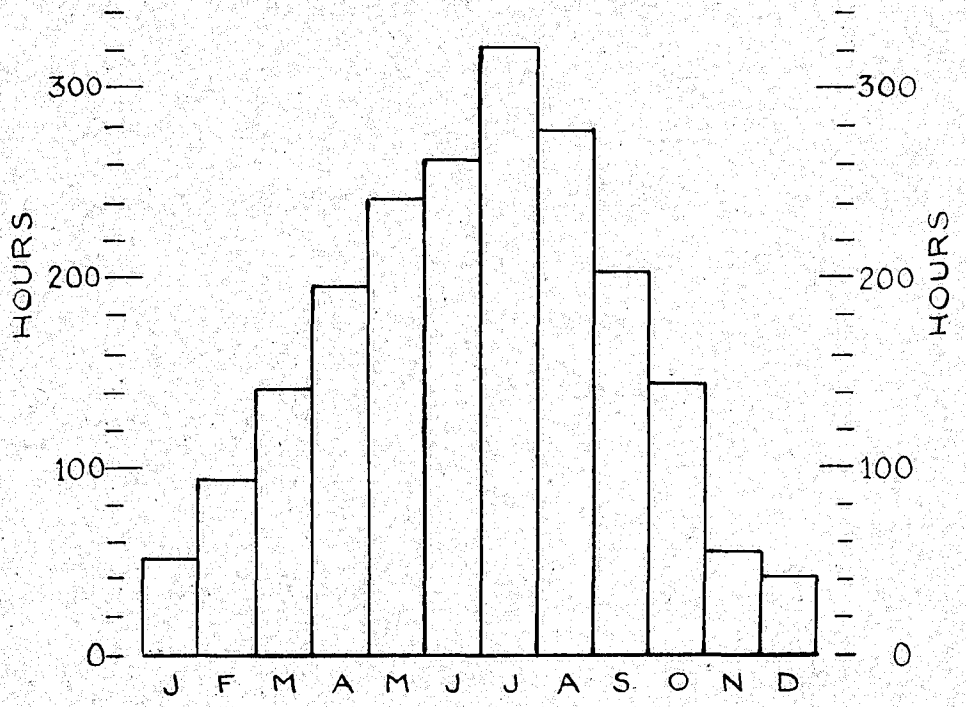
The different time of maximum and minimum temperatures on the eastern and western slopes of the valley presumes a difference in R/H consequent with the times. For efficient use of water, therefore, a farmer on the eastern slopes would be well advised to wait a few hours after the farmer on the western slopes has begun to irrigate his acres.

Although the low summertime R/H is a disadvantage to the farmer of the Penticton region who must irrigate his crops, it is a decided advantage to the people generally. In permitting rapid evaporation from the skin, a low R/H makes the sensible temperature cooler and thus brings the high day-time temperatures in summer much nearer to the range of comfort.

FIG. 28

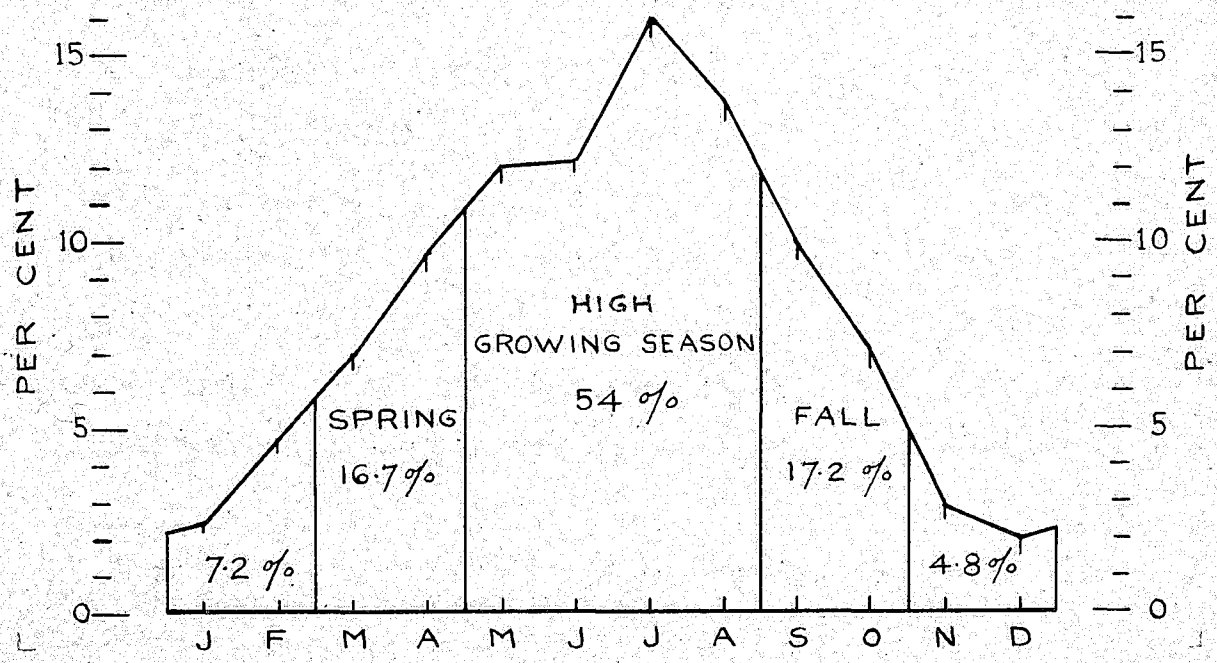
MONTHLY DURATION OF BRIGHT SUNSHINE FOR SUMMERLAND

A



B

PER CENT BRIGHT SUNSHINE FOR SUMMERLAND
(MONTHLY AND ANNUAL DURATION)



Cloudiness and Sunshine

In all of British Columbia only the southern part of Vancouver Island and Kamloops get more hours of bright sunshine than does the "Sunny" Okanagan. And yet, "sunny" is a true appellation only for the summer. In winter the days are cloudy and dull and as may be seen from Table VII, the sun is seen only a very few hours longer each month at Summerland than at Vancouver. The dense, cold air (often of P/C origin) which occupies the valley in winter is overridden by the moist, warm P/M air from the Pacific. The mixing and resulting condensation of the

TABLE VII

WINTER DURATION OF SUNSHINE IN HOURS AT SUMMERLAND AND VANCOUVER

	J	F	:	N	D	
Summerland	51	94		57	41	hours
Vancouver	48	82		48	39	hours

upper levels of the P/C air gives rise to cloud that covers the valley

Fig. 28A which shows the monthly duration of bright sunshine for Summerland, also shows the hours of bright sunshine for the entire Penticton region.[26] The yearly distribution is seen at a glance to be very unequal. July receives 6.2 times as much sunshine as January, and the months of the "high" growing season (i.e. May, June, July, and August) receive 4.5 times as much sunshine as the winter months (i.e. Nov-

[26] Data from Oliver to the south and from Vernon to the north parallel those of Summerland very closely.

ember, December, January, and February). This is, of course, all to the good, as the sunshine comes when it is most needed.[27]

Table VIII shows the monthly distribution of sunshine in 10-hour days. The wide seasonal variation is brought home much more significantly

TABLE VIII

NUMBER OF 10-HOUR DAYS OF BRIGHT SUNSHINE PER MONTH AT SUMMERLAND

J	F	M	A	M	J	J	A	S	O	N	D
5.1	9.4	14.2	19.6	24.1	24.6	32.2	27.9	20.2	14.6	5.7	4.1

Yearly Total - 201.7 10-hour days

when it is realized that January has the equivalent of only 5.1 ten-hour days of bright sunshine, whereas July has the equivalent of 32.2 ten-hour days.

In conclusion it might be pointed out that, not only do the summer months have the longest hours of sunshine, but the insolation received is of considerably greater intensity because the summer sun is nearer the zenith. Indeed, the ratio of insolation intensity between the June and December solstices is approximately 11:3. No wonder then that the summer sun stares from a blinding sky and the "heat waves" dance on every feature of the landscape.

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[27]It is perhaps pertinent to say that the preponderance of bright sunshine in the summer is not all attributable to clear skies. Much of the "extra" must be attributed to the longer period of daylight.

Winds

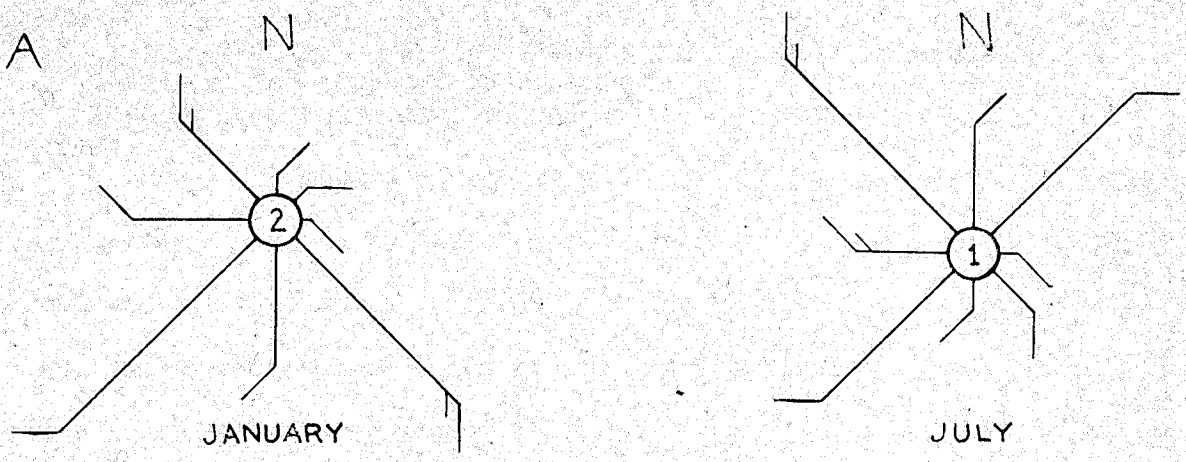
There are two kinds of winds which affect the Penticton region: Local winds which originate in the environs of the region, and extra-regional winds which result from cyclonic disturbances.

It may bear repeating here that local winds are usually due to convection caused by unequal heating of the land surfaces. The unequal heating may be due to difference in type of surface as between land and water, or between pasture and plowed field, etc; or it may be due to slope conditions as where one slope permits the sun's rays to strike more vertically than another. Whatever the cause, the surface which becomes warmest will transfer more heat to the air above it than will the cooler surface. The warmer air being lighter per unit volume than the cooler air, will begin to rise and the cooler air will move in to replace it. This movement of air by differential heating is one of the prime causes of local winds.

The local up- and down-valley winds also have their origins in convection. The slopes receiving more direct insolation during the day cause the air in contact with them to move upward along the main valley and its tributaries. At night the more rapid cooling of the upper levels due to heat loss by radiation, causes the air to cool and, becoming more dense, to flow down the tributary valleys into the main valley to make the down-valley wind. Connor cites a special instance when cool air flowing down from the heights may develop into a particularly strong wind.

> Near the foot of Lake Okanagan, Okanagan Mountain will frequently shed its air with a sudden rush near sunset. The downrush kicks up whitecaps on the lake and for fifteen minutes to half an hour there may be every appearance of a severe storm.

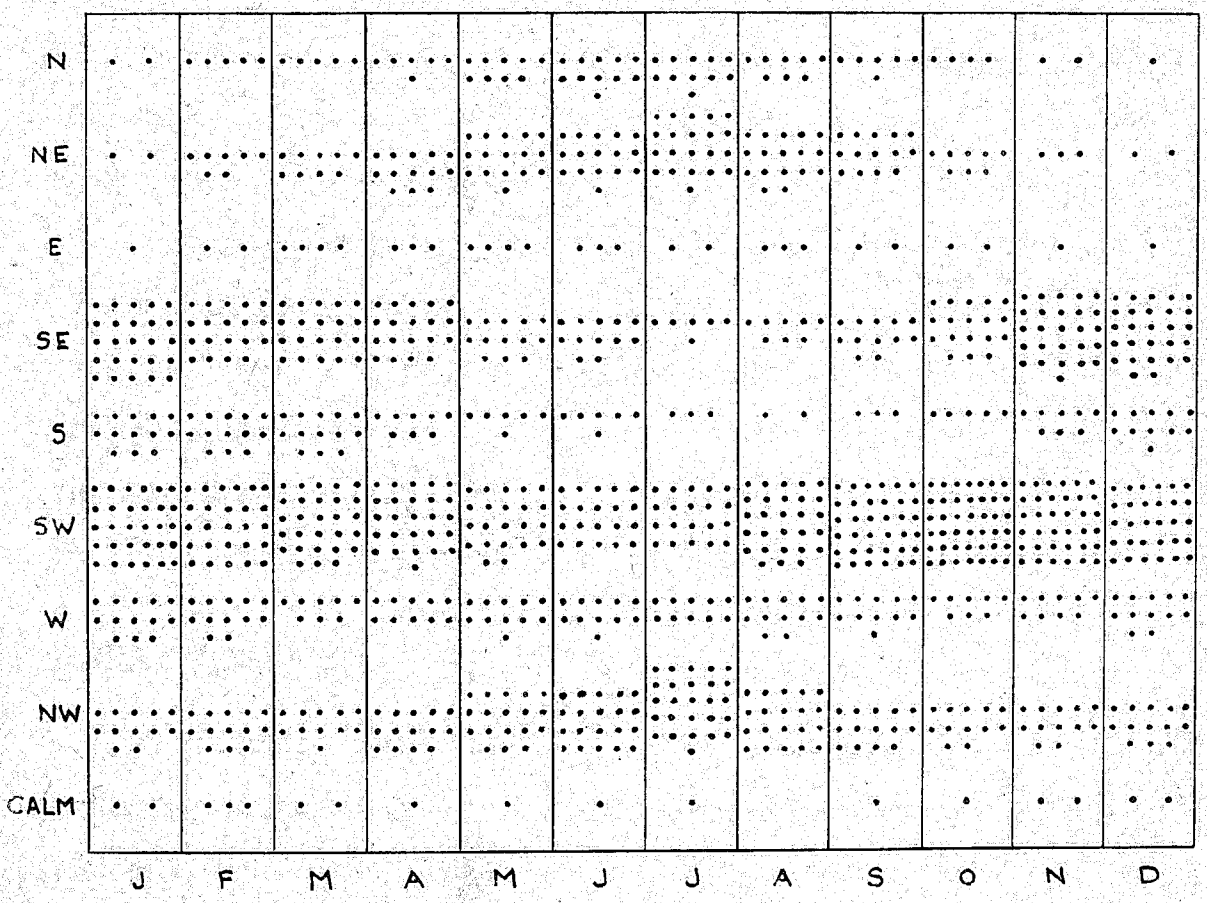
A



PERCENTAGE FREQUENCY OF WIND (BY DIRECTIONS) AND AVERAGE WIND SPEED FOR SUMMERLAND STATION.

10 % FREQUENCY; (2) % CALMS; 4-7 MPH; 8-12 MPH

B



PERCENTAGE FREQUENCY OF WIND (BY DIRECTIONS) FOR SUMMERLAND

- ONE DOT REPRESENTS ONE PER CENT FOR ANY ONE MONTH -

> At the same time that this strong northeast blow is occurring there may be no wind or only a gentle southerly breeze on the airport at the north end of nearby Skaha Lake.[28]

Fig. 29B shows that the northerly winds are most common in summer and southerly winds in winter. This is probably due to the extra-regional influences diagrammed in Fig. 15A and B. The Great Basin High extends well northward in January and the air moving north from the Columbia Plateau is probably the cause of the southerly winds. Even so, northerly winds bringing P/C air are not uncommon during this season and they often bring with them a sharp cold spell. In summer the Great Basin Low is well developed and the air tends to flow in a southerly direction. The west-east movement of cyclonic storms are responsible for winds coming from all directions, but prevailingly from the west. The north-south trend of the valley will, however, channel many of the winds and give them a more pronounced north-south component than they would otherwise have.

Common wind speeds vary from calms, which are rare, to 12 mph (see Fig. 29A), but winds of 30 mph and higher are not infrequent. If they occur when the trees are laden with fruit they can cause much damage. Strong winter winds often sweep down the valley bringing with them the raw discomfort of biting cold; yet, these are forgotten in summer when a welcome drying wind brings cool comfort to the heat of the day.

Climatic Summary

Although the climatic elements have been discussed separately, it should be apparent that they are mutually interdependent and that they work as a closely knit combination to make a climatic unit. It has been

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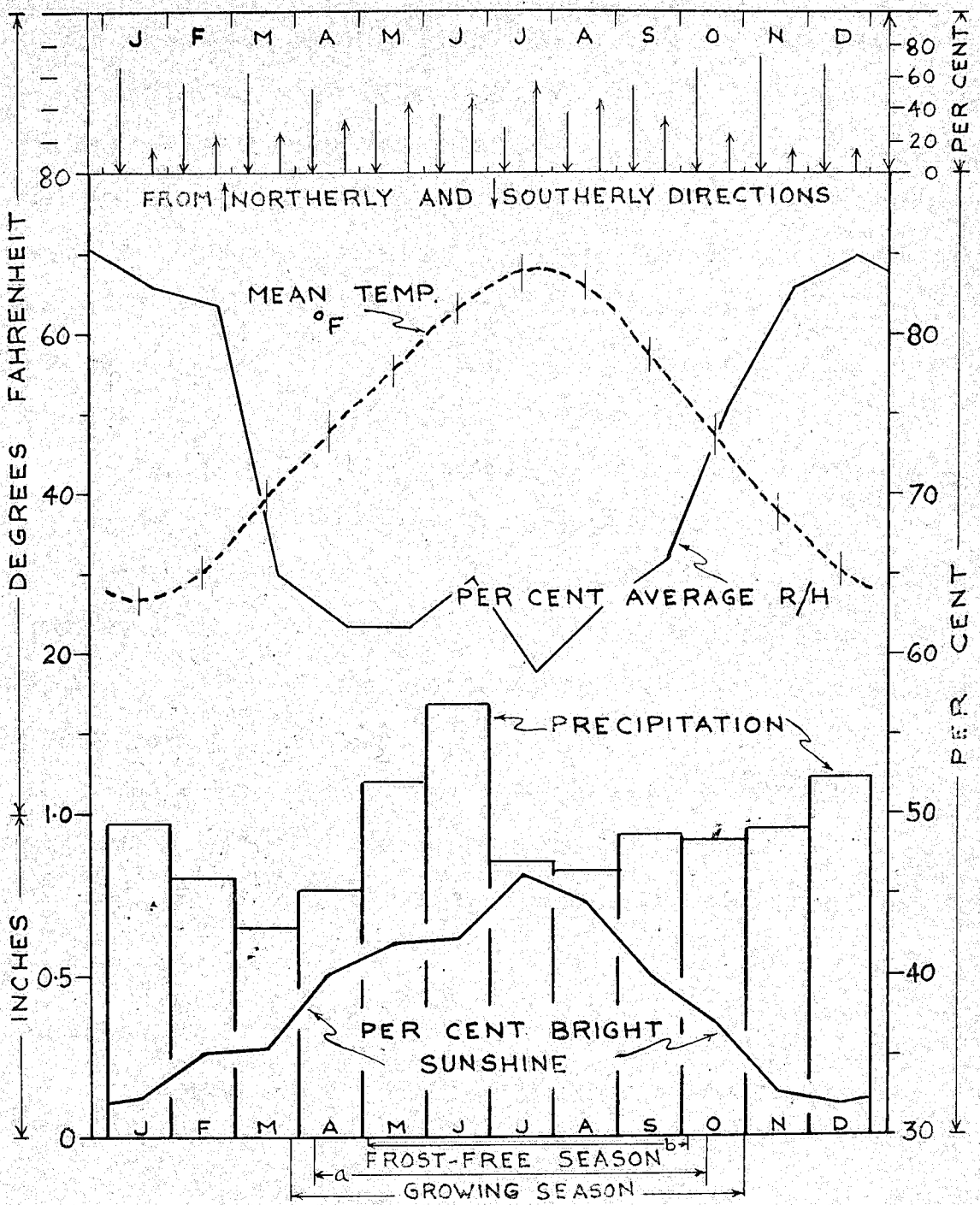
[28] Connor, op. cit., p. 8.

FIG. 30
CLIMATIC SUMMARY



– GROWING SEASON – MEAN TEMPERATURE > 43°F.
– FROST-FREE SEASON: a – KILLING FROST < 29°F
b – LIGHT FROST < 32°F

shown, for example, how variation in surface heating creates differences in temperature which cause winds and changes in R/H which in turn control the heat retaining properties of the atmosphere.[29] It has been shown, too, how the Okanagan climate is inextricably joined to the local control, namely the valley, which literally transforms the overall climate of the Southern Interior to create the sub-regional climate of the Okanagan. In turn the Okanagan climate is transformed into many micro-climates by the landforms, lakes, and varying surface conditions within the valley.

Fig. 30 is a graphic summary of the climate of the Penticton region. In it are shown the averages of the climatic elements, their distribution throughout the year, and their relationships to each other. An analysis of these factors shows that the climate of the Penticton region falls into the Köppen classification BSk, meaning middle-latitude, semi-arid, or steppe climate.[30,31]

How complete, then, is the differentiation of the Okanagan climate? Many differences have been pointed out between the valley and the plateau climates. For example, the valley is significantly warmer, its frost-free

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[29]That is, water vapor prevents loss of heat by long-wave radiation.

[30]Chapman, op. cit., Map accompanying "Climates of British Columbia."

The meanings of the symbols are as follows:

BS - semi-arid or steppe climate
k - average annual temperature under 64.4°F

[31]A finer break-down of climatic types is possible by using the Thornthwaite method of classification. This incorporates precipitation efficiency, temperature efficiency, and seasonal distribution of precipitation. However, it is felt that a finer break-down is neither desirable nor necessary to the purposes of this thesis.

and growing seasons are longer, its precipitation is half that of the plateau, its relative humidity is lower, and its winds are local, or regional winds re-directed by the valley trough. The transformation of the overall climate is more than "considerable" for the Okanagan controls have changed two closely related climatic types into another: the cold, snowy forest climates of the plateau have been transformed into the semi-arid or steppe climate of the Okanagan. The differentiation insofar as climate is concerned is therefore complete.[32]

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[32]This does not mean to imply that a definite line exists where one climate begins and the other leaves off. Rather, as the plateau is approached from the valley bottom, the valley climate becomes increasingly like that of the plateau so that one climate gradually merges into the other. Nevertheless, the deep valley climate is as distinct from that of the plateau as the concluding paragraph indicates.

CHAPTER VI

THE VEGETATION AND SOILS

In the preceding chapters some attempts were made to show the intimate relationships between the landforms, climate, and hydrography of the Penticton region: the landform influences the climate which influences the landform, and so forth. There is a constant striving for balance, a system in equilibrium, a continual effort for the better adjustment of one geographic element to the others to make a stable and indivisible whole. This striving of the elements of the physical region towards stability is a dynamic process which affects all things within the region and which is sensitive to the subtlest change.

It follows as a matter of course, therefore, that the soils and vegetation are as integral a part of the region as are the other elements. In other words, they are a "reflection" of the other elements as well as a cause of them.

Soil Classification

Because soil as a geographic element reflects the influences of all the other elements, it is not surprising that a method for soil classification should be devised which, indirectly at least, reflects the influences of these elements. The method of soil classification is based on soil color which depends on the soil's organic content which in turn depends on the kind and luxuriance of the vegetation the soil supports.

FIG. 31

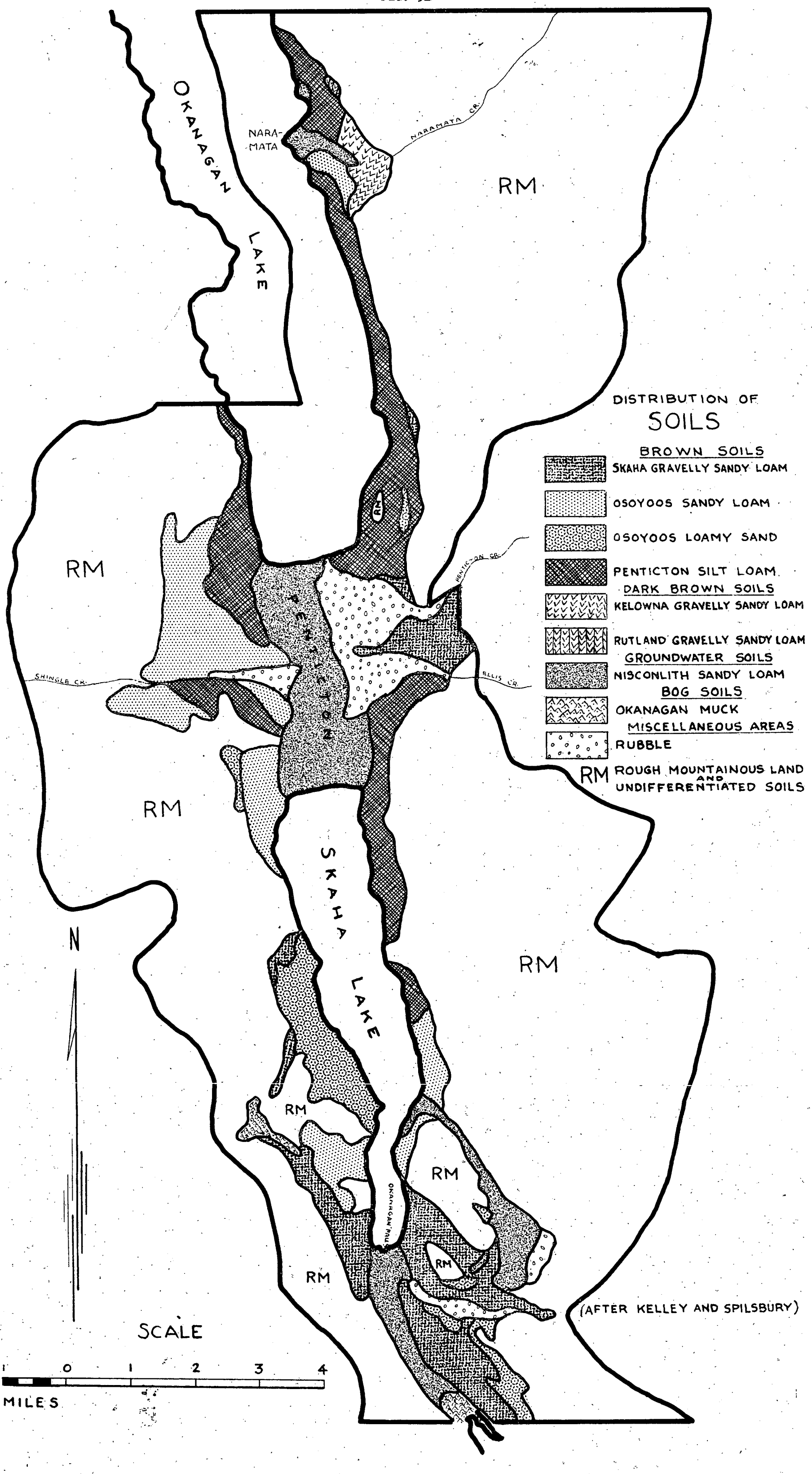
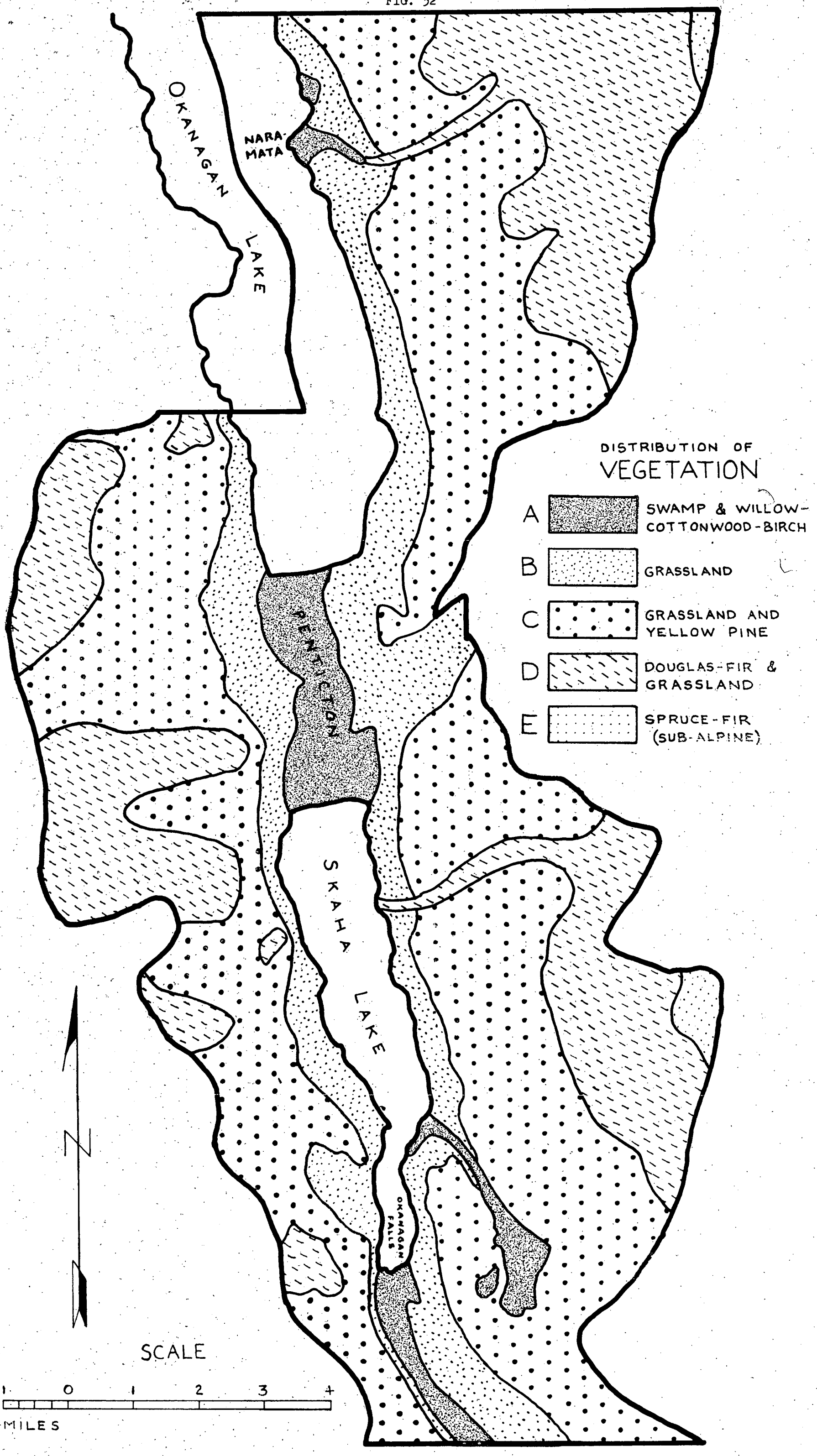

OKANAGAN LAKE
NARA-MATA
NARAMATA CR.
RM
PENTICTON
PENTICTON CR.
SHINGLE CR.
ELLIS CR.
SKAHA LAKE
OKANAGAN FALLS
N
SCALE
1 0 1 2 3 4
MILES
DISTRIBUTION OF SOILS
BROWN SOILS
SKAHA GRAVELLY SANDY LOAM
OSOYOOS SANDY LOAM
OSOYOOS LOAMY SAND
PENTICTON SILT LOAM
DARK BROWN SOILS
KELOWNA GRAVELLY SANDY LOAM
RUTLAND GRAVELLY SANDY LOAM
GROUNDWATER SOILS
NISCONLITH SANDY LOAM
BOG SOILS
OKANAGAN MUCK
MISCELLANEOUS AREAS
RUBBLE
RM ROUGH MOUNTAINOUS LAND AND UNDIFFERENTIATED SOILS
(AFTER KELLEY AND SPILSBURY)

FIG. 32


OKANAGAN LAKE
NARA-MATA
PENTICTON
SKAHA LAKE
OKANAGAN FALLS
DISTRIBUTION OF VEGETATION
A SWAMP & WILLOW-COTTONWOOD-BIRCH
B GRASSLAND
C GRASSLAND AND YELLOW PINE
D DOUGLAS-FIR & GRASSLAND
E SPRUCE-FIR (SUB-ALPINE)
N
SCALE
1 0 1 2 3 4
MILES

The soil color in the Penticton region varies from brown to black. The zone with the lightest vegetation cover, that is, the areas of the drought-resistant plants and sparse grasses have brown soils. As the grass cover becomes heavier up-slope and the soil's organic content greater, the soil color changes from brown to dark brown and finally to black in the zone of the most luxuriant grasses. Above the grassland and wherever coniferous growth exists a change in soil color occurs. As coniferous forest litter will not easily decompose the amount of organic material in the soils of the heavily wooded areas is small compared with that of the grasslands. As a result, grey-wooded or podsolic soils develop in areas of coniferous growth.

All the differentiated soils in the Penticton region fall into the Brown Soils and Groundwater Soils classifications (see Fig. 31).[1] However, some idea of the overall grouping of the undifferentiated mountain soils may be obtained from Fig. 32 which shows the distribution of vegetation. Thus the area of grasslands and yellow pine has soils grading from dark brown to black mixed with patches of podsols; the Douglas-fir and Grasslands Zone has patches of black and podsolic soils; and finally the Spruce-Fir Zone has only podsols.

Vegetation and Soils Classified

Bog soils. These soils are found in areas where the water table is at or near the surface, notably at the north end of Vaseaux Lake and in the Marron Valley west of Kaleden. The vegetation consists mainly of

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[1]With the exception of two small patches near Naramata which are classified as Dark Brown.

sedges, cattail, and rushes. Bog soils are not important to the Penticton region. Their main use when drained is for the production of hay.[2]

Groundwater soils. The natural vegetation on these soils is more or less independent of the regional precipitation. The main growth is deciduous forest, the dominant species being willow, cottonwood, and white birch. Among these are found alder and on the fringes, aspen. Common shrubs are the Rocky Mountain maple, hawthorn, elderberry, and choke-cherry. The color of the soil is dark brown due to the decomposed leaf litter.

The groundwater soils are particularly prominent at the bottom of the main valley between the valley lakes. Other areas are located along McLean Creek and the fans of Naramata and Robinson Creeks. Comparison of Figs. 5 and 31 will show that these soils are made up largely of fan materials.

Where the water table is not too high groundwater soils are suitable for orchards. Otherwise shallow-rooting crops such as tomatoes, onions, corn, potatoes, etc., and fodder crops do well on these soils.

Brown soils. The brown soils are found from the International boundary to as far north as Summerland. The highest elevation at which they occur is about 2,000 feet and the lowest 903 feet at Osoyoos.[3] All the terrace masses and low-lying soils not in the groundwater soils grouping fall into the brown soils classification.

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[2]A description of the soils is given in Appendix A.

[3]C.C. Kelley and R.H. Spilsbury, Soil Survey of the Okanagan and Similkameen Valleys, British Columbia, Report No. 3, (King's Printer, Ottawa, 1949), p. 28.

The grasslands occupy the brown soils area. Because of the low water table the grasslands must depend entirely on precipitation for moisture. As precipitation is extremely light, drought resistant grasses and xerophytics are best suited to this area. The dominant grasses are bluebunch wheatgrass, common speargrass and sand dropseed grass. Xerophytics, found most frequently on south-facing slopes where precipitation efficiency is particularly low, are cactus and desert shrub varieties such as sagebrush, rabbit bush, and antelope bush.

The brown soils have been further differentiated according to texture and roughness of surface. The texture may be gravelly, sandy, silt, clay or combinations of these. The surface is classed as terrace phase for even or gently undulating surface, and kettle phase for rough surface.

The brown soils are as follows:

(a) Skaha gravelly sandy loam. This soil type occurs in gravelly terraces from 1,100 to 1,800 feet in the Penticton region. The largest parcels of it are found east of Penticton and around Okanagan Falls, and smaller parcels lie to the east of Skaha Lake. The parcels may vary in size from a few acres to 1,000 acres or more.

The soil substratum consists of unsorted sand and gravel and a mixture of stones up to eight inches in diameter, the amount of each constituent varying from terrace to terrace. Cemented till in the substratum often forms an impervious layer which impounds water to form small lakes or ponds in the kettle holes.

As might be expected from its composition, this soil is extremely porous as a result of which most of it has been left in range. With the advent of sprinkler irrigation, however, more is being brought under cultivation. Even so, the kettle phase is too rough and most of it must

be left in range because of the great tendency to erosion.

(b) Osoyoos sandy loam. This soil occurs in terraces (kettle phase) west of Penticton on both sides of Shingle Creek, to the north of Okanagan Falls on the east shore of Skaha Lake, and near Naramata. The kettle phase is often too rough for agriculture and erosion has added to the surface irregularity in many places so that many of the narrower terraces, for example, have become completely unsuited to cultivation.

Most of this soil is in range due to unavailability of water, to roughness of topography, or to location within the Indian Reserve. The sandy loam is suitable for irrigation especially under the sprinkler system and where slopes are not too steep to instigate erosion. Excessive irrigation will, however, leach away the soluble salts of the solum because of the porosity of the C horizon.

(c) Osoyoos loamy sand is found in small sections east of Munson Mountain and west of Skaha. Larger sections are found in the Kaleden area and southeast of Okanagan Falls. Although the kettle phase contains a great deal of wasteland, much of it has been cultivated particularly near Kaleden because of the availability of water.

The rough topography and porosity of this soil presents the same problems of erosion and leaching as are found in the sandy loams. Sprinkler irrigation would do much to conserve this soil.

(d) Penticton silt loam is found on the lowest terraces on both sides of Okanagan Lake from Naramata and Trout Creek to Penticton. Smaller sections appear again south of Shingle Creek and on the east shore of Skaha Lake. It occurs in the remarkably even terrace formations laid down against the tongue of ice in the post-glacial valley lake. The

evenness of the terraces is frequently interrupted where the surface has been destroyed by erosion.

This is one of the most fertile soils in the valley. However, it will have to be carefully conserved as irrigation will accelerate the existing tendency to erosion.

Undifferentiated Mountain Soils

Dark brown soils occur in the Yellow Pine-Grasslands zone in the undifferentiated rough mountain area above the brown soils. The indigenous vegetation is the same as in the grasslands with some additions. Bluebunch wheatgrass is the most important and rough fescue and Junegrass become of secondary importance. Yarrow, everlasting, and balsam root are the most common forbs. Although the grasses are somewhat more luxuriant, the xerophytics are much less prominent. The wild rose, snowberry, and Saskatoon berry are common although the latter is frequently dwarfed.

The occurrence of yellow pine is a reflection of the greater amount of precipitation in this zone. This tree occurs singly and in thin stands which grow denser on shady slopes and towards the upper limits of the zone. Clumps of aspen are also found in the upper limits and in the shallow depressions or sheltered slopes.

Only two small parcels of the Dark Brown soils have been differentiated and they are both found near Naramata. They are classified as Kelowna Gravelly Sandy Loam and Rutland Gravelly Sandy Loam. The former is developed by surface weathering of glacial till deposited above the stratified materials in the lower part of the valley. Extensive unclassified areas of this soil occur between Okanagan Landing and the International boundary and most of it is used as range. Only very small parts

as near Naramata have been cultivated because of the availability of water. The Rutland Gravelly Sandy Loam will not be discussed because the parcel occurring in the Penticton region is too small to be significant.

The black soils. These soils are not differentiated but it is highly probable that they are found in the upper parts of the Yellow Pine-Grasslands Zone and extend into the Douglas-fir-Grasslands Zone where they exist in isolated patches.

The tree cover in the Douglas-fir-Grasslands Zone is relatively open except on sites where moisture is conserved and where young stands occur. The Douglas-fir is dominant but lodgepole pine, aspen and willow are important in burned over areas.

Dominant among the grasses is pinegrass which makes up 40 to 50 per cent of the ground cover. Bromes, needle grasses, and dwarf sedge also occur in quantity. The most abundant forbs are heartleaf arnica, strawberry, asters, lupines, and peavine. The shrub cover consists of dwarf to medium-size forms of bearberry, twinflower, wild rose, and spiraea. Among the tall shrubs are Canada buffaloberry, and serviceberry.

The black soils of the Penticton region are undifferentiated.

The grey-wooded or podsolic soils. These are found partly in the vegetation zones where conifers grow. They occur in small patches in the Yellow Pine-Grasslands, and in larger patches in the Douglas-fir-Grasslands, and occupy wholly the area of the Spruce-Fir complex.

It is the cool, moist climate of altitudes in the order of 6,000 feet which creates the Spruce-Fir complex. Engelmann spruce is dominant and is mixed with alpine fir in rather dense stands. The thickness of the forest and the short growing season inhibits growth of forage plants.

Ground vegetation consists principally of shrubs (the chief species of which is vaccinium) and of mosses and lichens. Grasses and forage plants do occur but chiefly in natural meadows, in the more open areas near the timber line, and in burned-over areas.

Miscellaneous Areas

Rubble. This is not a soil in the true sense as it consists of rock, both angular and rounded, brought down from the plateau and deposited just beyond the canyon mouths of the larger creeks. The rubble is coersest near the canyon mouths. It grades down in size and becomes increasingly mixed with soil towards the peripheries of the fans. The rubble boundary has been placed at the upper limits at which land may be plowed.

Rough mountainous land. This includes the valley slopes, hills inthe main valley too rough for cultivation, and the plateau surface above the valley rim. The unclassified vertical soil zones have already been touched upon in the introduction to this chapter and the succession of the brown, black, and podsolic soil zones has been established.

The rough mountainous land is eminently suited to grazing and this will probably continue to be its chief use. The forest, consisting of yellow pine, Douglas-fir, and some Engelmann spruce, also provides a "crop" for the local sawmills.

The sloping character of the terraces, although having certain advantages such as air drainage, has made them vulnerable to erosion particularly where streams from the upper slopes disgorge upon them.

Fig. 33 shows a section of the eastern terrace north of Penticton. In the centre is a large semi-circular block of silt which has slumped away from the main terrace.

There the terraces have in many instances been completely gutted, leaving the steep-sided silt cliffs which are subject to collapse and to attack from the side by the more localized run-off. Although these processes of erosion had been in progress long before the white man came into the region most of the terrace surfaces were still intact because they were protected by the weathered mantle of soils which made them naturally impervious to seepage.[4] This was changed with the advent of the white man. He plowed the terrace surfaces, destroyed the meager sod-forming grasses, introduced water to the soils, and immediately erosion was enormously accelerated.

Careless and heavy applications of irrigation water have caused excessive seepage (especially in soils with porous substratums) and gullying. Indeed, so excessive in some instances is the load of soil carried by irrigation run-off, that the suspension has been called "irrigation tailings" as if it were wastage from a mine!

Undermining and collapse of the cliff faces through seepage is a common occurrence (see Fig. 33). But this and gullying are not the whole extent of the damage: since the soil surface has been broken the physical and chemical processes noted under Geomorphology can come into full play. Heavy applications of irrigation water with resultant seepage and solution of the calcium carbonate cementing agent, will soon begin sub-surface consolidation and erosion. And, although little change may be seen in one lifetime, the destruction is cumulative and may be more far-reaching than even the thoughtful farmer may realize. Soils take thousands of years to

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[4] See footnote 16, Chapter III.

mature but only a short period of mismanagement to destroy. A man owes it to posterity to conserve even what he during his short lifetime may consider his own.

CHAPTER VII

SUMMARY OF THE PHYSICAL REGION

Although each geographic element has been discussed separately, an attempt has been made throughout the discussions to show that none of the elements is independent. On the contrary, each element is to some extent the result of all the others, and their interaction is so close that together they form an indivisible whole which may be called the natural geographic region.

Not one of the geographic elements can be subtracted or changed without drastically changing the region as a whole. Change the climate by adding, say, ten inches of rainfall per year, and all the other features will change with it. The vegetation will change from grassland to forest; the soils will probably become podsols; the water table will rise, the intermittent streams will become perennial, the perennial streams will increase their flow; the land surface will be cut down, rounded, and erosion will be greatly accelerated. A whole new cycle of readjustment will begin apace and the region will be changed into an "organism" of a very different species. Any change, no matter how small, will cause a change in the balance of things as they exist in the region.

Does imbalance in a region occur? Yes, with so many variable features it is bound to occur especially over long periods of time. The most common cause of change, however, is due to the activities of man. Man comes to a region and cuts the forest, plows the land, drains the streams, etc., so that with his coming a whole new cycle of re-adjustment

is instigated within the region. Man himself, therefore, may be called a geographic element for he becomes as integral a part of the region as landforms, climate, vegetation, and soils--perhaps even more so because he can introduce changes at will. It is up to him whether he will use the natural region wisely and to his advantage or unwisely to his long-term disadvantage.

In the second part of this thesis man and his works in the Penticton region will be assessed. From the assessment it should be possible to determine where his use of the region has been good and where it has been bad. Furthermore, some ideas for the region's long-term development should emerge from the study.

PART II

THE HUMAN GEOGRAPHY

A. THE SEQUENT OCCUPANCE

CHAPTER VIII

THE SEQUENT OCCUPANCE[1]

The sequent occupance of the Penticton region may be divided into two main periods of growth based on population change. The first period entails a slow initial growth to 1900 followed by an extremely rapid growth to 1921. The second period parallels the first in that, during the first 20 years to 1941, population increase was comparatively slight, but this was again followed by a rapid surge up to the present time. It is the purpose of this chapter to discuss the changes in the human geography of the Penticton region within each period of growth.

I. THE EARLY PERIOD OF SETTLEMENT AND GROWTH

Long before the White Man came to the region, Pen-Tek-Tan[2] existed as an Indian village on the east bank of the Okanagan River. It was the largest village in the Okanagan and extended from Ellis Creek a half mile northward along the east side of the river. The reasons for the size of the village were geographical. First, it was in a central position with regard to the valley trade routes; second, it was located

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[1] Locations of early buildings, zones, roads, and other works of man discussed in this chapter are given only approximately, and little mapping has been attempted as the research required is a major undertaking in itself. As Penticton has no map archives, it is suggested that mapping of early developments be undertaken before sources of first hand information in the persons of the pioneers are completely lost.

[2] Meaning "A permanent abode where waters pass by."

near the mouths of Shingle and Ellis Creeks whose gravelly deposits made the river shoal and afforded easy crossing; third, the campsite was well sheltered from the east and west by the valley walls and from all directions by the lush vegetation that grew on the bottom-lands; fourth, materials for making clothing, baskets, rope, and weapons were close at hand; and fifth, game was plentiful nearby and fish were caught in the river and in the streams and lakes of the immediate vicinity.

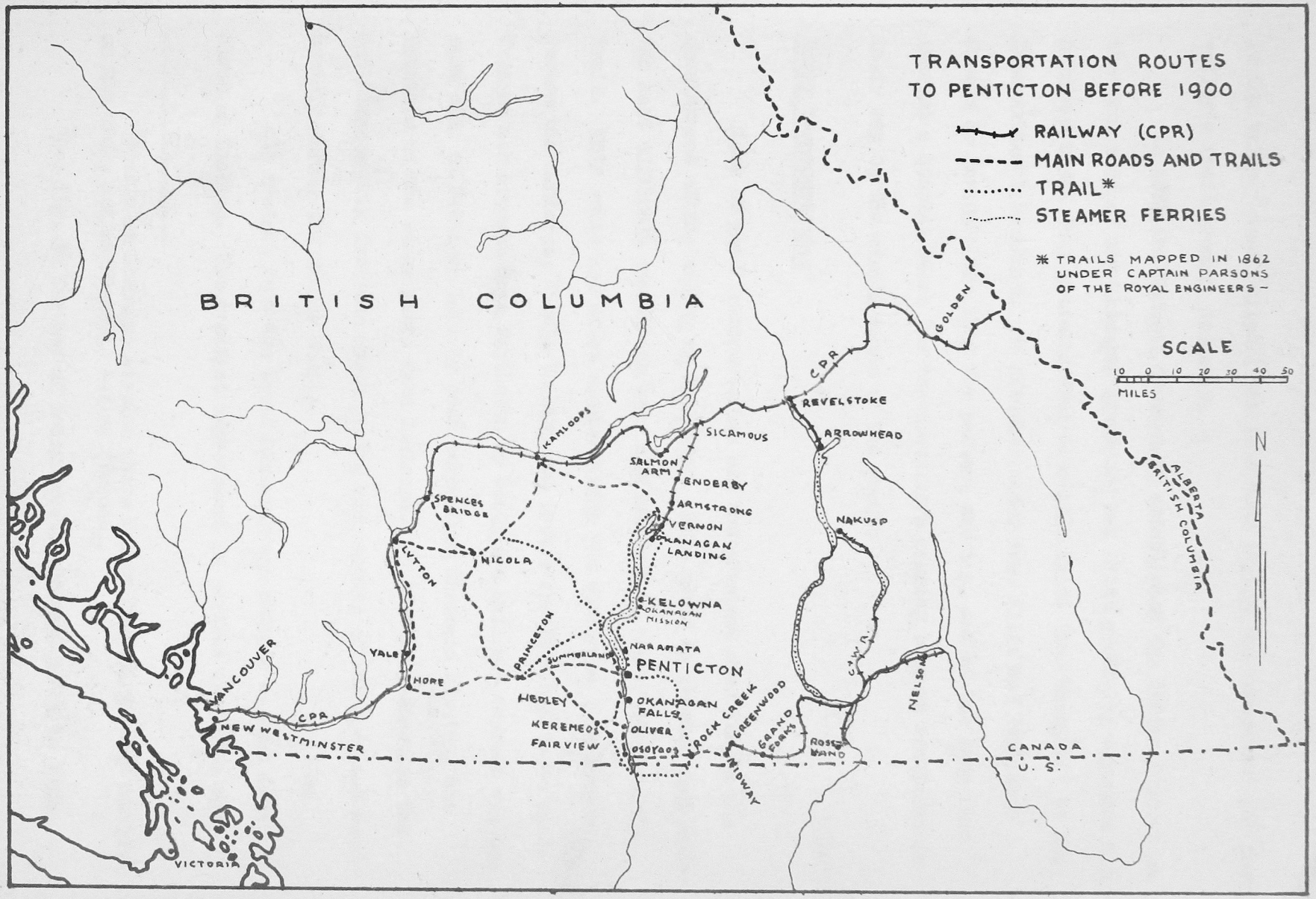
All in all the Indians made good use of the natural region. They adjusted their lives closely to what it had to give them and attempted but little to change the natural environment to their own advantage.

The first white men to pass through the region were a fur trader, Alexander Ross, and a Roman Catholic missionary in 1810-11. They were followed fifty years later by Father Pendozi who stayed to do missionary work, and in 1866 by Mr. Thomas Ellis, the first permanent white settler.

The Beginnings of Permanent Settlement and Industry.

Mr. Ellis built his homestead a half mile northeast of the Indian village near what is now Scott Avenue. There, taking advantage of the natural meadows through which flowed a small distributary of Penticton Creek, he cultivated the soil to raise vegetables for his own use and hay for the few cattle he had bought. A great deal of mining activity was going on at this time in southern British Columbia at Fairview, Rock Creek, Camp McKinney, Greenwood, and east to the Kootenays, and Mr. Ellis undertook to expand his holdings as much as possible to capture a part of the mining camp market for beef. In 1872, by way of experiment, he laid out an apple orchard which later proved so successful that other points

FIG. 34


TRANSPORTATION ROUTES
TO PENTICTON BEFORE 1900
RAILWAY (CPR)
MAIN ROADS AND TRAILS
TRAIL*
STEAMER FERRIES
* TRAILS MAPPED IN 1862 UNDER CAPTAIN PARSONS OF THE ROYAL ENGINEERS -
SCALE
10 0 10 20 30 40 50
MILES
N
BRITISH COLUMBIA
GOLDEN
C.P.R.
REVELSTOKE
ARROWHEAD
SICAMOUS
KAMLOOPS
SALMON ARM
ENDERBY
ARMSTRONG
VERNON
LANAGAN LANDING
NAKUSP
SPENCES BRIDGE
NICOLA
LYTTON
KELOWNA
OKANAGAN MISSION
NARAMATA
PENTICTON
SUMMERLAND
PRINCETON
YALE
HOPE
VANCOUVER
HEDLEY
OKANAGAN FALLS
KEREMEOS
FAIRVIEW
OLIVER
OSOYOOS
ROCK CREEK
GREENWOOD
GRAND FORKS
ROSSLAND
NELSON
C.P.R.
NEW WESTMINSTER
C.P.R.
VICTORIA
CANADA
U. S.
MIDWAY
ALBERTA
BRITISH COLUMBIA

in the valley[3] soon followed his lead thus laying the foundation for the valley's fruit growing industry.

In 1877 the Federal Government established the Indian Reserve on the west side of the Okanagan River and Mr. Ellis gradually expanded his holdings until they extended from Nine-Mile Point (now Naramata) to the International Boundary. He diverted water from Ellis and Penticton Creeks to irrigate the land for pasture and hay, and at the same time started a general store for the travellers passing through Penticton on their way to the mining camps of the south.

Early Transportation[4]

Lack of good transportation was the greatest drawback to the development of the valley at this time. Hope could be reached only under the most difficult conditions over Allison Pass by way of the Dewdney Trail. This route was often closed during the winter so that longer routes via Kamloops, Nicola Valley, and Lytton and Yale had to be used. Freight was brought into Penticton by boat, and mail and express via the east side of Okanagan Lake by pack horse from Okanagan Mission, the terminus of the stage route from Kamloops. In the early eighties the mail came weekly from the north during nine months of the year and semi-monthly during the winter months.

All freight from the North Okanagan was shipped by boat from Okanagan Landing. The greatest improvement in service came with the

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[3]Namely at Okanagan Mission where Father Pendozi was now carrying on his work, and at Priest's Valley (Vernon).

[4]See Fig. 34 for map of transportation routes prior to 1900.

completion in 1892 of the Canadian Pacific's Shuswap-Okanagan branch line from Sicamous to Okanagan Landing. Penticton got a government dock and a post office at the same time. The S. S. Aberdeen now arrived every second day with mail, express, and freight, and Penticton became the distributing centre for goods sent to the mining camps of the south and east. Every second day two stages carrying mail and passengers left Penticton--one for Rock Creek, Greenwood, and Grand Forks, the other for Washington State.

The Effect of Improved Transportation.

As might be expected, the improvements in transportation brought an increasing number of settlers to the valley. Besides Mr. Ellis, only two other farmers and a miner are listed as residents at Penticton in 1882-83.[5] By 1892 there were 31 men listed in the following occupations:[6]

(a)	Farmers	13
(b)	Stockmen	2
(c)	Blacksmith	2
(d)	Excelsior Mill	3
(e)	Sawmill	1
(f)	Carpenter	1
(g)	Others	9
	TOTAL	31

The "others" consisted of miners, merchants, packers, and loggers.

By 1897-98 the population increased to 50, but changed somewhat in character, for in 1899 it was said to consist of ranchers, freighters,

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[5] Williams' B.C. Directory, 1882-83, p. 308. No mention is made of families.

[6] Ibid., 1892, p. 269.

laborers, a pupil teacher, hotel keepers, miners, merchants, and one "gentleman."[7]

The surge in population with completion of the spur line to Okanagan Landing did not develop to the extent expected. The reason was largely attributable to what might be termed "land holding" on the part of the farmers and ranchers in the valley, so that new settlers were compelled to take up the very poorest lands or go elsewhere.[8]

Early Industries in the Penticton Region

The small enterprises mentioned in the occupations for 1892 and later, were overshadowed by the two larger industries--cattle ranching and farming. Yet, in 1894 there were only six settlers engaged in these

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[7] Ibid., 1899, p. 215.

[8] The following quotation with regard to land holding in the Okanagan is taken from 1891 Province of British Columbia Department of Agriculture, First Report, pp. 731-32, from the forward by J.R. Anderson:

> There is too great a disposition on the part of the farmers and others to acquire large tracts of land, and keep them locked up. This policy works very detrimentally to the best interests of the Province, inasmuch as many seeking homesteads are compelled either to take up the poor or worthless parts of the country, or go elsewhere. By returns received I find that not ten per cent of the land reported as owned is cultivated. . . . True . . . a great portion of the land owned is pastoral land, rock, etc., still enough remains to show that but a tithe of the land fit for cultivation is actually cultivated, and there can be no doubt that it would help if people would dispose of such lands as they cannot or will not utilise. It is a well recognised fact that a small quantity of land well cultivated will yield more profit than a large quantity badly cultivated.

industries in all of the Penticton and Trout Creek areas. These settlers owned 14,000 acres--practically all the good land--of which only three per cent was cultivated. In other words, farming was much less important than cattle ranching, and the best that can be said for the fruit industry is that it was developed far enough so that its future potentialities could be realized.

The Town

The smaller enterprises were confined to the first townsite which was surveyed in 1892 after the building of the government dock. This site was bounded by Ellis Street, Fairview Avenue (now Wade Avenue), the present railway grade, and Okanagan Lake. A hotel housing a new general store and post office was built overlooking the dock. Penticton's first court house was erected just north of the intersection of Vancouver and Van Horne Streets, and a livery stable was built near Mr. Ellis' homestead.

Extension of Transportation After 1900

Meanwhile a number of improvements had been made in transportation since 1900. A wagon road had been completed to Vernon on the west side of the lake by 1902. There were good wagon road connections also to Naramata, Okanagan Falls, Fairview, Keremeos, Hedley, and Princeton. Fruit was being shipped from Penticton by boat to Okanagan Landing, by spur line to Sicamous and from there to all parts of British Columbia and the Prairie Provinces by the Canadian Pacific Mainline.

Because of the intense mining activities being carried on to the south and east, the existing transportation routes were very heavily burdened, and the need for a railway was urgently felt. A small Kootenay railway, the Columbia and Western (C & W) (see Fig. 34) was proposed to link Greenwood and Camp McKinney from where a spur line was to have been built into the Okanagan and north to Penticton via the east side of Skaha Lake. A part of Main Street and Smith Street (now Front Street) were C & W grade and it was proposed that the Main Street section be linked to the government wharf by way of Front Street. The C & W finally found it impractical to continue with the railway construction and abandoned the project after having done some work on the roadbed in Penticton.

Meanwhile rapid expansion was taking place due to capital investment from abroad.[9] An option was obtained from Mr. Ellis by the Southern Okanagan Land Company in 1905 and land with irrigation water became available. The population grew apace and orchards were laid out rapidly so that by 1910 the fruit industry had superseded cattle ranching in importance. But with increased fruit production the need for better railway transportation became imperative and the Canadian Pacific Railway Company undertook to build the Kettle Valley Railway (KVR) to connect the Lower Mainland with the Okanagan, the Kootenays, and the Crows Nest Pass. Penticton was made a divisional point on the KVR. The first passenger train arrived on May 30, 1915. Penticton was now only twelve hours from

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[9]The Okanagan received a good deal of publicity abroad at this time. Lord Aberdeen's orchards at his Guisachan and Coldstream ranches (at Kelowna and Vernon, respectively) had come into production; and Mr. James Cartrell of Trout Creek had won top honors for his tree fruits at the Royal Horticultural Society's exposition in London, England.

Vancouver, less than half the time required by the old route via Sicamous.

The Effect of Transportation on the Townsite

Whether it was through lack of foresight or merely for temporary convenience or both, the early town planners adopted the C & W Front Street grade linking Main Street with the government wharf as a base line on which to lay out another plan for a townsite. The awkward angles in to-day's street system in that part of the town are therefore the result of early and inept planning.

But the legacy left to the town by the C & W was as nothing compared to that left by the KVR. When the KVR was being put through Penticton in 1912, the Railway Company handed the municipality what amounted to an ultimatum regarding the placement of the roadbed. The municipality could do naught but accept and the railway was laid down where it is to-day (see Plate XI). Insofar as the city is concerned the railway could hardly have chosen a worse location to reach the dock or to get out of the town to the east. It now cuts through the city's commercial, residential and industrial areas alike, not only marring the attractiveness of the city, but constituting a hazard to pedestrians, a "bottleneck" to traffic, and a practically insurmountable obstacle to subsequent planning.

The Growth of Population and Diverse Industry

The surge in population which had begun at the beginning of the century was given additional impetus by the coming of the KVR and the post-war developments between 1918 and the early twenties; the population

FIG. 35

THE GROWTH OF POPULATION IN PENTICTON FROM 1900 TO 1951 AND THE ESTIMATED GROWTH* FROM 1951 TO 1971

* WALKER AND GRAHAM, PLANNING ENGINEERS, VANCOUVER, B.C.

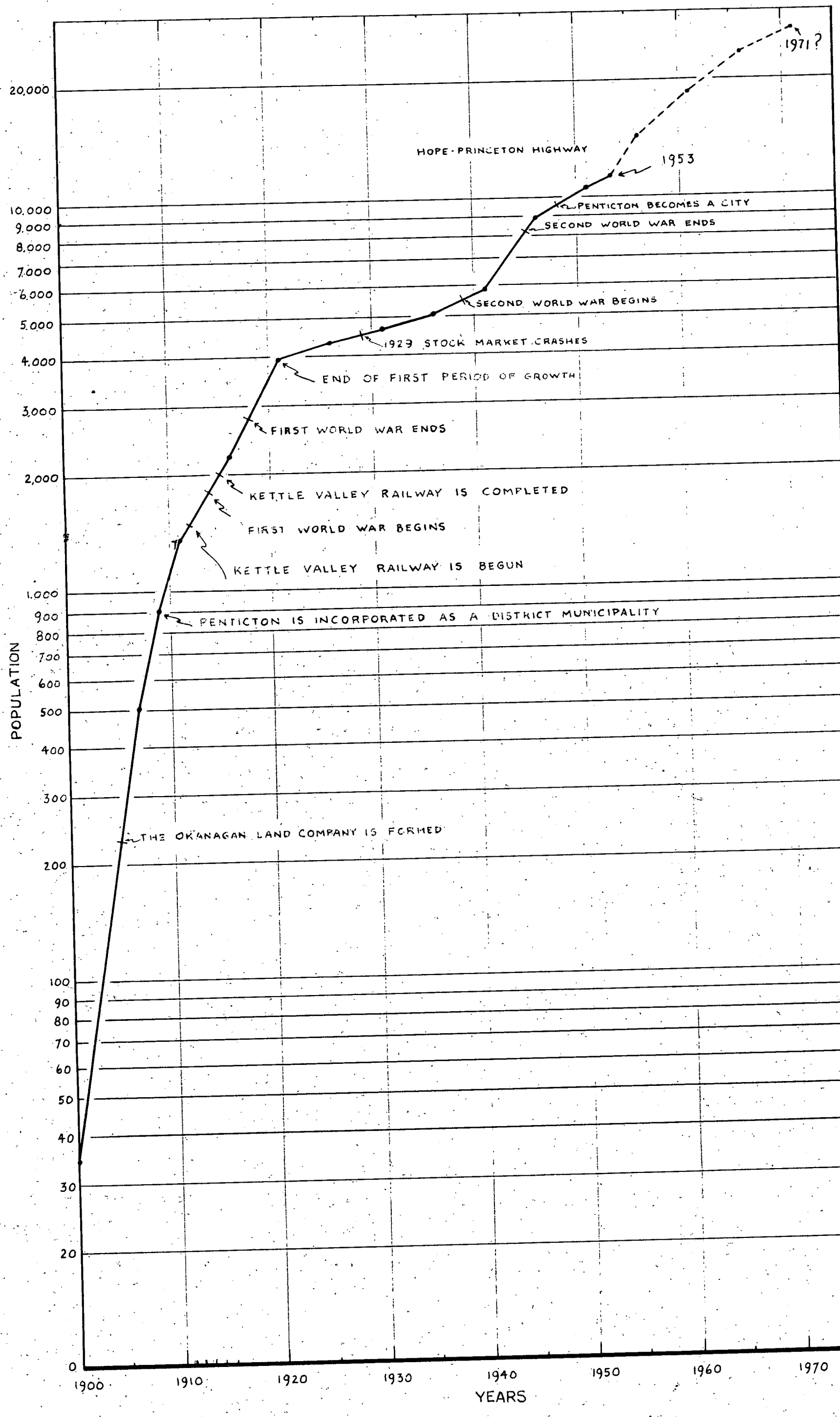
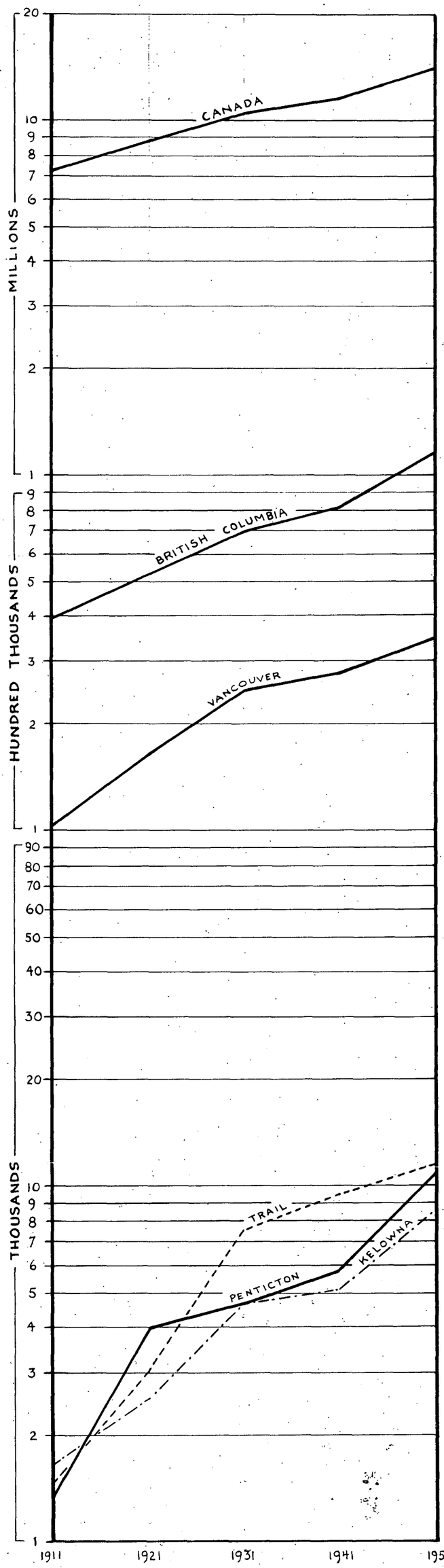


FIG. 36

POPULATION



which had been a mere 50 in 1900, reached nearly 4,000 by 1921 (see Fig. 35).

The growth of diverse industries did not keep pace with the growth of the fruit industry. Adequate facilities for canning and packing fruit were established; a small sawmill, a weekly newspaper, a city-owned electric light plant, a machine shop, and many small commercial enterprises took hold in the rapid growth; but on the whole, dependence on fruit and allied industries was one-sided and made the region's economy too sensitive to outside influences.

By the end of the first period Penticton had reached the "awkward stage." It had grown big and sprawling and a little unmanageable; and, like a fast-growing youth, needed time to consolidate its assets and fill in its deficiencies before taking the next step towards maturity.

II. THE SECOND PERIOD OF GROWTH

Population Growth During the Second Period

It is difficult to tell why Penticton's rate of growth which had been nothing short of phenomenal before 1921 dropped so sharply between 1921 and 1931. An examination of Fig. 36 shows that the population for Canada, British Columbia, and Vancouver kept growing at much the same rate as in the previous decade and Trail and Kelowna actually increased their rates, taking the best possible advantage of the post-war boom to further their development until the beginning of the "depression."

It is possible that Penticton stopped for a while to "catch its breath" after its furious growth in the previous decade. Certainly some period of consolidation and adjustment was necessary for, until now it had,

like Topsy, "just growed" beyond its plans which were never adequate and certainly beyond its ability to provide services for residents and new industries. The boom had inexorably rushed Penticton towards a one-point economy--fruit--and the increasing difficulty of marketing was beginning to tell in the municipality's and the region's inability to provide a livelihood for a rate of population increase commensurate with the previous years.

A further reason for the "slow-down" may have been due to Penticton's proximity to the south end of the valley which had just been opened up for new settlement. There the best kinds of orchard lands had been made available and were probably taken in preference to the poorer grade lands still available at Penticton.

Specifically, the growth of population during the second period may be described as follows: Whereas the decade 1911-21 saw a population increase of 2,629, the following decade, 1921-31, saw an increase of only 661. The rate of growth increased between 1931-41 (but only during the latter part of the decade which marked the end of the "depression") to add 1,137 and bring the total population to 5,777. From here on the spur of war and post-war developments brought 4,771 people to the city by 1951 --an increase of 83 per cent in ten years. Certainly few Canadian cities of equal size can match such a record.

The Growth of Transportation During the Second Period

Improvements in transportation more or less paralleled the growth of population. The CPR spur line from Penticton to Osoyoos was begun in the early twenties. The line extended to Skaha where cars were loaded on to barges and taken by tug to Okanagan Falls and from there by rail

to Osoyoos. By 1931 the line on the west side of Skaha Lake was completed and the barge service was discontinued.

The extension of the Canadian National Railway (CNR) from Kamloops to Kelowna in 1925 also brought changes in traffic on Okanagan Lake. The steamer service to Okanagan Landing became less profitable as more and more freight was handled by railway barges (both CNR and CPR) between Penticton and Kelowna. Furthermore, the inauguration of bus service between the valley points made the passenger service on the lake unprofitable. First the S.S. Okanagan, then the S.S. Sicamous were taken out of service[10] and the CNR's M.S. Pentowna was converted into a tug in 1937. Thus passed one of the most romantic phases in the history of transportation in the Okanagan Valley.

During the early part of the second period, little was done to improve the valley roads. They were for the most part gravel, often rough, narrow, and winding, and certainly no enticement to tourists who found the valley a playground and the roads an intolerable obstruction. With the end of the second period the situation changed. The policies of the post-war governments fostered province-wide expansion of the highways. The long-sought link between Hope and Princeton was pushed through at a cost of $12,000,000. The valley roads were widened, straightened and paved, and now form one of the best road networks in the Province.

The effect on the valley and especially on Penticton of the Hope-Princeton Highway was direct and immediate. Penticton was now only seven

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[10]The S.S. Sicamous was officially taken out of service in 1935 (although it made an occasional trip carrying fruit in 1936) and may now be seen at Penticton near the outlet of Okanagan Lake. It is a "museum piece" and a valuable tourist attraction.

hours driving time from Vancouver, and people on the Coast who had always wanted to visit the Okanagan were now able to do so on a week-end. Tourists flocked in from the Lower Mainland and the coast cities of Washington and Oregon. The improvements of the valley roads to the north and to the south, brought a stream of traffic up Highway 97 from as far south as California to visit the Okanagan, the Cariboo, and, with the completion of the Hart Highway, the Peace River and Alaska. Whereas the tourist industry had been a mere trickle before the war, it had developed into a good-sized stream and Penticton reacted with enthusiasm to make the tourist welcome and comfortable. Restaurants, auto courts and a large hotel sprang up as if over night, but the influx was so great that even private homes had to be called into service in the demand for rooms.

Penticton became an important trucking centre as more and more fruit was trucked to the Coast via the Hope-Princeton Highway. Bus traffic also increased so that Penticton is now one of the main passenger transfer points in the Interior. In an endeavor to compete with bus and truck service, the Kettle Valley Railway was recently completely dieselized making the railway service speedier and more efficient. To add to these transportation improvements, Penticton got a first class airfield during the war (1943). There is regular passenger service by scheduled air lines to the Coast and to Eastern Canada, as well as non-scheduled air service to the other Okanagan centres and Kamloops.

The Growth of Industry During the Second Period

The slow growth at the beginning of the second period had not brought a great deal of industry to Penticton. The small industries that did come in employed but a few men at most and the serious problem of

seasonal unemployment became increasingly troublesome. True, unemployment insurance alleviates the situation to some extent, but it does not provide a sound economic basis for either the livelihood of the workers or for the city. The need for more diversified industry is becoming increasingly apparent (and this aspect will be given more attention in the chapters devoted to industry.)

One serious problem within the fruit industry was grappled with during the second period and that was the problem of marketing. The first period was a time of growth and change from cattle ranching to fruit growing. It was a time of painful learning and experiment when the problem of growing the fruit was successfully solved. In the second period the problem of marketing the fruit which now came from the orchards in vastly increased quantity had to be faced. Competition among the individual growers and the dumping of excess fruit on the markets brought prices down and caused serious hardships among the growers generally. Co-operative organizations were formed but, although of some help, they were not as effective as they could have been so long as they competed with one another and individuals not belonging to them could undersell them on the open market. After many difficulties the growers were finally able to get together and organize a central selling agency.[11] This agency--B.C. Tree Fruits, Ltd.--has worked admirably up to now in obtaining a fair return to the orchardist for his investment and labor. There is one

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[11] The need for controlled marketing was clearly recognized by Margaret A. Ormsby in her thesis, "A Study of the Okanagan Valley," in the Dept. of History at the University of British Columbia, April, 1931. A brief history of the BCTF is contained in a pamphlet entitled, "The British Columbia Fruit Industry, a Short Review," published by the Kelowna Courier, (no publication date).

difficulty, however: although the BCTF has done much through advertising to create a market for Okanagan fruit in Canada and the United States, very little can be done to sell fruit to former markets--e.g., the United Kingdom--whose currencies have been greatly devaluated since the war. Yet, the new soldier settlements throughout the valley will soon add to the surplus of produce and the problem of finding markets promises to become more serious than ever.

It seems then that up to now in the second period of development, the fruit farmer has been able with scientific methods, good management, and the help of a central selling agency to obtain a just return for his produce. But the question of a steady and assured market still looms uncertainly on the horizon and its solution must be left to some time in the future.

The Development of the Land Use Pattern

In the foregoing sections the development of the land use pattern was only indirectly shown. In order to obtain a general view of the development, a brief discussion of it will be given here.

The development of land use in the region. Before the coming of the white man, the region was not intensively used for settlement and the only land directly connected with the activities of man was the site of the Indian village on the Okanagan River opposite the mouth of Shingle Creek.

When Mr. Ellis came to Penticton, the site of his homestead a half mile northeast of the Indian village became the first farm and the grasslands nearby a range for his cattle. In 1877 the west side of the

Okanagan River became the Indian Reserve. The Indians for some time lived much as they had done in the past but later acceded to the ways of the white man to the extent that they transformed their former hunting grounds into range for cattle. To this day the Indian Reserve is still in grazing land with the exception of a small part on the bottom lands which is irrigated for hay and fodder crops, the area put into use as an airfield in 1943, and the Penticton West Bench development.

After the Indian Reserve was established, Mr. Ellis pre-empted the land on the east side of the river and gradually expanded his holdings until they extended from Naramata to the International Boundary. He obtained irrigation water from Penticton and Ellis Creeks and irrigated much of the land north of Ellis Creek for pasture and hay. Some of his original homestead was also given over to fruit;otherwise practically all of Mr. Ellis' holdings were used for grazing cattle.

Two other farmers had come into the region and had established themselves north of Skaha Lake by 1882. But ten years later there were 13 farmers altogether and the beginning of a nucleated settlement near the Okanagan Lake front was in evidence as well.

"Land holding" on the part of the farmers kept most of the land in range until the formation of the South Okanagan Land Company in 1905. The company divided the "drift lands" (i.e., in the area now within the Penticton City boundary) into lots for orchards and provided irrigation water as well. The orchard lands nearest the settlement were probably taken up first, the tendency for them being to grow upward and outward along the terraces and away from the settlement on the bottomlands.

After the Southern Okanagan Land Company decided it was impractical to irrigate the lands beyond Four-Mile (Turnbull) Creek with water from Penticton and Ellis Creeks, the Naramata Irrigation District was formed separately and the bench lands of the Naramata area were subdivided and put into orchard.

In spite of the generally poorer land at Kaleden much of that area was put into orchard early because of the availability of irrigation water. Not so at Okanagan Falls, however, where the land is even poorer and development has been hampered further by the difficulties in obtaining irrigation water. For this reason most of the area around Okanagan Falls is still in grazing lands and the bottom lands along the river are used for hay and pasture.

Most of the land in the Penticton region had been taken up before the first World War, but the intensity of use has gradually increased up to the present time.

The most recent addition to the cultivated lands was made in 1952 when more than 200 acres were taken out of the Indian Reserve for soldier settlement (see Fig. 42 for location). The area--called the Penticton West Bench development--is divided into more than 90 lots averaging slightly over two acres each. The area will be used for residences, small orchards and gardens.

The Settlements

Okanagan Falls, 11 miles south of Penticton, existed as a small settlement in 1899[12] and doubtless served functions similar to those of

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[12] Williams' B.C. Directory, 1899, p. 209.

Penticton on the Okanagan Valley trade routes. In the early days it was a way point on the stage and wagon routes and much of the traffic to the mines of the south passed through there. The community grew very slowly along that part of the highway which runs east and west about 100 yards from the Skaha Lake front, and for several blocks along the highway after it turns abruptly south (see Plate XI). Otherwise there are three streets running south from the highway and ending rather indefinitely in orchard and farm land. Three other streets run east-west--one along the lake front and the other two south of the highway--to complete the settlement's street system.

In the early days a log school house (no longer in use) served the area's educational needs and a community hall provided a meeting centre and a place for recreation.

To-day the commercial activities of the village are centred in five retail outlets, two auto courts, two garages, one hotel, and one restaurant, all located along the highway. Manufacturing is confined to a small sawmill and a small cannery. The community still serves as an educational and recreational centre, having a two-room elementary school, two halls, and facilities for a small fair and "stampede" grounds.

There are about 60 residences in the community, the greatest density of houses occurring in the blocks immediately south of the highway. Otherwise the residences are rather thinly scattered among vacant lots, fields, and small orchards.

Naramata grew on the fan of Naramata Creek where easy access to Okanagan Lake is possible. Because the distance to Penticton is nine miles and the early means of transportation were slow and difficult, Naramata

became a nucleated settlement to serve the farmers of the immediate vicinity.

The street pattern of the town is shown in Plate XI. The commercial area is centred on the main street (which is the beginning of the main highway to Penticton) and consists of three retail outlets, one restaurant, two garages, a lodge, and two auto courts. Industry is confined to a fairly large packing house which packs and ships most of the fruit grown in the Naramata Irrigation District. The packing house has access to a dock on the lake and to the Kettle Valley Railway by means of a siding.

Educational facilities consist of an elementary school, and a youth leadership training centre (affiliated with a religious institution) which trains students from valley and interior points. Two churches serve the religious needs of the area.

Recreational facilities consist of a park and playground, a community hall, and a library.

In all there are some 80 residences in Naramata most of which are old--that is, pre-1930. Although somewhat more densely built up than Okanagan Falls, Naramata has many vacant lots, areas of bush, pasture, and orchard remnants within the townsite. Its out-of-the-way location, the numerous shrubs and trees, and the lack of bustle give Naramata the quiet relaxed atmosphere of a country village which, in fact, it is.

Penticton. Because the earliest Valley transportation routes were water routes which ended at Penticton on the shore of Okanagan Lake, it was but natural that the first settlement should grow where landing and transfer of goods and passengers was easiest. The first nucleus of

settlement therefore began on the Okanagan Lake front near the present CNR dock north of Van Horne Street. Because industry found it convenient to build near transportation facilities, those lands nearest the dock were taken over by industry. Farther back from the water front grew the commercial zone--at first consisting of a hotel, general store, post office, and livery stable--and beyond this was the residential area.

When the branch line of the CPR railway to Okanagan landing and the government dock at Penticton were completed in 1892, the settlement expected a large influx of people and accordingly a town plan was drawn up. No detailed map of this plan is now available, but it is known that the townsite was bounded by the present Ellis Street, Wade Avenue, the present railway grade on the west, and Okanagan Lake. However, as the potential orchard lands were not immediately released for settlement, the population of Penticton grew very little. Another town plan was prepared in 1905 by the Southern Okanagan Land Company (see Plate III) and with the simultaneous release of the lands for orchard the boom got into full stride.

The new town plan called for development west of Penticton Creek and commercial and industrial enterprises soon began to grow along the present Main Street away from the water front. Behind the commercial growth on both sides of Main Street grew the new residential part of the town.

On January 1, 1909, Penticton was incorporated as a District Municipality which took in all the holdings of the Southern Okanagan Land Company. The municipal area included the irrigated terraces from Four-Mile (Turnbull) Creek south to the end of the terrace sections along Skaha Lake, as well as the bottom lands east of the Okanagan River. When

the cold winter of the same year (1908-9) severely damaged many orchards, those orchards north of Ellis Creek were abandoned and the new municipality subdivided the land for residential purposes.

When in 1912 the KVR track was laid from the present railway yards to the government dock, space along the railway was at a premium and was given over to commercial and industrial interests. In the meantime the residential area between the commercial sector along Main Street and the industrial sector along the railway was filling up and began to spread out along the lake front, while east of Main Street the residences were beginning to "push" towards the foot of the terraces. A residential "ribbon development" along Main Street and Fairview Road began early, and residential outliers were soon appearing near the present railway station and east of Main Street along Manitoba Avenue.[13]

As the commercial centre filled up it began to spread out laterally along Westminster and Nanaimo Avenues, and along the north ends of Winnipeg, and Martin Streets. At the same time it grew thinly along Main Street until it reached Fairview Road.

A comparatively new form of commercial development--the auto court--began to make inroads on the land use in the thirties and, with the improvement of transportation after World War II and the consequent increase in the number of tourists, these new enterprises began to take over favorable locations along the main thoroughfares and along the shores of Okanagan and Skaha Lakes, thus adding to the ordinary residential ribbon growth.

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[13]These residential outliers were probably built up on the abandoned orchard lands which were subdivided in 1909.

North of Skaha Lake residential growth had begun more or less desultorily in the late twenties and grew little till after World War II. Even now it is growing less rapidly than the residential areas within the city proper.

Recent growth within the urban sector of the city has been filling in areas which had not been completely filled up, as well as spreading out over new subdivisions. The Central Mortgage and Housing project between Killarney and Kensington Streets and the restricted building area adjacent to Windsor Avenue are notable post-war additions to the city.

The outer fringe of the urban development is now rapidly encroaching on the orchard lands still remaining north of Ellis Creek and on other lands which had lain vacant. The pasture, hay, and vegetable lands between the river and the city proper are being considered for industry, recreation, and residences.[14] The site and environs of the original Indian village is zoned for industry and occupied by the railway yards, sawmills, a cannery, and storage facilities for construction firms. Elsewhere the fringe growth is residential.

In the chapter on Urban Land Use some of the problems of growth and of future development will be considered.

It will have become apparent in this chapter that a vast change has taken place in the Penticton region since the days when the Indian had it all to himself. Then the valley was independent and outside

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[14] A new town plan is now in the hands of the City Fathers.

influences were at a minimum. When the white man came he introduced changes so that he could gain a livelihood. He introduced cattle for which a market had to be found outside, and the valley's self-sufficiency was immediately destroyed. As comparatively few people were concerned with cattle ranching, the overall effect of this new element--the white man--within the region was not great. But with the advent of irrigation and the growth of the fruit industry, the population grew rapidly; a major change took place and considerable adjustment was necessary to re-establish that inner harmony and balance which is the test of the true geographic region.

Man changed the regional environment by building dams, introducing irrigation, planting orchards, and cutting the forests. These things were not in themselves harmful. What was harmful was the factor of imbalance introduced as he became increasingly dependent on a one-point economy. No longer was the region able to supply his livelihood; he had to depend on outside markets for his income--on markets that were uncertain at best and over which he had no control. In order to achieve a balanced economy within the region, he could do one of two things: either establish an artificial balance by obtaining assured and steady markets outside the region,[15] or change his economy to one of less specialization so that it would become more independent and less sensitive to outside influences. The two courses of action are opposites in nature and both have their merits in to-day's economy. The question to be resolved is: Has the

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[15] Which action would naturally incorporate the Penticton region within a larger region whose boundaries are defined by the locations of the markets.

Penticton region become too dependent on outside influences and, if so, what may be done to achieve a better internal balance? An attempt will be made to assess and answer this question in the following chapters.

D. THE PRESENT OCCUPANCE

CHAPTER IX

THE PRESENT POPULATION

Because man is an integral part of the geographic region, it is pertinent in a study of this kind to assess his presence within the region both from the standpoint of human resource and of population behavior. It is the plan, therefore, in this chapter to show the population distribution, to examine certain population structures, the origin, and the growth of the population. This examination should result in a better understanding of the inner structure and movements of the population as well as provide one of the important bases for predicting future growth.

Rural and Urban Composition

The Penticton region has both a rural and urban population totalling about 13,000 persons. One urban centre, Penticton, has a population estimated at 9,183. The remainder of the region may be classed as rural including dispersed farms and the nucleated settlements at Naramata and Okanagan Falls, the suburban area on the north shore of Skaha Lake and along the main highway between Skaha Lake and Ellis Creek. The total rural population is 3,780. Thus, the regional population is 71 per cent urban and 29 per cent rural--a ratio of 7:3.

The Corporation of Penticton includes the main urban area plus a rural farming area having a total population of 11,200. However, 9,183 is a truer figure for the size of the city than 11,200 which contains

FIG. 37

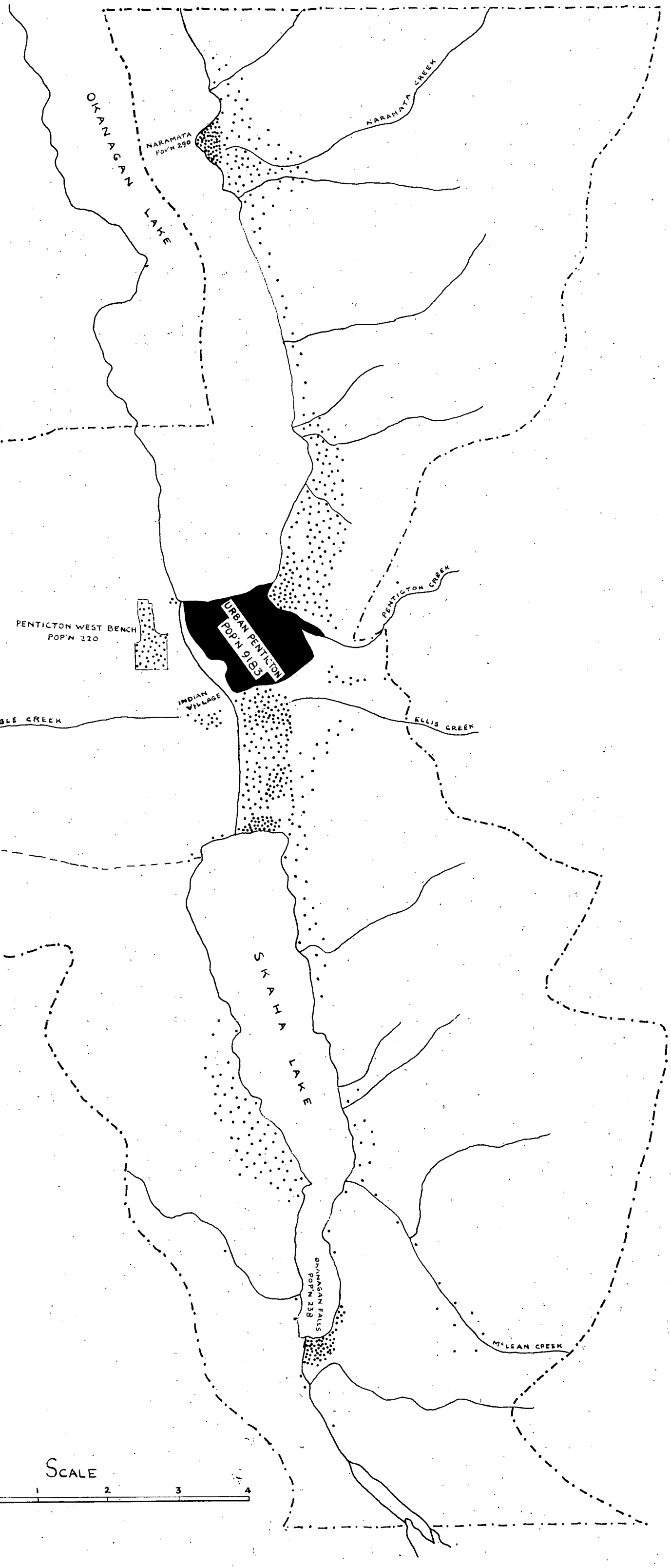
POPULATION DISTRIBUTION OF THE PENTICTON REGION, 1953*

ONE DOT REPRESENTS 5 PERSONS

* POPULATION BASED ON NUMBER OF HOUSES AS FOLLOWS:

URBAN	3·4	PERSONS PER DWELLING *
NON-FARM RURAL	3·5	" " " *
FARM	3·8	" " " *

* CANADA CENSUS, 1951



2,017 rural population.[1]

TABLE IX

THE DISTRIBUTION OF POPULATION IN THE PENTICTON REGION, 1953

Urban Population		Rural Population		Total
1. Urban Penticton	9,183	Rural Penticton	2,017	11,200
2.		Naramata (non-farm)	290	
		Naramata (farm)	456	746
3.		Okanagan Falls (non-farm)	238	
		Okanagan Falls (farm)	135	373
4.		Kaleden	307	307
5.		Indian Village	77	77
6.		Penticton West Bench	220	220
Total	9,183		3,740	12,923

Regional Population Pattern

Almost the entire population of the region is confined to the lands composed of drift materials--that is, the terraces and fans--the rough

[1]The population was estimated from data obtained in a house survey made in September, 1953 and allowing 3.4 persons per urban dwelling, 3.5 per rural non-farm dwelling, and 3.8 per farm dwelling as per Canada Census, 1951.

At the time of the survey there were 63 dwellings under construction or contracted for on the Penticton West Bench development (see Fig. 37) and the population, numbering 220, has been allotted to the development and included in the total estimate.

The bottom lands between urban Penticton and Skaha Lake were

mountainous lands being virtually uninhabited. This can be noted by comparing Figures 5 and 37.

The rural population is widely and thinly scattered on the terraces, but is concentrated into nucleated settlements on the larger fans. The rural farm population is for the most part restricted to the terraces, the smaller fans and the upper sections of the larger fans, whereas the rural non-farm population, found in heavier concentrations, is restricted to the lower sections of the fans near the lakes or along the well-travelled routes. A notable exception to the use of the terraces is found in the Indian Reserve where, but for the Penticton West Bench development, no dwelling of any kind exists and the terraces are given over entirely to grazing. The new Penticton West Bench development is therefore an isolated patch of growing population and industry in an otherwise empty area of grass and sage.

The population distribution of urban and suburban Penticton is shown in more detail in Plate IV. The greatest population density runs in a belt diagonally across the city from the northwest to the southeast. This belt is broken only by the railway and Main Street, and by school grounds and parks.[2] Small pockets of greater density exist within the belt, notably north of Westminster Avenue west of the railway; in the block bordered by Main Street, Nanaimo and Eckhardt Avenues and Ellis Creek; and the extreme southeast sector of the city. These densely

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classified as rural. All auto court units were included but each unit was allowed only half the number of persons of the regular single-family dwelling.

[2]Compare with Land Use Map, Plate IX, and Zoning, Plate VIII.

populated areas are either the older parts of the city where comparatively small lots crowded the houses together, or they may be newer parts[3] that have been more extensively built up as, for example, the Central Mortgage and Housing area on the extreme southeast.

Of medium density is the sector bounded by Fairview Road, and Eckhardt Avenue, Moosejaw Street, and Hastings Avenue. Within this area the lots are generally larger and the housing conditions not so cramped.

Areas of lesser density are found east of Penticton Creek and between Fairview Road and Main Street. In the former much of the land is waste due to Kettle formations which have been zoned for park development; in the latter, much space has been taken up by school grounds, and building has been handicapped because of the proximity of the railway which dissects the area.

Isolated concentrations of populations along the main highway south of Ellis Creek (i.e., Main Street and Skaha Lake Road) represent people living in auto courts. The population immediately north and towards the east of Skaha Lake is suburban in character. There are some summer homes but nearly all dwellings are occupied the year-round.

The Growth of Population in the Corporation of Penticton[4]

The sex and age structure of the population points "to the vigor of the population, to its potential labor supply, to its power of

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[3]For ages of buildings see Plate X.

[4]Statistics are for 1951. No Census statistics are available for other parts of the region but, as 88 per cent of the regional population lives within the city limits and as the city is both rural and urban in character, the deficiency is not so serious as it might be.

FIG. 38

POPULATION BY 5-YEAR AGE GROUPS AND SEX, PENTICTON, 1951

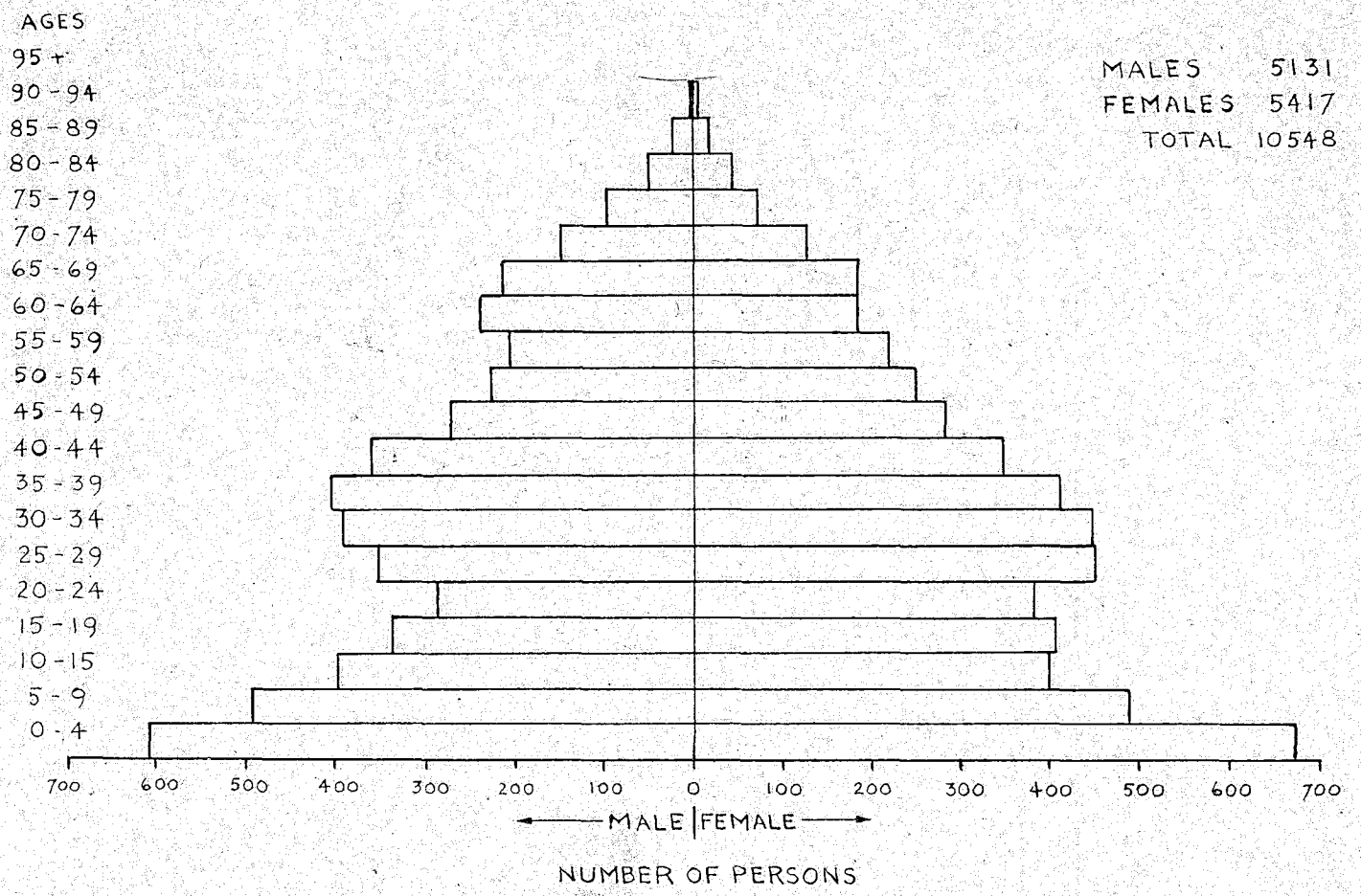
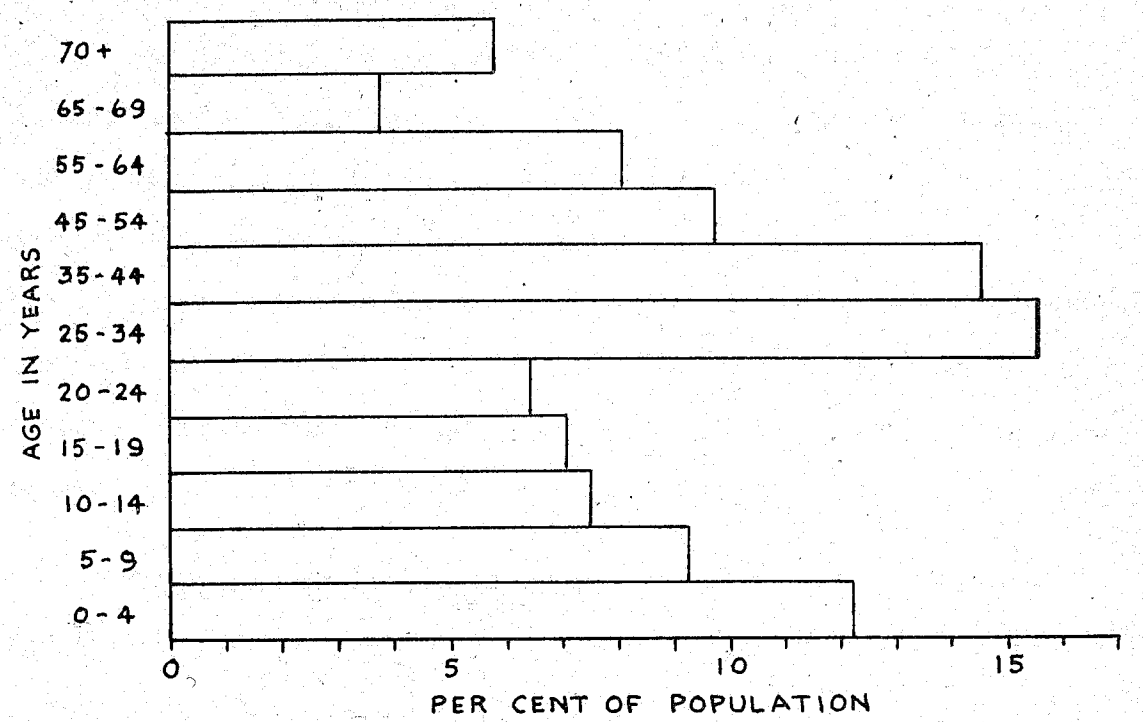


FIG. 39

PER CENT POPULATION BY SPECIFIED AGE GROUPS
PENTICTON, 1951



replacement, . . . , and, in fact, affect[s] almost every human activity associated with the region."[5]

The population of Penticton is young (see Figs. 38 and 39). Seventy-eight per cent is under 50, and over 50 per cent is between 15 and 49 years of age. This shows a high potential for population replacement as well as vigorous labor supply. The particularly large 0- to 9-year age group is a reflection of the comparative youth of the population and its ability to replace itself. The large 0- to 4-year age group indicates the need for increased school facilities within the next few years.

Natural population replacement.[6] The crude birth-rate for Penticton, 1952, was 23.4; the crude death rate, 7.3.[7] The natural increase being the excess of births over deaths per thousand of population is, therefore, 16.1. As the population of Penticton was estimated at 10,874, the total natural increase was 175. However, as the gain in population between 1951 and 1952 totalled 326, the number of immigrants for the same year must have been 326 less 175 (natural increase) which equals 151. In other words, the number of migrants into the Penticton region was less than the natural increase.

Migration and movement. Of the total 1951 population in Penticton, 3,809 were born in Canada outside British Columbia, 1,951 were

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[6]The vital statistics used were for Penticton, 1952. The population for that year was taken as 10,874--half the gain between 1951 and 1953.

[7]The crude birth-rate is defined as the number of children born per thousand of population; the crude death rate as the number of deaths per thousand of population.

born in British Commonwealth countries and the United States, 528 were born in Europe, and 60 in Asiatic and other countries. What fraction of the 4,200 born in British Columbia were actually born in Penticton is difficult to say. However, if a fourth of the 4,200 were born in other parts of the province[8] then the total immigrants to Penticton number 7,398, or 70 per cent of the population. This seems at first glance to be high, but the comparative youth of the city is a probable explanation of the matter.

Migrant labor adds greatly to the population of the region during the growing season.

> The influx of labor into Penticton and Summerland districts commences early in June when labor is needed for thinning the fruit crop. There is a gradual increase until the maximum is reached during the latter part of September; this force holds until the end of the first week of November when the picking of the apple crop is completed. The final exodus is around the middle of December when the fruit processing and packing is completed.
>
> During the peak period of September to November there would be approximately 2,000 men and 800 women employed in the fruit industry that are classified as transient workers. A great many of these return each year, coming from Grand Forks and Kootenay districts.[9]

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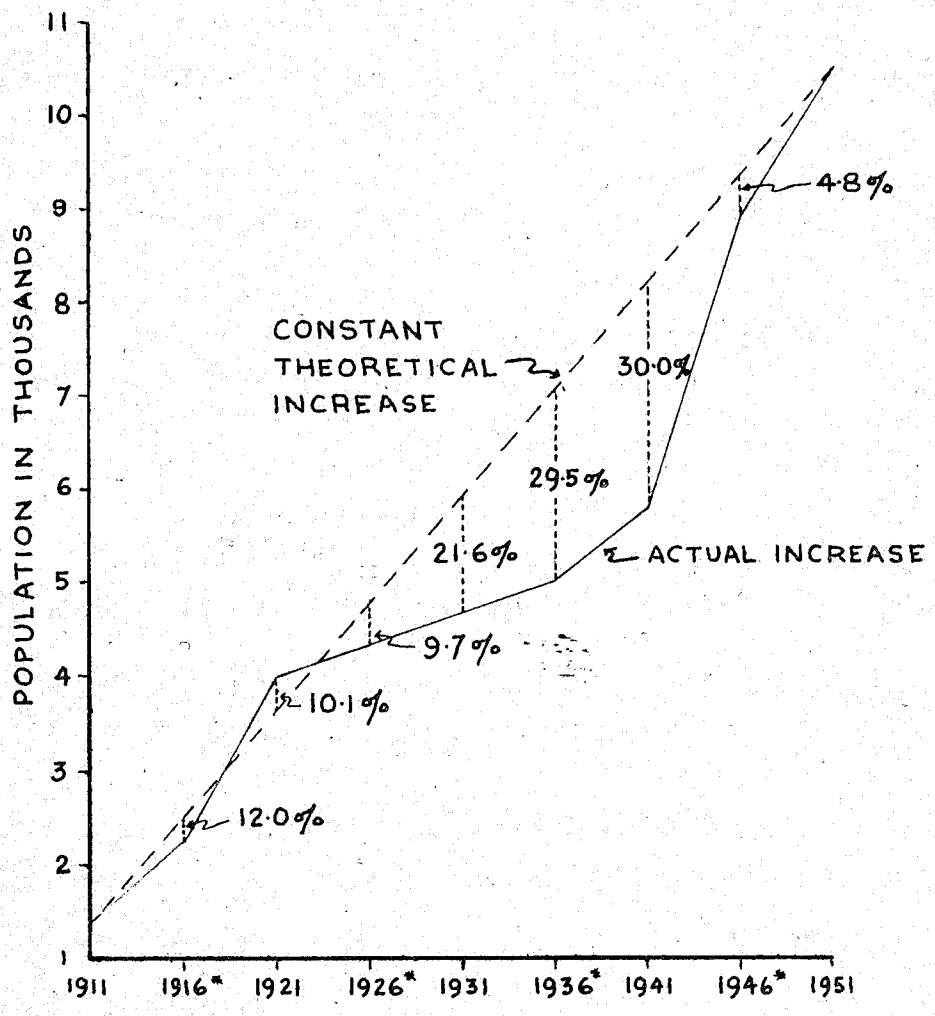
[8]This would seem to be a reasonable estimate as 1,234 and 971 came from Saskatchewan and Alberta, respectively.

[9]Personal correspondence--A.G. Thomas, Manager, National Employment Office, Penticton, B.C., Mar. 1, 1955. The information contained in Table X was also supplied by Mr. Thomas.

FIG. 40
POPULATION VARIABILITY INDEX
FOR PENTICTON



$$\text{VARIABILITY} = \frac{4{\cdot}8+30{\cdot}0+29{\cdot}5+21{\cdot}6+9{\cdot}7+10{\cdot}1+12{\cdot}0}{8} = 13{\cdot}5\%$$

(AFTER A. GEDDES, GEOGRAPHICAL REVIEW, 1942, VOL. 32, P. 569)

* ESTIMATED POPULATION

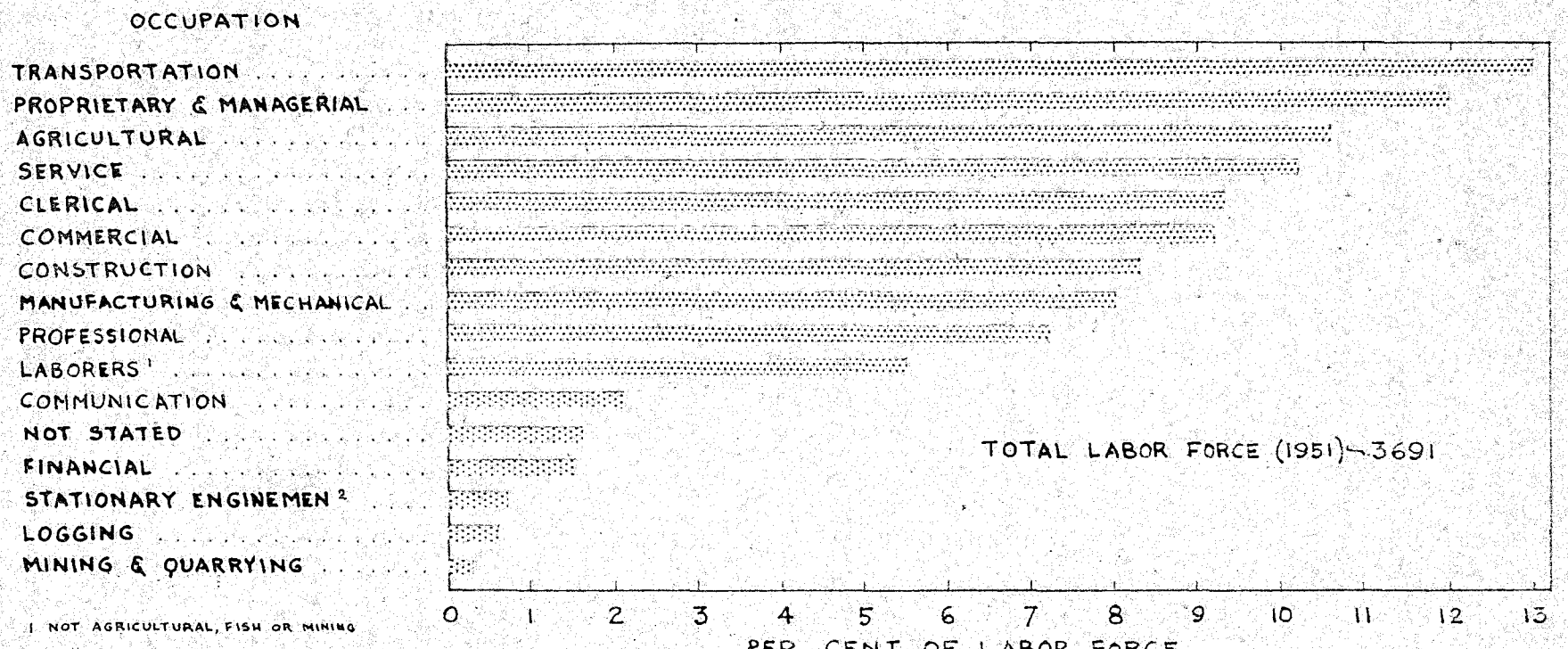
TABLE X

THE INFLUX OF MIGRANT LABOR INTO THE PENTICTON AND SUMMERLAND REGIONS DURING THE FRUIT SEASON

Month	Male	Female
June	400 men for thinning	
July	500 men for cherry picking	300 women for cherry processing and packing
August	400 men for apricot and peach harvest	500 women for apricot and peach picking, processing and packing
September	700 men for apple picking	200 women for apple packing

Population growth. As was intimated in the foregoing sections, the growth of the population equals the sum of the natural replacement plus the net migration--i.e., the difference between the immigration and the emigration--over the period under consideration. In the previous chapter on the Sequent Occupance, the growth of the population was shown graphically (see Fig. 35) and reasons for the different rates of increase were suggested. It was noted how the growth fluctuated from time to time and a measure of this fluctuation is shown in Fig. 40. The average fluctuation or variability over the eight five-year periods between 1911 and 1951 was found to be 13.5 per cent, a very considerable amount. But the maximum fluctuation is 30 per cent and, as in climate, it is the extremes that are the most difficult to deal with. Thus an erratic growth makes city planning a demanding task for the planner, a worrisome chore for the administrator, and a costly fare for the taxpayer.

FIG. 41



LABOR FORCE, 14 YEARS AND OVER, BY OCCUPATION

PENTICTON, 1951

CANADA CENSUS 1951

The Social Geography of Penticton

The ethnic structure of the population is often significant in a region because national traditions and characteristics have certain cultural and political influences; in other words, it may determine the manner in which a region is used and the very "character" of the region.

Penticton City is dominantly white racially and British nationally. Some 97.6 per cent of the population belongs to the white race, 72 per cent of which is of British national background. There are a few Asiatics (2.4 per cent) of Chinese and Japanese origin and a small percentage are Indians of the Salish tribe. About one quarter of the city's population (25.6 per cent) is comprised of some 13 other white nationalities, the most important of which according to number are German, Scandinavian, French, Dutch, Russian, Italian, Ukrainian, and Polish.

Occupational structure. The percentage of the total labor force in the various occupations is shown in Fig. 41. The high percentage in transportation is not extraordinary when Penticton's importance as a transportation centre is taken into consideration (see section on transportation). The importance of Proprietary and Managerial together with Service, Clerical, and Commercial, show Penticton's status as a commercial centre. The high percentage in Agriculture is unusual and makes Penticton quite unique as a city in this respect. Indeed, it emphasizes the dual characteristics (urban and rural) of the corporation. The importance of agriculture in the Penticton region must not be judged only by the percentage in the city's labor force. Not included in this percentage is the large transient labor force (see section on Migrant Labor and Table X above) which invades the region during the fruit season and makes

agricultulture the greatest single employer of labor in the region.[10] The fact that only about eight per cent of the labor force is engaged in manufacturing is significant and will be discussed in more detail in the chapter devoted to the industries.[11]

In the entire region there is little noticeable ethnic separation in the occupations except, perhaps, among the Indians who raise cattle on the Reservation, and among the Chinese who tend to be restaurateurs and vegetable farmers. Generally speaking, the population of European origin is quickly assimilated especially after the first generation and--as far as is known--no particular phase of industry or activity is more the prerogative of one nationality than another.

To predict the future population of a region two conditions are necessary if the predictions are to be reasonably successful: one, the history of the past population growth must be known; and, two, man's response to the environmental possibilities present in the region must be closely examined. The first condition has been met; the second will be the subject of the following chapters.

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[10]It should be noted again that the figures in the table also include the Summerland region.

[11]For a breakdown of the labor force 14 years of age and over by industry and sex for Penticton, 1951, see Appendix C.

CHAPTER X

RURAL LAND USE

The use to which man has put this region is on the one hand dependent on the physical environment and on the other, on the state of man's culture. The Penticton region is eminently suited to both cattle ranching and fruit growing. At the beginning man depended on cattle ranching because it suited the region, the character of his culture and needs of regional economy. Later he adopted fruit growing, again because it suited the region and because new-felt needs brought on by certain material advancements (e.g., population increase and better transportation) demanded a change in occupation. Man's motivating force is his needs and desires, and he puts the physical region to use to satisfy those needs and desires. The present use and potentialities of the rural region will be examined geographically in this chapter. It is pertinent first to assess the lands.

I. AGRICULTURE

Classification of the Rural Lands

The rural lands may be divided into three main classes: (1) the cultivable, (2) non-cultivable lands, and (3) uncultivated areas occupied by non-farm settlements. The lands which are occupied by rural settlements have been discussed under the Sequent Occupance and will receive no further attention here. Of the cultivable lands those which are at present under cultivation are of special interest to this study because they provide the

main source of income for the region. Those lands which may be brought under cultivation in the future are, however, also important as they are one of the chief factors in the region's full-scale development. The rough mountainous lands and those which must for one reason or another be left in range will always be of minor importance and will be discussed briefly at the end of this chapter.

The Agricultural Lands

The physical aspects of the land. A comparison of Fig. 5 and Plate IV shows that all the cultivable lands lie in the drift areas where soil materials have been deposited in relatively even-surfaced landforms. The surface configurations and parent materials of these lands have been discussed under Geomorphology. The hydrography dealt with the surface and ground waters of the land; and the chapter on vegetation and soils dealt with the soil types. Two things regarding the physical aspects of the agricultural lands must still be shown:

(1) The degree of usefulness of the lands for agricultural purposes. To show this the soils are divided into five groups as follows:[1]

Group I - - - - - very good soils

Group II - - - - - good soils

Group III - - - - - fair soils

Group IV - - - - - fair to poor soils

Group V - - - - - doubtful soils[2]

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[1] In the summer of 1953 a comprehensive survey was made of the soils of the Okanagan Valley and their suitability for irrigation. The data, although unpublished, were made available through the courtesy of Mr. C.C. Kelley, B.C. Dept. of Agriculture, Kelowna, B.C.

[2] For further description of each soil group see Appendix D.

(2) The irrigated, potentially irrigable, and non-irrigable lands. The distribution of these is shown in Plate VI, and they are presented according to acreage and soil group in Table XI.

TABLE XI

AGRICULTURAL LANDS OF THE PENTICTON REGION
(INCLUDING THE INDIAN RESERVE)

Soil Group	Irrigated Acreage	Potentially Irrigable Acreage	Non-irrigable Acreage	Total Acreage
I	477	23	7	507
II	937	267	73	1,277
III	1,537	870	68	2,475
IV	1,629	2,587	410	4,626
V	812	3,485	961	5,258
	5,392	7,232	1,519	14,143

Note: Non-arable acres total about 630 acres.

A study of Plate VI and Table XI shows that all the best or first class agricultural land (Group I) lies on the east terrace between Penticton Creek and Naramata, and of this all but a small fraction is irrigated. The second class lands are somewhat more widely dispersed but again the largest acreage is found relatively close to Penticton. Of the lands in Groups I and II over 1,400 acres are irrigated and slightly more than 260 acres are potentially irrigable. However, practically all of these potentially irrigable acres either lie within the Indian Reserve, are zoned for urban development, or lie at an altitude of over 2,000 feet

where fruit growing is risky due to lower temperatures and irrigation water is difficult to supply. The third class lands are widely dispersed

TABLE XII

AGRICULTURAL LANDS WITHIN THE INDIAN RESERVE*

Soil Group	Irrigated Acreage	Potentially Irrigable Acreage	Non-irrigable Acreage	Total Acreage
I	0	0	0	0
II	0	83	0	83
III	10	614	3	627
IV	4	523	0	527
V	0	1,494	122	1,616
	14	2,714	125	2,853

*Does not include 250 acres within the Penticton West Bench development.

throughout the region, but nearly two thirds of them are irrigated and about a third, less than 900 acres, are still irrigable. However, of these over 600 lie within the Indian Reserve and for the present at least must be considered unavailable. The only potentially irrigable lands which still exist in quantity are those belonging to the fourth and fifth classes which grade from fair to poor to doubtful. A third of these lands lies within the Indian Reserve, some lie east of Poplar Grove at elevations which make fruit growing risky and irrigation impractical. The largest areas are farthest from Penticton and are found south of the developed lands at Kaleden and southeast of Okanagan Falls.

This then is the situation in brief regarding the potential agricultural lands: The good lands (Groups I to III inclusive) still unused for agriculture, total about 1,160 acres of which 700 acres lie within the Indian Reserve and the remainder at altitudes of over 2,000 feet. Therefore, for fruit growing there are at present no good agricultural lands available in the Penticton region. Of the poorer lands (Groups IV and V) over 6,000 acres are potentially irrigable and of these a third

TABLE XIII

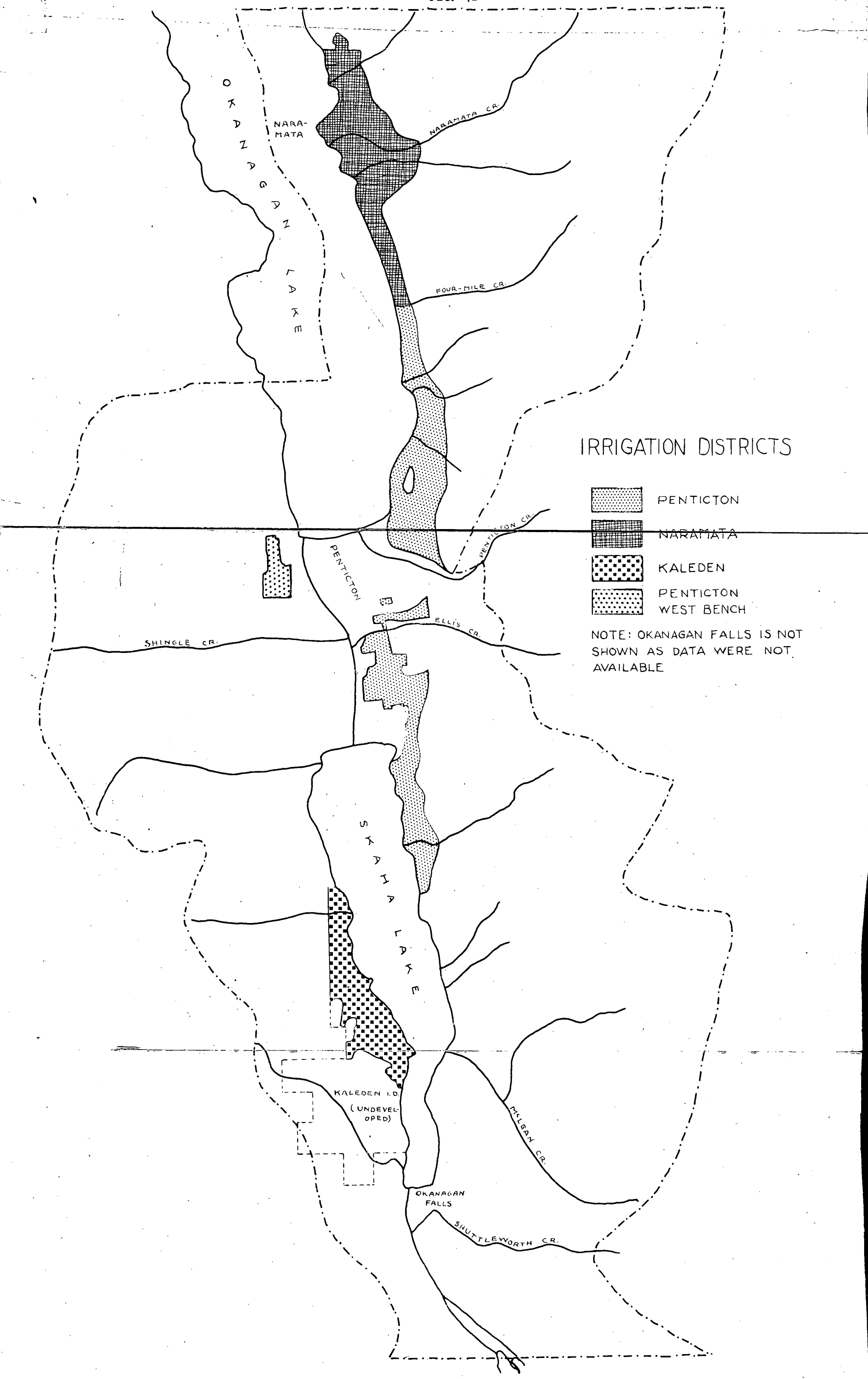
AGRICULTURAL LANDS NOT INCLUDING THE INDIAN RESERVE

Soil Group	Irrigated Acreage	Potentially Irrigable Acreage	Non-irrigable Acreage	Total Acreage
I	477	23	7	507
II	936	184	73	1,193
III	1,526	256	66	1,848
IV	1,625	2,065	410	4,100
V	811	1,991	840	3,642
	5,375	4,519	1,396	11,290

lies within the Indian Reserve; however, nearly 3,500 acres of the 6,000 belong to the doubtful group and, although developable, must be given every advantage and care to make cultivation profitable.[3]

[3] That is, cheap and plentiful irrigation water, fertilizer, and extensive markets for fruit so that competition from the good lands would not be too great.

FIG. 42


OKANAGAN LAKE
NARA-MATA
NARAMATA CR.
FOUR-MILE CR.
PENTICTON CR.
PENTICTON
ELLIS CR.
SHINGLE CR.
SKAHA LAKE
KALEDEN I.D. (UNDEVELOPED)
McLEAN CR.
OKANAGAN FALLS
SHUTTLEWORTH CR.
IRRIGATION DISTRICTS
PENTICTON
NARAMATA
KALEDEN
PENTICTON WEST BENCH
NOTE: OKANAGAN FALLS IS NOT SHOWN AS DATA WERE NOT AVAILABLE

Non-arable acres including undrained swamps and the rubble sections of Ellis and Shingle Creeks total about 630 acres. The distribution of these lands is shown in Plate V.[4]

Irrigation

Because of its importance to the economy and use of the land a brief discussion on the problem of irrigation is pertinent here.[5]

The irrigated lands are incorporated into four main systems: the Naramata, Penticton, Kaleden, and Okanagan Falls Irrigation Districts, and a new but minor district--the Penticton West Bench (see Fig. 42).

The Naramata Irrigation District serves over 1,000 acres in fruit from a gravity system having its source of water in Naramata and Arawana Creeks and principal storage in Eleanor and Chute Lakes. Nearly 100 per cent of this district is now under sprinkler irrigation. Sufficient water--more than 2½ acre feet per acre are delivered at a cost of $18.00 per acre per season. Water loss is estimated at 25 per cent between storage and intake.

The Penticton Irrigation System serves about 2,500 acres in fruit from an 85 per cent gravity system having its source of water in Penticton and Ellis Creeks with storage in the headwaters. About 15 per cent is supplied by pump with a 20-foot lift from the Okanagan River. Rapid conversion to sprinkler irrigation is taking place. Water delivered per acre is about 2½ acre feet at a cost of $14.00 per acre per season. The

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[4]Terrace faces and gullies are not included among the non-arable lands as no estimate of their extent is available.

[5]See Fig. 3 for location of dams, reservoirs, lakes and streams supplying water to the irrigation districts.

amount of water delivered is considered hardly adequate but may be sufficient when the entire district is under sprinkler irrigation. The system is in good repair and less than 5 per cent water is lost.

The Kaleden Irrigation District has a gravity system which has its source of supply in Brent and Marron Lakes with a diversion ditch from Shingle to Marron Creeks. This district, too, is converting rapidly to sprinkler irrigation. About 3½ acre feet of water per acre are delivered which is adequate. The cost, however, is comparatively high at from $27.20 to $31.20 per acre per season. The water loss is estimated at 20 per cent.

The Okanagan Falls Irrigation District has no water storage facilities as three dams in succession have been washed out and the financial backing for new construction has not been forthcoming. Water is supplied 75 per cent by gravity by a diversion flume from Shuttleworth Creek, and 25 per cent by pump from the Okanagan River. Three acre feet of water per acre are delivered which is not considered adequate for the type of land serviced. The cost per acre is $9.00 per season. More than 25 per cent of water is lost between storage and intake.

Although no data are available to bear out the assumption, it is doubtless true that with increased storage facilities more water could be supplied from the plateau. The cost of constructing dams is greater than some of the irrigation districts can bear--at least at present. The southern part of the region--Okanagan Falls--is especially poorly served with storage. Due to the generally poorer lands in the area and the somewhat drier climate,[6] more water is needed than in the better lands to

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[6]The climate becomes progressively drier to the south. The precipitation at Oliver averages only 9.8 inches per annum.

the north. It is highly probable that even with maximum storage facilities this area would still have to pump water to supply all the potentially irrigable lands.

The problem of supplying the Indian Reserve with water is one that has not been seriously investigated. Doubtless it is an important consideration for the future. The fact that some Shingle Creek water is already being diverted to Kaleden, lessens Shingle Creek's potential use for the Reservation. If future water storage facilities should prove inadequate, sufficient water is available to all districts from the valley lakes and the Okanagan River. The expense of raising water to great heights for irrigation makes pumping on a large scale prohibitive. In future, however, when the pressure of population becomes greater and adequate markets are available, more of the lands may be pressed into service. Too, by then cheaper power may be available to make irrigation by pumping entirely practical.

The Distribution of the Orchards

Because of the dryness of the Okanagan climate, tree fruits will grow only where irrigation is practised. Lands which are otherwise suitable for tree fruits are therefore only a potential resource until water is brought to them. With the combination of climate, good land, and water, tree fruits grow exceptionally well--as well or better than in most other parts of the Okanagan.

Plate VII shows the distribution of the six major fruits grown in the area. It is immediately evident that all the fruits are widely dispersed throughout the cultivated lands and that none are restricted to

a particular area.[7] In other words all fruits will grow where the land is good enough and water is available.

Apples consist of 31 per cent of the fruit trees in the region (see Table XIV) and they are the most evenly dispersed. There seems to be a heavier concentration, however, on the eastern terraces between Naramata and Skaha Lake than in other parts of the region. Generally

TABLE XIV

THE NUMBER AND VARIETIES OF FRUIT TREES IN THE DISTRICTS OF THE PENTICTON REGION 1952

District	Apples	Pears	Peaches	Apricots	Cherries	Prunes and Plums	Total
Naramata	24,469	14,217	12,417	14,052	4,372	2,949	72,476
Penticton	57,829	43,785	40,515	17,006	5,687	10,760	175,784
Kaleden and Okanagan Falls	17,718	13,956	14,220	20,479	3,006	3,924	73,303
	100,016	71,958	67,152	51,539	13,265	17,633	321,563

speaking the apple orchards are older than the stone fruit orchards and new plantings tend to concentrate on stone fruits, especially peaches and apricots.

Pears have about the same regional dispersion as apples but tend to be more concentrated locally. Pears comprise 22 per cent of all fruit

[7] This does not mean that some fruits or varieties of a particular fruit will not do better in one microclimate than in another. It means that generally speaking the overall climate of the Penticton region is suitable for growing all the fruits whose distribution is shown on the map.

trees in the region.

Peaches make up 21 per cent of all fruits and, although they are grown in all parts of the region, a definite concentration is to be noted in the environs of Penticton especially on the valley floor between Ellis Creek and Skaha Lake. Many of these peach orchards are young and it is likely that they are replacements--at least in part--of orchards that were killed or severely damaged in the exceptionally cold winter of 1949-50.

Cherries are definitely a minor crop comprising only 4 per cent of all fruit trees. They are found more or less evenly dispersed throughout the region.

Prunes and plums also are minor crops which together make up only 6 per cent of all tree fruits. The terraces east of Skaha Lake to Ellis Creek and Okanagan Falls show a definite lack in these fruits. Otherwise, although widely enough dispersed regionally, they tend, like pears, to be more concentrated locally.

Comparison With Other Okanagan Regions

A comparison of the Penticton region with other Okanagan regions as to the numbers of the various fruit trees in each may shed light on certain problems confronting the fruit industry in Penticton.

Reference to Table XV shows the concentration on stone fruits in the Southern Okanagan. At Penticton 47 per cent are stone fruits, at Summerland 44 per cent, and at Oliver-Osoyoos, 42 per cent. At Kelowna, however, less than 30 per cent are in stone fruit and at Vernon only

1h per cent. The major crop is apples and this crop has the greatest

TABLE XV

THE NUMBER AND VARIETIES OF FRUIT TREES OF FIVE OKANAGAN REGIONS 1952*

Region	Apples	Pears	Peaches	Apricots	Cherries	Prunes and Plums	Total
Penticton	100,016	71,958	67,152	51,539	13,265	17,633	321,563
Oliver-Osoyoos	103,h47	66,672	115,766	59,008	25,h5h	38,753	h09,300
Kelowna#	378,011	110,h03	h9,768	26,h26	50,28h	71,221	706,113
Vernon†	206,796	20,08h	3,656	h,167	7,262	h3,90h	285,869
Summerland	80,617	52,829	hh,160	3h,h38	9,019	17,219	238,282

*From the 1952 Horticultural Survey, B.C. Department of Agriculture.

#The Kelowna region includes Okanagan Centre, Winfield, Kelowna, Westbank and Peachland.

†The Vernon region takes in Enderby, Armstrong, Vernon, and Oyama. It is doubtful whether Enderby and Armstrong should be included in the Vernon region. However, their total number of fruit trees is only 5,230 of which h,0h9 are apples.

single value in all regions.

Of all the regions it would seem that Oliver-Osoyoos has the best balance in the quantities of each fruit grown and Kelowna is next. Vernon falls short in all stone fruits except prunes, and Summerland and Penticton are lacking in cherries, prunes, and plums.

It is but natural that fruit-processing industries be attracted first to regions which not only grow the most fruit but also to those which grow varieties suitable for processing and, moreover, can supplement

fruits with different kinds of vegetables. The Penticton region has therefore two important drawbacks when compared with the three other major regions: it has neither the quantity nor the variety of fruits grown at Oliver-Osoyoos and Kelowna, nor has it any vegetables to supplement the fruit processing as have Vernon and Kelowna, and to a lesser extent Oliver-Osoyoos. Furthermore, except for dehydration, peaches do not lend themselves easily to processing other than canning. To make dehydration profitable, large quantities must be processed and these quantities are not available after the fresh and canned fruit industries have been served. Further discussion of this problem will be left to a later chapter on the manufacturing industries.

It might be pointed out here that Penticton does have an important geographic advantage over all the Okanagan regions except Oliver-Osoyoos. This advantage lies in the earlier ripening of fruit than in the regions to the north and, hence, favored opportunity on the market.

II. CATTLE RANCHING

Although cattle ranching was at one time the most important industry in the Penticton region, it has gradually declined so that to-day it is of only minor importance. The rich grasslands on the terraces have been displaced by orchards. Most of the valley bottom on the east side of the Okanagan River is also in farms, and cattle have been relegated to the lands that are at present unsuited or unavailable to fruit growing.

Range is restricted to two kinds of land: (1) the rough mountainous lands and (2) cultivable lands at present unused either because they are poor, lack irrigation water, or are located within the Indian Reserve. The best grazing lands fall into the second group whose distribution is shown in Plate V. The Okanagan Falls-Kaleden area and the Indian Reserve have the largest amounts of good grazing land. A considerable area is found on either side of Penticton and Ellis Creeks after they leave their canyons, and isolated patches are found all along the cultivated terraces and at higher elevations on the eastern valley wall.

Pasture, hay, and other fodder crops are grown on the valley bottom on the Indian Reserve, east of the Okanagan River north of Skaha Lake, and at Okanagan Falls. A sizable pasture-hay area is located along McLean Creek east of Okanagan Falls and smaller patches are found at Marron Valley, near Naramata, and in the higher-altitude lands east of Poplar Grove.

Much of the hay consists of wild grasses and sedges which grow abundantly in the swampy areas along the river and other smaller streams. Some oats and timothy are grown at Okanagan Falls and on the Indian Reserve where they are cultivated with more or less indifference.

As the cold is never very great and the snowfall is light, the cattle are kept on the range all winter. Some feeding is necessary, however, if they are to be kept in good condition.

Overgrazing in the brown soils areas has led to severe depletion of forage and a consequent decline in the number of cattle the region can support. The overall effect of overgrazing is explained as follows:

> Due to less favorable conditions for plant growth, the effects of overgrazing have been more drastic [in the Brown Soils] than in the Dark Brown and Black Soils. With moderate overgrazing, bluebunch wheatgrass has been replaced by spoargrass, dropseed grass, and other secondary grasses. Severe abuse has resulted in the elimination of even these grasses of moderate grazing value and desert shrubs and annual weeds have come to be dominant. At present the area occupied by the original type of bunchgrass cover is relatively small.[8]

Ranching in the Penticton region is devoted entirely to beef cattle. Their numbers in the region are not known as the only statistics available cover a much larger area which includes the entire South and Central Okanagan. The cattle are marketed locally and in the Lower Mainland.

As the orchard lands continue to expand on to lands which are at present in range, cattle ranching will continue to decline in importance. Eventually ranching will be confined to the very poorest lands and the rough mountainous areas.

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[8] C.C. Kelley and R.H. Spilsbury, Soil survey of the Okanagan and Similkameen Valleys, British Columbia, Report No. 3, (King's Printer, Ottawa, 1949), p. 29.

CHAPTER XI

URBAN LAND USE

The City of Penticton is unique in that 36 per cent of its land area is in orchard (see Table XVI). Of the remaining 64 per cent, 25 per cent is barren and 39 per cent is used in the functions of the city. In other words, the orchard lands almost equal in area the lands used in the urban functions. Such a rural-urban character has certain advantages as, for example, control of growth outside the urban limits; but it also has disadvantages which arise through natural conflict between rural and urban elements, such as differences in taxes, city services, road building and up-keep, etc., and continual adjustments must be made. Whether it was wise to include such a large area within the city limits is questionable; experiments in controlling suburban growth have been tried in the environs of certain British Columbia centers (notably at Kelowna) with good results. The tendency to sprawl because of too much room--and in Penticton's case because of lack of adequate planning--is difficult to keep in check and the want of compactness results in the inefficiency of land use, of services, and in the spending of available funds for service improvements. Certainly Penticton has had--and is having--its problems, and it is possible that major surgery to limit its areal extent and make it conform to a more urban character will solve some of these problems.

As the orchard lands on the terraces have already been examined, the discussions in this chapter will be limited to that part of Penticton which is bounded by the Okanagan River, the lake shores, and the foot of

the eastern terraces. The Penticton City boundaries are shown on Plate XIV.

The Urban Land Pattern and Land Use

General. A comparison of the zoning (Plate VIII) and the land use (Plate IX) in Penticton discloses that the dividing line between zones is often non-existent and that one zone merges into and intermingles with another in such a manner as to hinder seriously their own and the city's functions. As it is, the land use shown in Plate IX often represents a generalization of the actual use especially near the zonal boundaries and the map must therefore be read with this reservation and preferably with the map showing the subdivisions. Thus much of the land zoned for industry is still in orchard, field crops, or assigned to recreation (golf). Residences encroach on industrial and commercial zones, notably west of Railroad Street and alongside much of the railway between Eckhardt Avenue and the lakeshore. Generally the land pattern follows the zoning; however, a more strict enforcement (where the regulations are good) of the zoning regulations is indicated.

The urban land pattern shows the results of too much room and inadequate planning. It grew from a small nucleus near the old wharf on Okanagan Lake and, accepting the lines of the old Columbia and Western Railway grade for a main thoroughfare (now Main Street) spread southward along this route and to either side. The first residential area was scattered and indeterminate, but the early commercial and industrial cores spread out along the early transportation routes and clung jealously to the water front.

TABLE XVI[1]

URBAN LAND USE: AREAS AND PERCENTAGES OF THE TOTAL LAND AREA

Major Divisions	Acres	Per Cent
Total land area of city	8,390	100
Total area of land	7,402	88
Total area of water	988	12
Land Use		
Orchard	2,700	36.48
Farm	140	1.89
Single-family dwelling	745	10.06
Multiple-family dwelling	10	0.14
Tourist courts and auto camps	45	0.61
Commercial	30	0.41
Light industry and warehouses	50	0.67
Heavy industry	40	0.54
Railway and Power	150	2.03
Public buildings, schools, churches	425	5.75
Parks, golf course, recreation	265	3.58
Vacant	390	5.29
Barren	1,860	25.13
Roads (Length, 75.3 miles)	459	6.20
Lanes (Length, 22.6 miles)	55	0.74
Total	7,364*	

*Difference from land total equals 38 acres or 0.51 per cent.

The commercial land pattern. With its roots in the early lake front development, the commercial core grew out along Main Street and, like the trunk of a tree, widened its base as it grew longer in its upper reaches. To-day it is almost triangular in shape and, instead of beginning "pruning operations" on the widespreading shoots and filling up still available down-town spaces present zoning (1953) is encouraging it to send

[1] Walker and Graham, Town Plan for Penticton.

out shoots along the main thoroughfare. The result of this will be an interrupted "ribbon" development which from the standpoint of the customer who likes to do his shopping in a compact, centralized area, is undesirable; through traffic will find it an increasing impediment; and prospective home builders will tend to avoid it. Much better and entirely desirable are the smaller commercial areas such as the one on Government Street which are restricted to supplying only immediate family needs.

Use. About 75 acres are being used for commercial purposes, the land being allotted for the following enterprises: retail, wholesale, restaurants, services, theatres, financial, printing and advertising, offices, garage and filling station, used car lots, hotels, and auto courts. Included with these are light industries such as bakeries, bottling works, dairies, and ice cream and confection manufacturing.[2]

The industrial land pattern. The land zoned for industry is more than adequate for present and foreseeable purposes. The bulk of it lies in a crescent from Main Street west to the Okanagan River and, bending northward with the railway, goes to Eckhardt Avenue in a broad, half-mile swath. Beyond Eckhardt and still following the railway, it enters residential and commercial zoning to the detriment of industry, commerce, and residents alike. A large block of land on the rubble fan of Ellis Creek has also been zoned for industry.

Use. Altogether 560 acres have been reserved for industry, 516

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[2]These industries are for the most part intermingled with the commercial enterprises and in generalizing the land use in which they are located they cannot always be shown separately on a small scale map.

acres for heavy and light industry and 44 acres for light industry only.[3] Ninety acres are at present in use for machine shops, a foundry, woodworking establishments, sawmills, canneries, packinghouses, and chemical works, and, of necessity storage space for raw materials, finished products, and containers.

The residential land pattern. Haphazard growth is indicated in the layout of the residential areas where the street pattern is often eccentric for no apparent reason as if the subdivisions were added like so many afterthoughts to the original nucleus on the lakeshore. Odd angles, off-set streets, blind alleys, narrow block divisions where houses on adjacent lots face in opposite directions[4] mar the beauty and efficiency of the street pattern and with it the residential pattern as a whole. Generally speaking the residential subdivision is clearly an effort at making the best of a situation after it is too late to do much about it.

Use. The residential land area consists of 755 acres which are subdivided into three categories: Single family dwelling, multiple dwelling, and restricted building. The single-family dwelling tends appropriately enough to be located away from the multiple dwelling which

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[3]Regional Industrial Index of British Columbia, Bureau of Economics and Statistics, B.C. Department of Trade and Industry, 1954 edition.

[4]Notably in the block east of Lakeview Street where some houses face on Lakeview Street and others on adjacent lots face on Brunswick Street; and in the block north of Churchill Avenue east of Power Street where some houses face Churchill Avenue and others a nameless alley or indeterminate street across which are the back yards of houses facing Lakeshore Drive--and this in a supposedly restricted building area.

has "moved into" the older residential sections near the commercial and industrial cores.[5] The three restricted building areas are attractively located and the one on either side of Windsor Avenue is particularly well laid out--a product of recent planning. Also well laid out but monotonous in aspect because of too great similarity in the appearance of the houses is the Wartime Housing Project in the extreme south-east sector of the city. It will be noted also that some land near Skaha Lake has been subdivided for residential purposes.

The recreational land pattern. Few cities have been as provident as Penticton in setting aside lands for parks and playgrounds which have a total area of 265 acres. Large tracts of these lands are well dispersed throughout the urban sector and a number of extensive parcels are located south of Ellis Creek--one adjoining Ellis Creek and others near Skaha Lake.

Use. Some of the parks notably on the Okanagan Lake front and that adjoining the City Hall have been developed and the beach, lawns, and trees are beautiful and a great asset to the city. Kings and Queens Parks have an ice hockey arena, race track ovals, a grandstand, and ball fields; and a playground south of the central school grounds has been developed into a ball park. Most of the other park lands are unimproved and are for the most part still in their original state.

Non-orchard farm lands pattern. Non-orchard farm lands are found in isolated but sizable patches along the river and where drainage is too restricted for orchard lands.

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[5]Compare Plate X on building ages and Plate VIII on zoning.

Use. About 140 acres is in farm use and much of the 390 acres described as vacant in Table XVI is actually in pasture. Besides hay and pasture the farms are devoted to growing vegetables--root crops such as potatoes, carrots, beets, turnips, and green vegetables such as cabbage, lettuce, and celery. The total acreage in commercial vegetable production is small; however, it is augmented to some extent by kitchen gardens common to many residences in the urban sector of the city. A few horses and cows are supported on the pasture and hay lands, but there is no commercial dairying.

Orchard land pattern. About 400 acres of the better drained land between Okaha Lake and Ellis Creek are in orchard. Occasional interruptions of poorly drained, open or partly wooded lands occur among the orchards. Another 150 acres of orchard lands in isolated patches are found north of Ellis Creek but are being rapidly taken over by residential developments. With better drainage much of the land near the river and between the residential section on the north shore of Okaha Lake and the present orchard lands could be put into orchard, albeit the land is of only fair quality.

Use. The orchards consist of all varieties of fruits with many younger plantings in stone fruits especially peaches and apricots.

The wastelands pattern. The wastelands include uncultivated grass-lands, the rubble section of Ellis Creek fan, the swampy areas alongside Lakeshore Road and near Eckhardt Avenue Bridge, the vacant areas zoned for industry, and uncleared poplar-willow growth.

Use. Most of the swamp lands will be drained and put into park; the bush lands are gradually being cleared for agriculture; and the uncultivated

grasslands and rubble will at some time support residential and industrial developments.

This then is the pattern of land use. North of Ellis Creek and bounded by the river, Okanagan Lake, and the foot of the terraces lies the densely populated urban area in which the lands have been zoned for the various urban functions. From the center of the commercial core the city spreads out in a rough semi-circle somewhat more than a mile in radius. The railway looping through this densely populated area divides it into three parts, the largest of which lies within the loop and contains the commercial core, most of the manufacturing industries and half the residential area. On the fringe of the urban area lie farm and orchard lands and lands zoned for industry but which are for the most part unused. Isolated dwellings with here and there "group" encroachment on orchard lands give the fringe a rural to suburban character.

South of Ellis Creek and bounded by the river, Skaha Lake, and the foot of the terraces lies a rural area with suburban encroachments along the highway and on the shore of Skaha Lake. This area is mostly in orchard and in pasture and hay lands, and to a lesser extent in vegetables. Certain wastelands are suitable for residences and industry, or may be developed as parks. Although this area is now rural, much of it may be taken over by urban development in the not-too-distant future.

Of recent years a progressive spirit and a growing desire to correct insofar as is possible the poor planning of the past has resulted in the creation of a Town Planning Commission and the engagement of professional

town planners[6] to assess the situation and make recommendations for future plans. These plans are now completed and have been turned over to the City Council for consideration. As regional and city planning are in some respects the field of geography, it is perhaps pertinent to this study to examine the new plans to discover how well they consider not only the urban area, but also the region on which the urban area depends. Before doing this, however, it will be necessary to study the industries and potential industries of the region so that judgments and recommendations may be based on solid foundations.

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[6] Walker and Graham, Vancouver, B.C.

CHAPTER XII

THE INDUSTRIES

Whatever the make-up of a region, the industries which it can support are in the final analysis the determining factors which make for a way of life in a particular culture. On looking back over the preceding chapters a study of the landforms, climate, hydrography, vegetation and soils has shown that the Penticton region is physically well suited to two kinds of primary industries--cattle ranching and fruit growing. In the chapter on the sequent occupance it was shown how changes in social and material development brought about a change in industry: how the pressure of population, improvements in transportation and markets brought about the "switch" from cattle ranching to fruit growing. Cattle ranching, although still carried on, is now relatively minor to agriculture. With the large influx of population other industries came into being, but again these were more or less based on agriculture. Even sawmilling is largely given over to agriculture in the provision of box shooks; and the tourist industry trades on "blossom time," "Peach Festivals," and the fruit harvest.

It becomes increasingly obvious that the Penticton region's livelihood is based to a very great extent on a one-point economy which is extremely sensitive to extra-regional changes in economic conditions, and which has the further disadvantage of being subject to large seasonal fluctuations. This problem has long been recognized and the need for diversification of industry is apparent. The purpose of this chapter then is to study the distribution of the existing industries and their relation-

ships to the local and extra-regional environment--the relationships of necessity including sources of raw materials and markets; and, having done this, and taking into account the relevant geographic factors, suggest some paths along which diversification may follow.

I. THE MANUFACTURING INDUSTRIES[1]

Enterprises in Fruit

The most important enterprises in the Penticton region are those engaged in preserving and packaging fruit. This is to be expected as the agricultural lands are given over almost entirely to fruit growing. Fruit is handled (a) in packing-houses where it is packed and shipped fresh to market and (b) in canneries where it is preserved by canning before being shipped to market.

The fruit packing industry. There are five packing-houses in the region; one in Naramata, three in Penticton, within the industrial area located on the Okanagan Lake front, and one at Kaleden. These packing-houses serve the districts in which they are located although the Penticton houses pack some fruit from Naramata and, with the one at Kaleden, help to take care of fruit from Okanagan Falls as well.

The raw materials used in the packing industry are the various fruits, the paper tissue fruit wrappers, colorful labels, and wooden box containers. The fruit is grown within the region; the wraps and labels are printed in Vancouver; and the containers are manufactured by local sawmills and assembled in the packing-houses.

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[1] Except where otherwise stated, the information on the various manufacturing industries was obtained through personal interviews with representatives of the industries.

Table XVII shows the tree fruit production of the Penticton region for a number of sample years. It will be noted that the production fluctuates from year to year, the chief controlling factor being climate--exceptionally cold winters and/or occurrence of frost during critical

TABLE XVII[2]

TREE FRUIT PRODUCTION FOR THE PENTICTON REGION

Year and Av. Price *	Apples	Pears	Peaches	Cherries	Apricots	Prunes	Plums
1930	795,597	46,530	101,763	31,639	11,602	17,695	22,090
Av. Price	1.30	1.50	1.00	2.25	1.25	0.65	0.80
1935	707,795	77,866	75,933	38,139	47,429	29,660	17,648
Av. Price	0.90	1.20	1.00	1.50	1.00	0.65	0.75
1940	873,363	87,034	167,540	36,834	49,391	24,756	16,132
Av. Price	0.80	1.25	0.70	1.90	0.95	0.55	0.65
1945	820,829	154,258	426,533	86,800	70,106	102,613	26,370
Av. Price	2.00	2.50	1.15	3.00	1.50	1.00	0.90
1950	1,403,969	147,192	114,093	63,508	13,877	93,085	21,330
Av. Price	1.60	2.99	1.68	4.43	2.23	1.14	1.35
1953	956,137	208,450	407,641	52,464	142,739	53,230	12,382
Av. Price	2.45	2.63	1.185	4.40	1.615	0.906	0.909
Weight per box	42--lb.	42--lb.	20--lb.	20--lb.	20--lb.	15--lb.	15--lb.

*Prices are average for the entire Okanagan and are for fresh fruits only. The above production figures include both fresh and manufactured products.

periods. Percentage wise, except for a "bumper" crop in 1950, apple production has increased the least,[3] whereas apricots have increased the

[2]Data obtained from B.C. Department of Agriculture, Kelowna, B.C.

[3]The year 1950 shows a large decline in stone fruits particularly

the most. Peach, pear, and prune production increased at much the same rate and cherries and plums declined. After the severe winter of 1949-50, most of the badly damaged trees were replaced by peaches and apricots which are now coming into production. The value of the 1953 apple crop was about one and one half times the value of all the other fruits combined. Pears were the next most valuable crop, followed by peaches, apricots, and cherries, respectively.[4] Prunes and plums are not important.

Since World War II the overseas market for fruit has declined due to currency restrictions, the United Kingdom taking but a small part of its pre-war purchases. Brazil, which at one time provided a valuable outlet for apples, dropped from the 1954 market altogether due to the lack of American and Canadian dollars. West Germany has made one or two "token" purchases in the post-war years but prospects for developing this market in the near future are not too bright. Production of European apples has increased considerably since the war and it is unlikely that the foreign demand for Okanagan fruit will ever rise to the pre-war level.

In spite of heavy production of their own, the United States are a valuable market for British Columbia apples. The superior quality of the Okanagan product and the attractive packaging create a good demand, especially in the mid-Western and "Corn Belt" States. However, American subsidizing of the native fruit industry has in the past contributed to the difficulty of selling unsubsidized foreign fruit on the American market.

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in peaches and apricots because of the severe cold spell in January and February of that year. The apple crop, instead of being adversely affected showed an unusually large yield.

[4]The value is useful for a rough comparison only. The cost of production varies with each fruit.

The best and most reliable market for Okanagan fruit lies within Canada itself, particularly Manitoba, Alberta, Saskatchewan, and British Columbia where fruit from Eastern Canada cannot compete successfully on the market because of generally poorer quality and cost of freight shipment. However, superior quality Okanagan fruits do compete in the home market of Eastern Canada--even in Nova Scotia--but only to a limited extent. All soft fruits are at present sold in Canada. With a general increase in population the Canadian market will expand and the day is not too distant when all the fruit the Okanagan can produce will be sold in Canada.

Large fluctuations in the price of fruit (see Table XVI) have occurred in the past, but in post-war years have been kept within reasonable range because of (1) a more stable economy in the market areas, (2) the regulated flow of fruit to market,[5] and (3) the cessation of fruit dumping on the market by individual farmers.

The fruit canning industry. Two canneries are located in the Penticton region, one--a fairly large one--in the industrial zone on Waterloo Avenue south of the railway station in Penticton; the other--a comparatively small one--in Okanagan Falls.[6]

The same kinds of fruits that are packed fresh for shipment are also canned. Some drawbacks to the development of really large canning and fruit processing enterprises in the Penticton region were mentioned in the chapter on Land Use and will not be reiterated here.

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[5]That is, by the central selling agency--B.C. Tree Fruits, Ltd.

[6]One old cannery on the Okanagan Lake front is no longer in use.

Besides fruit, the raw materials for the canning industry are sugar, cans, box containers, and labels for the cans and practically all these raw materials come from Vancouver. Unlike fresh fruits which need the rigidity of wooden containers for protection, canned fruits may be shipped in cardboard containers which are both lighter and cheaper. Thus the local sawmills have lost a considerable market for box shooks.

The markets for canned fruits are essentially the same as those for fresh fruits.

Food and Beverage Enterprises

Food and beverage manufacturing enterprises are responsible for more than half the gross value of manufactures in Penticton (see Table XIX). Foods and beverages are manufactured in the canneries, two bottling works, two dairies, and four bakeries. The canneries, being concerned with fruit, were discussed in the preceding section. The other enterprises are distributed throughout the commercial and light industrial zones, for the most part in or near the down-town retail area.

Practically all the raw materials (except fresh fruit) for these industries come from outside the region although they may be supplied to the industry by local wholesale or distributing agencies. Thus, the bottling works order their sugar, syrups, and bottles from Vancouver, the dairies get their milk and cream from the North Okanagan, and the bakeries import flour from Calgary and other ingredients from Vancouver.

The bottling works make soft drinks only; the dairies pasteurize and sell fresh milk and cream, make ice cream, ice cream mix, cottage cheese, chocolate milk, and yogurt; and the bakeries make bread and the usual bakery confections. Nearly all these products are sold locally and

in the South Okanagan, the exception being the products of one large bakery which caters to the wholesale trade and ships its products as far north as Vernon, and west and east to Princeton and Grand Forks.

The Wood-working Enterprises

These consist of two sawmills located in the industrial zone opposite the mouth of Shingle Creek, three sash and door factories two of which also make furniture and household fixtures, and a small boat-building works which also makes furniture and wooden toys. All the non-sawmilling enterprises are located in or near the down-town commercial zone.

Sawmilling. Timber growth in the South Okanagan is much lighter than in the north because of the meager rainfall, and all the mature timber immediately accessible has been cut. Much of the timber on the nearby plateau areas is inaccessible due to lack of roads and the roughness of the terrain. This means that the local sawmills have had to go ever-farther afield for their logs. The Kettle Valley and the Princeton area at distances of from 50 to 70 miles are to-day the chief sources of supply and 90 per cent of all logs must be brought in by train. The remaining 10 per cent are brought in by truck from scattered areas closer by.

The sawmills cut rough lumber most of which is shipped to the United States and a small portion to the Prairie Provinces. Some is cut into box shooks for the local fruit industry and the rest is finished for the local building trade.

Next to foods and beverages, and in spite of distance of log supply, sawmilling and other wood-working enterprises are the most important manufacturing industries in Penticton.

The other wood-working enterprises make sash and door fixtures and furniture. They obtain their hardwoods from Vancouver supply houses and soft woods from the local sawmills. Their trade is almost entirely confined to Penticton and the South Okanagon market.

Metal Products

Metal products are made by one foundry, two machine shops, two pipe and flume works,[7] and a small spraying machine factory.

The raw materials for the foundry consist of scrap metal gathered from valley points, sand from Vancouver, and fuel from the Crows Nest Pass. The products are relatively small iron and steel castings of pulleys, pipes, manhole frames and covers, and grates, etc. Some aluminum castings are also made.

Most of the castings find a local and valley market, but some are shipped to widely scattered Interior points.

The other metal works receive practically all their raw materials--sheet metal, structural steel, angle iron--from Vancouver. They produce farm implements such as disks, cultivators, spraying machines, heavy equipment for trucks and sawmills, irrigation pipes and flumes, heating equipment, eaves troughs, and so forth.

Whereas the valley is the chief market for metal products, other Interior points from the Thompson to the Kootenays are important outlets. A superior type of spraying machine manufactured in Penticton sells well in Washington and Oregon States, and 25 per cent of all shipments go to Australia and New Zealand.

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[7] One of the pipe and flume works is combined with a chemical spray industry.

Chemical Works

One chemical works located in the triangle made by the railway, Rigsby Street and Wade Avenue, is almost completely concerned with the manufacture of insect sprays[8] and is the only such firm in the Okanagan Valley. The raw materials (mostly chemicals) come from Vancouver, Calgary, the Crows Nest, and Texas (sulphur). The Okanagan Valley and other British Columbia fruit growing areas are the markets for this industry.

Miscellaneous Industries

These include awning and Venetian blind works, a small dental laboratory, tailoring, dress-making, and shoe repairing. Of these the most important is the first-mentioned which gets its raw materials from Vancouver, Toronto, and Montreal, and sells chiefly to local and valley points. The other smaller industries serve local needs.

Assessment of the Manufacturing Industries

To best assess the state of manufacturing in Penticton, a comparison with the other principal Okanagan centres is requisite.[9] Table XVIII has been drawn up to make this comparison.

The City of Kelowna has consistently led in the number of persons employed in the manufacturing industries and has more than the combined gross value of production of Penticton and Vernon. The column showing the

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[8] A subsidiary of the firm also makes metal pipes and flumes.

[9] Compare also with other B.C. cities in Appendix B.

TABLE XVIII[10]

MANUFACTURING STATISTICS FOR THE THREE PRINCIPAL OKANAGAN CITIES

Municipality	Year	Number of Manufacturing Enterprises	Number of Employees	Gross Production Value in Dollars	Employees as a Percentage of Municipal Population
Penticton	1937	(Not available)	100*	(Not available)	1.6*
	1941	" "	100*	" "	1.7*
	1947	11	148	1,063,831	1.6 (1.7)#
	1948	17	209	1,301,898	2.0 (2.3)#
	1950	17	237	1,721,820	2.4/
	1951	25	280	2,272,716	2.7/
Kelowna	1937	21	438	1,302,758	8.8
	1941	22	452	2,112,802	8.8
	1947	28	645	5,121,425	6.8 (9.0)#
	1948	26	683	5,747,217	6.8 (9.1)#
	1950	33	743	5,727,496	9.1/
	1951	35	697	6,054,184	8.2/
Vernon	1937	16	246	1,188,843	5.2
	1941	20	213	985,564	4.1
	1947	32	383	2,761,558	3.5 (5.7)#
	1948	39	376	2,785,794	3.4 (5.3)/
	1950	38	374	2,771,490	4.9/
	1951	43	434	3,136,521	5.5/

*Estimated.

#Corrections using adjusted population figures. All three Okanagan cities grossly overestimated their postwar populations. For example, in 1949, Kelowna claimed 10,000, Vernon 11,000, and Penticton 11,000, and, in spite of continued rapid growth, Kelowna had only 8,517, Vernon 7,822 and Penticton 10,548 by 1951. Accordingly the populations for the years 1947, 1948, and 1950 were adjusted by using the 1941 and 1951 Census figures as guides and allowing a proportionate increase for each year of the decade.

/Additions to the table from subsequent releases of statistics.

[10]The data for the years 1937 to 1948 inclusive are taken from Dept. of Trade and Industry, Industry and Markets in the Okanagan, Similkameen, and Kettle Valleys, (Victoria, B.C.), August 1951, p. 34.

industrial employment as a percentage of the total municipal population[11] is significant. The trend for Penticton was downward to 1947--which indicates that the population was increasing faster than employment in industry--and very slowly upward till 1951 which indicates the reverse. For Kelowna the trend was upward till 1950, after which it took a sharp drop; for Vernon it fluctuated but changed little on the average. Employment in manufacturing has increased in all three centres during the 15-year period, but only in Penticton's case has it kept pace with the increase in post-war population.

The table shows furthermore that the percentage of municipal population employed in manufacturing in Penticton is less than half of Vernon's and less than a third of Kelowna's. Table XIX which gives an itemized account of manufactures in the three Okanagan centres casts some light on the reasons for these differences. The food and beverage production in Vernon and Kelowna is much greater than at Penticton for reasons already suggested (see Rural Land Use). Sawmilling and wood-working enterprises are vastly more important in the northern centres because of the greater timber resources there. Moreover, printing and publishing, and allied industries at Kelowna and Vernon are important enough to be specially categorized, whereas at Penticton which serves a smaller regional population, they are less important and were included with "All other industries."

Further comparison of Table XIX with Table XX shows that Penticton's industrial employment is lower than that of the Census sub-division within which it lies and much lower than that of the province.

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[11] The weakness in the figures of this column should be pointed out. It is obvious that the urban population concerned with manufacturing

TABLE XIX[12]

GROSS VALUE OF PRODUCTION OF MANUFACTURING INDUSTRIES IN THE PRINCIPAL OKANAGAN CENTRES, 1948

Cities and Industries	Number of Enterprises	Gross Value of Production
		$
Penticton		
Foods and beverages	5	786,737
Sawmills and other wood-products	6	249,073
All other industries	6	266,088
Kelowna		
Fruit and vegetable preparations	3	2,032,160
Other foods and beverages	6	691,782
Printing, publishing, and allied industries	4	177,727
Sawmills and other wood-products	11	2,704,407
All other industries	2	141,141
Vernon		
Foods and beverages	6	1,206,863
Printing, publishing, and allied industries	3	181,587
Sawmills and other wood-products	27	1,294,301
All other industries	3	103,023

at Vernon and Kelowna are not all included within those cities' boundaries, whereas at Penticton a large farming population is included. This makes the actual Vernon and Kelowna percentages lower and the Penticton ones higher than those shown in the table. In other words, although the Penticton percentages would by no means equal the other centres', the disparity is not as great as the table indicates.

[12]Industry and Markets, etc., op. cit., p. 76.

TABLE XX[13]

INDUSTRIAL EMPLOYMENT AS A PERCENTAGE OF POPULATION

Year	Region 3* Per Cent	British Columbia Per Cent
1933	1.6	4.1
1941	3.0	7.6
1948	4.2	8.0

*Region 3 is a Census subdivision in which the Okanagan Valley is situated.

Manufacturing Prospects

An analysis of the Okanagan manufacturing industries has shown that, although considerable expansion has taken place since 1933 in the number of establishments and employment, the kinds of industries have remained substantially the same.[14] That they will tend to remain the same in the foreseeable future is likely although increasing specialization and refinement of product will gradually increase employment within the industries.

As Penticton's agricultural and timber resources are much inferior to those of Vernon and Kelowna, it is extremely unlikely that Penticton will ever equal the northern cities in manufactures allied with those resources. However, there is still a great deal of room for expansion in Penticton's fruit processing industries and it is likely that the greatest

[13] Industry and Markets, etc., op. cit., p. 33.

[14] Ibid., p. 51.

expansion will take place there. Obviously more labor is necessary in processing fruit--that is canning, dehydrating, making fruit juice, vinegar, wine, glace fruits, etc.--than in packing fresh fruit, and if Penticton's aim is to expand its population, it must direct its efforts towards the manufacture of more "refined" and therefore more valuable fruit products. As is shown in Table XXI, too much fruit grown in the Okanagan is processed outside the valley, and Penticton should make every effort to obtain a share of the processing which could be done more economically there. There should be good prospects for the production of fountain fruits and apricot juice.

TABLE XXI[15]

FRUIT PRODUCTION AND PROCESSING, 1948

Crop	Percentage of B.C. Fruit Grown in Region 3*	Percentage of B.C. Processing Done in Region 3
Apples (including crab-apples)	87.23	95.53
Apricots	99.70	64.21
Cherries	82.54	50.38
Peaches	99.48	61.22
Pears	89.71	49.58
Plums and prunes	84.69	53.38

*Essentially the Okanagan Valley

Present indications are that the lumber industry will not expand

[15]Industry and Markets, etc., op. cit., p. 44.

greatly because of the limited timber resources, and it may even decrease in value when the building "boom" begins to wane and competition from more favored areas becomes more intense. However, "the future of the lumber industry can be favorably affected by the development of by-products. . . . Experimentation with little-used species may offer possibilities for future expansion. The current use of lodgepole pine for box-shook and lumber manufacture indicates that opportunities are not necessarily limited to the timber species previously exploited."[16]

There is room for expansion in the wood-working industries such as in furniture and household fixtures, for specialties in wood such as toys, novelties, and--for the specially skilled craftsman--carvings, souvenir pieces, and oddities such as clock cases similar to those made by the Swiss during their "off-season."

The other industries, particularly those which have only a local or valley market will increase their productivity as the population they cater to grows; but competition from the Lower Mainland and the other Okanagan centres will almost certainly keep the markets confined to the Penticton region and the southern part of the valley.

It has been suggested that Penticton would be an ideal site for an aircraft factory,[17] and if this were so, it would be a great boon to the city and the region. However, only under certain contingencies such as war which would negate the economic and geographic factors involved, would such an industry be feasible. Certainly Penticton has an excellent

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[16] Industry and Markets, etc., op. cit., p. 41

[17] In conversations with civic officials.

airport and the climate is doubtless more suitable than in many regions where aircraft industries flourish. But lack of the necessary raw materials, cheap power, and skilled labor, and, moreover, distance to sources of supply would--at least under current conditions--make the successful establishment of an aircraft industry highly questionable. Yet, the possibility exists (if carried on under government subsidy) and no condition is hopeless until proved so. However, in view of the meager possibility, it would be foolhardy for Penticton to concentrate its efforts on the establishment of an aircraft industry to the extent that efforts to attract more likely industries would be neglected. Indications point strongly to the fact that Penticton will have to depend on the smaller manufacturing enterprises, particularly on those allied to the fruit and lumber industries. By doing so she will be building her economy solidly on the raw materials that the region can supply, or to which it has relatively easy access.

Potential industries that might bear investigating are also related to the fruit industry. One such is lithography for the production of the millions of colorful labels for the box containers and cans; another is bee-keeping for the production of honey from the fruit blossoms; still another is the making of confections from fruit and, possibly, honey, and so forth. The expansion of industries which manufacture agricultural implements should also be sought. First-hand knowledge of requirements in the Okanagan fruit industry coupled with the kind of inventiveness that has already been demonstrated,[18] might well result in

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[18]For example, a hydraulic lift being manufactured in Oliver for thinning, pruning, picking, and spraying of fruit trees has shown promise; and the "turbo-sprayer" manufactured in Penticton is definitely of a superior kind.

the manufacture of implements which are both cheaper and better suited to their purpose. Indeed, numerous regional specialties requiring some originality could be developed, and the services of bodies such as the B.C. Research Council might well be sought in the development of new enterprises.

It should be obvious that, if the Penticton region intends to manufacture articles that are not based on fruit, it must concentrate on compact, light weight, high-value articles that can better the price and match or supersede in quality similar products manufactured elsewhere. The problems involved offer a challenge to initiative, originality, and even daring--a challenge that has been successfully met countless times in our economy of free enterprise.

II. THE NON-MANUFACTURING INDUSTRIES

Construction

The rapid growth of Penticton since World War II has given the construction industry considerable importance. As may be seen in Fig. 41, 8.3 per cent of the total labor force, or approximately 300 persons are employed in construction.

Because of the availability and comparative cheapness of the building materials, practically all new residential buildings are of wood or of wood and stucco. Commercial buildings also are often of wood and stucco, but there is a strong tendency towards a more permanent type of structure sometimes of cement blocks and, more rarely, of concrete or brick.

Construction materials such as cement, brick, nails, roofing, glass, and structural steel are obtained from the Lower Mainland, mostly

from Vancouver; lumber, sand, and gravel are obtained locally.

Figure 43A shows the value of building construction in Penticton and Kelowna for the post-war years. The two cities are not strictly comparable because much urban construction at Kelowna adjoins the city but is not included in the building values, whereas at Penticton even rural construction is included.[19] Nevertheless, some rough comparisons may be made. The total building values of Penticton and Kelowna for the nine post-war years are remarkably close. Both cities show a good deal of fluctuation in the values of construction, but Penticton's values are considerably steadier. Some fluctuations may be explained by the construction of large, single buildings of considerable value as, for example, the new Penticton hospital and arena; others, by construction of large projects such as the Central Mortgage and Housing development in the southeastern sector of Penticton.

Figure 43B shows that in six years out of nine, the value of residential construction in Penticton exceeded that of commercial construction. This could be indicative of the number of people who have come to Penticton to retire rather than to go into business. According

TABLE XXII

COMMERCIAL AND RESIDENTIAL CONSTRUCTION IN PENTICTON AND KELOWNA AS PERCENTAGES OF THEIR TOTAL BUILDING VALUES FROM 1946 to 1954 (INCLUSIVE)

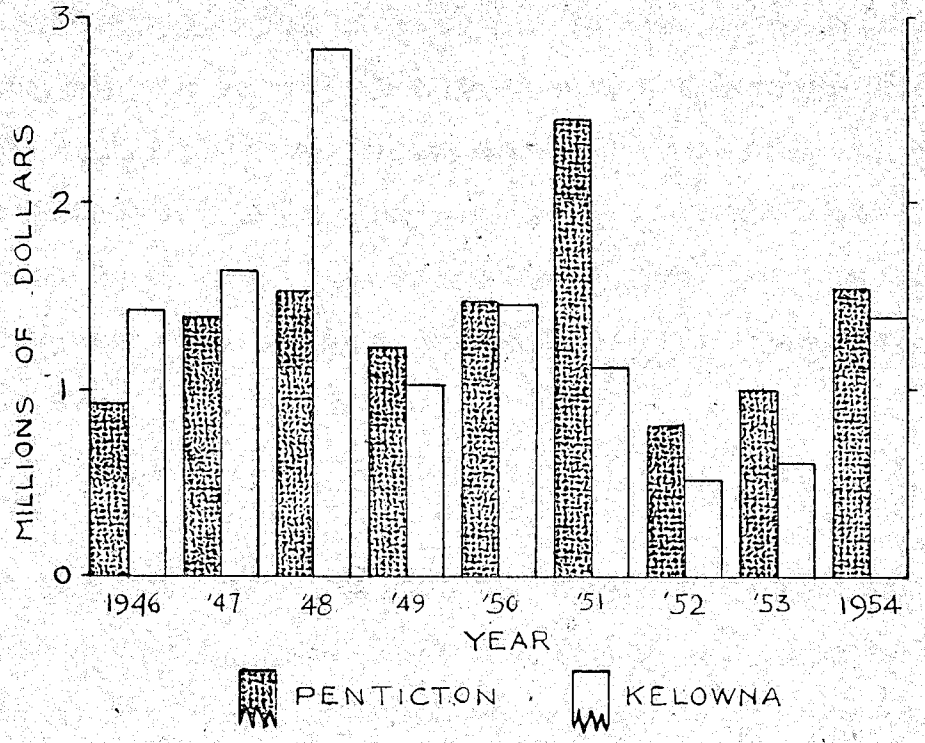
City	Commercial Per Cent	Residential Per Cent
Penticton	47	53
Kelowna	53	47

[19]Construction data for Vernon were not available for all post-war years so that no satisfactory comparisons could be made between construction in that city and in Penticton.

FIG. 43

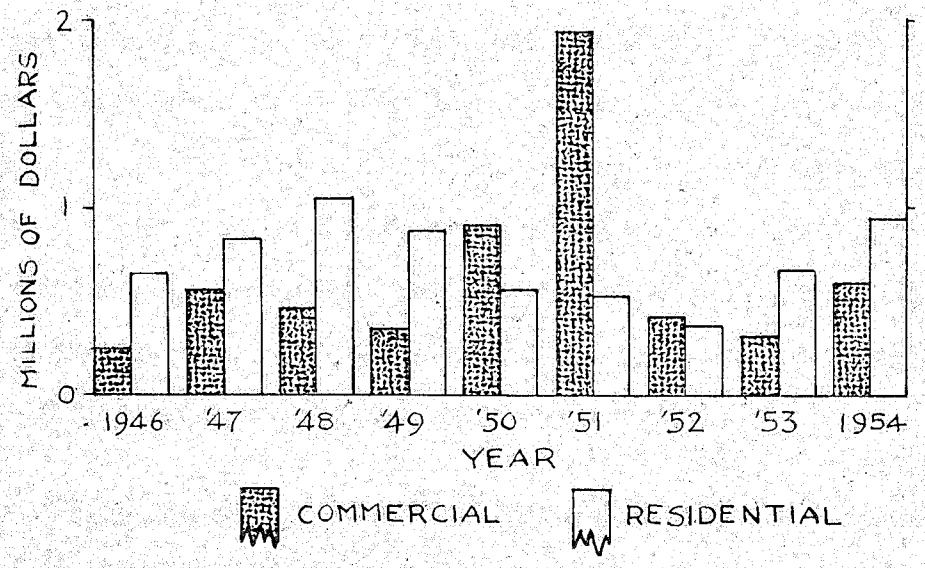
A

VALUE OF BUILDING CONSTRUCTION
IN PENTICTON AND KELOWNA
1946 - 1954



B

VALUE OF COMMERCIAL AND RESIDENTIAL
CONSTRUCTION IN PENTICTON, 1946-1954



to Table XXII, the opposite trend appears at Kelowna where manufacturing is of greater importance and where the population increase is less rapid.

Certain signs such as the decline in building values in 1952 and 1953 indicate that the post-war building boom is approaching an end. If this is so, it will be much to Penticton's advantage as it will provide a "breathing spell" during which the back-log in services (see Public Utilities) may be caught up. Nevertheless, a "healthy," more normal growth should be maintained and construction--as an industry--will continue to prosper.

Commerce

In the chapter on the sequent occupance it was shown how Penticton --even as an Indian village--achieved importance as a trading centre because it was a nodal point in the valley trade routes. The same is true to-day but even to a greater degree because the trade routes are now of many kinds and come from more varied directions and from greater distances. Moreover, the commodities finding their way to and from Penticton have increased vastly in number and kind. The early, primitive commerce has literally given way to a flood of goods which, moving into the city, are either used there or trans-shipped to other points. Commerce may therefore be divided into two kinds, that which is carried on within the city and is both retail and wholesale in nature, and that which is carried on outside the city and the region and is restricted mainly--from Penticton's point of view--to wholesaling.

The retail trade. The retail trade is centred in the commercial area of "down-town" Penticton, but small, isolated commercial areas

catering to immediate family needs are strategically located in the residential parts of the city. Naramata, Kaleden, and Okanagan Falls also have several retail outlets. In 1951 the stores in Penticton numbered 155 and varied from small to medium in size. However, there are several large stores of the department, hardware, furniture, and supermarket varieties. Most of the smaller stores are found together in groups under one roof as a part of a hotel or building block; others are "sandwiched" together but are actually separate buildings.

Penticton is a retail shopping centre not only for the region but also for towns such as Summerland, Oliver, Osoyoos, Brideaville, Rock Creek, Keremeos, and even Hedley and Princeton. Although these towns are well supplied with stores of their own, many of their residents depend on Penticton stores for greater choice in goods. These wider choices are most often found in clothing, household furnishings and equipment, sporting goods, and machinery, but rarely in foods.

Assessment. According to Table XXIII, the retail trade at Penticton compares very favorably with that of Kelowna and Vernon, even though Penticton's immediate region is not as populous as those of the other centres. Because no other large centre lies closer to the potential customer than does Penticton, Penticton's "drawing power" for retail trade goes farthest afield. It will probably continue to extend this drawing power as the populations of and the transportation facilities to and from the various settlements increase. Summerland, being the largest and closest of the extra-regional areas doubtless carries on the greatest per capita trade with Penticton. The Oliver-Osoyoos and Keremeos regions probably come next, and Princeton and the Boundary region east of Osoyoos

come last being farthest away.

TABLE XXIII[20]

VALUE OF RETAIL AND WHOLESALE TRADE AND THE NUMBER OF RETAIL STORES IN THE PRINCIPAL OKANAGAN CENTRES, 1951

Centre	Wholesale	Retail	Number of Retail Stores
Penticton	$ 8,466,100	$12,746,000	155
Kelowna	6,712,100	12,838,000	140
Vernon	16,837,200	12,938,000	135

The wholesale trade. Vancouver wholesale houses make a practice of establishing branch houses in the larger Interior centres for conveniences and speed in the handling of commodities. Penticton, because of its location, is the natural distributing centre for all the South Okanagan from Summerland to the International Boundary and, because of its excellent railway connections, for all the settlements along the railway from Penticton to Grand Forks. The Keremeos area is also supplied from Penticton, but not Hedley and Princeton which purchase more or less directly from the Coast. Some articles such as flour, feeds, and cereals are obtained from the Prairie Provinces, particularly Alberta. Fresh vegetables when in season come from the North and Central Okanagan, otherwise from California. Canned vegetables are brought in from other parts of British Columbia and Eastern Canada. Citrus fruits and juices, and

[20] B.M. Hamilton, Editor; Business Year Book, MacLean-Hunter Publishing Co., Ltd., Montreal, 30th ed., 1954.

grapes are imported from the United States.

In 1950 approximately 60 per cent by value of all groceries was imported by wholesalers and the remaining 40 per cent as direct purchases by retailers from wholesale and distributing agencies at the Coast, other parts of British Columbia, the rest of Canada, and the United States (in the order of importance).[21]

Practically no commodities sold outside of grocery stores are wholesaled from Penticton.[22] Retailers purchase from outside the region such items as meat and fish, clothing and textiles, furniture, leather goods, machinery, cars and trucks, and non-wood building supplies. With the growth of population of the area which depends on Penticton as a distributing centre, it is likely that more of the items now purchased elsewhere will be wholesaled from Penticton. This is particularly true of such items as stoves, refrigerators, textiles, drugs, toilet articles, and agricultural supplies.

Assessment. Only Vernon which supplies the Northern, and part of the Central Okanagan with wholesale goods can boast of a larger wholesale than retail trade (see Table XXIII). Penticton's wholesale trade is valued at about two thirds of its retail trade, and Kelowna's at slightly more than a half. Of the latter two cities, Penticton is marked for the

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[21] Industry and Markets in the Okanagan, Similkameen, and Kettle Valleys, Dept. of Trade and Industry, Victoria, 1951, p. 60.

[22] A notable exception is tobacco products which are widely sold outside grocery stores and are almost entirely wholesaled from Penticton.

greatest expansion in the wholesale business because of the vastly larger area it serves.

Both the retail and the wholesale trades in Penticton extend beyond the present regional limits and particularly is this true of wholesaling. With increased population in the area now served by the Penticton wholesalers, and with better transportation facilities, Penticton's importance as a retail and wholesale trading centre will grow. The growth in trade will doubtless be accompanied by a wider influence of Penticton's services--financial, recreational, processing, manufacturing, selling, etc.--the final result of which will be the extension of the present regional boundaries, first to include Summerland, and somewhat later, perhaps the entire South Okanagan.

The Tourist Industry

The tourist who wants a change from strenuous city life will find the atmosphere of Penticton friendly and relaxing for it still has the easy and unsophisticated charm of a "Saturday night town." He can come in blossom time or in the time of high summer, or when the fruit is ripening on the trees and find there much to refresh him both mentally and physically.

The geographic advantages. Penticton's geographic advantages for a flourishing tourist industry are very real indeed. Its location on the valley highway and nearness to the southern trans-provincial highway make it a tourist Mecca of the Interior. Easy access from Washington State

and the Lower Mainland enables thousands of automobiles to make Penticton their destination during the non-winter months, and many make the journey on a weekend "flying visit." Penticton's location between the valley lakes, the picturesque terraces, and green and brown hills gives it a superb setting. If the tourist suffers from holding his breath at the grandeur of the Rockies and Coast Mountains, he may well come to the Okanagan and Penticton to recover in the subdued beauty of the Okanagan landscape. With the completion of the Trans-Canada Highway tourists will doubtless visit the Okanagan in great numbers and Penticton will literally have a tourist influx from all the cardinal points of the compass.

The summer climate is ideal for the tourist who enjoys the sun, and the wide, sandy beaches of Okanagan and Skaha Lakes will further accommodate him if he likes sunbathing.

Boating, swimming, fishing, and water skiing are the more obvious attractions of the valley lakes whose location makes them easily accessible to those who are recreation bent. The Plateau lakes, too, are becoming better known to the sports fisherman and camper.

Perhaps some time in the not too distant future a road will be built to Carmi to open up the Kettle Valley to hunters and tourists from Penticton. When this happens, easier access to the plateau will doubtless encourage the building of summer cottages and hunting lodges near the many lakes and streams. This is the more likely because room for cottages on the shores of the valley lakes is definitely limited. Okanagan Lake has practically no beach along its east and west sides, and Skaha Lake has a narrow beach on its east side only wide enough for the road in places but with here and there enough room for a cottage.

The man-made attractions of the Penticton region are also geographic in the sense that they have location and provide one of the essential services--recreation--which the city renders the region. In and near the commercial centre are facilities for lawn bowling, a theatre, halls for meeting places and dances, and beverage rooms (restricted to the hotels). Many well-appointed stores cater to the American tourist who buys woolens, china, and silverware in quantity. The various parks and playgrounds distributed throughout the city (see Plate IX) have ball fields, an athletic oval, tennis courts, and an arena for ice hockey and special events. Outside the urban section, but easily accessible, are a drive-in theatre on Roy Avenue and Main Street, and an open air "live" theatre in the park area near Skaha Lake.

The Penticton Peach Festival is a high-light of the tourist season and its color and gaiety are attracting ever-increasing numbers.

Tourist Accommodation. Few small cities are as well equipped with tourist accommodation as is Penticton. Six hotels with 276 rooms and 28 auto courts with 335 units were listed in 1953.[23] The hotels are all located in and near the commercial zone; the auto courts are distributed along the Okanagan Lake front on Lakeshore Drive, and along the main highway between Skaha Lake and Ellis Creek. For the most part the auto courts are attractively situated. Those on the Okanagan Lake front take advantage of the beaches and parks close by; those on the highway are often almost completely surrounded by orchard and most of them are less than a mile from Skaha Lake.

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[23]Regional Industrial Index, Dept. of Trade and Industry, Victoria, B.C., 1954.

A trailer camp located near the Okanagan Lake front on Power Street is too small for the number of tourists who use it. It is unsightly and overcrowding during the peak tourist season makes it even less attractive. The camp should be moved or expanded to include a much larger area, and steps should be taken to beautify it.

Naramata has an attractive lodge and two auto courts, and Okanagan Falls a small hotel and two auto courts.

Tourist transportation and place of origin. It is estimated that 80 per cent of the tourists come to Penticton by private automobile and the remainder by bus and train.[24] The greatest number come via the Hope-Princeton Highway from the Lower Mainland, particularly from Vancouver, and a lesser number from the Puget Sound area. Highway 97 which originates in the United States is a well publicized interior route. Americans from as far south as California travel northward on it in ever-increasing numbers to visit the British Columbia Okanagan, the Cariboo, the Peace River, and ultimately Alaska--and Penticton is a favorite stopping place along the way. Between 1951 and 1954 the northbound traffic through the border port of Osoyoos-Oroville increased by 53 per cent--that is, from 116,051 to 177,636 persons.[25] Many--perhaps the majority--of these are northbound and either stop over at Penticton, stay to refresh themselves, or pass through. Traffic from the Prairie Provinces, particularly Alberta, has been taking advantage of recent

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[24]Penticton Board of Trade estimates, by personal correspondence.

[25]News item, Kelowna Courier, January 31, 1955.

improvements to the southern trans-provincial highway and it is expected that this traffic will increase rapidly in the next few years.

As yet the tourist traffic from the north is comparatively light but, with the completion of the Trans-Canada Highway, there is good reason to believe that the attractions of the Okanagan will entice many tourists to take the Okanagan rather than the Fraser Canyon route to Vancouver. The reasons for this optimism are obvious and some are geographical in nature: the Okanagan route is no longer; it is less dangerous to drive; it passes through more densely settled country as beautiful to some eyes as the Fraser Canyon; and, should these attractions fail, a final appeal to the tourist stomach by Okanagan fruit should decisively turn his wheels southward. Indeed, even the least prejudiced Okanaganite cannot understand why the Fraser Canyon route should be used at all by the tourist from the East. It is simply a matter of educating him on things Okanagan; the geographic advantages are there and he should be made aware of them.

Of possible significance and well worth exploring with a view to future development is the "circle tour" which would bring the tourist from the Lower Mainland up the Hope-Princeton Highway, through the Okanagan to Kamloops, and back to the Lower Mainland via the Fraser Canyon. Such a tour offers a great variety of scenery and has the further advantage of appealing to the tourist who has only a short time at his disposal.

Assessment of the Tourist Industry. The length of the tourist season is approximately six and one half months--from the beginning of blossom time in mid-April to the end of harvest time in October. The peak tourist season lasts only two months, however,--from July 1 to Labor Day in September.

In 1954 an estimated 15,000 tourists stayed over in Penticton for an average of three days.[26] If each tourist spent ten dollars during each day of his stay, the total income from the tourist trade was $450,000. This is a good deal more than the income from all manufacturing industries except those in food preparations and wood-working, and the prospects for expansion of the tourist trade are considerably brighter than for the less important manufacturing industries.

The single disadvantage of the tourist industry to the economy of the Penticton region is its season which corresponds exactly to that of the fruit-growing industry. Thus both the fruit and tourist industries are competing for and releasing labor at the same times. The dirth of labor in the summer and the glut in winter is therefore aggravated by this correspondence in seasons and the economy of the region is adversely affected.

Much could be done to stimulate the tourist industry particularly through the medium of advertising. However, as the expense involved is prohibitive especially for any one centre, a co-operative effort among all Okanagan centres might not be remiss. The Okanagan Valley is a geographic unit of which the Oliver-Osoyoos, Penticton, Summerland, Kelowna, and Vernon regions are each a part. What advertising accomplishes for one is to some extent shared by all the others. Penticton, having the

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[26] Penticton Board of Trade estimate, by personal correspondence.

best geographic position as well as superior facilities for tourist accommodation, would gain the most from such a co-operative effort. Leadership in this respect might very well then come from Pendleton. It cannot afford to maintain an insular attitude in matters pertaining to the entire valley.

CHAPTER XIII

TRANSPORTATION AND COMMUNICATION

If hydrography is the "bloodstream" of the physical region, then transportation may well be called the bloodstream of the cultural region. Indeed, hydrography and transportation in the Penticton region are so closely allied that the peculiar "oneness" or interrelationship common to all the geographic elements is once again demonstrated. For example, nearly all transportation routes take advantage of stream-carved valleys or of level surfaces of alluvial deposits; and this is so much so that were all symbols of hydrographic and alluvial deposits erased from a map which also shows transportation routes, a realistic pattern of the streams, terraces, and fans would still be shown by the route symbols. Few of man's works are as closely adapted to the physical region as are his transportation routes. In spite of the power of his mightiest machines, he must still take cognizance of the terrain and lay out his routes where nature lets him pass. He is wise, in other words, to take advantage of what the physical region has to offer, for even technology has its economic limits and man must conform or be prepared to pay the price.

I. TRANSPORTATION

The Road System

The Penticton region has taken good advantage of its terrain in the placement of its transportation routes. Highway 97 is a main valley route which runs from the International Boundary northward to connect all

major valley points.[1] The Vancouver highway, via Princeton and Hope, joins the valley highway west of Kaleden. All the main highways are first class roads on which it is a pleasure to travel and over which commerce flows in ever increasing volume. Good paved roads lead into Kaleden from the main highway and to Naramata from Penticton. Otherwise all other roads (except for certain urban and suburban ones) are gravel and vary in condition from good to poor. In a few places roads leading into the rough mountainous lands are little better than trails which a "Jeep" would find difficult to traverse.

Except for certain of the main thoroughfares, the urban and suburban streets and roads in Penticton, Naramata, and Okanagan Falls are much below standard. Many streets particularly in the older sections are too narrow for modern traffic movement and parking. Too much pavement, where it exists, is of an impermanent kind and it is often in such a state of disrepair that even gravel roads would be preferable. However, it is not a preference for gravel that makes such roads so numerous. In Penticton at least, a number of causes have contributed to lack of adequate streets and roads. One reason is that Penticton is trying to catch up on a "back-log" of necessary public works. A second reason is that, due to Penticton's rapid growth, water and sewerage facilities cannot be installed fast enough because of insufficient money and time, and it is wasteful to pave a street before the mains have been laid.

That the main highway is forced to go through the city is a serious mistake, not only because traffic is slowed, but because of the continual

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[1]For a map of all transportation routes see Plate XI.

hazard in the crowded conditions. Although the highway now leaves the city via Eckhardt Street, the plan is to re-route it via Westminster Avenue (see Plate XII). This will take the traffic through the busiest part of the commercial section. Main Street is not wide enough to accommodate the traffic flow unless all parking facilities are removed. The first plan to put the highway through the Indian Reserve was a wise one and should have been implemented in spite of short-sighted pressure groups.[2]

The sidewalk problem in Penticton is probably even more serious than that of the streets. The sidewalks on Main Street are narrow and inadequate for the busy commercial centre, and on adjoining streets they are made of inferior materials, are often broken and in places even non-existent. Some of the new and not-so-new residential areas have no sidewalks at all[3] and pedestrians are often forced to walk on the road.[4]

Commercial and Non-commercial Traffic

Trucking. Since the opening of the Hope-Princeton Highway in November, 1949, the movement of commodities by truck has increased considerably.

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[2] In Eastern Canada and in the United States a firm principle of all new highway construction is that all settlements should be by-passed but should be made easily accessible from the main highway.

[3] A notable exception is the Central Mortgage and Housing area in the southeastern part of the city. There both streets and sidewalks are adequate.

[4] The City Fathers and the Engineering Department are not unaware of the problem. To correct it, time, money, planning, and sustained effort are needed.

> Long distance trucking continues to make inroads on substantial portions of the fruit traffic. . . . Four years ago only two per cent of the Okanagan's fruit was handled by trucks. Last year, the figure jumped to fifteen per cent.[5]

In commenting on the increase of fruit shipments by truck, a member of B.C. Tree Fruits, Ltd., said:

> By far the greater part of all truck shipments are those to the B.C. Coast area, and this includes not only fruit for sale in Vancouver and the other Coast markets, but also a considerable portion of those apples loaded for export to the United Kingdom and off-shore markets per vessels in New Westminster and Vancouver. The possibility of overnight delivery, made practical since the

TABLE XXIV[6]

TRUCKING SCHEDULE, PENTICTON, B.C.

Company	Round Trips, Daily	Destination
Okanagan Valley	3	Vancouver
	3	Oliver
	6	Kelowna
Country Freight	2	Vancouver
	1	Kelowna
Expressways) Cascade)	2	Vancouver*
Shannon	1	Summerland
Chapman	1	Kelowna
Bailey	3 per week	Naramata
Williams	(Furniture only when called)	

*Only one round trip in winter.

[5]News item, Vancouver Sun, January 19, 1955.

[6]Walker and Graham, Town Plan for Penticton.

> opening of the Hope-Princeton Highway, has, of course, been responsible for this increase in trucking. Where highways are suitable and where facilities, both for loading and unloading of trucks, are available, this method of transporting fruit has, in many cases, reduced delivery costs. The railways have, . . . often reduced their rates to become competitive, but are not always successful in regaining all of the lost business.[7]

Plate XIII shows the routes taken by the seven trucking firms operating in and out of Penticton, the thickness of the line showing graphically the number of times each route is used. This map also shows the location of each firm's Penticton headquarters. Table XXIV shows the destinations of the trucks belonging to the various firms and the number of daily round trips.

Interurban passenger bus service. Interurban passenger bus service was inaugurated in the Okanagan in 1929 when four different operators using seven-passenger cars served the area between Kamloops and Osoyoos. In 1931 B.C. Greyhound colsolidated these operators into one company, and in 1945 Western Greyhound (with operational headquarters in Calgary) took over the B.C. Greyhound.

There is daily service from Penticton to Vancouver, Washington State, the Kootenays, Kamloops and the Cariboo, and in summer to the Prairie Provinces via the Big Bend Highway and Banff to Calgary. There is a definite seasonality in the demand for bus service because of the slackening of the tourist trade during the cooler months.[8]

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[7]Personal correspondence--H.J. Van Ackeren, Assistant Executive, B.C. Tree Fruits, Ltd., Kelowna, B.C., Feb. 7, 1955.

[8]In winter the bus schedule is limited to nine arrivals and nine departures; in summer these are expanded to twelve arrivals and twelve departures. No records of the numbers of passengers is kept but

". . . Coaches are thirty-three and thirty-seven passenger and when

Because of its location with respect to the Lower Mainland, the Kootenays, and Central Washington State, Penticton is a divisional point for drivers and buses are serviced there.

Urban bus service consists of three buses serving three urban routes which total 14 miles in length. One bus is allotted to each route on a normal day, the service being speeded up during the rush hour. Plate XIV shows the area within one quarter of a mile (i.e., walking distance) of each route, and the population within the area.[9] City bus service covers all the city except sparsely populated rural areas and the northeast urban sector.

Passenger and commercial vehicles. The total number of motor vehicles in the Penticton region in 1953 was estimated at 4,900 of which 3,500 were passenger cars and 1,400 were commercial vehicles.[10] There was therefore one motor vehicle to 2.7 persons in the region. By comparison, the Kelowna region has one motor vehicle to every 3.2 persons. Therefore

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the tourist trade is heavy in summer, all . . . trips pretty well carry overloads and, in some cases, as many as five."*

* Personal correspondence--L.C. Chambers, Regional Superintendent, Western Greyhound Lines, Ltd., Penticton, B.C.

[9] Walker and Graham, "Town Plan for Penticton," 1953.

[10] The estimates are made from the total number of motor vehicle licenses sold at Penticton. As the total population for the Penticton Area was estimated at 16,600 and the population of Summerland which was included was 3,600, a proportionate number of licenses were subtracted from the total number, 6,248, to obtain the figure for the Penticton region as defined in this thesis. The number of passengers and commercial vehicles were obtained in the same manner. The data were obtained from The Regional Industrial Index of B.C., Regional Development Division, Department of Trade and Industry, Victoria, B.C., 1954.

the density of motor vehicles at Penticton is greater, not only because there are more vehicles per capita, but also because the Penticton region is considerably smaller in area. The density is further augmented by extra-regional traffic (from the south and from the Lower Mainland) which doubtless comes to Penticton in greater numbers than to Kelowna which is more remote. There is every indication that the extra-regional traffic will increase and Penticton's traffic problem will increase with it. The wisdom of locating the main highway outside the city becomes ever more apparent.

Train service. The Kettle Valley Railway has served Penticton since 1915. It connects Penticton with Vancouver via the Coquahalla Pass, and with Medicine Hat via Nelson and the Crows Nest Pass. A spur line runs from Penticton to Osoyoos, and car-barge service on Okanagan Lake connects Penticton with the CNR line terminating at Kelowna.[11]

Penticton is a divisional point on the KVR and until recently had a roundhouse to service the steam locomotives used on the line. Recent conversion to diesel locomotives, however, has obviated the necessity for the roundhouse and all major repairs are now made at Nelson which is the half-way point between Vancouver and Medicine Hat. As a result of this change-over, only fourteen men are now employed in equipment repairs at Penticton whereas previously there were forty-five.

The railway station and yards are located in the industrial zone south of Hastings Avenue just beyond the densely populated part of the city (see Plate IV).

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[11]The CPR uses the CNR line from Kelowna to make connections with its own facilities to the north.

Passenger service is scheduled from Vancouver and from Medicine Hat, and freight service is fast and frequent. There is no passenger service to Osoyoos, but regular freight hauls are made from the south and are particularly heavy during the fruit season.

Both CPR and CNR have car-barge service on Okanagan Lake, the CPR having five barges and three tugs, and the CNR having three barges and three tugs. The barges have a capacity of from eight to ten freight cars, and each unit (i.e., one barge and one tug) employs from 10 to 12 men.[12] The barges are loaded at the wharves every evening except Sundays and make regular train connections at Kelowna. For the most part the northbound cars are loaded with fruit, whereas the southbound are usually empty. The barge service runs near capacity during August, September, and October, but schedules are restricted considerably during the remainder of the year.

Air transportation. Penticton is particularly fortunate in having an excellent airport less than three miles from the city centre. The city comes by this airport naturally because it lies on the direct route between Vancouver and Calgary. The airport has a landing area 5,000 feet by 500 feet and a paved north-trending landing strip 5,320 feet by 200 feet. It is equipped to handle aircraft of 40,000 pounds but has served aircraft of 75,000 pounds in an emergency.[13]

The airport is operated by the Department of Transport and is used

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[12] With the exception of only one or two, all men employed in the Lake service reside in Kelowna.

[13] For example, during the 1948 floods when rail and bus services were disrupted and passengers were flown from the Interior to coastal points.

by scheduled air lines which provide all-year, daily service to and from Vancouver and Calgary. Besides the regular scheduled service there is unscheduled service from Penticton to the other Okanagan centres and Kamloops, and a number of privately owned planes use the field.

The Penticton airport is strategically located not only with relation to the city but also to take advantage of important factors provided by the physical geography of the region. First of all it is located on fan materials which are smooth-surfaced and extensive; secondly, the landing strip running north and south takes advantage of the prevailingly north-south winds; furthermore, aircraft in landing can approach the strip along the valley trough where there are no topographic obstructions; lastly, it is located in an area of sparse settlement, namely the Indian Reserve.

Pontoon-equipped aircraft can and do use Okanagan Lake for landing. The lake has the disadvantage of often being rough especially towards late afternoon when the plateau begins to shed cold air. Even so, as the numbers of these aircraft increase--especially among hunters and sportsmen --Okanagan Lake will grow in importance as a landing base.

II. COMMUNICATIONS

Penticton's importance as a regional centre is reflected in the communications services which are centred there. The services include two telegraph offices, a telephone network, a radio station, two newspapers and daily mail deliveries.

Both the telegraph and telephone systems have indirect connections by line, cable, and radio to most parts of the civilised world. The

Penticton telephone exchange serves the entire region and provides yet another means whereby the region is tied together.

The Penticton radio station serves the entire South Okanagan from Summerland to the International Boundary. Its overall effect is to direct services and stimulate the movement of goods within the area depending on it by broadcasting news, educational and entertainment programs, and advertising for local and South Okanagan business firms.

The newspapers are published weekly and are of two kinds. One is mimeographed, circulated free and devoted almost exclusively to advertising. The other carries news of local import and advertising. Its circulation of 4,500 is mostly local and regional, but some few papers are sent to the rest of Canada, the United States, England, Australia, and New Zealand. The paper has a strong editorial policy which shows shrewd awareness of local geographic factors (e.g., those influencing the tourist trade, transportation, Penticton's relationships to the rest of the Okanagan)--a decided asset in a paper which helps to form opinion and shape policy affecting the future of both the city and the region.

The distribution of phenomena in area and their relationships to each other are made meaningful by the movement or interaction that is possible between them. In the natural or physical region the geographic elements themselves influence each other through movement--as of air, water, soil, rock--the means of transportation following natural processes. The easier and faster the movement between the geographic elements, the greater the influence they have on each other and therefore the greater the

unity or "oneness" among them. The same is true of things within the cultural region, only more so because there transportation can grow and gradually extend its influence. At its inception transportation feeds a dwelling; it grows to feed a hamlet, a village, a city, ever extending itself to take in and unify larger and larger areas. The immediate effect of this extension is to unify the smaller regions; the ultimate effect will be to unify the world. The cultural region is dynamic and it grows and extends itself along its transportation routes.

Thus, Penticton is sending out more and longer "shoots" to new and better sources of supply. The interaction and the interdependence between Penticton and Summerland is growing and the inclusion of Summerland within the Penticton region is but a matter of time. Similarly, the southern part of the valley is becoming increasingly dependent on Penticton (and vice versa) as interaction between the valley points over improved transportation facilities becomes easier and quicker. When the interdependence between Penticton and the southern part of the valley becomes more complete, the Penticton, Summerland, and Oliver-Osoyoos regions will have become one. Knitting them together in their oneness will be the system of transportation which will have grown with them.

CHAPTER XIV

PUBLIC UTILITIES

Public utilities are geographic in the sense that they have location, serve an area, and are related to and influenced by geographic factors within the area they serve. All the facilities except sewage disposal and fire protection serve the entire Penticton region although, as in the case of domestic water and electricity, distribution may be handled by different agencies.

With the exception of irrigation, it is to be expected that the greatest use of public utilities will occur in areas of highest population density (namely the urban sector of Penticton) and this will be taken for granted in this chapter. The purpose of this chapter is to show the location and areal extent of the utilities and to point out the geographic (and inadvertently, economic) factors which influence them.

The City Services[1]

Domestic water for the entire region has essentially the same sources of supply as has irrigation water (see Hydrography). However, only the area indicated on Plate XV has domestic water piped to the users in a pressurized system. With few exceptions all other parts of the region store irrigation water in cisterns and use it for drinking and other

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[1]Irrigation having been discussed in a previous chapter will not be included here.

household purposes. The exceptions are those areas on the valley floor which are not served by irrigation (see Fig. 42) but are able to get water from wells because the water table is high. Notable among these is the residential area north of Skaha Lake and the auto courts along the main highway. Distance and the relatively sparse population south of Ellis Creek and, moreover, the stoniness of the land (that is, rubble from Ellis Creek) are geographic factors which contribute to the difficulties of installation. Doubtless facilities will be extended as soon as the density of population and the economic considerations warrant it.

Fire protection. Closely allied to the domestic water supply is fire protection which depends largely on water as a fire-fighting medium. Only urban Penticton has fire hydrants, however, so that reasonable protection is provided only for the most densely populated area. Areas not served by hydrants must depend on chemical fire-fighting equipment brought by the fire trucks. As may be seen in Plate XV, much of the eastern and southern part of the city lies outside a half-mile radius from the fire hall, and the southeastern part lies outside a one-mile radius. To this long distance must be added the eccentric street pattern which further slows the arrival of the fire-fighting equipment. These are probably contributing factors which give Penticton a fifth class underwriter's rating instead of a fourth.

Sewerage and sewage disposal. The area served by the pipe sewerage system is shown in Plate XV and, as no heavily populated area can depend on septic tanks indefinitely, the need for extension of sewerage facilities is obvious. It is an incontestable fact that the longer sewerage installation is postponed, the more expensive will eventual installation become

because of the necessary destruction of street and sidewalk surfaces which have been built up in the meantime.

The sewage disposal plant is incongruously located next to a recreation and residential area and, although relatively inconspicuous to the eye, its objectionable odor is anything but inconspicuous to the nose. It is likely that with a large increase in population, the disposal plant will either have to be made less noisome or moved--probably both--and the wastes pumped into Skaha Lake.

Penticton has no storm sewerage of any kind and the necessity for it, especially along the main thoroughfares, is becoming increasingly apparent. Even short periods of rainfall will often cause flooding serious enough to impede both pedestrians and traffic.

Electricity is supplied by the West Kootenay Light and Power Company from their hydro-electric plant on the Kootenay River near Nelson, and is distributed through municipally owned facilities. The location of the power lines is shown in Plate XI. As the power must be imported over a distance of nearly 200 miles, the cost is relatively high; yet it is not prohibitive, and some concessions have been made to industry to encourage expansion in Penticton.

Gas. At present there are no definite plans for a gas pipe line through the Okanagan but, as the valley's population is large (in the order of 60,000) and is increasing, a branch pipe line from Kamloops into the valley seems likely. The chief use of gas in the Penticton region would probably be for heating, its large-scale use for industrial purposes being doubtful.

* * *

It is evident that due to Penticton's large and sprawling area and rapid growth, the services offered by the public utilities are not what they might be. There is a continual pressure to close gaps over distances too great and too sparsely populated for economical construction and operation of facilities. The accumulation of necessary but untouched public works has since pre-war times created a considerable "backlog" of projects to which rapid expansion is currently adding almost faster than they can be completed. Nowhere are Penticton's "growing-pains" as obvious as in its problems related to public utilities--complications which arise naturally from growing too big too fast and too "thin." As a result, taxes are high and must remain so until the "backlog" of construction is made up.

CHAPTER XV

RURAL-URBAN RELATIONS

In discussing the cultural boundaries of the Penticton region at the beginning of this work, the influences which the city exerts on the surrounding area and the reciprocal influences which the area exerts on the city were named as limiting factors which defined the region. The influences were broadly defined as (a) services which the city renders the region, and (b) resources which the region extends to the city for exploitation. Thus the city packs and processes the region's fruit, acts as a market and selling agency, provides financial, administrative, and transportation services, and acts as a retail and wholesale centre. Furthermore, it is a cultural and social centre where the various schools, churches, clubs, and recreational activities function. The region directly dependent on the city's services provides the resources--orchard produce, lumber, and water, etc.--which sustain the city's industries. In addition, the region provides scenic resources--game, fish, "breathing room" for the city's inhabitants, and, very often, social activities--such as dancing--in the rural communities. A constant interchange of material goods and non-material services takes place between the rural and urban parts of the region.

The non-material services having areal extent and varying degrees of influence, can be mapped and classified under the heading of Social Geography. Thus rural-urban relationships can be discovered in services and interests such as education, recreation, administration, religion,

conservation, health, etc., and, if possible, the city usually supplies them when the need becomes apparent.

Penticton City has, for example, taken over many of the educational responsibilities which formerly belonged to the rural areas. When it was found that large, centralized Junior and Senior High Schools located in the urban areas could serve the region's educational needs more efficiently than smaller schools dispersed throughout the region, the city took over the extra educational responsibilities and all but elementary school pupils now commute by school bus from the various parts of the region to Penticton.[1]

But other facets of rural-urban relationships are also important. For example, the dependence of the rural area on the city for recreation is even greater than for education. The various recreational facilities were discussed in the chapter on the tourist industry, but it might be mentioned in passing that in Penticton's case one form of recreation--hockey--cements the region's bonds almost as closely as do the native industries. Even when the rural resident stays at home, some tie such as the local radio station, the local newspaper, or the telephone still attaches him to the city. But interests and needs are not all centred on the city. Many urban residents own orchards, or, as a means of making their livelihood, are concerned with the country's scenic attractions, or depend on the country for recreation, etc., so that there is an outward flow of interests from the city as well. Moreover, the rural population is most often too sparse to support religious institutions and the members

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[1] Okanagan Falls pupils go to Oliver.

of the various faiths join those of their own faith in the city to build their own churches and meeting places. Administration is yet another field in which rural-urban relations are very close. This may take the form of government services, justice, irrigation services, control of disease, etc. The distribution of services and interests is indeed region-wide, and the web of interaction in non-material things is as real as that among material things.

Although the essential "oneness" of the city and its region have been exemplified here, the oneness must not be regarded in the sense of "sameness." The city and its region are analagous to an organism which possesses "oneness" in body but is able to exist only because of the differences in its organs which serve various functions. Each organ must be allowed a certain amount of autonomy in order to carry out its functions. The rural and urban areas, like the organs within the organism, are different, and to fulfil their functions they must, like each organ, be allowed a certain amount of autonomy. City administrations are notoriously short-sighted with regard to the needs of their rural areas and, where the urban-rural population is in the ratio of 7:3 as in the Penticton region, the administration can hardly be blamed if it looks after urban interests first. The need for a measure of autonomy for both rural and urban parts of a region because of their differences is therefore amply demonstrated. However, for the rural area and the city to go their own ways completely would be losing sight of their essential oneness and serious disruptions in the region's well-being would result. The aim should therefore be the well-being of the various parts for the benefit of the regional whole. To attain this aim an overall plan must be evolved. This plan should

consider every facet of the region, rural and urban, physical and cultural, and the evolvement of such a plan is largely the prerogative of geography.

CHAPTER XVI

CONCLUSION

As was stated in the beginning, the purpose in writing this thesis was threefold:

1. To present and analyze the geographic aspects of the Penticton region;

2. To show how the geographic aspects are related to make the region a geographic unit;

3. To evaluate the major geographic factors and, by means of this evaluation, indicate the most profitable course for the region's future development.

Points one and two have been the subjects of the preceding chapters whose major points will be used to answer the third point which is the subject of this chapter.

Penticton grew because of its region, and its continued growth is dependent, not only on its present region, but on certain extensions thereof. What, then, are the prospects for future population growth in the light of facts uncovered in the foregoing chapters? Remembering that a healthy growth must be firmly rooted in the industries that the region can support, the answer must be based on a forecast of industrial development.

In predicting a population of 27,770 for Penticton by 1971

(Fig. 35), Walker and Graham base their calculations on the history of the population growth and on the condition that Penticton acquire sufficient new industries.[1] As the condition they make is critical to the question in hand, it might be surmised that an analysis of the industrial possibilities within the region and the city would not be remiss. This was done in this work and the following facts are pertinent:

1. By far the largest part of the Penticton region's economy is based either directly or indirectly on agriculture.

2. The possibility of greatly expanding agricultural production within the near future is remote because (a) no good lands are at present available (However, greater intensification of use in lands already under cultivation is possible), (b) further expansion of irrigation will be expensive, and (c) markets for increased production are not easily available.

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[1] Walker and Graham, Town Plan for Penticton. The forecast is made in the following manner:

Year	Per Cent Increase	Population Increase	Total Population
1931			4,640*
1931-1941	25*	1,137*	5,770*
1941-1951	83*	4,771*	10,548*
1951-1956	35	3,692	14,240
1956-1961	30	4,270	18,510
1961-1966	25	4,630	23,140
1966-1971	20	4,630	27,770

*Census of Canada.

1961 pop. 13,859

3. Manufacturing based on fruit will of necessity be limited because most of the fruit is sold fresh, and insufficient quantities remain for large-scale processing.

Therefore, insofar as agriculture and allied industries are concerned, the prospects of population expansion within the near future are not great. Eventually, however, the growth of population in the Canadian market areas for fruit will encourage the presently uneconomical lands--and, perhaps, the lands within the Indian Reserve--into production. When this will be is difficult to say, but a recent news item disclosed the following:

> Over-production of fruit is causing concern in the Okanagan's $25,000,000 industry.
>
> Recent survey conducted by provincial department of agriculture disclosed that as a result of new plantings, particularly in the soft fruits line, production will just about reach the saturation point by 1960.[2]

Even if market conditions by 1960 are so promising that large-scale new plantings seem justified, the new trees will not come into full bearing for another seven to ten years. This important fact emerges therefore: Large-scale expansion of industries based on agriculture cannot be looked for with any great confidence by 1971, and the population of nearly 28,000 predicted for that time by Walker and Graham will have to be based on a large increase in other industries.

As practically all other industries (except sawmilling and the tourist trade) are dependent on a regional and a South Okanagan expansion of population to provide for future markets and expanding trade, this

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[2]News item, Kelowna Courier, January 20, 1955.

further fact must be faced: The entire South Okanagan economy is primarily based on fruit, and its problems and prospects for expansion are similar to those of the Penticton region so that much of what has been said in the preceding paragraph concerning the Penticton region applies to the South Okanagan and, moreover, to the fruit growing areas of Keremeos and Grand Forks as well.

If, then, no untoward increase in population is to be expected in these areas in the foreseeable future, there is little likelihood of exceptional increase in demand for Penticton manufactures and commerce. The point to be made here is that, although the industries will expand, there is every likelihood that the expansion will accompany normal population increase and will not be a direct cause of population increase. This is true of industries in metal, wood-working, foods and beverages, retailing, wholesaling, transportation, communication, and construction.

The possibility of great expansion in the lumber industry is not promising due to the too distant sources of logs and competition from more favored areas. Indeed, a decrease in importance of this industry seems rather more likely at this date than expansion, so that its contribution to future growth will be at best a minor one.

The tourist industry, however, shows more promise of growth and a 100 per cent expansion by 1971 is probably a conservative estimate. Indeed, tourism could well become third in importance after agriculture and commerce.

From the foregoing, it would seem that the prospects of Penticton's growth in the foreseeable future are rather dim; but this is not necessarily so because only the arguments against overly optimistic expectations have been presented. Continued industrial expansion and

diversification will almost certainly take place in most of the industries (see Chapter XII). If, for example, markets are not found for fruit which may be surplus in 1960, increased processing may solve the problem in a very satisfactory way. The point to be made here is that there is no foundation in the foreseeable expansion in industry on which to base the surge in population that is indicated between 1953 and 1971 in the Walker and Graham estimates.

What, then, is the 1971 population figure for which Penticton should plan?

If the population increased as much for each of the two decades between 1951 and 1971 as it did between 1941 and 1951, the decade of highest numerical increase, the total population in 1971 would be 20,100. But the years 1951 to 1953 have already shown a decline which, if allowed to go no farther, would bring the total 1971 population to slightly more than 17,000. Judging from Figure 35, the trend on the population curve is already apparent from 1951 on, and an extension of this curve (a "smoothing out" would seem to be justified by an analysis of the industries on which population growth is based) would indicate a population of less than 20,000 by 1971. This differs by some 8,000 from the estimates made by Walker and Graham, but, in view of the fact that their estimate was not based on an analysis of the possible industrial development, the figure, 20,000--barring unforeseen developments--is probably closest to the truth. One factor, an increase in the number of people who come to Penticton to retire, is not based on industry and should be considered. However, unless this increase is significantly greater than it was in the past, the

estimated 1971 population of 20,000 stands.[3]

How should Penticton plan for increased growth?

The new town plan which has been submitted to the City of Penticton by Walker and Graham is shown in Plate XVI. The difficulty in dealing with serious planning faults of the past has been recognized and Walker and Graham, making the best of a bad situation, have made many excellent recommendations in their plan. But, because they failed to adequately analyze the industrial situation, certain of their recommendations may be called into question.

The first and perhaps most serious recommendation which is questionable is the proposed subdivision of nearly 800 acres of orchard lands for residential purposes. Among these lands are 150 acres north, and 400 acres south of Ellis Creek, all on the valley bottom, and 260 acres (some of which comprise the very best lands in the entire region) on the terrace east of the urban sector. Certainly, the removal of some of these orchard lands is justified, especially along the urban fringe, but, in view of the shortage of good agricultural lands, most of the land, and in particular that on the terrace, should be left in fruit.

Questionable, too, is the size of the lots in most of the proposed residential areas. Granted that 60- and 80-foot lots are desirable wherever and whenever possible, and so are spacious parks and school grounds; but, is it justifiable to take the extra space at the expense of orchard lands on which the very livelihood of the region depends, and which, once in residences, are for all practical purposes lost to

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[3]It should be noted that this estimate (as well as that of Walker and Graham) is made for the area at present included within the Penticton City boundary and therefore includes a sizable rural population.

production for all time? Obviously compromises must be made, but preferably--and this cannot be emphasized too strongly--at the expense of the larger lot and of other than orchard lands.

The natural question then is: Where will the growing city expand if not over the orchard lands?

In Penticton there are at least three other alternatives that seem preferable. First, by far too much land has been set aside for industry. By comparison, in 1953 Vernon had set aside 125 acres for industry, Kelowna 253, and Penticton 560,[4] and of the three centres, Penticton has not only the least industry, but also the least promising prospects for industrial expansion. Yet, a comparison of Plates VIII and XVI shows that Walker and Graham would increase rather than reduce the industrial acreage. The argument may be that Vernon and Kelowna have grossly underestimated their needs; however, as only 90 acres are at present in use in Penticton for heavy and light industry (see Table XVI) and no phenomenal industrial expansion is indicated in the foreseeable future, the obvious conclusion is that Penticton has grossly overestimated its needs. Even if Penticton had a 300 per cent expansion in industry by 1971, its needs would probably be more than adequately served by 300 acres. This, if taken away from the Walker and Graham allowance would leave at least 300 additional acres for residences.

A second alternative to residential encroachment on the orchard lands would amount to a triple exchange of land. This would entail (1) the removal of the golf course from the location proposed by Walker

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[4]B.C. Department of Trade and Industry, Regional Industrial Index, Victoria, B.C., 1954, pp. 109, 118, 128.

and Graham, to the proposed park area adjoining the river near the Skaha Lake front, (2) the zoning of the vacated golf course for industry which belongs in that area, and (3) putting an equal amount of land now zoned for industry into residences.

The third alternative was very clearly expressed by Dr. J. Lewis Robinson when he spoke to the Community Planning Association in the Okanagan Valley as follows:

> If future horizontal expansion may prejudice the agricultural basis of the urban population, greater urban densities may still be accommodated on each acre by building apartment houses and other types of multiple dwellings.[5]

This literally means building up into the air and is advice particularly applicable to Penticton where 56 per cent of all dwellings have but from one to three residents. Eventually it will have to come to this for Dr. Robinson warns further that

> There is a limit to the population which the resources of these Valleys [the Okanagan and Thompson] can support--these limits are environmental and deal with area. It may be necessary, therefore, to take the step of zoning agricultural land to protect it from residential encroachment.[6]

Indeed, the warning for Penticton is timely, for a number of factors involved in the city's and region's growth have reached or will soon reach a critical stage. Industry must be balanced against population growth, and non-productive uses of land must be weighed carefully before they are allowed to replace productive ones. Penticton should see to it that all

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[5] J.L. Robinson, Agriculture and Industry in a Growing Community, an address prepared for the B.C. Divisional Conference of the Community Planning Association in the Okanagan Valley, B.C. (Mimeographed), October, 1951, p. 6.

[6] Ibid., pp. 5-6.

residential and non-revenue producing developments fill first the lands which are unsuitable for either industry or agriculture, then, and only then, should other lands be considered for removal from production. No over-riding of these considerations should be allowed by any so-called building boom which could well put an end to itself by "biting off the hand that feeds it."

Finally, although certain criticisms have been made of it, the Walker and Graham town plan provides an excellent base on which to lay the foundations for another plan more in keeping with a smaller population increase in the next 15 to 20 years. Dr. Robinson may very well have had Penticton in mind when he said:

> There may be some among you who confuse size with greatness. A great city, and a comfortable city--one in which it is a pleasure to work and play--is not always a big city. Work on your plan for growth, but limit your objectives. At present your resource base is narrow. Do not try to achieve size; do not try to cover too much area with your buildings. Plan for a comfortable and livable city--even if you have to place restrictive limits on your growth.[7]

So much, then, for the city. Now, what of the region?

It has been stated repeatedly that the Penticton region's economy is based either directly or indirectly on agriculture and to a small extent on the tourist trade and lumber. Agriculture is the staple, the primary industry and, as far as can be discerned at present, will continue to be such for many generations to come. The regional outlook will therefore be colored by this singular means of achieving a livelihood and the region's development must of necessity be guided by it.

Since before World War I, comparatively little areal expansion has taken place in the occupied fruit lands, but considerable intensifica-

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[7] Ibid., p. 6.

tion of use has resulted in ever-increasing yields and, as has been shown in the foregoing discussions, continued increases in yield for the next two decades will depend mostly on conservation and further intensification of land use.

In 15 to 20 years--probably not before--two eventualities may occur which will bring a larger population into the Penticton region. The first of these eventualities is the expansion into the poorer grade lands made possible by the increased market demands for fruit as the Canadian population continues to swell. The second will be the opening up of the Indian Reserve to white settlement on the west side of the river.

Certain signs are already pointing to the possibility of the second eventuality occurring. In a news item entitled, "Ottawa Hopes Indians Will Quit Reserves," Citizenship Minister Pickersgill is reported to have expressed the hope that

> . . . Indians some day will decide they no longer want to remain on reserves as wards of the government.
>
> "You can't push it," he told the Commons estimates committee. "You can only act when everybody is ready to act."
>
> Mr. Pickersgill said the government's hope for the future is that Indians will want to take their place "as common, ordinary Canadian citizens."
>
> . . . The present goal is to speed up the process of making Indians into normal citizens without interfering with their rights except by agreement.
>
> . . . Mr. Pickersgill said the main policy for adapting Indians to normal citizenship is through education.[8]

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[8] News item, Vancouver Sun, March 17, 1955.

Reference to Table XII will show that there are only about 80 acres of good land within the Indian Reserve, and somewhat more than 1,100 acres of fair to poor land, whereas 1,500 acres are of doubtful quality. Nevertheless, the proximity to urban Penticton will doubtless stimulate development even of the poorer lands. If the Reserve lands are developed to the same extent to which other lands within the region are developed to-day, at least 2,500 more people could be supported in the region.[9]

But the release of the Reserve lands will have a very important effect on the city other than increasing the agricultural produce and population. The bottom lands west of the river can then be opened up to urban development and the city will be free to expand on lands that are not agriculturally valuable. This is one of the most important factors which the town planners should consider in long-range planning. Furthermore, the mere possibility of acquiring the Reserve lands should be a strong incentive to keeping the residential development out of the present agricultural lands; the hope of directing residential developments across the river before the question of encroachment on agricultural lands becomes critical, should have a strengthening effect on the powers that be when the demand for the subdivision of the productive lands begins to mount. Remote as the release of the Reserve lands may seem at present, it is well to keep in mind that their release at <u>some time</u> is inevitable and Penticton would be well advised to plan for that day.

Apart from the Indian Reserve there are about 450 acres of good land at elevations too high for fruit growing and at present too expensive

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[9]This is a crude estimate made by using simple proportions: if 5,400 irrigated acres at present support a population of 13,000, then 1,100 additional acres should be able to support at least 2,500 more.

to irrigate. In addition, there are 2,500 acres of fair to poor land, and 2,000 acres of doubtful land (see Table XIII). Doubtless there is much that can be done with these lands when future demands for agricultural products will make their development economically feasible. As these lands are taken up and intensification of land use continues elsewhere, both the rural and non-farm populations will expand. The rural farm population will probably not increase greatly in the presently occupied lands because smaller orchards tend to become uneconomical; but on the Indian Reserve, south of Kaleden, and southeast of Okanagan Falls a considerable increase in farm population may be expected. The rural, nucleated settlements at Naramata and Okanagan Falls will also grow, but of the two, Okanagan Falls will probably grow the most because of its location on the main valley highway and the as yet undeveloped state of its hinterland. The appearance of a new nucleated settlement at Kaleden also seems likely.

The larger growth of Penticton and its region will, of course, take place when, as was intimated in the sections devoted to transportation and commerce, the regional boundaries are extended to include Summerland and the entire South Okanagan. That growth will not reach its ultimate state within the next 25 to 50 years, is almost a certainty and beyond that time any prediction would be a haphazard guess. Should the world of the future be a world of peace and prosperity, however, there is no doubt but that Penticton and its region, taking firm hold of every geographic advantage given them, would "bloom" and prosper also.

Briefly, then, what is the most profitable course for the Penticton region's future development?

In the light of what has been revealed in the preceding chapters, the following five points are vital:

1. The region must seek to expand its agricultural production, by intensifying present land use and by spreading out over new lands. These measures must be accompanied by a program for soil improvement and conservation, and prevention of urban encroachment on agricultural lands.

2. Encouragement of new manufacturing industries, especially those based on agriculture--such as fruit processing--or allied to agriculture--such as the printing of box and can labels, and the making of agricultural machinery.

3. Expansion of the tourist trade.

4. Continued improvement of transportation facilities on which extension of influence and growth of the region depends.

5. Reorganization of the town plan so that Penticton will better be able to serve its function within the region.

A number of problems allied to these five points but only touched upon in the body of this thesis might bear mention here. They are all important and several of them could well be subjects of separate theses in various fields of endeavor. These problems could be studied under the following headings:

1. The intensification of rural and urban land use in the Penticton region.

2. Soil conservation.

3. Potential water resources for irrigation.

4. The administrative differentiation between rural and urban Penticton.

5. The reorganization of the Walker and Graham town plan for Penticton.

6. Relocation of the main highway from the city to the Indian Reserve.

7. Potential industries of the Penticton region.

8. Possible uses for presently unused timber species.

9. Seasonal unemployment.

10. Stimulation of the tourist trade.

Even though these problems must still be explored, the topics essential to a regional study have been presented. Penticton and its region have been studied from the viewpoint embodying the "wholeness" of things, which is the particular viewpoint of geography. The study set out to present and analyse the geographic aspects of Penticton and its region; to show how the geographic aspects are related to make the region a geographic unit; and to evaluate the major geographic factors and, by means of this evaluation, suggest the most profitable course for the region's development. Therefore, these things being now done, the original purpose of this study is accomplished.

APPENDIX

APPENDIX A

SOIL PROFILE DESCRIPTION

Skaha gravelly sandy loam

Horizon	Depth	Description
A_1	0- 6"	Brown sandy loam with fine granular structure. pH 7.5.
B-D	6-18"	Light brown structureless sandy loam with matrix of stones and gravel in the lower part. pH 7.8.
D		Greyish brown to grey coarse sand, gravel and stones, with and without observable stratification. Lime plated stones and gravel in the upper part. Layers of cemented till present or absent at various depths in the gravelly material. pH 8.4.

Osoyoos sandy loam

Horizon	Depth	Description
A_1	0-10"	Brown sandy loam with large proportion of very fine and medium sands. Finely granular to single-grained structure. pH 7.8.
B_1	10-22"	Greyish brown sandy loam to loamy sand of very fine to medium texture. Single-grained, slightly compact. Scattered fine gravel, small stones and finely divided mica. pH 7.8.
B_2	22-28"	Clean grey loam sand, single-grained, compact, with finely divided mica and recognizable lime accumulation. pH 8.6.
C		Clean unweathered greyish brown to grey stratified sand containing finely divided mica. Porous and loose, with occasional thin layers of gravel or small stones. Stratification seldom noticed except where the finer grades of sand occur. pH 8.4.

Osoyoos loam sand

Horizon	Depth	Description
A_1	0- 8"	Brown coarse to medium loam sand, loose sand single-grained. pH 7.2.
B_1	8-24"	Pale brown coarse to medium loamy sand, compact, single-grained, with occasional stones or gravel. pH 7.5.
B_2	24-30"	Greyish brown coarse to medium loamy sand. Single-grained, with occasional small stones or gravel. Lime is indicated by a slight compaction or cementation of the sand. pH 8.6.
C		Deep clean, grey, unweathered, coarse to medium sand. Sand loose porous and stratified. Occasional layers of fine or coarse gravel. pH 8.4.

Penticton silt loam

Horizon	Depth	Description
A_1	0-10"	Brown to pale brown silt loam; soft and friable, with fine granular structure. pH 7.6.
B_1	10-20"	Pale brown silt loam, massive and compact. pH 8.0.
B_2	20-42"	Greyish brown silt loam; compact with specks of lime. Breaks into angular fragments suggesting broken lamination. pH 8.6.
C		Stratified silt, silty clay, clay and very fine sands bedded and laminated in thin layers. Occasional lenses of gravel only a few inches thick. The upper part of this horizon is rich in lime. pH 8.6.

Kelowna gravelly sandy loam

Horizon	Depth	Description
A_1	0- 8"	Dark brown sandy loam with fine granular structure. Scattered gravel and stones. pH 7.0.
B_1	8-20"	Brown to yellowish brown sandy loam, slightly compact, structureless. Scattered stones and gravel. pH 8.2.
B_2	20-28"	Transition to glacial till. Greyish brown sandy loam with specks and veins of lime. Dense, structureless, with fragments of cemented till. pH 8.6.
C		Indurated grey till of sandy loam texture, containing stones and gravel. Occasionally this mixture is not cemented, or the cemented material lies at greater depth. pH 8.4.

All of Appendix A is taken from: C.C. Kelley and R.H. Spilsbury, Soil Survey of the Okanagan and Similkameen Valleys, British Columbia, Report No. 3, B.C. Department of Agriculture, Victoria, B.C., 1949.

APPENDIX B

STATISTICS OF MANUFACTURES FOR URBAN CENTRES

1952-53

City	Number of Establishments	Employees	Gross Value of Production
Kamloops	27	393	$ 2,529,717
Kelowna	33	743	5,727,496
Nanaimo	24	405	3,798,826
PENTICTON	17	237	1,721,820
Prince Rupert	24	622	5,880,384
Vernon	38	374	2,771,490

Canada Year Book, 1952-53.

APPENDIX C

LABOR FORCE 14 YEARS OF AGE AND OVER BY INDUSTRY AND SEX FOR PENTICTON, 1951

Industry	Male	Female
1. Agriculture	351	35
Fruit farming	297	31
Grain and hay farming	5	-
Mixed farming	12	-
Nurseries and greenhouses	2	-
Poultry	2	-
Stock raising	5	-
Vegetable (except potato) farming	11	2
Agricultural services	17	2
2. Forestry and logging	24	-
Logging	18	-
Forestry services	6	-
3. Manufacturing	313	30
Foods and beverages	42	10
Leather products	5	-
Clothing	3	7
Wood products	82	3
Paper products	2	-
Printing and publishing and allied industries	29	6
Iron and steel products	38	2
Transportation equipment	99	2
Non-ferrous metal products	1	-
Electric apparatus	6	-
Non-metallic mineral products	1	-
Chemical products	16	-
Miscellaneous	7	-
4. Electricity, gas, water	36	1

	Industry	Male	Female
5.	Construction	413	3
6.	Transportation, storage, and communication	522	55
7.	Trade	556	217
	Wholesale trade	212	39
	Retail trade	344	178
8.	Finance, insurance, and real estate	89	52
9.	Service	472	428
10.	Not stated	50	14

Canada Census, 1951.

APPENDIX D[1]

CLASSIFICATION OF SOILS FOR THE PURPOSE OF IRRIGATION

Group I Soils:

Deep uniform alluvial, glacio-lacustrine and glacial till soils of medium to medium heavy texture, including sandy loams, loams, silt loams, and silty clay loams, topography is good and there are very few stones. Group I soils have desirable structure and other profile features and none to very slight deductions for alkali, topography, etc. This group represents the most desirable irrigation soils, capable of producing all irrigation crops in any given climatic regime.

Group II Soils:

Less uniform soils of the same types as in Group I, including well drained glacio-lacustrine clays. All Group I soils with moderate deductions for topography, stones, gravel, etc. Most of the Group II soils will have similar crop adaptations to those of Group I, but are rated down on account of being less uniform, requiring stone clearing or having some other limitation.

Group III Soils:

Heavy clays with fair to good drainage. Group I and II soils with moderate to high deductions for stones, topography, drainage, etc. Gravelly river channels and terraces with a comperatively stone free solum. Group III soils have a more limited range of crop adaptation than the first two groups, or are more difficult to irrigate.

Group IV Soils:

Heavy clays with alkali subsoil and flat topography with slow impeded drainage. All soils with depressional topography that are subject to flooding. These soils require drainage and are classed in Group IV until feasibility of drainage is determined. When drained such soils may go to a higher group. Thin, gravelly glacial river terraces and channel bottoms. With detailed survey the poorer acreage of such soils may be assigned to Group V.

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[1]B.C. Department of Agriculture, Proceedings of the Reclamation

Group V Soils:

S_3 to S_4 soils,[2] shallow soils, rough topography and all other soils of very limited use that may be irrigated for rough pasture. Such soils may not be worthy of any development under present conditions, yet may in time have limited use when land is at a premium.

Committee, Brief No. 22, (Mimeographed), Kelowna, B.C., May, 1953.

[2] S_3--Heavy clearing of stones, handicap to cultivation without stone removal. Includes gravelly terraces with 12" or less of fine material over gravel. S_4--Excessively stony--non-arable.

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