A CONSIDERATION OF SOME GEOGRAPHICAL FACTORS INFLUENCING THE DISTRIBUTION OF POPULATION IN BRITISH COLUMBIA.

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I.

INTRODUCTION.

In 1931 the population of British Columbia numbered 694,000. Considering the large area of the Province, the total is small, but that may be considered a natural consequence of the generally mountainous character of the region. Two important facts emerge from an examination of the settlement of British Columbia :-

1) that settlement in the region was retarded, being practically negligible until the second half of the Nineteenth Century, so that the size of the present population is indicative of rapid development.
2) that the distribution of population even on land apparently suitable for settlement is highly irregular; for example, the Province includes one area of dense urban and rural settlement in the Lower Mainland, but large areas of relatively level land in the centre of the Province are still sparsely settled.

This thesis attempts to put forward a geographical explanation of these two points, and also to suggest future developments which may lead to a re-distribution of the population.

The Economic development of the area has occurred only within the last hundred years, for even as late as 1818 so little

was known of the resources of the North-West of America that the Governments of U.S.A. and Canada agreed to share equally the trade of the whole region "West of the Rockies and North of California." Within less than thirty years, however, such an arrangement proved impossible, owing to the penetration of the region by pioneers, (mainly mining prospectors) and it was necessary to delimit the area for which each Government was responsible. 49° N. lat. was chosen as the dividing line, and British interests were concentrated on the area to the North of it. At the time of the first Census in 1871, the colony contained 35,000 people, 25,000 of whom were American Indians, so that, though immigration occurred, it took place slowly during the middle of the century. At the end of the next thirty years the population numbered 178,000, and the rate of increase has been still more rapid in the last three decades.

The present population consists mainly of immigrants from the British Isles, particularly from England. Non-British Europeans form 14% of the total, Scandinavians, French, Italians and Germans being the most numerous, but they do not form any well-marked national groups, and their presence has not caused any political problems to arise. Asiatics form 7.2% of the population, and their presence has led to racial animosity on the part of the workers, and has increased the interest which, from its position,

British Columbia would naturally feel in Pacific political questions.

In an endeavour to solve the problems which are apparent, an examination has been made of the position of the Province, of the topographical, geological and climatic conditions found and of the natural resources which have successively become open to exploitation. Detailed investigation of the conditions prevailing in the more densely populated areas of the Province has been made, in order to emphasize the advantages which the latter possess which enable them to support a large proportion of the population.

II.

Influence of Geographical Position on the Development of the Province.

Retardation of economic development due to location and to political situation in early Nineteenth Century. Importance of discovery of gold. Results of position on Pacific Coast.

Its remoteness retarded the development of British Columbia; Eastern Canada became known as a possible home for Europeans more than 300 years earlier, but from the small settlements which were made there westward expansion was difficult. The rugged, forested Laurentian shield, the wide prairies and the tremendous mountain ranges of the Western Cordillera separated the valleys of the East from those of the West, and it was not until the 19th. century that even the fur-traders found routes across to the West Coast.

Approach to the area by sea entailed a long and expensive journey by way of Cape Horn, and the attentions of the Europeans who did reach the Pacific Coast of the Americas were absorbed by the more southerly parts, until the fur-traders had discovered that the land which could be made tributary to the N.W. coast of America was rich in furs. Trading posts were made on the coast of what is now Washington and British Columbia, but their existence did not lead to any appreciable increase in population, for the established companies had monopolistic control of the fur trade, and no other resources were known to outsiders. Even after the delimitation of the Canadian area in 1846, no other

use was made of the area for several years. The retarding influence of the remoteness of the area would probably have waned more quickly, but political factors caused the conditions to be prolonged. The potentialities of the area were so far realized in 1849 for the Hudson Bay Company to be forced to agree that, though the Company should continue to exercise administrative control over the area, yet colonization should be encouraged. While apparently adhering to the agreement, the Company really discouraged immigration. Land was offered for purchase - but holdings were not to be larger than 20 acres and the price of land was fixed at £1 per acre - while South of the Boundary land was obtainable free. Under those circumstances a mere handful of free settlers took up land each year, and the Company had to give land to its retiring officials to show the Government that the area was being utilized. By 1857 the settlers were sufficiently numerous and influential to persuade the British Government that the Company's control should terminate; ~~and~~ a new colony was set up, and a new period of economic history began.

The attitude of the world to the scarcely-known region changed in the next year, when gold was found in the valley of the Fraser, and a tide of immigration set in. Many of these incomers proved only temporary inhabitants, but their presence served to stimulate the growth of a farming class. Population and goods entered and left by way of the Pacific, and coastwise connection with California was continuous and

important. Eastern Canada gradually realised not only the potential value of the area, but also the danger of its being absorbed by the United States, and the union of the western colony with Eastern Canada was suggested. As a result the Canadian Pacific Railway was built, and British Columbia was given a new political and economic bias. A considerable trade with the interior of the continent developed, for the opening up of the Prairie lands offered good market conditions for the sale of British Columbian forest products, while Immigrants could and did enter the Province more easily.

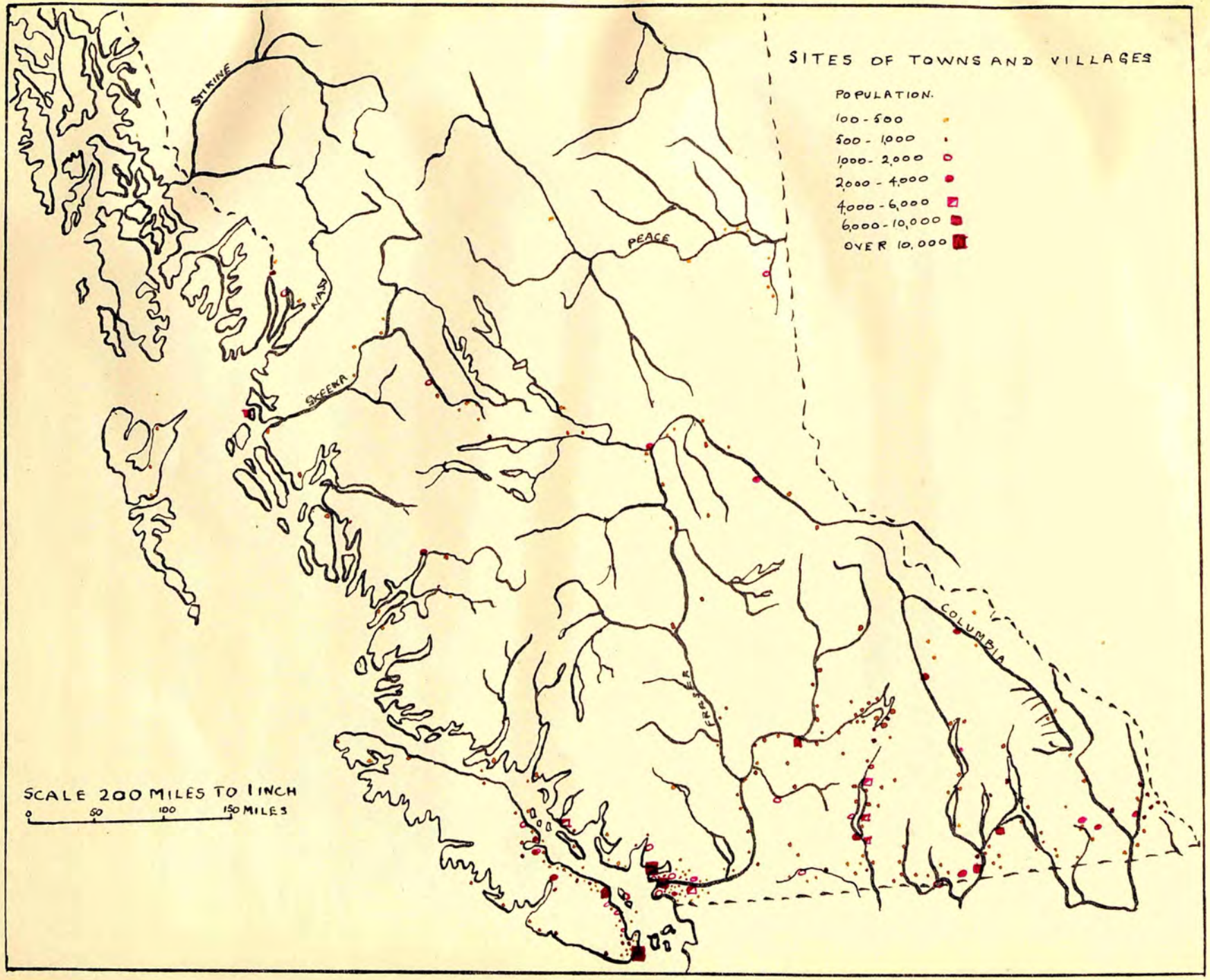
The importance of the Pacific approach, though it was overshadowed by that offered by the railway, never became negligible. That an Asiatic element should be found in the population is a natural result of geographical position. European emigrants seeking homes in America during the 19th. century found elsewhere more accessible sites for settlement, and British Columbia lacked a labour supply. Consequently, the early Chinese immigrants were welcomed; though this attitude changed, the incoming of Asiatics once begun proved difficult to arrest - especially as the rest of Canada, not containing any such people, found the problems of which the Columbians complained difficult to appreciate, and tended to oppose any suggestion of restrictive immigration measures.

Rail-borne traffic with the rest of N. America is the most important feature of British Columbian trade, but its position has enabled the Province to share in the trade which has resulted during the late 19th and 20th. centuries

from the commercial development of the Pacific basin, especially as its soft wood forests and fishing grounds gave it a surplus of goods which were needed in Australia and E. Asia. The cutting of the Panama Canal has increased the volume of sea-borne trade, for it has given British Columbia access to more distant markets in the Atlantic basin.

Thus, location on the Pacific shore for long prevented any economic development, but with improved transport both by land and sea the distance separating British Columbia from Europe became less effective, and economic development became rapid, and to face the Pacific has proved in more recent years an advantage rather than a disadvantage.

BRITISH COLUMBIA, SOUTH OF 58° N.



III

The Present Distribution of Population in the Province.
Sites of settlements; surface conditions; leading industries.

Map G1. (Density of Population per 32 sq. mi., according to statistical Publication Areas) shows the extremely irregular distribution of population within the Province. Large areas are virtually unpeopled; these include the extreme north of the Province, a large part of the North Interior, one coastal area, and 2 areas near the Eastern boundary of the Province. In marked contrast are the areas of the South, especially of the S.W. Mainland and S.E. Vancouver Island. The S.E. regions, especially the Okanagan area also support a relatively close settlement.

The map showing the sites of settlements shows clearly that even in the more thickly populated parts of the Province large areas are at present uninhabited. Only near the lower Fraser are towns and villages closely distributed over a relatively wide area. Elsewhere their distribution is markedly linear and confined to the East coast line of Vancouver Island and the major river valleys and lake basins. In Central British Columbia, of the valleys only those of the main Fraser and the Nechako and upper Skeena are used, and except for these scattered riverine villages there are only a handful of others which have grown up in this central area. The northern part of the Province is still emptier; one village, Atlin lies in the extreme north-west; that and the Hudson Bay

Company trading post on the Finlay R. are the only centres in the northern interior, except for the Peace R. area - which is more closely linked with the rest of the Peace R. Basin in Alberta than it is with British Columbia.

Certain points along the coast have evidently been found suitable for development, though surprisingly long stretches of coast are without even small villages. The size of the settlements at the head of Portland Canal and Observatory Inlet may seem unexpected when compared with the scanty population of inlets farther south, which might be expected to be more productive. In Queen Charlotte Is. villages occur only in Graham Is., and all of those are close to the coast-line.

The map, in leaving out of consideration settlements of less than 100 people, does not show a complete view of the distribution of population, though of course the majority are represented. The British Columbian Government, in offering pre-emptions to immigrants, imposed no restrictions regarding the choice of site, save that the holding should have been surveyed, and some settlers have taken up holdings in remote places. This has been the case particularly along the coast, which is not as completely unpopulated as would appear from the map. Many of the smaller valleys in the south and central interior regions also contain a small number of people. Such scattered settlement is unwise; living so far from markets it is with difficulty that isolated pre-emptors can dispose of surplus products; their buying capacity is low, and they can

attain to only a low standard of comfort. The Government suffers from being forced into administrative expenses great in proportion to the population served, since postal, police and educational services must be provided.

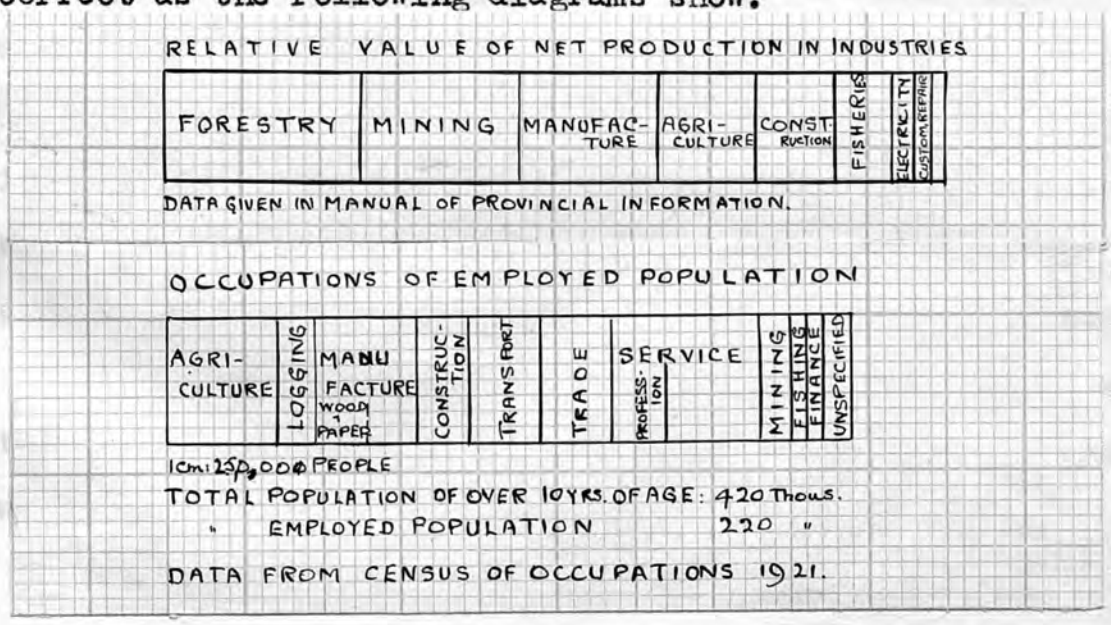
Map G2 shows that the most densely populated areas have experienced a moderate increase in population during the past decade, while the most striking increase has occurred in what is still one of the emptiest areas i.e. the Peace R. district. Exploitation of this part of the Peace River basin has proceeded since the war only, and though the total population is still small, it increased 956% in the area south of the main river between 1921 and 1931. The greater part of the Province shows an increase of population; a few areas show a slight decrease - never more than of 20%, and these are areas where the total numbers were in any case small, and where few permanent settlements were found even in 1921.

As may be seen from the diagram, surface conditions are highly varied. Nearly $\frac{1}{3}$ of the Province is returned as waste land, and therefore the large uninhabited areas might be expected. Only a small proportion of the total is suitable

for agriculture and but a small proportion of that area is at present occupied, and one of the problems connected with the development of the province is the utilization of this land which is suitable for agriculture. The great area which is returned as forested is noteworthy.

The author of a book published in 1862 and entitled "Vancouver Is. and British Columbia. Where they are; what they are and what they become" opined that the island was very suitable for small farms and market gardens, but unlikely to become an important pastoral colony. The mainland he considered to have great possibilities for both agricultural and pastoral development. He prophesied the future importance of the resources in timber and fish. He regretted the lack of attention given to dairying and urged that this industry should be developed suggesting as markets for the surplus produce the European settlements in Hong-Kong, Shanghai and other Chinese ports - and Australia.

On the whole his view of the position has proved correct as the following diagrams show.



The forests form the basis of the most productive industry, but the demands for labour that they make are relatively small. Presumably the product is of good quality and consequently of high value, and can be worked largely with machinery.

The mining industry shows a somewhat similar discrepancy between the value of the product and the numbers employed. A study of the economic history of British Columbia shows that mineral wealth has been worked ever since the days of the first gold rush to the Fraser. Similar discoveries of precious metals have been made in other parts of the province, and though the main body of men joining in a "gold rush" depart when the first productive period is ended yet a certain number of professional miners have each time remained to carry on a careful search for minerals, both precious and base.

The high position of agriculture in the diagram showing numbers employed is good, for, since agriculture is not an extractive industry, the settlements which result from it are likely to be among the most permanent in the Province.

An explanation of the present distribution of population is therefore to be found in an investigation of the conditions which have favoured the development of these industries. The position of the settlements already made would suggest that the most favourable conditions occur in the south-west, and that they are absent in whole or in part from all the north and much of the centre.

Topographical conditions are intimately connected with

agricultural possibilities and with the development of communication; geological structure has a direct bearing on mineralization; climate influences natural vegetation and agricultural and pastoral potentialities; power resources largely control the possibility of industrial development; fishing grounds attract population to the coast. Therefore these aspects of the geography of the Province will be examined so that some conclusion may be made as to the effectiveness of these factors in deciding settlement in British Columbia during the last 60 years, particular attention being paid to the settlements found to-day.

IV.

TOPOGRAPHY.[1]

Major physiographic subdivisions. Rivers and Lakes of the Province. Detailed topography of physiographic subdivisions, and influence each has exerted on settlement: I. Vancouver Range (A) Vancouver Is. (B) Queen Charlotte Islands.
II. The Coast Range (A) Mainland Coastline and adjacent islands. (B) Coast Range Batholith. (C) The Cascade Range.
III. The Interior Plateau. IV. The Columbia Mts.
V. The Rocky Mts. VI. The Great Plains.

The average elevation of the whole province of British Columbia is very great, the only lowlands of considerable size being those of the lower Fraser Valley, S.E. Vancouver Is. and N.E. Graham Is. (Queen Charlotte Is). In addition small lowlands occur at scattered points along the coast. The region may be subdivided into 5 major areas,[2] largely on structural grounds.

These main physiographical subdivisions are:-

1) Vancouver Is. Range, which appears in Vancouver Is. and the Queen Charlotte Group.

ii) The Coastal Range, 125 miles wide in the South, 40 in the North, extending through the entire length of the Province. In the south between the Thompson-Fraser confluence and the International Boundary are the Cascade Mts. an associated range more highly developed in N.W. United States than in Canada.

[1] Geological Survey of Canada Summary Reports, (abbreviated in succeeding footnotes as G.S.C.S.R), and Memoirs - Surveyors Reports to Minister of Lands, given in British Columbia Papers.

[2] Forest Resources of B.C. 1918. Report of Commission of Conservation (Forest and Physiographic Relations.)

iii) The Interior Plateau, which is about 500 miles from North to South and 140-170 miles East-West. The uplands average 4000-6000 ft. in height in the South, and 3000-3500' in the North. The valleys are of two main types:- (a) shallow valleys which are occupied by lakes and swamps.

(b) the deep river valleys cut, some a few hundred, some 4000 feet below the general level of the plateau.

(iv) The Columbia Mountains - folded ranges, exhibiting most rugged surface features, their higher parts covered with ice-fields. The ranges, Selkirk, Monashee and Cariboo are separated by deep troughs, both longitudinal (e.g. Purcell trough which contains Kootenay Lake, and Selkirk trough which contains the Arrow Lakes) and transverse.

(v) The Rocky Mountains which form the Provincial boundary south of 54°N; here they bend to the North-West with decreasing altitude, and do not form the continental watershed.

(vi) The Great Plains which are found in the North-East of the Province, where the more or less horizontal sedimentaries have been carved into a low-lying plateau.

The Rivers and Lakes of the Province.

The Rivers of British Columbia form an extremely complicated drainage pattern, for the chief rivers cross at least two of the main mountain areas.

The Fraser, for example, rises in the Rocky Mountains, flows North-West, receiving tributaries from the Columbia Mts., enters the Interior Plateau where it changes its course, and

flowing southwards receives much of the drainage of the Plateau region, and finally cuts its way through the Coastal Range, to form a large delta at the coast. Thus it crosses all the major structural divisions, except, of course, the Island Range.

Particularly in the North, several rivers rise in the Interior Plateau and cut through the coastal range e.g. Stikine (whose mouth lies outside British Columbia on the Alaskan coast) Skeena and Nass. In the central part of the range the Homathko cuts completely through the mountains, but in the South the Fraser alone does this.

The height of land between Arctic and Pacific drainage lies approximately in the centre of the plateau in the Cassiar and Yukon subdivisions; the Peace and the Liard both draw tributaries from the plateau, and both cross the Rocky Mts., the Peace flowing East, and the Liard North-East.

The last great river system which is in part in British Columbia is the Columbia. The main stream drains part of the Rockies and the Columbia mountains, where its chief tributary is the Kootenay, which itself rises in the heart of the Rocky Mts. The Rocky Mountain trench and the trenches of the Columbia Mountains are occupied by these rivers, and in the latter trenches the rivers expand into deep, narrow lakes, of which the Kootenay, Upper and Lower Arrow and Slocan are the chief. After its junction with the Kootenay the Columbia flows south into United States territory. The southern part

of the Interior plateau is also drained by tributaries of the Columbia, the Kettle,West Kettle and Okanagan in whose basin another long, narrow lake has been formed.

In addition to these lakes which occur in the south-east, many others are found in the Province, some occupying rock-basins, others moraine-dammed valleys. The greater number of these are found in the courses of the Fraser tributaries, e.g. in the Nechako basin are Stuart, Francois, Ootsa and many other lakes. In valleys on the margins of the Coast Range are Chilko, Taseko and Eutsuk Lakes. In the southern part of the Coast Range, in the longitudinal Lillooet valley are Lillooet and Harrison Lakes, and in parallel valleys to the West are the smaller Pitt Lake and Stave Lake. The Skeena system includes the large Babine Lake, and in the extreme North-West lies a group of lakes only partly within the Province, - Teslin, Atlin and Tagish.

Though the river and lake basins are not actually low-lying, except for the lower Fraser, they are so relatively, and even a cursory examination of the topographical features would suggest that they would prove the major lines of both settlement and movement in the Province.

Detailed topography of the major physiographic subdivisions.

A more detailed account of the topographical features emphasizes the difficulties that face settlers in many areas, partly, at least, explaining the scattered distribution of the population.

I. Vancouver Range.

These mountains are at their maximum height in the centre of Vancouver Is. Between that island and the Queen Charlotte group the range has been completely submerged. It reappears as a rugged highland in Moresby Is. but Graham Island, in the north of the group, is generally low-lying.

(A) Vancouver Island.

The mountains, for the greater part of Vancouver Island, rise steeply from the sea.[1] The coastline is very long, especially in the west, where it is broken by 5 deep sounds which are more or less choked with islands. Round both Barkley and Clayoquot Sounds is a narrow, broken coastal plain, 2-3 miles wide; round Nootka and Kyuquot Sounds the land is not of very great altitude, though the shores are generally steep and rocky. These inlets form sheltered waterways, especially Quatsino Sound[2] which is the longest, and which is also navigable by ocean-going vessels. It is surrounded by relatively low hills, seldom 2000 feet in height. Between the Sounds the coast is everywhere attacked by the waves, the most repellent part being Brooks peninsula where the coastal bench is either very narrow or absent, and the coast rises in rugged, lofty and forbidding cliffs. The southern part of the West Coast is very straight,

[1] W.C. Grant, the first independent colonist in the island in 1857 described its general aspect from the sea as uninviting, the coast consisting of densely wooded cliffs with hills immediately behind; in the interior rise bare mountains of trap. The whole centre of the island he called a mass of rock and mountains. 2 G.S.C.R. 1929. Quatsino-Nimpkish.

and offers little shelter to vessels; Sooke harbour[1] is the best, and it is nearly closed by a sandspit, outside which a heavy sea breaks in bad weather, especially if the tide and wind meet; inside the harbour a large expanse of deep water is found.

The East Coast[2,3] lacks deep inlets; the most rugged conditions are found along Johnstone strait the coastline is bold and rocky and behind it the land rises abruptly for 2000-5000 feet. The greater part of the East Coast is, however, bordered by a narrow lowland, and broken by small bays.[4] Small rivers reach the coast, the largest being the Chemainus and the Cowichan, both of which are building deltas at their mouths. The deepest inlet that of Saanich lies in the South-east; it is a submerged glaciated valley, and in its southern end, Finlayson Arm, particularly, shows characteristic fiord features.

The East Coast lowland was formed by the erosion of less resistant sedimentary strata which lie on the more resistant crystalline rocks which form the axis of the island. The sedimentaries are of varying degrees of resistance; the less resistant among them form extensive valleys; the more resistant

1. Mem. 96. Sooke. Duncan Map Sheets.
2. G.S.C.R. 1911. Nanaimo Coalfield and East Coast.
3. Mem. 36. Victoria and Saanich Map Sheets.
4. See Map A4.

form long ridges generally with a N-W- S.E. trend. Spurs from the central mountain mass project from the highland and form ridges, the highest, 3,300 feet, being that west of Nanaimo. The most level area in the whole island is found in the south-east where the valleys are flat, though each is only about two miles wide. The divides between them are knob-like or esker-like hills of drift. In small hollows, shallow lakes are found. The submergence of irregular valleys has given the harbours of Victoria and Esquimalt.

The mountain range varies in character. In the south the highland is plateau-like and between 1500 and 2000 feet in altitude, with rounded hills surmounting the general upland. The features are the result of the recent glaciation of a dissected uplifted peneplain, and the valleys are generally deep. The Alberni and Nitinat valleys have been most widened by glacial action. Lakes Shawnigan and Sooke and Finlayson Arm are the result of the glacial over-deepening of valleys.

Northwards, the plateau character is lost, and rugged mountain ranges, reaching to over 5000 feet, bear small snow-fields, above which project sharp rocky peaks, all glacier-carved. The highest region lies in the centre of the island (where Strathcona Park has been reserved).[1] Here the ridges rise steeply to 6000-7000 ft., in serrate peaks. The rivers, which contain many falls, have cut deep narrow valleys, in places

1. G.C.S.R. 1930. Part A. Buttle Lake Area.

true canyons. Buttle Lake occupies one of the deep valleys, being surrounded to East, South and West by high mountains. Similarly rugged, though generally slightly lower, ranges fill most of the Northern end of the island,[1] except in the extreme North-West, where rolling or rough hills occur. In no place are they more than 2500' high, and they alternate with low-lying valleys and swamps. This district somewhat resembles that of the low mountain country of the southern end of the island.

Settlement in Vancouver Island.

A consideration of topographical features alone would favour the expectation of extremely irregular distribution of population with settled areas widely separated from one another. The lowlands of the South-east, and North-west would appear to be the most suitable sites for settlement, and indeed they were both used in the early days of British occupation as farming districts, but the present population conditions are very different in the two areas, and evidently factors other than topography have hindered the development of the north.

The interior mountain country is not only difficult to settle - it is so difficult to cross that the linking of potentially-productive valleys with markets is prevented. The East coast lowland is occupied by a population which is fairly regularly distributed, as might be expected from its more or less continuous character, but on the West coast the patches

1. Surveyors Reports B.C. Papers 1932.

of lowland at the heads of the Sounds and small inlets are so isolated that it is only in recent years that any use has been made of them, and the villages which do occur are separated by miles of unoccupied coast.

Although the population of the Island may continue to increase (as it is doing everywhere except in the remote North-West. See Map G2), it is unlikely that any other distribution will be found than a peripheral settlement, with lines of population leading towards the mountain country up the main valleys, e.g. Cowichan, Chemainus, Nimpkish.

Vancouver Range (B) Queen Charlotte Islands.[1]

The Queen Charlotte Group consists of two main islands. Moresby Island and Graham Island. At the southern end of Moresby Island the mountains rise steeply from the sea for 1000-2000 feet. They increase in height northwards, and the main range forms a true sierra of high, rugged peaks. The east coast of the island is very irregular and is fringed by small islands; there are several harbours, of which the chief is that of the fishing centre of Lockeport. The West Coast is more regular, lacks an island fringe, and has few harbours; the best is probably Tasu, but that is difficult to enter at slack tide owing to the rapid current. The difficulty of approaching the West Coast of Queen Charlotte Is. is reflected in the fact that no Indian villages were located om this side of the group, though they were numerous on the east.

1. G.S.C.R. 1909.

Graham Is.[1] contains considerable stretches of low-lying ground, especially in the North-East. The Western part is filled by Queen Charlotte Range, a complex highland of rugged peaks and serrate ridges with precipitous slopes; the northern part of the range contains a number of cuesta-shaped peaks, which are probably due to gently-dipping volcanic sheets. None of the peaks reach great altitudes, and in the North the range sinks to between 1500 and 2000 feet. The South-East of the island is a plateau region where basins of relatively soft sediments are separated by higher ridges of metamorphic and volcanic rocks, in which a number of hills rise to 1500 feet. The North-eastern lowland is generally a low, undulating plain, interrupted by a few, flat-topped hills. Much of the surface is muskeg, which is formed of a tough, matted, peaty mass of vegetation, dotted with patches of stunted trees.

The coast of the island shows varied forms; on the North-East and East it is smooth, and barrier beaches are found. The long and dangerous Rose Spit in the extreme North-East has been caused by the meeting of currents. Masset Inlet is deep and is bordered by alternating thick basalt flows and softer pyroclastic rocks, forming a jagged coast, especially on the West.

Settlements in Queen Charlotte group.

The difference between Moresby and Graham Islands is reflected in the different degrees to which they have been

[1] G.S.C.S.R. 1912, 1931.

settled. The ruggedness of the southern island makes it unfavourable to settlement, and no villages of more than 50 people are found - the chief being Lockeport, which is a fishing centre, and Sandspit, which is a mining camp. In the northern island, however, Massett, Queen Charlotte and Port Clements each contain 200-300 people. It is notable also that all these villages lie on either an inlet or on the coast; so far, though the lowland extends inland no villages have been located there.

II. The Coast Range.

(A) Mainland Coastline and adjacent islands.

The coast of British Columbia is extremely long, for the lower parts of the valleys have been submerged. The inlets are deep - the longest being Gardner Canal (160 miles). Jervis Inlet (83 mi.), Dean Channel (70 mi), Portland Canal (90 mi.), also penetrate into the heart of the Coast Range. These fiords are from 1-3 miles wide; their shores are approximately parallel with few small indentations (this is especially true of the larger fiords); lofty rock walls flank the channels, the precipitous slopes being continued below sea-level, so that depths as great as 300 fathoms have been recorded.

Knight Inlet is one of the largest fiords, and almost the most rugged; on the North side the mountains are especially high and precipitous, rising to peaks of 7000'; within two miles of the sea two large glaciers discharge into the valley.

North of the Fraser delta little flat land is found along the coast; in many places there are no beaches even, but

at the head of some of the sounds, are small deltas e.g. at the head of Howe Sound, where for about 30 miles along the Cheakamus a strip of bottom land ¼ to 1 mile wide offers land suitable for farming. Toba Inlet has one of the most extensive deltas at its head; the Toba R. has its source in a glacier, and comes heavily laden down to its broad, terminal valley.

Some of the inlets, e.g. Sechelt, are so choked with rocky islands that tidal currents make navigation difficult except at low tide. This difficulty is also experienced at the Southern end of Johnstone Strait where islands block the passage between Vancouver Is. and the mainland.

Most of the coastal islands are similar to the adjoining parts of the mainland, and are rocky and mountainous. Even the small islands in the south are irregular, rocky hills, while on Pitt Is. bare, grey, pyramidal peaks rise to 4000 and 5300 feet. On Princess Royal Island steep, rugged, massive heights of 4000 ft. are found, cut by narrow, steep-sided and in places flat-floored valleys, which often contain long, narrow lakes in rock basins.

(B) The Coast Range Batholith.

The Coast Range[1] is a mountain mass with rugged peaks rising to heights of 5000-10000 ft. The irregular blocks into which the mountains have been carved are separated by deep valleys cut by rivers during an earlier erosional cycle, and widened and deepened by glaciation. The most notable of the

1. See Maps A6. & A7.

transverse valleys are those of the Fraser, Homathko, Skeena, Nass and Stikine which cut through the entire system.

Jagged peaks and ridges are typical of the greater part of this mountain region.[1] For example the region West of L. Chilko [2] is described as an uninhabited, largely unexplored, well-nigh impassable wilderness of rugged, ice-covered mountains and ridges, separated by deep, steep-walled valleys. In this area a great number of peaks rise to 8000 feet and some to 10,000 feet.

In the central region a number of spurs project northwards from the main range; they are generally rounded and flat-topped, and most of them are below the snow-line, though a few contain peaks of 8-10,000 feet, and so extend into the zone of Alpine glaciation.

Former glaciation has deeply marked the area. The valleys are deep and U-shaped, and in the transition zone previously mentioned these immense glacial valleys 1-5 miles wide form a network of deep broad trenches, and three of these

1. An exception to this is found in the area West of Entsuk Lake, where the mountains rise to between 6000 and 7500 ft. in broad-based pyramids, flat-topped peaks and broad massive mountains; though their slopes are generally steep the ridges are relatively flat and almost completely covered with snow and ice.

2. G.S.C.S.R. 1920, 24, 25.

contain great lakes - Taseko, Chilko and Tatlayoko[1]; where they do not contain lakes these valleys all have flat or hummocky floors and steep walls. Tributary valleys are generally similar, though some of them are small, hanging valleys.

The higher parts of the Coastal Range are covered by snow, and glaciers are found, especially in the north. In the Cambria Range near Portland Canal[2] the largest reaches down to 1000'. (See Map A6). These glaciers are all retreating as is shown by the fresh moraines and by the absence of vegetation in the valleys below their termination. e.g. Below Bromley glacier the Bitter Creek Valley is bare for half a mile. A still greater degree of present glaciation is found in the Stikine basin,[3,4] which lies also in an extremely rugged region, where peaks show fantastic, ice-covered outlines. Where the river is cutting through the coastal range, all the western tributary valleys and some of those to the East are occupied by glaciers extending down nearly to the river. The Great Glacier which before entering the valley is $\frac{1}{2}$-$\frac{3}{4}$ mile wide, expands there to 3-3$\frac{1}{2}$ miles. It melts at about $\frac{1}{3}$ mile from the river, the intervening strip of land being occupied by

[1] These lakes are reported to be of singular beauty, especially Chilko whose water is of a bluish, opalescent colour which "contrasts pleasingly with the green vegetation along the shore line, the red colour of the rocks above and the white snow-fields still higher." G S.C.S.R. 1924.

[2] G.S.C.S.R. 1909, 1910.

[3] Rept. on Yukon and Northern B.C. by Dawson 1887.

[4] G.S.C.S.R. 1930 Part A.

moraines and marshy pools.[1] Smaller glaciers also come down to the river flats.[2]

C. The Cascade Range.

This mountain country is separated from the Coast Range by the Fraser Canyon. Three ranges are included in the Cascades, the maximum heights occurring in the central branch where a mass of snow-covered peaks rises to 9000 feet. The high summits form sharp peaks; those which rise to less than 6000 feet are usually rounded, having been covered by the great ice sheet. The valleys are deep and steep, bare rock cliffs often forming the valley sides. The chief river is the Coquihalla, tributary to the Fraser, which with an average grade of over 120 feet per mile works its way with difficulty through narrow canyons, partly blocked by huge masses of rock which have fallen from the adjacent precipices. The tributaries also have very steep grades, plunging down to the Coquihalla over falls or through canyons. In the upper course the valley contains no flats, below Ladner the gradient decreases to 70 ft. per mi. and flats about ¼ mile wide line the river on each side.

[1] The front of the glacier is still receding, and the Indians have a tradition that the glacier once stretched across the valley, and that the Stikine passed under the ice through a tunnel!

[2] E.G. Dirt Glacier, named from its huge load of debris, and Flood Glacier, named from the sudden great rush of water that in some years takes place at the end of summer, and which is probably due to the breaking of an ice dam in some tributary valley.

Influence of Coast & Cascade Mountains on settlement.

The whole of this mountain region offers great difficulties to settlers, and forms a great barrier to movement between the coast and the interior. The valleys of the rivers, which maintained their courses as the mountains were uplifted and which therefore cut across the present range, are of great importance as offering relatively easy routes and relatively large areas suitable for settlement. The Fraser Valley is outstandingly important in this respect, though settlement has also begun along the Skeena.

The central part of the mountains will never support a population of any considerable numbers, a few resorts may develop at the most accessible points, as the population of the rest of the Province increases, and small mining centres may develop, of a lifetime limited to the duration of the workable deposits.

Even along the coast available townsites are limited in extent, and are found mainly on the post-glacial deposits at the heads of the fiords. The chief exceptions to this are the Tsimpkian Peninsula, where both Prince Rupert and Port Simpson are growing, and on the islands. Whether any of the small settlements will grow into towns of even moderate size probably depends on the area of the interior which may be made tributary to them.*

* Exceptions to this are sites chosen by some industrial concern for the development of a natural resource e.g. Britannia Beach (see ch. V p.68) Swanson Bay (see ch. VII p.125).

III. The Interior Plateau.

Though monotonous compared with the highly mountainous regions to East and West, the plateau is not undifferentiated. The general upland surface represents the remnants of a peneplain, the main irregularities being the result of vulcanism or of glaciation.

Valley glaciers, particularly in the Eastern part of the area, cut deeply into the valleys, giving them a U-shape, with truncated spurs and tributary hanging valleys, and also partly filling them with till, gravels, sands and silts, through which the post-glacial streams have cut, leaving benches at varying heights above the valley floor. Within some of these valleys small secondary gorges, 60-400 feet deep, 300-400 feet wide, have been cut, the river occupying practically the whole floor.

Owing to the eastward extension of the Coast Range the Interior plateaux are narrowest in the south.[1] The Upland here is 4000-4600 feet in height, its rolling surface being diversified by lava hills, which are often surrounded by cliffs, but which show crest lines nearly flat for miles. The soil covering is of irregular thickness, and everywhere contains erratics. The chief valley is that of the West Kettle, which is steep-sided and flat-floored, with irregular patches of terraces formed of re-sorted glacial materials on the valley sides. Many streams flowing in relatively broad troughs on the Upland flow through V- canyons into the West Kettle Valley.

[1] G.S.C. Mem. 79. Beaverdell Area and Southern Interior Plateau. see Map A. 9.

In Central British Columbia the plateau has a flat or gently undulating surface - in which lakes occupy irregularly distributed depressions. The Thompson and its tributaries have cut deep valleys into the plateau, the present channels being gorges cut either into the fluvio-glacial material which has partly filled the old valleys, or into bed-rock. There is little bottom land along the river, even round Kamloops Lake (which is due partly to glacial erosion and partly to the damming up of the river by the delta of Deadman Creek). In the Nechako region the deep valleys are absent; lakes are numerous, the smaller basins are due to the damming of valleys by glacial debris, the larger ones are rock-basins - Eutsuk L. being over 1000 ft. deep, Ootsa over 200'. Silting up of these basins is taking place with the encroachment of muskegs. The average elevation of the plateau is 3000', but it is interrupted by isolated hills (necks of Tertiary volcanoes) and by ranges formed of resistant lavas, 1-3000 feet above the general level. The greatest height here occurs in the Babine Mts. where the highest peaks (at the Northern end of the range) reach 8500'; Alpine glaciers are found on the Northern slopes of the higher mountains.

In the north of British Columbia the plateau is much less level;[1,2] the general altitude of the region is between 3500 and 4500 ft., but in the ranges peaks of 8000 and 9000 ft. are

[1] Surveyors Reports. B.C. Papers 1932. [2] G.S.C.S.R. 1911, 1912 (Groundhog Coalfield).

found, and the upper slopes of the mountains are characterised by arêtes and still bear glaciers. Vulcanism has been of great importance; extensive sheets of lava have outflowed over the surface and several batholiths occur. The main mountain masses are separated by low, wide passes and the main divides between the Skeena, Nass and Stikine headstreams are in general marshy flats, often containing lakes. Where the rivers cross the ranges they flow in gorges, lined with terraces, for the former channels lay at a much higher level than the present ones. Along the Upper Dease R. the terraces are found up to 2000 ft. above the river.[1,2]

In the extreme North-West of British Columbia lies a picturesque region on the border of the plateau and the Coast Range.[3] Lakes Tagish, Bennett and Atlin lie in this marginal country, their southern ends penetrating the outskirts of the Coastal Range. These lakes occupy parts of an extensive system of wide valleys, probably of great antiquity, all now largely filled with detritus. Between the valleys the plateau fragments are of uniform height, and on them a few small ice masses remain.

[1] G.S.C.S.R. 1925.
[2] Rept. on Yukon & N.B.C. 1887.
[3] G.S.C.R. 1910, 1925.

Settlement in the Plateau region.

So far the whole plateau region is very slightly populated. The northern part of the area is virtually empty, though some of the valleys (e.g. McDame Creek, tributary to Dease) contain a few semi-migrating prospectors and hunters. The bench and bottom lands of the river valleys of the south and centre are the most closely settled areas, and the greater area of benches in the Thompson as compared with the Fraser Valley is reflected in the distribution of settlement (see map, page 8.). Many of the valleys, however, which do contain level lands are at present empty. Since the plateau surface lies at least 3000 ft. above the sea it is unlikely that settlement will ever be widespread there, though it may take place where some natural resource such as mineral wealth is discovered in sufficient quantities to overcome the difficulties inherent in living at high altitudes.

IV. The Columbia Mountains.

These mountains comprise several ranges, of which the most imposing are the Selkirks.[1] This range is about 80 miles wide, and contains fifty peaks of altitudes greater than 10,000 feet, five of them being higher than 11,000.[2]

1. G.S.C.S.R. 1903.

2 One of the most rugged areas lies West of Kootenay Lake, where massive mountains lead up to narrow serrate ridges with rocky pinnacles and spires breaking the sky line. West of Slocan Lake lies another specially wild region with summits in some places massive domes, in others lofty precipitous crags.

The Selkirks are divided by deep tranches; the Purcell trench runs N.S. and in its deepest part forms the Kootenay Lake Basin. The trench varies from 2 to 4 miles in width; rivers flowing from both North and South into the lake are building up lake-deltas; the whole trench south of the lake is a former delta of the Kootenay which is still building up its flood plain. Slocan Lake occupies another N.S. trench, and in addition there are transverse trenches e.g. Nelson trench (occupied by the Western Arm of Kootenay L). Lardeau trench (Upper end of Upper Arrow L. to North end of Kootenay L.). These trenches form the main drainage lines of the area - which contains a vast number of tributary streams. Many of the latter rise in cirques formed by local glaciers, and the tributary joins the main trench by a hanging valley or through a deep box canyon at the head of which is a waterfall. The mountains rise steeply from the floor of the trenches, and the summits bear much ice - some are almost buried, others show large nunataks separated by tongues of ice, the largest being about 1000 ft. thick .
The Selkirk range is separated from the Monashees by the Selkirk trench of which the British Columbian portion is 225 miles long, Arrow Lake filling it for 92 miles. The Columbia river in the trench is large and silt-laden, but it flows rapidly and is still eroding its bed, the width of the river being approximately the width of the valley floor. Tributaries enter from both sides, but only one, the Goldstream (50 mil long) is of considerable size. The level lands of the area are

confined to the delta at the head of Arrow Lake, a small area of bottom land in the Goldstream Valley, and small benches along the Columbia.

West of the trench the Monashee Mts. rise steeply, but they are lower and less rugged than the Selkirks. The summits are somewhat dome-shaped, with gentle slopes; the ridges are often wide and comparatively flat and plateau like. In the south near Grand Forks the slopes are most thickly covered with drift and have grassy slopes, through which irregular, bare rocks protrude.

The Monashee range terminates northward in the North Thompson trench, beyond which rise the Cariboo Mts. - a deeply dissected area, divided in the south into blocks of upland by large, deep valleys. The North is of greater altitude, and bears more extensive ice fields which form the sources of the North Thompson, Clearwater and their tributaries. The valleys in which they flow have been filled with glacial till. The lower Clearwater Valley is bordered by precipitous cliffs of lava, and the tributaries contain falls when they reach the cliff; the greatest fall is the Helmcken Fall on the Murtle which has a height of 465 feet.

Settlement in the Columbia region.

The greater part of this mountain system is very scantily populated, the settlements being established mainly in the trenches, which offer facilities for the development of means

of transport and which contain level land of sufficient area for agriculture. Some of this is bench land, and some is deltaic, for not only ~~is~~ are the main Kootenay & Columbia building flats as they enter the lakes, but some of the tributaries are doing the same. Kaslo and Lardeau are two centres which have grown up on such deposits.

V. The Rocky Mountains.

The Rockies include many very rugged ranges trending S.E. - N.W. The chief stream valleys, which have been cut deeply into the mountains run roughly parallel to the mountain axis;* they show the usual features associated with glaciation. The interstream ridges have in many cases been worn down to very narrow ridges, in many cases less than 2 feet wide. Glaciers are found on the higher levels e.g. in Yoho Park a deeply-crevassed glacier, 5 sq. miles in extent, lies at the head of the Ice River Valley; the ice is at least 1500 feet thick, and the water from it is heavily loaded with silt. These glaciers are gradually decreasing in size.

Though passes through the mountains exist, no river crosses the Rockies except in the North, where the Peace and the Liard have cut water gaps; the Peace crosses the range at 2000 ft. and at a gradient so gentle and uniform that the river contains only two comparatively small rapids, both of which could be made navigable.

* One of the finest longitudinal valleys is that of the Elk R. in the South. It is a trough 2-12 miles wide, lying between high ranges of resistant limestone which, rising to 9-10,000 feet, tower 4 to 5000 feet above the valley bottom.

The Western limit of the Rockies is formed by the Rocky Mt. trench, which is occupied in parts by many rivers - which flow in reverse directions, and which are separated by low divides. The southern portion, which varies in width from 4 to 16 miles is drained by the Kootenay, which flows in a channel generally sunk 300 feet below the level of the trench. Where the trench is widest the river meanders in a wide flood plain. Where the Columbia flows northward in it,[1,2] the trench is somewhat narrower (3-6 miles), with a central depression about $\frac{3}{4}$ mile wide in which the river flows between steep silt banks.

The Fraser portion of the trench is also narrow. In the centre the river follows a tortuous course, swinging in broad, sweeping curves with many ox-bow lakes. Both it and its tributaries are very heavily loaded, especially those streams which rise in glaciers and which have built up alluvial fans of gravel at the points at which they break through narrow gaps in the side walls.

The trench widens to the north, and the Finlay meanders in a network of channels on the floor of this very slightly-sloping valley, (except at Deserter's Canyon about 30 miles above Fort Grahame where the river is constricted to a width of 100 feet with a current of 12 miles per hour at times of high water.).

[1] G.S.C. Mem. 148 1926 Windermere Map Area.

[2] See Map A 11.

Settlement in the Rocky Mts.

The Rocky Mt. trench where it is drained by the Kootenay, Columbia and Fraser has already been settled, to some extent, though the villages are small and widely separated. The only other area which has so far proved favourable is the Elk Valley and the adjacent highlands. A more intensive exploitation of the resources of the trench may take place, both in the stretches already utilized and in those tributary to the Peace.

The great heights of the mountain range are likely to remain an uninhabited area.

VI. The Great Plains.[1,2]

In the North East of the Province a part of the central plain of Canada is included. The northern part of the plain drains to the Liard by the Fort Nelson River, the southern to the Peace. Between the river systems the divide is formed by a relatively low range 3500 feet high. The average elevation of the plains is 2500 feet, the lowest altitude (1300 feet) being found where the Peace River crosses the Provincial Boundary. These northern level lands are low plateaus rather than plains, and they have been deeply cut by the river valleys in which there are large benches which form the best agricultural land available along the Peace and its tributaries, being mostly prairie or lightly timbered with poplars.

1. G.S.C.S.R. 1915, 1920. 2.Bulletin's on Peace R. country, issued by Dept. of Lands.

Landslides are unfortunately common in this region and the valley sides have been considerably modified by them, terraces in places being destroyed. The construction of roads and railways is in this way rendered difficult.

Summary - Effect of topography on settlement.

Surface relief does not in most of British Columbia favour settlement. There is no great extent of lowland, over which the dispersal of population might rapidly take place, as was the case in the Prairie Provinces when once railways laid them open to settlement. The greatest extent of level land is found in the south-west, and in the valleys of Central British Columbia. The valleys of the South-east offer important areas of bottom and bench lands, and in many parts of the Interior the plateau is undulating, though lofty.

The lowlands in the South-west do fulfil expectations regarding the distribution of population, for there the majority of the people live. That actual extent of level land is not the only factor controlling settlement is shown by the fact that the valleys of Central British Columbia do not as yet contain as many people as the narrower valleys of the south.

There is insufficient pressure of population in N. America for it to be worth while for man to attempt to use the Alpine areas, and they are likely to remain empty for a very long time.

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Why there should be such an irregular development of the valleys and whether that disposition of the population is likely to be a lasting feature of the human geography are questions to be answered in large part by an examination of factors other than surface relief.

V.

GEOLOGICAL STRUCTURE & DEVELOPMENT OF MINERAL WEALTH

Widespread location of mining centres.
Geological History.
Conditions favouring mineralization.
Coast Range Batholith & associated mineralized areas.
Islands.
Rocky Mts.
Columbia System.
Interior Plateau.
Pleistocene glaciations. Placer gold mining.
Lode mining. Gold. Copper. Silver Lead Zinc.
Non-metallic minerals.
Coal.
Building stone & gravel.

The Geological history of the Province has been highly favourable to mineralization, and as was shown in Fig. on P.12. on the basis of value of net production, the industry is second only to forestry. On the basis of employment its relative importance is lower, only approximately one-twentieth of the employed population being engaged in mining and kindred industries.

Mining centres are found in many parts of the Province; as is the case with mining centres elsewhere, their lifetime is often short. In the south of the Province, for example, Tulameen had a population of several hundred in the early eighties, of only fifty in 1932. Quesnel Forks in Cariboo has had a somewhat similar history. Conversely, of course, there are in the Province many centres whose growth has been rapid, and which have not yet begun to

decline e.g. Trail, Britannia, Fernie.

As will appear, mineral wealth is not only widespread, but is also highly varied, including lode deposits of gold, silver, copper, lead, zinc & iron, placer deposits of gold, and extensive deposits of non-metallic metals - principally coal and building material. Each of the physiographic subdivisions offers some contribution to the mineral wealth of the region, which has resulted to some extent at least in settlements being established on sites not favoured by topographical conditions, though topography in other areas prevents the mineral wealth from being prospected and exploited, even where geological conditions favouring mineralization are known to exist.

In the following account of the geological history of the region the most important incidents are the intrusions of molten magma into pre-existing sediments, many of which have since been removed by denudation, and recent glaciation, which has closely affected the placer mining industry, and which affected the progress of lode mining in some places by exposing through glacial erosion, or obscuring through glacial deposition, bed-rock containing veins of minerals.

Geological ~~Structure~~ History [1, 2].

In Pre-Cambrian times the Eastern portion of the area, from the Purcell trench East formed a geosyncline, while

1. Structure of the Pacific Region of Can. Prof. Brock.
2. Rept. Ord. Surv. 1930. Lead-Zinc.

westwards stretched a great continent, Cascadia. In the Geosyncline sediments collected until Tertiary times probably to a total thickness of 135,000'; they include deep water deposits of limestone, shallow water deposits and some coal seams. Cascadia gradually receded, giving place to a shallow sea - in which deposits from this land mass still farther west were gradually laid down. Intense volcanic activity developed in this western region especially in Triassic and Jurassic times. At the end of Jurassic times great mountain-building forces were at work, the Vancouver Range Coast range and Columbia System being formed then. Accompanying this movement came great intrusions of plutonic rocks, primarily of granodiorite; of these intrusions the greatest was of the Coast Range batholith, which is 900 mi. long, and 50 mi. wide on an average, reaching to 100 mi. at its maximum. These newly-formed mountains were heavily eroded during Cretaceous times and the detritus was deposited in the surrounding basins - on the present site on the Interior Plateau and the Eastern mountains.

In early Tertiary times further earth movements occurred in what has been called by Canadian geologists the Laramide Revolution - the older mountains were rejuvenated, the Interior Plateau basin was folded and the Rockies were formed. In the Rockies folding is simple at the ends of the range, but in the centre the rocks are fractured and overthrust, in extreme cases being overthrust for miles, to the East, so

that a succession of overlapping overthrust blocks has been formed.

Early Tertiary times were marked by heavy erosion, but at the close of the Oligocene earth movements and volcanic activity were renewed, especially East of the Coast Range; maximum vulcanism occurred in Miocene times, when vast floods of lava buried the interior plateaus, and large batholiths, generally of syenite invaded the older rocks. Normal faulting parallel to the Coast took place throughout the whole Cordilleran region, and was probably associated with the sinking of the old land mass of Cascadia.

Vulcanism has continued intermittently down to the present, but the most important events of later geological history was Pleistocene glaciation, when a continental ice-sheet covered the whole area, valley glaciers remaining in the more mountainous parts of the province after the retreat of the ice-sheet; of these fragments still remain. Depression of the land along the Pacific coast, causing fiords, and subsequent partial re-elevation, especially in the interior, where the rivers have been rejuvenated, have taken place in recent times.

Mineralization[1] has occurred extensively in the Cordilleran region, especially as a result of the granodiorite intrusions, and as intrusions took place in both Jurassic and Miocene

1. Ore deposits of Pacific Region of Canada. Prof. Brock.

times mineralization dating from both those epochs can be traced. e.g. at Rossland gold deposits of Miocene age were introduced after the chalcopyrite mineralization. Some of the mineral deposits occur within the masses of igneous rocks, but many are found at the contact of the older rocks and the intrusions. Some of the igneous rocks being brittle broke to form clean open fractures in contrast to the many little fissures into which some of the softer rocks sheared, and which were not favourable ~~for~~ to the formation of good ore bodies. The location of an ore body at a particular point is frequently due to structural conditions such as a fold or an intersecting dyke.

As the mineralizing solutions cooled, minerals were successively deposited, and with distance from the plutonic source the character of the ore changed; gold, copper and silver-lead-zinc deposits are frequently found in that order away from the batholith. A consideration of this zoning of the minerals should be taken into account in the search for minerals; the presence of silver-lead-zinc bearing veins close to a plutonic mass means the absence of gold in the region for evidently the mineralizing solutions had, on escaping, cooled too much for the deposition of gold to take place. In some places dissection has been carried on so deeply that the batholith has been exposed, and most of the minerals have been removed by erosion; in others erosion has not been deep enough to expose the mineral deposits. If

the plutonic mass does not outcrop at the surface gold may not be found, and a mining prospector in following up silver-lead-zinc through copper may meet copper again, followed by the silver-lead ore - presumably he has then passed the deep-seated summit of the intrusion and a search for gold would need to be made through deep working.

In the mineralized areas of the Laurentian shield the ores continue without appreciable change down to great depths; but in B.C. most of the large ore-bodies become worthless at comparatively shallow depths. e.g. at the Nickel Plate mine the deposits appear to be limited to 1150', at Rossland their max. depth is 1800-1900' and at the Premier Mine (Anyox) it is about 1200'. This shallowness of valuable ore deposits naturally makes the B.C. mines relatively short-lived.

1.2.

The coast Range batholith is a striking feature of the western region; it is an elongated mass of granite rocks stretching from the Fraser R. to Southern Yukon. It is formed of various rocks ranging from gabbro to granite, but it is mainly of granodiorite. On both sides are found sedimentary and volcanic rocks; one series is older than the batholith and intruded by it, and has been

1. Annual Repts. of Minister of Mines.
2. Summary Reports Geol. Survey 1909,10,11,12,13,20,21,22, 24,25,31.

metamorphosed and impregnated by ore deposits as a result; the other series is younger than the intrusion, has not been metamorphosed, and contains no metallic ores of any extent, but is important for the coal seams which it contains. Along the marginal zones especially on the East many spurs and bosses from the main batholith intrude the overlying, older formations that spread East through the Interior Plateau. Many of these branches appear to be separate intrusions, and they formed centres round which ores were precipitated.

There is a considerable difference between the margins of the batholith - inclusions are more numerous on the west side, and the rocks in them are mostly altered to sehists. The ore~~s~~ which these inclusions contain is mainly copper. Most of this zone, North of Vancouver Island, is under sea, except for ~~Q.C.I.~~ Queen Charlotte Is. Along the Eastern contact zone the rocks have been tightly folded, but there has been less metamorphism except in the immediate vicinity of the batholith. In this belt occur galena, tetrahedrite, and zinc blende, with a valuable gold, silver, lead and zinc content. Included in this important zone are the mining areas of Atlin, Salmon R., Alice Arm, Telkwa, Bridge R. and Coquihalla.

The general trend of these mineral belts is N.W. but in Southern B.C. they bend to the East, the Western belt

being continued in the Boundary district, and the Eastern one in Kootenay, the two merging in the area South of Kootenay Lake. The deposits of Copper Mountain, Phoenix, Deadwood and Rossland in the Boundary district are of the Western contact, copper-bearing type, and those of E. Kootenay (including the famous Sullivan mine) are of the eastern type, the ores being highly complex and producing silver, lead and zinc.

The difficulties of prospecting in the region are great, for the batholith forms the rugged mountain area of the Coast Range. So far all the mines which have been developed on the west are within a mile or two of the beach; the fiords give a degree of accessibility to the deposits of the western coastline which does not pertain to those of the eastern contact zone. Portland Canal and Alice Arm are the only two inlets which cut through the batholith to the Eastern contact zone, and they have enabled mineral development to take place, but throughout much of the zone inaccessibility has rendered even prospecting impossible.

The chief lode mines opened in the region lie in the N.W. and S.W. - in the N.W. lie Hidden Creek (yielding copper) Premier (silver and lead) and Porter-Idaho (silver). In the S.W. Britannia is the chief. New discoveries have been made since 1930 - either new discoveries on old

properties, as in the Portland Canal region, or of new deposits e.g. of lead zinc and silver in the Bella Coola division and of gold-bearing pyrite in quartz veins in the Skeena district.

The region has also great resources in non-metallics, though so far they are little worked. Limestone is quarried at Cunninghame Island on Gunboat Passage; it is mainly sent to the Ocean Falls and Woodfibre Paper mills, though some goes to Vancouver for stucco. Fluorspar is mined for a short time every 2 -3 years, for making hydrofluosilic acid for the Trail lead refinery. Mica is being developed on Mica Mt. near Fort Grahame, and sand and gravel are present in great quantities.

The islands immediately off the coast are largely filled by batholithic intrusions; Texada Is. does contain limestone, in beds which are gently folded, except where broken by small faults or thrown up by dykes; copper and gold are both produced.[1] Vancouver Is. is predominantly volcanic, the chief rocks being andesite, basalt and prophyries, with which are associated limestone beds. Small batholiths, stocks, dykes and silts of granodiorite are found in many places and large areas are covered with a thick layer of glacial deposit, to a maximum depth on the East Coast of 100 feet. Placer gold has been found on the beaches of the

1. G.S.C.S.R. 1909.

West and North Coasts; lead and zinc in the North; iron ore, especially magnetite is widespread, but undeveloped; attempts to mine copper have been made on the West coast, but without commercial success. The most important mineral, however, is coal, mined mainly on the East coast in the Nanaimo coal basin. Difficulties of transport have on Vancouver Island, as in many parts of the Coast Range, hampered prospectors in their work - as has also the dense covering of vegetation.

In the Queen Charlotte group[1], Moresby Island is composed of Triassic volcanic and sedimentary rocks - underlain by the steeply westward-dipping flank of the Coast Range batholith. The area should be favourable for the occurrence of ore deposits, but nothing of commercial importance has been found.

On Graham Island is a large area (probably 800 sq. mi.) covered by black sands which may be worked for gold and platinum; probably they will not pay everywhere, but some concentrated patches will do so. The gold and platinum have probably been transported hither from S.E. Alaska (where quartz veins containing gold and platinum are found) by glaciers, and have been concentrated by the action of glaciers, rivers and waves. The western part of Graham Is. is of resistant metamorphic and crystalline rocks, forming a rugged mountain area. The chief mineral resource is coal, which is of possibly great future value, and clay and possibly

1. G.S.C.S.R. 1909 (Moresby Is.) 1912,13 (Graham Is.)

oil. The coals vary from Tertiary lignites (some capable of being transported and of being used directly as fuel) to Cretaceous semi-anthracite. The lignite beds are exposed at low tide in the North-East.

On the west coast a bituminous shale of considerable thickness and with a strong odour of petroleum outcrops, and the occurrence of small seepages of petroleum and tar along the coast has led to prospecting which has so far been unsuccessful.

The Rocky Mts. consist of a series of great fault blocks, in which have been exposed an enormous thickness of more resistant Palaeozoic limestones with smaller amounts of sandstone and shale, and less resistant Mesozoic shales and sandstones. The erosion of the latter strata has produced long valleys between the Palaeozoic blocks. The Rockies are not notable for the occurrence of metallic ores- in the Rocky Mt. Trench area along the Finlay and Omineca are considerable areas of gneissic and schistose rocks and crystalline limestone. Overlying the younger rocks are slates and quartzites, the whole series closely resembling that found in E. Kootenay where lead and zinc have been found - and such ores may be present in the northern region, but it is so remote from transport that even prospecting would be of little value at present.

Of great importance, however, are the coal basins of the Southern region[1] - the Crows Nest, Upper Elk and Corbin fields. The deposits are of bituminous coal and in the Corbin coal-field is found a remarkable concentration of coal in a small area, owing to intense folding and faulting.

In the Columbian mountain system, which includes a series of high ranges and deep trenches, strata of many ages are found[2]. Pre-Cambrian sediments in the Purcell Range have been folded and faulted; in the Selkirk trench similar sediments are found in the trough which lies between great masses of granite. Triassic sediments are also important, but all the sedimentary rocks have been much altered by the intrusion of batholithic masses - as was stated in the paragraphs dealing with the major Coast Range batholith. Like that, the batholiths here vary from granite to diorite. The largest intrusion in this area is the Nelson batholith, a granite mass which occupies approximately 1000 sq. miles. Besides this large intrusion there are many smaller ones - silts of diorite or quartz porphyry dykes. The Monashee and Selkirk Mts. are both largely composed of batholithic intrusions.

1. G.S.C.S.R. 1900.
2. G.S.C.S.R. 1903,1904,1929. B.C. Papers Reports of Dept. of Lands 1932. 1884.

Included in these rocks are highly complex ores - of great value now - yielding silver lead and zinc; when they were first found much of their value was wasted as modern metallurgical methods were necessary for the separation of the ores. The Sullivan mine is the chief centre for the work; it is situated on a hill 2½ miles north of Kimberley, at 4600' above sea level in a district where quartzite forms the country rock, sulphides having replaced fine-grained quartz in veins.

Occupying an important zone in central B.C. is the Interior Plateau, formed mainly of sedimentary rocks of various ages, and of volcanic rocks. Into it have been thrust, especially in the North, batholithic intrusions, and to the west lies the major plutonic mass of the Coast Range batholith. The volcanic and sedimentary rocks deposited before the formation of the Coast Range were greatly crushed, fractured and contorted by that formation, and mineralization is associated with the margins of all these batholithic intrusions, in fact, with the exception of the lode gold occurrence in the Barkerville area, all lode minerals occurrences west of the Rocky Mt. trench are assigned to the influence of the batholiths. The Barkerville lode gold is considered to be the result of an older mineralization presumably due to a concealed unroofed batholith, whose presence is inferred from many dykes and sills and from

the mineralization itself.

The Interior Plateau [1] is gently undulating, except where recent volcanic rock has accumulated, or where it has been dissected by deep river valleys. Except for Rocher Deboulé and Hudson Bay Mts. the batholiths form for the most part inconspicuous topographical features. Erosion has done little more than expose the original surface of the minor intrusions.

The mineral resources of the Plateau are very varied; they include gold, silver, lead, and copper, in addition to a number of non-metallics, e.g. gypsum, worked at Falkland (Kamloops) to supply a manufacturing plant at New Westminster: coal at Hazelton and Telkwa, (for which there is a local demand in the settled area between Prince George and Prince Rupert) at Merritt and at Princeton for which the chief market is Vancouver, and which is the centre of a comparatively large undeveloped field.[2]

Pleistocene glaciation has had a marked influence on the economic development of B.C. because of its influence on the superficial geology of the area.[3] In the long period of erosion in Pre-glacial time the rivers slowly carved out

1. G.S.C.S.R. 1911, 1917. Mem.79. Beaverdell area.
2. Rept. of Minister of Mines for 1931.
3. Placer Mining in B.C. Bulletin No. 1. 1932.

valleys, and in the interior plateau region they cut across, and wore away quartz veins occurring in Schist formations; these quartz veins being gold bearing, the resultant gravels contained gold dust - coarse in upstream reaches, finer lower down. In some cases the river deposits became overlaid by sheets of lava, which preserved the underlying sediments.

During glacial times this old land mass became covered by a great ice sheet, which gradually melted - leaving valley glaciers - to re-form, and once more to retreat leaving valley glaciers, fragments of which survive to the present day. The ice sheets were comparatively stagnant, and did little erosive work. The valley glaciers did much more to modify the land surfaces and to disperse the placer gold deposits. At the melting of the ice sheet huge streams were formed which cut down through the glacial deposits. Most of these rivers followed the courses of the old valleys, in some places exposing and resorting the original gravels. In other places though the main lines of previous drainage were restored, in detail the course of the new rivers differed from that of the old, and sections of the older gravels were left intact, and probably many remnants of the old channels have not yet been found. These older gravels when found often occur as benches above the level of the

present drainage. In the later stages of the glacial period, some of the larger valley glaciers no longer filled their valleys completely, and between the edge of the glacier and the valley walls, large rivers found their way, depositing coarse, and often auriferous gravels. Since the present streams have cut down their beds to a lower level these gravels appear as terraces high up on the sides of the valleys. Sheets of glacial drift may also contain gold, but the content of such deposits is much smaller than that of the gravel bars, and there is no definite pay streak present. Occasionally such a deposit has been found of a high gold content, and is sufficiently rich to constitute a workable deposit e.g. near the lower end of Quesnel L.

In B.C., therefore, placer deposits are found in (1) original Tertiary gravels. (2) Interglacial gravels. (3) Post-glacial gravels - which are generally low grade, but practically all the rivers between the Rockies and the Pacific carry at least some gold.

As may be seen on the accompanying map (B2), the placers occur mainly in the plateau areas where alpine mountains are absent. The rocks include quartz veins ranging from mere stringers to broad veins 100' in width. These are the source of the placer gold. The stagnant character of the ice sheet over the Plateau region is probably the cause of the survival of the placer deposits -

the Western Coastal Range area lost all existing placers through glacial erosion; the Eastern mountain region probably never contained any, as it is not a centre of mineralization.

Lode mining has yielded far greater gold values than placer workings have done, but the placer workings led to the opening up of hitherto untouched areas in many instances, and in that ~~aspect~~ respect are of great importance.

The first placer deposits to be worked were those of the Fraser (1858); "Old-timers" from California were the chief members of the early gold rushes; they worked thoroughly, though with less elaborate equipment than is available to-day, when most of the work is done by hydraulic methods. As the bars of the placer fields were exhausted, the gold diggers moved out - generally the Chinese remained longest, or came in after the white man had abandoned the field e.g. 1873 Thibert Creek in Cassiar was discovered and worked by 20 miners; the next year 1600 worked there, of whom scarcely 100 stayed for the winter (and those who did suffered greatly from disease and lack of food). In 1878 the population was 1500 - $\frac{1}{3}$ being Chinese who worked the ground abandoned by whites; in the following year the population began to decrease - at the end of 10 years it comprised only 125 people, most of whom were Chinese, by

1895 the population consisted of 12 white men and 50 Chinese.

In recent years placer mining has fallen somewhat into disrepute, for the investments that have been made in the industry have not succeeded.[1] Large amounts have been wasted because affairs have been mismanaged; expensive plants have been erected on unsuitable ground which had not been fully prospected, or unsuitable methods of working the particular deposits concerned have been used. Under the Placer Mining Act, claims of 80 acs. or of half-mile strips along a creek are allowed; the size of each claim is limited, but not the number of claims that a man may hold, and in some promising areas men have staked several, merely to hold them to sell if chance occurs, and such areas may see considerable development. In the last two years interest in placer-mining has been stimulated largely by the depression prevailing in other industries. During the first half of 1932 seven thousand Free miners' certificates were granted, and not less that 5000 of them were used by men who prospected for placer gold, especially in the South Interior. As is the general rule on gold fields, the majority were disappointed, though many did manage to earn enough to keep themselves, who would otherwise have been a charge on the State. This new dispersal of would-be

1. The Miner. Nov. 1932.

miners has affected Cariboo also, for as was reported[1] "this season (1932) saw one of the largest movements of gold seekers over the Cariboo highway that has occurred for many years. Hundreds of men from all walks in life went North in search of placer gold."

The Resident Engineer reporting from the lower Fraser valley says "where possibly 150 men are working in groups of 2,3,4, or more the writer would say that the average return per day per man has averaged nearer 25 cents per day than 50 cents per day. Occasionally rich pay is recovered by careful mining of pay-dirt from under larger boulders, and nuggets valued at as much as $10 have in 1 or 2 instances been recovered."[2]

The Bridge R. district also attracted many men - and an engineer living in this district says[3] "There have been a few rich spots, but I doubt if any one can make anything on the bars or along the banks of the river. I would here warn anyone against paying money to lease holders for the privilege of placer mining on such ground. On the Fraser R. different conditions hold, for about the only chance the individual placer miner has is in working the benches and bars during the lower water period. Many enquiries indicate that the great majority of men induced to go into the Cariboo have not, and cannot, make a living. One rancher informed me

1,2,3, July 1932. The Miner.

that he feeds as high as 15 men a day who are apparently destitute."

The North-West of B.C. has not shared in this latest dispersal of placer miners to any extent - it is more inaccessible, is farther from the centre of unemployment, and those who did go were men of experience with a knowledge of the conditions which were to be expected. The output of placer gold from the Atlin district has been increasing since 1929. Between 1918-29 it did show a decline owing to the high wages demanded, the high cost of commodities, decline in the value of gold, and the attraction of the cities in their post-war expansion.

In most of the placer fields few discoveries have been made in recent years, and the work has consisted mainly in re-working the gravels in streams found by the old timers - in some places gravels not worked by them because of low gold content may be profitable if reworked with modern methods. Probably there are areas so far untouched that could be worked with profit. e.g. the Lava-buried gravels of the Stikine above Telegraph Creek. The Government is supporting the industry - mainly by the provision of new trails, especially in the Barkerville district, which has been one of the chief centres for placer mining in B.C. The absence of trails makes the movement of machinery into the areas a matter of insuperable difficulty, and hydraulic methods - which are the most successful - are then impossible.

The number of men engaged in placer mining in 1931 was approximately 700 - that number was increased in 1932 - probably only temporarily. This is not the first time, however, in the economic history of the Province, Short as that history is, that the placer gold fields have proved an important resource in that they lessen the effect of depression in other industries, and form a reserve source of employment.

An attempt to work deposits of lode gold[1,2,3.] ~~were~~ was first made in 1852, when, following the report of the discovery of nuggets of gold, the Hudson Bay Company sent thirty miners to work a deposit at Gold Harbour on the Western shore of Moresby Is, Q.C.I. These men were joined by independent miners from San Francisco; the vein, however, proved small; the Indians stole the ore as it was worked, and the mine was abandoned. The discovery and exploitation of placers absorbed the attention of miners for many years; the building of the C.P.R. with its great demand for men who could construct embankments and make cuttings and tunnels employed many miners, but with the completion of that work they were left free to take part in the development of the lode deposits whose existence was beginning to be suspected.

1. Lode Gold Deposits of B.C. Bulletin No. 3. 1932.
2. "Reports of Minister of Mines 1930,31,32.
3. Can. Min. Resources 1929.

Gold-bearing veins are widespread in the province, especially in the central region; generally they are quartz veins, but in the South between the Fraser and Kootenay L. calcite is frequently the gangue. These veins occur in the granite rocks of the batholithic masses, and also in the metamorphosed strata penetrated by the plutonic bodies.

Of all the gold produced in the province to the end of 1931, 80 % has come from gold mining, and the remainder has been derived as a by-product of base metal mining - the latter source is of decreasing importance - in 1932 by-product gold is estimated to be only 10% of the output. Anyox (Portland Canal) and Britannia Beach (Howe Sd) work copper ores which yield gold; at Ymir galena and pyrite are gold-bearing. Work done recently in the Bear R. area of the North West has shown appreciable gold values accompanying silver-lead-zinc mineralization.

Though gold is of wide distribution, so far the bulk of the output has come from a few centres - Rossland, Phoenix-Greenwood in the Boundary district, the Premier mine at Stewart (P.C.) and the Nickel Plate mine at Hedley.

The Rossland mines were located in 1890, and during the succeeding decade were the centre of intense activity, supporting 6000 people by 1898. A bad slump followed, but

the district recovered and developed into one of the great mining camps of B.C. until production began to decline in 1917. (Pop. 1932, 2900). For total production of gold the Rossland camp is the leader, though it is no longer the most important in annual output.

The Premier mine lies close to the Eastern edge of the Coast Range batholith, in an area composed of Jurassic sediments and tuffs penetrated by bodies of quartz prophyry and quartz diorite, the veins having been cut by fractures and faults. The mine was first worked for silver, but gold has been more important (silver 40%, gold 60% of total recorded output to 1930), and in 1931 it was estimated to comprise 75% of the ore produced. For some years the mine has been the chief source of gold in B.C.; 1927-32 it produced 60% of the total Provincial output. It is, however, apparently approaching exhaustion, though it will probably continue production of diminishing amounts of gold for some years. The mine is connected with the sea by a good road and by an aerial tramway (See Map A.6), which is used for shipping all the ores and concentrates, and for bringing in most of the required freight. It is of inestimable advantage for transport, since the mine is situated in a region of rugged topography which in winter has a deep snow covering. The ore lenses in this field vary from a few to a hundred feet in width, their horizontal length being rarely more than 300'.

At Hedley, gold ore bodies of irregular size and of varying gold content occur in Limestone beds - in an area of folded sediments and tuffs which have been intruded by stocks, sheets and dykes of diorite and gabbro and by large bodies of granodiorite.

At Surf Inlet on Princess Royal Is., the ore occurs chiefly in 2 large quartz veins which are 100-150' apart at the surface, but converge downwards and merge into one vein 40' wide.

At Rossland, veins and shoots occur in a locally limited area of basic volcanics and vein fractures, and mineralization has not been found in general to extend West of the serpentine area which, dipping under the mineralized ground has also terminated productivity at comparatively shallow depths. This district is noted for the exceptional richness of the ore-shoots, which are rarely more than a foot wide and correspondingly short.

The depressed condition of the base-metal market has led to a revival of gold mining - on lode as well as placer deposits. The output of lode gold in 1931 amounted to $3 million; the output of the first half of 1932 compared to the corresponding time in 1931 showed an increase of 25%, and the estimated total output for 1932 is $3-8[6].

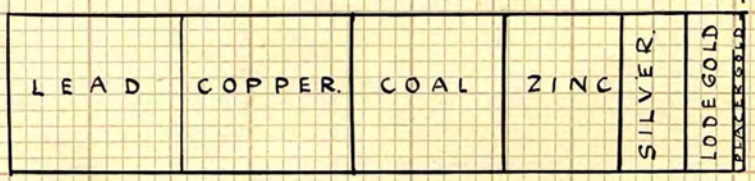
Increased prospecting and development work is reported from nearly all the mineral survey districts. In Cariboo 1932 was the busiest year for some time, and in the Bridge R. district and in the Nelson Mining Division gold production

VALUE OF LODE MINERALS PRODUCED
TOTAL VALUE BY 5-YEAR PERIODS
PLACER GOLD ADDED FOR COMPARISON.

DATA FROM REPORT OF MINISTER OF MINES 1931.

PLACER GOLD MORE VALUABLE EARLIER e.g. 1860-64 15 MILL. 65-69 13 MILL 70-74 7 MILL. '75-79 8 MILL. DOLLARS. (DECLINE THEN SET IN).

VALUE OF MINERALS PRODUCED (AV: ANN: VALUE 1927-31).



SCALE 1cm: 5 MILLION DOLLARS.

gave a considerable amount of employment. Indeed, it is expected that the Pioneer mine in the Bridge R. district will be the chief producer of gold in B.C. in 1933. At the Pioneer mine the country rock is basic, and the ore is quartz carrying ~~the~~ free gold. Cariboo, though so famous in the annals of placer mining, has so far not been much worked for lode gold - 1932 saw greater interest taken in this form of wealth, especially in the Barkerville area - where development is practically at production stage. Taku R. district, Omineca; points near Grand Forks, Greenwood Nelson, Ymir, Lardeau, Lillooet were all centres of great activity in 1932.

There are still many places where intensive geologic investigation has not yet been carried on, and where new discoveries may, from the main outlines of the geological structure as at present known, be expected; there are also places where gold deposits have been located but on which there has been no development. Given improved roads to, at present, inaccessible regions, and careful use of modern methods of mining and milling there seems little reason why the industry should not continue to produce as much gold and to employ as much labour as heretofore.

Copper[1,2] has been one of the chief metals produced in British Columbia; until 1930 this province was the leader among the Canadian Provinces in this respect, since then production has declined, and Ontario has become the leader.

1. Can. Min. Resources 1929.
2. Ann. Rept. Min. of Mines.

The chief producing areas are both adjacent to the Coast Range batholith; they are Anyox and Britannia Beach. A large low grade deposit has been worked at Copper Mountain at Princeton. A large number of copper deposits are found in the province, nearly all of them connected with batholithic intrusions; those in the Boundary district have been the most important.

At Anyox the Hidden Creek ores are smelted, and the resultant blister copper is shipped to Canadian and American refineries. Britannia ores are concentrated near the mine, and the concentrates are shipped to Tacoma.

The production of silver lead and zinc has shown a marked increase since 1920, and in 1928 B.C. was the leader in all three branches of the Canadian metallurgical industry - producing 94% of the lead, 88% of the zinc output of the Dominion. The ores which yield these metals are found mainly in ~~the~~ E. & W. Kootenay - they are highly complex, and have needed the application of modern metallurgical methods for their full value to be obtained. e.g. the silver-lead-zinc ores which were formerly penalized for their zinc content, now find zinc an asset, as the market price of spelter has been high since the war. The building of the smelting works at Trail had a marked stimulating effect on the industry.[1,2]

1. Can. Min. Resources 1929.
2. Repts. of Min. for Mines.

The Sullivan mine at Kimberley, though primarily a producer of lead and zinc, is the largest individual producer of silver in Canada. Silver is also recovered from concentrates which are exported for treatment abroad and from Trail and Anyox blister copper, and very small amounts are recovered from alluvial gold and gold bullion. The silver resources are thus very widely distributed, the greatest development in recent years being of a new mine at Stewart, which in 1930 yielded approximately 1½ ~~6~~ million ozs. and which was largely responsible for the fact that 1930 established a new high record for silver production. The average annual output 1926-30 was 10 million ozs; before 1922 only twice did the output reach 5 million ozs.

Kootenay is likewise the chief area producing lead and zinc, and the Sullivan mine in E. Kootenay is the most important for both, the ores from this mine being a very fine grained mixture of galena, zinc, sulphide pyrite and pyrrhotite, yielding 11% lead, and 7% zinc and also 5 ozs. silver per ton. The mine is operated by the Company which controls the Trail smelter where the ores are treated, much of the zinc being recovered from lead slag.

Nearly 50 mines in 1928 produced lead, and 19 produced zinc; the number is smaller at present, since the market price for base metals has fallen so low, and the output of

these in British Columbia is controlled by the world market price, there being practically no local market for the output, and even the Canadian market will not absorb more than 25% of it. It is the smaller mines which have been most affected by the depression in the base metal trade, especially those situated in the Slocan district (Output of lead 1929 5.6 million lbs. 1930 1.2 million. 1931 .5 million).

Though lead is produced in many centres, the amount is small except in the case of the Fort Steele mining sub-division ~~output~~ which in 1930 produced 301 million lbs. (total Provincial output for the year 319 million). Golden, Portland Canal, Slocan, Nicola, Vancouver, Greenwood and Omineca all contribute to the lead production.

Zinc is found in fewer areas. Fort Steele is the leader in this respect also, indeed during the last two years the Sullivan mine has been practically the sole producer.

Large reserves of iron ore[1] are found especially in the western part of the province, but very little has been worked; the deposits are partly limonite, found as a shallow deposit, easily worked with a steam shovel, and of generally good quality, and partly of magnetite of which the chief reserves are found on Vancouver Island, where on the West Coast the ores are exposed on the sides of the fiords. On Texada Is.

1. Can Min. Resources 1929.

lenses of magnetite, scattered over an area of $1\frac{1}{2} \times \frac{1}{2}$ mile and situated $\frac{1}{4}$ - $\frac{1}{2}$ miles from the coast, were worked before 1903. On the South side of Kamloops Lake a mine was worked from 1889-1901.

The chief limonite reserves are found on Copper Creek, about 35 miles from Copper City on the C.N.R. the ore contains 50-60% of iron, and covers 50 acs. In the Taseko district the ore is also of this type and contains 40-50% of iron.The working of the iron reserves is not worth while, as there is little local demand, and the world's iron-manufacturing countries have at present more accessible resources.

In the Tulameen district is a belt of peridotite rocks, cut by the Tulameen and its tributaries. In the gravels of these rivers is found black sand, carrying varying amounts of fine gold and platinum, which are, however, difficult to recover. In the Quesnel district are gravels which in places carry a high content of black sand, which might show paying values were they properly treated.

Of minor value are arsenic, produced at Hedley (Nickel Plate mine) in the form of arsenical iron concentrates carrying gold values, and shipped to Tacoma for treatment, and Sulphur, produced as a by-product by the Britannia mine and sold to chemical plants.

COAL RESERVES.

The coal reserves of B.C. are extensive and have been

worked for a century,[1. 2.] though production was on a very small scale until 1870, and it was not till 1884 that the value of the annual production amounted to 1 million dollars. The reserves are mainly bituminous, though some anthracite is found in the Skeena Valley and some lignite on Graham Is., and near Princeton. The chief bituminous fields occur on Vancouver Is. (the main basins being those of Nanaimo, Comox, Suquash, Courichan and Quatsino Sound) in the Elk River area (Crows Nest mines), near Nicola and Tulameen, in the South Interior, near Telkwa (Skeena R. basin) and the Peace and Pine R. regions. (See Map B2) Of these resources those which are being tapped at present are the Nanaimo and Comox basins on Vancouver Is. the Crows Nest field, Nicola-Princeton and Telkwa - where the production is still small. Coal has been reported from other areas of the Northern Interior, and that part of the province should have ample supplies for local needs when the district develops.

Vancouver Is. produces more than half the total output, and about $\frac{1}{5}$ of that comes from submarine workings in the Nanaimo area. The seams in this basin were deposited on a deeply eroded, uneven surface, and they are therefore of highly irregular thickness.

The Comox basin is thought to hold the largest reserves - the seams here are numerous, but irregular in thickness and extent, for they have been broken by faults and small folds

1. Can. Min. Resources.1929. 2. Repts of Min of Mines Inspectors 1929,30,31,32.

Much of this reserve is of coking coal, some having been made into coke by igneous intrusions.

The Crows Nest basin holds more than half the reserves of the whole province; there are at least 47 seams in the field, which vary in thickness up to a maximum of 80 feet at Corbin, the strata having been closely folded and faulted and squeezed into pockets.

The collieries of the Nicola-Princeton district produce ⅓ as much as the Crows Nest field, and the Northern District Skeena valley fields produce, so far, only 1000 tons per year.

Of the coal mined in B.C. the bulk is sold in Canada - a certain movement of coal to the U.S. takes place - mainly from the Crows Nest field - and a very slight amount is marketed abroad - the latter movement is all from the coastal fields. The Nicola-Princeton field takes practically no share in the export trade, finding its chief market in Vancouver.

The coal resources are capable of great development, but for some years the coal mining industry has suffered from the competition of fuel oils imported free of duty; since 1910 the use of coal has not kept pace with the general development of industry in the province. Since 1928 the rate of decline in the coal industry has been arrested, except in the Vancouver district, where a general lowering of standard of business has been felt, and where the competition of imported fuel oils is keenest. The Crows Nest field has been gaining

trade in Winnipeg, owing to the Dominion Government Subvention on coal moving East.

The coal-mining industry employed nearly 6000 men in 1919; now it employs 4600; one Indian works in the Nicola field and 337 Asiatics in Vancouver pits, but otherwise the workers are all whites. The Vancouver Is. Collieries employ 2400 men, those of E. Kootenay 1200, Nicola-Princeton 600, and the Skeena valley fields only 18.

In the whole Province in 1931 less than 500 men were employed in quarries.[1] The small output is the result of slight demand, not the absence of suitable material - the chief building material being wood, there is not much demand for stone and brick except in the larger towns. The South-West is the chief area in which quarrying is carried on; in that district granite is quarried at Granite Falls, Burrard Inlet, for crushing and subsequent use for general construction work; Haddington Is. quarry is being worked for building stone for the new Royal Bank building and the Canadian Northern Hotel, Vancouver; on Nelson Is. a quarry produces stone for building and monumental work.

Limestone is present in many areas, but is worked mainly near Nanaimo, and to a less extent near Victoria, Bella Coola and Nelson. The largest limestone quarry is at

1. Annual Rept. of Mining Industry for 1931.

Blubber Bay; it occupies 50 men, and another hundred are employed in the lime-kilns and a saw mill owned by the same company. At Vananda (Texada Is.) limestone for use in their pulp mill is worked by Prince Rupert Paper Co., and the Fife quarry is worked for lime by the Consolidated Mining and Smelting Co. to supply limestone to their smelter, and at Bamberton limestone is obtained for cement.

Crushed rock, sand and gravel, mainly for road-making, are quarried in all parts of the province, especially in the Vancouver and New Westminster districts. The two chief works in progress (1932) in B.C. which have led to the employment of quarrymen are the Big Bend Road and the Corra-Linn Dam. The B.C. government is building the road N. of Revelstoke along the Columbia R. to connect with work done by the Federal Government from Golden. The Corra Linn dam is being built on the Kootenay R. about 9 miles West of Nelson, in connection with a new hydro-electric power station.

Road and trail building is an urgent necessity in many parts of B.C., for there are still large areas in the West and North where back-packing in the only means of transport, and such work is likely to expand, with a necessary accompanying expansion of quarrying (In 1891 only 55 men were employed in quarries, 183 in 1921, 460 in 1931).

Dependent on the development of mineral resources are several subsidiary industries - the chief of these is

smelting - which is found only in the N.W., where at Anyox a copper smelter is situated, and in the S.E. where the chief centres are Trail, Grand Forks and Greenwood; all three have copper blast furnaces, one of the eight at Grand Forks being the largest in the British Empire. In addition Trail has two lead stacks. Power for these centres is derived from hydro-electric power generated at Bonnington Falls, 11 miles west of Nelson on the Kootenay R.

Concentrating mills are less important as employers of labour - those in Kootenay treat silver lead, those on Howe Sound copper and those on Portland Canal copper.

As is seen in the appended table, of all the branches of the industry, coal mining is the most important source of employment particularly in the S.W. where the rich coal-fields of Vancouver Is. are worked, but the area employing the greatest number of miners is the Eastern Mineral Survey District, which includes the metallic mining area of Kootenay, where mining centres such as Trail have grown up, and the Crows Nest coal fields where the chief centre is Fernie.

Men Employed in Mining, Quarrying and Associated Industries

1931. (By Mineral Survey Districts).

Dist.	Mines. Placer	Mines. Lode.	In Concentrators.	In Smelters.	Coal.	Quarries.	Building. Mat. Plants.	Misc.	Total
N.W.	187	815	111	339	-	18	6	13	1489
N.E.	273	19	-	-	11	5	6	2	316
Central	98	139	18	-	105	48	13	6	427
S.	48	124	9	-	443	8	2	2	636
E.	59	729	279	2818	1211	37	3	70	5206
W.	23	471	164	-	2312	344	496	287	4097
Total	688	2297	581	3517	4082	460	526	380	12171

From Rept issued by Minister of Mines, 1932.

The Province has sufficient mineral reserves to remain an important producer of minerals for a very long time. The exact distribution of the mining population may change, as has been suggested, as the result of the exhaustion of some and the discovery of other deposits. Except for the Rocky Mountain region north of the Crows Nest coalfield, no part of the Province is likely to be without mining centres. Those which exist to-day vary from centres of a few tens of people concerned with the working of one or two small mines, to villages of a few hundred inhabitants, situated at the junction of roads and trails leading to many mines, for which the village acts as distributing centre e.g. Denver, Salmo in Kootenay, to large towns of several thousands which serve large or peculiarly rich areas e.g. Kimberley, Rossland.

It is in the south-east of the Province that the greatest number of mining settlements are found - prospecting and exploitation have been easier than on the margins of the major Coast Range batholith, where, however, new discoveries are more numerous, and, with improved communications, it is probable that new settlements may arise in the region.

With increased general development in the Province a greater market will arise for coal, and that will stimulate the exploitation of coal fields like ~~that~~ those of the Groundhog and Peace R. regions, with consequent formation of mining villages. In British Columbia, however, manufactures are not

connected with the developed coal fields owing to the great resources of hydro-electric power - and none of the coal field towns has become an important manufacturing centre - Nanaimo is the largest (pop. 10,000) but it owes its size to its harbour and to the fact that it is a centre for farming, lumbering and fishing industries as well as for coal. In marked contrast to the conditions prevailing, for example, in England, the industries subsidiary to metallic mining have not been established on coal fields, but on sites which have access to hydro-electric power.

VI.

1,2,3,4.

Climatic conditions prevailing in British Columbia.
Controls.
Influence of topographical features on distribution of rain.
Snowfall.
Seasonal distribution of precipitation.
Influence of rainfall on farming.
Wind, force and direction.
Temperature.
Climatic regions. Description of each. Correlation with distribution of population.

The main factors controlling climatic conditions prevailing in British Columbia are (1) the position of the Province on the Pacific Coast in lat. 49-60°N, that is in the latitude of prevailing westerly winds, (2) the presence of a warm current, the Northern branch of the Japan current in the off-shore waters; this current is the Pacific counterpart to the N.E. Atlantic drift, (3) the fact that the topographical features are strongly marked, and that the axis of the mountain ranges run from South-east to North-west, parallel to the direction of the coast line.

A maritime type of climate, with prevailing westerly winds, would be the natural result of the first two factors, and certainly conditions are more equable in this province than in any of the others. A great contrast is to be noted

1. Canadian Climate by Koeppe 1932.
2. Climate of B.C. Statistics issued by B.C. Government, 1931.
3. Year Book of Canada.
4. Reports of Surveyors pub. by Geo. Surv. Can. and B.C. Dept. of Lands.

between the coastal waters of the East and West of Canada - no ice forms on the latter, while harbours that may be used in winter are few in the east. In this respect British Columbia resembles the North-West Coastal region of Europe. In a detailed examination of British Columbia, however, it is seen that these climatic conditions are not typical of the whole province - the lofty Coastal range following the line of the coast~~al~~ prevents maritime conditions from reaching into the interior. A short distance east of the axis of the coastal mountains comes an abrupt change in climate, particularly in cloud and rainfall conditions , the heavy cloud banks of the coast giving place to clear sky and bright sunshine.[1] The exact position of the dividing line varies with the intensity of the cyclonic storms which are frequent on the coast; some penetrate into the interior, but they are shallow and cause only light winds. The Interior plateau, lying at a lower altitude than the Coast Range is in the rain shadow of the mountains, and has a much lower rainfall, but the mountains to the east, both the Columbian and Rocky Mt. systems are lofty enough to cause further condensation of moisture, though the total precipitation received is barely half that of similarly lofty and exposed positions on the western slope of the Coast Range. In the North-east of the province the plains share in the continental type of climate experienced in the Prairie Provinces, the rainfall being only 14-15" per annum in

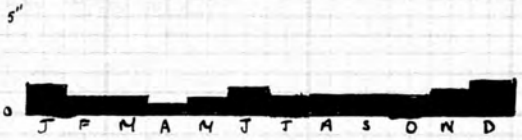
1. Surveyors' Reports 1930 (G.S.C.S.R.)

AVERAGE MONTHLY PRECIPITATION
AT CERTAIN STATIONS

CLAYOQUOT
(West coast Vancouver Is)

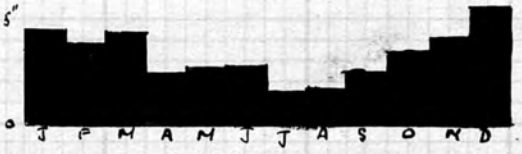
NEW WESTMINSTER.
(West coast Mainland)

MILL BAY.
(N-W Coast)



LILLOOET
(Dry belt interior plateau)

CRESTON
(sheltered valley in S.E)



FERNIE
(Exposed upland in S.E)

the few years that records have been made; the rainiest months are May, June and July - which is also characteristic of continental areas. As will be shown later, temperature as well as rainfall conditions are typically maritime only on the coast, continental influences being strong in the eastern part of the Province.

The influence of the topographical features on the distribution of rain is shown very clearly by the isohyetal map (Map C). The exposed western flanks of the mountains in the large islands receive over 100" of rain. The North of Graham Is. is as exposed as the South, but is low-lying, slightly-undulating land, and so has a smaller precipitation - between 50 and 100". In Vancouver Is. the wide opening of Barkley Sound causes a break in the 100" isohyet. Vancouver Is. is wide and lofty enough for the east coast to have an appreciably lower rainfall, and the South-east lowland receives only 30-40" - an amount much more favourable to agriculture than is 100". On the mainland the same features may be traced; the rainfall on the Coastal range is heaviest where the island barrier is narrowest, amounting to over 200" between Dean Channel and Gardner Canal. The fiords and valleys draining to them have considerably less precipitation than do the highlands, for example, the mountains bordering the lower part of Burke Channel receive 150", Bella Coola, at the head of the fiord 50", while higher up the valley only 30" are received.

As has been said, East of the Coastal range conditions change rapidly, and the average precipitation over the interior plateau is 20" or less. As little as 10" is received in the deeply-cut valleys of the Fraser, the Thompson and their tributaries, and these depressions form the arid region of the province, the whole plateau being semi-arid.

In the eastern mountain areas the ranges receive between 20" and 50", or in the highest parts over 50", but here, too, the valleys are less well-watered; the lower Okanagan, for example, receives less than 15" of rain. Kootenay and Arrow Lakes are bordered by mountains with a precipitation of 30-40", but the basins themselves receive only 25".

In the northern part of the province no meteorological station except Atlin (precipitation 11") has been established.

Snow forms a part of the precipitation in all parts of the province, but naturally the amounts vary greatly - Clayoquot (W. Vancouver Is.) has only 3.1", Nanaimo 17", Nelson 93", Ashcroft (Dry belt) 14". The mountainous districts report heavier falls of snow than do any other stations in Canada, most places above 4000 feet receiving over 100". Glacier, on the west slope of the Selkirks, receives 330". In the Northern regions, naturally, the snowfall is also heavier - at Ocean Falls it amounts to 53", at Mill Bay 124", at Anyox 176"; at Atlin, where the annual precipitation is but 11", the snowfall is 51". On the west coast lands the

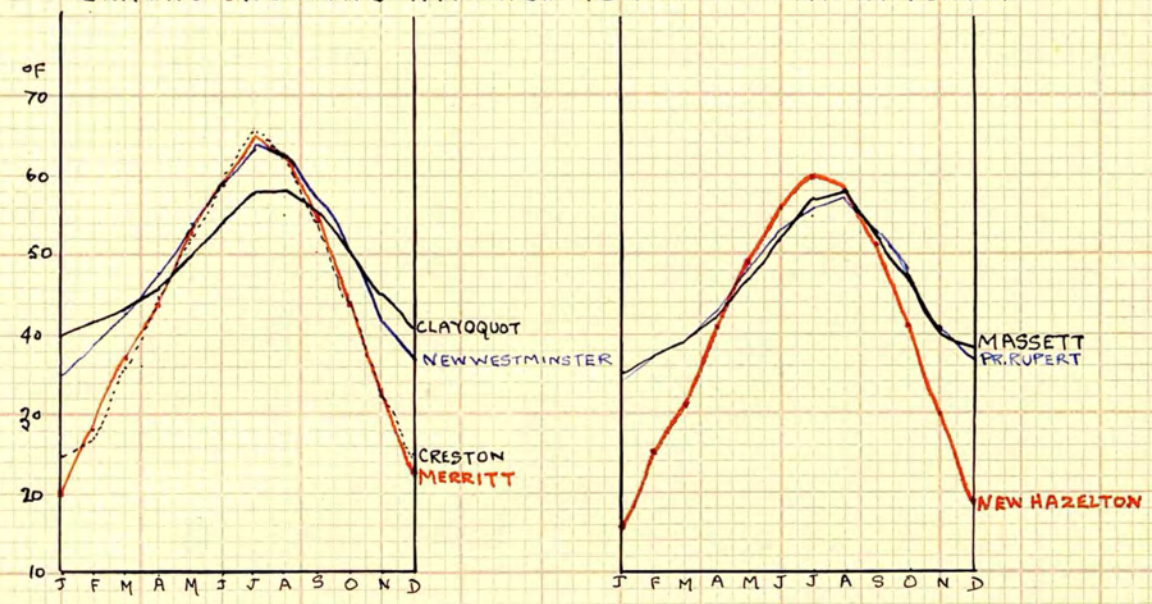
the snow does not lie for long, but in the interior and north the snow covering facilitates transport by sleighs for many weeks.

As is characteristic of oceanic and mountainous areas alike, the coastal and mountain regions receive most of their precipitation in autumn and winter; on the coast the winter half-year receives 70% of the total fall. In the interior the fall is fairly evenly distributed throughout the year, with a slight maximum in summer. Variability in the amount received is not of great importance where the average is high but in the interior where the average is barely enough for cultivation a slight decrease in the amount may be disastrous.

In exposed coastal positions the precipitation is too heavy for cultivation, and so areas like the west coastlands of Vancouver Is. have been disregarded by the agricultural settlers. Hardy vegetables may be introduced, however, with success. In the semi-arid valleys irrigation has proved necessary for successful cultivation, but apart from these extreme cases the rainfall conditions are suitable for agriculture, where surface and temperature conditions favour its development. In the lower mainland and S.E. Vancouver Is. which normally receive their maximum rainfall in winter, an occasional wet summer ruins a part of the fruit crop, which in most years is favoured by the prevailing fine weather of June, July and August (See Graph for New Westminster).

High winds are rare in all parts of Province, being most frequently reported on the Northern part of the coast.

GRAPHS SHOWING AVERAGE MONTHLY TEMPERATURES.



CLAYOQUOT	Lat 49°10'	MASSETT	Lat 54°
NEW WESTMINSTER	" 49°13'	PRINCE RUPT	" 54°19'
MERRITT	" 50° 6'	NEW HAZELTON	" 55°15'
CRESTON	" 49° 5'		

CLAQUOT and MASSETT show equability due to Insular position, with difference due to latitude.
N. WESTMINSTER and PR. RUPERT are slightly affected by the Continent, but regime is equable.
MERRITT and NEW HAZELTON illustrate more extreme conditions of plateau,
CRESTON those of Interior Valley.

At Vancouver the average velocity of the wind is between 4 and 5 miles per hour in every month of the year, and, on an average, gales do not occur once a month. Kamloops, which may be taken as typical of the Interior, has never reported the occurrence of a gale. At Prince Rupert the average wind velocity is 6 -8 m.p.h. in each of the winter months, 3 -6 m.p.h in the summer. The prevailing wind direction is from the South West, but locally its direction is greatly influenced by topographical conditions e.g. Kamloops and Vancouver, both in East-West valleys receive East or West winds for most of the year; at Prince George, the trend of the Fraser favours South or South-West winds.

Thunderstorms are also infrequent. They sometimes occur in the mountain regions where they are responsible for a certain number of forest fires every year. The North coast has, on an average, only one every year, Victoria three and Vancouver six.

The temperature gradient on the British Columbian coast is much more gradual than that of Eastern Canada; in the former it is only .70°F per degree of latitude; in the latter it is 2.7° F. The modifying influence of the Pacific is so strong that the annual range of temperature at Clayoquot is the lowest for Canada, being only 18°. The mean annual range at Massett is 23° at Ocean Falls 19°. A narrow strip of country along the west coasts of Q.C.I

and Vancouver Is. have never reported a temperature as low as zero, nor has Vancouver City. In the interior, however, continental influences are strong, and absolute minima of -50°F. or lower may be recorded, and on the plateau in winter cold spells, inwhich the temperature falls to 30° or 40° below zero, generally occur two or three times each year. Summer temperatures are higher on the plateau than on the coast, Kamloops often recording 90° and occasionally 100° F. The maximum recorded in the Province is 110°F. In the valleys of the South-East temperature conditions are similar to those of the plateau as may be seen by comparing the temperature curves for Merritt and Creston. The winter temperatures are slightly higher, and the short periods of frost are slightly less intense in the valleys than they are on the plateau.

The great latitudinal extent of the Province causes wide temperature differences between North and South. In the North, though in summer the days are long and sunny, night frosts are to be expected for most of the year, the average frost-free period being only two months.

Throughout the Plateau and the North-Eastern Plains, mild intervals occur in winter with the blowing of the Chinook from the West. This wind causes a rapid rise in temperature amd evaporation of snow. A settler near Ashcroft,[1] Fraser Valley, describes an occurrence of the

1. Monthly Weather Review 1907. Dry Chinook of B.C.

Chinook in which the temperature rose 59° within five minutes, a foot of snow being sucked off the ground in three or four hours, leaving only a mere trickle of water on the road, which had not absorbed any moisture as the ground was frozen. Sometimes the Chinook is accompanied by rain.

The Northern districts and those of greatest altitude suffer from such rigorous climatic conditions that they are of no agricultural value. At most a little gardening may be possible; for example, the operators at the cabins of the Yukon Telegraph Trail cultivate a few hardy vegetables for their own use. Except for trapping no outdoor work is possible for many months - placer mining, which has attracted men into the Liard basin, can be carried on for only 6 months, and except for scattered trappers and prospectors and a relatively large settlement at Atlin, where the mineral wealth is great, the province north of a line joining Stewart (Portland Canal) with the Peace R. is an empty region.

Apart from this area the regions of moderate altitude are highly favourable to settlement. The rainfall, with the exceptions already noted, is adequate for cultivation or stock-raising; the climatic conditions are bracing, and the highest temperatures are found in the driest parts of the Province. There is sufficient difference between the climatic conditions of different parts of the province to

justify its subdivision into 4 major climatic regions:-

(1) the Coastal region, with equable temperature and heavy rain, the maximum falling in Winter.

(2) the Interior Plateau with a greater range of temperature and slight to moderate rain, fairly evenly distributed throughout the year.

(3) the Interior humid belt of the mountains of the South - East, where ranges receiving 30-60" of rain are separated by deep valleys receiving less than 25", the seasonal distribution being similar to that of the Coastal region. The range of temperature in the valleys is similar to that of the Plateau valleys, though the winters are generally slightly warmer.

(4) the continental north-east plains, with short, warm summers, long, cold winters and moderate precipitation.

In each of the first three belts further subdivision is possible on the basis of temperature changes that are due to differences in latitude, and within each subdivision irregular relief causes the general conditions to be broken.

In the West Coastal region marine control is very strong; extremes of temperature are not found, and the precipitation is heavy. Throughout the region autumn and winter are the rainiest seasons, and late spring and summer the driest. At Victoria the November rainfall is fourteen times that of July, both July and August being in S.E.

Vancouver Is. markedly dry months. A large number of days each year are rainy - on an average 150 in the South, and over 200 on Queen Charlotte Island. In 1931 rain fell on 193 days at Vancouver, on 155 at Victoria and on 234 at Prince Rupert. Numerous cyclonic storms pass over the region, but they are not intense, and fairly calm weather is experienced at all seasons.* The daily range of temperature is low, particularly during the winter; at Victoria it is 8° in winter and 17° in summer, and at no place in the region is it more than 20° at any time of the year. The annual range of temperature is also small - 22° at Quatsino, 27° on the East Coast of Vancouver Is. on Howe Sound, 29° at Ocean Falls, 23° at Prince Rupert.

In the North on the Stikine basin[1] precipitation on the Coast Range is heavy all the year, and falls mainly as snow, which settles during December and which does not disappear from the heights until late summer. In the central part of the range, snow accumulates in winter to the depth of 20 feet, but at Telegraph Creek the accumulation is less than 6 feet. More information is available for the Portland Canal district - which has a long, cold winter, the

* July and August are the two driest months for the coast region because then the cyclonic control is weak; the winds are light and tend to blow parallel to the coast, and even when their direction is on shore they furnish little moisture unless the altitude of the mountains can make the temperature of the land lower than that of the sea.

1. Surveyors' Reports.

temperature being below 32° during Dec. Jan. and February. At Stewart, which is farther removed from marine influences than Anyox, this low temperature continues throughout March. Precipitation is heavy, and the records for snowfall are higher than in any other parts of British Columbia outside the high mountain country - (Anyox 176", Stewart 163"); heavy snow slides occur in late winter and spring; they generally follow valleys, and, plunging down the slopes, destroy the forest, at times being also a menace to mines. The summer temperatures are moderate, the coastal stations recording 57-60° during July.

From Prince Rupert southwards coastal stations show no record of any month with an average temperature below freezing, and the annual range of temperature is less than 30° at places on the coast. Bella Coola may be taken as typical of the central part of the coast - there are no summer frosts, and in winter the temperature rarely falls as low as zero. Snow may last throughout the winter, but as a rule the ground is not continuously covered. The settlement lies in a narrow valley from which mountain slopes rise abruptly; the hours of sunlight are curtailed by the mountain shadows, and in winter the greater part of the Southern side of the valley is without sun. Climatic conditions depend a great deal on local exposure - the effect on precipitation has already been pointed out, but

the point may be stressed by more particular statistics - Prince Rupert 98", Ocean Falls 158", Britannia Beach 74", Powell R. (in the rain shadow of Central Vancouver Is.) 36". The temperature for the hottest month varies from 61-65°, except for Prince Rupert, which partly because of its higher latitude and partly because of its very exposed position has a temperature of only 57° for the hottest month (August).

In the South the Fraser lowland permits ocean influence to penetrate slightly farther inland, though even Hope has an average January temperature of 28° F. The precipitation is lower here than farther north, for, sheltered by Vancouver Is, the coast receives less than 50". The summer months are the driest, and the hours of sunshine are long, in July Vancouver receives 54% and in August 57% of the possible number. Fogs are practically unknown between April and August and are most prevalent in October (6 out of a total for the year of 24); completely cloudy days are most frequent between November and February, but even in Jan. (the cloudiest month) the average number is only 17. As may be expected from the foregoing data, the daily range of temperature is greatest in the summer - 20° in July (cf. 8° in January). The annual range of temperature on the coast is between 25° (Steveston) and 29° (New Westminster); inland it increases to 31° at Chilliwalk and 36° at Hope, which is on the margin of the belt.

On Vancouver Island, the south-eastern coastline has much the same climatic conditions as the southern mainland coast - rainfall of less than 50", and an annual range of temperature of between 24° (Metchosin) and 27° (Nanaimo and Qualicum Beach). Victoria has more hours of sunshine than any other station in the Province (average 2190 cf, Kamloops 2139); the duration of sunshine is longest in July, when 60% of the possible total is received, and except for the highland stations the rainfall for July and August does not amount to 1" per month, and in some years water must be applied to the fruit crops, though, as a rule, harvesting the fruit crop is favoured by the prevailing conditions.

The West Coast of Vancouver Is. and the Queen Charlotte group are alike in equability of temperature, the annual range of temperature being less than 25° F., except for Port Alberni, which has such a protected position at the head of the long canal that the summer temperature rises to 65° in August. The other stations record an average for both July and August of 57° or 58°, except Holberg which has a position somewhat resembling that of Port Alberni, far up Quatsino Sound. Rainfall is everywhere heavy, and the wettest season is from October to May; sometimes rains persist all through the summer, though the days of June, July and August are generally warm and dry. For much of the year heavy rains make outdoor work unpleasant, but do not

prevent it altogether. The region is one of scanty population as yet, partly because of the wet climate which is not favourable to agriculture and partly because of inaccessibility; roads are difficult to make over the rugged areas which separate one lowland from another, and the coastal waters are stormy and more difficult to navigate than those along most parts of the B.C. coast. The development of the fishing grounds is leading to settlement on the West of Vancouver Is. but Western Queen Charlotte is still untouched. The heavy rains favour forest growth, but the stormy coasts prevent easy towage of the timber.

The Interior plateau forms the semi-arid region of the Province, but conditions vary greatly owing to differences of latitude and altitude. In the Northern plateau settlement is slight, and meteorological data ~~is~~ are meagre. Atlin is a notable exception - the area having been settled because of its mineral wealth. As may be expected from the high latitude and altitude (2240'), temperatures are always low; the average for the hottest month is 54°. Summer temperatures do not vary greatly, but those of winter do; the average for Jan. is 3°, but in 1931 the average for both Jan. and Feb. was 24° F. The absolute minimum recorded is -58°. Ice forms on rivers and lakes in November usually, and the break-up is expected in May, though on some lakes it may not occur until June. Precipitation is slight - 11", but

dependable, and half of it falls as snow, the maximum precipitation falling in November. Cultivation is practically impossible under such conditions; a few hardy vegetables are all that may be grown. Tree growth is scanty; it is absent over large areas, but along the valleys sufficient timber can be found to support the small saw-mills which cut timber for the local demands for fuel and mining timber. Mining can only be carried on on the surface for six months - from May to October inclusive.

Miners and surveyors have reported on the climatic conditions of other parts of the North; for example on the McDame Creek basin, which may be taken as typical of the Liard. The area has the appearance of a dry belt, the snowfall is light; low temperatures prevail in winter though the ground is not permanently frozen. In summer day temperatures are fairly high, but the nights are cool. The rivers are frozen from mid-October to early May, small lakes being ice-covered for longer.

The Iskut area, being nearer to the Coast range receives a much heavier precipitation. Heavy snow falls, and it is not till high summer that much of it melts. Prospecting is the chief interest of the few men who do penetrate into the area, and such work is possible for only a very restricted period. On small parts of very favoured slopes it may be possible to begin in May, but outside the

wooded areas it is not till August that large stretches of ground are available for inspection. By mid-October the accumulation of snow is again too great to continue operations.

These northerly stretches offer little incentive to permanent occupation of the land, but in that part of the plateau which is generally known as Central British Columbia conditions are less rigorous, and settlement has taken place in the Bulkley and Nechako valleys,[1] since the building of the railway to Prince Rupert gave an outlet to the farms. The winter here lasts from four to five months, the spring thaw coming in March, so that ploughing may start in mid April. During the winter the days are usually clear, calm and sunny; temperature conditions vary - occasional warm spells accompanied by rain may come with the blowing of a wind from the west; occasional cold spells, lasting for 2 or 3 days cause the temperature to fall to 30° and more degrees below zero. During some winters the minimum recorded is -20°F. Cattle, of course, must be housed and fed during these cold months. The summer days are long and bright; at Hazelton the average temperature for July is 60°; seeding takes place early in May, and though light frosts may occur later they are not generally severe enough

1. Cent. B.C. Bulletin issued by Dept. of Agri.

to damage crops. The precipitation varies from 16-20", and is sufficient, with the prevailing temperature conditions for the cultivation of roots, oats and even some hardy wheats. Summer frosts are most frequent in narrow parts of the valleys, especially when they are wooded. Clearing has rendered the farm land less susceptible to frost, as it has favoured circulation of the air, and areas which are now most affected will not necessarily be useless for agriculture, since the disability may vanish as the land is improved.

In the Fraser-Thompson region there is a marked difference between the valleys and the plateau; on the plateau the frost free period lasts only for 2 months, and above 3000' the only safe crop is hay. Precipitation, however, is twice as heavy as in the valleys, for up to 3000 feet it is insufficient for agriculture. The precipitation is fairly evenly distributed throughout the year, with a slight maximum in summer. Fogs, high winds and thunderstorms are all rare. Kamloops may be taken as typical of the semi-arid valleys. The precipitation amounts to only 10"; average monthly temperature ranges from 22°- 70°, Dec. Jan & Feb. having temperatures below freezing. The Chinook causes breaks in the cold weather, each break lasting for 2 -3 days. A certain variation from this mean may occur - in 1925-26 no cold weather occurred at all, while

in 1926-27 heavy snow fell all through the winter from early in November. The days are generally sunny, Kamloops being second only to Victoria for the average duration of sunshine. Owing to the low rainfall, the bottom lands and low benches of the Thompson and middle Fraser are covered with sage bush, and must be irrigated before they can be cultivated. This work has begun in the Thompson and Nicola valleys.

West of the Fraser the plateau is scantily populated, the land being suitable for stock-raising rather than for agriculture. Settlement is actually closest in the driest area, in the Thompson and its tributary valleys, where irrigation is possible, and where the valleys made the construction of railways practicable. Both C.P.R. and C.N.R. follow the Thompson below Kamloops, giving an outlet for the produce of the irrigated areas. The Pacific Great Eastern makes it more possible to use the plateau for stock-raising, but it is of recent construction (1922) and the full effect of the line is not yet felt, and without means of transport it is impossible to take advantage of even the most favourable climatic conditions.

The increase of elevation in the Columbian mountains and the highlands surrounding the Okanagan lake is reflected in an increase in precipitation. The trenches and deep valleys

particularly at their southern ends have a much slighter precipitation (12" Okanagan, 18-25 Arrow) than do the adjoining (25" Kootenay) heights. The winters are rather long, the valley stations having a temperature below freezing for three months, during which time there are short cold periods when the temperature drops to 0 or -10°, the minimum recorded at Kaslo being -14°. During the summer the average temperatures for the hottest months lie between 65 and 70°, with day records in July sometimes rising to 90°, and occasionally to 100°. The nights are always cool, though frost does not occur in summer. Snow covers the ground from Dec. until March in the valleys. On the intervening heights snowstorms occur throughout the year.

Irrigation must supplement the water supply in the trenches, but the rainfall on the mountains is sufficiently heavy to give an adequate supply of water, and fodder crops and fruit crops have been very successfully grown, the most anxious times on the fruit farms being those of the occasional severe frosts, these having sometimes injured the more delicate varieties of fruit trees.

In the Rocky Mountains conditions are highly variable and little data ~~has~~ have been collected; the Rocky Mountain trench is better known than the ranges. In the Columbia-Kootenay valleys bright sunny weather is general throughout the year. The winters are cold and long; summers are warm,

but occasional frosts occur in May, June and September, making the cultivation of fruit and more delicate annuals precarious. The greater part of the trench has a rainfall of less than 20", and irrigation is needed. When it is applied, fodder crops, vegetables and small fruits do well. Precipitation increases up the western slope of the Rockies. e.g. Cranbrook 14", Elko 20", Fernie 37". The ranges are forested, with snow-covered slopes above the timber. Climatic conditions are similar to those of Switzerland, and offer the same possibilities of developing a tourist industry, though inaccessibility will for many years be a limiting factor.

Meteorological stations are of recent establishment in the Great Plains, but reports have been given by settlers.[1] The winters are long and cold, though severe frosts are broken by frequent Chinook winds, so that, though the snowfall is heavy, it seldom forms a deep covering. Serious blizzards do not occur, but in summer hail is occasionally destructive and summer frosts are to be expected. For example, in 1931, on June 28th, 3° of frost were recorded, and the temperature fell just below freezing 5 times in the next six weeks. July is the warmest month; in 1931, the average July temperature at Rouce Coupe was 59° and at Fort St. John 62°, the precipitation amounting to 13" and 15" at these stations respectively. The Pine R. valley appears to enjoy milder climatic conditions

1. B.C. Papers.

than does most of the Peace R. Block. Though the winters are long, the great length of the summer days compensates for the shortness of the summer season, and it is possible to cultivate cereals, including hardy wheats; the rainfall is adequate, since the rate of evaporation is low, though similar precipitation must be augmented by irrigation in the South.

Of the types of climate found in British Columbia, the most favourable is the South Coastal type, found on the lower mainland and the south-east of Vancouver Is. Mild enough for the cultivation of a wide variety of crops, yet bracing enough for the maintenance of a good health record, never too cold for outdoor work to be carried on, suited to the breeding of cows, pigs, and poultry, the region offers conditions suitable for a wide variety of occupations, and it is here that the greatest density of population is found.

The valleys of the South are the next most favoured area; the climatic conditions are not quite so ideal here, owing to the inadequacy of the rainfall. The problem of irrigation, however, is not overwhelming, and progressive communities have been established there.

The valleys of the North East and Centre enjoy climatic conditions not entirely unfavourable to agriculture, but particularly in the Peace River block the land is on the

margin of agricultural safety. The Nechako-Bulkley and their tributary valleys offer greater security to farmers, largely because the C.N.R. gives an outlet for their produce, but in the Peace River block, after the long days of the short summer have been most carefully used in cultivating the land, weeks of the winter must be spent in hauling the crops over snow-covered roads to rail head. This adds greatly to the cost of production, and makes it unsafe for any but the most efficient settler to take up these marginal lands.

The large highland areas are most difficult to use, and are likely to remain empty, except where mineral wealth is present, or where forestry introduces a transient population of loggers. Their heavy rain and snowfall, however, is being increasingly used in the valleys in hydro-electric stations and irrigation works.

A close correlation may thus be drawn between the distribution of population and the prevailing climatic conditions. The regions most favoured climatically are those of greatest population, but, as has been shown, in parts of the province climate favours settlement, where at present little or none is found owing to absence of adequate means of communication.

VII.

FOREST RESOURCES.[1]

Importance. Forest Department. Statutory timber land. Reports of Commission of Conservation. Most important trees, their distribution and value. Developing of forestry in different parts of the Province. Transport of timber. Timber industries - saw-milling, shingling, cutting of posts and ties, manufacture of pulp and paper. Settlement dependent on forestry and subsidiary industries. Importance of markets outside B.C. Ports concerned in trade.

British Columbia possesses the last great forest reserve of the North American continent, a natural resource which is of great importance as a source of employmemt for approximately 12000 men are engaged in logging and an additional 15000 in saw-mills, paper and pulp-mills and other factories using the timber. In addition to its forming a livelihood for an important section of the population the forest yields considerable revenue to the British Columbian Government. The exploitation of the forests on a large scale ~~are~~ is a matter of the last decade, as is shown by the following diagram.

[1]Special Bibilography
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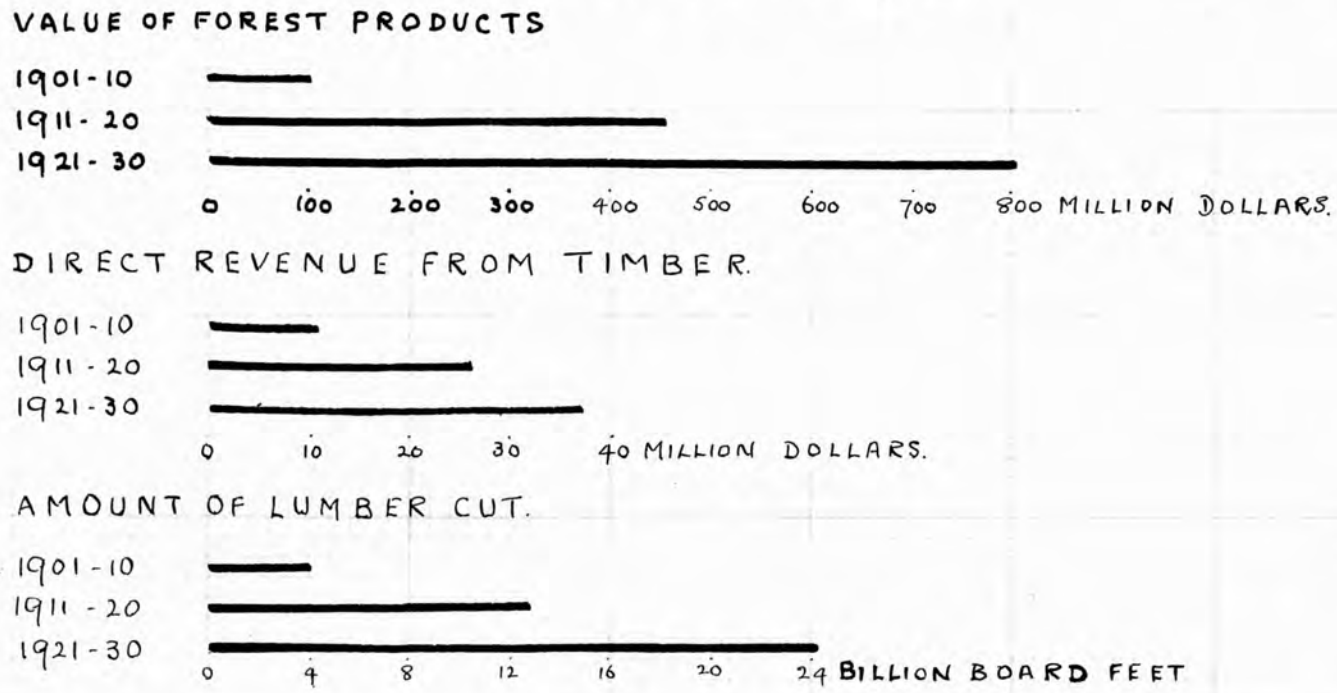
Revised Report to the Imperial Forestry Conference 1923.
Annual Reports of Dept. of Forestry (established 1912).

GROWTH OF FOREST INDUSTRIES SINCE 1900



The fur-traders first cut the timber, and as early as 1788 a deckload of spars was sent to China from Nootka with a crop of furs. This was but an experimental shipment, however, and the first sawmill was built near Victoria in 1846. A definite beginning to the industry resulted from the discovery of gold - first in California and later on the Fraser. In the eighties the C.P.R. caused a rapid expansion of the forest industries by giving access to the prairie market; every increase in the railway mileage and every new connection with other railway lines has benefited the industries by widening the market which the products could reach. The Panama Canal finally gave the possibility of an extensive trade with the Atlantic.

British Columbia is now the leading Province in the Dominion of Canada for saw-mill products, producing in 1930 48% of the total cut in lumber, and 78% of the shingles

As will be shown the forest varies considerably in type of tree and density of stand; some parts of the province have inferior resources, and there lumber centres are either absent, or small and concerned only with a local market; other districts have remarkably rich but so far inaccessible stands where therefore little development has so far been shown, e.g. N.W. coast. Other parts have long been ~~long~~ famed for the quality of their timber, and since it has been accessible lumber camps are of long-standing, and some have developed into considerable towns. Such is the case in the South-West Coast region and in the Columbia Mt. trenches.

The Provincial Government, realising the urgent necessity for conserving this great form of natural wealth, in 1912 organised a special Branch of the Department of lands for the administration of the forests. Forest fires were most destructive in the early days, especially where prospecting for mineral wealth was carried on, and much of the drier interior is covered with second growth of timber, often with jack-pine or lodge-pole pine which, after firing, has replaced the more valuable trees. The burning of slash on the farm lands is forbidden between May 1st. and October 1st., in case fire should spread to the adjoining forests. Land carrying merchantable timber, i.e. 8000 board feet per ac. on the coast or 5000 in the interior, cannot be taken by settlers for clearing to make agricultural land, and squatting on timbered land or land within a scheduled timber berth, whether it is

at present timbered or not, gives a settler no right to the land nor to the timber, and merely results in ejectment and the loss of any improvements he has made. In the earliest grants of land which were made no reservation was made of timber, so that in the lower Fraser valley practically all the timber is in private hands, and the supply is rapidly diminishing, as nearly all the land is valuable for agriculture and has been, or is being, cleared. In 1870 the system of granting the right to cut timber under leases as distinct from granting ownership of the forested land was introduced, and so the province has retained control over the greater part of the forest resources. (The Crown holds 90% of the forest area; 8% has been disposed of under license and 2% has been alienated).

An investigation into the Forest Resources was conducted by a Commission of Conservation in 1918, and in their report they estimated that of the total area 57% is incapable of producing forests of commercial value - 40% because it is above the merchantable timber line, the rest either because the land is too rocky or too wet, or because the forests have been so completely destroyed by fire that there is no hope of their being naturally re-established for centuries. Of the area considered to be capable of producing timber, only $\frac{1}{5}$ carries sufficient timber to be classed as statutory timberland; $\frac{1}{3}$ is either grass land or very open forest, the greater part being of value only for grazing. During the last few years the Forest Department has been engaged upon a revision of the

of the estimate of the forest resources. This work is, so far, unfinished, but in the coastal area, the only one so far fully investigated, the resources are shown to be smaller than they were thought to be by the Commission of 1918.* The Minister of Lands in a paper published February 1932[1] stated that the remaining stand was probably 275,000 million feet, of which 157,000 million are accessible under present standards of logging and economics. The only species which is definitely approaching exhaustion is the Douglas Fir, on which in the past the bulk of the trade has been built, and the mature Douglas Fir, it is computed, will, at the present rate of cutting, last little more than a quarter of a century. Logging consumes approximately 100,000 acs. of timber each year; the annual loss of young timber owing to fires in the last decade has averaged 117,000 acres. For the past 20 years, as has been stated, fire prevention has been practised, but during that time the fire hazard has increased owing to the opening up of the Province and the increase in the number of motor-tourists. In order to safeguard the timber resources permanent reserves are being made - more than ten million acres have already been set aside, and a research organization has been built up. A forest nursery has been established, and a limited planting programme has been inaugurated.

* Table appended.

[1] B.C. Lumberman Feb: 1932.

The number of species of trees found growing is comparatively small - only about 20 coniferous and 25 deciduous species being present; the trees of commercial value are limited to 16 species of conifers and one deciduous tree-cottonwood.

The best known tree is the Douglas Fir, commercially known as the Oregon Pine; it is the size of the individual rather than the widespread distribution of the species which has given the Fir its position of importance; a mature fir contains two to six thousand board feet of timber as a rule, and frequently the content exceeds ten thousand. The rate of growth varies; on the coast trees have attained a height of 80' and a diameter of 13-14" in fifty years, while trees in the interior in that time have grown only to 14 feet, with a diameter of 3-4". Deep, rich, well-drained soils suit this tree best, though it will grow on steep and rocky sites, provided they are not too wet. An annual precipitation of 50-60" is the optimum, and it is heavier rainfall, and consequent increased cloudiness, which prevents the Fir from growing on the more exposed parts of the coast; it occurs at the heads of the fiords as far North as Gardner Canal. On the other hand in the interior, where the rainfall is too scanty and the temperature range greater, the firs are smaller and of poor quality, the bole being shorter, and tapering more quickly (See Maps D2,3,4).

On Howe Sound and Clayoquot this timber in commercial

sizes is reported up to 3000 feet; towards the North the altidudinal range decreases - at Rivers Inlet and on Johnstone St. the maximum altitude for it is 2500', and at Gardner Canal 500 ft. is the limit. Even in the South, however, the best trees are usually below the 1500 ft. line. On the South west are some almost pure stands of Douglas Fir e.g. on Texada Is. and S.E. Vancouver Is. (which contains the greatest reserves in the province) but usually it makes up approximately 45% of the stand, being mixed mainly with Western Red Cedar. In the Interior the forest was originally 60% Douglas, but forest fires have led to its replacement by lodgepole pine. Small scale logging operators use these remnants of Douglas fir forest. The Douglas timber is highly valued in the building trade for beams, heavy mill flooring, scaffolding and all kinds of heavy work, and when cut tangentially its beautiful grain makes it very suitable for doors.

Western Red Cedar is the second most important tree; it grows best in wet situations, is tolerant of shade and so has a greater extension along the coast than the Douglas, and is absent from the drier Interior Plateau belt. It reappears on the flood plains and lower benches of the valleys in the Interior Wet belt of the South-East (See Maps D2,3,4.) The best Cedars are found in the Coastal region bordering the Straits of Georgia, though farther north, where it is the predominating species, it is of greater relative importance. On the lower slopes

Cedar is mixed, with Douglas, but it reaches a higher altitude than the latter, being found at almost 4000' on Clayoquot and Howe Sounds (cf. Douglas 3000); it reaches to an altitude of 1500' on Portland Canal. The tree is smaller than Douglas, single mature trees yielding about half as much timber.

The timber is not strong enough for good dimension lumber, but, having great resistance to the weather, it is used extensively for weather-boarding and roof shingles. The fact that it splits very readily also makes it suitable for shingling; its softness and freedom from warping recommended it in the past to the Indians for their dug-out canoes. It resists decay and is therefore especially suitable for posts and poles. The most important forests in British Columbia are those in which Douglas Fir and Red Cedar predominate. They contain the heaviest stands, and produce lumber of the finest quality. On especially good situations as much as 100,000 board feet are found per ac. and 50,000 b.f. per ac. are found over large areas. A large percentage of this type of forest in the South West is near tide water, is most accessible, and so has been most exploited.

Western Hemlock is the tree of which it is estimated greatest reserves exist- (see Maps D2 & 5) owing to the poor quality of Eastern Hemlock marketing of Western Hemlock has been difficult, and it has been suggested that the name of Alaskan Pine should be adopted. Though the wood is easy to work, not liable to warp if it has been properly seasoned, of uniform

texture and so suitable as a base for enamel or paint, indeed suitable for all but the heaviest construction work, it was of practically no value until the establishment of pulp mills, hemlock being the chief pulp material used at present. The tree grows in a poorer climatic zone than Douglas or Cedar, at higher altitudes, or on more exposed sites. It is found along the whole coastland, even in the far North, quite important stands being found in the Stikine basin, and some still farther north. Perhaps the best quality Hemlock is found on Q.C.I.. It is absent from the Interior Plateau, but occurs in the valleys and lake basins of the Columbia Mts. It will grow on poor thin soils, but it is best on deep, porous, moist soils at a considerable elevation, the Hemlock from lowland sites is generally larger but more defective. The greatest reserves of Hemlock are found on Vancouver Is., and the Prince Rupert District is second in this respect.

Spruce trees form the fourth greatest resource - Engelmann spruce being particularly important; in the interior it is the chief tree from the point of view of quantity of timber. On the coast Sitka spruce takes its place; it is seldom found more than 50 miles from the sea, the bulk coming in the North Coastal district. (See Maps D2 & 5). The Sitka spruce is not very abundant, but is an excellent wood and therefore as valuable as hemlock, it is used in light constructional work, for interior finish, for making aeroplanes and for wood-pulp. The individual trees are very large -

containing more timber even than a Douglas fir. This spruce is found only at lower elevations - e.g. on Howe Sound it reaches only to 2,200' (Douglas 3000, W. Hemlock 4000), and it occurs mainly on well-watered lands, in the valley bottoms, or close to the shore. In the south it forms only between 2 and 5% of the total stand; farther North, where Douglas fir does not occur, the relative proportion of Sitka is greater. East of the Coastal mountains the greater part of forested B.C. is occupied by types in which spruce forms at least 60% of the stand. Much of this is inaccessible because of lack of transport and a great deal of it has been badly fired, and lodgepole pine has encroached on what was once spruce territory. White spruce occupies valleys west of the Rockies in the far North, and east of the range it, with Alpine fir or cottonwood, formed the original forest on the North-eastern plains. Here, too, the forest has been badly burned, and lodgepole pine has replaced the spruce, - unless the fires have been so severe as to prevent re-growth of any type of tree, in which case the areas are barren or grass-covered.

Various types of Fir are found in the province - alpine fir being conspicuous in all the mountain regions, lowland fir on alluvial stream bottoms, lower, gentle mountain slopes, and depressions on Vancouver Is. and the adjacent mainland, and in the valleys of the S.E. (Arrow, Mabel, Kootenay, Moyie and Elk); Amabilis appears on the West slope of the Coast Range and the adjacent islands. The value of the timber lies

in its use as pulpwood, for box manufacture and in light constructional work.

The greatest amount of lodgepole timber is found in the interior. It will grow well on sandy and rocky soil from which the humus has been removed, and so frequently replaces the original stands of Douglas fir, spruce and Balsam after fires. The wood is seldom sawn into lumber, but is used chiefly for railway ties, mine props and poles.

Yellow Cypress appears only in the coastal belt, where it reaches a greater altitude than the other important trees, being found up to 5000 -at Howe Sound. It is not present in great amount, but is in great demand for boat construction, and for sashes and doors. It is the heaviest and most durable of British Columbian conifers, and is not liable to shrink or warp. Being easily worked, and having a satin-finish, it is highly suitable for interior and cabinet work.

The South Interior has one other resource - Western Larch, which grows on the upper benches of the valleys. It is a heavy, hard, strong wood, not quite as strong as Douglas Fir but used for the same purposes - structural timber, flooring and railway ties.

The only broad-leafed tree of commercial value is the Cottonwood, which is in demand for food-boxes, since the wood is odourless. It is also used for automobile bodies and to some extent for furniture. The tree is typically a pioneer on alluvial soils, being gradually replaced by conifers as

further deposition or erosion lowers the water level. Excellent stands of cottonwood are found on the bottom lands of the larger valleys of the North-West, e.g. Nass and Skeena.

The forests of the South-West which are the most extensively worked (see Map D6) are also the most varied, the roughness of the ground and the variation in the soil causes the forest cover to change very quickly both in density and species. The forest is mainly Douglas Fir and Red Cedar up to 2,500-3000 feet, with Red Cedar and Western Hemlock above to 4000 ft. These are maximum figures for the South; northward the altitude naturally decreases. A considerable loss of timber results here from the method of working; it is difficult to avoid waste on such broken, rocky ground as is found here, but the B.C. lumber industry is notorious for the high degree of waste found. Much of the best timber is used as fuel for the logging engines. A good deal of small timber is left in the woods because the heavy machinery needed for taking out the mainstand is not adapted to the economical handling of the smaller. Increased demand for wood pulp has led to the cutting of the hemlock and balsam of the forest. The shores of Burrard Inlet were once covered with extremely fine forests of Douglas fir and Red Cedar - the best cedar found on the Pacific. Practically all the forest between the Inlet and the Fraser R. has been cut, as has similar forest round Howe Sound, though some valuable pathhes still remain. Vancouver, by reason of these readily

accessible supplies, became a lumber market in the sixties. With the building of the C.P.R. it was able to extend its timber markets, and is still the chief centre of the lumbering industry of B.C. With the expansion of the saw-milling industry and the clearing of the adjacent forests, Vancouver has had to tap forests along more northerly inlets and on Vancouver Is. The sheltered waterways give easy transport, and Vancouver has been able to continue to obtain supplies for its saw-mills. It is Douglas Fir and Red Cedar that have been most thoroughly cut in this area, and so rapid has the rate of cutting become that depletion of the Douglas Fir is feared, and the lumber traders are most definitely warned by the Minister of Lands that they willhave to use hemlock for their large dimensional lumber or draw on sources of supply outside the district; the only alternative is to change the type of industry by finding a use for the smaller and lower grade material, now largely ignored in this region.[1] The partial exhaustion of the Douglas forests on the mainland Coast has caused several of the large logging Companies to turn their attention to the Forests of the Eastern side of Vancouver Is.

Forest fires have done a good deal of damage in the South-west, their ravages having spread with the extension of logging operations. The rugged topography of the coastal

1 B.C. Lumberman 1932.

region does prevent individual fires from spreading over great areas, as the forests are separated by high treeless ridges, but a forest fire on a steep slope is generally followed by swift and almost complete erosion of the soil, so that reproduction is not likely to occur for centuries. From the coasts of all the inlets northward to as far as Drury and Belsize Inlets timber is towed south to Vancouver for manufacture The cost of towage varies, according to distance and the position of the logging centres in relation to the rather difficult Narrows where tidal currents are swift, but as far north as N. Vancouver Is., that is for 250 miles the scale of charge is not prohibitive. From more northerly points it is too high; not only is the distance greater, but north of Vancouver Is. for some distance the coast lacks a close island fringe, and towing becomes more hazardous, and so more expensive. Logs have been successfully towed from Ocean Falls to Vancouver in cribs bound together by wire rope, but the cost of such transport was too high for the movement to take place regularly.

The Northern half of the West coast, beyond the radius of Vancouver's control, contains great reserves of timber, but of different type. The great pulpwoods are of chief importance here. So far relatively little has been done to open up the forest except in response to the demands for timber made by other industries, such as fishing and mining. The establishment of pulp and paper mills at Ocean Falls and

and Swanson Bay has stimulated the working of these forests; a new pulp mill site has been chosen at Prince Rupert, the capital being provided by a United States Company. The salmon canneries which need wooden boxes for packing from the chief local market, though even much of their requirements is met by importation from Vancouver.

On Queen Charlotte Islands the distribution of forest is largely determined by the drainage - much of the flat land, being poorly drained, ~~it~~ can bear little or not merchantable timber, and heavy stands are found mainly along the coast. The Sitka spruce of the island is the best found, and the Western Hemlock is also very good. On the other hand the Red Cedar, though large, is often unsound. It is the demand for Sitka spruce in aeroplane building that has stimulated the exploitation of the forests. A temporary stimulus was also afforded by the building of the Grand Trunk Pacific Rly., the logs being towed across to Prince Rupert in rafts. With the completion of the railway the demand slackened, and the mills which had been built to meet it closed down.

More important at present than the forests of the Northern section of the coast or Queen Charlotte Islands are the forests of the S.E. mountains - the Interior Wet belt. Lumbering is carried on mainly in the trenches which lie between the blocks of mountain; there are also some mills in the Rocky mountains along the railway line, but the question of transport has led to the greater part of the work being done

in the valleys. In the Rocky Mt. trench the Kootenay Central line makes the Kootenay valley forests accessible, both along the railway route and in the Upper Kootenay valley - above its entrance into the Rocky Mt. trench. Short branches of the railway bring timber from tributary valleys within easy reach of markets. Between the main C.P.R. line and the C.N.R. the timber in the trench is not as accessible and little logging is done - the lumber that is cut being driven along the Columbia R. The C.N.R. gives an outlet and a market for the timber of the trench along the Fraser Valley.

The Selkirk trench is most heavily forested at its northern end, and the head of Upper Arrow Lake is the site of the largest saw mills. The trench and its tributaries are well supplied with lines of transport, both rail and lake, and the chief market lies in the Prairies. Purcell trench is a smaller but similar centre, most of the logging operations there being carried on near Kootenay Lake. In this mountainous region many of the tributary valleys contain timber in their upper and middle sections, but since they are hanging valleys their timber resources are not easily accessible, and great expense would be encountered in an endeavour to make the rivers driveable in their lower courses.

The Interior plateau, though semi-arid, is not generally treeless, except in some of the larger valleys of the south; (see Map D 1) sage brush vegetation with no tree growth is found in a narrow belt along the lower benches of the middle

Fraser, and for a short distance up the tributaries which reach the river between the Thompson and Chilcotin. The lower Thompson as far as Kamloops and the lower parts of its tributary valleys are also of this type, which occurs where the precipitation is below 10" and where the summer temperature is the highest in the province. Where the rainfall lies between 10 and 15 inches natural grassland occurs, bunch grass being the characteristic plant of the South. These grasslands flank the sage-brush areas, in some cases extending up the slopes of the valleys on to the uplands, especially in the southern part of the plateau. Apart from these valleys most of the plateau is covered by thin forest, in which the Douglas Fir is the characteristic tree, though fires have now destroyed large areas, and lodgepole has taken its place. Compared with the timber of either the Coast or the South-east the plateau resources are of poor quality, but the patches of merchantable timber are worked mainly for local supply, and particularly where, as in the Thompson valley, the C.P.R. has given a means of transport, and in the South where the Kettle Valley Railway performs the same service.

In the valleys of the North considerable spruce, fir and pine timber is found - enough for the local needs of a considerable population, but at present the complete absence of demand prohibits cutting. During the gold rush to the Yukon a demand for these northern timbers was temporarily established, and a mill was opened near Telegraph Creek on the Stikine. In the extreme North-West of the province, in the

Atlin region, the tree growth resembles that found at elevations greater than 5000 ft. in the south, which is 1000 ft. above the merchantable timber line, and consequently the timber is of small size and poor quality. Were there any other supply cutting would not be carried on here, but small mills do cut white spruce, lodgepole and Balsam to supply the gold dredges with flumes etc., the very high cost of imported logs making the use of better wood impossible.

The forest industries, therefore, have so far influenced the distribution of population mainly in the South-West and South-east, though they are at least beginning to affect the North West Coast and the North-Central valleys.

In considering the possibility of developing the forest wealth, the transport of the timber is a matter of importance. Oxen were used to haul the logs at first; horses were introduced later, and steam engines in 1875. Dragging the huge logs is destructive to the forest, for in the process young growth even 2-3 feet in diameter may be pulled over. Also rocks and the stumps of previously cut trees form obstacles, and so the high-lead and overhead cable systems were developed. (1915). Very few of the coastal rivers can be used for driving the logs, for they are usually swift and rough, and the larger ones are blocked at their mouths by tidal flats. Chutes have been made where the grade is suitable. To reach the timber which is some distance from the shore logging railways are necessary - in 1916 there were 21 such railways on the

coast; their number has now increased to 100 with an aggregate length of 800 miles. When the logs reach the coast they are towed to the saw mills, in booms 60-70 feet wide and 500-1000 feet long; a few saw mills own their own tugs, but generally the work is done by special towing companies. The sheltered waterways found along almost the whole coast favour this mode of transport, and it is the difficulty of towing the logs which has hindered the development of the timber resources of the West of Vancouver Is. The storage of the logs at the saw mill is often difficult, since keeping them in salt-water for two or three months merely leads to their being riddled with teredos. Fresh or, at most, brackish water basins must be provided, unless they lie on tidal flats which are ~~dug~~ dry for part of every day.

In the interior forests the rivers are more frequently driveable - those of the Purcell trench offer most difficulty in this respect, but on the whole the rivers are slower, and the logs smaller than in the Pacific coast region.
Rail transport from logging centres to saw mills is important here e.g. the Kootenay Central Branch which connects the Crows nest line with the main C.P.R. line has made the Upper Kootenay timber accessible.

From the saw-milling and wood-working centres most (approx: 75%) of the timber sent from the Province travels by rail - export by sea being a comparatively new ~~department~~ development[1].

1. B.C. Lumberman Aug. 1932.

Oregon and Washington with similar timber resources have concentrated to a much greater extent on overseas shipment of timber. In 1920 B.C. shipped only 8% of all the Pacific Coast lumber that was exported, in 1930 it shipped 15.6 %; that represented 8% of the total B.C. cut in 1920, and 31% in 1930.

The importance of the movement of timber by rail is indicated by the fact that nearly one-half (42-45%) of the rail freight traffic originating in B.C. is made up of forest products, and in a normal year it takes approximately 80,000 trucks to handle the rail shipments of lumber.[1] The Prairie Provinces forms a great market for the timber; they demand low grade timber, and that could all be supplied by the Interior forests, which have an advantage over the Coast in rail freight charges. On the other hand the cost of logging and milling is lower on the coast, where the yield of timber per acre is higher, the cost of living lower and means of transport of the logs to the mills easier. The coast lumberman, too, can get a high price for timber of upper grade, and can therefore sell the poorer grade at a lower price than the lumbermen of the interior can do.

A comparison of the map showing the position of logging operations with that showing lumber and shingle mills (Maps D6 and 7) brings out clearly the importance of the Lower Fraser, primarily of Vancouver, as a centre for working the timber logged along the inlets to the North. Not only are the mills more numerous there than elsewhere, but they are larger. Many of those in the interior are small mills, fed by men working under

1. Manual of Provincial Information.

handloggers' licenses. With one exception all the shingle mills are found in the Vancouver district, where the Western Red Cedar is more cut than elsewhere. The cutting of Poles, posts and Railway ties is also widespread in the province, but as in the saw milling and shingling industries, so in this Vancouver is the chief centre. It is noteworthy that centres along the railways which are otherwise not important as saw milling centres produce this small type of material to supply a local need - e.g. Hazelton, Skeena Crossing, Smithers (all in the Skeena-Bulkley valley) and McBride (Fraser Valley) along the C.N.R. main line.[1]

Window sashes and doors[1] are made mainly in the Vancouver district, Vancouver itself containing 26 out of a total 41 such plants. Victoria is the second most important centre. In the trenches of the South-east, already noted as being centres for forest industries, sash and door factories have been established at Nelson, Kelowna, Penticton and Vernon. At Vancouver, too, a certain, though relatively small, amount of wood is used for making wood stave pipes.

The manufacture of wood-pulp[2,3,4] was introduced as late as 1909 and paper was not made till 1912, and the product still lags behind the potentialities of the province. Quebec

1. Directory of B.C. 1932, and B.C. Lumberman 1931-2.
2 Pulp & Paper Industry in B.C. by Reich 1926. (National Problems of Canada.) 3 Census of Industry - Pulp & Paper 1929.
4. Rept. of Minister of Labour 1931.

possesses 30% of the available stand of pulpwood in Canada, British Columbia 29%, Ontario 19% but B.C. produces only about 7% of the Canadian output of paper, Quebec producing 55% and Ontario 33%. It is B.C's isolation from the chief markets (Eastern U.S. or Britain) which accounts for the small production. In the pulp mills Western Hemlock, is used for sulphite and sulphate pulp, and Spruce and Balsam to make mechanical pulp, as is a small amount of poplar. The greater part of the pulpwood is bought by the mills from settlers and logging companies, only about a quarter of their requirements being cut by the Pulp Companies. There are 6 mills working in British Columbia, two making pulp alone, three making both pulp and paper, and one making paper only.

The paper mill is at New Westminster; the pulp mills are at Port Alice on Quatsino Sound (w. Van: Is) and Woodfibre (Howe Sound) and Swanson Bay. The latter mill stands in the centre of the great pulpwood area to which access is easy by protected waterways; the operation of the mill is of great importance to the Northern coast land, which is so largely undeveloped; it offers employment to the local population, and offers a market for the timber which must be cleared off the lands which are suitable for settlement. Mills making both pulp and paper are found at Victoria, Ocean Falls and Powell R. Ocean Falls is in the pulpwood region, and benefits from the long, navigable inlets along the coast which give a safe and easy means of transport. Powell R. mill stands in the

Douglas Fir Red cedar forest, and so draws its supplies of pulpwood from timber leases which extend to approximately 100 miles to the North; here, too, the protected channels give cheap, easy, towage lines. These mills provide a steady occupation for almost three thousand men; the industry has shown considerable expansion in the last decade, the output of pulp having doubled. The number of hands employed has not increased to quite the same extent, owing to the use of larger machinery. The industry offers work to approximately the same number of men all the year round e.g. in 1929 the average number of employees was 2,800, in August, the busiest month, this number increased to 2,990; in February it dropped to 2,600. Considerable expansion of this type of industry is probable - as the population of the province increases there will be a greater local demand for more paper and for paper of different types - at present 90% of the product is newsprint. The planning of a new pulp mill at Prince Rupert, already noted, is an indication of expansion in the near future.

The lumber industry is said to have placed more towns on the map of British Columbia than any other industry has done.[1] Vancouver and New Westminster both grew up round saw mills, and they are the greatest examples of lumber centres which have grown into big cities, by virtue of their location, which has given them control over a large forest area and access to many markets, in addition to other resources. The largest purely

[1] B.C. Lumberman Aug. 1932.

lumber settlements are the pulp and paper towns of Powell R. and Port Alice and the saw-milling town of Fraser Mills. In the province there are approximately 200 of these purely lumbering communities with an estimated population of about 100,000. Roughly one worker in every five in B.C. is employed in the timber industry in normal times. It is interesting to note that the bulk of the workers in the lumber industries are natives of Canada or Newfoundland, that the next most important group is the Scandinavians - no other industry approaching this one for them - Immigrants from the British Is. rank third in number, the remaining large groups being Asiatics. In Pulp and Paper mills men from the British Is. are most numerous, Canadians and Japanese making up the majority of the remainder.

NATIONALITY OF WORKERS IN LUMBER INDUSTRIES

CANADIAN	SCANDI-NAVIAN	BRITISH	JAP	CHINESE	US	RUSSIAN

Based on statistics given in report for 1931 issued by Minister of Labour.

The demand for timber in British Columbia itself would ensure employment for only about a quarter of the workers now employed and more distant markets must be sought to maintain the industry.

DISTRIBUTION OF LUMBER OUTPUT AVERAGE 1929-31

BRIT: COLUMBIA	PRAIRIES	E. CANADA		CENTRAL U.S.	S. CALIF.	ATLANTIC U.S.	OVERSEAS MKT.
R.	R	R	W	R		W	W

R = RAIL-BORNE W = WATER-BORNE.

The greatest market has for many years been the Prairie Provinces, where a great deal of building accompanied the extension of the agricultural lands, and the consequent demand for timber was met by B.C. East Canada has been a buyer of British Columbian sash and door stocks since the United States (whence the supplies were formerly derived) exchange became very unfavourable. A small amount of the timber is sent to E. Canada by sea, but the bulk is rail-carried. In normal times the United States takes a considerable amount of the timber, but at the present that line of trade has been largely cut off by the heavy tariff imposed. How serious that is may be deduced from the table showing the destinations of the Mine Props, Fence Posts, Rly ties etc. shipped by the various forest districts - the bulk of the poles and piling cut in every district having been in 1930 marketed in U.S. In addition, the United States took most of the shingles - Canadian shingles

obtaining the best price in the United States.

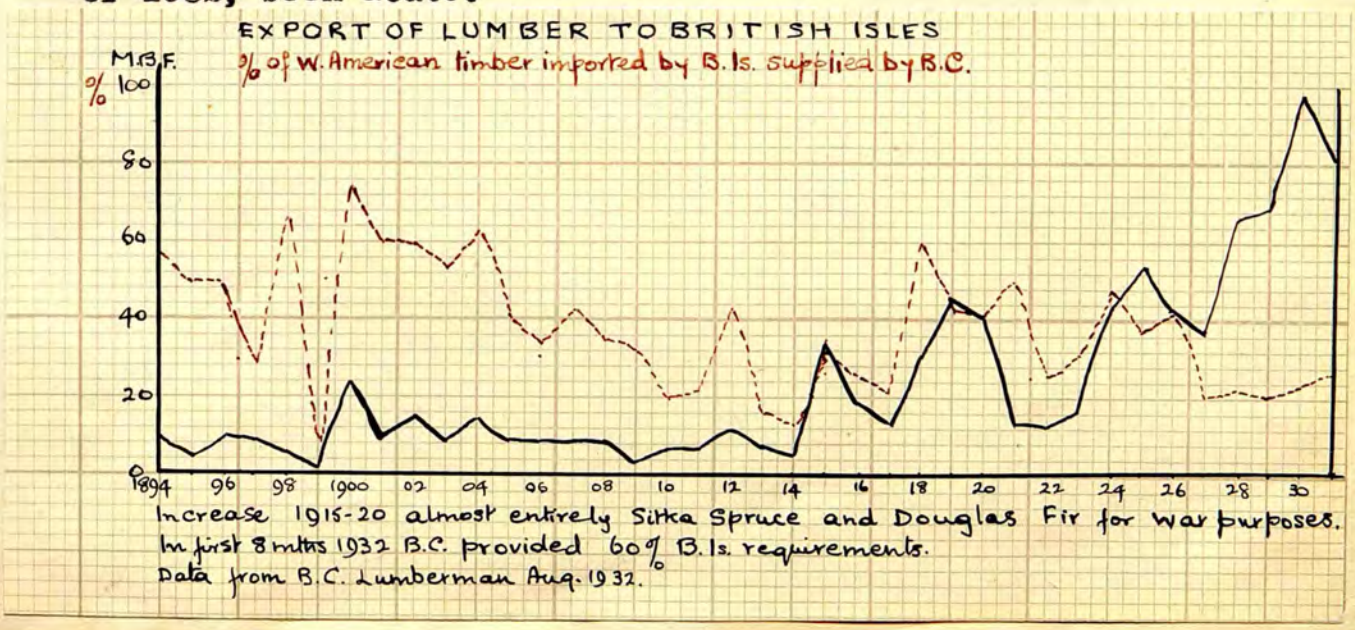
California has since the middle of last century been a purchaser of Douglas Fir; that State has stores of Redwood, but that does not compete with Douglas for heavy construction work, and coast-wise vessels have carried on the trade.

It was the cutting of the Panama Canal that opened up to the province markets in the East of the United States and Europe. During the war movement by the route was limited to Sitka spruce for aeroplane construction, and Douglas fir. It was not till after the war that more than 10% of the cut was exported.

The United States market was that which grew to greatest proportions, and the virtual closing of that market has led the Columbian lumbermen to push their products in other countries, particularly the United Kingdom and Australia. During the first nine months of 1932 75% of the timber exported went to Empire markets, compared with 47% in the corresponding period in 1931. Australia requires on an average 300 M.B.F. of soft wood annually, and most of that must be imported, Douglas Fir being needed for building, joinery scaffolding, mining timbers etc. Under the new Preferential agreement between Canada and Australia these supplies should come from B.C. Last year the Australian market consumed less timber, on account of the financial crisis, which caused a decline in building. The collapse of the real estate market in Australia hit the building trade, which had been carried on on speculative lines, and many of the timber merchants had to go into liquidation. In 1928 there were 90 timber merchants

in business in Sydney, but at the end of 1932 only 15 of them survived, and a similar situation was found in Melbourne. Australia also requires Hemlock for boxes, and Canada commands that line of trade. The Commonwealth has in the past bought Redwood shingles from the U.S. and attempts are being made to introduce Red Cedar shingles instead. The demand for shingles is not very great, as they are rarely used as a complete roofing material, being employed mainly for decoration in gables and bay windows. Facilities for shipping are naturally important in this trans-Pacific trade, and the U.S. Pacific timber shippers have had an advantage over Canadian traders in the past; from 1920-1923 the Canadian Government Merchant Marine enabled Canada to win a good place in Australian timber trade; when it was discontinued Canadian shipments dropped from 40 - 15% to revive only when Australian - British Columbia shipping was organised in 1929.

The United Kingdom market is being actively attacked by British Columbia, though as may be seen from the diagram competition with Washington and Oregon has, until the tariff war of 1932, been acute.



In Asia,

Japan has been the most important market, though in 1932 she bought less, owing to heavy stocks being held by the Japanese timber merchants. Japanese orders are of great importance, for example, an increased demand by Japan for pulp and paper enabled the B.C. Pulp & Paper Co. to re-open their Port Alice plant at the beginning of Dec. 1932. Similar orders are helping to keep the pulp mill at Woodfibre on Howe Sound working on full time. Both these mills had been closed for some weeks, Woodfibre being reopened on Oct. 1st. About 250 men are affected directly, and, if the demand continues, it will necessitate the opening of a logging camp which will employ another hundred men.

Not only are lumbermen and mill operatives affected by the development of the overseas trade in timber and wood products, but the actual traffic employs a considerable number of men. Vancouver is the leading port, shipping about half the total export, and as has been shown, much of this timber is produced on the coasts of inlets to the North - one billion feet of logs being towed into the port of Vancouver; More than 100 tug-boats are employed in towing the logs and scows, and besides their crews longshoremen are employed in loading vessels from the scows. Fifty thousand dollars are paid annually in harbour dues by timber ships at Vancouver.

The Fraser River ports, especially New Westminster, export approximately half as much timber as Vancouver does. Regular shipments are also made from Port Alberni, Chemainus, Victoria, Nanoose, all ports on Vancouver Is., and occasional

shipments are despatched from Prince Rupert, Queen Charlotte, Nanaimo and small ports on the East Coast of Vancouver Island.

In its forest wealth, therefore, British Columbia has a source of employment for many people; since it has now been realised that forests are exhaustible and need to be harvested carefully, with natural reproduction assisted by scientific re-afforestation, the remaining forests will provide a constant resource for a long future. It is in the S.W. mainland that greatest care will have to be exercised, and it may be that logging of large timber there will decline appreciably, though the smaller trees may be used while the large types are being reproduced. Vancouver may lose its pre-eminet position, though, as the influence of commercial inertia is so strong, it may be enabled to keep its position by drawing supplies of timber for its mills from Western Vancouver Island, which has so far been little touched, and where there is no likelihood of a rival to Vancouver, in general trade, rising up.

It is in the North-West and Northern forests that new lumbering centres are most likely to arise, though, as has been seen, expansion of timber industries is largely dependent on the revival of prosperity in the prairies and in Australia, and on the capturing of other markets to take the place of the United States.

VIII.

AGRICULTURAL DEVELOPMENT.[1]

Small area of potential agricultural land; small proportion at present cultivated. Improvement necessary in different areas. Clearing. Irrigation. Settler's need for capital. Land tenure in the Province. Consideration of types of farming practised. Relative unimportance of cereals. Fodder crops. Stock-raising (1) for Beef. (2) for Dairying. Sheeprearing. Poultry-farming. Fruit-farming. Bee-keeping. Agricultural settlement.

The potential agricultural land amounts to only 10% of the total area of the Province, and of that small area only $\frac{1}{7}$ is used at present.[2] The importance of agriculture in the life of the people is not commensurate with these figures. Farming is one of the chief industries developed in the region, and as it is not an extractive industry, the settlements which arise are likely to be permanent ones. Considerable expansion is possible - not only is there a considerable untouched area, but in addition, the home market is by no means supplied by the farm produce; at the same time, the farmers have specialised to such a degree in certain branches of agriculture that they need to seek an outside market for their produce. Farms of all types are found in the Province, except the purely cereal-producing farms; generally small in size, often only a part

[1] Special Bibliography
Agricultural Statistics for B.C. 1931. Bulletins & circulars issued by Dept. of Agricultural. Bulletins issued by College of Agriculture. Annual Reports of Minister of Agriculture in B.C. papers.

[2] Can: Yr. Book 1932.

of each holding cultivated, they are frequently found grouped in long narrow lines in the valleys, which are often less than two miles wide, separated from one another by wide stretches of agriculturally valueless land. The resultant settlement is scattered also, the villages coming at the junction of two or more of such lines of farms. The most extensive cultivable areas lie in the lower Fraser Valley, S.E. Vancouver Is., Graham Is. and the Bulkley - Nechako Valleys. In these areas, relatively wide level stretches are found, facilitating the transport and marketing of produce.

Steepness of slope, heaviness of rainfall, length of winter debar agricultural development of much of the mountain land; dense forest cover hinders it on many of the level lands, as Map D1 shows.

Difficulty of transport, a natural result of the irregular topography imposes another barrier to the development of the smaller scattered lowlands where transport is slow much time and energy are consumed which could otherwise be used in production. An example of this extreme difficulty may be quoted from a report on some pre-emptions on the West Coast. "A good horse trail built to grade is what is required very badly in these pre-emptions, as the pre-emptors experience great difficulty in packing their supplies on their backs over these partly open, wet and rolling lands. If this difficulty were solved it would enable the pre-emptor to spend the greater portion of his time getting his land into cultivation.[1] The building of every railway line in B.C. has been accompanied by an extension of the cultivated land in the district served; the Grand Trunk Pacific gave an outlet to the Nechako and Bulkley valleys in the North, the Kettle Valley line to the Similkameen and Boundary districts in the South, with an resultant increase in the numbers of settlers in each case. Many valleys, suitable for farming are still without adequate means of transport, and to attempt to settle in them imposes severe handicaps on the farmer.

The area of open land in the province is small, and most of the farm land has needed clearing and improvement. The

1. 1915 Report of inspection of Preemptions B.C. Papers.

cost of clearing varies. On Vancouver Is. it is between 200 and 400 dollars per ac., on the Lower Fraser Valley 250-400. In both these areas the tree growth is very dense, and in the lower Fraser Valley dyking and drainage have been necessary too. The big trees are cut 8-12' from the ground; the greatest difficulty is found in clearing out the stumps, which are highly resinous. With a donkey engine nine men can only pull and pile up one-half acre of stumps in a 10-hour day, and another two men are required to fill in the holes.[1] Less difficulty is found in clearing land in the Interior, where the process is consequently less costly - $100-300 in the Arrow Lakes basin, $50-150 in Kootenay, Slocan and Columbia R. Valleys, $ 40-100 in the North Thompson Valley, and still less in much of the north, where the timber cover is yet lighter, in the Fort Fraser district the cost varies from $12-50, and in the Bulkley is from $15 per ac.[2]

In the valleys of the south the bringing of the land under cultivation demanded methods of overcoming deficiency in water supply. Dry-farming methods were used at first, and in places impoverishment of the soil resulted. The earliest irrigation projects were organised in 1891, but rapid development took place only between 1905 and 1912. Large land Companies planned much of the work, but failed to organise it successfully, and could not carry on. In Okanagan and Kootenay there are

1 Settlement of the Coast Belt of B.C. (United Empire 1922)
2 Dept. of Agri. Bulletins.

thirty-four irrigation systems, nearly all of which have had to face financial difficulties. Miscalculations as to the cost of the works were made; more land was included in the Irrigation Districts than could be irrigated; inferior land was included which proved unprofitable to cultivate, and lots were sold for fruit cultivation which were suitable only for vegetables and fodder crops;the systems were not all designed for the economical use of the available water - seepage results in considerable loss of water where the subsoil is gravelly.[1,2]

The quality of the produce from the irrigated lands is very good, but the yield per ac. is not high (lower, for example, than in the adjoining State of Washington), and many holdings have reverted to the Crown. This has been due partly to the fact that many of the purchasers of land were men, inexperienced in irrigation farming, and without sufficient capital. The reversions may also be accounted for by the extraordinarily severe frosts which occurred in 1924, and which killed many orchards near Grand Forks and Peachland. Owners who were not able to replant could only produce roots and vegetables, and in the absence of a local market, these could be sold only in Vancouver or on the Prairies, and the movement yielded little profit, considering the great expense that had

[1] Report of Royal Commission Investigating the Fruit Industry 1928 . B.C. Papers 1929.

[2] Economic conditions in certain Irrigation Districts 1927 B.C. Papers 1929.

to be met, compared with that entailed in the well-watered Vancouver district. In some districts poor varieties of fruit were planted at first, and so the farms did not pay.

(30% of the irrigated area is under fruit, the rest is used for mixed farming, fodder crops for feeding dairy cattle being of great importance).

Farming in British Columbia suffers also from financial disabilities - compared with E. Canada[a] interest charges are higher; agricultural implements are dearer; local transport is more expensive; the average cost of living is higher. It takes a longer time and more labour to bring land into cultivation than is the case in Central Canada. Thus agriculture in this part of the Dominion is not suitable for a man of no capital, and the Department of Agriculture recommends that a settler should possess at least 4000 dollars, provided that he is a man with farming experience likely to make a success of his venture as soon as possible. Should he be without ~~with~~ experience the Department considers that either his resources should be greater, or he will need seasonal employment such as the fishing and fruit industries offer, or else if his holding includes woodland then he must clear it and sell cordwood, pulpwood, railway ties.

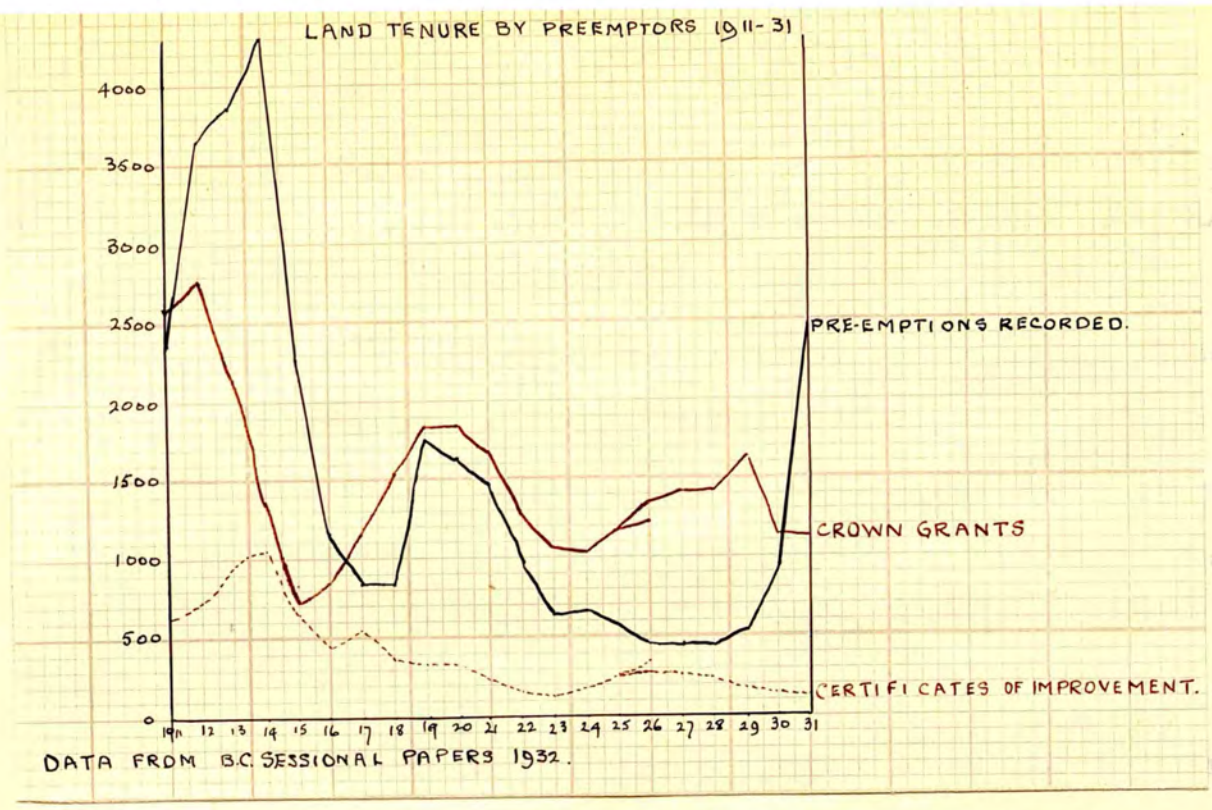
Thus though there are favoured and productive areas

[a]Year Book of British Columbia 1911/1914.

whose possibilities have long been realised the general agricultural development of the province has been slow and often disappointing.

Large areas of free grant land are and have been available;[1] pre-emptions of 160ac. of Crown land are permitted, provided that the land has been surveyed and is neither an Indian Reserve nor Statutory timber Land. A fee of $2 is charged for recording the pre-emption; occupation and improvement of the land must follow. At the end of five years, if improvements to the value of $10 per ac. have been made and 5 acs. have been cleared and cultivated a Certificate of Improvement (Fee $2) and a Crown Grant (fee $10) may be obtained. The number of Certificates of Improvement lags far behind the number of Pre-emptions recorded.[2] Many of them ~~having~~ have been taken up on marginal lands which have proved unproductive - often in the hands of inexperienced men.

[1] Land tenure in B.C. Forests of B.C. 1918. Manual of Provincial Information 1930.
[2] Report of Department of Lands. B.C. Papers. 1932.



In addition, homesite areas, to 20 acs. in extent, may be obtained at a small rent under improvement conditions, which include the building of a dwelling during the first year of occupation, title to the holding being given after five years' occupation. This provision was made to enable such people as fishermen and miners to obtain homesites, and they may be taken up on surveyed or unsurveyed land.

Vacant and unreserved Crown lands may be bought in areas not exceeding 640 acs. on improvement conditions. The minimum price for such land when first class is $5 per ac. and when second class (i.e. pastoral) $2.5. If the land is unsurveyed the purchaser must have it surveyed at his own expense; if it is already surveyed the charge for the land is half a dollar per ac. higher.

Crown land may be leased for various periods - for hay cutting up to 10 years, for other purposes except timber cutting up to 21 years, for industrial purposes up to

99 years. Timber-cutting rights are acquired only by timber sale.

Land which has been alienated in the past may of course be bought from the holders at the market price; which is naturally much higher, e.g. in Similkamen Valley unimproved land is worth $2.50 per ac. and improved 300-400 $ on an average.

In 1917 the Land Settlement Board was established, to further Agricultural Development;[1] its activities are varied. New settlers may receive loans through it; groups of farmers (not less than 6 in number) may form Cattle Clubs, for which the Board will buy cattle, selling the beasts to the farmers at cost price. In co-operation with the Department of Agriculture the Board has established creameries at Vanderhoof and Quesnel. Under the Land Settlement and Development Act the Board may organise any area of undeveloped agricultural land into a Settlement Area. Land in such an area held by a private owner must either be sold through the Board at its valuation, or improved by the owner as the Board prescribes; failure to follow either course entails a penalty of 5% yearly on the Board's valuation of the property. Prices of land available for purchase from the Board range from $3-10 per acre. Settlement areas have been established along the G.T.P.R. and P.G.E.R. in Bulkley valley, Francois L. basin, Nechako valley, Upper middle Fraser between Prince George and

[1] Land Settlement Board 1923.

Soda Creek. In all these areas the winter frost lasts from Dec. to March, and frosts may occur in summer. Stock must be fed for 4-6 months, but the summer rainfall is generally enough for silage crops, so that winter feed is available. Sunflower is becoming popular as a silage crop. Roots, lettuce and cabbage and other vegetables do very well, and with the building of more silos the production of good beef cattle should be possible.

Primarily to supply returned soldiers with homesteads, the Board undertook the reclamation of the Sumas L. district of the lower Fraser, the development of a district near Creston (Kootenay) and another ~~S.E.~~ on s.e. Vancouver Is. Land which was not taken up by returned soldiers was, and still may be, bought by other settlers.

The size of farm needed in the Province varies. On Vancouver Island and the Lower Mainland near the cities 3-10 acres may be sufficient, if they are cultivated intensively under truck crops, small fruits or poultry. In Okanagan and Kootenay many orchards are of 10 ac. only. The Lower Fraser dairy farms vary from 75 to 150 acres. The largest farms are needed in the Interior where for stock-raising ranches of at least one section (and generally several)

plus grazing privileges on the range land are necessary.

ACREAGE OF FARMS
Expressed as percentage of total number of farms

UNDER 5 acs.	5 - 10 acs.	11 - 50 acs.	51-100	101 - 200 acs.	OVER 200 acs.

Based on Census Returns 1921.

Since 1921 there has been a decrease in the number of very small farms, and an increase in those between 5 and 50 acres.

Approximately 65% of the total agricultural production is derived from mixed farming (including the rearing of livestock and the growing of hay, grain and vegetables) 17% is from dairy farms, 10% from fruit, 8% from poultry farms.

Grains are not extensively cultivated; the area under cereals being only half the area under fodder crops. The lack of attention to grain is due to the smallness of the local market, and the impossibility of the area's competing with the Prairies. The chief cereal is oats, wheat occupying approximately $\frac{2}{3}$ the area under oats. The bulk of the wheat is spring sown; some of it is grown for feed. Local flour mills take most of the product in the south, where Okanagan is the chief producer; that grown in the Bulkley valley is sold through the Alberta Wheat Pool at Prince Rupert. The grain elevators do not handle oats, and eastward movement of that grain is profitless, because of the Albertan production; in the south the dairy farms can consume the oats produced, but

farmers in the Bulkley and Nechako valleys find it difficult to dispose of their crop, since high freight rates preclude its shipment to the southern portions of British Columbia, which does import some oats from the Prairies. Heavy imports of wheat and flour from the east are likely to continue, since the cost of production is low in the Prairies. Other cereals are of minor importance, and are grown chiefly for fodder.

Clover and Timothy grass alone are cultivated on an area larger than that devoted to all the grains, grain-hay, alfalfa and wild hay occupying most of the remaining space which is used for fodder crops. With this cultivation the livestock industry is intimately associated.

Cattle are the most important livestock kept. (average value 1928-30 24 mill. dollars; c.f. horses 4½ million; sheep 2 million, pigs 1 million). Milch cows represent approximately $\frac{1}{3}$ of the total value of the cattle; they are of greater importance as sources of employment than the beef cattle, and the scale of dairy products yields three times as much money as the scale of beef. Beef cattle can be kept on the range country of the interior, and it is estimated that the ranges will support six times the number of cattle now found. The present markets are found at Vancouver, Victoria, Prince Rupert, and also at Edmonton and Calgary. The abbatoir at Prince Rupert is the newest of these, and it has advanced the beef industry of the Prince Rupert hinterland; formerly the settlers in the Bulkley valley allowed their beef

cattle to roam on the hills till they were driven back to the valley by snow and cold; then, all were sold at once, causing a temporary oversupply of the market. Now smaller herds are kept, and to them greater care is given, the cattle being marketed at Prince Rupert in any month. The production of beef cattle in the valleys is at the same time becoming proportionately less important with the increase in dairy hands. On the range country they are not likely to be supplanted. The Commissioner of Grazing in his report (1919)[1] differentiated between two topographic types of range in the south Interior - (a) the less rugged in the region between the Fraser, the Similkameen and the Rocky Mountains, where bunch grass and blue grass are found, with brome and rye grass on the lower more open southern slopes, and pine grass in the timbered areas. These grasses form very nutritious, though coarse forage, better suited to cattle than to sheep which waste much of it. Scattered in the area are steeper ranges, excellent for sheep, though many are large enough for one flock only. (b) the more rugged ranges outside the area, with bunch and blue grasses on the lower slopes, pine grass on the middle, and weedy annuals, sedges and grass above.

In much of this range country summer frosts occur, making the area unsuitable for crops. Winter feeding is necessary,

1. Rept. of Minister of Lands, B.C. Sessional Papers 1919.

e.g. in the Chilcotin country for $2\frac{1}{3}$ to 3 months on an average. Stock raising is the mainstay of the Chilcotin, Alkali, Lake la Hache and Cariboo country, and individual herds may number as many as 1700 head. In the N.E. much of the Peace R. District is primarily cattle land - the burnt areas being covered with good grass, peavine and vetch. The cattle can stay out all through the winter, but require food. Lack of means of transport prevents the full development of these Northern ranching lands.

The stock industry could be extended in B.C. by using suitable land which is at present unused, e.g. the flats along the Columbia Valley which bear wild hay, vetch and peavine,[1] and adjacent to which are cultivable areas which could be irrigated and which would produce winter feed. More systematic use of the range lands would also favour extension of the industry; a division of the areas into spring, summer and autumn ranges is necessary, with even grazing over the whole area. Careful use of salt is also required.

The climatic conditions experienced in B.C. are highly favourable to the dairying industry,[2] the summers being relatively cool, and the winters mild. The coolness of the summer nights is particularly advantageous. West of the Cascade Mts. green fodder is obtainable nearly all the year; east of

1. Columbia-Kootenay Valley. Agri. Dept. Circular No. 42
2. Dairy Farming in B.C. An economic study of 726 farms. College of Agric. Bulletin.

the mountains the fodder supply is less varied but is adequate. The development of the industry is closely associated with the increased cultivation of fodder crops and the increased use of silos, one of the favourite silage mixtures being spring sown peas, oats, vetch and wheat. In 1913 the Province contained 47,000 milch cows, in 1920 92,000, 1930 120,000, the greatest expansion of the industry being found in Okanagan. The chief centres are the Lower Mainland, Okanagan, (especially the Northern end), Vancouver and Gulf Is., Kootenay, Boundary and Columbia Valley. The industry has begun in the Interior, primarily in the Bulkley and Nechako valleys. The size of the dairy farms varies, - the average being 110 acres. Those in Okanagan are, generally speaking, the largest (140 acs). those in the Arrow basin the smallest (80 acs.). In all the districts the farms include a certain amount of unproductive land; in all except the Lower Fraser district a considerable part of the farm area is still in woods. As is to be expected, the Lower Fraser, the oldest farming area, contains the greatest proportion of tillable land per farm. Practically all the smaller farms are operated by their owners, though some of the larger ones are rented, and these are not as greatly improved as those operated by the owners.

In the Lower Mainland the farms are on sedimentary deposits, of rich silt and clay; in the Delta these dairy lands are very flat, and have needed protection by dykes.[1] East

1. Geol. of Fraser Region. Delta.

of the Delta in the Chilliwack district the sedimentary lowlands are interrupted by uplands of glacial drifts, which are avoided by the dairy farms, as the grass is less abundant than on the lowlands.

On the Vancouver and the Gulf Is. dairy farms the soils vary from sedimentary deposits in the valleys to gravelly, glacial drift soils on the uplands. The parts of Vancouver Is. concerned in the industry are the districts of Cowichan, Nanaimo and Comox, all on the eastern, less rainy side of the island.

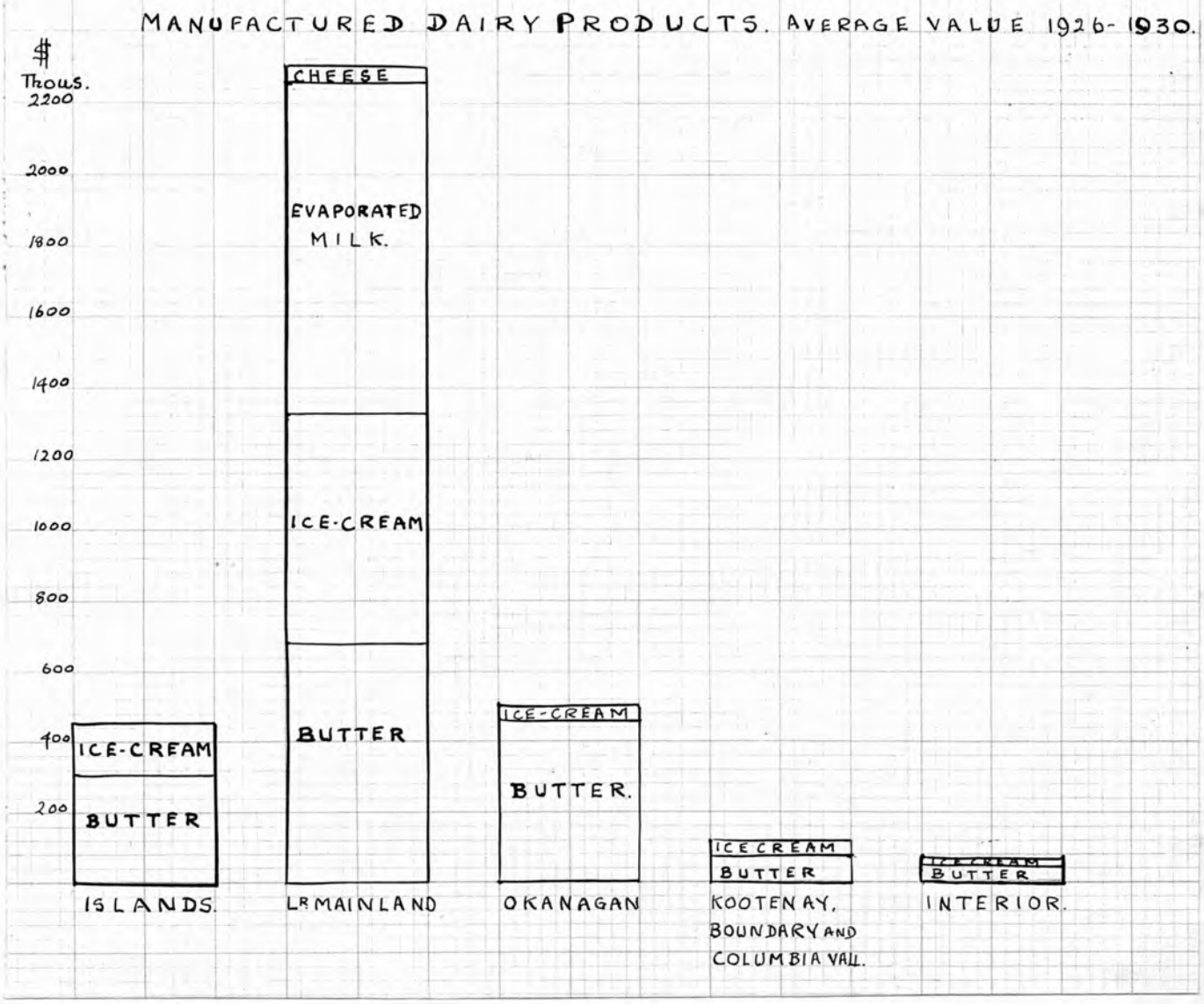
In all these districts the climate is relatively mild all the year; frosts sufficiently severe to stop ploughing may be expected for one or two weeks each year, The annual precipitation averages 40", the wettest month being December, and it is winter rain rather than hard frost which interferes with outdoor farm work. The summer rain, though lighter, is adequate.

In the Okanagan valley the soils vary from heavy clay at the Northern end to sandy silt and gravelly loam near Vernon and Kelowna. Precipitation decreases southwards in the valleys, and irrigation is necessary on the farms near Vernon (14" an; precipitation) and Kelowna (12"). The seasons are more clearly defined here than in the coastal districts, but extreme cold is unusual.

In the Salmon Arm district good cultivation is particularly necessary; the precipitation amounts to only 19",

which is evenly distributed through the year.

The dairy farms dispose of much milk to the adjacent settlements as fresh milk (1929 and 1930 value to farmer of total dairy products $ 13 million, of fresh milk marketed 7 million), but their demands leave a large surplus which is manufactured, and it is that branch of the dairying industry which has shown the most rapid expansion in the last twenty years. In 1912 there were 21 creameries and 2 condensed milk factories in B.C., in 1930 there were 32 creameries, 3 condensed milk and 2 cheese factories. Half of the plants were co-operative organisations, which handle not only butter, but eggs and sometimes fruit for their members, and which supply them with machinery, cattle food, sugar and flour. Between 1922 and 28 there was a 45% increase in butter manufacture - the most marked increase being in Okanagan where the product increased from a half-million to over a million lbs. per annum. The lower mainland output of butter also increased; the decrease found on the islands is to be associated with increased demands for ice-cream.



On the dairy farms other animals are reared to some extent - work-horses being everywhere of second importance to cows. Pigs ranked third, except in the Arrow L. Basin where the skim milk is fed to poultry. In the Ladner district the milk is mainly sold either to consumers or to the condensed milk factory, and there are few pigs reared.

British Columbia still imports, either from other parts of Canada or from abroad, dairy products to the annual value of approximately 4 million dollars. Such an import is unnecessary from the point of view of potentiality, but at present owing to lack of transport it is difficult to develop

suitable dairying areas in the valleys and lake basins of the North Interior, where the greatest expansion is likely to take place. A beginning has been made, through the building of the creamery at Vanderhoof in the Nechako valley; to this creamery milk is brought from the Bulkley valley to the west and the Prince George district to the East. The Canadian National Railway has ~~been~~ allowed of this development.

It is estimated that the province could carry two million sheep[1]; it, at present, contains only $\frac{1}{10}$ of that number. Much of the rugged mountain area is suitable for sheep e.g. in the Similkameen and Boundary districts of the south, where the chief difficulty would be the provision of winter feed, for which irrigation areas would be necessary. The western coastal highland is not likely to become a sheep area, as the hills of suitable altitude are too densely timbered. The chief increase in the flocks of the provinces, has taken place in the Interior, particularly in the Kamloops district. The wool produced is marketed through the Canadian Co-operative Wool-Growers' Association.

Pig-rearing also is not important. Pigs must have concentrated foodstuffs, which are expensive in B.C. Their cheapness on the Prairies has led in recent years to an increase of 100-500% in the number of sows in these Provinces, which are thus in a position to swamp the British Columbian

1. Care and management of sheep in B.C. pub. by Dept. of Agri.

market, where the market lies mainly in the lumber and mining camps. Most of the pigs which are produced in B.C. are raised on the dairy farms, and as the dairying industry has spread, so also has pig-raising e.g. in Okanagan. In response to the market demands, most of the pigs reared are of the bacon, not of the lard type.

Though yielding a somewhat smaller total income to the farmers of B.C. than fruit cultivation, poultry farming may next be considered, as it is to some extent linked up with the phases of farming already considered. The chief poultry farms are found near Vancouver and in S.E. Vancouver Is. A survey was made of 409 farms between 1921 and 1926, the report[1] showed that the average size of the farms was 13 acres - near Vancouver many occupy only 5 acres. Egg production is the chief aim of the poultry-farmers, and scant attention is paid to the production of meat, which is imported from the Prairies. Three types of poultry farm are found: (a) commercial egg-farms buying their stock annually either as pullets or chickens. (b) farms specializing in the production and sale of breeding stock. (c) farms on which breeding is solely for the replacement of the farm flock. The chief market for the eggs lies in the cities of Eastern United States which buy vast quantities of eggs from the Pacific region, mainly from the States, but B.C. has won a

1. College of Agriculture Bulletin No. 92.

footing in the market. The demand for a large white egg has led to the popularity of White Leghorns on the poultry farms, though other breeds are reared more extensively in B.C. than they are in the Pacific States. The eggs are marketed co-operatively through egg circles for the most part; on Vancouver Is. the creameries handle eggs for their members.

Some poultry farms have failed, some owing to their being mismanaged, others owing to poor location, accessibility to transport being one essential which was not always regarded in the location of the farm.

Mixed farming in British Columbia yields little surplus for export; fruit farming, which does, is more generally associated with the Province, though actually yielding much less produce. The suitability of the area for fruit cultivation was demonstrated even in the trading company's days, for the Hudson Bay Co. employees planted orchards to supply their own demands. Commercial orchards were not set up till after the building of the C.P.R. gave access to the Prairies market, which has been of supreme importance in the development of the fruit industry. The first fruit lands were laid out near Vernon, where in 1890 Lord Aberdeen bought a ranch on which he planted fruit. Now the fruit industry is well established in three types of district:-*1 (a) Lower Mainland and Vancouver Island, where the rainfall, (except near Victoria) varies from 40" - 70" per annum, (b) The Interior Dry Belt, including

1. (a) Annual Repts. of Minister of Agriculture. (b) Resources of B.C. ed. Boam, 1912.

* See Appendix, Table I

the Okanagan, Kettle, Thompson, and Similkameen Valleys, in which irrigation is necessary. (c) The Interior semi-humid belt, including Salmon Arm, Kootenay L. Arrow L. basins and the Northern end of the Okanagan Valley.

For small fruits, plums, pears, and cherries these areas are almost equally good, the product being of very high quality. The Coast lands suffer from fungous diseases in apples, for which fruit consequently the Interior leads, 5/6 of the product coming from the Okanagan valley.[1]

As is everywhere the case with a fruit industry, the demand for labour is seasonal, and consequently not always easy to obtain, especially in the Interior; the coastal fruit lands draw on the urban population, many of the seasonal workers being women. The high scale of wages paid in the mines and sawmills is a disadvantage for the fruit farmer. Some Asiatic labour is employed on the smaller mixed fruit and vegetable gardens.

In the marketing of the produce the price of grain on the Prairies is highly influential since it controls the purchasing power of the Prairie farmers. The British Columbian product meets the competition of United States produce - which is ready to market earlier, therefore the top price is taken before the West Canadian produce is ready, strawberries, hothouse tomatoes and plums feel this competition most

1. Agri: Dept: Circulars in Okanagan, W.Kootenay, Similkameen, & Vancouver island.

acutely. The late plums from California, which are the finest sold, are on the market at the same time as the British Columbian early plums.

West of the Cascades the chief product is strawberries, which are either sold in the adjacent urban centres, shipped East or manufactured in local jam factories. Raspberries and Loganberries are also important, and the making of wine from logan berries has begun. The Gulf Islands are not used to any extent yet, but they are highly suitable for horticulture, spring being a month earlier there than elsewhere in the Province.

The Dry belt valleys have a shorter growing season than the coast, but the summers are very sunny. The best fruit lands are on the bench lands which are generally very fertile, and less susceptible to frost than the bottom lands. The annual precipitation being under 15", irrigation is necessary to make the bench lands productive, but as clearing is generally easy the expense of irrigation can generally be met - unless, as has sometimes happened, a holding has been bought on what proves to be inferior soil. Some of the difficulties which face the fruit farmer have been pointed out in the discussion of irrigation. Apples are of outstanding importance in this region; all the fruits are more important here than elsewhere, but $\frac{5}{6}$ of the total tree fruits are apples.[a] Some attention is also paid to tomatoes, grown to supply three canneries;

a. Report of Orchard Survey - B.C. Papers 1932.

other canning crops have been tried, but they have not proved as successful.

The Interior semi-humid valleys with an annual precipitation of 18-40" have smaller extremes of temperature than do the dry belt areas. Small fruits do better here than in the dry belt, and strawberries are the chief fruits grown. They ripen later those of the Coast, with which, consequently, they do not come in direct competition in the Prairie market. The picking of the fruit is done largely by Doukhobors; a few Indians are employed, and some help is drawn from the larger towns. Labour costs are high in this section. Armstrong in the Upper Okanagan valley is famous for celery, and a new development in the district is lettuce cultivation, the first car load being shipped to Ontario in 1931.[1]

Greenhouse cultivation is chiefly carried on on Vancouver Is. and the Lower Mainland. Orientals as well as whites own greenhouses, 26 Orientals and 188 white men taking part in the industry. The houses owned by the Orientals are much larger individually than those of the white men, for the total area occupied by the houses of the two groups is approximately equal.

Commercial fruit farming, thus, is confined to the south of the Province, and is not likely to expand into the north,

1. Rept. of Dept. of Agriculture 1932.

though good results have been achieved in the gardens of the Cariboo District, and even in the far North operators living at the cabins on the Telegraph Trail produce vegetables - potatoes, lettuce, radish, and rhubarb. There is too much risk of loss because of frost for fruit growing on a commercial basis to be undertaken.

Closely associated with dairy and fruit farming is agriculture.[1] In some areas the orchard owners pay a rental to the apiarists who stand their hives near the orchards. The chief centres are the Lower Fraser with nearly 6,000 hives and the Okanagan valley with over 4,000.* The yield of honey is much greater in the interior than on the coast. Vancouver Is. Greater Vancouver, - the Upper Fraser, Shuswap and Thompson valleys and the Kootenay valleys also contain apairies. The Province was originally not thought suitable for the industry, because of the coolness of the summer nights, and when single-wall hives were used this may have been the case, but permanent outer cases are now fixed to all the hives and the disability has been removed. As a source of honey, the alfalfa grown for fodder is of great importance in the Okanagan Shuswap and Thompson districts. White Dutch Clover and Dandelion which were introduced into the Province are now widespread and are very important, alsike clover, which is wild in many places where the soil is moist enough, is the chief

[1] College of Agri: Bulletin no 92 and Dept, of Agri: Circulars on Farming regions.

* See Appendix, Table II

honey producer in some of the dairying districts. Among the wild indigenous plants which yield honey extensively are the maples of the Lower Mainland, Labrador tea on low-lying peaty lands, Salal, Cascara tree, Wild Raspberry, Wolfberry (variety of Snowberry) and Arbutus. Fireweed (Rose bay Willow herb) which spreads wildely on any burnt area sometimes yields very heavily, and it is the failure of the Fireweed that accounts for the low yield of honey in the Lower Mainland in recent years.

Since the Province imports large quantities of honey the industry offers a good opening to settlers.

Approximately one-sixth of the total employed population is engaged in some form of farming. The majority are engaged in mixed farming, the most numerous group of specialists being the fruit farmers, and stock-raisers, but together these two classes are only $\frac{1}{6}$ as numerous as the general farmers. Farm labourers are few, as has been pointed out; they do not number one-quarter of the total agricultural population. The seasonal demand for labour has not been great enough to set up a movement of labourers from foreign points, as was the case on the Prairies, and difficulty is often experienced in getting adequate labour at critical times, especially in the fruit industry.

Homesteads have been taken up in many parts of the Province; in this account of the agricultural industry emphasis has naturally been laid on the most productive

areas - S.E. Vancouver Is. the Lower Mainland, Okanagan and the Kootenay valleys. In all these areas settlement is relatively closer. The agricultural population of the Nechako-Bulkley valleys is also considerable, having increased greatly between 1911 and 1921 as a result of the construction of the Grand Trunk Pacific Railway (now C.N.R.). A thinner settlement is found in the ranching districts of the Interior Plateau. In addition to these there are many scattered farms in more remote areas e.g. along the coast where fishing is also practised or in the mountainous region between the Arrow and Kootenay Lakes where most of the settlers have cleared small parts (6-7 acres) of their holdings, and these they use for fruit or for fodder crops for dairy cows. These clearings do not yield their whole income, for at times the men work in the mines which are widely scattered in the region. A few settlers, true pioneers, have taken up land in such valleys as those of the Lower Parsnip, Stuart, Salmon, Nation, Canoe, Clearwater, and North Thompson.

The villages which form the local centres for the farmers, and which generally contain at least a post-office, a school, one or more stores, one or more hotels, vary greatly in size; they may contain less than 50 people; the more important contain several hundred, e.g. On the Lower Mainland - Pitt Meadows (830) Sardis (500). On the Gulf Islands, Pender (300). On Vancouver Is. Koksilah (250) Errington (200) In the middle Fraser valley Lillooet (350), In Okanagan valley Armstrong 1700, In the Bulkley Valley Smithers 1000,

The most notable expansion of a purely farming settlement during the past decade has been that of the Peace River block. It is not yet commercially important, but several hundreds of settlers have taken up land. Given adequate means of transport it is possible that this area may expand into one of the important and more densely populated rural areas. Further possibilities are associated with the chances of developing stock raising on the plateau regions West of the Northern Rockies, where the Finlay valley is one of the most promising areas. The stock would need to be winter fed, and housed for several months, and until there is a much greater demand for meat it is unlikely that any use of the ranges will be made.

The prosperity of the farming population of the Province depends a good deal on economic conditions both within and outside the Provincial boundaries. Such developments as gold rushes have always stimulated agricultural production, as has the construction of railways. When these temporary activities have come to an end the farmers who benefitted from them have suffered distress; in 1929 the Official District Agriculturist resident at Williams Lake (Cariboo District) reported that the farmers of his district had not responded quickly enough to changed economic conditions. During the booms which were the result of the discovery of gold in the Quesnel district, in the days of horse traffic over the famous Cariboo Wagon Road, the huge demand made for vegetables and horse feed led to

inflated prices, which resulted in intensive agriculture. This system was threatened by the waning of the prosperity of the mines, but the evil day was averted for a few years by the building of the P.G.E.R. when the line reached Quesnel and construction ceased, the labourers left the district, and the farmers were left without a market. Some tried fruitlessly to continue their old system, and did not realise that they must turn to stock-raising, for which the area is fitted.

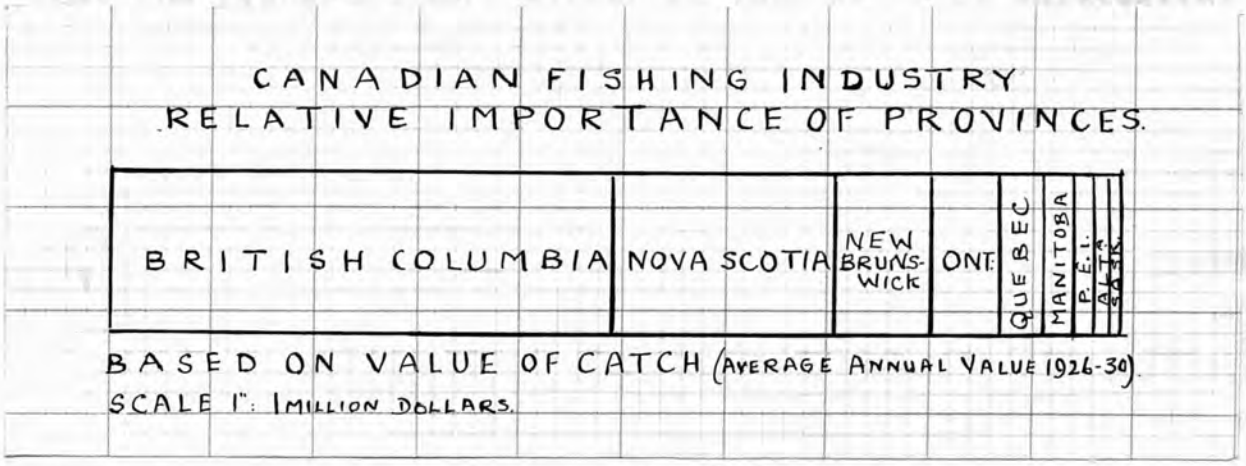
The buying power of the Prairies is of great importance, since they form the best market for the fruit crop. In the recent depression experienced in the Prairies, the ~~two~~ fruit farmers have found difficulty in disposing of their produce, but on the whole the farming population of British Columbia has not suffered as badly as have the farmers of the Prairies from the prevailing difficulty in marketing agricultural produce, largely because the farms are on the whole more diversified and therefore most self-contained.

IX.

FISHING INDUSTRY.[1]

B.C. leader among Canadian provinces. Varied fish resources. Salmon, halibut, herring, pilchard, cod, shellfish. Export trade in fish. Employment and settlement dependent on fishing industry.

British columbia holds the position of leader among the Canadian provinces for the value of its fish products.



The fish resources of the West lie in both deep sea and inshore waters; the submarine platform off the Coast offers suitable spawning grounds; the Japanese current bears great quantities of fish food, the varieties of fish found are numerous, and many of them are unexploited so far. Even so, the industry is one of the most important in the Province. The number of people engaged in the fishing industry is 20,000 - (which is 25% of the Canadian total) 12,000 of them working at the actual fishing, and 8,000 at packing

[1]Manual of Provincial Information 1929. Year Book 1911/14. Canada Year Book 1932. Annual Reports of Commissioner of Fisheries especially for 1928, 1929, 30,31.

and curing fish or in fish reduction plants.[1]

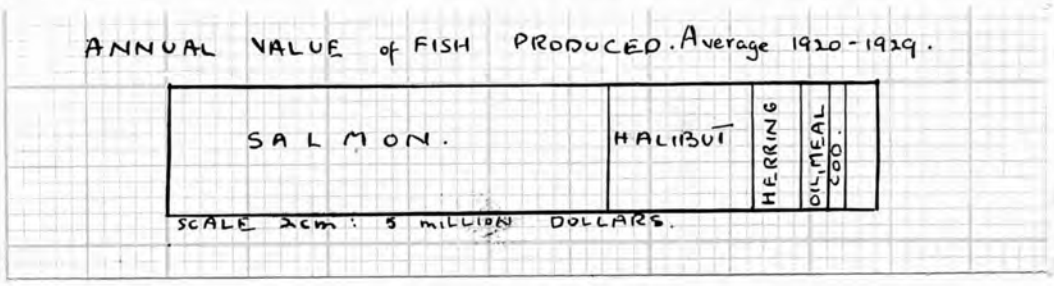
The fishing population is widely scattered along the West Coast, as is indicated by the position of the fish canning and curing centres (see Map F). The fishing industries are carried on seasonally, and the population of the fishing centres fluctuates - e.g. that of Kildonan varies from 50-500, and of Namu from 300-700. During the rest of the year the fishermen work either at logging or at cultivating their "homesite holdings" - small areas of 20 acres which may yield vegetables and support poultry for home use.[a] This has led to the settlement of small coastal areas where people could not earn a livelihood by farming alone, the seasonal work with the fishing fleets, at the traps or in the canneries giving an income with which the settlers can buy goods which they cannot produce on their homesites.

The early development of the industry was largely in the hands of Asiatics, and in 1921 2400 of the workers were still Orientals. The Chinese work in the canneries especially, while the Japanese own many fishing vessels[2] or form crews for vessels owned by white men. In addition the Japanese own some herring-curing plants on Vancouver Island. The tendency among the Japanese fishermen is for them to live in

1. B.C. Papers 1932. [a] Inspection of Pre-emptions - B.C. Papers 1915, Porcher and Banks Islands.
2. Can: Year Book.

small villages - in contrast to the scattering of the white fishermen during the close season.

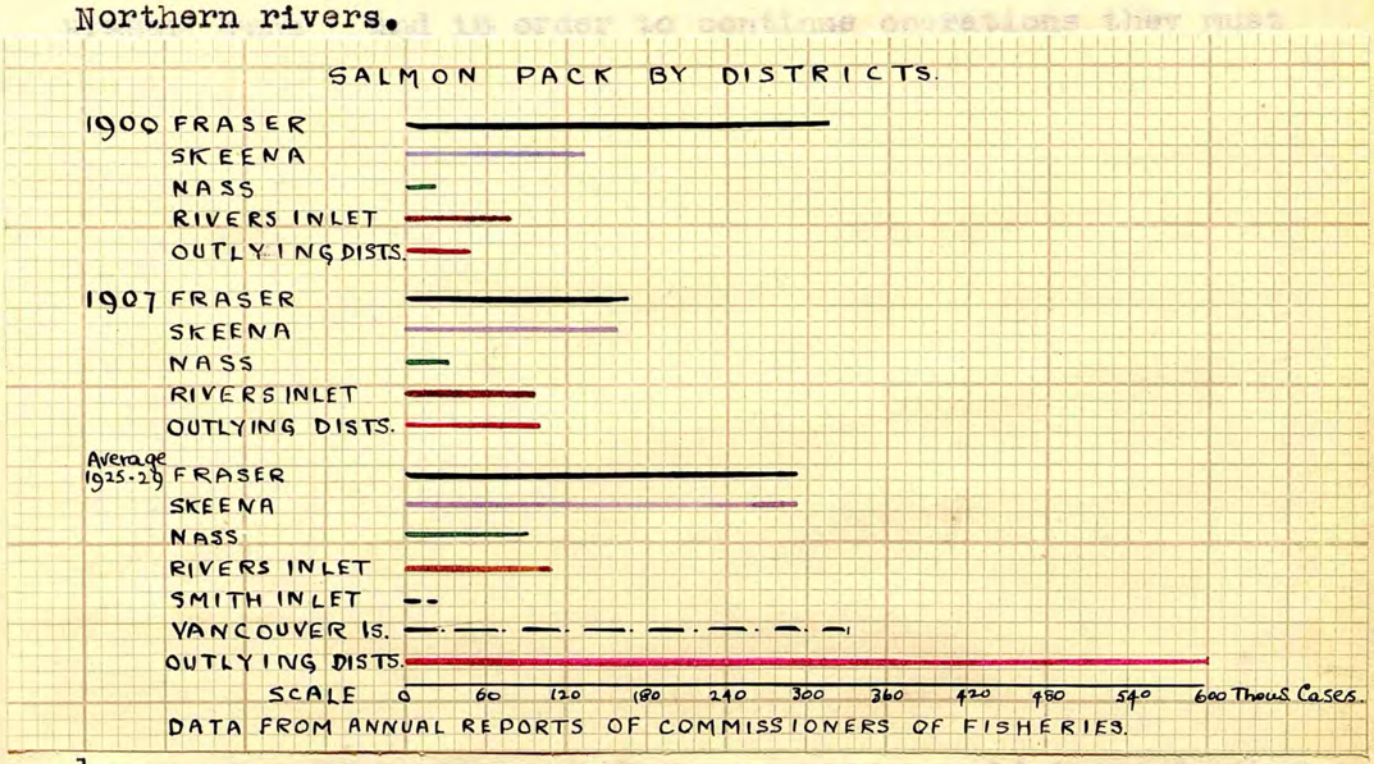
Fishing was first carried on by the fur traders for their own food supply. They hunted the sea-otter, whose skins were sold in China, but otherwise they left the resources of the sea practically untouched. The sea-otter has now vanished and the great source of prosperity for the West Coast fishermen is the salmon, though as the following diagram shows other ~~tppies~~ types of fish contribute to the total.



The rivers of the western mountain lands form excellent spawning grounds for salmon,[1] which are found in four varieties - sockeye, cheem, cohoe and Pink. They run in huge numbers - the maximum number being found every 4th year. The greater part of the salmon catch is canned: the first attempts to preserve the fish were made in 1863 when a fisherman from the Orkneys bought salmon from the Indians and cured it at Beecher Bay for export. Salted salmon was during the next few years

1. Annual reports on Investigation regarding salmon pub. by Commissioner of Fisheries.

exported in barrels from Forts Victoria, Langley and Hope to Hawaii. In 1867 the first attempts to can salmon were made; in a year or two canning as an industry began on the Fraser. The industry succeeded, and soon extended to the Skeena, Nass and Rivers Inlet on the mainland and to the shores of Vancouver Is. For long the Fraser retained its importance as leader but the waters of the Straits of Georgia have been overfished - mainly by U.S. fishermen. The decline found since 1913 in the catch is partly due to an accidental cause in the Fraser itself - a great rock-slide was precipitated into the river and this prevented the salmon from getting up river to spawn.[1] With the decline in the Fraser salmon industry has come a corresponding rise in the importance of the Northern rivers.



1. Canadian Fisherman April 1932.

The salmon catch shows huge annual variations - e.g. in 1930 the greatest salmon pack known was recorded. In that year on both the Skeena and Rivers Inlet the pack was double that of 1929, on the Nass it was four times as great, though the Fraser canneries packed only half as much in 1930 as they had done in 1929. 1931 was an extremely poor year - chiefly owing to market conditions - the runs, except on Fraser and Nass, were exceptionally large, but there was but slight demand in the world market for the product. Canneries are scattered along the Coast, but there is a marked concentration of plants at the mouth of the Fraser, on the coast of Van: Is., at Rivers Inlet, and near the mouth of the Skeena (See Map F 1). The Fraser canneries were established in the days of the great Fraser runs and in order to continue operations they must now buy salmon caught in the Rivers Inlet District and in Vancouver Is. District. Some of the Skeena R. pack was tinned at outlying canneries.

The great importance of the salmon and the need for ensuring the supplies of the fish is realised by the Dominion Government which maintains eight salmon hatcheries at the sources of the Fraser, Skeena and Rivers Inlet; the British Columbian Government maintains one large one on the Fraser, and the salmon canners' Association has a hatchery on Vancouver Island

The market for the salmon is world-wide, the chief buyer is Britain, but the produce has been sold in many other lands. The exported product feels the competition of the

more cheaply produced Japanese tinned salmon, which in Europe is 3 dollars a case cheaper than the B.C. product. This is despite the fact that operations in B.C. are carried on on a large scale;- most ofthe fish are caught in traps, and machinery can be used in the canning of the fish. Cheap labour too is used, for the Japanese and Indians are largely employed in catching the fish, while Chinese work in the canneries.

Halibut[1] is second to salmon in importance; the exploitation of the halibut began in the late 80's, and Seattle was the base for the industry, which was rapidly extended, and now affects 1800 miles of the N. West coast of America. U.S. vessels are more numerous than Canadian, but both fleets use Prince Rupert as their landing base. The halibut, unfortunately, grows slowly, and therefore the industry is faced with a serious question of decline, and to combat this the winter has been made a close season.[1] Prince Rupert has become the chief centre because it is the most northerly port with rail connections with the interior; the building of the C.N.R. placed the port in contact with the middle U.S. and Canada. The bulk of the fish is sent either fresh or frozen by the railway to these markets; small shipments only are carried south by coastal steamers.

[1] Report of International Fisheries Commission. B.C. Papers 1929.

Like most industries the halibut fishery found 1931 and 1932 extremely difficult seasons; the price of the fish fell so low that it became unprofitable to work the gasoline-driven vessels, those with diesel engines were the only ones which paid, and some of those worked at a loss. The landings for the whole N.W. Coast showed a decline, especially those at Prince Rupert - a better price was obtainable in the Seattle market, and also the Americans resented the agitation which took place in Prince Rupert in favour of closing the port to American vessels, and some gave up using the port, even though these restrictions were not enforced. In 1930 23.9 million lbs of halibut were landed - in 1931 but 16.7 million lbs; In 1930 American vessels contributed 18, in 1931 only 10 million lbs.[1]

Herring were unimportant until 1905 - when dry salting began on V.I. at Nanaimo, Barkley Sd. and Clayoquot; the venture proved successful and there are now twenty dry salt herring plants, the chief centre for the industry being Nanaimo where 240 men are employed in herring fishing, and the same number at the plant. Other centres are found on the coast of Vancouver, and Queen Charlotte Islands. The market for the cured herring lies in the Orient mainly in China. No great market for fresh herring has been built up - In April 1932 the first experimental shipment of fresh frozen herring took place - to Hong-Kong - to supply the British settlement.[2]

1. Canadian Fisherman Dec. 1931.

2 Canadian Fisherman 1932. April .....

The experiment succeeded, and small shipments of similar fish have been made monthly; this type of trade may be extended and aid in the fuller development of the herring resources; at present it is on too small a scale to affect the employment question materially. Herring are also used to some extent for the manufacture of meal and oil, though in this respect they are less important than Pilchards.

The pilchard meal and oil industry is of recent growth, the first plants being opened in 1925. By 1928 there were 23 plants at work on the West Coast of Vancouver Island, the chief centre being Nootka Sd; Barkley Sd. was second and Clayoquot third. (See Map F 1). The production of meal increased seven-fold; and of oil nine-fold between 1925 and 1928. The meal is of good quality, being made from the whole fish, and not, as is the case in Europe, from offal only.

The industry offered an opportunity for further development of the West Coast of Vancouver Is., and may revive, and fulfil its initial promise; the 1932 season was a poor one, the output of oil being halved, and the output of meal severely restricted.[1] Only 7 plants were at work during the season, but presumably with the recovery of world trade this industry will again be an important source of livelihood on the West Coast; as practically the entire product is exported, the state of world trade is of great importance to its continuance.

1 Can: Fisherman Nov: 1932.

Other fish are less extensively caught. Quantities of cod are found in the waters, but the cod industry is not as extensively developed as the shoals would allow. This is partly because the cod industry of the East Coast is so highly developed - the waters there lying nearer the market, and partly because available capital in B.C. has been used for other branches of the fish industry. Open-air drying which is practised on much of the east coast is impossible in the west, but a mechanical drier has been invented and successfully used.[1]

Shell fish are of small importance as yet; one shrimp cannery operates on the Fraser, the shrimps being caught in English Bay,[2] and one razor clam factory has been established on the N. coast of Queen Charlotte Is.; and its activities are not likely to extend appreciably owing to the small area which is suitable for the growth of the clam.[3] Collection and canning of the razor clam began in 1924, and 12,000 cases are packed annually. The labour employed is mainly Indian - from the large reserve at Massett. The occupation employs them for a short time only - clam-digging can take place only at low tide, and the tides are suitable for only about 12 days each month. The market lies in the United States - in common with other industries which supplied

1. Yr. Book of B.C. 1911-1914. 2. Can: Fisherman May 1932.
3. Can. Fisherman Aug. 1932.

that market, the canning was hit by the imposition of tariffs in 1930; the industry has not ceased to exist, however as recently the tariffs imposed have been offset by the rate of exchange.

Whaling was early developed on the coast, and there are still 5 whaling bases in the Province - 3 on Vancouver, 2 on Queen Charlotte Is., equipped with modern plant making oil and fertilizers, for which the chief market has in the past lain in U.S. the whalebone being sent to Dundee. The collapse of the demand in U.S. has led to inaction during the last year on the part of the Victoria whaling fleet, but as oil prices have risen the industry has a more hopeful outlook for the coming season.

Export trade in fish is primarily carried on from Vancouver, New Westminster and Prince Rupert but on the west coast of Vancouver are smaller centres of the trade - Kildonan, at the entrance to Alberni Canal, Pt. Alberni, and San Mateo, which export salted fish and fish meal mainly. Vancouver[1] controls practically all the trade in canned fish - the market for canned salmon lying mainly in U.K. and Australia, France and E. Canada being other important buyers; the complete list of purchasers of B.C. salmon includes most of the lands round the Pacific basin and also other countries of Europe. Canned pilchards go mainly to New Zealand and Fiji.

1. Port of Vancouver - Harbour Commission Report 1930.

One plant at Ogden point now prepares salmon steaks for shipment to the United Kingdom, each steak being separately wrapped in paper. This development is still in an experimental stage only.[1]

Salted dog salmon goes to Japan; dry salt herring to China and Japan (1931 China took 33,000 tons, Japan 22,000, though much of that was destined for transhipment to China). Though the packing plants are on the coast of Vancouver Is., only a few small vessels call for cargoes at the posts there, and the bulk of the product is transhipped to and exported from Vancouver. During 1932 the exporters formed a co-operative selling organization, which is taking measures to push the product in the Chinese market. Marketing conditions there have not always been favourable to the B.C. shippers, as the Chinese buyers have left much of the herring, sold on consignment, on the docks, until it was no longer in prime condition, and could be bought by them at their own price.

The trade in fish meal wss at first directed to Japan which used it for fertilizer. By 1928 the market included the United States and Europe. California is the chief market, Japan the second, Hamburg the third; Rotterdam takes a small amount.

1 Can: Fisherman Aug. 1932.

The fishing industry is thus one of several branches, and trade relations with many countries of the world have as a result been built up. Much of this trade is capable of still further development on the basis of unexploited resources, particularly that connected with the deep sea fisheries. The extent to which the prosperity of British Columbia is linked up with conditions in other parts of the world is exemplified in the effect of the boycott of Japanese goods which developed in South China during 1931.[1] The South Chinese refused to import herring which had been exported from British Columbia by a Japanese firm; in consequence two of the largest salteries have been taken over by white companies, and an agreement has been made under which the Japanese shippers do not attempt to sell to China, while the white exporters leave the Japanese and Manchurian markets to Japanese companies.

The fishing industry is one of the British Columbian interests which has developed very greatly during the last 30 years. In 1900 the catch of Nova Scotia, New Brunswick, and Prince Edward Island amounted to three times that of British Columbia, but by 1921 the catch of the Pacific Province was approximately equal to that of the maritime Provinces. Thus both the trade connections based on the production of fish, and the fishing settlements have but a

1. Can: Fisherman ~~Feb.~~ Jan: 1932.

short history; local conditions would favour their progressive growth, but economic conditions in other parts of the world are highly influential, since the small provincial market could not possibly consume all the fish that is caught.

X.

WATER-POWER RESOURCES AND INDUSTRIAL DEVELOPMENT.[1]

I.

Factors favouring hydro-electric power development.
Use of power in mining, quarrying and other industries.

II.

Factors favouring industrial development in the Province.
Types of manufacture established at present.
Manufacturing centres. (a) in North-Prince Rupert.
(b) in South :-(1) in S.E. valleys. (ii) in South West.
Minor centres:, Victoria, New Westminster. Vancouver.

I.

The Province has great resources of power; the mountainous character of the country ensures irregular gradients and swift flow in the streams. In many of the river Basins lakes form natural reservoirs, though in some areas where power has been required e.g. Southern Vancouver Is. such advantages have been absent, and it has been necessary to erect large dams in order to provide artificial reservoirs, and in the South-east on the Pend d'Oreille is the largest dam in Canada. Engineering feats on a great scale have been needed at some points - tunnels from natural reservoirs being made to adjacent streams at a lower level, where the power house is situated. This was done in the Coquitlam-Buntzen works which supply Vancouver City and the lower Fraser towns

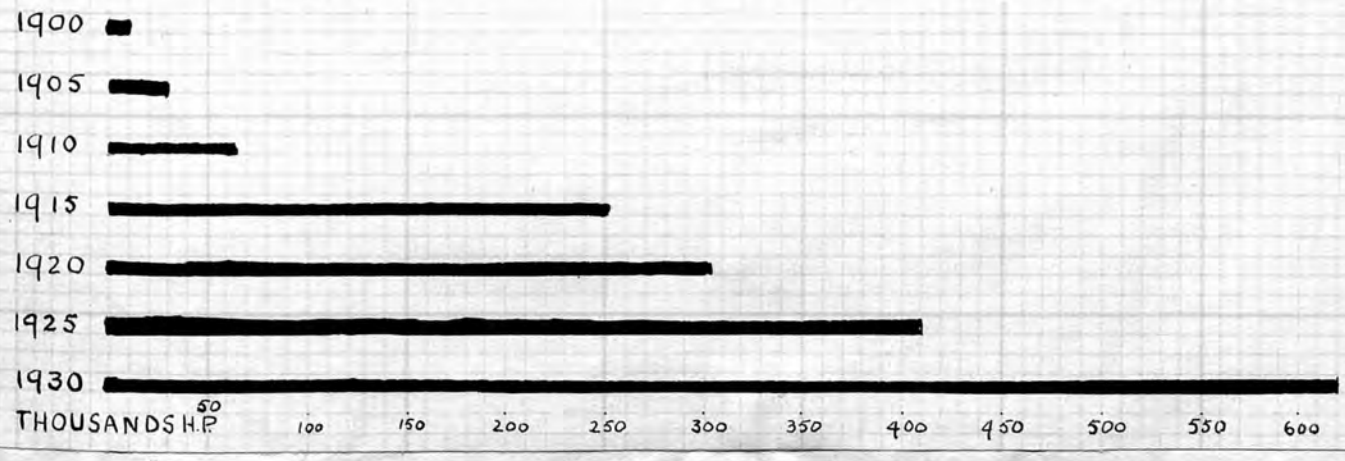
[1] Special Bibliography.
Water Powers - pub. by Dept. of Lands. Manual of Provincial Information 1930.
Industrial Survey of Vancouver and its adjacent territory.

and it is being done on the new Bridge River works where a tunnel two and a half miles long will deflect the surplus water of the Bridge R. into Seton Lake.[1]

A comparatively regular supply of water is found in the rivers, the long high-water season being due to the fact that the maximum precipitation on the mountains, both of the Coast and the Interior, falls in the winter half of the year, much of it at the headstreams in the form of snow, so that in winter the rivers are filled by the run-off of rain; in spring and early summer by the melting of the snow on the higher levels.

The earliest use of the water-power resources was made in 1897, when one plant was built on the Bonnington Falls (Kootenay R.) and another on the Goldstream (southern Vancouver Is), Development was slow until 1910 when a number of new schemes were put into operation, and they have been steadily increased; the two five-year periods showing the greatest rate of development being 1910-15, 1925-30.[2]

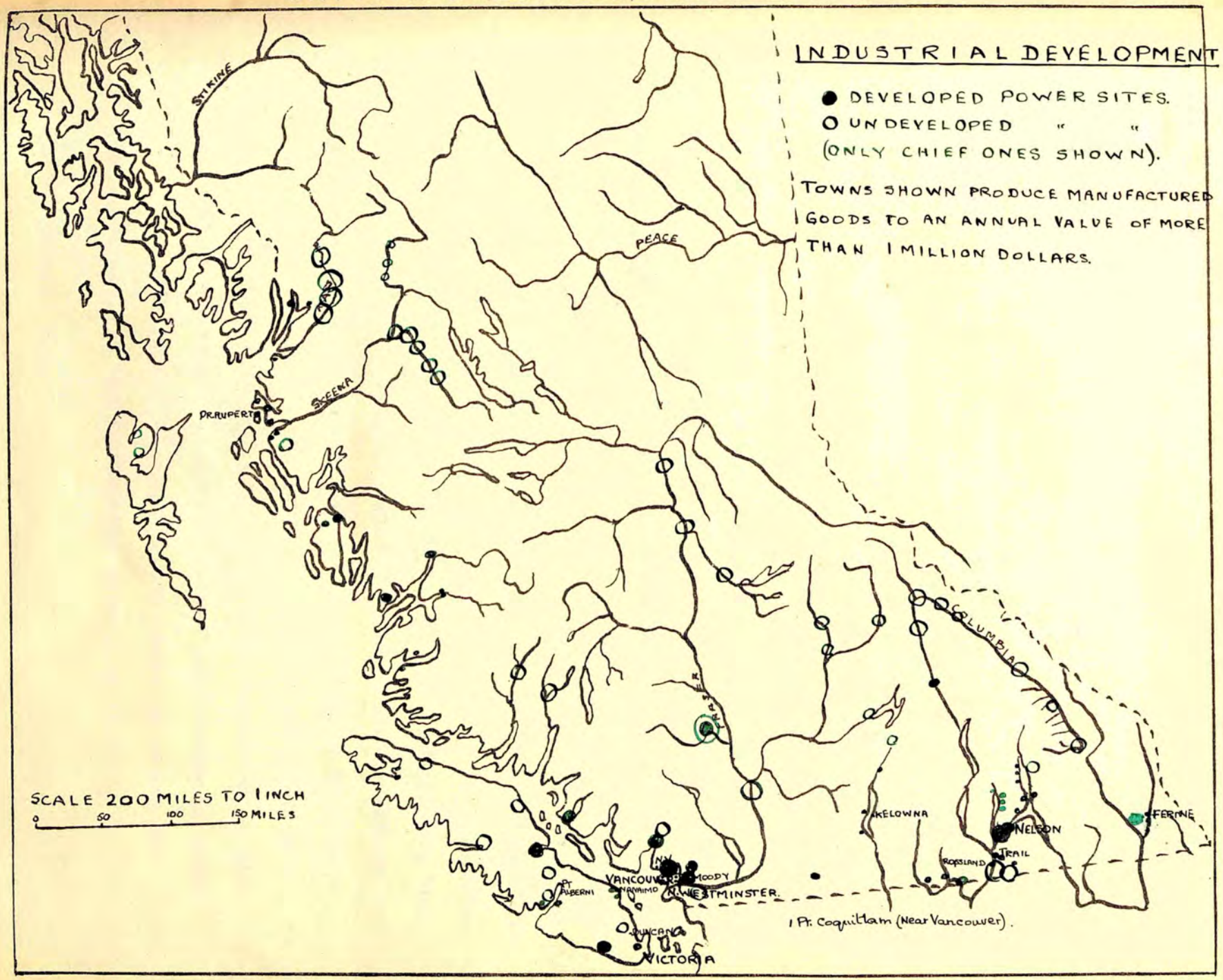
HYDRO-ELECTRIC POWER DEVELOPMENT



1.

2. Rep. pub. in B.C. Sessional Papers 1932.

BRITISH COLUMBIA, SOUTH OF 58° N.



During the years just before the Great War emigration to the whole of Canada from the old world was very great, and British Columbia shared in that influx of population. In addition British capital interested itself greatly in Canadian projects, and so in the Western Province rapid expansion took place. After the post-war depression another period of rapid expansion took place, the towns of British Columbia grew rapidly; new industries were set on foot; old ones were organised on a larger scale; and, in proportion to the new demands created, further developments of hydro-electric power took place.

As would be expected, the greatest development of power occurs in the south-west, (See Map E. on preceding page) since there the bulk of the population is to be found. Vancouver and the adjacent towns are supplied by works on two tributaries of the lower Fraser, - the Coquitlam-Buntzen and Stave R. stations. Not only are the cities supplied with light and power, but so is the Electric Railway which runs east to Chilliwack and south into the State of Washington. Victoria, Esquimalt and other adjacent urban centres make great demands on electrical supply in the south-east of Vancouver Is., and they are supplied by the Jordan R. and Goldstream R. works.[1]

The coal-mines of the eastern shore of Vancouver Island are supplied with hydro-electric power, so that the actual

1 Water Powers B.C.

running of the mine is not consuming the coal reserves, as is the case in the majority of the world's coalfields. The towns on the coalfield, Nanaimo, Cumberland and Courtenay, are also supplied with hydro-electric power. Though the presence of hydro-electric power in the area lengthens the life of the coal-mines, it does at the same time make their profitable working more difficult at ~~the~~ present, since it limits an already small market, and the Vancouver Is. field finds the disposal of its output difficult.

On the mainland some development has taken place in connection with quarrying, mining and fishing. On ~~th~~ one stream which flows into the eastern side of Howe Sound, power is generated for crushing rock, which is then loaded on scows and sent to Vancouver.[1] At Granite Falls on Burrard Inlet is a similar plant. At Britannia Beach the large, low-grade copper works are supplied with hydro-electric power; the ore is mined at elevations of 2000 ft. and the concentrating mill stands on the beach; the ore is conveyed by aerial tram to the mill; from the mill electrically-driven locomotives transport the concentrates to the wharf; the power for all these processes is supplied by Britannia Creek and its tributaries.[1] On Princess Royal Island power is generated for use in a gold mine which is situated in rugged country where three lakes lying at different levels have been united

1 Water Powers B.C.

through the building of a large dam. At Anyox, as at Britannia, the creek gives power for the mine, the smelter and the railway which transports the ore from the mine to the crusher. Near Stewart the Premier Gold Mine Company is able to generate hydro-electric power during the summer, in winter the supply of water falls, and so auxiliary engines, for which fuel oil is imported, have been installed.[1]

At all the pulping plants, Woodfibre, Ocean Falls, Swanson Bay, and at the newspaper factory at Powell River, hydro-electric power is used, the power-station at the latter centre being particularly large.[1]

Prince Rupert is the largest settlement along the north coast which is supplied with electricity; lighting and power are needed for the city itself and for the requirements of the large fish-curing and canning and cold-storage plants and the saw mills.[1]

The mountains of the south-east also contain many sites where water-power may be generated; the greatest development at present is that on the Kootenay, at Bonnington Falls, 11 miles from Nelson. There are two falls, the power station at the Lower Falls supplies the city of Rossland, 32 miles away, that at the Upper Falls supplies a wide area, high-tension transmission lines having been constructed to the Okanagan and Similkameen valleys, supplying the large copper Mt. mine near Princetown, Penticton, Summerland and Kelowna

1. Water Powers B.C.

on Okanagan L., Trail, Rossland, Grand Forks; a decreasing amount of power is transmitted to the State of Washington. The largest consumer of power is the Consolidated Mining and Smelting Company which uses it in its mines at Rossland and in the smelting and refining plant at Trail. Smaller hydro-electric power developments supply other centres e.g. Revelstoke, Nakusp (where the saw mills are the chief consumers) Armstrong, Kaslo. The coal mines of the Crowsnest field, the Sullivan mine at Kimberley and the mining centres of Fernie and Cranbrook receive power from the Elk and its chief tributary.[1] Thus the mining industry is ~~aided~~ favoured in the interior, as on the coast, by the presence of water power.

In the interior plateau there has been less development of power up to the present. The Fraser river offers possibilities for such developments in its upper middle course, but the only installations working are two in the Thompson basin. The falls on the Barriere R. supply Kamloops City - and also mines, lumber mills and pumping plants which raise water for irrigating fruit and farm lands, the power for these industrial purposes being transmitted ~~to~~ 50 miles away. The river is at times low, and for short periods in winter ice on the river prevents the generation of power and the provision of an auxiliary steam plant has proved to be a necessary safefuard. On the Thompson, near the mouth of the Nicola is a small centre with a population of 200; on an adjoining creek a

1 ibid:

small plant generates power to supply this village; it works only during the evening, as during the day the water is diverted and used to irrigate the orchards hearby. [1]

The water-power sites have been very fully investigated, and there are approximately 50 sites which promise at least 5000 H.P. as a minimum. Some of the greatest sites are in the North, in the Upper Middle Fraser, Bulkley, and Nass. These are unlikely to be developed for many years, but there is no part of the province where development need be held up by lack of cheap power.

The fact that the power resources are so widespread means that it is not this which has been of great influence in affecting the distribution of population. Had other factors favoured a different distribution from that existing, other of the potential sites would have been utilized rather than those on which work proceeded. The existence of the power sites is of great advantage to the settlements - most of the farms in the well-settled areas are supplied with electricity for domestic purposes as well as for working such farm machinery as separators. Thus the ruggedness of the country, while isolating one valley from another, does to some extent offer compensation by allowing certain amenities to be provided which would not be available were coal power to be relied on, not because the Province does not possess coal, but because of the difficulty of transporting it away from the railway lines.

1. ibid.

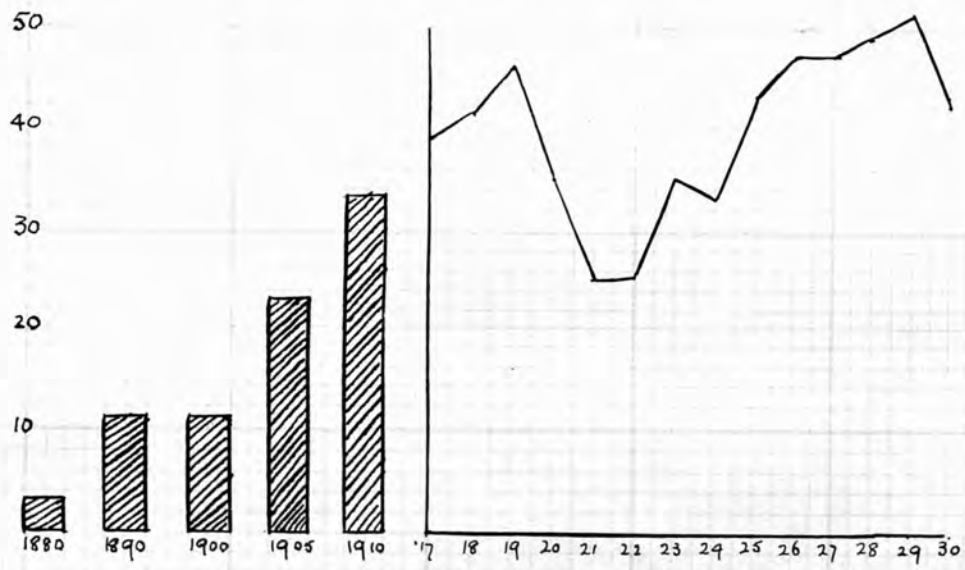
II.

Industrial development in this Province is favoured by the presence of a considerable variety of raw materials to which the forests, the mines, the farms, the rivers and coastal waters all contribute, though not in even proportions. The Province has great stores of power, and the climate is favourable to work being continued all through the year. The lack of markets has delayed the development of manufactures; the local market is small, though steadily increasing, and foreign markets are not easy to capture in the face of the competition of more established industrial centres.

A certain number of small establishments are always founded very soon after the settlement of any region, and in a publication entitled Information for Emigrants, compiled by the Agent-General of B.C. in 1875, quite an imposing list of plants is given. Sawmills are the most important, three out of a total of eleven being established at New Westminster; the others were scattered throughout the Province - at Nanaimo, Cowichan, on gold-yielding creeks in Cariboo and on the Fraser. Flour-mills, to supply another need as urgent as that for fuel and mining timber, were also working in the same districts. Otherwise, except for one quartz mill in Cariboo, industrial plants were to be found only in the South-West; a distillery and brickworks were working at New Westminster, a variety of plants at Victoria, including an iron foundry, gas works, 4 breweries, 2 tanneries, 2 sash factories, 2 waggon yards, a shipyard and brickworks. No mention is made of Vancouver.

In fifty years a great change has taken place; the chief manufacturing region is still the South-west, but the chief manufacturing city is no longer Victoria but Vancouver. B.C. is now the third most important manufacturing province in the Dominion - though its production lags far behind that of Ontario (42% Can: output) and Quebec (26%), for it amounts only to 8%. of the Dominion Total.

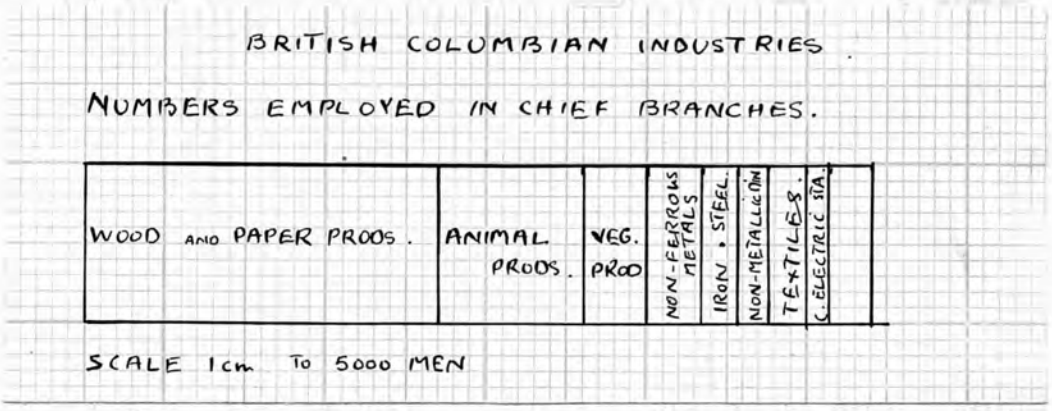
GROWTH OF BRITISH COLUMBIAN INDUSTRIES.
SHOWN BY NUMBERS EMPLOYED.



The most important group of manufactures is that of saw mill/products (gross value 1929 $64.6 mill.), the second is fish-canned and cured (gross value 21.7 mil.), the third pulp and paper (16.8 mill.). the fourth power from Central electricity stations ($13.5 mill.), fifth the meat from slaughtering and meat-packing establishments. The pulp and paper works are much larger than those in either of the two leading groups - for there are but six pulp and paper mills,

and in 1929 370 saw mills were at work and 140 fish preserving plants.

Since the development of these industries has already been discussed in connection with the primary industries with which they are associated and which provide the necessary raw material, it is not necessary to recapitulate the matter here.



The diagram shows clearly the overwhelming importance of the forest wealth, since the total numbers employed in the wood-using plants is two and half times as great as the number of men employed by the next most important group of industries - those connected with animal products.

Apart from the preparation of fish food, animal products receive little attention, and the province does not fulfil its potentialities in this respect, being still an importer of food which could be produced with the province. At the plants concerned with vegetable products canned fruit and vegetables are prepared for home and foreign markets, and at

the packing houses fruit for distant markets is most carefully wrapped. The importance of metal work is to be associated with the great stores of mineral wealth, though the treatment of the ores is not proportionate to the amount mined, as much is exported. Petroleum is imported free of duty when unrefined, and it is the treatment of this imported fuel oil that employs 350 men in the non-metallic mineral group, not the working of B.C. petroleum, for which, so far, the search has been vain. The textile workers supply B.C. demands, not those from any more distant centre; the group includes the workers in the clothing industry, and it is mainly in dye-works and laundries that the people in this group find employment.

By 1928 fourteen towns in British Columbia were producing manufactures to the annual value of at least a million dollars.[1] (See Map E). The most solitary centre was Prince Rupert, which, with a population of over 6,000, is the chief centre for both the progressive valleys of Central British Columbia, with which it is linked by the C.N.R., and the scattered settlements along the North-West Coast. Its harbour is very good, without obstructions, free from dangerous currents, open all the year and not subject to fogs. In consequence it is eminently suited to be the centre of the fishing industry of the North-West. The construction of the C.N.R. gave it an advantage over other good harbours in the North West, and so it can gather raw material from

1. Can: Yr. Book 1932.

both land and sea. Adjacent to the town are rivers yielding hydro-electric power. As a result of all these advantages, in Prince Rupert there have been established canning factories, slaughter houses, cold storage plant, grain elevator, saw mills and other plants which supply the local market. So far the population of the North and centre of the Province is too small to support any other industrial centre.

Of the thirteen remaining industrial centres, four are on Vancouver Is., and five on the Lower Mainland. The other centres are Rossland, Fernie, Kelowna and Nelson. Fernie and Rossland are mining centres, Fernie being the industrial and market centre for the Crowsnest coalfield, Rossland being a lode-mining town. Kelowna and Nelson owe their industrial development partly to the forest wealth which is worked and partly to the agricultural development of the Okanagan and Kootenay valleys respectively. At Kelowna are fruit and vegetable canneris, saw mills, a box factory and a tobacco factory.[1] At Nelson (see Map A 10) the industries are even more varied, and the works include saw mills, planing, box sash and door and veneer works, creamery, ice-cream factory, breweries, jam factory, and a motor-boat yard.[1] It is facilities for transport that explain the growth of industrialism in these centres rather than at any other points in the valleys - Nelson being served by lake steamers, by the Crowsnest line of the C.P.R., the C.N.R. branch from Slocan South to the

1. Directory for B.C. 1932.

Boundary and by roads, including the Trans. Provincial Highway.

The smaller manufacturing centres on Vancouver Is. are Port Alberni, Duncan and Nanaimo. Coal or water power are available at these centres, and the forests or fishing grounds provide the raw materials for the saw mills and canneries and fish reduction plants.

These industrial centres are as yet of minor importance, compared with Vancouver, New Westminster and Victoria. The plants at Victoria are two and a half times as numerous as those at New Westminster, and employ several hundred more people, though the gross value of their products is lower. Victoria is the chief centre for the most productive part of Vancouver Is.; it is linked with its hinterland by rail and coastwise steamer service; the chief manufactures are of wood and paper, and the city has great facilities for obtaining the necessary raw material. It has a good, triple harbour, and in this is situated a shipyard and ship-repairing plants. Fruit and vegetables are canned, the S.E. of the Island being one of the centres for the cultivation of small fruits.

New Westminster is the chief port on the Fraser River, and it benefits from the waterway, which is used to transport lumber to the city. Lumbering is the chief industry; besides saw mills, box factories, planing mills and sash and door factories are all supplied with timber, which is cut either in the main Fraser valley or in the tributary valleys of Lillooet and Pit Rivers. The complete list of plants

found in the city is a long one - and includes salmon and fruit canneries stock yards, meat packing establishments, distilleries, foundries, machine shops, and carriage works. The works are spreading to suburban sites - the largest saw mill in the province, which alone employs 1000 men, is situated at Millside, three miles outside the city. The banks of the Fraser, from the mouth up to New Westminster, are being rapidly taken up by factories and mills requiring larger areas of cheap land with water and rail transport, e.g. Additional lumber and shingle mills, canneries, cordage works, and cold storage warehouses.[1]

Vancouver is of supreme importance. Its industrial development began only in 1865 when a small saw mill was erected. It was not till after 1880 that the population numbered 1000, and industrial development did not really begin until after 1890. Wood and paper are still the most important industries in the city; easily accessible supplies of excellent timber were the cause for the great development of this trade, together with easy communication with the interior of Canada - the Fraser valley and C.P.R. line being very easily reached from the shores of Burrard Inlet. Burrard

[1] Vancouver and its near neighbours. Port of Vancouver.

Inlet offers excellent harbourage, enabling the timber merchants to draw timber supplies from the inlets to the North as the neighbouring forests became exhausted. It is this ease of transport of logs from the coastlands to the North and from Vancouver Is. which will enable Vancouver to keep its pre-eminent position as a wood-working centre, as the forests of the lower mainland are fast diminishing; the annual cut of Douglas Fir has for example, doubled in the last decade, and no system of re-afforestation has been introduced until the last few years. As has been pointed out, the merchants have been warned that they may have to change the type of product on which they concentrate. Greater economy in the actual use of the timber in the mills is urged, and greater care in this respect would certainly arrest the rate at which the depletion of the Douglas Fir is proceeding. In the case of other timbers the annual cut is not greatly in excess of natural reproduction.

Approximately one-third of the city's industrial workers are engaged in some branch of the timber industry; one-sixth in iron and steel works, one-ninth in textile industry - (Which includes laundry work), one-ninth in preparing vegetable products. In 1928 over 600 plants were working in the city, employing 16,000 people, and producing goods to the value of 94 million dollars (cf, New Westminster, the second industrial centre, which contained 53 plants employing 2300 people and producing goods to the value of 15 million dollars).

The earliest plants were erected on the shores of Burrard Inlet, and it is in that area that the major industries are still to be found - (~~Map here~~) the list of works including shingle mills, saw mills, dry docks, oil refineries, chemical works, ship yards, iron foundries, marine engine factories, abattoirs, sugar refineries, cold storage and refrigerating establishments, and canneries. The False Creek area is the second industrial centre in the city, and it contains the largest foundries and engineering works in Western Canada, railway shops, and works for making the donkey engines used in logging, and marine gas engines, used by many of the boats of the fishing fleet. In improving the channel to the South end of False Creek, the Harbour Commissioners pumped much sand into retaining basins and reclaimed a new area - Granville Is., taken up at once for the site of forty factories. In other parts of the city factories are scattered; they make jam, paper bags, envelopes, clothing and food. The waterside sites are served by all the transcontinental railways, and Vancouver is not only on the C.P.R. and C.N.R. but the U.S. Great Northern line from Seattle runs into the port; other American lines, including the North Pacific and the South Pacific have connections with the G.N.R. or with the British Columbia Electric Railway, which is a short line running from Vancouver east for 72 miles to Chillieack. Car barges, operated by the Railway Company link Vancouver with the Pacific Great Eastern on the north side of Burrand Inlet, and C.N.R. and C.P.R. steamers connect the port with settlements

along the whole coast. This great development of means of communication assists Vancouver in its industrial development, and enables it to reach a wide home market for its manufactures.[1] So great a hold has it obtained on the general trade of the Province that it is unlikely to be displaced by any other centre for a very long time, if ever.

1. Vancouver and its near neighbours of the mainland 1913.
   Vancouver World 1922.
   B.C. of To-day pub: by Van: Sun. 1931.
   Vancouver Port Annual 1913, 1929, 1930.

XI

MEANS OF TRANSPORT.

General lack of navigable waterways, use of lakes; canoe travel in North [a]. Roads, Railways.

a. Surveyors Reports. B.C. Sessional Papers.

The rivers of British Columbia are numerous, but they do not serve as means of transport to any great extent. The mountainous character of the land ensures a steep gradient and waterfalls and cataracts are found in nearly all the rivers. Cañons are common, owing to the rejuvenation of the rivers by the Uplift of peneplaned surfaces, and in such sections the rivers are generally of swift current and broken by rapids. Canoe travel is possible along stretches of many of the rivers, and it was in such a way that the early fur-traders penetrated into the area. Such traffic, unless settlement is very sparse and other routes impracticable, does not suffice for modern requirements.

The best inland waterways are found in the south-east, where in the deep trenches the rivers widen out to form lakes, and on Kootenay, Arrow, and Okanagan and Shuswap Lakes regular services of steamers work. The C.P.R. Company runs lake steamers to connect with the railway lines which serve other parts of the trenches, and on Saturdays a barge ferry takes the train from Kaslo to Lardeau. A daily service is maintained across Kootenay L. from Nelson to Kaslo, and once a week the boat continues its passage north to Lardeau. Steamers run three times a week along the length of the Arrow Lakes, in the north a daily tug and barge service is worked between Arrowhead and North-East Arm. Apart from these lake basins, the rivers are useless for navigation, e.g. the

Kootenay passes over the Bonnington falls soon after its exit from Kootenay L., the Okanagan falls lie only a few miles south of Okanagan Lake.

The Fraser is of value for navigation below Hope, the autumn is the best time for using the river; it is still deep enough, but the great swiftness has passed, so that steamers can navigate the river easily. From December to April the river is shallow, rising rapidly in May. In pre-railway days, especially at times of gold rushes the river was extensively used, navigation was continued, though with difficulty, as far up as Yale. The canon made that the final head of navigation, for between Yale and Lytton the river is bordered by banks, steep and in some cases precipitous from 300' to 1000 feet high.[1] On the upper middle river above Soda Creek boats plied when the Cariboo district was at the height of its fame. Similarly services were formerly run on the Nechako, Skeena and Columbia. The risk in such traffic was very high, and it was only practicable so long as artificial prices were paid for commodities. With the construction of the railways, which gave cheaper, because more rapid and more secure, transport river traffic was abandoned.

In the North Central region where, so far, the main Canadian National is the only railway line, some use is made of the tributary valleys. Some 5 or 6 motor launches.

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[1] Four Years in B.C. - Mayne 1857

ply on Stuart Lake, though they cannot pass down Stuart River - which could however be easily improved at its rapids, so that 300 miles of navigable waterway could be obtained. South of the C.N.R. Line, Lakes Eutsuk, Whitesail and Ootsa form part of what is locally called the "Great Circle". These lakes and the headstreams of the Neehako which form their outlets afford practically 200 miles of navigable waterway. Between Whitesail and Eutsuk is a portage of 1 mile, where a skid road over which the canoes and small boats that use the waterway are hauled.

The rivers of the North are also used, by the Hudson Bay Company and other traders. The amount of traffic carried is small, but the needs of the scattered population of mining prospectors and trappers - Indian and White-are thus met. These rivers can, of course, be used only in summer.

The Peace River Settlement depends mainly on road transport, but in the summer the Hudson Bay Company runs a steamer on the river as far up as Fort St. John; one week the boat goes down river, to return the following week. Other boats use the river as well.

Atlin is the only other settlement of considerable size in the north; in summer it can be reached from the Alaskan coast, by the Taku R. and Lake, portage to Atlin Lake and power-boats across the Lake.

The Nass is used in summer, but falls occur low down on the river, and even to reach Aiyansh a portage of

2 miles is necessary.

Regular passenger and freight boats work on the Stikine in summer; shallow boats being able to reach Telegraph Creek, though they can travel only by day, owing to the swiftness of the current and danger from projecting rocks. Above Telegraph Creek is a great canon, quite impassable for boats, though miners sometimes pass through it in winter on the ice. Drift trees brought down in summer form a menace to shipping. The river is frozen over by the end of November, the ice remaining until the end of April. The river is not approachable everywhere, since it is fringed by low flats covered with a dense scrub. Easy access is therefore limited to places where the river swings near to the side of the valley.

On many of the other rivers of the north canoes may be used, as on the Iskut and Clearwater tributaries of Stikine, Finlay and its tributaries etc. portages being frequently necessary.

In this part of Canada, then, the rivers have not been of importance in providing cheap means of transport, and as soon as settlement began it was realised that road-making was vitally necessary, and a company of Royal Engineers were introduced to build a road to encourage the development of placer mining on the Fraser Bars. The broken surface conditions make road-making an expensive process, owing to the difficulty of obtaining even a moderate grade and of crossing the numerous rivers.

"I think I am safe in asserting that road-making is the hardest and most expensive work in the Colony; for, when there are not hills to be scaled, there are woods and swamps to cross, and where these are wanting, rapid rivers and streams will be found that require bridging."[x] (1864)

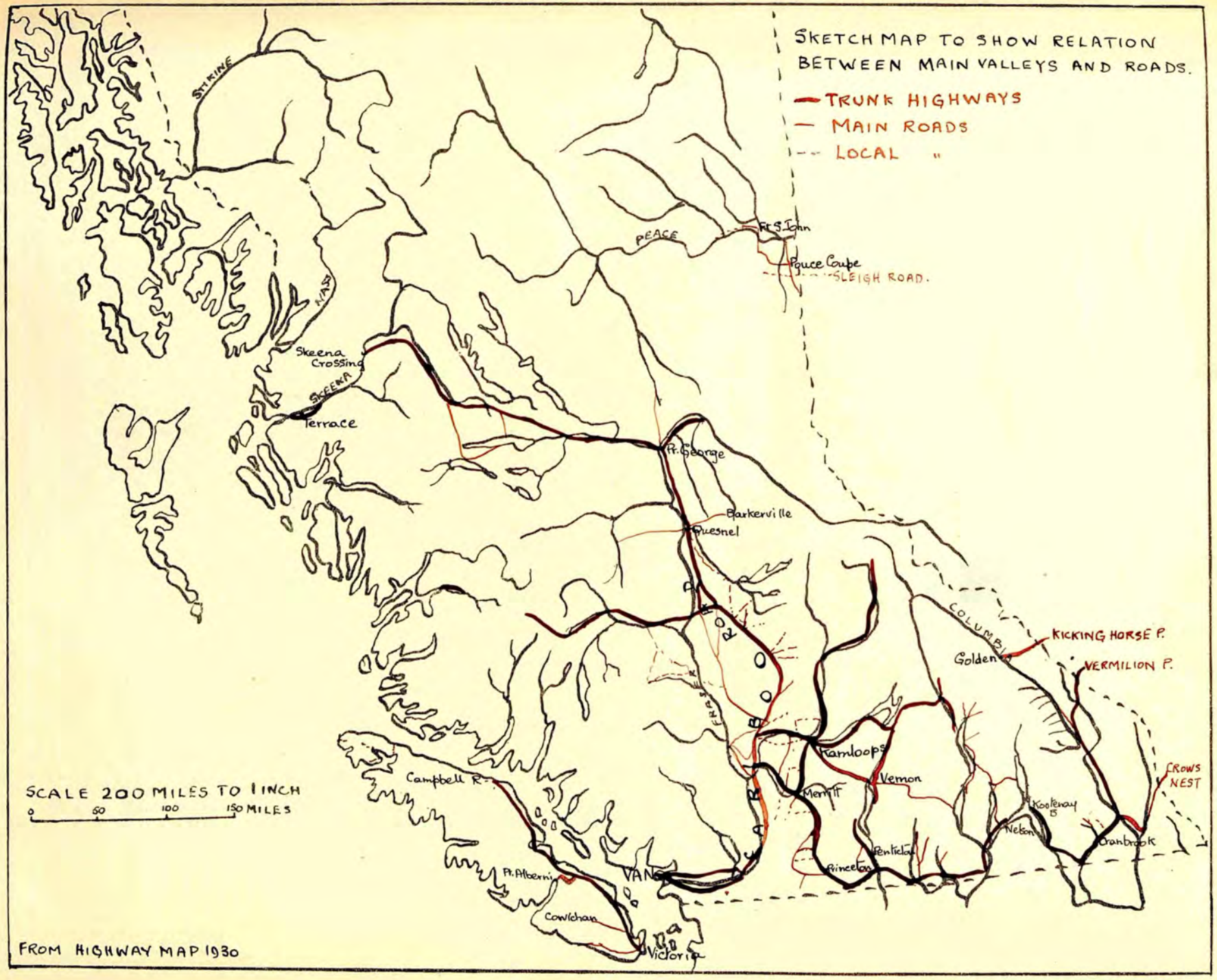
The first road built was a broad wagon road which linked up the navigable stretches of Harrison, Lillooet and Anderson lakes, and so gave a route from the lower to the middle Fraser, avoiding the difficult canyon. One of the most famous of all the provincial roads is the Cariboo Road, and that also dates from the early sixties. Built because of the gold discoveries in Cariboo, it remained the chief line of movement in the central plateau north of the Thompson River, until the construction of the Pacific Great Eastern line in 1922.

When gold was first found in the Kootenay and Boundary districts the mines had no connection with the rest of the province, communication following the natural direction of the valleys, southwards to U.S.A. The Provincial government therefore constructed first a pack trail, and later a road from the Fraser to the Kootenay.

Throughout the last seventy years the Government has continued to build roads, and as ~~Map H.~~ the following maps show~~s~~ a lengthy system of trunk highways and main roads has been completed. The maps

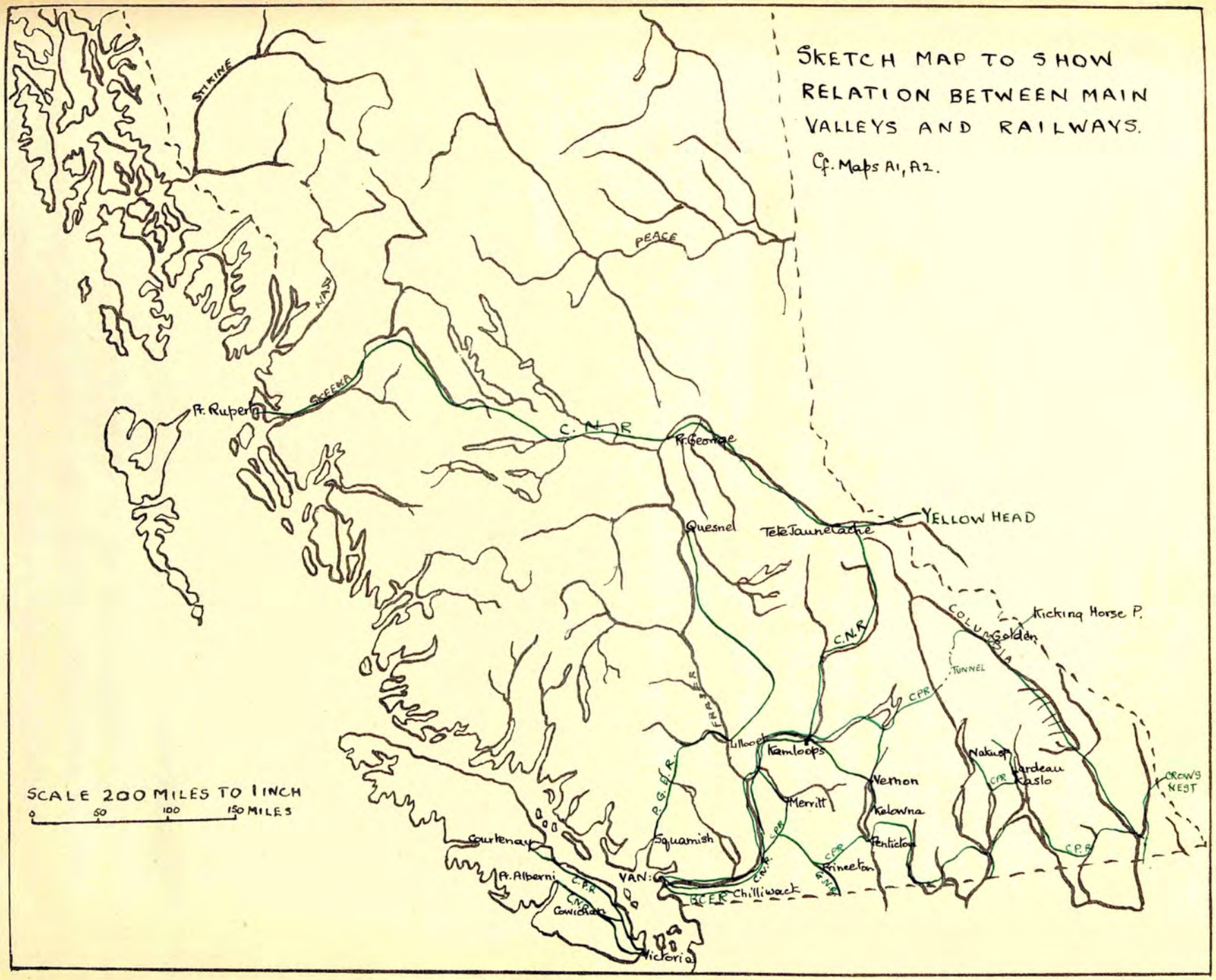
x "Four Years in British Columbia & Vancouver Island" - Mayne.

BRITISH COLUMBIA, SOUTH OF 58° N.



FROM HIGHWAY MAP 1930

BRITISH COLUMBIA, SOUTH OF 58° N.



shows clearly the control exerted by the river valleys on the direction of the main roads. As striking as the length of main road constructed is the large area which is still unsupplied with good roads. The local roads are of varying quality, not all of them suitable for motor transport. But over wide areas roads of any sort are missing, and trails only are found. Most of these are horse trails, along which pack animals may be used; in some of the wetter and more mountainous areas even that is impossible and back-packing must be resorted to.e.g. North Central Vancouver Is. where the loose cover of moss and soil makes the trail unfit for horses.[1] Under such conditions much settlement is impossible, but the land laws of the province have allowed pre-emptions to be taken up even in these inaccessible areas. There are few people, however, who are suited to life under such stern conditions.

Still further extension of the road system is required, and that is one form of public work which has not been arrested by the present economic depression.

The railway lines follow much the same courses as the main highways. The C.P.R. and C.N.R. are both well-established, the construction of the P.G.E.R. was a matter for long discussion, and it was eventually completed in part - from Squamish it reaches to Quesnel - the prepared but

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1 Geo. Sur. Can. Sum. Rept.1929.

uncompleted track to Prince George being used as a road. Sofar the line has not been a financial success, few trains run per week, but it has justified its existence so far as the stock ranchers of the Chilcotin Plateau are concerned. "Until the railway commenced operations in 1922 the ranchers had to drive their cattle from 120-150 miles to ship them at Ashcroft. This meant that for every steer shipped to market there was an added overhead cost of between 3 and 5 dollars. Cattle must be sold in the Fall of the year, and since the country was fenced, feed had to be arranged for at night. In addition there was the expense of food and pay for extra cowboys herding en route, and the cattle's serious loss in weight as a result of the long drive. To-day the bulk of the Chilcotin cattle are shipped from Williams Lake where the Government has built a stockyard." Everyone has not been pleased by the completion of the line; complaints have been reported from the Pavilion district that the farmers now find it difficult to dispose of their hay, for which a market was formerly found in the freighting teams which worked along the road. For the bulk of the settlers within reach of the line the railway should prove a boon.

The Canadian National certainly permitted the opening up of the Skeena, Bulkley-Nechako valleys enabling the settlers there to ship meat and dairy produce to the Prince Rupert market, for, though settlement began in 1904, it was not until the railway service was begun in 1914 that any considerable

agricultural development took place.

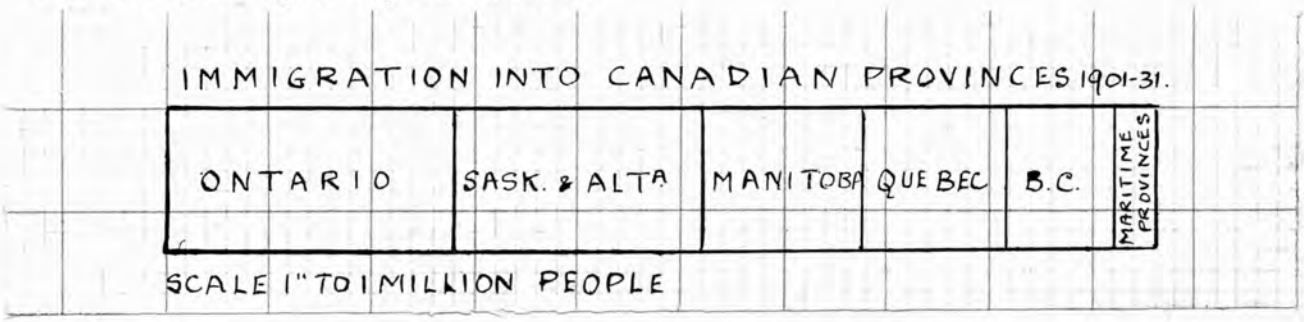
Still further extension of railway is needed in the Province to promote settlement in outlying areas. The Peace River Settlement was to a large extent the result of a virtual promise that a railway should be extended into the area. The farmers there have been bitterly disappointed that instead of loading their corn on to railway wagons, they should have to use the cleared trackway for hauling their wagons.

It is the railways which have permitted the cultivation of fruit to take place, for express shipments are necessary in such a branch of the farming industry. They have allowed the development of other branches of agriculture, of the forest wealth of the interior, and have been directly responsible for the great growth of the coast-al towns. The routes followed by the railways have, of course, been largely determined by the topographical conditions.

XII

PRESENT POPULATION.[1] Immigration. Settlers from Continent of Europe, Britain, the rest of Canada. Asiatic Settlement. American Indians.

Immigration has given the greatest number of the population of British Columbia - between 1901 and 1931 half a million people entered the Province. Some of these left again, but the majority remained. Compared with the other Canadian Provinces. B.C. has received few immigrants, as the following diagram shows.



The great distance at which the Province lies from important emigration centres partly explains the low position that B.C. holds in this respect, but it is partly due to the fact that many of the industries are open only to people with capital, and not to numbers of unskilled labourers.

In order to open up the country very few restrictions were imposed on immigrants, except as regards physical disability, until recent years.

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1 Special Bibliography:-
Dominion of Canada Census Returns. Can. Year Books.

In 1923 stringent laws were enforced against Oriental Immigration. Since 1930, in common with the rest of Canada, (B.C. Papers 1932) farm labourers, domestic servants and relations of settlers who had no other grounds for entering have been denied admission, on account of the serious unemployment situation.

In 1921 the non-British European portion of the population was mainly Scandinavian (19000) and French (11000). Germans, Italians and Russians were of equal numerical importance. [1] The Italians were found mainly in Kootenay and in Vancouver City, the Russians in West Kootenay, particularly at Yemir and in Yale, particularly at Grand Forks. The other Europeans were distributed throughout the province. In some areas e.g. the Bella Coola Valley and some places in N.Vancouver Island small groups of Scandinavians were the pioneer settlers, but, as a whole, compact social settlements of Europeans are not found. An interesting exception to this is found in the Doukhobor settlement in Kootenay. [2] These Russians were transferred from Saskatchewan early in the Twentieth Century, to farm lands in B.C. Most of them still live in the original villages around which the farm land is

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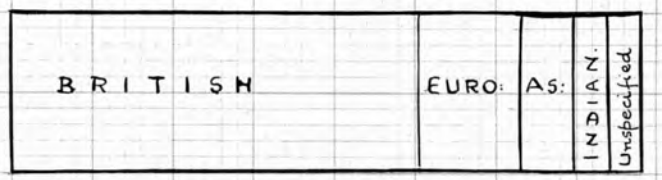
1. The 1931 Racial Census Report recently issued (Mar:1933) shows a marked increase in Germans and Scandinavians. German Immigration declined as a result of the war, but has revived during the last few years. Germans now number 16,000 Swedes 16000, Norwegians 12,000, French 15,000.
2. Report of Inquiry into Life and Customs of Doukhobors. B.C. Papers 1905.

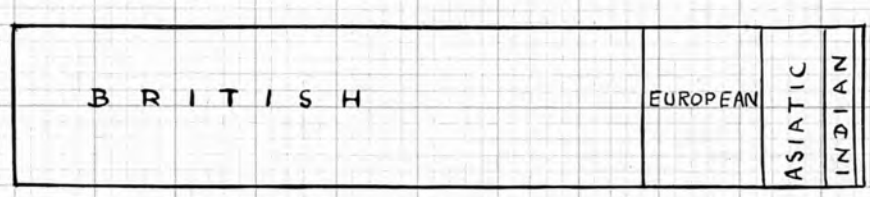
BRITISH COLUMBIA
RACIAL ORIGIN OF POPULATION

1901 CENSUS

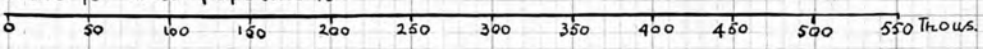
1911 CENSUS.



1921 CENSUS



Scale for total population.



1931 CENSUS.

communally held, a few have left these holdings to take up individual homesteads.

The British Immigration has been mainly from England. Many of the men were already experienced in the type of work they undertook in the Province, but some who took up farms the there had no experience in this highly-skilled occupation, and have not made a success of it. This has been particularly the case with some of the men who, under the Soldier Settlement Boards, auspices, began farming after the war. An extraordinarily large number of the settlers in the South-West have been people possessed of a private income - retired government officials or business men, who have taken up small scale fruit and poultry farming.

The mild climatic conditions of the South-West of the Province have attracted the latter type of settler, and have also led to many disabled men, from all parts of Canada, seeking homes there. A special "Handicap Section," of the Department of Labour is concerned with the interests of these 7,000 men, and very difficult it is at present to find work for them, when so many able-bodied men are out of work.

A certain, though not very high proportions of the population has entered from the United States, and these men have engaged particularly in the mining industry. During 1932 approximately 50 families settled along the C.N.R. line West of Prince George, and many of these have come from the middle Western States. They have taken up land, and efforts are being made

to induce them to stock their farms with good grade live-stock and to take up diversified farming.

Of great political and economic interest is the story of Asiatic Immigration into British Columbia. The Chinese came first, even before 1870 they were welcomed as domestic workers. Some went at once to the gold fields, where they worked placers considered of yield too low to be worthy of white attention, or placers which were abandoned by white men as worked out. Thus the end of any gold rush saw the diggings inhabited by Chinese . The Japanese influx began in the 90's and in 1905 a slight movement of Hindus began. They were numerous only in 1907-8 when nearly 5,000 were admitted, only one entered between 1915 and 1920, and the average annual Hindu entrants numbered only 45 between 1921 - 1931. Most of the Hindus have left the Provinces; only 1100 remain, and a Hindu problem scarcely exists.

The Chinese and Japanese have held rather different positions, and legislative measures concerning them have also differed considerably.

As has been stated, Chinese immigrants were at first welcomed by the small white population, though a few were alarmed by anti-Chinese riots which took place in California which they feared might be repeated in British Columbia. At the first session of the Provincial legislature held after the Confederation of the Canadian Provinces an appeal was made against the admission of Chinese, by the representative

of Nanaimo where Chinese were already being employed in coal mines. He asked for the imposition of a poll-tax; the appeal was lost; Chinese immigrants continued to become more numerous, and feeling against them to become more bitter. In 1884 a Royal Commission was set up, and as a result of their investigations a poll-tax of $50 was levied. Opposition to the admission of Chinese was based on various grounds - that they were of unsanitary habits, unreliable, of criminal tendencies, that they competed unfairly with whites, that by purchasing Chinese goods and remitting their savings to China they retarded the development of trade, and that by their presence they would prevent colonisation by white men. The poll-tax was increased later to a maximum of $500 (1904). The resultant revenue amounted to an average of $1,000,000 a year between 1912 and 1922, for each increase of the poll-tax resulted in only a temporary check to the numbers. Each ~~clerk~~ check lessened the labour supply; wages rose, and it was worth while for the labour - contractor to pay the tax. Final exclusive laws were passed in 1932, limiting Chinese entrants to Government Representatives, merchants and students, carrying credentials issued by the Government of China.

As a result only four Chinese have entered since 1924, while departures have averaged 5,000 a year, and the Provincial revenue from the Chinese tax has fallen to

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1 Can: Year Book 1932.

$30,000. Some of the Chinese have been naturalised, but it has been the exception for Chinese women to enter, so that there has never been any probability of their being assimilated into the life of B.C.[1].

Their role has been that of hired labour, and the presence of this body of relatively abundant and cheap labour certainty made possible the material progress which has been achieved. They formed a large part of the labour required for building the C.P.R. - the engineers in charge were bitterly reproached by some people for employing them, but there was in the Province literally no supply of white labour that would take their place.

The fish canning industry also drew on them - during the nineteenth century they both made the tins and packed the fish, but at the end of the century machinery was installed for making tins, though not for packing them. The timber industry employs many of them, especially the shingle mills; the heavy clearing of land for agriculture, placer mining and domestic service have all been done in part by Chinese.[2]

The Japanese did not enter till 1895, when the movement of considerable numbers began. Most of them, however, did not remain in the Province, but moved into the States. By 1901, 3500 Japanese were resident in B.C., 1908 was the peak year for Japanese immigration and 7,600 entered then. At the end of the year the Japanese Government agreed to limit

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1. 1931 Census shows 27,000 Chinese resident in B.C.

2. Enquiries into the position of the Chinese were held throughout the eighties and nineties and the proceedings were published in the B.C. Sessional Papers.

the number of labourers leaving Japan for Canada to 400 per year. By 1911 there were 8,600 Japanese in the Province - Vancouver City, New Westminster and the Skeena district containing the majority. Many Japanese women have entered the country, and the vital statistics show a high birth rate among this section of the population, which has increased considerably, despite the decrease in immigration and in 1931 they numbered 22,000.

The occupations followed by the Japanese are varied; fishing attracted them particularly, many having been fishermen in Japan. In 1914 they were reported almost to have driven the white fisherman from the coast; that condition no longer holds, though they still form an important part of the personnel of the fishing fleet; lumbering, pulp-making, canning, mining and agriculture employ others. [1] Before the twenties of the present Century the Japanese were welcomed as agriculturists, for farming was not an overcrowded occupation and they were admitted to membership of agricultural co-operative organisations. Agricultural depression in the early years of the last decade led to a feeling of antagonism, and the B.C. Legislature addressed a resolution to the Dominion Government asking that the province should be allowed to prohibit Asiatics from buying land or becoming proprietors of timber, fishing or other industrial enterprises, and from

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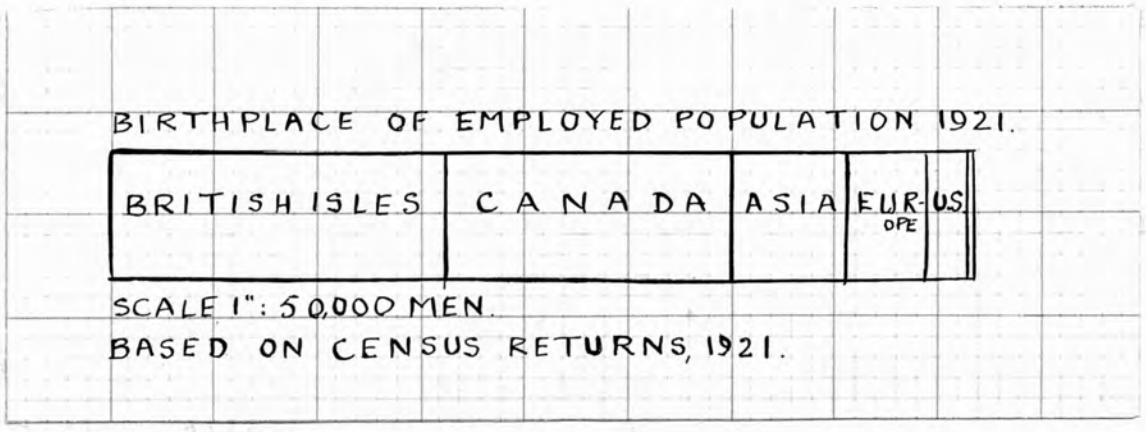
1 Report of Minister of Labour for 1931.

obtaining employment in any of these industries. The appeal was not granted, but that it should have been framed is indicative of the feeling prevalent in the province.



Similar figures of those used as a basis for this diagram are not yet published for the 1931 Census, but reports issued by the Dept of Labour show a decline in the numbers of Asiatics employed - in 1926 they formed 11.56% of the total number of employees, in 1929 10%, in 1931 7% (Actual numbers 1930, 9,978, 1931, 6,283.)

BRITISH COLUMBIAN INDIANS.

The Census for 1931 shows an Indian population of 24,600, (3.4% of the total population). The only other province in which they are as numerous is Ontario, which contains approximately the same number.

As elsewhere in Canada they live mainly on the reserves which are scattered throughout the Province, the most important being found in the S.W.Lowland, S. and W Vancouver Is. the Nicola, Okanagan, Shuswap and Skeena Bulkley Valleys.

At first employed as fur-hunters, the Indians very soon took up farming. By 1892 [1] they were already cultivating 3700 acs. of their reserves in the Fraser Valley and small areas in other parts of the Province. The most widely distributed crop was the potato, which were grown as far North as the Babine and Upper Skeena Agency. Spring wheat was the chief cereal, but a wide variety of temperate crops were introduced and domesticated animals.

By 1931 the cultivated land amounted to 26,000 acres. ($\frac{1}{30}$ of the total area of the reserves.) The chief food crops grown are oats and wheat, both yielding approximately 20 bushels per acre - an indication of the satisfactory agricultural methods used. Considerable herds of cattle and horses are reared, and both wild and cultivated hay is harvested. [2]

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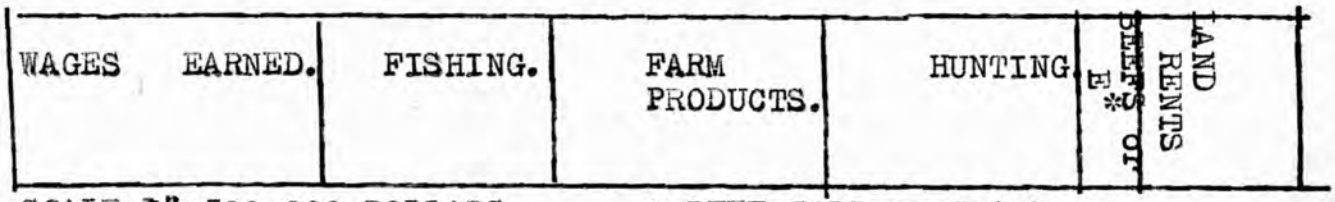
1. 1st Report issued by Dept. of Agri. 1891.
2. Report of Dept of Indian Affairs 1932.

The Indians of the Chilcotin area report that trapping no longer yields them a livelihood, and they are increasing their activities in the direction of cattle-raising and are also taking temporary work for white farmers. In the Pelican L. District the Anahim Indians have extended their occupation of land beyond, the boundaries of their reserve which is situated a few miles to the South east of Alexis Creek Post Office. The group is relatively small and difficult to enumerate because the tribe is generally scattered. In 1929 they were reported to number 230, (Dept. of Indian Affairs, Rept. of) They are cattle raisers, and they have begun to move in to the wild hay meadows of the Pelican Lake area, but since the land is not officially theirs they have done nothing to increase its productivity. This is but one example of what is the ease in many parts of the province where there surveyor's reports made in recent years refer to the use of the wild grazing grounds by bands of Indians, and it seems probable that the best way to utilize these more remote and inaccessible valleys e.g. on the margins of the Coast Range and Interior Plateau may be to extend the land rights of the Indians there.

The following table showing the sources of the Indians' Income in 1930 illustrates to some extent the way in which the Indians are participating in the life of the Province.

BRITISH COLUMBIAN INDIANS.

PROPORTIONATE VALUE OF INCOME FROM DIFFERENT SOURCES.



SCALE 1":500,000 DOLLARS * BEEF SOLD or Eaten.

LAND

TOTAL ACREAGE OF RESERVES	734,720 acres.
LAND CLEARED, BUT NOT CULTIVATED	261,189 "
LAND CULTIVATED	27,394 "

GRAIN, VEGETABLE AND ROOT PRODUCTION.

CROP	ACRES SOWN	BUSH. HARVESTED	CHIEF DISTRICTS
WHEAT	2279	44,673	OKANAGAN
OATS	3672	73,524	" Cowichan
PEAS etc.	489	10,963	LYTTON, OKANAGAN
POTATOES	1912	178,627	" " (Skeena R., Kamloops, (Babine
OTHER ROOTS	493	30,043	OKANAGAN
FODDER		TONS	
CULTIVATED HAY		14,548	NICOLA, OKANAGAN
WILD "		7,352	WILLIAMS LAKE.

INDIANS OWN 1400 Motor and Sail boats, and 3,000 Row boats and Canoes.

SOURCE:-

Rept. of Dept. of Indian Affairs 1932.

XIII

ANALYSIS OF CONDITIONS IN MORE DENSELY POPULATED PARTS OF THE PROVINCE.

A. Lower Mainland.

B. South-east Vancouver Is.

C. Okanagan Valley.

D. Prince Rupert and its Hinterland.

XIII. A.

LOWER MAINLAND

The lower Mainland, as the map showing population distribution makes clear, contains the bulk of the population of the Province. The high density is largely accounted for by the presence of Vancouver City and New Westminster, but the lower Fraser Valley Statistical Publication Area contains no such large cities, and demonstrates more clearly the high degree to which the land is utilized in this South-western area. A number of smaller towns are found here, - the largest being Chilliwack 2,500, Mission 1300, Port Haney 110, Port Hammond 950, Agassiz 750, and there are also a number of villages with populations of between 100 and 500. Altogether 380,000 people live in the region, the total population of the Province being 694,000.

All types of occupation have been developed, lumbering and wood-using industries, agriculture and manufacture being the most important. The natural resources are varied, the climate is equable, and the rainfall is sufficient but not too heavy, since Vancouver Island lies to the windward side.

The dense settlement is closely connected with the Fraser Valley, which is the main line of drainage. The chief tributaries joining the lower river are the Lillooet, Stave and Pitt on the north bank and the Chilliwack on the South. For the last hundred miles of its course the river is aggrading its bed, and low alluvial flats line the river. High water

occurs in May, June and July, and at that time many of the flats are liable to flood, and an extensive series of dykes has been built to keep the flood waters from the low-lying meadows. The greatest floods occur when heavy snowfall in winter is followed by hot weather early in summer; if that sudden rise in temperature is general throughout Central British Columbia. The most disastrous flood since the opening up of the area occurred in 1894; since then dyking has been improved, and such widespread damage to farm land has not been done again. The material deposited by the river in its flood plain is derived from the glacial deposits which cover Central British Columbia, and it is brought down by the river from that part of the basin which comes above the canyon. This resorted material is of highly fertility and has contributed greatly to the prosperity of the area. At its mouth the river is building up a delta, and the lowland is slightly different in character.

The Fraser lowland is nowhere wide, and the tributaries on the right bank flow for most of their course through the southern part of the Coast Range, the Lillooet occupying one of the best marked longitudinal valleys found in the entire system. Below the junction with the Pitt River the river lowland is bounded to the north by the low hill ridges of Burrard Peninsular which are densely populated, and which slope steeply down to the famous Burrard Inlet, one of the best harbours on the Pacific coast of America. To the north of Burrard Inlet the Coast Range approaches the coast.

Topographically[1] therefore, the south-west may be subdivided into (1) the Fraser flood plain, (2) the Fraser delta, (3) the hill ridges (a) north and (b) south of the lowland (4) the adjoining parts of the Coast and Cascade mountains.

The last region is important, not because it offers sites for settlement, but because it has made the development of the lowland easier by reason of the rivers by which it is drained. These rivers provide the water supply for all the lowland towns, and on three of them power stations have been built which supply the electric power consumed throughout the area. Coquitlam and Buntzen lakes have been joined by a tunnel and their combined waters supply one power station, Stave Lake and Alonette Lake provide water for the other stations, from which power is distributed over the Burrard and Lower Fraser Areas, some being exported to United States points. The mountain slopes are forested, and these timber resources are accessible along the valleys. The rapid flow of the rivers prevents driving the logs, but tugs can reach the lakes - Pitt Lake at all seasons and Harrison Lake for 5-6 months in summer when the water is highest. Logging has been carried on round the lakes and lower valleys, the logs being towed to the saw-mills which are closely distributed along the Fraser. The mountains probably contain mineralmwealth; small outcrops

[1]Sources; Geology of Vancouver & its vicinity. Burwash 1912. Geol. Surv.Mem. 135 Geology of Fraser R.Delta Map AreasMemoir 125 Sedimentation of Fraser R. delta.

of mineralized rock have been found, and proximity to the productive Britannia Beach deposits has encouraged this opinion, but the dense forest cover and the ruggedness of the interstream regions have prevented any development to the present time.

The Fraser leaves the camyon between the Coast and Cascade mountains at its junction with the Coquihalla, near which the town of Hope has grown up. The river bends sharply to the west and from this point to the sea deposits sediments; between Hope and Aqassiz the flood plain is narrow and discontinuous, and the deposits are chiefly of gravel and sand, of minor value agriculturally. Below Aqassiz the flood plain is wider, especially south of the river, and the deposit is of silt. The flood plain is interrupted by elevations which may be projections of underlying rocks or flat-topped accumulations of alluvium, deposited when the land was relatively lower than it is now. Reclamation works have increased the available farm land, one of the most recent improvements being that of the Sumas area.[1] Flood water from the Fraser backed into the Sumas Lake basin, which at other times of the year was largely dry, save for the drainage of the surrounding lands which entered the lake through two small streams. Reclamation was effected by barring out the Fraser flood waters, and by

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[1] The Land Settlement Board 1923. Pub. under Direction of Minister for Agri.

deflecting both the inflowing streams, which were led direct to the Fraser; this done, a minimum amount of pumping was necessary to drain the basin and 10,000 acres were added to the potentially productive area of the lower mainland, and 20,000 acres, previously marginal to Sumas Lake were protected from danger of flood. The soil of the reclaimed area is very fertile alluvium, of a high line content. The chief difficulty offered to its cultivation was the dense growth of willow which covered the area immediately after its drainage, and for which immediate ploughing was the only remedy. Clover proved to be the best first crop, as it reduced the nitrogenous deficiency of the soil.

Throughout the flood plain agricultural development is intensive; the low-lying flats, whether they have needed reclaiming or not, have proved excellent for fodder crops. The yield per acre is high, oats may yield as much as 100 bush. per ac. Hay gives $2\frac{1}{2}$-$3\frac{1}{2}$ tons of fodder per acre, and the yield of other crops is correspondingly high. Dairying has developed greatly, and co-operative creameries have been built at the towns, particularly at Chilliwack. Butter, ice-cream, fresh milk and cheese find a market in the urban centres of Burrard Peninsula. Poultry farming and market gardening are well established, the potatoes of Matsqui being of especially good repute; cultivation of hops in the Chilliwack Valley has also yielded good results. The cultivation of small fruits is widespread on the higher parts of the plain, Maple Ridge and Mission being famed for strawberries.

Industrial development at the centres is mainly concerned either with the preparation of the agricultural produce, the manufacture of butter, cheese and condensed milk, or the canning of fruit and vegetables, or with the working of the timber cleared from the farm lands (during 1932 the area cleared was greater than in any other year) or brought down from the tributary valleys. In a few places the manufacture of bricks and tiles is carried on, e.g. at Matsqui.

The Delta is growing seawards at a rate of approximately 10 feet per year, sea marshes fringe the seaward edge, and, westwards of these, sandbanks submerged at high tide, largely exposed at low tide, stretch for another 5½ miles. The apex of the delta is near the city of New Westminster, near which the river divides into two distributaries, between which are some 45 islands, of which Lulu, Sea and Westham are the largest and most important. Above New Westminster the flats are of alluvial rather than deltaic character, except for the deposits being laid down at the Southern end of Pitt Lake, where sedimentation is induced by the ponding back of the Pitt waters by the tide which rises up the Fraser, and the deposit can thus be considered an extension of the delta. Fifty years ago the delta consisted of great swampy tracts, overgrown with coarse grass and rushes. Now, these swamps have been dyked and rendered productive; they were 8-9 feet above the level of mean high tide, but dyking was necessary to protect them from high spring tides. The upper part of the delta, near New Westminster, is from two to five feet higher than the lower end. Natural levees some two to five feet high occur at some points along the river, but they are not well developed. Peat bogs cover one-third of the surface of the delta, occupying depressions which were former river channels; the peaty deposits are useless for fuel, because they are practically unaltered.

Burrard Peninsula is largely filled by two East-West ridges spearated by a valley (probably once a channel of the Fraser) occupied in its eastern end of Stiel Creek, Burnaby Lake and Brunette Creek. Its Western end is submerged forming the shallow bay of False Creek. The northern ridge is some 18 miles long and rises in Burnaby Mt. to over 1100 feet. The low western end forms the site of much of Vancouver City. The northern slope is extremely steep, and the south shore of Burrard Inlet is marked by cliffs and rounded headlands which force the C.P.R. line to cling closely to the shore line between Port Moody and Vancouver City. The ridge ends abruptly eastwards at the Coquitlam Valley, beyond which an outlier of the ridge is found, this, St. Mary's hill, is, however, only 120 feet high. The southern slope of the ridge is less steep than the northern, and is broken by the Valleys of small streams, flowing towards the Fraser or the Brunette. They do not all reach the main drainage lines, some being lost in the porous beds bordering the major streams. The southern ridge is more continuous but much lower than that to the north; the western half rises to only 300' and the eastern to 400. Steep slopes are not characteristic of the southern ridge which is important as being the site of New Westminster, South Vancouver and Point Grey.

South ofthe Fraser and east of the Delta is a flat-topped ridge, the Surrey Upland, which is divided into two by a broad valley, another former channel of the Fraser, now drained by the Serpentine. The upland rises to two or three hundred

feet, and has fairly steep slopes; it is only slightly dissected by streams, and apart from the two headstreams of the Serpentine the creeks, whether tributary to the Serpentine or the Fraser, are intermittent.

The Surrey Upland is separated from the Boundary Upland by a flat valley, less than 80 feet in height, running South-West from the Fraser at Port Langley to Mud Bay, draining to the Fraser by the Salmon and to Mud Bay by the Nicomekl. The Boundary Upland is a highly irregular hill district with summits 300-400 feet in height; it slopes most steeply towards Boundary Bay where the waves have cut cliffs 100-200 feet high.

The Point Roberts or English bluff terrace, which has been joined to the mainland by the construction of the delta is similar to the Boundary Upland.

The whole of this Burrard Peninsula and Fraser delta area is tributary to the cities which have grown up on Burrard Peninsula. The region is of low average elevation, but not monotonous, the topographical irregularities and differences in land utilization being due to differences in Geological structure. Conglomerates, sandstones and shales form part of the south coastline of Burrard Inlet, giving rise to the above-mentioned cliffs and headlands. Eruptive rocks occupy small areas e.g. Little Mountain (300'), Both east and west of Pitt river are massive outcrops of

batholithic rocks of the Coast Range series, forming nearly vertical cliffs for some miles along the west bank of the river. ~~while~~ Other isolated rock hills form conspicuous heights in the alluvial valley to the east. The rock which is quartz diorite is quarried for making crushed rock. In the rest of of the area the underlying conglomerates, shales and sandstones are covered by deposits of alluvial, glacial or marine origin.

All the upland ridges are covered with glacial drift of varying thickness. On the Boundary Upland the drift covering is in places 350' thick; sea-cliffs 200 ft. high have been cut in the drift e.g. at Point Grey (W. of Vancouver City) White Rock and Ocean Port (east side Boundary Bay) and at English Bluff. In Pitt Meadows a bore-hole passed through 1000 feet of unconsolidated deposits, most of them glacial in origin. Two sheets of till are found, separated by a thick bed of stratified sands, silty clays and peaty beds, laid down in an interglacial period. In some places the boulder clay is overlain by outwash and delta sands and gravels, deposited during the final retreat of the ice sheet. Some of these superficial deposits are of marine origin, the land having been uplifted several hundred feet since the end of the Ice Age.

In the lowest parts of the region - below 40' in altitude - the recent delta and alluvial deposits, consist of sands, gravels, and silty clays. Large amounts of material are present in these deposits; layers of vegetable material have been formed during the deposition of the sediments, and the

shore of the delta has always been a collecting ground for driftwood, which has gradually become buried as the delta has advanced seawards. The driftwood carried downstream during the freshet is often large, including trees 100' in length with a root base diameter of 20 feet. The greater part of this driftwood is carried out to sea, but some is caught in the soft sediments. Masses of concretionary limestone are sometimes found in the river channels, and these damage fishermen's nets, their formation seems due to the killing of large numbers of shell fish by the muddy fresh water brought down by the river when in flood. Their shells accumulate on the sandbanks, but owing to shifting of the channel and erosion of the river banks loosened masses are found in the river. The greatest development of deltaic deposits is found south of the river Alluvial flats fringe the river above New Westminster and Pitt Coquillam, Serpentine and Nicomekl Valleys are all flooded by alluvial material.

The intermediate areas are occupied by raised delta and alluvial deposits, laid down in post glacial time when the sea stood at a greater elevation in relation to the land than it does now.

The north shore of Burrard Inlet is not physiographically in the same region, but its economic development is so closely linked with that of Vancouver City that it may be considered here. It is formed from the southern margin of the Coast Range and is built of granitoid rocks, which have been overlain by glacial drift, which forms a narrow terraced

lowland at the foot of the mountains, giving a site for the town of North Vancouver, where the drift comes down to the shore. East and West of this, delta deposits have been laid down by the Capilano in the West and Lynn and Seymour Creeks in the East, and it is the deposition of the glacial till and the deltaic deposits which have partly filled in Burrard Inlet, which has a maximum depth of only 32 fathoms between the First and Second Narrows, while Indian Arm is over100 feet deep and wider than the main Inlet.

The soils of most of the area are highly productive though careful working is needed in the case of some types. Swamp soils occur in the delta and along the Fraser above New Westminster and in Pitt Meadows, the largest area being in the delta South of the Fraser, where the deposit is 20-30 feet deep and often soft. These areas are sometimes difficult to reclaim for agriculture, as the water does not drain away easily, even when drainage ditches have been cut. Lime must be added to the soil for cultivation, and this is sometimes obtained from ancient shell heaps. The swamp soils found above New Westminster contain a certain proportion of river silts and they are more easily cultivated, but cultivation of at least the edges of all the swamp areas is proceeding.

Apart from the bogs the deltaic and alluvial areas contain very fertile soil, clay loam or silty clay laom, retentive of moisture, and highly productive even in very dry

seasons. A certain deficiency in lime must be repaired, but given that, the yield is good.

The raised delta and alluvial soils are either clay or sand soils. The clay soils are best developed in Langley Prairie and near Port Hammond and Port Haney; they form highly valuable agricultural lands, being well-drained and free from flooding, and they have apparently always been treeless. Sandy soild occur in the raised deltas of the creeks flowing into the North side of Burrard Inlet; they are frequently gravelly, and are easily affected by dought.

With the exception of the peat bogs and the treeless prairies already mentioned, the whole area was densely forested, the trees being of the most valuable types. The presence of the forest and the ease of transport by the river and Inlets has fostered the development of the lumbering industry, and many sawmills, shingle mills, and other wood-using plants are established. Much of this wooded land is in private hands, the land having been alienated before the Provincial Forest Policy was formulated. Clearing has been extensive in some municipalities and has taken place largely as the demands for agricultural land have increased.

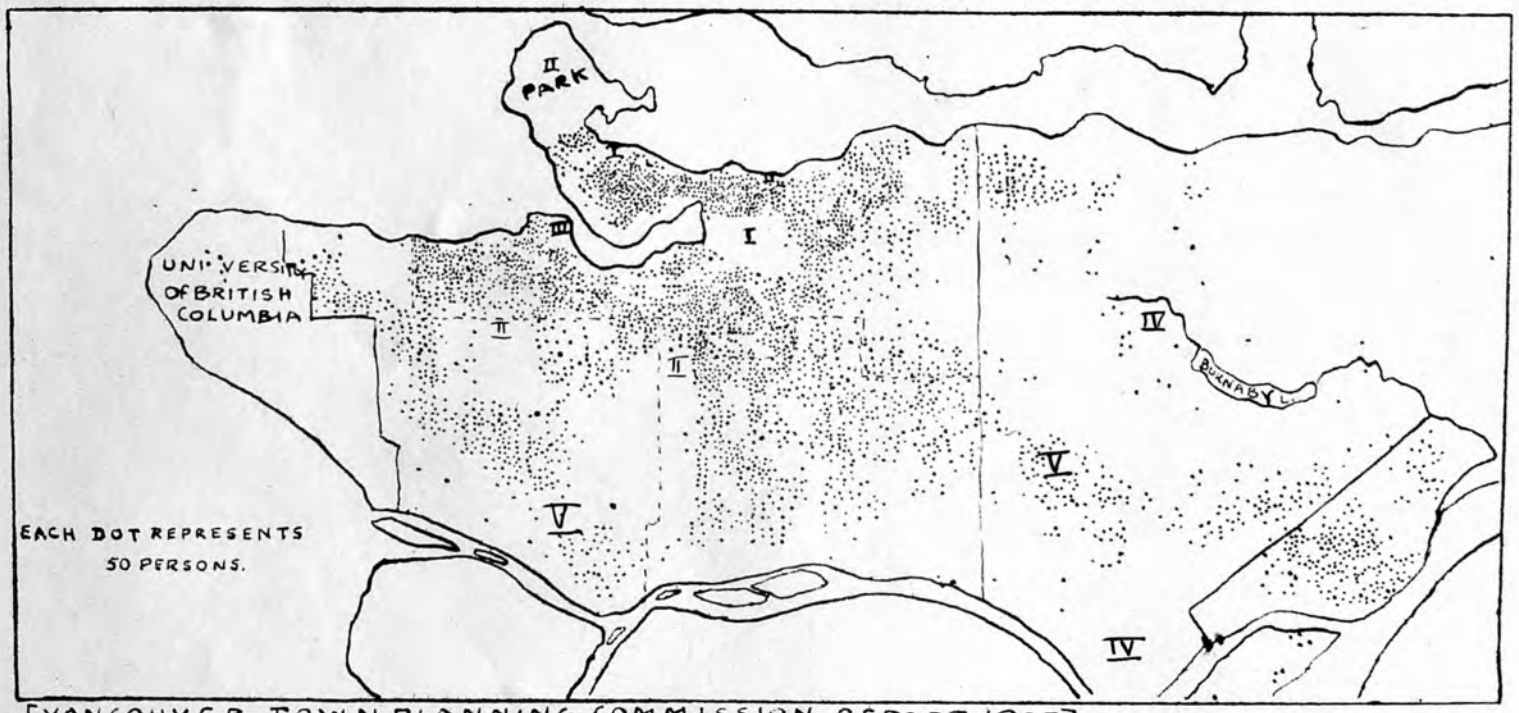
The cleared areas have proved highly productive; the glacial drift soils of the Upland form excellent fruit lands. Apples have proved susceptible to disease, and so fruit growers have specialized on berry cultivation. On the flats dairy~~ing~~

farming has proved most successful, heavy yields of fodder crops, hay, roots and oats being obtainable. Grain is also grown but small-holdings intensively cultivated are characteristic of the region. Poultry farms, vegetable gardens and apiaries are among the most profitable small-scale ventures.

Vancouver and New Westminster form good markets for much of the fruit and dairy produce but the rapidity with which urban development has progressed in the vicinity of Vancouver has not been altogether favourable to the advancement of agriculture, owing to land speculation. For example, the East of Pitt River there are three dyked districts which are used to a certain extent for dairying, but much of the land has been as a speculative investment, and consequently less than half of it has been ploughed. In the Coquitlam district 3,500 acres were reclaimed by dyking; land speculation here was increased and agricultural development was retarded by uncertainty as to what the full C.P.R. plans might be for development at Port Coquitlam, where the assembly yards for the Vancouver terminus are situated.

The natural resources of the area included great quantities of fish, the numbers of Salmon found in the Fraser being fabulous up to a few years ago. Recent years have seen a great decrease in the Fraser R. Salmon run, salmon canneries are still working along the Fraser and Burrard Inlet, but some of the requisite supplies of fish are brought from the northerly waters e.g. Smiths Inlet; Steveston is a centre whose main interest is salmon canning.

DISTRIBUTION OF POPULATION IN BURRARD PENINSULA.



[VANCOUVER TOWN PLANNING COMMISSION REPORT, 1927]

I RAILWAY YARDS
II PARK
III INDIAN RESERVE.
IV SWAMP
V SETTLEMENT ALONG B.C.E.R.

The topographical features have influenced the distribution of population,* which is found to be extremely uneven in this area, the presence of Vancouver and New Westminster being the chief cause for the high average density, The steep slopes and highest area of the northerly ridge of Burrard Peninsula are empty of settlement, which is closest on the western end of the north ridge and the eastern end of the south ridge. Vancouver City was established on the lower western end of the northern ridge; it has stretched southwards to the other ridge, on which its residential suburbs of South Vancouver and Point Grey are situated, as is the city of New Westminster (pop.17,000). The valley between the ridges, which is ill-drained and at least in part a peat bog, is, like the highest hills, avoided by settlers.

The deltaic and alluvial areas are being cultivated, and rural settlement is increasing, but the small towns, most of which are located near the Fraser, avoid the areas of unconsolidated sediments. Exceptions are Ladner and Steveston; the latter owes its origin to the salmon fishing industry (see preceding page). Ladner is the centre for the dairy-farming districts of the delta, the C.N.R. giving good transport facilities to New Westminster.

Otherwise, it is notable that the riverine towns are all situated where the river is bordered by drift-covered hills e.g. New Westminster, or by raised alluvial deposits.

*cf. Inset Map on preceding page with A5 showing topography and B3 showing superficial Geology.

e.g. Port Hammond, Port Mann, Fort Langley, while adjoining ground built of recent alluvium has not been used, and relatively long stretched of the river are without settlement.

Port Coquitlam is the largest centre on recent alluvium, and it stands on the margin of the alluvial plain, where it is almost 40 feet above the sea, its growth is largely due to ~~economic causes~~, the C.P.R. having chosen this site for its assembly yards, land being cheaper there than in Vancouver city, and more land being available.

The area is well served by lines of communication, the exact routes followed by the railways being markedly influenced by the topographical features, as has been shown in the case of the C.P.R. line from Port Moody to Vancouver. The highest parts of the Burrard ridges are avoided by the lines, and between Vancouver and New Westminster the Canadian National, Great Northern and British Columbia Electric Railway all use the low-lying Still Creek, Burnaby Lake Valley, though keeping to the drier edge of the soft beds which occupy the centre of the depression.

South of the river the same feature is found, both the uplands and the deltaic areas are avoided and the railway lines keep as close as possible to the foot of the hills. In the case of the G.N.R. line which goes direct into U.S.A. the line is forced to follow the coast line closely in order to avoid the Boundary Upland.

One important line has been built across the delta - that which leads to Ladner and which forms the means of transport for the dairy products of the Delta Country.

THE PORT OF VANCOUVER [1]

Burrard Inlet forms an excellent harbour, offering as it does a total shore line of 98 miles, along a sheltered waterway. Berthage for 37 ocean going vessels is obtainable in the 49 square miles of deep sea anchorage found in the harbour, which has a mimimum depth at low water of 36 feet. Naturally good, the Harbour has been made better through the activities of the Harbour Commissioners, who in 1920 inaugurated a scheme of improvement, one of the chief features being the widening of the water channel at the First Narrows to approximately 2000 feet (the original channel was 1200 feet wide).

The earliest recorded commercial use of the harbour took place in 1865 when the first Lumber Mill was established on the Inlet, and shipments were made from the Port. An important event in the economic history of Vancouver was the building of the C.P.R. in 1885-1886. Until then the chief means of transport used by the limited trade of the Interior were the lower Fraser and the highroads which made the lower Fraser their objective. The first terminus chosen was Port Moody but the shallowness of the eastern end of Burrard Inlet, where mud banks have been formed, led to the westward extension of

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1 Industry survey of Vancouver. Port of Vancouver pub.D.7. Harbour Commissioners. Port of Van: Annual 1929-1930.

the line although the steep slope of the coastlands offered considerable difficulty to the engineers. Even after the building of the first railway the growth of the port was slow, but during the twentieth century most rapid development has taken place, not only in the Port, but in the whole of the Lower Mainland and many Interior Valleys. Further railway construction was largely instrumental in causing this expansion, and one important feature of the city is the excellence of its railway service. C.P.R., C.N.R., B.C.E.R., G.N.R. all contributing to its trade. Post-war years have seen a particularly rapid growth, a comparison of statistics for 1930 with those for 1921 shows an increase in that time of 85% in imports, of 329% in exports, while the number of passengers embarking and disembarking increased from three hundred and fifty to five hundred thousand per annum. Fifty-two steamships lines serve the port, and of the vessels leaving every month twenty five are bound for Europe via Panama, seventeen for the Orient, five for Hawaii and Australia, and nine for Central and S. America; in addition there are regular sailings to the West Indies and S. Africa and a twice-weekly service to California. The Port is well equipped for dealing with all types of trade; it contains a dry dock, eight grain elevators, five lumber dogs, three berths for oil vessels and four oil-refining plants. Oil burning vessels can thus be re-fuelled - crude petroleum being imported from the States free of duty; coal-

burning vessels can also be supplied, owing to the proximity of the Vancouver Island Coalfield.

Eighteen ports besides Vancouver are visited by sea-going vessels. Many of these, however, engage in specialised trade only, e.g. Ladysmith which ships coal, Powell R. and Ocean Falls which are pulp and paper ports, and Chemainus which is a lumber port. Victoria and Prince Rupert are the closest rivals that Vancouver has, and New Westminster has in the last few years also entered the lists. Vancouver is, however, pre-eminent. During the fiscal year ending March 1931, 6000 vessels used the port of Victoria, 4000 that of Prince Rupert and 16000 that of Vancouver. (These figures include both ocean-going and coast-wise vessels, if only the former class be considered the difference between the ports from that point of view is slight). The value of the exports sent out through Vancouver is correspondingly greater than those of other ports. Indeed, Vancouver is now the second port of Canada, - the number of vessels visiting Vancouver is more than double the number using Montreal, but they are much smaller. In the growth of the port, inland waterways have been unimportant, the Fraser traffic being slight, and conducing rather towards the growth of Fraser River than of Burrard Inlet ports. Sheltered coastal waterways have favoured trade, affording, as they do, facilities for cheap towage of logs from the logging centres on the inlets to the north, and

for the transport of fish. As has been suggested, it is rail development which has contributed much to the growth of Vancouver's trade, both C.P.R. and C.N.R. link the port with the Prairies; the Great Northern links it with the North-Western States and railways in the central States have connections with these main lines. The British Columbian Electric Railway serves the lower seventy miles of the Fraser Valley, bringing this densely populated agricultural and industrial area into close touch with Vancouver. A regular service of barges links Vancouver with the Southern terminus of the Pacific Great Eastern Railway, enabling the port to share in the development of the area tributary to the new railway.

British Columbia has found a market for her primary products in the Orient, where lumber and fish are needed, and in Australia where the expansion of the mining industry and the rapid growth of towns has led to a demand for timber of great strength (e.g. Douglas Fir). Thus regular trans-Pacific routes have been opened up from Vancouver*, and minor markets in the South Sea Islands have been tapped en route to the primary trading areas. Vancouver's trade with the Atlantic basin has grown up since the cutting of the Panama Canal, which has made it practicable to ship bulky goods to the East Coast of N.America and to Europe. This has resulted in a great widening of the hinterland of Vancouver, and has resulted in the growth of the grain trade of the Port.

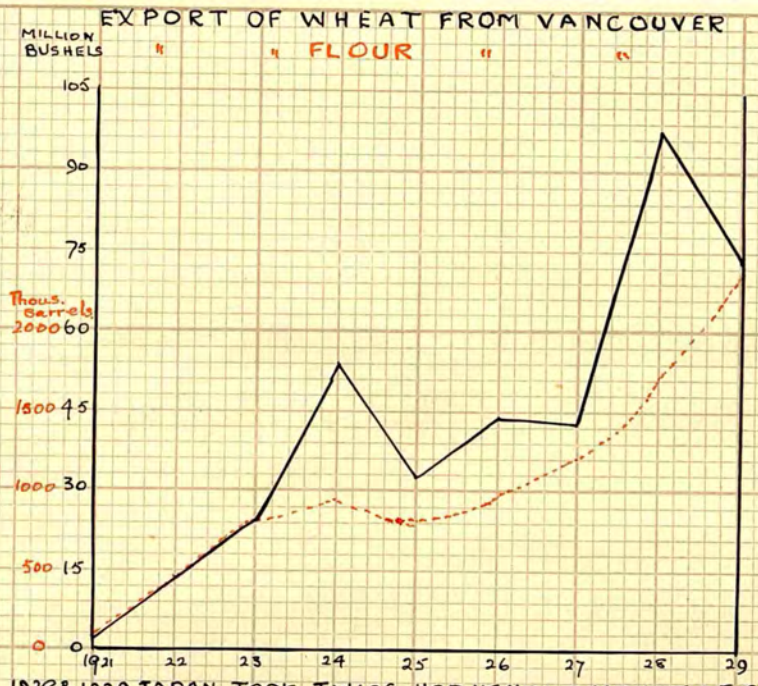
* Vancouver's Import trade is only approximately ½ the export. Petroleum (from U.S.A) is the chief import. Iron and steel goods enter from U.S.A, U.K. and Belgium. Cargoes brought in from trans-Pacific sources are small, and comprise brassware from China and Japan, Sugar from Fiji, Silk from Japan, Fruit from Australia and Japan.

Diag. showing growth of trade on p.247

The shipment of wheat in Feb.1909 was purely experimental, 8,000 bush. were sent to Mexico and 45,000 to the United Kingdom. Though itself successful so far as the transport of the grain was concerned, the experiment was not repeated until 1917 when, the Panama Canal having been opened a second experimental shipment, this time of 99,000 bushels, was made. The cutting of the canal was not sufficient to stimulate an export trade in Prairie grain; for some years land slides were frequent in the canal, and ocean rates via the new route high. When they were lowered, regular shipments from Vancouver began. High railway freight rates still delayed the full use of the Pacific outlet; this disability was removed in 1925 when the tariff was readjusted, and from Western Prairie points freightage is cheaper by a western than by an eastern outlet. For example from Calgary and Edmonton the rate is 12 cents per bushel to Vancouver, and 15.6 cents to Fort William. The cost of transport from Vancouver to Liverpool is approximately the same as from Fort William to Liverpool.

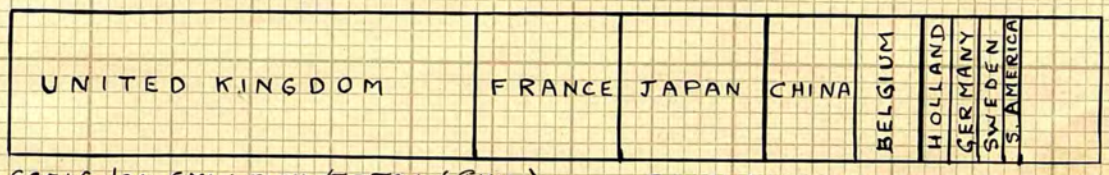
When necessary, drying and cleaning of the grain is done in the elevators; indeed in the handling of the grain the

port resembles a Great Lakes port more closely than it does Montreal. Vancouver is especially busy with the grain trade from December until late April - a time during which the St. Lawrence ports are closed by ice, a factor which helps to increase the attraction of Vancouver for the grain trade of the Western Prairies, which cannot get their wheat shipped to the St. Lawrence before it is closed. By 1928-29 Vancouver was handling slightly more of the Canadian wheat export than were the St. Lawrence ports. Between 30 and 60% of the grain traffic is carried by tramp vessels, but at the same time it is the grain trade which has been largely responsible for the increased liner traffic with Europe.



1928 & 1929 JAPAN TOOK TWICE HER USUAL AMOUNT OF GRAIN

DESTINATION OF GRAIN, 1931

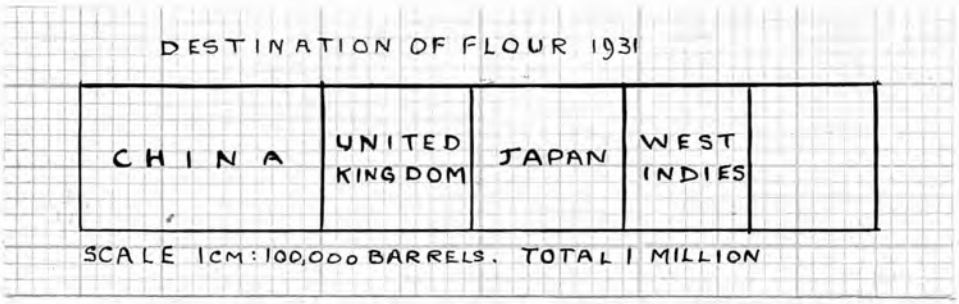


SCALE 1cm: 5 MILL. BUSH. (TOTAL 68 MILL).

FIGS. BASED ON REPORTS OF HARBOUR BOARD.

As the diagram shows, the chief destination of the grain shipped is the United Kingdom and Europe - mainly France and Belgium. The wmount of wheat sent to the Orient fluctuates considerably in proportion to the rice harvest.

Export of flour began at about the same time as the grain trade, and has increased in proportion to the demand for flour (of rather inferior grade) in China. The Japanese take some flour, but they prefer to mill the grain themselves.



As a lumber port, Vancouver leads in B.C., as has been shown, it has excellent facilities for collecting lumber from points as much as 200 miles to the north, and the good rail connection with the interior has permitted the building up of movement of timber to both Canadian and United States points. (The latter movement has been greatly reduced during the last year, owing to the imposition of a heavy tariff, though the good quality of the B.C. shingles, which command the highest market price in the States, enables a certain number to pass in). The export of lumber has multiplied several times since 1920, the

chief markets in normal years being Eastern U.S.A. Japan, U.K. Australia, S. Africa, W. Indies, China, South America and Egypt. The cutting of the Panama Canal was largely responsible for the growth of the lumber trade. Before 1915 none was shipped to the Atlantic coast; in 1928 over 300 million B.F. were sent. Before 1915 10 to 15 million B.F. were sent to U.K. and Europe; in 1928 over 40 million B.F. reached these markets. Approximately 70% of the total overseas movement of lumber is in chartered vessels, the remainder moving on regular line vessels. Vancouver controls approximately one-half of the total lumber trade of the Province, and one-seventh of the total shipments of pulp and paper. This concentration of the trade on this one port is largely the result of the early start that the timber trade had in this area, and the continued dominance of Vancouver is imperilled by the gradual overcutting of the forests in the adjacent areas, and it is much to Vancouver's advantage to further the Forestry Department's plans for conservation of the Forests and for re-afforestation.

Vancouver itself is of recent growth, but the ports of the north are younger still, and lacking the varied means of transport possessed by Vancouver they have not been able to establish trade with overseas markets direct and so it is found that Vancouver is still the chief point shipping canned salmon

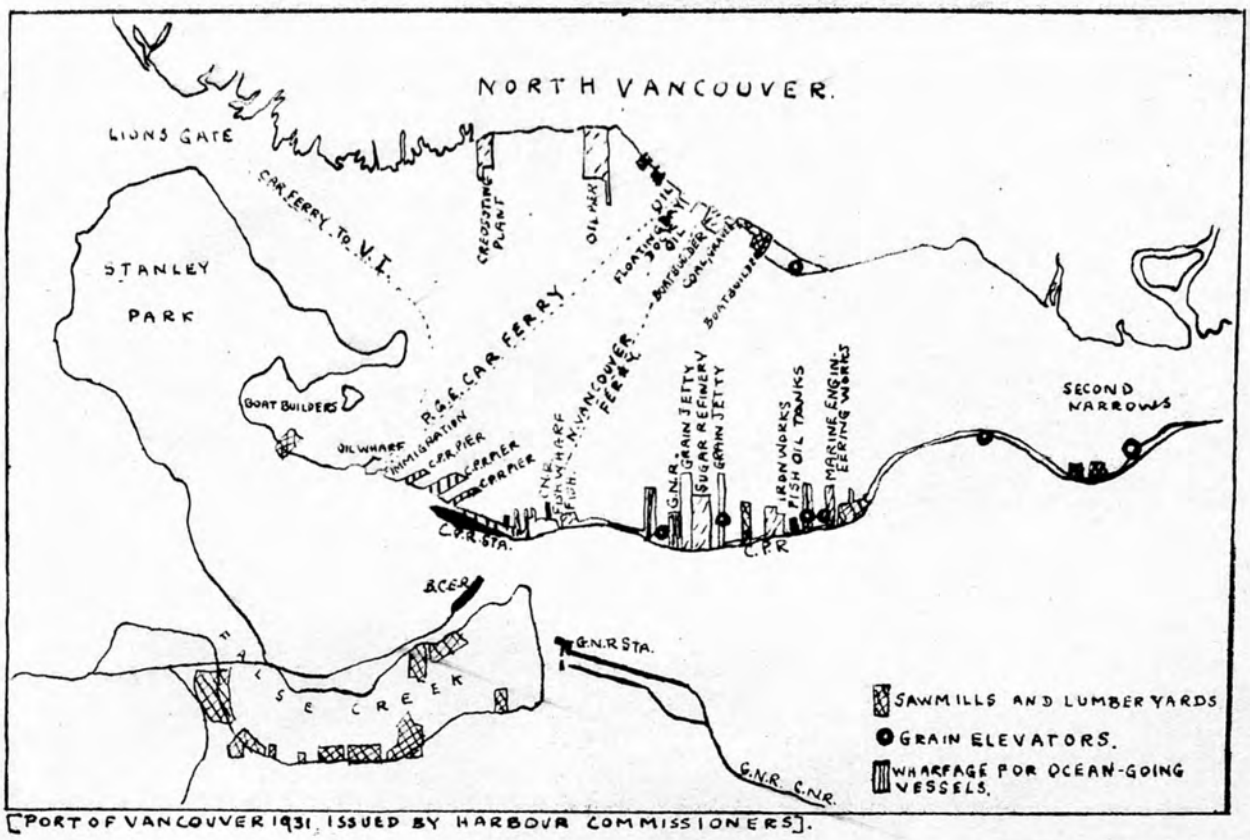
though the coast adjacent to Vancouver is no longer supreme in the actual fishing and canning industries. Coast-wise vessels transport the pack from the Skeena R. Rivers Inlet, Smith Inlet and other canneries to Vancouver. In the same way, dry salt herring, produced mainly on the coasts of Vancouver Is., are exported chiefly from Vancouver, though sometimes vessels load up at salting plants on Barkley Sound. Fish oil is despatched from the plants by coastal tank steamers to Vancouver, where bulk tankers are loaded for the United Kingdom and Europe and tank cars are loaded for rail transport to U.S.A.

The chief minerals exported from Vancouver are spelter and lead. The exports consist in part of concentrates, in part of bars, With increased construction of refineries has come an increases export of bar metal. About twice as much lead as zinc is exported from Vancouver, and shipments go mainly to the United Kingdom, Europe and Japan. Copper does not enter into Vancouver's trade, that which is produced at coastal copper mines moves in coastwise vessels to United States refineries, the refined copper produced in the interior moves to the consuming markets by rails. Copper is the only major interest of the Province which is not reflected in the trade of Vancouver.

In the discussion of manufactures so far developed, the dominant position of Vancouver in that field also became obvious.

Urban development in the area is encouraged by many

INDUSTRIAL DEVELOPMENT. VANCOUVER HARBOUR.



[PORT OF VANCOUVER 1931. ISSUED BY HARBOUR COMMISSIONERS].

factors, the immediate hinterland is, or may be rendered very productive, so that foods which are better when produced near to the consuming market, e.g. dairy produce, fruit and vegetables, may be readily obtained; the climate of the region favours the cultivation of a wide variety of temperate crops, affording raw material for one great group of manufacturing industries; power for all domestic and industrial purposes may be obtained from the mountains to the North of Burrard Inlet and from the Vancouver Is. Coalfields; water for all domestic and industrial purposes may be obtained from the rivers Capilano and Seymour which flow into the northern side of Burrard Inlet. The advantages of the site have been such that from being in 1881 a centre of only 1000 people it had, by 1931, a population of 246,000, living either within the boundaries of the original city or in Point Grey and South Vancouver (1929). North Vancouver (pop.8,510 in the city and 4800 in the District municipality) and West Vancouver (pop.of District 4800), though on the north side of Burrard Inlet, are intimately connected with Vancouver. North Vancouver was incorporated in 1891, but settlement proceeded slowly owing to the dense forest covering and the absence of means of communication. With the occupation of the water frontage to the South of the Inlet, some industrial concerns have sought sites along the north shore, and saw-mills gravel yards and ship-building yards are among the works already established.

~~already established~~.

NEW WESTMINSTER.

New Westminster is situated on the Fraser R. at the apex of the delta, where the Southern ridge of Burrard Peninsula comes close to the river, giving firm ground on which the city would be built, the lowest point on the river suitable for such development. The drift-covered hills behind the town were largely forested, and as late as 1912 the only important industry was lumbering, and just outside the town the largest sawmill in the Province is situated. Sawmills, box-factories, planing mills, sash and door factories are all dependent on the lumber industry; as is the case with the Vancouver mills, some of the raw material must be towed from logging centres on the mainland to the north or the east coast of Vancouver Is. and the city is well situated for receiving lumber from the lower Fraser tributaries e.g. Pitt and Stowe. The early development of Salmon-fishing favoured the establishment of fish canneries, and the clearing of the forests and the beginning of fruit cultivation favour fruit canning.

New Westminster is increasing in importance as a port; in 1921 only 21 deep sea steamships entered the harbour; by 1928 their number had increased to 198. The main channel

of the river will take vessels with a draught of 25 feet. Bars occur at some places but the river is there being deepened; and the port has a water frontage of thirty-five miles, much of it being served by three transcontinental railways which have enabled New Westminster to become the distributing point for the while Fraser Valley. Power is cheaply obtained from the power stations in the northern tributary valleys, particularly the Stave River, and various manufactures, resulting from the general development of the South-west of the Province have been established, e.g. meat packing, distilling, iron-founding, car-building, paper-making.

The chief export of the city is still lumber though hides, pulp and canned fish and fruit are also despatched. The most recent development in the export trade is that of grain and flour, in which New Westminster has a small share.

That the port is on a river is of advantage in that the fresh water kills marine growths on the hulls of the ships, and lessens the expense of cleaning them.

The Lower Mainland stands out among the regions of British Columbia for its high economic development. There is still room for expansion; settlement is increasing; though 1932 was a time of general depression, increased settlement was reported from Lulu Is., Maple Ridge, and the districts round Mission and Agassiz. (In the Maple Ridge area the new settlement was made by Japanese). There is still agricultural land available in the reclamation areas, though not of course cheap land; still further development of hydro-electric power will be possible when the demand justifies the construction of the power stations, and the region should be able to progress industrially in proportion to the increased development of markets in British Columbia and the Prairie Provinces. The enormous difference in population distribution which at present exists between this area and the rest of the province may disappear, but that will rather be the result of development in the other areas and not of decline in the Burrard Inlet, Lower Fraser area.

XIII B.

SOUTH EAST VANCOUVER ISLAND [1]

In the statistical Publication Area of South Vancouver Island the density of the population amounts to 38 per sq. mile - a high density for the western part of Canada. Within the area itself great irregularity in the distribution of settlement is found. Maps G.3. and G.4 and G.5 show the sites of buildings in parts of the area; no map is given for the West Coast and Highland district which are almost without settlement, except where inlets have allowed small fishing and lumbering centres to develop, e.g. Port Renfrew, River Jordan and Sooke each of which contains 600 or 700 people. Intervening stretches of the coast are empty. In the district shown in map G.3 settlement is seen to be evenly distributed over the lowland, with a few small towns (of population varying from 1000 to 8700) which are market and distributing centres for the farms and lumber camps at which most of the population are engaged. Settlement is almost without exception restricted to the land below 500 feet, above that height are found only a few miner's cabins (the largest group on Mt. Sicker where copper mining was formerly actively pursued) or small ranches, such as are found round the shore of Sooke Lake. The relatively wide

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1 Geo. Surv. Mem 13, Southern Van: Is.
" " " 36, Victoria and Saanich.
" " " 96, Sooke and Duncan

Cowichan Valley has offered an opportunity for the landward expansion of settlement; the Chemainus is narrower, and is little used so far.

On the Saanich Peninsula, (Map G4) settlement is evenly distributed over the whole area, except where Mt. Newton and Saddle hill occur; Sidney (pop. 800) is the market centre for the worth, and a small saw milling centre.

In Map G 5 the Victoria area also is seen to be evenly settled, particularly below 100 feet. The great centre of population is the City itself. and it is the presence of the 40,000 people there that has stimulated the close settlement of the adjacent area, where the land is intensively worked to provide truck and dairy produce for the city.

Victoria is the oldest city in British Columbia having been founded in 1843 by the Hudson Bay Company. The site was chosen by Sir. James Douglas who was looking for a site suitable for both trade and agriculture. The latter occupation developed slowly, owing to the slight demand for agricultural produce and the fact that the Hudson Bay Company did not encourage settlement by people outside the Company. The growth of the city stimulated by the discovery of gold in California - so slight was the development of the whole Pacific coast at that time that

the miners sought many supplies in the British Colony paying for their purchases with nuggets of gold. The rush of miners to the Fraser in 1858 caused a rapid growth of Victoria, and the results of this have been more permanent than the effects of the Californian gold rush.

The interests of the modern city are manifold. As the seat of the Government of the Province it is connected with mainland as well as Island matters, and a fairly high proportion of its population is engaged in administrative work (1100 out of a total employed population of 16,000).

The natural beauty of the island gives it a great attraction for holiday makers, and in recent years hundreds of thousands of tourists have visited Victoria - which is most accessible from the mainland.

Manufactures have developed, the chief being those using timber, of which the adjacent area has such excellent supplied.

As a port it is more used for passengers than for merchandise, being a port of call for liners from Puget Sound, Vancouver and the Orient. The harbour is now good - and consists of three parts, the outer part contains the piers used by deep-water ships, the inner part is used by coast-

wise vessels. Around the upper habour lumber mills have been built, and deep sea vessels use that. The port is the headquarters for the Pacific Salvage Company and for the chief Whaling Company.

The trade of the city is largely in lumber - the export being the produce of the local mills. An attempt has been made to gain for Victoria a share in the new Western trade in grain, and in 1928 an elevator was built; railway rates to Victoria are the same as to Vancouver from the grain area, and the railways can obtain a return cargo in lumber, but the absence of unbroken rail connection with the prairies makes it difficult for Victoria to capture much of this trade.

The adjacent harbour of Esquimalt is naturally better than that of Victoria, but the Hudson Bay officials choose the latter site, and it was there that the commercial industrial centre grew up, Esquimalt being used only as a naval base.

The most important occupations developed in the southern part of the island are lumbering and farming. Lumbering is favoured by the great stands of trees, mainly Douglas Fir, Red Cedar, Western Hemlock and Spruce, which are among the heaviest found in the Province. Sawmills are found at the coastal settlements, e.g. Chemainus and Duncan, Chemainus being one of the smaller ports of B.C. which carries

on export trade of timber.

Soil conditions are good over much of the area, though heavy clearing is necessary before the land can be utilized for farming. Below 100 feet very fertile clays and fine sandy loams are found, especially in the Saanich and Victoria districts. Most of the area is covered with a drift which is a mixture of sand, gravel, clay and large boulders which are mainly granite; this drift gives rise to a rather coarse sandy loan, fertile but difficult to prepare for cultivation owing to the pebbles and boulders. Alluvial deposits are found in the lowest parts of the valleys, and a former deltaic region, now uplifted and lying some 200 or 300 feet above the sea, forms the fertile Colwood Plain, one of the most level areas in the region. The Cowichan river meanders in an alluvial plain some two to three miles wide except near the delta when an uplifted former delta gives a lowland some 8 miles wide. From the time of the earliest attempts to cultivate land here, the farms have been famed for their fertility. On most of them mixed farming is carried on, though some specialisation is found, particularly in small fruit, dairy, or poultry farming. The climatic conditions, which are equable, with adequate, but not over-heavy rain, favour these branches of the farming industry and as they are successfully carried on on small farms, they encourage close and even settlement. Proximity to Victoria makes land values high in the extreme south, and that too

encourages the taking up of small holdings.

The sedimentary rocks that form the eastern coast lowland are interrupted by resistant conglomerates and sandstone, which form the unpopulated hills; low ridges of such rocks have formed the harbours of Chemainus and Ladysmith.

The West coast lowland is represented by only small remnants one to five miles long, a quarter to 8 miles wide; the rest has been removed by erosion. The Sooke is the only river which has been able to widen its valley and to build up a flood plain. The rainfall of this coastal region is extremely heavy (100") and the coastal region is densely timbered. As a result of all these factors settlement is very sparse on the coast, except, as has been said, where small inlets occur.

Mining is unimportant in the area; some washing for gold has taken place in the Leech River gravels, and a few prospectors are working in the hills. The Mt. Sicker copper mine was formerly of considerable importance and supported a smelter at Crofton Bay, but the works, closed down, and at present mining here is done on only a small scale. The East Coast coalfield lies north and west of the area, but Ladysmith is intimately connected with it, for it is a small coal-exporting port, and most of the seven hundred miners employed at the pits twelve miles to the west live there.

The highland is not likely to become a populated area; some ranching may in time develop on the elevated level lands such as the Jordan Meadows, or on the terraces which the rivers have cut in the glacial drift which has partly filled the valleys. It is, however, as a source of timber that the rugged upland country is likely to remain most important.

Conditions in the S.E. of Vancouver Island therefore, favour a scanty, largely transient population of lumbermen in the highland districts, and a fairly close settlement on the lowland. Soil conditions govern the distribution of farms which may best be made on the fertile loam areas. The heavier drift areas especially on the low uplands which interrupted the plain are best left under timber.

Saw-milling and the manufacture of dairy products and the packing and canning of fruit and vegetables are likely to remain the chief industries established in the towns, which will probably remain of but moderate size. No rival to Victoria is likely to develop in the region.

X111 C

OKANAGAN REGION.

In the Southern part of the interior plateau the most important drainage line is that of the Okanagan. (See Map A 8) and settlement in the region is closely associated with this major valley, though land has been taken up in tributary valleys and also in the Upper Shuswap Valley. Both east and west of these main valleys is high, rolling plateau country, cut by many valleys, the general elevation of the main valley being 1000-1500 ft, and of the subsidiary valleys 2,500'. The plateau rises to heights of 5000-7000 feet in the east merging into the Gold Range and Kettle Mts. The Okanagan Valley is approximately 150 miles long, the lake occupying the floor for 70 miles; in former eras the lake was much more extensive and the lower lands near its shore are covered with alluvium. Most important topographical features are the benches, which line all the valleys, and which are largely covered with soil derived from volcanic ash and silt.

Climatically the region lies in the drier belt of British Columbia, though as far south as Armstrong the rainfall is usually heavy enough for agriculture without recourse to irrigation. The rainfall is, naturally, scantier in the valleys than on the heights and the flats and lower benches are covered with bunch grass or sage brush. The higher land

is thickly timbered, and expensive clearing is necessary in the high~~ly~~er valleys, before they can be used for agriculture. In the southern part of the area the cost of clearing is lower, but that is counterbalanced by the expense of irrigating the land.

The numerous creeks supply water for the irrigation schemes, which vary in scale from the small work arranged by the individual farmer, through co-operative work done by a group and schemes organised by municipalities, to the British Columbian Government Irrigation Project, which affects the valley from 23 miles south of Penticton to the International Valley.

Fruit cultivation is favoured by the climatic conditions and by the finely divided soil, which is highly suitable for young fruit trees.

For the most part the soils are comparatively uniform for a considerable depth - which is an essential feature in an irrigated district, in order that the irrigation water may be absorbed. The soil is generally fertile, the chief deficiency being a low humus content, and it has become a usual practice to plough in Alfalfa, clover, vetch or peas before planting an orchard. Clean cultivation of the orchards has led to the breaking down of the texture of the surface soils with a consequent falling off in ~~two~~ the yield of the old orchards. The remedy for this is to grow a leguminous cover crop which is not cut. The orchards are small - 60% of them

being of less than 10 acres. Fodder crops yield well on irrigated lands, and dairy farming has made great progress as has bee-keeping.

All these branches of farming favour close settlement, and of the 5 towns in British Columbia which have between four and six thousand people, three - Penticton, Kelouna, Vernon, are in this Valley (Only 8 towns in the whole Province contain more than 6000 people). From the shores of the lake the land rises unevenly - in places the flats intervene between the lake shore and the clay cliffs of the bench lands; in some places the hills rise abruptly from the lake; in others they are 20 miles back from the lake. At Kelowna the lowland extends for 1½ miles from the lake; it rises in a series of benches (the higher ones ~~beginning~~ being timbered with increased altitude) to a high undulating plateau. In the South east of the basins the benches are almost continuous, and there is practically no break in the line of orchards from Penticton to Naramata.

Until 1919 the fruit grown in the area was marketed exclusively in Western Canada, but since that time an important export trade has been built up,

In connection with this growth of trade, railway communication is of great importance, outlets now being available from Vernon by C.P.R. via Sicamous, by C.N.R. via Kamloops, and from Penticton by the Kettle Valley line. The northern end of the lake is linked by daily steamboat

service with the railway at Penticton.

Their distance from the market has rather hampered the Okanagan farmers, since they have been at the mercy of the buyers, particularly at the more distant markets for fresh fruit. Natural desire to obtain the best market price has encouraged co-operative organization for marketing and packing the crop. There are some sixty packing houses situated round the lake; railway cars are loaded at the packing houses, and carried by barge to the railway; fast freight boats deal with perishable fruit, and express shipment are carried by passenger steamer.

The chief centre in the Northern end of the valley is Vernon which stands near the head of the lake in a region of broad tributary valleys, separated by low hill ranges, which afford respectively a considerable area of agricultural land and good pasture. The best orchard lies to the east of the town which is built at the foot of a long, low hill the slopes of which form the chief residential area. The industries are connected with the working up of agricultural produce - fruit and vegetable canning and pickling being the chief. The fruit warehouses are the largest found in the Province.

Kelowna has grown up midway along the lake on the eastern side where the bottom land widens to 1½ miles Above it lies a series of benches which lead to a high

undulating plateau. The soil on the flats is a rich black loam, and on the benches light sandy loam with subsoil. On the plateau are a number of lakes which are utilized to store water for irrigation. The bottom hands have proved excellent for truck, mixed or dairy farming, but not so good for fruit; the benches produce excellent apples, cherries and pears (for which the district is the chief area in the Province).

Canning crops of tomatoes and beans are produced on both bottom and bench land. Grapes, asparagus and tobacco are more recently introduced crops which are proving successful. Above 2000 feet are many good hay meadows, and stock-raising is carried on; a few settlers practise dry farming on the plateau.

The town is thus a centre for farms of various types; it is linked up with the surrounding lands by a system of good roads. Fruit and vegetable packing houses and canneries, dairies, sawmills, a tobacco curing establishment and a box factory are the chief industrial plants; their connection with the economic development of the surrounding land is obvious.

South of Kelowna for some miles high-land approaches too near the lake for settlement, except where one small creek enters; there the first settlement in the district. Okanagan Mission, was built. In the extreme south-east the benches are well developed, and the orchard centre of Naramata has grown up. On the Western side of the lake the land suitable for settlement is more extensive in the south, and it is there that the larger settlements are found. Peachland (pop. 300) and Summerland (pop. 1800). In Summerland is a considerable area of undulating

bench land, lying 200-400' above the level of the lake; two tributary valleys here enter the lake, and the municipality includes some alluvial land. One-half of its area is irrigated and produces large crops of soft fruit and early vegetables, besides apples. The Canadian Pacific Railway has been of great advantage in the development of the area.

At the southern end of the lake is a fertile flat with adjacent benches, planted with orchard and irrigated, three creeks supplying the neccessary water. The acreage under peaches is the largest in the valley, pears and apples are also important. The town of Penticton is a shipping centre not only for this adjacent area but for orchard lands situated at various points on the lake, the Kettle Valley railway giving direct access to the Prairie market, and to Vancouver. As an industrial centre the town owes a good deal to the railway, on which it is a divisional point, where machine shops have been built.

South of Penticton the valley averages 2 miles in width, with benches from 75 to 500' above the bottom. Around Dog Lake practically all the accessible bottom and low bench lands have been taken, mixed farming is general in this section of the Valley. The extreme south of the valley forms the centre of the British Columbian Government Irrigation Project. Water is led to the land by a canal some bench lands above the canal are irrigated by pumping. The lands within the project have been divided into plots varying from 10-20 acres. A Government demonstration plot has been established and packing houses have

been built. Though no railway runs through the area, good roads facilitate transport. Dairying is also likely to develop as adjacent hill and plateau areas give good summer pasture.

Besides the main Okanagan Valley smaller Valleys are used for the same type of intensive irrigation farming e.g. Long Lake Valley South of Vernon. It is separated from the Okanagan Valley by a long ridge which affords good pasture; the lower slopes and floor of the Valley are planted with orchards and are well settled. East of Vernon Lumby (pop. 450) is a centre for a dairy and mixed farming district, Most of the farms are in the Valleys but a few settlers have taken up land on the plateau at 3400-3800', where they are rearing poultry and practising dairy farming. The lumber camps and sawmills form a market for their produce, but part of their income is derived from the sale of wood, cleared from their farms and hauled to Vernon.

North of Vernon the precipitation though not heavy is sufficient to make irrigation unneccessary, and mixed and dairy farming are carried on on the flats and benches of the Upper Okanagan and Shuswap Valleys. Armstrong (pop. 1800) lies in a specially favourable position - the Okanagan Valley is here nearly eight miles wide - the Selkirk Ra. rising abruptly from its floor some 3 miles east of the town. Near the town the fertile bottom land is used for truck crops, Armstrong celery and lettuce being well-known on the Canadian market.

Mineral wealth is unimportant in this part of the Province, and the density of the population is a reflection of the development of farming and foresty, and the moderate increase (12½%) of the population in the decade 1921-1931 is evidence of the gradual clearing of farm land on the higher levels, and the closer settlement of the irrigated lands. It is the custom for a man to improve a part of his original holding and then to sell a portion of the improved land.

The prosperity of these intensively cultivated farm lands depends largely on the economic situation in the Prairies, which form the chief market for the produce and the last two years have been very difficult times for the farmers.

Xiii. D.

PRINCE RUPERT AND ITS HINTERLAND.

The town of Prince Rupert[1] owes its origin to the Grand Trunk Pacific Railway (now a part of the Canadian National Railway system), which almost thirty years ago (1905) received a charter permitting it to establish its terminus on Kaien Island. The island is only 6 miles long and 3½ miles wide, and is separated from the mainland by a deep and navigable channel. The island is mainly filled by a high forested ridge, the area available for the town-site being limited to a shelf of irregular hummocky rock, stretching for 3 miles along the foot of the ridge, and covering only some 2000 acres. The irregularity of the site led to great expense being incurred in laying out the town, which was constructed on the usual American rectangular plan, which was not really suitable for the site, the irregularities were ignored, and streets were planned to run horizontally on natural slopes, and had to be carried on trestles to fit in with the plan. House-building was rendered difficult also, since the houses had to be built at what was to be the eventual street-level, and not at the level of the existing surface. Unfortunately some of these artifical horizontal surfaces have sunk[2].

The town rapidly grew to its present size - 6,000 people. In the early days the construction of the town

1 Scottish Geog. Journal 1914. pp. 237-250 The New City of Prince Rupert, by H.M. Cadell.
2 Illustration in Recent Advances in Town Planning. Adams 1931.

employed the people, the industries which have developed have enabled the number to remain steady. The harbour is excellent, always deep, always open, Without dangerous currents, and very little subject to fogs. It is 500 miles nearer the Orient than any other American port, though so far that fact has not led to the capture of trans-Pacific trade, from ports to the south which have more varied commercial interests.

The close connection between the railway and Prince Rupert is exemplified by the fact that the original headquaters of the halibut fishing fleet was Port Essington, but when the railway gave access to the Prairie market the older port was abandoned. Prince Rupert is equipped with cold-storage and fish canning plants; not only coastal but river waters contribute fish.

The hinterland of the port includes the north-western Prairies, and a grain elevator has been built, so that Prince Rupert shares actively in the grain trade. The immediate hinterland lies in the Nechako Bulkley and Skeena Valleys, which form one of the leading agricultural areas of the Interior.

In the Public Works Report for 1890[1] the Surveyor reported that in the Nechako valley there existed much good farm land. "I have reason to think and it is also the

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1 B.C. Sessional Papers 1891

belief of Dr. Dawson[1] that, later on the whole of that plateau, which covers millions of acres will some day become useful for cattle raising... The first thing needed to open this country is a waggon road from Quesnel. No doubt the country will be thoroughly settled only when there is a railroad, but I think a waggon road would open the Nechako Valley in the meantime." "There is room for thousands of settlers and with its good land, abundance of water, fire-wood, game and fish, a rather large population of miners at short distances making a local market for produce for the first years, I believe no other place in the Interior offers better promises of success for the farmer or cattleman."

To a considerable extent these prophecies have been fulfilled, though the road did not accomplish as much as the railway has done. The Nechako valley has a gently rolling surface lightly wooded with small trees, with patches of meadow. Settlement is scattered along the valley, and along the tributary valleys which are linked up with the main valley by roads. The two chief centres are the villages of Fort Fraser and Vanderhoof (pop. 300 in each). The farmers are particularly interested in the raising of cattle, both wild and cultivated fodder crops being very successful. Increased interest is being taken in dairy farming and the

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1. Dominion Government Geologist.

Department of Agriculture has built a creamery at Vanderhoof, cream being brought to it by the C.N.R. from farms as much as 100 miles away. There is still much potential farm land which has not been taken up.

Except for its lower course the Bulkley flows through a relatively large valley, some 4 to 10 miles wide, (in Southern British Columbia many of the valleys are only 1-2 miles wide). The valley is filled with drift, and the river flows between terraces. The soils are variable, along the river being generally deep alluvium; the land is wooded but much has been burned, and is covered with willow, poplar and jack-pine, and scattered in the area are many natural meadows 5-40 acres in extent. The hillsides beyond the valley offer grazing lands. The land has proved good for mixed and dairy farming, and a considerable farming population has become established especially near Smithers and Telkwa. Smithers (pop.1000) has become the business centre for the Bulkley valley, and contains a cold storage plant and two lumber yards. The mountains both to the East and the West contain mineral wealth, and give resources of water power. Telkwa stands in a small coal-mining district, the coal-bearing rocks are very soft, and have been removed from the ridges. The total thickness of coal amounts to 300 feet, so that the area is not likely to become a great mining district, but the reserves are sufficient to supply the local market for a long time.

The Skeena Valley is less valuable, agricultural land is scattered and restricted in area, being limited to small islands of silt and narrow flats. Clearing is difficult for the valley is heavily forested; the best land is situated near Terrace, at the junction of the Kitimat-Kitsumgallum trench with the Skeena; in this district some 1100 people live, Terrace itself being a village of 350.

The farms are usually small, many being of between 5 and 20 acres, so that intensive farming is practised, and attention is paid especially to poultry, dairy cows and small fruits. The district, however has proved more difficult to develop than was anticipated and it has lost population in the past decade (1921 population of unorganized parts of lower Skeena 3,000, 1931, 2,200).

With this exception the region of Central British Columbia is progressive, and will probably become one of the more thickly populated parts of the Province. There is still farm-land which has not been taken up; timber for more than local supplies is available; power is obtainable both from the streams of the adjoining mountains and the Groundhog coalfields to the north, as well as from the small Telkwa field; with a closer network of roads it is likely that settlement will cease to be so linear, and will cover a wider area than it does at present.

There is every reason to anticipate that Prince Rupert has an important future before it; the resources of the North-West are very slightly exploited so far, but, as has been shown, for example in the consideration of the forest reserves

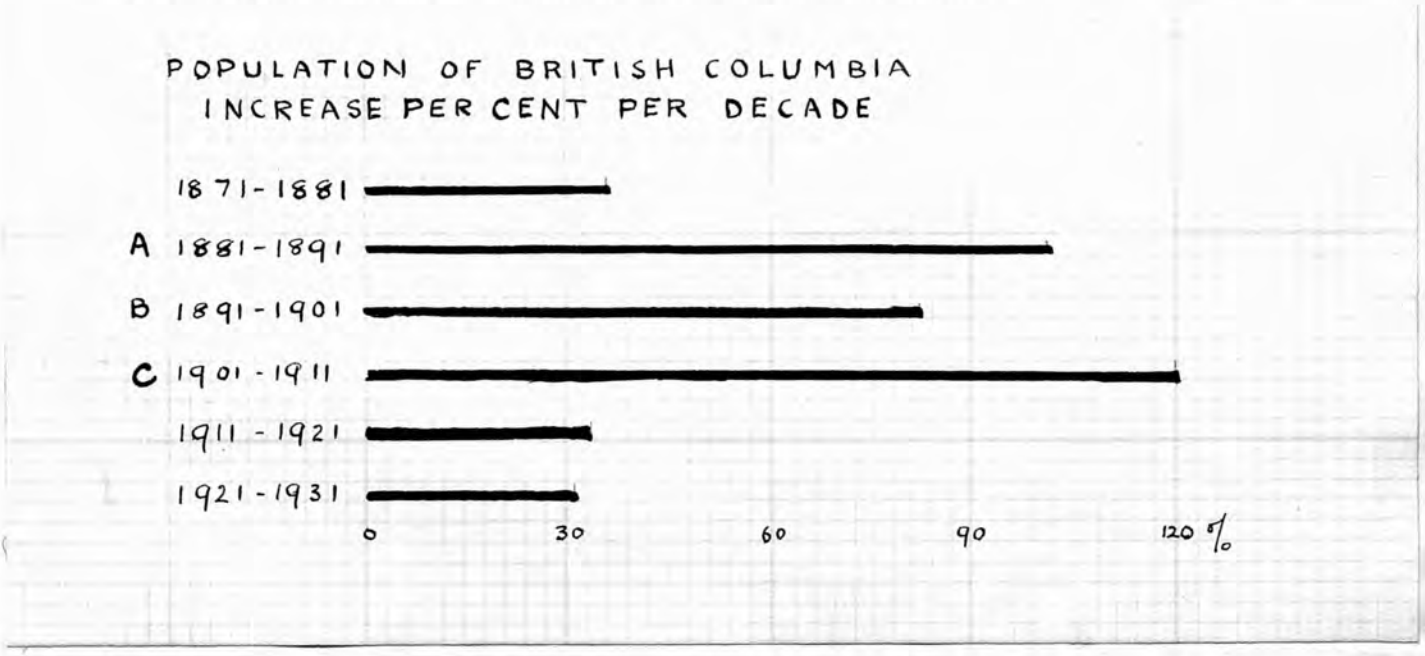
they are extensive. The growth of the city is largely linked up with the question of closer settlement of the Interior and that with the building of branch railways and a network of roads.

XIV.

SUMMARY

Increase of population per decade since 1871.
Influence of mineral wealth, climate, forests, power resources.
Inaccessibility and isolation of some potentially productive areas. Topography of prime importance as factor controlling distribution of population.

During the course of the economic history of the province, different geographical factors have been influential in attracting population. Between 1871 and 1931 population increased from 35,000 to 694,000, but the rate of increase has varied as the following diagram shows;



A. Rapid increase due to building of C.P.R. - gave link with rest of Canada, facilitated immigration, and gave access to Prairie markets.

B & C. Continued building of railways, and of roads.

C Marked interest taken in Britain in development of Canada during this decade.

Placer gold caused the first real wave of immigration, when the gravels of the Fraser were found to be worth working (1858). Probably 2000 miners worked the bars of the lower river in that year, and the mining towns of Langley, Hope and Yale grew rapidly. Accounts of the area written at the time speak of some miners "forcing their way" up the Fraser in boats,[1,2] the difficulties of navigation being so great. Many found a difficult route on foot along the sides of the canyon to the Upper Fraser. The building of the Harrison Lilloet trail from the lower Fraser via Harrison L. to the Fraser above the canyon did enable food to be taken in to the upper placer mines. Living was extremely expensive; prices fluctuated enormously, for pack-trains did not always succeed in making their difficult mountain journeys, an influx of 100-200 men into any one centre resulted in such pressure on the small stock of food that prices rose very greatly and the majority of the miners in these early years stayed in the interior for the summer months only,[3] the lower Fraser R. district being the only permanently settled part of the whole Province. Practically no necessities were produced in the province, and the colony was described as being

1. Report of Begbie's Journey into the Interior of B.C.1859
2. Four Years in B.C. Mayne 1864
3. Four Years in B.C.Mayne 1864.

in 1860 destitute of one highly important element, it has no farming class, the population being almost entirely composed of miners and merchants. Without the farmers' aid B.C. must for ever remain a desert - be drained of its wealth and dependent on other countries for its daily food.[1] The Governor made similar reports to the Secretary of State.[1] "The British element is small, and there is absolutely neither a manufacturing nor mining class; there are no landed proprietors, except holders of building lots in town; no producers except miners and the general population is essentially migratory, the only fixed population, apart from New Westminster, being the traders settled in the several inland towns, from which the miners obtain their supplies."

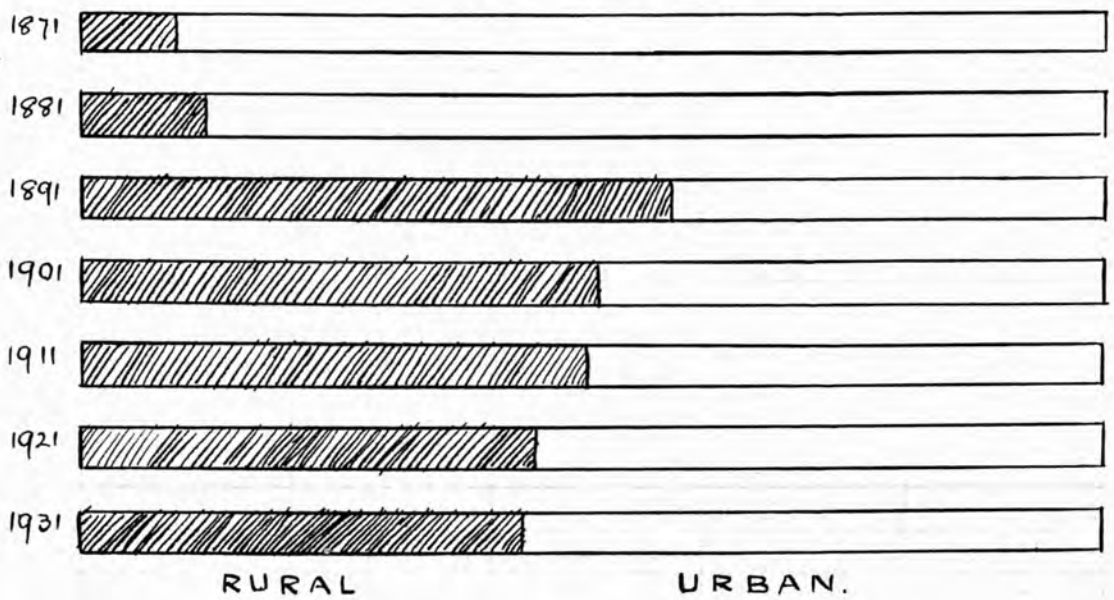
Relatively large sums ($92,000 in 1862) were spent by the young colony in constructing roads so that the resources of the interior might be exploited, the most important being the famous Cariboo Road. This led to an increased immigration, during the summer at least, as the Cariboo placer fields were discovered. Most of the miners still left the interior during the winter, as the climate was too severe for work to be continued, and during that season they retired to Victoria[2] - to the benefit of the merchants there.

1. Quoted in History of B.C. 1894. Begg.
2. Statistical Account of B.C. Harvey 1867.

This gold rush lasted only a short time, and immigration again diminished - to the dismay of the keepers of the roadside houses on the Cariboo Road who had obtained their livelihood by supplying food and fodder to the pack trains which passed through. The next discovery of gold was made in Kootenay. Like the other areas, this derived most of its mining population from the United States, which had a considerable floating population of mining prospectors. The natural outlet for the Kootenay valley is by a southward route into the United States; in order to counteract this natural direction of trade, the British Columbian Government built a pack-trail from the Fraser to the Kootenay.

Thus, in the days before the Confederation of the Colony with the rest of the Dominion of Canada it was the position of the placer gold fields which controlled the distribution of the small white population (only 10,000 in all in 1871). The extreme ruggedness of the region and the dense forest cover hindered the growth of a considerable agricultural population, except in the south-west, and so in 1871 when the first census was taken, it was found that less than 10% of the population was rural, the majority being found in the trading towns which were the centres for the scattered mining population.

CHANGES IN PROPORTIONS OF RURAL AND URBAN POPULATION



As the diagram shows, the second census shows very little change, but in 1891 the situation was completely reversed; that fact may be correlated with the great increase in population which occurred during the decade 1881-1891. During that time the Interior of British Columbia was opened up by the construction of the Canadian Pacific Railway. The taking up of farm land was encouraged by the market for farm produce afforded by the gangs of labourers concerned with the building of the line. When the railway was completed, miners, who had been engaged on railway engineering work, concerned themselves with the development of the newly-discovered silver and lead deposits, and continued to stimulate agricultural production.

Since 1891 the urban has become slightly larger than the rural population; that change is mainly due to the phenomenal growth of Vancouver and its suburbs, which has continued to the present time; (between 1918 and 1927 the population of the city increased by 30% and that of the suburbs by 60%)

Miners no longer form the bulk of the population, and mineral wealth is no longer the dominant factor influencing the distribution of population. Mining towns and villages are widespread, and frequently occur on sites where no other type of centre is likely to grow. For example Atlin lies in a rugged upland region in a high latitude, experiencing, therefore, rigorous climatic conditions, yet it contains 500 people. Stewart (see map A 6) at the head of Portland Canal lies on a narrow lowland at the mouth of the meandering river which flows in a gorge the sides of which are furrowed by glaciers. The site was formerly swampy and in 1909 (mining began here in 1905) Stewart consisted of only a few wooden cabins, separated from a possible landing by mud flats; now the waterfront has been improved; two long wharves have been constructed, and the town contains 600 people. Britannia Beach is a much larger example of a purely mining centre; the mine which supports this town of

1700 people is situated on the cliffside; the town and the manufacturing plant are on the shore. There is very little level land, and all the town's requirements must be brought in from the productive area farther south. All these centres are associated with the mineralized zones on the margins of the Coast Range batholith. The batholithic intrusions of the south-east with their accompanying zones of mineralization are also sites for the development of mining towns; some are small, of 200-300 people, e.g. Slocan and New Denver, but some of the mines have proved so rich that quite large towns are dependent on them. e.g. Kimberley, which is the centre for the great Sullivan mine, has a population of 3500; Rossland has nearly 3000, and Trail, which is not only a centre for mines at hand, but is also a smelting centre for the whole south-eastern region contains nearly 8000 people. In some parts of British Columbia are found parties of mining prospectors and placer-miners whose numbers fluctuate from year to year, and whose presence does not result in permanent settlement. Barkerville was the classic example in this region of a town dependent upon rich and extensive diggings. The Cariboo placer field has a smaller output than it did 50 or 60 years ago, and Barkerville has dwindled to 134 people. If the present hopes of finding rich lode deposits in Cariboo

materialise, Barkerville may receive a new lease of life, and regain its former size.

To a considerable extent, therefore, geological conditions, by their effect on the presence or absence of mineral wealth, influence the distribution of settlement in the Province.

The climatic conditions vary considerably. The south-west of the province has almost optimum conditions, but in the greater part of the Province high elevation reduces the temperature, and much of it has a very cold winter. Reference has already been made to this in connection with the enforced abandonment of their diggings by the "old timers" (the first placer-miners) during the winter months. Of course, the fact that the winter is too cold for the continuance of placer mining is not in itself an indication that farming is impossible, for unless the cold season is at the same time too long, spring-sown plants may be grown; a long cold winter increases the expenses of cattle-raising, since winter housing and winter feed are then necessary but it does not preclude it altogether. The valleys of Central British Columbia endure harsher climatic conditions than do those of the south, but farming is possible there; wild fodder consists of peavine and vetch, and is good; cultivated fodder crops do well, and the

growing season is long enough for the hardier grains. Very similar conditions are found on the Great Plains of the Peace R. district. The plateau north of the Skeena-Bulkley valleys is beyond the climatic limit for farming; this is partly due to altitude and partly to high latitude. Climatic conditions exert direct influence on the natural vegetation, and in that way they have influenced settlement in British Columbia. Forest growth is found throughout the country except in the remote northern regions, the semi-arid valleys of the south and the mountains which are above 3 to 4000 ft. In the south-west the heavy rain and equable temperature conditions result in rapid growth, and the trees are of extremely large size and of particularly valuable species Douglas Fir and Red Cedar. Dense forests of Western Hemlock and Spruce occur in the north-west, and on the coast important groups of lumbermen are to be found. In a few cases the manufacturing centres dependent for their raw materials on the forest industries have grown into towns e.g. Powell River (pop.5000), Woodfibre and Swanson Bay are smaller (500 each). In the south-east mountain country also the forests are dense enough and of large enough trees for forest industries to be important, and there, too, lumbering centres are numerous, though it is less easy than on the coast to mention any of ~~the~~ considerable size which are connected with the

lumbering industry only. The smaller poorer ~~the~~ growth of the interior plateau is cut to supply local demands, especially along the railway-lines. Such centres as Dewey and Penny on the Fraser are primarily timber-working villages - each of about 100 people. The valleys of the northern part of the province are covered with trees of small size, at present untouched, and of doubtful value in the future, owing to their poor quality and remote location.

Climatic and soil conditions are the factors which determine the location of potential forested and agricultural areas, but all such areas have not yet been utilized. The factor which has determined utilization has been accessibility. The high proportion of mountain land means that the province will never be thickly populated as a whole; the pressure of the world's population on the available food supply will have to become very acute before it is worth while to develop the Alpine pastures, and a great demand for health resorts in the mountains is unlikely to develop. The mountain ranges however are not only empty areas themselves; by isolating valleys, they have caused the latter to be left empty too. For example the Rocky Mountain trench, in its Columbia and Kootenay sections at any rate, is a potential agricultural area; so are the valleys of Central British Columbia, but they await the provision of adequate means of transport, and roads and railways are in British Columbia difficult and expensive to construct,

owing to the irregularity of the surface conditions. To attempt to open up an area without such provision is uneconomic, ~~and~~ as is evidenced in the Peace River block, where settlements were made in anticipation of the construction of a railway line.

Thus, in British Columbia, distance from Europe delayed colonization, mineral wealth decided the lines of the first dissemination of population, and still has some influence, but the geographical factors at present most influential in determining the distribution of population are climatic and topographical conditions. The densest distribution of population occurs where a great variety of natural resources is found in an area which as late as the Fifties was described as "some tolerable land on the lower Fraser," where climate, soil and surface relief have combined to make economic development rapid.

APPENDIX.

Table I.

Fruit Production Average 1927-30.

Figures give values in thousands of dollars.

	Islands	Lower Mainland	Thompson	Okanagan	Boundary &Kootenay
Apples	44	18	338	4342	379
Pears	6	8	8	239	21
Plums &) Prunes)	4	5	4	159	9
Peaches				127	2
Cherries	5	12	6	168	30
Strawberries	100	184	10		36
Raspberries	5	205	13	7	26

Table II

Total Honey Crop. (in tons).

1919,	172.	1920,	112.	1921,	154.
1922,	355.	1923,	216.	1924,	339.
1925,	319.	1926,	449.	1927,	493.
1928,	492.	1929,	494.	1930,	560

Distribution of Apiaries 1930.

	Crop (lbs)		Hives
Vancouver Is, Gulf.Is.	106	thousand	2,236.
Greater Vancouver	69	"	1,919
Lower Fraser	249	"	5,835
Upper Fraser	112	"	2,374
Okanagan, Shuswap & Thompson valleys.	427	"	5,874
Kootenays	134	"	1,927
Central Interior	22	"	294.

TABLE III.

Timber Reserves.[1]

A. Estimate of Commission of Conservation 1917.

B. " " Forest Surveys Division. Dec. 1931.

Figures in Billion Board Feet.

	Van.Is.		Van:Mainland		Pr.Rupert District		Rest of Interior		Total
	A	B	A	B	A	B	A	B	B
Douglas Fir	43	32	18	9	1	1	12	15	57
Red Cedar	28	21	23	14	10	8	16	10	53
Hemlock	28	28	10	8	17	16	8	7	58
Sitka Spruce	4	2	1	.7	9	7			9
Engelmann "					10	5	49	40	45
White Pine							1	1	1
Yellow "							4	2	
Lodgepole "					1	3	10	10	13
Larch							3	2	2
Cypess	1		.8	.8	1	.8			3
Total	117	95	60	35	59	51	115	95	276
Accessible*		66		20		22		50	157

Revised estimates. Cover all standing timber of merchantable quality with reference to present use in saw and pulp mills. They do not include small trees such as lodgepole pine suitable chiefly for pulp at some time in the future. Figs. for the coast are base on a completed inventory of the best available estimates. Figs. for remainder founded on estimates of 1917 with partial readjustments for subsequent logging, fires; they are preliminary and less reliable.

* Accessible as judged by past logging during prosperous periods with highest average prices; these figures are a rough estimate only, and are liable to fluctuation.

1 Published in a Paper by the Minister of Lands Feb. 1932.

Table IV. 1930

Shipment of Poles. Mine-Props. Fence Posts. Railway Ties.

Forest District			MARKETED IN U. S.A	~~Where marketed~~ CANADA.
Kamloops				
Poles & Piling,	lineal ft.	1½ mill.	1 mill.	300,000
Mine-Props	" "	18 thous.		18,000
Fence Posts	cords	30		30
Rly.ties	no.	55 thous.		55
Fort George				
Poles & Piling	lineal ft.	881 thous.	320 thous.	550 thous.
Fence-Posts	cords	628	*	628
Rly.ties	no.	355 thous.		355 thous.
Vancouver				
Poles & Piling	lineal ft.	10 mill.	9.6 mill.	
Cordword	cords	950	950	
Pulpwood	"	5200	5200	
Prince Rupert				
Poles & piling	lineal ft.	3.7 mill.	3.5 mill.	.2 mill.
Railway ties	no.	700 thous.		700 thous.
S.Interior				
Poles & Piling	lineal ft.	11 mill.	9 mill.	2 mill.
Mine Props	cords	9800		9800
Fence Posts	"	11	2	9
Rly ties	no.	350 thous.		350 thous.

Note Importance of U.S. market in Vancouver district.

Table V.

Port of Vancouver.*

	Local Coastwise	Foreign Coastwise	Deep Sea
No. of vessels.	18,000	1500	1100
Tonnage of Imports	3,000,000	40,000	1,300,000
" " Exports	700,000	36,000	3,100,000

Figs. gives averages for 1926-31.

Local Coastwise includes all vessels trading in British Columbia waters only.

Foreign Coastwise includes all vessels trading in Puget Sound & Atlaska. Deep sea indludes all vessels trading outside of Cape Flattery.

Note - Much timber and fish are brought into the post by coastwise abd removed bydeep sea vessels. Part of the heavy deepsea export is contributed by grain.

* Based on Harbour Commissioners Statistical Report.

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Relevant Articles in United Empire (vols. 6,13,22 etc).

" " " Geographical Journal 1857, 1861.

" " " Proceedings of Can. Min. Inst. 1931.

" " " Imperial Commerce vol. 3. (Future of Vancouver

" " " The World to-day.

Beyond the Rockies Lukin Johnston 1929.

Outcastes in Canada (the experience of a man who failed to makes a success of farming in Southern B.C.) Fripp 1932.

A6. Coast Range. Head of Portland Canal.

Heavily glaciated region. Snowfields at 4500'. Mt Otter 8800'. Bear R. gravel bars, shifting course. Rough benches in places. Minerals in quartz veins. Copper, Lead. Some silver & gold.

A7. Bridge R.

Glaciated area. swampy, flat main valley. Low divides on flat-topped Marshall Ridge.
Prospecting made possible by valley. Pioneer Gold.
Altitude too great for cultivation. Indians visit region for game and berries.

A8 Okanagan Basin

Irregular development of level land round lake. Flats determine sites of settlement. Largest Penticton, Kelowna, Vernon - junction of valleys.
Mountains forested. note Reserves. Lumbering important
Chute Valley (Kettle V. line) and E. of Vernon.
High plateau cut by steep-sided valleys.

A9. Beaverdell Area.

Mature topography. Rolling upland; N-NE trend of ridges - flat crests, small lakes, broad valleys. Buttes of lava. Benches line valleys. Post glacial gorges near tributary mouths e.g. Hall Creek and middle Beaver. Carmi and Beaverdell Mining villages.

All Rocky Mt Trench.

Purcell Ra. to west cut by deep canyons.

Steep slope to Rockies to East.

River and lakes in swampy central depression.

Benches line trench - some on west are swampy.

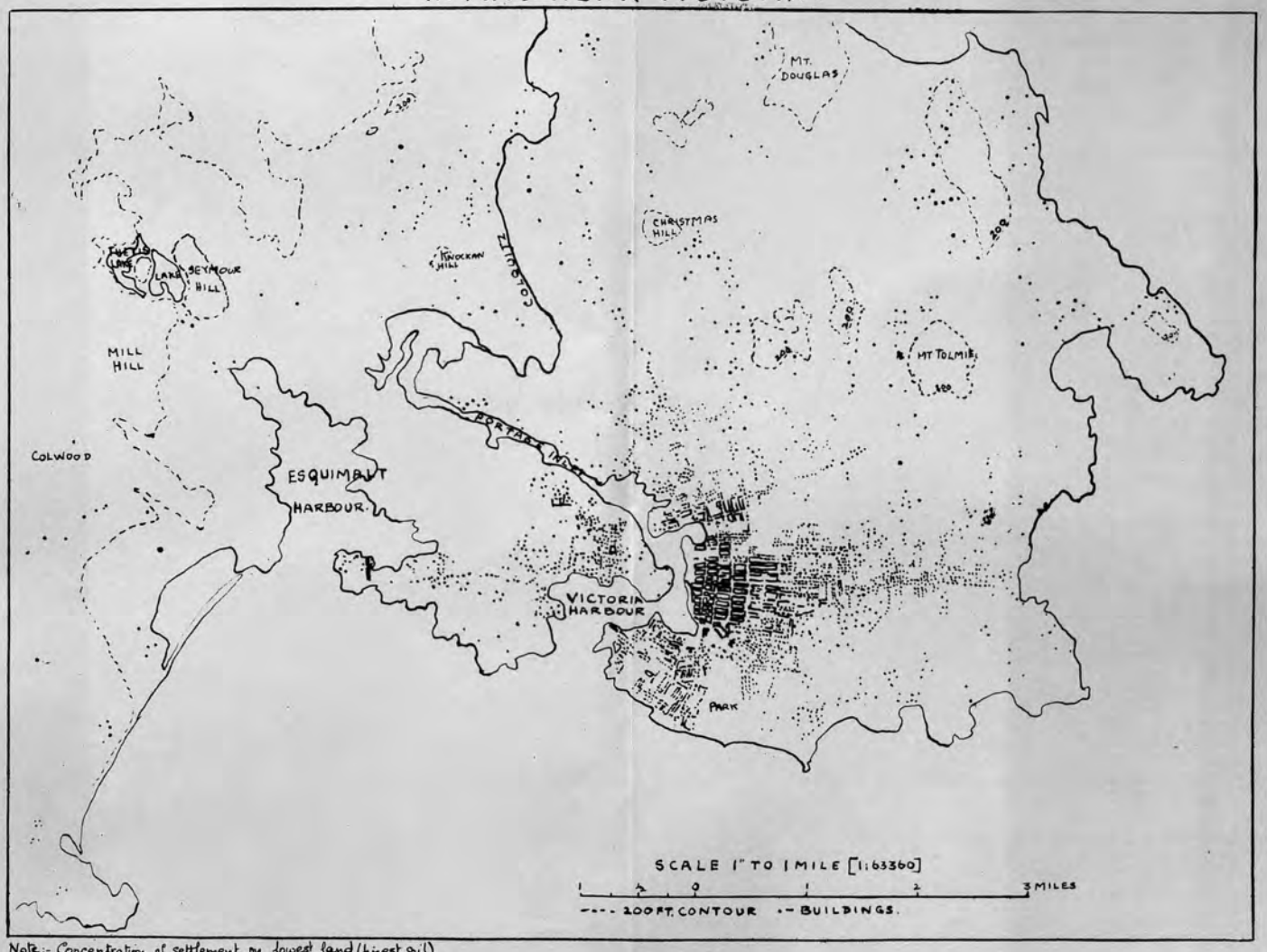
Erratum.

Gb. Observatory Inlet not Portland Canal.

SITE OF MINING CENTRE OF ANYOX.

CONTOUR INTERVAL 100 FEET ::: BUILDINGS GLORY HOLES MINING TUNNELS AERIAL TRAMWAY
SCALE: 1000 FEET TO 1 INCH

DISTRIBUTION OF SETTLEMENT IN AND NEAR VICTORIA



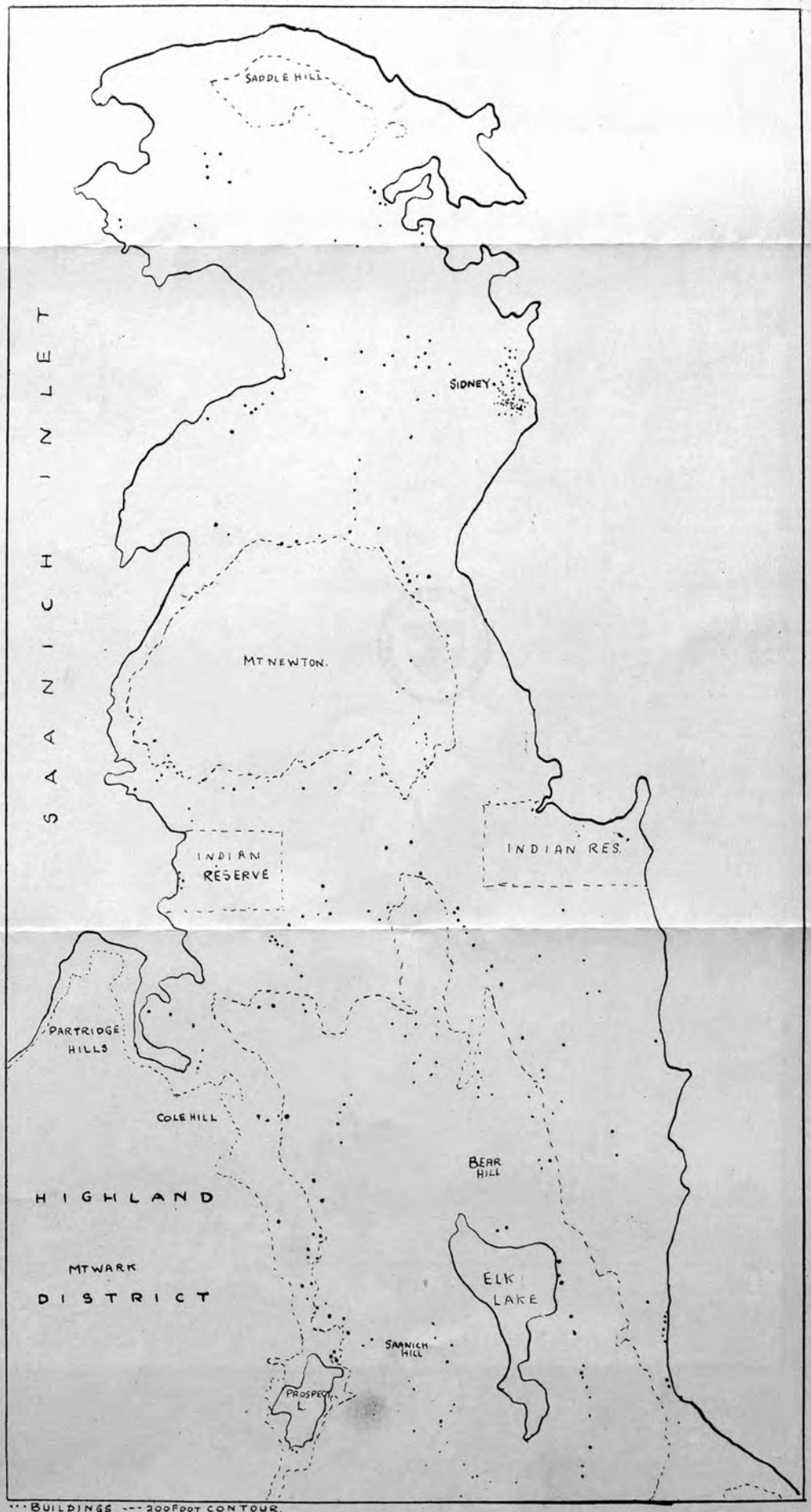
Note:- Concentration of settlement on lowest land (finest soil)
Closeness " " near Victoria (market for truck)
Linear settlement along roads leading from city.
Levelness of uplifted Colwood Plain has led to settlement there.

Additional Annotations.

Owing to its great size, it is impossible to give large-scale topographical maps of the whole region. Examples are included of some of the most distinctive and most important areas.

DISTRIBUTION OF SETTLEMENT
SAANICH PENINSULA

G4



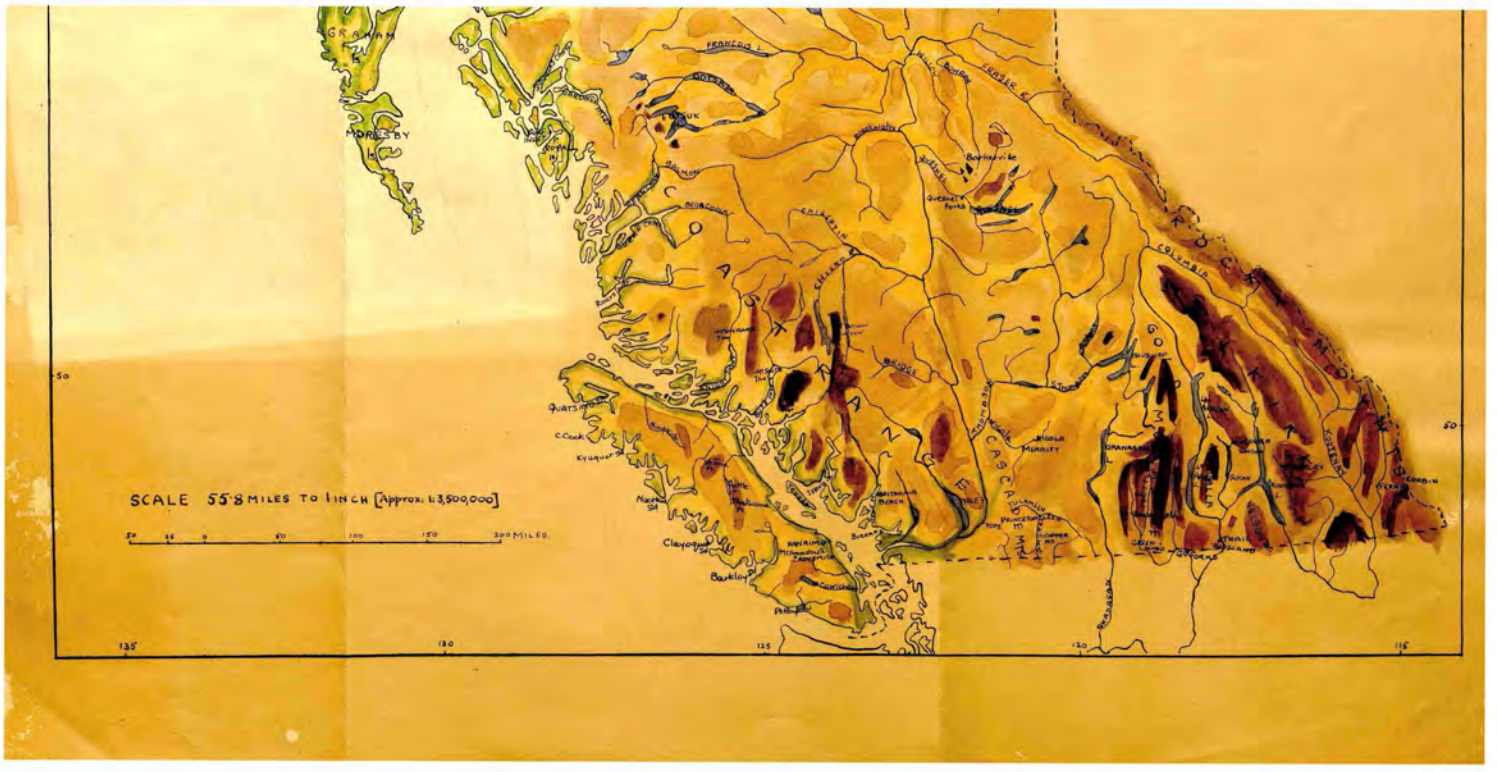
··· BUILDINGS --- 200 FOOT CONTOUR.

SCALE 1" TO 1 MILE 1 ½ 0 1 2 3 MILES

Note. Level surface, good soil ∴ even settlement. Sidney market town (strawberries).
Exception Highland, Saddle & Newton Hills.
Farms located along roads.

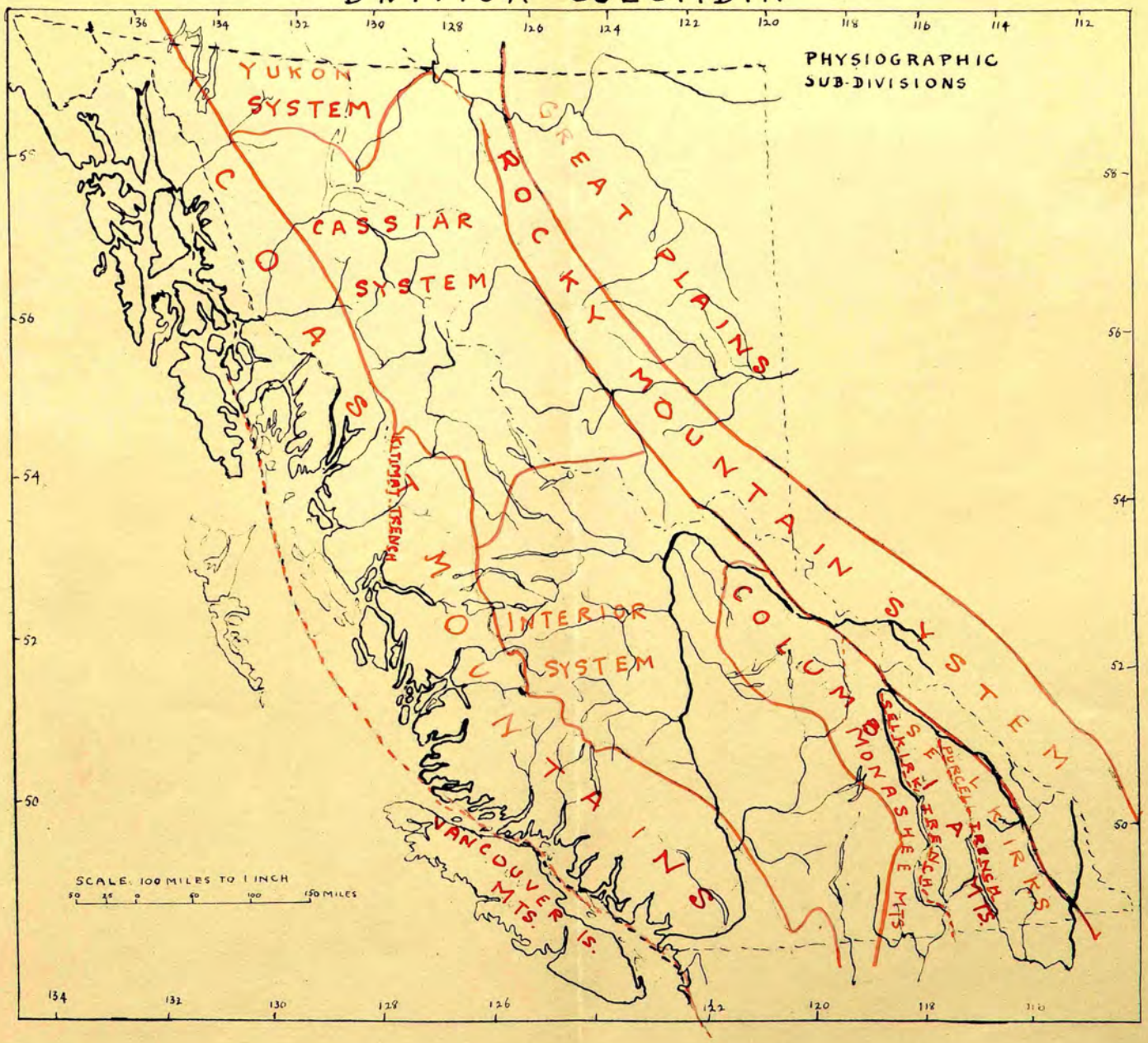
A1.

BRITISH COLUMBIA


GRAHAM Is
MORESBY Is
PORT INLET
ROYAL Is
FRANCOIS L.
OOTSA L.
ENDAKO
BLACKWATER
SALMON
BELLA COOLA
CHILCOTIN
CHILKO R.
WILLOW
COTTONWOOD
FRASER R.
QUESNEL
Barkerville
QUESNEL FORKS
QUESNEL L.
BRIDGE
COAST RANGE
CASCADE MTS.
GOLD RANGE
SELKIRK
ROCKY MTS.
COLUMBIA
S. THOMPSON
THOMPSON
NICOLA
NICOLA
MERRITT
KOOTENAY
OKANAGAN L.
OKANAGAN
CORBIN
FERNIE
NELSON
TRAIL
ROSSLAND
GRAND FORKS
GREENWOOD
HOPE
PRINCETON
TULAMEEN
COPPER Mt.
YALE
BRITANNIA BEACH
NANAIMO
COWICHAN
QUATSINO Sd
C. Cook
Kyuquot Sd
Nootka Sd
Clayoquot Sd
Barkley Sd
SCALE 55·8 MILES TO 1 INCH [Approx: 1:3,500,000]
50
25
0
50
100
150
200 MILES.
50
50
135
130
125
120
115

A2.

BRITISH COLUMBIA



LOWLAND OF SOUTH-EAST VANCOUVER ISLAND

CONTOUR INTERVAL 100 FEET

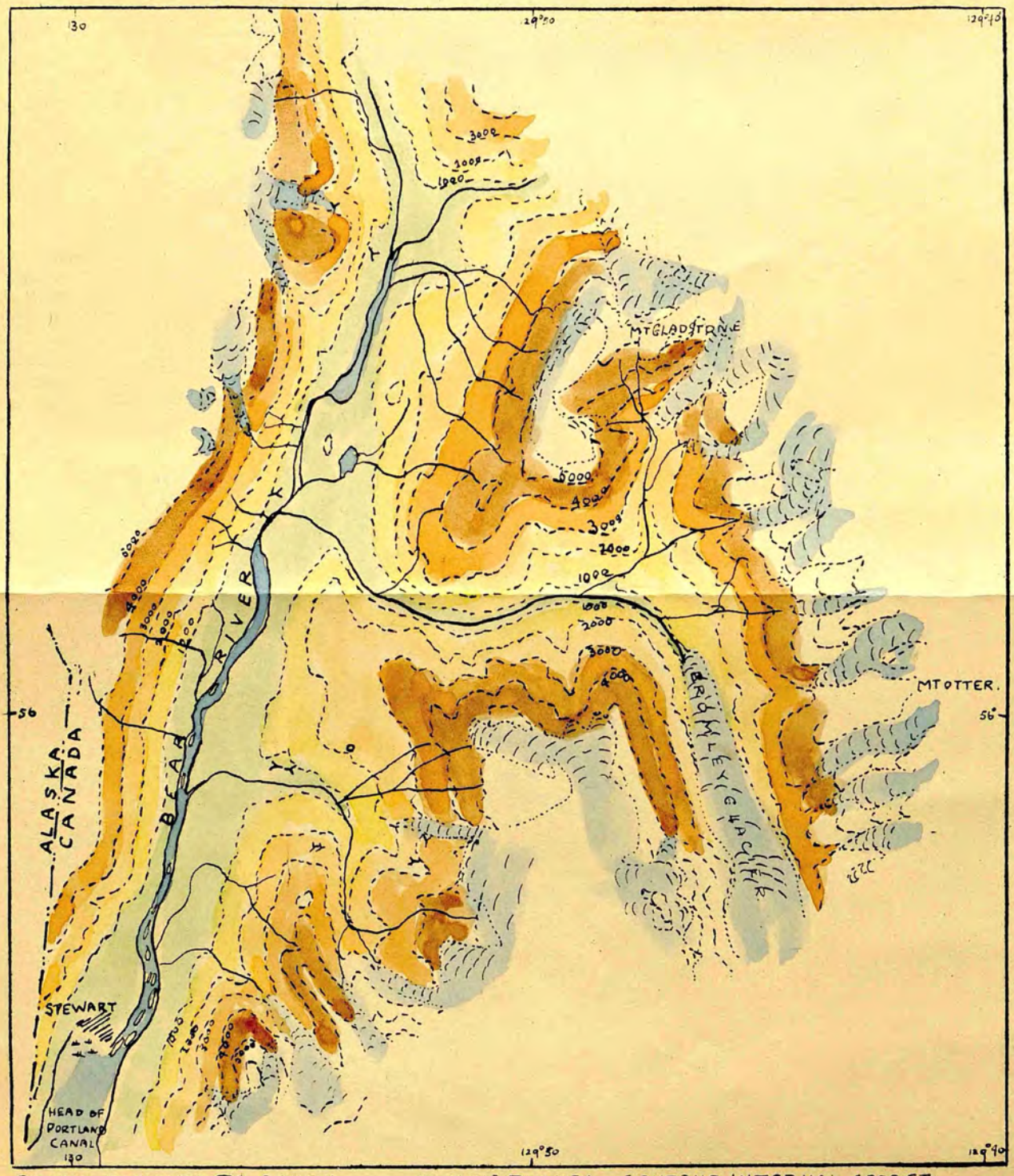
---- INTERMITTENT STREAM

PART OF EAST COAST REGION, VANCOUVER Is.

CONTOUR INTERVAL 500 FEET

A6

COAST RANGE, HEAD OF PORTLAND CANAL



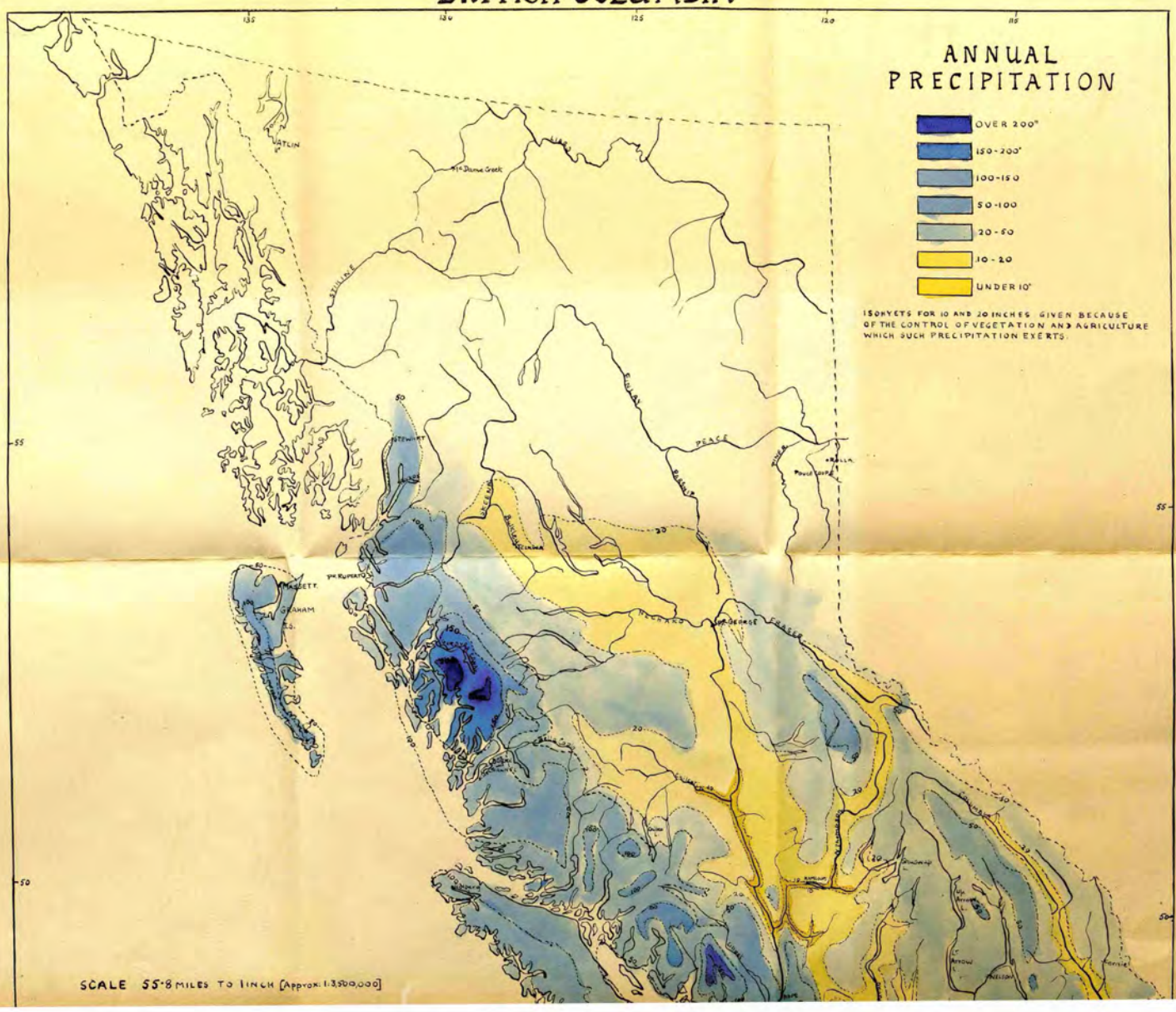
SCALE 2 MILES TO 1 INCH. Y. MINE TUNNEL CONTOUR INTERVAL 1000 FT.

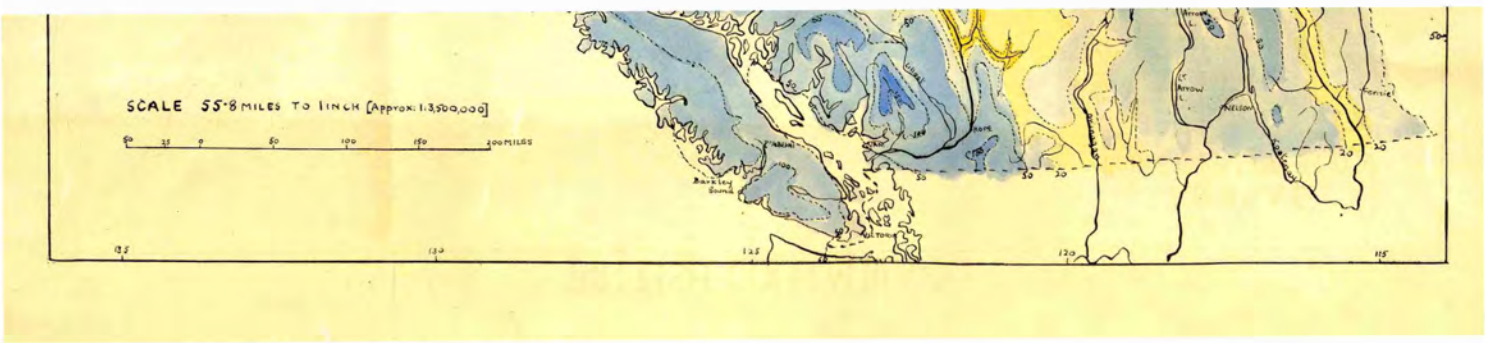
¾ ½ ¼ 0 1 2 3 MILES

GLACIER.

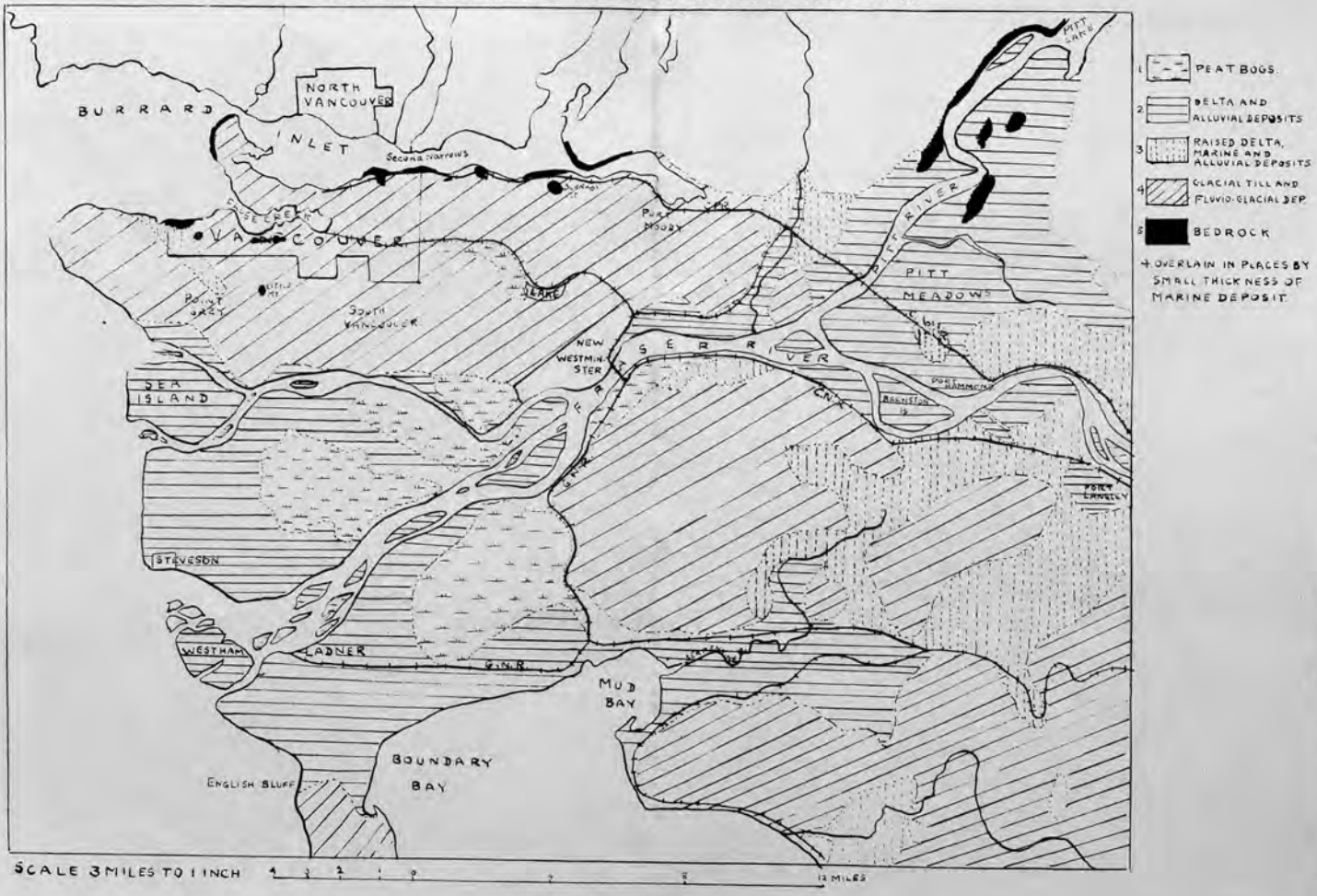
MAP C

BRITISH COLUMBIA

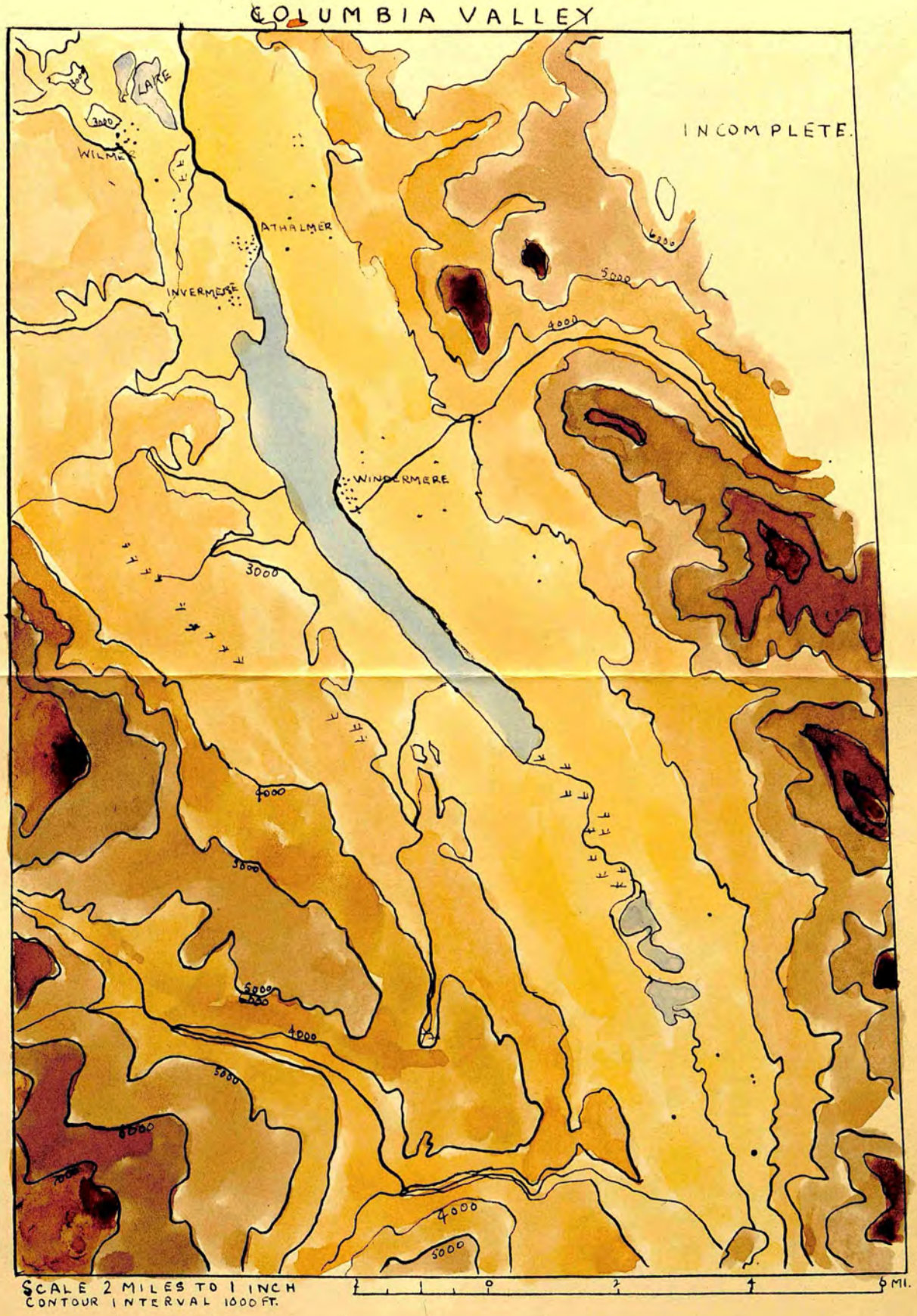



SCALE 55·8 MILES TO 1 INCH [Approx: 1:3,500,000]
50 25 0 50 100 150 200 MILES
Barkley Sound
Nootka
Kyuquot
Nootka Sound
Arrow L.
Nelson
Trinity
135
130
125
120
115

SURFACE DEPOSITS. FRASER DELTA REGION



PART OF ROCKY MT TRENCH
COLUMBIA VALLEY



SCALE 2 MILES TO 1 INCH
CONTOUR INTERVAL 1000 FT.

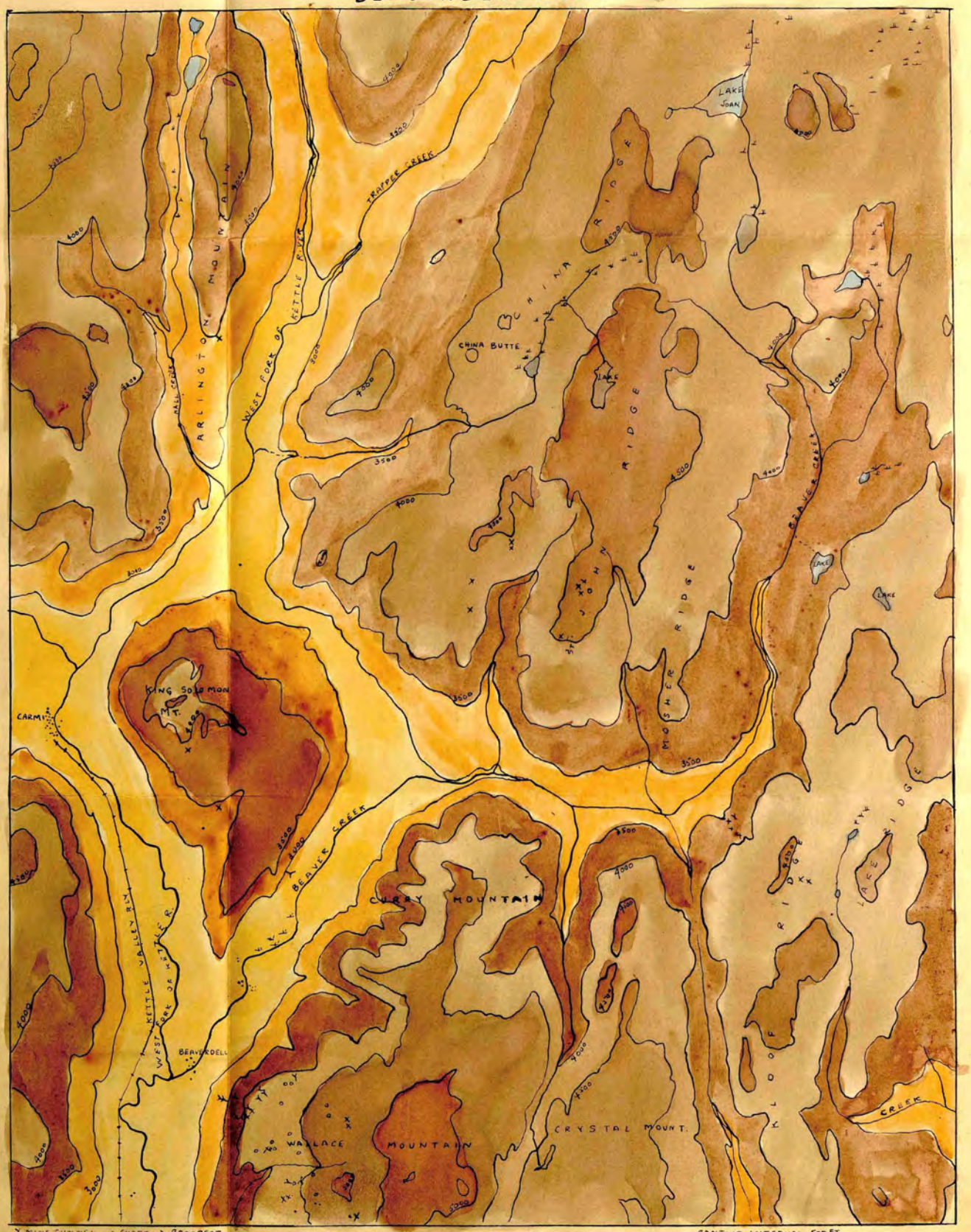
2 1 0 2 4 6 MI.

BRITISH COLUMBIA

MAP B1.


SCALE 55·8 MILES TO 1 INCH [Approx 1:3,500,000]
50 25 0 50 100 150 200 MILES
135
130
125
120
115

SOUTHERN INTERIOR PLATEAU
BEAVERDELL AREA



Y MINE TUNNEL o SHAFT X PROSPECT
:: BUILDINGS.

SCALE 1" TO 1 MILE

CONTOUR INTERVAL 500 FT.

MINERALIZED REGION OF BATHOLITHIC INTRUSIONS.

PART OF KOOTENAY VALLEY
SITE OF NELSON

Y MINES 1 ½ 0 1 2 3 4 MILES. SCALE 1" to 1 MILE CONTOUR INTERVAL 1000 FT.

NOTE. MINES SCATTERED OVER HILLS (BATHOLITHIC INTRUSION TO SOUTH)
TRANSVERSE TRENCH THROUGH SELKIRKS USED BY C.P.R.
KOOTENAY R. UNNAVIGABLE.
FORESTED MOUNTAINS

OKANAGAN LAKE BASIN

SOUTH

NO

SCALE 2 MILES TO 1 INCH. 2 1 0 2 4 6 8 MILES.

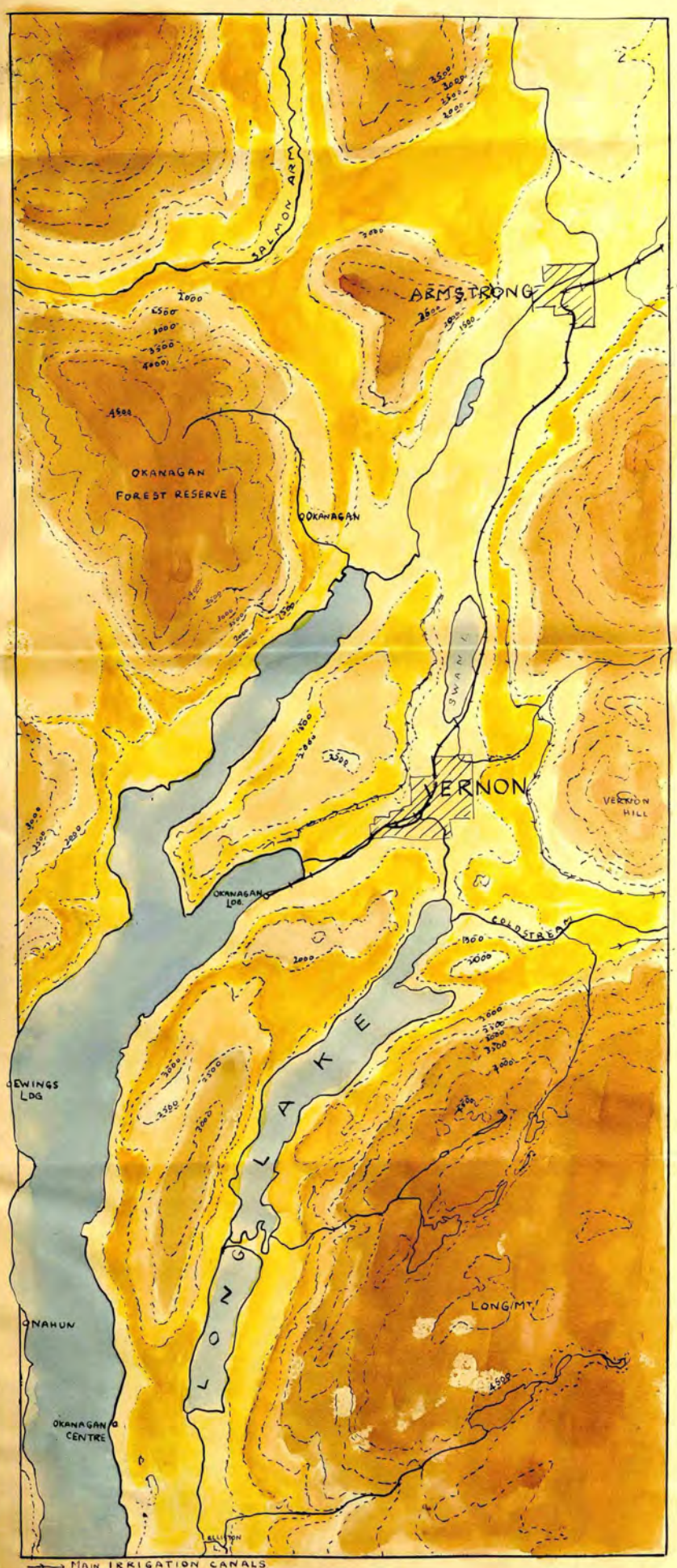
NOTE - UPPER LEVELS NOT DIFFERENTATED IN COLOUR

→ MAIN IRRIGATION CANALS

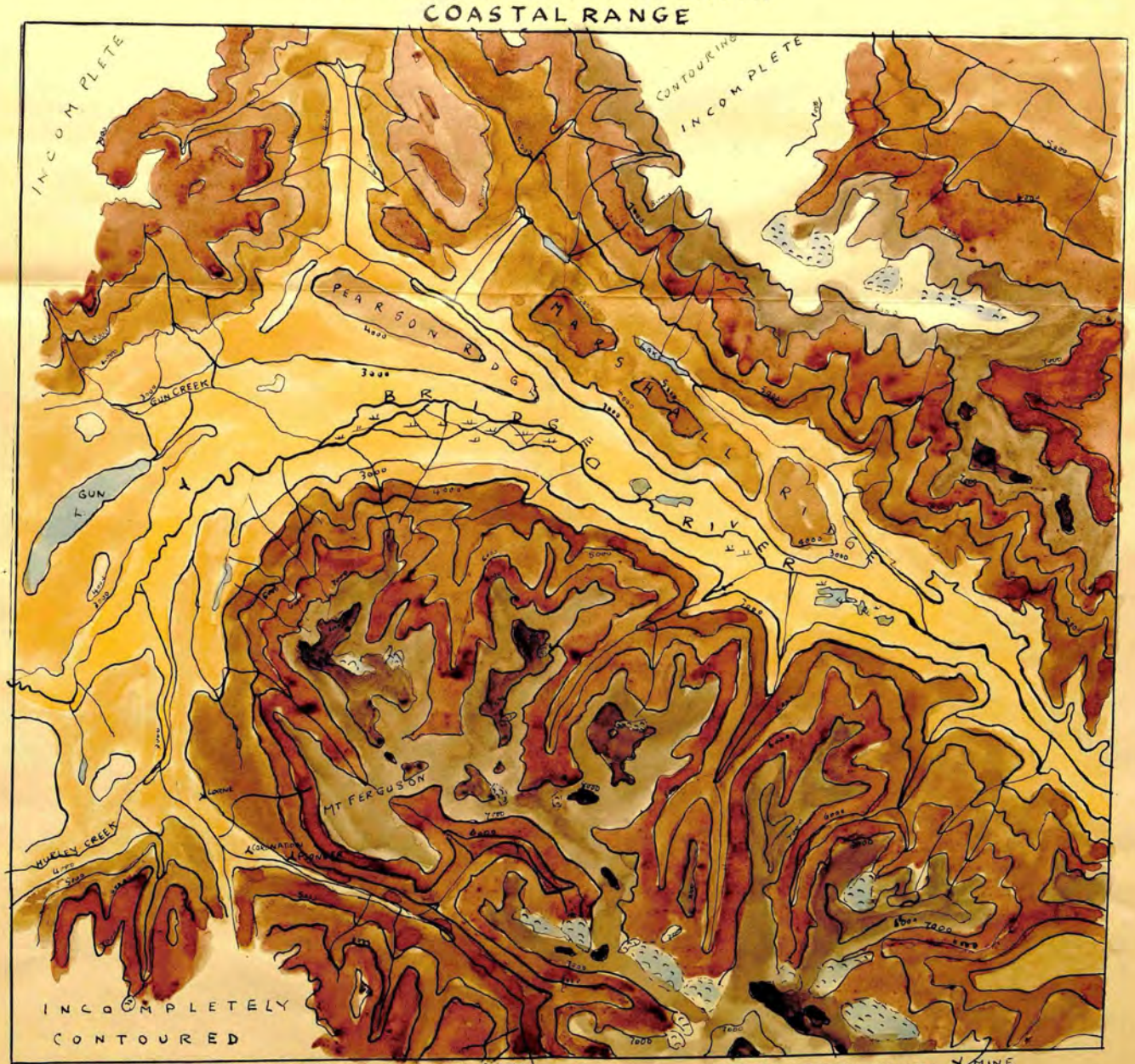
LAKE BASIN

A8

NORTH



PART OF BRIDGE RIVER BASIN
COASTAL RANGE



SCALE 1:125,000, FOR PRACTICAL PURPOSES 2 MILES TO 1 INCH
2 1½ 1 ½ 0 2 4 6 MILES

33 GLACIER. CONTOUR INTERVAL 1000 FEET Y MINE.

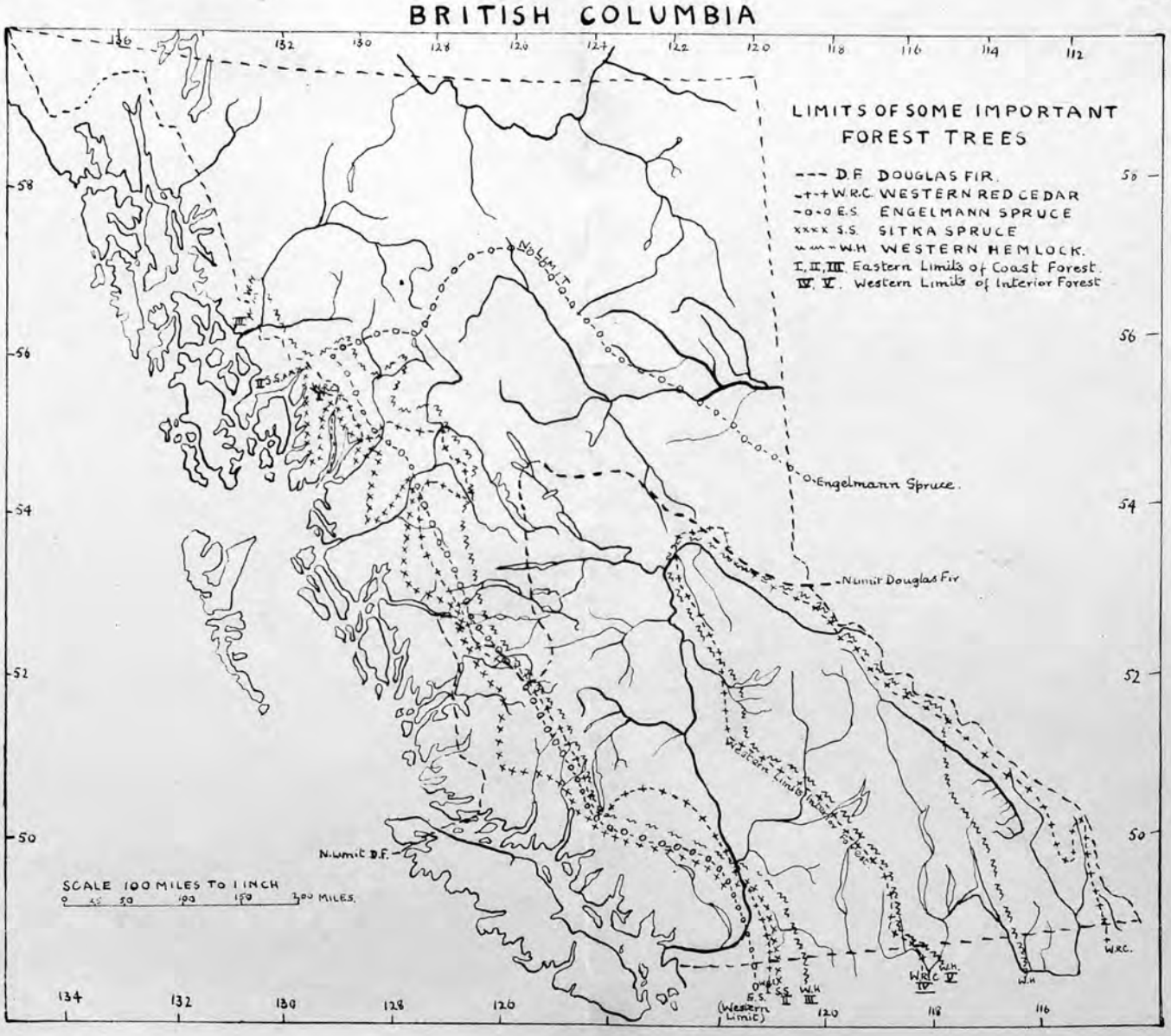
BRITISH COLUMBIA

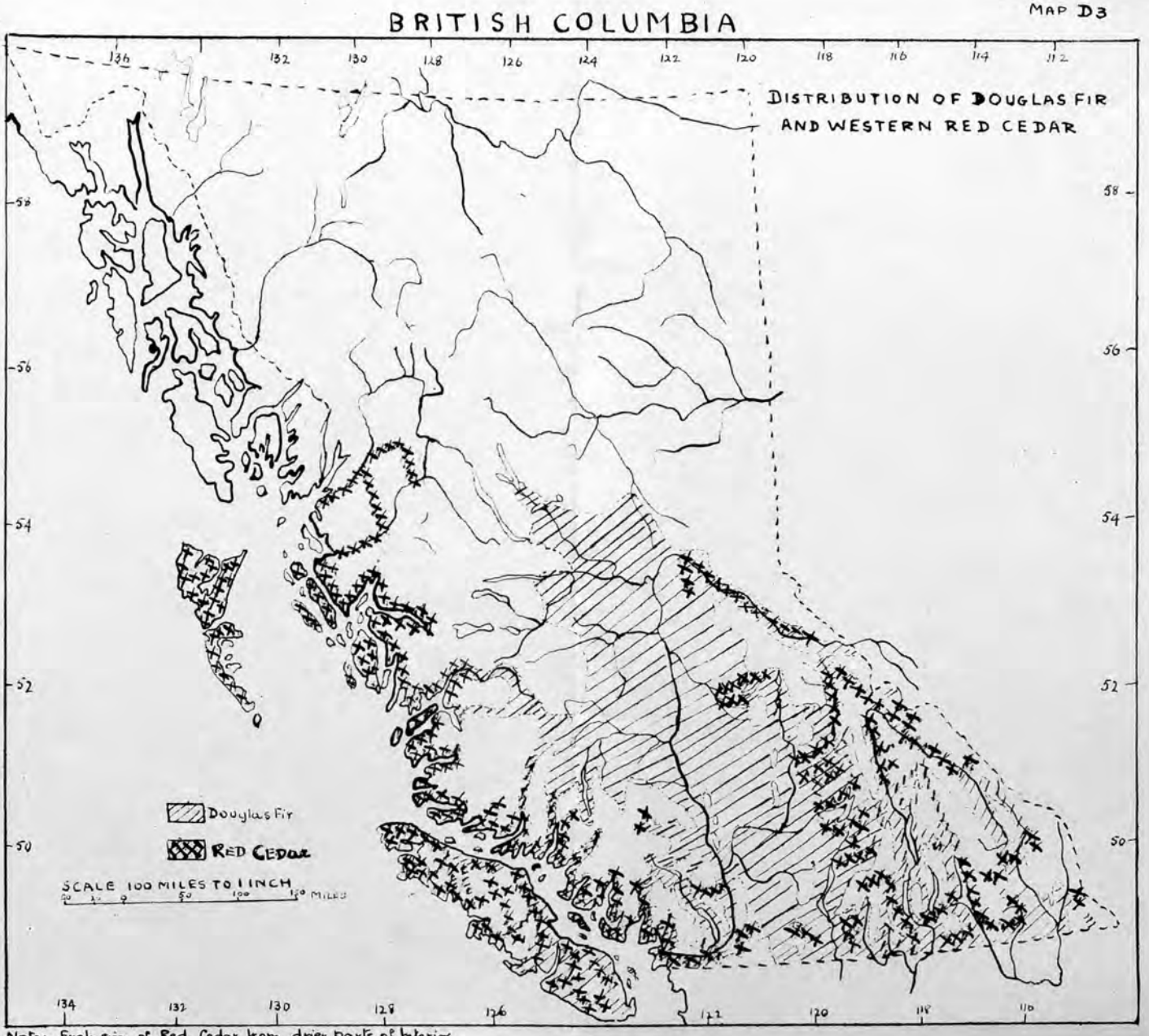
MAP D1.


SCALE 55·8 MILES TO 1 INCH
(1:3,500,000 Approx)
50 25 0 50 100 150 200 MILES

D2

BRITISH COLUMBIA





Note:- Exclusion of Red Cedar from drier parts of Interior.
" - both from Northern Regions.

BRITISH COLUMBIA

D4

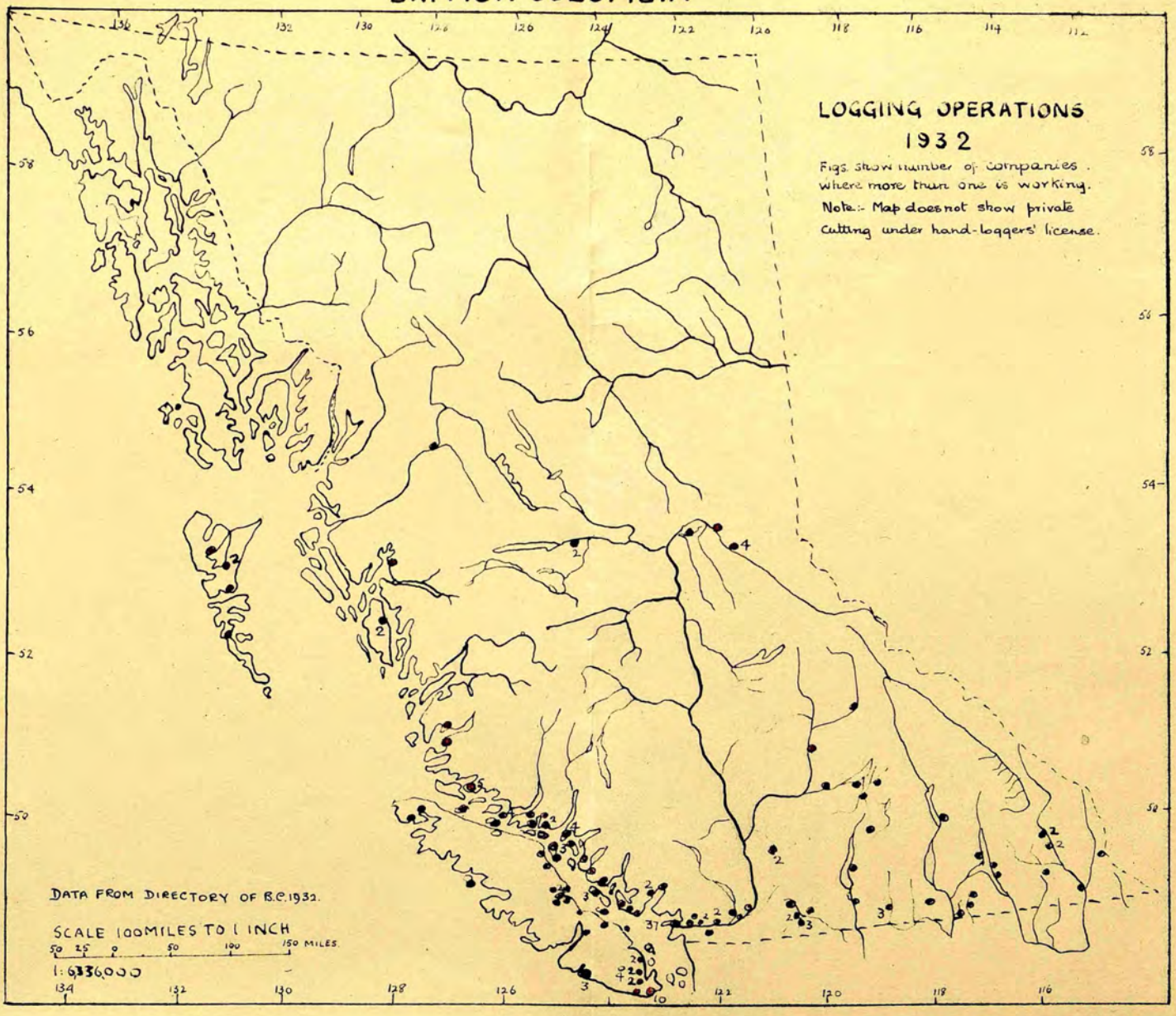
Note:- Though Douglas Fir occurs in the Interior (cf. D3) the stands are much lighter than on the Coast. Greatest reserves on Vancouver Is.

D.5.

BRITISH COLUMBIA

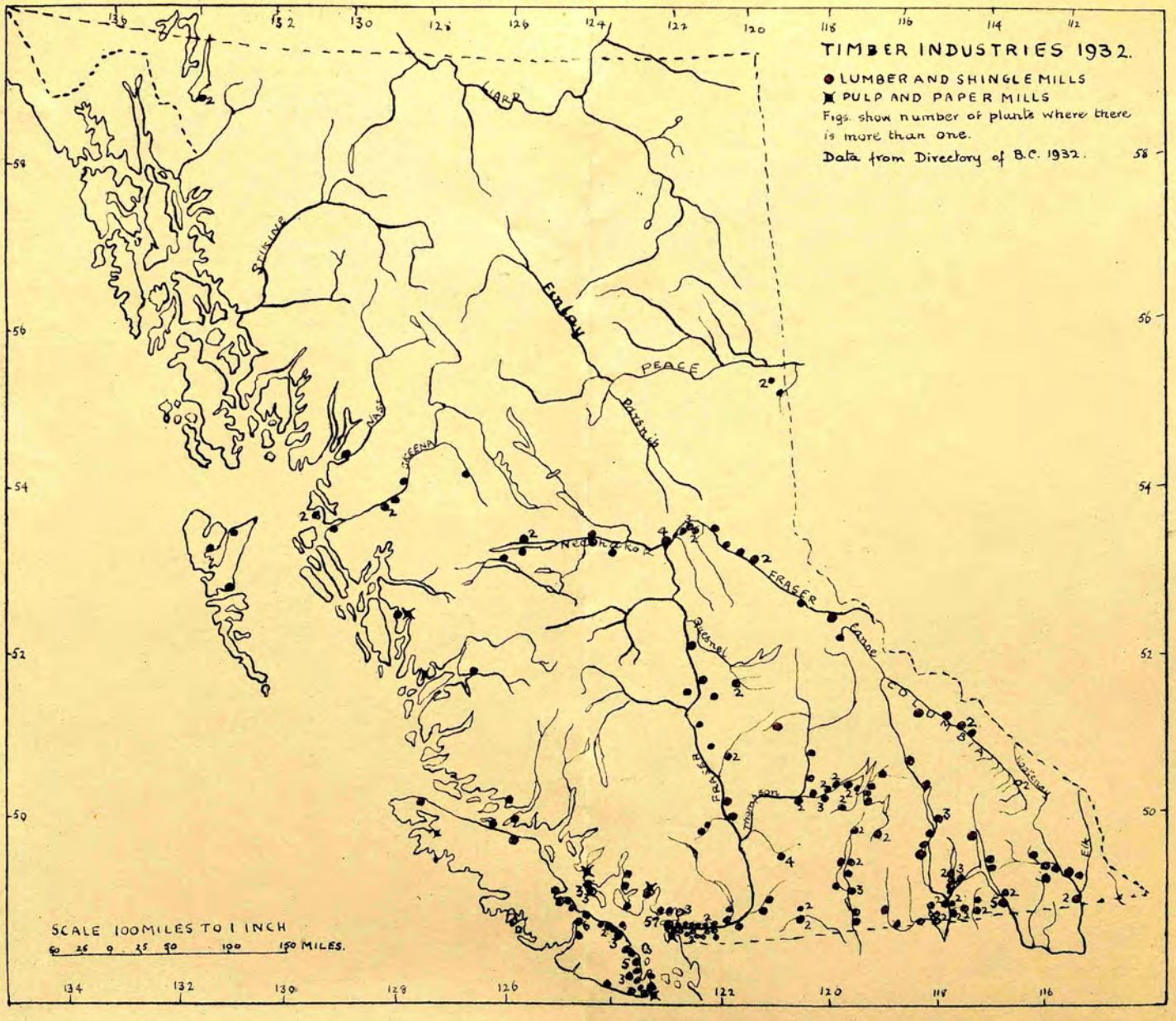
Note - Cf. D4. Pulpwoods form bulk of forests of Central and Northern B.C.

BRITISH COLUMBIA



BRITISH COLUMBIA

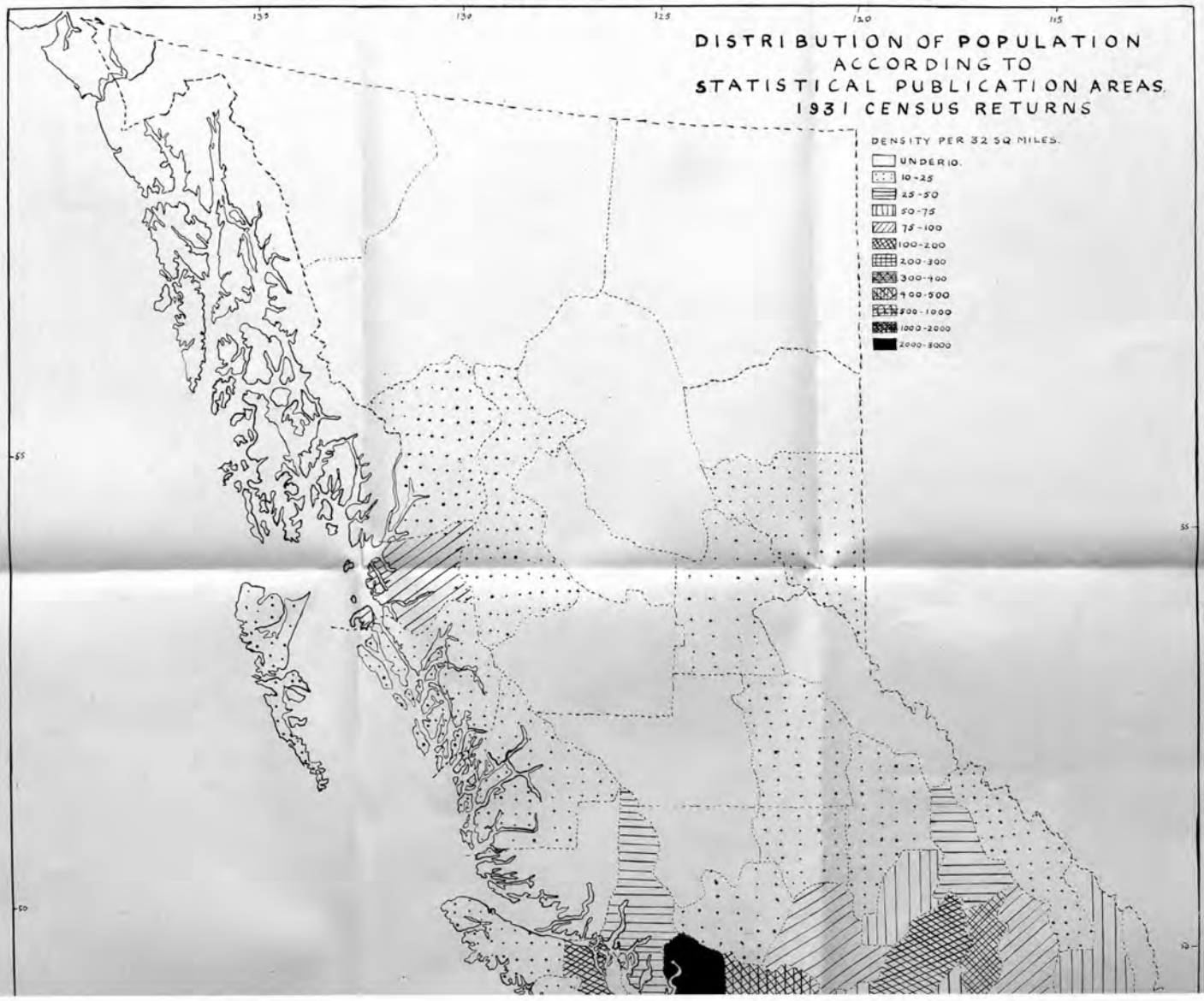
D7.

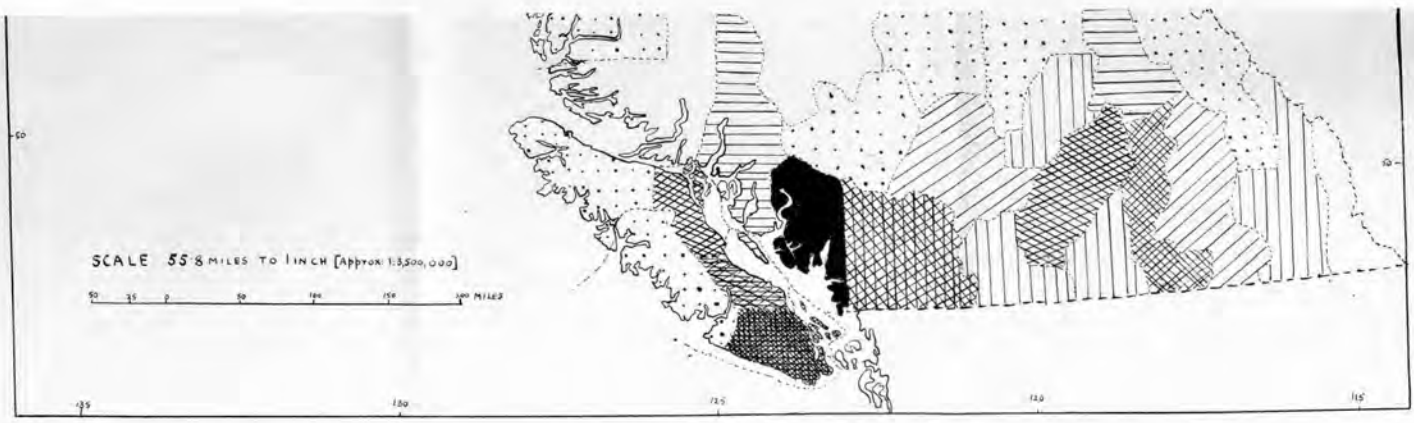



BRITISH COLUMBIA
F
FISH INDUSTRIES 1932
Nass R.
Arrandale
Pr. Rupert
Skeena R.
Charlotte
Butedale
Bella Coola
Rivers Inlet
Quatsino Sd.
Tofino
Kyuquot Sd.
Nootka Sd.
Clayoquot Sd.
Nanaimo
Vancouver
Barkley Sd.
Malcolm
Victoria
Fraser R.
C Fish Curing
● Fish Canning
X Manf. of Fish Meal and Oil
[Figs. show no. of plants when more than 1]
SCALE.
0 25 50 100 150 200 Miles.

BRITISH COLUMBIA

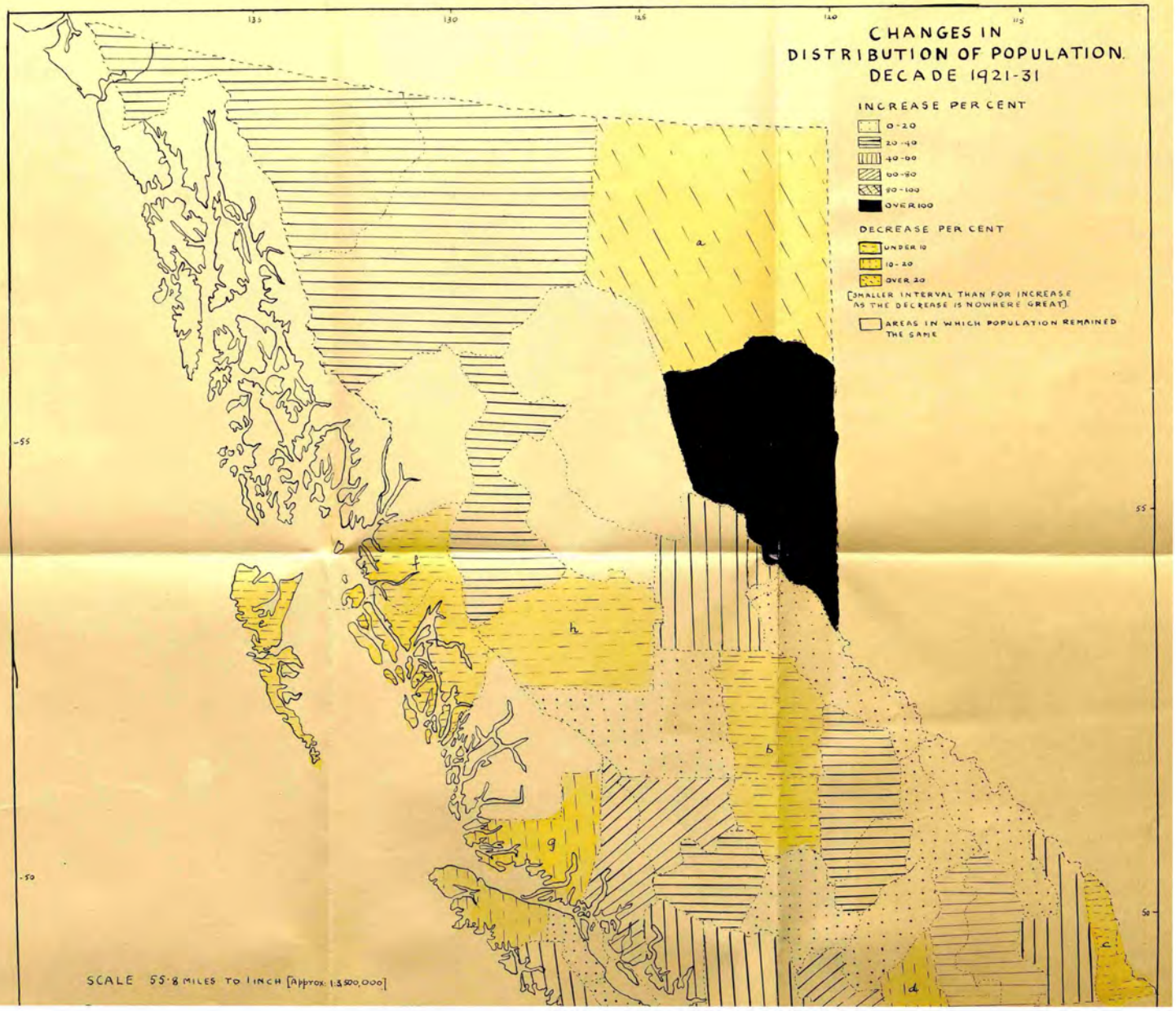
MAP G1.

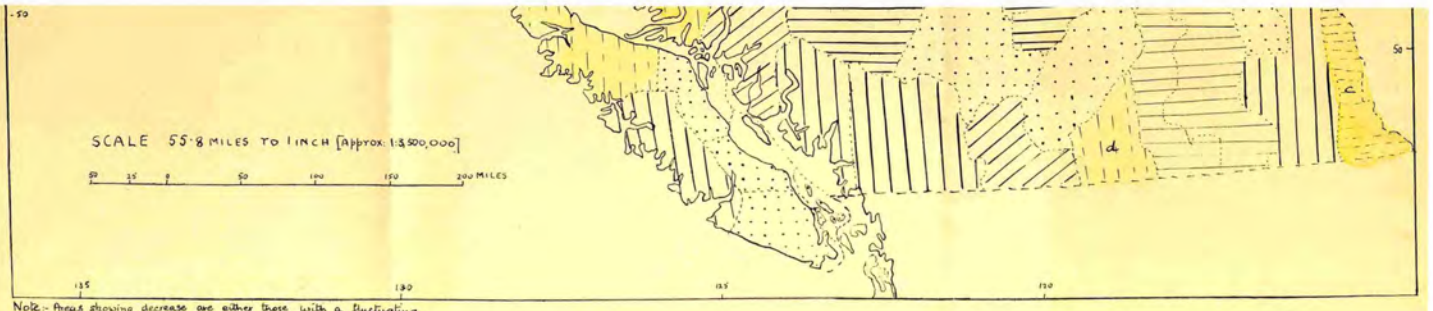



SCALE 55·8 MILES TO 1 INCH [Approx: 1:3,500,000]
50 25 0 50 100 150 200 MILES
50
50
135
130
125
120
115

BRITISH COLUMBIA

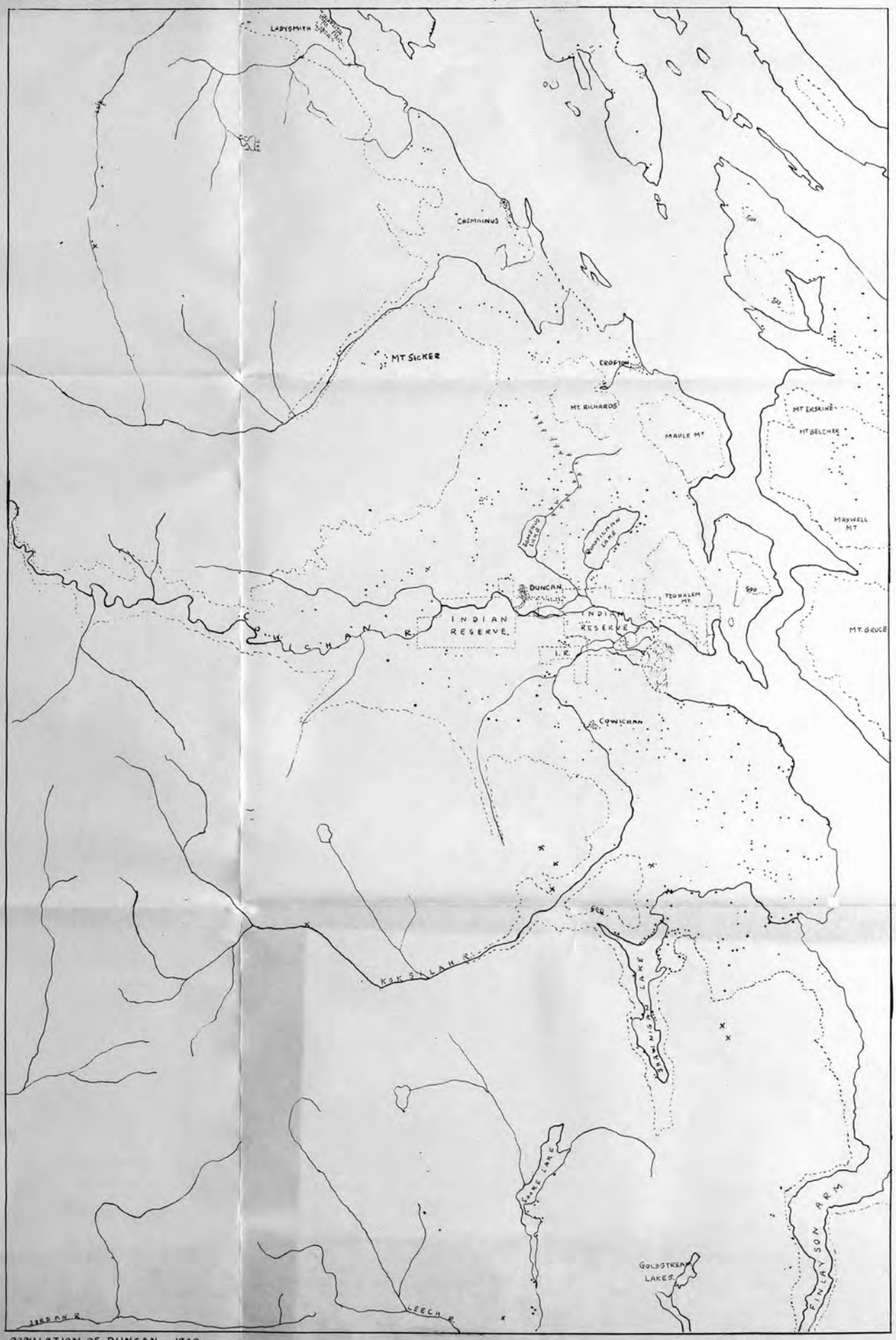
MAP G2





Note - Areas showing decrease are either those with a fluctuating population of miners, as in a, b, c, d, or those in which the Great War temporarily stimulated Forestry, as in e, f, g. In some cases returned soldiers and new immigrants took up land which they have since abandoned, as in h.

DISTRIBUTION OF SETTLEMENT
PART OF EAST COASTAL REGION, VANCOUVER ISLAND



POPULATION OF DUNCAN 1840
" " LADYSMITH 1440
" " CHEMAINUS 1000
" " CROFTON 200

NOTE - CONTROL EXERTED BY HIGHLAND. CF MAP A4
EVEN SETTLEMENT OVER LOWLAND. LOCATION OF
FARMS DETERMINED BY ROADS.

SCALE 1:125,000
1 0 1 2 3 4 5 6 7 MILES.
SCALE APPROXIMATELY 2 MILES TO 1 INCH.

- BUILDING.
--- 500-FOOT CONTOUR.
⊗ MINE
X MINING PROSPECT

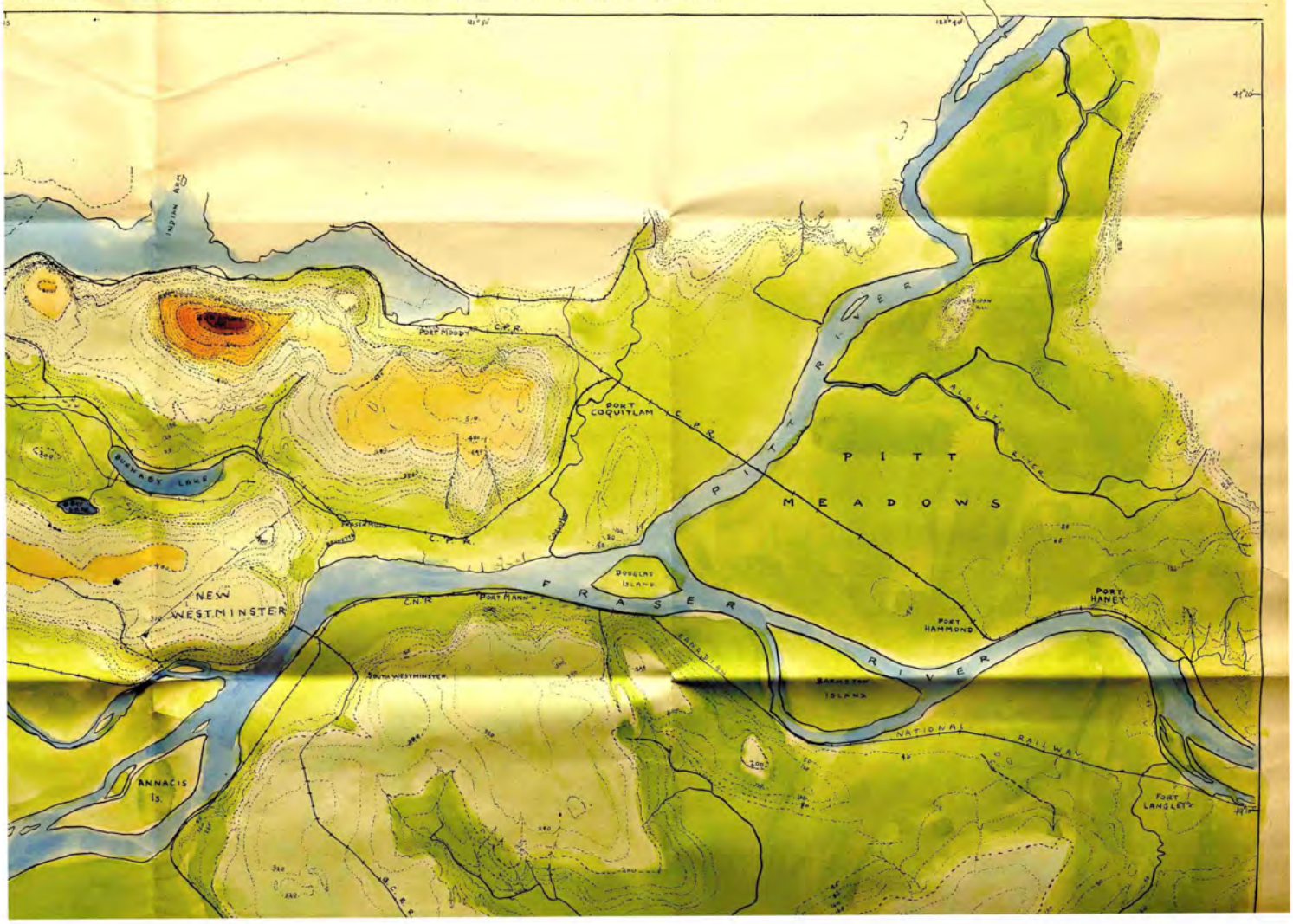
BRITISH COLUMBIA

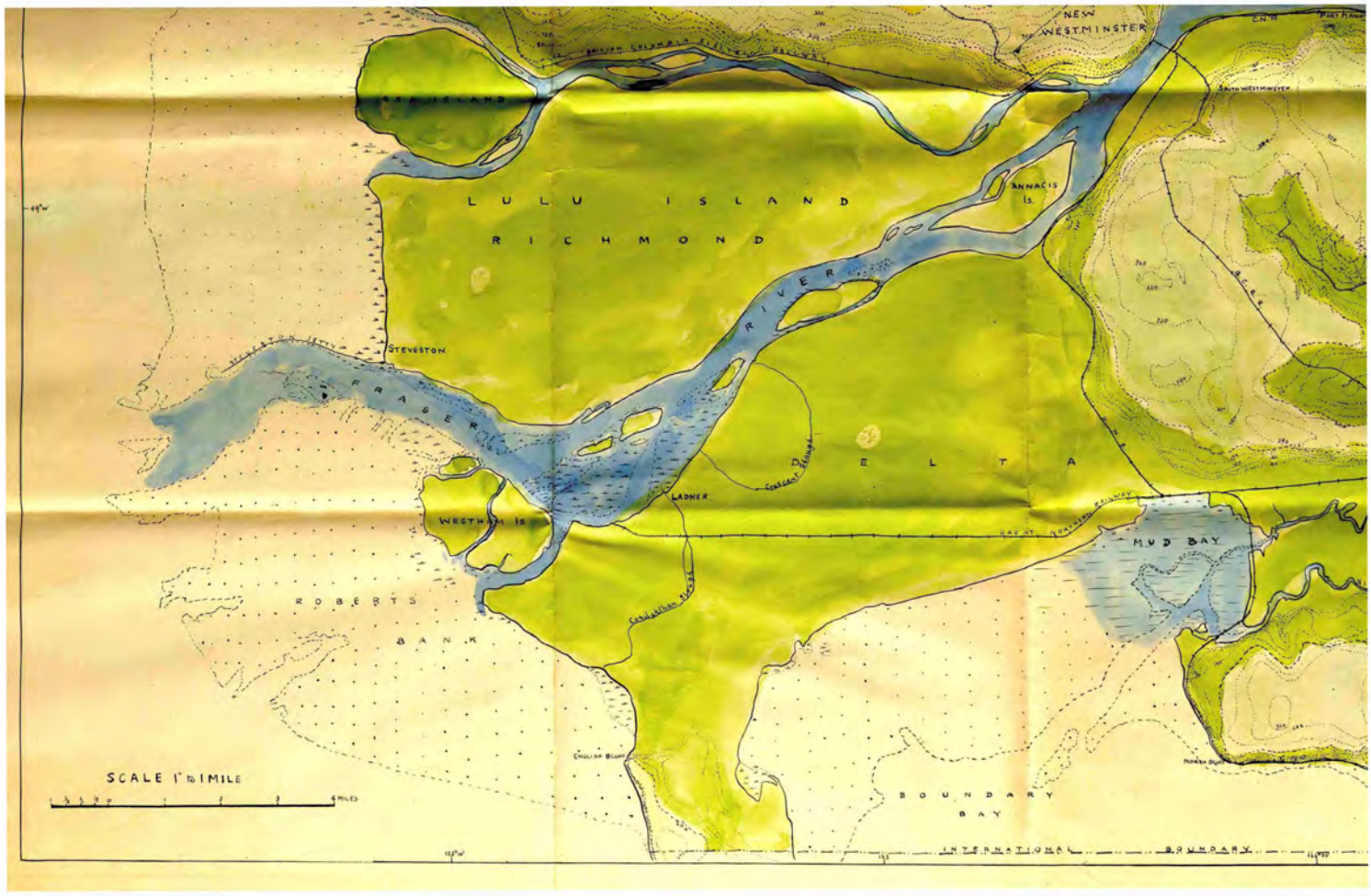
B2.

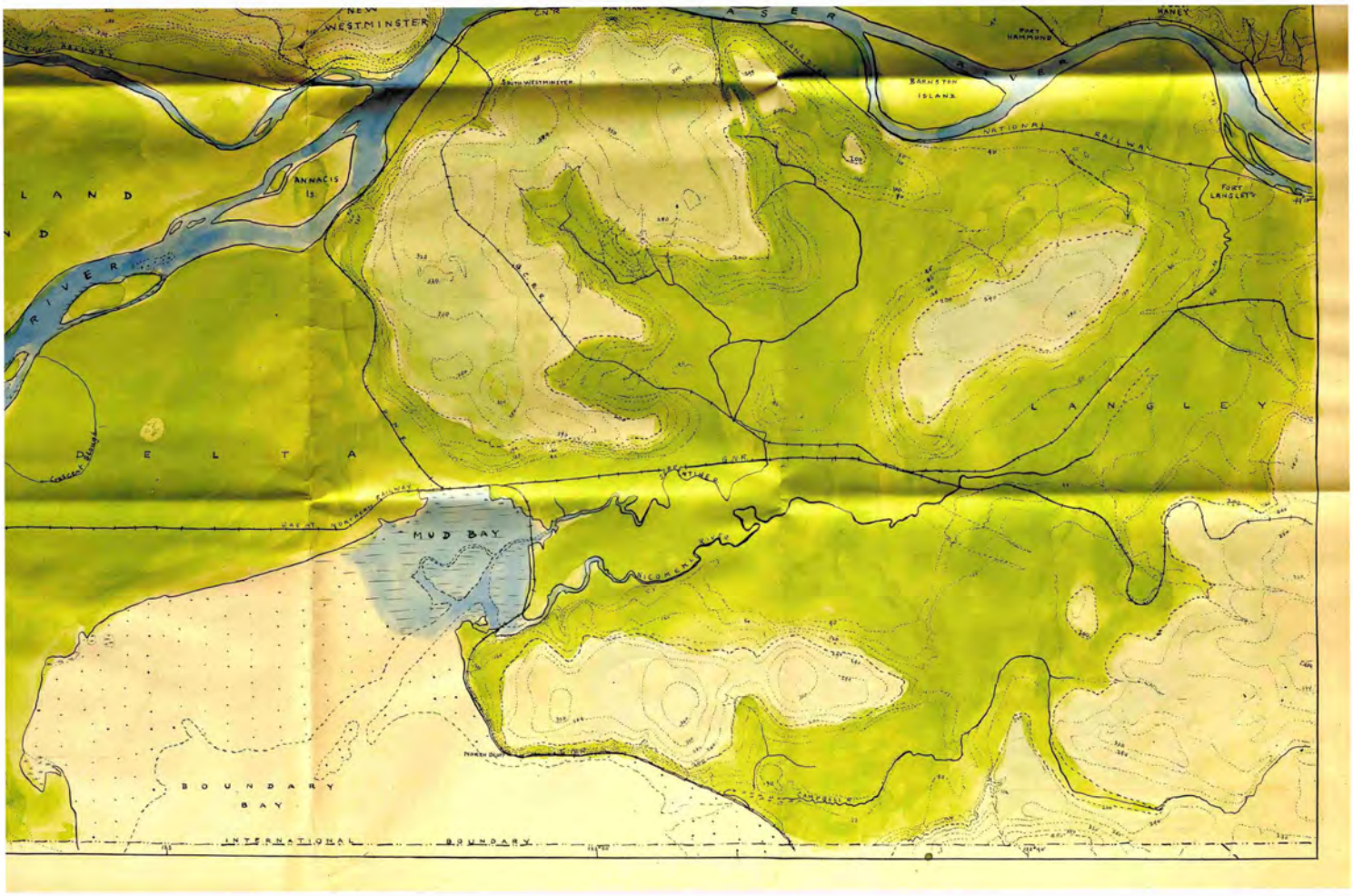

50 25 0 50 100 150 200 MILES
SCALE 55.8 MILES TO 1 INCH
YELLOWSTONE
CUMBERLAND
NANAIMO
LANCASTER
BERKLEY
BURKETT
COLETON
COPPER
G. THUR
SALMO
S.L.Z.
FRANCIS

TOPOGRAPHY OF LOWER FRASER R

LOWER FRASER REGION




NEW WESTMINSTER
LULU ISLAND
RICHMOND
ANNACIS IS.
RIVER
STEVESTON
FRASER
DELTA
LADNER
WESTHAM IS.
MUD BAY
ROBERTS BANK
BOUNDARY BAY
INTERNATIONAL BOUNDARY
SCALE 1" to 1 MILE


NEW WESTMINSTER
SOUTH WESTMINSTER
FORT HAMMOND
HANEY
BARNSTON ISLAND
NATIONAL RAILWAY
FORT LANGLEY
ANNACIS IS.
LAND
RIVER
DELTA
LANGLEY
MUD BAY
BOUNDARY BAY
INTERNATIONAL BOUNDARY