GEOGRAPHICAL BULLETIN

No. 3 1953

GEOGRAPHICAL BRANCH
Department of Mines and Technical Surveys
OTTAWA, CANADA

GEOGRAPHICAL BULLETIN

Address all correspondence to the Director, Geographical Branch, Department of Mines and Technical Surveys, Elgin Building, Ottawa, Canada. *Geographical Bulletin* will be mailed, post-paid, for 50 cents a copy.

CONTENTS

60288—1½

PREFACE

The articles in this number reflect aspects of work done in economic and social geography. Although they are parts of larger studies it is to be hoped that they are entities in themselves. Their purpose is to show how, under quite different circumstances and in different regions, the geographical pattern reveals the close adjustment of development and settlement to the physical environment.

In the interior of British Columbia it is indicated how topography and drainage, climate, and vegetation have not only produced a ranching way of life, but have set their mark upon different types of ranching and suggested in what areas they might be successful.

Farther north, in the Yukon, the study of Dawson shows how the city responded both to the immediate site and to its wider setting as a place to bring together routes over a wide area from which to tap the Yukon gold. The problems of its growth and decline are described in the geography of function and form.

The Lesser Slave Lake region does not have the strong relief of the Cordilleran studies, but is of interest as an area of critical climatic influence. The physical environment is perhaps all the stronger in its effect because the economic margins between success and failure are smaller than in more well-endowed areas. It is often the case that the geographic factor becomes most obvious at the economic frontier. Where there is a larger margin of safety, adjustment to topography, climate, and soils is likely to be less rigorous.

The fourth article is written about an area far removed from the others: the Strait of Canso, Nova Scotia. But it, too, reveals the close dependence of economic welfare on physical geography, by showing to what extent topography has controlled the landward contacts of Cape Breton Island.

In spite of their emphasis on the physical background of development and settlement these articles nevertheless bespeak the fact that different social systems and different economies can and do make a very different use of the physical environment and so produce changing geographical patterns, from one era to another. In other words, although the physical environment may remain a relatively unchanging and unchangeable thing, it is subject to various interpretations; it cannot be said to lay down any course of action or provide any "plan" for development. It may produce an altogether new geography of occupation, movement, and settlement in new historical, economic, or social circumstances.

Thus there is the need to study the geography of a region not only in relation to the "given" factors of position, relief, climate, and resources, but also to the "developed" factors of economy and society. Taken together, these provide the knowledge of past trends that are behind existing patterns and that are creating the patterns of the future.

J. WREFORD WATSON,
Director, Geographical Branch

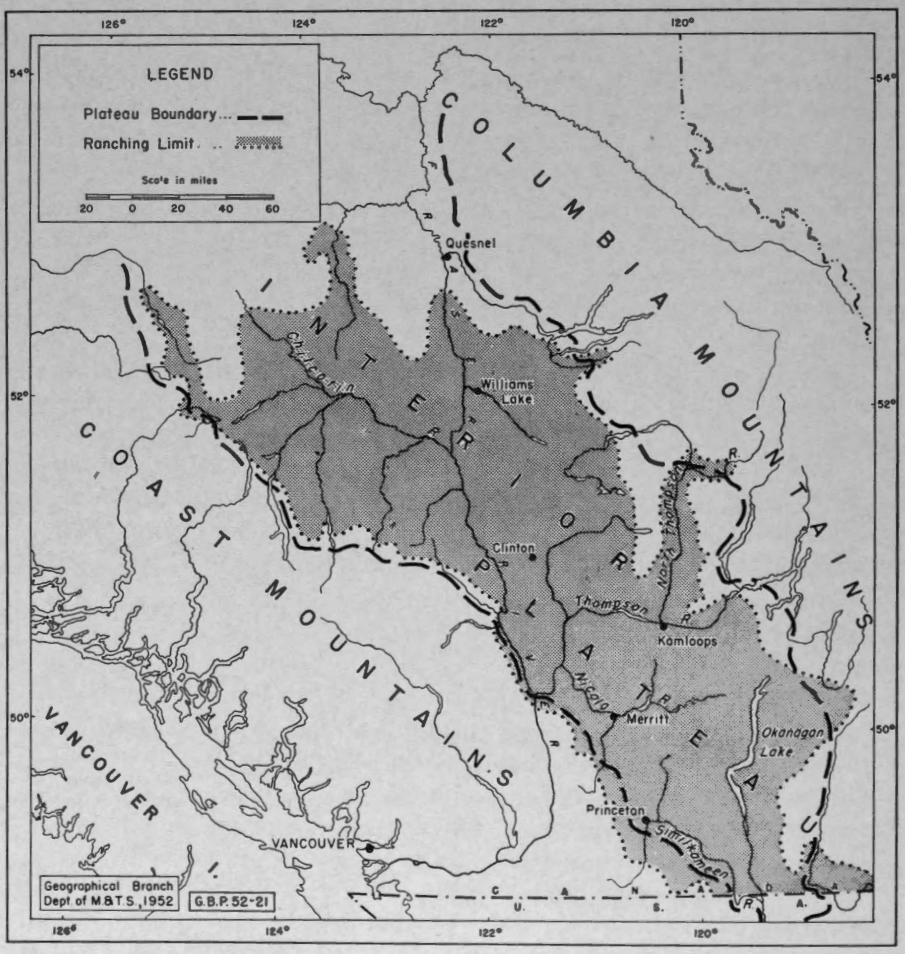


Figure 1. Location map.

THE PHYSICAL BASIS OF RANCHING IN THE INTERIOR PLATEAU OF BRITISH COLUMBIA

Thomas R. Weir[1]

One of Canada's two principal areas of livestock ranching is found in the southern Interior Plateau of British Columbia. Since the ebb of the Cariboo gold rush in the 1860s, this area of 31,000 square miles has remained the domain of the cattlemen, and to a lesser extent of the sheep herder. Ranching outliers of minor importance do occur in valleys to the southeast, but in these districts cattle raising is subordinate to horticulture and lumbering. Consequently, except for sheep raising, this paper excludes the Okanagan Valley.

The outer limits of the ranching area, that is, the area in which the raising of livestock by range methods is the principal economic activity, conform closely with the boundaries of the Interior Plateau physiographic region (Figure 1). On the west rise the peaks of the Coast and Cascade Mountains from 1,500 to 2,000 feet above the average level of the plateau, and the Cariboo and Monashee Mountains, two of the major subdivisions of the Columbia Mountains, form a similar bulwark on the east. Only in the north is topography not significant. Here the boundary follows the drainage divide between Chilcotin and Nechako Rivers, tributaries of the Fraser, where close timber stands invade the valleys replacing the desirable range grasses, and upland meadows give way to muskeg.

The physiographic boundaries are also areas of economic transition. Along the eastern and western margins, ranching as a principal industry is superseded by lumbering, mining, and recreation. On the north and again to some extent along the eastern margin mixed farming replaces cattle raising.

Within the ranching area thus defined several physical factors are favourably integrated for the ranging of livestock (Figure 2). Open and semi-open grassland at lower elevations make excellent spring and autumn range, and lightly timbered uplands afford sufficient forage for summer grazing. Valley terraces provide suitable sites for the cultivation of hay for winter feeding, and wild hay meadows interspersed through the timber on the uplands permit autumn grazing. Numerous small streams rising in lakes and swamps on the uplands supply water for stock and for irrigation in the valleys below. A rolling to hilly topography, on the whole not too steep for cattle except along the face of deeply entrenched valleys, provides accessible range. Except along the margins, winter conditions favour the rustling of stock well into December and sometimes January. At intervals on the mountain rim of the plateau alpine meadows serve well as sheep pasture in the summer.

[1] Thomas R. Weir, B.A., British Columbia, M.A., Syracuse, Ph.D., Wisconsin, Associate Professor of Geography, University of Manitoba. Leader of Geographical Branch party to the Interior Plateau of British Columbia during the summers of 1948 and 1949.

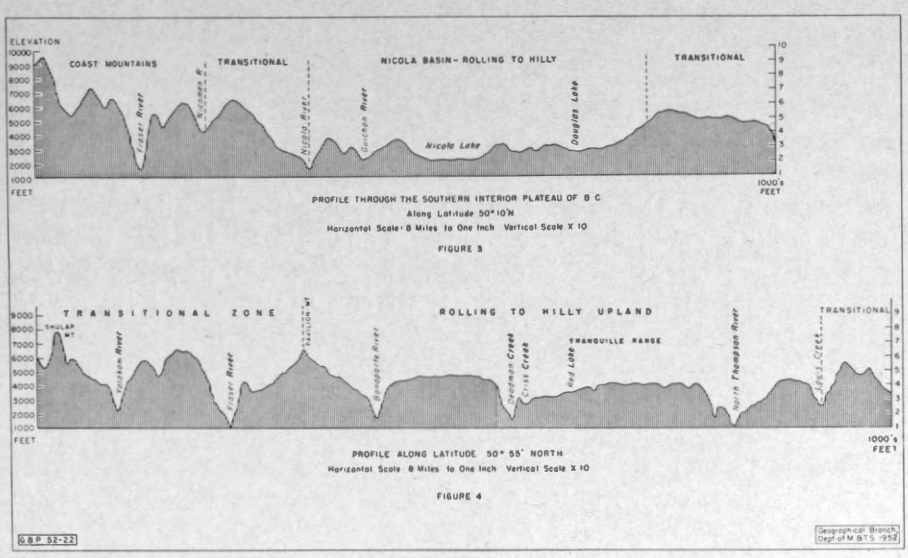
Figure 2. Panorama of Upper Hat Creek Valley, looking west toward the mountains. The valley bottom is irrigated whereas the piedmont slopes afford spring and autumn grazing with summer range on the timbered upper slopes.

Beyond the margins of the plateau the relief is too great, the grazing season too short, and the timber too dense to permit the profitable extension of the ranching industry.

An appreciation of the geographical aspects of ranching may be obtained by analysing certain basic distribution patterns, particularly range types and livestock distribution. These in turn depend largely upon fundamental physical elements such as relief and drainage, climate, and native vegetation.

RELIEF AND DRAINAGE

Fraser River and its principal tributaries, the Chilcotin, Thompson, and Nicola, together with the Similkameen in the extreme south, have carved the plateau into a system of uplands separated by deeply incised valleys. The resulting local relief is in many places measured in thousands of feet (Figures 3 and 4). Kamloops Lake, 1,123 feet above sea-level, lies 4,500 feet below the upland to the north, no more than 10 miles distant.



Figures 3 and 4. Profiles through the southern and central parts of the Interior Plateau ranching area. Figure 3 shows the Nicola Basin, an erosional feature of subdued relief and lower elevation. Figure 4 shows the rolling interfluves separated by deeply entrenched valleys, and the greater relief of the marginal zone.

The Chilcotin near its confluence with the Fraser flows in a valley 1,500 feet below the plateau, and the Fraser in its middle course is frequently entrenched 3,000 feet. Such sharp vertical differences are reflected in profound climatic and vegetation changes over a relatively small area.

Of great significance to the ranching industry is the system of extensive terraces that line the courses of the principal streams and their lower tributaries. Areas of conspicuous terrace development are referred to

locally as benchlands. Extensive areas of benchland affording potential sites for the cultivation of winter feed as well as ideal range are found in the valleys of Thompson River and its tributaries, in the middle Fraser from Alexandria to Big Bar Creek, and in the Chilcotin from its confluence to Alexis Creek. Wherever an upland stream cuts through such benchland to join the main stream in the valley below, it may be diverted into irrigation ditches running along the upper edge of the benches and so bring water to many acres of highly productive alluvial soil. The lower benches are thought to have been formed by the deposition of white silts in quiescent waters that filled the broad valleys during glaciation. The dark brown soils of the benches formed under a cover of grass in a semi-arid climate produce prodigious amounts of timothy and alfalfa for winter feed. Where streams have not become deeply entrenched (generally under 500 feet) their flood plains are frequently irrigated by upstream diversion ditches and so constitute important sites for cultivated hay. Such valleys as the San Jose in the Cariboo and the lower Bonaparte in the Lillooet district lend themselves to this form of cultivation. Abandoned valleys such as the Semlin, which at one time was the lower course of Bonaparte River, have been irrigated by diverting water from neighbouring streams.

In two localities, both in the southern limits of the plateau, the valleys are sufficiently broad to be considered basins. Princeton basin has been formed by the erosion of several streams converging on Similkameen River at one point. The uplands are so high as to preclude the development of range grasses, but the lower elevations of the basin have favoured the growth of bunchgrass, thereby supplying the basis for a separate ranching community. Again, the basin of the Nicola (Figure 5), probably the bed of a former lake fed by several glacial streams converging at this point, sustains the greatest concentration of range cattle in the province (*See* Figure 19).

Tabular uplands (above 3,000 feet) separated by the trough-like valleys collectively comprise about three-quarters of the grazing area. Whereas in general the relief of the uplands is moderate, it is possible to distinguish three categories each conforming to a sub-region (Figure 7). These may be described as: (1) undulating to rolling; (2) rolling to hilly; (3) hilly to mountainous, or transitional. The first characterizes the northern half of the ranching area, including the Chilcotin, Cariboo, and Lillooet districts. The second begins with the uplands north of Thompson River and includes Thompson valley and the Nicola and Princeton basins to the south. The third or transitional zone occupies the periphery of the plateau, becoming more extensive along the southern margins.

Relief differences in each zone are the result of differences in the kind and structure of the underlying rocks, elevation, and erosional history. The undulating to rolling relief of the northern sub-region, generally not more than 500 feet, is caused by extensive lava flows resembling those of the Columbia Plateau in Washington. Low massive forms due to doming and the occasional monadnock here and there break the gentle relief of the

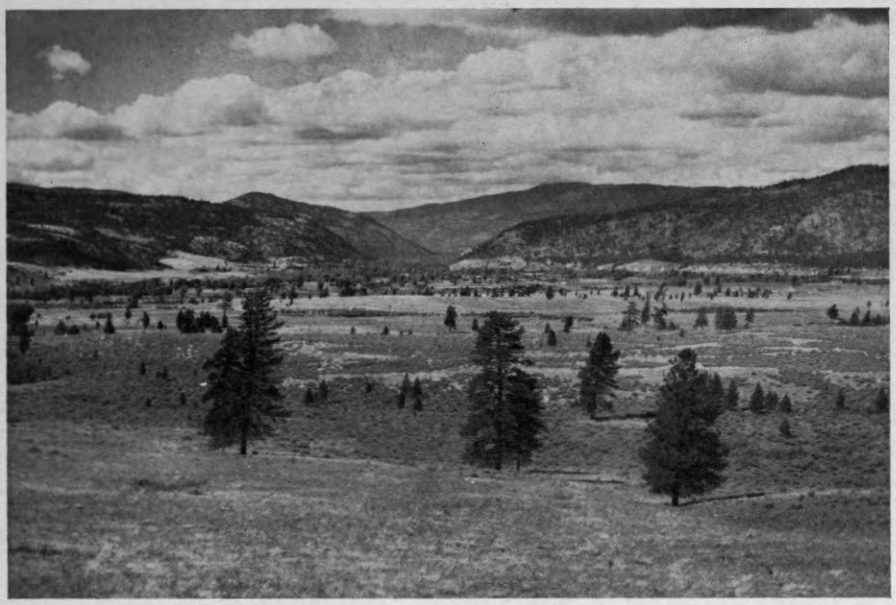


Figure 5. The Nicola Basin near Merritt reflects a steppe climate with sagebrush, bunchgrass, and yellow pine typical of early spring and late autumn range.

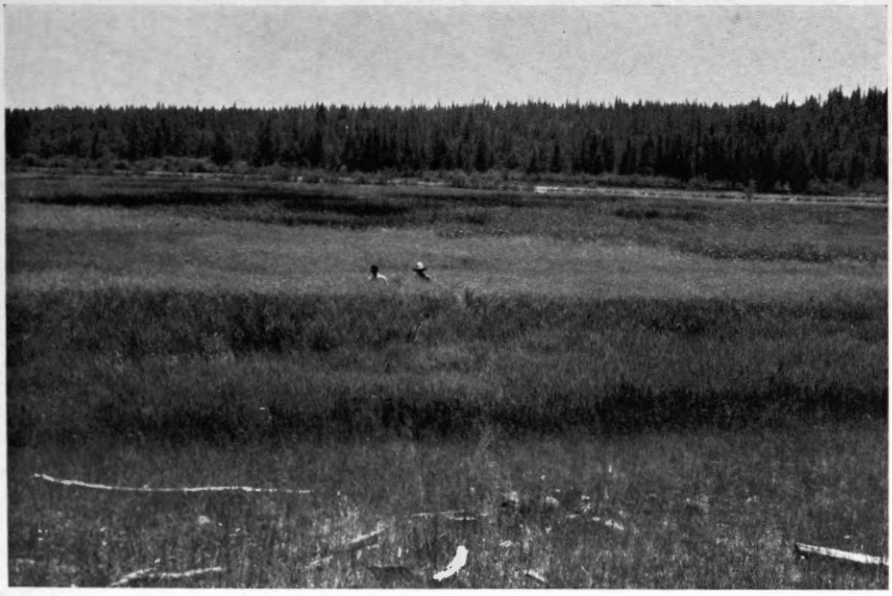


Figure 6. Marsh grass and sedges growing shoulder high around the margins of a swale in the Cariboo. Frequently such land is cut for hay in the summer and grazed over in the autumn. Dense stands of lodgepole pine cover the upland.

upland. Rolling to hilly relief, characteristic of the southern half of the ranching area, may be attributed to greater average elevation (4,500 feet) and the heterogeneous character of the bedrock. Volcanics are found closely associated with sedimentaries, which in turn have been intruded over wide areas by granitic rocks forming a complicated geological pattern. In consequence, differential weathering and erosion of unlike rocks, especially along zones of contact, have produced a hilly terrain in contrast with the more undulating surface to the north. Greater relief of the transitional zone, much of which exceeds 1,500 feet, is attributed to mountain-making forces that affected the margins of the plateau. Summits are rounded and many level off at 6,000 to 7,000 feet, favouring the development of alpine meadows.

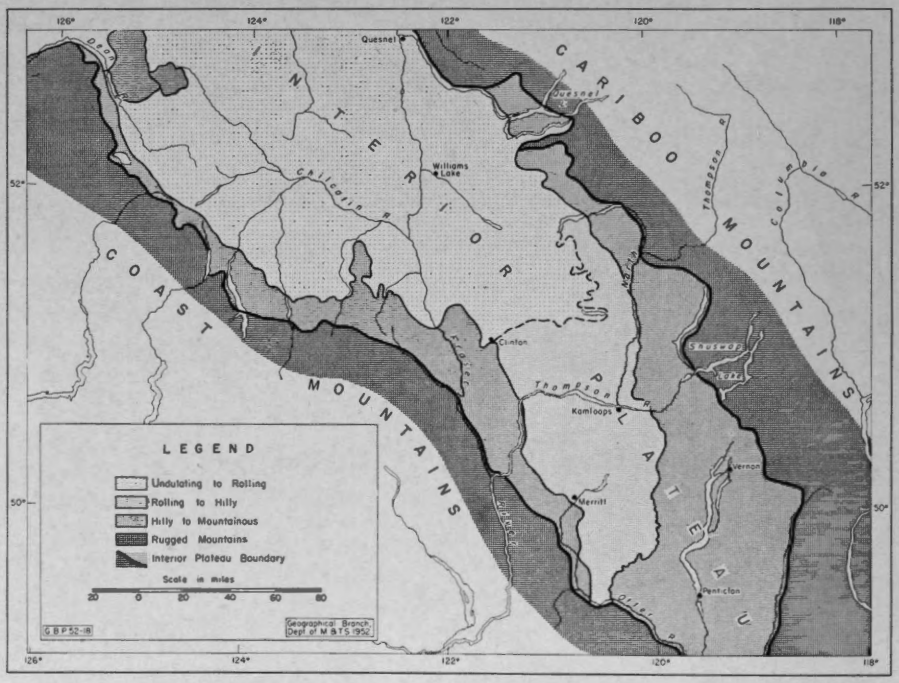


Figure 7. Generalized relief of the Interior Plateau of British Columbia.

During the Pleistocene the entire plateau was covered with an ice-sheet leaving a mantle of drift in its wake up to elevations of 5,000 feet. Except in the major valleys former drainage lines were filled in and the present surface became pitted with irregularities resulting from the uneven deposition of ground moraine.

Poorly drained swales on the timbered upland are referred to locally as swamp meadows, whereas those at lower elevations below the timber are known as pot-holes. Many of the former lend themselves to flooding by artificial means in the spring and are later drained and cut for hay.

The pot-holes, when not too saline, serve as valuable watering places for cattle on the lower range. Numerous lakes, frequently dammed by moraine, serve as storage reservoirs for irrigation water.

The three major categories of relief underlie three fundamentally different ranching practices. The northern sub-region with a gently undulating to rolling surface is poorly drained, with the result that swamp meadows occur in great numbers (*See* Figure 15). As a result at least

Figure 8. Alpine summer range grazed by cattle in the southeast Chilcotin. (Courtesy Grazing Division, British Columbia Department of Forestry.)

one-third of the ranchers in this area depend entirely on wild meadow hay, and the remaining two-thirds use it to some extent (Figure 6). Such meadows comprise most of the grazing land in the autumn and a large proportion in the summer. In the southern sub-region, on the other hand, where greater relief has resulted in better drained uplands, swamp meadows are proportionately fewer. This, in turn, has required the cultivation of hay by irrigation on the part of 85 per cent of the ranchers. Also, as twice

the area of lowland and benchland is found in this sub-region, dependence on the swamp meadow for autumn grazing is not necessary. In the third sub-region, that of hilly to mountainous relief found on the periphery of the ranching area, rounded summits frequently rise above timber-line into the zone of alpine grasses affording excellent summer range for sheep and in a few instances for cattle (Figure 8). In this sub-region in particular the practice of transhumance is a necessary adjustment where relief is measured in hundreds of feet.

CLIMATIC CONDITIONS

The pattern of climates according to Köppen[1] reveals two basic types: *steppe* in the valley bottoms and *snow-forest* on the uplands. Included within the area of *steppe* (BSk), generally below 2,300 feet, is the lower Nicola Valley, the South Thompson and the middle Fraser Valley from Lytton to the lower Chilcotin (Figure 9)[2]. The uplands above ± 3,000 feet belong to the *snow-forest* or humid continental type with short summers (Dfb and Dfc). Thus the semi-arid climate is typical of the deep valleys whereas the uplands have sufficient moisture to support a light forest cover. Intermediate elevations represent a zone of transition reflected in a change from grassland to forest.

Variation in the climatic pattern may be attributed to four dominant controls: latitude, elevation, topographic differences, and air masses. As the southern Interior Plateau is located between 49 and 53 degrees north, temperatures are appreciably cooler than in intermontane regions to the south such as the Columbia Plateau. This is reflected in cooler summers and a reduced evaporation rate, with the result that the uplands fall within the humid range despite a rainfall of only 12 to 14 inches a year. Elevation as a control is associated with abrupt changes in the climatic elements over a small horizontal distance. As a result, deep valleys with high summer temperatures and low precipitation fall within the steppe type, whereas the cooler uplands remain humid. At the same time the uplands are subject to late spring frosts, making the growing of vegetables above 3,000 feet hazardous. Frosts also limit the usefulness of the upland ranges. Stock begin to move down-slope when the first killing frost of September touches the succulent grasses in the timber. On the other hand, the increased precipitation of the uplands makes these areas important as watersheds. The pot-holes of the lower elevations brimming each spring with the winter's run-off become dry or saline with advancing summer.

Topographic effects related to the intermontane character of the plateau also give rise to climatic differences. As maritime air passes over the Coast Mountains it is considerably modified, becoming drier on the

[1] Köppen, W.: Grundriss der Klimakunde; Berlin, 1931.

[2] The *steppe* as shown in Figure 9 has been extended farther than suggested by the Köppen formula on the basis that the very low January average temperatures common to this latitude serve to depress the Köppen value unduly as indicated by the distribution of xerophytic vegetation.

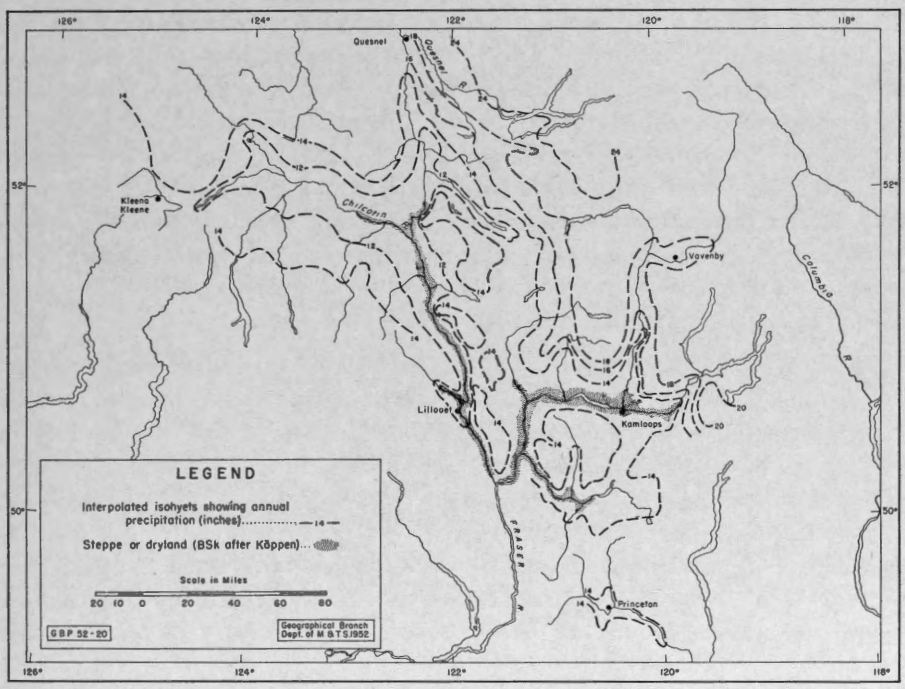


Figure 9. Climatic map of the Interior Plateau of British Columbia. Isohyets are interpolations based on the records of scattered stations.

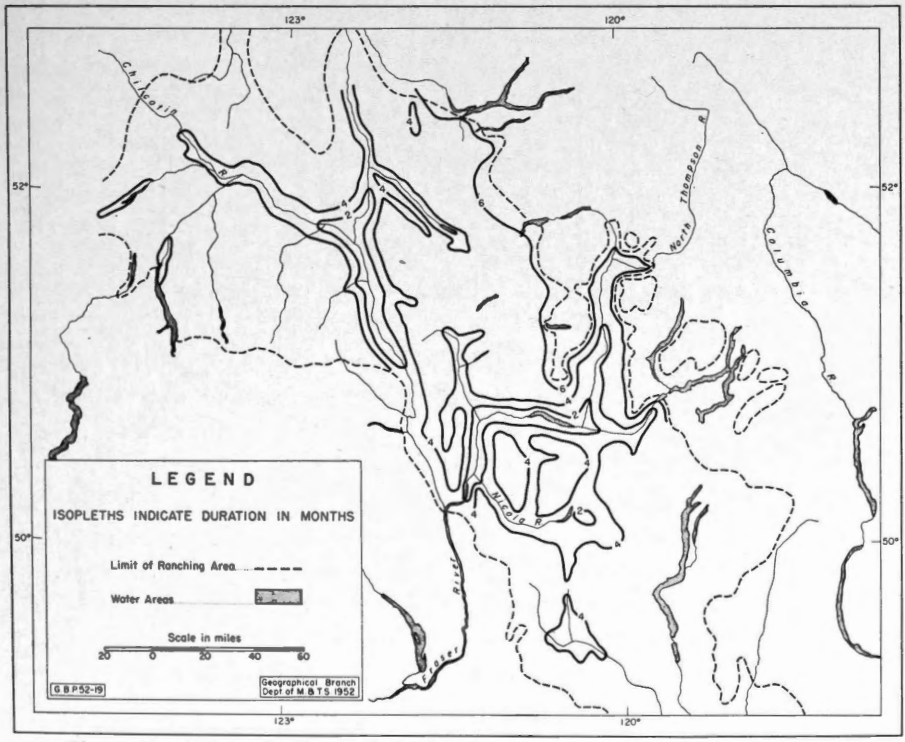


Figure 10. Winter feeding periods, based on a survey of one hundred ranches.

lee side. This is accentuated as the air moves down-slope into the deep valleys when it occasionally takes on the character of a chinook. As a result the major valley bottoms are usually free of snow most of the winter. The evaporation factor changes so abruptly with elevation that one may pass from desert conditions in a deep valley to dense timber in a vertical distance of no more than 1,000 to 1,500 feet and a horizontal distance of only a few miles. Sudden changes in elevation result in strong vertical currents of air, up-slope in the afternoon followed by cold air drainage at night. In order to escape the frost hazard most cultivated sites are on the upper margins of an alluvial fan or on valley terraces.

Air masses from without have far-reaching effects on seasonal weather conditions. During the winter a period of warm weather frequently accompanied by snowfall in the uplands is associated with the inland movement of maritime polar air. A sudden drop in temperature to minima of 30 and 40 degrees below zero with clear dry air suggests a southern thrust of polar continental air from the Yukon high pressure centre. In summer, long continued dryness broken occasionally by a convectional shower accompanies the inland movement of stable maritime tropical air. Such periods enable the rancher to secure the necessary hay supply for winter.

TABLE I

Climatic Statistics for Big Creek

(Elevation 3,100 feet)[1]

	J	F	M	A	M	J	J	A	S	O	N	D	Ann.
Precipitation (ins.)[2].....	0·75	0·71	0·83	0·51	0·96	1·78	1·40	1·54	1·21	0·77	0·92	0·96	12·34
Average temp. (° F.)[2]....	13	18	28	39	47	53	58	57	48	39	26	16	37
Absolute max. temp.[3]....	46	46	52	59	79	86	81	80	79	61	50	42	—
Absolute min. temp.[3]....	−10	−34	−17	−3	20	28	32	30	17	13	2	−26	—

The distribution of precipitation (Figure 9) conforms to upland and lowland. The former receives from 12 to 14 inches and the latter from 7 to 11 inches a year. These amounts make irrigation mandatory in the valleys and desirable in the uplands.

Temperatures are typical of inland locations. Although July averages seldom exceed 70 degrees anywhere in the lowlands, daily maxima indicate strong daytime heating, usually in the nineties. Big Creek in the Chilcotin district (Table I) and Kamloops in the Thompson Valley (Table II) are fairly typical of highland and lowland conditions respectively.

[1] Climate of British Columbia; Report for 1948; British Columbia, Dept. of Agriculture, Victoria, 1949.
[2] Averages for 49 years.
[3] For the year 1948 only.

TABLE II

Climatic Statistics for Kamloops

(Elevation 1,133 feet)[1]

	J	F	M	A	M	J	J	A	S	O	N	D	Ann.
Precipitation (ins.)[2].....	0·94	0·68	0·37	0·42	0·94	1·42	0·97	1·07	0·81	0·71	0·88	0·99	10·20
Average temp. (° F.)[3]....	23	27	39	50	58	64	70	69	60	47	35	28	47
Absolute max. temp.[4]....	47	45	63	76	92	100	94	87	86	67	54	48	—
Absolute min. temp.[4]....	9	−10	8	27	34	51	47	42	29	24	10	−8	—

Of great importance to the ranching economy throughout the area is the effect of comparatively long cold winters with a snow cover too deep to permit grazing. In consequence, large quantities of hay have to be put up each season, and on most ranches some feeding of grain is considered necessary to bring the herd through the winter. The expense involved in making such provision is the largest single item in the budget of most ranchers.

The length of the winter feeding period is the function of temperature and precipitation. Generally speaking, the upland areas, especially around the margins of the plateau, experience long-continued cold with considerable snow (30 to 50 inches), with the result that the feeding period is often from 4 to 6 months. Such areas are marginal, although the disadvantages are partly offset by an abundance of wild hay on the upland meadows. On the other hand, ranches located in the valleys have a less severe winter with lighter precipitation and, consequently, a shorter feeding period, from nil to 3 months. However, the cost of cultivating hay offsets, to some extent the economic advantage resulting from the milder winter. The close correlation between the climatic map (Figure 9) and the map of winter feeding periods (Figure 10) emphasizes the importance of climate as a major factor in the ranching economy.

NATIVE VEGETATION[5]

The combined effect of terrain, climate, and drainage finds expression in the types and distribution of the native plant cover. As grass is the raw material upon which the ranching industry depends, it constitutes the most important single element underlying the patterns of livestock distribution and range types.

The pattern of native vegetation has both a horizontal and a vertical component. The former as represented in Figure 11 shows in general the

[1] Climate of British Columbia; op. cit.
[2] Averages for 57 years.
[3] Averages for 55 years.
[4] For the year 1948 only.
[5] "Native", in contrast with cultivated vegetation, is used in preference to natural vegetation as overgrazing and fires have altered profoundly the climax plant cover.

distinction between forest and grassland types. It represents a composite of the effects of relief and climate as well as edaphic factors in defining lines of distribution. The pattern of grasslands conforms to the major lines of drainage whereas that of the forests is confined to the interfluves. Thus the southern region of greater relief with a larger area of lowland is two-fifths grassland and the northern division where elevations generally exceed 3,000 feet is only one-fifth grass covered.

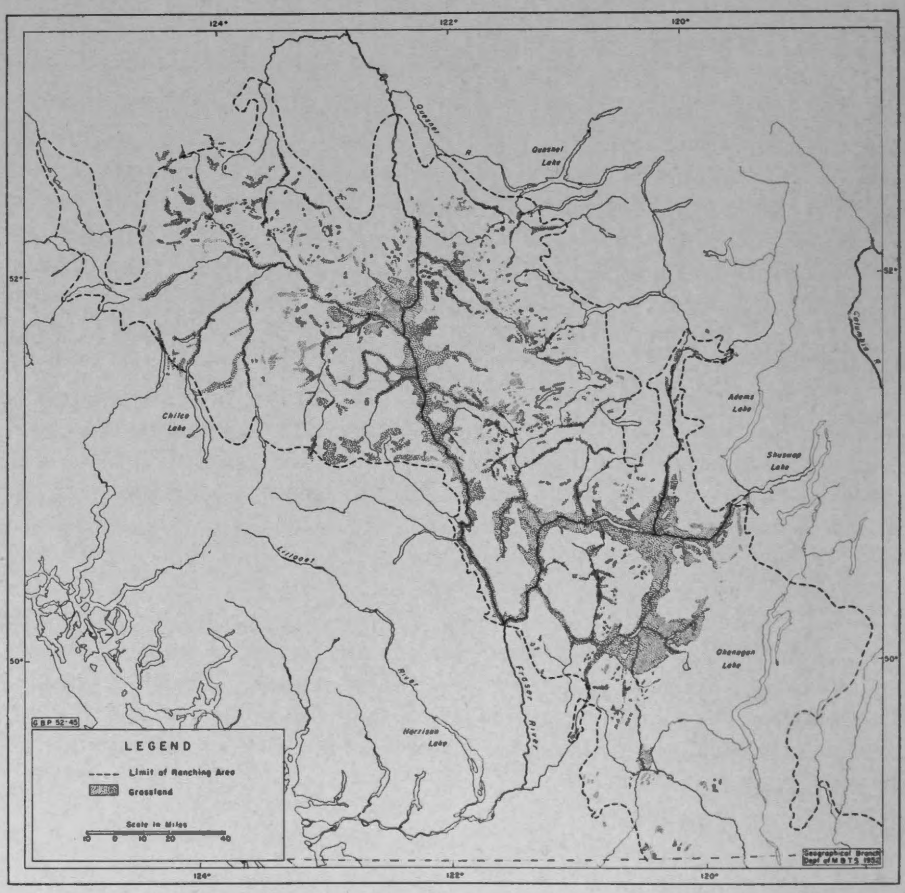


Figure 11. The distribution of native grassland in the Interior Plateau area of British Columbia.

Timbered areas on the other hand increase in extent and density both northward and eastward throughout the plateau. The northward increase is the result of greater precipitation effectiveness consequent upon higher latitude and a large expanse of unbroken upland. The increase eastward is the direct result of the decreasing rain-shadow effect of the Coast Mountains, together with the lifting influence of the Columbia Foothills, on precipitation. Such variations are apparent in decreasing cattle concentrations and a greater frequency of small marginal ranches.

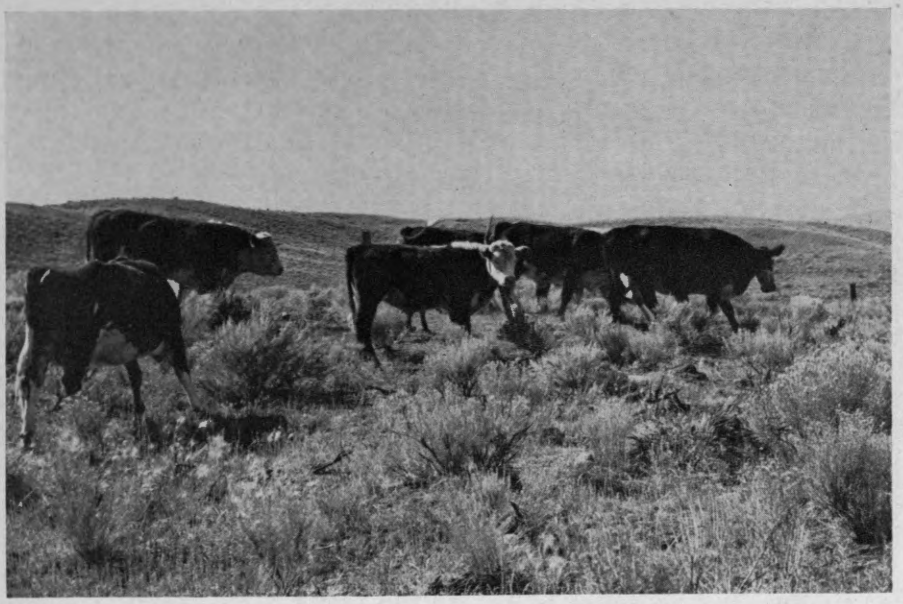


Figure 12. Hereford cattle on overgrazed (sagebrush) range in the vicinity of Ashcroft. Such range is used for spring, autumn, and sometimes winter grazing.

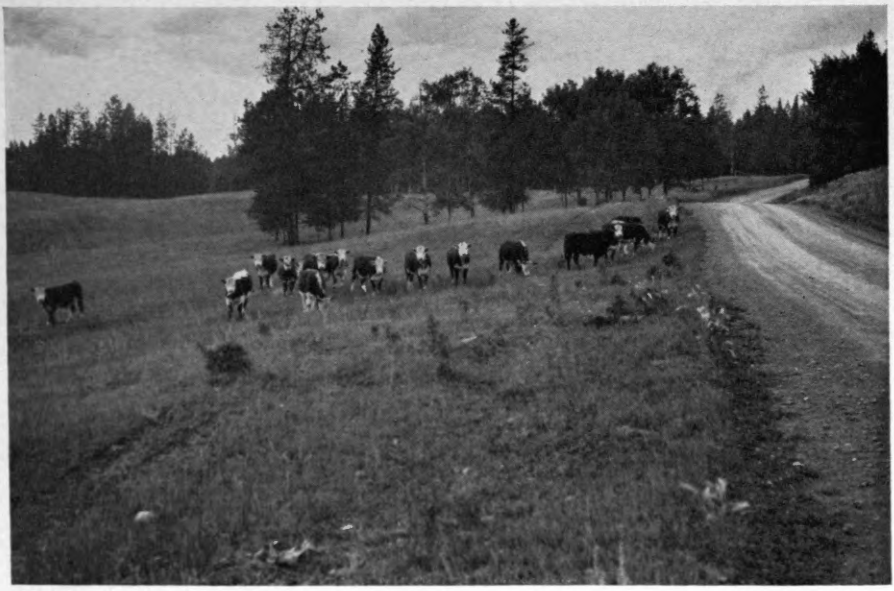


Figure 13. Park-like landscape along the Cariboo Road near 123 Mile House provides good summer range.

60288—2½

Of much greater significance than their area would suggest are the myriads of openings in the timber—tiny islands of grassland due in some cases to poor drainage occasioned by swales, or the widening of vaguely defined stream channels, or to local exposure of side-hills, or to the intervention of man. Such meadows in the northern region of the Chilcotin-Cariboo-Lillooet provide much forage during the spring and autumn and the bulk of the hay for winter.

In areas of considerable relief, such as the southern part of the region, strong temperature and precipitation gradients accompanying abrupt increase in elevation have introduced notable changes in both the pattern and types of vegetation. According to studies by Tisdale[1] in the Kamloops district, xerophytic types common to areas of steppe climate are characteristic below an elevation of 2,300 feet. Bunchgrasses, particularly bluebunch wheatgrass (*Agropyron inerme*) the climax type, provide the most attractive forage (Figure 12). Unfortunately, 90 years of heavy grazing has encouraged less palatable grasses to invade the lower ranges and a profuse growth of sage brush and rabbit bush. The results of overgrazing are also evident in a sparse forage cover and soil erosion. Above 2,300 feet the xerophytic shrubs quickly disappear, the ground cover becomes heavier in response to more moisture, and yellow pine makes its appearance in scattered clumps. From 2,700 to 3,000 feet the sod-forming types such as Kentucky bluegrass are dominant along with a variety of forbs to form a continuous cover from 1 foot to 2 feet high when not overgrazed. Within 2,700 to 3,200 feet, clumps of fir, pine, and aspen encroach on the grassland, producing a most pleasing park-like landscape and forming a zone of transition to the montane forests (Figure 13). Such park-like openings are characteristic of the undulating uplands within comparable elevations. It is around such openings that cattle collect in the early summer and autumn where the heat and seared vegetation of the lowland are exchanged for the shade and lush grasses of the parkland. Within the timbered zone, tree stands change from relatively open fir-spruce associations to denser spruce-fir-lodgepole pine to alpine forms along the upper timber-line. Owing to uncontrolled burning of the range, large tracts are covered with lodgepole pine, much of which has fallen to the ground making access difficult. Under light to moderately dense stands, pine grass (*Calamagrostis rubescens*), palatable shrubs, and many wild flowers, including vetch, peavine, and lupine, make good summer grazing. In some areas the timber harbours the poisonous timber milk vetch, which produces paralysis in cattle. Elevations above 4,000 feet are deficient in palatable forage plants and are only lightly grazed. In the subalpine around 6,000 feet, dwarf spruce and fir mingle with meadow grasses, sedges, and a profusion of brightly coloured flowers.

[1] Tisdale, E. W.: The Grasslands of the Southern Interior of British Columbia; Ecology, vol. 28, No. 4, October 1947. *See also* Spillsbury, R. H., and Tisdale, E. W.: Soil-plant Relationships and Vertical Zonation in the Southern Interior of British Columbia; Scientific Agriculture, vol. 24, No. 9, May 1944.

DISTRIBUTION OF RANGE TYPES

The integrated effect of the various physical factors finds expression in three fundamental ranching patterns: types of range, numbers of sheep, and numbers of cattle. The term "range" indicates more than the area grazed. It implies a system of use regulated by fencing and by restrictions imposed and enforced by the provincial government. It also involves the season of use. The quality and amount of forage and the time of its availability are together the most significant elements in range use.

Types of range fall into four groups according to the season of use. Of the four, winter range is the most restricted in area and the most desired. Its value rests in its ability to sustain stock through most winters without the necessity of feeding hay.

It conforms to the vegetation zone described as the lower grasslands (below 2,300 feet). As bunchgrass characteristic of this zone cures well and as its nutritive value remains high in spite of frost, it provides good forage. Snow depths seldom exceed a few inches so that cattle rustle through the winter. However, overgrazing and light precipitation result in a low carrying capacity of 35 to 45 acres per head on a 6 months basis. Steep slopes and the lack of water are added disadvantages to some areas of winter range. As this range is confined to very low elevations its distribution is restricted to the deep valley bottoms of the Thompson (Figure 14) and middle Fraser (Figure 16). Only one small area in the Nicola is grazed throughout the winter.

Spring range comprises those areas grazed first after the herds are turned out from winter feeding. It consists mostly of hard grasses (those that cure on the ground) such as Kentucky bluegrass and the bunchgrasses (Figure 15). It is typically located at elevations above winter range but below the timber. In the deep valleys and broad lowland basins of the southern part of the plateau the range is ready for grazing by the first week of April whereas in the zone of transition from grasses to timber the range is scarcely ready before the middle of May. On this basis early and late spring range may be differentiated. The northern part of the region depends mostly on late spring range except in the vicinity of the Fraser and lower Chilcotin Rivers where elevation favours early growth. Less deeply entrenched streams such as the San Jose in the Cariboo provide limited spring range to ranchers in the northern region. As a result of more moisture at higher elevations its carrying capacity varies from 10 to 30 acres per head for 6 months. Overgrazing or too early grazing has caused deterioration of some spring range by inducing less palatable types to multiply. On government-owned land, the number of cattle and the date of entry are established by the Grazing Division of the British Columbia Department of Forestry.

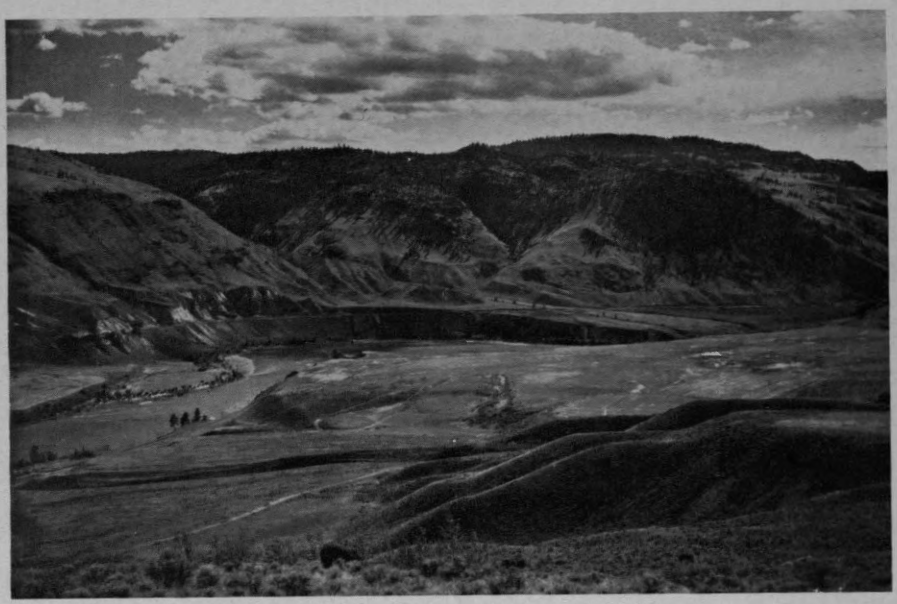


Figure 14. Terraced valley sides along Thompson River above Ashcroft provide both winter range and early spring range.

Figure 15. Upper grasslands consisting mostly of spear grass (*Stipa comata*) used as spring range at Alkali Lake, Cariboo district.

It will be observed from Figure 17 that the distribution of spring range corresponds to the major lines of drainage. Early spring range conforms to the zone of middle grasslands, whereas late spring range is confined to the transition zone.

Summer range is found typically under timber, in meadow openings (Figure 17), and on alpine meadows. It is almost entirely owned and allotted by the government and subject to regulations defining the period of use and the numbers of cattle. The rancher pays a small fee[1], which is used for administration and range improvement. Access to summer range is based on previous use and carrying capacity. In general, throughout the southern part of the area the amount of summer range available sets the ceiling on cattle numbers, whereas in the northern region spring range is usually more important.

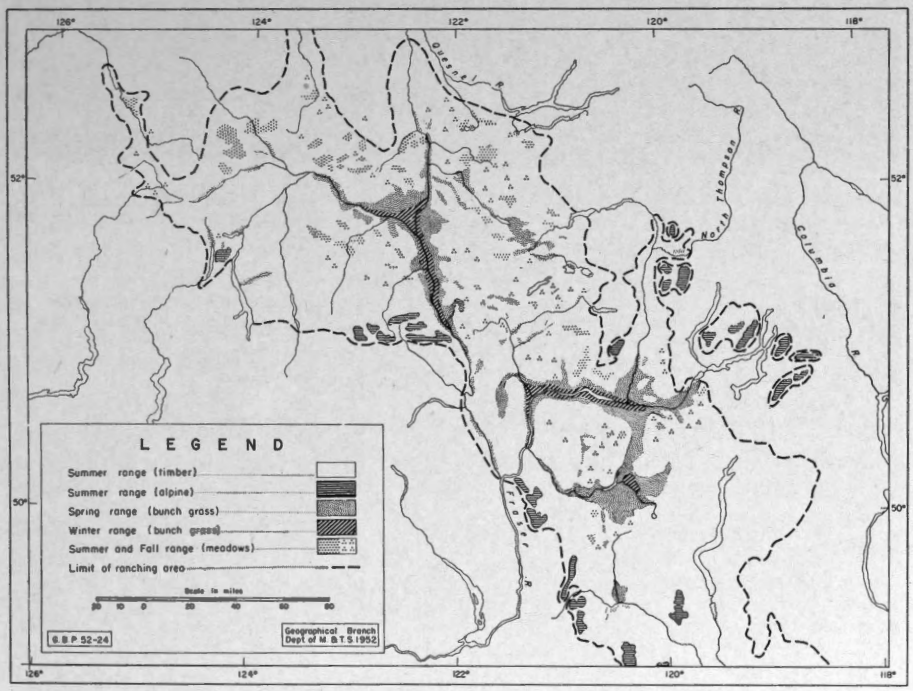


Figure 16. The distribution of range types in the Interior Plateau area of British Columbia.

The carrying capacity of summer range varies considerably. Where meadows are numerous and timber light, it varies from 20 to 30 acres per head, and where dense stands of lodgepole pine have grown up in the wake of a fire, capacities are as low as 40 and 45. As a rule there is ample water on summer ranges.

Autumn range may be either spring range grazed a second time or, in the case of more progressive ranches, part of the spring range set aside for

[1] In recent years the fee has been 50 cents per head of cattle for the season.

Figure 17. An overgrazed meadow opening on the summer range north of Tranquille Lake.

Figure 18. Sheep on the alpine range of Poison Mountain in the French Bar stock range of the southeast Chilcotin. (Courtesy Grazing Division, British Columbia Department of Forestry.)

autumn use. Distribution and carrying capacities correspond, therefore, to spring range. In the upland autumn range consists of swamp meadows, too wet to be accessible during the summer. Rustling on such meadows may continue into the winter provided that the snow is not too deep or encrusted. Frequently cut-over hay meadows on both upland and lowland afford considerable autumn grazing.

Grazing practices are closely associated with range types. In upland areas where spring range is greatly restricted the cattle are turned out onto bare patches on exposed side-hills after which they drift from one opening to another through the timber. In the autumn, hay meadows and swamp meadows become accessible. This pattern is typical of areas in the Chilcotin and Cariboo districts remote from deep valleys.

By contrast, in areas of considerable relief, transhumance involving the gradual movement of livestock from lowland to upland at a rate corresponding to the readiness of the range for grazing is characteristic of those units having access to spring and autumn bunchgrass range. After a short winter feeding period the cattle are turned out into early maturing pastures in the lower grasslands, usually in late March. In May they reach the late spring range of the upper grasslands, and by July are well into the summer range on the timbered upland. With the first killing frost of autumn (usually in late September) the succulent feed becomes unpalatable and the gradual movement down-slope commences, until in late October they are gathered into the fenced pastures on the autumn range of the lowland. Winter feeding commences usually in late December except in the case of those ranches possessing winter range. This seasonal migration involves a vertical movement of 1,000 to 2,000 feet.

Sheep follow somewhat the same pattern except that they travel as much as 50 to 60 miles to alpine summer range (Figure 6). Such ranges are frequently 4,000 feet above the winter feeding quarters in the lowlands.

PATTERN OF CATTLE DISTRIBUTION

Based on information supplied by the B.C. Cattlemen's Association, the total number of range cattle within the ranching area approximates 100,000 (Figure 19). This number is fairly equally divided between the Cariboo-Chilcotin-Lillooet sub-region and the Thompson-Nicola-Princeton sub-region to the south.

Variations in cattle distribution are the result of the combined effect of all factors significant to grazing. Areas of greatest density reflect the favourable combination of such elements as low elevation, mild winter conditions, irrigable land, and, particularly, carrying capacity of the range. Three major clusters may be recognized: the Nicola basin in the south with the largest cattle densities in the province; the elongated Thompson valley with an extension into the North Thompson; and the Chilcotin-Fraser confluence area with projections along the major valleys. Secondary densities follow the minor drainage lines such as San Jose Valley in the

Cariboo where beneficial effects of elevation, cultivable land, and open range are less evident. Distance from the principal lines of drainage means a thinning out in cattle numbers, as high elevation and poor range reduce carrying capacity still further. Certain detached clusters suggest the unusual occurrence of favourable factors. An example of this is the Anahim Lake district in the far northwest, which depends almost entirely on wild meadows present in large numbers. In the extreme south an island of bunchgrass in the Princeton basin favours a separate concentration and the clusters beyond show a limited use of alpine pastures by cattle.

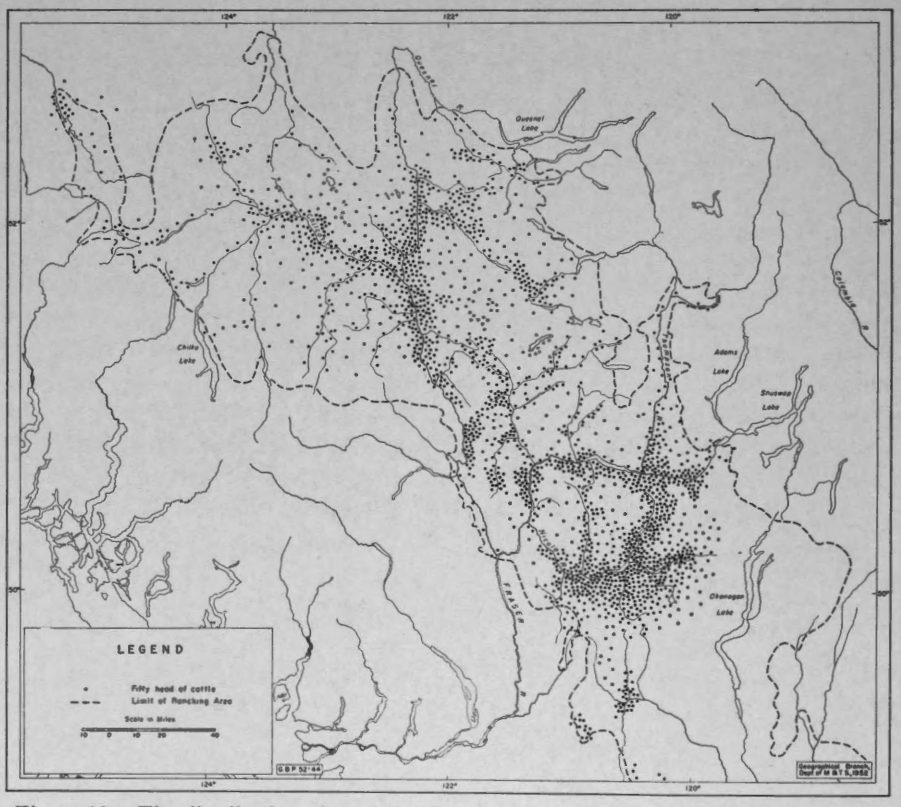


Figure 19. The distribution of cattle in the Interior Plateau area of British Columbia.

PATTERN OF SHEEP DISTRIBUTION

Excluding farm flocks, the total number of sheep in the ranching area together with those of the Okanagan Valley on the west is approximately 30,000[1]. For the most part, this number is confined to the southern half of the plateau (Figure 20). The most obvious explanation of the void to the north lies in the great number of predators and the absence of suitable alpine ranges. Moreover, much of the north is densely timbered, whereas sheep manage well on the rough dry ranges of the south (Figure 18).

[1] Personal communication from the Secretary. British Columbia Sheep Breeders' Association.

In two respects sheep distribution is in contrast with that of cattle. In the first place, sheep are found in tight, isolated clusters, and secondly, the clusters are mainly around the margins of the plateau. This reflects the very considerable use of alpine meadows for summer range. The ranch quarters are located in the valleys throughout the south, necessitating long drives to the summer ranges. Sheep increase in weight rapidly on the succulent forage and under the comparatively cool temperatures of alpine pastures. Moreover, they endure travel for long distances when taken in easy stages over a period of several weeks and actually put on weight. They negotiate steep, rocky terrain without difficulty and are capable of going without water for days and even weeks.

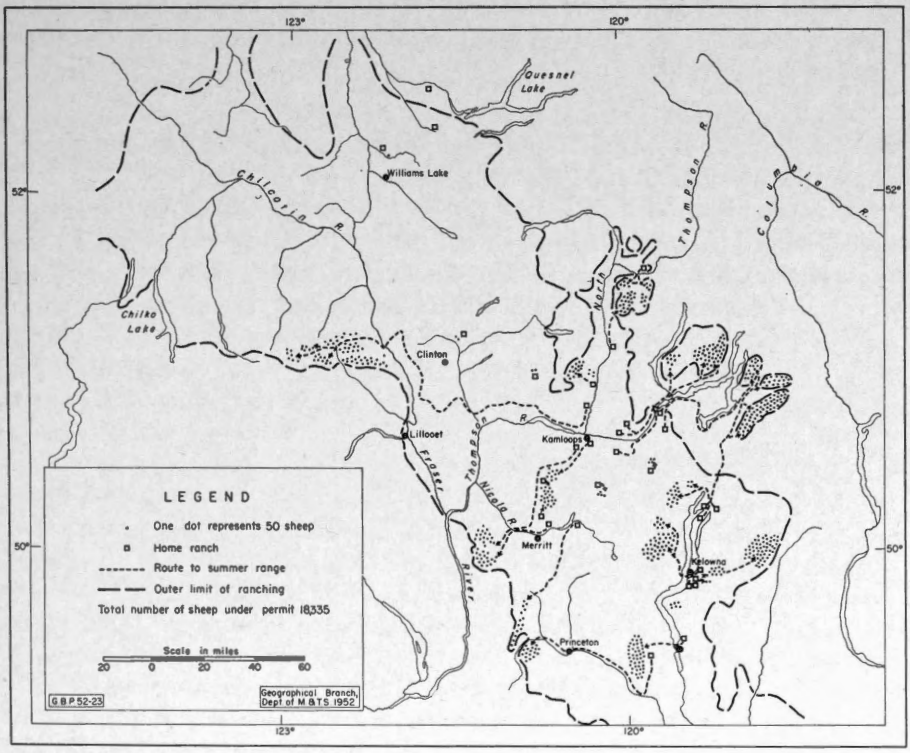


Figure 20. The distribution of sheep in the Interior Plateau area of British Columbia.

The use of alpine meadows is confined to the 2 warmest months, after which early frosts kill the lush vegetation. The lower bunchgrass ranges are successively grazed as in the case of cattle so that the distribution of ranches is fairly uniform in the valleys of the south. Only in the use of summer range is the pattern markedly different from that of cattle.

RÉSUMÉ

On peut discerner, dans le plateau intérieur du sud de la Colombie-Britannique, les principaux facteurs physiques propices à l'élevage des bestiaux, facteurs qui aident à déterminer les zones et les types d'élevage.

Étudiant d'abord le relief et le drainage, l'auteur divise le plateau en trois sous-régions: celle du nord, peu ondulée, marécageuse et pauvrement irriguée, celle du sud, mieux irriguée et au relief plus accentué, enfin une sous-région montagneuse située à la périphérie des deux autres. Il distingue ensuite deux types de climats: un climat de steppe dans les basses terres et un climat continental et humide dans les hautes terres. Mais l'élément physique le plus important est la végétation naturelle, que ce soit une végétation herbacée; en partie buissonneuse et arbustive ou, au-dessus, une végétation forestière. A ces facteurs il faut ajouter le cloisonnement des prés par des clôtures, la qualité et la quantité des fourrages et les restrictions légales.

L'étude de tous ces facteurs permet de diviser le plateau en quatre zones d'élevage: une zone d'hiver, inhospitalière et restreinte en étendue, située surtout dans le fond des vallées, une zone de printemps, une zone d'été, située au-dessous de l'étage forestier, avec ses prés et ses pâturages alpins, enfin une zone d'automme qui est une zone de printemps encore intouchée ou broutée pour la deuxième fois. Telles sont les zones qui servent à l'élevage de plus de 100,000 têtes de bétail et de 30,000 moutons.

DAWSON CITY

Barbara Gutsell[1]

Dawson is situated in the west-central part of the Yukon Territory in an area of high rolling hills and wide stream valleys. Physiographically, this part of the territory is known as the Yukon Plateau, a platform based on ancient metamorphic rocks, mainly Precambrian in age, with areas of Palæozoic and Mesozoic sedimentaries and volcanics into which have been intruded rocks of late Mesozoic and early Tertiary age[2]. These rocks are favourable to the occurrence of minerals, and as this section of the plateau remained unglaciated during the last Ice Age, and thus has no covering of glacial drift, it is a very favourable mining area.

SETTLEMENT

A series of minor gold discoveries on the rivers and creeks of this region preceded the discovery in the Klondike Valley in 1896. This proved to be the richest of the finds yet reported and caused a great influx of miners into the area now known as the Klondike.

The first movement into the area took place from centres along the Yukon Valley, in particular from Fort Cudahy at the mouth of Fortymile River about 50 miles below Dawson, and from the Stewart River area about 75 miles above Dawson. Later, miners from Juneau crossed the various passes to the headwaters of Yukon River and thence went downstream to the Klondike. Finally, as news of the strike reached farther afield, miners came down the Mackenzie waterway from its headwaters to an easy portage to the Yukon system via Rat and Porcupine Rivers. Alternate routes were from west coast ports to St. Michael at the mouth of Yukon River and thence upstream, and to the ports of Skagway or Dyea, across White, Chilkoot, or Chilkat Passes to the headwaters of Yukon River and thence downstream (Figure 1). Thus, miners migrating to the Klondike arrived at the gold fields from both north and south whereas supplies were moved over the easier, all-water route from the north. This meant that downstream centres were more easily supplied and that the junction of the Klondike with the Yukon was the most logical site for a supply centre as it was close to the claims, on the only route into the area, and relatively close to the source of supply. With the completion of the White Pass Railway between Skagway and Whitehorse the transhipment of supplies over the mountains was facilitated and the supply route shortened considerably. A winter road was soon built joining Whitehorse and Dawson, but it has not been used for some time and all supplies are now moved to Dawson in summer by river.

---

[1] Barbara Gutsell, B.A., Toronto. Geographer, Geographical Branch, Department of Mines and Technical Surveys. Member of Geographical Branch party to the Yukon Territory, 1949.

[2] Bostock, H. S.: Prospecting in Yukon; Geol. Surv., Canada, Dept. of Mines and Resources, Ottawa.

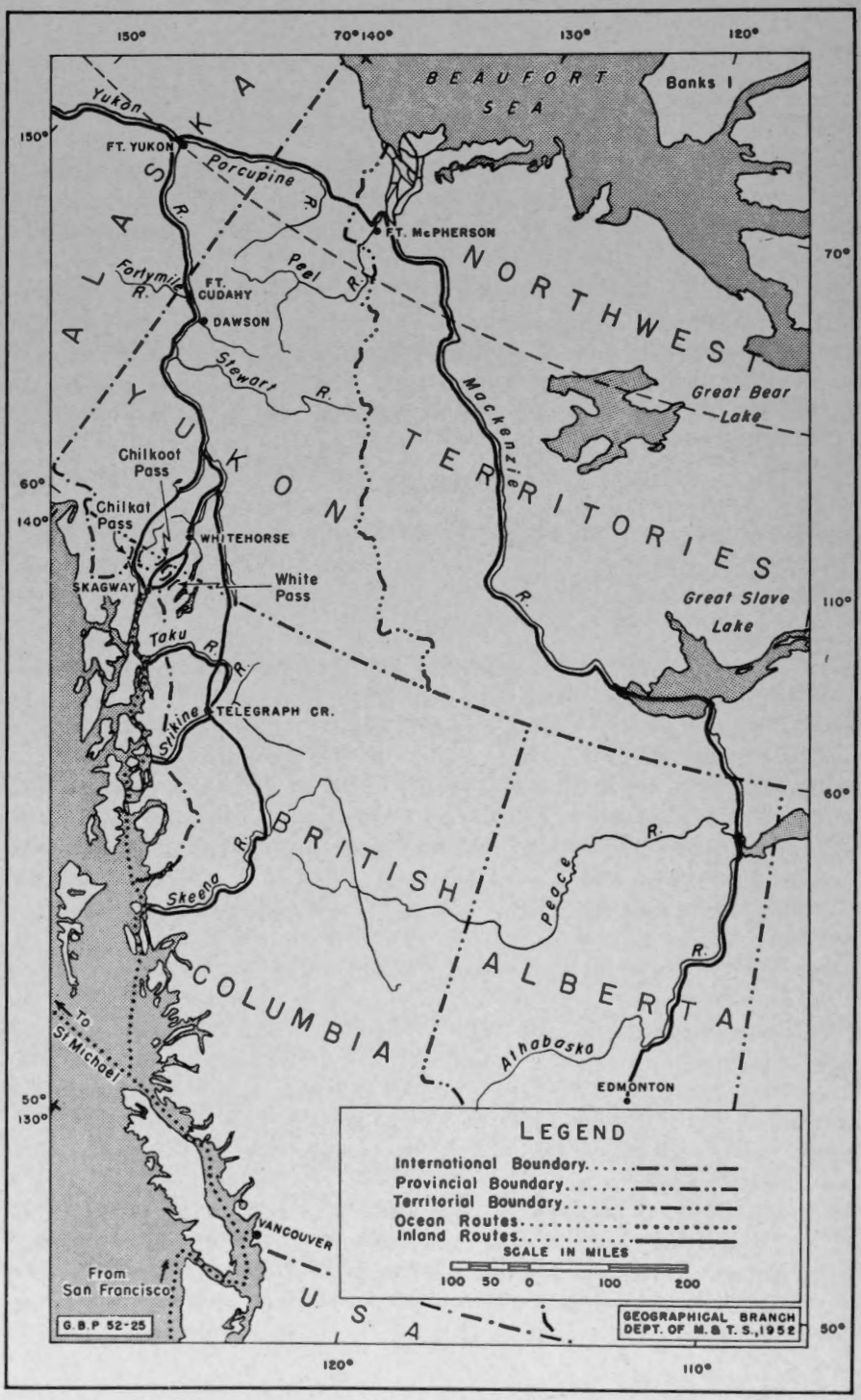


Figure 1. Routes to the Yukon Gold Fields, circa. 1898.

SITE

Lying at the junction of Klondike River with the Yukon, Dawson is picturesquely located on a low, wooded river flat backed by a high cliff (Figures 2 and 3). The original survey for the city included the flats on both sides of the Klondike as well as the islands near its mouth. With the decline in population subsequent to the decline in mining, the settlement contracted to its present limits, extending only on the flat to the north of the Klondike. This flat is bounded by the two rivers and the high rocky cliff known locally as Moosehide Mountain. This mountain extends to the river north of the town and prevents movement down the Yukon, with the result that communication northwards must be either by water or by trail over the mountain. This virtually isolates the Moosehide Indian Reserve, on a river flat to the north of Dawson, from the city itself because movement upstream, against the current, is impossible without a motor and the mountain trail is steep and difficult, especially for aged Indians.

Eastwards, along Klondike River, a road has been built skirting the cliff and leading to the mining camps, and to the airport and power plant. Klondike River, or Thron Diuck (plenty of fish) as the Indians called it, is a rapid-flowing shallow stream lying in a wide valley formed by high rounded hills. The valley floor, above the city limits, is now filled with crescentric piles of tailings due to the continuous dredging (Figure 4). The river now finds its way through these tailings, and the abundant salmon for which it was known long before the discovery of gold have almost disappeared. Within the city limits there has been no dredging and the valley floor retains its original characteristics.

Permafrost underlies the site of Dawson and comes quite close to the surface in most sections, except in the south where the Klondike has deposited sand for a distance of about 600 feet from its present bank. Here, the sand remains unfrozen on top of a layer of frozen muck.

FORM

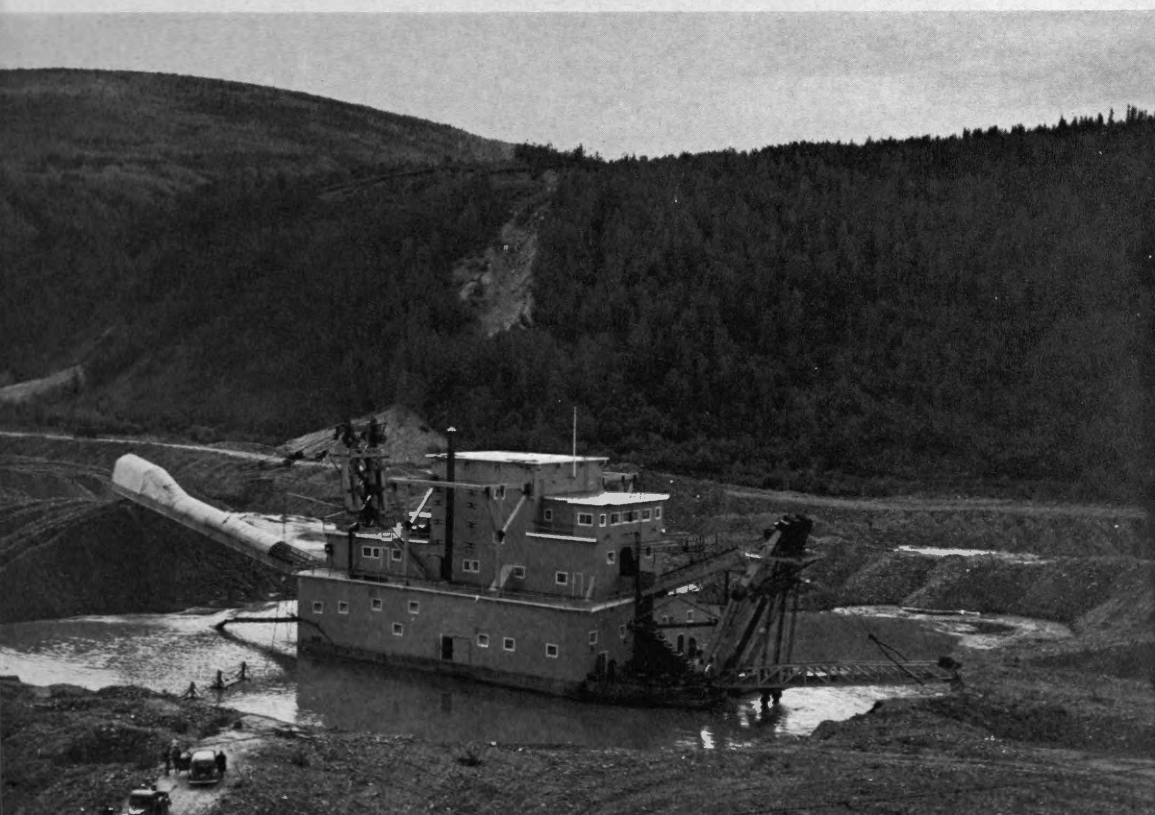
The shape of the settlement has been determined by the limits of the river flat. The steep slope of Moosehide Mountain prevented expansion to the east, although in the boom period when Dawson was expanding there were a few cabins perched on the lower slopes (Figure 6). As the population declined after the first "rush" to the Yukon, the peripheral cabins on the hillside and those on the islands and on the flat south of Klondike River were the first to be abandoned because their owners moved in toward the centre of town as vacancies occurred. Once the town was established on the river flat to the north of the confluence of the two rivers, more cabins were abandoned and this resulted in the present dispersed settlement pattern. There was little further contraction of the settlement as a whole because the remaining land was all equally desirable for building purposes and equally accessible. This scattered settlement pattern has tended

Figure 2. Dawson City looking southward up Yukon River.

Figure 3. Dawson City looking northward. Note the tailings on Klondike River in the foreground, the landslide scar, and the Moosehide Indian Reserve just visible on the flat below Dawson.

Figure 4. Looking southward across the Klondike Valley to the mouth of Bonanza Creek. Note the dredge tailings on the river floor and the hydraulic scar on the hillside to the east of the mouth of Bonanza Creek.

Figure 5. Gold dredge in Bonanza Creek.



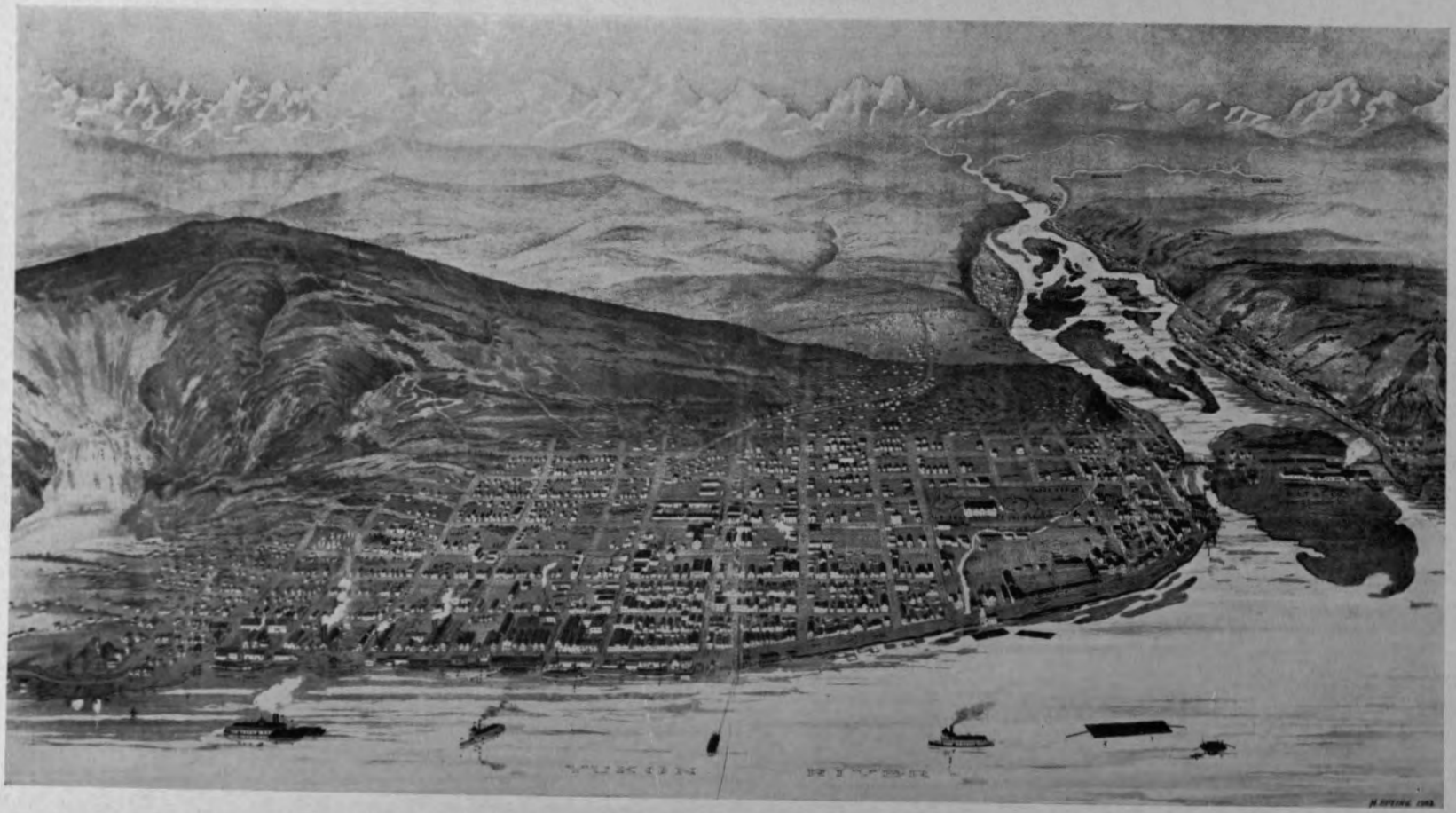


Figure 6. Reproduction of a print entitled "Birdseye View of Dawson, Yukon Territory, 1903".

to remain stable because buildings that are not used and maintained deteriorate rapidly through frost action. As a result, the cabin which is last abandoned will be the first to come into use again. One of the most notable features of Dawson is its park-like appearance, caused by the profusion of grass and trees on the overgrown and empty lots that symbolize its decline.

The city is laid out in a conventional rectilineal grid pattern, with the streets running northeast-southwest and southeast-northwest. All the streets are gravel or sand and the sidewalks, where they exist, are made of wood. First Avenue (Figure 7), parallel with the river, is still considered

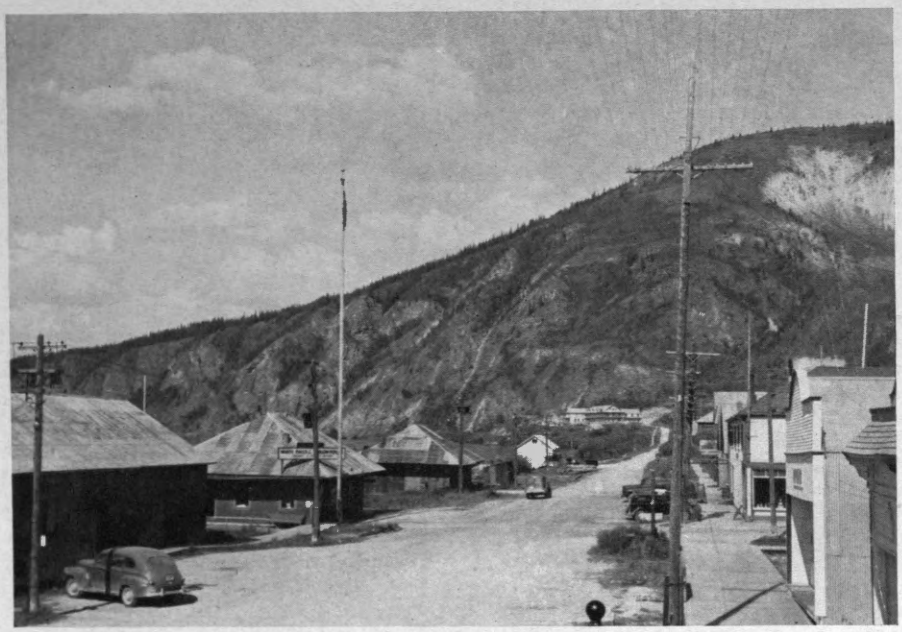


Figure 7. Looking northward along First Avenue, Dawson City.

to be the main street by the inhabitants, but Third Street, at right angles to the river and leading away from the wharf, today appears more prosperous. Second Street also contains a number of new shops and businesses, and it appears that the business section is contracting into a rectilineal unit rather than continuing to expand along the river. At one time, commercial establishments extended along First Avenue from First to Sixth Streets. Now the chief commercial area is two blocks square, extending between Second and Fourth Streets and between First Avenue and Third Avenue (Figure 8). It is by no means a compact block, however, as there are many deserted buildings and empty lots dispersed among the businesses.

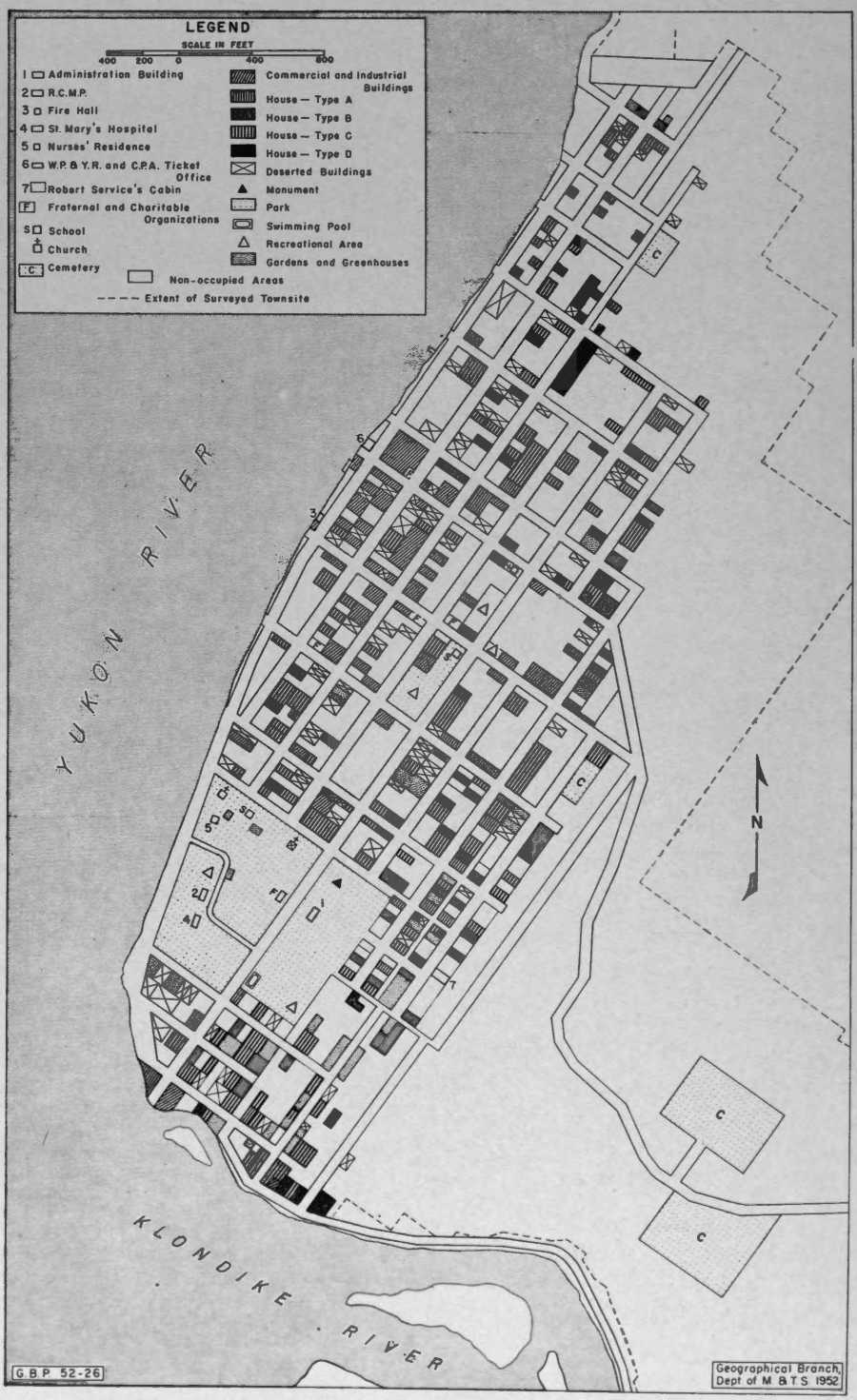


Figure 8. Land use map of Dawson City.

The business district is separated from the residential area to the south and west of it by a band of almost empty land. This empty land serves also to divide two areas of relatively continuous settlement, one surrounding the government buildings in the south, and the other occupied by Indians and half-breeds, to the north. It is not immediately apparent whether this band of non-settled land is a result of the shrinking of the business district or whether it is a result of an inherent tendency for white and Indian settlements to be distinct.

The houses and cabins have been classified according to their external condition, using the criteria as in Table I. Figure 8 is a map of the distribution of buildings in Dawson according to this classification.

TABLE I

House Types in Dawson

House Type	*Characteristics*
A	1 or 2 stories; freshly painted; well kept; neat lawn.
B	1 or 2 stories; not necessarily freshly painted; a neat lawn; no visible effects of frost action.
C	1 or 2 stories but generally smaller than A or B; not freshly painted; signs of frost damage; debris and grass in the yard.
D	small cabin; shows severe frost damage; in state of disrepair; lot completely overgrown.

In general, the A and B class houses are concentrated on a slight rise to the east of the administration building, whereas most of the type styled D are in the native section to the north. There appears to be little attempt to maintain this latter property, and as a result many of the cabins have been condemned. In the south, near Klondike River, most of the houses are in the C category. C class houses are also interspersed among other houses and among shops in the business district where they mark a decline in the commercial area, as many of them are shops converted back into homes.

Dawson has almost reached the last stage[1] of the urban cycle, which according to Taylor shows "large areas abandoned and the remainder stagnant". Dawson fulfils the first half of this definition, but it cannot be said that the city has become stagnant nor will it do so as long as there is gold in the area.

FUNCTION

Dawson, with an ample hinterland of gold-producing creeks and benches, is still a mining town and the centre of the placer gold operations of the Yukon. On August 17, 1896, the first discovery of gold in the Klondike area was made on Bonanza Creek, and early in September Joseph Ladue laid out the townsite of Dawson. Within 2 years Dawson had become a city of 8,000 people, the focal point of a gold-producing area containing nearly 22,000[2].

[1] Taylor, G. T.: Our Evolving Civilization; University of Toronto Press, Toronto, 1946. p. 231.
[2] Campbell, Colin: White Pass and Yukon Route to the Golden North; Seattle, Wash., 1902, p. 20.

Figure 9. This cabin, reputedly once owned by Robert Service, is typical of the small one-roomed log cabins.

Figure 10. A newly constructed cabin on the banks of Klondike River. Note the small greenhouse.

Figure 11. Typical of an A-class house is this white frame dwelling, home of the Commissioner of Yukon Territory.

The creeks soon became worked over and the most easily accessible gold removed. At this stage it became more profitable to mine with machinery and fewer miners were able to make fortunes in the area. Thus the population began a steady decline. The decline was accentuated by a fall in the price of gold, and by 1931 when gold prices reached an all-time low, so also did the population of Dawson (Table II). By 1941, gold prices had risen again and the population of Dawson began an upward trend. This, however, has not been continued.

TABLE II

The Population of Dawson City, 1901-1951[1]

Date	Population
1901	9,142
1911	3,013
1921	975
1931	819
1941	1,043
1951	754

Dawson was incorporated as a city soon after 1896, but with the decline in population and wealth subsequent to the decline in mining, it lost its civic status and became instead a taxation area administered by the territorial government. In September 1950, civic government was again granted to the citizens of Dawson.

Dawson was chosen as the administrative centre of the territory during the early days of the gold rush when it was the centre of population and activity. As it decreased in importance and Whitehorse became the transportation and commercial centre of the territory, it was decided that the administrative function would be moved from Dawson to Whitehorse. This has already resulted in a decrease in the population of Dawson (Table II).

Recent interest in Dawson as a tourist centre has led to an increased number of visitors each year. Tourists generally arrive every 10 days on the steamer *Casca* from Whitehorse and remain in town for 24 hours. During that period the souvenir shops put out their best displays and the restaurant menus offer such things as moose steak and "ice worm salad". As soon as the steamer carrying the tourists has departed Dawson again returns to the normal complacency characteristic of any small town.

The people living in Dawson are government officials, miners, and those who supply goods and services (Table III). Of the 510 gainfully occupied in 1941, 113 were employed in mining and 155 were providing services, including the school and hospital staffs, public servants, and others.

[1] Compiled from published and unpublished census reports.

TABLE III

Gainfully Occupied in Dawson City by Industry Groups[1]

—	Male	Female	Total
Total gainfully occupied	439	71	510
in agriculture	13	—	—
forestry, fishing, trapping	24	—	—
mining	110	3	113
manufacturing	38	—	—
construction	31	—	—
transportation and communication	33	2	35
trade and finance	63	6	69
retail	50	6	—
finance and insurance, etc.	13	—	—
service	96	59	155
professional	27	26	—
public	40	2	—
recreational	2	—	—
personal	27	31	—
not stated	31	1	32

By 1948, the picture had changed due to increased mining activity since the war. In May 1948, 559 were employed in mining, the average number per month being 316, varying from 80 in December to 559 (Table IV).

TABLE IV

Average Number of Men Employed in Mining in 1948, by Months[2]

Month	Number employed	Month	Number employed	Month	Number employed
January	86	May	559	September	415
February	90	June	546	October	338
March	121	July	503	November	189
April	414	August	457	December	80
				Average	316

This seasonal character of the work creates a labour problem, and usually, by the end of August and early September, there are not enough employees to carry on full-scale operations.

SERVICES

The power development that supplies electricity to the mining camps and to Dawson is controlled by the Yukon Consolidated Gold Corporation. There is a hydro-electric development, generating 15,000 h.p., on the north fork of Klondike River, 28 miles above Dawson. Power lines lead directly to the dredges and mining camps, and to the power plant in Dawson. In addition, a diesel motor in Dawson is used to generate power if for any reason there is a failure at the North Fork or a break in the lines.

[1] 1941 census (unpublished).

[2] Nordale, A. M., Resident manager, Yukon Consolidated Gold Corporation, letter to J. E. Gibben, May 4, 1948.

The city's water supply is taken from a well near the Dawson power plant and pumping facilities are located in the plant. The well water is pure but is slightly chlorinated because there are occasions when it must be augmented by water taken from Klondike River.

Other facilities include a public school and high school, fire-fighting equipment, and a telephone system. The latter is maintained by the Yukon Telephone Syndicate, which operates the lines in Dawson. The Yukon Gold Corporation maintains the lines to its camps and dredges and collects the revenue on these calls. No long distance phone connections extend to either Whitehorse or Fairbanks but there are telegraph lines connecting both these points.

A few small, specialized businesses have grown up in Dawson. Among them are two establishments manufacturing souvenir gold and ivory jewellery. Another interesting business is that connected with the Dawson greenhouses where fresh vegetables and flowers are grown under glass to supply local needs in the town and the surrounding camps.

In order to move equipment and supplies to the camps a number of truckers are based in Dawson. One company with a fleet of six trucks hauls materials to the Sixtymile mining area and four independent truckers supply both the Sixtymile and the Klondike mining areas.

Dawson was established first as a supply centre for the miners of the Klondike Valley stretching to the east and south, and later came to serve those in the Sixtymile mining area to the west. Both these areas came into being, and required the services of a centre such as Dawson, because they produced gold. The establishment of the administration centre followed naturally upon the gold rush, as Dawson was the centre of activity at that time. Tourist interest in the city followed just as naturally upon the gold rush, but at a much later date when people became interested in visiting the locale of that colourful era.

RÉSUMÉ

Dawson, située au confluent des rivières Klondike et Yukon, fut fondée en 1896 par Joseph Ladue. L'évolution de la ville suit de près la découverte et l'exploitation des mines d'or de la région. D'ailleurs le nombre de ses habitants qui a passé de 8,000, deux années après sa fondation, à 754 en 1951, illustre bien le caractère de ce "boom town".

La ville s'étend le long de la rivière et a adopté aujourd'hui la forme conventionnelle d'échiquier. On distingue facilement le quartier des affaires et le quartier résidentiel. Les fonctions urbaines sont également bien déterminées. Dawson en effet est le centre minier du territoire du Yukon. L'activité de sa population se répartit à peu près également entre les mines et les services. Enfin l'auteur énumère quelques-uns des services que la ville dispense à sa région et il souligne une nouvelle fonction urbaine qui est apparue récemment, une fonction touristique.

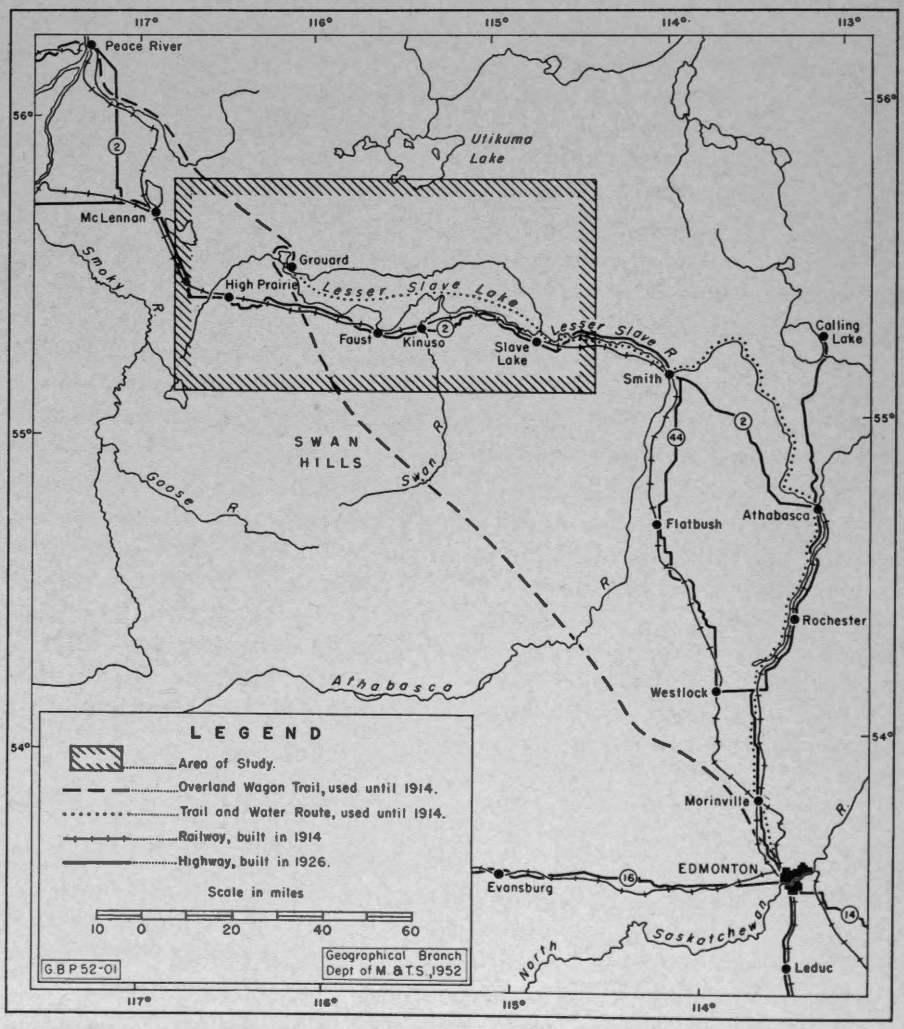


Figure 1. Location map.

HUMAN GEOGRAPHY OF THE LESSER SLAVE LAKE AREA OF ALBERTA

Gordon C. Merrill[1]

The region of Lesser Slave Lake holds considerable geographical interest. In eastern Canada, agriculture, even of a pioneer sort, has not extended much beyond 49 degrees north latitude[2]. The area under consideration, on the other hand, is located 450 miles north of the International Boundary, above 55 degrees north latitude, and thus lies on the northern fringe of prairie settlement. It corresponds roughly to the Improvement Districts 124 and 125 as set up by the Alberta Department of Municipal Affairs. Despite its northerly position, the area has lost many of the qualities of the frontier. From an economy characterized by the fur trade as late as 1898, the Lesser Slave Lake area has developed a regional economy of much wider base, with agriculture, lumbering, fishing, and fur farming all playing significant roles today. Development and diversification are phenomena of the last 50 years in the Lesser Slave Lake area, making it a region of present day contrasts and of historical change.

PHYSICAL SETTING

Lesser Slave Lake is located approximately 130 miles north-northwest of Edmonton (Figure 1). The lake, covering 485 square miles, occupies a long, irregular basin that extends from Grouard in the west to Slave Lake in the east, a distance of over 60 miles. The average width of the lake is 8 miles, with a range of variation from 3 miles at The Narrows to 12 miles at Giroux Bay. Drainage is to the east by Lesser Slave River into the Athabasca and eventually into the Arctic Ocean.

In the recent geologic past the lake was of greater extent, as is reflected in the present topography. A narrow lowland fringe skirts the south shore of the lake, opening up in the west to include a rich agricultural area centring upon the town of High Prairie. Rivers entering the lake from the south have added extensive deltas to this lowland fringe. Land of agricultural value is limited to the river valleys and to the flat prairies to the west of the lake. Here the parkland soils, consisting largely of silt and clay, and containing abundant organic matter, provide a physical basis for agricultural settlement. All the area to the north of the lake, and the interfluvial areas to the south of it, are characterized by wooded soils that are submarginal under present farming practices. This direct relationship that exists between agricultural possibilities and settlement is revealed by a comparison of Figures 2 and 3.

---

[1] Gordon C. Merrill, B.A., M.A., McGill, member of Geographical Branch party to central Alberta, 1950.

[2] Mackintosh, W. A.: Prairie Settlement, the Geographical Setting; Toronto, The MacMillan Company of Canada, Ltd., 1934, p. 153.

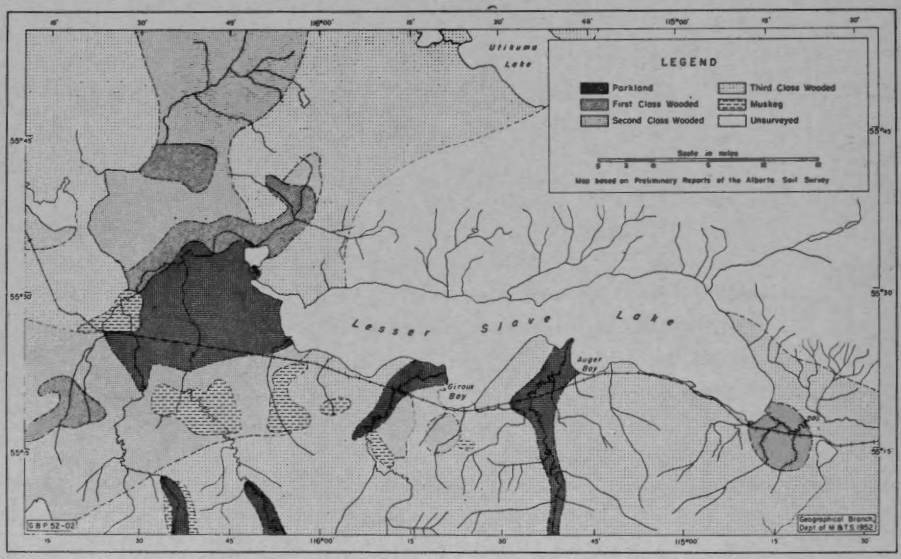


Figure 2. Generalized soils map of Lesser Slave Lake area.

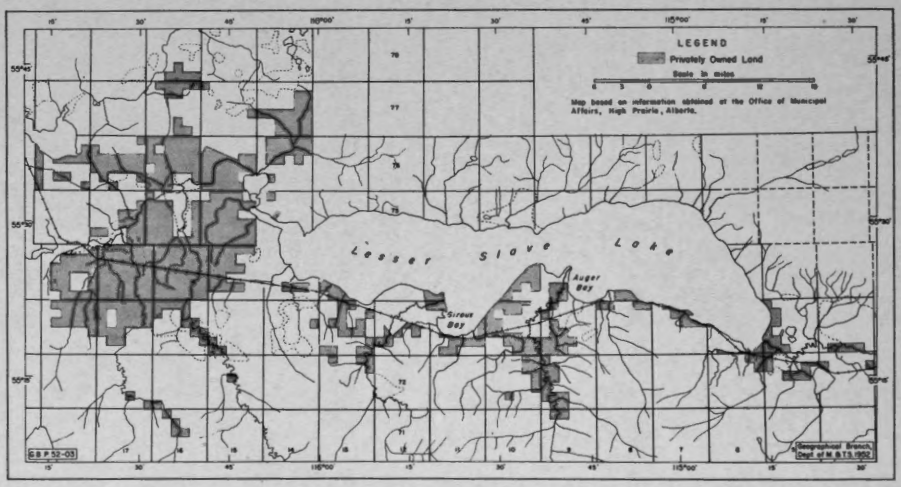


Figure 3. The distribution of land under private ownership in the Lesser Slave Lake area.

The climate[1] of the region is not severe for its latitude, approximately 55° 30′ north. The average July temperature at Grouard of 61° F. compares favourably with that of areas much farther south. Edmonton, for example, in latitude 53° 33′ north, has an average July temperature of 62° F. However, killing frosts in the autumn, as early as July 23 at Grouard and August 7 at Slave Lake, are important limiting factors to agriculture, causing heavy losses in crops from time to time. On the other

[1] The source for all the climatic data in this paragraph is Climatological Data, Northwestern Canada, 1950; Canada, Dept. of Transport, Meteorological Division.

hand, the annual precipitation of approximately 18 inches (17·94 inches at Grouard) is quite sufficient. It is relatively dependable, and the High Prairie agricultural area has suffered few losses from drought.

SETTLEMENT

The present century has witnessed the major part of the settlement of this area and, consequently, a number of the original settlers are still alive and resident in the region today. But many features of the present geographical landscape have their roots in the quite distant past. Prior to the arrival of the white man in the Lesser Slave Lake area, the Plains' Cree Indian held the land. In 1870 the Hudson's Bay Company lands were transferred to the Government of Canada. One claim to the land having been eliminated, the more intrinsic Indian claim still demanded settlement before the land could be opened up to white settlers, and in 1899 this occurred when a treaty was signed with the Cree Indians of the Lesser Slave Lake area. It is interesting to note that the land reserves set aside for the Indians included much alluvial land suitable for agriculture. Today there are several successful Indian farmers on reserve land, but in general the governmental policy of promotion of agriculture on these Indian lands has met with failure rather than success. Historically speaking, the Plains' Cree, who represent a minor element in the present population of this area, are a hunting people, and agriculture is alien to their culture.

The development of the Lesser Slave Lake area has been intimately concerned with the basic fact of its location, on the best route north from Edmonton to the Peace River district and beyond. In 1898 this mere fact of location resulted in the arrival of large numbers of men on their way to the gold fields of the Yukon. Many of them, failures in their attempt to reach the north, remained for a number of years around Lesser Slave Lake. Grouard, located at the western end of the lake, came into being for these "Klondikers". A newspaper account of 1899 described that settlement as follows:

> "There has been a wonderful growth of this important village since the Klondike boom. Its citizens are composed of Indians, half-breeds, and a conglomerate mixture of faint-hearted (or tenderfeet) Klondikers, who would go no further on account of the trails not being macadamized . . . . . The principal stores are the Hudson's Bay, and Larue and Picard. There are a number of smaller stores and trading posts, which have followed up the boom, and are now like Micawber, in David Copperfield, waiting for something to turn up. The population is about three hundred, one-third being disgruntled Klondikers and freetraders, and the rest are half-breeds."[1]

During the early years of the present century, location again brought benefits, as settlers intending to go to the Peace River district slowly made their way north through the area. At this time the agricultural possibilities of the Peace River district were being given wide advertisement, in the hope of attracting people for permanent agricultural settlement. Again, the Lesser Slave Lake area was serving as a thoroughfare for transient people, and again a number of them decided to go no farther. Four North

[1] The Edmonton Bulletin, August 7, 1899.

Dakota families, on their way to the Peace River country in 1907, viewed the Swan River Valley to the south of Lesser Slave Lake, and decided to homestead. In 1908 the first breaking of the sod took place and from that time development in the valley was rapid. In 1912 the first threshing machine was freighted in from Edmonton over the winter ice, and as a matter of interest, this machine is still in use today on a farm at Kinuso. These American settlers formed the nucleus about which the present day Swan River Valley agricultural settlement has grown.

Lesser Slave Lake itself, in the early days, was an important link in the route to the Peace and the Yukon because of its navigability. One route from Edmonton was overland to Athabasca Landing, then by river raft up Athabasca and Lesser Slave Rivers, then by lake steamer to Grouard. A second route was an all overland trail from Edmonton across the Swan Hills to Grouard. This latter route was used mostly in winter, and was difficult of passage (*See* Figure 1). A man would probably have welcomed as much encouragement as possible while struggling slowly over such rough country, but encouragement was not always found. It is reported that a sign board erected along the trail at the summit of the Swan Hills in 1899 gave the following grim warning to travellers: "Due north, Dawson City, starvation, and death; due south, home sweet home, and a warm bed"[1]. Despite the difficulties of travel, Grouard emerged as an important station along the route to the north, and from it branched trails to Grande Prairie, Spirit River, Dunvegan, Winagami Lake, Peace River Landing, and Fort Vermilion. Optimism became the order of the day in Grouard during the early years of the present century. In 1908 the town had twenty-two stores and businesses of all kinds, a police centre, a newspaper office, and three churches. About 1911 it became apparent that a railway was going to be built from Edmonton north to the Peace River district. Enthusiasm for the railway was high in Grouard, as it was believed that it would pass through the town, ushering in an era of even greater prosperity. This belief was widely held, and a small land boom resulted. Lots were surveyed far back from the limits of the town, and were sold to speculative buyers throughout the world. One choice lot was sold to a San Francisco millionaire, for a reported purchase price of $30,000 and a number of other lots were sold to purchasers in such distant places as India.

The Edmonton, Dunvegan and British Columbia Railway reached the Lesser Slave Lake area in 1914. The engineers engaged in the building of the railway decided the route to be followed on the basis of ease of construction and maintenance. It failed to pass through Grouard, and the bubble of prosperity that had surrounded that community broke. The decline of Grouard took place virtually overnight. Many buildings were removed immediately from their foundations, and transported to the new community of High Prairie. The population of Grouard fell rapidly, and soon only a few Indians and half-breeds were left. Figure 4 is a photograph

[1] The Edmonton Bulletin, March 13, 1899.

of present day Grouard and is typical of the scene. The few buildings that have survived the passage of 40 years are in a very dilapidated state, with gaping holes and flapping shutters.

High Prairie gained at the expense of Grouard. The coming of the railway, more than any other factor, opened up the Lesser Slave Lake area. High Prairie, Kinuso, Faust, and Slave Lake, the most important centres of settlement in the vicinity of the lake, all owe a considerable amount of their prosperity to the railway. Today the highway, which also skirts the south shore of the lake, is responsible for considerable additional development. Here is the most recent expression of an oft-recurring theme in the local history. The highway serves as the feeder line to the Alaska Highway, and thus development of an area far to the north is again bringing a measure of prosperity to the Lesser Slave Lake region.

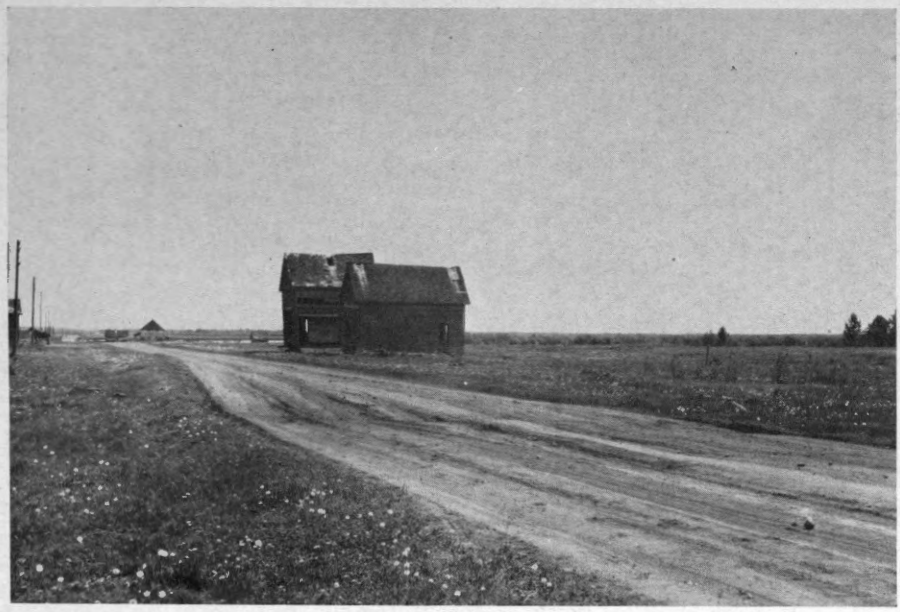


Figure 4. All that remains of the town of Grouard today.

COMPOSITION OF THE POPULATION

The prairies as a whole contain a large number of national groups in contrast with the eastern provinces where most of the people are of British, American, or French origin. The Lesser Slave Lake area illustrates this, its people being of Anglo-Saxon (British and American), East European (Polish and Ukrainian), German, French, Scandinavian, and Indian origin.

Colonization in the Swan River Valley section of the Lesser Slave Lake area began in the first decade of the twentieth century when settlers came from the United States. This is the only section of the Lesser Slave Lake area with a concentration of settlers of American birth. The rich

agricultural land centring on High Prairie experienced its initial rush after the completion of the railway in 1914. In this section most of the first settlers were British with Ukrainians and Poles coming later, possibly in the early twenties.

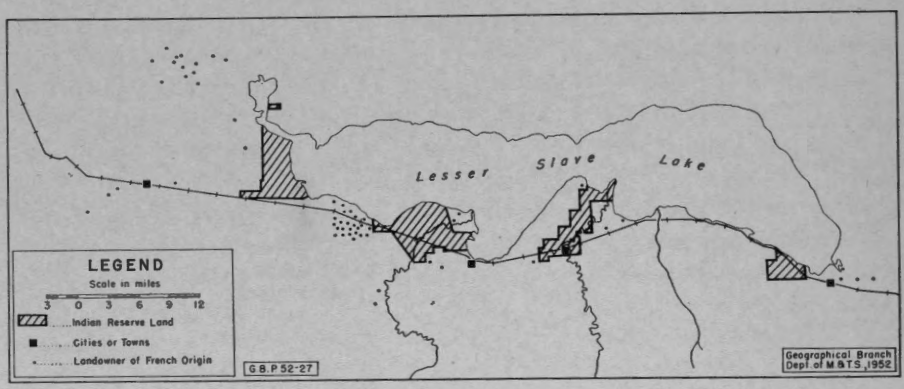


Figure 5.

Figures 5, 6, 7, 8, 9. The distribution of landowners in the Lesser Slave Lake area, according to origin.

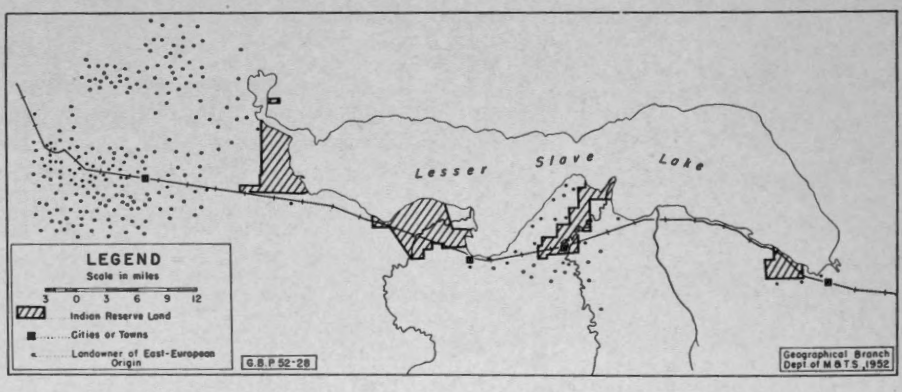


Figure 6.

Over a number of years French settlers were attracted to the area around St. Bruno's Mission, and this has resulted in a concentration of French at Joussard. Other Europeans, Scandinavians, Germans, and Belgians in particular, have settled in the area. There is a small Scandinavian settlement between High Prairie and Grouard but no other district has a majority of these people.

The Indians have been given reserves along the south shore of the lake, but the numbers living there are not large. Many more Indians live off the reservations than on them.

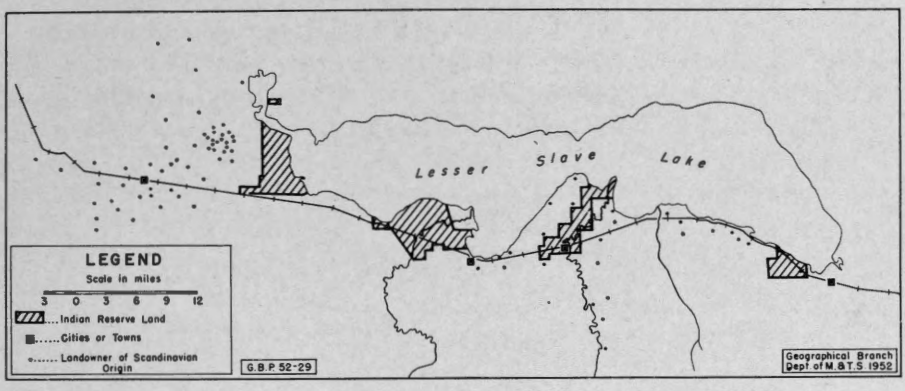


Figure 7.

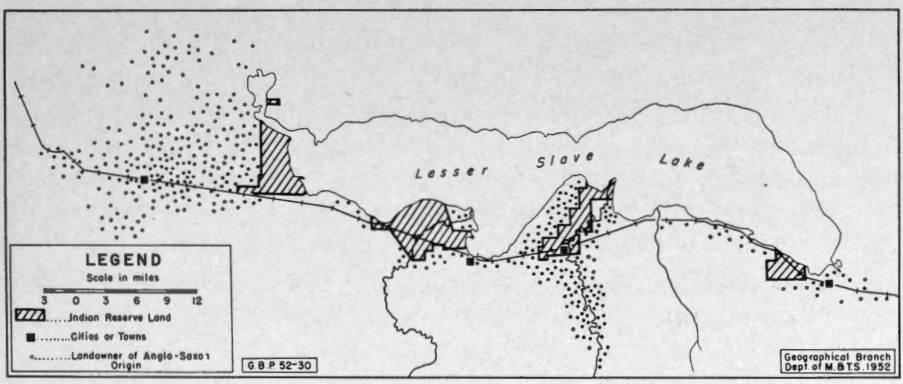


Figure 8.

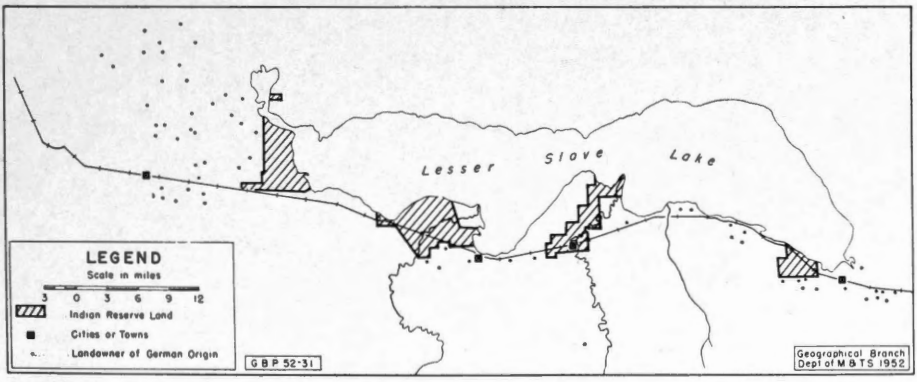


Figure 9.

The national origin of landowners in the Lesser Slave Lake area is shown on Figures 5 to 9. No detailed information concerning non-landowners was available, but it is believed that their inclusion would not change the general pattern of distribution except around Faust and Kinuso where large numbers of Indians are resident but not landowners. Over 50 per cent of the settlers are of British origin, and they operate most of the hotels, stores, service stations, garages, planing mills, and fish plants, as well as many of the successful farms.

In the agricultural area around High Prairie it was found that the early arrivals, the Anglo-Saxons, occupy the parkland soils. The Poles and Ukrainians, who arrived somewhat later, tended to take up soils that are transitional between the parkland and true wooded soils. These peoples of East European origin show a marked tendency to remain farmers and have very little interest in logging and fishing. They are now buying farms on parkland soil as the land becomes available. The East Europeans form a highly respected group in the community and the second generation are rapidly assimilating. Among the few French people in this section some are farmers, but the majority are mink farmers and commercial fishermen.

The Indian and half-breed population of the Lesser Slave Lake area is large. In this area distinction between treaty Indians and half-breeds is not a matter of racial purity as is usual. Instead, those who remain on the reservation, regardless of the amount of white blood in their veins, are considered to be full-blooded Indians and are treated as such.

There are about 700 treaty Indians, most of them living on the Sucker Creek, Driftpile, and Swan River reserves. Although there is excellent agricultural land on these reserves, the Indians seem disinclined to use it.

The half-breed population is larger than that of the treaty Indians and the majority are employed in lumbering. At Grouard non-treaty Indians and half-breeds have established a co-operative aimed at manufacturing such goods as moccasins through the development of their native skills. Many of the half-breeds work in the lumber camps during the winter, but the local labour force is not large enough to meet the seasonal demand and men are brought in from Edmonton each winter for such work.

There have been two periods of rapid growth of the population here. The first occurred during the Klondike gold rush and the second immediately after the completion of the railway in 1914. Otherwise growth has been slow but steady, keeping pace with economic development.

ECONOMIC GEOGRAPHY

In the early years agriculture was limited to small sites adjacent to the fur-trading posts. The success of such efforts brought forth comment from many early travellers, who were impressed by the large number of grains and vegetables that could be successfully grown[1]. Even before the

[1] Wyatt, F. A.: Preliminary Soil Survey of the Peace River-High Prairie-Sturgeon Lake Area; Research Council of Alberta, Report No. 31, 1935, p. 9.

Figure 10. Natural hay meadows as viewed from Grouard, at the western end of Lesser Slave Lake.

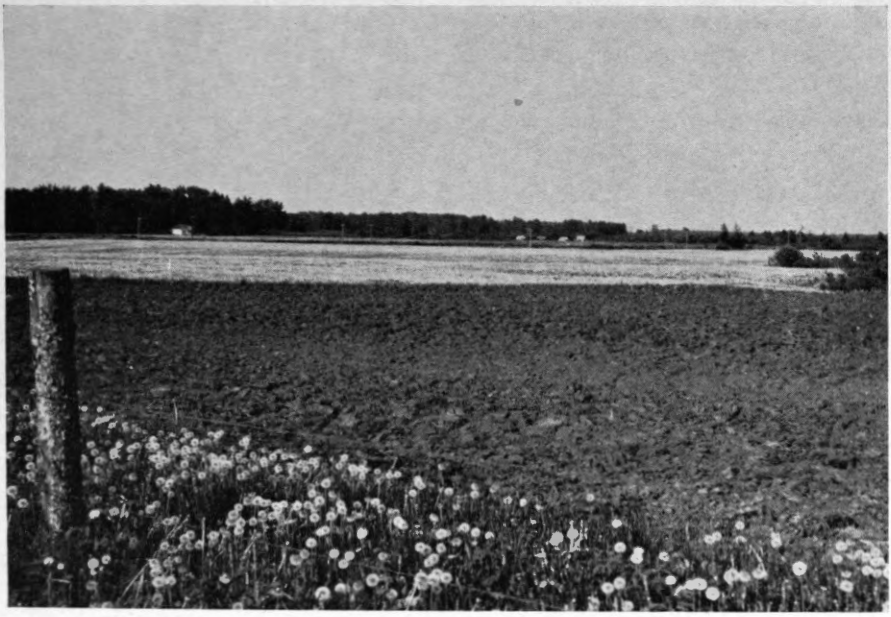


Figure 11. Delta land of agricultural value on the Driftpile Indian Reserve.

railway came into existence agriculture held an important position in the economic life of the region. A newspaper account in 1911 describes High Prairie and nearby agricultural settlements as follows:

> "Farming has been most successful in all its branches in this district for many years past . . . . and the High Prairie, Heart River, and Big Prairie settlements have won a name for themselves with their crops of wheat, oats, barley, and rye. Fall wheat cut at High Prairie last year yielded forty bushels to the acre, while crops of oats running one hundred bushels to the acre are a common occurrence. The average however, is about fifty bushels."[1]

The building of the railway during World War I resulted in an increase in the agricultural output of the area, permitting the farmers to produce for distant markets. For a number of years wheat was the principal grain grown, but at the present time mixed farming is more characteristic. The shift from wheat to mixed farming appears to have been made about 1930, in the lean days of the depression, when farmers found mixed farming to be more successful. Today the High Prairie district includes well-mechanized, highly capitalized farms, with barley and oats as the chief grain crops (Figures 10 and 11). A large number of cattle are kept, chiefly for beef. In 1949 the grain elevators at High Prairie handled over 1,000,000 bushels of grain, mostly barley, and during the same year over one hundred railway cars of cattle were shipped from High Prairie. The elevator at Kinuso, in the only agricultural district of note along the south shore of the lake, handled approximately one-tenth of the High Prairie volume in 1949, thus indicating the dominance of the High Prairie district in agriculture.

The Imperial Lumber Company has been operating a planing mill in Kinuso since 1948, and in the short interval of 2 years has invested $1,000,000 in the Kinuso mill, thus underlining the importance of lumbering in the Lesser Slave Lake region. Lumbering is the most important industry along the south shore of the lake, Kinuso and Faust being the main centres. Farther to the west, in the High Prairie district, lumbering is second to agriculture. High Prairie has two planing mills and Faust and Kinuso one each. Together they employ about one hundred and twenty persons. All three lumber companies operate sawmills in the woods during the winter, each company providing seasonal employment for three hundred or more men. In addition, a number of farmers and fishermen operate sawmills in the woods during the winter, and sell lumber to the planing mill operators.

Spruce is the only species economically valuable. In the tracts of merchantable timber the possible yield per acre varies between rather wide limits. In certain areas around Lesser Slave Lake there are stands of spruce running up to 30,000 board feet per acre. Elsewhere throughout the district, particularly in the river valleys, stands of 10,000 to 25,000 board feet per acre are fairly common. Taking the country as a whole, the exploitable forest will yield, on the average, 3,000 to 5,000 board feet per acre, including saw material, fuelwood, and other timber of merchantable size[2].

---

[1] The Edmonton Bulletin, July 17, 1911.

[2] Kitto, F. H.: The Peace River Country of Canada; Canada, Dept. of the Interior, Ottawa, 1930.

Output of the four Lesser Slave Lake planing mills amounts to about fifteen cars of lumber each week. The local consumption is less than 1 per cent of the total, the major part of the production being sold in American markets, as far afield as Florida.

Lesser Slave Lake is fished commercially, for whitefish almost exclusively. A large percentage of the catch is shipped to markets in the United States. One hundred and twenty-five commercial licences were issued in 1950 for fishing in the lake, an indication of the importance of this industry. There are nine fish-packing plants on the lake, one at Widewater, one at Canyon Creek, four at Faust, two at Joussard, and one at Shaw's Point (Figure 12). In addition to commercial fishing, the lake is exploited by the mink ranchers who depend largely upon catches of tullibee (great lake halibut) and rough fish, such as jack, for mink feed. In 1950 eighty licences were issued to mink farmers for this type of fishing.

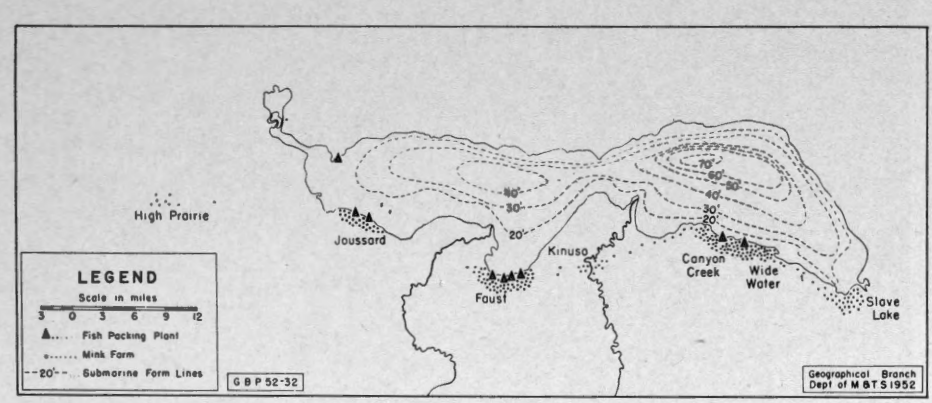


Figure 12. The distribution of industries based on the resources of Lesser Slave Lake.

Thirty years ago annual catches of whitefish ran as high as 2,000,000 pounds. Today the catch is rigidly limited to 700,000 pounds, the result of governmental recognition of the over-fishing of the lake during the war years, when commercial fishermen operated without a limit. The movements of fish make it necessary to impose a time limit upon fishing for rough fish by the mink ranchers. The season is closed to mink fishermen when commercial fish and rough fish are in the same feeding grounds. Also, if during an open season the mink fishermen are taking whitefish in excess of 5 per cent of their catch, the lake is automatically closed to mink fishing. Tullibee catches are high, often as much as 5,000,000 pounds a year.

The Alberta Fisheries Branch recognizes the heavy demands made by the mink fishermen upon the resources of the lake. There are over two hundred mink farmers in the Lesser Slave Lake area, attracted there by the possibility of cheap food (Figure 13). A similar concentration of mink farmers existed in the thirties around Lac la Biche, several hundred miles to the east. Heavy fishing for this industry reduced the resources of that

lake to the point where it failed to produce the cheap food, and the industry fell sharply. The Fisheries Branch is permitting the present heavy fishing in Lesser Slave Lake in the nature of an experiment, in order to determine the ability of the lake to stand up to it. In addition, heavy fishing appears to have a favourable influence on the degree of infestation of parasite found in the whitefish. Despite the insecurity of future years, present conditions in the Lesser Slave Lake area work to the advantage of the mink farmers. A large-scale operator in this area is able to save as much as $2,000 a year by feeding tullibee, the basic reason why this area is at the present time the most important one in the province of Alberta as a producer of mink pelts.

Figure 13. Mink pens, a common sight from Slave Lake to Joussard.

Mink farming requires heavy capitalization. One first class ranch may represent an investment of as much as $75,000, the value of buildings, freezing plant, fishing gear, and breeding stock. Small operators are able to get started without too much capital, but they are vulnerable in the bad years, and the percentage of failures among them is high.

Historically speaking, Lesser Slave Lake has been a thoroughfare, leading to more northern regions. Today it serves the same function, as evidenced by the large amount of through traffic along the Alaska Highway. But a great deal of permanent settlement has been made.

The agricultural settlement centring upon High Prairie has the appearance and the history of a successful settlement, and each year new land is broken, and brought into cultivation. High Prairie farmers pride themselves on the number of their sons who choose to remain in the area, willing

to homestead. Lumbering has increased in importance over the years. In all cases, industries operate for the Edmonton market or beyond, and Edmonton is known to all as "the city", but the region has much sound development to its credit, and has lost many of the characteristics of a frontier. Thirty-seven years ago Grouard was reduced to a ghost town, reflecting the poor economic foundations upon which it had been built. Today, High Prairie, the successor to Grouard, could probably suffer no such fate.

RÉSUMÉ

La région du lac Lesser Slave en Alberta est située à la limite nord du front de colonisation de la prairie. La seule activité au dix-neuvième siècle était le commerce des pelleteries. La ruée vers l'or du Klondike en 1898 et le développement de la région de la Rivière-la-Paix, au début du vingtième siècle, furent des facteurs importants dans l'histoire de la colonisation locale. Ces deux événements attirèrent des habitants, dont un certain nombre s'établirent sur place. En 50 ans, c'est-à-dire depuis l'arrivée des premiers colons, la région a perdu quelques-uns des traits distinctifs d'une zone pionnière. Aujourd'hui, la pêche et la chasse organisées, l'agriculture et l'exploitation du bois jouent un rôle de premier plan dans l'économie régionale.

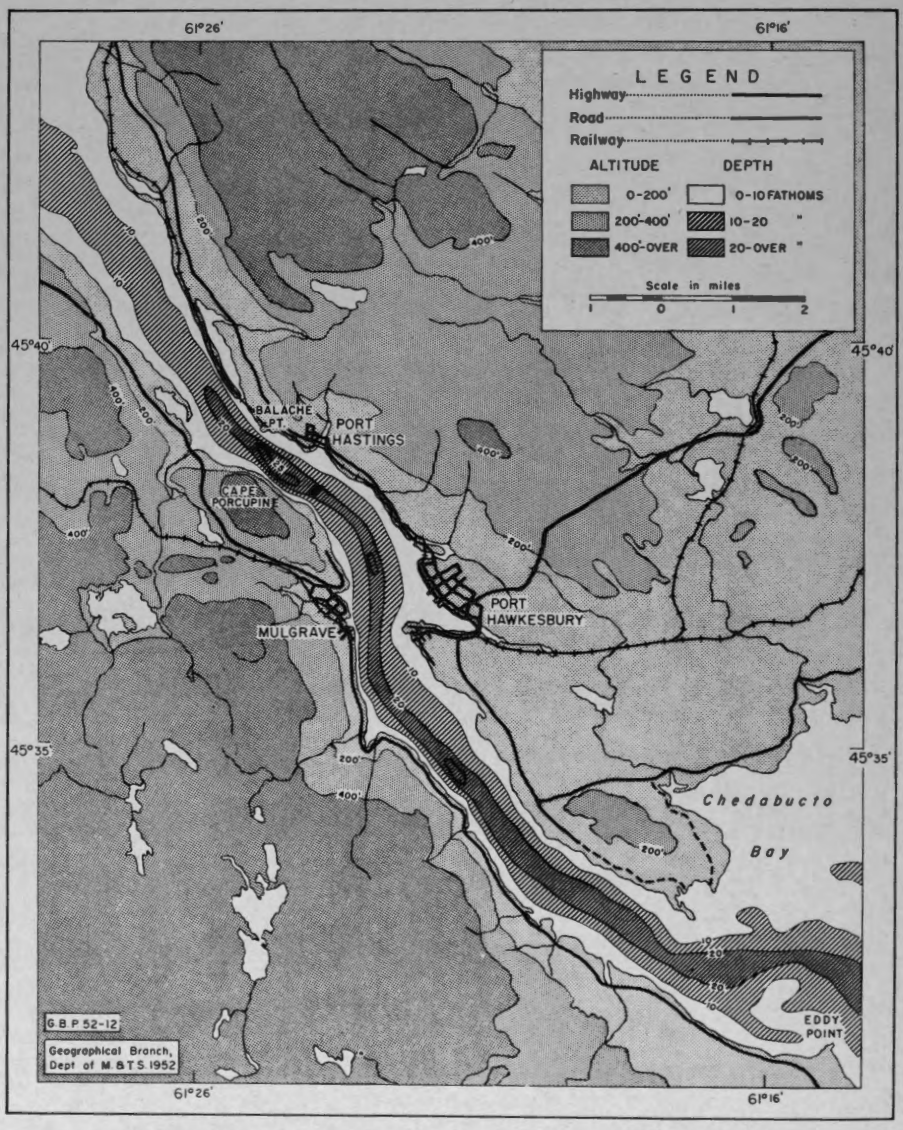


Figure 1. Bathy-orographical map of Strait of Canso.

THE STRAIT OF CANSO IN RELATION TO THE ECONOMY OF CAPE BRETON ISLAND

Pierre Camu[1]

The Strait of Canso as a transportation link between Cape Breton Island and the mainland of Nova Scotia has been the subject of serious discussion for many years. Ever since the opening of a ferry service between Mulgrave and Port Hawkesbury at the beginning of the century, the possibilities of bridging the channel other than by ferry-boat have been discussed in eastern Canada. Various groups, since the end of World War II, have urged the governments of both Nova Scotia and Canada to start building a bridge, a causeway, a tunnel, or even to provide improved ferry service. Many engineering surveys have been conducted and studies were made of the physical conditions of the strait[2]. The recent decision of the Federal Government to build a causeway in co-operation with the Nova Scotia Provincial Government has focused attention on this part of Canada[3].

This survey outlines first, the physical setting of the Strait of Canso, then the human and economic geography, which is mostly a study of the traffic across the strait, and, finally, stresses the economic activity of the island and its dependence on the strait as a transportation link.

THE PHYSICAL SETTING OF THE STRAIT

The Strait of Canso separates Cape Breton Island from the mainland of Nova Scotia and links the Gulf of St. Lawrence with the Atlantic offshore. It is the southernmost of the three waterways between the Gulf and the Ocean, the others being the Strait of Belle Isle in the north and Cabot Strait between the two.

The length of the strait, from the lighthouse on Eddy Point at the southern entrance to the lighthouse at the northern entrance, opposite Heffernan Point, is 14½ miles; the width varies from 2,736 feet at the narrowest section between Balache Point and Cape Porcupine, to over a mile at other points[4]. There are two natural sites for harbours on the strait. On the west, south of Mulgrave, is Pirate Harbour surrounded by hills and not easily accessible from the land, and on the east side is Ship Harbour at Port Hawkesbury, the best harbour of the strait.

The land on either side is high, rising more or less abruptly to the summits of ridges of 500 feet elevation. The mainland side is higher than the island side (Figure 1). A set of three cross-sections taken at different

[1] Dr. Camu is a member of the Geographical Branch, Department of Mines and Technical Surveys. This article arose out of a brief report prepared for the Department of Finance by Dr. Camu and W. J. Blowes, B.A., University of Western Ontario, Geographer, Geographical Branch.

[2] These studies are summarized in the Appendix.

[3] House of Commons Debates, Official Report, unrevised ed., Tuesday, 9th October, 1951, p. 2, column I.

[4] Gulf of Saint Lawrence Pilot (Canadian Edition), Third Edition, Department of Mines and Resources, Ottawa, 1946, p. 121.

points on the strait stresses the different altitudes between the two coasts (Figure 2). The most remarkable feature along the strait is Cape Porcupine (640 feet), which dominates the surrounding country. The strait north of Port Hastings is surrounded by higher peaks than the area to the south, making accessibility from the interior of the island difficult. The natural pathways towards the hinterland follow the brooks and the few natural valleys.

The rocks of the coast belong to the lower members of the coal Carboniferous formation and are composed of slates, schists, conglomerates and sandstones, gypsum, and Carboniferous limestones. The schists outcrop to the south, the conglomerate sandstone dominates to the north, and the granite stands in between[1].

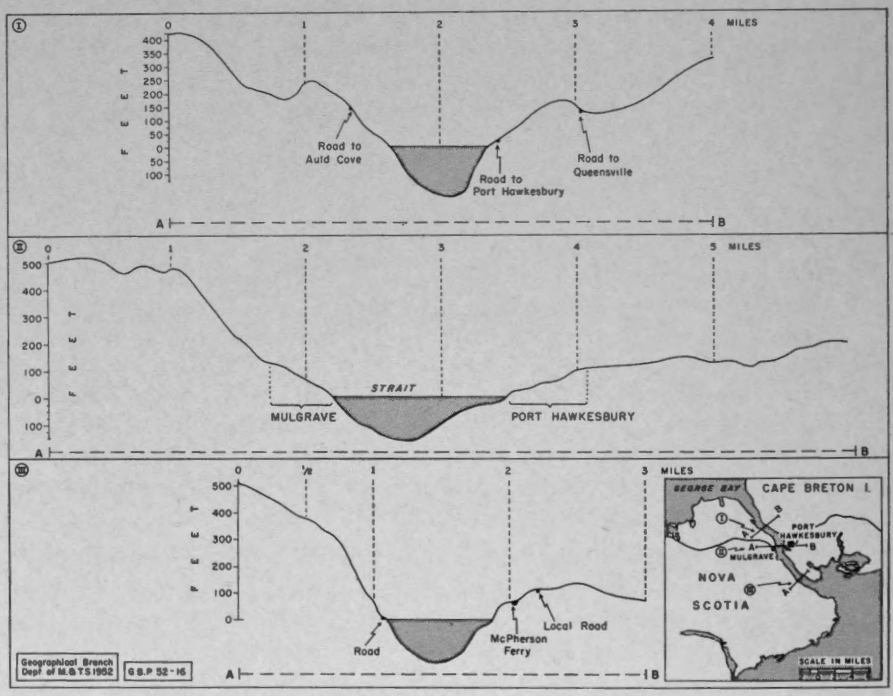


Figure 2. Cross-sections at various points along the Strait of Canso.

The shores are steep and precipitous in many places. Elsewhere they terminate in gentle slopes with or without flat beaches. Several small rocks and shoals appear at no great distance offshore. At many places depths are over 180 feet. The natural channel follows depths varying between 20 and 25 fathoms (Figure 1). In the bed of the strait, rocks appear in many places but other materials such as sand and mud are not uncommon (Figure 3).

[1] Goldthwait, J. W.: Physiography of Nova Scotia; Canada, Department of Mines, Ottawa, 1924.

The range of tide is about 6 feet and 4½ feet at the two ends of the strait, the maximum difference of level between the Gulf of St. Lawrence and the Atlantic being 3⅓ feet[1]. Currents are of 3 and 4 knots, the strongest occurring in the vicinity of Point Tupper and Cape Porcupine where they have a velocity of 5 knots at spring tides. The flood tide stream and the

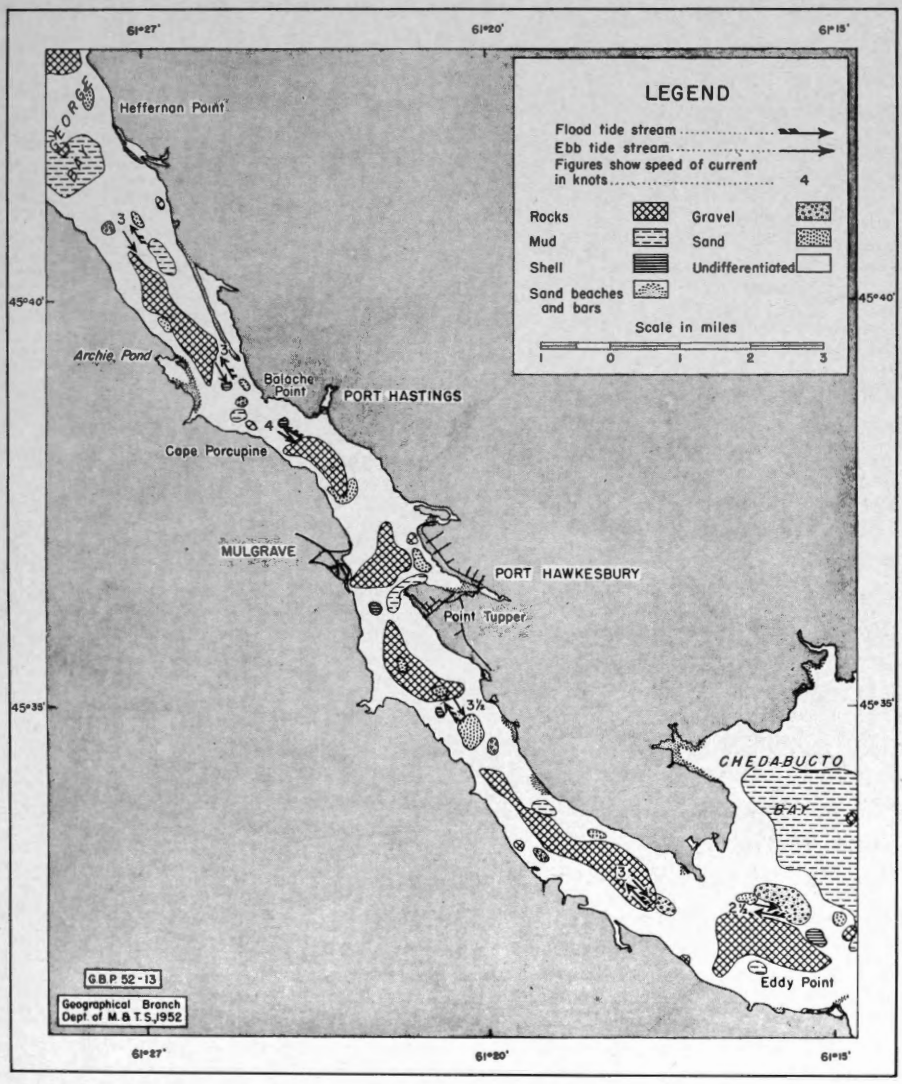


Figure 3. Character of the bottom of the Strait of Canso.

ebb tide stream are indicated on Figure 3. There is a greater flow of water to the southward, which appears to correspond with the constant outward flow from the Gulf of St. Lawrence towards the Atlantic Ocean[2].

[1] Tide Tables for the Atlantic Coast of Canada; Canada, Department of Mines and Technical Surveys, Ottawa, 1951.

[2] Gulf of Saint Lawrence Pilot; op. cit., p. 136.

Climatic variations also affect the flow of water. During the winter the ice that forms in the Gulf of St. Lawrence is carried down by the current and lodges all around the coast. George Bay is frozen over and the northern section of the strait, i.e., north of Archie Pond and Ghost Bay, is covered by a solid bridge of ice. Most of the coves and bays are frozen for a couple of months in the winter. For the most part, from the middle of January until the third week of April ocean navigation is completely interrupted though ferry-boat service is continued. Port Hawkesbury is completely closed only at intervals between these dates. South of Mulgrave and Port Hawkesbury the ice moves in both directions according to tidal flow and has not much chance to form an ice bridge. This movement of ice-cakes, up and down the channel, makes the navigation of ferry-boats difficult. The breaking of the ice in April is another difficult period. Ice breaks up first in Northumberland Strait and moves northwestward between Prince Edward Island and the coast of Nova Scotia; then the ice in George Bay breaks up and moves first northward and then southward. On one day the whole bay might be clear, but on the next day might be covered over again by southward-moving ice. Usually the ice-packs escape through the Strait of Canso. April then is the month when the strait may be free or covered with ice on alternate days. The breaking and clearing of ice in Chedabucto Bay occurs at the beginning of April, usually clearing itself within a week. It is only in the third week of April that the strait is definitely clear of ice and declared open to navigation until the following January.

HUMAN AND ECONOMIC FEATURES

Social and economic activity along the strait are concentrated in the towns of Mulgrave and Port Hawkesbury. The pattern of roads and railway lines is oriented towards these crossroads where almost everyone works for one or another of the transportation systems. The strait is a navigational route for vessels that are sailing from the St. Lawrence harbours to New England and the West Indies. The crossing from the mainland to Cape Breton Island is assured by ferry-boats operating the year round. Two ferries have provided a regular shuttle service between these two towns since 1901. From 1883 until 1901, the Federal Government operated a barge with a steam-tug lashed alongside for propulsion[1].

The railway ferry service uses two boats to carry cars (freight and passenger) across the strait, the *Scotia I* and the *Scotia II*. Passengers and automobiles are carried by two other ferry-boats, the *George H. Murray* and the *John Cabot*, owned by the Nova Scotia Department of Highways and Public Works.

[1] A Permanent Crossing Over the Strait of Canso; The Canso Crossing Association, Sydney, 1948, p. 5.

THE RAILWAY FERRY SERVICE

This ferry system joins the piers of Mulgrave to Point Tupper, which is located south of Port Hawkesbury; siding tracks and yards are spread south of each point mentioned above. On either side, trains are broken, switched, sorted, and remade before continuing either towards Sydney or to western Canadian cities.

The volume of railway traffic transported by ferry-boats has steadily increased from 40,000 cars a year in 1920 to 113,000 cars a year in each of the last 5 years. During World War II, the traffic varied greatly, exceeding 120,000 cars a year. By 1960 the estimated traffic per year might reach 145,000 cars[1]. Table I shows the traffic of railway cars for selected years. The movement of cars in both directions equals approximately 57,000 railway cars (average 1946-50).

TABLE I

Number of Railway Cars Transported by Ferry-boats

Year	Total number of cars	Year	Total number of cars
1922	44,950	1946	113,694
1924	46,000	1947	89,000
1927	47,000	1948	116,585
1931	52,000	1949	117,839
1934	54,000	1950	131,724
1938	59,000	Average 1946–1950	113,867

Source: Report on the Problem of Crossing the Strait of Canso (1949), p. 22. Statistics supplied by the Department of Research and Development, Canadian National Railways.

The daily volume of traffic across the strait averages 311 railway cars. The capacity of the ferry-boats is 18 cars a trip. The newest ferry-boat makes an average of 17 trips in a 19-hour day with the oldest ferry-boat as a stand-by.

The traffic of railway cars for the last 5 years is given in detail in Table II. It is broken down into east- and west-bound, loaded and empty cars, and into commodities and kind of cars. It brings out the following points:

(1) The total number of railway cars moving east and west each year is equal;

(2) The heavier traffic of commodities is westward rather than eastward. This is noticeable in the movement of empty cars eastward and loaded cars westward;

(3) The largest tonnage of commodities going east is composed of general freight and food, and the largest tonnage going west is coal;

(4) Steel and scrap are shipped eastward to be smelted and processed at Sydney; the steel in turn is one of the major items transported westward.

[1] Ellis, D. S., Pratley, P. L., and Surveyer, A.: Report on the Problem of Crossing the Strait of Canso; Ottawa, 1949, p. 13.

TABLE II

Traffic Handled by Railway Ferry Service Over the Strait of Canso 1946-1950 (Number of Cars)

Year	Passenger equipment number of cars	Number of cars loaded with						Number of empty carloads				Total number of cars
		Coal		Steel	Rail	Scrap	Other commodities	Gondolas and general purpose	Hopper	Flats	Other	
		O.C.S.[1]—revenue										
A. East-bound—Mulgrave to Port Hawkesbury												
1946	7,497	3	9	156	9	968	21,294	12,247	12,669	895	1,251	56,998
1947	6,966	257	487	202	48	1,248	21,854	5,607	6,299	625	1,085	44,678
1948	7,509	11	3	194	26	1,946	22,200	9,278	13,712	1,135	2,383	58,397
1949	7,844	7	4	147	18	1,138	23,061	10,538	13,345	1,448	1,493	59,043
1950	7,769	3	5	99	17	1,050	22,299	9,238	21,847	1,897	1,626	65,850
Total	37,585	281	508	798	118	6,350	110,708	46,908	67,872	6,000	7,838	284,966
Average 1946-50 (approx.)	7,517	56	101	159	23	1,270	22,121	9,381	13,574	1,200	1,567	56,993
B. West-bound—Port Hawkesbury to Mulgrave												
1946	7,435	6,543	19,721	3,414	1,158	65	6,927	111	98	293	10,931	56,696
1947	6,970	2,197	9,324	5,550	821	63	6,910	31	517	335	12,098	44,816
1948	7,502	6,418	17,372	5,499	1,487	76	8,373	17	12	180	11,252	58,188
1949	7,824	4,249	17,227	6,495	1,709	44	7,337	32	35	213	13,631	58,796
1950	7,760	7,416	21,458	6,884	2,343	117	7,150	24	61	127	12,579	65,919
Total	37,491	26,823	85,102	27,842	7,518	365	36,697	215	723	1,148	60,491	284,415
Average 1946-50 (approx.)	7,498	5,364	17,020	5,568	1,503	73	7,339	43	144	229	12,098	56,883

[1] O.C.S. means on company's service.

Source: compiled from data supplied by the Department of Research and Development, Canadian National Railways, August 1951.
The total number of cars giving averages 1946-50 were obtained by dividing the totals 284,966 and 284,415 by 5.

The movement of railway cars across the strait and the type of freight they carry indicate certain aspects of the economy of the island. One can evaluate the traffic in tons by multiplying the number of cars by their capacity in tons. This gives a total of 966,700 tons moving east and 1,990,600 tons moving west, estimating the capacity of railway cars as follows: for coal, 60 tons per car; for rail, steel, and scrap, 50 tons; and general, 40 tons. But these are maximum estimates and are valid only if each car is fully loaded, which is not always the case. Box-cars, gondolas, and flat cars, for instance, may be partly loaded or, if fully loaded, the weight may be as low as half the capacity. To be more accurate, the tonnages of general cargo should be readjusted by cutting down the maximum estimated capacity by one-third, and the amount of coal moving westward should be reduced to 1,100,000 tons, a figure that is closer to reality[1]. So far as the iron and steel industry is concerned, in 1950 the quantity of sales of iron and steel in net tons amounted to a total of 591,165 tons[2]. Between 33 and 40 per cent of this production usually is shipped by rail, or approximately 200,000 tons, which is also lower than the maximum estimated tonnage. Table III shows the tonnages adjusted on these bases.

TABLE III

Estimated Tonnage of Commodities Carried Across the Strait of Canso by Railway Cars

Average of 1946-1950 (in Short Tons)

——	Coal	Steel	Rail	Scrap	General	Total
East-bound.....	9,400	7,900	1,100	63,500	663,600	745,500
West-bound.....	1,140,000	200,000	75,100	3,600	220,000	1,638,700
Total.....	1,149,400	207,900	76,200	67,100	883,600	2,384,200

Source: based on Table II.

THE HIGHWAY FERRY SERVICE

This ferry service operates just north of the railway ferry. The two vessels are relatively new and they have a capacity of 21 automobiles each. During the last war, due to restrictions on gasoline and difficult conditions of motoring, the traffic of automobiles varied between 22,000 and 28,000 vehicles a year; in 1946, 51,166 vehicles crossed the strait and in 1949 more than 90,000[3]. By 1960, a potential traffic of 170,000 vehicles is anticipated, with an average of 465 vehicles a day requiring 22 trips across the strait by both ferries or 11 trips by each one[4].

[1] *See* the section on mining in Cape Breton Island.
[2] From statistical data supplied by the Dominion Steel and Coal Corporation, Ltd., 5th November, 1951.
[3] Nova Scotia, Department of Highways and Public Works; Annual Report, 1949, Halifax, 1950, p. 14.
[4] Ellis, D. S., *et al.*: op. cit., p. 24.

The physical, human, and economic features of the Strait of Canso reveal already its role as a transportation link. A step forward is to find the importance of that link by comparing the traffic across the strait with the total traffic of commodities produced or, at least, caused by the various economic activities of Cape Breton Island.

THE ECONOMY OF CAPE BRETON ISLAND

POPULATION

The 1951 census shows the total population of Cape Breton Island to be 157,014, or about 24 per cent of the total of Nova Scotia. Although the population has been growing at a steady rate, the number of people living in the rural areas has decreased since 1891. The main reason for this trend toward urbanization has been the development of the Sydney area as a coal, iron, and steel producing centre. This area, extending in a radius of 18 miles around Sydney, includes such centres as North Sydney, New Waterford, Sydney Mines, and Glace Bay; it has a population of approximately 83,000, or almost three-fifths of the total population, and accounts for the majority of the urban population (Figure 4). The rural population may be divided into three classes:

(a) The farm population deriving its livelihood entirely from farm operations;

(b) The non-farm population engaged in occupations other than farming, such as blacksmiths, teachers, miners, factory workers;

(c) The population living on farms but deriving the major part of its livelihood from some other occupation.

AGRICULTURE

The physiography, climate, and soil of Cape Breton Island are such that farming on a commercial scale is very restricted.

More than half of the island is formed of highlands underlain by resistant rocks, mostly covered by forests. In the centre of the island is Bras d'Or Lake, actually an arm of the sea reaching far inland. The agricultural areas are limited to the lowlands and land-locked lakes. The frost-free season is about 153 days in the southern part of the island, whereas around the Bay, at Sydney, the usual interval ranged from 136 to 163[1].

The scattered farms and the scale of operations, added to the physical conditions, put farming on a predominant self-sufficient, part-time basis. Of the total farms on the island, almost 80 per cent are of the above-mentioned types. Specialized farming has developed around the Sydney area in order to supply the demand of the large urban population. Outside the Sydney milk shed, farms are scattered throughout the island except for the northern plateau, which is almost farm free. Most of the farms produce a livestock combination of beef and sheep as well as dairy products, poultry, and forest products. The farms themselves are small, averaging a little over 100 acres, with approximately 50 per cent in woodlot. Field crops are relatively unimportant and for the most part utilized as winter feed.

[1] Lewis, J. N., and Hudson, S. C.: Land Use and part-time Farming in Cape Breton County, Nova Scotia; Canada, Dept. of Agriculture, Ottawa. 1942, p. 6.

Investigations in 1937 showed that the island supplies only about 21 per cent of the food supplies for the Sydney market area, the remaining 79 per cent being imported from adjacent Canadian and American regions.

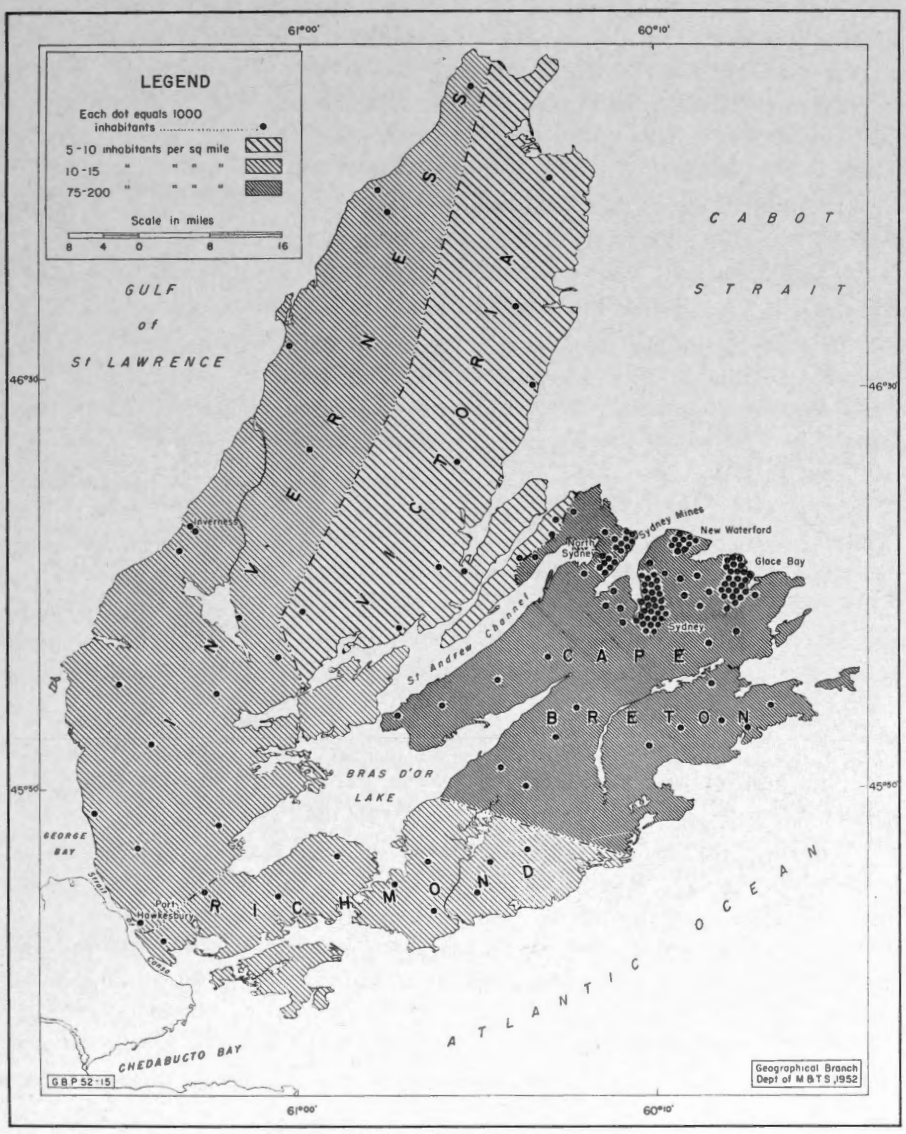


Figure 4. The distribution of population on Cape Breton Island.

The import of food is still today one of the largest volume of commodities carried east-bound across the strait[1].

[1] Reid, E. P., and Hopper, W. C.: The Market for Farm Products in the Sydney Area of Nova Scotia; Canada, Dept. of Agriculture, Ottawa, 1941, p. 10.

FISHING[1]

Fishing is one of the most important industries of Cape Breton Island. Fish of all kinds is plentiful; salmon and trout are to be found in the rivers, and coastal waters contain cod, halibut, mackerel, herring, haddock, etc. Fishing is mainly a part-time occupation; many of the 4,000 fishermen find winter employment in the lumbering industry. The industry itself is dispersed, the fishing ports being scattered along the entire coast, with the heaviest concentration along the southeast coast of Cape Breton county. There is no commercial fishing in the waters of the Strait of Canso itself.

In 1948, Cape Breton Island accounted for a landed value of fish of over $2,750,900. This was about 14 per cent of the value of fish landed in Nova Scotia for that year, or about 4 per cent of the Canadian total. The leading catch was lobsters, followed by cod, sword-fish, and halibut.

The fishing industry has given rise to processing plants and canneries. Leading processing plants handle salt fish, followed by those that handle fresh fish and lobsters. In the canning industry lobsters are the most important, but many other species are also canned.

Lobsters and fresh frozen fish are marketed chiefly in the United States, with a small amount finding its way into interior Canada. This catch is exported directly by small vessels or through Halifax by small vessels and then transshipped into larger vessels. The main markets for salt fish are foreign countries such as Jamaica, Puerto Rico, Spain, Portugal, and Italy. Salt fish is exported to foreign countries through the harbours of Sydney and Louisburg. Only a small amount is exported via the strait.

FORESTRY[2]

The native trees of the island are oak, elm, birch, maple, ash, pine, spruce, fir, and hemlock, the coniferous types being the most predominant.

Logging in Cape Breton, as in most other parts of Canada, is a seasonal industry. The large supply of labour, usually available in the off season for agriculture and fishing, coupled with cheap transportation down the many short rivers, places logging in a favourable position. In Cape Breton, wood operations produce raw materials, not only for sawmills, planing mills, and sash and door factories, but also logs, pulpwood, railway ties, pit-pumps, fuel wood, and other primary products that are finished in the woods.

Although no pulp mills are located on the island, sawmills are numerous. In 1949, there were 106 sawmills, 3 planing mills, sash and door factories, with a gross value of products of over $1,205,000. Over 47 sawmills were located in Inverness county, accounting for about 50 per cent of the island's production of softwood lumber. On the other hand, 3 planing mills, and sash and door factories, located in the Sydney area, were responsible for over

[1] Based on Nova Scotia Fisheries Year Book, Year 1949-1950; Nova Scotia, Dept. of Trade and Industry, Halifax, 1949 and 1950. A valuable reference to this subject is S. Bates' Report on the Canadian-Atlantic Sea-Fishery, in Report of the Royal Commission on Provincial Development and Rehabilitation, Halifax, 1944.

[2] Principal Statistics of the Manufacturing Industries of Cape Breton Island, 1946-48; Canada, Dept. of Trade and Commerce, Ottawa, 1951.

40 per cent of the gross value of products of both the sawmills and planing mills, and sash and door factories. In comparison with the total production for Nova Scotia, Cape Breton wood industries were responsible during the 1949-1950 season for approximately 8 per cent of the softwood lumber, 6 per cent of the hardwood lumber, 42 per cent of the production of railway ties, 50 per cent of the pit-props, and 17 per cent of the shingle production. A certain percentage of this production remains on the island for local consumption and a relatively small tonnage crosses the strait for outside markets[1].

MINING

The most important economic mineral found on the island is coal: actually it is the backbone of the island's economy. The chief deposit is found in the vicinity of Sydney and this area supplies about 75 per cent of Nova Scotia's total output of coal[2]. The productivity area is a narrow fringe of lowland coast 30 miles long in an east-southeasterly direction and covers a land area of about 57 square miles as well as a large area in which mining is carried out beneath the sea. A smaller field is located at Inverness, but its output is negligible in comparison with the Sydney production. The following table gives an idea of the production and shipment of coal for Cape Breton and Inverness counties. In 1950, the 9,000 people directly employed in the coal-mining industry produced $39,000,000 worth of bituminous coal, which in effect was approximately 38 per cent of Canada's total production[3].

TABLE IV

Production and Shipment of Coal for Cape Breton Island 1945-1949 in thousands of short tons

Year	Cape Breton county		Inverness county		Total (C.B. Island)	
	Production	Shipment	Production	Shipment	Production	Shipment
1945	3,735	3,423	93	74	3,828	3,497
1946	3,880	3,575	92	87	3,972	3,662
1947	3,011	2,688	83	79	3,094	2,767
1948	4,881	4,760	97	92	4,978	4,852
1949	4,784	4,511	89	82	4,873	4,593
1950	4.928	4,689	79	76	5.007	4,765

Source: Department of Mines, Nova Scotia, Halifax: Annual Report on Mines: 1948, p. 179 (1949); 1949, p. 172 (1950); 1950, p. 130 (1951). The 1950 figures are based on a calendar year.

About one-half of the coal that is mined in the Sydney area comes from submarine seams that dip seaward and extend for an unknown distance. At present, coal is mined 3 to 4 miles out.

[1] Nova Scotia, Dept. of Lands and Forests; Annual Report, 1950, Halifax, 1951, p. 36.

[2] Geology and Economic Minerals of Canada, Third ed.; Canada, Dept. of Mines and Res., Ottawa, 1947, p. 135. *Also* MacKay, B. R.: Coal Reserves of Canada; Reprint of Chapter I and Appendix A of Report of the Royal Commission on Coal, 1946. Ottawa, 1947.

Coal Statistics of Canada 1950; Canada, Dept. of Trade and Commerce, Ottawa, 1950, pp. 42-43.

Although the industry has an advantage in its proximity to tide water, this has been offset by the high costs of production and the difficulties in finding suitable markets.

Today one-third of the production finds its way to markets in Quebec, another third is utilized by the local iron and steel industry, with the remaining third being taken up by railways, factories, and domestic consumers in the Maritimes region. The industrialized northeastern United States receives very little and Ontario none. In 1950 the shipments of coal from Cape Breton Island by rail amounted to 1,180,550 tons[1]. This estimate is close to the tonnage of coal carried westward across the strait in the previous years. Thus, approximately 29 per cent (24 per cent in 1950) of the coal mined on the island is transported across the Strait of Canso.

Many other minerals such as zinc, lead, copper, and gold are found on the island, but none is found in large enough quantities to render commercial extraction profitable. Gypsum, silica, and limestone, however, are quarried and utilized for local building and industrial purposes.

MANUFACTURING[2]

In terms of gross value of production, the manufacturing industries lead all other economic activities. Manufacturing is centralized in the Sydney area, with primary iron and steel and its affiliates, such as wire and wire products and coal by-products, being the principal industry. In 1949, the iron and steel industry was responsible for over 83 per cent of the gross value of the island's manufactured products. The industry had a gross product value of approximately $49,200,000 in 1949 as against $23,000,000 in 1946[3]. In 1949 it was the second largest employer, with over 5,200 employees. Although the gross value of products has almost doubled in the above-mentioned interval, it should be realized that increased prices for iron and steel as well as increased production have to be taken into consideration. In 1949 the primary iron and steel industry of Cape Breton Island accounted for approximately 10·5 per cent of the total value of the iron and steel production of Canada.

Little iron ore is found in Cape Breton. The ore comes from Bell Island in Newfoundland, and, along with some limestone, is brought in by ship direct to Sydney. While it is being processed, local coal and limestone are added. The industry has a great transportational advantage, which is offset by the high cost of coal, the metallurgical problems, the low labour productivity, the cost of importing scrap, and the distance from markets.

Fish, canned and cured, was the second leading manufacturing industry in 1949, with a gross value in products of almost $4,260,000. Other leading industries were bread and bakery products, planing mills, sash and door factories, printing, and publishing.

---

[1] From information given by the Dominion Steel and Coal Corporation Ltd., letter of November 5, 1951.

[2] The Maritime Provinces in their Relation to the National Economy of Canada; Canada, Dept. of Trade and Commerce, Ottawa, 1948.

[3] Principal Statistics of the Manufacturing Industries of Cape Breton Island 1946-1948; Canada, Dept. of Trade and Commerce, Ottawa, 1951.

The manufacturing industry is responsible for the east-bound movement of scrap and for a west-bound movement of steel. The fish manufacturing industry does not represent a very large tonnage. The latter is likely to be a regular item transported across the strait, whereas iron and steel, depending on so many factors, might be considered as an irregular one.

TOURISM

Another activity of considerable importance to the island is "tourism". Statistics illustrate that the number of people who visit the island has increased since World War II. Over 8,443 cars classed as tourists cars entered the island in 1949 at Port Hawkesbury, an increase of about 2,000 over the previous year[1]. The number of visitors registered at the Ingonish entrance to Cape Breton Highlands National Park was 31,134 in 1949, compared with 25,551 in 1948[2]. The island with its cool summers, colourful scenery, abundant wildlife, places of historical interest, and pleasant people offers much to the tourist, whether he be there for sightseeing, hunting, fishing, or just plain relaxation. In turn, the tourist offers much to the island, by providing an outlet for farm products and local handicraft products, and giving employment in lodges, hotels, tourist camps, service stations, and other service establishments. The tourist industry is one of the brightest spots in the economy of the island; it is vital for it to have good roads and highways and a good system of crossing the strait. A causeway will facilitate the numerous proposed trips to the island, but it also necessitates good roads. "Tourism" depends almost entirely on the means of crossing the strait.

TRANSPORTATION

The importance of transportation to the overall economy of Cape Breton cannot be overestimated. Transportation is vital, not only because of the large amount of food products that have to be brought in, but also because of the large volume of production that is shipped to outside areas.

Water shipping and railway freight are responsible for most of the commodity movement to and from the island; although highway carriers have gained at the expense of both in the past few years.

The island is served by two railways, the Canadian National Railway and the Sydney and Louisburg Railway. The latter is owned and operated by the coal and iron interests in Sydney and performs many useful services for the owners as well as offering passenger and freight transportation to the public. The length of the line is about 70 miles and it runs along the east coast, from Sydney to Louisburg, serving such centres as Bridgeport and Glace Bay. It has no direct contacts with the strait. The Canadian National from the mainland crosses the Strait of Canso by ferry between Mulgrave and Port Hawkesbury. At Port Hawkesbury the main line carries through to Sydney, with minor lines branching north to Inverness and

[1] Nova Scotia, Dept. of Trade and Industry, Halifax, Annual Report 1949, p. 41 (1950).
[2] Ibid., p. 41.

southeast to St. Peters. Freight and passenger services are maintained and there is no doubt that a causeway will speed up the movement of passenger trains.

Highways like railways have been built to conform with the physical geography of the island and present a definite east-west pattern (Figure 5). Highway contact with the mainland is via the ferry service across the strait, which is available 24 hours a day. Gravel and hard surface roads predominate. Route No. 4 from Port Hawkesbury to Sydney is paved and a high concentration of paved surfaces is to be found in the Sydney area.

Trucks are found extensively on the island. In 1939, truck traffic around Sydney, between Glace Bay, New Waterford, and North Sydney Mines, was the heaviest in the province[1]. "This traffic is local to the area. Through freight is conveyed to Sydney by rail or sea and is then distributed and collected to and from these towns by road"[2]. Trucks are particularly adaptable for local cartage. Their flexibility allows fish and wood products to be collected in areas where no rail facilities exist. In 1949, there were 8,705 passenger and 4,279 commercial motor vehicles in Cape Breton Island[3]. It seems that there is now a heavy truck transportation between the island and the mainland.

Water shipping is important as a transportation medium. The coal traffic to the St. Lawrence ports makes up most of the tonnage and non-bulk freight such as iron and steel products; coal by-products, fish, and wood products comprise the smaller proportion. The cargoes shipped to foreign countries consist of iron and steel products and coal, but they are a small percentage of the total tonnage due to the large coastal movement. Iron ore and limestone from Newfoundland form the largest proportion of goods coming in by water transport, with a small amount of food and manufactured products arriving from the mainland. Imports from foreign countries are negligible in quantity. Sydney and North Sydney are the largest harbours, with Louisburg and Port Hawkesbury rendering service as secondary harbours. In winter, Sydney and North Sydney are closed because of ice conditions and any water shipping is carried through Louisburg.

CONCLUSION

The actual ferry system serves a total population equal to 24 per cent of the total urban and rural and 33 per cent of the total urban population of Nova Scotia. Adding the population of the adjacent counties on both sides of the strait, the regional population amounts to a total of 200,000 inhabitants. These are the people who will stand to benefit directly by an improved transportation system. If a seasonal tourist population of 40,000 people is added, roughly 250,000 people will stand to profit by the building of a new causeway.

---

[1] Reports of the Nova Scotia Economic Council, Volume VI, 1941; Halifax, 1942, p. 52.
[2] Ibid., p. 52.
[3] Nova Scotia, Dept. of Highways and Public Works, Halifax, Annual Report 1949, pp. 104-105 (1950).

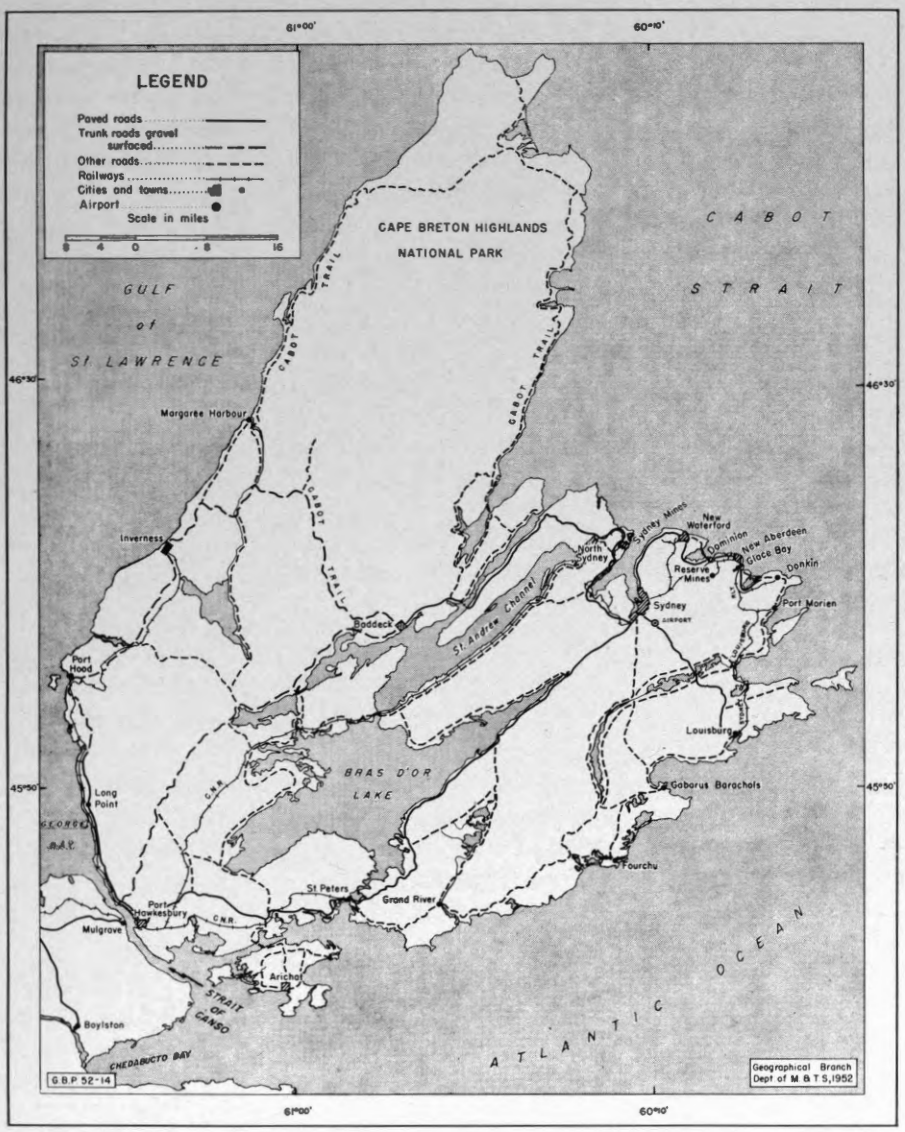


Figure 5. The major transportation facilities of Cape Breton Island.

All the economic activities of the island involve the use of the ferry system to a greater or lesser degree. Mining products account for 60 per cent of the west-bound tonnage, followed by manufactured products, which account for 20 to 25 per cent of the total west-bound tonnage. The rest of the west-bound traffic is made up of canned and cured fish and some other food, and fishery and forestry products. The east-bound tonnage is made up of general cargo, which comprises agricultural products as well as wholesale trade and general commodities. It was estimated that 79 per cent of all food supplies for the Sydney market in 1937 came from regions located on the mainland[1]. This 79 per cent has since increased. Other cargoes transported eastward are some steel, rail, and scrap. This total tonnage of commodities carried across the strait does not represent the total tonnage of products that contribute to the economic life of Cape Breton Island, but is a part of it. In fact, a large percentage of the traffic of commodities that enter or leave the island depends on harbour facilities, water connections, and shipping. The imports of raw materials (iron ore and limestone) from Newfoundland, the export of coal to the Quebec market, the export of fish directly overseas (or by small boats to Halifax and New England harbours), plus an indefinite amount of general cargo, are all transported by vessel. Hence, about 60 per cent of the total flow of commodities resulting from the economy of Cape Breton Island is carried by vessel and 40 per cent by rail across the Strait of Canso.

In the case of the traffic flow of passengers to and from Cape Breton Island, most of it occurs via the strait; there are other services such as the Sydney-Newfoundland shipping and passenger service but they form a small percentage of the total.

In relation to the economy of the island, the strait means more than its percentage of the total tonnage of commodities involved. If the amount of money spent by tourists as well as the quality of commodities carried across the strait are considered, then the importance of the Strait of Canso to the economy of Cape Breton Island is realized.

APPENDIX

THE PROJECTS OF CROSSING THE STRAIT OF CANSO

Several engineering studies have been made, in the last 5 years, to improve the transportation facilities across the Strait of Canso. Engineers of the Department of Transport and a board of engineers have submitted to the Federal and Provincial authorities several solutions, such as a bridge, a causeway, a tunnel, or a new ferry service.

The first study to be conducted was made in 1947 by the Department of Transport[2]. It dealt at length with the possibility of reducing railway

[1] Reid, E. P., and Hopper, W. C.: op. cit., p. 10.

[2] MacLachlan, D. W.: Canso Investigations 1947; Canada, Dept. of Transport, Ottawa, 1947, 34 pp., mimeo., 23 plates.

The question of a bridge or a causeway across the strait had been discussed in the section on Transportation of the Report of the Royal Commission on Provincial Development and Rehabilitation, Halifax, 1944, pp. 21-25.

operating costs by relocating part of the lines. The author also studied three other projects: the ferry service, the causeway with lock, and a high-level long-span bridge. The project for a tunnel was not investigated because it was judged to be uneconomical due to depths of the strait. It is inferred that the construction of a high-level long-span bridge or a causeway was not favoured "but that if anything should be done, an improvement by which railway grades are reduced but the crossing of the Strait is continued by ferry is more advantageous than an improvement in which a bridge or a causeway is introduced"[1].

On February 6, 1948, a board of engineers was appointed by the Federal Government to study the possibilities of crossing the strait by bridge, by causeway, by tunnel, and by ferry. Its members reported that a high-level long-span cantilever bridge would be an uneconomical undertaking and they did not study this solution. A true tunnel under the bed of the strait would be too expensive to build even if physically practicable. A causeway with a lock and a movable span for navigation purposes is feasible but expensive. A low-level short-span bridge was also considered in a new location and was the only one to show a net benefit, after construction. The improvement of the ferry service would necessitate the purchasing of new boats and rebuilding the terminals; materially the service would not be improved and the uninterrupted passage as desired by the public would not be given, the railway service would still remain the bottleneck as its capacity would only be half the capacity of the railway lines on both sides of the strait. Thus the Board found the low-level short-span bridge the best one that is economically justifiable. In this comprehensive report, supported by several plates, the board studied carefully this special subject[2]. Precise surveys, current measurements, borings, and determinations of the rock level at the bridge site would have to be obtained before a final decision could be reached. The board was dissolved, but one of its members was retained to prepare plans for the construction of the low-level bridge.

In September 1950, a meeting was held in Ottawa to discuss certain features of the plan with members of the cabinet and representatives of the Canadian National Railways and the Department of Highways and Public Works of the Province of Nova Scotia. During these discussions, it became evident that some further investigations would be necessary. Therefore, the Minister of Transport reconvened the Board of Engineers in order to review the findings of the March 1949 report and "to recommend the best method of improving the present rail and highway transportation facilities across the Strait, bearing in mind that navigation, national defence and continuity of transportation services are matters of considerable importance"[3]. This time the Board studied especially the ferry and the causeway.

---

[1] Ibid., p. 1.

[2] Ellis, D. S., Pratley, P. L., and Surveyer, A.: Report on the Problem of Crossing the Strait of Canso for the Federal Department of Transport and the Nova Scotia Department of Highways and Public Works, by the Strait of Canso Board of Engineers; Ottawa, March 1949, 62 pp., mimeo., maps.

[3] Ellis, D. S., Pratley, P. L., and Surveyer, A.: Report of Strait of Canso Crossing for the Federal Department of Transport and the Nova Scotia Department of Highways and Public Works, by the Strait of Canso Board of Engineers, Ottawa, June 1951, 11 pp., 2 maps, p. 3.

Their findings appeared in the June 1951 report in which they concluded that in view of the high cost of improving the ferry service, the causeway scheme remains the best practicable solution to the problem. The estimates of all these projects are grouped in the next table.

TABLE I

Total Cost of Each One of the Projects of Crossing the Strait of Canso

1. Projects of 1947:	
(a) Ferry and relocation of railways	$ 4,500,000
(b) Causeway	35,093,800
(c) Bridge (high-level long-span)	54,208,000
2. Projects of 1949:	
(a) Ferry—highway and railway ferry and relocation of tracks	8,900,000
plus annual charges	1,900,000
(b) Causeway	29,100,000
plus annual charges	1,500,000
(c) Bridge (low-level short-span)	13,500,000
plus annual charges	500,000
(d) Tunnel	47,457,000
plus annual charges	2,196,000
3. Projects of 1951:	
(a) Ferry services	14,687,000
plus yearly operating cost	1,957,000
(b) Causeway	22,760,000
plus annual charges	1,130,000

Source: Reports submitted by the Board of Engineers to the Department of Transport, 1947, 1949, and 1951.

RÉSUMÉ

La décision récente du gouvernement fédéral de construire, en coopération avec le gouvernement provincial de Nouvelle-Écosse, une chaussée à travers le détroit de Canso et de relier directement l'île du Cap-Breton à la terre ferme, a attiré l'attention sur ce coin de pays.

Le détroit est l'une des trois voies navigables qui relie le Golfe Saint-Laurent à l'Atlantique. Le peuplement le long des rives s'est concentré dans les centres de transbordement de Mulgrave et de Port Hawkesbury, reliés par deux services de traversiers, l'un pour les chemins de fer et l'autre pour les automobiles, camions et piétons.

Le tonnage annuel des denrées, transportées par chemin de fer, s'élevait à plus de 2·3 millions de tonnes durant la période 1945-1950. De ce total, 750,000 tonnes de ferraille, de produits alimentaires et de marchandises générales étaient acheminées vers l'est et plus de 1·6 million de tonnes de charbon, d'acier, de bois et de poisson en conserve, vers l'ouest. Plus de 90,000 véhicules traversèrent le détroit en 1949, dont plusieurs milliers appartenaient à des touristes.

Analysant ensuite chacune des activités économiques de l'île, on explique que l'agriculture ne suffit pas à nourrir la population, qu'il faut importer de grandes quantités de produits alimentaires, que les expéditions de poisson frais et de bois se font surtout par mer et que les principaux produits transportés vers l'ouest sont le charbon et l'acier, le premier extrait des mines des environs de Sydney et le second venant des aciéries du même centre.

En somme, on peut dire qu'environ 40 pour cent du tonnage total des denrées produites, consommées ou en transit dans l'île, emprunte la voie ferrée et le détroit de Canso et que 60 pour cent dépend des communications directes par mer.

MAP NOTES

Selected Maps Published by Federal Mapping Agencies

Map of Canada, Exclusive of Northern Regions, Indicating Main Natural Resources. 1 : 6,336,000.

Canada, Department of Mines and Technical Surveys, Surveys and Mapping Branch, Ottawa, 1950.

This map shows natural and economic resources represented by coloured symbols, by solid tints, and by names set in type. The several categories of agricultural and forest areas are denoted by solid tints; resources, with the exception of water power, are shown in type on the face of the map within the area of development or production, and set in differing size type that suggests a quantitative value. For minerals there is a differentiation between producing and prospects by the use of upright or sloping type. Water power sites are shown by circular symbols of varying size that indicate horsepower capacities.

This is a new edition of the resources map originally published by the former Department of the Interior prior to 1930. During this period several editions have been published with revisions to resources information from material supplied by various government departments.

Principal revisions to the 1950 edition concern the inclusion of the island of Newfoundland, mineral resources, and agricultural areas. The latter are considerable and are based on the map "Type-of-farming areas, 1941" compiled by the Department of Agriculture. One important feature in the distribution of mineral resources is the addition of uranium prospects. Revisions have also been carried out for forest areas and forest industries, the fisheries, and water power sites.

Canada, Principal Mining Areas and Producing Mines (Map 900A, Second Edition). 1 : 7,603,200.

Canada, Department of Mines and Technical Surveys, Mines Branch and Geological Survey of Canada, Ottawa, 1952.

This map replaces the 1947 edition published under the title "Canada, Mining Areas". A new base map was prepared for this edition on the Lambert Conformal Conical projection with a scale of 1 inch to 120 miles.

The new map is similar in style and content to the first edition, showing the division of the country into physiographic regions, with the mineral information overprinted. The locations and names of the new oil and gas fields in Alberta are included and the oil pipe-line to Lake Superior is delineated. Mineral information for the province of Newfoundland is also shown. There is a useful series of insets of Canada showing the distribution of metallic and non-metallic minerals.

Mineral Map of British Columbia (Map 1008A). 1 : 1,267,200. In two sheets.

Canada, Department of Mines and Technical Surveys, Geological Survey of Canada, Ottawa, 1951.

This forms a companion map to the Geological map of British Columbia (No. 932A, 1948) and completes a uniform set of eight maps covering the four western provinces, which were published between 1946 and 1951 in order to cover each of these provinces with a geological map and a mineral map.

The map is printed in colour on a black base map drawn at a scale of 1 inch to 20 miles and constructed on a Lambert Polyconic projection with two standard parallels. Mineral information is overprinted with coloured symbols and shows mineral occurrences and mining properties, the latter classified according to production. Also included is an index to mining properties giving the name of the property, production, metal content, and the years of greatest value production.

Pulp and Paper Industries of Canada. 1 : 6,336,000 (approx.).
Canada, Department of Resources and Development, Forestry Branch, Ottawa, 1951.

This new edition of the Forestry Branch map of the distribution of pulp and paper mills in Canada is similar in form and content to the previous edition (1945) but shows a radical change in style of presentation. In the previous edition the base map was printed in black with distribution information and political boundaries overprinted in red. The edition lacks clarity, particularly in areas with a concentration of pulp and paper mills, as in the St. Lawrence Lowlands. This defect has been eliminated in the 1951 edition by using the technique of overprinting the distribution information in black on a grey or "faded" base. As a result, the new map is graphic and legible and the distribution pattern is immediately apparent. In addition, a much bolder symbol has been used, large enough to carry a figure denoting the number of mills in each unit as well as differentiating between the type of mill. In the areas of principal congestion, where the scale of the map does not allow for clear spacing of symbols, insets have been used to advantage.

The map-sheet includes a complete index to the industry in tabular form and arranged by province, showing the name of the company, locations of the mills, and the products of each.

Forest Classification of Canada South of Latitude 75°. 1 : 6,336,000.
Canada, Department of Resources and Development, Forestry Branch, Ottawa, 1950.

This is a new edition of the original map that accompanied the Forest Service report "A Forest Classification for Canada", by W. E. D. Halliday, 1937. It is published to accompany the Forestry Branch Silvicultural Research Note No. 92 "Reproduction on Cut-over and Burned-over land in Canada", and shows by means of an overprint the approximate locations of areas sampled by the Forestry Branch or other agencies. Basically the map is the same as the 1937 edition, the main revision being the inclusion of the island of Newfoundland within the classification scheme.

[B. V. G.]

BOOK NOTES

Recent Government Publications of Geographical Interest

Report of the Royal Commission on Transportation 1951. King's Printer, Ottawa, 1951. 307 pp. Price $1.

The fourth Royal Commission to inquire into and report upon transportation matters since 1917, reviews in its report the effect of economic, geographic, and certain disadvantageous factors under which certain sections of Canada find themselves in relation to the various transportation services. The report also examines the Railway Act with respect to general freight rate revisions, competitive rates, etc.; it investigates the capital structure of the Canadian National Railways, the accounting and statistical procedure of railways in Canada, the results achieved under the Railway Act of 1933, and the Maritime Freight Rates Act. There are some chapters dealing with other modes of transportation such as air and water transportation and motor vehicles. The report concludes with an outline of Canada's national transportation policy.

[P. C.]

Directory of Canadian Geographers. Compiled by Barbara J. McLeod. Canada, Dept. of Mines and Tech. Surv., Geogr. Br., Misc. Papers 3, Ottawa, 1951. 29 pp.

This directory lists all geographers of Canadian citizenship who have received part or all of their training in Canada regardless of the country in which they are now employed, as well as those geographers born outside Canada who have received part or all of their training in Canada or who have worked or are working in Canada.

Two hundred and seventeen persons are included, with information on their university degree, address, occupation, areas known from field work, and travel and membership in professional societies.

[N. L. N.]

REPRODUCTION OF CUT-OVER AND BURNED-OVER LAND IN CANADA. By R. H. Candy. Canada, Dept. of Res. and Dev., Forestry Br., Ottawa, 1951. 224 pp., illus., tbls., map.

This report presents the data obtained from field work in seven provinces from 1946 to 1948 to determine the extent to which cut-over and burned-over lands were reproducing, particularly with respect to coniferous pulpwood species. The results are tabulated by provinces according to forest region and classed by forest type and show reproduction following logging, following fire and logging, and following fire. An excellent selection of type photographs is also included in the main part of the report.

A lengthy appendix includes detailed tables of data obtained in each area sampled and a bibliography. It also presents a tentative forest classification for the island of Newfoundland to supplement the Forest Classification for Canada by W. E. D. Halliday, 1937. The map that accompanies this report is described under "Map Notes".

[B. V. G.]

SURVEY OF THE COPPER RESOURCES OF CANADA. By W. R. McClelland. Canada, Dept. of Mines and Tech. Surv., Mines Br., Mem. Ser. No. 113, Ottawa, 1951. 88 pp., tbls., graphs, maps.

The first part of this survey deals with Canadian Copper-Producing Mines, province by province. Within each province a brief description of each mine is given together with the transportation facilities serving it, production figures, and ore reserves. The second part deals with non-producing copper properties in a similar manner and the third part summarizes the statistics on reserves, by provinces. The report ends with a list of concentration with their rated daily milling capacities, smelters, and refineries.

The location of the principal producing copper mines and non-producing properties are shown on two maps. There is no bibliography but references are given at the end of the sections on the individual mines.

[N. L. N.]

PROCEEDINGS OF THE 1950 SOIL MECHANICS CONFERENCE. Canada, Nat. Res. Coun., Ass. Comm. on Soil and Snow Mech., Tech. Mem. 19, Ottawa, 1951. 58 pp.

This includes some articles of particular geographical significance. *Organic Terrain*, by N. W. Radforth is concerned with a system of classification of what has hitherto been called "muskeg". N. I. Lea presents a *Standard Terminology for Soil Description* (as opposed to soil classification) and A. Baracos described the work done in connection with the Winnipeg flood with regard to soil mechanics.

[N. L. N.]

FIRST ANNUAL REPORT ON ACTIVITIES UNDER THE MARITIME MARSHLAND REHABILITATION ACT. Canada, Dept. of Agr., Maritime Marshland Rehabilitation Br., Amherst, Nova Scotia, 1951. 25 pp., map, illus.

This is mainly concerned with the construction or reconstruction of the dykes, aboiteaux, and breakwaters necessary to protect the 86,000 acres of marshland in New Brunswick, Nova Scotia, and Prince Edward Island from the sea, but the map and sixteen photographs as well as some of the descriptions of the areas are useful material for the geographer.

[N. L. N.]

SOIL SURVEY REPORT OF SOUTHEASTERN NEW BRUNSWICK. By H. Aalund and R. E. Wicklund. Canada, Dept. of Agr., Expt. Farms Serv. in co-operation with the New Brunswick Dept. of Agr., Fredericton, N.B. 104 pp., tbls., illus., map.

This report, the third to be presented for the province of New Brunswick, discusses the classification of the soils, the characteristics of each soil type, and the relationships of the soils to agriculture in the selected area. A table contains the estimated productivity rating of the soil types and suggests a land classification. Important physical features of the surveyed area, the distribution of the soils, and certain cultural features are contained in the soil map accompanying the report.

[M. R. D.]

SURFACE WATER SUPPLY OF CANADA, ST. LAWRENCE AND SOUTHERN HUDSON BAY DRAINAGE, CLIMATIC YEARS 1945-46 AND 1946-47. Canada, Dept. of Res. and Dev., Water Res. Paper No. 99, 1950. 409 pp., map. Price $1.

Hydrometric data for the drainage basin is given in the form of tables accompanied by explanatory notes in both English and French. The daily and monthly discharge of the rivers, in second-feet, is tabulated for the climatic years 1945-46 and 1946-47, that is, from September of one year to September of the next. In the case of lakes the mean daily gauge height in feet is presented. The tables are arranged so that the maximum, minimum, and mean annual discharge are easily read.

[C. N. F.]

PRELIMINARY REPORT ON THE SOUTHWEST PART OF LESUEUR TOWNSHIP, ABITIBI EAST COUNTY. By R. B. Graham. Quebec, Dept. of Mines, Mineral Deposits Br., P. R. No. 243, Quebec, 1950. 15 pp., geol. map.

Carte et rapport géologiques sur une section de 34 milles carrés au sud-ouest du canton de Lesueur, comté Abitibi-Est. L'auteur discute des différentes formations de roches intrusives, volcaniques et sédimentaires et passe ensuite à la structure, en discutant des plissements et des failles. Il traite brièvement de la géologie économique et décrit les propriétés.

[P. G.]

CLIMATIC CONDITIONS OF THE PROVINCE OF QUEBEC, AND THEIR RELATIONSHIP TO THE FORESTS. By G. O. Villeneuve. Quebec, Dept of. Lands and Forests, Forest Protection Serv., Bull. No. 6, Quebec, 1951. 123 pp., biblio., tbls., maps.

In this dissertation presented to Yale University, the author introduces a revised classification of the forests of the province of Quebec based on climatic conditions. The province is divided, after Halliday, for a great part, into four regions: the Tundra, the Coniferous Forest, the Mixed Forest, and the Hardwood Forest; these in turn are subdivided into two, thirteen, four, and three sections, respectively, and each section is treated separately. There are twelve tables and twenty-one maps, dealing mainly with climatic data.

[P. G.]

SOIL SURVEY OF SOULANGES AND VAUDREUIL COUNTIES IN THE PROVINCE OF QUEBEC. By P. Lajoie and P. Stobbe. Canada, Dept. of Agr. Expt. Farms Serv. and Quebec Dept. of Agr. and Macdonald College. 67 pp., 1 map.

This is another soil survey sponsored by the Federal Department of Agriculture in co-operation with the Provincial Department of Agriculture and Macdonald College of McGill University. After a general description of the area and a classification of soils, every soil type is described in considerable detail. The physical characteristics of the soil by which it may be recognized are described; the adaptability of the soil to crop production, its use, and its fertility are also discussed. The soil map indicates the location and extent of the different soils and shows the most important physical features of the area.

[P. C.]

THE FLORA OF BIC AND THE GASPE PENINSULA, QUEBEC. By H. J. Scoggan. Canada, Dept of Res. and Dev., Dev. Serv. Br., National Museum of Canada, Bull. No. 115, Biol. Ser. 39, King's Printer, Ottawa, 1950. 399 pp., illus., map, biblio. Price $1.

Une bonne étude biogéographique et phytogéographique de la région sert d'introduction à ce travail systématique sur la flore gaspésienne. Après une courte description des principaux traits physiques de la péninsule, l'auteur discute la théorie de la non-glaciation des monts Shickshock et prouve l'évidence du contraire. Les influences climatiques, pédologiques et biotiques sur la flore sont étudiées séparément ainsi que les affinités géographiques. La partie systématique de ce travail comprend 97 familles, 418 genres, 1,216 espèces, 233 variétés et 118 formes.

[P. G.]

THE SAINT LAWRENCE EARTHQUAKE, MARCH 1, 1925. By E. A. Hodgson. Canada, Dept. of Mines and Tech. Surv., Dominion Observatory Pub., vol. VII, No. 10, Ottawa, 1950. Illus., tbls.

This paper is a final and complete publication in which all previous observational data is used to systematically develop the subject. Prepared in 1930, the study notes the change of location of the epicentre from the eastern boundary of the Laurentides Park to the fault line crossing the St. Lawrence near the mouth of Rivière Ouelle. A general description of the earthquake, the various means of locating the epicentre and confirmatory supporting evidence are set out. Certain related subjects, having a bearing on investigations of the seismicity of the St. Lawrence Valley, are included in appendixes.

[M. R. D.]

REPORT OF THE SELECT COMMITTEE ON CONSERVATION. Toronto, King's Printer, 1950. Illus., maps. Price $1.

This consists of the findings of a Select Committee of the Legislative Assembly of the Province of Ontario. All aspects of conservation, in Ontario, particularly those dealing with primary resources, soil, water, and wood were investigated. Appropriate recommendations for the initiation of a long-range program of conservation for Ontario are set out.

[M. R. D.]

NITH VALLEY (INTERIM) CONSERVATION REPORT. Ontario, Dept. of Planning and Dev., Conservation Br., Toronto, 1951. 41 pp., tbls., maps, graphs, illus.

This deals with the conservation survey made of the Nith River Valley, during the summer of 1949. The geography of the watershed, forestry, water, and wildlife are appraised along with their attendant problems. A section of the report dealing with the Nith flood problems is not treated in full because they are only part of the flood problems pertaining in the whole Grand River system. A special study has been made of sawmills and wood-using industries within the Nith area. Recommendations are made for carrying out conservation projects over the whole watershed.

[M. R. D.]

PLEISTOCENE GEOLOGY OF THE LAKE SIMCOE DISTRICT, ONTARIO. By R. E. Deane. Canada, Dept. of Mines and Tech. Surv., Geol. Surv., Mem. 256, Ottawa, 1949. 108 pp., maps, illus., biblio. Price $1.

This deals with an area of about 1,300 sq. mi. around and including Lake Simcoe. "It describes the physiography or land forms . . ., deals with the bedrock and unconsolidated material comprising these forms, and discusses in some detail the origin and mode of accumulation of the glacial deposits. It relates the historical events following the retreat of the last continental glacier from the region and subsequent inundation of much of the land by glacial Lake Algonquin". A geological map and a map showing physiographic divisions and locations of soil samples are included. The latter divisions are those adopted previously in the geographical work of Putnam and Chapman.

[N. L. N.]

MANITOBA TRADE DIRECTORY. Manitoba Dept. of Industry and Commerce, Winnipeg, 1951-52. 206 pp., map.

This Directory has been prepared as a comprehensive guide to goods and services available in Manitoba. It has been divided into eight sections listing fully the products, manufacturers, and wholesalers of the province as well as showing graphically the diversity of manufacturing and the common trade marks of the manufacturers. The other sections list the Chambers of Commerce and Boards of Trade and their officials, and the towns and cities with a population of over 500. The eighth section gives such information as population, location, resources, labour supply, transportation facilities, power and water supply, and other services.

One sketch map shows the location of manufacturing centres and indicates, by means of symbols, the number of persons employed in manufacturing in each centre.

[B. J. G.]

REPORT OF THE ROYAL COMMISSION ON THE COAL INDUSTRY OF SASKATCHEWAN 1949. King's Printer, Regina, 1950. 79 pp., tbls.

The purpose of this Royal Commission was to "report upon the most desirable provision . . . . which the coal industry . . . . might make for the welfare and security of the coal miners in such industry . . . ." The last three of the four chapters of the report are, consequently, primarily concerned with social and financial conditions. But the first chapter "The Industry" deals mainly with the location and extent of the coal deposits, tenure and royalties, production, methods of mining, and markets.

[N. L. N.]

CLAY RESOURCES OF SASKATCHEWAN. By W. G. Worcester. Saskatchewan, Dept. of Natural Resources, Res. Utiliz. Br., Tech. and Econ. Ser. Rept. No. 2, Regina, 1950. 198 pp., tbls, maps.

This is a non-technical report that presents a summary of the research on and exploration of Saskatchewan's clay resources from 1921-1947. It includes an outline of the geology and topography of the clay-bearing regions and discusses the origin, occurrences, distribution, classification, and general properties and uses of the clays and shales of the province. A series of tests was made on each sample of clay to determine hardness, plasticity, working properties, drying conditions, and shrinkage in the unburned state, as well as burning tests at various temperatures, to determine the burned colour, hardness, shrinkage, absorption, porosity, and other properties.

Certain opinions and conclusions of the author have been presented so that they will aid in further studies of the clays and their industrial development.

[B. J. G.]

STATISTICS SHOWING POPULATION AND PRIMARY PRODUCTS PRODUCTION AND VALUES BY CENSUS DIVISIONS IN ALBERTA. Compiled by A. Bradshaw. Alberta, Dept. of Econ. Affairs, Edmonton, 1949. 37 pp., mimeographed, 1 map.

These statistics were compiled for the purpose of bringing together in simple form all the available information. They are based on the 1946-48 provincial census and cover a wide range of subjects. Three main categories of data are presented: first, population figures, second, agricultural statistics, and third, a grouping of figures describing the production and value of coal, oil, gas, power stations, and lumber or sawmills.

[P. C.]

TRANSACTIONS OF THE THIRD BRITISH COLUMBIA NATURAL RESOURCES CONFERENCE. British Columbia, Dept. of Lands and For., Victoria, 1950. 322 pp., maps, tbls.

With a declared theme of "A critical examination of the problems inherent in, or specific to, the individual resources", representatives of industry, university, and government attempted, in 2 days, to discuss the problems of British Columbia resources. The transactions consist of the reports read and the discussions that followed. These reports dealt with: base maps, soil, water, agriculture, fisheries, forestry, mining, power and energy, recreation, wildlife, and a conference summary. Also included is a dinner address by Dr. H. L. Keenleyside, "The International Significance of Canadian Resources".

[B. C.]

FACTS ABOUT IRRIGATION AND IRRIGABLE LAND IN THE TREE-FRUITS AREA OF THE OKANAGAN AND SIMILKAMEEN VALLEYS. British Columbia, Dept. of Trade and Industry, Regional Dev. Div., Victoria, 1950. 47 pp., map, tbls.

This detailed account of 47 irrigation districts in part of the Columbia River watershed deals with such pertinent data as type of system, storage and delivery capacity, numbers of irrigated acres, percentages in various crops, cost per acre, and annual revenue. For twenty-four of the districts, the same information is presented in the form of comparative graphs.

[B. C.]

THE MARKET FOR FARM PRODUCTS IN NORTH-CENTRAL BRITISH COLUMBIA. Canada, Dept. of Agr., Ottawa, 1950. 54 pp., map, tbls.

This report presents the results of a survey made of agricultural production and needs in a narrow strip of north-central British Columbia, extending for 375 miles from Prince George to Terrace. The report is based on a vast amount of statistical information that was collected between July 1944 and June 1945, and which indicates a reliance, by the region, on Edmonton and Vancouver, and at the same time shows an unfavourable balance of trade for the area as a whole, most noticeably in the case of commodities that it produces itself.

[B. C.]

KENO AND GALENA HILLS, YUKON. By K. C. McTaggart. Canada, Dept of Mines and Tech. Surv., Geol. Surv. of Canada, Paper 50-20, Ottawa, 1950. 2 maps.

Descriptive notes are printed directly on the two maps comprising this paper. The maps are blue and white line prints on a scale of 1 : 12,000, showing the geological formations and structure, roads, cabins, mining properties, and types of workings. The notes include a brief résumé of the location of Keno and Galena Hills, and communications into the area, as well as a description of the geological formations and the main silver-lead workings.

[B. J. G.]

ARCTIC AIR NAVIGATION. By Keith R. Greenway. Canada, Dept. of Nat. Def., Def. Res. Bd., Ottawa, 1951. 138 pp., tbls, illus., map.

The first chapter of this book deals with maps and map projections because "maps based on the mercator projection . . . . . are not satisfactory for navigation in high atitude". The other chapters are mainly of a technical nature although certain sections, such as "Direction", "The Magnetic Compass in the Arctic", and "Twilight", achieve the stated purpose of bringing together hitherto scattered geographical information on these subjects.

[N. L. N.]

AN INTRODUCTION TO THE GEOGRAPHY OF THE CANADIAN ARCTIC. Canada, Dept. of Mines and Tech. Surv., Geog. Branch, Inform. Ser. 2, Ottawa, 1951. 118 pp., maps, illus., biblio. Price 50 cents.

This handbook presents an up to date survey of the Canadian Arctic. It covers the various aspects of the topography, climate, weather, hydrology and ice conditions, soils, vegetation, and wildlife. One chapter summarizes the discovery and exploration of the area and the human geography is dealt with by chapters on white population and settlements, the Canadian Eskimo and government and social services. Transportation and communications, the fur trade, reindeer herding, and mineral exploitation are concerned with the economic geography. The booklet is particularly rich in maps. Seven are used to illustrate the routes of explorers, and others show generalized geology, relief, and Eskimo population. At the back of the book are three maps, each on a scale of approximately 100 miles to 1 inch, which together show the most up to date coastlines and place names of northern Canada.

[N. L. N.]

MEASUREMENTS OF GRAVITY IN THE CANADIAN ARCTIC AND GREENLAND. By Michael Beer. Canada, Dept of Mines and Tech. Surv., Contributions from the Dominion Observatory, Ottawa, vol. 1, No. 5, Ottawa, 1950. 9 pp., tbls., photograph, map.

Using the pendulum apparatus of the Dominion Observatory, four determinations of gravity were made during the summer of 1948 between latitudes 53° N. and 77° N. It was observed that gravity anomalies in these latitudes are not larger than many that have been observed in more southerly parts of Canada and it is anticipated that these determinations will serve as useful reference points to which further observations using gravimeter apparatus may be referred.

[J. K. F.]

NAVIGATION CONDITIONS ON THE HUDSON BAY ROUTE FROM THE ATLANTIC SEABOARD TO THE PORT OF CHURCHILL. Canada, Dept. of Transport, Ottawa, 1950. 82 pp., illus., map. Price 15 cents.

The report is essentially a statistical treatment of meteorological and ice conditions in the season of navigation, 1949. Full meteorological reports from a number of stations are included. These reports embody the results of observations made during the period from early July to late November or December, 1949. Ship reports, compiled by the masters of ships navigating the Hudson Bay route, are in the form of notes and extracts from ship's logs. Full particulars of vessels using the port of Churchill during 1949 are presented, in addition to a list of aids to navigation.

[C. N. F.]

EASTERN ARCTIC WATERS. By M. J. Dunbar, Canada, Dept. of Fisheries, Fisheries Res. Bd. of Canada, Bull. No. 88, Ottawa, 1951. 131 pp., maps, graphs, tbls., biblio.

The author presents a summary of the present knowledge of the physical oceanography of the eastern Arctic area, from Hudson Bay to Cape Farewell, and from Belle Isle to Smith Sound. This study includes 32 figures and an extensive bibliography listed on eleven pages.

[W. A. B.]

KOREA—A GEOGRAPHICAL APPRECIATION. Canada, Dept. of Mines and Tech. Surv., Geogr. Br., For. Geog. Inf. Ser. No. 4, Ottawa, 1951. 84 pp., maps, tbls, graphs, biblio., map biblio., glossary. Price 50 cents.

This is the fourth Foreign Geography Information report produced by the Geographical Branch. It considers the economic and social geography of the Korean peninsula against its physical background, and attempts to point out the relative standing of the two Korean republics in terms of human and material resources. However, as is pointed out in the introduction, the report was prepared with a view to outlining the more lasting qualities of the Korean culture and environment with no attempt to be timely. The report contains sixteen well executed maps and an extensive selective bibliography both textual and cartographic. Of particular value for research purposes is the Glossary of Korean and Japanese Name Equivalents included in an appendix.

[G. A. B.]

THE SUEZ CANAL. By D. K. Doherty. Canada, Dept. of Mines and Tech. Surv., Geog. Br., For. Geog., Top. Ser. No. 1, Ottawa, 1951. 9 pp., maps, tbls., graphs, biblio.

This paper on the Suez Canal is the first in the new Foreign Geography Topical Series produced by the Geographical Branch. The series is designed primarily to provide Canadians with brief, factual appreciations of the geographical background of timely issues. The report on the Suez, well illustrated by three maps and one graph, considers the character of the Canal and its traffic in its Middle East setting and indicates the Canal's relative importance to countries of the North Atlantic community and the world at large.

[G. A. B.]

EDMOND CLOUTIER, C.M.G., O.A., D.S.P.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1953