THE BRIDGE RIVER REGION
—— A GEOGRAPHICAL STUDY ——

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ABSTRACT

The Bridge River Region is a mining district situated in southern British Columbia on the eastern side of the Coast Range. The boundary of the region is defined by the drainage basin of Bridge River above Moha. The region is isolated.

The geology is complex, and highly metamorphosed sedimentary, volcanic and intrusive rocks are present. The rocks range in age from Permian to Recent. Mineralization is thought to be linked with the location of the region on the eastern margin of the Coast Range batholithic intrusions.

The topography is mountainous and strongly glaciated. The hanging valley of Bridge River is the deepest erosional feature of the district. Generally, the valley is at an elevation of 2000 feet, and the flanking Bendor and Shulaps ranges rise to 8000 and 9000 feet. The rugged nature of the country makes transportation especially difficult.

Towards the Chilcotin Plateau, the mountains are more subdued in character. During the snow-free season, sheep and cattle are pastured in the alpine grazing ranges of this transition belt of mountains. The country is also the habitat of big-game animals which are a resource of the tourist industry.

The Bridge River Region has many climates because of great relief. As a whole, the climate is continental, although continentality is modified by proximity to the Pacific Ocean. The annual average
temperature in the main area of settlement is forty degrees and
the annual average precipitation is twenty-four inches. Three
months have average temperatures below freezing.

The country is forested but timber is generally of little
commercial value. Ponderosa pine, Douglas fir and Lodgepole pine
are the basis of a small-scale forest industry. The industry is
largely subsidiary to mining.

Trapping is a part-time occupation based on the fur-bearers
of the region.

The many creeks of the district head from snow-fields and
glaciers. Hurley River and Cadwallader Creek have been developed
for hydro-electric power. Bridge River, which has its source in
extensive ice-fields, ultimately will produce 620,000 horse power.
Most of this power will be supplied to Vancouver and the Lower
Mainland. Rapid run-off makes storage dams necessary. The
resultant flooding obviates most agricultural development.

Historically, mining has been the dominant industry of the
Bridge River Region. Beginning in 1858, miners came into the
district seeking placer gold. Their sporadic and desultory
activity gave place to the more permanent lode gold mining around
1898. In modern times, Bralorne and Pioneer Gold Mines have
developed as successful producers. Efficient transportation has
come to the region by the building of the Bridge River highway
which provides a link with the Pacific Great Eastern Railway.

Bralorne and Pioneer are small-scale, fully mechanized mines.
Most of the ore is produced by shrinkage and cut and fill stoping.
Bralorne ranks first as a gold producer in British Columbia and
Pioneer holds fourth place. The known reserves at both mines will last eight years at present rates of production. Much exploration work is going on in the district to bring other mines into production.

The population of about two thousand persons in the Bridge River Region is almost entirely dependant upon mining. Three quarters of the people live in the company towns of Bralorne and Pioneer. The destiny of future settlement rests largely with the mining industry.

George Alan Wood
Vancouver, British Columbia
December, 1949
TO MY WIFE
I selected the Bridge River Region for a thesis topic because of my familiarity with the area gained during a two year residence between 1945 and 1947. During that time, I became keenly interested in the local geography. In the spring of 1948 while attending the University of British Columbia I wrote an essay on the region which was favorably received. In early January, 1949, in Vancouver I began full time work on the thesis. Seven months were required to complete it.

Investigations were begun by writing many letters soliciting information from various sources. In February, I spent a week in Victoria seeking data in departments of the provincial government. Before writing the final draft, five days were spent in the field in order to bring information up to date.

Acknowledgements

Much of the detail has been obtained through correspondence and interviews with persons familiar with the area. This thesis could not have been written but for their kind assistance. Thanks are due to the following residents of the Bridge River Region: Messrs. C. Cunningham, J. Bremner, M. Wedell, G. White, W. Davidson, O. Fergusson, W. Shaw, H. A. Rose and C. Inkster.

In Lillooet, I was given aid by old-timers Messrs. "Artie" Shaw and J. Russel and by the government agent Mr. G. Beley.

Mr. E. Lazenby and Mr. E. Campbell of the B. C. Electric
Company, Mrs. H. Turley of the B. C. Telephone Company, Mr. J. Hughes of the Neal Evans Transportation Company and Mr. A. Devine of the Blackwater Timber Company cooperated by supplying me with helpful information.

I am also indebted to Mr. W. Ireland of the Provincial Archives; Mr. A. Collins, Mr. W. Young and Mr. W. Pendry of the Department of Lands and Forest; Mr. A. Graham, Department of Municipal Affairs; Mr. J. Meredith, Department of Trade and Industry; Dr. J. Stevenson, Department of Mines; Mr. H. Rose, B.C. Game Commission; and Mr. W. Christie, Indian Agent at Williams Lake.

Useful statistics were supplied by the Vancouver office of the Dominion Water and Power Bureau, and by Bralorne and Pioneer Mines.

Mr. P. Elliot who is studying the history of the Bridge River Region kindly gave me free use of his copious notes.

Special thanks are due to Mr. H. Agnew, geologist, Mr. H. Parliament, geologist, Mr. E. Emmons, mine manager at Pioneer, Mr. W. Haylmore, Mines Recorder, Mr. R. Allaire, trapper, Mr. W. O'Keefe, licensed guide, and U.B.C. faculty members Mr. J. Chapman, Dr. A. White and Dr. K. Watson for reading parts of my manuscript and giving helpful suggestions.

I am deeply grateful for the unstinted guidance given me by Dr. J. Lewis Robinson of the University of B.C. who painstakingly read and offered critical comment on the whole work.
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INTRODUCTION

This study describes geographical conditions within most of the drainage basin of Bridge River. The method of presentation is, first, to show the features of the natural environment which are significant to human activity; second, to explain how man wrests his living from that environment and alters the face of nature while so occupied. The purpose of the thesis will be fulfilled if the geographical antecedents of economic problems are brought to light. It is hoped that a picture of the region in its totality will help the administrators of government and industry to bring about a more enlightened use of the resources.

The investigation has been limited to the watershed of Bridge River above the canyons, (see Fig. 16 following p.10). In this region, there is a basic geographical unity brought about by the mountain environment and the mining economy. All industry faces a common transportation problem.

The twelve miles of canyon above the Yalakom tributary effectively prevent human intercourse between the main Bridge River Valley and the lower part of the river. For this reason, the canyons have been adopted as part of the regional boundary and the watershed below them has been excluded from the study.

The writer has been able to discover only a relatively small body of published geographical information pertaining to the Bridge River region. The Department of Mines (Canada)
Geological Survey Reports are the best single source. They have been used extensively for geological, topographical, historical and mining information. The two outstanding works are Memoir 130 Geology and Mineral Deposits of the Bridge River Map-area, British Columbia (1922) by W.S. McCann, and Memoir 213 Geology and Mineral Deposits of the Bridge River Mining Camp, British Columbia (1937) by C.E. Cairnes.

A number of provincial government reports contain useful data. In the 1947 Report of the Deputy Minister of Lands, Mr. W.R. Young has a general description of the Tyaughton Creek area. In the 1948 Report, Mr. Young describes the Bridge River Valley and the flanking mountains. The latest information is provided on mining activity in the Minister of Mines Annual Report for 1948. The Provincial Game Commission Report for 1947 has up-to-date facts dealing with game resources and hunting activity. Land Series Bulletin No. 31 has some source material, but it is highly generalized and there are erroneous statements.

Mr. P. Elliot of Vancouver is at present engaged in writing a Master's thesis on the history of the Bridge River district. His excellent notes were partly the basis for the chapter on sequent occupance.

The B.C. Electric Company has begun development of Bridge River for hydro-electric power. The writer has made use of their authoritative pamphlets and brochures publicizing the power project. The Vancouver Sun of Oct. 23, 1948 includes a supplement dealing with the project. Some of the information is unreliable, but it contains authentic statements made by two B.C. Electric Company executives.
Maps have been used profusely to illustrate phases of the regional geography. The Pre-emptor's map, Lillooet Sheet (Scale three miles to one inch) is the most commonly used base. The National Topographical Series, Merritt-Lac La Hache Sheet (Scale eight miles to one inch) and the Bridge River Sheet (scale two miles to one inch) also serve as base maps.

Photographs as well as maps illustrate the thesis. The aerial photographs and most of those showing topography were obtained from the provincial government. The writer has taken most of the remainder with a 620 Kodak Vigilant camera.

Graphs were drawn from statistics in Climate of British Columbia.
PART I

THE NATURAL ENVIRONMENT
CHAPTER I

SPATIAL RELATIONSHIPS

The Bridge River Region is located on the eastern flank of the Coast Range of British Columbia. The general trend of Bridge River and the mountains of the area conforms to the northwest-southeast alignment of the Coast Range axis.

The 51st Parallel North cuts Bridge River twice and the Meridian 122°30' West passes through the mid-point of the drainage area. Vancouver and the Lower Mainland are one hundred air miles directly south. The long arms of Bute and Toba Inlets, some eighty miles west of the region, are the closest salt water.

The Bridge River is a west bank tributary of the Fraser River. Their junction is five miles north of the little town of Lillooet. Another settlement, Moha, is located at the confluence of the Bridge River and its tributary, the Yalakom. The Bridge River Region is separated from the Fraser River by the intervening Camelsfoot Mountains and the Yalakom Valley.

The Chilcotin Plateau adjoins the region on the north. Big Creek and Churn Creek flow northward from the Coast Mountains across the undulating plateau. The settlements of Big Creek and Hanceville are on the plateau and the Gang Ranch is near the meeting place of Churn Creek and the Fraser River.

* Throughout the thesis, principle figures relating to chapters are listed on the first page of each chapter. Chapter I - Figs. 1, 2
Drainage on the northwest is to the mountainous Taseko Lakes district. The Lord and Taseko Rivers are the principal streams. On the west of the region are the extensive icefields which are the source of Bridge River.

On the southwest, the watershed falls away to the Lillooet River which occupies a deep longitudinal valley within the Coast Range. Pemberton is a settlement which the Pacific Great Eastern Railway crosses the valley.

Southeast of the Bridge River Region, there is a valley which is transverse to the trend of the Coast Range. Within the valley are Birkenhead and Gates Rivers, Anderson and Seton Lakes and Seton Creek. The P.G.E. Railway follows this low altitude break in the eastern part of the range. The isthmus called The Portage between Anderson and Seton Lakes is partly settled. Bridge River is the B.C. Electric Company's town on the railway near the west end of Seton Lake. Shalalth, the terminus of the Bridge River highway, adjoins the town of Bridge River on the east. Lillooet is on the Fraser, at the eastern entrance to the valley.

The area of the Bridge River Region is computed to be 1,320 square miles.
Figure 1
CHAPTER II

TOPOGRAPHY

The topography of the Bridge River Region is mountainous. All ranges have peaks exceeding 8000 feet and some are higher than 9000 feet. Local base level is given to the region by Bridge River which crosses the 2000 foot contour above Moha. The maximum relief is therefore more than 7000 feet.

BRIDGE RIVER VALLEY

"The major structural feature of the Bridge River district is a broad anticlinal arch or dome trending northwestward——Bridge River has incised itself deeply into the Palaeozoic core of this dome...."

Bridge River flows within a valley which bears a hanging relationship to Fraser River Valley on the east. The deep box canyons where Bridge River swings in a northeasterly direction are caused by the river's attempt to reduce its channel to grade. The presence of these precipitous canyons destroys the possibility of an easy water-grade route to the upper valley.

The valley of Bridge River is also elevated in relation to Seton Lake on the south. The intervening Mission Ridge has been tunnelled to produce a high head water-power development. In connection with this project, the river has been

* See Figs. 3 - 16 inclusive; also Figs. 39, 51

1 McCann, W.S., Geology and mineral deposits of the Bridge River map-area, British Columbia, 1922, Canada, Dept. of Mines, Geological Survey, Memoir 130, p.21
Bridge River has the characteristics of maturity for 25 miles above the flooded portion of the valley. The river flows sinuously within a mile-wide flood plain of oxbow lakes, marshes and cut-offs. Tributary streams descending from the flanking mountains have built alluvial fans along the sides of the valley. In a few places, farms occupy this land which is above flood-plain level.

Figure 3:
Bridge River Valley at Rexmount (looking southeast, downstream)
Note in foreground, gravel deposits made by Jones Creek.

The flood plain is formed of glacial, fluvioglacial and Recent stream deposits. The ground is patchy with beds of gravel, sand and clay. During most of the year, the river is heavily charged with fine glacial silt, a rock flour product from the ice-fields. This silt has been spread over the bottom land by repeated river flooding. Tyaughton Creek
periodically makes a deposit over the delta at its mouth.

**BENDOR MOUNTAINS**

Rising steeply from the flood plain on the south are the rugged Bendor Mountains which extend from Mission Ridge on the east to Hurley River on the west. The thick growth of fir which covers the slopes ends at 6500 feet, which is timberline in the region. These mountains exhibit the typical heavily glaciated forms of the Coast Range with serrated ridges, cirques and matterhorn peaks. Whitecap Mountain (9600 feet) in the Bendor Range is the highest peak in the Bridge River Region.

The hanging valleys of Tommy, Bobb and Truax Creeks which flow from these mountains are at right-angles to the main river. The feeder creeks head in armchair-like cirques from small glaciers and snowfields. Tarns have been formed by rock slides or morainal blocking at the base of the cirques. The three streams descend from their hanging valleys to the level of Bridge River by post-glacial canyons. Traplines follow these streams to timberline.

**SHULAPS MOUNTAINS**

On the north side of the valley, the Shulaps Mountains are the main range. They have a more northward trend than does Bridge River and their only direct abuttment to the Bridge River Valley is below Marshall Creek. There, they tower precipitously above the flood plain. The topography of this part of the range is similar to that of the Bendor Mountains, opposite. Northward of the Shulaps in the vicinity of Noax
and Mud Creeks the mountains, although high, become less rugged as they approach a belt of country which is transitional to the Chilcotin Plateau.

MARSHALL AND PEARSON RIDGES

Above Marshall Creek, Marshall Ridge (5200 feet) and Pearson Ridge (4800 feet) flank Bridge River. Tyaughton Creek flows southeastward through a deep canyon between them. Yellow pine and Douglas fir are logged from the steeply sloping ridges.

BENCH NORTH OF BRIDGE RIVER

Bridge River takes a northeast-southwest alignment above the settlement of Minto. North of the valley and approximately 800 feet above it, a broken benchland averages 3000 feet elevation. On this bench are located Pearson Ponds (including Mawson Lake), Gun and Little Gun Lakes. Tyaughton Lake at the base of the Eldorado Mountains is above the general level of the bench, at its northeastern extremity. Gun Creek has incised itself within a deep canyon across the bench. Lumbering operations are carried on at Mowson Lake and the other lakes are important for recreational activity.

BRIDGE RIVER VALLEY ABOVE MINTO

Two miles above Minto, Bridge River is youthful in appearance. There is no flood plain and the banks rise sharply from the swiftly-flowing water. In this narrow valley, at LaJoie Falls, a storage dam is being constructed.

The term "Eldorado Mountains" has been used by the writer to designate the range lying between Gun and Tyaughton Creeks. It takes its name from Eldorado Creek which is tributary to Gun Creek.
Up river two miles from LaJoie Falls and continuing for six or seven miles, the valley widens to a flood plain similar to the lower one. The sloughs and side channels are the best muskrat trapping area along the entire course of the river. Higher for twenty miles to its glacier birthplace, the river flows swiftly with little standing water alongside its channel.

Above LaJoie Falls, the Dickson Mountains flank the river on the north and the Sloan Mountains on the south. Both ranges are heavily glaciated and rugged like the Bendor.

**HURLEY-CADWALLADER ROCK BENCH**

Hurley River enters the main stream at Gold Bridge. South of Gold Bridge there is a glaciated rock bench with an average elevation of 3000 feet - 4000 feet. It stretches six miles between the Bendor Mountains on the east and the Sloan Mountains on the west. Its upper limit is Pioneer Mine on Cadwallader Creek, a tributary of Hurley River. The united streams have eroded a deep gorge in the bench. On the eastern margin of the rock bench a chain of small lakes is dammed against the base of the Bendor Mountains. Everywhere the drift-covered surface supports a thick growth of Lodgepole pine which is a source of fuel wood.

Cadwallader Creek flows in a gorge which extends between Pioneer and the Hurley River junction, but above the town it flows within a glacial trough between the Cadwallader and

---

1 The writer has used this name for clarification purposes to designate the range between the Bridge River and the Hurley River. Locally, "Sloan" is the name given to the dominant peak between the junction of those rivers.
Bendor Mountains. The deep erosion by this stream and its ancestral glaciers have contributed to the exposure of the gold-bearing veins of Bralorne and Pioneer Mines.

The canyon of the Hurley River ends a mile above its junction with Cadwallader Creek. The upper course, like that of the Cadwallader, is within a glaciated valley. Both streams are utilized for hydro-electric power.

TRANSITION BELT OF MOUNTAINS

Between the northern end of the Shulaps Mountains and Gun Creek the topography is notably different from that developed in the intrusive rocks of the mountains to the south. Tyaughton Creek is the principal stream draining the area.

Much of the district is underlain by the sandstones of the Eldorado Group of rocks.

"There is a marked difference between the topography carved upon the soft-weathering Eldorado series and that developed on the other more resistant rocks."

As well, the structural history has probably played a part in producing this more subdued topography.

"The mountain-making forces have acted from the west, so that near the Coast Mountains batholith the series is strongly compressed and locally overturned and faulted, whereas towards the Fraser plateau the close folds give place to open folds and more simple structure."

1 McCann, Memoir 130, op.cit., p.11
2 Ibid., p.35
The Red Mountains north of Tyaughton Creek are part of this transition belt between the Coast Mountains to the south and the Chilcotin Plateau on the north. The slopes are gentle with broad, smooth, partly sustained ridges. Peaks such as Relay and Castle are erosion remnants of flat lying Tertiary volcanic rocks.

The modulated topography underlain by Eldorado sedimentary rocks extends to Gun Creek in the vicinity of Spruce Lake. The lake occupies a pass in the Eldorado Mountains which separate Gun and Tyaughton Creeks. The Eldorado Range is fairly rugged west of Spruce Lake, but to the east it is more accessible.

In the transition belt of mountains, the effects of glaciation are everywhere evident in the U-valleys and cirques, but steep headwalls and talus slopes are less typical. The altitude varies from 4000 feet in the hanging valley of Tyaughton Creek to the summits which are above 8000 feet.

The dry climate produces a light forest and grass cover. The country is more snow-free than are the ranges to the south, and there is no permanent ice. In summer, big game animals and domestic sheep and cattle range there.

These mountains are easily accessible and there is a network of trails through them. At the head of Tyaughton Creek, a pass leads to the Chilcotin Plateau.

1 Bateman, A.M., Geological Survey Summary Reports 1912-13, Ottawa, King's Printer, p.117. The writer has adopted Bateman's term "Red Mountain" to refer to the range between Tyaughton and Relay Creeks.
Figure 4: Bridge River Valley
(looking west, upstream)

1 Gun Lake
2 Little Gun Lake
3 Mount Penrose (8620 feet)
4 Dickson Mountains
5 ice-fields
6 LaJoie Falls Dam
7 cultivated land
Figure 4: Bridge River Valley (looking west, upstream)
Figure 5: (Cadwallader Creek Area)
(looking southeast, upstream)

1 Cadwallader Creek
2 Hurley River
3 Noel Creek
4 Piebiter Creek
5 King Lake
6 Woods Lake
7 Hurley-Cadwallader Rock Bench
8 McGillivray Pass (5800 feet)
9 Mount Fergusson (8200 feet)
10 Cadwallader Mountains
11 Pioneer
12 Bradian (Bralorne)
13 No. 2 Townsite (Bralorne)
14 No. 1 Townsite (Bralorne)
15 logged-off area
16 Bridge River highway
17 power line
Figure 5: Cadwallader Creek Area (looking southeast, upstream)
Figure 6: Bridge River Valley and Hurley-Cadwallader Rock Bench (looking south, upstream)

1 Bridge River
2 Hurley River
3 Cadwallader Creek
4 Noel Creek
5 Gun Lake
6 Little Gun Lake
7 Gwyneth Lake
8 McDonald Lake (Fish Lake)
9 Sucker Lake
10 Mount Sloan (8000 feet, plus)
11 Sloan Mountains
12 cultivated land
13 Bridge River highway
14 Gold Bridge
15 Hurley-Cadwallader Rock Bench
Figure 6: Bridge River Valley and Hurley-Cadwallader Rock Bench (looking south, upstream)
Figure 7: Bridge River Valley
(looking southeast, downstream)

1. Tyaughton Creek
2. Marshall Creek
3. Truax Creek
4. Marshall Lake
5. Marshall Ridge
6. Pearson Ridge
7. Bendor Mountains
8. Shulaps Mountains
Figure 7: Bridge River Valley (looking southeast, downstream)
Fig. 8: Bridge River Valley (looking west, upstream) Mouth of Tyaughton Cr. in right foreground and Truax Cr. on opposite side of Bridge R. Gun Cr. Valley in background

Fig. 9: Bendor Mountains (looking south from Pearson Ridge) Foreground - Bridge River Valley. Background - Mount Truax (9450') center, Mount Williams (9137') left
Fig. 10: Spruce Lake (5140') A cabin used by cattle men on lakeshore. Note forest fire damage. (Looking south towards the Dickson Mountains)

Fig. 11: Mission Ridge (looking east). The Bridge River Highway crosses the ridge at the forested pass. Note the Bridge River, lower left.
Fig. 12: Castle Mountain (Tyaughton Creek watershed)
Note cap of Tertiary volcanic rock. Typical sheep range country of the Red Mountains.

Fig. 13: Typical alpine sheep range country in the Red Mountains. Note rounded ridges and lightly forested valleys.
TOPOGRAPHY
(DIAGRAMMATIC)
of the
Bridge River Area
RELIEF of BRIDGE RIVER and RELATED DRAINAGE AREAS

Contour Intervals 1, 2, 3, 4, 6 - 8000 feet

Scale Miles

SOURCE and BASE: NATIONAL TOPOGRAPHICAL SERIES
MERRITT - LAC LA HACHE SHEET 91 NE

Figure 15
CHAPTER III

GEOLOGY

The oldest rocks in the Bridge River Region are those of the Fergusson Group (25) of the Palaeozoic Era. They consist of marine sediments and volcanic rocks. Chert, sandstone, argillites and limestone were deposited in a wide, shallow, and subsiding epicontinental sea-bottom during the Permian Period. There were also contemporaneous flows of basaltic lava upon the sea-bottom. The Fergusson Group predominates in the Bridge River Valley from the canyons above Moha to Gun Lake including the lower slopes of the Bendor and Shulaps Mountains. These rocks are also exposed in the valley of Cadwallader Creek and the lower valley of Gun and Tyaughton Creeks.

Epirogenic upwarp and local deformation of marine deposits occurred perhaps at the close of the Palaeozoic followed by an erosion interval.

* See Fig. 17, page 15; and Fig. 18, following p. 15

1 McCann, Memoir 130, op.cit., p. 43 f.


The following geological history of the Bridge River Region has been taken principally from Memoir 130. McCann's statements have been summarized to some extent and the names now used for the formations—found in Memoir 213 and Map 932A (see footnote following)—have been substituted for those appearing in Memoir 130. Quotation marks have not been used because of the fragmentary nature of the quotations and the (continued next page)
The transgression of the Upper Triassic sea upon a land surface of considerable relief brought about the deposition of the Noel-Hurley Group (29) consisting of conglomerate, sandstone and argillites, with some fossiliferous limestone. Such sedimentation upon the subsiding sea-bottom was interrupted by accumulations of coarse clastics and outpourings of numerous basaltic flows. The Tyaughton Group (31) which is found in the headwaters of Tyaughton Creek is Upper Triassic sedimentary and volcanic rock.

The Taylor Group (36) of Lower Jurassic age consists of arenaceous rocks, some fairly coarse conglomerates, and limestone. They occur in the vicinity of Gun Creek.

Undivided sedimentary rocks of either Middle or Upper Jurassic age (38) are found south of Tyaughton Creek.

A disturbance at the close of the Jurassic resulted in the folding of the Noel-Hurley Group and older series, accompanied by an intrusion of augite diorite and soda granite—Bralorne Intrusives (2)—and probably followed by a period of mineralization resulting in the gold-quartz deposits. The Bralorne Intrusives occur as a northwest trending band interbedded axially in the highly folded zone of the Noel-Hurley Group along Hurley River and Cadwallader Creek.

The Sumner gabbro (1), President Intrusives (1) and

1, p.11 cont'd — present writer's frequent substitution of terminology.

2 Bracketted figures correspond to those of the Geological Map of British Columbia Map 932A, 1948, Canada, Dept. of Mines and Resources.
Shulaps "Volcanics"\(^1\) (1) which followed are ultrabasic rocks, mainly peridotite, or diorite which has been much serpentized. They are found around Gun Lake, northward in the Eldorado Mountains and in the mining area of Cadwallader Creek. They form also an extensive part of the northern end of the Shulaps Mountains.

Deposition of the Eldorado Group (40) occurred in the Lower Cretaceous Period with contemporaneous volcanic activity. The Eldorado Group consists of partly marine and partly continental sediments. Eldorado rocks are distributed over a large part of the northern Bridge River Region, particularly in upper Tyaughton and Relay Creeks. The volcanic rocks are the Denain Group (43) which occupies the area between upper Gun Creek and Big Creek.

Over large areas, granodiorite and quartz diorite were intruded after the Lower Cretaceous Period. These Coast intrusions (3c) form the Dickson Mountains and the summit areas of the southern Shulaps. The Bendor Mountains are composed of a batholith of quartz diorite. The Eldorado Mountains east of Spruce Lake have a small area of Coast intrusions, and on the west are partly underlain by the Sheba intrusions (4).

During a long period of crustal stability, the Upper Cretaceous cycle reduced the land surface. The land was up-

\(^1\) A recent study of the relationships of the Shulaps ultrabasic rocks shows that they are intrusive and can no longer be regarded as volcanics.
lifted and folded during the Laramide Revolution. Active erosion and peneplanation occurred during the Eocene. At the close of the Eocene, the maximum uplift occurred along the axis of the present Coast Mountains. Dissection of the Eocene peneplain followed. Local sedimentation was accompanied by local volcanic activity and the intrusion of dikes spatially associated with antimony deposits. Erosion continued during Miocene time with outpourings of lava which filled depressions on the existing land surface. Subsequent erosion removed much of the volcanic flows, but some lava cappings (54) remained north of Tyaughton Creek. This erosion was probably responsible for removing the rocks covering the augite diorite intrusions and the tops of the gold quartz veins. Placer gold deposits were formed at the expense of lode gold deposits. Further uplift and erosion occurred in late Pliocene time which produced in great part the present topography. The existing placer deposits were probably increased and reconcentrated in lower parts of the valleys.

Pleistocene glaciation with alternating advances and retreats of valley glaciers sculptured cirques and U-shaped hanging valleys in the pre-existing topography. Part of the eroded material was scattered over the lower slopes as glacial drift which in many places seriously hinders prospecting. Rivers flowing from the ice deposited thick beds of clay, sand and gravel in the valleys. Dilution was probably the main effect upon placer gold deposits.
During the Recent Epoch, the topography was further altered by post-glacial stream cutting and formation of deep box canyons in the lower parts of the glacially modified valleys. Pleistocene deposits, including placer gold, were reworked and shifted farther along the stream courses. Alluvial fans were built at the mouths of streams. Talus formed at the base of steep cliffs. A layer of volcanic ash or pumice, commonly found a short distance beneath the surface, is the youngest formation of all. The bed varies in thickness from a few inches to three feet and is of remarkable uniformity and free from interbeds of foreign material. It is thought that the ash originated in vents near the headwaters of the Lillooet River.

Figure 17:
Volcanic Ash in surface layer.
LaJoie Falls, Bridge River.
INTRUSIVE ROCKS

MESOZOIC (mainly)

4 Acidic intrusions: granodiorite, Cretaceous or Tertiary

3 Acidic intrusions (mainly): chiefly granodiorite and quartz diorite. 3C post-Lower Cretaceous

2 Basic rocks (mainly): chiefly gabbro and diorite. 2A is post-Lower Cretaceous. May not all be intrusive.

1 Ultrabasic rocks (mainly): peridotite, dunite, pyroxenite, serpentine, gabbro. Pre-Upper Cretaceous. May not all be intrusive.

Volcanic rocks not otherwise differentiated from sedimentary formations of the same age.

Sedimentary rocks not otherwise differentiated from volcanic formations of the same age.
LEGEND

SEDIMENTARY AND VOLCANIC ROCKS

CENOZOIC
Tertiary and Quaternary
54 Volcanic rocks: post Eocene

MESOZOIC
Cretaceous
43 Volcanic rocks (mainly)
Upper Jurassic and/or Lower Cretaceous (undivided)
40 Sedimentary rocks (mainly)
Middle or Upper Jurassic (undivided)
38 Sedimentary rocks
Lower Jurassic
36 Sedimentary and volcanic rocks
Upper Triassic
31 Sedimentary and volcanic rocks (differentiated in part)
Triassic
29 Sedimentary rocks

PALAEOZOIC
Carboniferous and Later
25 Sedimentary and volcanic rocks (undivided)
CHAPTER IV

HYDROGRAPHY

USES OF WATER IN THE REGION

Water is a natural resource of particular importance in the Bridge River Region. It is expected that ultimately more than 600,000 h.p. will be produced from Bridge River by the B.C. Electric Company.

The placer miners of the 19th Century made use of water to recover gold from the beds of Hurley River, Marshall, Tyaughton, Gun and Cadwallader Creeks. When lode mining began, the mills at the Lorne and Pioneer mines were powered by water wheels. Today, hydro-electric power developed on Cadwallader Creek and Hurley and Bridge Rivers has been substituted. Copious quantities of water are used in the milling process at Bralorne and Pioneer. Small mountain creeks provide the domestic water supply of the settlements. The lakes and streams of the region are the habitat for wild life which man uses.

GLACIERS

The mountains of the Bridge River Region share in the precipitation brought to the Coast Range by the prevailing easterly movement of air. High relief with resultant low temperatures means that much of the precipitation falls in the form of snow, a good deal of which persists in the summit areas.

* See Figs. 4; also 6, 7
throughout the year. In high catchment basins, the snow has formed permanent ice. The snow and ice-fields of the region act, to a certain extent, as natural water storage reservoirs.

Bridge River drains from extensive ice-fields which also feed the Lord and Lillooet Rivers. This glacial source of Bridge River is vital to the control of its regimen. Due to the continuous melting of glacier ice through the late summer and early autumn, Bridge River carries high water at that period of the year. This fact has an important bearing on hydro-electric power developments on the river.

Except in the western extremity of the Bridge River Region, the glaciers are small with tongues seldom extending below 7000 feet. Their positions are usually on northeast slopes where ablation is least. These remnant glaciers are less common towards the Chilcotin Plateau and non-existent in the Red Mountains. All the major tributaries of Bridge River are partly glacier-fed.

**CREEKS**

The creeks of the region are fast-flowing, turbulent streams. None is more than a few yards wide and two or three feet deep. In case of future mining development, they are potential sources of hydro-electric power. The streams are likely to be harnessed only if power requirements be small and the location be in a part of the region remote from the B.C. Electric transmission line.
### TABLE I - Undeveloped Power Sites in the Bridge River Valley (above Yalakom River)

<table>
<thead>
<tr>
<th>Stream</th>
<th>Undeveloped h.p.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marshall Creek</td>
<td>2,000</td>
</tr>
<tr>
<td>Tommy Creek (a)</td>
<td>144</td>
</tr>
<tr>
<td>Tommy Creek (b)</td>
<td>209</td>
</tr>
<tr>
<td>Truax Creek</td>
<td>730</td>
</tr>
<tr>
<td>Gwyneth Creek</td>
<td>190</td>
</tr>
<tr>
<td>Neel Creek</td>
<td>1,120</td>
</tr>
<tr>
<td>Hawthorne Creek</td>
<td>176</td>
</tr>
<tr>
<td>Copp Creek</td>
<td>150</td>
</tr>
</tbody>
</table>

**STREAM REGIMEN**

The high water period for most streams of the region is late spring when the mountain snows melt rapidly. Jones Creek which drains from the Shulaps Mountains often breaks out of its channel and causes a wash-out on the Bridge River highway. Disastrous floods may occur, as in 1948 when the rest of the province suffered also. Farm lands were partly eroded near Minto and at the mouth of Tyaughton Creek. Bridges were torn out everywhere.

Unstable run-off conditions are caused by the relatively barren and precipitous character of the watershed. Heavily wooded, flat country with large lakes is best suited to the seasonal conservation of water supplies. That type of terrain is totally absent from the Bridge River watershed. The ratio

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1 Information supplied by Water Right Branch, Dept. of Lands and Forests, Victoria. (Information supplied is incomplete)
of maximum to minimum flow on Bridge River is actually 158:1.

For this reason large scale production of hydro-electric power necessitates artificial water storage.

LAKES

Although lakes are too few and too small to have much effect upon water storage, they are important locally for sport fishing and boating. Aeroplanes occasionally land on Gun Lake (2908 feet). This lake is four miles long and is the largest body of water in the region. In winter, the lake usually freezes in January and ice remains until March or April. Little Gun Lake lies immediately to the south of Gun Lake. Towering above the lakes is Mount Penrose (8577 feet). The two lakes with their splendid mountain setting are a favorite summer recreation area for residents of the region and for a few tourists. Small gravel beaches are used for bathing. Fishing is fair in both lakes.

Tyaughton Lake (3200 feet) is a narrow strip of water about two miles long. As at the Gun Lakes, summer camps have been built by Pioneer and Bralorne people on its wooded shoreline. There is also tourist accommodation at this lake.

Other small mountain lakes are accessible only by trail and are seldom visited.

CHAPTER V

CLIMATE

CLIMATE IN GENERAL

Climate has little influence upon underground mining but most other forms of human activity are affected. Prospecting and grazing are carried on only during the summer season when the mountains are snow-free. Trapping is a winter occupation. Some of the lumbering operations seasonably shift from Ponderosa pine to fir. Recreational activities are seasonably divided.

The lack of meteorological data prevents any detailed study of the climate of the Bridge River Region. At present, weather data are recorded solely at Bralorne and records go back only seventeen years. For short periods, precipitation records were kept at Little Gun Lake and at Rexmount. In order to present a picture of climate in the region, the writer has been forced to draw upon his own observations and upon reports from residents.

Climatic generalizations are inapplicable to the Bridge River Region where relief exceeds 7000 feet. In such an area there is almost no uniformity of climatic conditions. In the preliminary discussion which follows the remarks generally pertain to areas of moderate elevation, in particular to the settled parts of the region.

* See Figs. 20–23.
The climate corresponds to the continental climate on the interior plateau of British Columbia. The Bridge River Region is wholly within the Coast Range although it is on the eastern flank of the range. This position is climatically transitional between the Pacific Coast and the interior of British Columbia. Continental conditions are dominant but they do not reach the full development found on the neighbouring plateau.

Moderately cold winters and warm summers are characteristic of the climate. The precipitation which occurs largely in winter is probably less than 35 inches for most areas below 4000 feet.

The interaction between polar-maritime and subtropical-maritime air masses originating over the Pacific Ocean is the main influence upon daily weather in the Bridge River Region as elsewhere in British Columbia. These air masses are borne across the Coast Range by the prevailing easterly movement of air. In winter, polar continental air makes occasional encroachment on the southern part of the province (including the Bridge River Region) bringing a sharp drop in temperatures. As a result of conflicting air masses, variability is a characteristic of the climate. A succession of dry and wet spells is the rule. Most precipitation is probably the result of an interplay of cyclonic and orographic conditions although some precipitation is likely convectional.
The intermittent "cold snaps" which punctuate the winter season usually last two or three weeks. The lowest temperatures during these periods are typically a few degrees below zero but extremes of below -30° have been recorded.

The winter weather is often delightful. The bright sun shines out of a stainless blue sky on a sparkling snow scene. The dry frosty air has a bracing and invigorating nip. Cloudiness is associated with warmer weather.

Air masses from the Pacific Ocean moderate the winter climate and temperatures may rise as high as the middle forties. Such temperatures prevail at Bralorne when the valley is swept by a descending and therefore warming wind called a "chinook". The effect of this wind is to melt the snow cover rapidly.

When the subsequent "tightening up" occurs the country becomes ice-bound. Trucks operating across Mission Mountain must be equipped with special hooks on their tire chains to cope with glare ice conditions.

The first fall of snow at Bralorne usually occurs in October although it is not uncommon for snow to come in September. (A little snow may be experienced even in summer.) It is seldom that snow which falls before November persists on the ground. The first really heavy snowstorm usually comes around the middle of December.

Lakes like Gun and Little Gun are often not solidly

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According to local report, "chinook" winds do not reach as far as the Bridge River Valley.
frozen until mid-January. During most winters Bridge River is open but small creeks are generally ice-covered.

Spring is more of a transition than a sudden break-up such as occurs under fully continental conditions. At Bralorne the snow cover ordinarily reaches its maximum depth in February and reduction goes on throughout March and April. Ablation proceeds by rain as well as by higher temperatures. In most years the ground is snow-free by late April or early May. Gun Lake commonly becomes free of ice in April. In the valley of Bridge River, the season is about one month advanced over that at Bralorne.

There is a good deal of cloudy and rainy weather in late spring. In the Bridge River Valley and at Bralorne, May and June are wetter months than April. There is often warm weather in May but the first hot spell usually occurs in June. During June and August, the monthly extreme temperature is more than 80° and in July it reaches 90°. July and August are the driest as well as the warmest months of the year. At Bralorne, about an inch of rain falls during July and during August. In the Bridge River valley at Rexmount, there is less than a half an inch for July, but slightly more than an inch for August.  

**TEMPERATURE**

The elevation at Bralorne where temperature records are taken is 3500 feet. Brexton, Ogden and Pioneer are also in the same valley at approximately similar altitudes. Temperature
conditions may be inferred as roughly the same as for Bralorne although, of course, local configuration and other factors may cause considerable discrepancies.

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Mean Temp. (deg.F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>20</td>
</tr>
<tr>
<td>February</td>
<td>24</td>
</tr>
<tr>
<td>March</td>
<td>33</td>
</tr>
<tr>
<td>April</td>
<td>41</td>
</tr>
<tr>
<td>May</td>
<td>48</td>
</tr>
<tr>
<td>June</td>
<td>54</td>
</tr>
<tr>
<td>July</td>
<td>59</td>
</tr>
<tr>
<td>August</td>
<td>58</td>
</tr>
<tr>
<td>September</td>
<td>52</td>
</tr>
<tr>
<td>October</td>
<td>42</td>
</tr>
<tr>
<td>November</td>
<td>30</td>
</tr>
<tr>
<td>December</td>
<td>22</td>
</tr>
<tr>
<td>Year</td>
<td>40</td>
</tr>
</tbody>
</table>

For the fourteen years on record the average mean annual temperature is 40°. The annual range of 39° is fairly wide and evidences the continentality of Bralorne's climate. The coldest month is January with an average temperature of 20° and the warmest July with an average of 59°. A marked deviation from the January average occurred in 1937 when the mean temperature for the month was 7°.

From 1941 to 1948 the record low temperature was -31° which occurred in January 1943. The usual winter extremes are around -6°. The highest temperature reported is 100°.

1 British Columbia, Department of Agriculture, Climate of British Columbia, Report for 1948, Victoria, B.C., p.5
recorded in July 1941, but the usual extreme high temperature is about 90°.

Air drainage is a feature of the climate under calm weather conditions. The movement is typical of areas of concave topography. Cold air from higher altitudes creeps down the slopes. This condition has its maximum effect in fall and winter when the Bridge River Valley may experience lower temperatures than does Bralorne. In the fall, a cold mist frequently collects in the valley overnight.

Frosts may occur in summer at Bralorne as in July of 1948 and August 1945 and 1946. Frosts are frequent in June.

| TABLE III | Length of continuously frost-free period at Bralorne (3500') based on a 13 year record |
| Last frost in spring (date) | First frost in Autumn (date) | Av. frost-free period |
| June 11 | May 19 | July 6 |
| Sept. 7 | Aug. 16 | Sept 22 |
| 89 days |

Unfortunately, figures are not available for the Bridge River Valley where the data would have a bearing upon agriculture. According to one local report, the frost-free season at Rexmount is from May 10 to October 5. This period is longer than might be expected. Frosts in early July occasionally damage vegetables at the mouth of Tyaughton Creek, according to other local reports. There appears to be no particular difficulty

about growing hay and grain crops for stock feed in the Bridge River valley. Dews are reported to be heavy during summer.

To illustrate the contrasting continental and oceanic influences, the mean monthly temperatures of Bralorne are compared to those at Big Creek on the Chilcotin Plateau, and Vancouver Airport where coastal conditions exist.

<table>
<thead>
<tr>
<th>Station</th>
<th>Elevation</th>
<th>Period</th>
<th>J</th>
<th>F</th>
<th>M</th>
<th>A</th>
<th>M</th>
<th>J</th>
<th>A</th>
<th>S</th>
<th>O</th>
<th>N</th>
<th>D</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver</td>
<td>45'</td>
<td>1938-48</td>
<td>37</td>
<td>40</td>
<td>43</td>
<td>49</td>
<td>54</td>
<td>59</td>
<td>63</td>
<td>62</td>
<td>58</td>
<td>51</td>
<td>42</td>
<td>39</td>
</tr>
<tr>
<td>Bralorne</td>
<td>3500'</td>
<td>1935-48</td>
<td>20</td>
<td>24</td>
<td>33</td>
<td>41</td>
<td>48</td>
<td>54</td>
<td>59</td>
<td>58</td>
<td>52</td>
<td>42</td>
<td>30</td>
<td>22</td>
</tr>
<tr>
<td>Big Cr.</td>
<td>3100'</td>
<td>1900-48</td>
<td>13</td>
<td>18</td>
<td>28</td>
<td>39</td>
<td>47</td>
<td>53</td>
<td>58</td>
<td>57</td>
<td>48</td>
<td>39</td>
<td>26</td>
<td>16</td>
</tr>
</tbody>
</table>

It will be noted that whereas Vancouver has no month with an average temperature below freezing, Bralorne has four months and Big Creek has five. The progressively lower temperatures at Bralorne and Big Creek illustrate the effect of increasing remoteness from maritime influences.

Ordinarily, it could be expected that the interior stations with continental conditions would be warmer than the coast during summer. Actually, temperatures are higher at Vancouver than at either Bralorne or Big Creek. The reverse would be true if the effects of elevation were discounted from the Bralorne and Big Creek figures. For example, using a lapse rate of 1° per 330':

1 Temperatures at the airport show slightly greater extremes than do those for Vancouver City.

2 *Climate of British Columbia, 1948*, op.cit., p.5
Av. Mean Monthly Temps.  Corrected Temps.

<table>
<thead>
<tr>
<th></th>
<th>July</th>
<th>August</th>
<th>July</th>
<th>August</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver (45')</td>
<td>63</td>
<td>62</td>
<td>63</td>
<td>62</td>
</tr>
<tr>
<td>Bralorne (3500')</td>
<td>59</td>
<td>58</td>
<td>70</td>
<td>69</td>
</tr>
<tr>
<td>Big Creek (3100')</td>
<td>58</td>
<td>57</td>
<td>67</td>
<td>66</td>
</tr>
</tbody>
</table>

Proximity to the ocean is responsible for the low July and August temperatures at Vancouver. The higher temperatures at Bralorne as compared to Big Creek are probably the result of low night temperatures which reduce the average at the plateau station.

**PRECIPITATION**

Precipitation records are available from Rexmount, Little Gun Lake and Bralorne. Rexmount is in the lower part of the Bridge River Valley. Climatic conditions there probably apply also to Minto, farther west along the valley. Little Gun Lake is on a bench at the foot of Mount Penrose.

**TABLE V** - Average Monthly Precipitation and Yearly Averages at Rexmount, Little Gun Lake and Bralorne for the periods shown.

<table>
<thead>
<tr>
<th>Station</th>
<th>Elevation</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Rexmount</td>
<td>2100 feet</td>
<td>1916-28</td>
</tr>
<tr>
<td>#2 Little Gun Lake</td>
<td>3000 feet</td>
<td>1925-31</td>
</tr>
<tr>
<td>#3 Bralorne</td>
<td>3500 feet</td>
<td>1932-48</td>
</tr>
</tbody>
</table>


#1 1.55 1.45 0.90 0.61 0.71 1.20 0.55 1.10 1.36 2.33 1.95 2.45 16.16
#2 2.92 1.61 0.94 0.93 0.46 1.13 0.48 0.69 1.33 2.71 2.01 4.04 19.48
#3 2.78 2.01 1.74 1.15 1.39 1.41 1.07 0.99 1.56 2.94 3.35 4.11 24.48

AVERAGE MONTHLY PRECIPITATION AT BRALORNE (1932-48)
and
YEARLY AVERAGES AT BRALORNE, LITTLE GUN LAKE AND REXMOUNT

Figure 22
It should be noted from the outset that these figures do not cover the same period of years for the three stations. Any comparisons therefore will be quite erroneous if the periods are other than normal.

For the years on record, the average annual precipitation is 16.16 inches at Rexmount, 19.48 at Little Gun Lake and 24.48 inches at Bralorne. The ascending scale is the result of elevation and local position. Rexmount and Little Gun Lake, where there is land under cultivation, suffer from drought conditions in July when Rexmount has 0.55 inches and Little Gun Lake receives 0.48 inches. In August, Rexmount with 1.10 inches fares better than Little Gun Lake with 0.69. It is likely that the valley station is receiving a share of convective rain during August.

Variability of precipitation from year to year is great in the Bridge River Valley. In 1928 the total precipitation at Rexmount was only 6.54 inches. Since agriculture is developed on only a small scale, the variability has not great significance. Moreover, most farms irrigate with water supplied by the mountain streams.

The arid climate at Rexmount in the Bridge River Valley is sharply reflected in the vegetation. The forest is open and Ponderosa pine, a characteristic tree of the dry belt, grows along the south-facing slopes.

The general deficiency of rain in summer coupled with low humidity may create at times a serious forest fire hazard.
Large tracts of woodland have been denuded by fires in the past.

Snowfall is an immensely important feature of the climate of the region, particularly because of the hydro-electric power development on Bridge River. Although artificial water storage is necessary for the power project, natural storage of water in the form of snow and glacier ice is important. River dams would have to be impractically large if all precipitation were in the form of rain.

Information on snowfall is very scanty. Records for Bralorne cover the years 1933 to 1937 when the average was 96 inches. During that period, 139.7 inches was the greatest snowfall and 65 inches the least. At Little Gun Lake, snowfall averaged 73.4 inches between 1925 and 1931. There are records for only two individual years at Rexmount, 1925, when the snowfall was 29.10 inches and 1928, when it measured 15.50 inches.

The usual maximum depth of packed snow at Bralorne is between two and four feet. According to local reports, seven feet is the greatest depth ever experienced. Periods of mild weather bring about shrinkage, but also produce crusts which seem to retard melting.

At altitudes above 5000 feet, the snowfall is heavy---usually ten to twenty feet. High elevation mines such as the

\textit{Climate of B.C.}, \textit{op.cit.} for years mentioned below
Lucky Strike (6200 feet) have faced special operating problems as the result of this heavy snow-pack.

In the Bridge River Valley there is usually not more than two feet of snow. This section of the highway is generally not obstructed unless slides occur. The Mission Mountain section is more often temporarily closed as the aftermath of heavy snowstorms.

Precipitation figures for Vancouver and Big Creek show a contrast between continental and oceanic conditions. As in the comparison dealing with temperatures, Bralorne occupies a mid-point in the relationship, which is the result of the geographical position of the Bridge River Region.

**TABLE VI** - Average Precipitation (in inches) at Vancouver Airport, Bralorne and Big Creek for the periods shown.

<table>
<thead>
<tr>
<th>Station</th>
<th>Elevation</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Vancouver Airport</td>
<td>45 feet</td>
<td>1937-48</td>
</tr>
<tr>
<td>#2 Bralorne</td>
<td>3500 feet</td>
<td>1932-48</td>
</tr>
<tr>
<td>#3 Big Creek</td>
<td>3100 feet</td>
<td>1900-48</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>4.99</td>
<td>4.55</td>
<td>3.45</td>
<td>2.61</td>
<td>1.92</td>
<td>1.47</td>
<td>1.17</td>
<td>1.10</td>
<td>2.04</td>
<td>4.74</td>
<td>5.15</td>
<td>6.39</td>
</tr>
<tr>
<td>#2</td>
<td>2.78</td>
<td>2.01</td>
<td>1.74</td>
<td>1.15</td>
<td>1.39</td>
<td>1.41</td>
<td>1.07</td>
<td>0.99</td>
<td>1.56</td>
<td>2.94</td>
<td>3.33</td>
<td>4.11</td>
</tr>
<tr>
<td>#3</td>
<td>0.75</td>
<td>0.71</td>
<td>0.83</td>
<td>0.51</td>
<td>0.96</td>
<td>1.78</td>
<td>1.40</td>
<td>1.54</td>
<td>1.21</td>
<td>0.77</td>
<td>0.32</td>
<td>0.96</td>
</tr>
</tbody>
</table>

The above data for the three stations show Bralorne receiving more than half as much precipitation as does Vancouver,


2 Precipitation at Vancouver Airport is less than for Vancouver City because of the greater distance of the former from the North Shore mountains.
### Average Monthly Precipitation and Average Yearly Totals

<table>
<thead>
<tr>
<th>Station</th>
<th>Elevation</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vancouver Airport</td>
<td>45 feet</td>
<td>1937-1948</td>
</tr>
<tr>
<td>Bralorne</td>
<td>3500 feet</td>
<td>1932-1948</td>
</tr>
<tr>
<td>Big Creek</td>
<td>3100 feet</td>
<td>1900-1948</td>
</tr>
</tbody>
</table>

**Figure 23**
and Big Creek halving Bralorne's total. The rain-bearing air masses which pass from the Pacific Ocean over the Coast Range deposit a decreasing quantity of moisture from west to east. Beyond the Bridge River Region towards the plateau, the air begins to descend and is therefore warming and unlikely to produce precipitation. As a result, Big Creek has winter drought.

Summer rain, a continental feature, occurs at Big Creek. The Bridge River district probably shares in this convectional rain.

PREVAILING WINDS

At Bralorne and Pioneer, the direction of prevailing winds appears to be almost completely controlled by local configuration. Winds blow either up Cadwallader Creek Valley or down, with little deviation. Winds are usually light and gale-force winds are infrequent.

Mountain and valley breezes are developed under calm conditions. Air which has been chilled by radiation blows down the valley at night. In the daytime, a breeze blows up the valley.

VERTICAL ZONATION OF CLIMATE

Isotherms and isohyets in a mountain region roughly conform to contour intervals. There is, then, a vertical zonation of climate with the general principle being lower temperatures with increased altitude. The human significance is apparent from a single example. Gold Bridge at 2200 feet
and the Ranger property on Mount Truax at 8000 feet are about five miles apart. Because of the vertical gradient of one degree Fahrenheit for each 330 feet of altitude, there may be some 17° difference between the temperatures of these two places. Thus, on a day when the valley settlement experiences a mild 49°, a thermometer at the Ranger might read a freezing 32°. This contrast is a theoretical one rather than an actual one because other factors such as slope, exposure and air drainage complicate the picture. Nevertheless, the principle of the illustration has general application throughout the region.

Vegetation is correlated with the vertical zonation of climate. Particular species of trees grow at various levels on various exposures. A gradation of tree types begins with deciduous trees in the valley bottom of Bridge River and ends with coniferous alpine species at timberline. The forest industry in turn shows adaptations to these patterns by operating in areas productive of particular species.

SLOPE AND EXPOSURE

In the mountains, slope and exposure are important factors governing local climate. Configuration which governs the two factors modifies the vertically layered climatic zones set up by the temperature gradient. The angle of slope determines the obliqueness of the sun's rays. The relative positions of mountain slopes to prevailing winds locally
affect precipitation, and shade is created by towering mountain walls. The residents of Pioneer often complain of the lack of sunshine at their townsite which is overshadowed by precipitous slopes. For a period in winter, Pioneer almost completely loses the sun.

The stratification of flora from lowest altitudes to highest is modified by an overall spottiness which is the result of the complexities produced by configuration. On the mountainsides facing northeastward above Pioneer, the cover is a thick growth of stunted Lodgepole pine. The snow persists there until late in the spring. On the opposite slope which faces southwest, the forest is more open and there are some deciduous trees and bush. The snow goes from these sunny slopes early in spring. Such contrasts are widespread throughout the region.
CHAPTER VI

VEGETATION

Climate and soils act together to produce the flora of the region.

CLIMATIC FACTORS

Precipitation is heaviest in the western and southern areas and diminishes towards the north and east. The density of cover correspondingly thins with the increased aridity. Thus, the mountains to the south have a thicker cover than do the Eldorado, Red and Shulaps Mountains.

Within the general pattern of cover, details of density and species are affected greatly by exposure. South slopes of the mountains receive more sunlight than do northern exposures. Evaporation is greater on the former, and the effectiveness of precipitation for plant growth is decreased.

It is principally the combination of these two factors, precipitation and exposure, which account for the marked difference between the cover on the north side of the Bridge River and that on the south. The lower slopes of the Bendor Mountains facing the Bridge River have a thick forest growth, where fir predominates. Across the river on the south-facing slopes of Marshall and Pearson Ridges and the Shulaps is an

* See Fig. 24; also Figs. 3, 5, 7-13.
open, park-like forest where Ponderosa pine is the chief tree.

The vertical arrangement of climatic belts is instrumental in producing a parallel arrangement of cover. Increased al­titude means a decreased growing season for plants. Climatic conditions become intolerable for the growth of trees above 6500 feet, but this boundary may be lower or higher depending upon local conditions. Since base level in the region is some 2000 feet, the forested zone extends through approximately 4500 feet. Within this zone, every tree has its own limits.

Ponderosa pine and Douglas fir grow from base level to about 3500 feet. Engelmann spruce and Lodgepole pine extend to 5000 feet. Above this limit to timberline grows the Alpine fir. At timberline there is a narrow zone occupied by the White-barked pine. These are the limits in the Bridge River Region within which the various species named can grow. Actual occurrence within these limits depends upon a whole set of ecological controls.

EDAPHIC FACTORS

The floor of Bridge River Valley has been covered by alluvial deposition. The soils are sandy, and in places poorly drained. Marsh plants, water-tolerant bush and deciduous trees are the vegetation response.

The lower slopes of the mountains are buried in glacial drift with a surface blanket of volcanic ash. Developed soils are thin, usually largely organic, and therefore easily destroyed by forest fires. At altitudes above 7000 feet,
extensive areas of bare rock are largely devoid of soils and plant life.

**VEGETATION BY AREAS**

The forest resources are meagre because of the rugged character of the country and the limitations imposed by climate.

**Bridge River Valley** — The heaviest precipitation in the Bridge River Region occurs near the headwaters of the Bridge. Coastal type trees, cedar and hemlock, are found thinly scattered in the upper valley. Deciduous trees such as Black cottonwood, willow, alder and western white birch line the river banks throughout its course. On gravel slopes, but usually close to water, are stands of poplar. Where the river flows within a flood plain, these deciduous trees occupy the natural levees and other pieces of higher ground. The deciduous cover is nowhere continuous, but as revealed from the air is sinuous in pattern.

In parts of the flood plain, more land is under water than above it. Marsh vegetation includes reeds, rushes, sedges and bush.

The deciduous cover has little economic importance, but is a necessary part of the habitat for wild life. Small amounts of poplar are occasionally cut as fuel wood.

A thick coniferous forest grows above the valley on the slopes of the Bendor Mountains. Douglas fir predominates to practically the exclusion of other species. On the steep
hillsides the trees are small, but larger specimens grow near the valley floor. Spruce also grows on the floor of the valley, but in damper places.

On the cover map the forest on the south side of Bridge River is classified as immature, except for small enclaves of commercial timber. A small cut of fir and spruce is made by a single mill.

On the opposite side of the Bridge River, extending from Marshall Creek to a point west of LaJoie Falls, is a narrow belt of commercial Ponderosa pine and fir. The strip is largely below the 3000 foot contour and it reaches its maximum width south of Tyaughton Lake. The continuity of this commercial forest is broken just east of Gun Lake where scrub trees intervene.

Ponderosa pine, which is a characteristic tree of the drier parts of interior British Columbia, flourishes in open, park-like stands. The bark beetles which attack this tree throughout the province have not made heavy inroads in the Bridge River district. Ponderosa pine is of high enough value to withstand the cost of export outside the region.

The belt of commercial timber is everywhere accessible by road. The best stands yield as high as 20,000 f.b.m. and many patches run as high as 7-10,000 f.b.m. Yields of 4-10,000 f.b.m. are considered commercial if the stands are

accessible. Three saw-mills are engaged in cutting this timber.

North of Minto around Pearson Ponds a marshy meadow-land is used for a cattle range during part of the year. Near Rexmount there is enough grass for a few cattle to graze.

**Gun Creek** --- Higher on the slopes and extending up Gun and Tyaughton Creek valleys are thick forests of Lodgepole pine, spruce and fir. The same deciduous trees of the Bridge River Valley line the banks of the creeks to about the 4500 foot contour. Poplar persists to almost 5000 feet on sunny slopes facing south.

The traveller following the Chilcotin trail up Gun Creek finds that the forest begins to thin noticeably by Eldorado Creek. The trend of the valley between Eldorado Creek and Spruce Lake is north toward the drier Chilcotin Plateau. Increased aridity and altitude together produce the open, sub-alpine forests that characterize the south slopes of the Eldorado Mountains. The forest floor is carpeted with grasses and flowers and there is almost a complete absence of underbrush.

This lightly-wooded country is a favorite summer range for deer. For this reason the district is visited annually by hunting parties. Cattle are able to forage as well and a government-assigned grazing area extends between Trigger Lake and Spruce Lake.

1 Mulholland, F.D., *The Forest Resources of B.C.*, 1937, British Columbia, Dept. of Lands, B.C. Forest Service, Victoria, B.C.
In damp valley bottoms, or on north and north-east slopes, the cover again reverts to a thick growth of spruce, Alpine fir or Lodgepole pine. Spruce Lake at 5140 feet takes its name from the trees which grow so thickly on its eastern shore. The hillside on the western shore of the lake has been badly scarred by a forest fire.

Tyaughton Creek --- Up Tyaughton Creek valley the transition to dry belt conditions is apparent by Mud Creek. Above this tributary, the vegetation becomes similar to that of upper Gun Creek. The slopes of the Red Mountains are sparsely wooded, but a rather heavy growth of Lodgepole pine covers the north slopes of the Eldorados. The grasses extend from the valley floor to above timberline on the rounded, broad, smooth ridges of the Red Mountains and eastward towards the Yalakom River. In summer, several thousand sheep find pasture on these grazing ranges.

Hurley-Cadwallader Area --- Lodgepole pine predominates on the Hurley-Cadwallader rock bench practically to the exclusion of other species. It is the writer's opinion that much of the area has been swept by forest fires, probably less than one hundred years ago. The cover of Lodgepole pine is immature, and blackened stumps in the forest are larger than the butts of present growing trees.

Lodgepole pines of this vicinity are about a foot thick at the butt. They grow tall and straight in dense stands where every tree pushes upward to the sunlight. Only the
uppermost part of the tree has branches. The smooth trunks are used occasionally for log buildings, and they are the main supply of fuel wood for the settlements of Bralorne and Pioneer. The logs can be handled conveniently without machinery because of their small size.

Below the rock bench where the streams have cut deeply, there are large fir trees. On the west side of the river the growth is thick, but on the east side the trees are more scattered. For the most part, these trees are not readily accessible.

Some deciduous trees, chiefly cottonwood, grow along the banks of the Hurley and the Cadwallader.

The glacial troughs of upper Cadwallader Creek and Hurley River are densely forested chiefly by spruce, Lodgepole pine and Alpine fir. Pioneer Mines owns timber leases on the west side of the Hurley above the dam-site. The fir which once grew in this location has largely been logged-off. Ten to fifteen miles upstream there is a valuable stand of spruce. It is possible that the river could be developed for running the logs. In these upper valleys, as elsewhere in the district, great vertical swaths have been cleared in the forests by spring avalanches.

INVENTORY OF FOREST RESOURCES

The following inventory of the forest resources does not include the upper Tyaughton and of course the Yalakom is not within the Bridge River Region as defined for the purposes of this thesis. Since no official figures exist for the Bridge
River area alone and the much smaller Yalakom area does not greatly distort the picture of the forest resources, it was deemed fit to include this data.

<table>
<thead>
<tr>
<th>Classification of Areas</th>
<th>(acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merchantable timber</td>
<td>23,790</td>
</tr>
<tr>
<td>Immature timber</td>
<td></td>
</tr>
<tr>
<td>over 25' (fully stocked)</td>
<td>32,040</td>
</tr>
<tr>
<td>under 25' (fully stocked)</td>
<td>17,320</td>
</tr>
<tr>
<td>under 25' (sparsely stocked)</td>
<td>6,950</td>
</tr>
<tr>
<td>Logged</td>
<td>330</td>
</tr>
<tr>
<td>Burned</td>
<td>180</td>
</tr>
<tr>
<td>Non-commercial cover</td>
<td>5,520</td>
</tr>
<tr>
<td>Total productive</td>
<td>85,230</td>
</tr>
<tr>
<td>Barren</td>
<td>441,720</td>
</tr>
<tr>
<td>Scrub</td>
<td>289,420</td>
</tr>
<tr>
<td>Swamp and water</td>
<td>3,690</td>
</tr>
<tr>
<td>Cultivated</td>
<td>340</td>
</tr>
<tr>
<td>Open grazing</td>
<td>7,100</td>
</tr>
<tr>
<td>Total area</td>
<td>827,500</td>
</tr>
<tr>
<td>(grazing under cover</td>
<td>4,150</td>
</tr>
<tr>
<td></td>
<td>acres)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Merchantable Volumes</th>
<th>(thousand board feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas fir</td>
<td>51,750</td>
</tr>
<tr>
<td>Spruce</td>
<td>20,850</td>
</tr>
<tr>
<td>Balsam²</td>
<td>11,970</td>
</tr>
<tr>
<td>White pine</td>
<td>370</td>
</tr>
<tr>
<td>Yellow pine</td>
<td>28,920</td>
</tr>
<tr>
<td>Lodgepole pine</td>
<td>2,390</td>
</tr>
<tr>
<td>Total Volume</td>
<td>116,850 m.b.m.</td>
</tr>
</tbody>
</table>

By dividing the acreage of merchantable timber (23,790) into the total merchantable volume (116,850 m.b.m.) the

1 British Columbia Forest Surveys Branch of the Forest Economics Division, B.C. Forest Service, "Forest Resources of British Columbia", Forest Inventory of British Columbia Watershed No. 1, Drainage No. 20, 1937.

2 This is the Alpine fir (Abies lasiocarpa) mentioned in the discussion.
quotient is under 5000 f.b.m. This figure represents the average volume per acre of all merchantable timber... a marginal quantity.

SHRUBS AND FLOWERS

Small shrubs and flowers have their place in the pattern of vegetation, adding to the general attractiveness of the country. Typical flowers are the penstimon, lupine, Indian paint-brush and tiger lily. There are hundreds of alpine species ranging from the columbine and anemone in the lower areas to the Arctic anemone (glacier lily) which springs up on the very margins of the receding snows. The region as a whole supports only sparse underbrush, as a result of lack of moisture. Oregon grape is a representative shrub.
CHAPTER VII

WILD LIFE

BIG GAME

Big game is the attraction which brings sportsmen to the Bridge River Region in the autumn. The variety of big-game animals is remarkable. There are moose, deer, bears, mountain goats and mountain sheep. A few wapiti or elk have been liberated in the district. Caribou are native but they have now almost disappeared from the country. The diversity of animals is possibly explained by the generally favourable character of the mountain habitat.

There is a seasonal migration of the deer, and to a certain extent of the moose, sheep and bear between the low elevation areas in winter and the high mountains in summer. During severe winters the goats also retreat to the valleys. From these winter ranges—chiefly the valleys of the Taseko, Anderson and Seton Lakes, the Bridge, Yalakom and Fraser Rivers and the Chilcotin Plateau—the animals move upward as the snows melt. By late June, many of the big-game animals are high in the alpine country where they remain until the snowstorms of October and November. It is the smooth, lightly forested and grassy mountains towards the Chilcotin Plateau which are the favorite summer ranges.

The moose, which is partly aquatic in its habits, feeds in the sloughs of the Bridge River Valley. They range also
into alpine country in summer. Moose are protected south of the 51st Parallel and are officially reported as increasing in number. However, according to local report, the moose population has suffered a decline recently.

A favorite wintering ground for mule deer is the south-facing slopes of the Bridge River Valley where there is a minimum depth of snow. In summer, the deer range as high as timberline. They are the most plentiful big-game animal. Around Spruce Lake or upper Tyaughton Creek, it is not uncommon to see 30 or 40 deer in the course of a day's walk. However, Bralorne and Pioneer residents who hunt on the slopes adjacent to the Bridge River Valley claim that the animals are becoming fewer each year.

Black bears and grizzlies are the enemies of the sheep herders but the stock-in-trade of the big-game guides. In summer, black bears are to be found anywhere within the forested areas, but grizzlies seek the timberline country where they prey upon marmots, which are mountain-dwelling rodents. Bears, especially grizzlies, are scarce in the district as a whole, although grizzlies are locally reported as numerous in the valleys of Truax and Tommy Creeks.

Mountain goats are usually year-round inhabitants of the summit areas. Around Bralorne and Pioneer their numbers have become depleted, probably through over-hunting. Elsewhere, they are thought to be holding their own.

1 British Columbia, Dept. of Attorney-General, Provincial Game Commission Report, 1947, p.32
There are a few bands of mountain sheep. One is reported near Whitecap Mountain, and another two around Tyax Pass and Relay Mountain. Several bands frequent the Shulaps and the head-waters of Churn Creek. A small number of sheep from the Shulaps Mountains cross the Bridge River near Rexmount to winter in the Bendor Range. The animals seem to prefer the less precipitous type of mountains and areas where the snowfall is not excessive. Sheep are seriously decreasing in number although they are reported as increasing within the Yalakom Game Reserve which lies on the east bank of the Yalakom River. Formerly, these animals were plentiful and their depletion is probably due to disease as well as to over-hunting. The disease may be contributed by the domestic sheep which are summer-pastured in parts of the mountains.

Wapiti are reported both in the Shulaps Mountains and in the vicinity of the Hurley River. Only a very few of the animals are in the district, and they are protected.

**PREDATORS**

Some of the predatory animals kill big game and therefore are of economic importance. In the Bridge River Region, cougars do by far the most damage. They prey mainly upon the deer and their depredations go almost completely unchecked. The control of this animal would help to restore the big-game population. Wolves are too few to be very injurious, but they are reported as increasing. Coyotes and bears take only a small, unimportant toll. Bears kill a few domestic sheep, but

1 Provincial Game Commission Report, *op.cit.*, p.32
the herders are well-armed, vigilant sentries. In the eyes of the licensed guides, the bears shot by the herders constitute a serious loss. Local opinion is that the decrease in deer will eventually cause predatory animals to attack cattle, but so far this has not occurred.

BIRDS

The lakes and marshes of Bridge River are the home of Canada Geese, Mallards and other waterfowl. These migratory birds gather in fair numbers, but their habitat is particularly vulnerable to hunters because of the presence of the Bridge River highway along the floor of the valley.

Upland game birds are grouse and ptarmigan. Grouse inhabit the forested areas and ptarmigan live in the mountains above timberline. There is only a small population of these birds, and they are protected.

Of no economic importance, but adding a dash of moving color to the landscape is the abundance of small birds such as pine grosbeaks, tanagers, cedar-waxwings, redpolls, finches and mountain bluebirds.

FISH

In the waters of the lakes and streams are Rainbow Trout and Dolly Varden. The primary food supply for fish in the lakes depends very largely on shallow-water aquatic plants of which there are not large quantities in the typically deep mountain lakes. Marshall Lake (at the base of the Shulaps Mountains) and Gun Lake have trout in fair numbers. Fish Lake (on the rock bench, near Brexton), Little Gun and Tyaughton
Lakes are better producers for their size. Liza (near Marshall Lake) and Spruce Lakes have shallow water along their margins and they teem with undersized trout. King and Woods Lakes (on the rock bench, near Bralorne) have been artificially stocked, but fish are not plentiful.

The creeks are not really suitable for fish because of their erratic flow and swift, shallow water. Nevertheless, most of the larger streams have little mountain trout in them. The turbid waters of Bridge River contain Dolly Varden and there is a small run of Spring salmon up the river to Tyaughton Creek.

FUR-BEARERS

Trapping helps to support a number of persons within the Bridge River Region. Fur-bearing animals inhabit the forested country. Most of them, such as marten, weasel and squirrel, have a wide distribution. In detail, the forest denizens are concentrated along the creeks where the basic food supply of vegetation and small animals is greatest. Muskrat and beaver are aquatic animals whose chief habitat is the marshes, sloughs and oxbow lakes of the Bridge River. Other animals caught occasionally by trappers are cougar, bob cat, lynx, wolverine, fox, coyote and bear.
The remainder of this study will describe the occupance.

"The term occupance is ... adapted in geography to indicate the process of occupying or living in an area and the transformations of the original landscape which result."

The following introductory chapter gives an historical or sequential account of how the modern occupance developed.

1 James, Preston, E., *An outline of geography*, Boston, Ginn and Company, 1935, p.31
CHAPTER VIII

SEQUENT OCCUPANCE

Human use of the Bridge River area has been conditioned especially by the mountain character of the region. During the Indian era, the mountains served as summer hunting grounds. During the placer and lode mining eras, the mineralization of the mountains was the stimulus to human activity. In the modern era the mountains continue to supply gold, and the high relief is an important factor in the development of hydroelectric power.

Transportation, because of the rugged setting, has presented an outstanding problem from earliest to modern times. The Bridge River flows through an elevated valley girt by lofty mountains. There are no passes below 4000 feet, except the dangerous and therefore historically unimportant river-canyon route. The story of the development of the region has, to a large extent, been the story of the development of transportation.

The mountain environment precluded from the start the possibility of extensive agricultural land-use. Sparse forests provided a weak base for lumbering. Hydro-electric power and mining emerged the logical economic adjustments to this region of high relief.

Lode gold mining, the culminating stage of the occupancy,

* See Fig. 25
has reached its present level because of the technological
development of modern times. The sequential occupance of a
region is always related to the sequential occupance of the
civilization of which it is a part. The advance from primitive
arrastras to stamp mills, from pack-horses to diesel trucks,
was part of the industrial progress of an age. The Bridge
River Region shared that progress.

THE INDIAN ERA

"Schum-Schum", the land of plenty, was the Indian name
for the Bridge River country. The district was a hunting-
ground for the semi-nomadic Indians who followed the game
animals into the summer ranges high in the mountains. To this
day, a small band from the Stone Reserve near Hanceville makes
the trek over the old Chilcotin trail when the snows leave the
passes. In ancient days, the journey was often continued to-
ward the Fraser River where a foray might be made on the
Chilcotins' traditional foes; the Lillooet Indians. The
Indians living around Lillooet were principally salmon and
berry eaters, but in all probability there was a certain amount
of rivalry over the Schum-Schum hunting grounds. In modern
times, the Chilcotins engage only in the friendly contests of
the Lillooet Stampede.

THE PLACER MINING ERA

The Indian era in the Bridge River Region came to an end
when the Cariboo Gold Rush began. Probably gold was first

1 Also spelled "SkumSkum" and "Scumacum"
discovered in the Fraser River area in 1856. By 1858 the rush was on. "Forty-niners" from California, inexperienced British immigrants and the pig-tailed Chinamen struggled over the portages of the Harrison-Lillooet route or along the narrow Indian trails of the Fraser canyons. Up river from Yale, the miners used pans, rockers and sluice boxes to wash the alluvial gold from the gravels of the river.

Soon, the bars of the lower Fraser River were stripped of surface gold. Then came the dry digging along the banks, which was work requiring more capital. Miners without it pushed on into the upper Fraser and some turned aside to the tributary rivers such as the Bridge. It was the exhaustion of easy placer gold on the Fraser which caused the penetration of the Bridge River area.

In the fall of 1858 came reports to the Victoria Gazette of mining activity on the Bridge River. The Gazette's "travelling correspondent" writes of meeting parties which had been 20 or 30 miles up the Bridge River. That the Indians resented the intrusion of their hunting grounds is shown by his statement:

"The Indians who a few weeks since prohibited the whites going up Bridge River threatening to kill those who persisted in the attempt, are now peaceful...."

Victoria Gazette, Victoria, B.C., 30 September, 1858.
By Christmas there were 200 men working on the Bridge River. The scene of their activities was from the canyons to the mouth. Above the canyons where the river flows a meandering course through a flood plain, no gold was discovered.

The canyons served as a barrier against those who would prospect the headwaters. An Indian trail so narrow that pack animals could not safely traverse it was the only path up the river.

During the winter of 1858-59, the price of provisions rose so high that many miners were forced to leave.

"Provisions on and below Bridge River are now selling at the following rates: Flour 50¢ per lb., bacon 75¢, pork 70¢, beans and rice 45¢, butter $1.25 ...."  

And loud were the complaints against the exactions of the mule packers. Transportation from the coast through the rugged mountains was a primary factor in hindering development.

In the late spring of '59, many of the claims were close to exhaustion.

"...the working claims are with but few exceptions quite superficial furnishing paydirt for a comparatively short duration in each locality...." 3

Those miners who had sought gold in the upper Fraser rather than in the tributaries had, by the fall of 1860, penetrated the head streams of the river. There, the great strikes of

1 Victoria Gazette, 18 December, 1858  
2 Ibid., 21 December, 1858  
3 Ibid., 28 May, 1859
Keithly and Antler Creeks were made. News of this Eldorado caused the Fraser River area to be virtually abandoned as the miners pressed on towards the "easy pickings" of far Cariboo. Bridge River was left behind.

Improvements came in transportation. In 1861 and 1862 steamers operated on Anderson and Seton Lakes with a tramway across the portage. In 1862, the Cut-off Valley road deflected traffic directly to Clinton, by-passing the Fraser River route. When in 1856 the Royal Engineers completed the road from Barkerville to the coast via Spences Bridge and the Fraser River canyons, the Harrison-Lillooet trail fell into disuse. Not only was the Bridge River area forsaken, but it was no longer adjacent to the main travel route.

However, there were some few who did remain to work the Bridge River. They were, for the most part, the ubiquitous Chinese.

"I doubt now if that all absorbing focus Cariboo, leaves us a miner to represent the white interest among the Celestials."

Lillooet sōtre-keepers had lost heavily by the decline of the Bridge River diggings. These merchants were anxious to bring a return of business by stimulating a new rush. They were backed by the public-spirited Judge A. C. Elliot of Lillooet who lost no opportunity of bringing Bridge River before the attention of the government.

In the spring of 1863, Judge Elliot raised a subscription

1 The British Colonist, Victoria, B.C., 30 May, 1863
for a prospecting party in the upper Bridge River area. The subsequent report written by one of the prospectors was forwarded to Governor Douglas. The governor was favourably enough impressed to send $250 to aid in the work.

Judge Elliot next dispatched John Cadwallader, a Lillooet miller, to verify reports by certain Italians regarding the diggings. Cadwallader evidently penetrated into the headwater areas and later submitted a written account of his trip.

It was not until the summer of 1865 that the government took further steps to explore the mineral possibilities of the upper Bridge River. Four hundred pounds had been set aside for this purpose. Andrew T. Jamieson headed the Bridge River Exploring Expedition which included John Cadwallader and John Gallagher, both of whom had done previous exploration. Their route into the area was directly west from Big Bar and over the Shulaps to Tyaughton Creek (called at this time Gallagher Creek). They reported good diggings everywhere capable of paying six to thirty dollars a day. Numerous quartz veins were discovered. Judge Elliot made the trip in to see for himself the findings of the expedition.

The glowing reports that followed were marred by only one consideration. There was still no adequate trail into the valley. The government had done some work in the spring, but the trail was incomplete. Seventy-six Lillooet citizens signed a petition asking Governor Seymour to have a trail constructed up the left bank of the Bridge River.
The governor requested more information and a survey was made. It was estimated that the trail could be constructed at a cost of $150 per mile or, altogether, $18,000. The government took no action on an offer which came from Gallagher to construct the trail in exchange for the right to operate a ferry across the Bridge River.

Under the supervision of the famous trail builder, Dewdney, the government commenced work in the spring of 1866. Dewdney evidently built a trail part of the way up Bridge River, but for some reason abandoned the project when only half the allotted money had been expended.

Judge Elliot and the Lillooet storekeepers seemed, then, only partially successful. Some interest was revived in the Bridge River, and probably some revenue accrued, but the transportation problem was only partly solved.

From the Elliot Papers we learn that Jamieson was planning a trip to the Cadwallader Creek area in 1866. From this date until the '80's, Bridge River appears to fade from the official records and newspapers. In all probability, casual placer mining took place from time to time. Mr. Soues, Gold Commissioner for the Lillooet District, noted that most of the gold produced in his District from 1860 to the discoveries of

1 The British Colonist, 7 May, 1866, reported that Lillooet citizens were petitioning the government to push the trail farther. Further research might disclose the reason for Dewdney's abandonment of the project.

2 Elliot, A.C., "The Elliot Papers", Letter to Hon. H.M. Ball, Acting Colonial Secretary at New Westminster, 2 June, 1866. From file of manuscripts in Provincial Archives of British Columbia.
Cayoosh Creek came from the Bridge River. Gold Commissioner Mr. Phair in the Mines Report of 1882 writes of a wingdam operation being conducted on the South Tributary and of thirteen Indians who had come down from the upper Bridge with gold dust in their pouches.

It is in this report that the first mention is made of the use of the Mission Mountain route into the Bridge River Valley. The Indian paths across the Shulaps at 8000 feet and across McGillivray Pass (a later route) at 5800 feet were open for only a short time in the year because of heavy snows. The canyon route beset by rock-slides was too dangerous. In spite of its difficulties, the low point in Mission Ridge (4470 feet) was to become the motor road pass of modern times.

Rich placer was struck by the Chinese on Cayoosh Creek near Lillooet in 1884. For a period there was a rush to this stream, but Bridge River was not totally neglected for in 1886 Mr. Phair was able to report that "Bridge River has done well this season." He also makes the statement that

"There are well-defined quartz ledges on the South Fork and tributaries of Cadwallader Creek."

Two prospectors, Ward and Gould, who explored the upper Bridge in 1886 seemed definitely interested in "float rock"—one of the first signs of "lode interest" on the part of the prospectors.

1 British Columbia, Dept. of Mines, Minister of Mines Report, 1896 (Lillooet District). Note: all Mines Reports hereafter mentioned refer to Lillooet District.
2 South Tributary or South Fork is the Hurley River of today.
3 Minister of Mines Report, op. cit. 1886, report of Mr. C. Phair
THE LODE MINING ERA

The discovery of the Golden Cashe mine on Cayoosh Creek in 1896 gave a new focus to mining activity. As a result of this find, miners became conscious of the possibility of lode instead of placer mining.

Capital was necessary and there were slower initial returns from lode mining, but larger profits were to be made in the end. The stakers of the Golden Cache sold out at a handsome profit to a syndicate, and moved on to find new mines. And what likelier areas than the Bridge River, where the steady placer gold indicated a mother lode source? In 1896 the Forty Thieves (now Bridge River Consolidated) was staked, and by the end of the following year the Alhambra, Blackbird, Lorne, Little Joe and Ida May (all now Bralorne—the last three currently referred to as King, Coronation and Empire mines respectively) and the Pioneer had all been located. These and other famous claims were staked on the belt of augite diorite which is the basis of the Bridge River gold-fields.

Wild staking continued until 1898 when fifteen miles of ground were allocated on the east and west banks of Cadwallader by persons interested only in payment by gullible backers. Most of the claims were later to lapse when assessment work was neglected.

The wave of stakers rather quickly subsided when news came to Cadwallader of the gold discoveries in the Klondike. Will Haylmore, an old-timer, writes on the effect of that news.
"I counted ninety tents on the Ida May Flats---about two hundred prospectors. Overnight they vanished."

Not all decamped from the area, however. The faithful remained to begin hard rock mining. Those were the days of rock drilling with hand tools, laborious ditch digging and whip-sawing lumber for flumes and arrastras. The arrastras were primitive Spanish Mills which were driven by huge water wheels.

All supplies were dependant upon precarious pack-trains which took, on the average, five days from the Mission (now Shalalth) to the Forty Thieves. The trail crossed to the north bank of the Bridge River at Jack's Landing near the foot of Mission Mountain. A dugout canoe was the ferry at this point, and at Sucker Creek (McDonald Creek). Canoes served only the passengers and it was necessary to raft the loads and swim the horses. Dangerous fords were encountered at Tyaughton and Gun Creeks.

A few years later the hazards of the journey were reduced when scows were substituted for the dugouts. The scows were attached to tigelines and the motive power was supplied by the current of the river.

Unfortunately, the Golden Cache which had been sold to Worts of Gooderham and Worts played out quickly. There was talk of a fraud and, according to the old-timers, Eastern capital was embittered. At any rate, there seemed to be no major

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1 Haylmore, William, "In the days of '96", an unpublished article, p.4
financial backing for the struggling mines of Cadwallader Creek.

The Pioneer was operated by F. H. Kinder who had gained a half interest by promising its owner, Allen, to build a mill on the property. Kinder fulfilled his contract by erecting a toy stamp mill. He then proceeded to work the mine single handed and to operate a home-made arrastra for eleven summers. Next, the property passed through the hands of a number of different owners until in 1914 Pioneer Gold Mines Ltd. was formed.

In the meantime, transportation had improved. By 1911, a narrow wagon road had been built over Mission Mountain to Jack's Landing. By 1912 the road was extended to the Cadwallader area, and in 1913 the first motor car was driven into the valley. Freight moved over the road by wagon or by the solid-tired truck of Mr. Rebagliatti at the rate of three dollars per hundred from Shalalth to the mines. The P.G.E. Railway had reached Shalalth in 1914, further easing the problem of transportation. However, transport was by no means simple, and snow on the summits in the early part of the winter stopped movements for the season, except for mail which was brought in by sleighs or pack-horses.

By 1917, Pioneer had produced $135,000 in bullion, and the mine had been opened to a depth of 250 feet. In spite of this success, the mine was almost dormant and plagued with financial problems.

1 Cairnes, Memoir 213, op. cit., p.116
difficulties until operations were begun in 1924 by David Sloan and his associates. No work at all had been done for two years and, in Sloan's own words, the Bridge River had become "...the valley of dead mines." There were only four permanent residents in the valley at that time.

The courageous and intelligent handling of the mine by David Sloan led to rapid successes. In the years following, the mine proved fabulously rich in places. One pocket yielded 400 lbs. of gold from 900 lbs. of ore. By 1928 the company was able to build a 150-ton capacity cyaniding mill. Installation of hydro-electric plants on the Hurley River and Cadwallader Creek, and finally in 1934 the B.C. Electric development on Bridge River, gave a plentiful supply of power for further mine expansion.

Below Pioneer on what is today Bralorne property the crude arrastras handled only the highest grade of ore. Machinery was the answer to milling lower grades economically and to the problem of speeding production. Between 1900 and 1926, up-to-date mills were installed at the Lorne, Coronation and Empire properties.

Fragmentary holdings at first inhibited development.

"up to 1911 practically all the gold quartz deposits were held by individual owners with small capital who were able to mine only the richest ore...."

1 Sloan, David, "History and early development of the Pioneer Gold Mine," The Miner, August 1934, vol. 7, no. 8, p.341
2 Cairnes, op.cit., p.123
3 McCann, Memoir 130, op.cit. p.1
In 1916, A.F. Noel acquired the controlling interest in the Lorne group of six claims. The consolidation process bringing greater capital reserves continued and in 1928 the Lorne Gold Mines Ltd. was formed. In 1930 due to the failure of fiscal agents of the company, Bralorne Mines Limited was formed, incorporating the workings of the King (Lorne), Empire and Coronation mines and the Alhambra and Blackbird claims. By 1932 a 100-ton mill, and two years later a 450-ton mill was operating, and the company had begun development with a sound economic policy.

THE MODERN ERA

It is of primary importance to the history of the region that alluvial gold existed in the Bridge River and its tributaries. It is of equal importance that like all mineral deposits it was limited in quantity. The exploitation of this resource meant its recovery from the streams until finally placer gold was nearly exhausted. The mining economy was sustained when it was revolutionized by adopting a new basis and new techniques in lode gold production. The historic function of the ephemeral waves of gold seekers was complete. They had pioneered the trails and passes, and traced down the mother lode.

The lode mining era was at first a trial and error period. It was a struggle to bring the new mines into production and to place them on a sound economic footing. The development was handicapped by lack of capital, antiquated machinery and poor

Noel was one of the stakers of the Golden Cache
transportation. A railway and road solved the transportation problem. The mines gained the financial backing they needed after the consolidation of the mining properties. New machinery and electric power allowed an accelerated production.

The modern era has been characterized by a continuous effort to duplicate the success of Bralorne and Pioneer mines. In addition, the service needs of the communities and the requirements of the mines have called into being new subsidiary industries. The final stamp has been placed on the region by the development of the hydro-electric power potentialities of Bridge River.

The years 1933 and 1934 witnessed an all-time boom in the Bridge River Valley. The higher price of gold and the successes of Pioneer and the new Bralorne were responsible. There were 4000 mineral claims staked in the valley and 30 mining companies operating.

The annual average lode production of Bridge River from 1920 to 1924 was 173 ounces. From 1924 to 1930 inclusive it rose to 6,221 ounces annually, and from 1930 to 1934 it reached 1 68,910 ounces. In 1934, B.C.'s lode gold production was 2 297,130 ounces of which about one quarter came from the Bridge River area.

Two other mines came into production—the Wayside on the Bridge River highway a short distance west of Gun Creek, and Minto, close to the mouth. In the middle '30's both mines were

1 Cairnes, Memoir 213, op. cit., p.1
2 Minister of Mines Report, op. cit., 1934, p.12
successful producers.

Mining did not fulfill its rich promise. The Wayside and Minto soon closed, having run out of ore.

In spite of intensive prospecting, Bralorne and Pioneer remain today the only producing mines in the region. The exploration of their ore bodies revealed that the mines were capable of long-term production. The companies were then prepared to make the capital outlays necessary for the establishment of permanent towns.

Forest industry began in response to the need for building materials and mine timbers. Agriculture became established on a small scale to provide pack-horses and wagon teams with essential feed on the journey to and from the mines. Later, supplies were brought into the region by an organized trucking service. A tourist industry was able to function because of the transportation facilities already developed in connection with mining.

Man has been able, because of modern technology, to integrate one more phase of the natural environment with his activities. The production of hydro-electric power has come in the modern era due to the needs of a distant community and the peculiar suitability for development of Bridge River. When the immense project is completed it will have almost no effect upon the number of people living in the region. Mining will remain the dominant industry supporting population.
Scale:
10 statute miles to 1 inch

Taken from A MAP OF A PORTION OF THE COLONY OF BRITISH COLUMBIA compiled from various sources including original notes from personal explorations between the years 1832 and 1851 by Alex T. Anderson, 23rd May, 1867.

Provincial Archives

Figure 25
CHAPTER IX

MINING

Most human activity in the Bridge River Region centers around the mining industry. It has been shown historically that mining has been responsible for almost all settlement in the region. The basis for the industry, according to some geologists, is the situation of the Bridge River Region "... on the eastern margin of the great belt of Coast Range batholithic intrusions..." to which the mineral deposits may be genetically related.

Gold is the chief mineral resource being exploited at present in the Bridge River Mining Camp. Lode production comes entirely from Bralorne and Pioneer Mines which are two of the most important gold mines in the province. Limited quantities of silver are recovered at these two mines. There are antimony showings in the valley of the Bridge, as well as on Truax Mountain. Tyaughton Creek area has chromium, tungsten, mercury and magnesite deposits. Occurrences of copper are

* See Fig. 26; also 46, 49

1 Cairnes, Memoir 213, Geological Survey, op.cit. p.8
2 Bridge River Mining Camp is the term used by W. S. McCann and C.E. Cairnes when referring to the Mines area which has as its heart Bralorne and Pioneer. The Camp includes other mines which are in the Bridge River Valley or are accessible from it.
known in the headwaters of Cadwallader Creek. During the summer of 1948, radio-active substances were discovered in the Dickson Mountains.

**BRALORNE AND PIONEER GOLD MINES**

Bralorne mine is on the east bank of Cadwallader Creek, about a mile and a half above its junction with the Hurley. Underground development is in three sections...the King, Empire and Coronation mines. A 6000 foot crosscut links the amalgamated properties. The main portal is near creek level, at 3200 feet elevation. A secondary entrance is at Bradian (Coronation and Empire workings) about a mile southeast. Pioneer mine is located at 4000 feet, two and one quarter miles up Cadwallader Creek from Bralorne, on the east bank. The mine is developed by three shafts---two from the surface and one internal shaft.

Bralorne and Pioneer mines are located in the vicinity of the eastern contact of the Coast Range batholith. Like most of the mining camps of the world, they are on a break or fault in the earth's crust. This fault runs the length of Cadwallader Creek and extends down the Hurley River. Other lesser fractures related to this fault contain gold-bearing quartz. Erosion has exposed this mineralized rock or vein material.

Both mines are supplied with electricity from Bridge River Power Company's generating station at Bridge River, and in addition develop their own electric power from Cadwallader Creek and the Hurley River. The mines are fully modern; hoisting, haulage and ventilation systems are electrically powered. Compressed air is piped throughout the workings to drive rock
drills and mucking machines.

Mining Methods

The methods of mining at Bralorne and Pioneer include a number of structural and topographical controls which fall within the realm of this geographic study. This discussion is meant to serve only as it is related to the central problem — i.e., how the special conditions of the environment (in this case, geology) affect man's activities.

"Raises" (steep-angled tunnels between levels of a mine) and "adits" (passages open at one end only) are used to open up a mine where the ore body is above the floor of the valley. This makes for lower costs than shaft mining as ventilation and drainage are then accomplished by natural means and the ore can be dropped by a complete gravity system to haulage level for transportation to the mill.

At Bralorne, part of the ore body lies above the creek which is deeply incised at this point. The ore above creek level is mined by a gravity system, but from sub-creek levels the broken ore must be hoisted to the main haulage. All of Pioneer's ore body lies below the valley floor, making shaft mining a necessity. This involves costly hoisting, pumping and ventilation.

Since ore is defined as "a commercially exploitable mineral" such costs can become crucial for continued mine development. When costs become higher than returns, ore ceases to be ore since it can no longer be mined at a profit. The
problems of working veins under conditions given below em-
phasizes this fluctuating relationship which exists between
marginal ore and profitable ore.

Mining techniques must also be adapted to the type, size
and dip of the veins. At Bralorne, the veins are principally
in an intrusion of augite diorite and soda granite. At
Pioneer, greenstones as well as soda granite are the host
rocks. The veins are typically narrow and steeply dipping.

To fit these conditions, the largest tonnage of ore from
Bralorne and Pioneer is produced by what is known as "shrinkage"
stoping, with most of the remaining tonnage coming from "cut
and fill" stoping.

Advance is made following up the steeply dipping veins
by drilling and blasting out a stope (an excavation) within
the ore body. The width of this stope conforms to the width
of the vein, but a minimum stoping width is two and one half
feet since it is impossible for a man to work in a smaller
stope.

Shrinkage stoping is used when the vein is narrow but
not under two and one half feet in width. After each blast,

enough of the broken rock is drawn from the stope to allow
working room for a repeat operation. The space formerly oc-
cupied by the vein becomes filled with broken ore which is
drawn off when the stope is mined out. The system requires
steeply dipping veins as otherwise the ore would not flow by

1 Cairnes, Memoir 213, op.cit., p.79
2 Ibid., p.118
gravity from the stope. Another requirement is that the wall rock be solid enough to withstand ore being drawn from the stope. Otherwise, the walls slough and cave, diluting the ore with waste rock. Sometimes, too, the vein narrows to less than two and one half feet. Then some of the wall-rock must be mined with the vein, consequently reducing values. Unless the grade of the ore is high enough to keep up value per ton when it is diluted by either of these means, the more selective "cut and fill" stoping is used.

The stope is first excavated to the necessary working width and a plank floor is laid. Ore and waste are blasted simultaneously and then removed from the stope by scrapers. Waste is separated from the ore on a sorting belt in the mill.

Shrinkage stoping is obviously a cheaper method of mining than cut and fill. Nevertheless, cut and fill has an advantage in that the ore can be milled as soon as it is mined. Most of the ore mined within a shrinkage stope must remain there until the whole stope is mined out.

Of course, neither method is used if the vein material is of too low a grade or of insufficient quantity to withstand the costs of mining. Under these conditions, the vein is abandoned, at least temporarily. A rise in the price of gold or a decrease in the price of either labour or materials may bring about the reopening of the workings. For this reason underground at Bralorne and Pioneer there are accessible bodies
of marginal ore which, although explored and surveyed, await development.

The lower levels of Pioneer mine are called the "Banana Belt" by the miners. The depth is 3300 feet with the temperature usually an enervating 80° and humidity about 75%. Ventilation is a real problem in spite of an elaborate fan system. Men are reluctant to work where the air is hot and humid. Wages and bonuses must be attractive enough to provide the incentive. Higher costs are therefore involved as Pioneer proceeds to mine at depth.

**Milling**

The ores from both mines are similar. The gold occurs either free or associated with sulphides (arsenopyrite, galena, pyrite, and sphalerite). At Bralorne mill, free gold is removed by mechanical means and shipped in the form of bullion. Sulphides are handled by a flotation process. Flotation merely concentrates the sulphides which must be shipped to the smelter at Tacoma, Washington.

The ratio of concentration is 50:1 — i.e. 50 tons of broken ore yield 1 ton of concentrate. Bralorne is now milling about 500 tons daily. It is necessary, therefore, to ship each day 10 tons of concentrate.

1 Bralorne Mines Ltd., Eighteenth Annual Report, 1948, "Consulting Engineer's Report".

Marginal material 313,000 tons 0.21 oz. au p/t

No quotation is available for Pioneer
Pioneer mill uses a cyanide process which is able to remove all gold. The company ships only bullion which goes to the Royal Mint in Ottawa. The efficiency of the cyanide is thus greater and a projected mill for Bralorne will probably use this process, eliminating the shipment of concentrate.

Lime is required to obtain the correct alkalinity in the cyanide process. About 4 pounds per ton of ore is required. Pioneer mills approximately 200 tons of ore per day and the daily lime requirement is therefore about 800 pounds.

The mill at Bralorne was manned by an average of 25 men in 1948; at Pioneer by 14 men.

The mills are located below the main haulage levels so that ore cars have only to dump their loads upon emerging from the mine portal. Tailings which otherwise would constitute a removal problem, are effectively carried away by the swift waters of Cadwallader Creek. Some mine waste is used as fill, providing a foundation for industrial buildings and some is taken back underground to fill stopes.

Cadwallader Creek is poisoned by the rock dust and cyanide, but pollution does not reach the Bridge River.

At Bralorne a terrace has been artificially created out of the steep stream bank, some 75 feet above Cadwallader Creek level and the mine railway emerges from the main portal

1 Minister of Mines Report, 1948, op.cit., p.40

which opens on this terrace. Various servicing shops (blacksmith, drill steel sharpening, tin) and the lamphouse in which the miners' battery lamps are recharged are at this level, as are the engineering offices. Below and occupying a flat surfaced by mine waste, are the carpenters', machine and electrical shops, the mill buildings, warehouses, assay office, the power plant and the automobile garage. No. 1 Townsite is built on a natural terrace about 100 feet above the creek. It is connected with the two lower levels by a short road and an alternative steep flight of covered steps.

The layout of townsite, mine entrance and mill takes the fullest possible advantage of local topography. The townsite occupies the nearest extensive flat area to the mine workings. The mine entrance is close to the level of Cadwallader Creek, yet sufficient vertical space has been provided so that ore can feed through the mill below, partly by a gravity system.

The V-shaped valley at Pioneer provides little space for either mill or townsite. The ore is hoisted vertically to a shaft house on the sidehill. Conveyor belts pass the ore down to the mill which is on creek level. Close by the mill within a bow formed by Cadwallader Creek is a congestion of industrial buildings around the main adit. The buildings include the assay office, laundry, heating plant, mine timber yard, sawmill, warehouse and offices.
As at Bralorne, corrugated iron is used extensively for roofs and walls of mine buildings. This material is fireproof, durable, easy to transport and it sheds the snow.

The Place of Bralorne and Pioneer in B.C.'s Mining Economy

The average number of men employed at Bralorne during 1948 was 441; at Pioneer, 251. Judged by the number of men employed, Bralorne and Pioneer are relatively small operations. This criterion though, is hardly adequate for estimating the importance of a mine. Even the Sullivan, which is one of the largest and most productive mines in Canada, has only about 2000 employees. Bralorne and Pioneer are contributing a large share of the lode gold production in this province. A comparison with the major producers illustrates their position.

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<th>TABLE VIII - Relative Positions of Major British Columbia Gold Producers</th>
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1 Minister of Mines Report, 1948, op.cit., p.40
2 Loc.cit., To this total should be added a proportion of the employees at Trail who are smelting Sullivan ores.
3 Minister of Mines Report, 1948, op.cit., p.40
4 Ibid., Notes on Metal Mines, (a) p.96, (b) p.123, (c) p.61, (d) p.97, (e) p.86, (f) p.87, (g) p.124
5 Ibid., p.30
It is seen that Bralorne's current position is first as a gold-producer in the province, and Pioneer is fourth. The two mines are well ahead of all other properties in dividends paid. They have together dispensed the amazing total of $24,024,193. The ore at Bralorne and Pioneer grades close to one-half ounce of gold per ton while that of most other producers averages about 0.30 per ton.

British Columbia's total production of lode gold in 1948 was 286,230 ounces, worth $10,018,050 of which Bralorne and Pioneer together produced 99,102 ounces, worth $3,468,570, a little more than one-third. The statistics show the importance of the Bridge River Mining Camp in the lode gold production of British Columbia.

The total reserves at Bralorne according to Mr. Ira B. Joralemon, the consulting engineer, are 1,288,000 tons which carry an average value of 0.447 oz. of gold per ton. This reserve tonnage may be divided by 148,119 --- the current annual tonnage being mined. The dividend is approximately 8, which represents the known life of the mine in years. However, the consulting engineer makes this statement

"There is every reason to expect that ore developed on the six new levels, together with that still to be found on existing levels, will amount to several times the present ore reserves."

1 Ibid., p.21
2 Computed at $35.00 per ounce
Bralorne Mine can thus anticipate about 20 years of continued production.

The estimated available ore at Pioneer is 426,000 tons, having a grade of 0.50 oz. per ton. Dividing the reserves by the current production (52,211 tons in 1948) the dividend shows a known life for the mine of 8 years. As at Bralorne, there is the possibility of new ore discoveries which could prolong the life of the mine.

For nearly a decade lode gold mining has been faced with unfavorable conditions. During and after World War II there have been shortages of labour, equipment and materials. Costs were greatly increased in the post-war period and the price of gold remained pegged at $35.00 per ounce.

To bolster the industry, the Dominion Government passed the Emergency Gold Mining Assistance Act in 1947 which gave cost-aid to gold mines. In the case of Bralorne, in 1948 this aid amounted to $150,092. Pioneer received $193,654.

The devaluation of the Canadian dollar in September, 1949 boosted the price of gold to $38.50 (Canadian) per ounce because all the gold is sold in the United States. The increased price has the effect of adding 10% to the value of gold production. At this rate Bralorne's 1948 production of 75,459 ozs. at $38.50 per oz. would be worth $2,905,171. Pioneer's 1948 production of 23,643 oz. figured at the new rate would be $910,255. Since the 10% gain of Pioneer

2 "What devaluation means to various gold mines", The Northern Miner, 22 September, 1949, p.16.
($82,750) is less than the $193,654 previously paid as cost-aid, the mine will continue to receive cost-aid to make up the difference.

Devaluation places Pioneer Mine on a more self-sufficient basis and removes all subsidy from Bralorne. In addition, the higher price of gold gives exploration in the region a new stimulus.

SOME CHARACTERISTICS OF THE MINING INDUSTRY AND THEIR EFFECT UPON MINING IN THE BRIDGE RIVER REGION

To understand mining as carried on in the Bridge River area it is necessary to examine some characteristics of the industry as a whole.

In the first place, government regulations have an important effect upon the mining industry. Under the Mineral Act, a person holding a free miner's certificate is entitled to stake claims. Of course, claims may also be purchased. When the claims are Crown granted they can be held in perpetuity. As a result of this system of tenure, nearly every foot of ground in the Cadwallader Creek area around Bralorne and Pioneer is held by speculative claim holders.

Most claim holders lack the necessary capital for large scale development work. However, they hold the mineral rights and they may accept or reject proposals from companies wishing to attempt exploration. Mining development in the Bridge River Region, as is the case throughout the province, is hindered in certain instances by this system of mineral rights.
Unpredictability is another important feature of mining.

"New mineral discoveries, new technical advances, or for example in the case of gold, political decisions in which the industry has, perhaps, little or no voice, may interfere drastically with operations."

Because of this unpredictable factor, mining companies in the Bridge River Region, as elsewhere, are backed by the risk capital of the stock market.

Companies usually own a property or prospect consisting of a number of claims. From time to time, depending upon current capital, development work is carried on. Recently, Wayside, Pinebrayle, Golden Ledge and others have been active. By next year with the exhaustion of funds, this or that property may become idle, but perhaps stock promotion will have resulted in new "prospects under development". The two producing companies are interested in perpetuating their activities. Therefore, part of their surplus is assigned to exploration work which may bring new mines into production. Recently, Bralorne has been carrying out exploration work at the Elizabeth Group in the Shulaps Mountains.

Many diamond drill camps represent the savings of individuals and the profits of industries in other parts of Canada and the world. In the Bridge River Region, the search for minerals as well as the extraction is part of the prosperity. Employment is provided for the miner, truck-driver

1 British Columbia, Dept. of Lands and Forests, Second Resources Conference, Mining Outline, February 17 and 18, 1949, Victoria, B.C. (Preliminary report issued to conference members).
2 Minister of Mines Report, 1948, op.cit. pp. 106, 97, 105 respectively.
and flunky. These people are supported by surplus savings and profits created both in the Bridge River Region and elsewhere. During 1946, for instance, mining companies in the region (exclusive of Bralorne and Pioneer) dispensed a payroll of $258,618.

Unfortunately, prospecting operations are not always a sincere effort to discover a mine. In some cases it is a gullible public which is being mined. In recent times, such practices have been retarded by the Security Commission which gives protection against misrepresentation by mining companies and so helps to safeguard the stockholders' dollars.

Most prospecting ventures have been sustained by the expectation of a financial return which never matured. Here and there throughout the country, one finds the abandoned cabins, workings and machinery which are the evidence of millions of dollars expended on fruitless human effort. Bute, Pilot, Jewel, Lucky Strike and the Standard are examples of these ephemeral camps.

Not all this effort has been wasted. Some mines now closed, notably the Minto, have been briefly productive. Their history emphasizes the "one crop" nature of the mining industry. Once the crop is harvested, there is nothing left but to close the mine.

Nevertheless, exhaustion is not always proven to the satisfaction of all. Occasionally, a new company will attempt to reopen a mine. Wayside, for instance, was reopened

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1 Figure supplied by Regional Development Division of Dept. of Trade and Industry, Victoria, B.C.
in 1946 after having been closed since 1937.

The Manitou, at the junction of Tyaughton and Mud Creeks, produced a small quantity of mercury during World War II. The property might again become operative if the price of mercury were to increase. Also during the war, the nearby Tungsten Queen was active. A few shipments were made of the high grade tungsten ore. The ore may not be exhausted, and the mine might be reopened if conditions were favorable.

Bralorne and Pioneer, the only productive mines in the Bridge River Region, began like their many unsuccessful neighbours as prospects. Instead of their leads petering out, however, they continued at depth and someone had found a gold mine. The attempt to duplicate such success is the motivation for prospecting in the region.

**NON-PRODUCING MINES**

The discussion which follows deals with some of the more important non-producing mines of the Bridge River Region. All are defunct except Wayside and B.R.X. where, currently, exploration work is being carried on. Small lode-mining camps have only a minor effect on the appearance of the landscape because most of the human activity is below the surface of the ground.

**Minto Mine** (gold)

Minto mine is on the Bridge River highway, a mile east of Gun Creek. The principal adits are just above the level of Bridge River. The mine has been closed since 1937, but the mill building remains standing beside the road. There is
also a dilapidated bunkhouse on the steep sidehill and a house on the river flat below. When the mine operated, nearby "Minto City" served as the townsite.

The mineral deposits are associated with porphyritic intrusive rocks. The veins carry abundant mixed sulphides in which the gold occurs.

In a brief productive period between 1934 and 1937, Minto produced $625,000 in gold. Most of the developed ore has been mined out, but it is the opinion of a Dominion Government geologist, C.E. Cairnes, that the possibilities of the property have not been exhausted. Nevertheless, the mine has now been closed for over ten years.

Congress Mine (gold and antimony)

Congress mine is less than a half mile west of Gun Creek on the Bridge River highway. The mine is on the floor of the Bridge River Valley. There is no mill on the property, but for testing purposes, the nearby concentrator of Wayside has been used. Three shiplap buildings in good condition are on the north side of the road. They consist of the usual bunkhouse, cookhouse, storage sheds and office. Electric power is supplied to the mine from the Bridge River Transmission Lines.

The minerals of this mine are gold, and antimony which is here found in stibnite. As at Minto, the deposits are

2 Ibid., p.15
3 Ibid., p.16
associated with porphyritic intrusive rocks, in which the veins carry abundant sulphides. The deposits appear to be irregular and the mine has never produced either mineral.

In 1937 when high prices were being offered for antimony, arrangements were made to ship concentrates, but these plans did not mature. The latest attempts to work the mine were in 1946 and 1947. All operations have now ceased, but mining equipment remains on the property.

Wayside Mine (gold)

Wayside mine is about two miles west of Congress on the Bridge River highway. Bridge River flows beside the property. A 100-150 ton mill and a few recently renovated buildings are adjacent to the road. The workings are into the steep slope of the ridge which separates the lower end of Gun Lake from the Bridge River. During a brief productive period (1935 and 1936) the Company supplied its own mill power from two hydro-electric plants on Fergusson Creek.

A stock of Bralorne augite diorite extends across the Bridge River and the mine workings lie within this body.

In spite of encouraging mineralization, the mine discontinued operations in 1937 due to unfavourable financial conditions. The mine is not producing at present, but diamond drilling and other development work is proceeding on a small scale.

1 Cairnes, Memoir 213, op.cit., p.64
2 Cairnes, Memoir 213, op.cit., p.133
3 Cairnes, Paper 43-15, op.cit., p.13
One of the hydro-electric plants is working again to supply the necessary power.

**B.R.X. Mine (gold)**

The camp at B.R.X. is situated three and one half miles north of Bralorne at an elevation of approximately 3800 feet. The site is on the Bridge River highway, close to the divide between the Hurley River and Fergusson Creek. Some half a dozen frame buildings as well as a large log house have been constructed. B.R.X. owns a 150-ton mill at the Arizona workings.

The holdings of the company include four widely-separated mines, Golden Gate, Arizona, Gloria Kitty and the California. At present the California, a short distance south of the camp, is the scene of activity. The mine is developed by an inclined shaft.

The formations at the California are similar to those at Bralorne and Pioneer. They are shown on a geological map as "...indistinguishable Pioneer greenstone and Bralorne intrusives". Values are below commercial grade.

The company, B.R.X. Consolidated Mines, has been able to operate continuously over a long period because of strong financial backing by French interests. In spite of the failure to develop a producing mine, systematic exploration has continued at each property owned by the company. During 1947, an average of 14 men were employed.

1 Canada, Dept. of Mines and Resources, Gun Lake Area, Map 430A, 1938.
2 Minister of Mines Report, B.C., 1947, *op.cit.*, p.135
P.E. Mine (gold)

The chief workings of Pacific Eastern Gold Mines are less than two miles by road above Pioneer on Cadwallader Creek. "Pioneer Extension" is the name given to the claims. A single large building serves as both bunkhouse and cookhouse. A log house and one or two storage buildings are on the property. Operating power is supplied by the B.C. Electric Transmission Lines which terminate at P.E.

Some of the vein matter is analogous to the rich, gold-bearing veins of Bralorne and Pioneer. In 1937 Cairnes wrote

"...The recent explorations beneath the valley of Cadwallader Creek have been successful in discovering not only an apparent continuation of the greenstone body at Pioneer Mine but, also, intrusions of Bralorne diorite and Bralorne soda granite."

The location of the workings in relation to Cadwallader Creek means that water must be constantly pumped out of the mine. An additional problem is methane gas, which caused a disastrous explosion in 1947. The mine is now abandoned.

PLACER MINING

Intermittent placer mining has been carried on in the Bridge River Region since 1858. The miners of the 19th and early 20th centuries largely stripped from the stream beds the alluvial gold which was the accumulation of ages. Today,

1 Cairnes, Memoir 213, op.cit., p.110
2 Trueman, Allan Stanley, Placer Gold Mining in Northern B.C., 1860-1880, An M.A. History Thesis, U.B.C. This work has been the source for methods of placer mining described on the following pages.
profitable recovery is seldom made, although occasionally by good luck the placer miner is able to make fair wages.

The Hurley River is auriferous as far as its confluence with Cadwallader Creek. No gold is found on Cadwallader Creek much above Pioneer. The lower reaches of Gun, Tyaughton and Marshall Creeks also carry small amounts of gold. These three creeks are occasionally worked by prospectors, but there has been a more sustained interest in the Hurley River and Cadwallader Creek. Mr. Wm. Haylmore, valiant old-timer of the district, continues to work his placer leases at the mouth of the Hurley River. From time to time, one or two other miners will try their luck upstream, but usually not for long.

Although gold production from placer mining is today almost negligible, historically it has been most important. The methods practiced in the Bridge River Region, as elsewhere, depended upon the nature of the ground as well as the aim of the miner.

For reconnaissance prospecting, the pioneer miners such as Gallagher and Cadwallader would merely pan the loose dirt in order to ascertain the gold content. Panning as a method of gold recovery is inefficient, and once the presence of gold in paying quantities is established the miner usually turns to less wasteful methods.

The rocker was used by those who wished quick returns from working the surface sand or gravel. In the bottom of the cradle-like box are nailed cleats or riffles to arrest
the gold as it is washed along with sand and gravel through the length of the box. The whole is mounted on rockers which allow a motion assisting the separation.

Sluicing was undertaken by miners who believed the field to be worth the extra time and expense of building sluice-boxes and digging deeply into the banks and beds of the creeks. The boxes, placed end to end, form a long trough down which the dirt is carried by a stream of water. The riffles perform the same function as in the rocker.

In the early days, rockers and sluice-boxes were constructed by whip-sawing nearby trees for the necessary boards. Rocking and sluicing require a minimum of capital, but a maximum of labour—mostly shovelling. The water needed for both methods is readily available in the rushing streams.

A still more ambitious project than sluicing is wing-damming which seems to have been a favorite placer method of the Chinese. A number of men cooperate in constructing a log dam usually half way out into the creek. Attached to its end another dam is constructed downstream. If the fall of the creek be rapid enough, the streambed within the wing would be free of water and accessible for mining. If not, another dam has to be constructed from the downstream end of the second dam to the bank, thus forming an enclosure to be pumped dry.

The climax technique in placer methods is hydraulicking. Usually the purpose is to work the side banks of the streams
after the bed has been mined out. As a rule, hydraulicking involves considerable capital expenditure. A head of water is obtained from an elevated flume or ditch and a hose from the flume directs a forceful stream of water against the bank. The sluice-boxes below receive the loose sand and gravel which is washed down. In the early days of this century, extensive hydraulicking operations were conducted at Marshall Creek.

Placer mining today is largely confined to sluicing, and as was pointed out, the scene is chiefly the Hurley River and Cadwallader Creek. Cairnes indicates the special difficulties of the area.

"...Work has been handicapped by an abundance of large boulders; by, in places, the depth to bedrock; by seasonal variation in stream levels; and locally by the cemented character of the auriferous gravels."

It was evidently the "cemented character" of the gravels which caused the suspension of operations on placer leases below Bralorne in 1932. On this location, an estimated 350,000 yards of gravel had an average value of one dollar per yard in gold. Placer mining in the Bridge River Region is likely to stay in a defunct state as long as the price of gold remains low and prosperity prevails in other industries. Depressed economic conditions can readily make small wages appear attractive. District placer might be revived on a small scale if the incentive were thus renewed. Hydraulic placer methods on the Hurley River and Cadwallader Creek would likely

1 Cairnes, Memoir 213, *op.cit.*, p.46
2 Ibid., p.47
have the best chances for success.

**NON-METALLIFEROUS DEPOSITS**

Non-metalliferous deposits in the Bridge River Region are asbestos, talc, magnesite, pumice and limestone. There are possible commercial uses for all but the asbestos of which the known deposits are probably too small to be worth considering as economically exploitable.

Talc is associated with the altered serpentine rock of the upper valley of Cadwallader Creek. The shaft at P.E. mine I passes through 100 feet of highly talcose rock which is slightly impure. At nearby Anderson Lake, talc has been mined intermittently from 1917 to 1935 and there are other more accessible deposits than those of Cadwallader Creek area. The chief use of talc in British Columbia has been for dusting asphalt roofing materials, but at present there is no production in the province.

Magnesite, like talc, has resulted from altered serpentine rock. In the vicinity of Liza Lake, there are outcrops of pure magnesite over 60 feet in diameter. Magnesium, carbon dioxide, furnace linings and fire-proof structural materials are manufactured from magnesite. Small tonnages have been quarried near Kimberley, but in recent years there has been no production in British Columbia. Other more accessible deposits are likely to be utilized before those of Liza Lake area.

Widespread deposits of volcanic ash or pumice have been

1 Cairnes, Memoir 213, *op.cit.*, p.71
2 McCann, Memoir 130, *op.cit.*, p.75
described before (chiefly under "Geology"). At Vancouver, firms are using pumice imported from Washington for the manufacture of concrete blocks and wallboard. The pumice costs more than $6.00 per cubic yard laid down in Vancouver. Its weight is about 1,250 pounds per cubic yard. Dr. H. Sargent of the Department of Mines, Victoria, believes that it might be possible for Bridge River pumice to compete with the Washington product, under these conditions.

Prior to 1931, Pioneer operated a small limestone quarry two miles north of the mine, near the base of Mount Fergusson. Lime is required in the cyanide process to attain the correct alkalinity. Improved transportation made it cheaper to import the lime from Blubber Bay on the coast.

Limestone is associated with the rocks of the Fergusson and Noel-Hurley formation. It is not abundant in the Cadwallader Creek area, but there are ample supplies for the limited requirements of milling. Bralorne's projected cyanide plant may bring about a renewed use of local resources.

In British Columbia, lime derived from limestone is used mainly for agricultural purposes and the manufacture of wood pulp and cement. Many deposits of limestone are located close to rail and to centers of population, therefore there is little possibility that the Bridge River product could be exported to other parts of the province.

1 Sargent, H., letter to writer, 12 May, 1949
The position of the Bridge River Mining Camp in relation to transportation routes and sources of supply is an important consideration in any geographical study of mining in the region. The costs of developing and operating the mines are intimately related to transportation charges.

The city of Vancouver, 200 miles away from the Camp, is the largest source of supplies. The main movement of goods is over the P.G.E. Railway with its Vancouver to Squamish water link. There is an additional fifty miles of trucking over steep mountain grades. The isolated position of the Camp makes the total transportation charges heavy.

There is a relatively small outgoing movement of freight. Bralorne ships about 10 tons of concentrate daily to Tacoma. Pioneer's position is ideal because its product is all reduced to gold brick size and transported by the regular mail trucks.

The returns from mine production must cover not only the direct cost of transportation of materials but also the indirect ones which stem from maintaining a supply of labour in an isolated area. The cost of living is high because of shipping charges and wages must be commensurate with these costs.

Any major change reducing freight rates might have far-reaching influences upon mining activity. (Possibilities of this nature are discussed in the chapter on "Transportation"). In some cases, marginal ores would become mineable ores and properties now dormant might come to life.
CHAPTER X

HYDRO-ELECTRIC POWER

BRIDGE RIVER

Two of the natural prerequisites for hydro-electric power development—abundant precipitation and high relief—are well represented in the Bridge River Region. The power needs of the developing mines were partly met by harnessing the tumbling creeks. The requirements of a far-distant community, however, made the Bridge River the scene of a major power project. Vancouver's growth necessitated new sources of energy for expanding industrial and domestic needs.

The choice of Bridge River is a logical one since this river can provide a large ultimate capacity, but development may proceed economically, one stage at a time. In addition, the run-off of Bridge River is complementary to Lower Mainland streams from which power was already developed. Moreover, the power-site is within one hundred and thirty miles of Vancouver, a practical transmission distance.

What are the geographical conditions which made Bridge River particularly adaptable to hydro-electric power development? In the first place, climatic conditions provide an adequate supply of water. Twenty-four inches is the annual precipitation at Bralorne where the elevation is 3500 feet. Higher on the slopes and particularly in the western part of

* See Figs. 27-35, see also Fig. 4, 11, 19
the region, precipitation is much heavier.

A short distance above the canyons, the Bridge River approaches within less than three miles of Seton Lake. In this vicinity, the difference in elevation between lake and river is 1200 feet, the lake being 777 feet and the river 2000 feet. Intervening, is precipitous Mission Mountain. Thus there is available by tunnelling through the mountain a remarkably high head of water. The rate of flow of the Bridge River in comparison to other power rivers of Canada is fractional, but because of the high head, a great amount of power can be produced from a small amount of water.

The minimum flow of the Bridge River is 164 cubic feet per second, a flow which has allowed the operation of the first two generating units without water storage being required. The character of the run-off made storage a necessity for additional power development. The high ratio of maximum to minimum flow is a result of the terrain conditions emphasized in the "Hydrography" chapter. To bring about a maximum utilization of the resource, the mean flow of 3,620 cubic feet per second must be available at all times. This may be accomplished through water storage which allows a uniform production of electric power.

The Bridge River Valley is emminently suitable for the required water storage. The flanking mountain walls of the

2 Statistics from Dominion Water and Power Bureau, Vancouver, B.C.
narrow valley allow easy damming of the river in a number of places. Inexpensive low level dams can be used because the grade of the valley is gentle.

The project will do a relatively small amount of damage to other resources and industries. Flooding for water storage will result in a minimum loss of agricultural land because this resource is meagre. The commercial forests are largely on the slopes above the flood level. There is no important salmon run which will be hurt by the project. The lower Bridge River is not used for irrigation.

The extensive glaciers and snow-fields from which the Bridge River heads are responsible for maintaining a high rate of flow during the summer and early autumn months. At this period, the run-off is at a minimum from other water-sheds supplying Vancouver's power needs. Power from Bridge River is able to fill this gap nicely. Run-off figures for the Allouette River from which Vancouver draws part of its supply illustrates the complementary flow of Bridge River.

<table>
<thead>
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<th>TABLE IX</th>
<th>Comparative Run-Off on Allouette and Bridge Rivers</th>
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<tr>
<td></td>
<td>Alouette</td>
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<tr>
<td>Long term mean flow: Annual (cu.ft.per sec.)</td>
<td>784</td>
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<tr>
<td>: August</td>
<td>171</td>
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<td>: Sept.</td>
<td>400</td>
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<td>: October</td>
<td>912</td>
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August and September are well below average on the Allouette, but well above on the Bridge.

1 Dominion Water and Power Bureau, op.cit.
The potentialities of Bridge River for hydro-electric power development were first appreciated in 1910 by Geoffrey M. Downton, a land surveyor. From the top of Mission Mountain, he saw that the difference between the levels of Seton Lake and Bridge River spelled "power". Three years later, the Dominion Water and Power Bureau began a systematic study of the run-off of Bridge River. Authentic records gathered gave a basis for development by a private power concern, the B.C. Electric Company. Plans were thus begun over thirty years ago for the long-term development of Bridge River.

In 1922, preparatory work was begun, and by 1931 the 13,200 foot tunnel through Mission Mountain was completed. Depressed economic conditions, with a falling off in power demands, brought a temporary suspension to the project. The only development during the remainder of the decade was a small pilot unit of 5000 h.p. It was a temporary generating station installed in 1934 to provide power for mines and towns in the Bridge River district. The expanding Pioneer and Bralorne were the largest consumers. The power development is administered by the Bridge River Power Company, a subsidiary of the B.C. Electric Company.

Resumption of the main project became mandatory due to increased power demands from the Lower Mainland by the end of World War II. At present, the initial stage in the project is almost complete. Two 62,000 h.p. generating units

1 "Bridge River area has own power", Bridge River Hydro-Electric Supplement, The Vancouver Sun, Vancouver, B.C., Oct. 23, 1948, p.41.
have been installed and a third will be completed by the end of 1949. Ultimate plans call for a total of ten such units.

To achieve the present functioning development, it was necessary to build a diversion dam across the narrow, rocky gorge at a point two miles below the tunnel intake. This dam serves to pond the river for week-to-week regulation of the flow. The water thus impounded floods 1300 acres and extends back up the valley beyond Cedar Creek. Two miles of road had to be rerouted at a higher level and an abandoned farm on the south bank was inundated.

Local materials used in construction of the Diversion Dam include talus from the rock slides, gravels from the river bars and clay, mostly from Mowson Lake near Minto. The clay forms the core of the dam which is 60 feet high and 1000 feet long. Flood-water discharge is by a concrete spillway 900 feet long and 50 feet wide cut out of the solid rock. A spillway weir takes care of the normal overflow.

The Diversion Dam interferes with a small run of Spring salmon to Tyaughton Creek. There are no fish ladders on the dam but construction is being considered.

1 B.C. Electric Public Information Department, B.C. Electric's Bridge River Hydro, Vancouver, B.C., 1948, p.4
2 Ibid., p.4
3 Ingledow, Thomas, Bridge River Hydro-Electric Supplement, The Vancouver Sun, Vancouver, B.C., 23 October, 1948, p.58.
4 Whitmore, A.J., Chief Supervisor of Fisheries, letter to the writer, 17 Feb., 1949
During spring flooding, the river often carries along branches and logs torn from the banks. The two control gates for the tunnel intake are housed within a cement grill and protected by screens to prevent this debris from being carried through the tunnel and damaging the turbines.

The tunnel, which is 14 feet in diameter, is lined with concrete to minimize the accumulation of silt borne by the glacier-fed waters of the Bridge. On the Seton Lake side of the mountain, the tunnel branches into a "Y" which is designed to distribute water to the first five generating units. The water falls 1100 vertical feet (almost four times the height of Niagara) through the penstocks and down the 41° slope (sic) of Mission Mountain to the generating plant on the shore of Seton Lake.

The transmission line, carried on 704 towers, follows the P.G.E. Railway as far as Squamish and continues to North Vancouver (via Howe Sound and Capilano Creek), crossing to Vancouver at the Second Narrows. Bridge River transmission lines enter the Metropolitan Power Ring at the Horns Payne Substation in Burnaby. The carrying capacity of these transmission lines is 200,000 kw. No power is distributed along the line because of the high voltage.

Storage for the first three generating units will be

1 B.C. Electric's Bridge River Hydro, op. cit., p.6

The figure 41° is probably incorrect. It is likely to be 41½° instead.
2 Ingledow, Bridge River Supplement, loc. cit., p
provided by a dam at LaJoie Falls. Engineers have chosen the site within a stretch of the river which is easy to block. In the narrow valley they have taken advantage of a transverse ridge by extending from it a rock and concrete dam across the river channel. The rock for construction is being blasted from bluffs opposite the mouth of Hurley River. The water is detoured through the ridge by two tunnels 14 feet in diameter. A cofferdam houses the control gates for the subterranean tunnels. The initial flooding by the LaJoie Dam will extend to where Bridge River crosses the 2380 foot contour, creating a reservoir covering 6200 acres. A small amount of merchantable timber and part of a trapline will be submerged by this flooding.

Three hundred men are living in a camp at the LaJoie Falls damsite. A few other B.C. Electric employees stay at Gold Bridge and at Minto.

Final hydro-electric power developments on the Bridge River are still in the blue-print stage. Ultimately, the LaJoie Falls Dam will be raised to over 240 feet and will probably flood back as far as the 2460 foot contour. It will then provide storage for five generating units. It is expected also that a second storage dam will eventually be constructed about a mile and a half below the present Diversion Dam. The stored water will likely flood out most of the valley bottom traversed by the Bridge River highway. Compensation will be made to those farmers whose lands will

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1 B.C. Electric's Bridge River Hydro, op.cit., p.4
be flooded. Gun Lake, too, has been considered for possible water storage. Concurrently with the building of the second storage dam and the installation of the sixth generating unit, a second tunnel will be drilled through Mission Mountain.

It has been estimated that the full development from Bridge River of 620,000 h.p. will be capable of supplying a metropolitan population of 1,300,000. The growth of the project will conform to consumer demands. With the installation of the second generating unit, the company has already begun exporting Bridge River power to the Pacific North West.

The three 62,000 h.p. generating units which are the first stage of the project will increase the capacity of hydro-electric power available for the needs of the Lower Mainland by about seventy-five percent.

"In terms of kilowatts, the present hydro-electric plants on the Lower Mainland system are capable of producing 175,000 kw. The addition of this initial installation at Bridge River will add 135,000 kw. to that total."

1 Ingledow, Bridge River Supplement, loc.cit.
2 Campbell, E., "Bridge River", B.C. Digest, March, 1947, p.75. Also: "Guaranteeing Vancouver's Industrial Future", Bridge River Supplement, op.cit., p.31 ".... 600,000 h.p.--enough to supply an industrial city of three times Vancouver's present size."
3 The Vancouver Sun, May 5, 1949
4 Ingledow, Bridge River Supplement, loc.cit.
5 Loc. cit.
The aggregate total of 310,000 kw. produced by Lower Mainland plants and Bridge River will amply provide for the anticipated peak load for 1950 of 290,000 kw.

With the completion of the first three units, Bridge River will be the largest single plant in the province, Its ultimate capacity of 620,000 h.p. makes the plant one of the largest developments in Canada although dwarfed by Shipshaw on the Saguenay River which has a rated capacity of 1,500,000 h.p.

The complete installation will have an actual dollar value far in excess of the gold produced by Bralorne and Pioneer. A rough estimate of the annual dollar value of Bridge River power is $6,300,000. By contrast, the two mines in 1948 produced less than $3,500,000 in gold. The electric power, unlike the gold, will provide a sustained yield in perpetuity.

The development work has brought a boom to the Bridge River district. The Blackwater Timber Company has expanded its production. The Neal Evans Transportation Company has been especially busy. Stores, hotels, cafes and taxis are doing much more business. A few people who were unemployed have been absorbed by the project.

When construction work is complete, the hydro-electric power developments of the Bridge River will have little

1 Ingledow, Loc. cit.
3 B.C. Electric Company official, interview with the writer, March, 1949
effect on settlement within the region. A handful of men will be able to carry on maintenance work. However, the great turbines will provide the basis for population growth in the Lower Mainland.

**SMALL SCALE DEVELOPMENT**

Pioneer mine was considerably handicapped by lack of power during the early stages of its development. A 195 h.p. turbine was driven by water flumed from Cadwallader Creek when David Sloan took over the mine in 1922.

The problem at this time was that during the cold weather the flume would freeze (more than 14 degrees of frost gave trouble) and there would not be enough power to pump out the mine. After three years of operation under these conditions, the company found it best to close for three or four months during the winter.

By 1927, Pioneer had constructed an all-weather pipeline thirty-six inches in diameter, of locally manufactured spruce staves. The intake is at a diversion dam on the Cadwallader at P.E. 380 h.p. can be developed by this unit at Pioneer mine. At present, it serves as "stand-by" power in case of emergency.

In 1930, a second installation was begun on the Hurley River because Cadwallader Creek was not large enough to supply the growing power needs of the mine, especially during mid-winter when the run-off was small. A storage dam on

---

1 McCann, Memoir 130, Geological Survey, *op.cit.*, p.92
3 Rose, H.A., Mine Superintendent, Pioneer Mine, letter to the writer, 4 Feb., 1949
Cadwallader Creek was considered impractical as a lake created by the dam would have been rapidly filled by sediments and boulders.

On the Hurley River, Pioneer was able to obtain a high head of water by taking advantage of local topography. The diversion dam was placed at the end of the U-valley, and two generating plants some distance below where the river is deeply incised within a post-glacial canyon.

At the intake, a heating plant sends a jet of steam into the water to prevent freezing during cold weather. A pipeline on either side of the valley carries the water to the generating plants. The upper one is 6600 feet below the diversion dam on the point of land enclosed by the junction of Hurley River and Cadwallader Creek. The lower plant is 1800 feet farther downstream on the opposite side of the Hurley River.

The aggregate capacity of both plants is 1800 h.p. There is daily inspection but the plants are operated by remote control from Pioneer. Extensive flood damage occurred at Pioneer's hydro-electric installations in 1948.

Pioneer is unable to develop enough power for its requirements during low water periods. At these times, the company purchases up to 1000 h.p. from the Bridge River Power Company for the mine. An additional 300 h.p. is bought.

2 Loc. cit.
3 Rose, correspondence, op. cit.
Bralorne's development of hydro-electric power is on a smaller scale than is that of Pioneer. Since prior water rights on the Hurley River had been obtained by Pioneer, it was cheaper for Bralorne to buy most of its supply from the Bridge River Power Company than to develop its own power extensively.

Bralorne's only production comes from Cadwallader Creek. A mile and a half above No. 1 Townsite, a diversion dam has been constructed. The pipeline falls 465 feet to the power plant near creek level at Bralorne.

The capacity of Bralorne's plant is about 1100 h.p. but during low water (usually in winter) the figure may drop as much as ninety percent. When production is at the maximum from the local plant, Bralorne draws more than 2500 h.p. from the Bridge River Power Company. This power is synchronized with that produced from Cadwallader Creek. The company supplies all the domestic load for Bralorne by a separate distribution system.

It is unlikely that either Pioneer or Bralorne will develop further their own hydro-electric power supply. The nearby large-scale development at Bridge River is the logical source of cheap power for the mines.

1 Loc. cit.
2 Bremner, J.W., Bralorne, B.C., letter to the writer, 22 January, 1949
3 Loc. cit.
Consideration on the part of the mining companies might be given to substituting electricity for wood as a source of domestic and industrial heat. A great amount of labour and expense goes into supplying Bralorne and Pioneer with fuel. Electric furnaces would be more convenient and they might be cheap to operate.

Other small mines have taken advantage of hydro-electric power possibilities. Butte developed electric power from Copp Creek, a tributary of Cadwallader. The Pilot Mine on Gun Lake utilized Walker Creek. Two plants were installed on Fergusson Creek by Wayside mine. All these installations are now defunct except for the plant at the mouth of Fergusson Creek. It develops 600 h.p. from a 650 foot head of water.

Water remains a potential source of electric power on hundreds of creeks of the region, ready to give assistance to mining development where it would be difficult and costly to take power lines.
Fig. 27: Diversion Dam, Bridge River.

Fig. 28: Construction of spillway at Diversion Dam, Bridge River.
Fig. 29:
LaJoie Falls Dam, Bridge River,
showing part of construction camp.

Fig. 30:
Coffer Dam being constructed at LaJoie Falls,
Bridge River
Fig. 31:
Penstocks on slope of Mission Mountain. Town of Bridge River in foreground.

Fig. 32:
Generating plant under construction at Seton Lake.

Fig. 33:
Power plant owned by Pioneer mine. Plant is located at junction of Cadwallader Creek and the Hurley River.
PROFILE OF MISSION MOUNTAIN SHOWING HYDRO-ELECTRIC POWER DEVELOPMENT

Figure 9 p 22 of Hydro-Electric Power & Hydro-Electric Power Development by T. INGLEIDOW

Figure 34
Approximately 100 men are employed in the mills and logging camps of the Bridge River Region. The difficulties of terrain, the small size of timber and the patchy type of stands allow only small-scale methods of harvesting. The isolated position of the region works for and against most local industry by, on the one hand, discouraging competition from outside but, on the other, discouraging export beyond the confines of the region. However, high value Ponderosa pine can withstand the cost of shipment elsewhere.

LOCAL MARKET

The requirements of Bralorne and Pioneer provide most of the market for wood products. There is a multiplicity of uses for wood at the mines. Timbering is required underground to strengthen walls and roofs of excavations. Shafts must be provided with runways for hoisting equipment. Manways and ore shoots are usually timbered. At the surface, lumber is needed for constructing the mill, other industrial buildings and houses. Staves are required for the pipelines.

Demands for wood products have been, of course, greater

* See Figs. 36-38, also Figs. 5, 24.

1 Parlow, A.E., District Forester, Kamloops, letter to the writer, 1 March, 1949.
during initial development at the two mines. Most surface construction has been accomplished, but there remains a steady demand for lagging, stulls, heavy mine timbers and small amounts of lumber. In addition, wood is used for heating because of the high cost of transporting other fuels.

Second growth fir about 15 feet long and 10 inches in diameter at the small end is preferred for stulls. They are used for timbering where there are heavy strains. Lagging is saplings of Lodgepole pine, fir and spruce, measuring 14 feet in length and 3 inches in diameter on the small end. Lagging cannot stand great strains and it is most frequently used for roofing tunnels.

LOGGING OPERATIONS AND SAWMILLS

The logging is done chiefly on the north side of Bridge River in the belt of commercial timber. At Mowson Lake is the Blackwater Timber Company's Tyax Mill, the largest in the district. Ponderosa pine and some fir are cut on the bench and hillsides below Tyaughton Lake. The trees are felled by power saws, handled by donkey-engines and tractors and moved to the mill by trucks.

The little lake serves to pond logs for convenience of movement to the mill. Steam, produced from waste wood, powers the machinery. The mill is manned by 25 to 30 men.

Ponderosa pine lumber is trucked to Shalalth for shipment via the P.G.E. Railway with the eventual destination being the United States or the United Kingdom. In addition to mine timbers and lumber, the mill supplies Bralorne and Pioneer
with about 1,000 cords annually of slab fuel wood for the heating plants.

When Mowson Lake freezes in winter, it becomes impractical to run the Tyax Mill. The company therefore shifts the key employees to Mill C on the Bridge River highway about three miles below Tyaughton Creek. There, fir is logged from several locations on Marshall Ridge. Horses are used for hauling logs on the steep slopes under snow conditions. The mill is diesel-powered because of the high cost of installing a transformer, even though the location is on the Bridge River transmission line.

Two million board feet is the normal annual cut by the Blackwater Timber Company's mills. Since dam construction began, the production has been much expanded to meet the requirements of the B.C. Electric Company.

Bralorne Mines owns a small mill on the south side of Bridge River near the mouth of Tommy Creek. Ten men are in the camp. The trees are logged on the alluvial fan built by the creek. Power saws and tractors are used and the mill is driven by two diesel engines. A ditch supplies water for washing logs, cooling machinery and fire protection.

Most of the fir, used for mine timbers, has been removed and spruce is now being milled almost exclusively. This wood lacks the strength of fir and it is used only for lumber. Some firewood is cut also.

The Tommy Creek Mill is to be moved soon to Bralorne where it will be electrically powered. The timber is largely
exhausted around the present site, but there are stands on the opposite side of the creek which are allocated for future cutting. The main source of supply will be above the LaJoie Falls storage dam on the north side of Bridge River. The company desires to remove its timber from this location before flooding begins.

At the Bradian entrance to Bralorne Mine there is a framing shed where mine timbers are trimmed for size before being taken underground.

Bralorne Mines purchases lagging, stulls and cordwood from a private timber contractor. The company annually requires approximately 5000 stulls, 15,000 lagging and 1200 cords of wood. The contractor employs seven or eight men. His cutting areas are the rock bench above Bradian, the slopes of B.R. Mountain across the creek from No. 2 Townsite at Bralorne and the Bridge River Valley around Little Gun Lake. The men in his employ use Swedish saws rather than power equipment.

Pioneer Mines formerly logged above the power dam on the Hurley River. This area is largely logged-off and present operations are in timber leases on the north side of Bridge River south of Little Gun Lake. The logs are trucked some 15 miles to Pioneer where they are milled. Electrically powered machinery at the mine timber yard is used to prepare lagging and stulls as at the Bradian framing shed. The mine uses annually approximately 3000 stulls and 6000 lagging. A small mill produces fir and spruce lumber.
Lodgepole pine is the main source of fuelwood in the region, but other trees (mainly fir, spruce and poplar) are used as well. Many residents of Bralorne and Pioneer cut their own domestic supply. The cutting area for Bralorne people is the extensive flats of the rock bench above the town. At Pioneer, the steep hillsides of Cadwallader Creek's west bank provide local fuelwood. A winter's wood supply is obtained by felling trees in spring or summer with axes and Swedish saws. The logs are then cut into three foot lengths, split in half and piled for seasoning. In the autumn, the wood is hauled into town by trucks. The householder usually pays to have a buzz-saw cut the wood into stove lengths.

PROBLEMS AND FUTURE OF THE FOREST INDUSTRY

It is estimated that the reserves around the Tyax Mill are approximately 40 million board feet. Even at the present accelerated rate of cutting, there is thought to be a ten year supply. The greatest reserves are in Ponderosa pine and it might become necessary, eventually, to use this wood underground.

The techniques of logging practiced are accidentally silviculturally, sound. The methods are selective and numerous seed trees are left standing. Tractors and horses disturb the soil sufficiently to provide a good reproductive bed. Growth of younger trees is accelerated when the older trees are removed. In some locations the company has already

(see page 107)
begun re-logging timber which was immature when the area was first cut over.

In the course of time, logging costs will inevitably become higher. With the exhaustion of the larger stands of timber around the Tyax Mill and in the Bridge River Valley near Little Gun Lake, operators will be forced to log small, scattered patches.

Fuelwood around Bralorne and Pioneer is far from being exhausted. The supply will probably meet the demands of the settlements for a good many years to come. Sawdust which also could be used for fuel is being wasted at present.

There is a real danger of forest fires in the Bridge River Region. Denudation of the forest cover would mean not only that a hundred men would lose employment, but also that the mines would be forced to pay high transportation costs on timbers, lumber and fuel. In addition, natural water storage would be decreased and the habitat for valuable animals would be ruined. For some years now, the one forest fire look-out station of the Bridge River Valley has been closed. There is one forest warden in the region.

Forest industry is in large measure subsidiary to mining, which is purely extractive. The termination of mining development will likely end, in large measure, the exploitation of the forest resource.

1 Estimate by Mr. A. Devine, manager of Tyax Mill. It should be noted that this estimate does not seem to be in accord with the merchantable volume of Yellow pine, (28,920 m.b.m.) shown in Table VII, p. 41. Of course, Mr. Devine's estimate includes both fir and Yellow (Ponderosa) pine
Fig. 36: Sawmill at Tommy Creek

Fig. 37: Tyax Mill, Mowson Lake. Bendor Mountains in the background.
FOREST INDUSTRY
Bridge River Area

LEGEND

SAWMILL
PORTABLE SAWMILL
LOGGING AREA
PRINCIPAL TREES CUT:
Lodgepole pine  
Spruce  
Fir  
Ponderosa Pine

1958 G.A.W.
CHAPTER XII

AGRICULTURE

When Mr. I. B. Saunders accompanied Judge Elliot on a "...reconnaissance for a mule trail from the mouth of Bridge River to Tyaughton Creek...", he made the following report on the activities of the Chinese placer miners.

"We also observed numerous parties of these people (variously estimated at one hundred to two hundred) all along the banks of the River, most of whom have logs huts and patches of ground under cultivation."

From his observation on the same journey, Judge Elliot himself noted

"There are many pieces of open land along the river, and one very large one adjoining Tyaughton Creek, fit for cultivation. The latter is already taken up."

These two reports are the first evidence of agricultural land use in the Bridge River Region. The Chinese, born agriculturalists, evidently were providing part of their food supply from home-grown vegetables. Judging from Elliot's remarks, at least one white man was interested in making a living from the land. Certainly such land use did not endure for long, but subsided with the ebb of placer miners.

1 See Figs. 39 and 40; also Figs. 4, 6 and 17
1 "The Elliot Papers", op. cit., 18 November, 1865
2 Present writer's italics
Permanent agriculture began in the lode mining era. An Indian named Alexander kept a few horses and had a small garden at Rexmount as early as 1895. Grant White began farming at the mouth of Tyaughton Creek in 1897. These farms and another at the foot of Mission Mountain were stopping places for pack-horse trains and later for wagons and teams. The farms provided essential feed for the horses. Probably a small amount of farm produce was supplied to the struggling mining camps.

The succeeding years saw very little agricultural development. Even when Pioneer and Bralorne mines became firmly established in the 1930's, there was no rush of farmers to take up land. The trucks which replaced horse-drawn wagons had no reason to stop at the little farms. Fast transportation meant that farm products could be supplied cheaply from elsewhere.

Today, there are only four farms worthy of the name in the Bridge River Valley. In addition, several persons have enough land under cultivation to keep a horse or cow for their own use.

The cultivated land is on slightly higher ground than the poorly drained general level of the flood plain. The soils are predominantly clay, silt or loam with a surface layer of volcanic ash. The ash is infertile where the layer is thick, but a small amount is valuable—according to local report—in that it prevents the ground from baking. The light pulverulent character of the ash usually makes irrigation a necessity.
At Rexmount a farm occupies the gently sloping alluvial fan built by Jones Creek. The stream supplies irrigation water to the forty-one acres under cultivation. In this location there is no volcanic ash and the soils are chiefly clay, sand and silt. The farm is operated partly in conjunction with the owner's activities as a licensed guide. The crops grown are for the support of twenty head of saddle- and pack-horses and eight head of beef cattle. Hay, oats, spring wheat, timothy and alfalfa are grown.

Across the river from Rexmount, a short distance downstream, twenty acres are being farmed on a self-sufficing basis. The farmer uses a boat to cross Bridge River.

At the mouth of Tyaughton Creek there were formerly three farms, but only one is being actively worked at present. The soils are similar to those at Rexmount but there is volcanic ash and some loam. A farm which specialized in swine and vegetables was washed out during the high water of 1948. The channel of the creek is being deepened to prevent the recurrence of such damage.

Twenty acres are now being cultivated to supply mixed produce to the settlements. The stock includes ten milk cows, four horses, four pigs and sixty-five chickens. Fifty tons of hay is harvested annually on land irrigated by Tyaughton Creek. Garden vegetables are also grown, but

(p. 109) No soil survey of the area has been made.
occasionally early summer frosts do extensive damage. One or two horses are rented to prospectors or sportsmen.

Forty head of beef cattle which use the grazing land of upper Gun Creek (discussed under "Grazing") are owned by Minto interests. The cattle are mostly registered pure-bred Herefords which are exported from the valley as prize breeding stock. A little meat is supplied to the settlements. Twenty-five head of horses are kept for packing in the mountains. To winter these animals, one hundred tons of hay, oats and fall wheat are grown on bottom land west of the mouth of Gun Creek. Some additional hay as well as grain must be imported. The fields are within an oxbow bend of Bridge River. This low-level land was seriously damaged by the flooding of the Bridge in 1948. The surface of the ground is a deep covering of fine silt.

Figure 39:
Cleared land, flood plain of Bridge River at Minto. Note cattle and horses.
A few patches of land have been cleared or cultivated elsewhere in the Bridge River Valley. Up Jones Creek, a little cow-pasture has been made on a bench three or four hundred feet above the flood plain. West of Jones Creek on the Bridge River highway, a family of Indians owns several acres of cleared land. At the mouth of Tommy Creek a small area has been cleared for a cow and some chickens. Old-timer Grant White still keeps two horses on his place at the mouth of Tyaughton Creek. He is able to grow berries, plums and apples for home use. At Little Gun Lake, a few acres are cultivated for vegetables, hay and oats.

Agriculture has failed to develop in the Bridge River Region beyond a pioneer stage. What are the geographic reasons for this failure?

In the first place, natural factors militate against agriculture. The valley floor of the Bridge River is the only extensive area of flat land. Climatic conditions governed by altitude rule out development above this level.

On the valley floor, climate is border-line for agriculture. Drought conditions exist during most summers. Summer frosts are exceptional, but they may occur because of the altitude and air drainage. On the south side of the Bridge River, the mountains tend to shade the valley, reducing the hours of sunlight.

Much of the soil is infertile. There are extensive patches of gravel and sand and, in places, a deep layer of volcanic ash.
A large percentage of the bottom land is subject to flooding in summer. The grade of the meandering river across the flood plain is slight—insufficient at times to carry off the enormous quantity of water formed by melting snow. It is only where tributary creeks have built alluvial fans that there is ground free from flooding.

An additional problem is the difficulty of clearing the thick, deciduous cover of bush, willow and cottonwood.

Handicapped by these natural factors, Bridge River agriculture has been unable to compete with outside areas. Farm products from the Lillooet area, the Portage and the lower Fraser Valley successfully invade the Bridge River market.

The irrigated benches of the Fraser River above and below Lillooet produce excellent fruit, vegetables, hay and grain which are sold in the Bridge River Region. Climatic conditions there and on the Portage closely parallel those of the productive Okanagan Valley. Shipping distance to Bralorne and Pioneer is relatively short. Agricultural products from the lower Fraser Valley (already developed to supply urban centres such as Vancouver) are sent north cheaply by steamer and railway.

In the summer and autumn, a number of peddlars sell Lillooet fruit and vegetables at the Bridge River settlements. In some cases the ranchers themselves bring in their products.

In addition to natural obstacles, man himself has decreed against Bridge River agriculture. Over thirty years
ago the potential water power resources of the Bridge River were recognized and the B.C. Electric Company was given flooding rights extending practically the length of the valley. Farms existing prior to the granting of these rights are, over a period of time, being bought out by the company. Farmers who continue their operations do so with full knowledge of the eventual fate of their land.

Although having little initial promise, the industry might have developed on a more extensive scale, but for the power project. Intelligent forethought and long range planning prevented a larger dislocation of one industry by another. Under such conditions, then, agriculture in the Bridge River Region persists as only a minor human activity.
Figure 40: AGRICULTURE in the Bridge River Area.

LEGEND:
- Occupied Farms
- Abandoned Farms

Source: Government Agent, Lillooet, 1849. G.A.W.
CHAPTER XIII

GRAZING

Cattle and sheep are grazed in the transition belt of mountains which is drained largely by Tyaughton Creek. These sub-alpine and alpine grazing ranges lie mostly above 4000 feet. The soft weathering rock and the open folds give the region an accessibility which is not typical of the more rugged mountains to the south.

Climatically the country is affected by its position on the edge of the Chilcotin Plateau. The drier climate produces areas of open forests and a grass cover.

All grazing ranges, as elsewhere in British Columbia, are controlled by the provincial government through grazing permits (or leases). A nominal fee is charged per animal per month and there is a periodic inspection to prevent overgrazing. For instance, sheep tend to band and to crop closely if not properly handled. Cattle often overgraze around water. Frequently they are kept dispersed by "salting". By careful management the grazing ranges of the Bridge River Region can continue to be an important link in the livestock industry of the province.

SHEEP RANGES

The sheep come to the Bridge River Region from a single ranch near Kamloops where summer pasture is scarce. In 1947

* See Fig. 41; also Figs. 10, 12, 13 and 39
about 6,500 animals made the long trek from the Thompson River country. They are ferried over the Fraser at Big Bar and thence travel by way of French and Watson Bar Creeks to the ranges, arriving in June when the mountains are snow-free.

The sheep are usually divided into three bands,--- a band of yearlings numbering about 1,000, and two others of between 2,500 and 3,000. Each band is guarded by a herder and his dog. Two or three horses are used for transportation. The sheep are moved in a big circuit and camp is shifted about every two weeks. The herder must keep a wary eye open for predatory animals, particularly bears and coyotes which at times make heavy inroads upon the sheep. The herders occasionally shoot molesting grizzlies and this action is deeply resented by the licensed guides who wish the bears to be preserved as game.

Red Mountain, Poison Mountain and Quartz Mountain ranges are the first areas grazed. The sheep are then moved on to


2 These grazing ranges lie beyond the watershed of the Bridge River proper, but since they form an integral part of the grazing ranges, they deserve consideration.

3 Information dealing with sheep ranges has its source in the following work: Copley, George V., The sheep ranges west of the Fraser River, etc." 1933, Department of Lands and Forests, B.C. Forest Service files, Victoria, B.C.
the timbered Fish Lake Range. Beaver Creek valley acts as a driveway area to the Beaver Mountain range beyond.

Eventually, the bands are driven into Paradise Valley where conditions of topography and climate have created the most extensive and richest of the ranges. Local configuration is probably responsible for producing a greater rainfall than is received by the other ranges. The resultant cover has a carrying power of 5 acres per head as compared to 6 and 7 for the other ranges. Usually the homeward course at the end of the summer is via Tyaughton and Mud Creeks.

This annual tour of the ranges is the most economical method of carrying on the summer grazing. Individually, the ranges could carry small bands of sheep throughout the summer, but a large number of herders would be required to tend them.

**TABLE X - Carrying Capacity of Sheep Ranges**

<table>
<thead>
<tr>
<th>Area No.</th>
<th>Area Name</th>
<th>No. of Acres</th>
<th>Acres per head</th>
<th>No. of sheep</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paradise Valley</td>
<td>8,198</td>
<td>5</td>
<td>1,639</td>
</tr>
<tr>
<td>2</td>
<td>(unnamed)</td>
<td>403</td>
<td>7</td>
<td>57</td>
</tr>
<tr>
<td>3</td>
<td>Beaver Creek</td>
<td>1,222</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Beaver Mountain</td>
<td>5,587</td>
<td>6</td>
<td>931</td>
</tr>
<tr>
<td>5</td>
<td>Fish Lake</td>
<td>233</td>
<td>6</td>
<td>450</td>
</tr>
<tr>
<td>6</td>
<td>Fish Lake</td>
<td>2,470</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>Quartz Mountain</td>
<td>5,005</td>
<td>6</td>
<td>834</td>
</tr>
<tr>
<td>8</td>
<td>Inaccessible</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Poison Mountain</td>
<td>4,346</td>
<td>6</td>
<td>724</td>
</tr>
<tr>
<td>10</td>
<td>Red Mountain</td>
<td>4,326</td>
<td>7</td>
<td>618</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>31,790</strong></td>
<td></td>
<td><strong>5,253</strong></td>
</tr>
</tbody>
</table>

1 Taken from the table attached to a "Map shewing separate Range Sheep Units on Relay, Beaver, Churn, French Bar, Watson Bar Creeks and Yalakom River", 1933, by Geo. V. Copley; map is in the files of B.C. Forest Service, Department of Lands and Forests, Victoria, B.C.
CATTLE RANGES

Cattle as well as sheep move into the mountains in summer to take advantage of the lush alpine pastures. A number of Chilcotin cattle ranches hold grazing rights and the Gang Ranch is the chief of these. Small numbers of cattle are driven into the valleys of upper Dash, Beaver and Relay Creeks.

Until only four years ago, Gang Ranch cattle were summer pastured in the area around Spruce Lake. About 350 head used to be driven via Big Greek, Graveyard Creek and Tyax Pass. In the autumn, sometimes, a number of animals would be brought out via Gun Creek to supply the mine settlements with meat. A change in the grazing rights resulted in the discontinuance of the movement.

The Spruce Lake range which extends into upper Gun Creek is now used exclusively by a Minto ranch which specializes in pure bred Herefords. About 40 animals are taken to the range around June 1st. They remain until driven out by snow in the fall. This registered stock spends the remainder of the year in the Bridge River Valley. They range on the boggy meadow-lands around Pearson Ponds and on a cleared portion of the valley floor near Minto.

Only occasionally is an animal butchered for the local market---most being sold outside the valley for breeding purposes.

The rancher owning the stock believes that the Spruce Lake range could possibly support 300 head of cattle for the
summer season. Such an expanded use of this range is unlikely because of the inability of Bridge River farms to produce the necessary winter feed.

Eight head of cattle are kept by the rancher at Rexmount. The stock is not moved into the alpine country, but grazes locally between Jones Creek and Marshall Creek. Surplus animals are marketed at the settlements.
Figure 41
CHAPTER XIV

BESTICULTURE

Besticulture is man's use of the wild life resources. Trapping, hunting and fishing are the adaptations in the Bridge River Region.

TRAPPING

Trapping is not an important occupation. It is an activity which provides employment during the winter for the prospector, miner, farmer and others who can turn conveniently to this avocation. There are, however, two or three trappers whose main source of income is their trap-lines.

There are ten registered trap-lines within the watershed of the Bridge River Region, as well as an area held jointly by Indians of the Seton Lake Band. The chief animals trapped are muskrat, squirrel, marten, weasel and beaver. Muskrat and beaver are taken almost exclusively from trap-lines which cover parts of the flood plain of Bridge River where there is a favourable habitat for these aquatic animals. Squirrel, weasel and marten range from valley bottom to timberline and therefore are trapped on most lines. Other animals taken occasionally are mink, bobcat, lynx, cougar, wolverine, coyote, wolf, bear, and -- very rarely -- fisher and fox.

The trapping season for most fur-bearing animals is from

\[ \text{X See Fig. 42, also Figs. 10, 12, 13} \]
November 1st to February 28th,\textsuperscript{1} but the open season for beaver and muskrat is from March 1st to April 30th\textsuperscript{2}.

The map of trap-line areas shows that the areas vary from those of large size, such as the upper Bridge River (No.3) to those of small size such as No.9 in the vicinity of Bralorne. The boundaries, in many cases, have been drawn with little respect for water-shed areas.

Indians are not required to submit fur returns and therefore the catch made in the lower Bridge River area is unrecorded. A statistical picture of the remainder of the region is shown below.

\textbf{TABLE XI} \hspace{1cm} \textit{Annual Average Fur-Catch by Trap-Line}\textsuperscript{3}

<table>
<thead>
<tr>
<th>Trap-line No.</th>
<th>Muskrat</th>
<th>Squirrel</th>
<th>Weasel</th>
<th>Marten</th>
<th>Beaver</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>56</td>
<td>14</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>40</td>
<td>2</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>437</td>
<td>16</td>
<td>14</td>
<td>43</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>41</td>
<td>33</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>58</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>72</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>72</td>
<td>24</td>
<td>13</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>55</td>
<td>10</td>
<td>19</td>
<td>1</td>
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<tr>
<td>9</td>
<td>0</td>
<td>20</td>
<td>4</td>
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<tr>
<td>10</td>
<td>0</td>
<td>25</td>
<td>22</td>
<td>23</td>
<td>0</td>
</tr>
</tbody>
</table>

\textbf{TOTALS} \hspace{1cm} 644 \hspace{1cm} 277 \hspace{1cm} 122 \hspace{1cm} 125 \hspace{1cm} 14


\textsuperscript{2} Ibid., p.5.

\textsuperscript{3} Compiled from Returns of Registered Trap-lines in the offices of the B. C. Game Commission, Vancouver, B.C. The catch for the three most recent years of operation were averaged for each trap-line. Because of "lay-off" years, the same period could not be used for all lines.
As evidenced by the table, line No. 3 which traverses the marshy upper Bridge River produces the bulk of the "rats" as well as most of the marten. The table also shows that the total catch for each trapper is small, but the aggregate totals make clear the fact that the region is producing a considerable number of furs each year.

In the Bridge River Region, the trapper must cover rugged terrain during the winter when there is a heavy snow cover in the mountains. He usually wears rubber "muck-lucks" because wet snow conditions are common. Snow-shoes are a necessity, for without them he would be helpless in the deep snow.

If his line is extensive (as are Nos. 1, 3 and 10), the trapper must build and provision his line-cabins in summer for over-night use during the trapping season. Where the cabins are built at high altitudes, as for instance in McGillivray Pass, the roofs must be strongly constructed. Instead of individual rafters, the roof may have a solid layer of poles to stand the weight of snow. A temporary shelter is constructed by erecting a tent and covering it with a layer of poles. These tent-camps and the log cabins are spaced a day's journey apart along the trap-line. In some cases, the trapper has appropriated abandoned mining buildings.

For short lines which are close to roads, such as Nos. 4, 5 and 9, the trapper is often able to make his rounds conveniently without staying overnight on his line. One or two emergency cabins are all that is required in the way of buildings.
Some trappers make use of pre-existing trails when covering their trap-lines. No. 10 follows the B. C. Telephone Company's trail (along their telephone line) which leads to McGillivry Pass. In the territory of No. 1, the Chilcotin Indian trail is used up Gun Creek. In most cases, of course, the trapper makes his own trails, placing his blazes high up on the trees if he is in "snow country".

His trap-line usually follows the water courses where the animal population is more concentrated. In the mountains, where the run-off may be exceedingly rapid, small streams become raging torrents overnight. The trapper is usually able to span such creeks by felling trees, but in No. 3 areas where the headstreams of the Bridge River flow in a wide, gravel bed this is not always possible. To bridge these streams, the trapper constructs rude cantilever bridges or strings a cable tightline.

A saving in human effort would result if the allocation of trap-line areas followed the natural watershed boundaries. For example, the trapper who works No. 10 area snow-shoes his way up the south bank of the Hurley while his neighbour who works the adjoining No. 8 duplicates the journey on the north bank. In a similar fashion, the man trapping No. 8 area ranges from the headwaters of Truax Creek in the Bendor Mountains to the ridge of the Shulaps on the other side of the Bridge River Valley. The division is the same for the man working Tommy Creek and lower Marshall Creek. He too must cross the Bridge River and ascend the mountains on the opposite side of the valley.
Ideal handling of a wild life resource always envisages a sustained yield basis. A sustained yield of fur-bearing animals is discouraged by such fragmentation of trap-line areas as exists in the Bridge River Region. The trapper who has only a small line is almost inevitably tempted to take too many animals from it. Since the line is not extensive enough to provide him with a living, he is not vitally interested in "farming" it. A larger, adjoining "farmed line" is likely providing many of the animals for the part-time trapper working a small line. The solution to the problem would seem to lie in the consolidation of the smaller lines.

Trapping is an industry which will probably decline in the Bridge River Region. Its present pattern is in large measure a result of mining settlement. If the region had remained in a wild state it would have contained, probably, two or three large trap-lines providing the sole source of income for as many men. The present fragmented allocation of trap-lines will almost certainly lead to over-trapping and a resultant depletion of the resource. Inevitably, too, the advance of settlement sounds the retreat for wild life.

The hydro-electric power project has already dealt the industry a blow. The storage dam at the LaJoie Falls will flood and destroy the best muskrat and beaver area in the district. Later flooding developments will mean the loss of the trapping grounds for these animals in trap-line areas Nos. 5, 6, 7 and that of the Seton Lake Band of Indians.
HUNTING

The Bridge River Region has been a traditional hunting-ground for Indians. Some years ago the entire Stone Band, comprising about 120 members, would journey from the Chilcotin Plateau into the mountains in early June. These people travelled by horse-back from their reserve near Hanceville via the Taseko Lakes District. En route they lived largely off the country, eating the meat of big-game animals which they could secure. Saskatoon berries were gathered for winter use. Since deer are the most plentiful game, their flesh was the mainstay of the diet. The Indians also hunted marmot for a winter fat supply as well as for the fur which was much prized for sleeping robes. The skins of deer and other animals were tanned for moccasins and clothing.

Today, only a few families keep up the semi-nomadic practice. More prosperous conditions resulting from the Family Allowance and work and wages during the war, have almost ended the summer migration of the Stone Band. Hunting is now largely restricted to deer. The excess meat is cured, as of old, and the squaws tan some buckskin for later sale.

Prospectors, as well as Indians, kill game for needed food. While in the mountains they can save themselves trips to the "outside" by supplementing their supplies with wild meat.
To many valley residents venison, while not a necessity, is a welcome addition to the larder. In the fall a pair of bucks hanging in the woodshed is a common sight at Bralorne and Pioneer. Hunting is a favourite form of recreation for the residents. Deer, the chief animal hunted, is sought on the mountain slopes to the north of Bridge River. The base of these slopes is conveniently reached by car. The recent influx of population at the town of Bridge River means that there will be an increasing pressure of hunting in the area.

Some goats are shot - mainly in the mountains adjacent to Cadwallader Creek - by Bralorne and Pioneer sportsmen, but there is less interest in this strenuous form of hunting.

Residents and visitors hunt ducks and geese which frequent the sloughs and marshes of the Bridge River Valley in fair numbers.

While game still serves for food and for local recreation, its main importance is in relation to tourism. By the turn of this century, the Bridge River Region was already famous as a hunting ground for sportsmen, and its big-game guides such as W.G.C. Manson, were internationally known. Large sums were paid to the guides for furnishing the accoutrements of the hunting parties. Horses, camping equipment and provisions were supplied as well as the wranglers and a cook to take care of the "dudes".
Between 1903 and 1910 no fewer than 96 hunting parties outfitted at Lillooet for the Bridge River country. The trophies for that period were: 145 sheep, 207 goats, 146 deer, 22 bears, 27 caribou, 1 panther.

Thirty or forty men were engaged in conducting hunting parties during the autumn.\(^1\)

Certain regulations of the B. C. Game Department are designed to provide an income for licensed guides. It is compulsory for non-residents of the province to be accompanied by a guide when hunting big game. A further stipulation is "No guide shall guide more than two persons at any one time on any big game hunting trip."\(^2\)

Of course, B. C. residents also hire guides, but Americans form most of the clientele.

To take advantage of the regulations nine persons are at present registered as guides in the Bridge River Region. Only two of them have horses and equipment for large-scale parties, but others are hired when the number of non-resident hunters is more than two. About fifteen licenced guides who hunt in the region have headquarters at Big Creek, Gang Ranch and Moha.

The main area hunted is the mountains between the Taseko Lakes and the Fraser River and lying north of Gun Creek and Bridge River. Recently, each guide has been assigned a separate part of this district in which to operate.

\(^1\) Figures and information were kindly supplied by Mr. A. Phair from a record book kept by him at Lillooet

\(^2\) B. C. Game Regulations, 1948-49 _op. cit._, p.28.
By this means it is hoped to gain a measure of control over hunting activity.

The network of trails (see Transportation Map following P.143) is due partly to the activities of the guides. The trails are worn by packhorses and occasionally guides take the trouble to clear away bush and windfalls from the paths which expedite their parties.

The Bridge River Region lies east of the Cascade summits and therefore belongs within the "Eastern District" as defined for the purposes of game regulations. It is administered from Kamloops and the supervising game warden is stationed at Lillooet. The provincial police at Bralorne act as deputy game wardens.

The big-game bag limit for 1948-49 within the region is as follows:

<table>
<thead>
<tr>
<th>Animal</th>
<th>Limit</th>
<th>Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 deer</td>
<td></td>
<td>open season from Sept.15 - Nov. 30</td>
</tr>
<tr>
<td>1 mountain sheep</td>
<td></td>
<td>Sept.15 - Nov. 15</td>
</tr>
<tr>
<td>2 mountain goats</td>
<td></td>
<td>Sept.15 - Nov. 30</td>
</tr>
<tr>
<td>2 grizzly bears</td>
<td></td>
<td>Sept. 1 - Dec.31 (1 only)</td>
</tr>
<tr>
<td>1 moose</td>
<td></td>
<td>Jan. 1 - June 30 (1 only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sept.23 - Nov. 30</td>
</tr>
</tbody>
</table>

Two reserved areas help to keep up the number of big-game animals. Tyaughton Lake is in the center of one of these reserves (see map of Trap-line Areas following P.132)

1 Coast Range
2 B. C. Game Regulations, 1948-49, op.cit., p.3 ff.
Within its confines, animals of the deer family are protected. The location has been chosen with reference to Tyaughton Valley which is a favourite migration route between the summer alpine ranges and the winter ranges near the Bridge River.

Yalakom Game Reserve is on the east side of the Yalakom River. Within its boundaries, all big game have sanctuary. The reserve is especially valuable for protecting a nucleus band of mountain sheep.

Guiding, like trapping, is a part-time occupation which provides a supplementary cash income. The sportsman pays on the average, between $500 and $700 for a ten or twelve day trip.\(^1\) Few of the guides conduct enough parties to earn their living at this work. Most are ranchers who are able to keep horses and who have spare time in the fall of the year.

There was an abortive attempt recently to expand the guiding business. A hunting club was formed with headquarters at Little Gun Lake and during 1947 a chain of cabins was built in the hunting grounds. An agency in Vancouver sold memberships to American hunters. The experiment was not a financial success.

Horses are essential to guiding activity but the supply of hay in the valley is very limited. About twenty saddle and pack-horses are wintered at Rexmount and a like number at Minto where ranches are able to produce enough hay for feeding.

\(^1\) Local guide, letter to the writer, 18 January, 1949
Other horses must be taken the long journey to the Lillooet area. At Lillooet, where the snowfall is light, the animals can be left on the range all winter provided that they are given a certain amount of feed. A guide has estimated that his costs would be cut in half if he were able to keep his horses in the Bridge River Valley.

As was indicated under "Wild Life", the game animals are declining in numbers. No surveys of the game population have been made, but in the opinion of guides the depletion is serious. The mountain sheep are the worst affected and there is real danger that they are being exterminated. The latest Provincial Game Commission Report has this to say:

"Some consideration will have to be given to the number of hunters invading mountain sheep areas. R.H.Church of Big Creek, a registered guide of thirty years experience, has drawn this to our attention. If the pressure is increased, he adds, and more guides and hunters continue to hunt the Churn Creek area and one area to the north there will be no sheep left... This viewpoint is not that of a lone guide only but reflects the opinion of other guides who know the above sheep country...."

It has been recommended by the chief game warden that

"There should be a game reserve established somewhere in the mountain sheep country to the south of Big Creek."

It may be that wild sheep are being infected with the

1 Local guide, letter to the writer, 18 January, 1949
3 Provincial Game Commission Report, 1947, op.cit., p.35
diseases of domestic sheep. If investigation proved this to be the case, it might be necessary to re-allocate the routes and the ranges of domestic sheep.

In the Bridge River district, as in other hunting areas of British Columbia, there is an absolute necessity for competent assessment of the wild life resources followed by an intelligent policy of game management. If this is not undertaken, there will be a substantial loss of tourist dollars and a number of people will lose part of their livelihood.

Both big game and migratory game birds will suffer from the B.C. Electric power project. Moose and deer will lose part of their winter range when the Bridge River Valley is flooded by the ultimately-planned high level dam. The loss may be serious because the herbivore population is closely related to the amount of winter range available.

The flooding will likely render the water too deep for the aquatic vegetation which supports ducks and geese. Poisoning of the water may result from the decay of inundated trees and bush.

**FISHING**

The fishing offered by the small mountain lakes of the district is not particularly noteworthy. The fish are only fairly plentiful in most lakes, and seldom weigh more than two pounds. They are caught chiefly by trolling. Prospectors occasionally vary their diet with the little mountain trout of the creeks.
Little Gun, Gun and Tyaughton Lakes, being accessible by road, are the most heavily fished. Most of the fishing is done by residents, but visitors also come to these lakes. As a rule, people do not travel expressly to fish in the Bridge River Region. Better fishing can be had in other less remote parts of the province.

Indians enjoy the privilege of spearing salmon in Tyaughton Creek. A few spawning Springs are taken this way in the autumn, but the run is very small and economically of little importance. The run will be ended unless fish ladders are constructed at the B.C. Electric Diversion Dam.

The open season for fishing extends from March 1st to November 30th. Fishing is prohibited in the following streams to protect spawning trout:

1. Penrose Creek - tributary of Little Gun Lake
2. Little Gun Creek - connecting Little Gun and Gun Lakes.
3. Big Gun Creek (LaJoie Cr.) - flowing out of Big Gun Lake to Gun Creek
4. McDonald (Fish) Lake - flowing out of McDonald Lake into Bridge River.
5. Cranes and Bells Creeks - tributaries of Tyaughton Lake
6. Tyaughton Creek - for a distance of one mile downstream from Tyaughton Lake

1 British Columbia, Provincial Game Commission, Sport Fishing Regulation, 1949, p.7
2 Ibid., p.9
TRAP-LINE AREAS

in the
Bridge River Region

SOURCE:
MAP 24A, BC GAME COMM.
BASE:
PRE-EMPTORS MAP
LILLOOET SHEET
BC DEPT. OF LANDS 1938

SCALE:
1 inch = 3 miles

SETON LAKE BAND
OF INDIANS

DEER
RESERVE

1

2

3

4

5

6

7

8

9

10

TALAKOM
GAME
RESERVE
CHAPTER XV

TOURISM

The chief tourist assets of the Bridge River Region are the wild life and the splendid mountain scenery. The settlements offer little or no attraction.

Very few tourists visit the region by using the P.G.E. railway and the stage service. There are equally attractive and more conveniently located resorts along the railway.

The few tourists who do come to the area travel by automobile. Many would-be visitors are deterred by the charges and the schedule of the gas-car service between Lillooet and Shalalith (see Transportation Chapter).

Under existing conditions, the isolation of the district probably works to the long-run advantage of the licensed guides. If the district were easily accessible there would be more customers, but inevitably less game.

Hunting and fishing have been described under "Besticulture". Hunters are the best source of tourist dollars. More sportsmen could be encouraged to visit the area if the big-game animals existed in greater numbers.

Guides might well consider capitalizing more on the second asset mentioned, namely the mountain scenery. Conducted horse-back tours could be made over the extensive trail system in the picturesque Red, Eldorado and Shulaps.

* See Fig. 43; also 44
Mountains during the summer. In other parts of British Columbia, notably in Manning Park and in the mountains near Penticton, trail-riding is a lucrative branch of the tourist industry. Advertising is the prerequisite to its initiation in the Bridge River Region.

The present tourist business is on a small scale. There are hotels at Shalalth, Minto, Gold Bridge, Brexton and Ogden. Tourists occasionally use these facilities, but business men provide most of the custom.

Tyaughton Lake has two fishing lodges, and Gun Lake and Little Gun Lake each has one. These lodges are open during a short summer season and the one at Little Gun Lake operates also during autumn when it caters to hunting parties. On the shorelines of the lakes there is a large number of summer cottages which detract from the value of the lakes as tourist assets. Many people coming from the cities prefer more of a wilderness setting for a holiday.

The Bridge River hydro-electric project might serve as a tourist attraction; thousands visit Grand Coolee Dam in the state of Washington each year. The Bridge River project is much less spectacular, but if the power plant at Seton Lake were open to the public for inspection it would be one more incentive to visit the district.
TOURISM
IN THE
BRIDGE RIVER AREA

LEGEND
Meals Served
Overnight Accommodation
Service Station
Store
Licensed Guide
Big Game
Migratory Game Birds
Trout
Railway (P.G.E)
Main Roads
Primitive Roads
Trails

Scale:

0 1 2 3 4 5 6 miles
CHAPTER XVI

TRANSPORTATION AND COMMUNICATION

The Pacific Great Eastern Railway is the main transportation link between the Bridge River Region and the coast. The southern terminus of this railway is Squamish at the head of Howe Sound, forty miles from Vancouver. Slow freight is loaded into boxcars in Vancouver and carried by P.G.E. barges to Squamish. Passenger movement to this point is by Union Steamships which connect with the twice-weekly train service. At Shalalth, 105 miles from Squamish, freight and passengers begin the motor journey to the Bridge River district.

There is no road connection from the provincial highway system to the Bridge River Region. Twice daily, automobiles and passengers are carried by a railway gas-car the fifteen miles between Shalalth and Lillooet. From Lillooet, the main Cariboo Highway is reached either by travelling down the Fraser to Lytton or northeastward to Clinton (or to Carquille). The distance from Lillooet to Vancouver is 219 miles.

Beginning at Shalalth on Seton Lake, the Bridge River

Gas Car schedule between Lillooet and Shalalth (no service on Sundays)
Leaves Lillooet daily: 8:00 A.M. 4:00 P.M.
Leaves Shalalth daily: 9:15 A.M. 5:10 P.M.
The fare is $8.00 return for car and driver; extra per passenger.

* See Fig. 44, 45; also Fig. 5, 6, 11, 43
highway ascends the steep slope of Mission Mountain in a series of hairpin switchbacks. Five miles from Shalalth the road reaches the 4500 foot summit which is the lowest point in Mission Ridge. The road then zig-zags down the equally precipitous slope on the other side. It crosses Bridge River after traversing about a mile of the valley. A small portion of this stretch of road had to be rerouted to a higher level because of the Diversion Dam flooding.

The north side of Bridge River Valley has a more moderate slope than the south, and is less densely timbered, making it more favourable for the highway. For the remainder of the thirty-five miles along the valley bottom, the road is located at the edge of the flood plain where construction has been facilitated by flat ground.

Along the valley the only "towns" are Minto and Gold Bridge where the road forms the main streets. There are occupied farms close to the road at Rexmount, Tyaughton Creek and Gun Creek.

After recrossing the Bridge River at its junction with the Hurley River, the road is steeply graded in a series of steep, climbing turns from Gold Bridge (2200 feet) to Brexton (3100 feet). To avoid the sheer slopes of the Hurley canyon, the road hugs the mountain wall above 3500 feet before it descends to Bralorne (3400 feet). The last three mile stretch from Bralorne to Pioneer (3800 feet) is up the east bank of Cadwallader Creek. This terminus of the circuitous Bridge River Highway is 55 miles from Shalalth. The straight
line distance across a forest of peaks is a mere 24 miles.

Construction of the Bridge River highway has been costly. Cribbing and embankments are necessary on the switchbacks of Mission Mountain and those above Gold Bridge. Since there are many small creeks, frequent use of culverts is required.

Maintenance, also, is expensive. In winter, tractors keep the road plowed, but heavy snows on Mission Mountain and in the vicinity of the mines create difficult transportation conditions. Snow-slides occur after sudden thaws, occasionally isolating Bralorne and Pioneer for a few days. Low-lying sections of the valley road may be inundated by the flooding of Bridge River as in 1948. In 1939, the mines were isolated for ten days when the bridge at Gold Bridge was washed out.

Some of the smaller creeks are also troublesome particularly in the section of the road between Jones Creek and the bridge at the foot of Mission Mountain. These creeks drain from the south-facing slopes of the Shulaps and in hot spring weather they may overflow their banks. As a result, the road is either washed out or made impassably by deposits of loose gravel and stone.

The highway is surfaced with local gravel, but generally speaking it is a rough road with potholes and "washboard" which give cause for complaint to residents and tourists alike.

The Neal Evans Transportation Company (head offices in
(138)

Vancouver) carries most of the freight that is moved over the highway. It also has the franchise for passenger traffic. The company owns a fleet of thirty-one vehicles including trucks and stages. The trucks make the round trip between Shalalath and Pioneer in 12 hours. They carry in supplies of every description, and concentrates from Bralorne form the chief outgoing freight.

In the year ending May 31, 1948, the company moved a total of 10,323 tons into the valley and 4,055 tons out. To make these figures representative of a normal year the incoming tonnage should be divided by two, because about half of it was carried for the B.C. Electric Company's power project.

Food is a large proportion of the freight brought into the Bridge River district. Almost all food must be imported because of the feeble state of agriculture.

Stage service between Pioneer and Shalalath connects with the P.G.E. Railway. Passengers are able to make the journey from Bralorne and Pioneer to Vancouver via P.G.E. in about 13 hours. Another way of reaching the coast is by Neal Evans stage down the Fraser Canyon.

There are three taxi concessions which operate from Bralorne and Gold Bridge to supply everyday transportation.

Many residents of the district own automobiles. Tourists as well as residents travel frequently over the spur roads to Gun and Tyaughton Lakes. Hunters sometimes drive to the

1 Manager, Neal Evans Transportation Co., interview with writer, 15 April, 1949.
Manitou Mine on Tyaughton Creek or to the Jewel Bridge on Guh Creek.

The cost of transporting supplies to the Bridge River Region is necessarily heavy. The number of times that the freight must be handled is a large factor in the high costs. Fast freight is moved three times: from truck to boat, boat to train, train to truck. Slow freight misses one handling since it is loaded directly into boxcars at Vancouver. The projected road link between Squamish and Vancouver will speed the service and may ultimately reduce costs a small amount.

Truck haulage over the steep gradients of the Bridge River highway is expensive. During the winter season, the roads are dangerously icy. Truck tires are fitted with special ice creeper chains. There are no automobile service stations between Minto and Shalalth, but for emergency use on the Mission Mountain section of the road, telephones are placed in roadside boxes. Neal Evans' trucks usually travel in pairs in case of breakdowns or accidents.

Air transport is possible to Gun Lake which is more than 3 miles long, and therefore a large enough expanse for float-plane landings. There are occasional unscheduled plane-flights from Vancouver. Float-planes cannot land between January and April because of ice on the lake.

It is interesting to speculate on the use of helicopters in a mountainous country such as the Bridge River Region. It might be possible to prospect from the air by geophysical
methods. Perhaps supplies could be transported to high
elevation mines.

Access to the Bridge River Region may also be gained by
a number of trails. The mountain paths give mobility within
the region to Indians, prospectors, trappers, herders and
sportsmen. Trail approaches to the region are used only for
a short period of the year. Such passes as Warner and McGillivray
are usually not free of snow until July, and in most years
are blocked again by the end of September.

The trails, like the roads, follow closely the drainage
pattern of the region. Every major creek has a trail of
some sort along its banks. These routes may be circuitous,
but they offer the easiest gradients in a country where pro­
files are steep.

Trails present difficulties to the uninitiated traveller.
There are no direction signs where trails fork. Often in
open country where each traveller is free to choose his own
route, the way becomes ill-defined. Little-used trails below
timber-line are crossed with windfalls and overgrown with
bushes. Fords are hazardous after heavy rains or when snow
melts rapidly.

The "cayuse" or Indian horse is the pack animal of the
mountains. Carrying a load of two hundred pounds or a rider,
this sure-footed animal will pick its way safely across
dangerous scree slopes. No food is carried for pack-horses,
the lush grasses of the alpine country being forage enough.
Many prospect mines were originally supplied by horses. Pack­
trains brought provisions and equipment to such high-elevation
mines as Lucky Strike, Lillomer, Gem and the Jewel.

From Big Creek on the Chilcotin Plateau, a rough road reaches as far as the north end of Taseko Lake. A well-defined Indian trail follows up the Taseko River leading either over high Warner Pass (6700 feet) or the easier Taylor Pass (6964 feet) to Gun Creek.

Primitive roads from the settlements of Big Creek and the Gang Ranch extend into upper Big Creek and Churn Creek. From the roads, trails lead by numerous routes into the Tyaughton Valley. Cattle were formerly driven to Spruce Lake over part of this trail system.

A number of trails can be followed westward from the Fraser River ferry points at Watson Bar and Big Bar to the sheep range country north and east of Tyaughton Creek. The trail along French Bar Creek is a favorite among the sheepmen.

A road has recently been constructed from Moha up the Yalakom Valley to the Elizabeth Group, a gold property at 6550 feet elevation on the east side of the Shulaps Mountains. Supplies were originally packed to the mine by a trail from the Bridge River via Liza Lake.

Between upper Cadwallader Creek and Anderson Lake, a trail leads over McGillivray Pass (5800 feet). This route was much used in the early pioneering days of the Bridge River Mining Camp.

Telephone and telegraph communication are operated by a private company and the Dominion government. Over forty-
five years ago a government telephone-telegraph line was strung between Lillooet and the old Lorne Mine via Shalalth and Mission Mountain. The line generally follows the present Bridge River highway. In 1934, because of the expansion of Pioneer and Bralorne, the B.C. Telephone Company completed a branch line from the P.G.E. tracks over McGillivray Pass to Pioneer, Bralorne, Ogden, Brexton and Gold Bridge.

Below Gold Bridge, communications are still handled by the government. An operator at Gold Bridge attends to both the telephone and telegraph services. There is a telegraph office at Lillooet, where there are of course telephone outlets as well. Within the Bridge River district, the government telephone line has outlets at Minto, at 23 Mile where the Blackwater Timber Company has a mill, and at Woodward's Ranch situated at the mouth of Tyaughton Creek. A branch line extends to the forest warden's residence (Keary Lodge) at Tyaughton Lake.

The B.C. Telephone Company operates also a radio-telephone. This provides direct communication between the station at Bralorne and one at Point Grey near Vancouver. The system is operated only in emergencies when avalanches and windfalls sever the line over McGillivray Pass.

The company employs five operators at Bralorne as well as a line maintenance man. The linesman's winter work often requires him to journey over McGillivray Pass on snowshoes. He has a cabin near the summit and another on McGillivray
Creek. Most of the line which he follows is strung on trees, but over the pass where timber is widely scattered, telephone poles are used.
Figure 44
CHAPTER XVII

SETTLEMENT

Mining seldom supports a large population and the Bridge River Camp is no exception to this rule. Bralorne, sustained by the most productive mine, is the biggest town with a population of 1000-1200. Pioneer's population is 400. The last official census in 1941 gives the following population figures:

<table>
<thead>
<tr>
<th>Settlement</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settlement of Bralorne</td>
<td>894</td>
</tr>
<tr>
<td>Settlement of Pioneer</td>
<td>486</td>
</tr>
<tr>
<td>Settlement of Gold Bridge</td>
<td>105</td>
</tr>
<tr>
<td>Settlement of Minto</td>
<td>96</td>
</tr>
<tr>
<td>Settlement of Brexton</td>
<td>59</td>
</tr>
<tr>
<td>Other places</td>
<td>28</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>1,668</strong></td>
</tr>
</tbody>
</table>

Slightly more than 2000 is probably a fair estimate of the number of people living in the Bridge River Region today.

Compact settlement largely conforms to the distribution of known and prospective ore bodies. Past geological history has been such that ore bodies have been discovered in the Cadwallader Creek area. It is therefore in this area that population is most concentrated. In detail, the location of building sites is determined by flat ground. Water supply presents no problem because of the numerous creeks.

\* See Figs. 46 - 52, Fig. 5

1 Lemieux, O.A.: Director, Census Division, letter to the writer, 10 February, 1949 - quoted population figures by Dominion Bureau of Statistics.
2 The following from enquires in the field, May, 1949: Gold Bridge 150; Minto 300; LaJoie Falls construction camp 300.
Both Bralorne and Pioneer are company towns in which the normal civic functions are carried on by the company instead of by an elected administration. It is the company's responsibility to supply medical facilities, water and to dispose of sewage and garbage. No land within the townsites is privately owned by residents. The general stores at both towns are company-owned and operated, although concessions are given for restaurants. Many services which one would expect to find within the communities are lacking due to the bar against private enterprise.

This anomalous feature, the company town, is a social and economic adjustment of large scale business enterprise to the necessity of town settlement in a pioneer region. Unlike the typical promiscuous development of towns, Bralorne and Pioneer have been planned and built by single agencies. This planning is strongly evidenced by the uniformity within the pattern of the settlements.

Most houses are closer to minimum rather than to maximum building standards. One reason for this situation is the difficulty of transporting materials. The reluctance on the part of the companies to spend large amounts of money on non-earning assets is another reason. Their hesitancy is heightened by the diminishing and exhaustible nature of the resource which supports their activities. The houses are spaced close together in order to conserve on piping for water and sewage.
PIONEER

Pioneer is roughly sectionalized into four areas because of the scarcity of suitable ground for building in the narrow, steep-walled valley. Two parts of the town are on the valley floor and two others occupy hillside benches.

The heart of the little settlement is around the mine portal. This built-up area is within an arc formed by Cadwallader Creek. In addition to the industrial buildings mentioned in the section on "Mining", there is a general store, a post-office, a bank, a curling rink and a bunkhouse, all on the north side of the creek. Most of the lumber for construction of these and other buildings has been cut locally in the Hurley and Bridge River Valleys.

Upstream a short distance, where the valley widens slightly, buildings occupy both sides of the creek which is spanned by two bridges. On the north bank, the road traces a crescent around the tennis courts. A number of houses have been built on the perimeter of this crescent. On the south bank are bunkhouses, a cookhouse, hospital, church, skating rink and the community hall. A long row of houses are all of a two-storied duplex design adopted by the company to economize on both space and materials.

The elementary school and a few houses are on a narrow bench about 100 feet above the mine portal. The houses are privately owned by people desiring independence from company rents and controls.

Another hundred feet higher on a second bench are 20
company houses. The baseball field is above on the highest bench of all. A covered stairway as well as a road gives access to the first two levels.

The water supply at Pioneer comes from Cadwallader Creek and a small nearby tributary. When P.E. mine operates, the water in Cadwallader Creek is polluted and Pioneer then draws its water from President Creek. Sewage disposal is by septic tanks, but sink water drains into Cadwallader Creek.

Bralorne

Bralorne is divided into three townsites. No. 1 and No. 2 are on the floor of the old U-valley. The mine portal and the various industrial buildings are below No. 1 townsite, within the post-glacial notch cut by Cadwallader Creek. Recently, a new building area has been selected below the main rock bench at the Bradian entrance to the mine.

The triple division is the result of a shortage of flat ground. The successive exhaustion of building space caused the establishment of the second and third building areas.

The typical house at Bralorne is a wooden frame bungalow of three or four rooms. As at Pioneer, there is full indoor plumbing. The simplest material for roofing, an asphalt-type paper, is commonly used. Behind each dwelling is a shed to contain wood which is the chief fuel.

Most of the public buildings are at No. 1, the original townsite. On either side of the highway which forms the main street are a general store, clothing store, drug store, bank, community hall, post-office, bunkhouses and "dry". The
latter is the change building where the miner's clothes are left to dry when he comes off shift. Special lamps are provided there to give the underground worker the ultra-violet rays of out-of-doors sunlight.

The company offices are the most imposing structure of the townsite. Other offices are those of the B.C. Telephone Company, the Bridge River Power Company, and Neal Evans Transportation Company. Some 20 houses and an apartment block are above the highway on two short streets.

Most of the executive staff live in the Lower (No. 1) Townsite where public facilities are most convenient and housing is best.

The No. 2 townsite is a half mile up the highway opposite the junction of Noel and Cadwallader Creeks. About 75 houses are built facing two streets which lie below the main road. The buildings are neat in appearance with each lot separated from its neighbour by a fence.

In this No. 2 or Upper Townsite is a service station, church, dentist's office, hospital (now servicing Pioneer and LaJoie Falls Construction camp as well as Bralorne), the residence and office of a provincial policeman, baseball diamond, tennis courts, skating rink and a combined elementary school and high school. Pioneer's high school students commute daily to this school. The curling rink is located half way between No. 1 and No. 2 Townsites.

At the Bradian entrance to the mine, on sloping ground, 30 company houses, a dry and a bunkhouse have been constructed
recently. A covered stairway and a road give access to the main highway. There is a restaurant but no other commercial building. The recent construction does not represent entirely an expansion of the mine. Instead, it is part of the company's policy to replace single men with family men. A more stable supply of labour is gained by this measure.

As at Pioneer there are a number of privately-owned houses. Some of these are on company property. The buildings are for the most part rough shacks or log cabins. Some are well built and neatly kept, but others are dilapidated, forlorn looking structures. Most lack plumbing facilities. The majority of privately owned houses are across the creek from No. 1 Townsite on the road which leads to Pioneer dam. A Chinese laundry which services Bralorne is also located there. A few more "squatters" live at Bradian and some are northwest of No. 2 Townsite on a lower flat locally called "Honeymoon Hollow".

Bralorne's water supply comes from Blackbird Creek. Sewage is disposed of septically in a cesspool. Special precautions are taken for insulating plumbing in buildings because of cold winter weather. During one season an interlude of below-zero temperatures froze Bralorne's shallow reservoir so completely that water had to be dispensed from house to house.

At both Bralorne and Pioneer there is a keen interest in sports and a general community spirit. The isolation plays a large role in fostering such interest and the feeling
of "no place to go" introverts activity. The curling and skating rinks have natural ice during the months of December, January and February, which have average temperatures below freezing. Skiing, too, is abetted by the climate, and at Bralorne there is one of the largest clubs in the province. Basketball and badminton flourish in the community halls. In baseball as in all other sports there is a friendly rivalry between the towns.

However, the remoteness of the settlements and the small population is a disadvantage for cultural life. Outlets along these lines are very limited. Nevertheless, there are opportunities for local talent in the dance orchestras, church choirs and the occasional concert. Twice weekly movies and most other performances are held in the community halls. There is a small public library in each hall.

Hospital facilities are a necessary provision because of the hazardous character of mining and the isolated position of the two communities. At present, Pioneer hospital is closed but the well staffed and well equipped institution at Bralorne takes care of both communities.

Bralorne and Pioneer, although only three miles apart, have grown up independantly of each other. Ideally if the two mines had been owned by one company, a single townsite might have been built on the rock bench half way between the workings. There would have been the advantages of a larger community without the present duplication of services. Such a combination is impractical now, but in the event of new
mines coming into production, mining companies might give consideration to the idea of consolidated townsites.

There is a measure of dissatisfaction with the authority exercised by the companies over the settlements at Bralorne and Pioneer. A people initiated in a democratic and free enterprise system tend to resent bureaucratic control, however benificent. The residents lack any effective voice in municipal affairs. All local purchasing must be done in the company-owned stores where prices are free from normal competitive control. Many people deplore the payroll deductions for company-provided services. It is not intimated that the companies are guilty of maladministration. On the contrary, the communities are generally well-run and they enjoy many facilities which are not necessarily available in "open" towns. Nevertheless, there is dissatisfaction because some people resent their employer being also their landlord, merchant and mayor.

OTHER SETTLEMENTS

Ogden is less than a mile north of Bralorne. The settlement is in two clusters, one around the hotel which has been built as close to Bralorne as possible and the other, farther north where the mountainside is less steep. As well as the hotel, there is a liquor store, general store, clothing store, shoe repair shop, hairdresser's and dry-cleaning establishments, service station, taxi stand and cafe. Their location, as is the case of other businesses as far as Gold Bridge, is due to the prohibition of private enterprise within the
company towns of Bralorne and Pioneer. A few houses, mostly shacks and log cabins, are spread out above and below the highway.

Brexton (or Fish Lake) is a hamlet four miles from Bralorne. Truax Mountain towers magnificently above the tiny settlement. The land is owned by B.R.X. Consolidated Mining Company which originally built a few houses there in connection with their mines. Today, about seven houses and a hotel are occupied, but abandoned buildings are witnesses of more prosperous days. The water supply is drawn from a ditch which taps Fergusson Creek. B.R.X. Camp is nearby.

Gold Bridge is 8 miles from Bralorne and a half-mile from the Hurley-Bridge River junction. The settlement is at the foot of the steep hill where the highway enters the Bridge River Valley. Gold Bridge was originally surveyed as a government townsite when it was hoped that such prospect mines as the Golden Gate and the Arizona would develop. This expectation proved to be incorrect, but a spacious hotel, theatre and a number of stores were built before the boom collapsed. Still persisting are a few businesses which cater some to highway traffic and some to trade at other settlements, chiefly Bralorne and Pioneer. There is a taxi stand, service station, two cafes, hotel, general store, laundry and bakery. The government telegraph office and public works headquarters are in Gold Bridge.

1 The water supply for the town is drawn from Fergusson Creek.
Since work was begun on the LaJoie Falls Storage Dam, the town has had a temporary boom from the influx of construction workers.

Haylmore, nearby on the Hurley River, is the centrally located Mines Recording office where claims are registered. "South Fork" is the name used locally for 8 houses built beside the mouth of the Hurley River. Some of the buildings are occupied by dam workers.

At LaJoie Falls Dam, a temporary camp has been built to provide for some 300 construction workers. The camp is on the north side of Bridge River, close to the dam site. Fifty or 60 buildings made of shiplap and tarpaper are on the gently sloping sidehill about 200 feet above the river channel. As the dam construction is a two year project, the camp is likely to be occupied for that period.

Minto is located on flat, gravelly ground at the mouth of Gun Creek. It was built originally as a company town for Minto Mine. The mine is now defunct but the town has been taken over by the Minto Trading and Development Company.

The water supply for Minto is taken from Girl Creek on the opposite side of Bridge River rather than from the more distant Gun Creek. The pipes are laid across the bed of the river.

There are approximately 65 houses in the town and of these about 20 have been sold to private individuals.

Wayside Mine between Gold Bridge and Minto is a settlement which is described under "Mining".
Casual travellers as well as mining men make use of the store, hotel and automobile service station. Sawmill operators from the Tyax Mill and construction workers from LaJoie Falls Storage Dam solve the housing shortage by living at Minto. During world war II, enemy-alien Japanese were sent to Minto. They have been evacuated gradually from the town and today only about 75 of these people remain.

The summer cottages at Little Gun, Big Gun and Tyaughton Lakes have a temporary population, mostly Pioneer and Bralorne people, during the July and August recreation season.
Fig. 46:
Bralorne from south side of Cadwallader Creek. Note industrial buildings in foreground and No. 1 Townsite on bench

Fig. 47:
Hospital, Bralorne

Fig. 48:
Typical three-room dwelling No. 2 Townsite, Bralorne
Fig. 49:
pioneer. Industrial buildings beside Cadwallader Creek. In background note houses on bench.

Fig. 50:
Two-storied duplex dwellings at Pioneer.

Fig. 51:
Gold Bridge. Note Bridge River; also road to Gun Lake and LaJoie Falls.
SETTLEMENT IN THE CADWALLADER CREEK AREA

LEGEND

- Main Road
- Placed Road
- Side Road
- Primitive Road
- Bridge
- Intermittent Stream
- Marsh
- Commercial Area
- Industrial Area
- Buildings
- Shanties
- Tunnel
- Mine Dump
- Water Tank
- Pipe Line
- Place Line

SOURCE (HERE)
MAP 3684-A 1935
CANADA DEPT. OF MINES-RESOURCES
BUREAU OF ECONOMIC GEOLOGY
CHAPTER XVIII

CONCLUSION

The foregoing study has shown the correlation between the natural environment and the occupance within the Bridge River Region. The conclusion reviews the outstanding relationships. In addition, the concluding remarks are meant to emphasize the inter-connection and in certain cases the impingement of industrial activity. Where possible, solutions to economic problems are suggested. The future development of the region is broadly outlined.

The mountainous Bridge River country lies on the eastern flanks of the heavily glaciated Coast Range of British Columbia. The hanging valley of Bridge River is the deepest erosional feature of the district. The mountain environment, the common problem of transportation and the dominant mining economy gives a geographical unity to the region.

The climate is mainly continental in character because of the interior position. Many special climatic conditions prevail as the result of high relief. In the chief area of settlement the annual average temperature is 40° and the average precipitation is 24 inches. Four months have average temperatures below freezing.

Most of the mountains are rugged, but to the north where folding has been simpler and where the topography is
carved upon soft weathering, less resistant rocks, the mountain forms become more subdued in a transition belt between the Coast Range and the Chilcotin Plateau. Tyaughton Creek drains from these mountains.

The precipitation is relatively low in the transition belt of mountains. The broad, smoothly rounded ridges are covered with grass and only lightly forested. Sheep and cattle as well as wild animals are able to feed there in summer.

In the transition belt there is no permanent settlement, but a few transient sheepmen, cattlemen, Indians, big-game hunters and trappers use the network of trails which follow the creeks. Prospectors also frequent these mountains because of the mineralization.

Unless exploitable mineral wealth is discovered, the economic destiny of the transition belt of mountains probably will continue to be grazing and hunting, with trapping a very minor activity.

The most satisfactory use can be made of the area by solving its indigenous problems. Only a biologist is capable of planning the restoration of the depleted game resources, but a few preliminary steps can safely be suggested.

An inventory of the game population with an assessment of the carrying capacity of the winter and summer ranges is required. Special attention should be given to the mountain sheep. If they are being infected by domestic sheep, the ranges of the latter should be adjusted to separate the two
as much as possible. Sheep herders should be discouraged from shooting bears unless sheep actually are being molested. However, a judicious control of predators is to the interest of the game population. Finally, the number of registered guides which operate in the area might be limited to help control the bag of big-game animals.

There is some conflict, mostly through misunderstanding, between cattle and sheep interests. The complaint is made that sheep crop the grass so closely that cattle cannot feed. This may occur where the moving flocks of sheep transgress on the cattle ranges of Beaver Creek and Upper Relay Creek. It does not affect the Spruce Lake Range which is used only by cattle. If sheep are kept dispersed rather than allowed to band, they are no harder on the range than cattle. Then, too, sheep are able to feed on the short wiry grass at high altitudes leaving the longer grass on the lower slopes for cattle.

The licensed guides contend that domestic sheep spoil the feed for game. Aside from the veracity of the claim, it has no bearing upon the animal population. There is plenty of range for both game and sheep in summer. The population of wild animals is limited by its winter range, not by its summer range.

It is the writer's opinion that these scenic mountains on the edge of the Chilcotin Plateau might well be considered for a provincial park. It has been suggested by the game authorities that a new game reserve be created for mountain
sheep. It might be that such a reserve could be combined with a mountain recreation area. The district offers outstanding opportunities for trail riding and the climate is of the dry belt type appreciated by coast residents. The area is within a day’s drive of Vancouver via Moha and the recently-built road to the Elizabeth Group.

Settlement in the Bridge River Region is in the valleys of Cadwallader Creek, Hurley and Bridge Rivers. The basic industry supporting population is mining, but other industries are lumbering, agriculture, tourism and the production of hydro-electric power. Trapping is a relatively unimportant part-time activity.

Modern occupancy is the outcome of an historical development through an Indian era, placer mining era and lode mining era. This sequence of adaptations to the Bridge River environment resulted in the discovery of Bralorne and Pioneer mines and the building of a highway to supply them.

The inhospitable environment, while militating against other industries (with the exception of hydro-electric power) provided a strong basis for mining.

The mineralization of the region is believed to be the result of the Jurassic mountain-making revolution with its accompanying granitic intrusion. Bralorne and Pioneer gold mines are in the vicinity of the eastern contact of these intruded rocks where they have been exposed by deep erosion.

Most of the mining at Bralorne and Pioneer is by shafts because the ore bodies lie below the level cut by Cadwallader
Creek. The ore is produced largely by shrinkage and cut and
fill methods which are best suited to the character of the
gold-quartz veins.

The two properties occupy an important position in the
gold mining economy of British Columbia. Bralorne Mines is
the leading producer of gold in the province and Pioneer Mine
ranks fourth. Together they support a population of about
1500 people in the towns of Bralorne and Pioneer.

The development of the two mines has resulted in the
contemporaneous evolution of a modern transportation system,
and a forest industry largely subsidiary to mining.

The Neal Evans Transportation Company operates a fleet
of trucks over the 55 mile long Bridge River highway which
connects with the Pacific Great Eastern Railway at Shalalth.
Most of the company's business is supplied by Bralorne and
Pioneer Mines. Transportation charges are high because of
the rugged terrain and the isolated position of the region.
The incomplete road link between Shalalth and Lillooet is a
hindrance to most industry within the district.

A few tourists use the Bridge River highway to visit the
region for hunting and fishing. A number of lodge-owners and
licensed guides capitalize on the mountain scenery and wild
life by catering to the visitors.

A small scale forest industry was called into being as
a result of mine requirements for lumber, stulls and lagging.
Ponderosa pine, fir, spruce and Lodgepole pine are the chief
The Tyax Mill of the Blackwater Timber Company is the largest in the district. It is located at Mowson Lake in the best stand of merchantable timber. This mill supplies the mines and as well exports Ponderosa pine which is of high enough value to bear the cost of shipment out of the district. There is about a ten year supply of timber in the area near the mill.

The forest resources are small, but the industry should not be appraised in terms of its diminutive size. Its importance lies in the vital role which it plays in connection with mining. At present, there is little organized protection against a large scale fire which could strip the district bare of trees. There is a real need to safeguard the resource by adequate measures of forest fire protection. The forest resources can be administered best as a complementary asset to the mineral resources.

The Bridge River Region is considered to be a promising field for prospecting. As well as gold, deposits of mercury, tungsten, antimony, copper and chromite have been discovered. Non-metallic deposits are limestone, talc, asbestos, magnesite and pumice. It should be noted that the present producing mines were discovered over 50 years ago, and there has been continuous prospecting activity since with little productive result. It may be that these efforts would be rewarded better elsewhere along the eastern contact of the Coast Range batholith.

The primary basis for settlement in the Bridge River
Region will disappear unless new mines are discovered. Pioneer and Bralorne mines have an assured life of only eight years each. If new discoveries come, they will likely be the outcome of thorough and intensive prospecting by well-trained personnel. The government might increase its participation in the search for new mines and do all in its power to stimulate private enterprise in the same endeavor.

Of the non-metallic deposits, perhaps pumice stands the best chance of commercial exploitation. The demand for pumice as a construction material is increasing. The high cost of transportation is the main bar against the development of local pumice deposits. The problem might be solved by using the abundant electric power to manufacture the required product on the spot. This less bulky, higher value product could then be shipped.

Special factors in the topography and climate make the Bridge River Region the scene of British Columbia's most important power project. The water is obtained from Bridge River which drains an extensive mountain district of fairly abundant precipitation. The proximity of the hanging valley of Bridge River to Seton Lake makes available a high head of water. The electrical energy produced in the generating station on Seton Lake is transmitted to the Lower Mainland. Eventually, the project will develop 600,000 h.p.

Because of high relief and steep slopes, artificial water storage is necessary for efficient use of Bridge River. A storage dam has been constructed at LaJoie Falls and a
second high dam is planned for the valley.

The B.C. Electric Company has long held flooding rights in the Bridge River Valley and this has been one of the central facts in preventing a greater development of agriculture. Faced with this restriction and generally unfavourable environmental conditions, agriculture has little future in the region.

Flooding for water storage will also bring losses to trapping, forest industry and tourism. The losses to these industries are small when weighed against the gain which will result from large scale production of electric power.

Very few workers are required to produce hydro-electric power. Once the great project is completed, it will not bring settlement to the region.

Three quarters of the present population live at the two company towns, Bralorne and Pioneer. These settlements enjoy the conveniences of most small towns of British Columbia, in spite of the remoteness of their location. Their destiny and that of the other little communities rests almost entirely with the mining economy. This unique industry is never permanent and never can be fully planned. Its future and that of settlement will be largely a result of fortuitous circumstances which could make the district prosperous for years to come or turn it back into a "valley of dead mines".

The potentialities for hydro-electric power may prove the central factor in the economic geography of the region.
Unlike the minerals, this resource is measureable and inexhaustible. Bridge River power will play a major role in Lower Mainland industry.
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APPENDIX

PHOTOGRAPHS.

The following air photographs were obtained from the Air Surveys Engineer, Lands and Forests Department, Victoria, B.C.

Figure 6 XL33:34
               BC 390:34

Figure 7 XR138:55
               BC 566:70

Figure 4 XL138:56
               BC 567:17

Figure 5 XR 138:62
               B.C 566:77

The following photographs were obtained from the Topographic Division, Lands and Forests Department, Victoria, B.C.

Figure 8 2-33-Y48

Figure 9 1-15-Y48

Figure 10 8-17-Y47

Figure 11 10-31-Y48

Figure 12 8-29-Y47

Figure 13 6-11-Y47