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SECOND PRELIMINARY MAP

A S H C R O F T
BRITISH COLUMBIA

(MAP AND DESCRIPTIVE NOTES)

BY

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ASHCROFT MAP-AREA,
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(Descriptive Notes)

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Illustration

Second preliminary map --- Ashcroft, B.C.

INTRODUCTION

Ashcroft map-area lies between latitudes 50 and 51 degrees and longitudes 121 and 122 degrees, with the town of Spences Bridge about 8 miles southeast of its geographical centre. It occupies parts of both the Interior Plateau and Coast Range physiographic provinces, the former including all of the area west of Fraser River as well as Lytton Mountains to the east. The remainder is typical of the Interior Plateau, with broad upland areas and deeply incised valleys.

Much of the map-area lies within the "dry belt" of southern British Columbia, and the vegetation and climate are, for the most part, characteristic of that belt.

Rock outcrops are generally abundant, particularly along the slopes of the river valleys as well as on the higher ridges. In the uplands of the plateau region, however, heavy deposits of glacial drift obscure much of the bedrock. The entire area has been glaciated, and glacial striae have been found on some of the highest peaks.

GEOLOGY

SEDIMENTARY AND VOLCANIC ROCKS

The map-area has contributed a bountiful record of sedimentary and volcanic rocks from late Palaeozoic times to the present. The oldest, those of the Cache Creek group (1,2)¹ of late Palaeozoic

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Numbers in brackets are those of the map-units appearing in the map legend.

age, form three unconnected belts. The largest of these occupies the medial part of the map-area, varies in width up to 20 miles, and is more than 40 miles long, including its extension beyond the northern boundary of the area. The two smaller belts lie west of Fraser River, one near the southern boundary of the map-area, the other commencing about half way between Lytton and Lillooet and trending northwest beyond Lillooet. The Marble Canyon limestone member of the group (2) is well exposed along Pavilion Lake and in Pavilion Mountains, as well as south from Upper Hat Creek to Blue Earth Lake and Cornwall Mountain. It is composed of massive, blue-grey limestone in part altered to light coloured marble. In places only was it possible to recognize bedding. Fossil foraminifera were collected from two localities in this limestone, and indicate an Upper Permian age.

The Triassic period is represented by rocks of the Nicola group (3), which are well exposed on the east side of Thompson River near Basque, and again east of Ashcroft along Thompson River to the eastern boundary of the area. These rocks consist mainly of green, andesitic and basaltic flows, with some red andesitic lavas and greenish grey agglomerates and tuffs. At Basque a bedded series of sedimentary and volcanic rocks includes a fossiliferous limestone of Upper Triassic age. The group has been intruded by the granitic batholith that outcrops to the east (13), and for the most part occurs either as small roof pendants within, or as relatively small areas along the border of the batholith. It has, therefore, undergone considerable crushing and metamorphism. Between Spatsum and Basque the bedded section referred to above shows persistent dips to the north of from 15 to 40 degrees.

On both sides of Thompson River may be seen a series of conglomerates, shales, and sandstones, (4), unconformably overlying the Nicola group and occurring in a narrow, synclinal belt along the river valley in the vicinity of Ashcroft. The sandstones and conglomerates are greenish grey, and the sandstones are generally arkosic. The shales are black, and in many places carbonaceous. Shales of this group in the Black Canyon and on Minibarriet Creek have yielded ammonites of Middle and Upper Jurassic ages. Conglomerates of this group overlie unconformably the granitic rocks of the batholith to the east.

Rocks of Lower Cretaceous age have numerous representatives within the map-area, and it was possible to determine the relationships between those in contact with each other. Specimens of Aucella collected from rocks (5) lowest in the stratigraphic sequence were examined by F.H. McLearn of the Geological Survey and determined as most probably of earliest Cretaceous age. These rocks occur in two, northwest-trending belts west of Fraser River and have been intruded by the Coast Range batholith.

The Jackass Mountain group (6) contains Lower Cretaceous marine fossils as well as plant remains of Aptian (late Lower Cretaceous) age. These rocks outcrop along almost the entire length of Fraser River within the map-area, diverging from the valley only at the extreme north boundary. In the south they form a narrow selvage along the river, but widen out near Lillooet and are well exposed on Fountain Ridge and to the northwest across Fraser River. These rocks are in faulted contact with all adjacent groups, so their stratigraphic relationships cannot be seen. They are much folded and faulted, the folds in some places exerting an influence on the course of Fraser River.

About mid-Lower Cretaceous time volcanic activity was dominant in the area, resulting in the deposition of the Spence Bridge volcanic group (7). This group occupies nearly 500 square miles of the map-area and is more than 5,000 feet thick. Interbedded with the volcanic rocks are conglomerates and some tuffaceous sandstones that carry plant remains of Aptian age. The lavas are mainly andesitic, with augite as the chief ferromagnesian mineral. The group occupies a belt 2 to 16 miles wide that extends northwesterly from just below the mouth of Spius Creek on Nicola River to beyond the northern boundary of the area.

The overall structure of the Spence Bridge group is one of gentle folds with dips varying from 10 to 40 degrees. The strike is variable, and much of the group lies horizontally or nearly so. The rocks on the northeast slope of Nicola Valley tend to dip gently to the southwest and probably form the northeast limb of a broad syncline. The group has suffered more regional metamorphism than the volcanic rocks of Tertiary age, appears more altered, and is commonly traversed by narrow seams of calcite.

The Spence Bridge group is succeeded by about 500 feet of sedimentary material (8) of continental origin. Fossil leaves collected from a 3-foot bed of shale were identified as of Albian (latest Lower Cretaceous) age by W. A. Bell of the Geological Survey, and are similar to those collected by H.M.A. Rice at Kingsvale in the Princeton map-area to the southeast. Conformably overlying these strata is a series of about 3,000 feet of mainly amygdaloidal and vesicular basaltic and andesite flows (9). These rocks are well exposed in the higher regions of the Nicoamen Plateau between Nicola and Nicoamen Rivers. In the Princeton area Rice has called this assemblage of sedimentary rocks and amygdaloidal lavas the Kingsvale group¹, a name that will be applied to the similar rocks in this

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Rice, H.M.A.: Princeton Map-area, Geol. Surv., Canada, Memoir (in press)

The Kingsvale group enters the map-area from the southeast and extends northwesterly along the Nicoamen Plateau as far as Thompson River. No counterpart of this group was recognized to the west and northwest in the Scarped and Clear Mountains. Along the line of Prospect Creek and Nicoamen River rocks of this group overlap the granitic complex (14) of the Lytton Mountains.

Just above Lytton on Fraser River is an assemblage of freshwater conglomerate and shales, with some interbedded tuffs and agglomerates (8a) from which plant remains of Albian age have been collected. The stratigraphic relationship of these rocks with those of adjacent groups is not clear because of faulted contacts. Probable correlation is with sediments of the Kingsvale group or with the Pasayten group of the Hope map-area to the south.

A small area of conglomerate and sandstone (10) is exposed at the eastern border of the map-area near Walhachin. These rocks outcrop more extensively in the Nicola map-area to the east, where they were studied by W. E. Cockfield¹, who mapped them as Lower Cretaceous or later. He

¹

Geol. Surv., Canada, Paper 44-20, p. 3 (1944).

had obtained no definite fossil evidence of age, but the relationships with certain granitic stocks indicated a possible Lower Cretaceous age.

Sedimentary rocks of Tertiary age (11) occur in a number of widely separated localities in the northern third of the map-area. The occurrences are small, except for one belt that stretches northward as a band 2 to 4 miles wide to beyond the northern boundary of the area. In the Trachyte Hills and in the Upper Hat Creek area these rocks are overlain by Tertiary lavas. No fossils were found to date these sediments more closely. Near the Indian Village on Pavilion Creek patches of Tertiary sediments are exposed on both sides of the valley, and about $2\frac{1}{2}$ miles south of Spences Bridge a very small patch of Tertiary sediments outcrops in a dry gully at an elevation of 2,200 feet. The smaller areas consist mainly of buff, green and red, light-coloured shales and sandstones, whereas green, brown, and red sandstone and conglomerate, in places almost unconsolidated, predominate in the larger area referred to above.

The great plateau in the northeast corner of the map-area is floored with lava flows of Tertiary age (12). Fossil leaves obtained from interflow sediments near the base of the series are of early Tertiary age. The flows are mainly basaltic lavas, with some rhyolite and andesite and associated breccias and tuffs. The volcanic rocks forming the plateau may be followed south across Thompson River to Glossie and Forge Mountains. They are very little disturbed, dips rarely exceeding 15 degrees. The rocks are much less altered than the Cretaceous flows, from which they can be distinguished readily. Several small outliers west of the main area cap some of the higher hills. One larger belt, on the eastern flank of Clear Mountain Range, occupies a considerable part of the valley of upper Hat Creek.

INTRUSIVE ROCKS

The intrusions of the map-area are mainly of granitic batholiths and stocks. The batholith (13) that outcrops over a wide area east of Ashcroft ranges in composition from granite to granodiorite and diorite. It intrudes rocks of Upper Triassic age (3) and is overlain unconformably by others of Middle and Upper Jurassic age (4). Rocks of this complex form the host for the copper deposits of Highland Valley.

The granitic intrusion (14) forming the Lytton Mountains consists mainly of granodiorite, but includes some diorite. The stocks occurring in Mount Martley and at the northern end of Pavilion Lake are quartz diorites. These granitic intrusions (14) have been emplaced in pre-Lower Cretaceous time, as they were eroded to supply granitic detritus to sedimentary members of the Spence Bridge and Kingsvale groups.

The granodiorite mass occupying the southwest corner of the map-area is part of the Coast Range batholith (17) and intrudes rocks of earliest Lower Cretaceous age (5).

Certain other intrusive rocks of different character are exposed west of Fraser River. A persistent band of serpentine (15) occurs along the contact of late Palaeozoic (1) and early Cretaceous (5) groups in the southwest corner of the map-area. Closely associated with the serpentine near Skihist Mountain is a mass of hornblende syenite and hornblende granodiorite (16).

Small bodies of granodiorite and syenite (18) intrude rocks of the Jackass Mountain group (6). These may be part of the main Coast Range batholith (17) but at no place were they found in contact with it.

Lenses and patches of metamorphosed and schistose rocks (A) occur within the granitic intrusions. Some of these are identifiable as Cache Creek, but in general no specific correlation could be made. The largest single area of such rocks is on the southern slope of the Scarp Mountains along the Canadian National Railway tracks east of Lytton.

Near the mouth of Venables Creek and farther north near Cornwall Creek are several pods and lenses of limestone (B) that resemble in many respects the limestone of Marble Canyon. However, fragmentary fossils found in one such lens (B1) indicate a Mesozoic age.

ECONOMIC GEOLOGY

PLACER MINING

Considerable placer mining for gold was done years ago along Thompson and Fraser Rivers within the map-area, but little has been attempted in recent years. However, individual miners still work sporadically along bars and old channels of Fraser, Thompson, and Nicola Rivers and their tributary streams. One such operation, which has met with some success during the past two seasons, is that by Mr. Leonard of Lillooet, who has been working ground along Fraser River near the mouth of Fourteenmile Creek above Lillooet.

LODE MINING

During World War I considerable interest was shown in the copper deposits of Highland Valley 20 to 25 miles by road southeast of Ashcroft. No active work has been done on these properties since 1917, but prior to that several properties were opened, and the O.K. mine (No. 1)¹ was brought into production. The mineralized area extends beyond

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Numbers refer to properties listed on map margin.

the boundaries of the present map-area, but those properties occurring within this area are the O.K., Kathleen, Highland, Transvall, and Glossie.

The greatest amount of work has been done on the O.K. property, which during the period of activity mined and concentrated 10,000 tons of ore. The ore contained 3.6 per cent copper and the concentrate 20.33 per cent copper and 1.19 ounces silver a ton. The deposit lies along a fault zone in the granitic complex, strikes north 80 degrees east, and dips vertically to steeply south. The copper-bearing solutions caused intense sericitic alteration of the wall-rock for a width of several feet. At the workings as much as 10 to 12 feet of this altered zone has been mined. The main fissure contains 2 to 4 feet of gouge, and this contains most of the ore, which consists of chalcopyrite in a gangue of quartz and altered wall-rock. Secondary copper minerals such as azurite, malachite, and chalcocite are conspicuous along the walls of the old open-cut workings. The Kathleen claim (No. 5) lies about 3 miles south of the O.K. mine, and carries ore of a similar character.

At the Transvaal (No. 12) and Highland (No. 11) properties similar copper minerals occur in narrow discontinuous veins that carry a high percentage of black tourmaline, variety schorlite. The amount of tourmaline varies from 10 to 95 per cent. The copper minerals are not as abundant as at the O.K. property, and the wall rocks are not sericitized.

At the Glossie property (No. 13) mineralized vein matter on the dump near the shaft contains chalcocite, bornite, chalcopyrite, and specular hematite in a gangue of calcite, quartz, and crushed granite. In 1915, 21 tons of selected ore from the Forge shaft assayed 0.03 ounce gold and 2.96 ounces silver a ton, and 12.62 per cent copper.

Specular hematite occurs at several places in the batholith, the most prominent being the deposit (No. 3) east of Toketic. Here the hematite occurs in a shear zone striking north 75 degrees east, dipping 34 degrees southeast, and lying entirely within the granitic mass. The hematite occurs as narrow stringers following the shear zone or as a cement between broken fragments of the wall-rock. Some copper minerals occur with the hematite. No work has been done on this deposit for many years.

Chromite deposits associated with lenses of serpentine occur northwest of Ashcroft Manor (No. 15), near Cache Creek settlement (No. 16), and, farther north, on Scottie (No. 19) and Ferguson Creeks (No. 18). The latter two are by far the most important. They have been known since the turn of the century, and during World War I an unsuccessful attempt was made to work the Scottie Creek deposit. In 1929 the Consolidated Mining and Smelting Company optioned the property and carried out a program of exploration, but no work has been done since.

The ore occurs as lenses and pods of massive chromite; as a rough interbanding of massive chromite and serpentine; and as disseminated chromite in the serpentine. The Ferguson Creek deposit consists of lenses of disseminated ore with a few small seams of massive chromite.

None of the ore is of direct shipping grade, and all of it would have to be concentrated. The Ferguson West ore appears to have the best chance of economic exploitation, as it yields the best product on concentration. However, due to the high iron content of the concentrate and high shipping costs to treatment centres it has not been economic to work the deposits.

Considerable work has been done on the property of Martel Gold Mines Limited (No. 2) which is situated about half way up Venables Valley. Altogether 1,035 feet of drifting, crosscutting, and sinking have been done on narrow lenticular quartz veins that occur in highly folded and metamorphosed shales and contain molybdenite and gold. A sample shipment tested by the Bureau of Mines at Ottawa assayed 0.015 ounce gold and 0.04 ounce silver a ton, 1.48 per cent molybdenite, and 0.11 per cent copper. Minerals occurring in the ore are molybdenite, chalcopyrite, pyrite, pyrrhotite, sphalerite, and arsenopyrite.

At the mouth of Kelly Creek on Fraser River above Lillooet narrow quartz veins (No. 20) occur in dioritic rocks, probably a part of the diorite stock that here intrudes greenstones, shales, and quartzites of the Cache Creek group. These veins were worked in the early days as the "Big Slide Mine", and during the period from 1933 to 1938 as the "Grange Mine". In 1934, 646.1 ounces of gold, 765 ounces of silver, and 4,669 pounds of copper were obtained from 3,330 tons of ore milled. The mill closed down in August 1935, and all operations ceased in 1938. The veins vary in width from 1 inch to 4 feet and average 8 to 12 inches. Minerals consist of pyrite, pyrrhotite, arsenopyrite, chalcopyrite, and minor amounts of gold and silver.

At the old Maggie Mine (No. 17), 18 miles north of Ashcroft on the Cariboo Road, considerable development and prospecting was done for copper on a sulphide deposit that occurs along a shear in the Cache Creek rocks. The sulphides are reported to have carried a small amount of silver, lead, and zinc, in addition to the copper. A very noticeable feature of the property is the highly coloured nature of the crushed and altered rocks, due to oxidation of pyrite. The amount of silica and pyrite present in the rocks close to the workings indicates strong hydrothermal activity in this area.

On the Fairview claims (No. 14) at Cabin Gulch, sphalerite (in part massive), chalcopyrite, and pyrite, occur in quartz gangue in fractures in the Nicola greenstones. The vein matter has not been traced for more than 10 or 15 feet in each of several widely spaced open-cuts.

A mineral deposit consisting of galena, sphalerite, chalcopyrite, and pyrite, and carrying low values in silver, lead, and zinc has been reported from the Coronation group (No. 22) on Barnes Creek.

Several properties lie west of Fraser River, mainly in the pre-batholithic rocks of the region but some in the granitic rocks themselves. The Serpentine and Summit groups (No. 7) contain numerous quartz veins in talc schists and quartzites. Most of these are parallel with the bedding or schistosity, and although many appear to be barren others are rusty and pyritiferous. One shear zone, at the border of a small body of granodiorite, contains pyrite and chalcopyrite, and some of the veins are reported to carry gold.

The Paystreak group (No. 8) contains several small quartz veins that lie conformably in the slates about 100 feet east of the main serpentine belt. No ore minerals were seen, but veins on the property have been reported to carry silver.

The Glacier group (No. 9) is underlain by slates, hornblende schists, talcose schists, and serpentine. The slates and schists are cut by dykes that are offshoots of the granodiorite mass to the northwest. Two quartz veins, ranging in thickness from a few inches to 6 feet, lie in the bedding planes of the slates and schists. Pyrite and arsenopyrite are common in the quartz, and values in gold and silver have been reported.

An antimony prospect (No. 10) is exposed in a shear zone that cuts the granitic rocks and may be traced for several hundred feet in them. The shear zone is approximately parallel with the contact between the intrusive and intruded rocks, and the heaviest mineralization occurs where the shear is nearest the contact. The ore mineral is stibnite, and occurs as veinlets irregularly distributed in the shear zone.

On the property of Lytton Gold (No. 23) a quartz vein has an estimated minimum horizontal length of 1,200 feet. The vein occurs in a coarse-grained, gneissic, biotite granodiorite that locally contains inclusions of gneiss and schist. The vein strikes on an average of north 55 degrees west, and dips 55 degrees to the northeast. It varies in thickness from a few inches to 6 feet, with an overall average of about 4 feet. A few, narrow, subsidiary veins were noted. The main vein is offset by east-striking faults along which the displacement is not more than a few tens of feet. The quartz is sparsely mineralized, in part

vuggy, and is locally sheeted parallel with the wall of the vein. No sulphides were identified, but the quartz is rusty in places. It is reported that during the past 25 years about a ton of gold ore has been mined.

NON-METALLIC DEPOSITS

Coal

The lignite deposit of interest in the area (No. 21) is situated on upper Hat Creek about a mile south of the branch in the roads to Pavilion Lake and Upper Hat Creek. The coal outcrops along the creek for about 2,000 feet, and is interbedded with semi-indurated shales, clays, and sandstones of early Tertiary age. No fossils have been found in the beds, but not far to the west of the creek light-coloured yellow and red shales are overlain by vesicular lavas of probable Miocene age.

As much of the immediate area is overlain by a thick mantle of drift a drilling program of considerable scope is necessary to prospect and delimit the area of the coal basin. In 1925 seven holes were drilled, four of which encountered coal. B. R. MacKay¹ examined the property in

1

Geol. Surv., Canada, Sum. Rept., 1925, pt. A, pp. 164-181 (1926).

that year, and estimated that the underground work and drilling had shown that an area of about 100 acres was underlain by coal. The aggregate thickness of clean coal, as indicated by the drill holes and workings, was calculated to be 111 feet 5 inches. On the assumption that this much underlay the 100 acres MacKay estimated that the area contained some 1,500 tons of coal per acre foot, with a total of 16,800,000 tons. However, the coal basin was by no means delimited by the drilling and in all probability occupies a larger area.

During the intervening years to the present about 7,000 tons of coal have been mined, mainly by Mr. Leonard of Lillooet who worked the mine during the winter months and sold the coal to local markets. The coal rapidly dries and disintegrates on exposure, leaving very little lump, a feature adverse to stockpiling and long distance haulage. In 1944 the property was optioned by the St. Eugene Mining Corporation who undertook to investigate its possibilities as a stripping operation. When the property was visited during the summer of 1946, it was closed, though there was evidence that a surface survey had been made recently.

About $2\frac{1}{2}$ miles south of the town of Spences Bridge, light-coloured, unconsolidated sandstones of Tertiary age outcrop in a dry gully at an elevation of 2,200 feet, and contain a lignite seam about 6 feet thick (No. 24). The coal is exposed for a distance of about 100 feet by two short adits driven into each side of the gully. The area of sedimentary rocks can only be of limited extent, as rocks of the Spence Bridge group outcrop on all sides within a few hundred feet of the coal seam.

Salines

Two saline deposits occur within the map-area, one of which has been of economic interest in the past. At the Basque Epsomite deposit (No. 4) high-grade epsomite occurs in four small ponds. The deposit has been worked at intervals from 1919, the latest production being in 1942, when 45 tons of technical salts and 20 tons of medicinal grade were shipped.

A full report on the deposit was made by M. F. Goudge¹. At that time it was

1

Mines Branch, Dept. of Mines, Canada; Investigations of Mineral Resources and the Mining Industry 1924, pp. 64-75 (1926).

estimated there were 75,500 tons of salts available in the four ponds. About 3,000 tons have since been removed.

The other saline deposit (No. 6) occurs on the mud flats and around the shores of Soap Lake on the mountain directly south of Spences Bridge. During each summer the lake partly dries up, leaving the mud flats and shore line covered with an encrustation of salts composed mainly of sodium carbonate. A full report was made on this occurrence by L. H. Cole².

2

Mines Branch, Department of Mines, Canada: Investigations of Mineral Resources and the Mining Industry, 1926, pp. 25-27 (1928).

Its economic possibilities are slight.