CACHE CREEK–NICOLA CONTACT
ASHCROFT AREA
(92I/11W)

John H. Ladd
Graduate Student
Department of Geological Sciences, Cornell University, Ithaca, N.Y.

ABSTRACT

Mapping southwest of Ashcroft has revealed Paleozoic Cache Creek Group rocks which are both undeformed and structurally complex and which have a wide variation in metamorphism and rock type. Triassic Nicola Group rocks are generally hydrothermally altered volcanic rocks and volcanogenic sedimentary rocks which dip steeply to the southwest, and the Jurassic Ashcroft Formation consists of gently dipping conglomerate and folded shales. The Cache Creek-Nicola and the Cache Creek-Ashcroft contacts are thrust faults, while the Nicola-Ashcroft contact is probably an unconformity. The Nicola Group was deposited, hydrothermally altered, and tilted before deposition of the Ashcroft Formation. The Cache Creek Group was thrust over both the Nicola and Ashcroft rocks. Copper showings are found in greenstone, in contact with a quartz diorite and microdiorite intrusion on Red Hill and in quartz syenitic bodies within the Cache Creek Group.

INTRODUCTION

Detailed mapping on a scale of 1:15 840 was completed during 1977 in an 80-square-kilometre area southwest of Ashcroft. This mapping fills a gap between areas recently mapped by McMillan (1975), Travers (in press), and Grette (unpublished map). The area was previously mapped by Duffel and McTaggart (1952) and Carr (1962) did detailed mapping in the southeastern portion. The rocks underlying most of the area are primarily Nicola and Cache Creek with lesser amounts of Ashcroft Formation and Tertiary (?) basalt. The Trans-Canada Highway bisects the region, and additional access is provided by the Cornwall Lookout road and a number of ranch roads.

STRATIGRAPHY

Nicola and Cache Creek Group rocks have been metamorphosed and sheared; consequently fossils are rare and cannot be used as a basis for correlation. Rocks were correlated by lithologic similarity to those mapped by workers in adjoining areas. Structural style and metamorphic grade aid in classification. In general, Ashcroft rocks are unmetamorphosed and gently folded; Nicola rocks are hydrothermally metamorphosed, tilted, and sheared; and Cache Creek rocks, while they show a wide range in structural complexity and degree of metamorphism, lack any indication of hydrothermal metamorphism. Cache Creek rocks are often intensely folded or chaotically deformed.

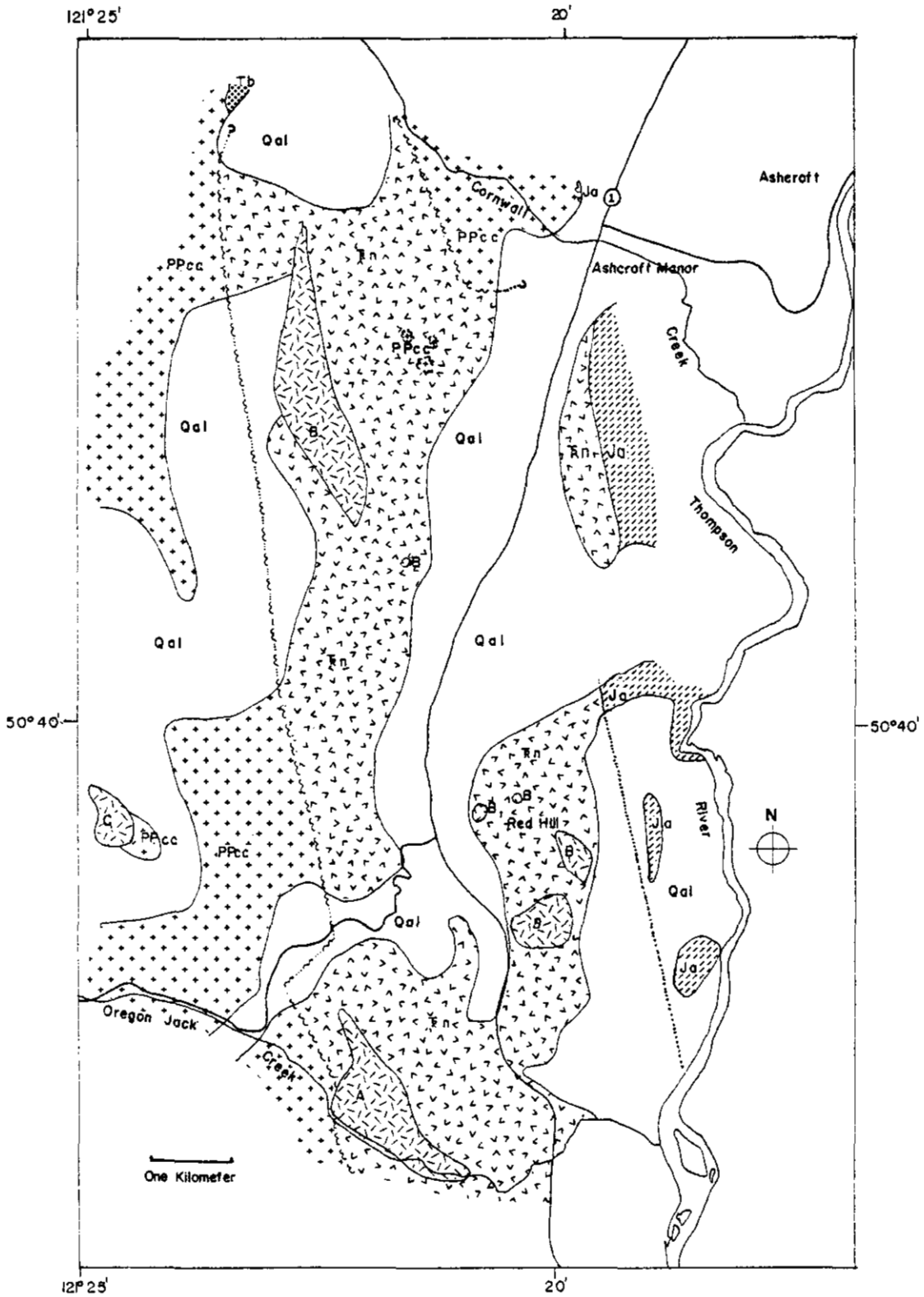


Figure 18. Geology of the Ashcroft-Red Hill area.

LEGEND

Qal — Quaternary Alluvium

Tb — Tertiary Basalt

Jo — Jurassic Ashcroft Fm

TRnv — Triassic Nicola Group

PPcc — Pennsylvanian–Permian Cache Creek Group

Plutonic Rock
- A. Alkaline Granite
- B. Quartz Diorite
- C. Quartz Monzonite

Contacts

— Approximate

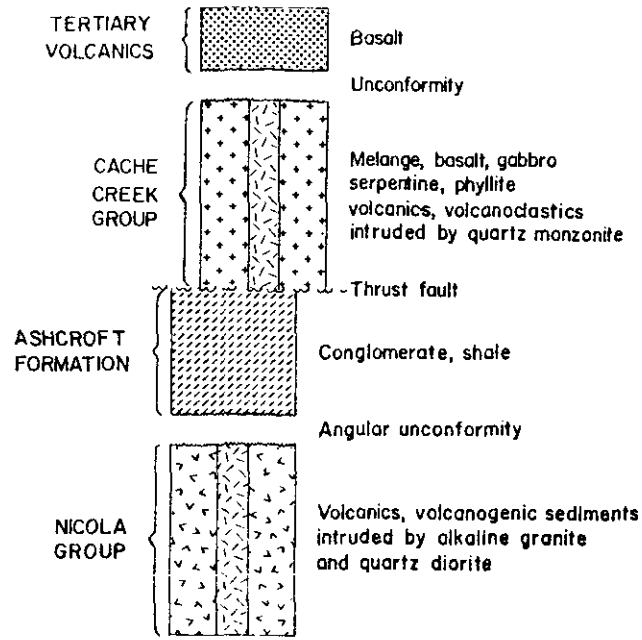
····· Buried

Faults

~~~ Approximate

~~~ Buried

TECTONOSTRATIGRAPHIC COLUMN



Cache Creek Group: The most extensive rock unit within the Cache Creek Group is a melange. Outcrops along Oregon Jack Creek (Fig. 18) consist mainly of highly deformed phyllite or black chert with blocks of mafic rocks up to 5 metres across. Melange near Cornwall Creek (Fig. 18) consists of large blocks (up to 100 metres by 500 metres) of massive basalt, clean limestone, and grey pure chert in a matrix of highly deformed and poorly indurated black argillite. The Cache Creek Group also contains large areas of massive mafic rocks, including fine-grained green or pale blue basalt and layered black and white metagabbro. These rocks are generally highly fractured, with two sets of fracture planes. Calcite veins in the fractures are offset and folded. Numerous outcrops of serpentinite occur in the northwestern section of the map-area. Between areas of mafic rocks and melange are bands of relatively undeformed grey phyllite and volcanic and volcaniclastic rocks.

Nicola Group: The Nicola Group here consists mainly of volcanic flows and volcanogenic sedimentary rocks. Stratigraphic complexities and the widely varying intensities of hydrothermal alteration make it impossible to draw a precise stratigraphic section. Numerous rock types are found within a small area and possible marker beds are rare and discontinuous. A workable stratigraphic sequence can be developed by grouping rocks which are commonly found in close proximity and then determining at what stratigraphic level these units usually occur. It should be stressed that units grouped in this manner both interfinger and grade into one another. The lowest unit in the section is comprised of grey mafic volcaniclastic rock that lacks epidote and is overlain by a thick sequence of greenstone. The greenstone includes altered, fine-grained volcanic flows, green chert, plagioclase andesite and basalt, schist, and minor limestone. Above this is a thick sequence of felsic to intermediate quartz-bearing tuff and quartz sericite schist. This unit is distinguished by the large number of subangular to subrounded quartz fragments. Within both the greenstone and the quartz-bearing tuff units, several areas of massive epidotized basalt are found. Interfingered with, and above the tuff units, are layers of green phyllite and semischist, and a unit of grey semischist which appears to be of a clastic, nonvolcanic origin.

Ashcroft Formation: The Jurassic Ashcroft Formation outcrops in several localities near the Thompson River and Ashcroft Manor (Fig. 18). Conglomerate is the most common rock type. In the southeastern section of the map-area it is well indurated with well-rounded clasts of a wide compositional range including greenstone, porphyritic rock, intrusive rock, sharpstone conglomerate, and limestone. These clasts are generally about 5 centimetres in diameter, but range upward to 18 centimetres. In contrast, near Ashcroft Manor, the matrix is grey and the conglomerate is poorly indurated. Outcrops of shale are located northeast of Red Hill (Fig. 18) where they are poorly indurated, fine grained, black, and apparently unmetamorphosed.

An outcrop area, tentatively identified as Tertiary basalt (Kamloops Group ?) is situated on a hilltop in the northwest corner of the map-area. On fresh surface the rock has a fine-grained, black matrix with numerous plagioclase phenocrysts and lacks epidote and chlorite alteration.

INTRUSIVE ROCKS

Three major types of intrusive rocks are found within the map-area. One, which forms a pluton centred on a hill immediately north of Oregon Jack Creek, about 2 kilometres west of the Trans-Canada Highway (Fig. 18), is composed of large subangular quartz crystals in a highly sheared and altered matrix. The matrix is primarily recrystallized sodic feldspar with a minor amount of muscovite as is typical of alkaline granites.

Altered but not sheared medium to coarse-grained quartz diorite and microdiorite crop out in several small bodies on Red Hill and form an elongate pluton southwest of Ashcroft Manor. It has a greenish colour due to the alteration of mafic minerals to chlorite and green staining of feldspars. Numerous mafic inclusions in these intrusive bodies consist of fine-grained crystals altered to chlorite. The borders of these inclusions in the quartz diorite are sharp and irregular. The microdiorite is very fine grained with little quartz and mafic minerals are completely altered to chlorite. A pluton of quartz monzonite is located 2 kilometres north of Oregon Jack Creek and 4 kilometres west of the Trans-Canada Highway. This rock is medium grained, appears fresh, and contains unaltered biotite. It is intruded by a coarse-grained quartz feldspar rock at several localities. There are numerous small gabbroic sills within the Nicola Group between Red Hill and Oregon Jack Creek. A quartz siderite body and several dykes outcrop within the Cache Creek Group.

METAMORPHISM, STRUCTURE, AND TECTONIC RELATIONSHIP BETWEEN UNITS

The wide variety of metamorphic and structural styles exhibited within the Cache Creek Group makes it difficult to generalize the tectonic history. The rocks can be subdivided into zones showing complex deformation and those showing little internal deformation. The melange matrix, whether it is phyllite, chert, or argillite, is tightly folded and faulted. Blocks within the matrix often show little deformation, but basalt, clean limestone, and chert are in close proximity to one another in the sheared matrix indicating that they have been tectonically juxtaposed. In contrast, the phyllite and the volcanic and volcaniclastic rocks show little deformation despite being surrounded by deformed rocks. The phyllite has a well-developed foliation and crops out in long linear bands as seen in Grette's area to the south. The volcanic and volcaniclastic rocks occur as large massive outcrops with no apparent internal deformation. Some basalt and chert appear to be unmetamorphosed while some of the layered metagabbros are amphibolites. Metamorphism within the phyllite has not destroyed graded bedding. There is no field evidence of hydrothermal alteration.

The Nicola Group, in contrast to the Cache Creek Group, shows only minor deformation but has been intensely hydrothermally altered. The rocks form a single upturned block which strikes between north 20 degrees west and north 40 degrees west and dips 50 to 80 degrees southwest. No major fo ds were observed and no evidence was found to show whether the rocks are overturned. A well-developed but discontinuous foliation is parallel or subparallel to bedding throughout most of the area. Occasionally, within the space of tens of metres, outcrops grade from schist into massive, poorly foliated rock. Sericitization along planes of foliation is common, and foliation surfaces often have a micaceous luster. Kink bands in the foliation are common and generally display a counter-clockwise rotation. These rocks have been subjected to several kinds of alteration, the most widespread being epidotization and chloritization which have produced the characteristic green colour of Nicola Group rocks. Silicification is also important and chert is common in both the greenstone and quartz-bearing tuff units, and its close association with volcanogenic sedimentary and volcanic rocks suggests that it is a secondary alteration product. Gossan zones located on the north and south ends of Red Hill, and along Oregon Jack Creek adjacent to the alkaline granitic intrusion, appear to be due to the breakdown of pyrite. Sulphuric acid associated with this breakdown has bleached some of the rock so that a few greenstone and tuff beds are pure white. The effect of this alteration rock varies greatly within single outcrops and suggests that the processes are extremely localized.

The Ashcroft Formation is distinguished by its lack of metamorphism and alteration and its poor induration. Several clasts within the conglomerate appear to be Nicola greenstone suggesting that Nicola

rocks had already been deposited and were being eroded at the time of Ashcroft deposition. The conglomerate generally strikes north 10 degrees west and dips 25 to 35 degrees southwest. Shales found northeast of Red Hill also strike north 10 degrees west but are folded and exhibit a well-developed slaty cleavage.

Undeformed rocks of the Cache Creek Group are found between outcrops of highly deformed Cache Creek rock suggesting that the undeformed rocks are either in fault contact with the deformed rocks, or that they were deposited after the melange was emplaced. Also, the degree of metamorphism within the Cache Creek Group varies widely, which supports the idea that many of these rocks are in fault contact.

Cache Creek and Nicola Group rocks are found in direct contact in two localities. Approximately 4 kilometres west of Ashcroft Manor, Cache Creek argillite overlies Nicola greenstone in an apparent reverse fault contact which dips 55 degrees southwest. The argillite is thoroughly sheared while the greenstone shows only a characteristic foliation. Several outcrops of nearly pure limestone, identical in appearance to fossiliferous Cache Creek limestones found nearby, sit directly on top of Nicola plagioclase andesite along a gully 2.5 kilometres southwest of Ashcroft Manor. Some of the plagioclase andesite has been closely fractured, the only location where intense deformation was observed within the Nicola rocks. A similar, but much larger, limestone block is found directly overlying poorly indurated and unmetamorphosed conglomerate which is considered to belong the Ashcroft Formation. Although the limestone block is unfossiliferous, W. R. Danner (personal communication, 1977) has found Permian fossils in a limestone block approximately 1 kilometre to the north. Another block of Cache Creek rock has been found surrounded by Ashcroft rock further to the east in Cornwall Creek (Travers, in press). It appears, therefore, that Cache Creek rocks were transported eastward over both Nicola and Ashcroft rocks probably in post-Early Jurassic time.

Nicola Group rocks on the east side of Red Hill dip steeply westward, away from their contact with the Ashcroft Formation. The Ashcroft Formation also dips westward, toward the contact, but more gently. The contact is not exposed but must either be an angular unconformity or a fault. On a hill 2 kilometres southeast of Ashcroft Manor the contact is an angular unconformity. However, north of Cornwall Creek rocks of the Nicola Group are thrust over the rocks of the Ashcroft Formation (Travers, in press).

The contact between the Tertiary (?) basalt and the Cache Creek Group is not exposed but is presumably an unconformity.

The alkaline granitic intrusion along Oregon Jack Creek shows a variety of contact relationships with the surrounding country rock. Along the southern and eastern margins, it appears to grade into Nicola felsic tuff, suggesting that the two rock types are genetically related. The intrusive rock is in fault contact with Nicola green phyllite and semischist at the northern end of the intrusion. While the granitic rock is always somewhat sheared, it is mylonitized at this contact. The foliation within the granite is parallel to that of the surrounding Nicola rocks, therefore the granite predates this foliation and possibly unfoliated quartz diorite intrusions as well. Along the southwestern edge of the pluton, the alkaline granite intrudes both Nicola green phyllite and a layered algal limestone that is tentatively included in the Cache Creek Group.

The quartz diorite and microdiorite appear to be in intrusive contact with the country rocks which are metamorphosed to fine-grained schist which commonly forms slivers in the intrusive rock. The elongate pluton west of Ashcroft Manor lies on strike with a small outcrop of quartz diorite, the plutons on Red

Hill, and the Spatsum pluton at the west edge of the Guichon batholith. Gossan zones on the north and south ends of Red Hill and east of the Trans-Canada Highway, south of Oregon Jack Creek (Carr, 1962), also fall along this trend. The quartz diorite is similar in appearance to the plutonic rock near Spatsum (W. J. McMillan, personal communication, 1977). The trend is approximately north 25 degrees west and is approximately parallel to the country rock foliation. These plutons, therefore, may be related and represent the outcropping of a larger pluton which has intruded along the plane of foliation in the Nicola Group rocks. In this interpretation, the gossan zones occur in roof rocks immediately above the pluton.

The contact between the quartz monzonite and the country rock was not observed. Its fresh appearance and undeformed state suggests that it is younger than the other intrusive rocks.

MINERALIZATION

Numerous small showings of copper were found throughout the map-area. Almost all of the showings are associated with one of two types of rock. Copper showings on Red Hill occur in Nicola greenstone near or within gossan zones. As mentioned previously, this rock is presumably underlain by the quartz diorite and microdiorite pluton. The main showings occur in or near a pit located approximately at the 'e' in Red Hill on Figure 18. A minor showing occurs at the base of the hill immediately northwest of the southernmost outcrop of the plutonic rock. Copper mineralization consists of chalcopyrite mainly altered to malachite and lesser amounts of azurite. Abundant pyrite is associated with the copper mineralization.

Copper showings within the Cache Creek Group occur in a quartz siderite body and in two veins. The massive quartz-siderite body is contained in altered limestone. It is more resistant than the limestone and forms a small hill about 50 metres high, located about 2 kilometres east of the quartz monzonite intrusion. Two thick veins of identical rock, one striking north 2 degrees west, the other striking north 26 degrees west, are located in a creek valley about 4.5 kilometres west of Ashcroft Minor. Within these quartz-sericite bodies, minor amounts of chalcopyrite remain but most of it has been altered to malachite which is evenly disseminated throughout the rock. Two minor showings of malachite are located in Nicola felsic tuff east of the alkaline granitic pluton.

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