PRELIMINARY SERIES

GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

92 P

LEGEND

CENOZOIC

QUATERNARY
RECENT

30	Blocky basalt flows

PLEISTOCENE AND RECENT

29	Till, gravel, clay, silt, alluvium (few if any bedrock exposures)

PLEISTOCENE OR RECENT

28	Basaltic cinder cone (incorporates cobbles of older rocks)

TERTIARY OR QUATERNARY
PLIOCENE OR PLEISTOCENE

27	27a, basaltic arenite, conglomerate, breccia, rubble; basaltic flows, locally pillowed; 27b, extinct basaltic volcanoes; basaltic flows and cinder deposits

TERTIARY
MIOCENE AND/OR PLIOCENE

26	Plateau lava; olivine basalt, basalt andesite, related ash and breccia beds; basaltic arenite; minor necks and plugs

MIOCENE

25	Shale, sandstone, tuff, diatomite, conglomerate, breccia

EOCENE
KAMLOOPS GROUP (23 and 24)

24	SKULL HILL FORMATION: dacite, trachyte, basalt, andesite, rhyolite, related breccias
23	CHU CHUA FORMATION: conglomerate, sandy shale, arkose, coal

EOCENE (?)

22	Andesite, dacite, felsite; related tuff and breccia; greywacke, shale; minor lignite and conglomerate

MESOZOIC

CRETACEOUS (?)

21	21a, biotite quartz monzonite and granodiorite; minor pegmatite, aplite, biotite-hornblende quartz monzonite; 21b, hornblende diorite; 21c, quartz diorite, diorite, granodiorite (may include some older rocks); 21d, aplite and leuco-quartz monzonite

LOWER CRETACEOUS
JACKASS MOUNTAIN GROUP

20	Greywacke, shale, siltstone; minor arkose and lenses of pebble conglomerate

JURASSIC (?)

19	Shale, grit
18	Chert pebble conglomerate, greywacke

MIDDLE JURASSIC (?)

17	Biotite granite, quartz diorite, hornblende granodiorite (phase of 14)

JURASSIC
LOWER AND (?) MIDDLE JURASSIC

16	Porphyritic augite andesite breccia, conglomerate and flows; minor andesite, arenite, flows; 16a, isolated areas of augite and hornblende andesite (may be all or partly intrusive)

LOWER JURASSIC

15	Andesitic arenite, siltstone, grit and breccia; local granite bearing conglomerate; minor argillite and flows; includes minor amounts of 12, 11, and (?) 2

TRIASSIC OR JURASSIC
UPPER TRIASSIC OR LOWER JURASSIC

14	Hornblende-biotite quartz diorite and granodiorite, minor hornblende diorite, monzonite, gabbro, hornblendite
13	13a, fine- to medium-grained, pink to brown and grey syenite and monzonite; 13b, medium-grained, creamy-buff, locally coarsely porphyritic (K-feldspar) syenite and monzonite (13b may be equivalent in age to 14 or 17)

TRIASSIC
UPPER TRIASSIC
NICOLA GROUP (11 and 12)

12	Augite andesite flows and breccia, tuff, argillite, greywacke, grey limestone; includes minor 2, 10, and 11
11	Black shale, argillite, phyllite, siltstone, black limestone

TRIASSIC AND/OR EARLIER
UPPER TRIASSIC AND/OR EARLIER

10	FENNELL FORMATION: pillow lavas, greenstone, foliated greenstone, greenschist, argillite, chert, minor amphibolite, limestone, breccia
9	9a, quartzite, quartz-phyllite, quartz-granule conglomerate, argillite, phyllite, calcareous phyllite, marble, greenschist, greenstone; 9b, dark grey and black argillite, siltstone, phyllite, minor limestone
8	Serpentinite and serpentinized peridotite

PALAEOZOIC

PERMIAN
UPPER PERMIAN
CACHE CREEK GROUP (IN PART)

7	MARBLE CANYON FORMATION: massive limestone, limestone breccia and chert; minor argillite, tuff, andesitic and basaltic flows

UPPER (?) PERMIAN
CACHE CREEK GROUP (IN PART)

6	Argillite, basaltic flows, tuff, chert, limestone

LOWER PERMIAN
CACHE CREEK GROUP (IN PART)

5	Basic volcanic flows, tuff, ribbon chert, limestone, argillite (may be equivalent in part to 6)

PERMIAN (?)
PAVILION GROUP (3, 4)

4	Tuff, chert, argillite, limestone, greywacke, andesitic and basaltic flows (may be equivalent in whole or in part to 5 or 6)
3	Chert, argillite, siltstone; minor tuff and limestone (may be equivalent in whole or in part to 2)

PENNSYLVANIAN AND PERMIAN
LOWER PENNSYLVANIAN TO LOWER PERMIAN
CACHE CREEK GROUP (IN PART)

2	Volcanic arenite, greenstone, argillite, phyllite; minor quartz-mica schist, limestone, basaltic and andesitic flows, amphibolite and conglomerate; includes small bodies of 16a

CAMBRIAN OR LATER
LOWER CAMBRIAN OR LATER
CARIBOO GROUP

1	SNOWSHOE FORMATION: feldspathic quartz-mica schist, locally garnetiferous, micaceous quartzite, black siliceous phyllite, quartz-hornblende-mica schist, marble, chlorite schist, greenstone, amphibolite

SHUSWAP METAMORPHIC COMPLEX

A	Micaceous quartzo-feldspathic gneiss, quartz-mica schist, amphibolite, micaceous quartzite, pegmatite

Geological boundary (approximate)
Bedding, tops not indicated (inclined, vertical)
Schistosity and cleavage (inclined, vertical)
Fault (approximate, assumed)
Thrust fault (approximate, assumed)
Anticline (defined, approximate)
Syncline (defined, approximate)
Fossil locality ....Ⓕ
Mineral occurrence ....× Au

MINERALS

Coal	Coal	Molybdenum	Mo
Copper	Cu	Silver	Ag
Diatomite	diat	Volcanic ash	ash
Gold	Au	Zinc	Zn
Lead	Pb		

Geology by R. B. Campbell and H. W. Tipper, 1964, 1965
Geological cartography by the Geological Survey of Canada, 1966

PUBLISHED, 1966
COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

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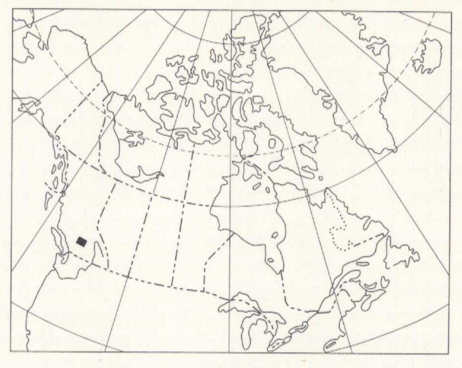

INDEX MAP

MAP 3-1966

GEOLOGY

BONAPARTE RIVER

BRITISH COLUMBIA

Scale 1:253,440
1 inch to 4 miles

Miles 4 0 4 8 12 Miles
Kilometres 6 0 6 12 18 Kilometres

Road, all weather
Other roads
Cart track
Trail
Railway
Station and stop
Airport
Horizontal control point
District boundary
Indian reserve
Intermittent stream
Marsh
Dam
Contours (interval 500 feet)

Base-map compiled and drawn by the Surveys and Mapping Branch, Department of Lands and Forests of British Columbia, 1954, 1955

Mean magnetic declination 23°41' East, decreasing 3.3' annually. Readings vary from 23°19' in the SE corner to 24°08' in the NW corner of the map-area

DESCRIPTIVE NOTES

Two main highways, Nos. 5 and 97, cross the map-area and access to all parts is provided by secondary and logging roads. Outcrops are sparse but are sufficiently well distributed to permit interpretations of the geological relationships in most places. Several map-units (A, 20, 22, 27, 28, and 30) are of small extent and minor importance in this map-area and are not discussed in the notes.

The Snowshoe Formation (1) can be traced northward through the Quesnel Lake map-area[1,2] to the type locality[3]. The rocks are deformed into tightly appressed folds and have probably been subjected to more than one stage of deformation. The generally easterly dipping foliation is roughly parallel with the contact between the Snowshoe and Fennell Formations along which the older strata appear to overlie the younger. This contact dips eastward and is assumed to be a thrust fault.

Rocks assigned to the Cache Creek Group (2) near North Thompson River have not yielded determinable fossils but they are the direct extension of fossil bearing rocks in Nicola[4] and Vernon[5] map-areas. The rocks are foliated and were deformed first into tight folds with northerly and northeasterly trends and subsequently into more open folds with northwesterly trends. Volcanic arenite and argillite are the dominant lithologies; volcanic flows are rare. Most of the information on the Cache Creek Group (5-7) and Pavilion Group (3, 4) is derived from the work of H. P. Trettin[6] but new or different interpretations by the writers are a result of new information in this and adjoining areas. The Pavilion Group (3, 4) is in fault contact with adjoining rock units and its stratigraphic position is uncertain. Lithologic similarity to parts of the Cache Creek Group and an apparent stratigraphic position below a major carbonate unit to the west of this area suggest that the Pavilion Group is older than the Marble Canyon Formation (7). The Cache Creek Group (5-7) outcrops in two distinct belts that are believed to be in fault contact. The eastern belt (5) is dominantly volcanic with ribbon cherts, argillite and limestone at its base. Lower Permian fossils occur in thin limestone lenses. The western belt of the Cache Creek Group consists of two units, the Marble Canyon Formation (7) and an underlying volcanic and sedimentary unit (6). The Marble Canyon Formation is essentially a limestone unit but has a variable lithology and thickness. Fossils indicate late Permian age. Complex folding, thrust faulting, and transcurrent faulting related to several different tectonic events from Triassic to Tertiary time have created a structural complex within the Cache Creek and Pavilion Groups thus obscuring stratigraphic relationships.

Map-unit 9 includes rocks that may be of several ages. Quartzose rocks, part of map-unit 9, that are well exposed on and near Armour Mountain, may be correlative with the Snowshoe Formation (1). The remainder of map-unit 9 and its continuation eastward into the Adams Lake map-area[7] is believed to be equivalent to the Cache Creek Group (2). These rocks can be traced into the Eagle Bay Formation of the Mount Ida Group in Vernon map-area[5]. The rocks of map-unit 9 can be traced to the east and southeast into what has been mapped as the argillite unit of the Cache Creek Group and also into the Mara Formation of the Mount Ida Group in the northwest part of Vernon map-area[5]. Rocks of map-unit 9 are lithologically similar to those of map-unit 11 of possible Late Triassic age.

In the Fennell Formation (10) pillow structures in greenstone are well displayed in exposures along the sides of North Thompson Valley and on Clearwater Peak. Elsewhere these features are rare or absent. Sedimentary rocks of the formation are restricted mainly to the eastern part south of Clearwater Station where they are associated with intrusive and extrusive phases of the greenstone. Uglow[8] named and described the formation as mainly pillow lava with minor sediments and intrusive phases. Walker[9] called the unit the Fennell Batholith and considered the greenstone to be entirely intrusive. The writers concur with the opinion of Uglow. The Fennell Formation appears to be in fault contact with other pre-Tertiary stratified units with the exception of map-unit 11 in the valleys of Lemieux and Mann Creeks.

The Nicola Group (11 and 12) consists of rocks that exhibit a considerable alteration, especially along the contact of the batholith near Eakin Creek, and are apparently more deformed than the younger rocks of map-units 15 and 16. The relationships of the Nicola Group to the Cache Creek Group are not known but the two groups are most probably separated by an unconformity, as they are to the south[4]. Some Cache Creek Group strata are mapped with the Nicola Group in the region west of Lemieux Creek where both Permian and Triassic fossils were found.

The rocks of map-units 15 and 16 together with those of the Nicola Group can be traced northerly through Quesnel Lake[1,2] and Quesnel[10] map-areas into and beyond Prince George[11] map-area. Strata of map-unit 15 rest unconformably on the Nicola Group and the base is marked locally by thick conglomerate. Map-units 15 and 16 were probably deposited partly or entirely contemporaneously. The contact of map-unit 16 and the Cache Creek Group (2) near Lemieux Creek was not observed. Its location is uncertain and it may be a fault or unconformity.

Map-units 18 and 19 are lithologically similar to Jurassic rocks mapped to the south near Ashcroft[12].

The Kamloops Group as used herein consists of the Chu Chua and Skull Hill Formations (23, 24). The Chu Chua Formation is restricted to the North Thompson Valley and represents Eocene deposition in the ancestral valley. The Skull Hill Formation overlies the Chu Chua Formation conformably in the North Thompson Valley and older units unconformably beyond the valley. Breccias and tuffs predominate but related flows locally are more abundant. The flows and breccias are slightly deformed and dip at low angles in all directions. In the area of Loon Lake very broad, open folds may be recognized but for most of its area of outcrop the group occurs as numerous fault blocks tilted in various directions.

Miocene sediments (25) along Deadman River and northward represent lake deposits conformably below the plateau lavas; they are not extensive and are confined to basins or depressions in the pre-Miocene surface.

Plateau lavas (26) are undeformed and usually occupy low areas, valleys or depressions; apparent dips are probably original. In this map-area the unit is situated near the southeastern extremity of an extensive, dissected lava plateau[1,10,13].

The entire area was overridden by ice and glacial deposits (29) mantle bedrock to varying depths. In general glacial overburden is extensive but not deep. The ice moved in a general southerly and southeasterly direction but was controlled locally by major valleys and hills.

Ultramafic rocks and serpentinite (8) form two small bodies just to the south and southwest of Little Fort. The intrusive rocks of map-unit 14 are similar in general composition and probably also in age to the Guichon Batholith[4,12] to the south. Fragments of these rocks and of syenite (13) were found in the conglomerate of map-unit 15. A K-Ar age of 166 m.y. for biotite from the granite of map-unit 17 is younger than the assumed age of the more basic rocks of map-unit 14 but the two are closely related in space and may represent major phases injected during a long history of intrusion. The granite (17) was not found in contact with Lower Jurassic rocks (15, 16) hence the radiometric age cannot be geologically verified. Younger granitic intrusions (21) cut all but Tertiary rocks.

West and northwest from Little Fort the granitic and Mesozoic layered rocks are laced with a multiplicity of surface lineaments that are believed to represent faults and fractures. Some of the more prominent of these are shown as faults.

The occurrence of several ages of intrusive rocks, of Late Triassic and Early Jurassic volcanic and sedimentary assemblages, of extensive fracturing, and of copper and molybdenum mineralization provides a combination suggesting that the area underlain by Triassic, Jurassic, and intrusive rocks is one of considerable potential for mineral exploration. The paucity of outcrops should make the use of geophysical and geochemical methods particularly applicable. In many aspects the region is geologically comparable to copper producing areas to the south. Similar geological associations are to be found northwestward through Quesnel Lake[1,2], Quesnel[10], and Prince George[11] map-areas and beyond.

[1]Campbell, R. B.: Quesnel Lake, west half, British Columbia; Geol. Surv. Can., Map 3-1961.
[2]__________: Quesnel Lake, east half, British Columbia; Geol. Surv. Can., Map 1-1963.
[3]Holland, S. S.: Geology of the Yanks Peak - Roundtop Mountain area, Cariboo district, British Columbia; B.C. Dept. Mines, Bull. 34 (1954).
[4]Cockfield, W. E.: Geology and mineral deposits of Nicola map-area, British Columbia; Geol. Surv. Can., Mem. 249 (1948).
[5]Jones, A. G.: Vernon map-area, British Columbia; Geol. Surv. Can., Mem. 296 (1959).
[6]Trettin, H. P.: Geology of the Fraser River valley between Lillooet and Big Bar Creek, British Columbia; B.C. Dept. Mines, Bull. 44 (1961).
[7]Campbell, R. B.: Adams Lake, British Columbia; Geol. Surv. Can., Map 48-1963.
[8]Uglow, W. L.: Geology of the North Thompson Valley map-area, British Columbia; Geol. Surv. Can., Summ. Rept. 1921, Pt. A, pp. 72-106 (1922).
[9]Walker, J. F.: Clearwater River and Foghorn Creek map-area, Kamloops district, British Columbia; Geol. Surv. Can., Summ. Rept. 1930, Pt. A, pp. 125-153 (1931).
[10]Tipper, H. W.: Quesnel, British Columbia; Geol. Surv. Can., Map 12-1959.
[11]__________: Prince George, British Columbia; Geol. Surv. Can., Map 49-1960.
[13]__________: Taseko Lakes, British Columbia; Geol. Surv. Can., Map 29-1963.
[12]Duffell, S., and McTaggart, K. C.: Ashcroft map-area, British Columbia; Geol. Surv. Can., Mem. 262 (1952).

MAP 3-1966
BONAPARTE RIVER
BRITISH COLUMBIA
92 P