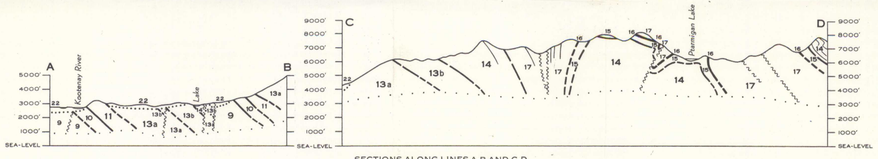
GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF MINES AND TECHNICAL SURVEYS

PRELIMINARY SERIES

SHEET 82 $\frac{1}{4}$



SECTIONS ALONG LINES A-B AND C-D

LEGEND

CENOZOIC

QUATERNARY
PLEISTOCENE AND RECENT
22 — Till, gravel, sand, silt, alluvium

MESOZOIC OR (?) CENOZOIC

CRETACEOUS OR (?) TERTIARY
21 — Quartz monzonite

PALAEOZOIC

MISSISSIPPIAN
20 — BANFF FORMATION: silty cherty limestone, limy cherty siltstone; shale

DEVONIAN OR (?) MISSISSIPPIAN
19 — Silty shale

DEVONIAN
MIDDLE DEVONIAN AND (?) EARLIER
18 — BURNAIS FORMATION: gypsum, limestone; dolomite, shale; 18a, presence inferred

ORDOVICIAN AND SILURIAN
UPPER ORDOVICIAN AND LOWER AND (?) MIDDLE SILURIAN
17 — BEAVERFOOT-BRISCO FORMATION: dolomite, limestone; quartzite and graptolitic shale (in upper part)

ORDOVICIAN
MIDDLE OR UPPER ORDOVICIAN
16 — WONAH FORMATION: quartzite, sandstone

LOWER AND (?) MIDDLE ORDOVICIAN
15 — GLENOGLE FORMATION: shale, limestone; siltstone

CAMBRIAN AND ORDOVICIAN
UPPER CAMBRIAN AND LOWER ORDOVICIAN
14 — McKAY GROUP
Limestone, shale; intraformational limestone conglomerate

CAMBRIAN
MIDDLE AND/OR UPPER CAMBRIAN
13 — JUBILEE FORMATION: 13a, lower division, dolomite, commonly laminated; 13b, upper division, dolomite, commonly massive

LOWER CAMBRIAN
11 — EAGER FORMATION: shale, limestone, sandstone, quartzite
10 — CRANBROOK FORMATION: siliceous quartzite, grit, and pebble conglomerate; sandstone
12 — CRANBROOK AND EAGER FORMATIONS: undivided

WINDERMERE
HORSETHIEF CREEK GROUP
9 — Pebble conglomerate, sandstone, argillite, siltstone, limestone

8 — TOBY FORMATION: conglomerate (sedimentary pebbles dominant), argillite, sandstone

PURCELL OR LATER
UPPER PURCELL OR LATER
7 — MOYIE INTRUSIONS: meta-diorite, meta-quartz diorite

PROTEROZOIC

PURCELL
UPPER PURCELL
6 — MOUNT NELSON FORMATION: argillite, dolomite, quartzite, limestone

5 — DUTCH CREEK FORMATION: grey and green argillite, dolomitic and buff weathering in part, black argillite, siltstone, buff and orange weathering grey dolomite, grey argillaceous quartzite
3 — KITCHENER-SIYEH FORMATION: grey and green dolomitic or calcareous argillite and siltstone weathering buff, dark argillite, grey calcareous quartzite, buff and orange-weathering grey dolomite and argillaceous dolomite; limestone
4 — KITCHENER-SIYEH AND DUTCH CREEK FORMATIONS: undivided

LOWER PURCELL
2 — CRESTON FORMATION: grey and green weathering grey and green argillaceous quartzite and quartzite, green weathering green argillite

1 — ALDRIDGE FORMATION: rusty and grey weathering grey argillaceous quartzite and quartzite with partings of dark argillite, rusty and grey weathering thin-bedded dark argillite and light siltstone

Geological boundary (defined, approximate, assumed)
Bedding (inclined, vertical, overturned)
Bedding (dip known, tops unknown)
Fault (defined, approximate, assumed)
Fault (inclination known)
Anticline (defined, approximate; arrow indicates plunge)
Anticline, overturned (showing dip of limbs, trace of crest plane and approximate direction of plunge of crest line)
Syncline (defined, approximate; arrow indicates plunge)
Syncline, overturned (showing dip of limbs, trace of trough plane and approximate direction of plunge of trough line)
Minor fold (axial direction and plunge)
Mineral prospect (lead) ×Pb
Sink-hole S.H.

Geology by G.B. Leech, 1953, 1955, 1956

In response to public demand for earlier publication, Preliminary Series maps are now being issued in this simplified form, thereby effecting a substantial saving in time. There is no loss of information, but the maps will be clearer to read if all or some of the map-units are hand-coloured.

PUBLISHED, 1959
COPIES OF THIS MAP MAY BE OBTAINED FROM THE DIRECTOR, GEOLOGICAL SURVEY OF CANADA, OTTAWA

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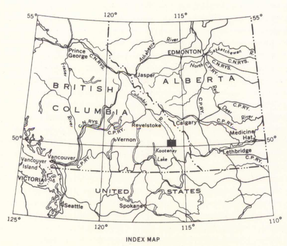

MAP 24-1958

CANAL FLATS

KOOTENAY DISTRICT

BRITISH COLUMBIA

Scale: One Inch to One Mile = $\frac{1}{63,360}$

Miles

1 ½ 0 1 2 3

Air photographs covering this area may be obtained through the National Air Photographic Library, Topographical Survey, Ottawa, Ontario

24-1958

LEGEND

Main highway
Other roads
Trail
Lake and stream (position approximate)
Marsh
Sand bar
Contours (interval 500 feet)
Contours (position approximate)
Height in feet above mean sea-level 2655

Cartography by Geological Survey of Canada, 1959

Approximate magnetic declination, 22° 13' East

DESCRIPTIVE NOTES

The Aldridge and Creston formations consist of quartzites and argillites similar to those farther south, and contrast with the succeeding Kitchener-Siyeh and Dutch Creek formations in which argillaceous and dolomitic rocks predominate. Although each of the last two formations has distinctive characteristics, they have many features in common. Consequently, where Purcell lavas, which mark the boundary between them farther south, are absent and the structures are complex they may be indistinguishable from one another. The old subdivision of the Purcell system, into Lower and Upper parts at the top of the Kitchener-Siyeh formation, is therefore inapplicable here. Instead, the boundary is placed at the top of the Creston formation, where quartzites and argillites give way to a predominance of argillaceous and dolomitic strata.

The Toby conglomerate along the west edge of the Rocky Mountain Trench contains here and there pebbles and boulders of massive and gneissic granitic rocks. These are relatively abundant 2½ miles southwest of Canal Flats. A concentration of fragments of dioritic rock dissimilar to normal Moyie intrusions occurs in the conglomerate west of Columbia Lake.

Horsethief Creek strata are lacking in the Hughes Range near latitude 50°.

The Palaeozoic formations are described in Geological Survey Paper 54-7. A revision of the palaeontology of the Beaverfoot-Brisco formation has shown the Brisco (Silurian) part to be more extensive than was previously indicated.

Structurally the area can be divided into eight main regions. Region 1, the mountain west of Columbia Lake, is part of the east limb of a major open anticline that plunges gently northward. Its eastern limit is a steep, west-dipping thrust fault that extends northeast from the White Creek batholith, which cuts it, and swings north obliquely into the Rocky Mountain Trench. This fault is either a continuation of the Hall Lake fault, which is interrupted by the southwest end of the batholith, or is related to it.

Region 2 consists of the lowlands west of Columbia Lake, the mountains and lowlands west of the axis of the Rocky Mountain Trench south of the lake, and probably also part of the lowland within the bend of Kootenay River at Canal Flats. Its structures are complex, partly because the rocks are incompetent. The region is characterized by folds that plunge northward and are overturned eastward; these are sliced by faults striking northeastward and northward. The positions of the larger folds are imperfectly known, because horizon markers are scarce and directions of stratigraphic tops are ill-defined, but their patterns are probably reflected by the consistent patterns of the associated minor folds. Axial planes, as indicated by pervasive cleavage, strike N35°E and dip 50° to 80°NW in the southern part of the region. However, they then swerve northward so that in the latitude of Findlay Creek, most of the axial planes strike N5°E to N20°E and dip 40° to 65°NW. The plunges of minor folds average about 20°, directed east of north in the south part of the region, and west of north near Findlay Creek. The patterns of sliced overturned folds are visible best on the mountain-front north of Copper Creek, where quartzites of the Mount Nelson formation are horizon markers. The patterns shown on the map are, in part, diagrammatic. The area west of the mountain-front undoubtedly contains important unrecognized faults. The presence of these is indicated by the persistence northward of formations whose plunges should otherwise cause them to disappear from view.

Structural region 3, the mountains between Columbia Lake and Kootenay River, contains faulted, northward-plunging folds that apparently are shortened along their axes. Lying conformably within the core of the Mount Sabine syncline of Lower Palaeozoic strata is a second syncline of Precambrian and Cambrian rocks. This is believed to have been thrust relatively southward and upward into the competent Mount Sabine syncline, although it is possible that the thrust was originally nearly planar, and that the synclinal form was later imposed upon the whole sequence. Region 3 has moved southward relative to the regions south of Kootenay River, as is evidenced by abrupt changes there in the thicknesses, and, to a lesser extent, in the lithologies of Lower Cambrian and Cambro-Ordovician formations.

Region 4, the Kootenay Valley adjoining region 3, contains Devonian strata relatively downdropped into and athwart Precambrian and lower Palaeozoic rocks. This region is the site of early oblique thrust faults, probably related to some of those in the Purcell mountains and, in the northeast, of longitudinal thrust faults that became in part strike-slip faults. The graben pattern is a late feature of this complex zone of weakness.

Region 5 is the Hughes Range, which is the east limb of a major anticline that plunges gently northward. Its scarp-like west face presents a stratigraphic section, whereas the east side is a dip-slope. Two steep, transverse faults, both with their north sides moved relatively upward and/or eastward, cross the range. Both faults apparently feed hot springs.

Region 6 comprises a series of linear ridges and valleys between the Hughes Range and the Kootenay River. The ridges are similar blocks of east-tilted strata that repeat parts of the stratigraphic sequence of the Hughes Range. The largest block, extending south from Mount Grainger, is shortened lengthwise in a manner similar to region 3 north of the Kootenay. The irregular hilly area, west of the north end of this block, contains complicated structures apparently related to a thrust fault at the junction of the Rocky Mountain Trench and the Kootenay valley. The westernmost block, which forms a narrow linear ridge near the axis of the Trench, is unbroken for its exposed length of 6 miles. The intervening valleys contain longitudinal faults that cut those that shorten the Mount Grainger block. However the relation of the longitudinal faults to transverse faults of the type that cut the Hughes Range is uncertain. The longitudinal fault zones have complex histories involving early thrusts, possibly later strike-slip movements, and still later gravity faults. The three longitudinal faults observed in the valley west of the Hughes Range all dip west. It is believed that each fault block is downdropped relative to its eastern neighbour, but it has not been disproven that each is upthrust relative to its western neighbour.

Region 7, the mountains east of the Hughes Range and north of Whiteswan Lake, is separated from the Hughes Range by a faulted syncline along which both thrust and strike-slip movements appear to have occurred. The western part of the region consists chiefly of an upright anticline in the form of an elongate dome that is bowed slightly westward and whose west limb is locally overturned. The eastern part of the region is the underlimb of an anticline overturned to the west. The boundary between the two parts is an east-dipping thrust fault in the site of the intervening syncline. This region is part of a larger one, extending far to the north, characterized by anticlines that are upright or overturned to the west and by synclines that are tightly compressed, if remaining at all. The sites of missing synclines are loci of longitudinal thrust faults, some of which later became strike-slip faults. Originally, the positions of the faults were partly controlled by incompetent Devonian strata.

Region 8, the lowlands and ridges east of the Hughes Range and south of region 7, is the northwest part of the Lussier syncline. Its west boundary, against the Hughes Range, is believed to be a fault. At its south end, southeast of the map-area, the Lussier syncline is open and descends gently northwestward toward the plunge depression that occurs near the confluence of Lussier River and Coyote Creek within this map-area. North of this point, the plunge is reversed and the syncline becomes tightly compressed and faulted until its remnant reaches a plunge culmination at the heads of Mutton and Nine Mile Creeks, between the Hughes Range and region 7. The eastern limb of the syncline is disrupted by a transverse fault that extends from White River, east of the area, along Whiteswan Lake and into the syncline at the east border of the area. Outcrops are few in region 8, chiefly because of the occurrence of gypsum-bearing Devonian strata. The structure south of Alces (Moose) Lake is probably simple in its major form and complex in detail.

MAP 24-1958
CANAL FLATS
BRITISH COLUMBIA
SHEET 82 $\frac{1}{4}$