

LEGEND

- QUATERNARY  
PLEISTOCENE AND RECENT**  
12 Till, gravel, sand, silt, alluvium
- MESOZOIC  
CENOZOIC**  
11 Grandodiorite, quartz monzonite, pegmatite
- PALAEZOIC**  
**CAMBRIAN**  
10 EAGER FORMATION: dark argillite, grey argillite, grey limy argillite, brown weathering sandy limestone  
9 CRANBROOK FORMATION: siliceous quartzite, grit, and conglomerate
- PURCELL OR (?) LATER**  
8 MOYIE INTRUSIONS: meta-diorite and meta-quartz diorite
- PURCELL**  
7 DUTCH CREEK FORMATION: laminated black argillite, green argillite, quartzite, dolomite  
6 KITCHENER-SIYEH FORMATION: varicoloured argillites and dolomitic argillites, mostly buff and brown weathering; buff and brown weathering dolomite, commonly sandy  
5 CRESTON FORMATION: green and grey weathering green, grey, and purplish argillaceous quartzite, quartzite and argillite; Sa, grey weathering grey argillite and silty argillite, mud-cracked dark argillite
- ALDRIDGE FORMATION (1-4)**  
1 Lower Division: rusty weathering grey quartzite, siltstone, and argillite; grey weathering massive quartzite; metamorphosed equivalents  
2 Middle Division: grey weathering massive grey quartzite and siltstone with argillite partings, rusty weathering quartzite, siltstone, and argillite  
3 Upper Division: rusty weathering laminated argillite and siltstone; quartzite  
4 Middle and Lower Divisions undivided

- Limit of area in which distribution of Moyie intrusions is uncertain
- Outcrops of Moyie intrusions within above area
- Geological boundary (defined, approximate, assumed)
- Bedding (horizontal, inclined, vertical, overturned)
- Bedding (dip known, top of bed unknown)
- Cleavage (inclined, vertical)
- Fault (defined, approximate, assumed)
- Anticline (defined, approximate)
- Syncline (defined, approximate)
- Syncline (overturned, showing direction of dip of limbs)
- Anticline and syncline (arrow indicates plunge)
- Glacial striae (direction of ice movement known, unknown)
- Fossil locality
- Mine or mineral prospect (silver, Ag; gold, Au; copper, Cu; lead, Pb; tin, Sn; tungsten, W; zinc, Zn)

- INDEX TO MINES AND PROSPECTS**
- Sullivan Mine - open pit (Pb, Zn, Ag)
  - Sullivan Mine - "3900" portal
  - North Star (Pb, Zn, Ag)
  - Cotnoir-Fors group (Pb, Zn)
  - Rice group (Au)
  - Anderson group (Au, Ag, Pb)
  - Birdie L. group (Pb, Ag)
  - Running Wolf (Au)
  - Leader (Wellington) (Au, Pb, Ag, Cu, W)
  - Warhorse (Boy Scout) (Pb, Zn, Ag, Au)
  - Dan Howe (Pb)
  - Dominion group (Pb, Ag, W)
  - Warren (Pb)
  - Storm King (Pb, Ag, Sn)
  - Copper King (Pb, Ag, Cu)
  - High Peak (Cu)
  - Mystery (Cu)
  - Blue Peter (Cu)
  - Falter (Cu)
  - Whitefish (Cu)
  - Evans (Cu)
  - Good Hope (Cu)

Note: Some of the prospects were staked, or restaked, under other names

Geology by G. B. Leech, 1950, 1951, 1952

Approximate magnetic declination, 22° 05' East

Cartography by the Geological Cartography Unit, 1957

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.



DESCRIPTIVE NOTES

The Proterozoic Purcell strata (1-7) form an apparently conformable sequence and their subdivision is based solely on lithology, though lithological changes are gradational and similar rocks recur in various parts of the sequence. A twofold division can be made on the basis that the lower part of the section, comprising the Aldridge and Creston formations, is characterized by quartzite, accompanied by siltstone and argillite, whereas in the upper part, comprising the Kitchener-Siyeh and Dutch Creek formations, quartzite is subordinate, argillites are dominant, and distinctive dolomites occur.

The Lower Division (1) of the Aldridge formation, at least 4,500 feet thick, is a markedly rusty weathering assemblage of quartzites, siltstones and argillites; grey quartzite with fine, dark laminations, commonly cross-bedded, is the most diagnostic rock. The lowest exposed strata on both sides of St. Mary Valley near Matthew Creek are altered to quartz-mica schist and contain beds of vitreous quartzite. Near the top of the division there is a 275-foot zone of massive quartzite similar to that of the Middle Division but separated from it by beds more typical of the lower assemblage. The Middle Division (2) is characterized by massive and generally light-weathering grey quartzite beds with dark argillite partings, typical examples of which can be seen near the former Meachams farm. The division also contains rusty weathering argillite and siltstone, accompanied by less distinctively laminated dark argillite and, especially near its gradational junction with the Middle Division, beds of grey quartzite. The division is particularly distinctive northeast of St. Mary River, where it is about 1,250 feet thick. The characteristic rusty thin-bedded rock is thickest in the northeast and becomes less distinct toward the southwest, where also the grey quartzites are more abundant throughout the division. The overlying Creston formation (5) contains a basal member (5a) which is thickest and most distinct northeast of St. Mary River, less distinct west of the river, and either missing or indistinguishable to the west of it. It is a greyish weathering assemblage of grey argillite and siltstone and dark argillite with abundant mud-cracks. The rest of the Creston formation is a non-rusty sequence of grey, green, and, here and there, purplish quartzites, siltstones, and argillite weathering grey, green, and purple. Lenses of grit occur locally within the eastern quartzites. Quartzites with irregular purple lines and mottles are diagnostic, and green argillites with tiny metacrysts of magnetite are also fairly common. Structures due to current action and the flow of unconsolidated sediments are common.

The overlying Kitchener-Siyeh formation (6), about 5,000 feet thick, contrasts with those beneath it because of its content of grey-buff to brown weathering dolomitic argillites and dolomites. Some of the argillites within it, however, are similar to those in the underlying Creston formation and other resemble those of the overlying Dutch Creek formation (7). The latter consists chiefly of thin-bedded argillite, mostly black but locally grading to green on strike, with dolomitic rocks like those of the Kitchener. The dioritic Moyie intrusions (8) occur in two main groups, one in the Lower Aldridge and the other near the top of the Middle Aldridge. Individual bodies are generally sill-like but locally they transect bedding, as a rule gently, in places steeply, and in a few instances the bodies lose their sill form and become relatively narrow dykes. The presence of these transgressions, together with the apparent lack of stocks, indicates that the upper sills were fed through the lower ones.

The map-area is on the crest of the Purcell geanticline that underlies the Purcell Mountains and plunges gently northward. In this region the geanticline is cut by three major faults, the Moyie (south of the map-area), the St. Mary, and the Hall Lake, which repeat the structure successively northward and between which the segments plunge northward more steeply than does the geanticline as a whole. The St. Mary fault, which is steep and, where exposed, marked by breccia, appears to represent dominantly vertical adjustment between tilting blocks but has many of the characteristics of a strike-slip fault. The Hall Lake fault is steep and is the locus of intense shearing. It is probably a thrust fault on which the west block moved relatively upward and northward. These faults, together with variations in lithology, divide the map-area into three blocks with contrasting structures. The largest block, north of St. Mary fault and east of Hall Lake fault, is underlain by competent Aldridge strata stiffened by Moyie intrusions and is characterized by open north-trending folds. In those anticlines that are obviously asymmetrical, which are chiefly the smaller ones, the east limbs are typically the steeper. The two largest individual faults within this block are the Alki, a southwest dipping thrust fault, and the Kimberley, a north-dipping normal fault whose history probably involved a hinge movement increasing eastward and a later movement which was more nearly strike-slip, possibly with the north side displaced relatively eastward and upward. Near Matthew and Mack Creeks there are north-striking and northeast-striking faults whose movements apparently overlapped each other and those of the Kimberley fault. The block contains numerous north-striking steep faults, mostly small and generally with the west side relatively down-dropped, some of which are the youngest in the area. The structural block west of Hall Lake fault, underlain by less competent rocks, is characterized by steep dips, isoclinal folds overturned to the east, intense axial plane cleavage, and a second or cross cleavage associated with steeply plunging crenulations. The block probably contains unrecognized longitudinal faults. The structural block south of St. Mary fault consists chiefly of west-dipping west-facing strata repeated successively westward by a series of steep longitudinal faults.

The lode deposits are of three main types: replacement deposits in sedimentary rocks, not localized along fractures, vein and replacement deposits localized along fractures, not restricted to particular rock formations; deposits associated with Moyie intrusions. The Sullivan and adjacent North Star deposits, the only representatives of the first type, account for almost all the recorded mineral production of the area. They lie near the top of the Lower Division of the Aldridge formation. Their age is probably Precambrian. Deposits of the second type, which include the more promising prospects in the area, contain various combinations of galena, sphalerite, pyrite, pyrrotite, chalcocite, arsenopyrite, hematite and, in a few instances, scheelite. They include the Anderson and Birdie L. groups, the Cotnoir-Fors prospect, "Dan Howe" prospect, part of the Dominion group, the Leader and Warhorse groups, the Rice prospects on Sawmill Creek, and the "Warren" prospect, most of which are in or near faults. This type also includes replacement vein deposits such as the Storm King and Copper King containing pyrite, galena, tetrahedrite, and minor chalcocite in limy rocks. Deposits of the third type, associated with Moyie intrusions, are quartz-calcite veins and lenses in diorite, in and adjacent to which occur pyrrotite, pyrite, and chalcocite, and, less commonly, minor amounts of galena and sphalerite. They occur characteristically in the upper parts of sills, pinch out upward at or near the sill roof and pinch out downward in diorite. Judging from the few in which sections parallel to the sill roofs are visible they are lenticular and their average length is probably greater than their average depth. The distribution of the sulphides is generally erratic, with chalcocite subordinate to pyrrhotite and pyrite. The chief groups of workings on these deposits are around Mount Evans and Alki and Pyramid Creeks.

The area from Pitt Creek across the head of Sawmill Creek to Angus Creek has attractive possibilities, though it is difficult to prospect. The St. Mary and adjoining fault zones are poorly exposed but the relatively few exposures that do occur contain metallic minerals on Pitt Creek, on Sawmill Creek, at the Leader prospect, and on the east wall of Angus Creek. The deposits are not important individually, nor are they identical mineralogically, but their widespread occurrence in an intersecting system of major shear zones indicates the potential of the intervening ground.

MAP 15-1957  
**15-1957 ST. MARY LAKE**  
KOOTENAY DISTRICT  
BRITISH COLUMBIA

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

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

LIBRARY  
Geological Survey of Canada

RECD JAN 3 1958

INDEX MAP

LEGEND

- Roads
- Trail
- Building
- Intermittent stream
- Marsh
- Sand or gravel
- Contours (interval 500 feet)
- Height in feet above mean sea-level