



- LEGEND**
- QUATERNARY**
PLEISTOCENE AND RECENT
16 Glacial till, lake silts and clays, gravel, sand, silt
- CRETACEOUS**
UPPER CRETACEOUS
15 DUNVEGAN FORMATION: sandstone, shale, conglomerate (marine and non-marine)
- LOWER CRETACEOUS
FORT ST. JOHN GROUP
14 SIKANNI FORMATION: shale, sandstone, siltstone (marine) (includes some Upper Cretaceous beds at top)
- 13 BUCKINGHORSE FORMATION: shale, silt shale; minor sandstone (marine)
- LOWER CRETACEOUS AND JURASSIC
12 BULLHEAD GROUP: sandstone, shale, coaly shale, conglomerate, coal (marine and non-marine)
- JURASSIC
11 FERNIE GROUP: shale, siltstone; minor sandstone and ironstone (marine)
- TRIASSIC
10 TOAD, GRAYLING, LIARD, AND PARDONET FORMATIONS: shale, calcareous sandstone, calcareous siltstone, limestone, dolomite (marine)
- PERMIAN ?
9 Chert (marine)
- MISSISSIPPIAN
8 Sandstone, siltstone, shale, limestone (marine) (upper beds may include some Pennsylvanian and/or Permian strata)
- 7 PROPHET FORMATION: limestone, dolomite, chert, cherty limestone, calcareous chert (lower part consists of shale, chert and argillaceous limestone) (marine)
- DEVONIAN
UPPER DEVONIAN
6 Shale, calcareous shale; minor argillaceous limestone (marine)
- MIDDLE DEVONIAN
5 Limestone, argillaceous limestone; minor dolomite and calcareous shale (marine)
- ORDOVICIAN AND SILURIAN
3 Dolomite, silty dolomite; minor quartzitic sandstone and limestone (marine)
- CAMBRIAN AND/OR ORDOVICIAN
UPPER CAMBRIAN AND/OR LOWER ORDOVICIAN
2 Platy limestone, nodular limestone, shale, calcareous shale; minor siltstone, dolomite, argillite (marine)
- PRECAMBRIAN AND/OR LOWER PALAEOZOIC
MISCHINKA GROUP
1 Limestone, chlorite schist, phyllite, calcareous sericite schist, schistose sandstone; minor white quartz
- Geological boundary (approximate or assumed)
- Limit of geological mapping
- Bedding (horizontal, inclined, vertical, overturned)
- Thrust fault (position approximate; teeth in direction of dip)
- Thrust fault (assumed; teeth in direction of dip)
- Anticlinal axis (position approximate)
- Synclinal axis (position approximate)
- Fossil locality
- Coal mine
- Geology by E. J. W. Irish, 1959, 1960, 1961
- Road, loose surface, all weather
- Road, loose surface, dry weather
- Cart track
- Trail
- Building
- District boundary
- Horizontal control point
- Intermittent lake and stream
- Marsh
- Contours (interval 500 feet)
- Height in feet above mean sea-level
- Base-map by the Army Survey Establishment, R. C. E., Department of National Defence, 1950-1954
- Cartography by the Geological Survey of Canada, 1962
- Mean magnetic declination, 28° 30' East, decreasing 3.9' annually.
Readings vary from 28° 16' E in the SE corner to 28° 58' E in the NW corner of the map area



DESCRIPTIVE NOTES

The map-area includes the western edge of the Great Plains, the Foothills Belt and the Rocky Mountains, the latter two divisions trending N15° W. The Rocky Mountains, about 13 miles wide, are in the most westerly part of the area. They are underlain mainly by Lower Palaeozoic rocks, and are characterized by steep to precipitous ridges and peaks with intervening heavily timbered valleys. Many of the main ridges extend approximately east-west across the trend of the mountains. The mountains have an average elevation of about 6,500 feet though some peaks rise to more than 8,500 feet. Average relief in this region is 3,000 feet. On the gentler slopes, timber-line is at about 5,000 feet.

The foothills region, between the Plains and the Rocky Mountains, is about 30 miles wide. It is underlain predominantly by Lower Mesozoic strata and consists of irregularly shaped ridges that tend to parallel the trend of the structures. In general, the average altitude of the Foothills is lower than that of the Rockies and the ridges are less rugged, mainly because the underlying rocks are relatively less resistant.

The eastern boundary of the Foothills is quite abrupt. It occurs at the east-ern side of Butler Ridge, Hackney Hills, and other high ridges formed by folded and faulted Lower Cretaceous sandstone formations. East of these ridges and forming the western boundary of the Great Plains are low rounded hills separated by wide valleys with gently sloping sides.

Low-grade metamorphic rocks of the Mischinka Group (1) comprise a succession of slightly altered sedimentary strata estimated to be more than 4,000 feet thick, owing to structural repetition the exact thickness could not be measured. The northeastern limit of these beds is probably more irregular than is indicated on this map. These metamorphic strata are thought to be the oldest rocks within the map-area but their age relationship with the Lower Palaeozoic strata could not be determined.

Rocks considered to be Lower Ordovician and, perhaps, Upper Cambrian in age (2), outcrop mainly toward the western side of the main ranges. These strata, in which argillaceous, platy, and nodular grey limestones predominate, yielded no fossils, but probably underlie the dolomites of unit 3. They are repeated by many small thrust faults, and no complete section could be measured. Unit 2 is estimated to be at least 2,000 feet thick. In places where the limestones are intensely sheared they closely resemble limestones of the Mischinka Group.

Unit 3 comprises about 2,200 feet of dolomite and siliceous dolomite with minor amounts of quartzitic sandstone, and makes up the main part of the higher mountains. These very resistant dolomites form rugged peaks and precipitous walls. Fossils of Lower, Middle and Upper Ordovician ages and of Middle Silurian age have been collected from them. The uppermost several hundred feet of the succession yielded no fossils and may be, in part, of Devonian age.

In those places where the present information precluded a division into more precise groups, the rocks have been designated as Undivided Lower Palaeozoic (4), comprising strata of units 2 and 3 and possibly also some of unit 1.

Unit 5, consisting mainly of limestone and argillaceous limestone, between 800 and 1,100 feet thick, overlies strata of units 3 and 4 with apparent conformity. Fossils collected from these beds are of Middle Devonian (Givetian) age.

Unit 6 includes at least 800 feet of shale and calcareous shale. The lower contact with the Middle Devonian carbonate rocks appears conformable but is rather abrupt. Fossils collected from shaly limestone beds within the shale succession indicate an Upper Devonian (Famennian) age.

The Prophet Formation (7) includes, at the base, 400 to 500 feet of interbedded argillaceous limestone, chert and shale that transitionally overlies unit 6. Shale decreases in amount upward and chert becomes more prominent in the higher beds. These strata are overlain by 800 to 900 feet of resistant, interbedded chert, calcareous chert, cherty limestone and limestone. The upper part, at least, of the transition beds is considered to be of Lower Mississippian age and is probably equivalent in part to the Band Formation. Fossils from the remainder of the Prophet Formation are also of Mississippian age and indicate correlation, in part, with the Livingston and Mount Head Formations of the Rundle Group.

The Prophet Formation is in most places overlain conformably by a 100- to 600-foot-thick succession (8) of shales, siltstones, sandstones and limestones. Late Mississippian fossils that suggest correlation with the upper part of the Rundle Group have been collected from these strata. At most exposures the Mississippian fossils are from beds directly below the chert of unit 7, but at a locality about 4 miles north-east of Gold Bar, a fauna indicating a Pennsylvanian or Permian age was collected from beds not far below the chert.

Unit 9 consists of dark-coloured bedded chert, between 20 and 60 feet thick. At most places within the map-area it lies disconformably above unit 8 and, where present, is an excellent stratigraphic marker. It may be of Permian age.

Triassic strata of unit 10, including the Toad, Grayling, Liard and Pardonet Formations, underlie a large part of the Foothills region. Basal shales representing typical Grayling lithology are present in only a few of the more westerly exposures. Elsewhere, siltstones of the Toad Formation, containing a Lower Triassic fauna near the base, rest directly on the chert of unit 9. Sandy and silty beds of the Liard Formation, mainly of Middle Triassic age, succeed those of the Toad and are in turn overlain by strata of the Upper Triassic Pardonet Formation. The whole succession, about 3,500 feet thick, lies disconformably on unit 9. The formations appear to have gradational boundaries and are not mapped separately.

Shales overlying the Triassic strata are considered to be of Jurassic age equivalent in part to the Fernie Group because of their similar stratigraphic positions. No fossils were collected from them. They occur on the flanks of several synclines and anticlines both on the north and south sides of Peace River valley and in the Hackney Hills. The group is poorly exposed but is estimated to be between 500 and 700 feet thick. It is probably disconformable with the underlying Triassic beds and grades into the overlying Bullhead Group.

The Bullhead Group (12) consists of a lower marine part about 3,000 feet thick and an upper non-marine, coal-bearing part (Gething Formation) about 1,200 feet thick. The group forms the ridges at the eastern edge of the Foothills and also underlies most of the area south of Peace River and west of Hackney Hill. The lower part of the marine beds is probably of Upper Jurassic age. Lower Cretaceous (Valanginian) fossils were collected from beds about 1,200 feet above the Fernie Group on a ridge 3 miles south of Chowade River. Aptian plants have been collected by earlier workers from the Gething Formation.

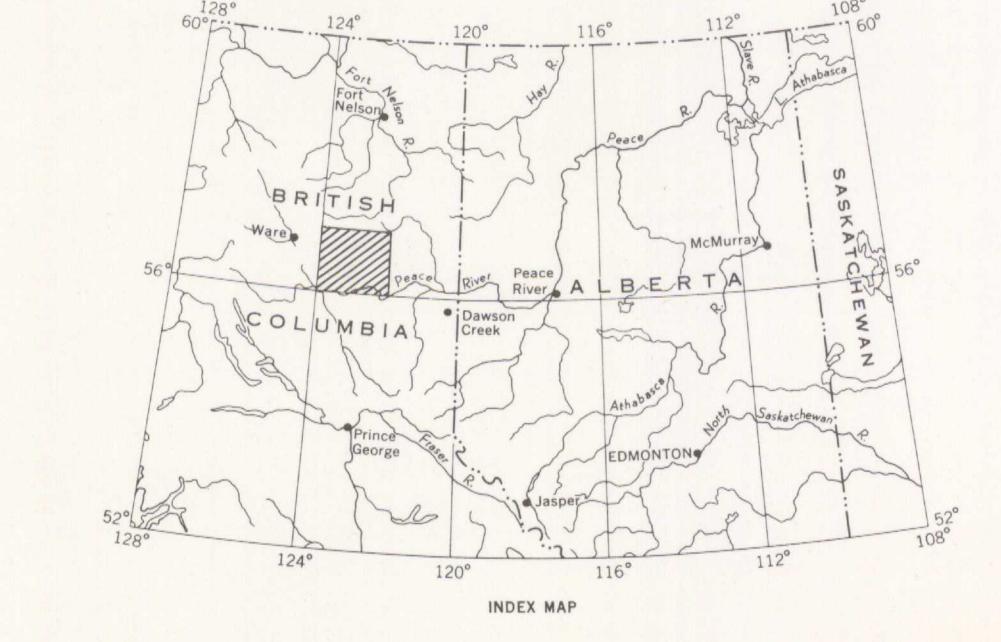
The Fort St. John Group in this map-area comprises the Buckinghorse and Sikanni Formations. Shales of the Buckinghorse Formation (13) are confined mainly to the region of low relief between the Foothills and Halfway River, and outcrops are along stream valleys. The formation may be as much as 3,300 feet thick. Sikanni strata (14), particularly the basal sandstones of the formation, underlie large areas east of Halfway River and cap the uplands west of it. Fossils of the Neoproterozoic fauna were collected from the lower part of the formation along Halfway River. The estimated thickness is 1,000 feet.

The youngest consolidated strata in the map-area are those of the Dunvegan Formation (15). They underlie most of the interstream areas east of Halfway River. No thickness was obtained and no fossils were collected. The formation is known to be of Upper Cretaceous age in adjoining areas.

Unit 16 includes glacial-lake clays and silts, boulder till, outwash sand, silt and gravel, and recent stream deposits. The glacial and fluvio-glacial deposits occur as terrace remnants along all major valleys.

Folds and west-dipping thrust faults are the main forms of structural deformation throughout the map-area, although some small, normal faults are present. In the western part of the mountains, thrust faulting has produced much repetition of strata. There, folds are small and of minor importance; most are compressed and locally overturned to the east. Along Peace River valley, repetition by thrust faults continues to the east through the main part of the mountain belt. This appears to be an imbricate zone caused by thrusting over the large, open, asymmetrical and south-plunging folds that extend northward from about 16 miles north of the valley. These folds have gentle southwest limbs and steep northeast limbs. Faults are not so numerous where the large folds occur. Still farther east, tight folds and imbricate thrust faults are present in the areas underlain by Mississippian strata. Throughout the Foothills Belt, long, narrow, and in part on echelon, folds are typical. In general, anticlines are narrow and compressed and separated by relatively wide synclines. Many anticlines are faulted and some have very steep southwest limbs, flat crests, and gently dipping northeast limbs. East of the Foothills several broad anticlines and synclines occur. Their axes are very irregular and their limbs dip at small angles. Some faults are probably present.

Placer gold has been found in small quantities on many gravel bars along Peace River. Gold is in very fine particles or 'colours'. High-grade bituminous coal seams of Lower Cretaceous age were formerly mined on a small scale just west of Butler Ridge and at Peace River canyon. Natural gas is produced from numerous wells drilled along and east of Halfway River valley, east of the Foothills. Four established gas fields—Highway, Gundy Creek, Blueberry West, and Kobes Townsend—lie within, or partly within, the northeastern part of the map-area. The wells in the Highway and Kobes Townsend fields produce from Mississippian, Triassic and Cretaceous formations while those in the Gundy Creek and Blueberry West fields produce only from Mississippian and Triassic strata. In the southeastern corner of the area two exploration wells were drilled, one on either side of Butler Ridge. These were unsuccessful and were abandoned.



MAP 37-1961
GEOLOGY
HALFWAY RIVER
BRITISH COLUMBIA
Scale: One Inch to Four Miles = 1/253,440
Miles

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

Library
Geological Survey of Canada
MAP 37-1961
HALFWAY RIVER
BRITISH COLUMBIA
SHEET 94B

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