

- LEGEND**
- MESOZOIC**
- CRETACEOUS**
- UPPER CRETACEOUS**
- 5 KASKAPAU FORMATION: shale and silty shale; minor amounts of sandstone, siltstone, and ironstone (marine)
- 4 DUNVEGAN FORMATION: sandstone, grey, fine-to medium-grained, evenly bedded; interbedded grey to dark grey siltstone, shale and carbonaceous shale; some ironstone bands and thin coal seams; massive, cross-bedded, grey sandstone in the lower 300 feet; minor coarse sandstone and fine conglomerate in northwestern part of map-area (marine and non-marine)
- LOWER CRETACEOUS**
- FORT ST. JOHN GROUP**
- 3 UPPER SHALES: grey shale and silty shale; minor amounts of sandstone and siltstone; thin bands and scattered concretions of ironstone (marine)
- 2 GATES FORMATION: sandstone and siltstone; minor shale (marine)
- 1 MOOSEBAR FORMATION: shale and silty shale; some sandstone, siltstone and ironstone (marine)

- Rock outcrop, area of outcrop x xxx
- Geological boundary (defined, approximate, assumed) - - - - -
- Bedding (horizontal, inclined) + / -
- Fault (position defined, position approximate) - - - - -
- Fault (position and/or occurrence assumed) - - - - -
- Anticlinal axis - - - - -
- Synclinal axis - - - - -
- Fossil locality @
- Boundary of oil and gas field - - - - -

- INDEX TO OIL AND GAS FIELDS**
- | | |
|---------------------------|----------------------------------|
| 1. Blueberry Field | 7. Fort St. John Field |
| 2. West Blueberry Field | 8. Fort St. John Airport Field |
| 3. West Buick Creek Field | 9. Fort St. John Southeast Field |
| 4. Buick Creek Field | 10. West Kiskatinaw Field |
| 5. Red Creek Field | 11. Kiskatinaw Field |
| 6. Montney Field | 12. Boundary Lake Field |

- Geology by E. J. W. Irish, 1955, 1956, 1957
- Main roads =
- Other roads - - - - -
- Trail - - - - -
- Interprovincial boundary - - - - -
- Township boundary (surveyed) - - - - -
- Township boundary (unsurveyed) - - - - -
- Indian Reserve boundary - - - - -
- Intermittent lake and stream - - - - -
- Rapids - - - - -
- Marsh - - - - -
- Height in feet above mean sea-level 2268

Approximate magnetic declination, 28° 34' East

Cartography by the Geological Cartography Unit, 1958

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

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 map-area lies in northeastern British Columbia along the western edge of the Great Plains. Where sandstone of the Dunvegan formation occurs near the surface the country is relatively high and hilly; where this sandstone is overlain by shale as in the eastern part of the area, or has been removed to expose shale as in the southwestern part, the country is flat to gently rolling. Elevations increase gradually towards the north and northwest where the maximum altitude is about 3,500 feet. In the southern part of the area Peace River and its major tributaries are deeply incised to an altitude of about 1,300 feet, giving a maximum relief of about 2,200 feet. Minor tributaries flow through swamps and muskeg on the upland surface but, on nearing a major stream valley, cut down rapidly to join the larger stream at grade. The map-area is wooded except where now cleared for agricultural purposes. Probably most of the country has been burned at least once so that little virgin timber now remains. The principal forest growth at present consists of poplar, white spruce, and lodgepole pine although limited stands of black spruce and tamarack occur in the swamps.

The region is underlain by a succession of marine and non-marine sedimentary strata with a total thickness of over 14,000 feet. Formations exposed within the map-area range in age from uppermost Lower Cretaceous to lower Upper Cretaceous and have a total thickness of about 3,500 feet. The strata have a regional dip to the north-east and east that can be measured only in feet per mile but superimposed on the regional dip are several gentle folds, on whose limbs dips up to 20° occur locally. Glacial, glacial-fluvial, and glacial-lacustrine deposits cover most of the map-area. The strata are thin on the higher parts but thick over the lower areas and very thick in the larger stream valleys. Bedrock is best exposed in the deeply incised valleys where present streams have cut down through the glacial materials. The MOOSEBAR formation (1) outcrops only in the extreme southwestern corner of the map-area where the upper 250 to 300 feet are exposed in steep cut-banks on both sides of Peace River. These strata consist mainly of shale and silty shale with a 60- to 70-foot thick sandstone unit about 250 feet below the top. The formation contains different species of the ammonite genera Lemuroceras and Beudanticeras.

The GATES formation (2) lies conformably above the Moosebar. West of Hudson Hope the formation is exposed on the southwest limb of the Hudson Hope anticline but only the lower 50 to 60 feet are visible, the top being eroded away. It is composed of grey, fine- to medium-grained, well-bedded sandstone. At the Gates, 7 miles northeast of Hudson Hope, the formation is 10 to 8 feet thick and is exposed on the crest and southwest limb of the Gates anticline. Between the Hudson Hope and Gates anticlines, strata of this formation outcrop only in the canyon of Maurice Creek and along the lower reaches of Lynx Creek. East of the Gates the formation disappears beneath the overlying shales. The Gates formation, from which several pelecypods and specimens of the ammonite genus Beudanticeras have been recovered, may be wholly or in part equivalent in age to the Notikewin member of the Peace River formation.

The Upper Shales (3) lie stratigraphically between the Gates and Dunvegan formations, are equivalent in age to the combined Hasler, Goodrich, and Cruiser formations farther west, but with the facies change eastward and northeastward from sandstone to shale, the Goodrich formation disappears and a lithological division between the Hasler and Cruiser formations is then not practicable. These strata occupy approximately the same stratigraphic interval as the Shaftesbury formation farther east and southeast. The 'Upper Shales' range between about 1,400 and 1,800 feet in thickness. They weather readily to clay and for this reason most of the lower areas and all of the main valleys in the map-area have been excavated in them. Outcrops are almost entirely restricted to the deep stream valleys. Gypsum crystals commonly occur along bedding planes or in fractures in exposed strata. Water issuing from the shale is bitter and deposits red iron hydroxide on the stream bottoms. Sandy beds roughly 400 to 500 feet above the Gates formation and containing the Gastropiles fauna are approximately equivalent in age to the Cadotte member of the Peace River formation. The Neogastropiles fauna occurs in shale about 900 to 1,000 feet above the Gates formation.

The DUNVEGAN formation (4) lies conformably above the 'Upper Shales' and the Fort St. John group. The strata underlie the uplands both north and south of Peace River. To the east they dip below shales of the overlying formation and to the west form the cap-rock on interstream ridges with abrupt west and southwest facing scarps at several places. Dunvegan strata are best exposed on the escarp situated on the north side of Peace River about 2 miles downstream from the mouth of Cache Creek, and in the canyon of Kiskatinaw River from its mouth to the southern border of the map-area. The approximate thickness ranges between 500 and 600 feet. The lower 300 to 350 feet are characterized by three massive, cross-bedded, cliff-forming beds up to 40 feet thick which in places grade into shales and shaly sandstone. The upper part of the formation consists of a succession of thin-bedded sandstone and arenaceous shale strata that are transitional into the overlying Kaskapau formation. Beds of very coarse sandstone and fine conglomerate occur in the formation only in the northwestern part of the area. Unio dowlingi occurs at the base of the formation at many places throughout the map-area.

The KASKAPAU formation (5) conformably overlies the Dunvegan and, although a considerable area is thought to be underlain by these shales, the only exposures seen were in the north bank of Peace River at the provincial boundary and in the east bank of Kiskatinaw River between 2 1/2 and 3 miles above its mouth. Both of these outcrops consist of the lower 15 to 20 feet of the formation. Elsewhere the Kaskapau formation is concealed by a cover of glacial till, clay, and gravel.

The main structural features of the map-area consist of several broad, open anticlines and synclines that parallel the northwest trend of the Rocky Mountains. Three such simple folds with gently dipping limbs are indicated where they cross Peace River in the southwestern part of the area. These folds appear to plunge gently to the southeast. The gas and oil fields within the map-area are located mainly on subsurface structures which, as there is little or no indication at the surface, are not shown. Subsurface information suggests that the Fort St. John gas field is located on a complex structure which is probably the result of northwest folding superimposed on earlier east-west folding or faulting. Surface evidence for this structure is very limited because of the gentle attitude of the beds, although a southeast-plunge is indicated. Other folds, not located due to the paucity of outcrops, may be present. Faults occur in the banks of Peace River west of Hudson Hope, at the Gates, and on Maurice Creek. None of these can be traced far, but all appear to be west-dipping thrust faults having a small stratigraphic displacement. Others may be present but not exposed.

The area is of great economic importance as it contains the large Fort St. John gas field as well as several smaller fields. Boundary Lake is the only oil field known as yet, although several wells throughout the map-area are producing oil. Several industries based on the gas and oil production are, or will be, operating at Taylor near Fort St. John. Production of oil and gas has come, so far, mainly from the Mississippian, Triassic, and Lower Cretaceous strata lying below the Fort St. John group. South of Charlie Lake map-area and to the east in Alberta several members in the lower part of the Fort St. John group are productive but so far little gas or oil has been found in these beds within the area.

Thin coal seams occur in the Dunvegan formation but are not considered to be of commercial value.

Crushed sandstone from the Dunvegan formation has been used on the Alaska Highway and, with the inevitable demand for more and better roads within the district, this sandstone may be used for road material as good, readily available gravel deposits are scarce.

OCT 31 1958
17-1958

MAP 17-1958
CHARLIE LAKE
WEST OF SIXTH MERIDIAN
BRITISH COLUMBIA

Scale: One Inch to Four Miles = $\frac{1}{253,440}$ Miles

Library
Geological Survey of Canada

MAP 17-1958
CHARLIE LAKE
BRITISH COLUMBIA
SHEET 94A

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