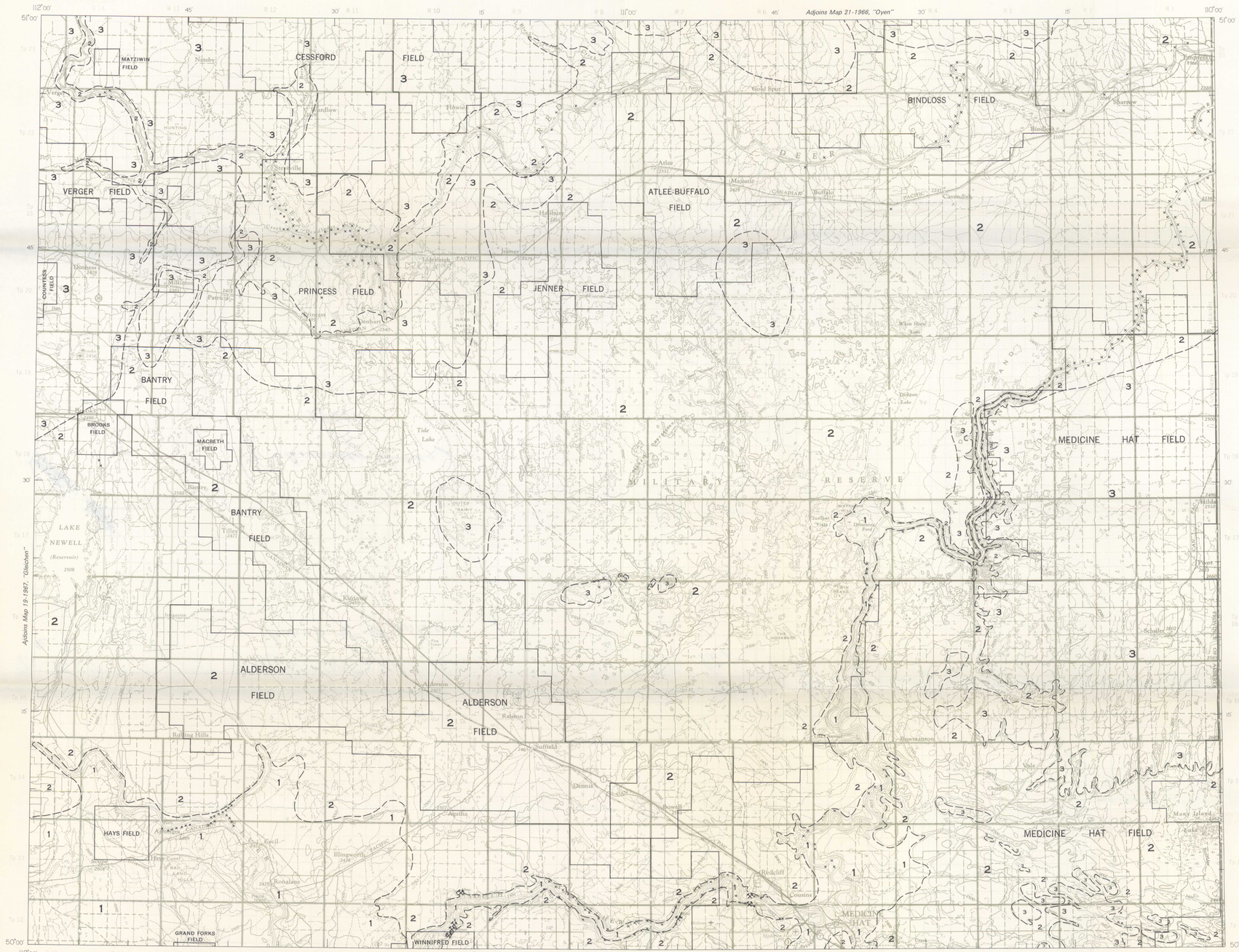
GEOLOGICAL SURVEY OF CANADA
DEPARTMENT OF ENERGY, MINES AND RESOURCES

PRELIMINARY SERIES



LEGEND

MESOZOIC
CRETACEOUS
UPPER CRETACEOUS

3 BEARPAW FORMATION: dark brown, sandy shale; dark grey shale; argillaceous sandstone; ironstone concretionary bands; bentonite (marine)

2 OLDMAN FORMATION: grey shale; dark grey carbonaceous shale; grey and dark grey siltstone; grey and light grey sandstone; thin limestone beds; ironstone bands; coal seams (non-marine)

1 FOREMOST FORMATION: green and grey shale; carbonaceous shale; grey siltstone; grey and pale brown sandstone; ironstone bands; coal seams (non-marine)

Geological boundary (approximate or assumed)

Rock outcrop

Coal mine

Oil and gas fields

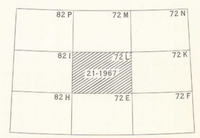
Geology by E.J.W. Irish, 1965, 1966, 1967

Geological cartography by the Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, 1967

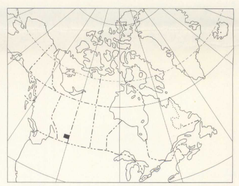
Base-map compiled and drawn by the Surveys and Mapping Branch, 1958

Magnetic declination 1968 varies from 19° 33' easterly at the center of the east edge to 20° 23' easterly at the centre of the west edge. Mean annual change decreasing 3.1'

All elevations in feet above mean sea-level



NATIONAL TOPOGRAPHIC SYSTEM REFERENCE



INDEX MAP

Published, 1968
Copies of this map may be obtained from the Director, Geological Survey of Canada, Ottawa

MAP 21-1967
GEOLOGY

MEDICINE HAT

WEST OF FOURTH MERIDIAN
ALBERTA

Scale 1:253,440
1 inch to 4 miles

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

Printed by the Surveys and Mapping Branch

DESCRIPTIVE NOTES

Glacial and glaciofluvial deposits of clay, silt, sand, gravel and till cover most of the map-area and bedrock exposures are rare except in parts of the stream valleys. South Saskatchewan River enters the map-area from the south in Tp. 12, Rge. 10W4. and flows easterly as far as the city of Medicine Hat. It then flows east of north for about 68 miles and leaves the map-area in Tp. 22, Rge. 1W4. Red Deer River enters from the north in Tp. 23, Rge. 14W4. and flows westerly across the northern part of the map-area. Bow River flows approximately southeast across the southwest corner of the map-area.

The bedrock formations that occur at the surface or immediately below the unconsolidated deposits are of late Upper Cretaceous age. In most cases, the outcrop symbols shown on the map indicate the relative amount of rock exposure rather than specific outcrops.

The oldest strata are those of the Foremost Formation (1). Foremost beds, except for a region of about 200 square miles in the southwest corner of the map-area, are confined to the valleys of South Saskatchewan and Bow rivers. The uppermost beds only, outcrop along Bow River Valley in Tp. 13, Rge. 13W4. Along South Saskatchewan River Valley, excellent exposures occur in Tps. 12 and 13, Rges. 6 to 10W4. and, where the river flows southeast from Rge. 6 to Rge. 8, a thickness of between 150 and 200 feet of beds is exposed. North of Medicine Hat the Foremost strata outcrop in both banks of the river as far as Tp. 19, Rge. 3W4., where the northeast dip takes them below river level.

Foremost strata consist of grey-weathering, grey, and pale brown, soft, argillaceous sandstone; buff-weathering, grey, hard sandstone; grey siltstone; green and grey shale; dark grey, carbonaceous shale; and ironstone bands. The carbonaceous shales grade, in places, into coal seams. The individual units are lenses rather than beds and do not extend far in any direction.

The Foremost Formation is differentiated from the overlying Oldman Formation, mainly, on colour differences. Strata of the younger formation are typically lighter than those of the underlying formation. Because the contact is transitional, the upper limit of Foremost beds is placed arbitrarily and, perhaps, at different horizons at different localities. The lower contact is transitional downward into the Pakowki Formation but is not exposed in this map-area. Thickness of the formation is estimated to range between 300 and 500 feet but the maximum thickness of strata exposed is about 200 feet.

Foremost strata are overlain conformably and gradationally by the Oldman Formation (2). Beds of this formation underlie about two-thirds of the total map-area. Good exposures of the Oldman Formation occur in the valley of Red Deer River across the northern part of the map-area. South and east of Steveville, in Tp. 21, Rges. 11 and 12W4., erosion of the Oldman beds has resulted in spectacular "badland" topography on both sides of the river valley. Much of this region is now administered by the Alberta government as Dinosaur Provincial Park. Oldman beds are almost continuously exposed along South Saskatchewan River valley throughout the map-area and a complete section, about 350 feet thick, occurs in the deep gorge in Tps. 17 and 18, Rge. 3W4.

The rocks consist of green, grey and light grey shale and silty shale interbedded and interlensed with grey and light grey, argillaceous sandstones. Hard, calcareous sandstone beds occur throughout the succession and thick, crossbedded, light-grey weathering, lenticular sandstone units are typical of the upper part of the formation. Thin, discontinuous ironstone beds are common. Plant impressions and carbonized wood are present in some strata though the formation is not very carbonaceous except for the Lethbridge coal member at the top. This carbonaceous zone marks the approximate top of the Oldman Formation in southern Alberta and contains mineable coal seams at several localities.

Both fresh water and brackish water invertebrates occur in these strata although the Oldman Formation is most famous for its rich vertebrate fauna. Many excellent dinosaur specimens have been collected from localities along the Red Deer River.

The Oldman Formation is overlain rather abruptly by shales of the marine Bearpaw Formation (3). The lower contact is not well exposed in this area and the upper contact is the present land surface. Bearpaw strata are thought to underlie large areas in the north and northwest parts of the map-area on both sides of Red Deer River valley and, also, a large region east of the South Saskatchewan River and between townships 14 and 19. Small erosional remnants are present toward the middle of the map-area and east of the city of Medicine Hat.

Outcrops are extremely scarce and the positions of geological boundaries shown on the map are doubtful at many localities. The formation is known to consist, mainly, of dark grey shale and sandy shale with some interbedded sandstone zones.

The major structure is the northeastern extension of the Sweetgrass Arch which crosses the central part of the map-area from southwest to northeast. This arch has a general northeasterly plunge of about 5 feet per mile.

Coal seams occur within the upper part of the Foremost Formation along South Saskatchewan River valley west of Medicine Hat and several small mines operate on a part time basis. The coal is sold locally.

Natural gas and some oil are recovered from the area. The established fields are shown on the map.

MAP 21-1967
MEDICINE HAT
ALBERTA
72L