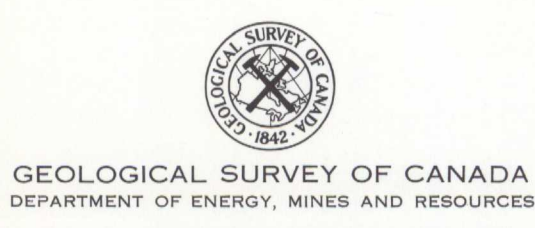


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 AHC 13 1967
 GEOLOGICAL SURVEY



LEGEND

- TERTIARY**
- OLIGOCENE**
- 12 CYPRESS HILLS FORMATION: conglomerate (non-marine)
- PALEOCENE**
- 11 RAVENSCRAIG FORMATION: soft, grey- and buff-weathering, grey and light brown, fine-grained sandstone; soft, grey- and buff-weathering, argillaceous sandstone and siltstone; soft, grey- and buff-weathering, brownish grey clays and shales; lignitic coal seams; bentonite layers; ironstone (non-marine)
- CRETACEOUS**
- UPPER CRETACEOUS**
- 10 FRENCHMAN FORMATION: massive, fine- to coarse-grained crossbedded, buff- to reddish-brown-weathering, grey and light brown sandstone; green and grey shale, silty shale and siltstone (non-marine)
- 9 WHITEMUD AND BATTLE FORMATIONS: white-weathering, green and grey, argillaceous sandstone; green and grey clay and silty clay (Whitemud Formation); overlain by mauve-weathering, dark grey to purplish grey, bentonitic, rubbly shale; light-grey weathering tuff (Battle Formation)(non-marine)
- 8 EASTEND FORMATION: grey- to buff-weathering, grey and pale brown, fine- to medium-grained, clayey, in part cross-bedded, sandstone; green, grey and dark grey shale; grey silty shale and siltstone; black, carbonaceous shale; coal seams (marine and non-marine)
- 7 BEARPAW FORMATION: dark grey and brownish grey, rubbly and flaky shale; silty shale; light buff-weathering, grey, argillaceous sandstone; ironstone concretions; bentonitic layers (marine)
- MESZOZOIC**
- 6 OLDMAN FORMATION: massive, crossbedded, medium- to coarse-grained, light-grey weathering sandstone; grey, clayey siltstone; grey and light grey weathering, green and grey shale; dark grey and brown, carbonaceous shale; ironstone concretions (non-marine)
- 5 FOREMOST FORMATION: green and grey shale; dark carbonaceous shale; grey and green siltstone; grey and pale brown sandstone; ironstone; coal seams (non-marine)
- 4 PAKOWKI FORMATION: dark grey shale and sandy shale; grey sandstone; thin chert pebble conglomerate at base; chert pebble bed at base (marine)
- 3 MILK RIVER FORMATION (Upper Member): soft, grey-weathering, grey, argillaceous sandstone; lenses of massive, light-buff-weathering, grey sandstone; soft, grey shale and silty shale; dark grey, carbonaceous shale; ironstone (non-marine)
- 2 MILK RIVER FORMATION (Lower Member): massive, light-grey- to white-weathering, grey, soft and hard, sandstone; ironstone concretions; grey and light grey shale and sandy shale (marine)
- 1 ALBERTA GROUP: dark grey, friable and fissile shale and sandy shale; brown-weathering, grey sandstone (marine)

- Geological boundary (approximate).....
- Rock outcrop.....
- Oil and gas fields.....
- Thrust fault (position approximate).....

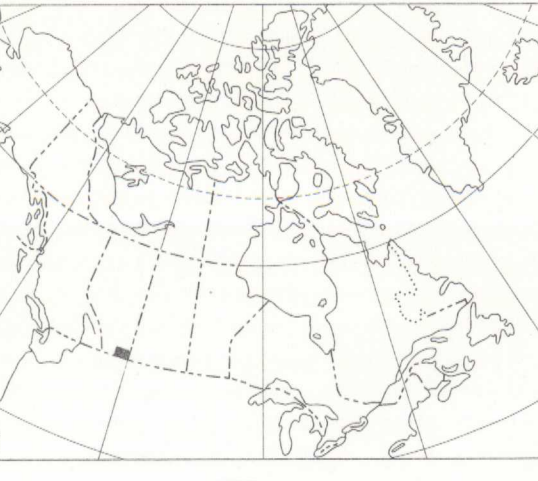
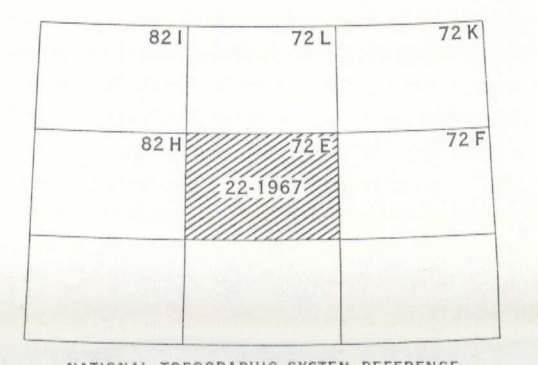
Geology by E. J. W. Irish, 1964, 1965, 1966, 1967

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

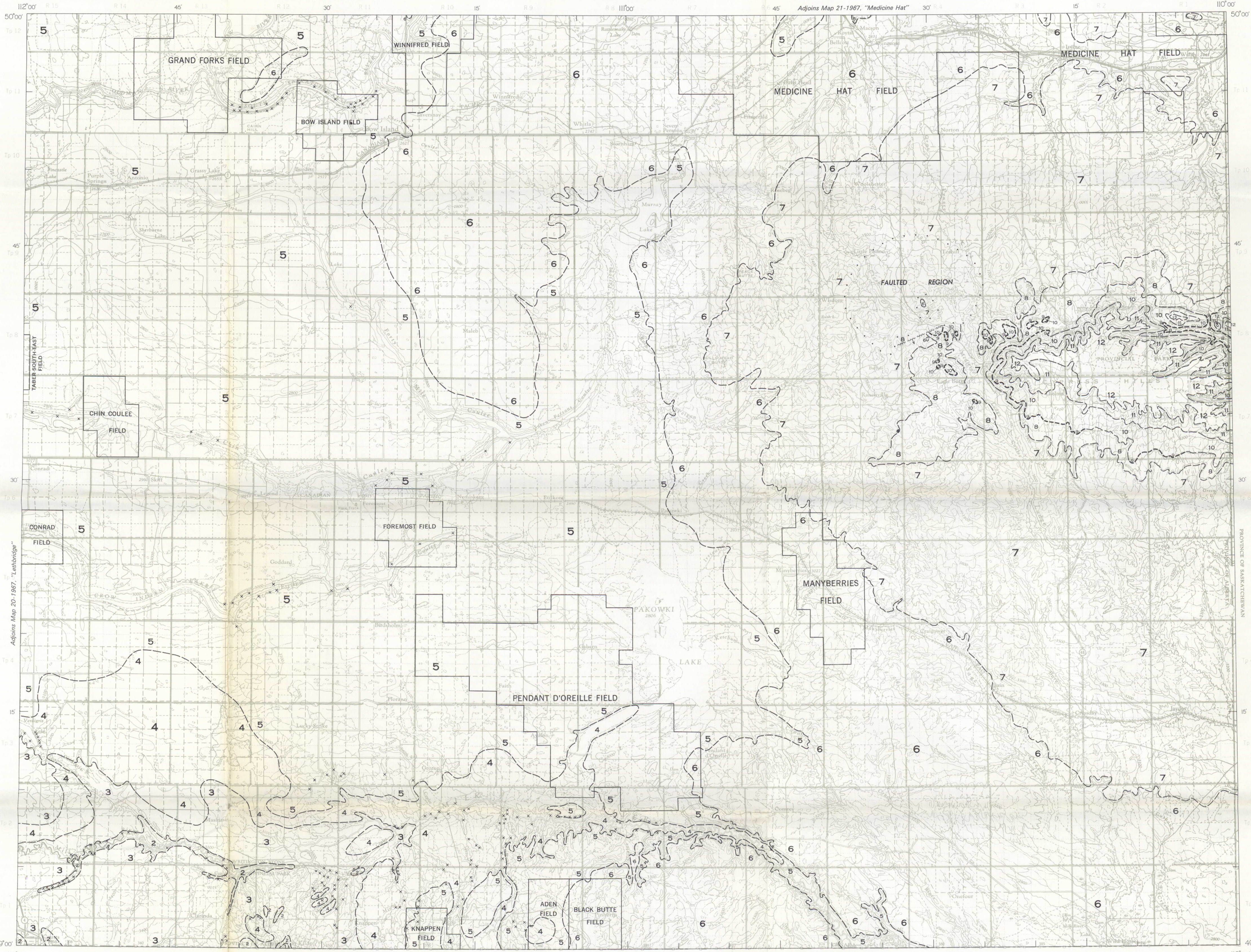
Base-map compiled and drawn by the Surveys and Mapping Branch, 1958

Magnetic declination 1968 varies from 19° 09' easterly at the centre of the east edge to 10° 40' easterly at the centre of the west edge. Mean annual change decreasing 3.1'

All elevations in feet above mean sea-level



PRELIMINARY SERIES



DESCRIPTIVE NOTES

The marine Bearpaw Formation (7) rests conformably and relatively abruptly upon the Oldman beds. It underlies an extensive region in the eastern part of the map-area flanking the Cypress Hills. The best outcrops occur on Ross Creek, Bullhead Creek, Bullhead Butte, Medicine Lodge Coulee, and in several coales south of Cypress Hills. The formation consists of grey-weathering, dark grey or brownish grey shale and silty shale; spheroidal ironstone concretions; fine-grained, clayey sandstone; and bentonite beds. Thick sandstone units, that occur in the upper part of the formation, are poorly exposed along the sides of Medicine Lodge Coulee. The Bearpaw Formation is about 850 feet thick in this map-area.

Sandstone strata of the Eastend Formation (8) conformably overlies the Bearpaw shale. Eastend strata are confined to the Cypress Hills area and occupy a belt at the foot of the main escarpment. The best sections outcrop near the west end of the hills on Thelma Creek, and in Medicine Lodge Coulee. The formation consists of grey- to buff-weathering, grey and pale brown, fine- to medium-grained, clayey sandstone; green, grey and dark grey shale; grey silty shale and siltstone; black, carbonaceous shale; coal seams. The thickness of the formation in Medicine Lodge Coulee is approximately 330 feet. Marine fossils occur in some of the lower beds though the upper part of the formation is of non-marine origin. In the vicinity of Elkwater Lake, a mineable coal seam occurs about 70 feet below the top of the formation. Eastend strata grade upward into the overlying Whitemud Formation.

The relatively thin Whitemud and Battle formations have been combined and mapped as a single unit (9) on the map. Outcrops of these formations are confined to the lower slopes of the Cypress Hills.

The Whitemud Formation outcrops at several places both on the north and south slopes of the Cypress Hills but, because of its softness, good exposures are rare. The formation is of non-marine origin and consists of white-weathering, fine- to medium-grained, feldspathic, crossbedded, argillaceous sandstone; white- to cream-weathering, grey, white and pale green clays and silty clays. Generally, a three-fold division can be recognized: a lower unit composed mainly of argillaceous sandstone; a middle thin unit composed of buff-coloured clay and siltstone with interbedded brown and black carbonaceous clay; and an upper unit composed mainly of white- to cream-weathering, clay and silty clay. There is considerable lateral variation of each of the three subdivisions and, also, of lithologic units within each subdivision. The total thickness of the formation in south-eastern Alberta is about 25 feet.

The Whitemud Formation overlies conformably and, in most places abruptly, by the dark clays and shales of the Battle Formation. A complete exposure of these beds, showing both the upper and lower contacts, occurs on the north face of Eagle Butte in a quarry of the Medicine Hat Brick and Tile Company. The formation is very uniform, consisting of mauve-grey weathering, dark brown to purplish black, bentonitic shales, all of which contain some fine silt. A grey-weathering, grey-brown, siliceous tuff bed, about 8 inches thick occurs within the upper part of the shale. The upper contact of the Battle is an erosion surface so that thicknesses are different at different localities. The maximum thickness of the formation is about 30 feet.

The Battle shale overlies unconformably the Frenchman Formation (10). These beds, also, are confined to the slopes of the Cypress Hills and consist, mainly, of massive, medium-grained, crossbedded, buff- to reddish brown-weathering grey and light brown sandstone intercalated with beds of green and grey siltstone, silty shale and shale. The maximum thickness of the non-marine, Frenchman Formation in southeastern Alberta is estimated to be 200 feet.

The upper contact of the Frenchman Formation is transitional into the overlying non-marine Ravenscrag Formation (11). Ravenscrag strata are confined to a narrow rim around the higher parts of the Cypress Hills. The beds consist of soft, grey- and buff-weathering, grey and light brown, fine-grained sandstone; soft, grey- and buff-weathering, brownish grey clays; lignitic coal seams; bentonite layers; and thin beds of ironstone. Because of the similarity of the upper Frenchman and lower Ravenscrag beds, the contact is usually placed at the base of the lowest coal seams.

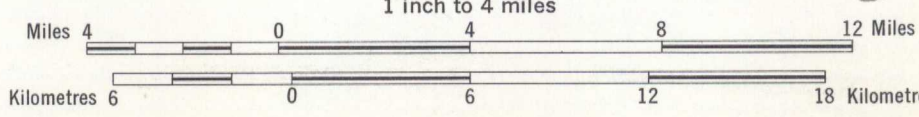
The youngest beds within the map-area comprise the Cypress Hills Formation (12). This formation caps the Cypress Hills and consists, mainly, of a hard, well-cemented, pebble and cobble conglomerate with some intercalated grey, coarse, sandstone lenses. Most of the pebbles and cobbles of the conglomerate are composed of grey, brown and purplish chert and grey quartzite and the matrix is composed of medium-grained, calcareous sandstone.

All formations lie on the east flank of the Sweetgrass Arch and the strata dip at very small angles to the east and southeast. Several small thrust faults are known to exist near and just north of Eagle Butte but slumping in this region combined with the thick cover of glacial materials prohibits the determination of their lateral extent by surface mapping.

At Elkwater and vicinity coal was mined for several years from the main seams in the Eastend Formation. These workings are now abandoned. The Medicine Hat Brick and Tile Company quarries clay on Eagle Butte and from a hill just east of Elkwater Lake. Although the Whitemud Formation is the main source, some clay is obtained from both the Eastend and Ravenscrag formations.

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

MAP 22-1967
 GEOLOGY
FOREMOST
 WEST OF FOURTH MERIDIAN
 ALBERTA
 Scale 1:253,440
 1 inch to 4 miles



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