

- EXPLANATION OF MAP UNITS AND SYMBOLS**
- Qal ALLUVIUM-- Stratified clay, silt, sand and gravel; may include outwash sand and gravel in some areas
 - Qo OUTWASH-- Areas underlain by sand and gravel deposited by glacial melt-water
 - Areas of thin to thick glacial deposits; includes small scattered to large outcrops of bedrock (Fox Hills Formation, Bearpaw Shale, Judith River Formation, and Claggett Shale)
 - BURIED SCARP OR VALLEY WALL
 - BURIED STREAM CHANNEL OR ICE-MARGINAL CHANNEL; dotted lines show inferred continuity
 - ABANDONED VALLEY, ICE-MARGINAL CHANNEL OR VALLEY NOW OCCUPIED BY UNDERFIT STREAM
 - INFERRED DIRECTION OF FLOW OF WATER IN BURIED, ABANDONED CHANNEL OR VALLEY
 - CONTACT

This map was prepared to show the location of small thin shallow potential aquifers that were overridden and buried during glaciation. Many are now represented by long narrow sinuous to straight topographic sags. They can be seen stereoscopically on aerial photographs and are expressed by contours on topographic maps.

Outcrops of thick till, sand and gravel also indicate the location of buried drainage. The presence of bedrock outcrops also helps indicate the presence or absence of buried drainage. Aerial photographs used in making these maps vary in scale from 1:19,440 to 1:24,000. Small scale (1:60,000) aerial photographs were also interpreted.

Glacial deposits in this and adjacent areas were studied and mapped during short field seasons in 1951, 1980, 1981, 1982, 1983 and 1984 by Roger B. Colton, David S. Fullerton and Thomas W. Patton. A map of the Havre 10' x 20' Quadrangle showing the distribution of glacial features and deposits was compiled by Colton (unpublished) in 1955 as part of the Glacial Map of Montana East of the Rocky Mountains (1961). Thomas W. Patton and Roger B. Colton spent two weeks in the Harlem 30' x 60' Quadrangle during the 1983 field season and three weeks in the Havre 30' x 60' Quadrangle during the 1984 field season. All field maps were compiled on U. S. Geological Survey topographic maps at 1:24,000.

The only published geologic maps of the area are by Alverson (1965), Pepperberg (1910), U. S. Department of Energy (1979), and Zimmerman (1960).

REFERENCES CITED

Alverson, D. C., 1965, Geology and hydrology of the Ft. Belknap Indian Reservation, Montana: U. S. Geological Survey Water-Supply Paper 1576-F, Pl. 1, 1:63,360

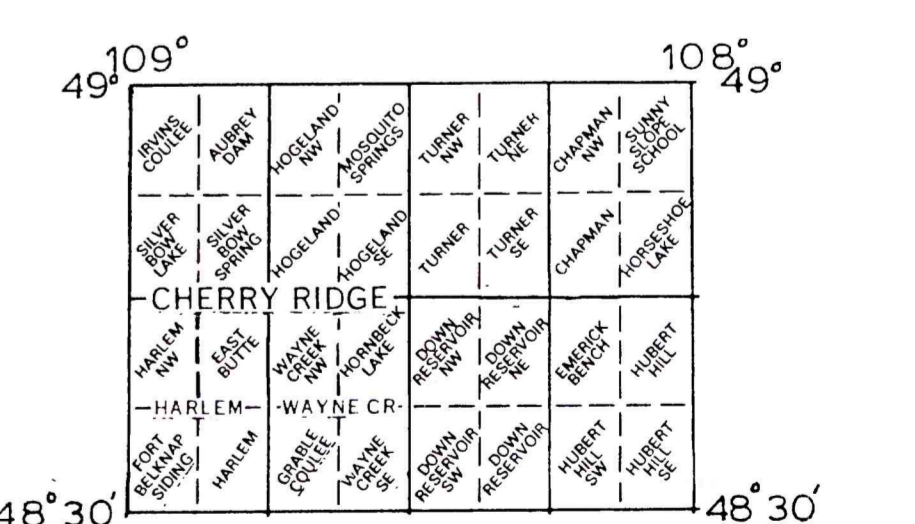
Colton, R. B., Lemke, R. W., and Lindvall, R. M., 1961, Glacial Map of Montana East of the Rocky Mountains: U. S. Geological Survey Miscellaneous Geologic Investigations Map I-327 (scale 1:500,000)

Pepperberg, L. J., 1910, The Milk River Coal Field Montana: U. S. Geological Survey Bulletin 381-A, Pl. 6, 1:190,000

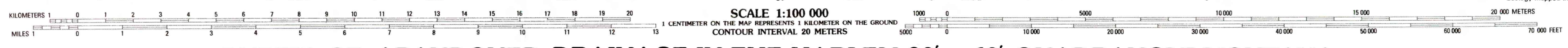
Stebinger, Eugene, 1917, Possibilities of oil and gas in north-central Montana: U. S. Geological Survey Bulletin 641-C, Pl. 4, 1:1,300,000 Pl. 5, 1:62,500

U. S. Department of Energy, 1979, Geology of Havre Quadrangle: AEA Engineering & Drafting Co. Salt Lake City, Utah: Bendix Open File No. GJEX-126(79)C -available from U. S. Geological Survey Open File Services Section, Box 25425, Denver Federal Center, Denver, Colorado 80225

Zimmerman, E. A., 1960, Preliminary report on the geology and ground water resources of north-eastern Blaine County, Montana: Montana Bureau of Mines and Geology, Bulletin 19, Pl. 1, 1:125,000



INDEX TO TOPOGRAPHIC MAPS IN HARLEM 30'x60' QUADRANGLE



BURIED OR ABANDONED DRAINAGE IN THE HARLEM 30' x 60' QUADRANGLE MONTANA

By
Thomas W. Patton* and Roger B. Colton
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This map is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

* MONTANA BUREAU OF MINES AND GEOLOGY