

GEOLOGIC AND STRUCTURE CONTOUR MAP
OF THE HARLEM 30' x 60' QUADRANGLE
NORTH-CENTRAL MONTANA

by

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Introduction

This geologic quadrangle map is an updated and digitally produced revision of MBMG Open-File 324, Preliminary Geologic Map of the Harlem 30x60-minute Quadrangle, published by the Montana Bureau of Mines and Geology in 1994. Revisions are primarily focused on (1) redefining the extent of Tertiary gravels, (2) more detailed mapping of Holocene deposits such as landslides and colluvium, and (3) combining the Cretaceous Fox Hills and Hell Creek Formations and modifying the contacts of the combined unit, pending better field definition of these formations.

Tertiary gravels may underlie glacial deposits on many of the bench lands of the map area, but they are only shown where field mapping or water-well data indicate their presence.

Glacial till of varying thickness masks the bedrock over most of the quadrangle. Most map unit contacts, even where shown as a solid line, should be taken as concealed or approximate. Because this map, like its earlier version, is intended primarily as a bedrock map, almost no delineation of the extensive and diverse glacial deposits has been included. Nonetheless, the authors recognize this predominant Pleistocene history in the region, and anticipate that future mapping of these deposits would be a significant contribution to understanding the geology of Montana's north-central plains.

Faults shown on this map are derived from the early work of Zimmerman (1960), from the Geologic Map of Montana (Ross and others, 1955) and a preliminary edition of that map (Andrews and others, 1944), and from Sholes and Bergantino (1994). No new field investigation of these faults was conducted for this report; the authors recognize that further work is required to address fully the faults in this quadrangle. These faults are considered to be distal occurrences of the extensive gravity-slide fault blocks that dominate the foothills surrounding the Bears Paw Mountains south of Havre, Montana (Hearn, Jr., 1976).

The structure-contours drawn on the top of the Judith River Formation are based on data available from petroleum and ground-water wells in the area. Contours are necessarily generalized in many areas, but can serve as a first approximation for estimating drilling depths for new wells.

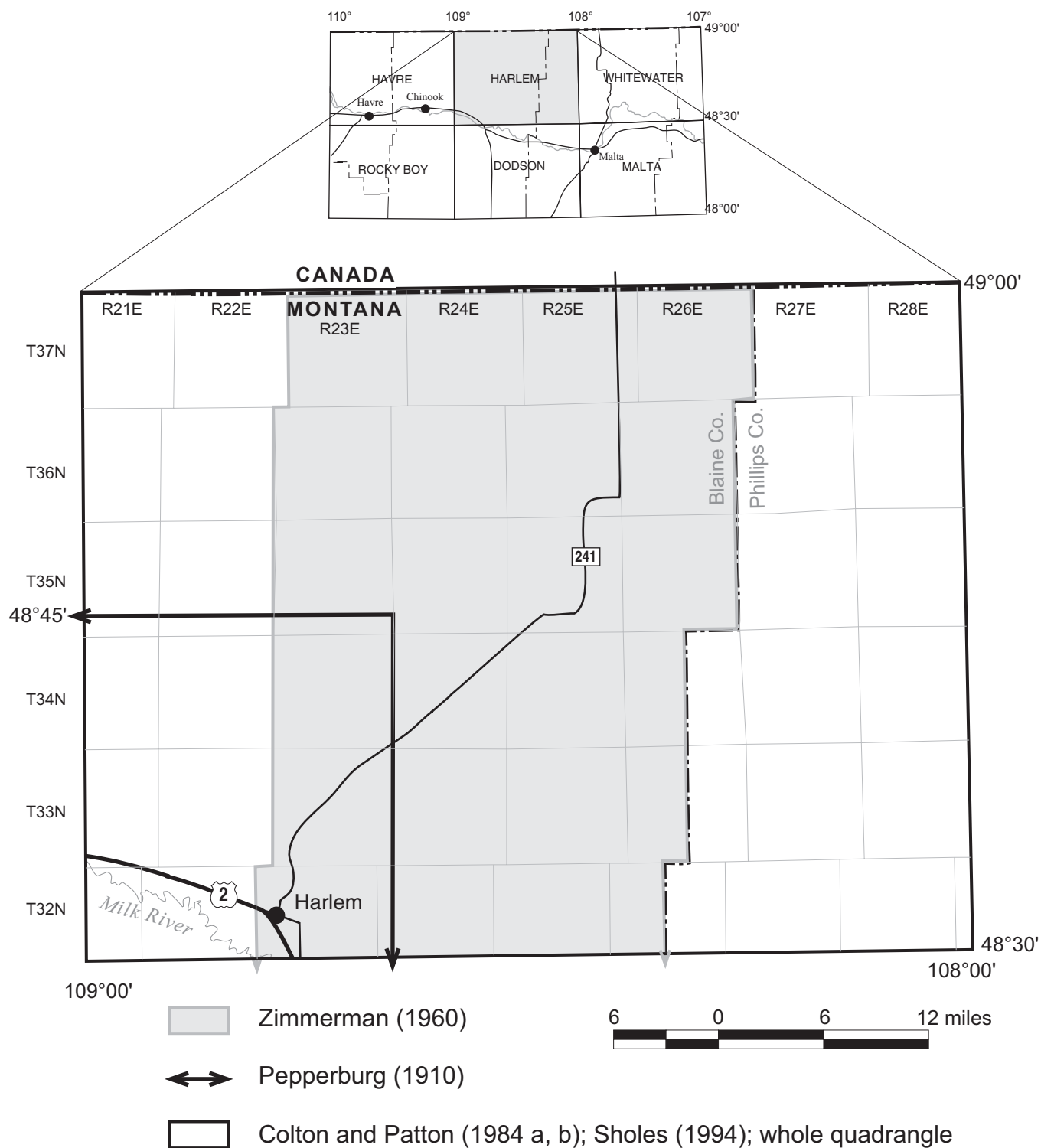


Figure 1. Location map for Harlem 30'x60' quadrangle showing areas covered by older geologic maps within the quadrangle (see Sources of Previous Geologic Mapping), and location of adjacent geologic maps published by MBMG.

Correlation Chart of Map Units Harlem 30' x 60' Quadrangle

Quaternary

Qal	Qls
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Tertiary

Unconformity

Tsg

Unconformity

Upper Cretaceous

Khfh
Kb
Kjr

Figure 2. Correlation chart of map units

Map Units

QUATERNARY

- Qal **Alluvium** (Holocene). Deposits of modern streams and associated flood plains; includes colluvium, and modern terrace deposits; locally includes some slightly older Holocene terrace alluvium, and includes some glacial outwash. Thickness not measured.
- Qls **Landslide deposit** (Holocene). Deposits primarily developed within the Bearpaw Shale where it is deeply dissected along primary streams.

TERTIARY

- Tsg **Sand and gravel** (Miocene-Pliocene). This unit, predominantly sand and gravel, locally cemented with calcium carbonate, possibly is equivalent in part to the Flaxville Formation, but may include high-level sand and gravel deposits of possible early Pleistocene age that, owing to lack of fossil evidence, have not been dated. The unit is up to 100 ft (30 m) thick.

UPPER CRETACEOUS

- Khfh **Hell Creek Formation and Fox Hills Formation, undivided.** Hell Creek Formation principally composed of siltstone in its upper portion; sandstone content increases toward the base and, where adequately recharged, is a productive aquifer. Wells, however, should be continued into the underlying Fox Hills Sandstone to maximize yields. The Hell Creek Formation averages about 250 ft (80 m) thick. The Fox Hills Sandstone has a maximum thickness of 150 ft (45 m).
- Kb **Bearpaw Shale.** Dark-gray fissile marine shale, weathering lighter gray; contains thin beds of white bentonite, and numerous calcareous concretions. Forms gentle slopes and rounded hills; outcrops are few and generally poor; exposed surfaces commonly dessication-cracked and minimally vegetated. Maximum thickness is about 1,000 ft (300 m).
- Kjr **Judith River Formation.** Light-tan to light-gray, fine- to medium-grained, strongly lenticular, resistant sandstone that weathers to buff and light orangish-brown, interbedded with lesser amounts of siltstone, light-gray shale and claystone, and local thin lignite beds.; drill holes in the area record thicknesses of as much as 175 ft (53 m) (Feltis and others, 1981).

GEOLOGIC MAP SYMBOLS



Contact: dotted where concealed



Fault: dotted where concealed; ball and bar on downthrown side



Strike and dip of bedding



Significant break in slope between two levels of Qal. Tick marks point to lower level.

References

Sources of Previous Geologic Mapping within Quadrangle

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