GEOLOGIC MAP OF THE

CHESTER 30' x 60' QUADRANGLE

NORTH-CENTRAL MONTANA

by

David A. Lopez

Montana Bureau of Mines and Geology

Open File Report MBMG 445

2002

This map has had preliminary reviews for conformity with technical and editorial standards of the Montana Bureau of Mines and Geology.

Partial support has been provided by the STATEMAP component of the National Cooperative Geologic Mapping Program of the U. S. Geological Survey under Contract Number 01-HQ-AG-0096.

INTRODUCTION AND DISCUSSION

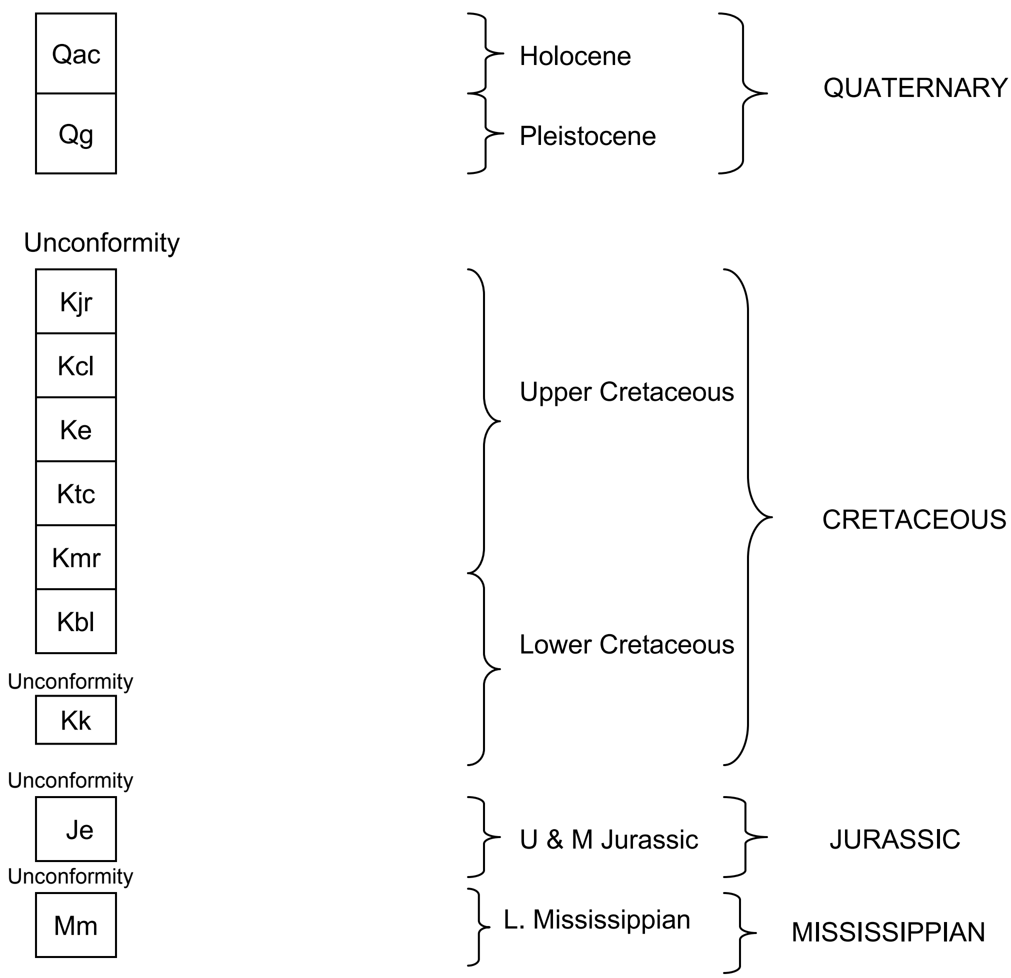
The Chester 30' X 60' Quadrangle lies within the area that was covered by Pleistocene continental glaciers. Thus, glacial deposits cover much of the bedrock in the area. Glacial deposits are depicted by a stippled pattern, and buried bedrock units are identified by letter symbols in parentheses (see map symbol explanation). The bedrock geology depicted here is based on limited exposure and on oil and gas drill-hole data. Because of the lack of sufficient data, buried contacts beneath glacial deposits are approximate and appear rather stylized.

The northeast-trending Great Falls Tectonic Zone is a broad zone that passes beneath most of the area of this quadrangle (Lopez, 1995; O'Neill and Lopez, 1985). Its effect on bedrock geology in this area could not be determined because of the limited amount of bedrock exposure and detailed subsurface mapping is beyond the scope of this report. In the areas covered by glacial deposits, the bedrock structure must be much more complicated than shown on this map, as is the case in the nearby Sweet Grass Hills (Lopez, 1995). Limited available gravity and aeromagnetic data, as well as unpublished proprietary data, show the structure in the area is dominated by a northeast-striking basement faults that are part of the Great Falls Tectonic Zone and that are known to affect the Paleozoic and Mesozoic rocks in the area (Lopez, 1995; O'Neill and Lopez, 1985).

Significantly, thrust sheets that have been gravitationally emplaced off of the Bearspaw uplift (Reeves, 1924a, 1924b, 1946) appear in a few places on this quadrangle. There undoubtedly are many more of these structural features buried beneath glacial deposits. These thrust sheets appear to sole in, and glide on, two horizons about in the middle of the Marias River section (Baker and Johnson, 2000). The thrusts, therefore, effect rocks younger than the Marias River Formation. Structure below the thrust sheets is unrelated to, and does not reflect, the thrusted geometry. These thrust features are important structural traps for natural gas in the region surrounding the Bearspaw uplift.

This map is based on, and supersedes an earlier compilation of the geology of the Chester Quadrangle, published as Open-File Report MBMG-312 (Lopez and Sholes, 1994)

CORRELATION OF UNITS
CHESTER 30'X 60' QUADRANGLE



DESCRIPTION OF UNITS
CHESTER 30'X60' QUADRANGLE

Qac **Alluvium and colluvium, undivided (Holocene) –** Alluvial deposits in active streams and rivers, consisting mainly of locally derived sand and gravel and reworked material from glacial till. Coarser material, as large as boulder size, can be present close to mountainous areas. Locally may include colluvium, glacial outwash, and glacial lake deposits.

Qg **Glacial deposits, undivided (Pleistocene) –** Unsorted deposits of Clay- to boulder-size material. Clast composition is anomalous relative to local bedrock; predominant lithologies of clasts are pink granite, quartz-biotite schist, granite gneiss, and quartzite. Locally, cobbles and boulders of ultramafic rocks are present. Areas underlain by these deposits display characteristic hummocky topography. Roger Colton (written communication, 1994), on unpublished mapping of Quaternary deposits, divided these deposits in greater detail, but this detailed mapping is not included here because of the bedrock emphasis of this map.

Kjr **Judith River Formation (Upper Cretaceous) –** Interbedded deposits of fluvial sandstone, shale, mudstone, siltstone, and coal. Forms rounded, light-colored outcrops. Sandstones are lenticular, trough cross-bedded, fine to coarse grained, light gray to yellowish brown, and nearly-white to brown-weathering. Mudstones are commonly carbonaceous. Fossil plant debris is common. A complete section is not exposed in the area, but the total thickness in the area is reported to be about 750 ft (Erdmann, 1942).

Kcl **Claggett Shale (Upper Cretaceous) –** Brownish gray silty and sandy shale with thin interbeds of argillaceous and calcareous sandstone. Brown septarian concretions and *Inoceramus* prisms are common. The lower part contains beds of bentonite. The Claggett is typically very poorly exposed. Cobban (1955) reported a thickness of 420 ft at Goosebill Butte, 30 miles south of Chester.

Ke **Eagle Sandstone (Upper Cretaceous) –** Upper part is generally poorly exposed and is characterized by thin sandstone beds interbedded with brown and olive mudstones and less abundant bentonite, bentonitic mudstone, carbonaceous shale, and coal. Fossilized plant debris is common in this part of the section. The lower part is light-brown to buff-weathering thick-bedded to massive sandstone that forms rounded rims and bluffs. Sandstones are fine grained, light gray to light brownish gray, limonite speckled, and well indurated to friable. Ripples, low-angle cross bedding, and burrowing are common. This lower part of the section is commonly referred to as the Virgelle Member. The Eagle Sandstone is about 350 ft in total thickness in the area.

Ktc **Telegraph Creek Formation (Upper Cretaceous) –** Interbedded medium-brownish gray sandy shale and brown, fine-grained, thin-bedded, argillaceous sandstone. Proportion of sandstone relative to shale increases upward in the section. Total thickness in the area is about 150 ft.

Kmr **Marias River Formation, undivided (Upper Cretacous) –** used only on cross section.

Kbl **Blackleaf Formation (Lower and Upper Cretaceous) –** used only on cross section.

Kk **Kootenai Formation (Lower Cretacous) –** used only on cross Section.

Je **Ellis Group (Upper and Middle Jurassic) –** used only on cross section.

Mm **Madison Group (Upper Mississippian) –** used only on cross section.

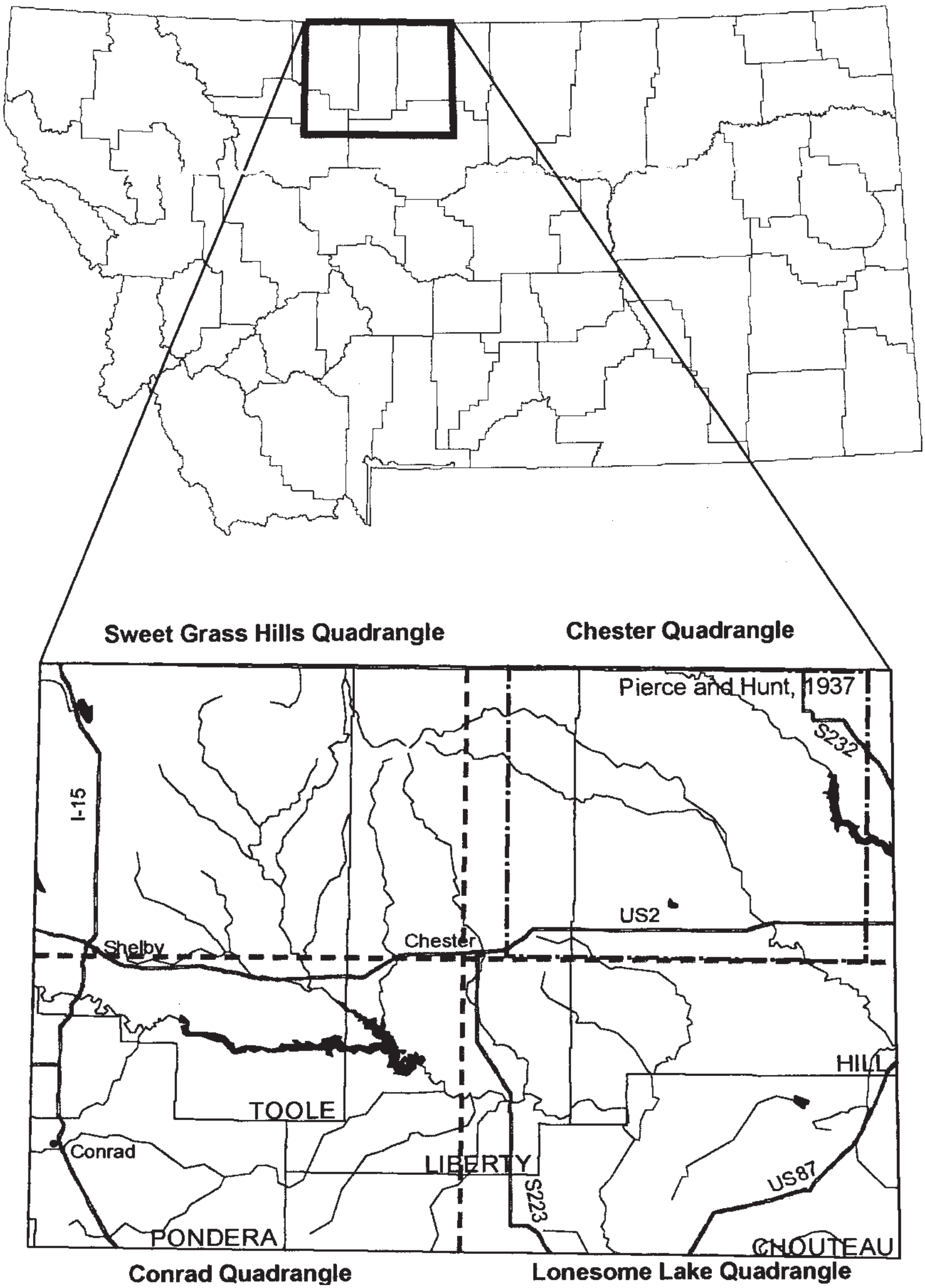
Map Symbols

Contact, dotted where concealed.

Thrust fault; dotted where concealed; teeth on upper plate.

(Kjr)

Unit symbol in parentheses denotes that the unit is concealed by glacial deposits.



Index map and sources of geologic mapping for the Chester 30’X60’ quadrangle

REFERENCES CITED

Baker, D. W., and Johnson, E. H., 2000, Tectonic framework and gas-filled structures of the Bearpaw Mountains, north-central Montana: in Schalla, R. A., and Johnson, E. H., eds., 2000, Montana/Alberta thrust belt and adjacent foreland: Montana Geological Society 50th Anniversary Symposium. p. 1-26.

Cobban, W. A., 1955, Cretaceous rocks of northwestern Montana, in Sweetgrass Arch-Disturbed Belt, Montana, Sixth annual field conference guidebook, P. J. Lewis, (ed.): Billings Geological Society, p. 107-119.

Erdman, C. E., 1942, Preliminary map of the areal and structural geology of T36N,R1E, Toole County, Montana showing the Kicking Horse Dome and Simmons Creek anticlinal nose: U. S. Geological Survey map, scale 1:62,500.

Lopez, D. A., 1995, Geology of the Sweet Grass Hills, North-Central Montana: Montana Bureau of Mines and Geology Memoir 68, 35p, Plate 1, scale 1:100,000.

Lopez, D. A., and Sholes, M. A., 1994, Preliminary geologic map of the Chester 30' X 60' quandrangle: Montana Bureau of Mines and Geology Open-File Report MBMG-312, scale 1:100,000.

O'Neill, J. M., and Lopez, D. A., 1985, Character and regional significance of the Great Falls Tectonic Zone, east-central Idaho and west-central Montana: American Association of Petroleum Geologists Bulletin, vol. 69, no. 3, p. 437-447.

Pierce, W. G., and Hunt, C. B., 1937, Geology and mineral resources of north central Chouteau, western Hill and eastern Liberty Counties, Montana: U. S. Geological Survey Bulletin 847-F, p. 225-264, Plate 43, scale 1:125,000.

Reeves, Frank, 1924a, Geology and possible oil and gas resources of the faulted area south of the Bearpaw Mountains, Montana: U. S. Geological Survey Bulletin 751-C, p. 71-114.

_______, 1924b, Structure of the Bearpaw Mountains, Montana: American Journal of Science, 5th Series, vol. 8., p. 296-311.

_______, 1946, Origin and mechanics of thrust faults adjacent to the Bearpaw Mountains, Montana: Geological Society of America Bulletin, vol. 57, p. 1033-1048.