GEOLOGIC MAP OF THE HYSHAM 30'x 60' QUADRANGLE

EASTERN MONTANA

Compiled and mapped by
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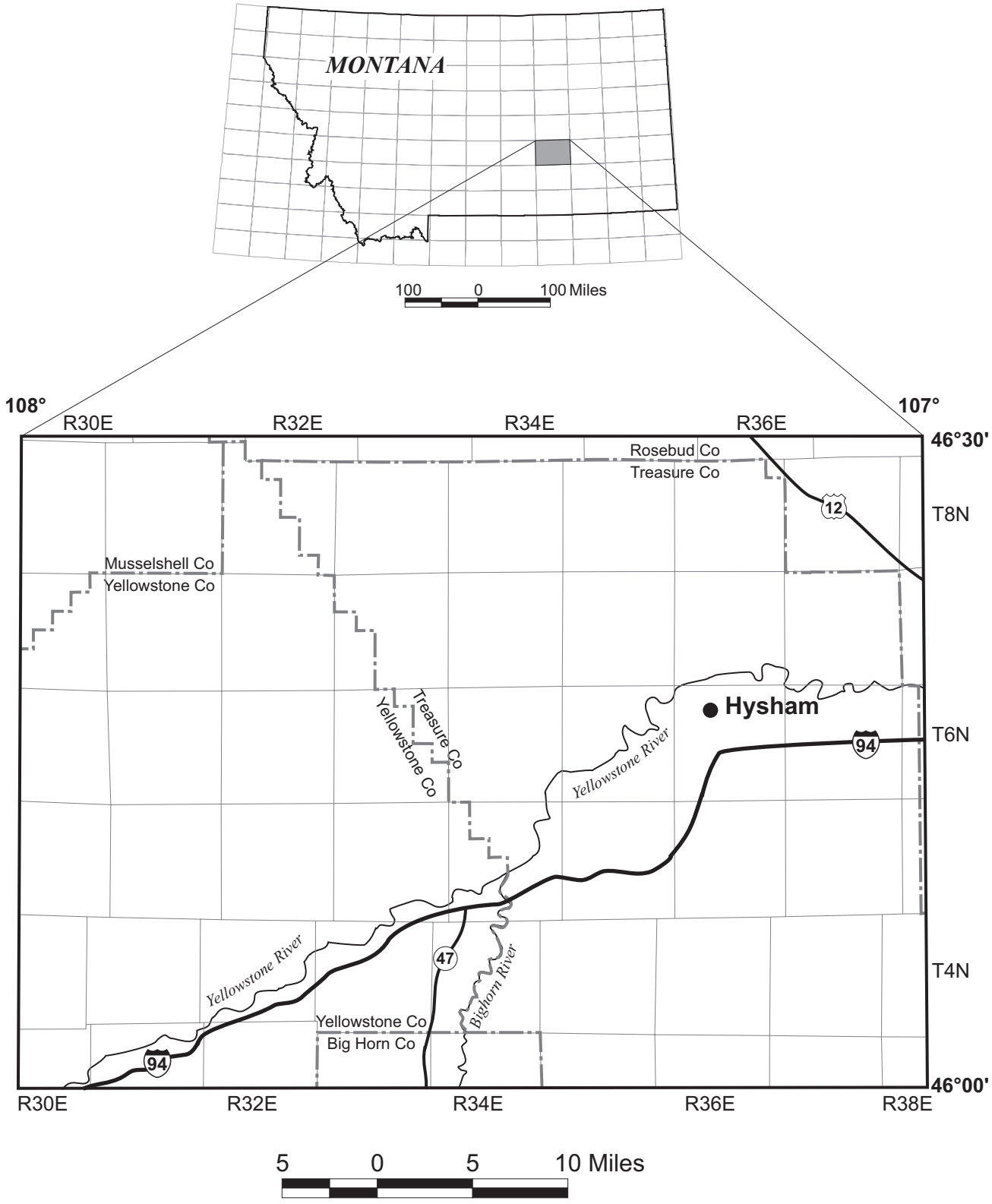
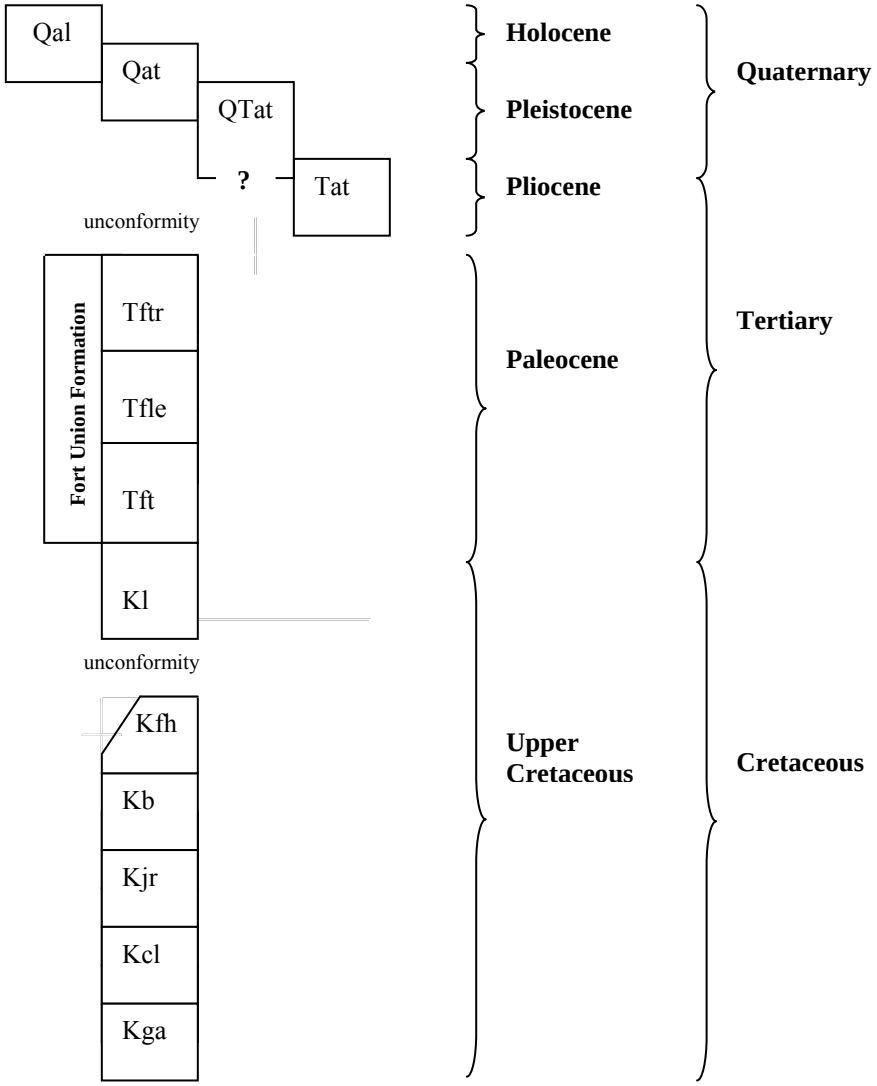


Figure 1. Location of Hysham 30'x60' quadrangle, eastern Montana.

CORRELATION DIAGRAM
HYSHAM 30’ x 60’ QUADRANGLE



GEOLOGIC MAP SOURCES AND INDEX OF 7.5' QUADRANGLES
HYSHAM 30' x 60' QUADRANGLE

108° 107°

46°30'

Chandler Spring 3, 10	Weed Creek West 3, 10	Weed Creek East 6, 10	Ruskosky Ridge 6	McKonkey Creek 6	Steie Ranch 5, 7	Ahles 5, 7	Vananda 2
Pine View 6	Mailbox Hill 6	Mexican Buttes 6	Devil's Kitchen 6	Rancher Cemetery 6	Myer 6, 8	Hysham 6, 8	Sanders 6, 8
Bull Mountain NW 6	Mud Butte 6	Coal Bank Creek 6	Custer 6	Bighorn 6, 9	Eldering Ranch 6, 9	Scraper Coulee 6, 9	Woods Water 6, 9
Big Mary's Island 4, 6	Bull Mountain 1, 6	Waco 1, 6, 8	Mission Creek 1, 6, 8	Marsh Coulee 6, 9	Hope Ranch 6, 9	South Bear Creek 6, 9	Minnehaha Creek North 6, 9

46°

1. Agard, S.S., 1989, U.S. Geological Survey Miscellaneous Investigations Map MF-2094, 1:100,000 scale.
2. Bowen, C.F., 1916, U.S. Geological Survey Bulletin 621-F, Plate X, 1:250,000 scale.
3. Ellis, A.J., and Meinzer, O.E., 1924, U.S. Geological Survey Water-Supply Paper 518, Plate 1, 1:250,000 scale.
4. Hancock, E.T., 1919, U.S. Geological Survey Bulletin 711, Plate XIV, 1:125,000 scale.
5. Heald, K.C., 1927, U.S. Geological Survey Bulletin 786, Plate 1, 1:63,360 scale.
6. Hall, G.M., and Howard, C.S., 1929, U.S. Geological Survey Water-Supply Paper 599, Plate 7, 1:250,000 scale.
7. Renick, B.C., 1929, U.S. Geological Survey Water-Supply Paper 600, Plate 1, 1:250,000 scale.
8. Rogers, G.S., 1914, U.S. Geological Survey Bulletin 541-H, Plate XVIII, 1:125,000 scale.
9. Rogers, G.S., and Lee, Wallace, 1923, U.S. Geological Survey Bulletin 749, Plate X, 1:125,000 scale.
10. Woolsey, L.H., Richards, R.W., and Lupton, C., 1917, U.S. Geological Survey Bulletin 647, 1:125,000 scale.

Entire Map

Ellis, M.S., and Colton, R.B., 1994, U.S. Geological Survey Miscellaneous Investigations Map I-2298, scale 1:500,000.

Stoner, J.D., and Lewis, B.D., 1980, U.S. Geological Survey Miscellaneous Investigations Series Map I-1236, scale 1:500,000.

Vuke, S.M., Wilde, E.M., and Bergantino, R.N., 1990, Preliminary geologic map of the Hysham 30x60-minute quadrangle, scale 1:100,000. (Superseded by this report.)

HYSHAM 30’ x 60’ QUADRANGLE
EXPLANATION

Qal **Alluvium (Holocene)—**Light-brown and gray gravel, sand, silt, and clay deposited in stream and river channels and on flood plains. Clasts are well rounded to subrounded. Deposits are poorly to well stratified. Thickness as much as 26 ft under flood plain of Yellowstone River and less than 13 ft under flood plains of tributaries.

Qat **Alluvial terrace deposit (Holocene and Pleistocene)—**Light-gray to light-brown gravel, sand, silt and clay in terrace remnants at elevations from 2 to 275 ft above rivers and streams. Along the Yellowstone River unit includes colluvium. Clasts are generally well sorted and most are well rounded. Deposits are poorly to well stratified and poorly to well sorted. Thickness generally less than 15 ft, but locally as much as 30 ft thick.

QTat **Alluvial terrace deposit (Pleistocene and Pliocene?)—**Light-brown and light-gray gravel and sand at elevations between those of Qat and Tat. Clasts are generally well sorted and most are rounded to subrounded volcanic rocks, crystalline rocks, and quartzite. Deposits are moderately to well sorted. Thickness 20-30 ft.

Tat **Alluvial terrace deposit (Pliocene)**—Light-brown and light-gray gravel and sand. Poorly to moderately well-sorted and stratified with planar and trough cross-bedding. Gravel clasts consist of rounded to subrounded volcanic rocks, crystalline rocks, and quartzite (Agard, 1989). Thickness about 30 feet.

Fort Union Formation (Paleocene)

Tftr **Tongue River Member—**Yellow, orange, or tan, fine- to medium-grained sandstone with thinner interbeds of yellowish-brown, orange, or tan siltstone, light-colored mudstone and clay, brownish-gray carbonaceous shale, and coal. Sand bodies are generally channels that do not persist laterally. Clay dominantly nonswelling. Upper part of member was removed by erosion in map area. As much as 450 ft exposed in map area.

Tfle **Lebo Member—**Gray and greenish-gray smectitic shale and mudstone that contain lenses and interbeds of gray and yellow, very fine to medium-grained, poorly resistant sandstone. Brown ironstone nodules ranging from granule to small boulder size are locally abundant. The Big Dirty coal bed and associated dark-gray or grayish-brown carbonaceous shales are at or near the base of the member; shale contains numerous plant impressions. Thickness of member 150-300 ft.

Tft **Tullock Member—**Light-yellow and light-brown, planar-bedded, very fine to medium-grained sandstone and subordinate gray shale with thin beds of dark-brown to black carbonaceous shale and coal. Locally contains silcrete beds. Thickness of member 200-220 ft.

Kl **Lance Formation (Upper Cretaceous)—**Light-orange or light-tan, medium-grained, massive to cross-bedded sandstone in lenses and channels interbedded with light-gray or greenish-yellow sandy shale. Calcium carbonate-cemented concretions occur locally in fine-grained sandstone. Crossbedded conglomerate lenses at the base contain quartzite and limonite pebbles as much as 1 inch in diameter and armored claystone balls as much as 9 inches in diameter. Thickness 330-525 ft.

Kfh **Fox Hills Formation (Upper Cretaceous)**—Light-brown or light-orange, thin- to thick-bedded, micaceous, fine- to medium-grained sandstone in the upper part and thin-bedded siltstone and silty shale in the lower part. Thickness 0-75 ft.

Kb **Bearpaw Shale (Upper Cretaceous)—**Dark-brownish-gray, montmorillonitic, fissile shale, and mudstone, with numerous thin bentonite beds and zones of calcareous and less common ferruginous concretions. Most bentonite beds are less than 6 inches thick but some are as much as 4 ft thick in the Vananda area (Berg, 1970). Several intervals contain concretions with *Inoceramus*, *Baculites*, and other fossils. Basal Bearpaw contains fissile shale that is rich in organic matter (Heald, 1927). Thickness 900-1500 ft.

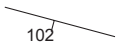
Kjr **Judith River Formation (Upper Cretaceous)**—Upper: Light-gray, thin- to thick-bedded, fine- to medium-grained, cross-bedded sandstone that weathers light-grayish-white, and thin coal lenses. Middle: Dark-gray, thin- to thick-bedded shale unit. Lower: Light-gray, thin- to thick-bedded, fine- to medium-grained sandstone that weathers light-grayish-white, and may contain limonitic concretions. Casts of *Halymenites major* occur throughout the formation and bones of turtles and dinosaurs have been found in the lower concretionary beds (Heald, 1927). Thickness about 245 ft (Heald, 1927).

Kcl **Claggett Shale (Upper Cretaceous)—**Dark-gray, thin-bedded shale with zones of calcareous concretions and bentonite beds. Zone of septarian concretions near top, and 40-ft-thick, cross-bedded sandstone at the top. Prominent bentonite zone (Ardmore bentonite of Gill and Cobban, 1973) at base. Thickness about 435 ft (Heald, 1927).

Kga **Gammon Shale (Upper Cretaceous)**—Light-gray shale, silty shale, and lesser siltstone and fine-grained sandstone, with thin beds of calcareous concretions, ferruginous concretions, and bentonite scattered throughout the formation. Only the uppermost 20 ft exposed in the northeast corner of the map.

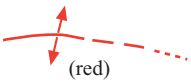
MAP SYMBOLS
HYSHAM 30'x 60' QUADRANGLE

Contact—Dotted where concealed.

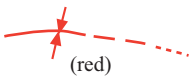


Strike and dip of bedding—Number indicates amount of dip in degrees.

Fault—Ball and bar on downthrown side, dotted where concealed fault interpreted from apparent offset of stratigraphic units.



Anticline—Showing trace of axial plane; dashed where approximately located; dotted where concealed.



Syncline— Showing trace of axial plane; dashed where approximately located; dotted where concealed.

Silcrete bed—Siliceous paleosol bed in Tullock Member of Fort Union Formation.

Dike—Light- to dark-greenish-brown, extremely weathered porphyritic lamprophyre a few inches to a few feet thick (E.S. Larsen in Heald, 1927).

Diatreme — Froze-to-Death Butte lamproitic pipe-like intusion and associated small dikes. Contains sedimentary zenoliths (Doden, 1997).

REFERENCES AND SELECTED BIBLIOGRAPHY
HYSHAM 30′ x 60′ QUADRANGLE

Agard, S.S., 1989, Map showing Quaternary and late Tertiary terraces of the lower Bighorn River, Montana: U.S. Geological Survey Map MF-2094, scale 1:100,000.

Berg, R.B., 1970, Bentonite deposits in the Ingomar-Vananda area, Treasure and Rosebud Counties, Montana: Montana Bureau of Mines and Geology Special Publication 51, 5 p., 1 plate.

Babisak, J., 1958, Wolf Springs field, *in* Nordquist, J.W., and Johnson, M.C., eds., Montana Oil and Gas Fields Symposium: Billings Geological Society, p. 230–231.

Bowen, C.F., 1916, Possibilities of oil in the Porcupine Dome, Rosebud County, Montana: U.S. Geological Survey Bulletin 621-F, p. 61–70.

Cochran, W., 1956, Wolf Springs Pool, Yellowstone County, Montana, *in* Foster, D.I., ed., Central Montana: Billings Geological Society Seventh Annual Field Conference Guidebook, p. 108.

Connor, C.W., 1992, The Lance Formation—Petrography and stratigraphy, Powder River Basin and nearby basins, Wyoming and Montana: U.S. Geological Survey Bulletin 1917-I, p. I1–I17.

Doden, A.G., 1997, The geology, petrology, and geochemistry of ultramafic igneous rocks from Porcupine Dome and Grassrange, central Montana: University Park, Pennsylvania State, Ph.D. dissertation, 510 p.

Ellis, A.J., and Meinzer, O.E., 1924, Ground water in Musselshell and Golden Valley Counties, Montana: U.S. Geological Survey Water-Supply Paper 518, 92 p.

Ellis, M.S., and Colton, R.B., 1994, Geologic map of the Powder River Basin and surrounding area, Wyoming, Montana, South Dakota, North Dakota, and Nebraska: U.S. Geological Survey Miscellaneous Investigations Map I-2298, scale 1:500,000.

Gill, J.R., and Cobban, W.A., 1973, Stratigraphy and geologic history of the Montana Group and equivalent rocks, Montana, Wyoming, and North and South Dakota: U.S. Geological Survey Professional Paper 776, 37 p.

Hall, G.M., and Howard, C.S., 1929, Ground Water in Yellowstone and Treasure Counties, Montana: U.S. Geological Survey Water-Supply Paper 599, 118 p.

Hancock, E.T., 1919, Geology and oil and gas prospects of the Huntley Field, Montana: U.S. Geological Survey Bulletin 711, *in* White, David, and Ashley G.H., eds., Contributions to Economic Geology, Part II Mineral Fuels, p. 105–148.

Heald, K.C., 1927, The geology of the Ingomar Anticline, Treasure and Rosebud Counties, Montana: U.S. Geological Survey Bulletin 786, p. 1–37.

Irving, A.J., and Hearn, B.C., Jr., 2003, Alkalic rocks of Montana: kimberlites, lamproites, and related magmatic rocks, *in* Montana Field Trip Guidebook, Eighth International Kimberlite Conference: Geological Survey of Canada, Ottawa, Ontario, 44 p.

Langen, R.E., 1956, Wolf Springs Field, Yellowstone County, Montana *in* Foster, D.I., ed., Central Montana: Billings Geological Society Seventh Annual Field Conference Guidebook, p. 109.

Luebking, G.A., Longman, M.W., and Carlisle, W.J., 2001, Unconformity-related chert/dolomite production in the Pennsylvanian Amsden Formation, Wolf Springs Field, Bull Mountain Basin of central Montana: American Association of Petroleum Geologists, Bulletin 85, p. 131–148.

Lupton, C.T., 1909, The eastern part of the Bull Mountain coal field, Montana, *in* Contributions to Economic Geology, Part II—Mineral Fuels: U.S. Geological Survey Bulletin 431-B, p. 79–105.

Renick, B.C., 1929, Geology and ground-water resources of central and southern Rosebud County, Montana: U.S. Geological Survey Water-Supply Paper 600, 140 p.

Rice, D.D., 1976, Stratigraphic sections from well logs and outcrops of Cretaceous and Paleocene rocks, northern Great Plains, Montana: U.S. Geological Survey Chart OC-71.

Rogers, G.S., 1914, Geology and coal resources of the area southwest of Custer, Yellowstone, and Bighorn Counties, Montana: U.S. Geological Survey Bulletin 541-H, p. 26–38.

Rogers, G.S., and Lee, Wallace, 1923, Geology of the Tullock Creek coal field, Rosebud and Big Horn Counties, Montana: U.S. Geological Survey Bulletin 749, 181 p.

Stoner, J.D., and Lewis, B.D., 1980, Hydrogeology of the Fort Union coal region, eastern Montana: U.S. Geological Survey Miscellaneous Investigations Series Map I-1236, scale 1:500,000.

Woolsey, L.H., Richards, R.W., and Lupton, C.T., 1917, The Bull Mountain coal field, Musselshell and Yellowstone Counties: U.S. Geological Survey Bulletin 647, 281 p.