GEOLOGIC MAP OF THE WIBAUX 30´ x 60´ QUADRANGLE EASTERN MONTANA AND ADJACENT NORTH DAKOTA

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GEOLOGIC MAP SOURCES AND INDEX OF 7.5′ QUADRANGLES
WIBAUX 30′ x 60′ QUADRANGLE

103° 104°

47°

Marsh 2, 6, 7	Hoyt 1, 2, 6, 7	Upper Magpie Reser-voir 1, 2	Twin Forks Reser-voir 2	Hodges 2	Freeman Creek 3, 4	Wibaux 2, 4, 5	Beach West 2, 4, 5
Marsh SW 2, 3	Simons Butte 2, 3	Grave-yard Hill SW 1, 2, 3	Grave-Yard Hill 1, 2, 3	Hodges SW 2, 3	Hodges SE 2, 3	Red Top Butte 2, 3, 5	Duck Creek 2, 3, 5
Mildred 3	Mildred NE 3	Dorothy Draw 3	Ayer Spring NE 1, 3	Rocking Chair Butte 1, 3	Cap Rock 3	Carlyle NW 3	Carlyle 3
Loony Hollow 3	Ismay North 3	Ayer Spring 3	Law-rence West 3	Law-rence East 1, 3	Rush Hall Reser-voir 1, 3	Shell Butte 3	Ollie 3

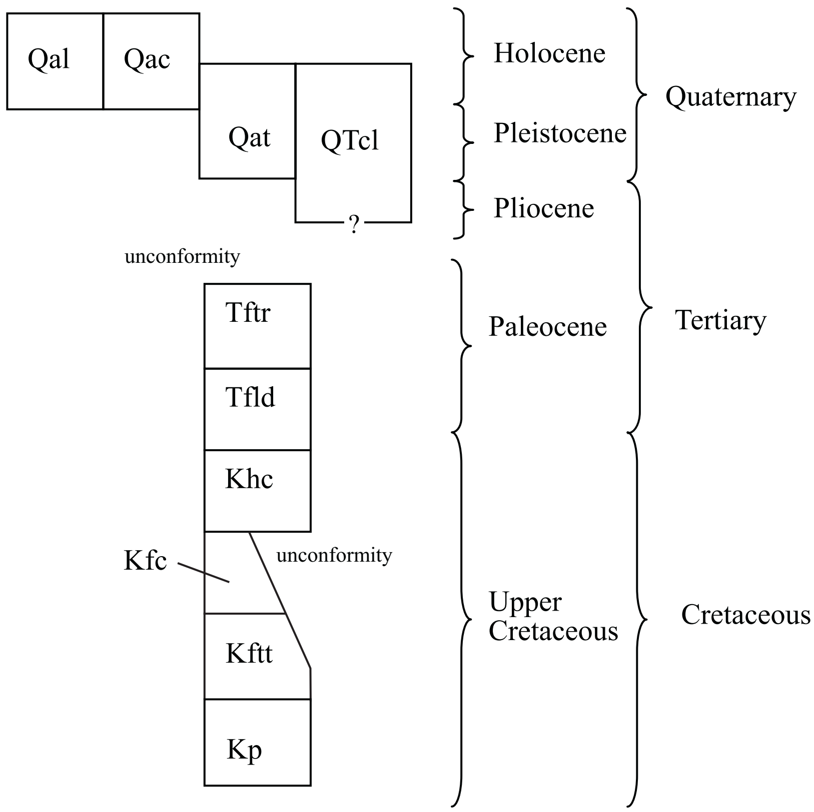
46°30′

Numbers above correspond with reference list below.

1. Erdmann, C.E., and Larsen, R.M., 1934, scale 1:63,360.
2. Hance, C.J., 1912, scale 1:125,000.
3. Herald, F.A., 1912, scale 1:125,000.
4. Leonard, A.G., and Smith, C.D., 1909, Plate II, scale 1:253,440.
5. May, P.R., 1954, Plate 39, scale 1:40,000; Plate 40, scale 1:40,000; Plate 43, scale 1:60,000.
6. Moulder, E.A., and Kohout, F.A., 1958, Plate 2, scale 1:125,000.
7. Torrey, A.E., and Swenson, F.A. 1951, Plate 1, scale 1:125,000.

Entire quadrangle
Bergantino, R.N., 1977, scale 1:250,000.
Calvert, W.R., 1912, scale 1:1,013,760.
Stoner, J.D., and Lewis, B.D., 1980, scale 1:500,000.
Taylor, O.J., 1965, Pl. 1, scale 1:176,306 (excludes North Dakota).
Vuke, S.M., 1989, scale 1:100,000.
Vuke-Foster, S.M., Colton, R.B., Stickney, M.C., Wilde, E.M., Robocker, J.E., and Christensen, K.C., 1986, scale 1:100,000.

CORRELATION DIAGRAM
WIBAUX 30′x 60′ QUADRANGLE



DESCRIPTION OF MAP UNITS
WIBAUX 30´ x 60´ QUADRANGLE

Qal **Alluvium (Holocene)**—Light-brown, reddish-brown, yellowish-brown, grayish-brown, brown, olive, gray, and light-gray gravel, sand, silt, and clay deposited in stream and river channels and on flood plains. Gravel clasts poorly to well sorted and as much as 2 ft in diameter. Deposits poorly to well stratified. Thickness generally less than 20 ft, but locally as much as 40 ft.

Qac **Sheetwash alluvium and colluvium (Holocene)**—Yellowish-brown, olive-brown, grayish-brown, olive-gray, and brownish-black, poorly to moderately well sorted pebbles, sand, silt, and clay. Deposits poorly to well stratified. Thickness generally 1 to 20 ft.

Qat **Alluvial terrace deposit (Holocene and Pleistocene)**—Light-brown, grayish-brown, and light-gray gravel, sand, and silt in terrace remnants at elevations ranging from 2 to 360 ft above rivers and streams. Gravel clasts generally well sorted, and dominantly well rounded. Deposits poorly to well stratified. Thickness generally less than 10 ft, but as much as 130 ft along the Yellowstone River.

QTcl **Clinker (Holocene, Pleistocene, and Pliocene?)**—Red, pink, orange, black, and yellow, very resistant metamorphosed shale, siltstone, and sandstone of Fort Union and Hell Creek Formations. Bedrock was baked by natural burning of underlying coal, and collapsed into voids created by burning. Locally, baked rock was melted and fused to form buchite, a black, glassy, vesicular or scoriaceous rock. Age reflects time of metamorphism. Thickness generally 20 ft, but locally as much as 75 ft.

Fort Union Formation (Paleocene)

Tftr **Tongue River Member**—Dominantly yellow, orange, or tan fine-grained sandstone and thinner interbeds of yellowish-brown, orange, or tan siltstone, and light-colored mudstone and clay that is dominantly non-swelling. Contains thick to thin, poorly cemented, fluvial sandstone beds that locally weather to cavernous cliffs. Member generally poorly cemented and weathers to badlands topography. Locally contains plant and small vertebrate fossils, and several prominent lignite beds. In part of the map area (shown with green hachure pattern on map), the lower part of the unit contains orange silty limestone beds associated with light-colored intervals that may contain white or light-gray silcrete and other paleosol beds. Silcrete beds characteristically contain molds of plant stems and roots, range from 1 inch to 1.5 ft thick, and locally weather to rubbly clasts ranging from boulder to pebble size. The relatively resistant orange silty limestone beds form flat-topped caprocks, producing a characteristic topography. Orange or yellow, trough-crossbedded fluvial sandstones dominate in some areas. Upper part of member removed by erosion in map area. Exposed thickness 460 ft.

Tfld **Ludlow Member (Paleocene)**—Dominantly gray and grayish-brown sandstone, siltstone, and mudstone interbedded with thinner, yellow or orange, fine-grained sandstone beds as much as 100 ft thick. In some areas, the gray and grayish-brown sandstone, siltstone and mudstone are interbedded in planar beds. In other areas gray, crossbedded, lenticular, fine-grained, clay-rich sandstone that contains abundant calcium carbonate-cemented concretions is abundant. Member generally poorly cemented and weathers to badlands topography. In contrast to the dominantly non-swelling clays in the Tongue River Member, abundant smectite in fine-grained units produces characteristic “popcorn” weathering. Distinguished from similar beds in the underlying Hell Creek Formation by presence of more yellow and orange sandstone beds; more tabular and persistent bedding; more numerous, thicker, and more persistent lignite beds; and by the lack of dinosaur bones that are found in the Hell Creek Formation. A yellowish-orange or brownish-orange sandstone bed generally less than 30 ft thick typically overlies a lignite bed or beds at the base of the member. Thickness of member 80 to 245 ft.

Khc **Hell Creek Formation (Upper Cretaceous)**—Dominantly gray and grayish-brown sandstone; smectitic, silty shale and mudstone; and a few thin beds of lignite or carbonaceous shale. Sandstone is fine- or medium-grained, and may contain abundant calcium carbonate-cemented concretions. Generally poorly cemented, weathering to badlands topography. Swelling clays produce characteristic “popcorn” weathering. Contains dinosaur fossils locally. Top of formation is at base of a lignite bed or lignitic shale that persists throughout exposures in the map area. In the Cedar Creek Anticline area, the base of the formation is a brownish-orange, medium- to coarse-grained sandstone with a scour base, including rip-up clasts. It rests unconformably on progressively lower parts of the Fox Hills Formation toward the axis of the anticline, down to lower Trail City Member. Away from the axis of the anticline, the base of the Hell Creek Formation rests with apparent conformity on the Colgate Member of the Fox Hills Formation. Thickness of the Hell Creek Formation is 250 to 400 ft.

Kfh* **Fox Hills Formation (Upper Cretaceous)**

Kfhc **Colgate Member**—White or light-gray, micaceous, fine- to medium-grained sandstone, and dark gray, locally lignitic, carbonaceous shale as much as 2 ft thick in upper part. Sandstone composed of angular quartz, feldspar, and volcanic rock fragments, and scattered flakes of muscovite; cemented by white sericite and illite that impart a light color. Tabular and trough crossbeds well developed. Channel bases in the sandstone display well developed scour features including large rip-up clasts composed of carbonaceous shale or mudstone. Characteristically weathers into high-angle, fluted surfaces. Thickness ranges from 0 to 130 ft.

Kftt **Timber Lake and Trail City Members, undivided**

Timber Lake Member—Brownish-gray siltstone and fine-grained sandstone that weathers medium brown. Hummocky bedding and trough crossbedding are characteristic of the member, and locally it contains *Ophiomorpha* burrows. Thickness of member ranges from 0 to 70 ft.

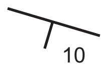
Trail City Member—Interbedded light-gray siltstone and dark-gray shale. Member is a transition interval between the underlying Pierre Shale and the sandy Timber Lake Member. Thickness of member ranges from 15 to 35 ft.

Kp **Pierre Shale (Upper Cretaceous)—**Dark-gray and black bentonitic mudstone and shale with thin jarosite layers, and fossiliferous limestone concretions that contain marine ammonites and pelecypods. Base not exposed in map area. Exposed thickness 165 ft.

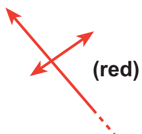
**Kfh* used only on cross section

MAP SYMBOLS
WIBAUX 30´ x 60´ QUADRANGLE

Contact—Dotted where concealed.

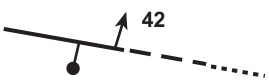


Strike and dip of bedding—Indicating strike direction, direction and amount of dip.

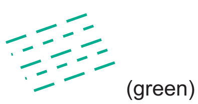


Asymmetric anticline—Showing trace of axial plane and direction of plunge. Shorter arrow on more steeply dipping limb. Dotted where concealed.

Synclinal flexure—Showing trace of axial plane. Dotted where concealed.



Fault—Dashed where inferred; dotted where concealed. Ball and bar on down-thrown side. Arrow and number indicate direction and amount of fault plane dip where measured.



Paleosol unit—Zone of thin orange limestone beds, light-colored beds, and paleosol beds, including silcrete**.** Unit occurs within the lower Tongue River Member in the map area.

Silcrete bed—Siliceous paleosol bed within paleosol interval.

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