

**GEOLOGIC MAP OF THE POWDERVILLE 30' x 60'
QUADRANGLE, EASTERN MONTANA**

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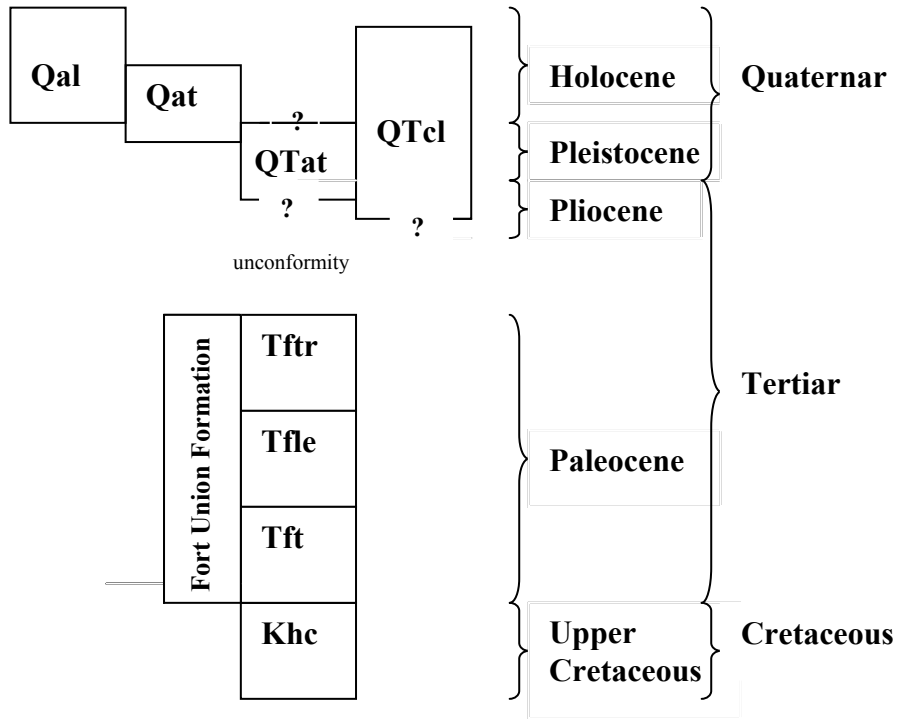
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CORRELATION DIAGRAM
POWDERVILLE 30' x 60' QUADRANGLE



DESCRIPTION OF MAP UNITS
POWDERVILLE 30' x 60' QUADRANGLE

Note: Thicknesses are given in feet because original field maps were on 7.5' quadrangles with contour intervals in feet. To convert feet to meters (the contour interval unit on this map), multiply feet x 0.3048.

- Qal Alluvium (Holocene)**—Light-gray and light-brown gravel, sand, silt, and clay deposited in stream and river channels and on their flood plains. Clasts are poorly to well sorted, and most are well rounded. Deposits are poorly to well stratified. Thickness as much as 35 ft under larger floodplains, but generally less than 15 ft.
- 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 300 ft above rivers and streams. Clasts are subangular to well rounded at lower elevations and subrounded to well rounded at higher elevations, and are dominantly cobbles and pebbles of Fort Union Formation sandstone and clinker with less than 5 percent composed of igneous rocks and limestone, and rare pebbles of silicified wood and quartzite. Deposits are poorly to well stratified, poorly to well sorted, and range from unconsolidated to well cemented by calcium carbonate. Thickness 10–40 ft.
- QTat Alluvial terrace deposit (Pleistocene and/or Pliocene)**—Light gray to light brown gravel in terrace remnants about 600 ft higher than streams and rivers. Clasts are rounded to well rounded. Deposits are cobbles, pebbles, and granules of Fort Union Formation sandstone and clinker; and cobbles and pebbles of quartzite, chert; and crystalline igneous and metamorphic rocks. Clasts of rocks foreign to the area are considerably more abundant than in younger terrace deposits (Qat). Thickness about 25 ft.
- QTcl Clinker (Holocene, Pleistocene, and Pliocene?** [Coates and Heffern, 2000])—Red, pink, orange, black, and yellow, very resistant metamorphosed sandstone, siltstone, and shale of the Fort Union Formation. 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. Thickness 10–135 ft.
- Fort Union Formation (Paleocene)**
- Tftr Tongue River Member**—Yellow, orange, or tan, fine-grained cross-bedded sandstone with thinner interbeds of yellowish brown, orange, or tan siltstone and light-colored mudstone and clay; and significant coal beds that include the Dietz, Sawyer, A, Knobloch, Flowers-Goodale, and Terret (McLellan and Olive, 1991a, b, c, d). Clay dominantly non-swelling.

The upper part of the member was removed by erosion in the map area. Thickness of as much as 350 ft exposed in map area.

- Tfle** Lebo Member—Dark- to light-gray smectitic shale and mudstone interbedded with less dominant lenticular to tabular beds of yellow, brown, and gray sandstone, gray siltstone, and carbonaceous shale. Unit contains ironstone concretion zones and coal beds (fewer, less continuous, thinner, and dirtier than the coal beds in the Tongue River Member). Sandstone channels locally cut into above units. In part of the map area (shown with hachure pattern), the upper Lebo contains a unit characterized by paleosol development including silcrete beds, thin orange limestone beds, and light-colored fine-grained sandstone, siltstone, and mudstone. Thickness of member 175–225 ft.
- Tft** Tullock Member—Light-yellow and light-brown planar-bedded very fine- to medium-grained sandstone interbedded with less dominant gray shale and mudstone, and locally with brownish gray well-indurated argillaceous limestone beds that may contain plant fragment molds. Locally lower part contains narrow, sinuous, single-storey, steep-walled channel deposits less than 50 ft wide composed of brownish yellow, cross-bedded sandstone. Thickness of member 150 ft.
- Khc** **Hell Creek Formation (Upper Cretaceous)**—Gray and greenish gray, massive, smectitic, silty mudstone with “popcorn” weathering; and grayish yellow to moderate-yellowish brown crossbedded and ripple-laminated, micaceous, fine- to medium-grained channel sandstone; interspersed with carbonaceous shale and rare thin lignite beds. Sandstone contains less than one percent gravel-size clasts of gray claystone; and lesser amounts of fossil bone fragments, petrified and carbonized wood fragments, and ironstone. Gravel-size clasts generally found at paleochannel bases. A yellowish brown sandstone that caps the northeast-striking ridges in the easternmost part of the quadrangle, east of the Powder River, is mapped as Hell Creek Formation based on dinosaur fossils found in the sandstone (E.S. Belt, oral communication, 1991). It is unlikely that the Cretaceous dinosaur bones and teeth were reworked into a Paleocene basal Fort Union sandstone because a similar sandstone bed at the same stratigraphic position within the south-adjacent Broadus 30' x 60' quadrangle contains Cretaceous palynomorphs (D. Nichols, written communication, 1992) as well as dinosaur fossils (U.S. Bureau of Land Management, Miles City). In the Powderville 30' x 60' quadrangle, this ridge-capping sandstone was previously shown as Fort Union Formation on some maps (e.g. Stoner and Lewis, 1980). Base of formation not exposed in map area. Exposed thickness 300 ft.

MAP SYMBOLS

POWDERVILLE 30' x 60' QUADRANGLE



Contact—Dotted where concealed.



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



Paleosol interval—Zone of thin, orange limestone beds, light-colored beds, and paleosol beds. Zone is better developed east of the map area.

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