

**Geologic and Structure Contour Map of the  
Fort Peck Lake West 30' x 60' Quadrangle  
Eastern Montana**

By

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## **GEOLOGIC SUMMARY**

The Fort Peck Lake West quadrangle is located in east-central Montana (Figure 1) in an area of rolling plains. It includes parts of Valley, Philips, and Garfield Counties. The area is gently rolling and sparsely vegetated where underlain by shales of the Upper Cretaceous Bearpaw Formation. In the southeastern part of the quadrangle, Tullock and Lebo Members of the Tertiary Fort Union Formation crop out on the timbered upland divides. The predominant feature of the region is Fort Peck Reservoir that lies in the valley of the Missouri River in the southern half of the quadrangle. The major portion of the reservoir is located in the east-adjacent Fort Peck Lake East quadrangle, but the water body extends westward into the present quadrangle. Gravel-covered benches obscure the bedrock in some areas, and formation contacts along both shores of the reservoir are obscured by slope wash and landslides.

Along the shores of Fort Peck Reservoir, extensive landslide complexes have formed due to saturation of the incompetent shales of the Bearpaw Formation. The shales currently lie under water at the reservoir level and may extend to as much as 200 feet above the reservoir level. Where saturated shales have given way, overlying beds have moved down slope in either rotational or translation slides.

The Upper Cretaceous and Tertiary strata of the region (Figure 2) are dipping very gently to the southeast. Structure contours on the top of the Judith River Formation indicate a regional gradient of about four meters per kilometer (0.2 degree) for the eastern map area; the western map area appears more structurally complicated at this depth. At the surface, incipient mass wasting has locally produced low-angle dips toward the reservoir as the shorelines of the reservoir are approached. A few small-scale anticlinal and synclinal folds also cause local modifications to the generally flat-lying beds. A few small-scale, variably oriented faults offset beds as much as 20 to 60 feet in the north-central part of the quadrangle north of the reservoir.

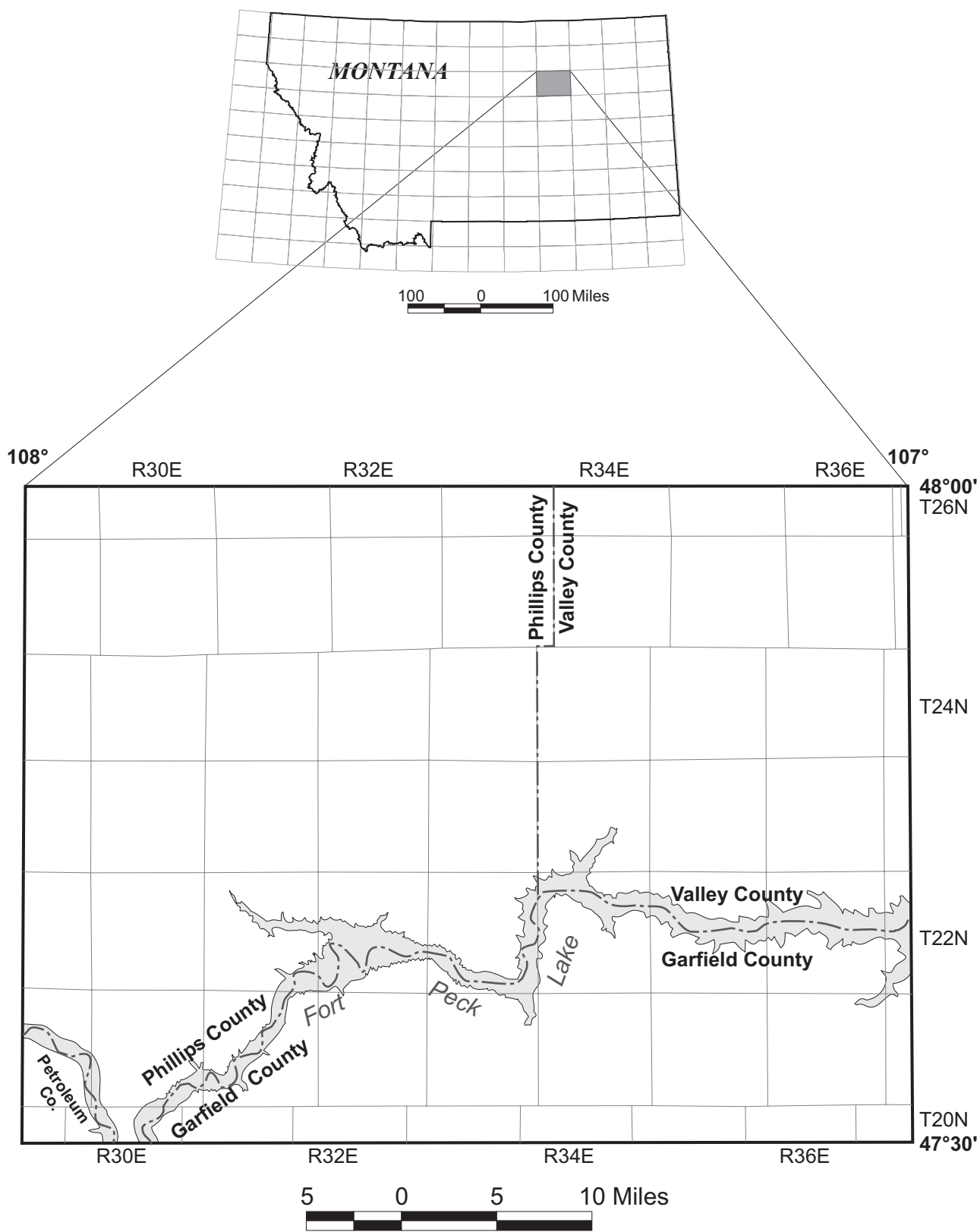


Figure 1. Location of Fort Peck Lake West 30'x60' quadrangle, Eastern Montana.

## Correlation Chart of Map Units Fort Peck Lake West 30' x 60' Quadrangle

### Quaternary

Qal	Qaf	Qat	Qao	Qac	Qgac	Qls	Holocene
				— ? —	— ? —	— ? —	_____
							Pleistocene

### Tertiary

Unconformity

Tfle
Tft

### Upper Cretaceous

Khc
Kfh
Kb
Kjr

Formation not exposed at surface; top  
= structure contour datum (Pl. 2)

Figure 2. Correlation chart of map units.

## DESCRIPTION OF MAP UNITS

NOTE: Map unit thicknesses, where given, are in feet. To convert feet to meters (the contour interval unit on this topographic map base), multiply feet x 0.3048.

### Quaternary

- Qal Alluvium (Holocene)**—Light-brown, yellowish-brown, and light-gray gravel, sand, silt, and clay deposited in modern stream and river channels and on flood plains. Clasts are well to poorly sorted, well to poorly stratified, and composed of both carbonate and siliciclastic rock types. Thickness varies from a few inches to more than 30 ft.
- Qaf Alluvial fan deposit (Holocene)**—Tan to gray and grayish-brown gravel, sand, silt and clay deposits located at the mouths of streams. A fan-shaped deposit is characteristic, and deposits may be moderately well stratified. Thickness may vary from a few inches at the leading edge of the fan to several tens of feet near the mouth of the stream.
- Qat Alluvial terrace deposit (Holocene and Pleistocene)**—Light-brown, grayish-brown, and light-gray gravel, sand, and silt in terrace remnants at multiple elevations along all streams emptying into Fort Peck Reservoir. Clasts are generally well sorted, and most are well rounded, indicating reworking of older glacial and terrace deposits. Clasts are brown, reddish, or yellowish quartzite; carbonate clasts are absent. Bedding is not usually evident. Thickness ranges from 6 to 25 ft.
- Qao Alluvium, older (Holocene and Pleistocene)**—Light-colored gray and yellowish-gray, unsorted sand, silt, and clay accumulated by slope wash and by glacial-outwash stream flow associated with the continental ice sheet that lay just to the north. Occurs as extensive deposits along most major stream channels throughout the area, and locally includes alluvial terrace deposits not separately mapped. Thickness varies from 3 to 20 ft.
- Qac Alluvial-colluvial deposit (Quaternary)**—Brown, yellowish-brown, grayish-brown and light- to dark-gray sand, silt, and clay deposits derived from slope wash and fluvial deposition. Commonly located in older abandoned fluvial or glacial-outwash channels that may be located at the heads of, or between and connecting to older streams; deposits also occur in broad, generally flat-lying, linear deposits along presently underfit stream channels. Thicknesses vary from a few inches to 10 feet.
- Qgac Gravelly sheet-wash alluvium and colluvium (Quaternary)**—Gray, brown, brownish-gray or yellowish-gray, fine to coarse gravel, fine to coarse sand, and silt. Unit located on upland benches in patchy deposits covering bedrock units. Thicknesses vary from 4 to 20 feet.
- Qls Landslide deposits (Quaternary)**—Deposits resulting from mass movement of bedrock and surficial deposits, primarily by slide and flow processes. Materials involved usually are incompetent shales on steep slopes; water-saturated shales become mobile, often

carrying overlying units down slope. Throughout map area, extensive slope failure and land sliding is observed in the Bearpaw Formation.

## **Tertiary**

### **Fort Union Formation (Paleocene)**

**Tfle Lebo Member**—Medium- to dark-gray, grayish-brown and olive-gray sandstone, siltstone, and mudstone that is commonly smectitic and/or carbonaceous, interbedded with gray to dark-gray, silty shale, thin yellowish-gray siltstone and sandstone, and very thin lenticular coal beds. Contains small-scale, light-gray, fine- to medium-grained, cross-bedded channel sandstones. Smectitic mudstones often exhibit characteristic “popcorn” weathering. Typically forms gently rolling slopes except close to river banks. Thickness varies from 190 to 300 ft.

**Tft Tullock Member**—Yellowish-gray, fine- to medium-grained, trough-cross-bedded to planar-bedded or massive sandstone. Interbedded with brownish-gray or purplish-gray claystones, dark-gray, carbonaceous shale, and thin lenticular coal beds. Sandstone beds are thinner, more tabular, and more persistent than those in the underlying Hell Creek Formation. Channel sequences are larger-scale than those found in the Lebo Member, but generally smaller-scale than those of the Tongue River Member. Thickness ranges from 240 to 280 ft.

## **Upper Cretaceous**

**Khc Hell Creek Formation** —Dominantly gray and grayish-brown sandstone, smectitic, silty shale and mudstone, and a few thin lenticular coal beds or carbonaceous shale. Sandstones are fine- or medium-grained, and calcium carbonate-cemented concretions are typical in the fine-grained sandstones. Generally poorly cemented overall, and may weather to badlands topography. Swelling smectitic clays may locally produce “popcorn” weathering. Numerous bone fragments and plant fossils are present in the formation throughout the area. Contact with the underlying Fox Hills Formation may be either gradational or erosional. Thickness ranges from 320 to 450 ft.

**Kfh Fox Hills Formation**—Thin layers of interbedded tan sand, silt, and clay overlain by well-sorted, very fine- to medium-grained, upward-coarsening, cross-bedded, poorly consolidated sandstone. This upward-coarsening sequence is more clay-rich in the lower part. An interbedded transitional sequence is present at the base of the formation throughout most of the area. It consists of thin beds of very fine-grained, tan sand, light-gray to brownish-gray silt, and gray to dark-gray or medium- to dark-brown clay that grades downward into the sandy shales of the upper Bearpaw Formation. Locally, a cross-bedded, fine- to medium-grained, upward-fining channel sandstone that weathers white to light-gray is present at the top of the formation. Thickness ranges from 40 to 180 ft.

**Kb Bearpaw Formation**—Dark-brownish-gray to black bentonitic mudstone and shale. Locally contains thin stringers of jarosite and fossiliferous limestone concretions that contain marine ammonites and pelecypods. Lower part of formation not exposed. Exposed thickness is less than 200 ft.

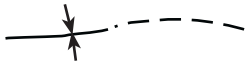
## Map Symbols



Contact: dashed where approximately located, dotted where concealed



Fault: dashed where approximately located, dotted where concealed. Ball and bar on downthrown side where known



Syncline: showing trace of axial plane; dashed where approximately located.



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