

DEPARTMENT OF THE INTERIOR  
UNITED STATES GEOLOGICAL SURVEY

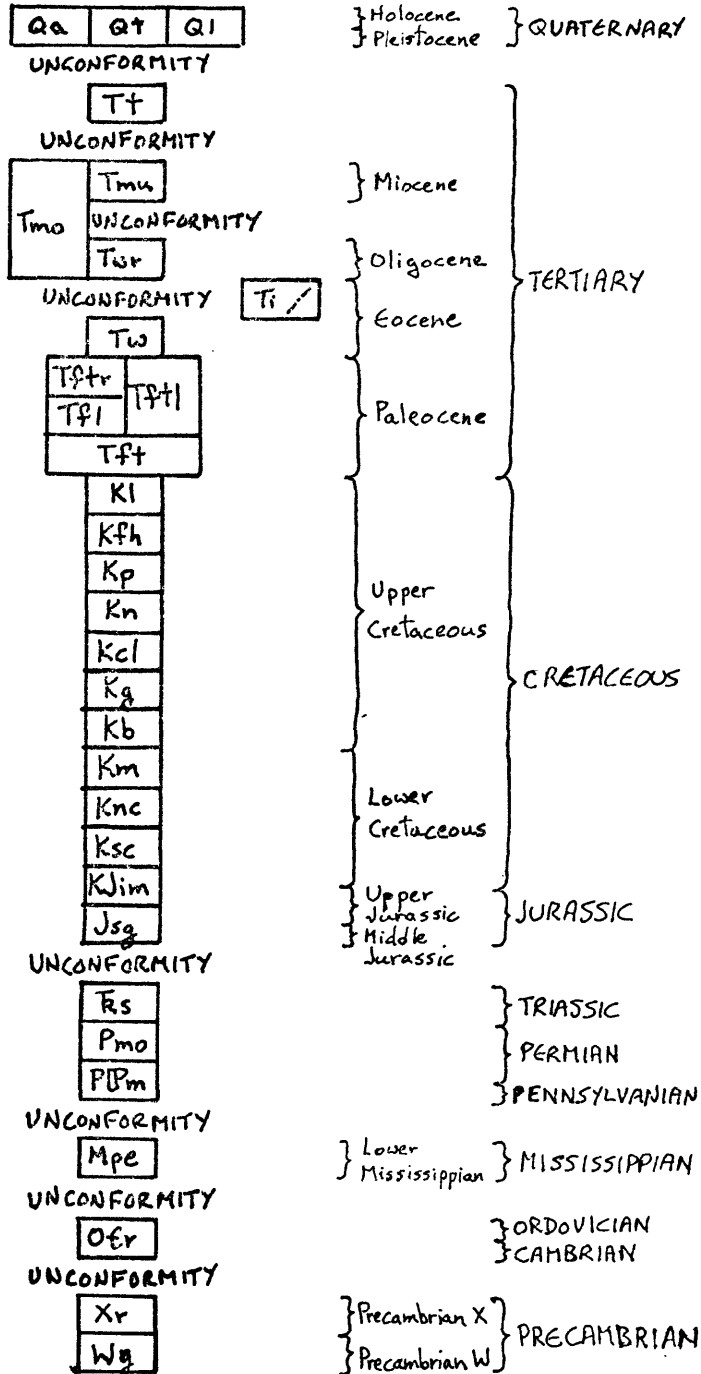
Preliminary geologic map of the Gillette 1° x 2° quadrangle  
northeastern Wyoming and western South Dakota

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# CORRELATION OF MAP UNITS



## DESCRIPTION OF MAP UNITS

[The Miocene-Pliocene boundary is used in the European sense, as applied to marine rocks (Berggren and Van Couvering, 1974), the separation being at about 5 m.y. (million years).]

- Qa ALLUVIAL DEPOSITS (HOLOCENE AND PLEISTOCENE)--Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in flood plains and lowest terraces
- Qt UPPER TERRACE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Silt, sand, and gravel
- Ql LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)--Unsorted rock debris, ranging from clay to boulder size, emplaced by mass movement
- Tt TERRACE DEPOSITS (TERTIARY)--Silt, sand, and gravel
- Tmu UPPER MIOCENE ROCKS--Tuff, poorly sorted conglomerate, sandstone, and siltstone, white to tan, soft; some pumicite beds. Thickness less than 16.5 m (55 ft)
- Twr WHITE RIVER FORMATION (OLIGOCENE)--White to pale-pink blocky tuffaceous claystone and tan siltstone, and lenses of arkosic conglomerate. Thickness generally less than 60 m (200 ft)
- Tmo MIOCENE AND OLIGOCENE ROCKS--Similar to upper Miocene rocks (Tmu) and White River Formation (Twr)
- Ti INTRUSIVE ROCKS (EOCENE--38.8-55 m.y.)--Monzonite and syenite porphyry, latite, trachyte, phonolite, bostonite, nepheline syenite, latite lamprophyre, and pseudoleucite and phonolite porphyry. K/Ar age determinations: 40.5±1.6 m.y., phonolite porphyry from Devils Tower, (Bassett, 1961); 48.9±1.6 m.y. and 38.8±2.1 m.y., porphyritic syenite (2 samples) from Bear Lodge pluton; 54.3±2.2 m.y., porphyritic monzonite from Black Buttes stock, sec. 23, T. 50 N., R. 62 W.; 49.6±1.7 m.y., porphyritic phonolite from Missouri Buttes pluton, T. 54 N., R. 66 W. (the last 4 ages from McDowell, 1971, p. 14-15)
- Tw WASATCH FORMATION (EOCENE)<sup>1/</sup>--Buff arkosic sandstone, lenticular conglomerate bodies, drab siltstone, carbonaceous shale, and many coal beds; upper part contains variegated claystone in southwestern corner of map area. Thickness 0-915 m (0-3,000 ft); the upper 305 m (1,000 ft) only in the northwestern corner of the map area
- FORT UNION FORMATION (PALEOCENE)<sup>1/</sup>
- Tftr Tongue River Member--Light-colored massive sandstone and gray shale; numerous coal beds. Thickness 150-240 m (490-790 ft)
- Tfl Lebo Member--Fine-grained drab to gray sandstone, finely conglomeratic in part, interbedded with drab siltstone, claystone, shale, and thin coal beds. Thickness 0-760 m (0-2,490 ft)

Tft1 Tongue River and Lebo Members--Not mapped separately in central Campbell County

Tft Tullock Member--Has a light-colored appearance and contains massive sandstones, whereas the Lebo Member is drab colored and contains more shale and claystone. Thickness 0-460 m (0-1,510 ft)

K1 LANCE FORMATION (UPPER CRETACEOUS)--Somber shale and drab massive lenticular concretionary sandstone. Thickness 610-760 m (2,000-2,490 ft)

Kfh FOX HILLS SANDSTONE (UPPER CRETACEOUS)--White to light-gray sandstone and gray sandy shale, both containing marine fossils. Thickness 45-60 m (150-190 ft)

Kp PIERRE SHALE (UPPER CRETACEOUS)--Dark-gray to black concretionary marine shale. In Black Hills area, Kara and Monument Hill Bentonitic Members in upper part, Groat Sandstone Bed of Gammon Ferruginous Member in lower middle part, Pedro Bentonite Bed of Mitten Member as base. Thickness 510-625 m (1,675-2,050 ft)

Kn NIOBRARA FORMATION (UPPER CRETACEOUS)--Light-gray to yellow marl and gray to yellow limy speckled shale. Thickness 40-60 m (125-197 ft)

Kcl CARLILE SHALE (UPPER CRETACEOUS)--Dark-gray to black soft sandy shale. Sage Breaks Member at top; Turner Sandy Member in middle. Thickness 135-230 m (443-755 ft)

Kg GREENHORN LIMESTONE (UPPER CRETACEOUS)--Light-gray limestone, marl, and limy sandstone interbedded with gray limy concretionary shale. Thickness 20-110 m (66-361 ft)

Kb BELLE FOURCHE SHALE (UPPER CRETACEOUS)--Dark-gray to black soft bentonitic concretionary shale. Thickness 215-245 m (705-804 ft)

Km MOWRY SHALE (LOWER CRETACEOUS)--Black, hard, siliceous; weathers silvery gray; abundant fish scales; many bentonite beds. Clay Spur Bentonite Bed at top. Thickness 60-75 m (197-246 ft)

Knc NEWCASTLE SANDSTONE (LOWER CRETACEOUS)--Gray sandstone, sandy shale, and siltstone; some bentonite and coal. Thickness 0-30 m (0-100 ft)

Ksc SKULL CREEK SHALE (LOWER CRETACEOUS)--Black, soft, fissile. Thickness 60-75 m (197-246 ft)

KJim INYAN KARA GROUP (LOWER CRETACEOUS) AND MORRISON FORMATION (UPPER JURASSIC)

Inyan Kara Group (Lower Cretaceous)

Fall River Sandstone--Brown sandstone, siltstone, and shale. Thickness 30-45 m (100-148 ft)

Lakota Formation--Intertonguing variegated claystones and sandstones, and, in northeastern area, gray conglomeratic sandstone underlain by nonconglomeratic sandstone, mudstone, and coal. Thickness 20-70 m (66-230 ft)

Morrison Formation (Upper Jurassic)--Dully variegated siliceous claystone containing nodular limestone and gray silty sandstone lenses. Thickness 0-60 m (0-197 ft)

- Jsg      SUNDANCE AND GYPSUM SPRING FORMATIONS  
          Sundance Formation (Upper and Middle Jurassic)--Greenish-gray  
          glauconitic sandstone and shale underlain by red and gray  
          nonglauconitic sandstone and shale. Thickness 60-130 m  
          (197-427 ft)  
          Gypsum Spring Formation (Middle Jurassic)--Massive white  
          gypsum; locally at top 0-24 m (0-80 ft) of red and green  
          claystone. Thickness 0-40 m (0-130 ft)
- Prs      SPEARFISH FORMATION (TRIASSIC)--Red shale, red siltstone, and  
          white gypsum beds. Thickness 60-275 m (197-902 ft)
- Pmo      MINNEKAHTA LIMESTONE AND OPECHE SHALE (LOWER PERMIAN)  
          Minnekahta Limestone--Gray, slabby, hard. Thickness 8-14 m  
          (25-46 ft)  
          Opeche Shale--Red, sandy, soft. Thickness 8-37 m (26-120 ft)
- PPm      MINNELUSA FORMATION (LOWER PERMIAN AND PENNSYLVANIAN)--Light-  
          gray and red sandstone, solution breccia that merges with  
          anhydrite in subsurface, thin limestones, and red and  
          black shale. Thickness 175-274 m (575-900 ft)
- Mpe      PAHASAPA AND ENGLEWOOD LIMESTONES (LOWER MISSISSIPPIAN)  
          Pahasapa Limestone--Gray, massive, cavernous, dolomitic.  
          Thickness 155-365 m (508-1,198 ft)  
          Englewood Limestone--Pink, thin-bedded, dolomitic in part.  
          Thickness 15 m (50 ft)
- O6r      ORDOVICIAN AND CAMBRIAN ROCKS--Chiefly includes the following  
          units:  
          Whitewood Dolomite (Upper Ordovician) and Winnipeg Formation  
          (Middle Ordovician)--Gray to tan dolomite underlain by  
          green shale and siltstone. Thickness 0-90 m (0-300 ft)  
          Deadwood Formation (Lower Ordovician and Upper Cambrian)--  
          Brown sandstone, greenish-gray shale, and gray limestone.  
          Thickness 90 to more than 270 m (300 to more than 885 ft)
- Xr      PRECAMBRIAN X ROCKS--Mostly granite, light-gray to tan;  
          includes lesser amounts of metasedimentary rocks in the  
          Bear Lodge Mountains. Age determinations indicate a  
          minimum age of 2,600 m.y. (M. H. Staatz, written commun.,  
          1977)
- Wg      PRECAMBRIAN W ROCKS--Mica schist, dark-gray, intruded by lesser  
          amounts of granite and amphibolite; confined to Negro Hill  
          area along the east boundary of the quadrangle. Age not  
          precisely known

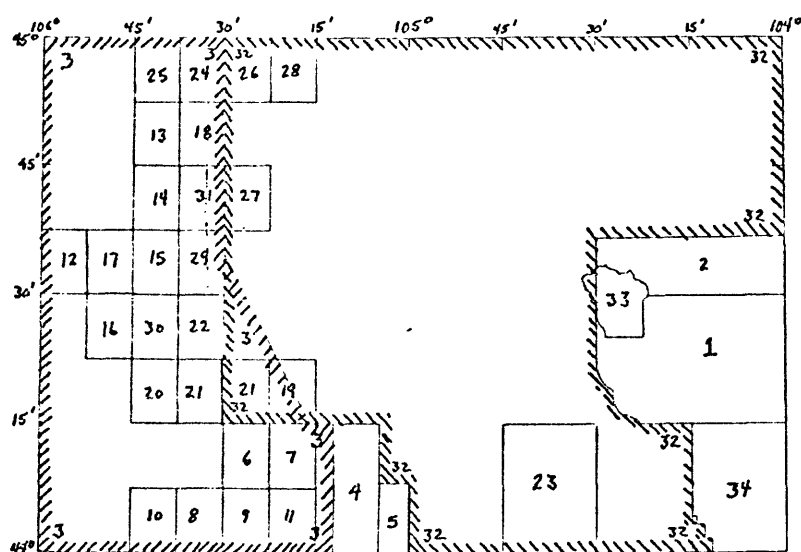
— CONTACT--Dashed where projected

⌋ FAULT--Dotted where concealed. Bar and ball on downthrown side

<sup>1/</sup> The contact between the Fort Union Formation and the  
 Wasatch Formation is being reviewed and is subject to change.

## REFERENCES

- Bassett, W. A., 1961, Potassium-argon age of Devils Tower, Wyoming: Science, v. 134, p. 1373.
- Berggren, W. A., and Van Couvering, J. A., 1974, The Late Neogene--Biostratigraphy, geochronology, and paleoclimatology of the last 15 million years in marine and continental sequences: Palaeogeography, Climatology, Ecology, v. 16, no. 1/2, 216 p.
- Hill, D. J., Izett, G. A., and Naeser, C. W., 1975, Early Tertiary fission track ages of sphene from Devils Tower and Missouri Buttes, Black Hills, northeastern Wyoming (abs.): Geological Society of America Abstracts with programs, v. 7, no. 5, p. 613-614.
- McDowell, F. W., 1971, K-Ar ages of igneous rocks from the Western United States: Isochron/West, no. 2, p. 1-16.



INDEX TO SOURCES OF GEOLOGIC DATA

## SOURCES OF GEOLOGIC DATA

[Brackets indicate published names of topographic quadrangles as of date of this compilation.]

1. Darton, N. H., 1905, Description of the Sundance quadrangle (Wyo.-S. Dak.): U.S. Geological Survey Geologic Atlas Folio 127, scale 1:125,000.
2. Darton, N. H., and O'Harra, C. C., 1905, Description of the Aladdin quadrangle (Wyo.-S. Dak.): U.S. Geological Survey Geologic Atlas Folio 128, scale 1:125,000.
3. Denson, N. M., U.S. Geological Survey unpublished mapping, 1969-71, scale 1:126,720.
4. Dobbin, C. E., and Barnett, V. H., 1927, The Gillette coal field, northeastern Wyoming: U.S. Geological Survey Bulletin 796, pl. 9, scale 1:125,000.

5. Dobbin, C. E., Kramer, W. B., and Horn, G. H., 1957, Geologic and structure map of the southeastern part of the Powder River Basin, Wyoming: U.S. Geological Survey Oil and Gas Investigations Map OM 185, scale 1:125,000.
6. Galyardt, G. L., 1974, Preliminary geologic map and coal resources of The Gap quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 74-98, scale 1:24,000.
7. Galyardt, G. L., 1974, Preliminary geologic map and coal resources of the Coyote Draw quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 74-350, scale 1:24,000.
8. Grazis, S. L., 1977, Geologic map and coal resources of the Scaper Reservoir quadrangle, Campbell County, Wyoming: U.S. Geological Survey Coal Investigations Map C-77, scale 1:24,000.
9. Grazis, S. L., 1977, Geologic map and coal resources of The Gap SW quadrangle, Campbell County, Wyoming: U.S. Geological Survey Coal Investigations Map C-78, scale 1:24,000.
10. Grazis, S. L., 1977, Geologic map and coal resources of the Pleasantdale quadrangle, Campbell County, Wyoming: U.S. Geological Survey Coal Investigations Map C-76, scale 1:24,000.
11. Grazis, S. L., 1977, Geologic map and coal resources of the Saddle Horse Butte quadrangle, Campbell County, Wyoming: U.S. Geological Survey Coal Investigations Map C-79, scale 1:24,000.
12. Haddock, D. R., Kent, B. H., and Bohor, B. F., 1976, Geologic map and coal sections of the Croton quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-826, scale 1:24,000.
13. Hayes, P. T., 1973, Preliminary geologic map of the Croton 1 SW [Homestead Draw SW] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-544, scale 1:24,000 [1974].
14. Kent, B. H., 1976, Geologic map and coal sections of the Recluse quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-732, scale 1:24,000.
15. Kent, B. H., 1976, Geologic map and coal sections of the Wildcat quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-735, scale 1:24,000.
16. Kent, B. H., U.S. Geological Survey unpublished mapping, 1975-76, scale 1:24,000.
17. Kent, B. H., Haddock, D. R., and Bohor, B. F., 1978, Geologic map and coal sections of the Truman Draw quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-917, scale 1:24,000.
18. Landis, E. R., and Hayes, P. T., 1973, Preliminary geologic map of the Croton 1 SE [White Tail Butte] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report, scale 1:24,000.
19. Law, B. E., 1974, Preliminary geologic map and coal resources of the Fortin Draw quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 74-36, scale 1:24,000.
20. Law, B. E., 1975, Preliminary geologic map and coal resources of the Oriva quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 75-195, scale 1:24,000.

21. Law, B. E., U.S. Geological Survey unpublished mapping, 1972-74, scale 1:24,000.
22. Mapel, W. J., 1973, Preliminary geologic map of the Rawhide School quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report, scale 1:24,000.
23. Mapel, W. J., and Pillmore, C. L., 1964, Geology of the Upton quadrangle, Crook and Weston Counties, Wyoming: U.S. Geological Survey Bulletin 1181-J, pl. 1, scale 1:48,000.
24. McKay, E. J., 1973, Preliminary geologic map of the Croton 1 NE [Homestead Draw] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report, scale 1:24,000.
25. McKay, E. J., 1973, Preliminary geologic map of the Croton 1 NW [Corral Creek] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report, scale 1:24,000. (Quaternary alluvial deposits only.)
26. McKay, E. J., 1974, Preliminary geologic map of the Bertha 2 NW [Rocky Butte] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 74-173, scale 1:24,000. (Quaternary alluvial deposits only.)
27. McKay, E. J., 1974, Preliminary geologic map of the Bertha 3 NW [Oliver Draw] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 74-174, scale 1:24,000.
28. McKay, E. J., and Landis, E.R., 1974, Preliminary geologic map of the Bertha 2 NE [Nipple Butte] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report 74-172, scale 1:24,000. (Quaternary alluvial deposits only.)
29. McKay, E. J., and Mapel, W. J., 1973, Preliminary geologic map of the Calf Creek quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report, scale 1:24,000.
30. McLaughlin, R. J., and Hayes, P. T., 1973, Preliminary geologic map of the Townsend Spring [Oriva NW] quadrangle, Campbell County, Wyoming: U.S. Geological Survey Miscellaneous Field Studies Map MF-545, scale 1:24,000 [1974].
31. McLaughlin, R. J., and McKay, E. J., 1973, Preliminary geologic map of the Pitch Draw quadrangle, Campbell County, Wyoming: U.S. Geological Survey Open-File Report, scale 1:24,000.
32. Robinson, C. S., Mapel, W. J., and Bergendahl, M. H., 1964, Stratigraphy and structure of the northern and western flanks of the Black Hills uplift, Wyoming, Montana, and South Dakota: U.S. Geological Survey Professional Paper 404, pl. 1, scale 1:96,000. (Except Wasatch Formation and some Quaternary alluvial deposits.)
33. Staatz, M. H., U.S. Geological Survey unpublished mapping, 1975-76, scale 1:24,000.
34. Van Lieu, J. A., 1969, Geologic map of the Four Corners quadrangle, Wyoming and South Dakota: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-581, scale 1:48,000.