



- EXPLANATION**
- Recent**
- Alluvium
  - Unconsolidated silt, sand, and gravel; also includes the lower terrace deposits (Q1) along stream channels in Big Horn River. Only the larger areas are shown.
  - Undifferentiated surficial deposits; silt, clay on pediments covered by rounded terrace gravels.
  - Unconsolidated silt, sand, and gravel of deposits coextensive with upper surfaces of stream terraces.
- Quaternary (Q)**
- Along Big Horn River and its tributaries:
    - Q1, deposits pertaining to lower and middle terraces; in this province, by highest and oldest surface; Q2, follows upland deposits pertaining to surface dissected and surface was higher or lower in numbered succession.
    - Along Big Horn River: Q3, undifferentiated deposits pertaining to upper terrace; in this province, by highest and oldest surface; Q4, differentiated deposits pertaining to surface of late Tertiary age.
- Tertiary (T)**
- Hell Creek formation
  - Largely sandstone with some greenish shale.
  - Beauregard shale
  - Dark-gray shale with numerous bentonite beds.
  - Judith River formation
  - Two members mapped in T. 5 S., R. 32 E. and T. 6 S., R. 33 E. The upper member consists of sandstone and gray with green and gray mudstone and shaly limestone nodules. Lower part: shaly sandstone and shaly limestone, grades upward into overlying sandstone; contains siliceous concretions that weather gray, yellowish or brown.
  - Cody shale, upper members equivalent to Steele shale.
  - K1, Claggett shale member; dark-gray bentonitic shale. No shale member equivalent to part of Steele sandstone with many limestone concretions, in this range area. K2, Tipton Creek member; sandy shale, which weathers to buff and red.
  - K3, undifferentiated, or prominent sandstone equivalent to part of Steele sandstone.
- Upper Cretaceous**
- Cody shale, lower members equivalent to Warm Creek shale.
  - K4, Niobrara and Carlisle shale members undifferentiated; dark-gray shale, much of which is bentonitic, with thin zone of calcareous shale indicated on map by C1. K5, Oakesboro calcareous member; dark-gray calcareous shale; (dry, weathers buff and gray). K6, Bulla Pointe member; shaly sandstone and shaly limestone and shaly shale. K7, Bulla Pointe member below top of Shap Creek bentonite bed; dark-gray shale and sandy shale.
- Lower Cretaceous**
- Murray shale
  - Gray shale, largely siliceous, interbedded with sandstone, and bentonite.
  - Thermopsis shale
  - Upper part: largely dark-gray shale containing several bentonite beds. Lower part: siliceous, weathers buff, and dark-gray sandstone. K8, bentonite sandstone member; thin but prominent sandstone between upper and lower parts of K7.
- Miocene**
- Cloverly and Morrison formations
  - K9, (Cloverly Formation); m.
  - Morrison Formation
  - K10, undifferentiated
- Pliocene**
- Pre-Morrison formations, undifferentiated, to upper part of Madison limestone.

- QUATERNARY**
- Outcrop of bentonite bed where only small amount of clay is visible. Dashed where approximately located; dotted where concealed.
  - Outcrop of bentonite bed. Bentonite bed covered by overburden of 20 feet or less shown as shaded area; dashed line shows approximate level of bentonite thus covered.
  - Area from which bentonite has been mined.
  - Bed of bentonite shale.
  - Contour.
  - Dashed where approximately located; dotted where concealed.
  - Fault.
  - Dashed where approximately located; dotted where concealed. U, upstream side; D, downstream side.
  - Axis of anticline. Dashed where approximately located.
  - Axis of syncline. Dashed where approximately located.
  - Strike and dip of beds.
  - 3500
  - Structure contours drawn on top of the Murray shale. Contour interval 100 feet; datum is mean sea level.
  - Coal mine.
  - Gravel pit.
  - Bedrock dissected by landholding; letter grade shows formation or number to which displaced rocks belong.
  - 20
  - Location for which information on bentonite is given in table 1.
  - Oil well.
  - Shut-in oil well.
  - Gas well.
  - Dry hole.
  - W, when used as water well.
  - Intermittent stream and dam.
  - Irrigation canal.
  - U. S. Coast and Geodetic Survey benchmark.
  - Elevation in feet.

MAP SHOWING GEOLOGY AND BENTONITE DEPOSITS OF THE HARDIN DISTRICT, MONTANA AND WYOMING (SOUTH HALF)



BIG HORN COUNTY  
SHERIDAN COUNTY  
WYOMING

Structure of area north of and including T. 5 S. adapted from U. S. Geological Survey Oil and Gas Investigations Map OM 111, Geology of the Hardin area, Big Horn and Yellowstone Counties, Montana, 1951, by P. W. Richards and C. P. Rodgers. Remainder of area and bentonite beds mapped by S. H. Patterson in 1949.