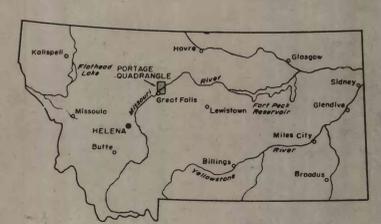


- EXPLANATION**
- Alluvium
Flood plain deposits of Missouri River. Material ranges in size from clay and silt to coarse gravel. Generally less than 10 feet thick.
 - Colluvium - Alluvium
Silt and clay with small amounts of sand and gravel. Deposited along valley walls of Missouri River trench and bottoms of major tributaries. Includes soil creep, slope wash, deposits of tributary streams and intermixed wind blown deposits. Ranges from thin veneer to deposits more than 30 feet thick. Not mapped in many areas where less than two feet thick or in the small tributary coulees.
 - Landslide deposits
Mostly blocks of ground moraine along walls of valleys tributary to Missouri River trench.
 - Aeolian deposited sand
Thin blanket of wind blown sand generally less than ten feet thick. Not mapped in most places where less than two feet thick.
 - Younger gravel deposits
Deposits of sand and gravel forming terrace remnants in Missouri River trench. Mostly medium- to coarse-grained; poorly sorted quartzites, argillites, and granitic rocks. As much as 40 feet thick but generally 15 to 25 feet.
 - Younger lake deposits
Mostly thinly bedded silt and sand deposited in later glacial Lake Great Falls, commonly 5 to 30 feet thick overlying till. Some highly plastic thinly laminated lacustrine deposits, believed to be essentially of contemporaneous deposition with the younger lake deposits, are intercalated in upper 20 feet of underlying silt. The area mapped as younger lake deposits includes small but numerous patches of till where lake deposits were not deposited or have been locally removed by erosion, upper contact, therefore, marks high level stage of lake.
 - Deltic deposits
Chiefly moderately to well sorted deposits of fine- to coarse-grained sand and gravel deposited where glacial channels emptied into the later glacial Lake Great Falls. Gradational contact with the younger lake deposits, are intercalated in upper 20 feet of underlying silt. The area mapped as younger lake deposits includes small but numerous patches of till where lake deposits were not deposited or have been locally removed by erosion, upper contact, therefore, marks high level stage of lake.
 - Meltwater channel deposits
Thin veneer of silt and clay with local deposits of sand and gravel along bottoms of meltwater channels.
 - Kame and kame terrace deposits
Poorly sorted sand and fine gravel. Isolated and contorted groups of small, irregularly shaped mounds especially prominent at mouths of meltwater channels are believed to be kames; small strips of hummocky sand and gravel along walls of meltwater channels are believed to be kame terraces.
 - End moraine and ground moraine
Chiefly a plastic clayey till with lenses of silt exhibiting deformed bedding generally intercalated in upper part. End moraine differs from ground moraine only in having a more hummocky topography of mounds and undrained depressions and in most places forming a higher topography. Thickness ranges from a few feet in places on the upland to 200 feet along the walls of the Missouri River trench.
 - Older lake deposits
Thinly laminated lacustrine silt and clay of early glacial Lake Great Falls underlying till and other younger deposits. Moderately to highly plastic. Ranges in thickness from less than one foot to 70 feet but in most places is 5 to 15 feet thick.
 - Older gravel deposits
Poorly to moderately well sorted medium to coarse gravels underlying younger deposits along the walls of the Missouri River trench and mouths of tributaries. Locally intercalated with overlying lake deposits. Chiefly quartzites and argillites; porphyritic rocks next most abundant with minor carbonate and granitic rocks. Ranges in thickness from less than one foot to more than 40 feet but commonly 5 to 15 feet thick.
 - Bedrock
Colorado shale and Kootenai formation, undivided.

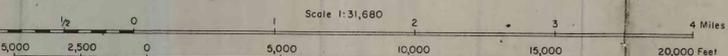
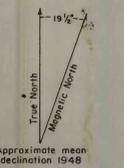
- Contact (dashed where approximately located)
- Contact (inferred or gradational)
- Fault
- Intermittent stream
- Spring
- Gravel pit
- Section line (dashed where approximately located)
- Primary road
- Graded Road
- Secondary road
- Unimproved road or trail



Base taken from U.S. Geological Survey topographic map of Portage Quadrangle

**PRELIMINARY
GEOLOGIC MAP OF PORTAGE QUADRANGLE, MONTANA
SURFICIAL GEOLOGY**

Geology mapped in 1950-1952 by
R.W. Lemke, C.F. Eskine and E.K. Moughan



OPEN FILE REPORT
This report and/or map is preliminary and has not been edited or reviewed for conformity with Geological Survey standards or nomenclature.