Geologic Maps of Missouri National Recreational River

Nebraska and South Dakota

National Park Service
U.S. Department of the Interior

Geologic and Soil Resources Inventory
Natural Resource Stewardship and Science

Geologic Map of Missouri National Recreational River

Chalkstone bluffs. Scenic river bluffs along the Missouri River consist of the Cretaceous Smoky Hill Chalk Member of the Niobrara Formation. NPS photograph.

North Alabama steamboat wreckage. The steamboat sank on 27 October 1870 and the remains reappeared in the spring of 2004 during a period of low river level. NPS photograph.

Old Baldy. The Lewis & Clark Expedition investigated Old Baldy (bare knob to the left) in September 1804. NPS photograph.

Two prairie dogs (*Cynomys*) perch alertly on the plains, descendants of the "barking squirrel" first documented by Lewis and Clark in 1804 and once misclassified as marmots under the genus *Arctomys*. NPS photograph.

Spirit Mound. Fascinated by its cultural significance, the Lewis & Clark Expedition hiked to the summit of Spirit Mound in August 1804. NPS photograph.

Bedrock Geologic Map (Eastern Portion)

LEGEND

- NPS boundary
- Highways and roads
- Water
- Places of interest
- State park boundary
- Geological sites

Bedrock Geologic Units (eastern portion)

No	Ogallala Group (Miocene)
Kp	Pierre Shale (Upper Cretaceous)
Kn	Niobrara Formation (Upper Cretaceous)
Kc	Carlile Shale (Upper Cretaceous)
Kfb	Fort Benton Group (Upper Cretaceous)
Kgg	Greenhorn Limestone and Graneros Shale, undivided (Cretaceous)
Kd	Dakota Formation (Cretaceous)

This map displays geologic map data compiled by the National Park Service Geologic Resources Inventory (GRI). It is not a substitute for site-specific investigations. All GRI products are available at https://go.nps.gov/gripubs.

GRI Source Maps:

Joeckel, R. M., N. I. Scofield, D. P. Divine, and L. M. Howard. 2019. Surficial geologic map of Missouri National Recreational River corridor and surrounding areas in Nebraska and South Dakota, Fort Randall Dam and environs to Springfield, Nebraska and South Dakota (scale 1:24,000). Unpublished digital data. University of Nebraska-Lincoln, Lincoln, Nebraska.

Lundstrom, S. C., T. Cowman, P. Hanson, J. Holbrook, S. Mahan, A. Moreno-Ward, and J. Paces. 2022. Geologic map geodatabase of the valley corridor of the 59-mile reach of the Missouri National Recreational River, South Dakota, Nebraska, and Iowa (Gavins Point Dam to North Sioux City) (scale 1:100,000). Unpublished data release. US Geological Survey, Reston, Virginia.

Source Scales: 1:24,000 and 1:100,000. According to US National Map Accuracy Standards, features are within 12 m (40 ft) and 51 m (167 ft), respectively of their true location.

Poster Layout: Trista L. Thornberry-Ehrlich (Colorado State University)

Poster Date: May 2025

LEGEND

- NPS boundary
- Highways and roads
- Water
- Places of interest
- State park boundary
- Wildlife refuge boundary
- Reservation boundary
- Geological sites

Geologic Line Features

- Past river extent, concealed
- Point bar, known or certain
- Fluvial scarp, known or certain

Geologic Sample Points

- Radiocarbon age-date locality
- U-series age-date locality
- Optically stimulated luminescence age-date locality

Landslide Areas

- Landslide area, contacts known or certain
- Landslide area, contacts inferred

Geologic Contacts

solid black where known or certain, long dashed where approximate, dashed where inferred, dotted where concealed, blue where a shoreline

contact

Geologic Units (western portion)

Qpi	Pit (Holocene)
Qfi	Fill (Holocene)
Qantd	Niobrara River tributary delta, subaerial part (Holocene)
Qf	Alluvial fan sediments (Holocene)
Qc	Colluvium (late Pleistocene to Holocene)
Qanfc	Flood-channel deposits of Niobrara River (Holocene)
Qal	Alluvium of small streams (Holocene)
Qalt	Alluvial terrace deposits of small streams (late Pleistocene to Holocene)
Qavc1	Verdigre Creek alluvium, ca. 1951–present (Holocene)
Qavc2	Verdigre Creek alluvium, late 19th and 20th centuries? (Holocene)
Qavc3	Verdigre Creek alluvium, pre-late 19th century? (Holocene)
Qapc1	Ponca Creek alluvium, accreted ca. 1961 to present (Holocene)
Qapc2	Ponca Creek alluvium, accreted ca. 1939–1961 (Holocene)
Qapc3	Ponca Creek alluvium, accreted ca. 1858–1939 (Holocene)
Qapc4	Alluvium of Ponca Creek accreted prior to ca. 1858 (Holocene)
Qapc5	Alluvium of Ponca Creek, oldest (late Pleistocene to Holocene)
Qansr	Sand ridges atop alluvium of Niobrara River (Holocene)
Qan1	Niobrara River alluvium, accrete ca. 1954–present (Holocene)
Qan2	Niobrara River alluvium, accreted ca. 1938–1951 (Holocene)
Qan3	Niobrara river alluvium, accreted ca. 1858–1938 (Holocene)
Qan4	Niobrara River alluvium, accreted prior to 1858 (Holocene)
Qan5	Niobrara River alluvium accreted prior to 1858, but older than Qan4 (Holocene)
Qam1	Missouri River alluvium, accreted post-ca. 1954–present (Holocene)
Qam2	Missouri River alluvium, accreted ca. 1939–1954 (Holocene)
Qam3	Missouri river alluvium, mid-19th century–1939 (Holocene)
Qam4	Missouri river alluvium, pre-mid-19th century (Holocene)
Qalc1	Lost Creek alluvium, ca. 1970--present (Holocene)
Qalc2	Lost Creek alluvium, pre-ca. 1970 (Holocene)
Qalc3	Lost Creek alluvium, intermediate low terrace (Holocene)
Qalc4	Lost Creek alluvium, higher low terrace (Holocene)
Qabc1	Bazile Creek alluvium, ca. 1957 to present (Holocene)
Qabc2	Bazile Creek alluvium, pre-1957 (Holocene)
Qabc3	Bazile Creek alluvium, oldest (Holocene)
Qpo	Peoria Loess (thin) atop shallow Ogallala Group (late Pleistocene)
Qp	Peoria Loess (late Pleistocene)
Qante	Eolian sands atop Niobrara River high terrace (late Pleistocene to Holocene)
Qant	High alluvial terrace sediments of the Niobrara River (late Pleistocene to Holocene)
Qtw1	Till, stagnation moraine (late Pleistocene)
Qtw2	Till, ground moraine (late Pleistocene)
Qosg1	Younger coarse alluvium, interpreted as glacial outwash (late Pleistocene)
Qosg2	Older coarse alluvium, interpreted as glacial outwash (late Pleistocene)
Qapct	High alluvial terrace sands of Ponca Creek (late Pleistocene)
Qath	High alluvial terrace sand and gravel (late Pleistocene)
Qtpi	Pre-Illinoian glacial till (Pleistocene)
Nofr	Fort Randall Formation of the Ogallala Group (middle Miocene)
Nov	Valentine Formation of the Ogallala Group (middle Miocene)
Nb	Broadwater Formation (Pliocene to early Pleistocene?)
Kp	Pierre Shale (Upper Cretaceous)
Knsh	Smoky Hill Chalk Member of the Niobrara Formation (Upper Cretaceous)

Geologic Units (eastern portion)

Hsb	Modern emergent sand bar (Holocene)
Hvb	Modern vegetated sand bar (Holocene)
Hep	Extractive pits (Holocene)
Hef	Engineered fill (Holocene)
Hbsa	Backswamp axial Yazoo alluvium and marsh deposits (Holocene)
Hj	Alluvium of James River (Holocene)
Hs	Alluvium of Big Sioux River (Holocene)
Hal	Tributary alluvium, including alluvial fans (Holocene)
Hds	Dune sand (Holocene)
Qal	Tributary alluvium (Holocene and late Pleistocene)
Qtr	Tufa, travertine and hosting clastic matrix (Holocene and late Pleistocene)
Qoa	Outwash and alluvium (Holocene and late Pleistocene)
Qls	Landslide deposits (Holocene and late Pleistocene)
Hpbc	Point Bar and paleochannel sand (Holocene)
Hlcs	Levee and crevasse splay silt and very fine sand (Holocene)
Hcf	Abandoned channel fill (Holocene)
Hmc	Minor channel and chute sediment (Holocene)
Hu	Fluvial sediment of Missouri River, undivided (Holocene)
Hbs	Backswamp mud (Holocene)
Qvf	Valley fill (Holocene)
Q/Ku	Discontinuous thin undivided Quaternary sediments overlying Cretaceous rocks (Holocene and Pleistocene)
Qes	Eolian sand (early Holocene and late Pleistocene)
Qu	Undivided surficial deposits of uplands (Quaternary)
Qtu	Terrace alluvium (Holocene)
Qt	Alluvial and/or outwash terrace (Holocene and late Pleistocene)
Qg	Glacial gravel, including outwash (late Pleistocene)
Qwgs	Glaciofluvial deposits along valley margin slope (late Pleistocene)
Qwgp	Glaciofluvial deposits, pitted to flat morphology (late Pleistocene)
Qwgr	Ridge-forming glaciofluvial deposits (late Pleistocene)
Qwtg	Till of ground moraine (late Pleistocene)
Qwth	Till of hummocky moraine (late Pleistocene)
Qwtb	Till of bedrock cored moraine or end moraine (late Pleistocene)
Qlu	Peoria loess over older Quaternary units (late Pleistocene)
Ql1	Lower sandy loess (late Pleistocene)
Qot	Older glacial till and associated sediment (middle and early Pleistocene)
Qo	Older glacial outwash and associated sediment (middle and early Pleistocene)
Kp	Pierre Shale (Upper Cretaceous)
Kn	Niobrara Formation (Upper Cretaceous)
Knc	Niobrara Formation and Carlile Shale, undivided (Upper Cretaceous)
Kc	Carlile Shale (Upper Cretaceous)
Kgg	Greenhorn Limestone and Graneros Shale, undivided (Upper Cretaceous)
Kgd	Greenhorn, Graneros, and Dakota formations, undivided (Cretaceous)
Kd	Dakota Formation (Cretaceous)