

# Surface Geology

## Rugby Quadrangle, North Dakota

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### EXPLANATION

All color descriptions refer to moist material.

**Qf Construction Fill**  
Material consisting mainly of silt and clay used to level building sites and roads, and reclaim borrow areas. The units mapped as fill are small and are probably more extensive than shown. As a general rule, fill should be anticipated in any urban area.

### QUATERNARY SYSTEM

#### HOLOCENE

**Qols Windblown Sediment**  
Well-sorted, light olive-brown very fine to medium-grained sand. Obscurely bedded; flat to undulating with local relief less than 20 feet (6 m). Faint, northwest-southeast orientation indicative of prevailing westerly wind direction. Generally distinguishable from subglacially molded ridges by their more northerly trend (approx. N 55° W vs N 70° W) and more diffuse outline on aerial photographs. Thickness > 6 feet (1.8 m). Gradational with units Qcl and Qcd.

**Qop Pond and Slough Sediment**  
Clay, silt, and organic debris; obscurely bedded; dark colored; deposited in modern ponds and sloughs.  
All map areas not coded are (Qop) pond and slough sediment.

**Qor River Sediment**  
Clay, silt, sand, and organic debris; obscurely bedded; dark colored; sticky; deposited on the floodplains of modern streams. Commonly associated with sand and gravel of older river channel sediment.

**Qoss Colluvium and Eolian Sediment (undifferentiated)**  
Light olive to olive-brown silt and fine sand; obscurely laminated; generally well-sorted but commonly reworked by burrowing animals (mostly rodents); clayey in places. Patchy accumulations of surface boulders, unsorted mudflow sediments, and slope-washed sand and gravel. Thickness > 6 feet (1.8 m). Found mainly on, and at the base of, steeper slopes on till-covered uplands. Local relief 10 to 50 feet (3-15 m).

#### COLEHARBOR GROUP (HOLOCENE AND PLEISTOCENE)

The Coleharbor Group includes all sediments in North Dakota that are associated with deposition by Pleistocene glaciers. Most of the surface sediments in the mapping area were deposited by Late Wisconsinan ice during a brief, rapid readvance from the northwest between 13,000 and 12,500 years ago, and later in glacial Lake Souris as the ice margin receded northwards. The thin layer of sandy till deposited by this fast-moving glacier was sufficient to only partially modify the underlying glacial topography. Most of the landforms in the till-covered parts of the mapping area consist of collapsed glacial topography that formed over stagnant ice and was subsequently overridden by the readvancing ice-front. In some areas, hydrologic conditions resulted in extensive longitudinal shearing of the subglacial surface and the formation of low-relief fluted topography.

The undulating topography of the glacial Lake Souris plain indicates that, during its early stages at least, the lake formed over stagnant ice. Shoreline deposits at 1,600 and 1,550 feet (475 and 485 m) have been identified in other parts of Pierce County. Glacial Lake Souris sediments consist mainly of silt and fine sand. Redistribution of this material by wind action after the lake drained produced areas of low dunes and mantled large parts of Pierce and its neighboring counties with a thin veneer of wind-blown silt and sand.

**Qcd1 Till, Palimpsest, Above Maximum Level (1,600 feet [485 m]) of Glacial Lake Souris**  
Thin (1.5-10? feet [0.5-3? m]) layer of olive-brown glacial sediment consisting of unsorted, unstratified, slightly stony, clayey, sand and silt draped over, and only slightly modifying, preexisting glacial topography. Bouldery in places but generally lacking in clasts above pebble-size. Stony fraction is dominated by crystalline and carbonate lithologies; locally derived fragments (sandstone, shale, and lignite) are rare. Caps uplands at elevations above 1,600 feet (485 m) that existed as islands during the early stages of glacial Lake Souris. Lithology of the underlying material is uncertain but is presumed to be sand and gravel. Rolling to hilly surface. Local relief up to 80 feet (25 m).

**Qcd2 Till, Palimpsest, Below Maximum Level (1,600 feet [485 m]) of Glacial Lake Souris**  
Same as unit Qcd1. Overlies light-olive-brown, locally planar or cross-bedded, well-sorted silt, sand, and gravel; low-relief stagnation deposits, and subglacially molded surfaces from earlier glaciations. Washboard moraines and circular disintegration ridges visible on air photos in some areas; numerous, commonly water-filled depressions. Gently undulating to rolling surface with poorly integrated drainage. Wave-eroded in places. Local relief up to 50 feet (15 m).

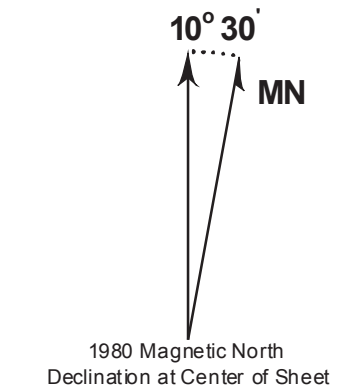
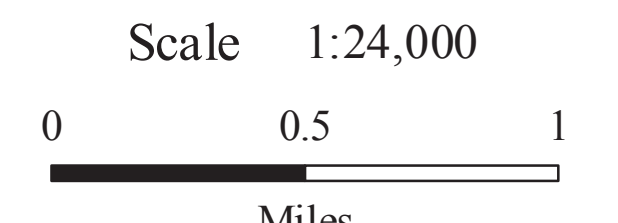
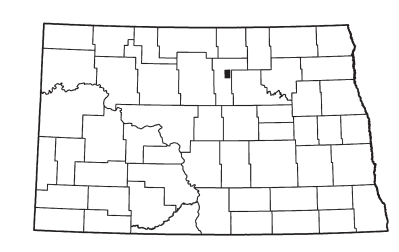
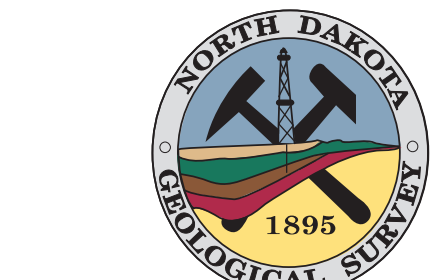
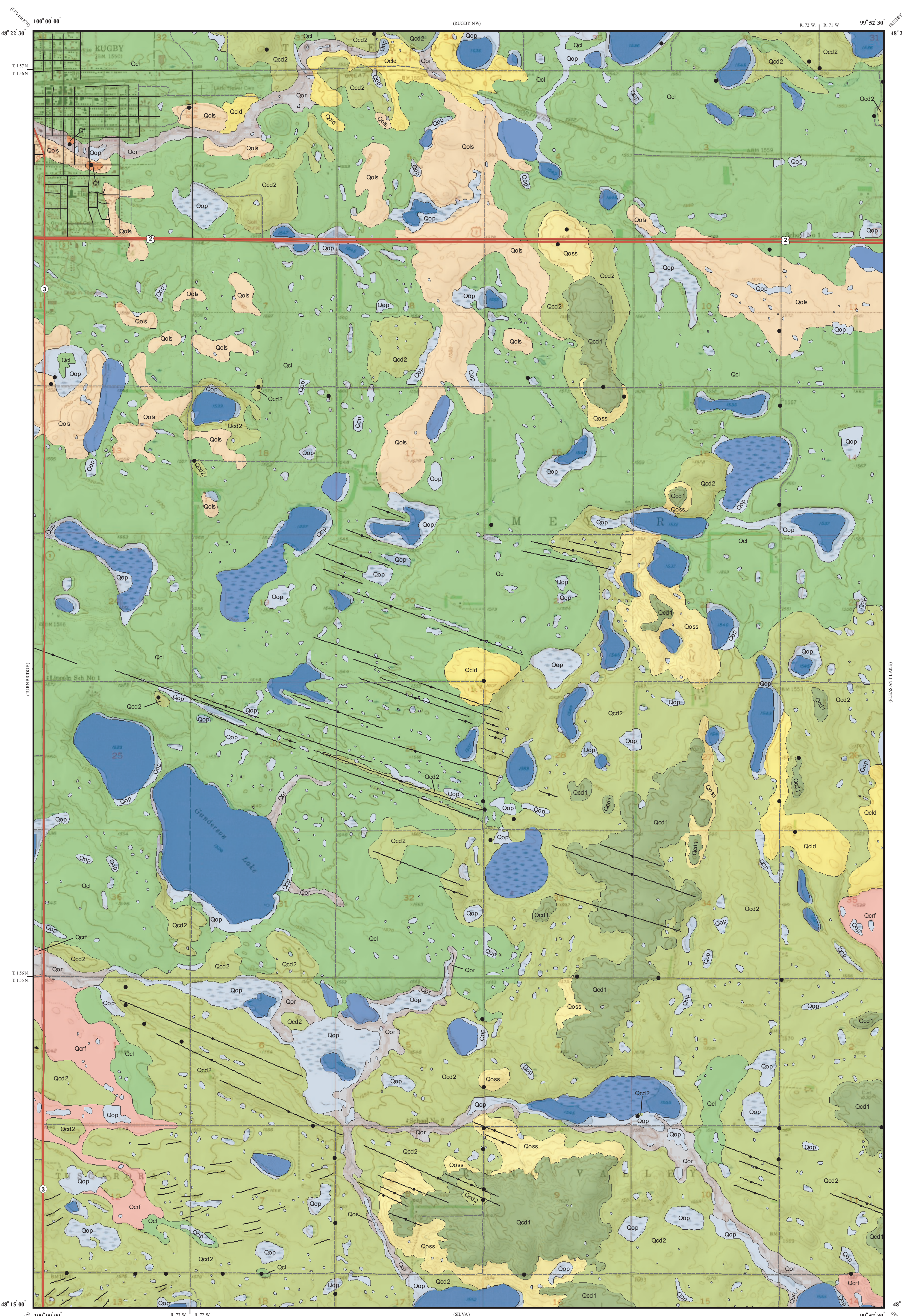
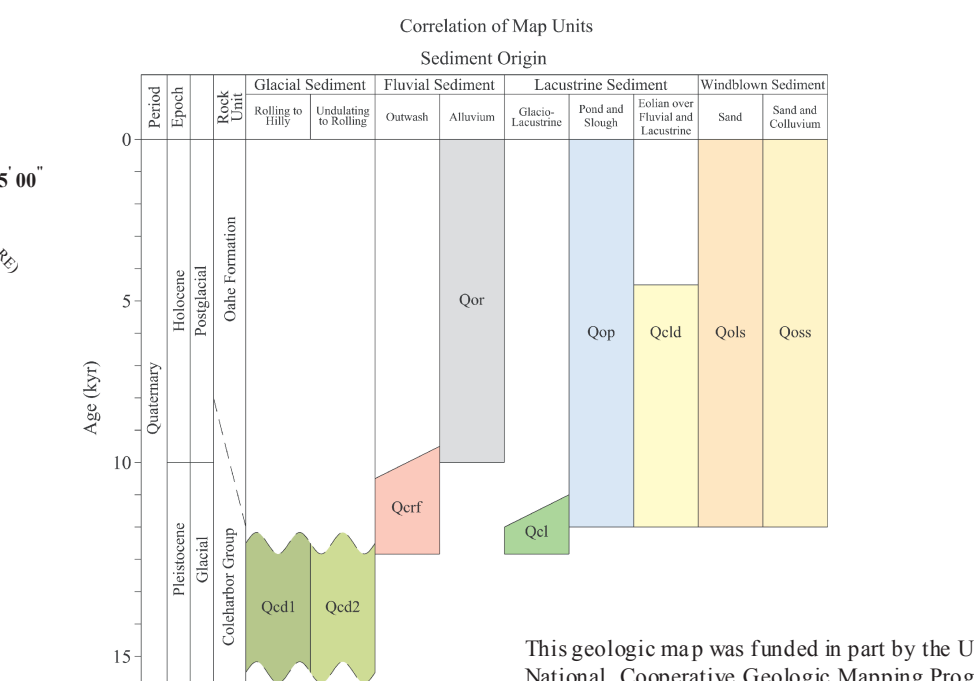
**Qcrf River Channel Sediment**  
Moderate to well-sorted; light olive-brown, locally planar to cross-bedded silt and sand. Lower-flow-regime fluvial sediment deposited by tributary streams of spillways to the south flowing out of glacial Lake Souris. Associated with early stage lake levels above 1,550 feet (475 m). Smooth to gently undulating surfaces with local relief generally less than 10 feet (3 m).

**Qcl Lake Sediment**  
Light olive to olive-brown thinly laminated, clay, silt and sand; well-sorted; up to 30 feet (9 m) thick. Deposited by meltwater streams in low to moderate-energy areas of glacial Lake Souris. Generally flat to gently undulating surface with areas of higher relief (10-30 feet [3-10 m]) where sediment was deposited over stagnant ice.

**Qcd Windblown Sediment Over Sand and Gravel, and Lake Sediment**  
Thin (< 5? feet [ $< 1.5? m$ ]) layer of light olive-brown well-sorted, very fine sand over yellowish light olive-brown well-sorted fine sand capped by a very thin (about 4 inches [10 cm]) lag of gravelly sand and pebbles. Origin of the sand and gravel is uncertain but local topography suggests it is probably channel sediment associated with meltwater streams flowing into, or spillways flowing out of, glacial Lake Souris; or kame deposits.

**Geologic Symbols**  
— Known contact between two geologic units  
- - - Approximate contact between two geologic units  
— Crest of longitudinal subglacially molded ridge  
— Transverse ridges on till; mainly washboard moraine  
• Control Points: test holes, observation wells, and field observations

**Other Features**  
— Water  
— U.S. Highway  
— State Highway  
— Paved Road  
— Unpaved Road



Lambert Conformal Conic Projection Standard Parallels 48° 15' 00" and 48° 22' 30" 1927 North American Datum NGVD 1929 USGS 7.5 Minute Topographic Map Contour Interval 5 Feet Road Layer Rectified to 2006 NAIP Digital Orthophoto