

# Surface Geology

## Braddock NW Quadrangle, North Dakota

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2023

### QUATERNARY SYSTEM

#### HOLOCENE EPOCH

**Hls** Landslide deposits: Moderately to poorly sorted combination of soil, unconsolidated sediments, and sedimentary rocks that has slid down the local slope under its own weight. Common where unconsolidated sediments form low bluffs along the south shoreline of Long Lake.

#### HOLOCENE/PLEISTOCENE

#### OAHE FORMATION

Sand, silt, clay, gravel, and organic debris all postglacial sediment deposited on the landscape; includes river sediment, windblown sediment, and lake sediment.

**Qod** Windblown sand: Well-sorted, fine to medium sand; obscurely bedded; poorly developed paleosols common; subdued topography, consisting of vague knobs and elongated ridges with long axes aligned parallel to prevailing northwesterly winds; blowouts common; windblown lake and fluvial sand reworked into dunes; currently inactive.

**Qoww** Windblown silt and sand: Moderately to well sorted grayish brown to tan, silt and sand; deposited as a thin mantle draped over, and only slightly modifying, the pre-existing glacial and non-glacial topography; generally less than 10 feet (3 meters) thick.

**Qoop** Pond and slough sediment: Organic debris, clay, and silt; obscurely bedded; dark colored; generally more than 3 feet (1 meter) thick; deposited in poorly drained depressions in the landscape.

**Qor** Alluvium and overbank sediment: Sand, silt, clay, and disseminated organic debris; obscurely bedded, dark colored; locally abundant gastropod and pelecypod shells including *Valvata tricarinata*, *Sphaerium* sp., and *Psidium* sp.; commonly up to 50 feet (15 meters) thick in the Missouri River floodplain and up to 15 feet (4.6 meters) thick along creeks in the area.

**Qoc** Colluvium: Unconsolidated sediment, mostly fine sand, silt and clay; obscurely bedded, dark colored; deposited primarily by slope wash and mass movement as an apron at the base of bedrock uplands. Commonly up to 15 feet (4.6 meters) thick.

#### PLEISTOCENE EPOCH

#### COLEHARBOR GROUP

The Coleharbor Group includes all sediments in North Dakota associated with deposition by Pleistocene glaciers.

**Qcd** Collapsed glacial sediment: Light olive-brown to olive-brown; unsorted; unbedded; calcareous; very shaly; lignite fragments common; contains abundant cobbles and surface boulders of mostly crystalline lithologies, with minor amounts of limestone, dolomite, and, more rarely, local bedrock types; undulating to rolling, hummocky surface; deposited as end moraine on a predominantly non-glacial surface by an early Late Wisconsin glacial (Long Lake Advance).

**Qcdn** Draped glacial sediment: Light olive-brown to olive-brown; unsorted; unbedded; calcareous; shaly; lignite fragments common; contains abundant cobbles and surface boulders of mostly crystalline lithologies, with minor amounts of limestone, dolomite, and, more rarely, local bedrock types; undulating to hilly surface; disconformity thin; lacks hummocky topography owing to postglacial erosion; deposited on a non-glacial surface as a thin mantle draped over, and only slightly modifying, the pre-existing topography by a pre-Late Wisconsin glacial (Napoleon Advance). May be covered by a patchy, thin (less than 5 feet [1.5 meters]) veneer of windblown sediment.

**Qoah** Collapsed lake sediment: Flat-bedded to gently folded, pale-gray to pale olive-gray laminated clay, clayey silt, silty clay, silt and sand; non to moderately calcareous; iron-stained in places; small (generally less than pebble-sized) carbonate nodules and masses of gypsum, and sand-sized organic fragments common; subtle, flat to gently undulating hummocky surface, pitted by steep-sided, bowl-shaped depressions (kettle holes) formed by the melting of detached blocks of buried ice; sediment deposited in a proglacial lake formed by stagnant ice from an earlier glacial advance. May be covered by a patchy, thin (less than 5 feet [1.5 meters]) veneer of windblown sediment.

**Qorf** Collapsed outwash: Moderately well-sorted, light to dark olive brown, low-angle flat-bedded to high-angle cross-bedded silt, sand, and gravel; calcareous; shaly; bouldery in places; deposited as outwash or by meltwater in contact with the ice margin.

**Qorh** Collapsed outwash: Moderately well-sorted, light to dark olive-brown, faulted and contorted plane- and cross-bedded, pebbly silt, sand, and gravel; calcareous; shaly; cobbles and boulders common; rolling to hilly surface; collapsed sediment deposited by supraglacial rivers.

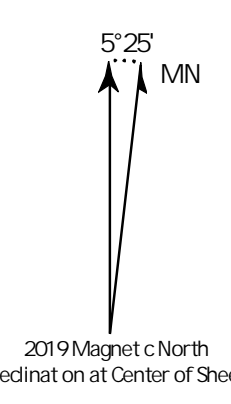
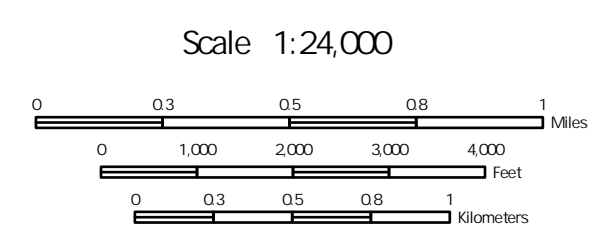
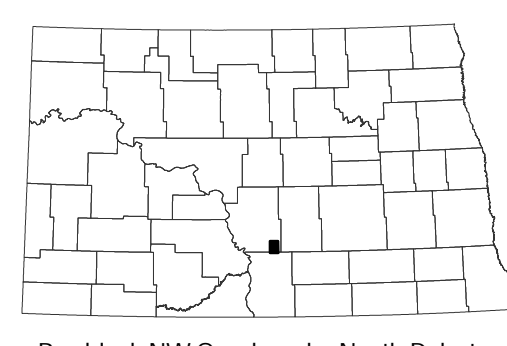
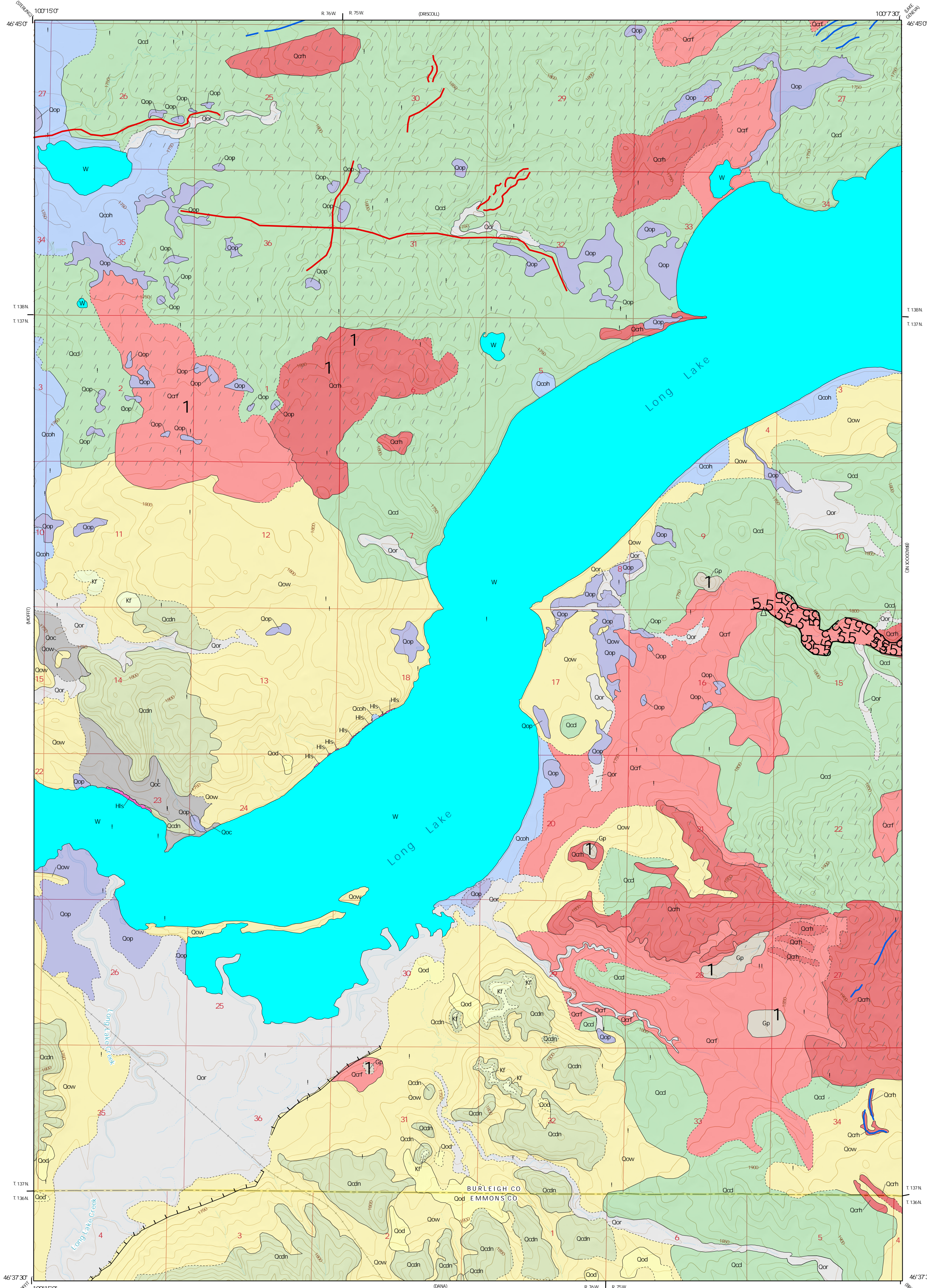
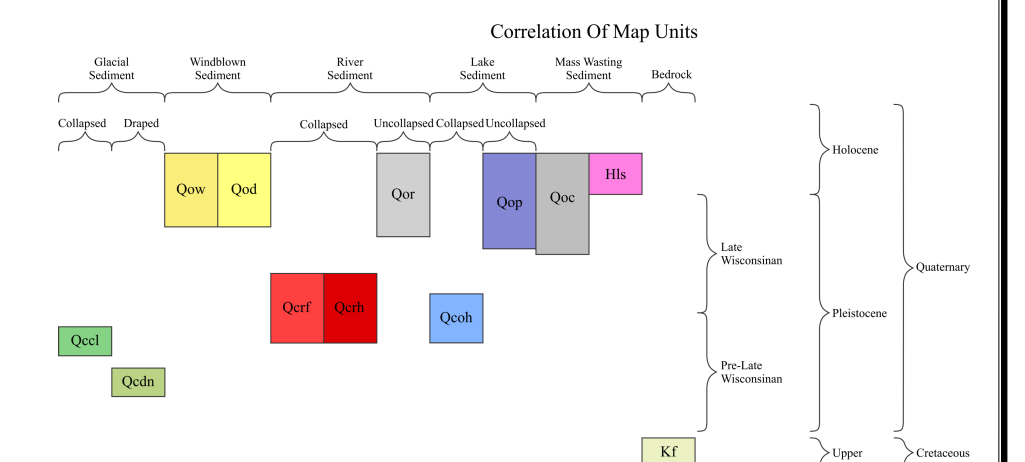
-Nonconformity-

#### CRETACEOUS SYSTEM

**Kf** FOX HILLS FORMATION: Yellowish brown to gray mudstone, siltstone, and sandstone; poorly to well-cemented, very thinly bedded to massive locally cross-bedded sandstone; organic laminae; tuffaceous bed(s); abundant iron oxide nodules. Of shore marine and nearshore deposits. Maximum thickness of the Fox Hills Formation is about 250 feet (76 meters) in this map area.

#### Geologic Symbols

- Geologic contact
- Geologic contact (inferred)
- Hummocky topography - Established from aerial photographs and LIDAR; the circular pattern indicates areas of hummocky topography in collapsed supraglacial sediment; interpreted as circular disintegration on ridges formed by the subsidence of supraglacial sediment (commonly till) during wastage of the underlying ice; generally difficult to discern on topographic maps and on the ground.
- Partly buried channel - Established from aerial photographs and LIDAR; lines indicate the crests of the scarps; half-circles indicate the downslope direction; interpreted as a partly buried stream or meltwater channel; generally apparent on topographic maps, may not be apparent on the ground.
- Sharp-walled channel - Established from aerial photographs and LIDAR; paired sharp scarps indicate the crests of the scarps and hachures point downslope; interpreted as a meltwater channel; apparent on topographic maps and on the ground.
- Elongate hummocks - Established from aerial photographs and LIDAR; line indicates the crest of a conspicuous, sinuous ridge, located in collapsed supraglacial sediment; interpreted as single or coalesced disintegration on ridges formed by the subsidence of supraglacial sediment (commonly till) during wastage of the underlying ice; may be apparent on topographic maps and on the ground.
- Other lineations - Established from aerial photographs and LIDAR; line marks the long dimension of the feature; located in glacial sediment and thinly veneered glacial sediment; interpreted as streamlined bedforms associated with the movement of glacial ice, or lineations of unknown origin; generally difficult to discern on topographic maps and on the ground.
- Drillholes and auger locat on
- Outcrop



Lambert Conformal Conic Projection on North American 1983 Datum  
USGS 7.5 Minute Topo Map  
Standard Parallels 46°37'30"N, 46°45'0"N  
NAVD83