

# Areas of Landslides

## Grand Rapids Quadrangle, North Dakota

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### UNIT DESCRIPTIONS

#### QUATERNARY SYSTEM

#### RECENT/PLEISTOCENE

#### Qlsa Areas of Recently Active Landslides

Landslide areas showing movement between 2008 and 2020.

#### Qls Landslide Deposits

A mass of material that has moved downslope. Includes earth flows, slumps, and areas of soil creep.

Landslides identified on this quadrangle were mapped from stereo pairs, black and white 1:20,000 scale aerial photographs flown in August 1964 by the United States Department of Agriculture (USDA). Additional data sources include digital orthophotography from the USDA National Agriculture Imagery Program (NAIP) flown in September to October 2021 and the North Dakota Geological Survey LiDAR Map Series, which compiles raw data flown in November 2020 from the North Dakota State Water Commission.

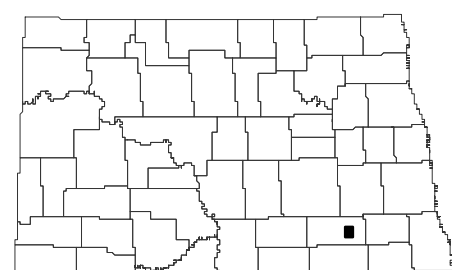
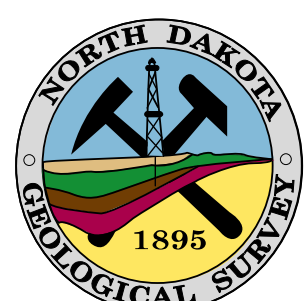
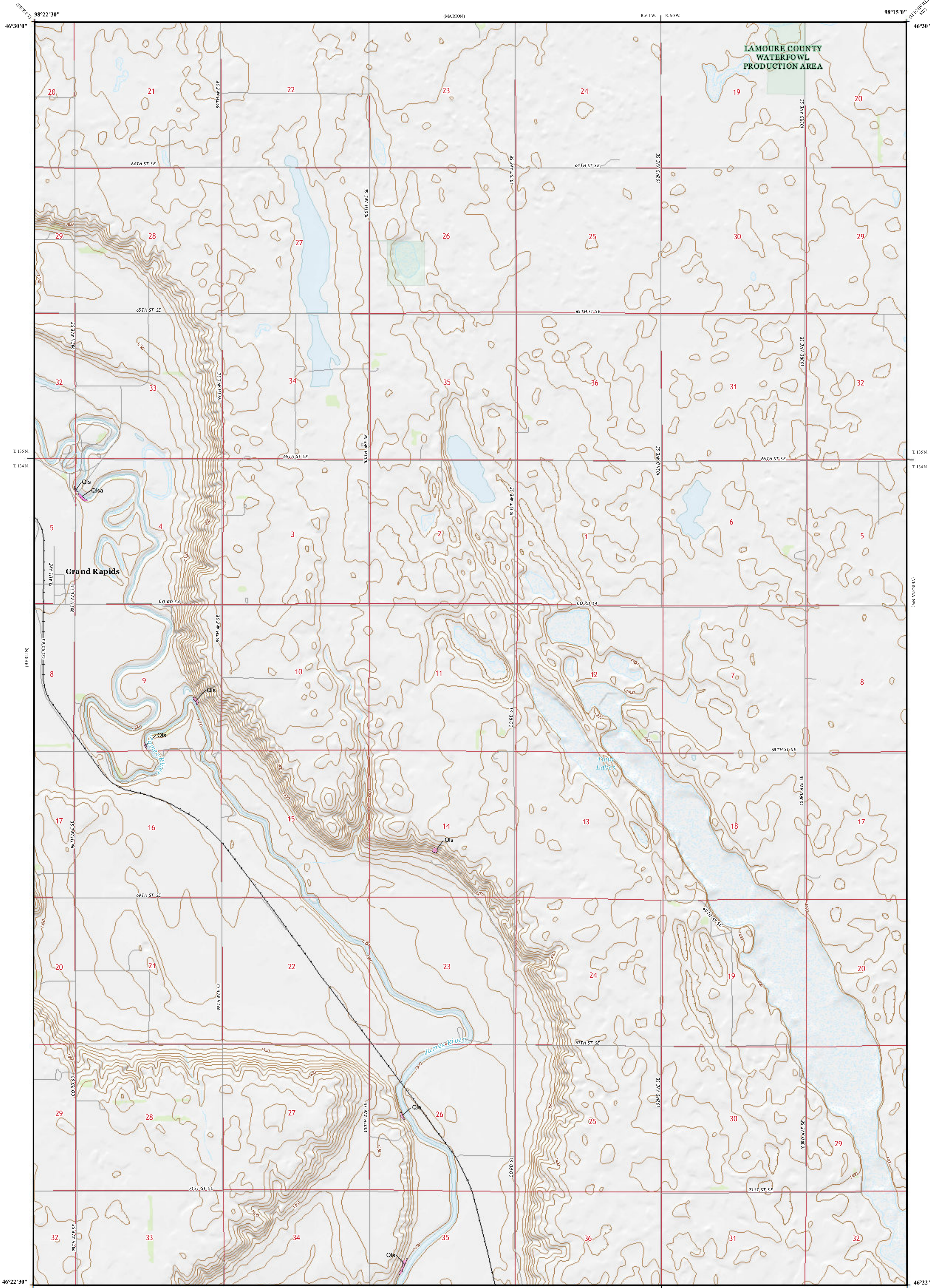
Areas of recently active landslides (Qlsa) mapped on this quadrangle were identified from changes between the 2008 and 2020 LiDAR elevation datasets observed on an elevation subtraction raster. Noise introduced from data precision (typically within a foot between the LiDAR datasets) is removed on this raster by excluding the signal from elevation change in the +/- 1 foot interval. Geologists interpret areas of landslide movement in geomorphic context (typically a decrease in elevation near a landslide headscarp paired with an increase in elevation downslope near the toe) and delineate those areas within the larger landslide dataset. Landslides not identified as recently active may have also experienced movement relatively recently, but did not show discernable signs of movement during the 2008 to 2020 window between LiDAR collects.

#### ROAD CLASSIFICATION

- Expressway
- Secondary Hwy
- Ramp
- Interstate Route
- US Route
- State Route
- Local C connector
- Local Road
- 4WD

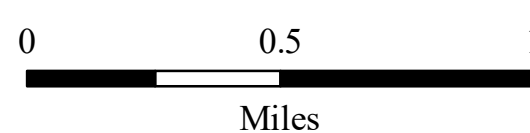
Map Unit	No. of Landslides	Mapped Landslide Area		Map Area %
		acres	m <sup>2</sup>	
Total Landslides (Qls & Qlsa)	7	4	15,035	0.01
Recently Active Landslides (Qlsa)	1	1	2,497	0.001

*16.6% of the mapped landslide area was active between 2008 and 2020*



Grand Rapids Quadrangle, North Dakota

Scale 1:24,000



Miles

Lambert Conformal Conic Projection  
North American 1983 Datum  
USGS 7.5 Minute Topo Map

Standard Parallels 46°22'30"N, 46°30'0"N  
NGVD 1988  
Contour Interval 10 Feet

