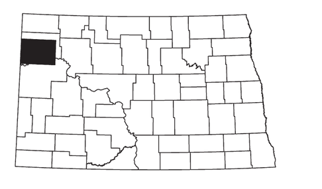
North Dakota Geological Survey

Areas of Landslides

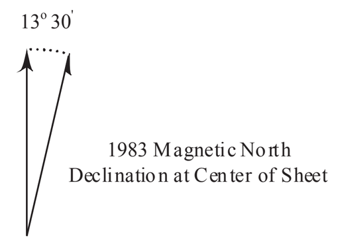
Williston 100K Sheet, North Dakota

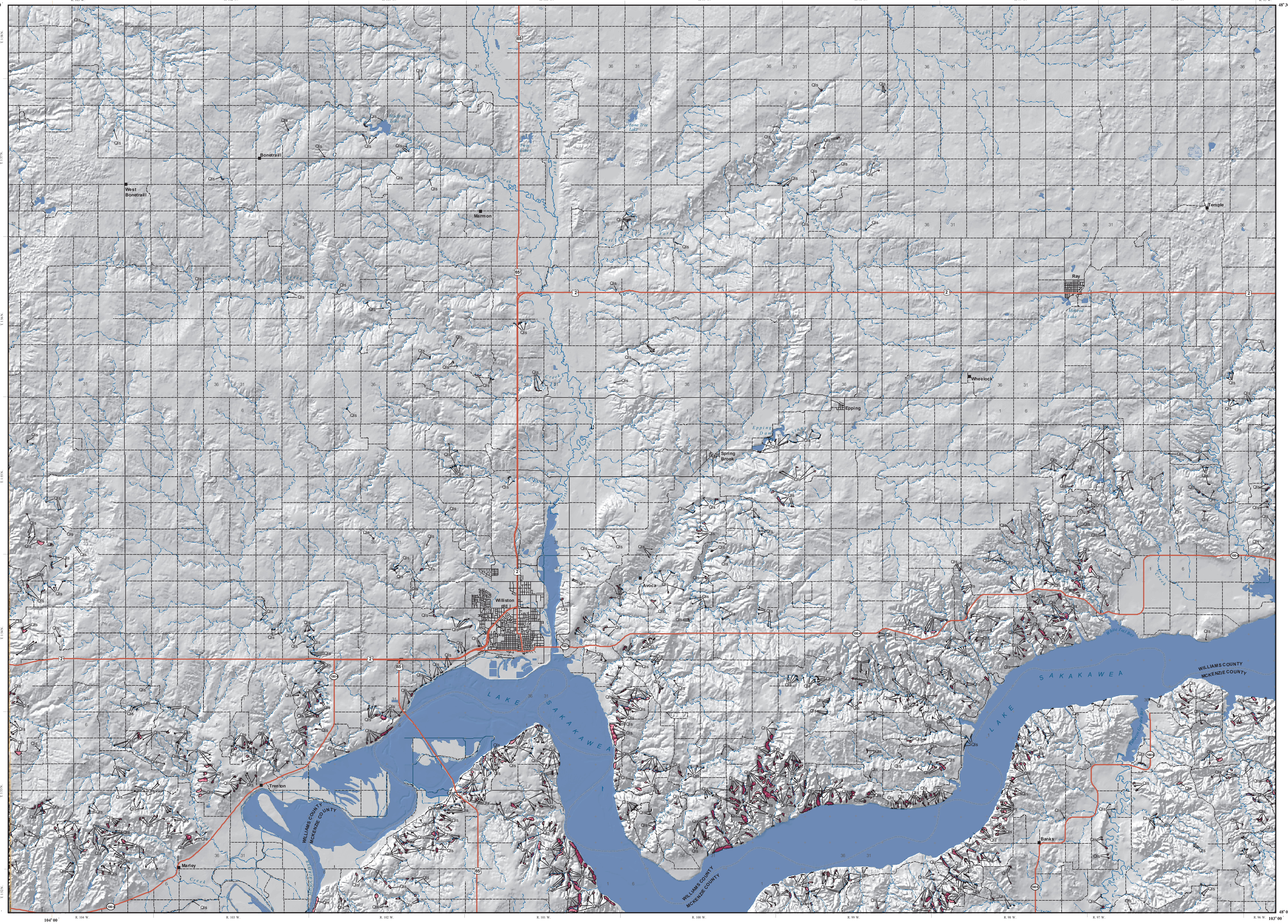


Williston 100K Sheet, North Dakota

Plentywood	Crosby	Kenmare
Culbertson		Stanley
Sidney	Watford City	Parshall

Adjoining 100K Maps





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General Information on Landslides

Landslides are masses of rocks and sediment that have tumbled or slid down a slope under their own weight. These geologic hazards can destroy buildings, roads, railroad tracks, pipelines, transmission lines, and other types of infrastructure. Landslides are generally characterized in the field by steep, near-vertical slopes (the scarp) that are upslope from a mound of displaced rock (the body). The body of the slide may be relatively intact or it may be severely fragmented. Recent or relatively new landslides are generally characterized by a fresh (well-exposed rock) scarp and a sparsely vegetated body. Older slides are typically more difficult to identify in the field because the scarps may be covered with vegetation and the landslide bodies are often well-vegetated, covered by mature trees.

Landslides are most readily identifiable from aerial photographs. Landslides mapped on the Williston City Sheet were identified from a complete set of aerial photographs (1:20,000 scale) that were flown between May and October of 1958. It is unfortunate that these photographs were taken when leaves were on the trees because groves of leaf-bearing trees tend to obscure landslides, especially small ones. On the other hand, leaves can sometimes make it easier to identify these features. Trees and bushes are often aligned within very distinct parallel-, transverse-, and/or semi-circular-depressions that occur generally occur within the body of the landslide.

Slopes fail for various reasons including the steepness or angle of the slope, rock type, bedding, and moisture content of the rocks. Most landslides in western North Dakota are rotational slumps that have a well-defined head and toe. Typically, the part of the slope that breaks apart slides down the slope as a single unit and the beds tilt back in the direction of the slope. The failed mass of rock is, however, almost never a cohesive unit; tension cracks generally cause the failed material to splinter into smaller portions. Successive landslides may occur at the same location. Over time, the accumulated material from multiple, adjacent landslides can cover an area that is several thousand feet wide and several miles long.

The Williston Sheet

Glacial deposits are present at the surface throughout most of the Williston map sheet and vary in thickness from a few feet to more than 250 feet. The Sentinel Butte Formation (Paleocene) underlies glacial deposits throughout the area and is present at the surface throughout the Missouri River Valley. The Sentinel Butte Formation consists of alternating beds of sandstone, siltstone, claystone, mudstone, and lignite.

Landslides are concentrated in the southern portion of the Williston map sheet, within the Missouri River Valley and associated badlands topography. All of the slides in this area involve strata of the Sentinel Butte Formation. Most of these slides cover an area of less than 10 acres but, a few landslide complexes are up to 100 acres in size. Landslides are concentrated along drainages, ravines and coulees, within the badlands topography. All, or portions, of the head of a ravine typically fail, presumably because headword erosion causes these areas to undergo some of the fastest rates of erosion. A relatively small number of landslides were identified along the moderately-steep sided, tree-covered ravines and coulees within the badlands topography in the southern portion of this sheet. There are undoubtably more slides in these areas but they were not identifiable on aerial photographs due to the lack of irregularities in the leaf canopy. Even when landslides are not identified in these types of setting, these areas are often vulnerable to slope failure and should, when possible, be avoided.

In the north half of the Williston Sheet, landslides are generally very small, a few acres, and therefore, generally very difficult to identify on 1:20,000 scale aerial photographs. These slides generally do not have pronounced scarps but, are characterized by mounds or irregularities at the surface near the base of the slope. Small coal mines, commonly referred to as wagon mines, are present along the walls of Cow Creek and other drainages in the area. It is often difficult to determine whether small surface irregularities along the drainage slopes are old mines or slumps. The problem of identification is further complicated because abandoned mines are susceptible to slope failure. Occasionally these surface cuts were extended into the subsurface and are recognizable based upon surface depressions created by underground mine collapse.

Small landslides, 10 acres or less in size, are common throughout badlands topography in western North Dakota. Many of these, as well as larger landslides, are typically obscured by slopewash or colluvium. Layers or blankets of slopewash typically cover the lower portion of a slope and extend horizontally from the base of a slope. Thick, smooth layers of slopewash often completely obscure the broken, jumbled beds of landslide material. In some areas of the badlands, smaller landslides, or landslides that are very old and have been inactive for a long period of time, are only visible if slopewash is thin or absent, or the beds are sufficiently jumbled to create subtle irregularities at the surface. An obvious rejuvenation surface is present along the southern edge of the Missouri River Valley within the map sheet. The pediment or colluvium surface is present at the midpoint of the slopes in the area. Colluvium tends to be very thick in this area.

A total of 1,698 landslides were identified in the Williston Sheet. Many of these slides are complexes, consisting of multiple landslides that formed from a dozen or more individual events. Therefore, the number of individual landslides in this sheet is much higher. These landslides cover an area of 4,789 acres or approximately 0.5 % of the map sheet. Most of the landslides (1,550) occur within the Missouri River Valley where they occupy approximately 1.5 % of the area. Slide material is much less common outside of the valley where landslides occur over less than 0.03 % of the land surface.

UNIT DESCRIPTIONS

Surface geology undifferentiated

QUATERNARY

RECENT/PLEISTOCENE

Qls **Landslide**

A mass of sediment and/or rock that have slid or tumbled down slope. A pink area on the map my represent dozens of individual landslides.

Geologic Symbols

Known contact between two geologic units

Other Features

Water	River/Stream	Federal Highway
Marsh	Stream - Intermittent	State Highway
	Section Corner	Paved Road
	County Boundary	Unpaved Road

Landslides identified on this sheet were mapped from stereo pairs, black and white 1:20,000 scale aerial photographs flown between 6-21-58 and 9-7-58. As a result these maps can be used to identify areas that are vulnerable to slope failture, but are not an up to date assessment of all landslides for the area.

Note: This map was expanded beyond the normal Williston 100k Sheet to include an additional width of two miles to the Montana border.

The text for the general information on landslides section was modified only slightly from the Parshall 100K Landslide sheet.

Scale 1:100,000

0 1 2 3 4

Miles

Mercator Projection — 1927 North American Datum

Standard parallel 48° 15' — Central meridian 103° 30'

Shaded Relief - Vertical Exaggeration 9x

Cartographic Compilation: Elroy L. Kadrmas