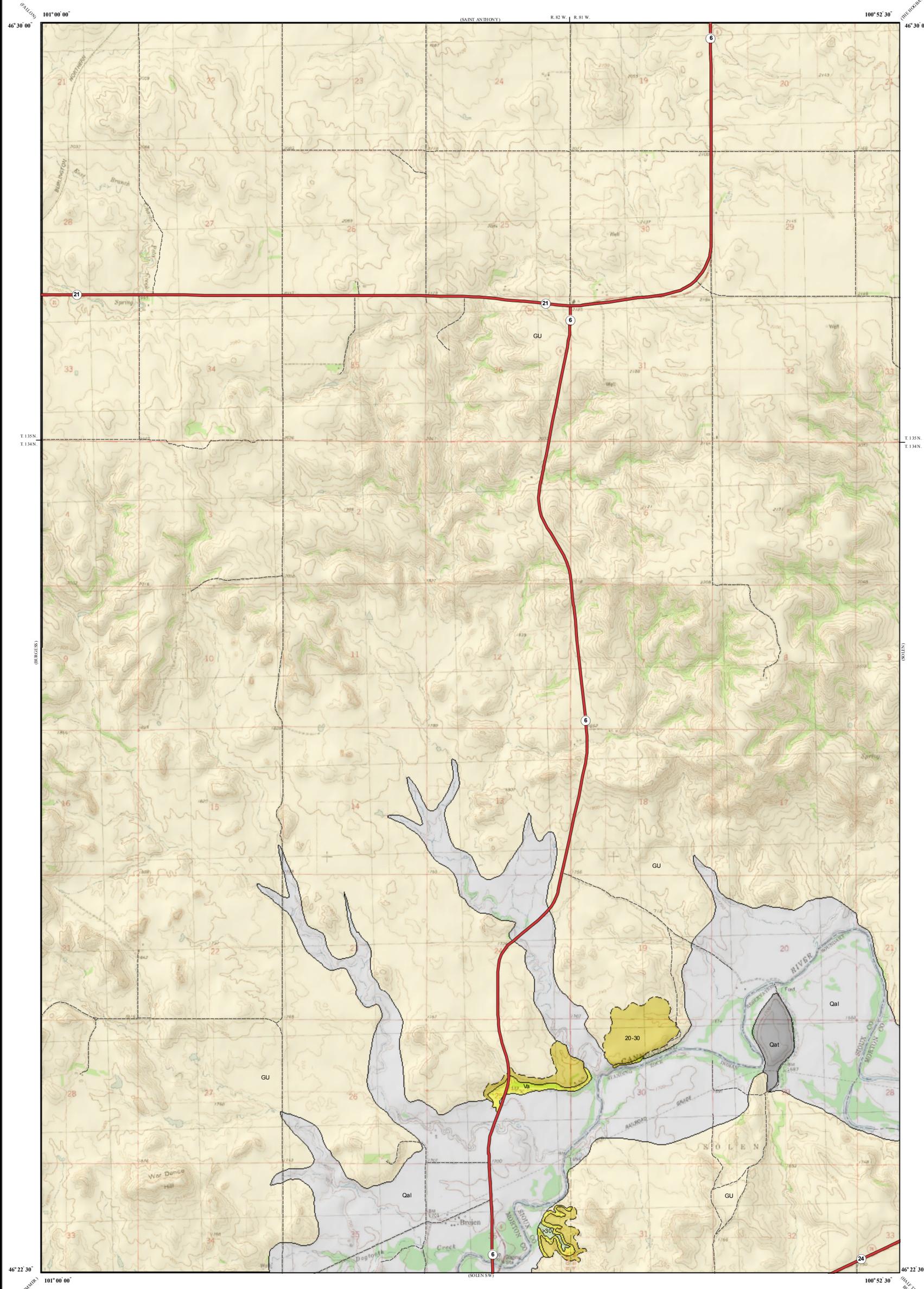


# Volcanic Ash

## Breien Quadrangle, North Dakota

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**Introduction**  
Tuffaceous sandstone and siltstone are present along the Cannonball River in northern Sioux and southern Morton counties, in south-central North Dakota. These deposits occur within a two-mile radius of the town of Breien.

**Previous Work**  
These volcanic ash deposits were first identified by Laird and Mitchell (1942). They reported a layer of ash was present in the basal portion of the Hell Creek Formation, the stratigraphic position of this ash was later confirmed by Frye (1967). Murphy and others (1995) noted the ash was 15 feet thick and placed it within the base of the Hell Creek Formation in a geologic section measured in section 36 (T.134N., R.82W.). Frye noted the ash had a rhyolitic composition and that 98% of the deposit was silt-sized glass shards. In 1972, Feldmann noted the Breien ash is lithologically similar to the Cannon Ball and Linton ashes, but is coarser grained.

**This Study**  
**Breien Ash**  
Exposures of the upper Fox Hills and lower Hell Creek Formations were investigated for ash deposits within a 15-mile radius of Breien. Only eight outcrops within three deposits were identified along both sides of the Cannonball River. As first noted by Feldmann (1972), the ash in the Breien area appears coarser-grained than ash near Linton. The Breien ash is at least 20 to 25 feet thick in a steep cut on the north side of the Cannonball River (T.134N., R.81W., secw section 30). The ash contains 72% silica and 13.5% aluminum oxide. The Breien ash deposit extends over an area of at least 160 acres and contains approximately 9 million tons of ash.

**Commercial Uses of Volcanic Ash**  
Manz (1962) listed many commercial uses of volcanic glass including: abrasives, cleansers, scouring or polishing compounds, concrete admixtures, glazes for pottery, brick and tile, glass wool, enamels, lightweight products, fertilizer, asphalt constituents, acoustical tile, sweeping compounds, paint filler, insecticide carrier, a catalyst carrier in the chemical industry, absorptive packing material, and in purification of lard and tallow. Most of the ash mined in the United States is used in the manufacture of lightweight concrete. Some toothpastes and powders, as well as soaps, contain volcanic ash. Volcanic ash has also been promoted as a surfacing material to create a comfortable, non-slip, minimum-maintenance cow race.

**References**  
Feldmann, R.M., 1972, Stratigraphy and paleontology of the Fox Hills Formation (Upper Cretaceous) of North Dakota: North Dakota Geological Survey Bulletin 61, 65 p.  
Frye, C.L., 1967, The Hell Creek Formation in North Dakota: PhD Thesis, University of North Dakota, Grand Forks, 211 p.  
Laird, W.M. and Mitchell, R.H., 1942, The geology of the southern part of Morton County, North Dakota: North Dakota Geological Survey Bulletin 14, 42 p.  
Manz, O.E., 1962, Investigation of pozzolanic properties of the Cretaceous volcanic ash deposit near Linton, North Dakota: North Dakota Geological Survey Report of Investigation 38, 42 p.  
Murphy, E.C., Nichols, D.J., Hagenson, J.W., and Foreman, N.F., 1995, The Cretaceous/Tertiary boundary in south-central North Dakota, North Dakota Geological Survey Report of Investigation No. 98, 84 p., 2 plates.



The Breien ash exposed in a cut on the north side of the Cannonball River (T.134N., R.81W., secw section 30). Approximately 20 feet of ash is exposed at this locality.



Approximately 15 feet of the Breien ash (white rock) is exposed in ravines leading into the Cannonball River (T.134N., R.82W., secw section 30). At this locality, the ash is within the base of the Hell Creek Formation and dinosaur fossils were found five feet above the ash. Three-foot long pick is for scale.



Ripple marks, small scale cross stratification, indicate the coarse-grained Breien ash was deposited in water. Three-foot long pick for scale.

**EXPLANATION**

- GU** Geology Undifferentiated  
Includes geologic units that are both younger and older than the Linton Ash.
- QUATERNARY SYSTEM**
- RECENT**
- Qal** **OAHE FORMATION**  
**Alluvium**  
Brownish gray to black sand, silt, clay, and lenses of gravel; floodplain deposits typically less than 30 feet thick along recent drainages. Not differentiated where it overlies Qac.
- Qat** **PLEISTOCENE**  
**COLEHARBOR GROUP**  
**Terrace Deposits**  
Five- to 20-foot-thick layers of sand and gravel (consisting primarily of siltstone, chert, flint, agate, petrified wood, siltstone) found beneath flat to gently undulating slopes adjacent to many of the major creeks and creeks and rivers.
- CRETACEOUS SYSTEM**
- HELL CREEK FORMATION**
- Va** **Volcanic Ash**  
The ash layer occurs at, or just beneath, the surface.
- OVERBURDEN**
- 20-30** The ash layer is overlain by 20 to 30 feet of overburden.
- > 30** Greater than 30 feet of overburden.
- Geologic Symbols**
- Known contact between two geologic units
- - - Approximate contact between two geologic units
- \* Outcrop (control point)
- Other Features**
- State Highway
- Paved Road
- - - Unpaved Road

