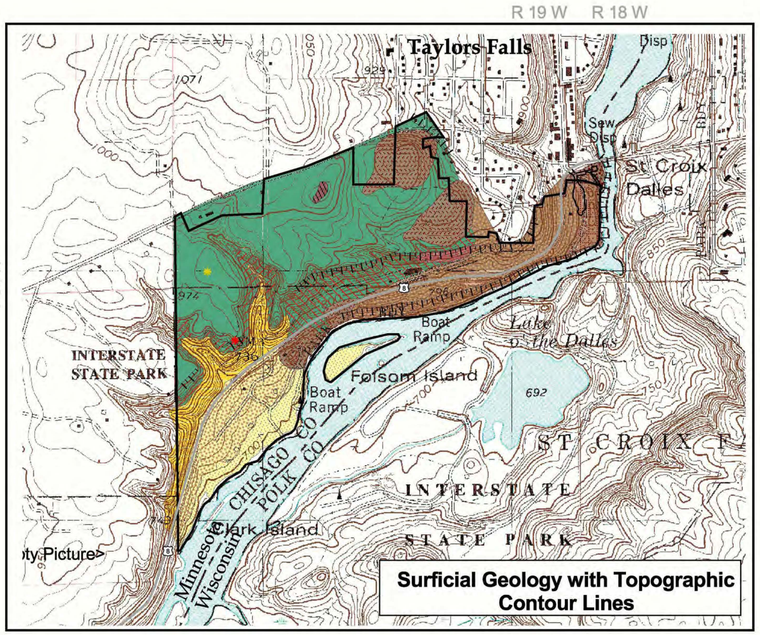
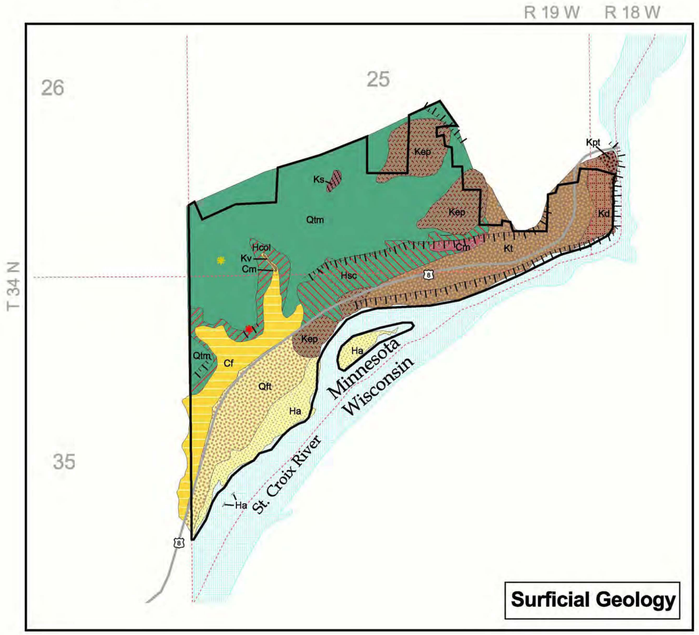
Minnesota Department of Natural Resources
Division of Lands and Minerals
William C. Brice, Director

Surficial Geology of Interstate State Park

By
Matt Oberhelman
2002





Scale 1:12,000

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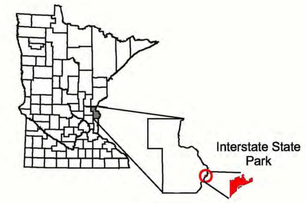
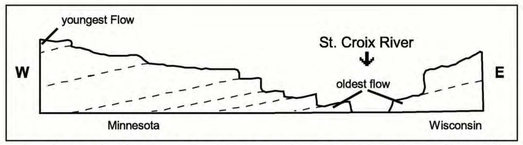




Generalized profile of lava flows in the St. Croix River Valley at Interstate State Parks, MN and WI. Erosion of the westerly dipping lava flows created a "stair-step" topography. The lava flows were extruded one on top of the other. The gentle west facing slopes are developed on the flow tops. Modified from Berkey, 1897.

Joint patterns within the basalt flows have contributed to the development of steep cliff faces along the dalles. The dashed lines represent vertical joint planes.

DESCRIPTION OF MAP UNITS

HOLOCENE (POST ICE AGE) DEPOSITS (10,000 years ago to present)

Water:

Ha FLOODPLAIN ALLUVIUM: Sand, with some gravel and finer sediment, contains variable amounts of organic material. Deposited by modern streams during flood stage.

Qft ALLUVIAL FAN/TERRACE: Poorly sorted mixture of sand, silt, pebbles and cobbles. Contains Superior provenance clasts with locally derived pebbles and cobbles of basalt and sandstone. Interpreted as coalesced alluvial fans overlying an older stream terrace deposit.

Hsc AREA EXHIBITING SOIL CREEP EROSION: Steep hillside exhibiting areas of gradual downhill movement of upslope glacial sediments (Qtm).

Hcol COLLUVIUM DEPOSITS: Steep hillside exhibiting areas of rapid mass slumping of upslope glacial sediments (Qtm). Colluvium deposits are commonly found at the base and/or sides of steep ravines.

PLEISTOCENE (ICE AGE) DEPOSITS - LATE WISCONSINAN (35,000 to 10,000 years ago)

Qtm SUPERIOR LOBE AND GRANTSBURG SUBLOBE TILL (MANTLED BY SAND AND/OR SILT): Surface exposures of till are very limited within the park due to an overlying mantle of sand and/or silt. Observed mantle thickness ranged from 1ft. to greater than 6ft. for sand and 1ft. to 31/2 ft. for silt.

Superior lobe till: reddish-brown, unsorted sediment, primarily sandy in texture with varying amounts of pebbles, cobbles and boulders. Exposed at surface.

Grantsburg sublobe till: tan - yellowish brown, unsorted sediment, fine loamy texture with small scattered pebbles. Carbonate and shale pebbles present. Till not exposed at surface, mantled by 2 ft. of silt (loess). Sample observed with soil auger.

CAMBRIAN SEDIMENTARY ROCKS (550 million years ago)

Cf FRANCONIA FORMATION: White, buff, tan or yellow, fine- to medium-grained quartzose sandstone with minor amounts of shale, locally glauconitic. Local zones contain fossil fragments of trilobites and brachiopods. Beds commonly exhibit cross-bedding. Outcrops occur as steep-faced cliffs. Talus deposits are commonly observed at bases of the cliffs.

Cm MILL STREET CONGLOMERATE: Coarse-grained conglomerate composed of rounded to angular pebbles, cobbles and boulders of basalt, surrounded by a fine- to medium-grained matrix of quartz sandstone. The sandstone matrix locally contains fossils of trilobites, brachiopods, and monoplacophorans. A yellowish-brown to reddish-brown iron rich cement helps bind the conglomerate together. Small infrequent exposures.

MIDDLE PROTEROZOIC VOLCANIC ROCKS (1.1 billion years ago)

The basalt flows are well exposed within the park. The flows are generally gray to greenish-gray in color, weathered surfaces vary from tan, gray, reddish-brown, to purple. The flows are resistant to erosion, cropping out as steep cliffs along the St. Croix River or as thinly vegetated round hills in the northern part of the park. The flows strike north to northeast and dip gently west at approximately 15 degrees. Individual flows can be recognized by textural variations. A typical flow exhibits a relatively thin fine-grained to aphanitic flow base, which grades into a coarser interior. The upper zone or flow top often contains numerous gas cavities (vesicles) that are commonly filled with secondary minerals. The volcanic map units are based on the previous mapping of William Cordua (1989).

Ks SKI TRAIL FLOW: Gray to greenish-gray, porphyritic basalt exhibiting scattered light green to pink plagioclase crystals (phenocrysts) in a fine-grained crystalline matrix. This map unit is named for exposures in a small abandoned quarry near a ski trail in Wisconsin's Interstate State Park.

Kep EAGLE PEAK FLOWS: Gray to greenish-gray, porphyritic basalt containing numerous large tan to pink plagioclase crystals (phenocrysts) up to 2 inches (5 cm) long, in a fine-grained crystalline matrix. The numerous plagioclase crystals aid in identifying this unit. Within the park three thick flows of this unit are evident. This map unit is named for exposures at Eagle Peak in Wisconsin's Interstate State Park.

Kt TRAP ROCK ALLEY FLOW: Gray to greenish-gray, ophitic basalt. This flow is recognized by medium-grained, somewhat circular pyroxene crystals that weather as lighter patches and/or pits. The weathered surfaces of this flow exhibit a distinct mottled and/or pitted appearance. This map unit is named for exposures along Trap Rock Alley in Minnesota's Interstate State Park.

Kd DRESSER FLOWS: Gray to greenish-gray, fine-grained basalt. The flow top is typically amygdaloidal (contains gas cavities filled with secondary minerals) and extensively epidotized (contains epitote a yellowish-green mineral). The Dresser flows lack the large plagioclase crystals found in some of the other flow units. Spectacular potholes are found in these flows. The map unit was named for exposures in quarries of the Dresser Trap Rock Company in Wisconsin.

Kpt POTHOLE TRAIL FLOW: Gray to greenish-gray, porphyritic basalt containing large reddish-pink to light green plagioclase crystals (phenocrysts) in a fine-grained crystalline matrix. Noticeably fewer phenocrysts observed at base of exposed flow. The large plagioclase crystals aid in identifying this unit from the overlying Dresser flows. This map unit is named for exposures along the Pothole Trail in Wisconsin's Interstate State Park.

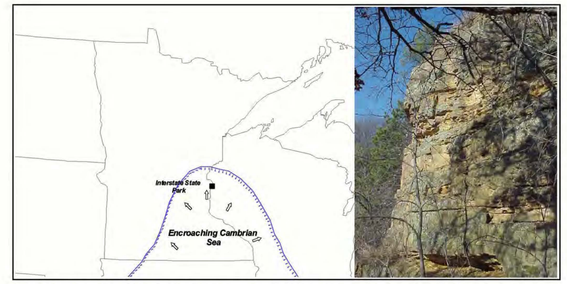
Kv BASALT (undifferentiated): Greenish-gray basalt. The poor exposure makes it difficult to correlate the relationship of this exposure with other flow units.

ABANDONED CHANNEL ESCARPMENT: Well defined channel wall. Formed by the flood waters from Glacial Lake Duluth. Ticks point downslope.

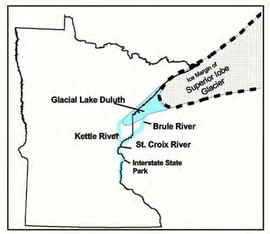
PARK BOUNDARY

PUBLIC LAND SURVEY SECTION LINES

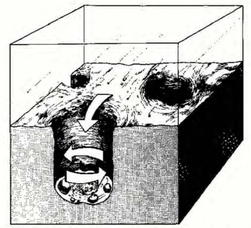
US HIGHWAY 8



By late Cambrian time, about 500 million years ago, a shallow sea extended into Minnesota. The sandstone deposits (as shown in photo) mark where ancient beaches had once existed. Figure modified from Webers, 1972.



The St. Croix River Valley formed when Glacial Lake Duluth overflowed it's basin sending tremendous amounts of water down the St. Croix River.



The spectacular potholes formed when turbulent, high-velocity flood waters from Glacial Lake Duluth scoured over the park. The abrasion action of swirling pebbles and boulders cut the potholes into the hard basalt. (Diagram from Ojakangas and Matsch, 1982).