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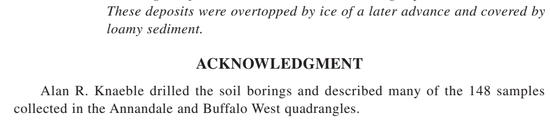
MISCELLANEOUS MAP SERIES
MAP M-152
Surficial Geology, Buffalo West Quadrangle

SURFICIAL GEOLOGY OF THE BUFFALO WEST QUADRANGLE, WRIGHT COUNTY, MINNESOTA

By

Barbara A. Lusardi
2005

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

This map emphasizes the distribution and origin of surficial materials in the area of the Buffalo West 7.5-minute quadrangle. It was constructed in part using aerial photographs taken in 1977 (1:80,000 scale) and U.S. Soil Conservation Service soil-survey maps of Wright County (Edwards, 1968). This was augmented by fieldwork conducted during 2004. Most exposures consisted of excavations, including construction sites and road cuts. Surface samples were supplemented with soil borings drilled to a depth of about 17 feet (5.2 meters). Additional data from previous mapping (Lehr, 1991; Meyer and others, 1993; Meyer and Patterson, 1999) were also included in the interpretation of map units.

Most of the deposits in this area are attributed to glacial ice that advanced from the northwest (Fig. 1). This ice, called the Des Moines lobe, deposited sediment that contains abundant gray, siliceous shale fragments derived from the Winnipeg lowland in Canada. The till color is variable but is typically yellow-brown where oxidized and dark gray where unoxidized. An offshoot of the Des Moines lobe, called the Grantsburg sublobe, carried shale-bearing sediment northeastward to Grantsburg, Wisconsin. As the Grantsburg sublobe crossed this area, it incorporated much of the typically reddish debris left by the Superior lobe (Fig. 1). Thus, the till in places is a blend of the northwest and northeast source material; in other places, the till is stratified with distinct brown and red layers. The distinguishing factor between Des Moines lobe and Grantsburg sublobe sediment is the amount of shale fragments present. Des Moines lobe material has nearly 20 percent more shale in the 1-2 millimeter very coarse-grained sand fraction. The Superior lobe, which advanced from the northeast, occupied this area prior to the Des Moines lobe. It is likely that ice from the Superior lobe advance was still melting when the Des Moines lobe moved into the region. Thus, the landscape records not only the most recent glacial events in the sediments described above, but also the history of earlier glacial events reflected in the landforms and sediments just beneath the surface.

HOLOCENE

pe **Clay, silt, and organic debris**—Dark brown to black peat and muck. *Peat and bog sediment.*

al **Sand**—Medium- to coarse-grained; interbedded with sandy loam to silt loam; layers of sand and gravel. Organic debris may be disseminated in the sediments and/or form discrete peat beds. *Floodplain alluvium.*

PLEISTOCENE

os **Sand, gravelly sand, and cobble gravel**—Moderately to poorly sorted; crossbedded to flatbedded; interbedded in places with unsorted sediment (till, cobbles, boulders). Variable thickness, generally 10 to 45 feet (3 to 14 meters). Contains sediment from both northeast and northwest sources: the former includes few red sandstones and abundant crystalline rocks (basalt and granite), the latter includes many carbonate rocks and some gray, siliceous shale fragments. *Outwash.*

dt **Loam to clay loam**—Pebbly, unsorted; pockets of silt, sand, and gravel in places. Average composition of the very coarse-grained sand fraction includes crystalline rocks (44 ± 6 percent), carbonate rocks (25 ± 4 percent), and shale fragments (31 ± 6 percent). Unit is about 30 feet (9 meters) thick. *Glacial till.*

dti **Loam over sand and gravel**—Sediment as above, over sand and gravel and layers of silty sand to cobble gravel. Broad, flat-topped esker ridges are common. Unit is generally more than 30 feet (10 meters) thick. *Glacial till over sand and gravel. Sand and gravel interpreted to be esker and related glaciofluvial sediment laid down during a previous ice advance. These deposits were overtopped by ice of a later advance and covered by loamy sediment.*

ACKNOWLEDGMENT

Alan R. Knaeble drilled the soil borings and described many of the 148 samples collected in the Annandale and Buffalo West quadrangles.

REFERENCES

Edwards, R.J., 1968, Soil survey of Wright County, Minnesota: U.S. Soil Conservation Service, 140 p., scale 1:15,840.

Lehr, J.D., 1991, Aggregate resources and Quaternary geology, Wright County, Minnesota: Minnesota Department of Natural Resources, Division of Minerals Report 294, 23 p., 1 pl., scale 1:100,000.

Meyer, G.N., and Patterson, C.J., 1999, Surficial geology of the Anoka 30 x 60 minute quadrangle, Minnesota: Minnesota Geological Survey Miscellaneous Map M-97, scale 1:100,000.

Meyer, G.N., Patterson, C.J., Hobbs, H.C., and Lehr, J.D., 1993, Surficial geology, pl. 1 *of* Meyer, G.N., and Falteisek, J., eds., Anoka Sand Plain regional hydrogeologic assessment: Minnesota Department of Natural Resources, Division of Waters Regional Hydrogeologic Assessment RHA-1, scale 1:200,000.

Patterson, C.J., 1994, Tunnel-valley fans of the St. Croix moraine, east-central Minnesota, USA, *in* Warren, W.P., and Croot, D.G., eds., Formation and deformation of glacial deposits: Rotterdam, Balkema, p. 69-87.

MAP SYMBOLS

Geologic contact—Dashed where gradational or inferred. Established from aerial photographs, geomorphic expression, soils maps, well logs, borings, and examination of surficial material.

Esker—Sinuous ridge of sand and gravel deposited in an ice-walled channel. The subglacial fluvial and related fan sediments may be covered by 25 to 75 feet (7 to 23 meters) of till. Although the actual esker and fluvial sediments are not visible at the surface, the geomorphic expression of the ridges and associated fan-shaped feature indicate that the flow direction is to the south.

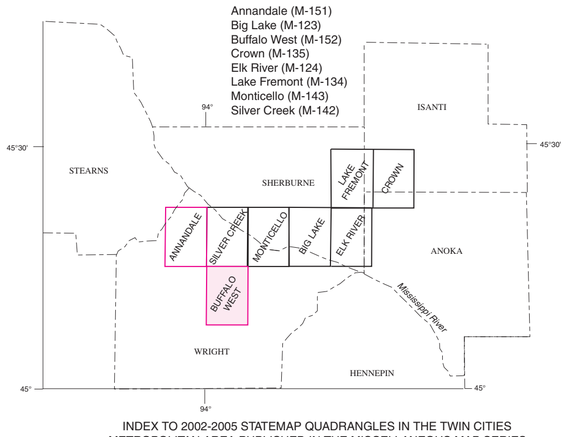
Irregular trough—Collapsed and filled channel; may have been cut by meltwater flowing beneath the ice, or through stagnant ice; partially buried by subsequent glacial events.

Gravel pit (sand and gravel)—Indicates areal extent of large gravel pits; outline drawn from aerial photographs, site-specific observations, and locations as shown on topographic maps.

Soil boring—Auger depths average 17 feet (5.2 meters).

Sample location—Includes outcrops, road cuts, and construction sites.

Record of water-well construction—Location of a water well for which there is a log prepared by a well driller. The information on the log is interpreted by a geologist and the location of the well verified. There are 103 well records for the Buffalo West quadrangle.



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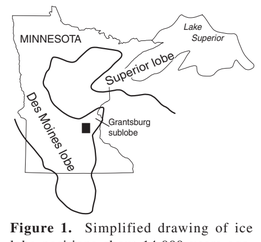

Figure 1. Simplified drawing of ice lobe positions about 14,000 years ago. Previously the Superior lobe covered the area of the Buffalo West quadrangle.

QUADRANGLE LOCATION

APPROXIMATE MEAN DECLINATION, 2005

SCALE 1:24 000

1 1/2 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Base from U.S. Geological Survey Buffalo West 1:24,000 quadrangle, 1976, revised 1981.

Universal Transverse Mercator grid, zone 15
1983 North American Datum

GIS compilation by T.E. Wahl
Edited by Lori Robinson