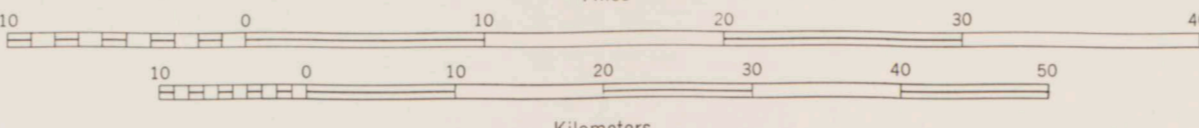


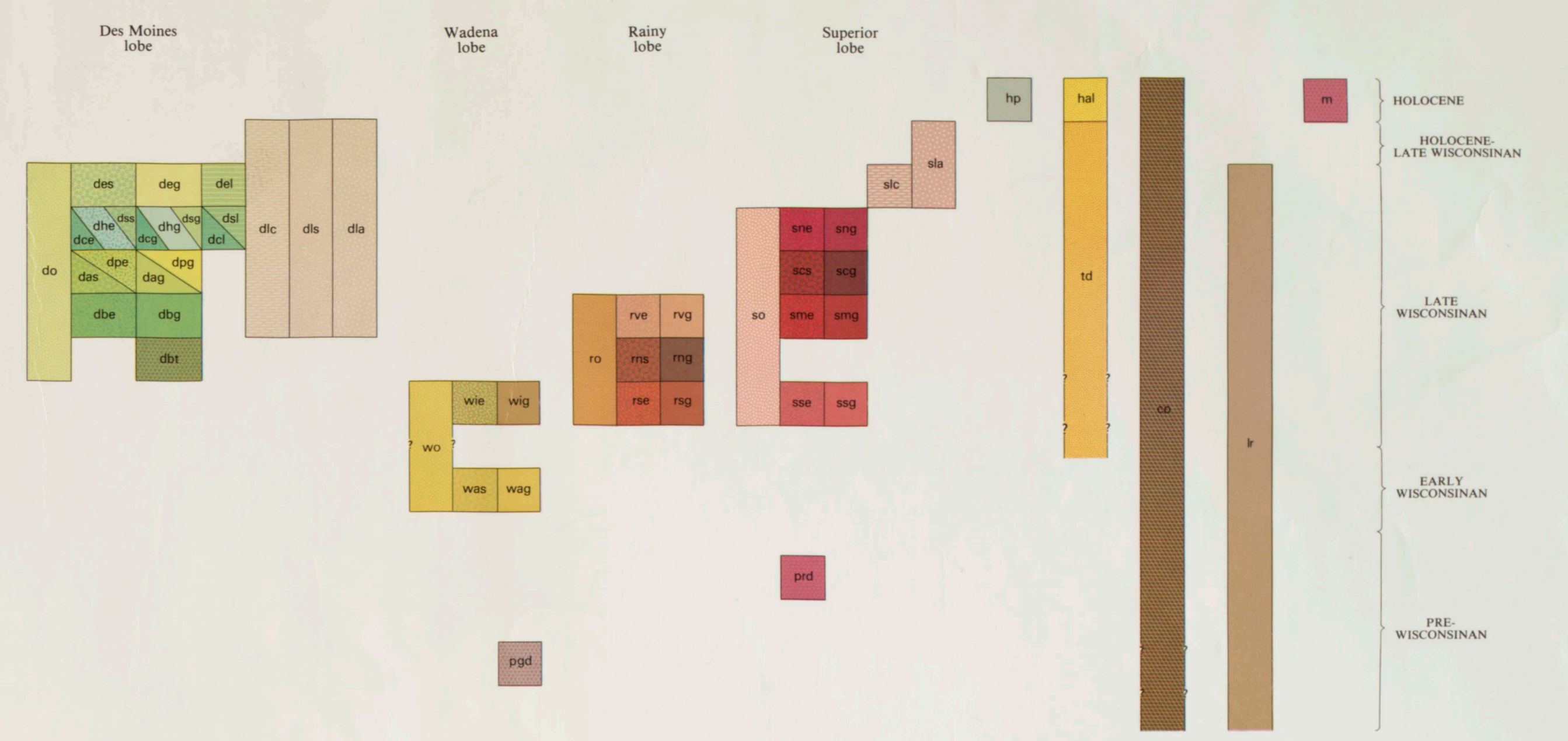
GEOLOGIC MAP OF MINNESOTA QUATERNARY GEOLOGY

by
Howard C. Hobbs and Joseph E. Goebel
1982

Scale 1:500,000



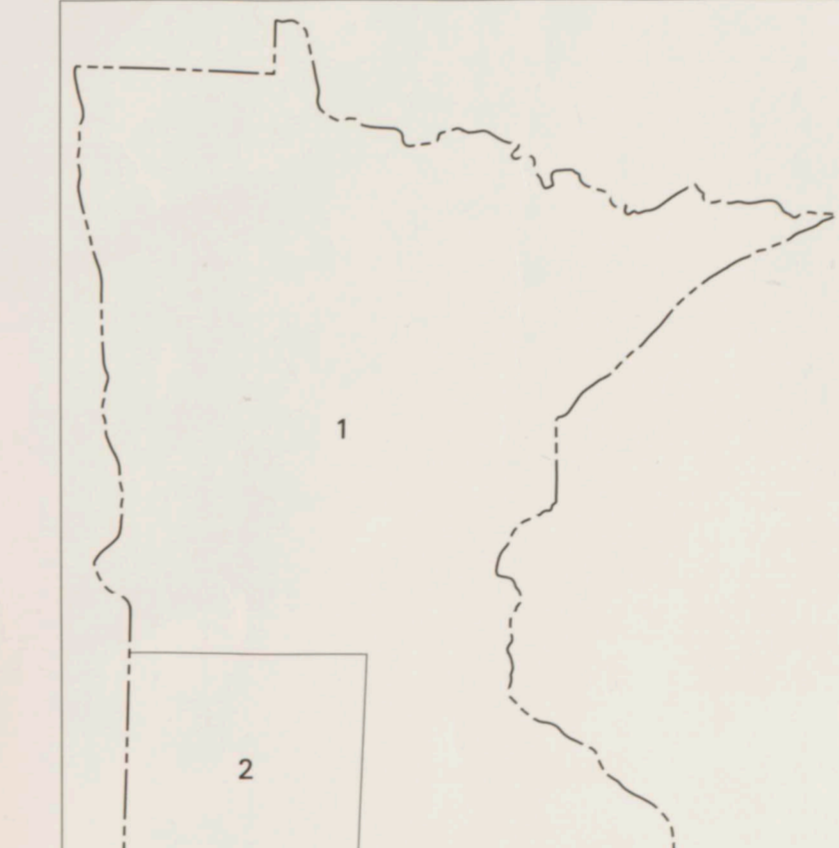
CORRELATION OF MAP UNITS



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DESCRIPTION OF MAP UNITS

- MINE PITS AND DUMPS (HOLOCENE)**
 - MP1 MINE PITS AND DUMPS (HOLOCENE)—mapped only where they are known to occur.
- PEAT (HOLOCENE)**—organic deposits in wetlands; mapped only where they are known to occur.
- ALUEVUM (HOLOCENE)**—sand and gravel, etc., and other deposits in the beds of the floodplains of modern rivers. Mapped only where the beds are exposed above the level of the water table.
- TERACE (HOLOCENE TO PREHISTORIC)**—remnants of former channels and floodplains above the level of present floodplains, and above the level of adjacent modern or ancient waterways. Features include terraces, terraces, and terraces. Mapped only where they are exposed above the level of the water table.
- COLLUVIUM (HOLOCENE TO PREHISTORIC)**—unsorted debris and other material deposited in a variety of local settings.
- DEPOSITS ASSOCIATED WITH THE DES MOINES LOBE (PREHISTORIC)**
 - DM1 DES MOINES LOBE (PREHISTORIC)—includes the Des Moines, the Wadena, and the St. Croix moraine associations.
 - DM2 ERKINE MORaine ASSOCIATION—includes the Erkinne, the Erkinne, and the Erkinne moraine associations.
 - DM3 BIG STONE MORaine ASSOCIATION—includes the Big Stone, the Big Stone, and the Big Stone moraine associations.
 - DM4 CULVER MORaine ASSOCIATION—includes the Culver, the Culver, and the Culver moraine associations.
 - DM5 SUIK HILLS MORaine ASSOCIATION—includes the Suik Hills, the Suik Hills, and the Suik Hills moraine associations.
 - DM6 ALAMOUNT MORaine ASSOCIATION—includes the Alamount, the Alamount, and the Alamount moraine associations.
 - DM7 PINE CITY MORaine ASSOCIATION—includes the Pine City, the Pine City, and the Pine City moraine associations.
 - DM8 MILL LACS MORaine ASSOCIATION—includes the Mill Lacs, the Mill Lacs, and the Mill Lacs moraine associations.
 - DM9 NASKAWIA MORaine ASSOCIATION—includes the Naskawia, the Naskawia, and the Naskawia moraine associations.
 - DM10 ST. CROIX MORaine ASSOCIATION—includes the St. Croix, the St. Croix, and the St. Croix moraine associations.
 - DM11 WADENA MORaine ASSOCIATION—includes the Wadena, the Wadena, and the Wadena moraine associations.
 - DM12 ITACA MORaine ASSOCIATION—includes the Itaca, the Itaca, and the Itaca moraine associations.
 - DM13 ALEXANDRIA MORaine ASSOCIATION—includes the Alexandria, the Alexandria, and the Alexandria moraine associations.
 - DM14 WATERSIDE MORaine ASSOCIATION—includes the Waterside, the Waterside, and the Waterside moraine associations.
- DEPOSITS ASSOCIATED WITH THE SUPERIOR LOBE (PREHISTORIC)**
 - SL1 SUPERIOR MORaine ASSOCIATION—includes the Superior, the Superior, and the Superior moraine associations.
 - SL2 CLOQUET MORaine ASSOCIATION—includes the Cloquet, the Cloquet, and the Cloquet moraine associations.
- DEPOSITS ASSOCIATED WITH THE WADENA LOBE (PREHISTORIC)**
 - WA1 WADENA MORaine ASSOCIATION—includes the Wadena, the Wadena, and the Wadena moraine associations.
- DEPOSITS ASSOCIATED WITH THE RAINY LOBE (PREHISTORIC)**
 - RA1 RAINY MORaine ASSOCIATION—includes the Rainy, the Rainy, and the Rainy moraine associations.
- DEPOSITS ASSOCIATED WITH THE EARLY WISCONSINAN (PREHISTORIC)**
 - EW1 EARLY WISCONSINAN MORaine ASSOCIATION—includes the Early Wisconsinan, the Early Wisconsinan, and the Early Wisconsinan moraine associations.
- DEPOSITS ASSOCIATED WITH THE PRE-WISCONSINAN (PREHISTORIC)**
 - PW1 PRE-WISCONSINAN MORaine ASSOCIATION—includes the Pre-Wisconsinan, the Pre-Wisconsinan, and the Pre-Wisconsinan moraine associations.



Sources of Data

1. Compiled from published and unpublished data cited in Goebel, 1978, and from the interpretation of LANDSAT imagery, the Minnesota Soil Atlas, and large-scale topographic maps.
2. Compiled from the above sources and the unpublished field maps of C.L. Mutsch.

Minnesota Geological Survey
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GEOGRAPHIC FEATURES

- BEACHES AND STRANDES OF LACAL LAKES—long, narrow, low-lying ridges of sand, silt, and gravel, deposited in the margins of glacial lakes.
- ESKERS—long ridges of sand, silt, and gravel, deposited in the margins of glacial lakes.
- BURIED CHANNELS AND TUNNEL VALLEYS—filled to sublevel by glacial till, sand, and gravel, and covered by a thin layer of soil.
- MELTWATER CHANNELS—formed by meltwater flowing in the margins of glacial lakes.
- DRENAGE AND FLUTES—formed by meltwater flowing in the margins of glacial lakes.

DEFINITIONS

- DRIFT**—All the rock materials transported by a glacier; includes till, outwash, ice-contact stratified drift, glacial till, and loess.
- LOESS**—A fine-grained material of a continental glacier. Also the body of drift deposited by it.
- MORaine ASSOCIATION**—Related bodies of drift deposited during a more or less distinct phase of advance and retreat of an ice lobe. Each association consists of a certain moraine and other glacial features on a local scale.
- GROUND MORaine**—A body of drift deposited from the bottom of a glacier as a more or less uniform blanket. Commonly characterized by the underlying surface of hummocks or depressions.
- END MORaine**—A body of drift deposited at the margin of a glacier in the form of a ridge or a series of ridges. Commonly composed of till and outwash, sand and gravel, but it may include blocks of local material. Landforms range from hills of till to a broad, low-lying terrace, produced by tillage as the ice retreats east.
- STAGNATION MORaine**—A body of drift released by the melting of a glacier, composed of till, sand, and gravel, which has been deposited by glacial meltwater. Commonly found in the margins of glacial lakes.
- OUTWASH**—Material that is eroded and transported by meltwater from a moraine, a glacier, or a glacier margin. It is commonly composed of sand, silt, and gravel, and is deposited in the margins of glacial lakes.
- LESS**—Windblown silt and fine sand. Source areas include meltwater channels, narrow plains, and exposed glacial lake beds.

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Copy 2