

Cumulative Sand and Gravel Thickness in McLean County, Illinois

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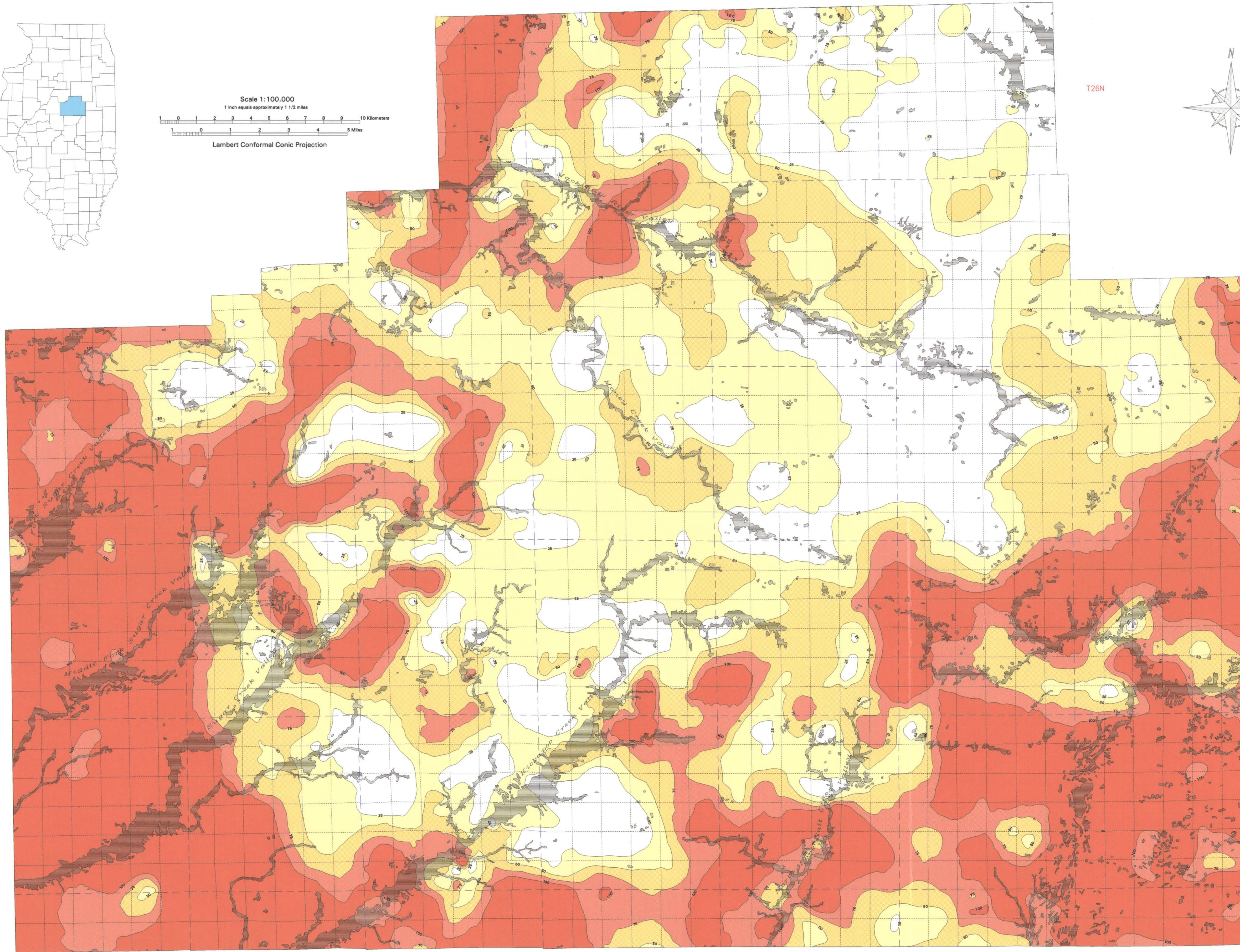
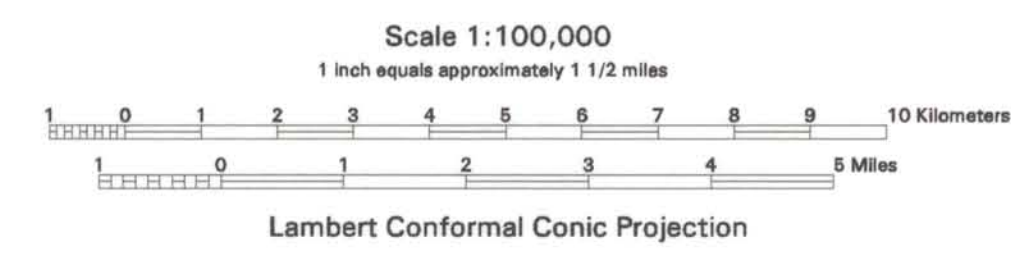
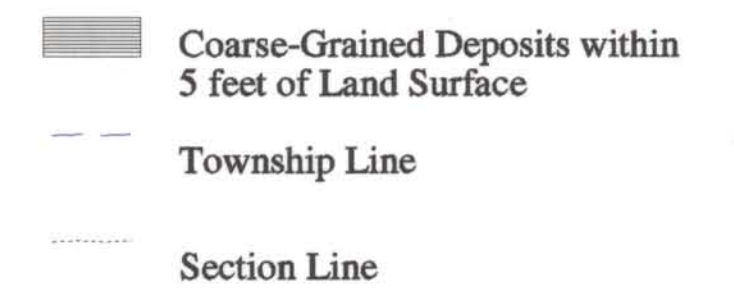
1998



Cumulative Sand Thickness



Open File Series 1997-1f



INTRODUCTION

This map shows the extent and cumulative thickness of near surface and subsurface sand and gravel deposits in McLean County, Illinois. Its purpose is to show deposits that may be sources of groundwater or pathways for migration of contaminants. It is one of a series of maps produced by the Illinois State Geological Survey (ISGS) as part of a geologic mapping program in McLean County, Illinois, to support decisions regarding the siting of solid waste disposal facilities. Data used in the production of the map were obtained from many sources, including 1,716 logs of water-well borings, engineering borings, and oil and gas wells. Additional information was compiled from the map of sand and gravel pits and coal mines (McLean and Kelly, 1997), the topography of the bedrock surface (McLean et al., 1997), the Quaternary Deposits of Illinois (Lineback, 1979), the Stack-Unit Map of Northern Illinois (Berg and Kempton, 1988), the McLean County Soils report (Wynhorn, In Press), a report on geophysical exploration for potential groundwater resources (Larson and Pook, 1989), an application of landfill site approval near Randolph prepared by McLean County Disposal Service, Inc., and several reports on previous geologic investigations (Kempton et al., 1991; Kempton and Viscoky, 1992 and Herzog et al., 1995).

REGIONAL GEOLOGY

The majority of the areas on the map that show large thicknesses of sand and gravel are associated with the Mahomet and Mackinaw bedrock valleys (see inset map). These two bedrock valley systems formed prior to and during glaciation and converge in McLean, Tazewell, and Logan Counties (McLean et al., 1995). Deposits from three major glacial episodes have been found in these valleys and include pre-Illinois Episode Banner Formation, Illinois Episode Glasford Formation, and the Wisconsin Episode Wedron Group (Kempton et al., 1991; Kempton and Viscoky, 1992 and Herzog et al., 1995). The pre-Illinois Episode Banner Formation, the oldest deposits identified in the valleys, includes the principal sand and gravel aquifer, the Sankaty-Mahomet sand aquifer (Kempton and Viscoky, 1992; Herzog et al., 1995). The Sankaty-Mahomet sand aquifer includes the Sankaty Sand Member in the Mackinaw Bedrock Valley and the Mahomet Sand Member in the Mahomet Bedrock Valley. These deposits coincide in the confluence of these (Kempton and Viscoky, 1992; Herzog et al., 1995). The combined unit in the confluence area averages 100 feet in thickness, but in places can reach 150 feet. It is generally found below an elevation of 500 feet. The sand and gravel grades laterally into fine-textured silts and sands and is commonly overlain by till or lacustrine deposits (Herzog et al., 1995). In some locations, other pre-Illinois Episode sand and gravel units are deposited directly on the Sankaty-Mahomet sand (Kempton and Viscoky, 1992).

Overlying the Banner Formation are deposits of the Illinois Episode Glasford Formation which include fine-grained tills interbedded with many sand and gravel layers. The Glasford Formation contains at least two significant sand and gravel deposits, one located at the base of the formation and the other between two diamicton units, the Radnor and Vandalia Till Members (Kempton and Viscoky, 1992). The basal unit is generally less than 20 feet thick and may directly overlie the Sankaty and Mahomet Sand Members. The sand and gravel between the Radnor and Vandalia till is generally thinner and less continuous than the basal unit (Wilson et al., 1994; Herzog, et al., 1995).

Overlying the Glasford Formation and forming the uppermost units in McLean County are the deposits of the Wisconsin Episode Mason and Wedron Groups. The Wedron Group includes diamictites of the Lenoist and Tazewell Formations (Hansel and Johnson, 1996), the later forming the Bloomington Lundrifi which is the dominant landform in the county (see inset map). In general, these formations contain discontinuous sand and gravel lenses within or at their base. Thick deposits of sand and gravel mapped in the vicinity of T23N and R5E may be part of the Ashmore Tongue of the Henry Formation.

Surficial sand and gravel deposits layers deposited as outwash valley trains in several of the major stream valleys (Sugar Creek, West Fork Sugar Creek, Middle Fork Sugar Creek, and the Kickapoo River) flowing southwest from the Bloomington Moraine are included in the Henry Formation of the Mason Group. High energy streams carried meltwater away from the glaciers, deposited layers of coarse- to medium-textured sediments along their valleys (Kempton and Viscoky, 1992; Herzog, 1995). These valley train deposits in McLean County average 10 to 30 feet thick and can reach thicknesses of 70 feet (Kempton and Viscoky, 1992). Sand and gravel deposits are also mapped within the county in major stream channels north of the Bloomington moraine (Mackinaw River and Money Creek). These relatively thin deposits of Chokola Formation were deposited by modern stream activity. Thin alluvial deposits of sand and gravel also occur along smaller stream channels, but these deposits are not shown due to the scale of the map.

METHODOLOGY

This map was created using Dynamic Graphics' EarthVision, Environmental Systems Research Institute's ArcInfo, and other software packages. EarthVision was used to create 2-D models of the land surface topography and bedrock topography, and a 3-D computer model of the Quaternary deposits based on interpretations of the grain size distribution of geologic materials described by well drillers, engineers, and geologists. Using the 3-D model and the 2-D surfaces, an isopach map representing the cumulative thickness of coarse-grained deposits (primarily sand and gravel) was derived. The isopachs delineate areas of different thicknesses of sand and gravel. White areas represent regions with the least thickness of sand and gravel (less than 25 feet), and the

orange areas represent regions with the greatest thickness of sand and gravel (greater than 100 feet). Also depicted on the map are areas where coarse-grained deposits lie at or within five feet of the land surface (gray-shaded regions). The latter information was compiled from the recent soil survey compiled for McLean County (Wynhorn, In Press). Soils formed in coarse-grained parent materials were grouped together and digitized. The final map was produced using ArcInfo.

Public Land Survey boundaries were digitized from U.S. Geological Survey (USGS) 7.5-minute topographic maps. The slight skewness in the orientation of the map is due to the map projection (Lambert Conformal Conic). Public Land Survey lines and the boundaries of the county, in this part of the state do not run true north-south or east-west. Water bodies were obtained from USGS 1985 1:100,000 digital line graph data.

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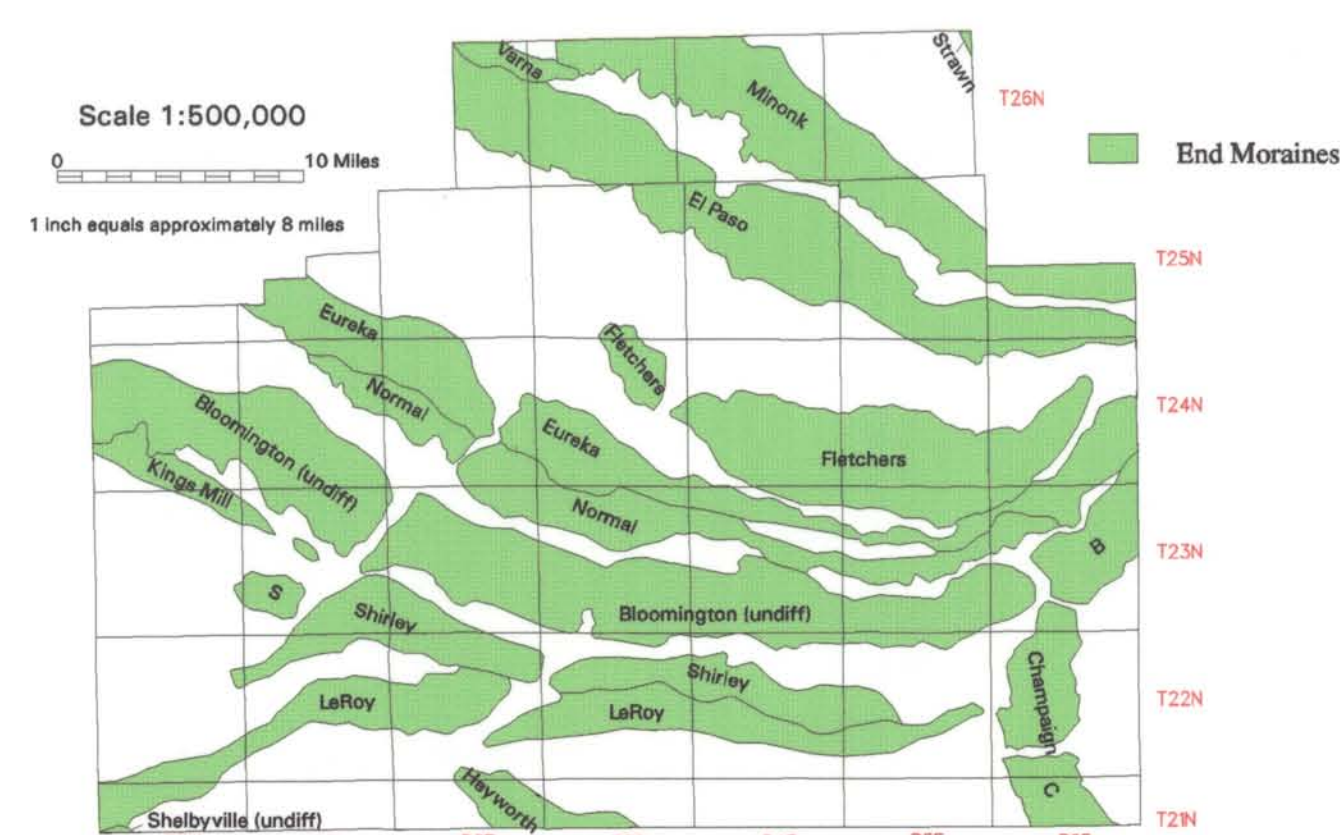
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Late Wisconsin End Moraines in McLean County, Illinois
modified from Willman and Frye, (1970)



Bedrock Valleys in McLean County, Illinois
after McLean et al., 1995

