SURFICIAL GEOLOGIC MAP OF THE CHENOA 7.5 MINUTE QUADRANGLE, MCLEAN COUNTY, ILLINOIS

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Abstract

Surficial geologic mapping at the 1:24,000 scale has been completed for the Chenoa 7.5 Minute Quadrangle in the north-central part of McLean County, IL. The longitude of the map ranges between 88°45′ to 88°37′30″, and the latitude ranges from 40°45′ to 40°37′30″. The map was created as a digital PDF file allowing for quick access to the map and introduces compatibility to other mapping programs for local geology to be completed. The map was mostly ground moraine and it was constructed using soils survey data, water well log, and outcrop descriptions. Using well log data, we were able to obtain the thicknesses of some of the formations; The thickness of the Quaternary units can span over 100m in paleovalleys. The youngest Quaternary units present are within the Mason Group consisting of the Peoria Silt and the Cahokia alluvium. The Cahokia formation contains poorly sorted sand, silt, and clay sized grains that are associated with modern stream systems with thicknesses less than 2m thick. The Peoria Formation contains yellow-brown silt and clay, which is interpreted as loess. The Henry Formation is a sand and gravel unit that forms terraces in valley train outwash systems and alluvial fans varying in thickness between 3-20m. The Wedron Group dominates the north east to the central part of the quadrangle and it contains the Lemont Formation, which is a grey diamicton that is deposited on a ground moraine with thicknesses ranging between 5 and 10m. The Cahokia alluvium occurs in the north-central areas of the Quadrangle and the Peoria silt is found in the southwest portion of the quadrangle. In some regions in the north west area of the Quadrangle the Henry Formation is layered within the Lemont Formation. After the map was drafted a field check was conducted to validate contact placement and water well records.

Introduction

Mapping at the 7.5 minute scale was completed in the Chenoa, IL in correlation with EDMAP and the ISGS(Illinois State Geological Survey). The purpose is to map the quadrangle in detail for strategic land usage and educate the young generation of geologic mappers. The units deposited in Chenoa are part of the Lake Michigan Lobe area and are the end products of the Wisconsinan glaciation of the Pleistocene. The Lemont formation was deposited in this region; specifically the Yorkville member, recognized as the middle fine grained member of the Lemont. The Cahokia alluvium is deposited in creeks during the Holocene leaving traces of clay, silt, and sand sized particles. The mapping area was originally hypothesized to include Yorkville member as well as some outwash to the southwest of the Minonk moraine. The well data and DTM model (Figure.1) later led me to the conclusion that the entire quadrangle consist of the Yorkville formation and some Cahokia Alluvium.

Methodology

A variety of data was obtained from the ISGS regarding the region of study prior to a field check. The first data we looked at is the Soils Polygon data within McLean County (Figure 4) provided by the United States Department of Agriculture and Natural Resources Conservation Service. The Soil Survey was made by soil scientist who observe the steepness, length, and shape of the slopes. Soil scientist also observe the native plants that occur and obtain soil profiles with soil probes to support their classification. The data was analyzed and separated into geologic units grouping by parent material. After we classified the parent material we place it into GIS to be further analyzed with well logs and a digital elevation model created from LIDAR data (Figure 1). LIDAR data is remote sensing data that is created from the use of a low energy laser and radar to detect the distance a targeted object is from the satellite in great detail. The LIDAR data is excellent for imaging geomorphic features caused from Glaciation. The features were then extensively analyzed to help determine the surficial geology. A field check was made at the intersection of Henline Creek and N 3200 E Road, where clast samples were taken to observe the lithology. The quad was checked near other creeks within the quad to find and check cut banks for lithology type. A 3-D elevation model was then uploaded to the VISLab at the University of Illinois Champaign-Urbana, to observe high resolution 3-D data of the Minonk and El Paso Moraine within the Chenoa Quadrangle. The VISLab trip was useful for observing regions that were inaccessible to the public and visualizing the geologic history of the region.

Results & Discussion

The surficial deposits in the Chenoa Quadrangle are dominated by the Yorkville member of the Lemont Formation. The Yorkville member is a till deposit with finer grains than the Batestown member below it. The clasts taken from the Yorkville member along Henline creek are dolomitic with some being chert clasts. The clasts are thought to be connected to the dolomitic units in the Silurian and are commonly found within the Yorkville member (Willman,Frye 1970). Gravel lenses can be found throughout the mapping area within the Yorkville formation; The lack of surficial gravel determined from the well data suggest that these features are not part of the Henry outwash. Clay and silt deposits of the Cahokia formation can be found along creeks in the region. The Cahokia formation occurs as bedded clay through gravel deposits in Patton Creek, Henline Creek, and Rooks Creek. The Minonk end moraine has a till plain(figure 2) most apparent in the Southeast. In the Northwest portion of the Minonk moraine hummocky topography is the dominant landform(figure 3). The gradual elevation changes and lack of outwash suggest the Minonk moraine retreated slowly during the Pleistocene Wisconsinan glaciation. An additional study can be conducted by collecting representative clast samples in the quadrangle. Using class size and abundance to estimate the energy of the glacier, and plotting the sample locations in GIS comparing with a DTM (Digital Terrain Model) hypothesize the glacial flux of the Minonk Moraine. Limited land access and surface feature deformation from farming equipment in the mapping area were the leading causes of error in the study. The land plowed over by farmers can be better classified with well data as well as advancements in remote sensing technologies.

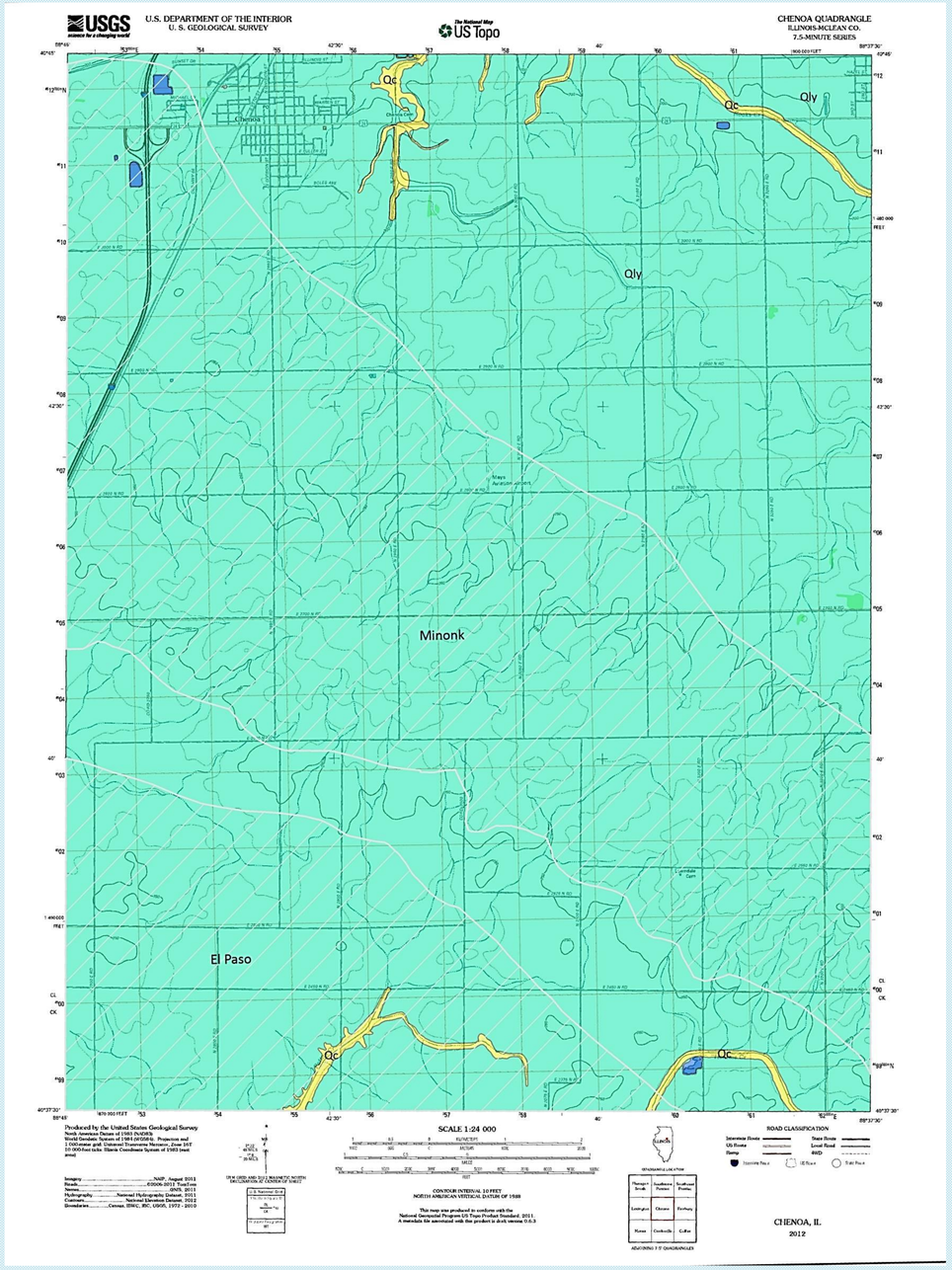

Figure 1. Digital Terrain Model of the Chenoa Quadrangle . Wells Labeled with Green Dots

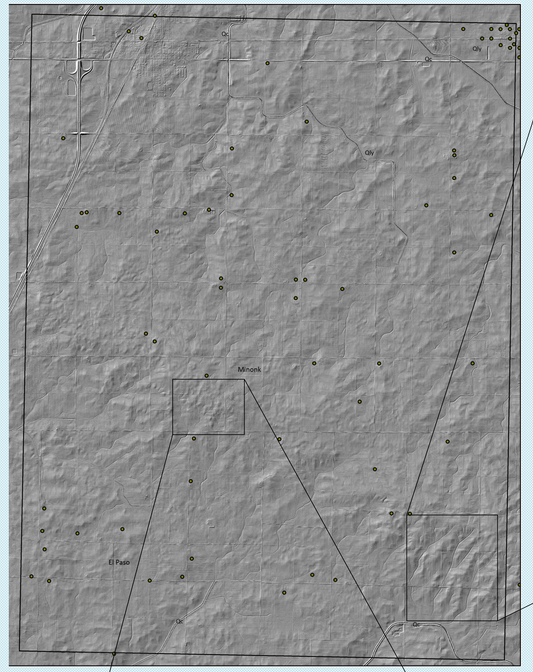

Figure 2. Glacial Till plain formed along the terminus of the Minonk moraine

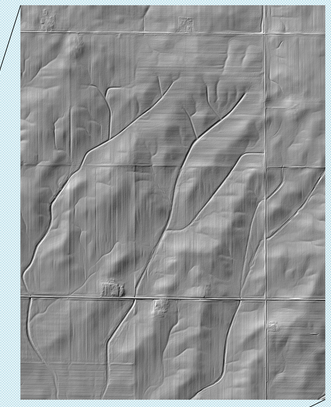

Figure 3. Hummocky topography starts to form in the middle of the Minonk Moraine and extends out to the North West.

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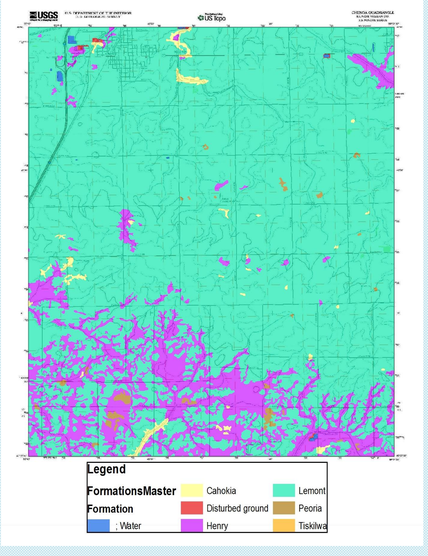

Figure 5. Soils data created from United States Department of Agriculture and Natural Resources Conservation Services

Unit Descriptions

Qc — **Cahokia (Alluvium):** Bedded silts, clays and gravels deposited in modern creeks 5-10ft thick

Qly — **Lemont (Yorkville Member):** Calcareous, gray, fine textured silty clay diamicton often oxidizes to olive brown. Some areas in section are mixed with gravel lenses although majority is fine grained diamicton. Thickness in quad ranges from 80-100ft

Surface Features

End Moraine: End moraines marked with light gray hatch marks. Northeast moraine is the Minonk moraine and the southwest moraine is the El Paso . The southeastern most extent of the El Paso Moraine is the Yorkville-Batestown boundary with the Batestown member to the southeast.

Water: Surface water in the form of ponds or lakes

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