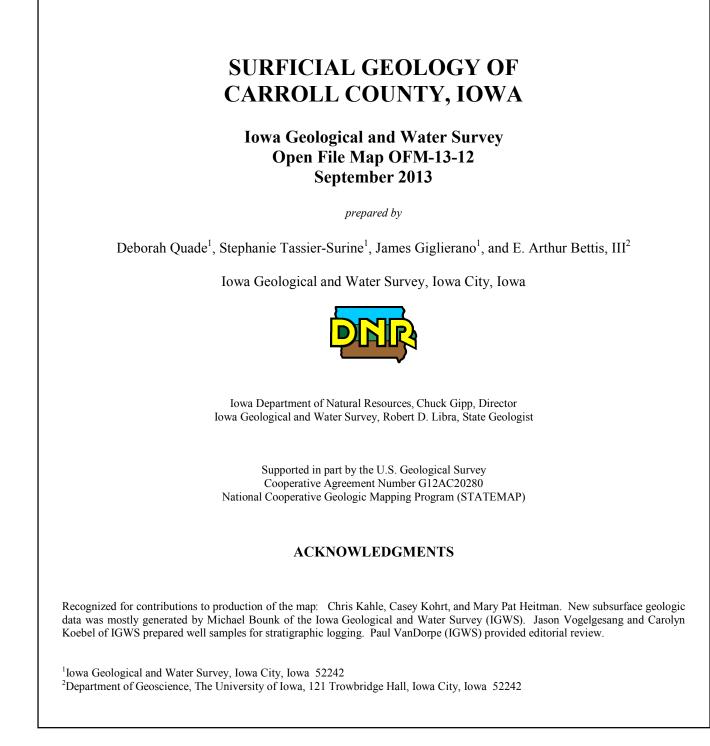
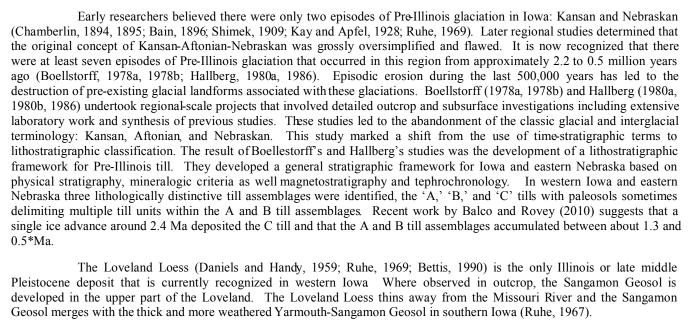


# LEGEND



### Introduction to the Surficial Geology of Carroll County, Iowa

Carroll County lies in west-central Iowa and straddles the western margin of the Late Wisconsinage Des Moines Lobe (DML) landform, the most recently glaciated region of the state and the much older Southern Iowa Drift Plain Landform Region (Prior and Kohrt, 2006). Surficial materials consist of a mix of eolian deposits (loess), glacial till, and alluvium. Multiple periods of Quaternary glaciation and subaerial erosion have led to the landscape we see today. Previous surficial geologic mapping of the area is limited to the Des Moines 4 ° x 6 ° Quadrangle at a scale of 1:1,000,000 (Hallberg et al., 1991). Compilation mapping was completed near the project area in 2011 and 2012 for Adams County (Tassier-Surine et al., 2011), Mills County (Tassier-Surine et al., 2012a), and Montgomery (Tassier-Surine et al., 2012a), and Montgomery (Tassier-Surine et al., 2012a), and Montgomery (Tassier-Surine et al., 2012b). New mapping was completed near the project area in 2002 for Dallas County (Quade et al., 2002) and in 2003 for Polk County (Quade et al., 2003). Statewide bedrock geologic maps by Hershey (1969), and most recently, by Witzke, Anderson, and Pope (2010), depict the increased understanding of the distribution of geologic units at the bedrock surface across this region, including Carroll County.



In Carroll County, the highly eroded and dissected Pre-Illinois upland and older terraces are mantled by Wisconsin loesses of variable thickness (Ruhe, 1969; Prior, 1976). The Wisconsin loesses are the youngest regionally extensive Quaternary materials and were deposited between 30,000 and 12,000 years ago. Two loess units were deposited across Iowa during Wisconsin time, the older Pisgah Formation and the younger Peoria Formation. The Pisgah is thin and includes loess and related slope sediments that have been altered by colluvial hillslope processes, pedogenic and periglacial processes. The upper part of the unit is modified by development of the Farmdale Geosol. It is not uncommon to see the Farmdale developed throughout the Pisgah and incorporated into the underlying older Sangamon Geosol. The Pisgah Formation loess was deposited on the western Iowa landscape from about 55,000 to 26,000 years ago (Bettis et al., 2003) and is typically buried by Peoria Formation loess. The Peoria Formation loess accumulated on stable landsurfaces inwestern Iowa from 23,000 to 12,000 years

In the eastern portion of the map area, the younger DML region consists of a complex suite of depositional landforms and sediment sequences related to supraglacial, subglacial, and proglacial sedimentation. The DML is characterized by hummocky terrain that forms arcuate belts of moraine complexes and undulating plains with thick increments of supraglacial sediment (>3 m). In the map area, the most noteable features of the DML are the Bemis Moraine, the terminal moraine of the DML which is dated at approximately 14,500 to 14,000 years before present and the slightly younger Altamont Moraine I which is dated at approximately 13,500 years before present. Supraglacial and proglacial sediments associated with hummocky terrain, elongated and aligned hummocks, and outwash channel deposits, which encompass the western flank of the DML, are mapped in Carroll County. Extensive outwash deposits are mapped along the North Raccoon River and Purgatory Creek valleys, as well as the western flank of the sliver of Altamont Moraine I that is mapped in the extreme northeast corner of Carroll County. Surficial deposits of the map area are composed of five formations: DeForest, Noah Creek, Peoria, Dows and undifferentiated Pre-Illinois tills. Hudson age deposits associated with fine-grained alluvial and colluvial sediments include the DeForest Formation which is subdivided into the Camp Creek, Roberts Creek, Gunder and Corrington members. The Noah Creek Formation includes coarser grained deposits associated with large valleys which are overlain by finer-grained alluvial material or eolian silt and sand. Peoria Formation eolian materials consist of wind-blown silt that may be up to 9 m (30 ft) in thickness. Limited areas of eolian sand may be present adjacent to river valleys. Additional eolian materials may be intermittently present mantling Wisconsin Episode terraces. The Dows Formation consists of upland glacial deposits and is subdivided into the Alden, Lake Mills, Morgan and Pilot Knob members. Pre-Illinois glacial deposits are exposed in the map area along drainages and where loess cover is thin. Based on existing well data, Pre-Illinois deposits may be as thick as 152 m (500 ft) in bedrock valleys.

Soils series units from the Soil Survey of Carroll County, Iowa (Sherwood, 1982) were categorized into surficial geologic units based on soil data and available subsurface geologic data from the Iowa Geological and Water Survey's GEOSAM database (water well log database) as well as other existing subsurface data for this compilation map project Modeling and mapping of the glacial till outcrops was completed using ArcGIS 10.0, gvSIG open source GIS program and the Sextante landscape classification subprogram. \* We disagree with the younger 0.2Ma age estimate for Pre-Illinois glaciations presented by Balco and Rovey (2010) and suggest 0.5Ma is more consistent with regional data and stratigraphic relationships.

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