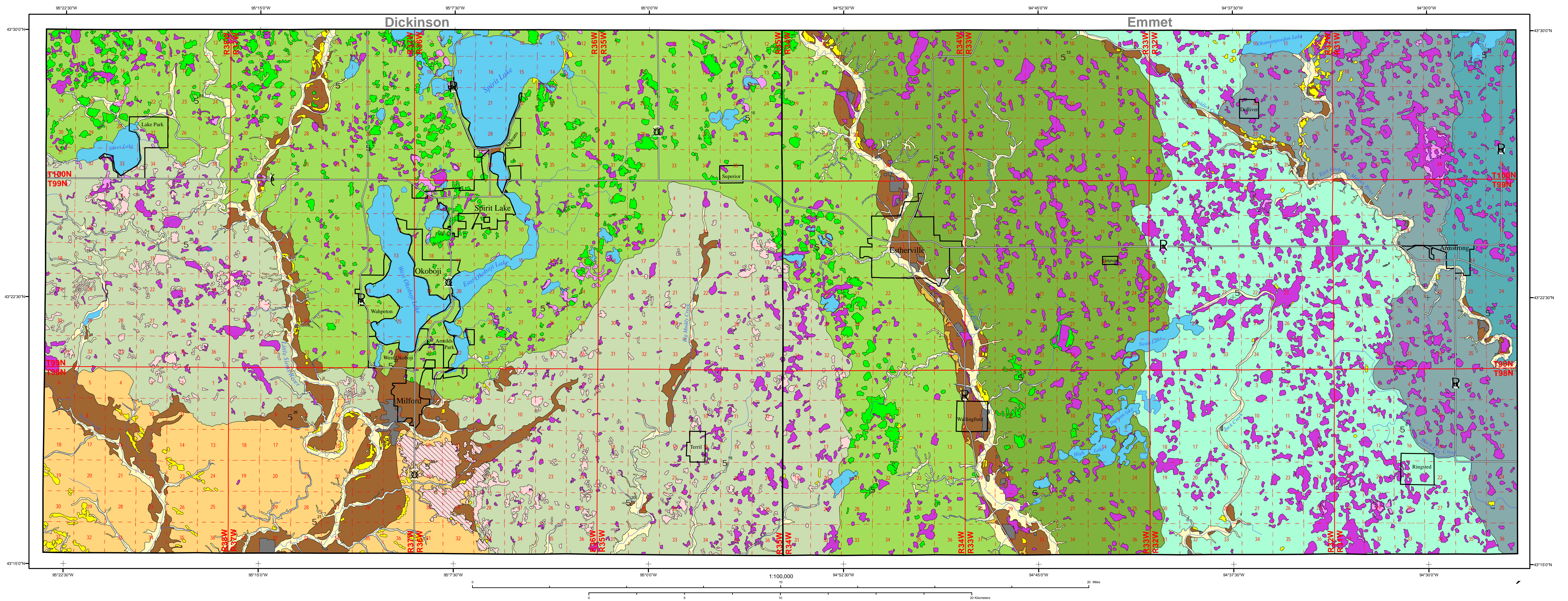


Surficial Geologic Materials of Dickinson and Emmet Counties, Iowa



SURFICIAL GEOLOGIC MATERIALS OF THE DES MOINES LOBE OF IOWA Phase 6: Dickinson and Emmet Counties

Iowa Geological Survey Open File Map 04-02, September 2004

Prepared by Deborah J. Quade¹, James D. Gliglerano¹, and E. Arthur Bettis III²

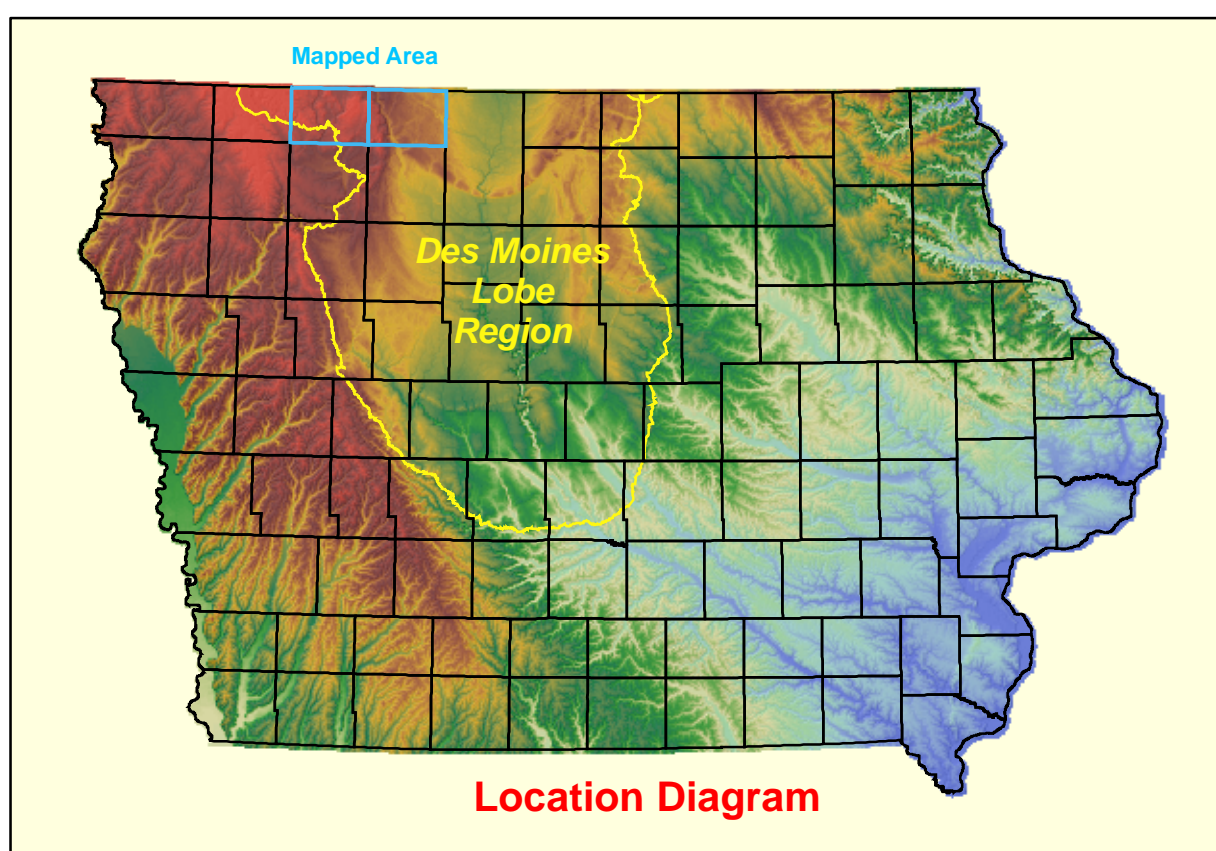
Iowa Geological Survey, Robert D. Libra, State Geologist
Iowa Department of Natural Resources, Jeffrey R. Vonk, Director

Supported by the U.S. Geological Survey, Cooperative Agreement Number 03HQAG0087
National Cooperative Geologic Mapping Program (STATEMAP)

ACKNOWLEDGEMENTS: Recognized for contributions to map's production: Andrew B. Asell, Pete Kollasch, Mary Pat Heitman and Lois Bair. Drilling was provided under contract with Aquadrill of Iowa City, Iowa; a special thanks to Diane Edberg, Jay Jojya and drilling crew members who worked at times in challenging drilling conditions. Assistance in describing solum cores was provided by the Natural Resources Conservation Service, Storm Lake office personnel, Mark Minger. A special thanks to the following individuals who graciously allowed access to their land for drilling: Jim Hemphill, Tim Hemphill, Brian Langel, Jay Lausen, Donna Maynes, Glenn Olson, Eugene Powell, Marge Powell, Don Richards, Marlene Skovgaard, Tom Sunde, Kim Swanson, Leroy Welle and to the management staff at the Department of Natural Resources and Union Slough National Wildlife Refuge for allowing access on public lands located in both counties. Also, a special thank you to Cohrs Construction Inc., Kruse Rock and Gravel, Rohlin Construction and Wedeking Construction for allowing access to observe gravel pit sections.

¹Iowa Department of Natural Resources, Iowa Geological Survey
109 Trowbridge Hall, Iowa City, IA 52242-1319

²Department of Geoscience, The University of Iowa, 121 Trowbridge Hall, Iowa City, IA 52242



LEGEND

Description of Map Units

Map Unit	Description
Hudson Episode	
Qd - Depressions (DeForest Formation-Wooden Mbr.)	Generally 2.5 to 6 meters of black to very dark gray, calcareous, muck, peat and silty clay loam colluvium and organic sediments in drained and undrained closed and semi-closed depressions. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.) or Noah Creek Fin. sand and gravel. Associated with low relief features that occupy depressions and low rags on the landscape. Supports wetland vegetation and can be permanently covered by water. High water table.
Qal - Alluvium (DeForest Formation-Undifferentiated)	Variable thickness (<1 to 5 meters) of very dark gray to brown, noncalcareous to calcareous, stratified silty clay loam, clay loam to sandy loam alluvium and colluvium in stream valleys, on hill slopes and in closed depressions. May overlie Dows Formation (Morgan or Alden Mbr.) or Noah Creek Formation. Off the Des Moines Lobe this unit overlies Sheldon Creek Formation diamicton. Associated with low relief modern floodplains, closed depressions, modern drainages or toadpole positions on the landscape. Seasonal high water table and potential for frequent flooding.
Qpplo - Lake Sediment small-scale landform features (Dows Formation-Wooden Mbr.)	Generally less than 3 meters of dark grayish brown, massive, calcareous silty clay loam, silt loam overlying a thin (<1 meter) basal increment of sand and gravel. Unit overlies yellowish to grayish brown calcareous, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. (Dows Fin.-Morgan Mbr.) or it may overlie a gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). Small postglacial lake beds usually associated with very low relief till plain with reticulate-linked depression systems and occasionally on hummocky/moderate relief terrain. High water table.
Wisconsin Episode	
Qe - Sand Dunes and Sand Sheets (Pocahontas Formation-sand facies)	Generally less than 3 meters of yellowish brown, massive, calcareous loamy sand to fine sand. It may overlie yellowish-brown coarse-grained sand and gravel (Noah Creek Fin.), or it may overlie yellowish to grayish brown, usually calcareous, stratified loam to silt loam to sandy loam diamicton (Dows Fin.-Morgan Mbr.). Usually restricted to a narrow belt along major river valley bottoms or adjacent uplands on the Des Moines Lobe.
Qtp - Till plain (Dows Formation-Morgan Mbr.)	Less than 8 meters of yellowish brown, often calcareous and fractured, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). Low to moderate relief (3 to 8 meters), undulating plains with irregular surface patterns. Seasonal high water table.
Qtr-humc - Till ridge (Dows Formation-Morgan Mbr.)	Generally 3 to 5 meters of yellowish to grayish brown, usually calcareous and fractured, stratified loam to silt loam; stratified sands and gravels to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). The Alden Mbr. in this mapping unit can extend to depths in excess of 15 meters, in southeastern Dickinson county it appears the Alden Mbr. is underlain by proglacial outwash and underlying lake sediments. This proglacial package overlies the Sheldon Creek Formation diamicton. Low to high relief hummocky landform features exceed 3 to 10 meters of local relief. This landform is associated with the Benett-Alamont Moraine Complex in Dickinson and Emmet Counties. The surface pattern is irregularly shaped and some rounded irregularly shaped patterns. Seasonal high water table.
Qtr-alm - Till ridge (Dows Formation-Morgan Mbr. or Pike Knob Mbr. or Lake Mills Mbr.)	Generally 3 to 5 meters of yellowish to grayish brown, usually calcareous and fractured, stratified loam to silt loam; stratified sands and gravels to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). The Alden Mbr. in this mapping unit can extend to depths in excess of 25 meters. This sediment package overlies the Sheldon Creek Formation diamicton. Moderate to high relief hummocky landform features exceed 3 to 10 meters of local relief. This landform is characterized by moderate to high relief hummocks, esker and kame features and ice-walled lakes, and is associated with the Alamont Moraine Complex in Dickinson and Emmet Counties. The surface pattern is primarily rounded circular to rounded irregularly shaped patterns. Seasonal high water table.
Qtr-alm - Till ridge (Dows Formation-Morgan Mbr.)	Generally 3 to 5 meters of yellowish to grayish brown, usually calcareous and fractured, stratified loam to silt loam; stratified sand and gravel to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). The Alden Mbr. in this mapping unit can extend to depths in excess of 25 meters and overlies the Sheldon Creek Formation diamicton. Low to high relief landforms expressed as broad terraces, low, narrow longitudinal terraces or cusped-point terraces. Terraces associated with the major valleys are bench on a gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). In southwestern Dickinson county which is beyond the extent of the Des Moines Lobe landform this unit is bench on Wisconsin age Sheldon Creek Fin. diamicton. This unit encompasses deposits that accumulated in stream valleys during the Wisconsin Episode. No flooding potential.
Qdp - Lake plain (Dows Formation-Lake Mills Mbr.)	Generally less than 3 meters of dark grayish brown, massive, calcareous silty clay loam, silt loam overlying a thin basal increment of sand and gravel (<1 meter). Overlies yellowish to grayish brown usually calcareous, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. Sheldon Creek Fin. diamicton. Low relief broad plain with less than 3 meters of local relief. Seasonal high water table.
Qghc - Collapsed lake sediments-hummocky isolated ice-walled lake plains (flat-topped hummocks) (Dows Formation-Lake Mills Mbr./Morgan Mbr.)	Generally less than 3 meters of dark grayish brown, massive, calcareous silty clay loam, to silt loam, often overlying a thin basal increment of sand and gravel (<1 meter). It overlies yellowish to grayish brown usually calcareous, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable (Dows Fin.-Morgan Mbr.). Isolated ice-walled lake plains comprise a portion of this landform area. Other hummocks consist of less than 15 meters of yellowish to grayish brown usually calcareous, stratified loam to silt loam to sandy loam diamicton (Dows Fin.-Morgan Mbr.). Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). Moderate to high relief hummocky landform area with 3 to 10 meters of local relief.
Qpplo - Lake Sediment small-scale landform features (Dows Formation-Lake Mills Mbr.)	Generally less than 3 meters of dark grayish brown, massive, calcareous silty clay loam, silt loam overlying a thin (<1 meter) basal increment of sand and gravel. Unit overlies yellowish to grayish brown calcareous, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable (Dows Fin.-Morgan Mbr.) or it may overlie a gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). Small postglacial lake beds associated with very low relief till plain with reticulate-linked depression systems. High water table.
Qp4d - Till Plain with linked depression systems and discontinuous elongated hummocky ridge forms (Dows Formation-Morgan Mbr.)	Less than 8 meters of yellowish brown, calcareous, fractured, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). The Alden Mbr. in this mapping unit can extend to depths in excess of 15 to 20 meters and overlies Sheldon Creek Formation diamicton. Discontinuous elongated ridge forms within the unit are underlain by less than 8 meters of yellowish brown, often calcareous, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). Isolated elongated hummocks are oriented transverse to glacier flow on a very low relief till plain with reticulate-linked depression systems. Ridge forms are predominantly low relief (<3 meters) features. Low to moderate relief (3 to 8 meters) discontinuous isolated ridges that run oblique to glacier flow are common. Numerous medium to large depressions and small glacial and historic lake beds. Overall landform exhibits swell and swale topography. High water table.
Qp4d-3 - Till plain with linked depression systems and aligned ridge forms to discontinuous elongated hummocky ridge forms (Dows Formation-Morgan Mbr./Lake Mills Mbr.)	Less than 10 meters of yellowish brown, calcareous, fractured, stratified sand and gravel with interbedded stratified loam diamicton or yellowish to grayish brown, calcareous, fractured, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). The Alden Mbr. in this mapping unit can extend to depths in excess of 20 meters and overlies Sheldon Creek Formation diamicton. Aligned ridge to discontinuous elongated ridge forms. These are overlain by less than 10 meters of yellowish brown, often calcareous, stratified loam to silt loam to sandy loam diamicton; textures can be quite variable. Overlies gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). Traces of loam to distinct aligned ridges to elongated hummocks oriented transverse to glacier flow on a very low relief till plain with reticulate-linked depression systems. Low to moderate relief (3 to 8 meters) discontinuous isolated ridges that run oblique to glacier flow are not uncommon. Numerous medium to large depressions and small glacial and lake beds. Overall landform exhibits swell and swale topography. High water table.
Qocb - Shallow water deposits overlying valley train outwash (Noah Creek Formation-silt facies)	Generally less than 3 meters of dark gray, dark grayish brown, dark brown to dark yellowish brown medium to coarse sand, gravelly sand to pebbly gravel. Low relief landforms expressed as broad terraces; long, narrow longitudinal terraces or cusped-point terraces. Unit is bench on a gray, calcareous, massive, dense loam diamicton (Dows Fin.-Alden Mbr.). No flooding potential.
Qw4 - Loamy Sediments Shallow to Glacial Till (Unmated erosion surface sediment)	One to three meters of yellowish brown to gray, massive to weakly stratified, well to poorly sorted loamy, sandy and silty erosion surface sediment. Map unit includes some areas mapped with less than one meter of Pocahontas Formation (silt or sand facies). Overlies massive, fractured, slightly firm gillacial till of the Sheldon Creek Formation.
Qf - Fill Area of major land filling.	Fill associated with railroad grades, highway grades and land leveling. Variable in texture ranging from loamy to sandy to concrete rubble. Extent mapped as shown in county soil surveys.
Qp - Pits and Quarries	Sand and gravel pits and rock quarries. Extent mapped as shown in county soil surveys and aerial photography.
Water Features	
Dwell Sites	