Surficial Geology and Interpretive Geologic Cross Section of the Schuyler 7.5 Minute Quadrangle, Nebraska

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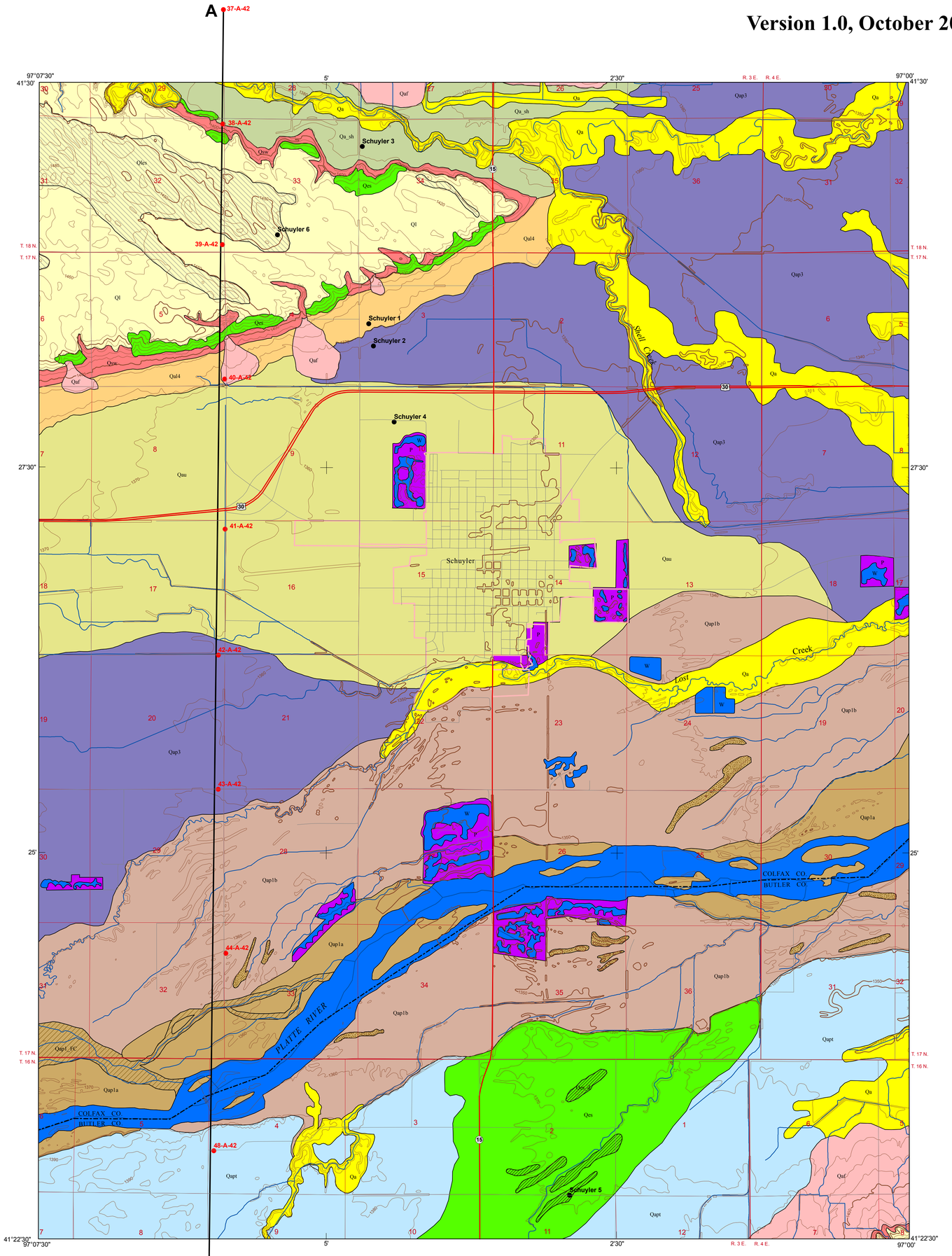


Surficial Geology of the Schuyler 7.5 Minute Quadrangle, Nebraska

Description of Mapping Units:

Qa **Alluvium (Holocene).**

Silt and clay with local sandy deposits

Predominantly Late Holocene sediments from smaller streams that are tributary to the Platte River or Shell Creek. These deposits are primarily Holocene to Late Holocene in age, and most are up to 5m (16.5ft) in thickness.

Qa_sh **Shell Creek alluvium (Holocene/Late Pleistocene)**

Silt or clay with local areas fine to coarse sand

Abandoned alluvium of Shell Creek. These deposits are likely Holocene to late Pleistocene in age. These deposits are generally 4 to 9m (13 to 29 ft.) thick and overlie much older alluvium that is Pliocene/Pleistocene in age. See accompanying interpretive geologic cross-section.

Qaf **Alluvial Fan Deposits (Late Pleistocene and Holocene)**

Silt and clay with local sandy deposits.

Predominately silt and clay deposits that gently slope away from the loess covered uplands from which these fans are sourced. The fan fills are 3-10m (10-30ft) thick.

Qal4 **Loup River Alluvium (Late Pleistocene)**

Silt and Clay with local sandy deposits that overlie deeper sandy sediments

Late Pleistocene alluvium of the Loup River that is higher in elevation than the Holocene alluvium of the Platte River. These deposits are only located adjacent to a loess covered surface in the Northwestern corner of the map. The Qal4 alluvium is locally covered by slopewash and alluvial fan deposits from the loess covered uplands to the north.

Qap1 **Platte River alluvium, recent braided channel belt (Late Holocene).**

Fine to coarse sand with local areas of silt or clay

Late Holocene and largely historic sediments along the present Platte River. Bar and swale topography evident where not obscured by vegetation. These areas have a shallow water table and the lands are generally utilized as pasture or fallow ground. Much of the fallow ground is covered with a cottonwood/cedar forest. These deposits are approximately 10m (30 ft) thick over Pliocene/Pleistocene aged alluvial sand and gravel.

- **Qap1a** Deposits have abundant bar and swale topography.
- **Qap1b** Deposits have local bar and swale topography.
  - **Qap1_FC** Flood Channel. Channels that are occupied during flooding events on the Platte River. These flood channels are usually occupied by small streams throughout the year.
  - **Qap1_SR** Sand Ridges. Linear features that are composed predominantly of fine sand that stand approximately 2-4 m above the surrounding Qap1 surface.

Qap3 **Platte River alluvium (Holocene)**

Fine to medium sand with local areas of gravel

Alluvial sediments that are older and higher than Qap2 deposits. The water table is generally close to the surface (3-5 feet), however an intricate series of drainage ditches has lowered the water table to allow the ground to be extensively farmed. Secondary carbonates are present from the surface to the maximum depth cored of ~11m (35ft). These deposits are approximately 10m (30 ft) thick over Pliocene/Pleistocene aged alluvial sand and gravel.

Qapt **Platte River alluvial terrace (Late Pleistocene to Early Holocene).**

Fine to medium sand overlying pebbly sand

Alluvial sediments, commonly sand and pebbly sand, that are locally covered by thin eolian sand sheets and low relief eolian dunes. Based on the lack of loess cover, and numerical age estimates from other locations in the eastern Platte River Valley, these terraces are very late Pleistocene in age (~18-13ka). This unit is locally covered by alluvial fan deposits that are sourced from loess covered uplands to the south.

Qau **Undifferentiated Holocene alluvium (Holocene)**

Silt and clay with local sandy deposits

Undifferentiated alluvium of the Platte or Loup River system. The Qau sediments are silty to a depth of about 1m (3 ft) with secondary carbonates. Below 1m (3 ft) sediments consist of laminated sand with lenses of gravels. Generally, this unit is slightly lower (<1m or 3ft) than the Qap3 unit, however this change in elevation is too subtle to appear on the topo map.

Qes **Eolian sand (Holocene).**

Fine to medium sand

Greater than 1.5 m (~5ft) thick, this unit includes areas of both dunes and sand sheets that commonly overlie the Qapt terrace. Qes units are predominantly eolian sand sheets.

- **Qes_d** Dunes with ~3m of relief. Numerical age control from other locations in the Eastern Platte River valley suggest these dunes are Late Holocene in age.

Ql **Peoria Loess (Late Pleistocene).**

Silt to silty clay.

Peoria loess in the mapping region ranges from 3-7 m (10-25ft) thick. The loess is generally massive silt or silty clay with secondary carbonates present locally. Peoria loess on this map directly overlies alluvial sand and gravel deposits that are likely Pleistocene in age.

Qles **Loess Covered Dunes (Late Pleistocene)**

Silt to silty clay

Sand dunes derived from older underlying alluvium. Dunes are covered by approximately 4 meters (~13ft) of Peoria Loess. Loess covered dunes have a maximum relief of about 10 meters (~30ft) in the mapping area. These dunes directly overlie alluvial sand and gravel deposits that are likely Late Pleistocene in age.

Qsw **Slopewash (Late Pleistocene and Holocene).**

Silt and silty clay, locally sandy

Predominantly silt and clay deposits that are located adjacent to, and sourced primarily from Peoria Loess. In other locations slopewash is sourced from sandy units.

P **Gravel Pits**

Includes deposits resulting from both active and inactive gravel mining operations

W **Water.**

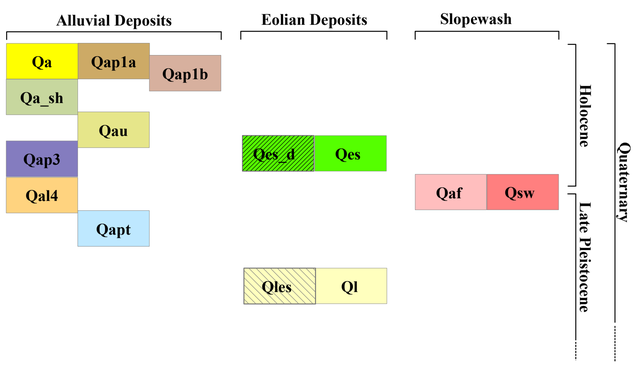
● **Modern test hole locations**

Test holes drilled during the 2009-2010 mapping season.

● **Historic test hole locations**

Test holes drilled by the Nebraska Geological Survey. The last two digits of the test hole name represent the year drilled.

City or town boundary.



Projection: UTM zone 14 North, NAD83

Contours from the Nebraska Department of Natural Resources, compiled from USGS 7.5 minute topographic quadrangles

Additional base data derived from 2005 second edition TIGER/line files

Magnetic North Declination Approximately 4°8', 2010

SCALE 1:24,000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

Clarkson SW	Clarkson SE	Dodge SW
Richland	Schuyler	Rogers
David City West	David City East	Bruno

This geologic map was funded in part by the USGS National Cooperative Geologic Mapping Program. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

IANR University of Nebraska Lincoln

Overview and Interpretive Geologic Cross-Section of the Schuyler 1:24,000 Quadrangle

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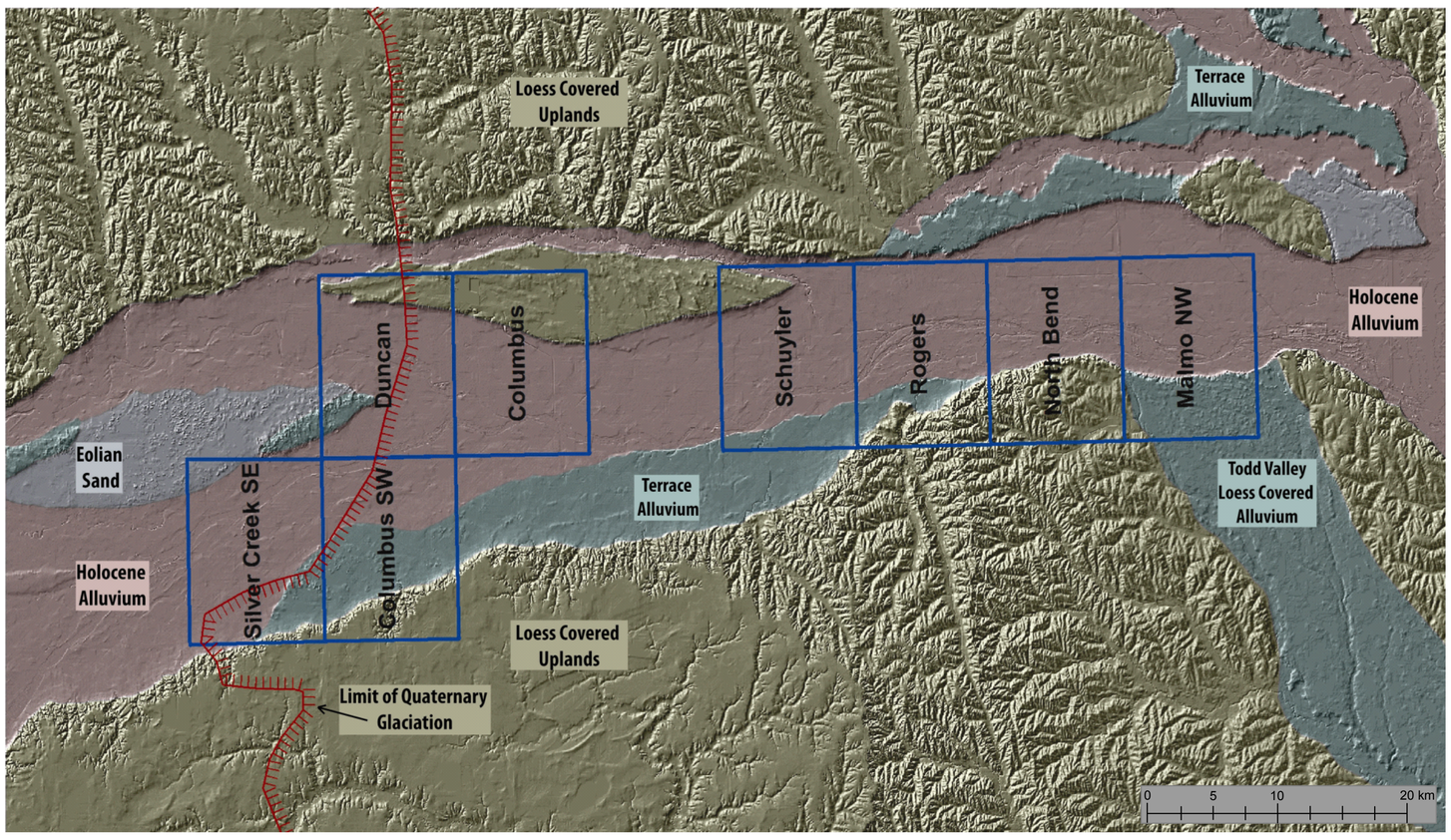

Figure 1. Surficial geology of the eastern Platte River valley over a hillshade of a digital elevation model (DEM). Shown are the 7.5-minute scale surficial geologic maps from the area. These include the Columbus (Hanson and Young, 2007), Columbus SW (Hanson and Young, 2007), Duncan (Hanson et al., 2009), Malmo NW (Joeckel and Mason, 2003), North Bend (Joeckel and Mason, 2003), Rogers (Hanson and Mason, 2003), Schuyler (Young et al., 2010), and Silver Creek SE (Hanson et al., 2008) 7.5-minute Quadrangles. The geology of uplands in the region are characterized as Pre-Illinoisan glacial deposits that are covered by varying thicknesses of Quaternary age loess deposits. The lower elevation deposits are generally alluvial units of the Elkhorn, Loup, and Platte Rivers. These deposits are late Pleistocene to Holocene in age and are locally covered by eolian dunes and sand sheets.

Overview and Interpretive Geologic Cross-Section of the Schuyler 1:24,000 Quadrangle

The Schuyler 1:24,000 Scale Quadrangle lies within the Platte River valley in eastern Nebraska. The area's surficial geology is dominated by late Quaternary eolian and alluvial sediments that locally overlie glacial age sediments and Cretaceous bedrock.

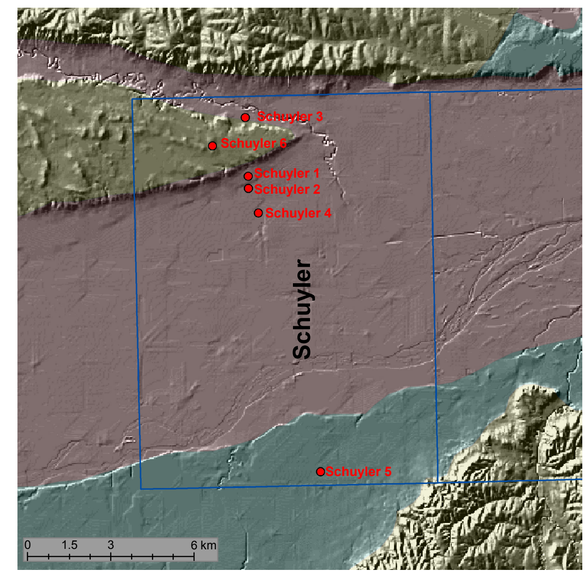

Figure 2. Surficial geology of the eastern Platte River valley over a hillshade of a digital elevation model (DEM). Shown are the locations of the Test Holes drilled with a Geoprobe coring device in the Schuyler 7.5-minute Quadrangle in the 2009 mapping year. The stratigraphy and particle size analysis of these cores are shown in Fig. 3.

Platte River Valley Geology

The Platte River Valley contains a complex fill of alluvial and eolian deposits that overlie Cretaceous bedrock. The majority of the alluvial deposits found in the valley were deposited by the Platte River in the past ~ 25 ka. The loess-covered landform located between the Platte River and Shell Creek in the northwestern portion of the map is interpreted as abandoned alluvium of the Platte River. The top of this landform lies ~ 26 to 33 meters (86 to 108 feet) above the present-day Platte River. After its abandonment, the terrace tread contained some active sand dunes locally and eventually the surface was covered with Peoria Loess. Based on the Peoria Loess cover, relative dating suggests the terrace tread was abandoned around 25 to 20 ka.

Two younger terrace fills are found in the Platte River valley and are located on the extreme southern edge of the map , and to the northwest of the town of Schuyler. The terrace on the southern edge of the map lies approximately 6 to 8 meters (20 to 25 feet) above the present Platte River. This terrace is locally draped with eolian sand sheets and sand dunes. Preliminary age estimates from optical dating of the terrace fill indicate that the alluvium was deposited between 16 to 14 ka. The other terrace is located along the loess-covered alluvium on the northwestern portion of the map and is also found 6 to 8 meters (20 to 25 feet) above the present Platte River. This terrace tread is locally covered with alluvial fan and colluvial deposits sourced from the Peoria Loess found upslope.

Recent alluvial deposits of the Platte River are generally sand and gravel-rich deposits that are locally capped by varying amounts of overbank floodplain deposits. These latter sediments are generally sand, silt and clay-rich sediments that range from 0.5 to 3 meters (2 to 10 feet) in depth. Preliminary results from optical dating indicate that the upper 10-15 meters (30-50 ft) of the alluvial fill in the Platte River valley was deposited within the past 40ka years, or is late Pleistocene to Holocene in age. Older sand and gravel and silt and clay deposits are found between the recent Platte River alluvium and the Cretaceous bedrock. Because we have not recovered core from these deposits their depositional environment cannot be precisely determined. However, we attribute the deposits to alluvial and eolian sediments found in paleovalleys that may pre-date Pre-Illinoisan glaciation.

Upland Geology

The dissected uplands found to the immediate north and south of the mapping area are draped with Peoria Loess. Based on historical CSD Test Holes, Peoria Loess ranges from approximately 26 to 40 feet (8-12 meters) in thickness in the area (Mason, 2001). Peoria Loess was deposited beginning around 25 ka, and loess deposition ended sometime between 15 to 13 ka (Bettis et al., 2003; Mason et al., 2008). The Peoria Loess on the uplands is underlain by older loess units, locally including the Gilman Canyon Formation and the Loveland Loess. Combined these loess units are commonly at least 9-13 meters (29-43 feet). The older loess units overlie glacial deposits, including glacial till and associated sand and gravel rich outwash deposits. These glacial deposits are Pre-Illinoisan in age and comprise approximately 30m (100 ft) of sediment. Locally sand, gravel, silt, or clay deposits are found below the glacial sediments. Cretaceous age bedrock is commonly found Around 43m (140 ft) below the uplands. Bedrock is either the sandstones, shales, and siltstones Dakota Formation, or the shales and limestones of the Greenhorn, Graneros and Carlile Formations.

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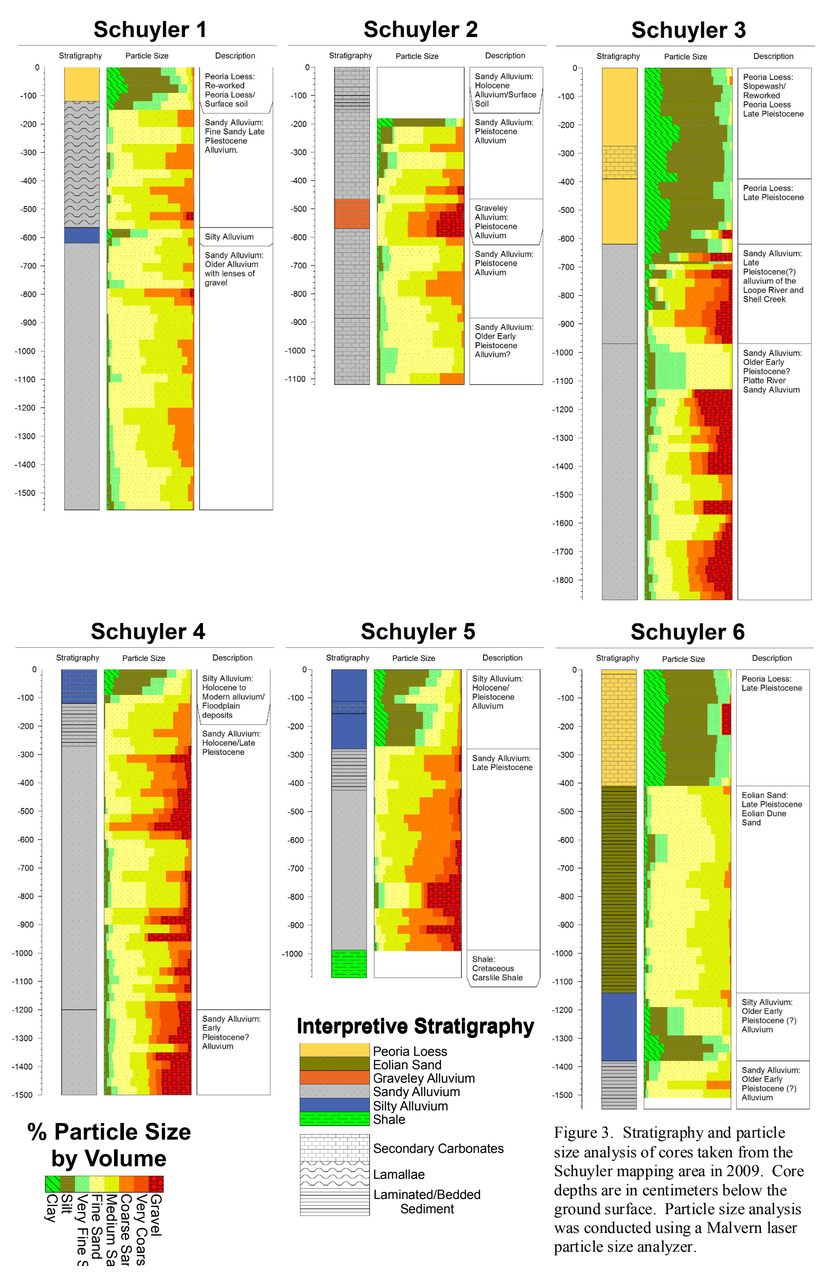

Figure 3. Stratigraphy and particle size analysis of cores taken from the Schuyler mapping area in 2009. Core depths are in centimeters below the ground surface. Particle size analysis was conducted using a Malvern laser particle size analyzer.

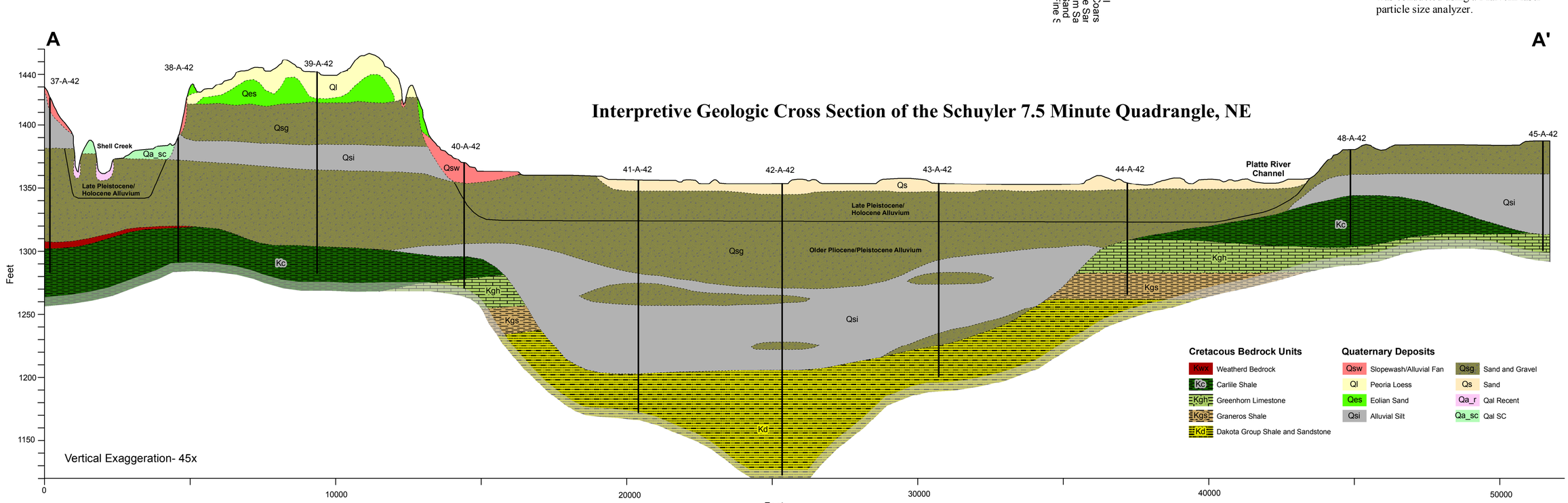

Figure 4. Interpretive geologic cross-section in the Schuyler Quadrangle. Stratigraphy is based on Conservation and Survey Division Test Hole borings drilled in 1942. These holes were drilled as to Cretaceous bedrock as part of a state-wide drilling program aimed at assessing water and other geologic resources. Dotted lines represent interpreted contacts.