Prairie Research Institute
ILLINOIS STATE GEOLOGICAL SURVEY

Surficial Geology of Russellville Quadrangle

Crawford and Lawrence Counties, Illinois and Knox County, Indiana

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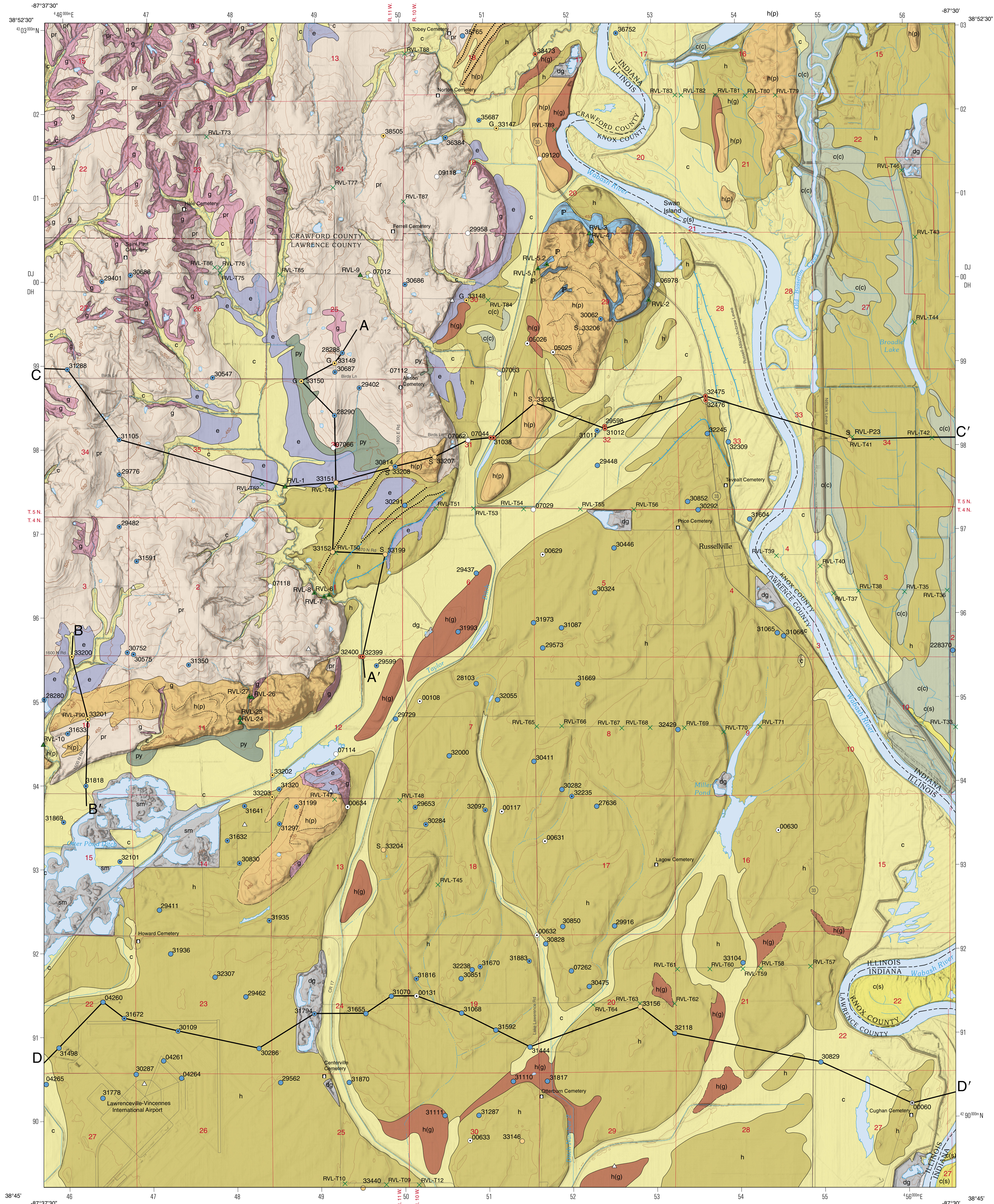
2022



QUATERNARY DEPOSITS

Description	Unit	Interpretation
HUDSON EPISODE (~13,000 years before present [B.P.] to today)[1]		
Disturbed Ground	Disturbed Ground (dg)	**Small excavations, dredge spoil, levees**
Removed Earth	Surface Mine (sm)	**Aggregate mines and borrow pits;** Commercial extraction in southwest quadrant exploits channel and outwash gravels. Other small borrow pits for local use or levee maintenance
Silt loam to loam, with local gravel; massive to weakly bedded; yellow brown; less than 10 ft thick	Peyton Formation (py)	**Colluvium;** thin units occur along foot slopes and can interfinger with alluvial units; derived from loess, till, and weathered bedrock
Loam, silt loam, and silty clay loam; local basal sand or pebbly sand beds; fine portion typically massive, but locally laminated or thin bedded; graded upwards; brown to yellow-brown; typically leached; as much as 30 feet thick	Cahokia Formation (undifferentiated) (c)	**Alluvium;** Less than 10 feet thick in tributary stream valleys draining bedrock uplands and in small streams in main valley; possibly as much as 30 feet thick below the Wabash River; contemporary flooding in sluiceways of the Wabash River valley deposits annual layers; where lithology of underlying unit is similar, contact is gradational and recognized by a weak buried paleosol
Silty clay to silty clay loam, intercalated with minor loam; massive to weakly stratified; grayish brown to dark yellow brown; less than 10 feet thick	Cahokia Formation (clayey facies) (c(c))	**Backswamp, floodplain lake, or overbank deposits;** fills depressions on alluvial and glacifluvial surfaces
Sand to sandy loam, may be covered by silt loam veneer; bedded to massive; fine gravel lenses; brown to yellow brown; leached near surface; less than 20 feet thick	Cahokia Formation (sandy facies) (c(s))	**Point bar and channel deposits;** mapped along modern Wabash River; may include thin recent floodplain deposits
WISCONSIN EPISODE (~55,000–13,000 years B.P.)[1]		
Silt loam to clay loam; upper unit massive with gradational contact, brown to yellow brown, leached; lower unit sandier with granules, massive to crudely bedded, slightly darker brown to yellow brown, leached; upper and lower units less than 15 and 5 feet thick, respectively	Peoria and Roxana Silts (pr)	**Loess;** mapped over all upland surfaces where more than 5 feet thick, intercalates with some of the valley fill or with Parkland facies, and a veneer is included with Henry Formation; lower Roxana Silt is loess intermixed with colluvium
Sand to sandy loam to sandy gravel, medium to coarse, typically 2-50% gravel; thin bedded to massive, silty and coarse gravel lenses; brown and light brown to gray; calcareous below ~5 ft; as much as 50 feet thick in Wabash River valley	Henry Formation (undifferentiated) (h)	**Outwash;** comprises the surficial unit on terraces and over much of Wabash River valley where it is dissected by late glacial downcutting and Hudson Episode alluviation; intercalates locally with Equality Fm and higher surfaces include loess and eolian dune sand; in high terraces in tributary valleys, fluvial marginal deposits formed sediment dams that blocked the valleys, and those prograding deltaic facies intercalated with slackwater lacustrine facies
Fine sand to loamy fine sand and silt loam; thin-bedded to massive, yellow brown to brown; upper portion leached, as much as 15 feet thick	Henry Formation (Parkland facies) (h(p))	**Eolian dunes;** reworked from outwash deposits; occur on terraces and bedrock uplands; landforms include parabolic and linear dunes formed by westerly winds; intercalates with loess
Gravel and sand, fine to coarse, may include up to 50% sand; bedded, with sand lenses; brown to gray; calcareous; up to 50 ft thick	Henry Formation (gravelly facies) (h(g))	**Outwash;** differentiated in soil parent material maps in bar forms and channel facies; pervasive at depth across the Wabash River valley
Silt loam to clay, few silty and sandy interbeds; laminated to massive; fossiliferous zones with gastropod and mussel, and shells and ostracode valves, plant matter, and peaty horizons, generally calcareous; brown to olive brown to dark gray; typically 15 feet but as much as 35 feet thick	Equality Formation (e)	**Shallow to deep slackwater lake deposits** from damming of tributary valleys by outwash of the Wabash Valley train; comprises extensive low-relief surficial units in tributary valleys; buried by Cahokia Formation or Henry Formation in river valley fills; inset into Teneriffe Silt in the subsurface; mixed with loess at surface; upper elevations as high as 440 ft asl in Indian Creek valley, but as high as 465 ft asl in Big Slough valley
ILLINOIS EPISODE (~190,000–130,000 years B.P.)		
Silt loam, silty clay loam, and clay; laminated to massive; interbedded with fine sand; leached where included in paleosol; gray brown to where unweathered; up to 35 feet thick	Teneriffe Silt (cross section only) (tr)	**Lacustrine to alluvial sediment** in slackwater valley fills; found only in boreholes below Equality, Henry, or Cahokia Formations; recognized by remnants of eroded Sangamon Geosol developed in upper portion; upper elevations ~430-440 feet asl
Coarse sand with gravel and loam, medium to poorly sorted; bedded to massive; light brown to gray; leached to dolomitic; inferred to be up to 40 feet thick	Pearl Formation (cross section only) (pl)	**Outwash;** as lowermost fill of Wabash River valley, differentiated based on coarser texture than Henry Formation and reddish color noted in water well logs; shallow water wells stop above this layer because of typically high iron content in water, interpreted as evidence of Sangamon Geosol; texture is finer in tributary valley fills
Sandy loam to clay loam diamicton; brown to gray; leached to calcareous; generally less than 10 feet thick	Glasford Formation (g)	**Till;** Thin layers occurs on bedrock hills below Peoria and Roxana Silt Formations, locally exposed in gullies and stream valley walls where it supports steep slopes; mostly eroded from bedrock valleys; truncated Sangamon Geosol is developed in upper portion
Undifferentiated	Glasford-Banner Formations (undifferentiated) (cross section only) (g-b)	**Undifferentiated,** inferred to fill depression in bedrock valley characterized by single geophysical sounding of bedrock depth

PRE-QUATERNARY DEPOSITS

Description	Unit	Interpretation
PENNSYLVANIAN SUBSYSTEM (323–299 million years B.P.)		
Sandstone, shale	Pennsylvanian Bedrock (ℙ)	**Sandstone and shale** are most common outcrop and subcrop; crops out along many steep tributary slopes not shown in map; includes several feet of residuum

[1]The time periods for the Wisconsin Episode and the Hudson Episode are reported as calibrated radiocarbon years and can be directly compared to calendar years before 1950 (Stuiver et al. 2015).

Base map compiled by Illinois State Geological Survey from digital data (2021 US Topo) provided by the United States Geological Survey. Shaded relief and contours derived from lidar elevation data from the Crawford and Lawrence county collections (2020) provided through ILHMP, and the Indiana state collections (2013) provided through the Indiana Office of Information Technology.

North American Datum of 1983 (NAD 83)
Projection: Transverse Mercator
1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

Recommended citation:
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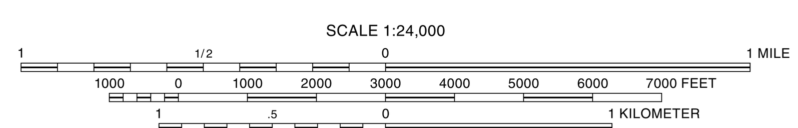
SCALE 1:24,000



BASE MAP CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1988

Geology based on field work by A. Phillips, 2021–2022, S. Dendy, E.R. Weber, J. Thomason, A. Graeti, and K. Mandera 2022.

Digital cartography by Ethan Lehmann, Katie Mandera, Deette Lund, and Emily Bunse, Illinois State Geological Survey.

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This map has not undergone the formal Illinois Geologic Quadrangle map review process. Whether or when this map will be formally reviewed and published depends on the resources and priorities of the ISGS.

Point Data Type

- Stratigraphic boring
- Water-well boring
- Engineering boring to bedrock
- Coal boring
- Other boring
- Outcrop
- Historic outcrop
- Passive seismic sounding
- SG 26211 — Labels indicate samples (S) or geophysical log (G). Boring labels indicate the county number. Outcrop labels indicate geologist's field number. Dot indicates boring or outcrop is to bedrock.

Note: The county number is a portion of the 12-digit API number on file at the ISGS Geological Records Unit. Most well and boring records are available online from the ISGS Web site.

Line Data Type

- Contact
- Contact, inferred
- Contact, approximate
- Glaciofluvial levee crest
- Terrace scarp
- Dune crests
- A—A′ Line of cross section

ILLINOIS
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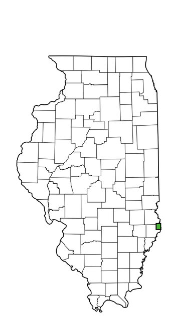
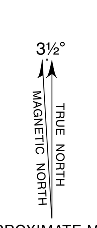


1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES
1 Flat Rock
2 Heathsville
3 Carlisle
4 Birds
5 Oaktown
6 Lawrenceville
7 Vincennes
8 Fritchton



APPROXIMATE MEAN DECLINATION, 2022

ROAD CLASSIFICATION

Local road

Introduction

The Russellville 7.5' Quadrangle includes much of the width of the Wabash River valley and some of its western uplands, just upstream of the confluence of the Embarrass River and about 70 miles (110 River Miles) upstream of the mouth of the Wabash River (Fig. 1). The river valley is ~5 miles wide in the northern portion of the quadrangle but widens abruptly to ~10 miles near Russellville. The bedrock surface was sculpted by fluvial and glacial processes through at least 3 glaciations, though incision may have started as early as the Cretaceous. The valley fill is mostly composed of late-glacial outwash that was partly incised by post-glacial flows. This braided surface is the dominant feature of the quadrangle. Bedrock-supported uplands and isolated bedrock knobs in the valley are capped by a thin layer of Illinois Episode glacial till with a blanket of loess on top. Flat-lying slackwater deposits fill tributary valleys. The quadrangle occurs near the center of the Wabash Valley Seismic Zone (Obermeier et al. 1993). The entire area is rural, although the county seats of Lawrenceville, Illinois, and Vincennes, Indiana occur just southwest and southeast of the quadrangle boundary, respectively. The landscape is dominated by agricultural activities. In the southeast corner of the quadrangle are two economically important regional businesses, the Lawrenceville-Vincennes International Airport, and a large aggregate mining company. Oil and gas extraction occurs in the northeast, and a portal for underground coal mining was opened in the center of the quadrangle. This surficial geologic map is part of a long term mapping project (Phillips et al. 2020; Phillips et al. 2019; Phillips 2017; Phillips 2016; Phillips et al. 2014; Phillips et al. 2013; Phillips and Gemperline 2012; Bryk et al. 2012) in the lower Wabash River valley region straddling the border between Illinois and Indiana. Immediately south lies the Vincennes Quadrangle, one of the pilot 3D mapping projects that became the Great Lakes Geological Mapping Coalition (https://igws.indiana.edu/GreatLakesGeology/). The Quaternary geology depicted here represents preliminary interpretation from this mapping effort. The map builds upon the existing geologic framework and supports studies of water and aggregate resources, seismic hazard, glacial processes, river processes, and geologic history.

Methods

The surficial geology was interpreted from compilations of boring records archived at the Illinois State Geological Survey (ISGS), Indiana's ILith database (Brown et al. 2000), the Indiana Department of Natural Resources (2022), unpublished geologic field notes from the ISGS, aerial imagery, and soil surveys (Soil Survey Staff 2015; Soil Survey Staff 2018; Soil Survey Staff 2021). Locations of the water well (n = 105), geotechnical (n = 9), and other borings (n = 24) shown on the surficial map were confirmed with the best available data. The geotechnical boring locations are within 1-50 ft of their true locations, whereas the accuracy of most water well locations range from 10 to 330 ft. New data were generated by a coring program, bedrock sounding using the passive seismic horizontal-to-vertical spectral ratio method (Haefner et al. 2011), interpretation of recent high-resolution elevation data (Illinois Height Modernization Program, et al. 2016; IndianaMap 2011), and 15 outcrop studies. Coring with hydraulic push methods to depths of 8 to 49 feet totaling 530 ft at 21 sites targeted valley fills, terrace assemblages, and loess thickness. Nine sites were explored for geotechnical properties by cone penetrometer and hydraulic profiling (CPT-HPT) with paired push probe sampling in cooperation with the Illinois Department of Transportation. Data collected on core samples included particle size analyses by laser diffraction (n = 30), elemental and clay mineral analysis by Energy Dispersive X-Ray Fluorescence (n= 11), and X-Ray Diffraction (n = 6), strength by hand penetrometer, and water content (n = 101). Ages of 3 samples were obtained by optically stimulated luminescence and of 6 samples by AMS radiocarbon dating (Table 1).

The bedrock topography map (Fig. 2) and unconsolidated (Quaternary) sediment thickness maps (Fig. 3) were constructed by machine contouring of point observations and contour interpretations with the Topo to Raster and Empirical Bayesian Kriging tools of ArcGIS. In addition to the 147 data points shown, another 155 points within a two-mile-wide buffer surround the map area were included. Further, because of low data density relative to relief, overall thin sediment thickness, and common outcrop areas, additional synthetic contour data of the bedrock surface elevation were created according to inferred geologic interpretations. Preliminary maps were modified based on bedrock topography maps of surrounding areas by Phillips et al. (2019), Weibel (2005), as well as small scale maps of Indiana (Naylor et al. 2015) and Illinois (Herzog et al. 1994). The final bedrock topography map was constructed from these data as a 30 m raster grid. Smoothing was accomplished in part using the ArcGIS Focal Statistics tool. Contours derived from the resulting raster were further generalized and smoothed to account for the low density of the primary point data. The unconsolidated sediment thickness map (Fig. 3) was constructed using the same data and a similar process but using depth-to-rock instead of elevation.

Geologic Setting

The Wabash River valley has been a major Midwestern fluvial valley throughout the Quaternary Period. Faulting and downwarping within the Wabash Valley Seismic Zone (Bristol and Treworgy 1979; Woolery 2005; Hermann et al. 2008) were likely conducive to formation of the valley. Ancient seismicity is evident from mapping of liquefaction dikes (Obermeier et al. 1993; Hajic et al. 1995; Munson and Munson 1996; Fig. 1), and ongoing seismicity includes the M5.4 Mount Carmel Earthquake, the largest ever recorded event in Illinois, with an epicenter about 40 miles south of the Russellville quadrangle (Hermann et al. 2008). Southeastward-flowing ice during the Illinois Episode glaciation, ~160-130 ka, and possibly during earlier glaciations, advanced over the area to reach its terminal moraine on highlands in Indiana, ~30 mi to the SE (Grimley et al. 2017; Gray 1988). During deglaciation, the Wabash Valley as well as the Embarrass Valley were major meltwater outlets of different lobes of the ice sheet. Outwash deposition filled the trunk valleys to dam tributary valleys and formed slackwater lakes. These lakes filled largely with fine sediment derived from the uplands. Erosion during the ensuing Sangamon Episode interglacial, ~130-60 ka, removed much of the sediment from the uplands and valleys to expose bedrock and till. During the Wisconsin Episode, ice of the Huron-Erie lobe first entered the drainage basin ~50 ka. It reached its maximum extent about 50 miles north of the quadrangle by ~23 ka. Deglaciation began before 20 ka and lasted until ice retreated from the drainage basin just after ~17 ka (Dyke 2004; Curry et al. 2011; Luczak et al. 2022). During the deglaciation, aggrading outwash again dammed tributary valleys to form slackwater lakes that reached silghtly higher surface elevations than during the Illinois Episode. Dry and windy climate towards the end of the Wisconsin Episode was conducive to the generation of loess and dunes from the extensive unvegetated outwash plains; the thickest deposits accumulated on the eastern side of the Wabash Valley, but a thin blanket of loess covers uplands and intermingles with alluvial deposits, and dunes occur on outwash terraces and some uplands. The ice paused during retreat to build several moraines. These were episodes of increased outwash aggradation followed by downcutting during ice retreat which left mid-level outwash terraces in the Wabash valley (Fidlar 1935; Weir and Friedman 1954). Glacial moraines dammed proglacial lakes at the headwaters of the Wabash (present day Indiana and Ohio) during the glacial-interglacial transition (Fraser 1993; Curry et al. 2014). These dams failed episodically to release huge floods which cascaded down the Wabash Valley at about 17 ka (Bleuer and Moore 1971). The floods eroded much of the fill in the Wabash Valley, but bedrock knobs protected some of the deposits (Fidlar 1935). The extensive outwash plain within the Russellville Quadrangle was deposited during the wane of the last flood, the Maumee Torrent (Fidlar 1948; this study). The flood flows also left scarps of slackwater lake deposits at tributary mouths. Downstream of Russellville, outwash deposits are largely buried by floodplain deposits of the meandering systems that developed during the Hudson Episode postglacial, ~13 ka – present. During this period, repeated episodes of valley fill incision followed by reaggradation resulted in overlapping deposits that can be difficult to differentiate (Autin 1996).

Key Findings

Landscape-sediment Assemblages

Landscape-sediment assemblages relate the origin and composition of the landforms. Four main landscape-sediment assemblages were differentiated within the quadrangle. (1) Bedrock-controlled uplands occur in the northwest quadrant of the quadrangle, but also as knobs protruding from the valley fill. The uplands are covered by thin to thicker loess over a veneer of till. The bedrock is exposed by erosion in steeper gullies and along portions of the Wabash Valley wall. (2) Broad, flat plains within bedrock uplands are lacustrine slackwater deposits, which were deposited mainly during the maximum Wisconsin Episode glaciation. The slackwater deposits include colluvial, alluvial and nearshore sediment along the margins. (3) Outwash terraces comprise most of the quadrangle area. Deposits at the surface are from late-glacial meltwater flows which eroded older slackwater and outwash terrace deposits. Scarps are shown on the map where they are not differentiated by change of map unit. Sandy ridges topping slackwater terrace edges are interpreted as levee deposits that spilled into the shallow lakes that still occupied the slackwater basins. The sandy deposits are partly reworked into eolian dunes, some of which are symbolized along their crests. (4) The main channel of the Wabash River and its floodplain which includes seasonally active channels which dissect the lowest outwash terrace. The course of the modern Wabash River is partly controlled by anthropogenic levees. Repairs to levee failures over time are evident in water-filled borrow pits and jogs of the levee crest. Fine-grained sediment blankets sandy to gravelly scroll bars at meander bends.

Bedrock Uplands and Buried Valleys

Bedrock within the quadrangle, mostly Pennsylvanian sandstone and shale, supports the ridged uplands (Fig. 1). The topography of the bedrock surface below the valley fill is not well-constrained. The broad Wabash Bedrock Valley extends from the northeast quadrant to the south. Its thalweg is centered below the modern channel until the southern boundary of the quadrangle where it bends abruptly west (Fig. 2). The valley is more than 10 miles wide along the southern boundary where it is joined by the confluence of the Embarrass Bedrock Valley (Phillips et al. 2019; Weibel 2005). The valleys were incised before the Illinois Episode, perhaps as early as the Cretaceous (Weibel 2005).

Bedrock uplands are covered by a <10-foot-thick blanket of loess, mainly Wisconsin Episode Peoria Silt, over a layer of till of the Illinois Episode Glasford Formation (henceforth, "Fm"; cross sections A, B). Bedrock crops out on steeper valley slopes. More than 5 feet of weathered bedrock was encountered in some test holes.

The Glasford Fm is largely loamy till. It appears to be thinner on the highest hilltops likely because of erosion during the Sangamon Episode; sampling in those locations encountered truncated Sangamon Geosol. Thicker till is inferred from well data and depicted in cross sections on lower bedrock surfaces. It thins into the tributary bedrock valleys, but it was completely eroded out of the Wabash Bedrock Valley (cross sections C, D).

Slackwater Terrace Units

The Wabash Valley was a meltwater outlet for all Quaternary glacial episodes (Thornbury 1958). During each episode, outwash filled the main valley to dam tributary valleys and form slackwater or proglacial lakes, which in turn filled with lacustrine sediment (Fidlar 1948; Heinrich 1982; Fraser 1993). The drainage basins of many of the tributary valleys were quite small. The accumulating sediment may have been directly deposited as loess or in flooding events from the trunk valleys. Horizons with weak soil development and concentrations of plant matter are evidence of episodic drainage. Colluvial and alluvial sediment was deposited along lake margins. The sequence depicted in cross section A-A' is interpreted as several episodes of slackwater lake filling and incision over the Illinois and Wisconsin episodes. Similar sequences were found tributary bedrock valleys to the south (Phillips 2016; Phillips 2017).

Fine grained sediment of the Illinois Episode above the Glasford Fm is included in the Teneriffe Silt, which includes slackwater lake and alluvial facies. It was recognized in test holes along Cross Sections A & B by a weathered zone, presumably weak Sangamon Geosol, but is being confirmed as of this writing by radiocarbon dating of fossil remains, mainly needles and seeds. The slackwater lakes were supported by base level changes caused by alluviation in the Wabash Valley, i.e., deposition of the sandy Pearl Fm interpreted in well 133201. This unit appears to have been eroded out of the valley fill in Cross Section A. In the Wabash Valley, Pearl Fm is inferred to occur at depths greater than ~50 ft (Cross Sections C, D). A unit of undifferentiated Quaternary sediment is depicted filling a 30-foot-deep depression in the bedrock surface below test hole 133152 (Cross Section A; Fig. 2). The depression was interpreted from a single HVSR sounding. Although the sounding was of seemingly good quality, it is not known if it is real or spurious.

Economic and Groundwater Resources

The dominant economic activity in the quadrangle is farming. An aggregate operation that mines the gravelly- to sandy outwash in the southeast has been active since before 1935 (Fidlar 1935). The main valley fill generally provides abundant groundwater but iron degrades water quality below about 50 ft depth (Tim Hacker, personal communication, 2022). The iron may possibly be associated with weathering of the Sangamon Geosol in the top of the Pearl Fm (cross sections C, D). Tributary valley slackwater deposits are largely too fine to be reliable water sources and the included coarse-grained units are limited in extent (cross section A).

Cone Penetrometer - Hydraulic Profiling Results

The CPT-HPT method measures standard geotechnical data gathered by a cone penetrometer (CPT) system along with a relative measure of permeability determined with a constant rate fluid injection system (HPT). Representative logs of soil strength, water pressure, and electrical conductivity and are correlated to Henry Fm., Equality Fm., Teneriffe Silt, and possible Glasford Fm. in Figure 4. At these sites, ten CPT soil behavior types were identified that correlate to "sensitive fine grained" to "gravelly sand" textural classes (Robertson et al. 1986; Robertson & Campanella, 1988). The method differentiated graded bedding and thin, fine-grained interbeds in Henry Fm., and laminated to bedded silty, clay, and fine sand in Equality Fm. Overall low pressure (high permeability) was expected in Henry Fm. in RVL-P2. However, it was relatively high in RVL-P10, possibly because of confinement by the overlying silty Equality Fm. Teneriffe Silt is distinct by its very fine, relatively uniform texture and high conductivity. Glasford Fm. was not reached in the paired sample of RVL-P9 but is inferred from the increased variability of all parameters below 10.8 m (~35 ft).

Acknowledgements

We thank the several landowners who graciously allowed access to their property, especially where drilling was involved. The ISGS drill team accommodated a challenging schedule. Special thanks to ISGS staff Emma Weber, Anthony Gaeti, Alexx Sanchez, and Katie Mandera who assisted with fieldwork. Deette Lund, Ethan Lehmann, and Emily Bunse constructed the cartography. CPT-HPT studies were completed under Illinois Department of Transportation award number PTS 1680400101 to Thomason. This map was made possible by the USGS National Cooperative Geologic Mapping Program under STATEMAP award number GS21AS00006.

Table 1 Ages from core samples dated by AMS radiocarbon and optically stimulated luminescence methods.

Method	API Number	Core Number	Laboratory ID	Depth (ft)	Elevation (ft asl)	Material	Calibrated Years B.P.**	+- (1σ)	
	120333850600	RVL-P5	UCIAMS-266799	14.6	419	organics	17807	128	
	121013319900	RVL-P21	UCIAMS-266801	31.1	409	gastropods	50900 rcybp	2,400	
Radiocarbon*	121013320100	RVL-P25	UCIAMS-266798	11.1	441	needles, cones	23065	145	
	121013320100	RVL-P25	UCIAMS-266800	16.6	435	thorns	23747	192	
	121013320100	RVL-P25	UCIAMS-266814	17.8	434	gastropods	25519	183	
	121013320100	RVL-P25	UCIAMS-266815	32	420	gastropods	30248	556	
	API Number	**Core Number**	**Laboratory ID**	**Depth (ft)**	**Elevation (ft)**	**Equivalent Dose (Gy)**	**Dose rate (G/ka)**	**Age**	**+- (1σ)**	**n (accepted/total)**
Optically Stimulated Luminescence***	121013319900	RVL-P21	864	10.5	430	36.9 ± 3.2	1.51 ± 0.06	24,500	2400	18/71
	121013319900	RVL-P21	865	12	428	34.1 ± 2.1	1.44 ± 0.06	23,700	1800	22/48
	121013320600	RVL-19	866	7.5	482	29.9 ± 1.8	1.56 ± 0.09	19,200	1700	20/68
	121013320600	RVL-19	867	10	480	28.9 ± 1.3	1.46 ± 0.07	19, 800	1400	30/96
	121013315200	RVL-P10	883	5	448			pending		

*Ages determined at the Keck Carbon Cycle AMS Facility, University of California at Irvine

**Radiocarbon ages calibrated to calendar years before 1950 (Intcal20.14c; Reimer et al., 2020) using CALIB 8.2 (Stuiver and Reimer 2020)

***Ages determined at the Illinois State Geological Survey Optically Stimulated Luminescence Dating Laboratory

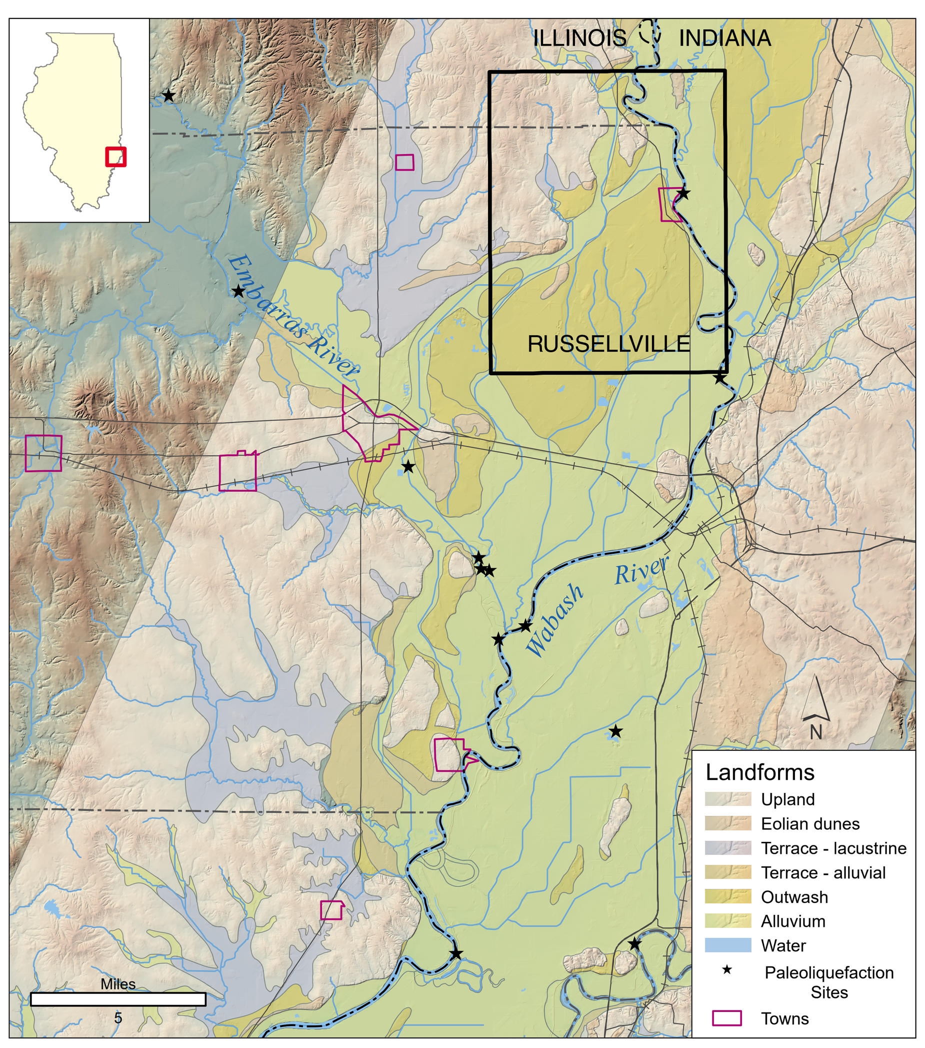


Figure 1 The Russellville quadrangle lies above the confluence of the Embarrass R. with the Wabash R. in portions of Illinois and Indiana. The colored swath highlights landforms in the valley and surrounding uplands. Paleoliquefaction features have been observed along many river cutbanks (Hajic et al. 1995; Munson and Munson 1996).

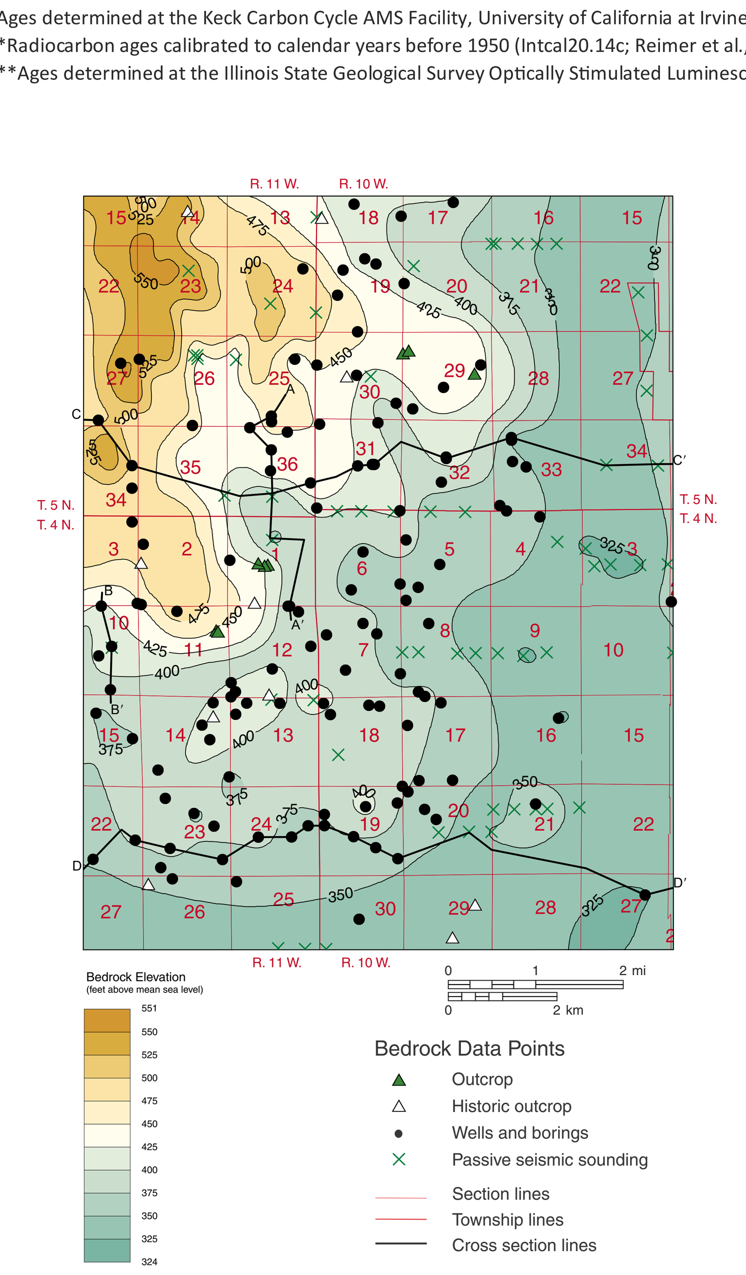


Figure 2 Bedrock Topography. This map was digitally modeled from well log data, sample set studies, outcrop studies, geophysical measurements, and judgement. Map scale is 1:100,000.

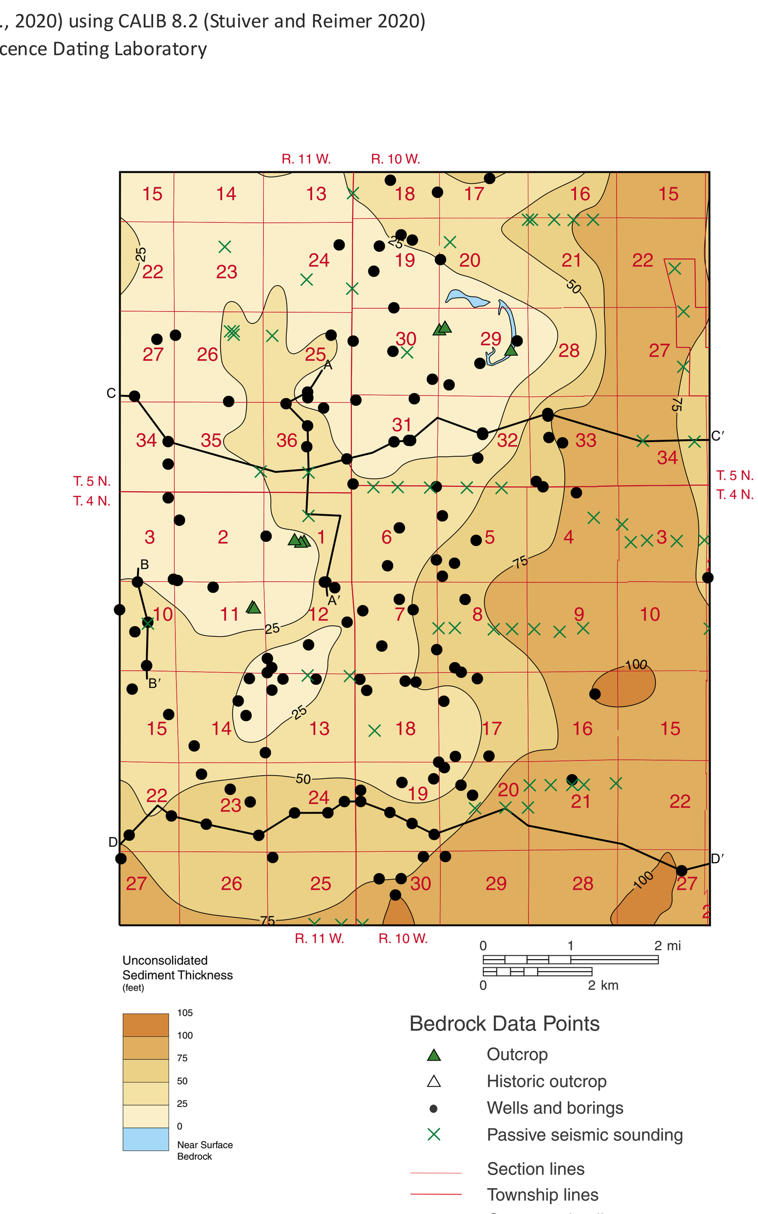


Figure 3 Unconsolidated Sediment Thickness. This map was digitally modeled from well log data, sample set studies, outcrop studies, geophysical measurements, and judgement. Map scale is 1:100,000.

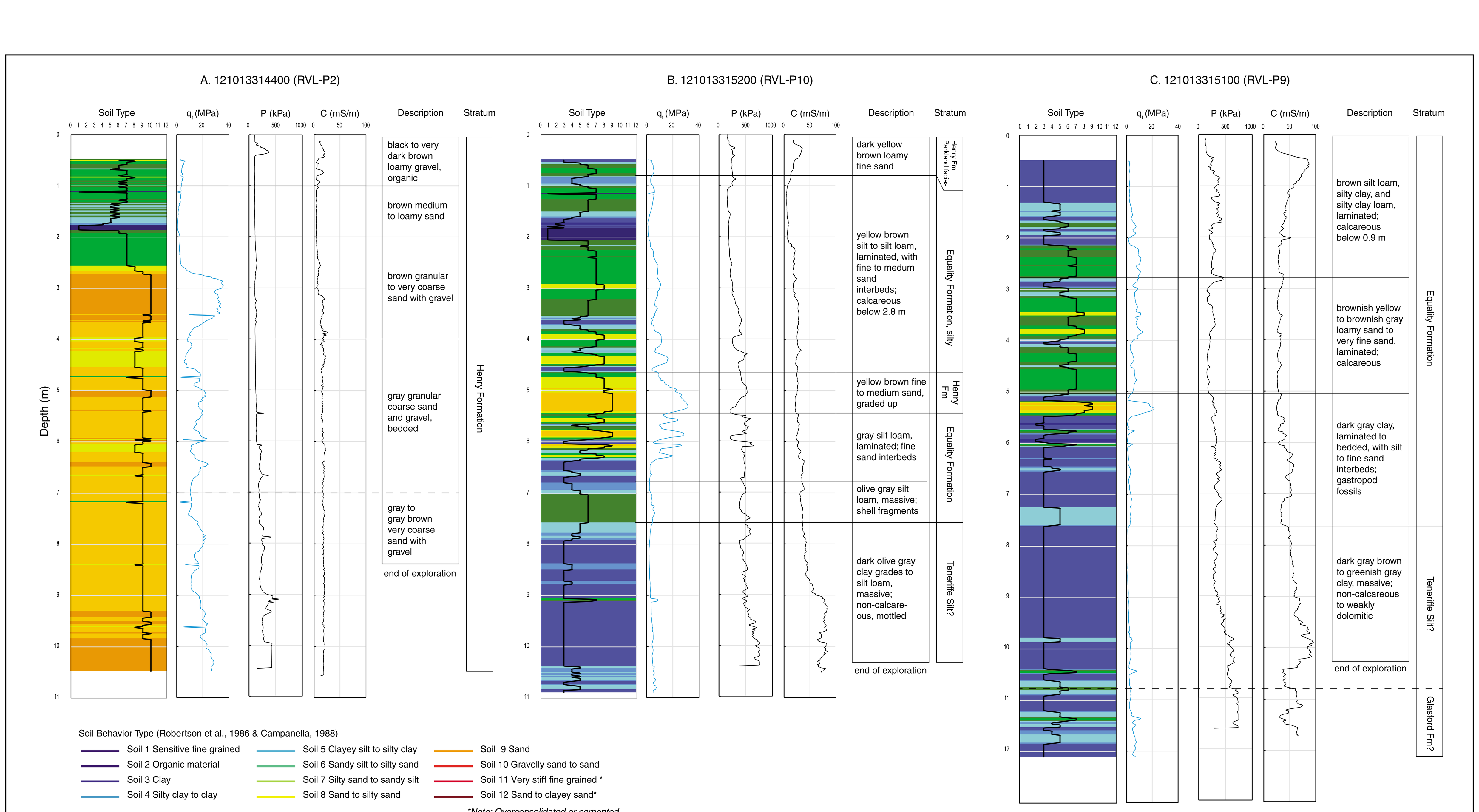


Figure 4 Results from probing and CPT-HPT characterization with stratigraphic correlation. qt = tip pressure; P = average water pressure; C = electrical conductivity

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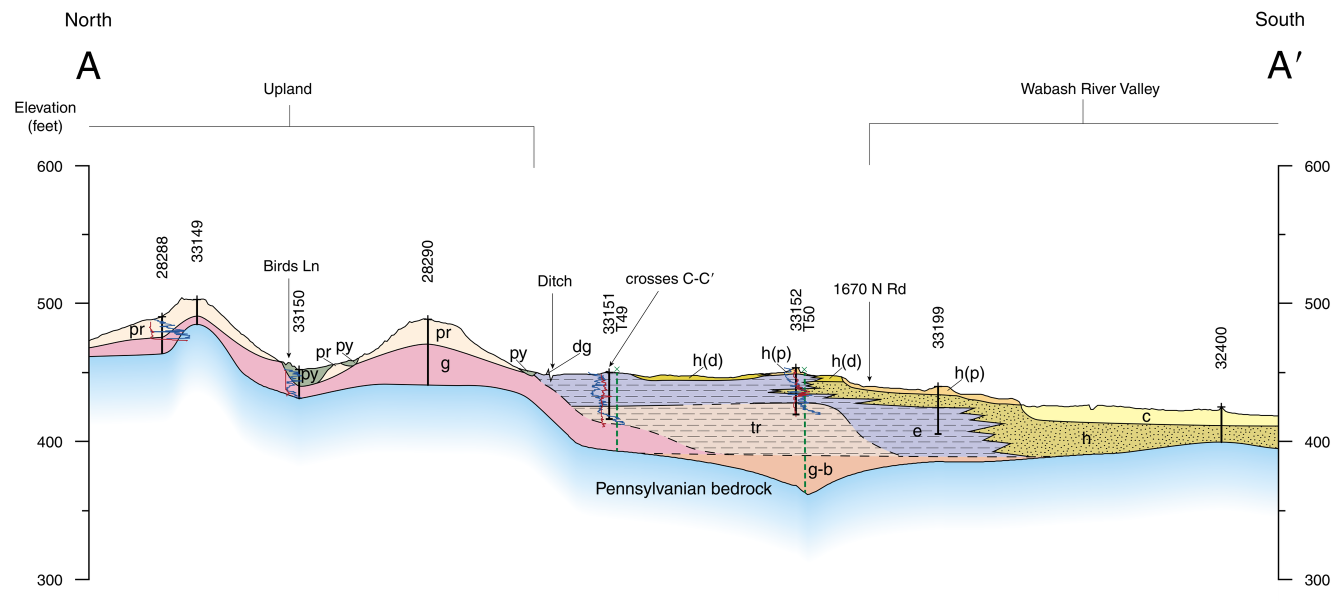
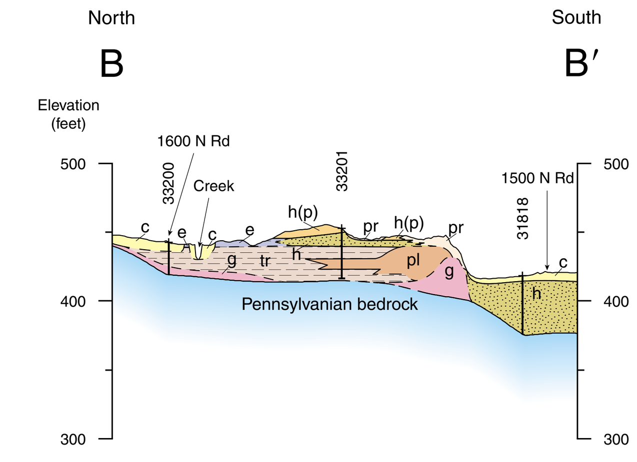




Cross Sections

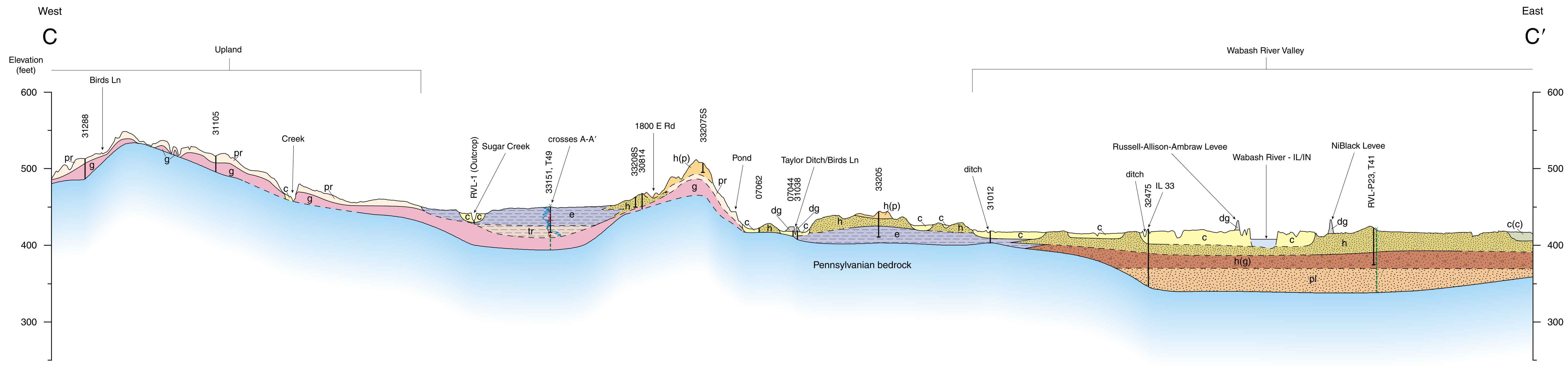
- Laminated silt and clay
- Fine and very fine sand
- Medium sand
- Sand with gravel
- Contact
- Contact, approximate

Borehole Information

- Borehole
- Passive seismic sounding
- CPT-HPT

0 15 MPa · 0 750 KPa · MPa = MegaPascal · KPa = KiloPascal

Horizontal scale: 1:24,000 (1 inch = 2,000 feet)
Vertical scale: 1 inch = 100 feet
Vertical exaggeration: 20×



dg disturbed ground	e Equality Formation
py Peyton Formation	tr Teneriffe Silt
c Cahokia Formation	pl Pearl Formation
pr Peoria and Roxana Silt Formation	g Glasford Formation
h Henry Formation	g-b Glasford-Banner Formations (undifferentiated)
h(p) Henry Formation (Parkland facies)	IP Pennsylvanian bedrock
h(g) Henry Formation (gravel facies)	water