George H. Ryan, Governor

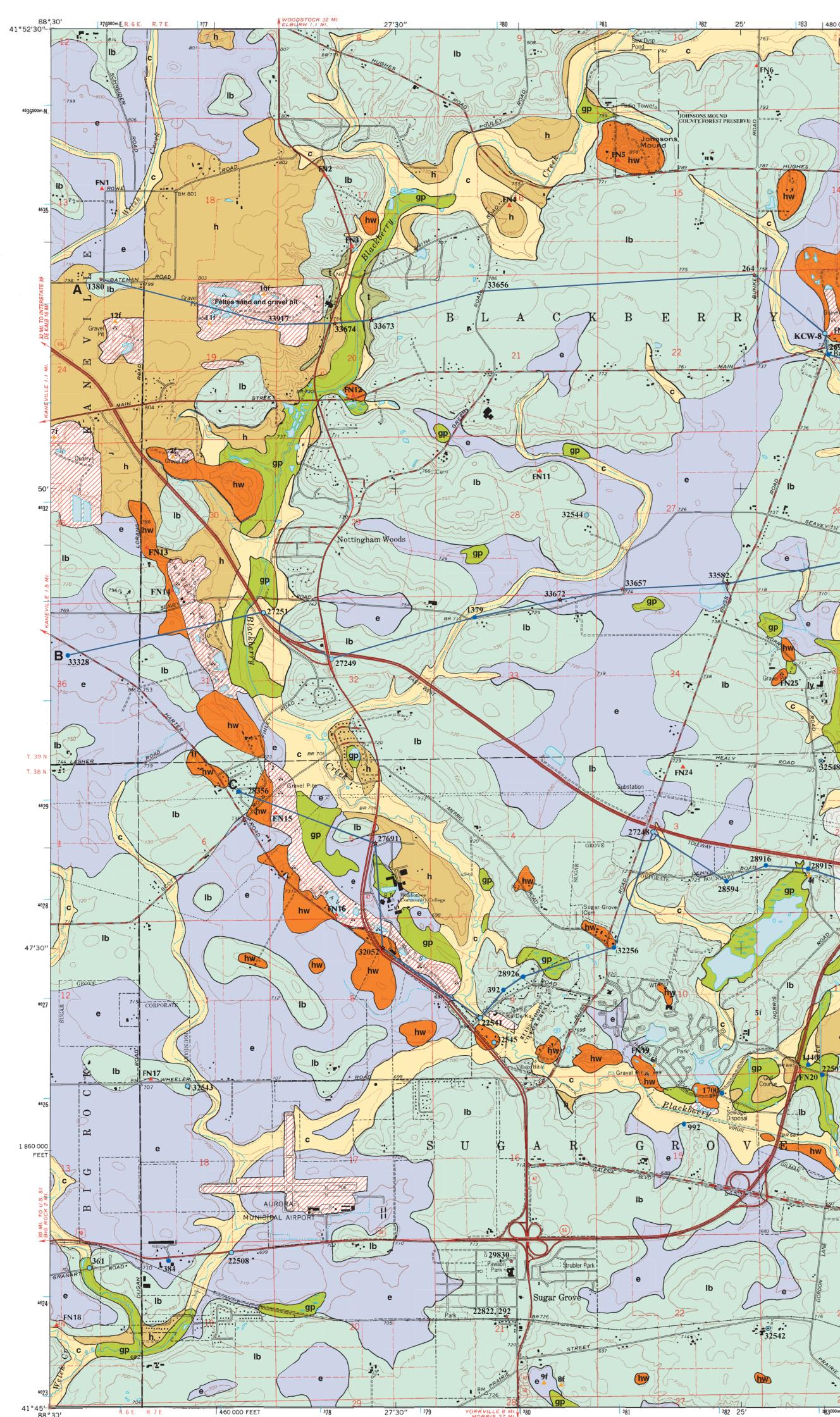
Department of Natural Resources

Brent Manning, Director ILLINOIS STATE GEOLOGICAL SURVEY William W. Shilts, Chief

Illinois Geologic Quadrangle Map: IGQ Sugar Grove-SG

SURFICIAL GEOLOGY MAP

Sugar Grove 7.5-minute Quadrangle, Kane County, Illinois B. Brandon Curry, David A. Grimley, and Timothy H. Larson



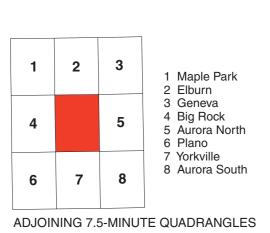
Produced by the United States Geological Survey in cooperation with State of Illinois agencies Control by USGS and NOS/NOAA Topography by photogrammetric methods from aerial photographs taken 1963. Field checked 1964. Revised from aerial photographs taken 1988. Field checked 1991. Map edited 1993. Projection and 10,000-foot grid ticks: Illinois coordinate system, east zone (transverse Mercator 1000-meter Universal Transverse Mercator grid ticks, zone 16, shown in blue 1927 North Americagn Datum (NAD 27) North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are given in USGS Bulletin 1875. Red tint indicates areas in which only landmark buildings are shown. Fine red dashed lines indicare selected fence and field lines where generally visible on aerial photographs. This information is unchecked.

Recommended Citation Curry, B.B., D.A. Grimley, and T.H. Larson, 2001, Surficial Geology Map, Sugar Grove 7.5-minute Quadrangle, Kane County, Illinois: Illinois State Geological Survey, Illinois Geologic Quadrangle Map, IGQ Sugar Grove-SG, 1:24,000.



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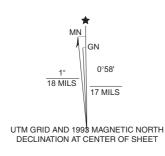
Scale 1:24,000

Base map contour interval 10 feet

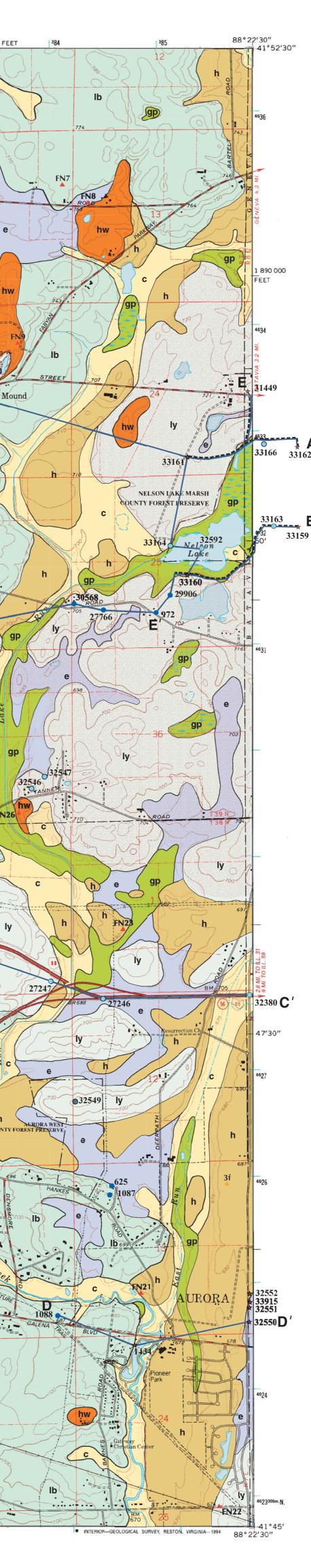
Base map compiled at the Illinois State Geological Survey (ISGS)

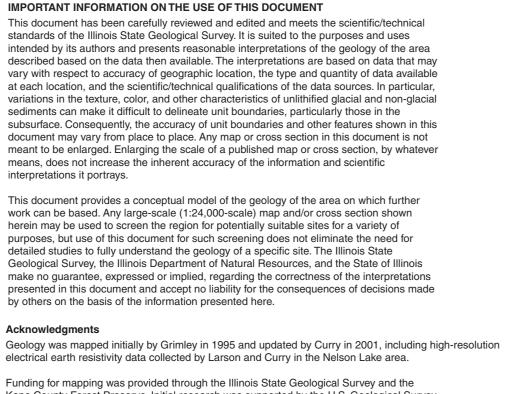
from digital data provided by the U.S. Geological Survey and the ISGS

2000 feet



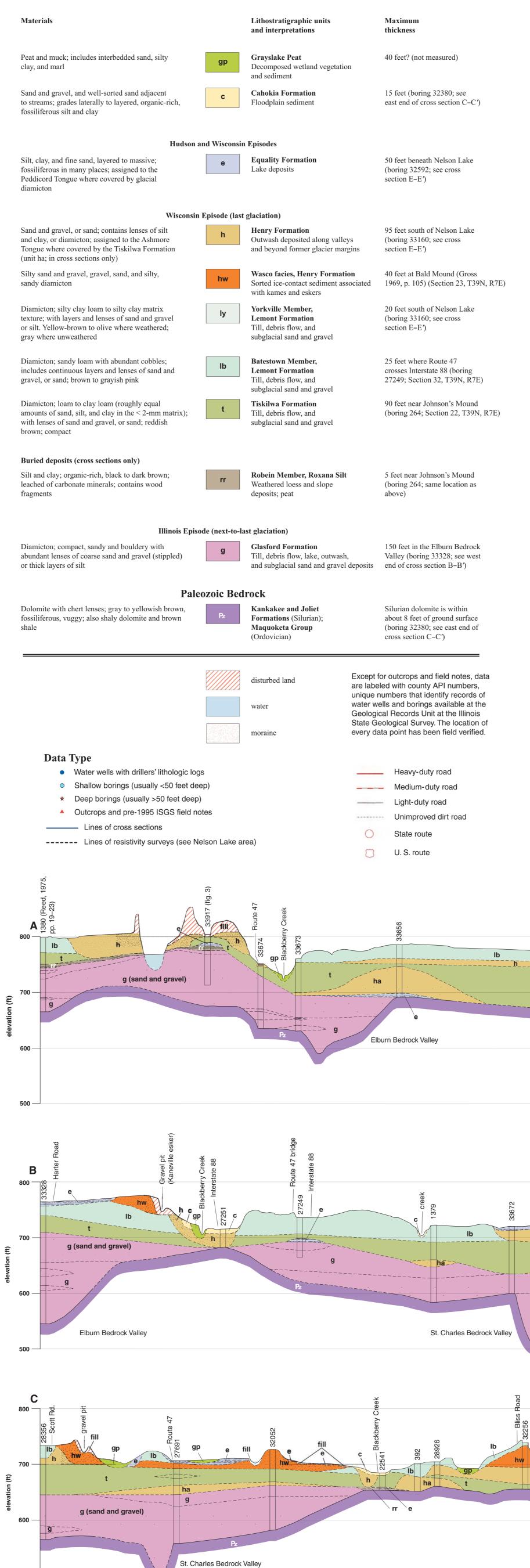
Acknowledgments David Gross.





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Quaternary Deposits Hudson Episode (postglacial)





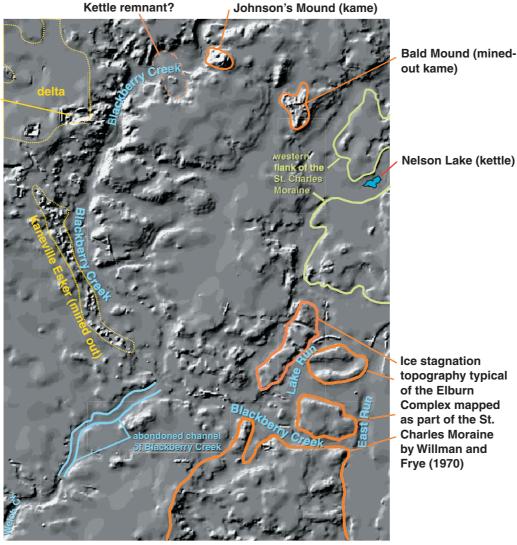


Figure 1 Shaded relief map of the Sugar Grove Quadrangle (from McGarry 2000) showing the landforms of the Elburn Complex (fig. 2) and drainageways.

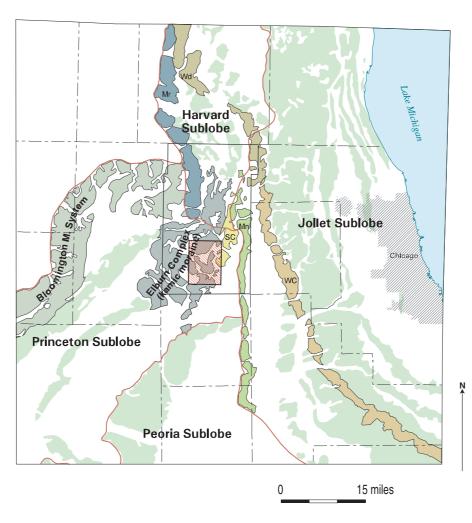
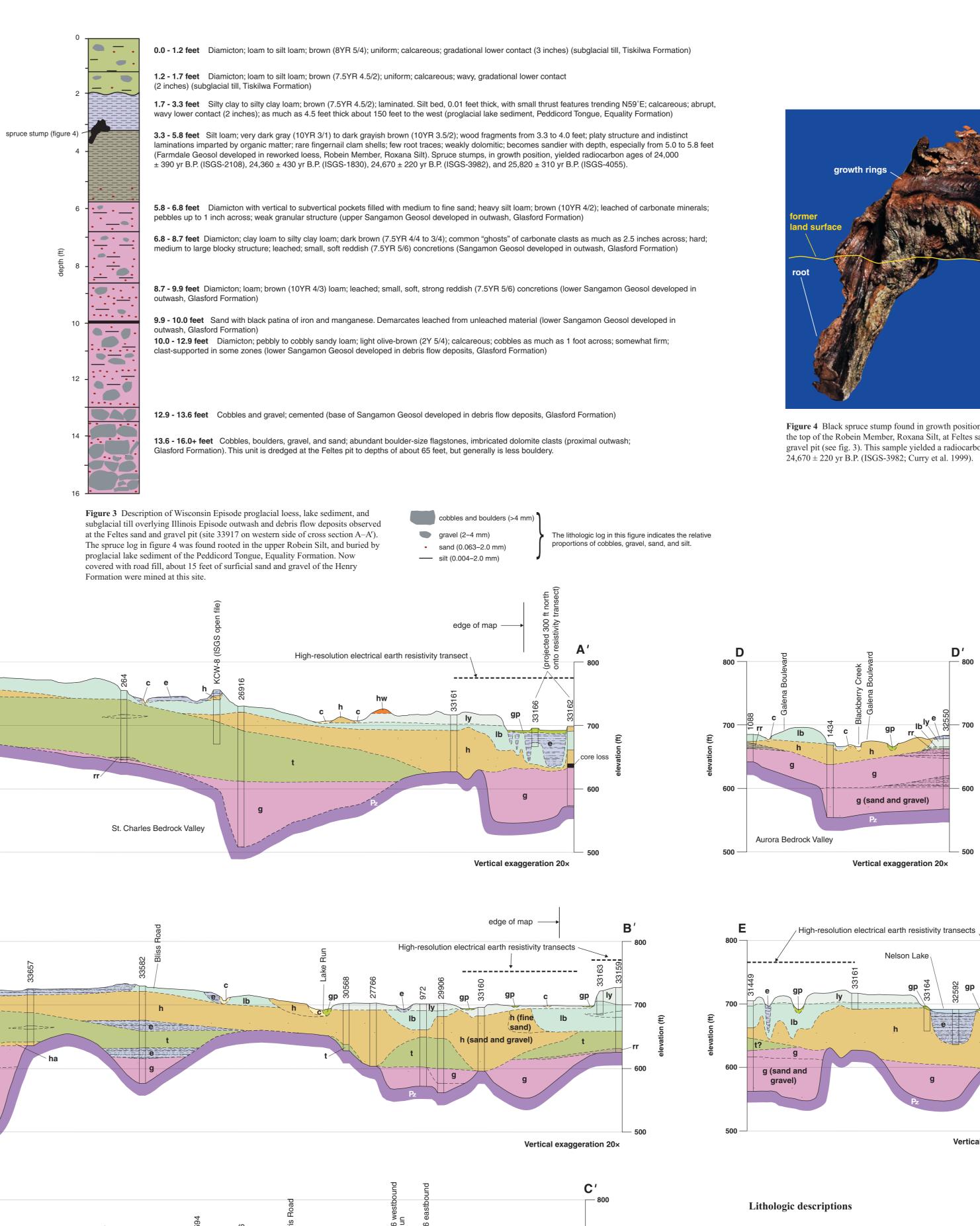
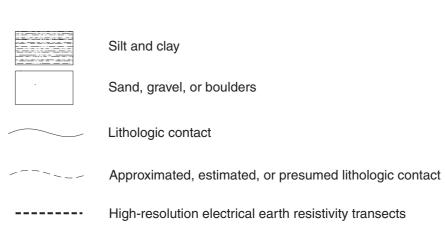


Figure 2 Wisconsin Episode moraines in northeastern Illinois. Moraines, shown in blue and green, formed at or near the terminus of the Lake Michigan Lobe. Ice advanced in a westerly and southwesterly direction into Illinois from the Lake Michigan basin. The older moraines occur generally to the west and the younger moraines to the east (modified from Willman and Frye 1970, Hansel and Johnson 1996). Kane County is outlined in black.



Vertical exaggeration 20×

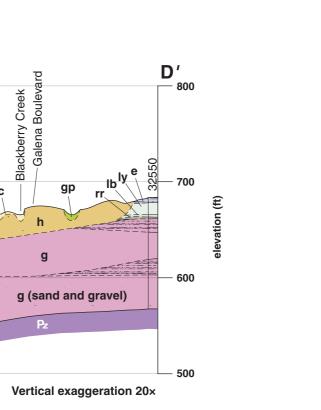


Mr Marengo Moraine Bloomington Morainic System Elburn Complex sc St. Charles Moraine Mn Minooka Moraine Wd Woodstock Moraine WC West Chicago Moraine other moraines sublobe boundary Sugar Grove Quadrangle

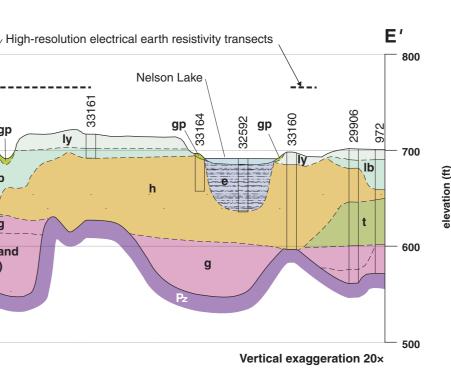
Key to Moraines



Figure 4 Black spruce stump found in growth position rooted in the top of the Robein Member, Roxana Silt, at Feltes sand and gravel pit (see fig. 3). This sample yielded a radiocarbon age of



g (sand and gravel



Quaternary Geology Continental glaciers and their associated lakes and meltwater streams deposited

most of the surficial deposits in the Sugar Grove Quadrangle. The first glaciers probably arrived in Kane County more than 425,000 years ago, but no deposits of this age are preserved in the map area (Killey 1998). The oldest glacial deposits present in the area were deposited during the Illinois Episode from about 180,000 to 130,000 years ago (Curry and Pavich 1996); the youngest glacial sediment was deposited during the Wisconsin Episode from about 24,000 to 17,500 years ago (Hansel and Johnson 1996, Curry et al. 1999). As part of the Elburn Complex (figs. 1 and 2; Willman and Frye 1970), Wisconsin Episode deposits form an array of landforms that are typically associated with stagnating glacial ice. Several kames (e.g., Johnson's Mound, Bald Mound), kettles (e.g., Nelson Lake and unnamed depressions throughout the quadrangle), and the Kaneville esker, a long, sinuous, mined-out ridge (Lukert and Winters 1965), are among these landforms (fig. 1).

Present in the subsurface throughout the Sugar Grove Quadrangle, Illinois Episode glacial sediment of the Glasford Formation (unit g) is composed of boulder gravel, sandy diamicton, silty lake sediment, and sand and gravel. Diamicton is very poorly sorted sediment, containing particles that range in size from clay to boulders. In the southern Great Lakes region, most diamicton has bimodal particle-size distribution in which the >2-mm fragments (i.e., gravel and larger) are matrix-supported, "floating" in a matrix of sand, silt, and clay. At the Feltes sand and gravel pit (Sections 19 and 20, T39N, R7E), the boulder-size dolomite flagstones and discontinuous layers of sandy diamicton suggest the sediment assemblage was deposited in an ice-marginal environment (Curry et al. 1999; fig. 3; see also site 33917 near the western end of cross section A–A').

An ancient weathering horizon, the Sangamon Geosol, formed in Illinois Episode sediment from about 130,000 to 55,000 years ago (Curry 1989, Curry and Pavich 1996, Curry et al. 1999). This horizon developed under several climatic regimes, including a climate similar to that of northeastern Illinois today (Curry and Baker 2000). Intermittently capping the Sangamon Geosol is silty, windblown sediment assigned to the Roxana Silt (cross section unit rr). This unit includes an upper discontinuous layer of dark brown, organic-rich sediment modified by soil and slope processes (Robein Member)(fig. 3). Where this material contains features such as root traces, pores, and fine desiccation structures, it is assigned to the Farmdale Geosol. Based on radiocarbon analyses in northeastern Illinois, the Roxana Silt was deposited between 55,000 and 24,000 years ago during the early Wisconsin Episode (Wickham et al. 1988, Curry and Pavich 1996, Hansel and Johnson 1996). At the Feltes sand and gravel pit, wood fragments and even in situ tree stumps often are discovered in the uppermost Robein Silt (figs. 3 and 4).

During the Wisconsin Episode, the Lake Michigan Lobe ice advanced and retreated three times in southern Kane County, leaving deposits of diamicton and sorted sediment assigned to the Tiskilwa Formation and to the Batestown and Yorkville Members of the Lemont Formation. In many places the diamicton units are thin, have non-uniform matrix textures, and hence, are locally difficult to distinguish. Compared with the surficial geology of the Elburn Quadrangle to the north (Grimley and Curry 2001a), these units contain more lenses and interbeds of sand and gravel and less diamicton. Thick successions, including (1) sand and gravel (Henry Formation) and clay, (2) silt, and (3) fine sand (Equality Formation) were mapped throughout the quadrangle; in many places, these layers underlie Wisconsin Episode diamicton.

The oldest diamicton unit from the last glaciation (the Wisconsin Episode) is the Tiskilwa Formation (map and cross section unit t). It is exposed along reaches of Blackberry Creek in the north-central part of the map. The diamicton is distinguished by its reddish brown color (7.5YR 5/3 Munsell notation), uniform lithology, and the mean sand, silt, and clay percentages of the matrix (35%, 38%, 27%, respectively; Graese et al. 1988). From north to south, diamicton of the Tiskilwa Formation generally thins and contains more interbeds of sand and gravel. Throughout the map area, the lower boundary of Tiskilwa diamicton is commonly in contact with thick basal sand and gravel classified with the Ashmore Tongue of the Henry Formation or with silty lake sediment assigned to the Peddicord Tongue of the Equality Formation (fig. 3).

Sandy loam to loam diamicton of the Batestown Member of the Lemont Formation (map and cross section unit lb) is the most widespread surficial unit in the Sugar Grove Quadrangle. The brown to gravish pink color (10YR 5/3.5 Munsell notation), sandy matrix texture, and abundant interbeds of sand and gravel distinguish this unit. A layer of sand and gravel mapped as an unnamed tongue of the Henry Formation occurs below sandy loam Batestown diamicton across most of the study area. This layer of sand and gravel is thickest in the area around Nelson Lake.

Above the sandy Batestown Member is a silty clay loam to silty clay diamicton, the Yorkville Member of the Lemont Formation (map and cross section unit ly), the youngest diamicton unit of the last glaciation in the map area. The maximum known thickness, 20 feet, is south of Nelson Lake. Immediately to the east on the Aurora North Quadrangle, the Yorkville Member thickens to more than 70 feet (Curry 2001a). Compared with Batestown diamicton, Yorkville diamicton is less sandy and more clayey. For example, the mean sand, silt, and clay percentages of the matrix from 14 samples of Yorkville diamicton from test borings in the Nelson Lake Preserve are 23%, 40%, and 37%, respectively; 15 samples of Batestown diamicton have mean sand, silt, and clay percentages of 43%, 38%, and 19%, respectively. The mapped distribution of the Yorkville Member in the Sugar Grove Quadrangle is based on the local characteristic of larger clay percentage relative to the Batestown Member.

Generally assigned to the Henry Formation, deposits of glacial sand and gravel abound in the Sugar Grove Quadrangle. In many of these areas, sand and gravel layers can be traced to where they become buried by diamicton of the Batestown Member. Where it forms kames and eskers, the surficial sand and gravel is assigned to the Wasco facies of the Henry Formation. In many places on the flanks of kames and eskers, the Wasco sand and gravel is covered by diamicton of the Batestown Member (see the western side of cross section C–C'). Compared with undifferentiated Henry Formation, the Wasco facies has more chaotic bedding, is more lithologically heterogeneous, and contains more silt. The results of our mapping are consistent with the interpretation that kames formed in large cavities that received water-laid sediment at the base of the glacier (Clayton 1964). Bald Mound, before it was mined out, was composed mostly of highly contorted, indistinctly bedded sand and gravel, medium gravel, and 25 to 50 foot long lenses of cross-bedded medium-grained sand (Gross 1969). Johnson's Mound is likely composed of similar material but is protected from mining by the Kane County Forest Preserve.

The Kaneville esker was formed by river sand and gravel that accumulated in a linear, subglacial cavity. Lukert and Winters (1965) measured pebble orientations in six localities in the esker deposits and concluded that during sediment deposition, water flowed upgradient to the northwest, which is evidence for flow in a closed ice tunnel. As the esker formed, sediment-laden water exited from beneath the glacier in the northwestern portion of the Sugar Grove Quadrangle, forming a delta composed of cross-bedded medium sand as much as 25 feet thick (fig. 1; Curry et al. 1999). The sandy deltaic deposits are also assigned to the Henry Formation. Only the flanks of the Kaneville esker remain because of extensive mining of the sand and gravel since about 1910.

Nelson Lake occurs in a large depression on the western flank of the St. Charles Moraine (fig. 1). Surrounded by glacial diamicton and sand and gravel, such depressions are known as kettles. They are known to be forming currently in areas of retreating glaciers where ice blocks melt after being buried in rapidly accumulating sand and gravel (Price 1973). Nelson Lake may have formed as he Lake Michigan Lobe rapidly advanced during deposition of the Yorkville Member and covered ice blocks associated with deposition of the Batestown Member and the Tiskilwa Formation. Nelson Lake and the other depressions formed after the ice melted.

Landforms associated with Blackberry Creek also reveal aspects about the postglacial history of the Sugar Grove Quadrangle. In the southwestern portion of the map, a shallow valley with no discernible surficial drainage suggests that Blackberry Creek once flowed southwest and joined Welch Creek (fig. 1). In the north-central part of the map, an exceptionally wide portion of the valley of Blackberry Creek in Section 16, T39N, R8E may be the remnants of a kettle (fig. 1). Both areas are likely underlain by sand and gravel, although they are covered by a veneer of postglacial alluvium mapped as Cahokia Formation (see map).

Postglacial Sediment

Surficial, normally consolidated silt, clay, and fine sand (map and cross section unit e; Equality Formation) and peat (map and cross section unit gp; Grayslake Peat) were mapped extensively in upland areas and in floodplains. The thickest known deposit of surficial silt and clay (50 feet) was cored in boring 32592 under 6 feet of water near the center of Nelson Lake (see cross section E-E' Electrical earth resistivity transects indicate that the northern part of Nelson Lake marsh also is underlain by thick postglacial silt and clay perhaps as much as 60 feet thick (see the eastern end of cross section A–A'). The thickness of peat deposits has not been measured in the map area. To the east in the Aurora North Quadrangle, as much as 40 feet of peat was reported in some structural borings (Curry 2001). The three glacial units, as well as surficial lake sediment, some peat deposits, and coarse outwash (map units e, gp, and h, respectively) are capped by 3 to 4 feet of silty clay loess known as Peoria Silt (Hansel and Johnson 1996). The loess is generally organic-rich and has been altered by development of the modern soil. Because loess is ubiquitous, its extent was not mapped. Floodplain deposits, assigned to the Cahokia Formation (map and cross section unit c), include deposits of silt and clay, peat, sandy gravel, and sand.

Aggregate and Groundwater Resources

For almost 100 years, surficial and buried deposits of sand and gravel on the Sugar Grove Quadrangle have been mined to produce construction aggregate Additional aggregate resources occur in the northwestern portion of the quadrangle. At the Feltes sand and gravel pit and at other pits nearby, Illinois Episode sand and gravel is dredged for aggregate, whereas finer grained Wisconsin Episode sorted sediment is mined above the water table. Bald Mound and the Kaneville Esker have been almost completely mined out for sand and gravel aggregate. From the 1930s through the 1970s, Nelson Lake marsh was mined for low-quality peat (Curry et al. 1999). Johnson's Mound and Nelson Lake are currently protected by the Kane County Forest Preserve.

Groundwater pumped from surficial sand and gravel aquifers is becoming an important supplement for municipal water supplies. On the Sugar Grove Quadrangle, groundwater is drawn from Illinois Episode sand and gravel deposits in buried bedrock valleys, including municipal wells for the communities of Sugar Grove and Aurora (Gilkeson et al. 1987, Curry and Seaber 1990). Private wells obtain water from a variety of aquifers, including surficial sand and gravel, shallow dolomite bedrock, and deep sandstone bedrock.

Mapping Methods

High-resolution electrical earth resistivity (HR EER) transects were done in the Nelson Lake area to map the thickness of lake sediment and to determine the location of significant changes in sediment character to a depth of about 100 feet. HR EER estimates the thickness of layers of sediment with unique resistivities (Griffiths and Barker 1993, Loke and Barker 1996). Transects were about 656 feet long (200 meters) with an electrode spacing of about 9.8 feet (3 meters).

The surficial geology map is based in part on previous investigations (Leighton et al. 1930; Graese et al. 1988; Curry 1990, 2001, 2002; Grimley and Curry 2001a, 2001b) and the Kane County soil survey maps (Goddard 1979). Cross sections of the surface and subsurface units of the Sugar Grove Quadrangle are based on interpretations of data from (1) water-well test-borings done by Layne-Western, Inc. (Gilkeson et al. 1987), (2) published and unpublished stratigraphic test borings and sample set descriptions done by the ISGS (e.g., Reed 1975) unpublished engineering borings for bridges and other structures, (4) the HR EER transects described above, and (5) water-well logs. Grimley (2002) provides descriptions of outcrops, interpretations of pre-1995 field notes, and lithologic logs of key borings, including new shallow borings. Downhole geophysical (gamma-ray) logs are available for several borings around Nelson Lake (ISGS, unpublished data).

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