Quaternary Geology of Oneida County, Wisconsin

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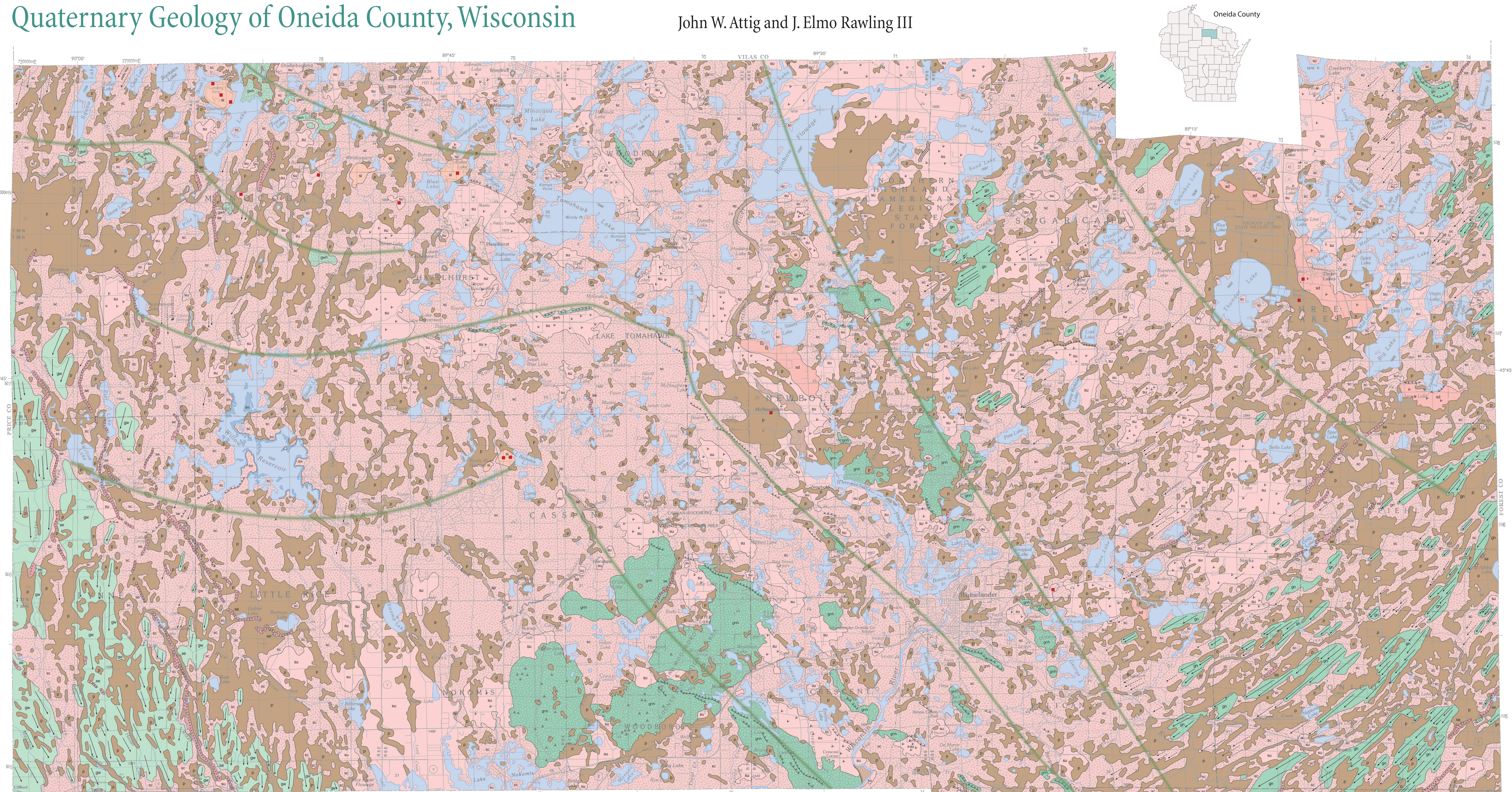

Quaternary geology

Oneida County lies in the heart of Wisconsin's Northern Highlands, a mostly forested area with abundant lakes and wetlands. The county's glacial landforms record the direction of ice flow across the area during the last part of the Wisconsin Glaciation. They also document the sequence of events during the recession, stagnation, readvance, and final melting of the ice. Although bedrock crops out in some areas, mostly in the eastern part of the map area, the landforms and sediments in Oneida County are nearly all the result of the most recent glaciation of the area during the last part of the Wisconsin Glaciation that occurred between about 30,000 and 14,000 years ago (Attig and others, 2011).

Figure 1. *Location of Oneida County and the maximum extent of the glacial lobes during the last part of the Wisconsin Glaciation. Arrows show direction of ice flow.*

Glacial advances that occurred prior to the last part of the Wisconsin Glaciation are known to have covered north-central Wisconsin, but little is known about their impact on Oneida County. The deposits and landforms of these early glacial advances have been buried or destroyed by subsequent glaciations. During the last part of the Wisconsin Glaciation, the Wisconsin Valley and Langlade Lobes of the Laurentide Ice Sheet formed in north-central Wisconsin when the Superior Lobe thickened and spilled southward out of the Superior basin. The Wisconsin Valley and Langlade Lobes advanced southward and reached their maximum extent just south of Oneida County (fig. 1). The southerly flow of the Wisconsin Valley Lobe and the southwesterly flow of the Langlade Lobe are clearly indicated by the orientation of drumlins. The direction of ice flow is also recorded by striations on bedrock. Glacial sediments deposited by the two lobes are shown as map units **gw, gwh, gn,** and **gnh**.

By about 20,000 years ago, the lobes of the Laurentide Ice Sheet had begun to recede from the area (Attig and others, 1985). The general northward recession of the margin of the ice lobes was interrupted by episodes of readvance and ice-margin stability. It is during this period of general recession that the major landforms of Oneida County formed. Heads-of-outwash, the areas nearest the ice on outwash plains, dominate the landscape and record where the margin of the Wisconsin Valley and Langlade Lobes stabilized. They were the source of extensive outwash and are shown on the map as units **su** and **sc**. Locally, lakes temporarily formed in the low areas behind heads-of-outwash (fig. 2).

The regional distribution of ice-marginal features in central Wisconsin indicates that the eastern part of Oneida County was first covered by the Wisconsin Valley Lobe and was later covered by the western margin of the Langlade Lobe (Attig and Rawling, 2016; Attig and others, 2011). The Wisconsin Valley Lobe flowed over the highest part of the bedrock divide at the southern edge of the Superior basin. As the ice thinned, the flow of ice in the Wisconsin Valley Lobe was restricted while ice for the Langlade Lobe continued to flow across a lower part of the divide to the east (Attig and Rawling, 2018).

Lakes and wetlands occupy the abundant depressions that are a characteristic feature of outwash deposits in the county. In some places, the original depositional surface of the outwash (map unit **su**) is well preserved. In other places, outwash was deposited on top of stagnant ice (map unit **sc**). In these areas the original depositional surface was locally or more broadly destroyed when the buried ice melted. Regional geomorphic and stratigraphic relationships indicate that buried ice persisted through multiple glacial advances and did not melt until permafrost thawed. The collapse of outwash surfaces and the formation of basins, many of which are now occupied by lakes and wetlands, did not occur until thousands of years after the active ice receded (Attig and Rawling, 2018).

Ice-marginal deltas and eskers are also common meltwater-deposited features in Oneida County. Deltas (map unit **sd**) were deposited where rivers of meltwater flowed into ice-marginal lakes. The part of the deltas that was in contact with the ice typically shows abundant evidence of collapse as a result of loss of support by adjacent or underlying ice. Eskers (map unit **se**) formed where meltwater rivers deposited sand and gravel in subglacial tunnels. Eskers show in the modern landscape as long, somewhat sinuous ridges that are oriented approximately parallel to the flow of ice. Meltwater-stream sediment was also deposited in ice-walled rivers (map unit **si**). Sediment that accumulated in ice-walled lakes underlies conspicuous high-level plains in some parts of the map area. The most conspicuous of these small ice-walled-lake plains, in south-central Oneida County, are shown by a symbol on the map.

Methodology

This map is based on field and laboratory work completed between 2010 and 2016. Map contacts were drawn using U.S. Geological Survey (USGS) quadrangle maps (7.5-minute series, topographic, scale 1:24,000; 10-ft contour interval) and refined using 5-ft-resolution lidar-derived hillshade model (WisconsinView, 2013), U.S. Department of Agriculture (USDA) 1:20,000 black-and-white aerial photographs, and USGS National High Altitude Photography program 1:58,000 color-infrared aerial photographs. Sediment cores were collected using the Geoprobe direct push method; they were sampled, photographed, and analyzed at the WGNHS. Additional lithologic information was derived from USDA soil maps (scale 1:15,000), well construction reports, WGNHS geologic logs, grain-size analyses performed using the Malvern Panalytical Mastersizer 2000 particle size analyzer, and F.T. Thwaites' field notes (stored at WGNHS). Hydrography derived from USGS Digital Line Graphs (scale 1:100,000).

References cited

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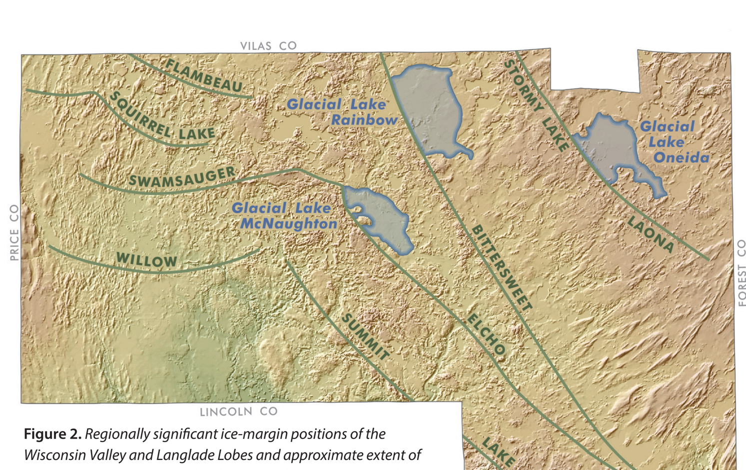


Figure 2. *Regionally significant ice-margin positions of the Wisconsin Valley and Langlade Lobes and approximate extent of major ice-marginal lakes. (U.S. Geological Survey 30-meter digital elevation model, 2006, scale 1:600,000)*

Explanation

Postglacial sediment

p — Organic sediment in low, typically wet areas. Peat or slope sediment overlying the glacial, stream, or lake sediment indicated by adjacent map units; low-lying, flat to very low-relief surfaces.

lm — Modern lake sediment. Silty, sandy, and gravelly wave-washed nearshore sediment deposited in modern impoundments; mapped around flowages where exposed by low water level.

sp — Postglacial stream sediment. Silty, sandy, and gravelly sediment deposited by streams; flat to low-relief floodplains. Mapped where extensive; present but unmapped adjacent to most streams.

Copper Falls Formation

su — Meltwater-stream sediment, outwash plains, and fans. Stratified sand and gravelly sand deposited by streams carrying meltwater from the Wisconsin Valley and Langlade Lobes; flat to low relief. Original depositional surface recognizable in most areas.

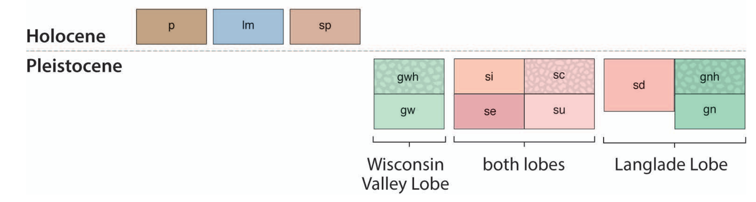
sc — Meltwater-stream sediment, collapsed. Stratified sand and gravelly sand deposited by streams carrying meltwater from the Wisconsin Valley and Langlade Lobes and deposited on ice. Moderate to high-relief surfaces. Original depositional surface recognizable in few areas because it was destroyed when buried ice melted. High elevation areas composed of ice-proximal deposits typically contain abundant very poorly sorted gravelly sediment.

si, sd, se — Meltwater-stream sediment in ice-walled rivers, deltas, and eskers. **Unit si:** Stratified sand deposited in meanders of ice-walled rivers. **Unit sd:** Stratified sand and gravelly sand deposited in ice-marginal deltas. High level fans and deltas locally overlain by up to about 0.5 m of silty to very fine sandy loess. **Unit se:** Stratified sand, gravelly sand, and silty sand deposited by rivers flowing in subglacial tunnels. Occurs in long, somewhat sinuous esker ridges oriented generally parallel to the direction of ice flow.

gn, gnh — Glacial sediment of the Nashville Member, deposited by the Langlade Lobe. **Unit gn:** Brown to reddish brown sandy till. Occurs as drumlins and in other upland areas in the eastern part of the map area. Locally overlain by about 0.5 m of silty to very fine sandy loess. **Unit gnh:** Brown to reddish brown, poorly to well-stratified, poorly to well-sorted glacial sediment in areas of hummocky topography. May include areas underlain by stratified sand and gravel.

gw, gwh — Glacial sediment of the Wildcat Lake Member, deposited by the Wisconsin Valley Lobe. **Unit gw:** Reddish brown sandy till. Occurs as drumlins and in other upland areas in the western part of the map area. Locally overlain by about 0.5 m of silty to very fine sandy loess. **Unit gwh:** Brown to reddish brown, poorly to well-stratified, poorly to well-sorted glacial sediment in areas of hummocky topography.

Correlation of map units



Scale 1:100,000

MILES

KILOMETERS

Wisconsin Transverse Mercator Projection1991 adjustment to the North American Datum of 1983 (NAD 83/91).

The base map was constructed from U.S. Census Bureau TIGER/Line files (2000), U.S. Geological Survey digital line graph files (1990, scale 1:100,000) and modified by the Wisconsin Department of Natural Resources (1992) and the Wisconsin Geological and Natural History Survey (2012).

This map is an interpretation of the data available at the time of preparation. Every reasonable effort has been made to ensure that this interpretation conforms to sound scientific and cartographic principles; however, the map should not be used to guide site-specific decisions without verification. Proper use of the map is the sole responsibility of the user.

This map was supported by the Great Lakes Geologic Mapping Coalition Project, part of the National Cooperative Mapping Program of the U.S. Geological Survey, under Cooperative Agreement G15AC00343.

Symbols

Geologic contact. Position shown on map is judged to be generally within 0.2 km of actual position.

Ice-marginal ridge. V symbol points in direction of ice flow.

Ice-margin position. General location of extensive ice-margin position.

Ice-contact face. Steep slope formed at former ice-margin position.

Stream cutbank. Hachures point toward stream channel center line.

Shore ice-collapse trenches. Trenches formed when ice buried along a lake shore melted.

Drumlin. Length of line proportional to length of drumlin long axes; arrow points in the direction of ice flow.

Modified drumlin. Draped with meltwater-stream or other post-drumlin sediment.

Esker. V symbol points in direction of water flow.

Meltwater flow. Arrow indicates flow direction of meltwater streams.

Ice-walled-lake plains. Location of sediment deposited in ice-walled lakes.

Sediment core sample.

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Map 507 • 2020