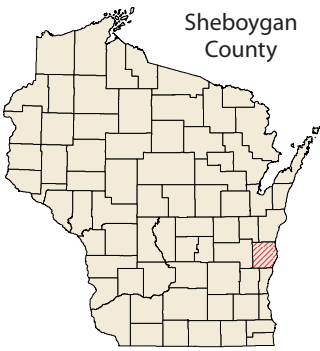


Quaternary Geology of Sheboygan County, Wisconsin

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Logic of unit descriptors

Stratigraphic unit/material/landform
Rds = Horicon Member, d = diamicton, s = streamlined landscape

Postglacial deposits only use 1 letter descriptor.

Stratigraphic units (first letter)

Kewaunee Formation
V Valders Member
Z Ozaukee Member

Oak Creek Formation

O Entire formation

Holy Hill Formation

N New Berlin Member
R Horicon Member
H Undifferentiated deposits

Materials (second letter)

d diamicton
s silty sand to sand
g gravel and sandy gravel

Landforms (third and fourth letters)

s streamlined landscape, in an area of drumlins and flutes
r rolling land surface
h hummocky landscape, uneven terrain with many closed depressions (kettles) and small hills
he hummocky end moraine
p plain, generally flat to gently sloping plain with less than 20 percent surface interrupted by collapse depressions
lp lacustrine plain, nearly flat to gently sloping former lake bottom
pp pitted plain with between 20 and 80 percent of surface interrupted by collapse depressions
t outwash terrace

Symbols

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

Ice-margin position. Interpreted position of maximum extent of reach of ice or position of ice-margin stability where ice-contact face or end moraine is missing.

Stream cutbank. Hachures point toward stream channel center line.

Esker. V points in direction of water flow.

Striation. Direction of scratches or grooves on bedrock surface.

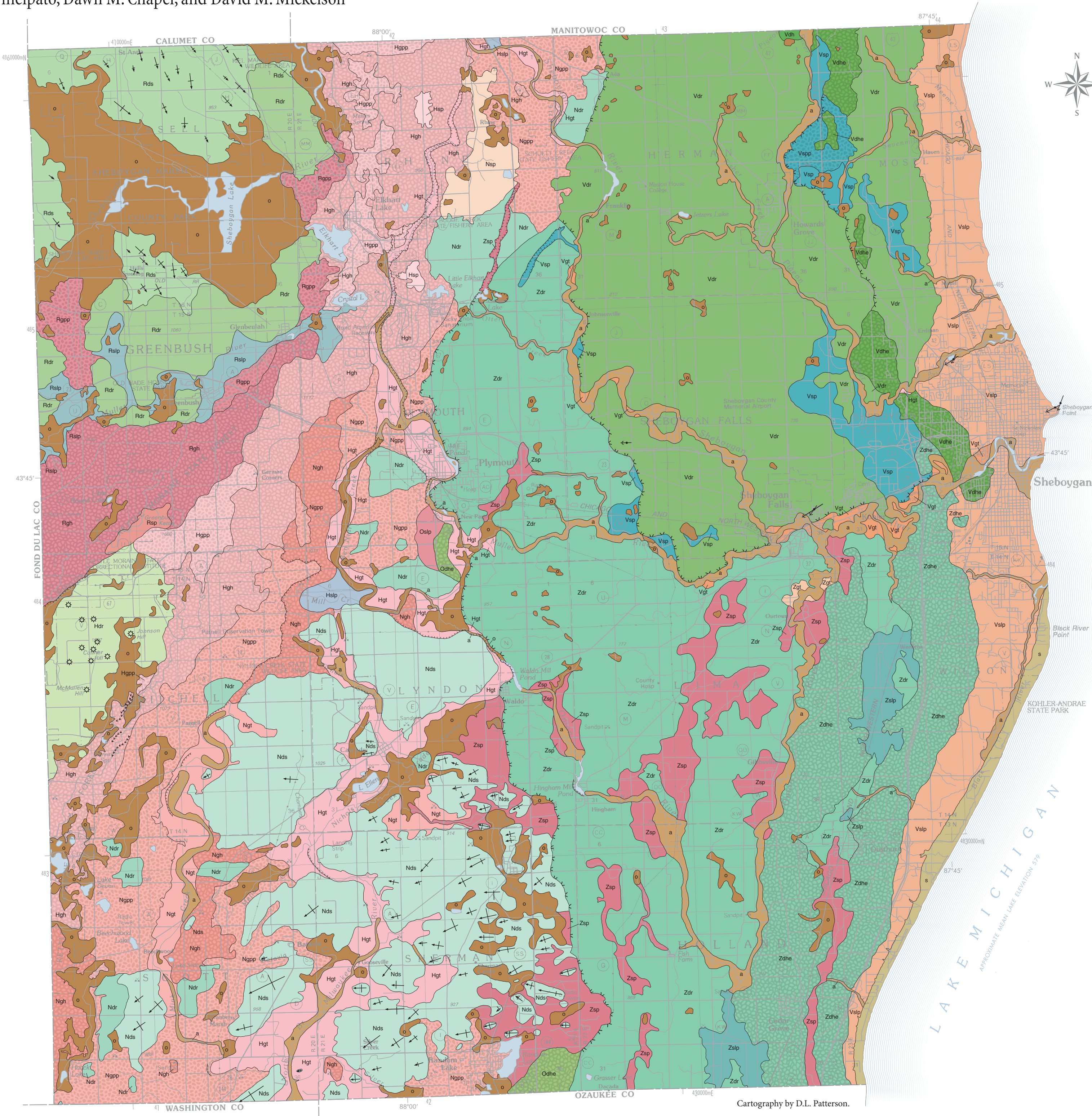
Drumlin. Length of arrow on symbol proportional to length of drumlin axes; arrow points in the direction of ice flow; cross-line on symbol proportional to drumlin width.

Kame. Conical hill interpreted to be a moulin kame.

Wisconsin Geological and Natural History Survey

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Extension



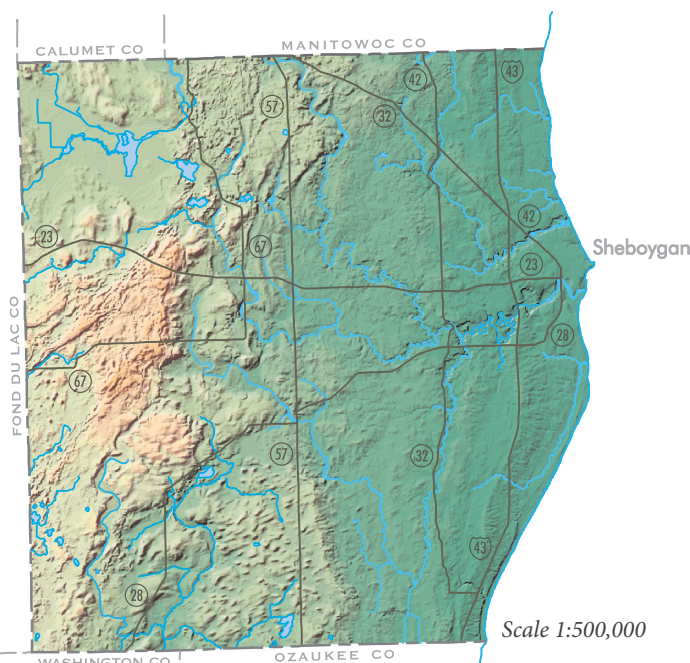
Cartography by D.L. Patterson.

Wisconsin Transverse Mercator Projection 1991 adjustment to the North American Datum of 1983 (NAD 83/91).

The base map was constructed from 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 (2004).

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.

Shaded relief of Sheboygan County



Explanation

Postglacial deposits

o Postglacial organic sediment. Peat and muck; thickness ranges from less than 1 m to about 5 m; underlain by deposits of streams, glaciers, or lakes; generally found in low parts of the landscape on flat to gently sloping surfaces.

a Postglacial sand and silt. Commonly a mixture of sand, silt, and clay containing varying amounts of organic matter from place to place; alluvium found mostly along the edges of modern streams and at the base of extensive slopes. Contacts between this unit and postglacial organic sediment have been drawn arbitrarily in many places.

s Postglacial sand along Lake Michigan. Most deposited as beach sand during the Nipissing high stand of the lake and later reworked by wind.

Kewaunee Formation

Valders Member

Vdr Diamicton in areas of hummocky topography. Mostly basal till, commonly with a layer of mudflow sediment (less than 1 m thick) at surface; reddish-brown, crudely stratified or unstratified, clayey silt; generally compact and uniform, except in upper few meters, where sand lenses and other discontinuities are found; upper 3 m contain fractures; surface has low relief (less than 5 m), hummocky topography. Hummocks may, in part, be inherited from surface form of older glacial deposits. Unit **Vdhe** is end moraine that marks still stand of the ice margin.

Vdr Diamicton in rolling topography. Generally compact, uniform basal till; reddish-brown, crudely stratified or unstratified clayey silt; upper 3 m contain fractures. Unit is draped over pre-existing topography.

Vgt Moderately well-sorted, well-stratified gravel and sand in outwash terraces. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams near the glacier margin, then surface abandoned as streams downcut.

Vsp Postglacial wave-cut terraces and associated river terraces along the shore of Lake Michigan. Sand and gravel less than 1 m to several meters thick over older diamicton; generally well sorted; in many places contains imbricated pebbles; sand is water-deposited beach and offshore sediment. Represents higher Glenwood and Calumet phases of Lake Michigan.

Vsp Sand and some gravel in outwash and lacustrine plains. Moderately well-sorted, well-stratified sand and sandy gravel deposited by glacial streams or waves and currents. Unit **Vsp** has less than 20 percent of surface interrupted by depressions formed by melting ice blocks (kettles). Unit **Vsp** has between 20 and 80 percent of original floodplain interrupted by depressions formed by melting ice blocks. Both units deposited by braided streams in front of end moraines or in valleys running parallel to glacier margin.

Ozaukee Member

Zdr Diamicton in areas of hummocky end moraine topography. Mostly basal till, commonly with a layer of mudflow sediment (1 to 3 m thick); reddish-brown, crudely stratified or unstratified, clayey silt; generally compact and uniform, except locally in upper few meters, where sand lenses and other discontinuities are found; upper 6 m contain fractures; surface has low-relief (less than 5 m) hummocky topography.

Zdr Diamicton in areas of rolling topography. Generally compact, uniform basal till; reddish-brown, crudely stratified or unstratified clayey silt; upper 6 m contain fractures.

Zgt Gravel and sand in outwash terraces. Moderately well-sorted, well-stratified sand and gravel. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams near the glacier margin, then surface abandoned as streams downcut.

Zsp Moderately well-sorted sand and minor gravel in outwash plains deposited by glacial streams in front of end moraines or in valleys running parallel to glacier margin.

Zsp Silt and sand in lacustrine plains. Moderately well-sorted silt, sand, and clay underlying nearly flat plains. Occupies low places in the landscape where lakes were dammed by retreating ice margin.

Oak Creek Formation

Odr Diamicton in areas of hummocky end moraine topography. Mostly basal till, commonly with a layer of mudflow sediment (more than 3 m thick); gray, crudely stratified or unstratified, clayey silt; generally compact and uniform, except locally in upper few meters, where sand lenses and other discontinuities are found; upper 6 m contain fractures; surface has low-relief (less than 5 m) hummocky topography.

Osp Silt and sand in lacustrine plains. Moderately well-sorted silt, sand, and clay underlying nearly flat plains. Occupies low places in the landscape where lakes were dammed by retreating ice margin.

Holy Hill Formation

Horicon Member

Ndr Diamicton in areas of rolling or streamlined topography. Light yellowish-brown, crudely stratified or unstratified, gravelly, clayey, silty sand; generally compact, uniform basal till. Unit **Ndr**: rolling topography with moderate relief (less than 6 m). Unit **Rds**: streamlined forms produced by sliding at the glacier bed; surface has high relief (generally greater than 15 m).

Rgn Gravel and sand in areas of hummocky topography. Poorly to moderately well-sorted gravel and sand; surface has moderate to high-relief (greater than 10 m) hummocky topography; deposited on and beneath glacial ice by meltwater stream near ice margin; sediment later collapsed to produce hummocky topography as underlying ice melted.

Rgpe Gravel and sand in pitted outwash plains. Moderately well-sorted, well-stratified gravel and sand. Unit has more than 20 percent collapsed surface, yet exhibits some of the uncollapsed former stream bed. Gravel deposited by braided streams in front of glacier margin.

Rsp Sand and gravel in outwash plains. Moderately well-sorted, well-stratified sand and gravel. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams in front of glacier margin.

Rsp Sand in lacustrine plains. Moderately well-sorted sand and silt underlying flat plains; occupies a low position in the landscape where lakes were dammed by retreating ice margin.

New Berlin Member

Ndr Diamicton in areas of streamlined or rolling topography. Light yellowish-brown, crudely stratified or unstratified, gravelly, clayey, silty sand; generally compact and uniform, except in upper few meters, where sand lenses and other discontinuities are found; upper 3 m contain fractures; surface has low relief (less than 5 m), hummocky topography. Hummocks may, in part, be inherited from surface form of older glacial deposits. Unit **Ndhe** is end moraine that marks still stand of the ice margin.

Ndr Diamicton in rolling topography. Generally compact, uniform basal till; reddish-brown, crudely stratified or unstratified clayey silt; upper 3 m contain fractures. Unit is draped over pre-existing topography.

Ngt Moderately well-sorted, well-stratified gravel and sand in outwash terraces. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams near the glacier margin, then surface abandoned as streams downcut.

Ngpe Gravel and sand in pitted outwash plains. Moderately well-sorted, well-stratified gravel and sand. Unit has more than 20 percent collapsed surface, yet exhibits some of the uncollapsed former stream bed. Gravel deposited by braided streams in front of glacier margin.

Nsp Sand and gravel in outwash plains. Moderately well-sorted, well-stratified sand and gravel. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams in front of glacier margin.

Undifferentiated deposits in the Kettle Moraine area

Hdr Diamicton in areas of rolling topography. Light yellowish-brown, crudely stratified or unstratified, gravelly, clayey, silty sand; generally compact, uniform basal till. Rolling topography with moderate relief (less than 6 m).

Hgn Gravel and sand in areas of hummocky topography. Poorly to moderately well-sorted gravel and sand; surface has moderate- to high-relief (greater than 10 m), hummocky topography; deposited on and beneath glacial ice by meltwater streams near ice margin; sediment later collapsed to produce hummocky topography as underlying ice melted.

Hgpe Gravel and sand in outwash plains. Moderately well-sorted, well-stratified gravel and sand. Unit has more than 20 percent collapsed surface, yet exhibits some of the uncollapsed former stream bed. Gravel deposited by braided streams in front of glacier margin.

Hgt Gravel and sand in outwash terraces. Moderately well-sorted, well-stratified gravel and sand. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams near the glacier margin, then surface abandoned as streams downcut.

Hsp Sand and gravel in outwash plains. Moderately well-sorted, well-stratified sand and gravel. Less than 20 percent of original stream bed interrupted by depressions formed by melting ice blocks. Deposited by braided streams in front of glacier margin.

Hsp Sand in lacustrine plains. Moderately well-sorted sand and silt underlying flat plains; occupies a low position in the landscape where lakes were dammed by retreating ice margin.