

# Deglacial Chronology of the Sturgis Moraine in South-Central Michigan and Northeast Indiana

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## Abstract

The landscape of south-central Michigan and northeastern Indiana was formed from the retreat of the Saginaw Lobe of the LIS. Studying this landscape aids an understanding of the climate conditions during the retreat of the lobe from its LGM position. The purpose of this study is to generate chronology for the retreat of the Saginaw Lobe by dating the Sturgis Moraine. Previous work suggests that the Sturgis Moraine formed sometime between 15.5 <sup>14</sup>C and 16.1 <sup>14</sup>C kysr BP. To date the Sturgis Moraine, Livingstone sediment cores were collected from lakes associated with the moraine. Ages of 13.7±60<sup>14</sup>C, 13.75±80<sup>14</sup>C, and 13.3±60<sup>14</sup>C kysr BP were from wood fragments at the bottom of each sediment core. These ages are similar to the age of the Ft. Wayne Moraine and the Valparaiso Moraine.

## Introduction

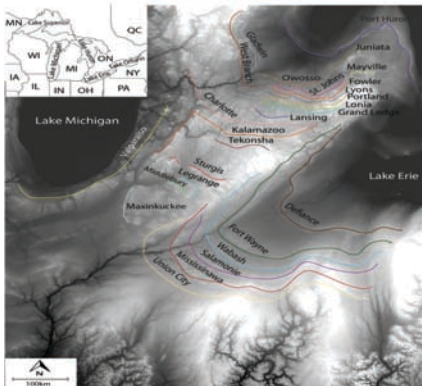


Figure 1. Map of moraines in northern Ohio, Indiana, and central Michigan. Adapted from Leverett and Taylor (1915).

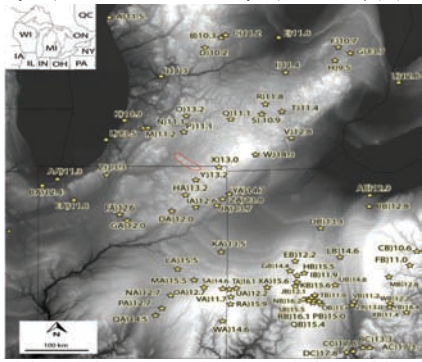


Figure 2. Map of radiocarbon dates for deglaciation. Yellow stars represent the location where the samples were collected. Red stars indicate the Sturgis Moraine. Radiocarbon dates are provided to the nearest hundred. Adapted from Sykes (2004).

## References

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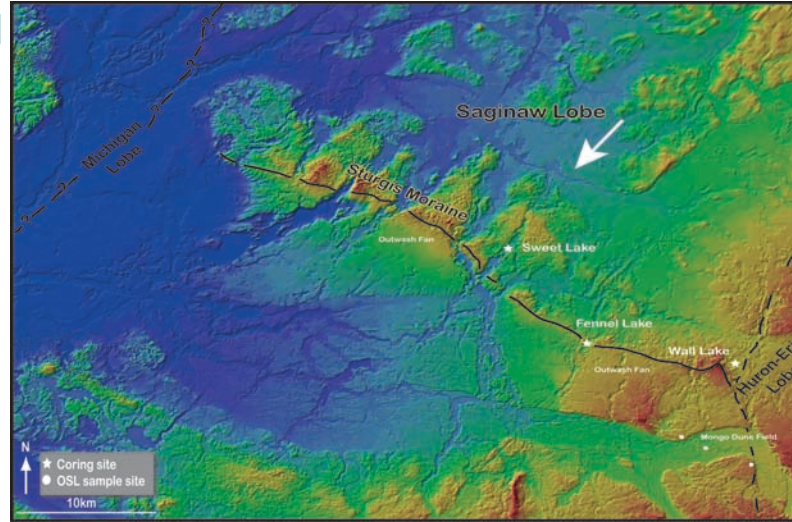


Figure 3. Digital elevation model of the study area. Red color represents areas of higher elevation while blue represents areas of low elevation. The solid black line is the ice margin at the Sturgis Moraine.

## Methods

**Site Selection:** Samples were collected from three scour lakes within tunnel channels associated with the moraine. Scour lakes within meltwater channels are preferred over kettle lakes to minimize the organic accumulation lag from meltout of buried ice.

**Core Recovery:** A hydraulic Livingstone piston corer was used to extract one meter sections of sediment close to each lake's center. Overlap cores were extracted 1m from the original hole.

**Core Description:** Cores were photographed immediately after splitting and a detailed laboratory description of each core was made noting color, apparent grain size, sedimentary structure, and disturbances.

**Magnetic Susceptibility:** Relative measurements of iron, magnetite, and other magnetic sediments, within the sediment cores were measured using Bartington magnetic susceptibility instrument with a MS-2 probe at 2cm interval.

**Loss-On-Ignition:** Sediment samples of 0.5cm<sup>3</sup> at 2cm intervals were weighed at 100°C, 550°C (organic matter), and 950°C (carbonate).

**Radiocarbon Dating:** Identifiable terrestrial plant macrofossils were wet sieved from the bottom section of each sediment core and radiocarbon dated with the AMS procedure at The Woods Hole Oceanographic Institute.

**OSL Sampling:** Soil pits were dug to collect samples of sand for OSL dating. Samples were collected from the C-horizon of the soil within several sand dunes of the Mongo Dune Field.

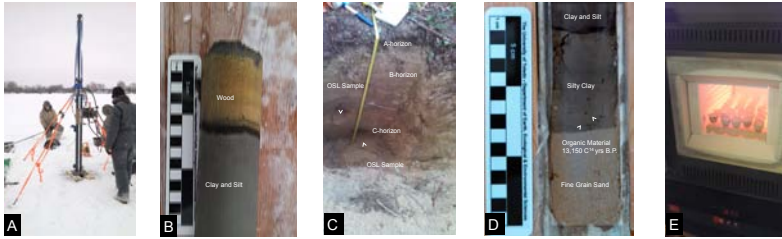


Figure 4. Field methods. A) Hydraulic Livingstone piston corer. B) Sediment core from Fennel Lake immediately after extraction. C) OSL pit, sand sample was taken from the hole in the pit wall. D) Basal section of sediment core from Sweet Lake E. LOI samples within a Muffle Furnace.

## Acknowledgements

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## Results

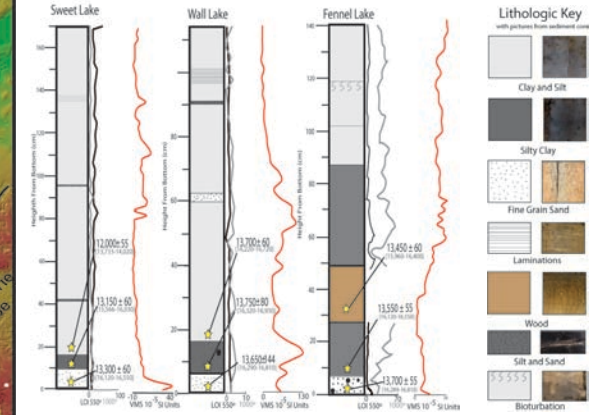


Figure 5. Lithologic descriptions of the basal sections of each lake's sediment core. The red line is the MS data and the grey line and black line represent LOI (950° and 550°C). Stars indicate locations of radiocarbon samples. Bracketed numbers are the calibrated radiocarbon ages at the two sigma range

## Discussion/Summary

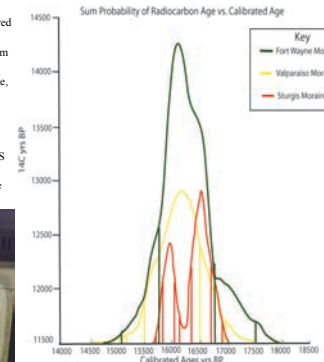


Figure 6. Sum probability of calibrated radiocarbon ages. Select radiocarbon dates for each lobe were calibrated using the software CALIB 7.0 (Stuiver and Reimer, 1993). Bracketed numbers are the one and two sigma range of calibration. The Valparaiso Moraine, between the Fort Wayne Moraine, and the Sturgis Moraine were all ice free around 16250 B.P.

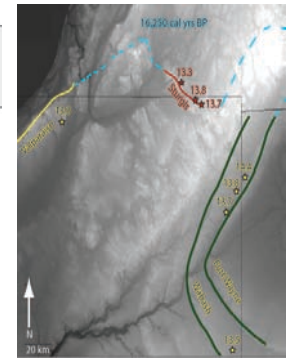


Figure 7. Ice margins (dashed line) for the Huron-Erie, Michigan, and Saginaw Lobe at approximately 16,250 cal yrs BP.

**Summary:** The Sturgis Moraine is now dated. It corresponds with the Valparaiso Moraine of Michigan Lobe and the Fort Wayne Moraine of the Huron-Erie Lobe. Forthcoming OSL dates and surficial mapping will strengthen this deglacial chronology.