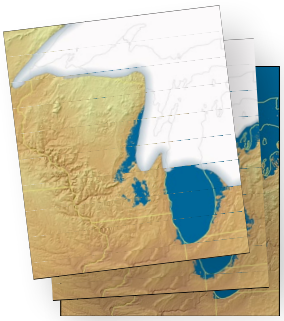

Laurentide Ice Sheet: Ice-Margin Positions in Wisconsin

David M. Mickelson and John W. Attig

Educational Series 56 | 2017
Second Edition

This series of maps shows the chronology of the Laurentide Ice Sheet's many advances and retreats. The 44 maps cover Wisconsin and parts of surrounding states. They track the location of the glacier and the extent of ice-marginal lakes between 31,500 and 11,000 calendar years ago. We used mostly 500-year intervals between each map; we used different intervals when a significant event occurred that would otherwise be missed, or when we have good controls on the ice-margin position. Where helpful, we have referenced major regional events, especially if they are well-documented in the geologic literature. For more detailed studies on the subject, please see our list of references.

Nearly all of the maps are based on our long-distance and uncertain correlation of landscape features that mark former positions of the ice margin. Few of the ice-margin positions are closely constrained in time by radiocarbon or other types of age estimates, and positions of the ice margin during recession are particularly poorly constrained. Therefore, unless otherwise noted in the map description, there are no numeric age constraints on the ice margins.

Wisconsin ice-margin names are summarized in Attig and others (2011) and Syverson and others (2011); occasionally ice-margin names from Illinois and the Upper Peninsula of Michigan are used where the margins are continuous across the state borders. Note that the distance of ice-margin recession and re-advance was significantly greater in Illinois and Indiana than in Wisconsin, especially after 26,000 years ago, likely because the climate was warmer to the south.

Dating ice extents

Radiocarbon age estimates in Wisconsin and Illinois provide some constraints on the initial advance of the Lake Michigan Lobe. In Wisconsin there are very few radiocarbon age estimates between about 30,000 and 16,000 calendar years ago that control ice-margin positions, and none at all dating advances out of the Lake Superior basin. New age estimate techniques provide more accuracy on ice-margin fluctuations, but so far they are limited in both number and extent.

We have used crosscutting relationships of moraines, stratigraphic relationships, and available ages to assemble a series of maps that illustrate our best estimate as to where the ice margin was at various times. For many of the maps there is little or no precise age control, but we hope these maps highlight important areas for future research of ice-sheet chronology.

Lobes of the Laurentide Ice Sheet

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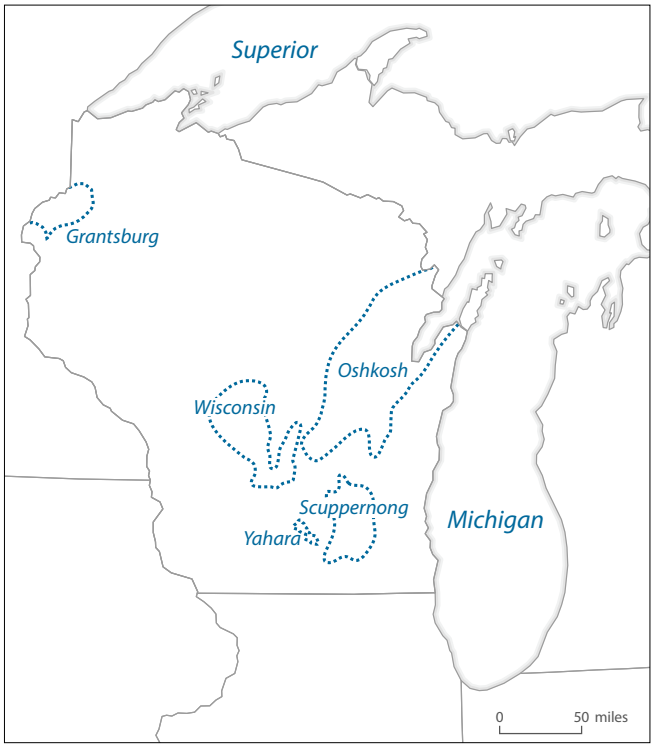
Determining lake positions

Large glacial lakes are shown in Wisconsin, but many smaller ones are not. (Glacial lakes are not shown outside of Wisconsin.) The geologic evidence for these former lakes is the distribution of lake sediment and, in a few places, beaches. The elevations of the lakes depicted on each map were calculated by incorporating an isostatic rebound model that calculates land surface elevations at various times in the past (Clark and others, 1994; James Clark, personal communication, 2010, 2011). For each map, we subtracted those elevations from the present-day digital elevation model (DEM). Those elevations were extrapolated onto the paleo-DEMs to depict a representative shoreline for illustrative purposes.



General location of major glacial lakes in Wisconsin. Glacial lakes were formed and drained as the ice sheet advanced and retreated. These lakes were not all present at the same time.

Acknowledgments

The authors wish to thank the many people involved in this project:

GIS specialists: Michael S. Bricknell, Erin L. Hamilton, Stephen W. Mauel, and Caroline Rose

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NOTE: The ice-margin maps are intended to be used at the 8 ½- x 11-inch page size and no larger; they are not intended to provide the level of details found on larger maps. The maps are best viewed as a continuous sequence.

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Kenneth R. Bradbury, Director and State Geologist

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A sample of some of the references used in putting together this set of maps is listed below.

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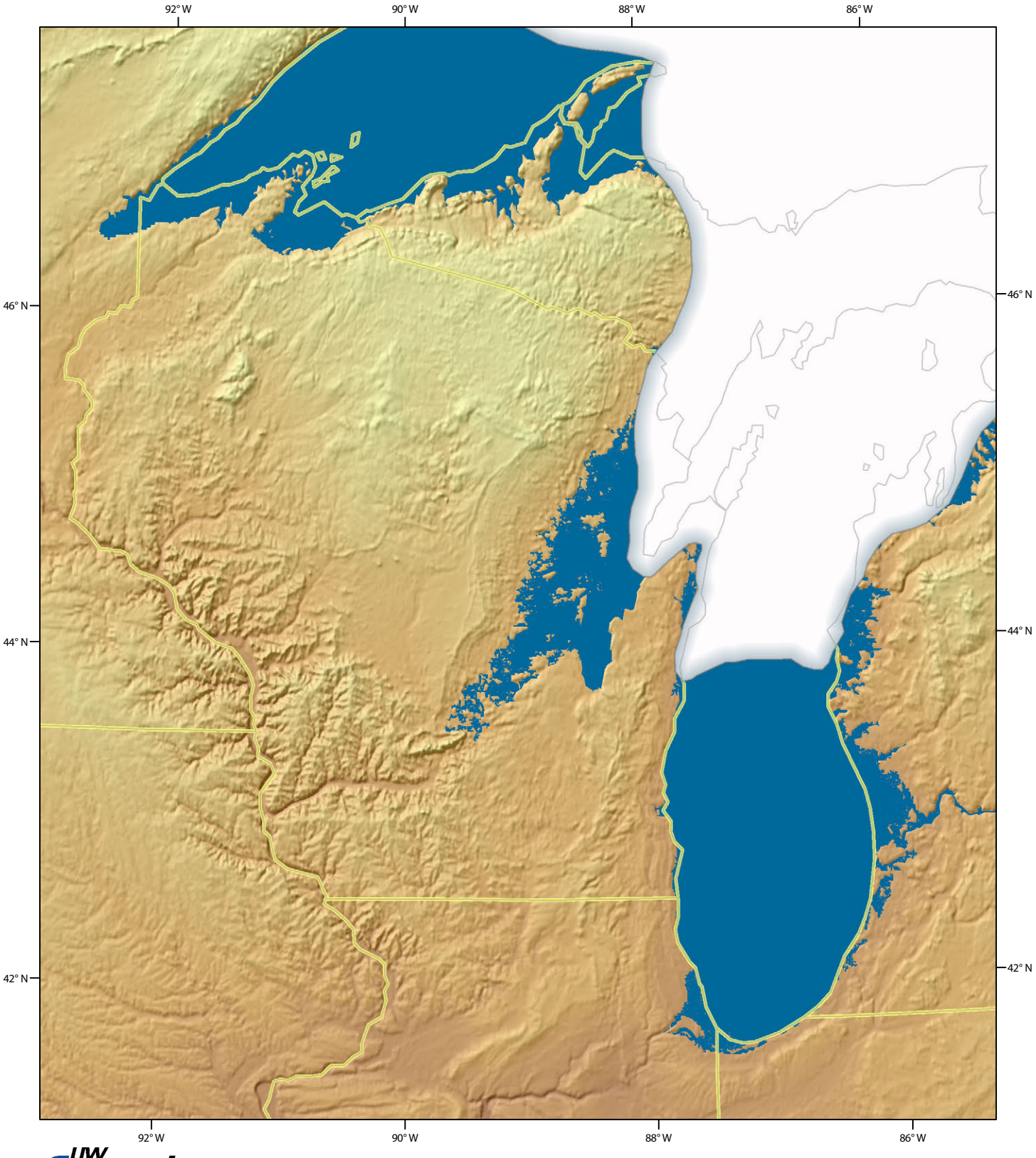
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

31,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice advances into the eastern part of Lake Superior basin and the northern part of the Lake Michigan basin, Lakes Michigan and Superior at higher phases, glacial Lake Oshkosh forms—constraints are dates of 39,350 of hardwood in pink till and 31,640 in lake sediment between two tills in Sheboygan County.



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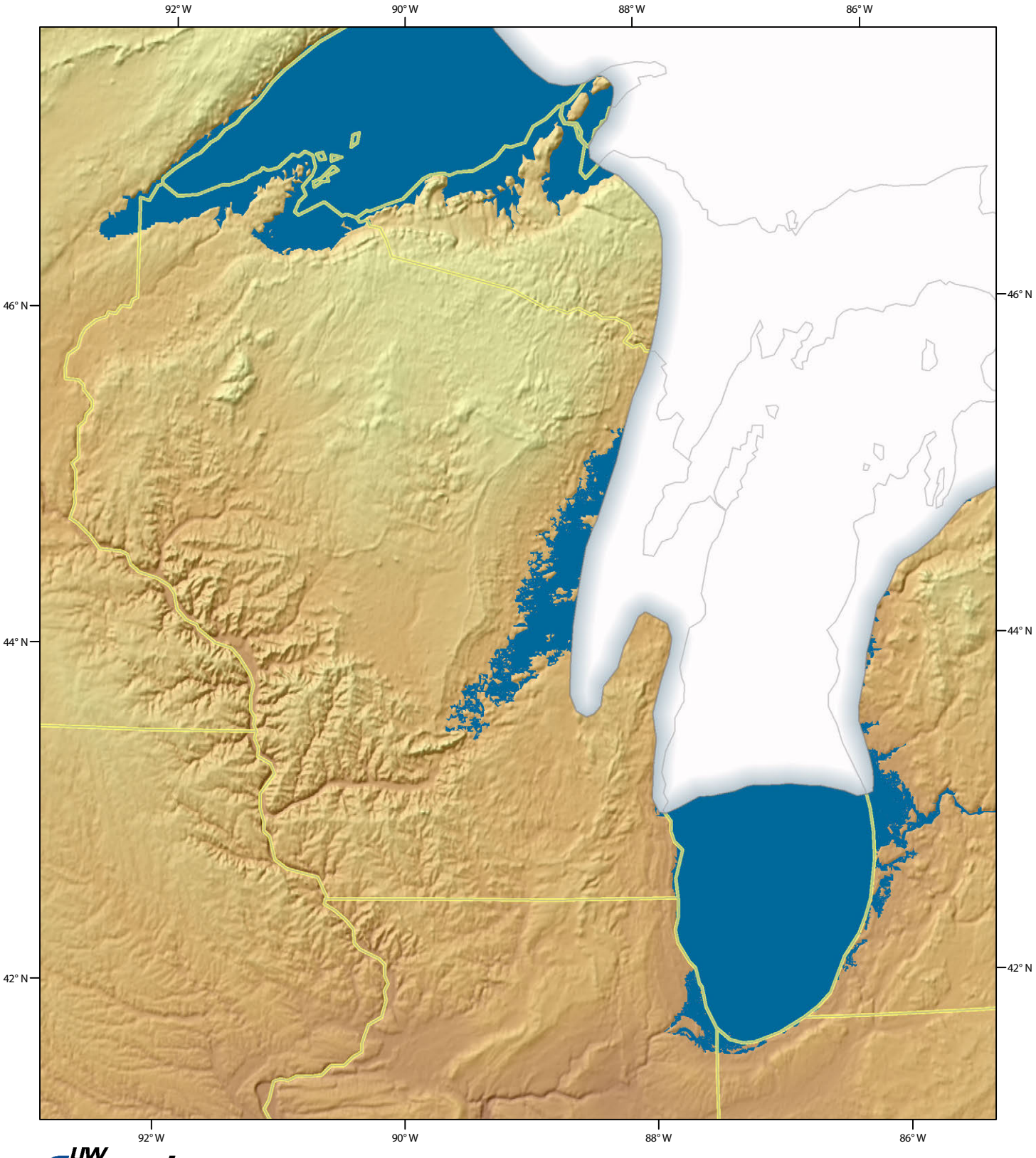
31,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Continued advance.



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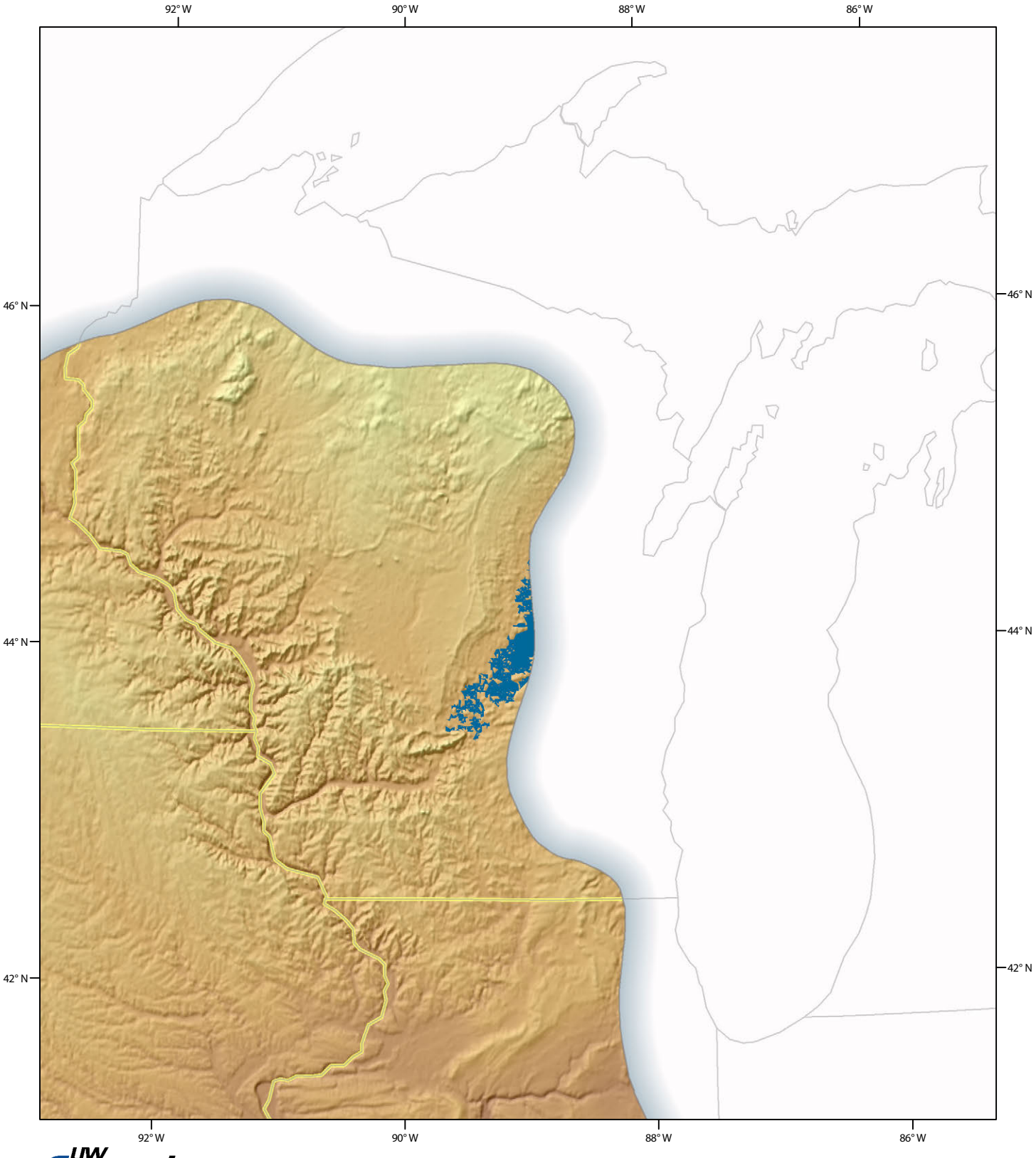
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

30,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice advancing toward the Early St. Croix, Early Chippewa, Stanley, Arnott, and Brooklyn positions.



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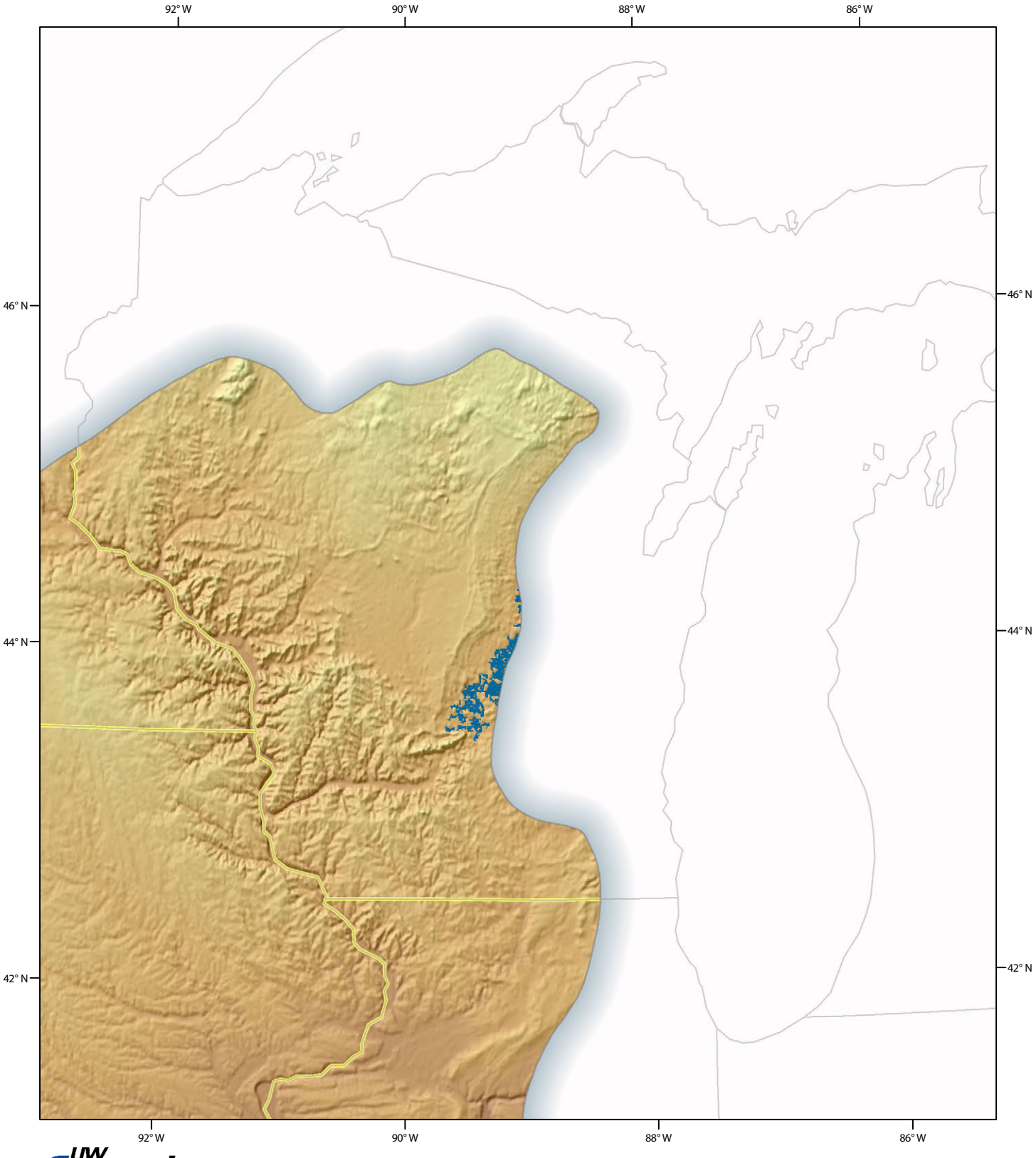
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

29,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Slight advance.



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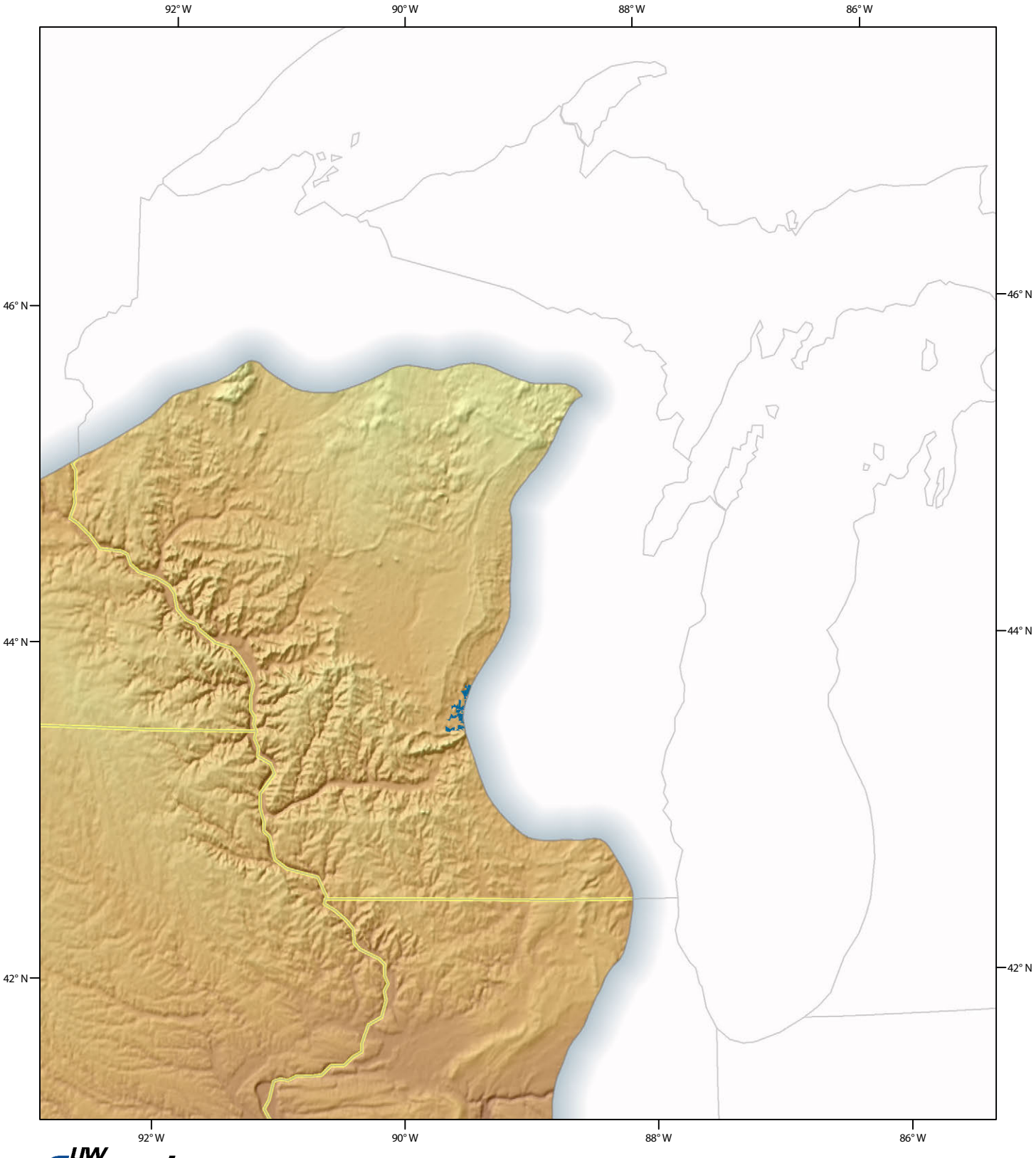
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

29,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Slight advance—several 28,000 to 29,600 ages under Tiskilwa till in Illinois.



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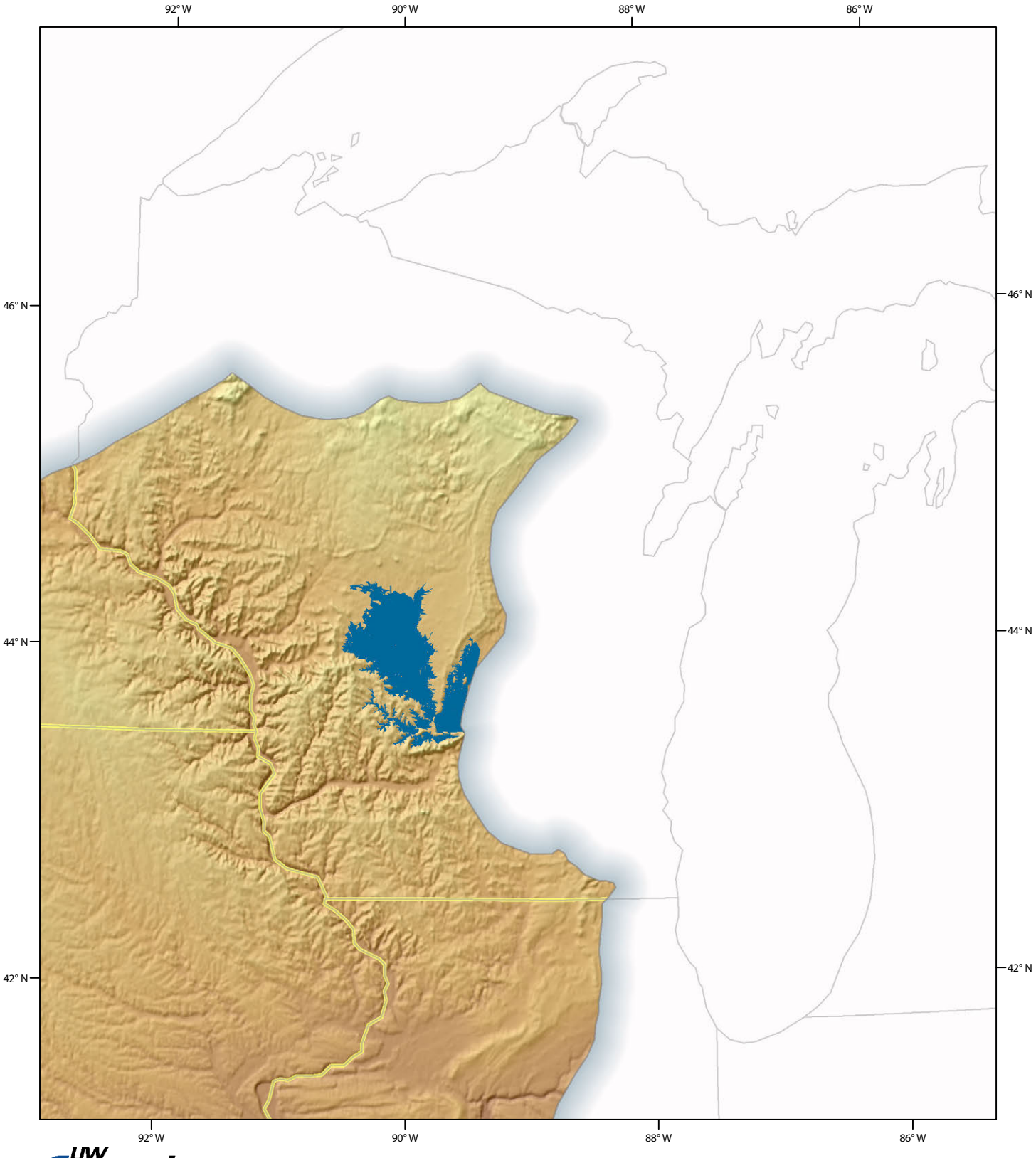
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

28,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Slight advance, glacial Lake Wisconsin forms.



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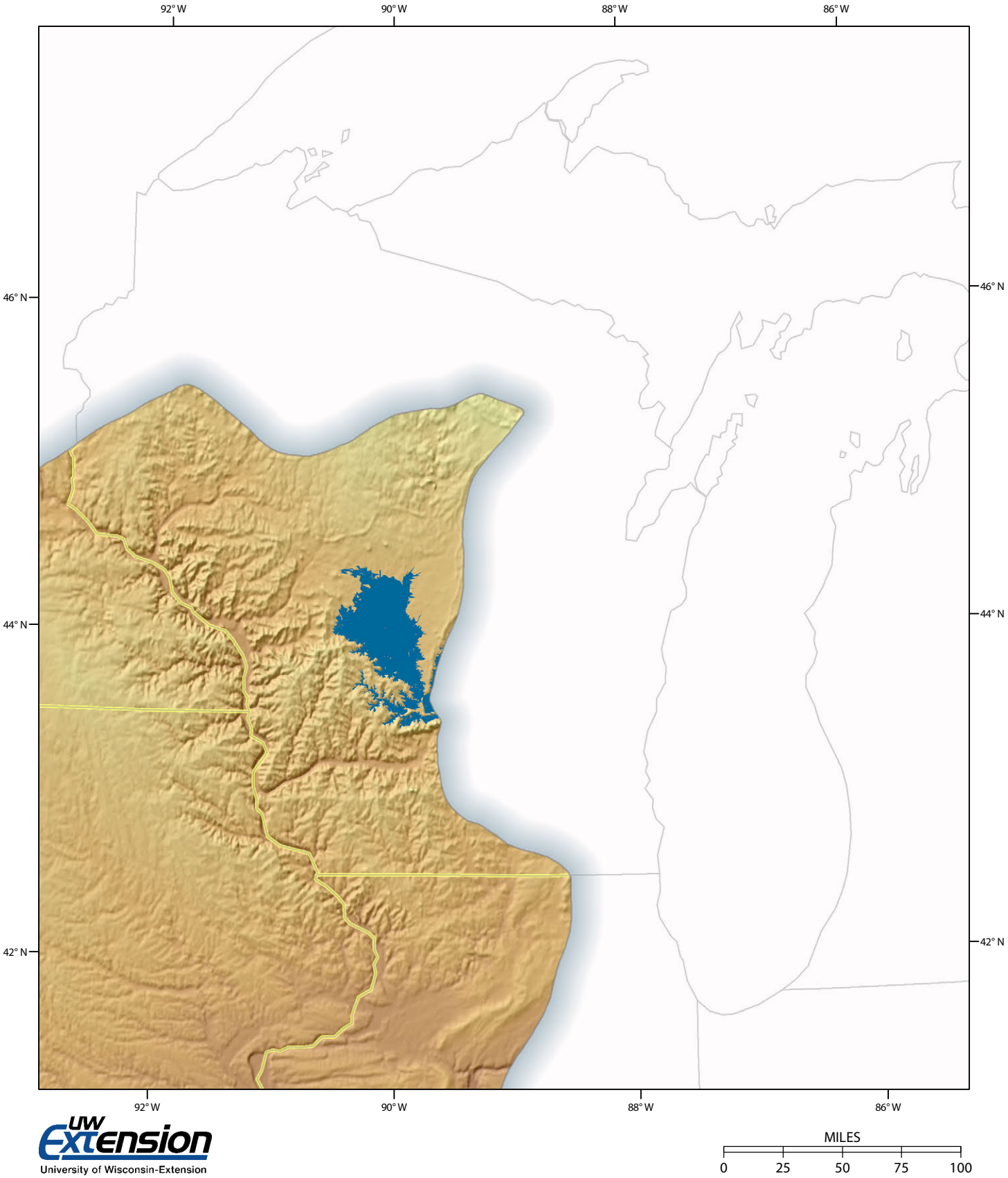
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

28,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Continued minor advance.



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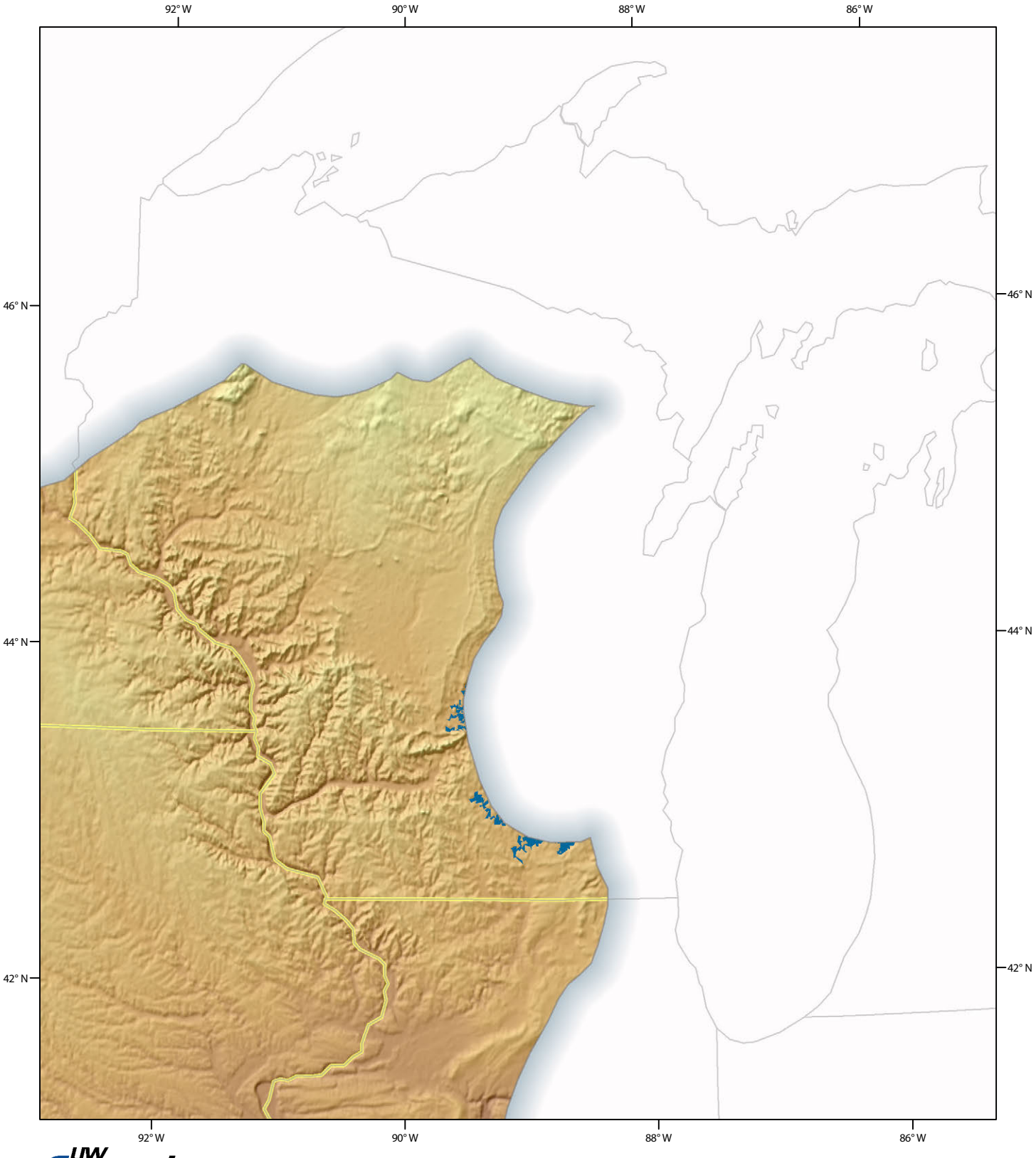
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

27,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor recession, glacial Lake Wisconsin drains.



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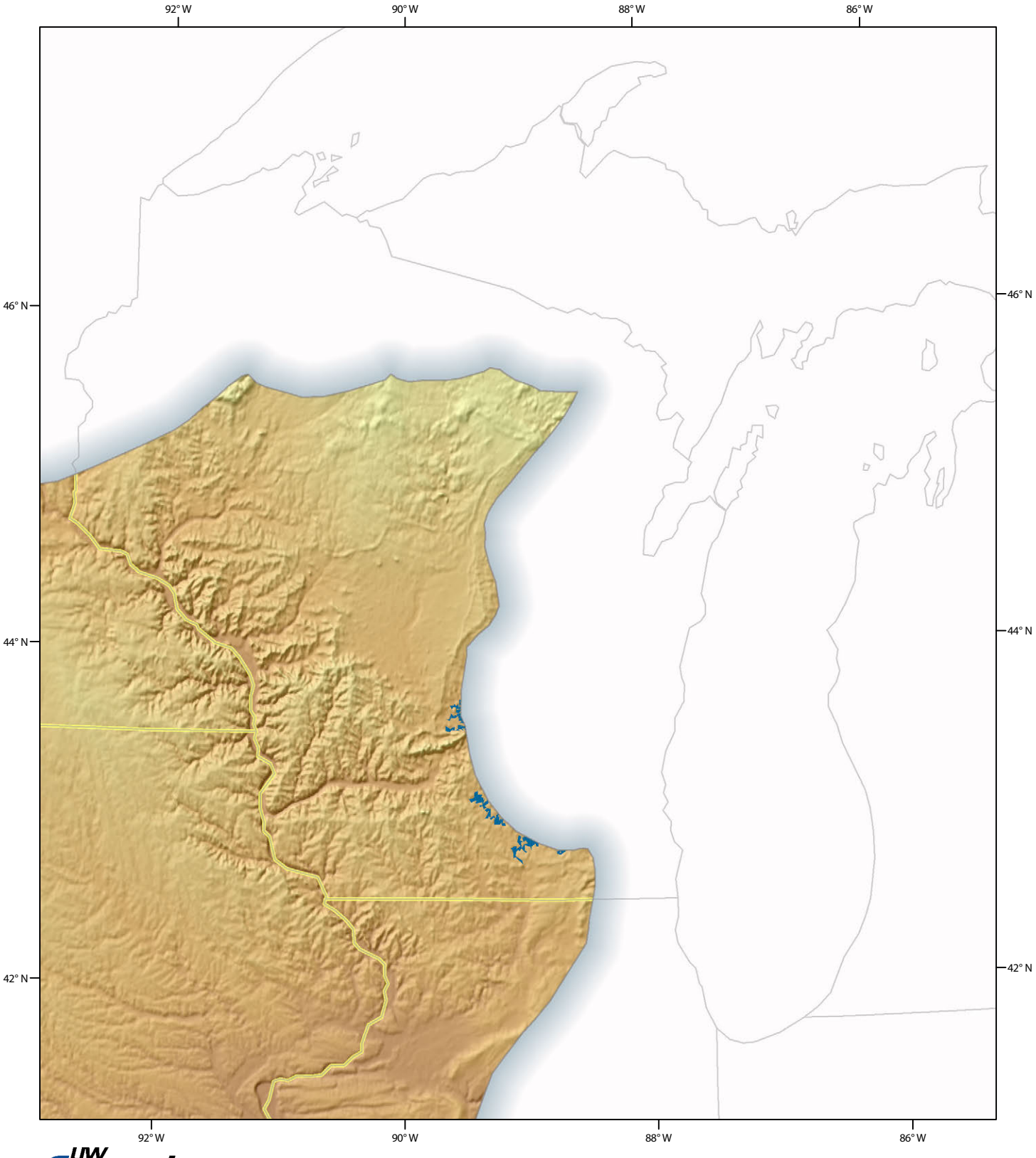
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

27,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor advance and recession, glacial Lake Yahara forms.



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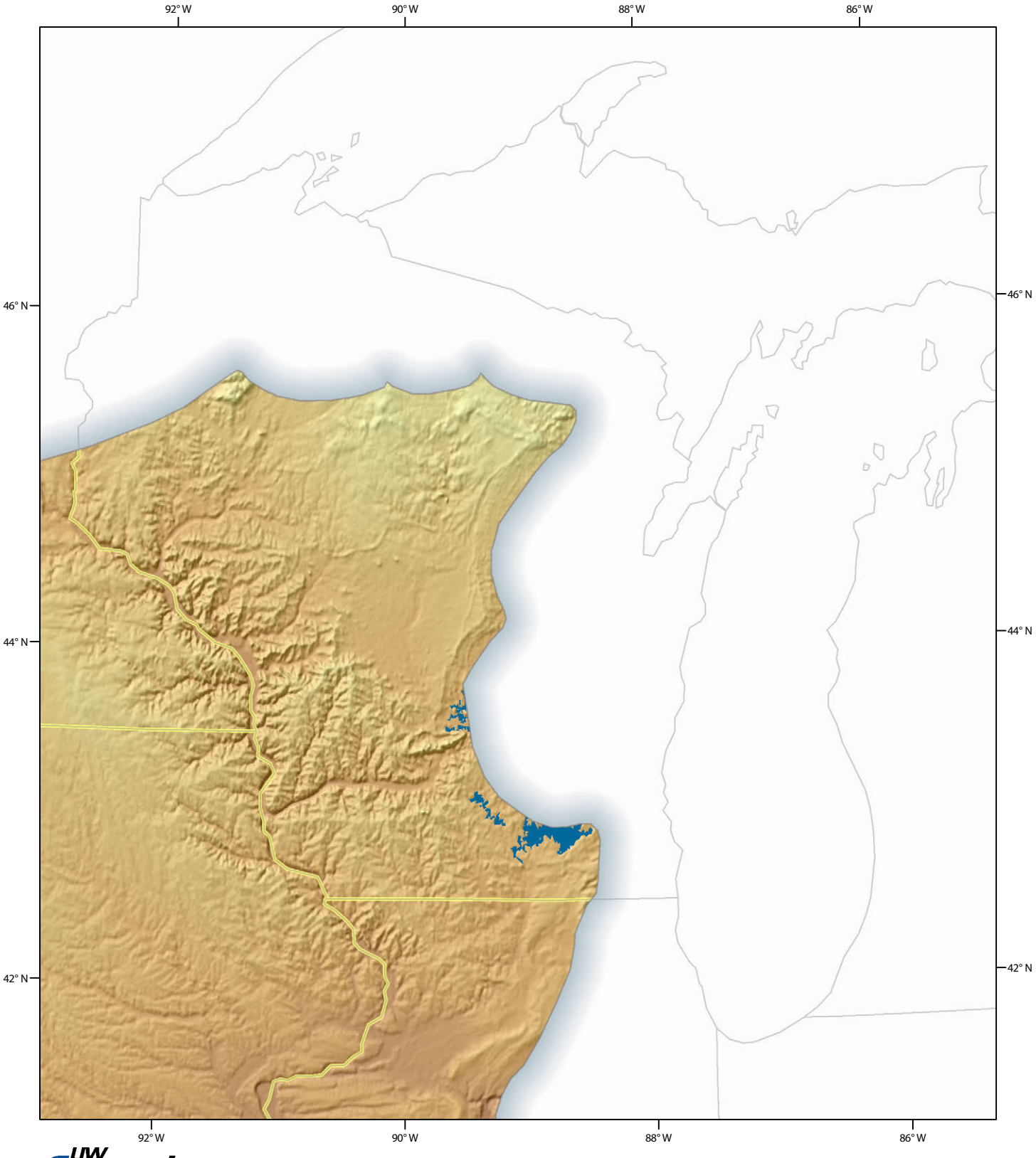
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

26,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice-margin position nearly stable, glacial Lake Scuppernong forms.



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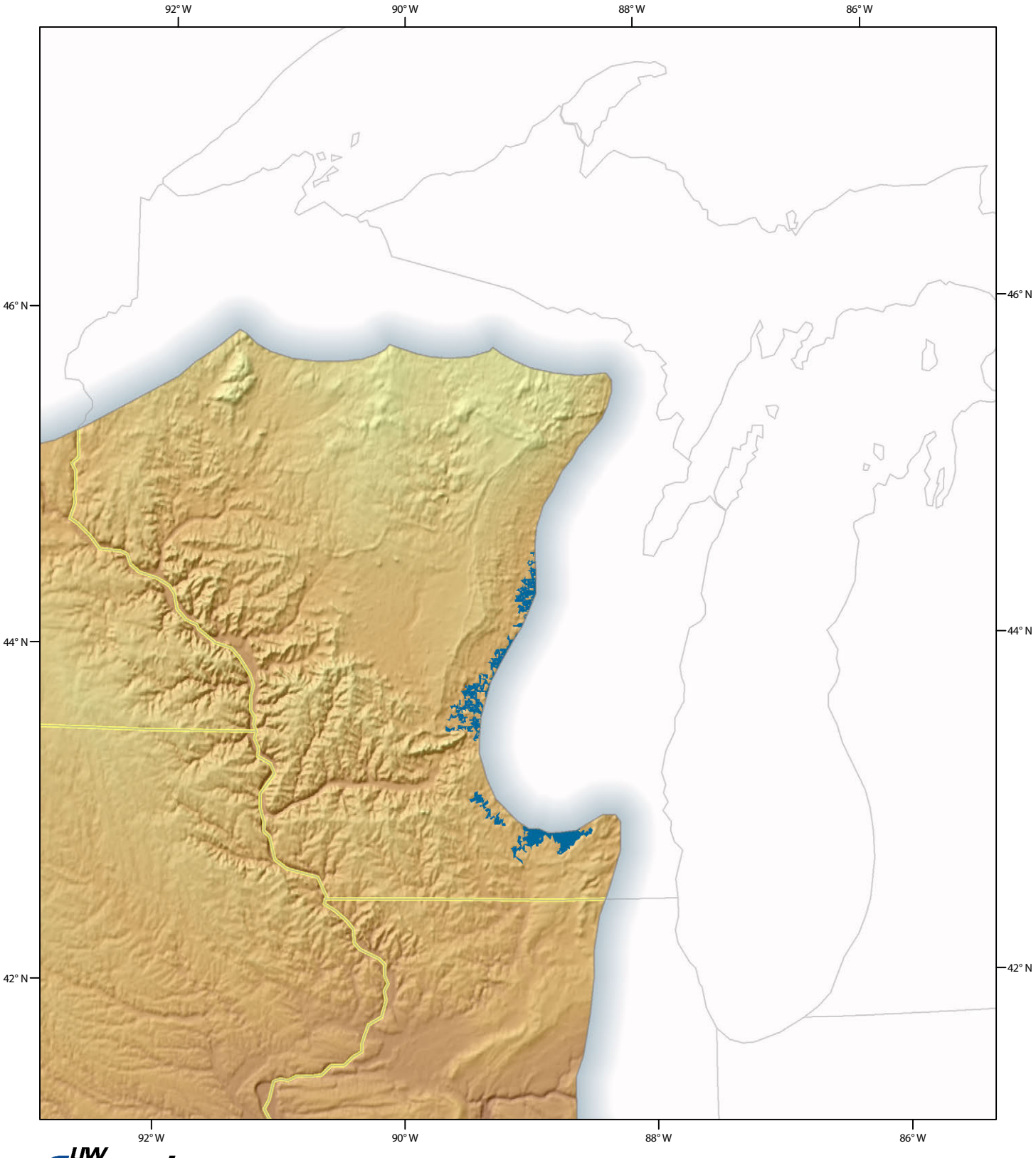
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

26,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor recession, glacial Lake Oshkosh forms.



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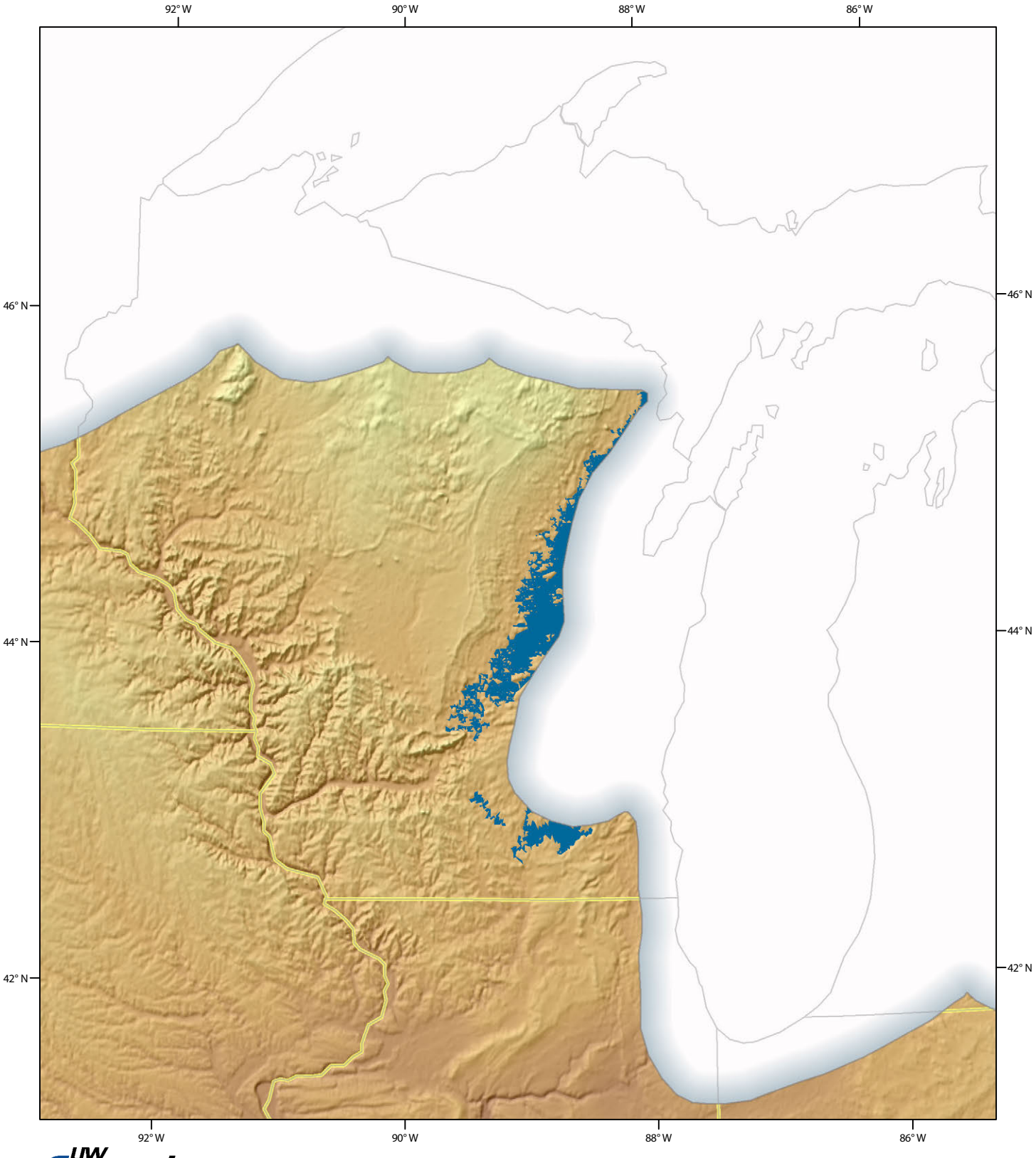
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

25,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor advance or recession.



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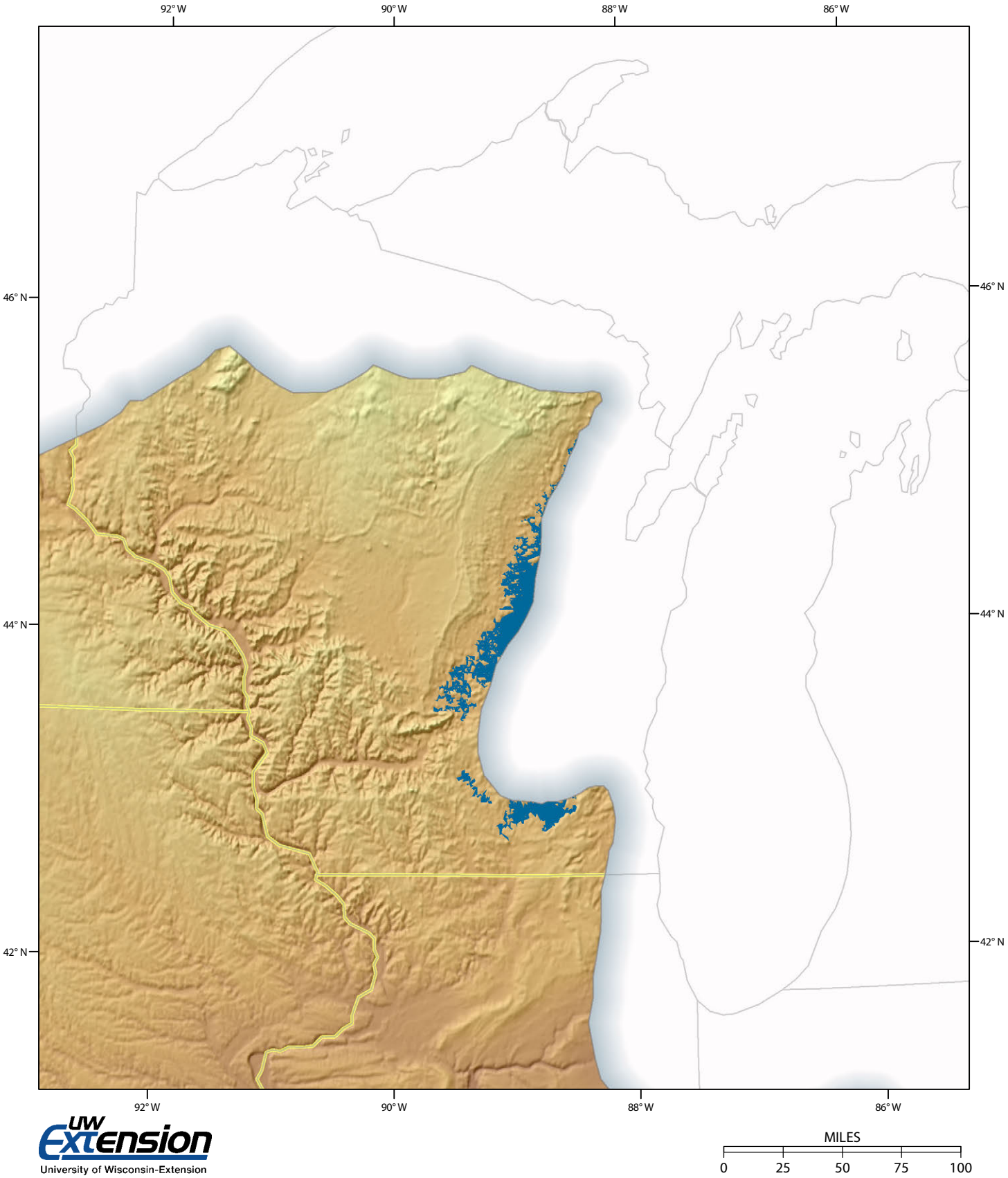
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

25,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor advance.



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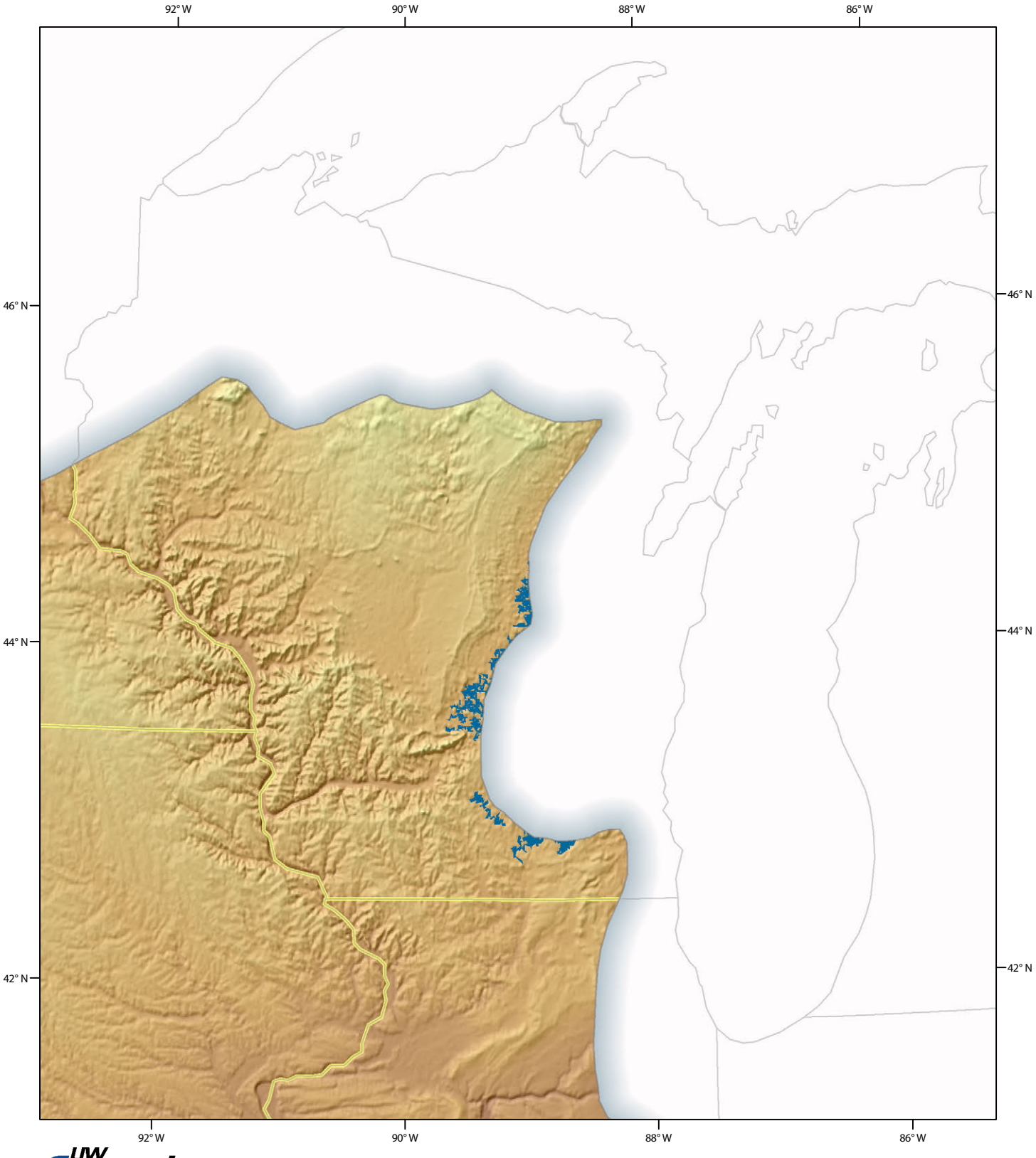
24,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Continued minor advance.



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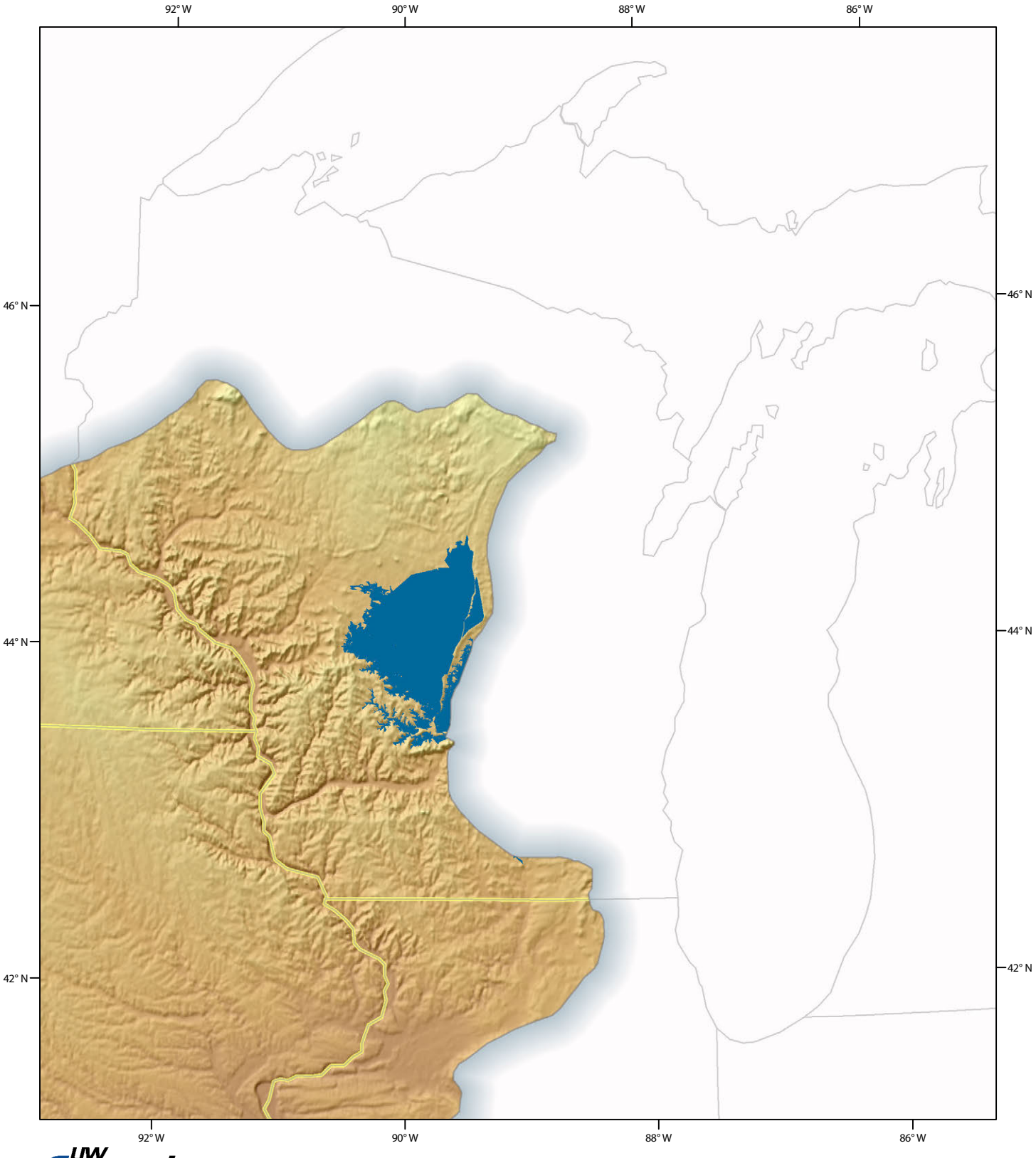
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

24,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Advance to near the Johnstown position, glacial Lake Wisconsin forms as ice margin reaches the eastern Baraboo Hills.



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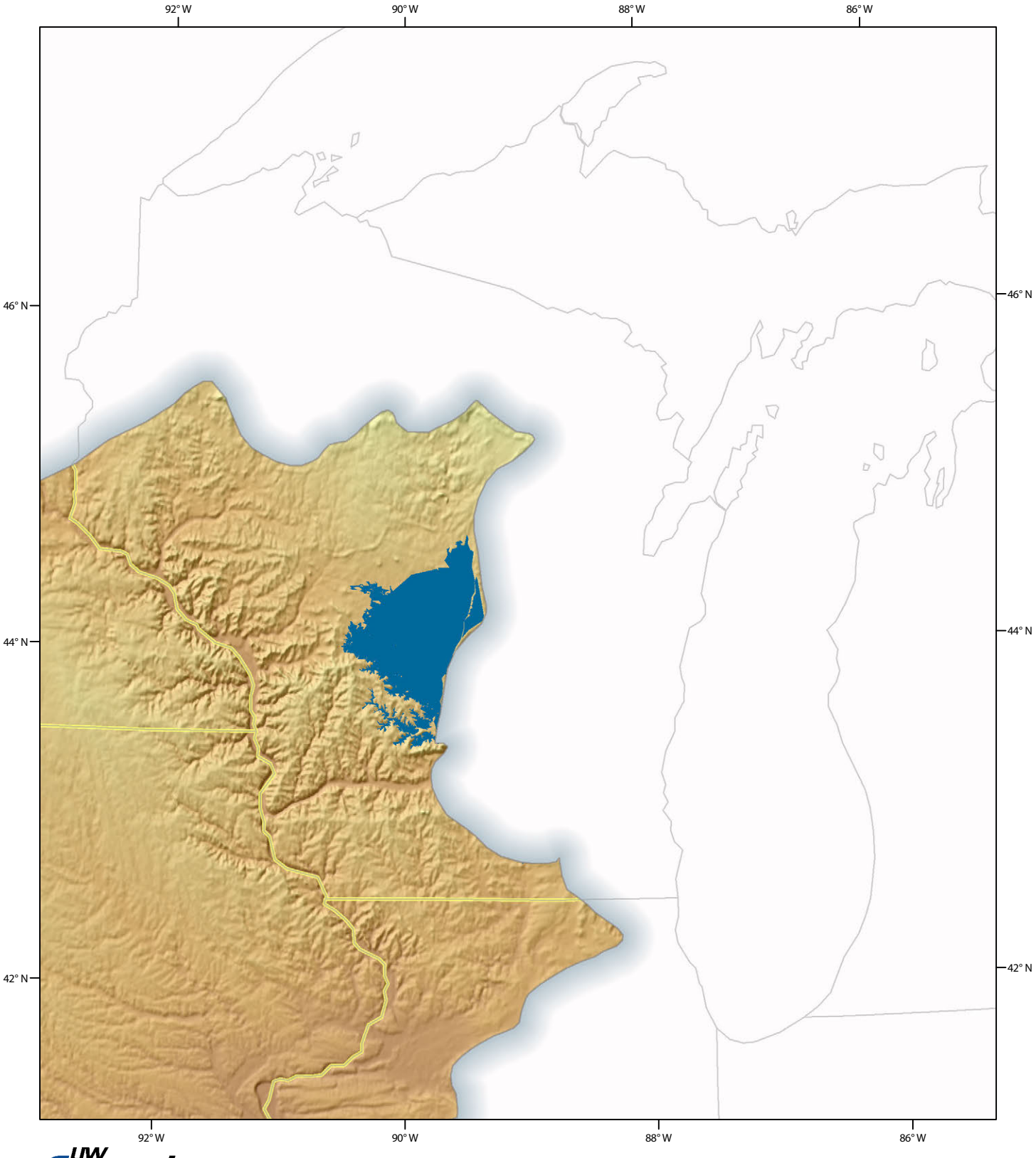
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

23,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice margin at the Hancock, Johnstown, Bloomington positions —several 23,000 dates in Illinois.



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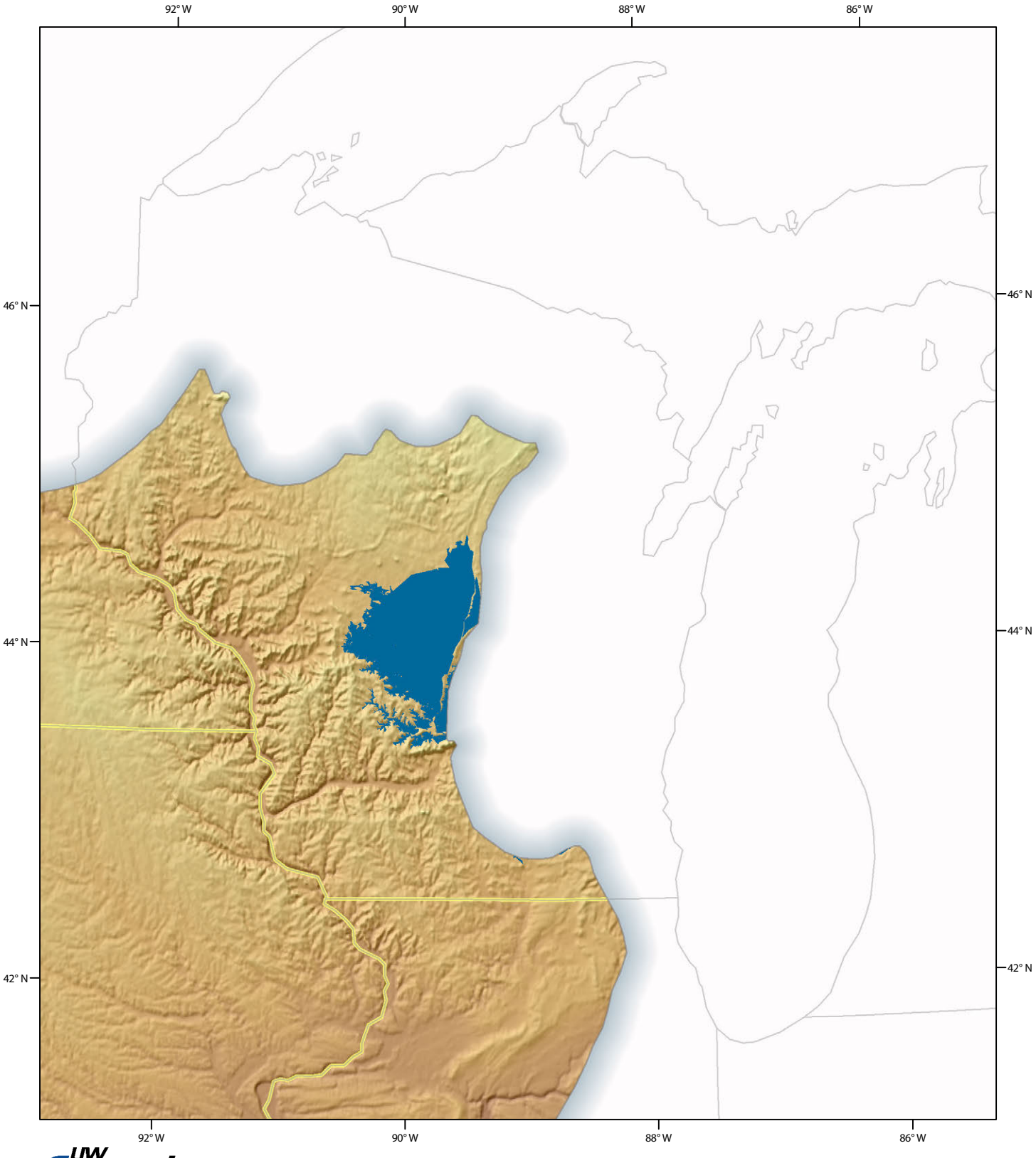
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

23,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor recession and advance to the Parrish, Harrison, Chippewa positions.



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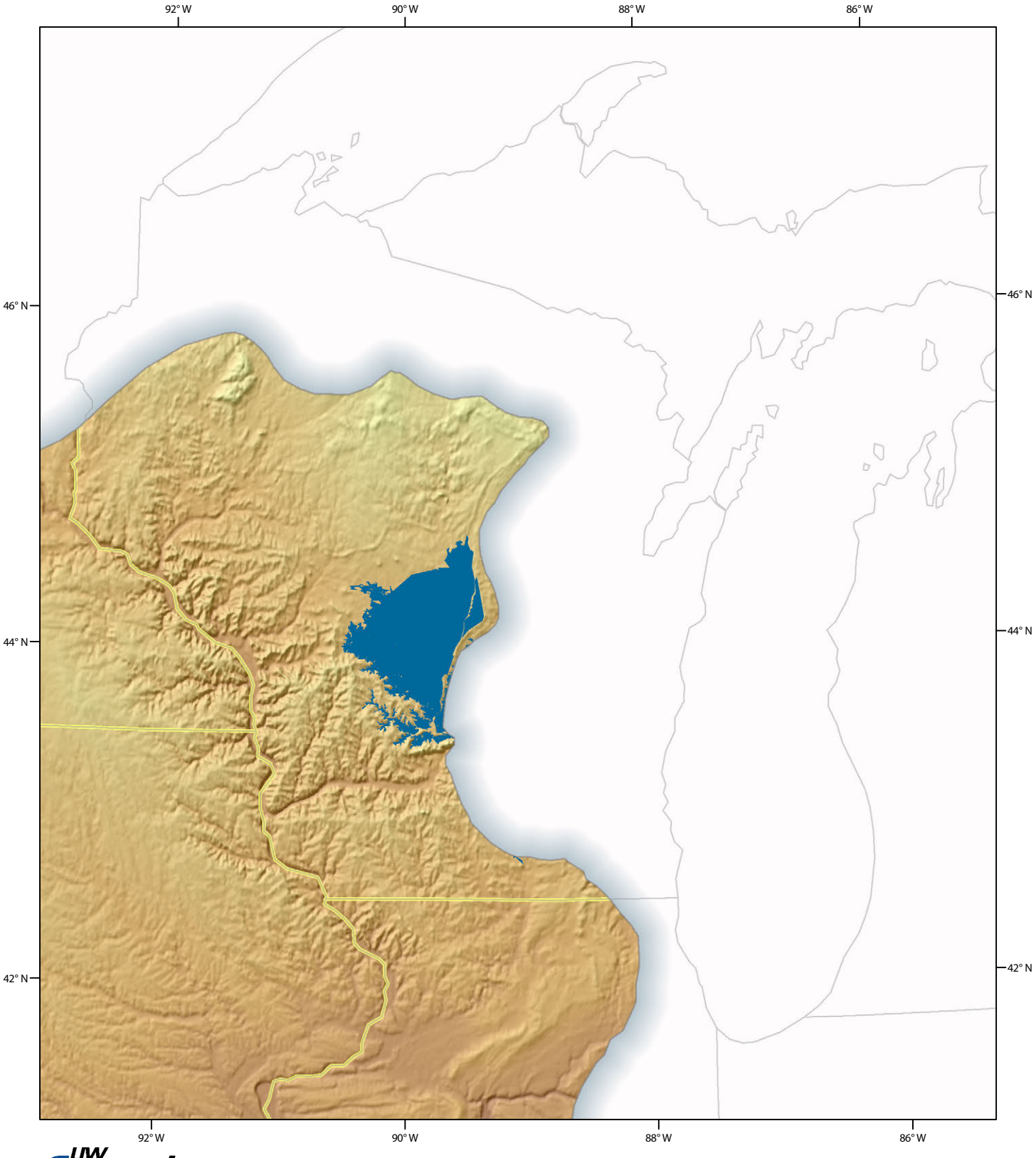
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

22,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Minor recession.



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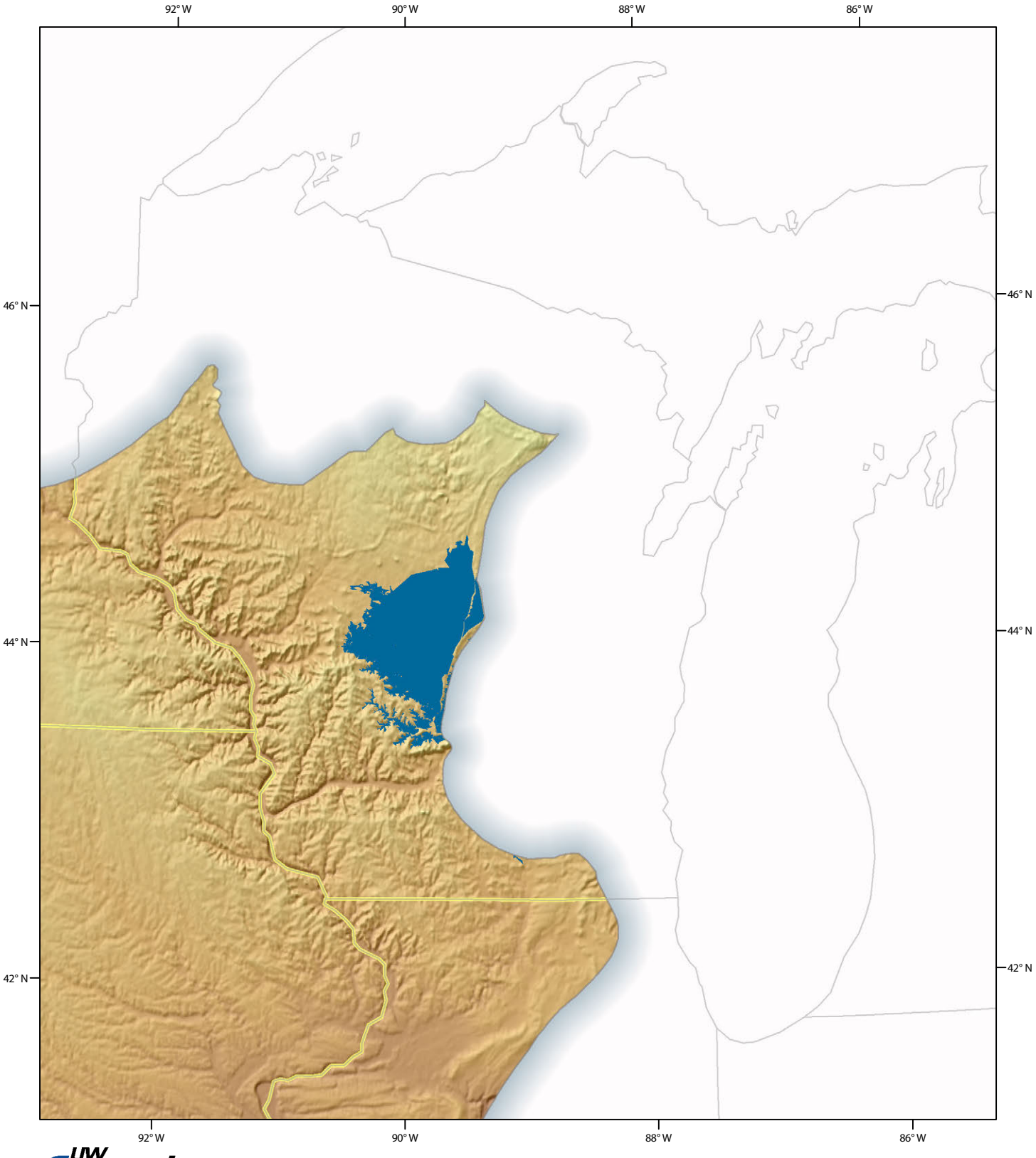
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

22,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Chippewa and Wisconsin Valley Lobes advance, Green Bay Lobe behind Almond position.



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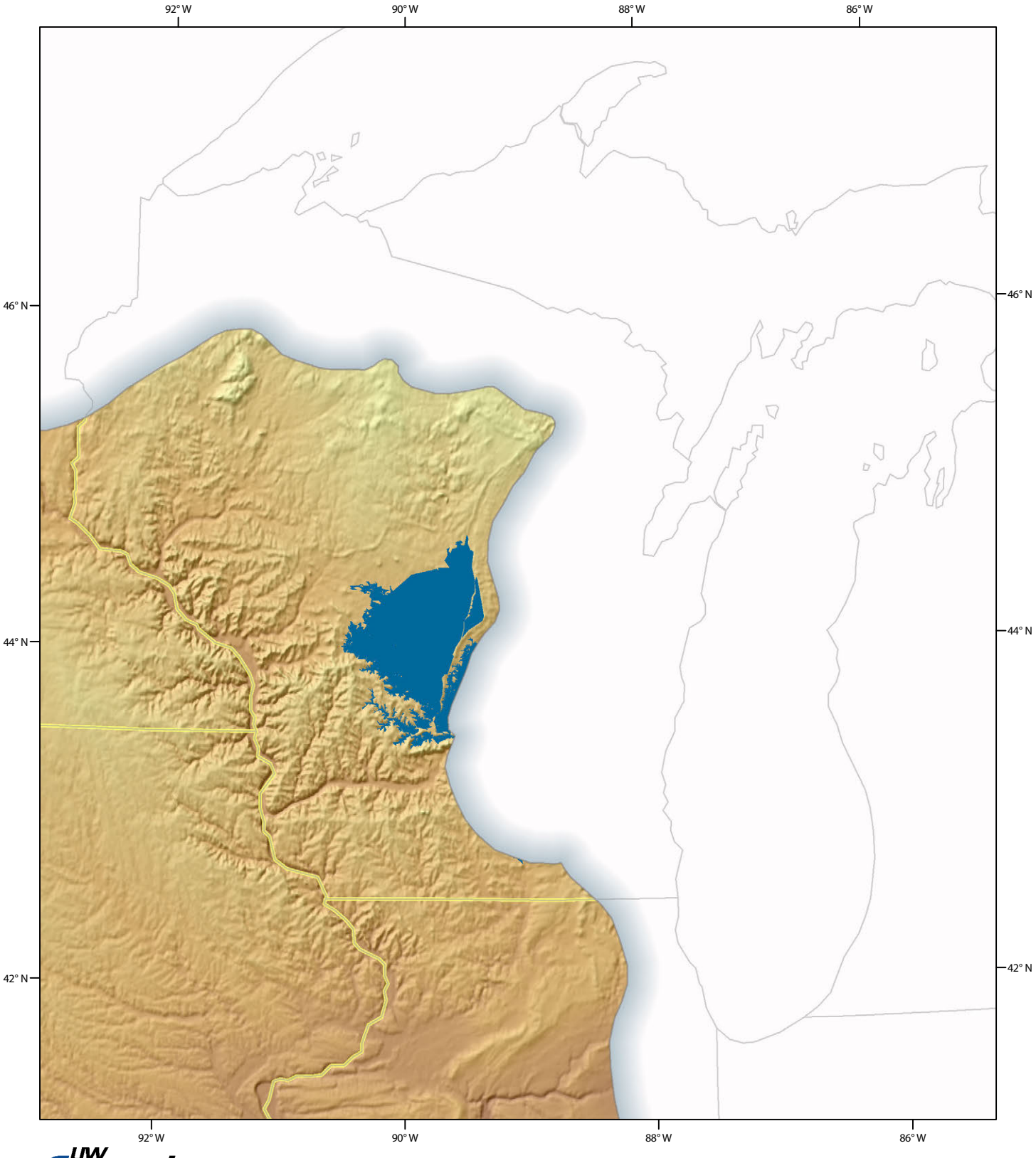
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

21,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession.



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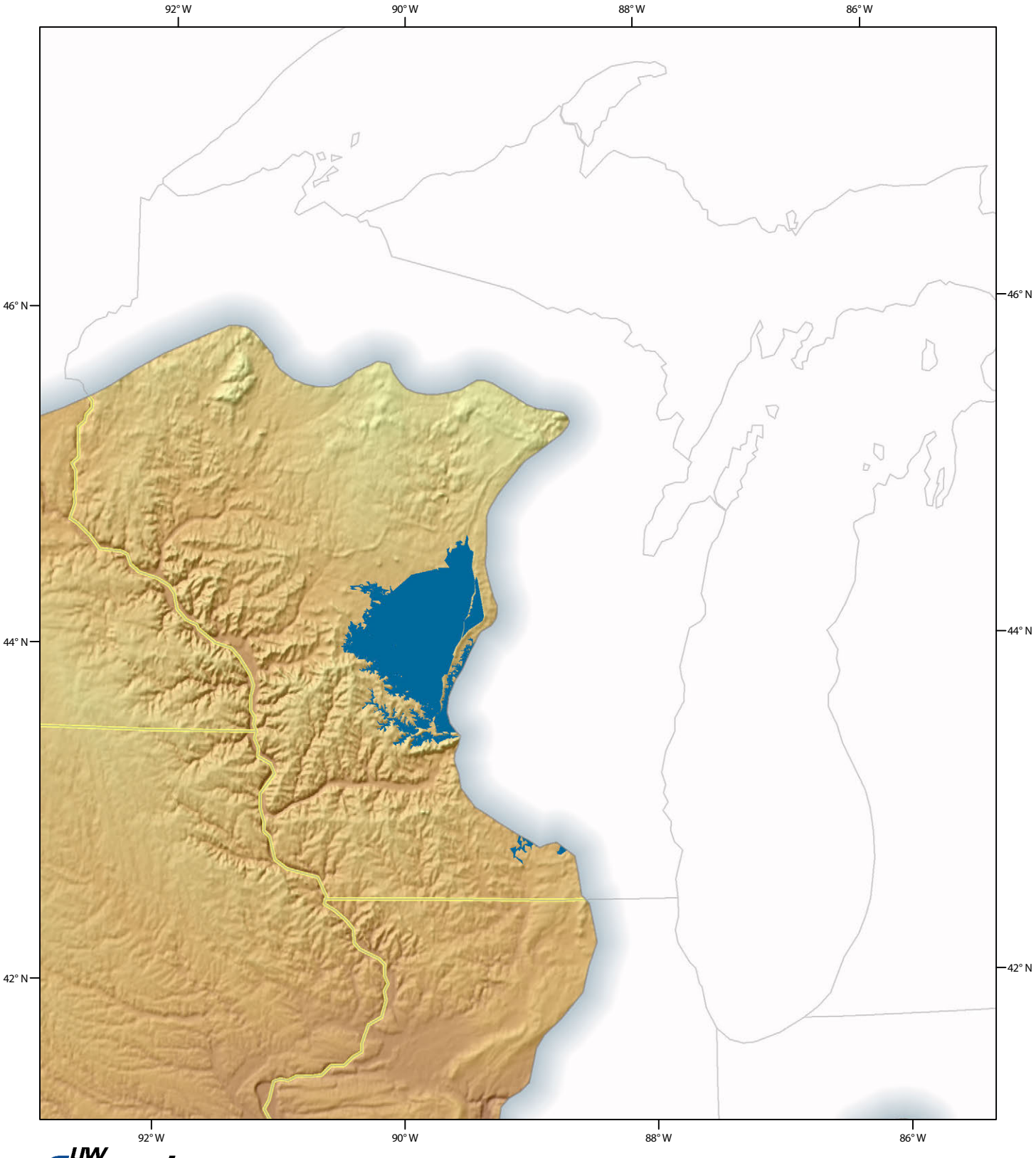
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

21,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Little change in Wisconsin; recession to the Paxton, Farm Ridge, Chatsworth, and St. Charles positions in Illinois.



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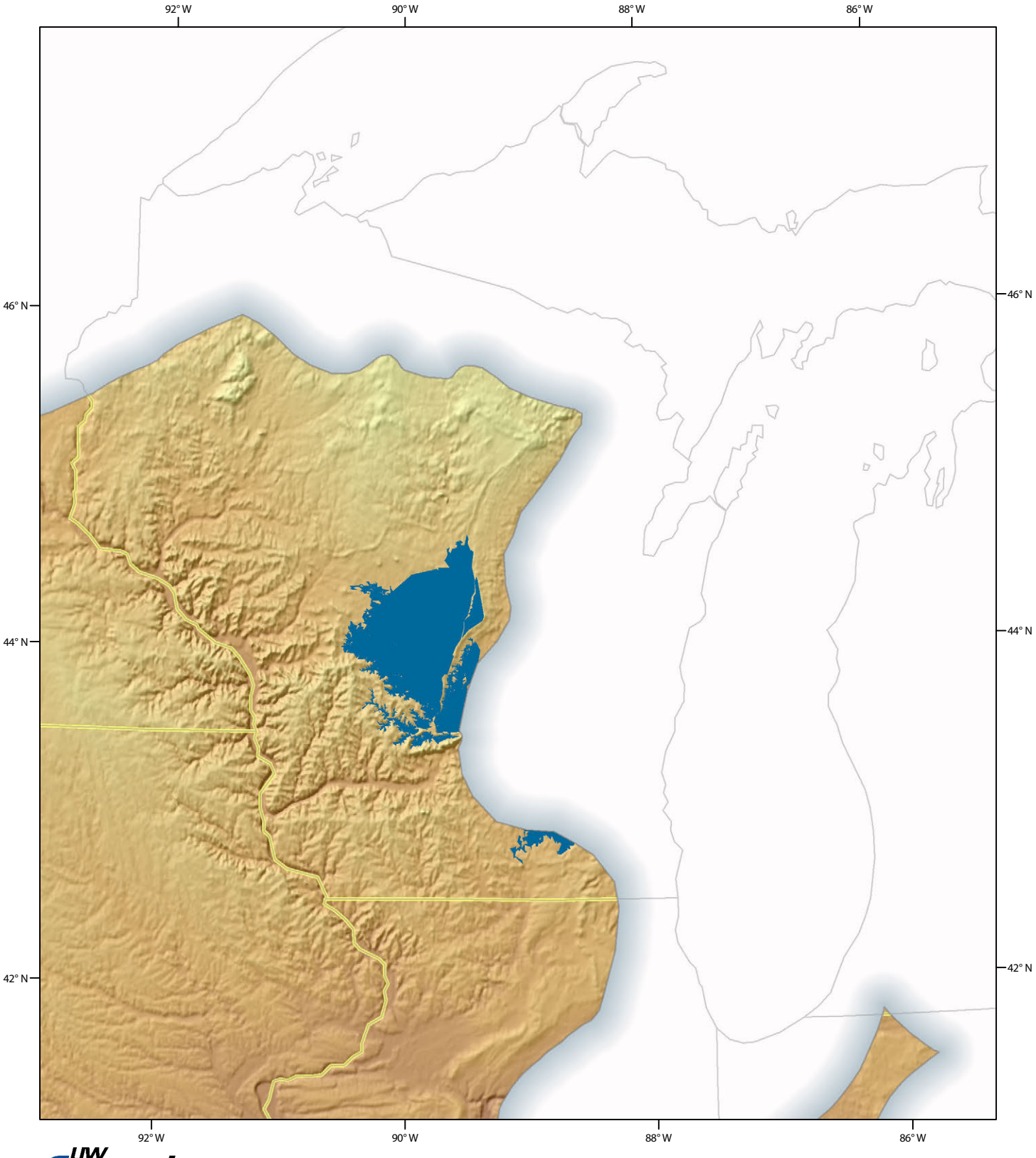
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

20,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice still on eastern Baraboo Hills, ice at Marseilles position in Illinois.



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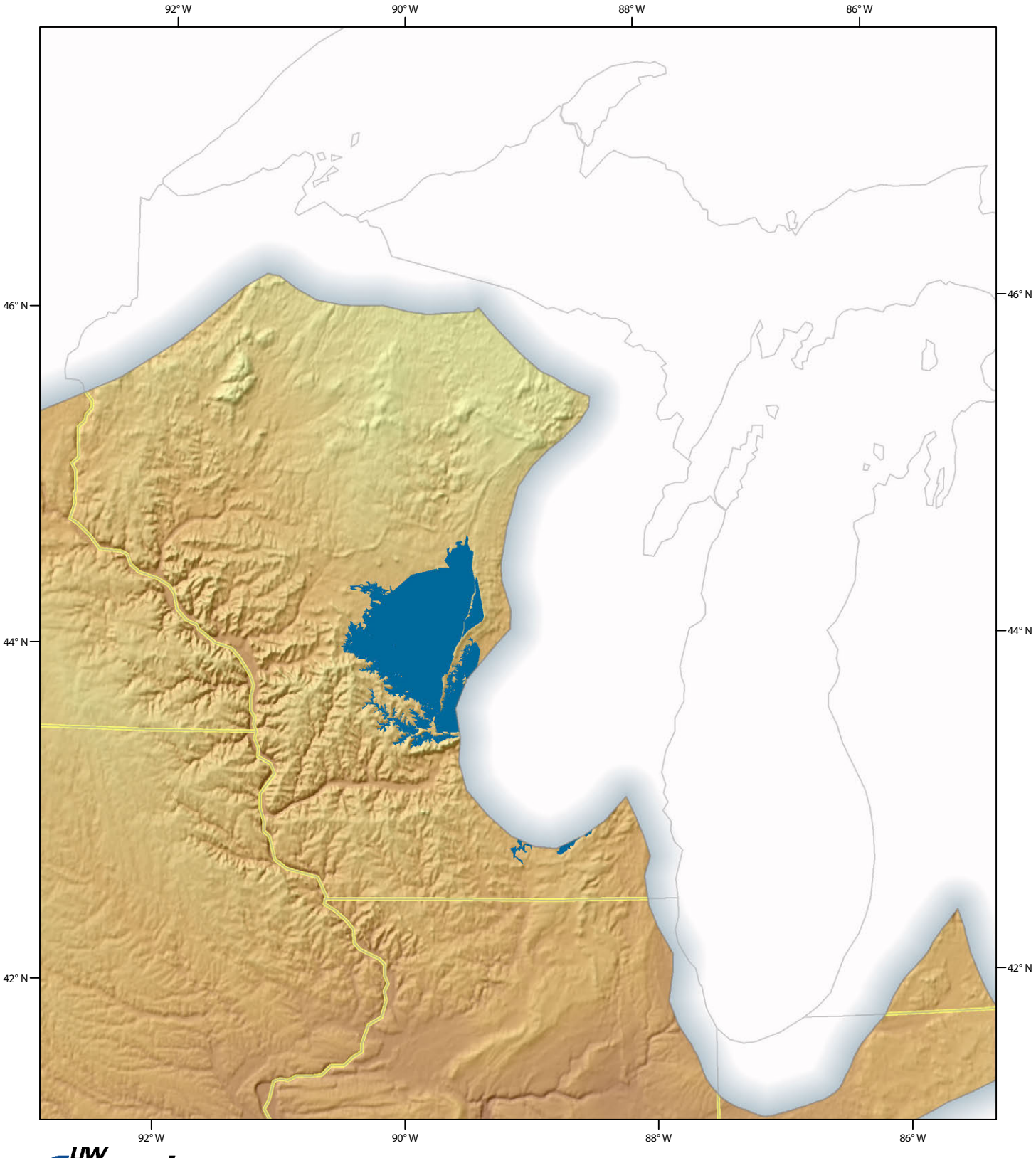
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

20,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice still on eastern Baraboo Hills, recession from Marseilles position.



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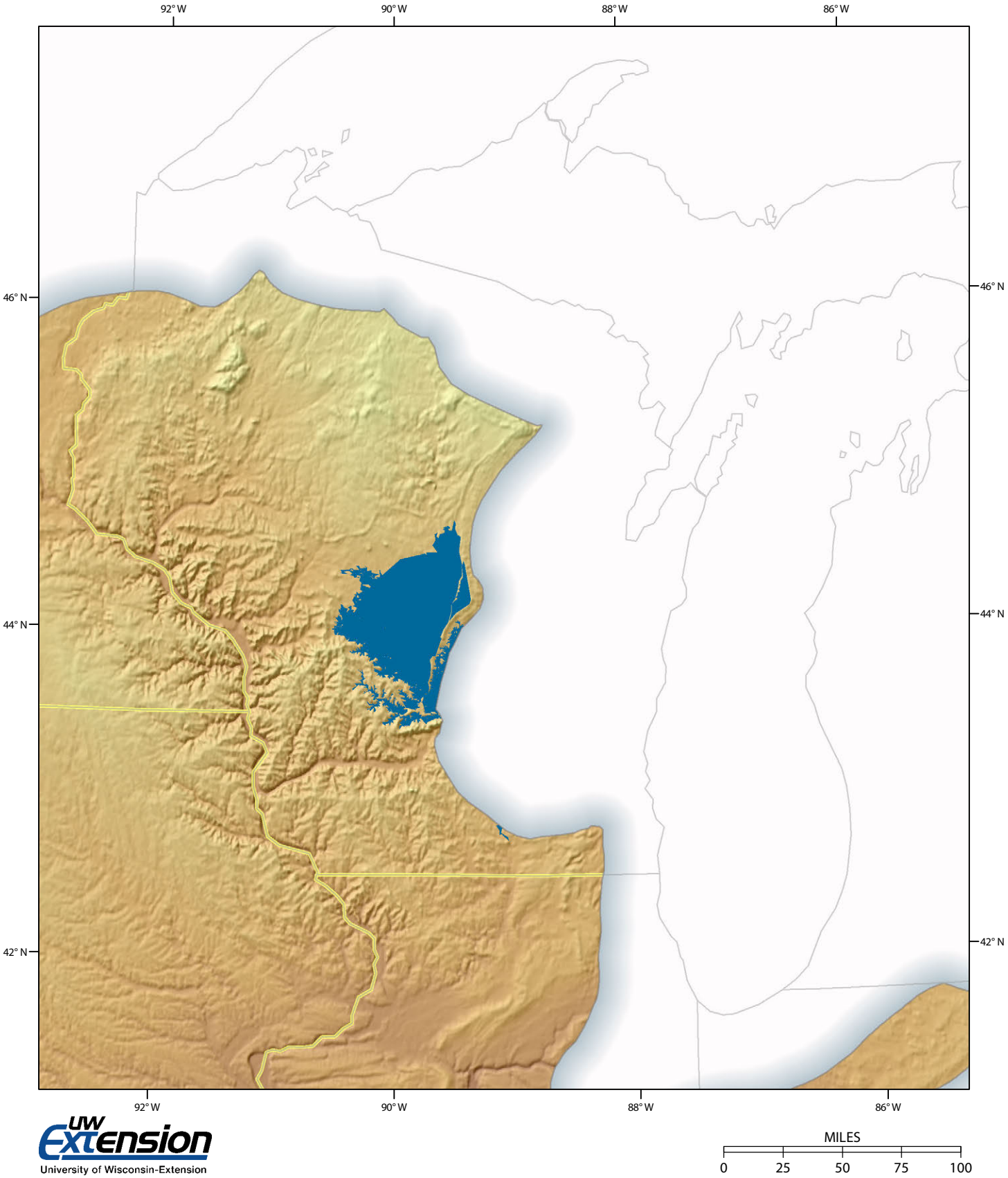
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

19,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Little change in Wisconsin, Chippewa Lobe at Tiger Cat position, Wisconsin Valley Lobe at Willow position, and Langlade Lobe at Summit Lake position; advance to Minooka position in Illinois.



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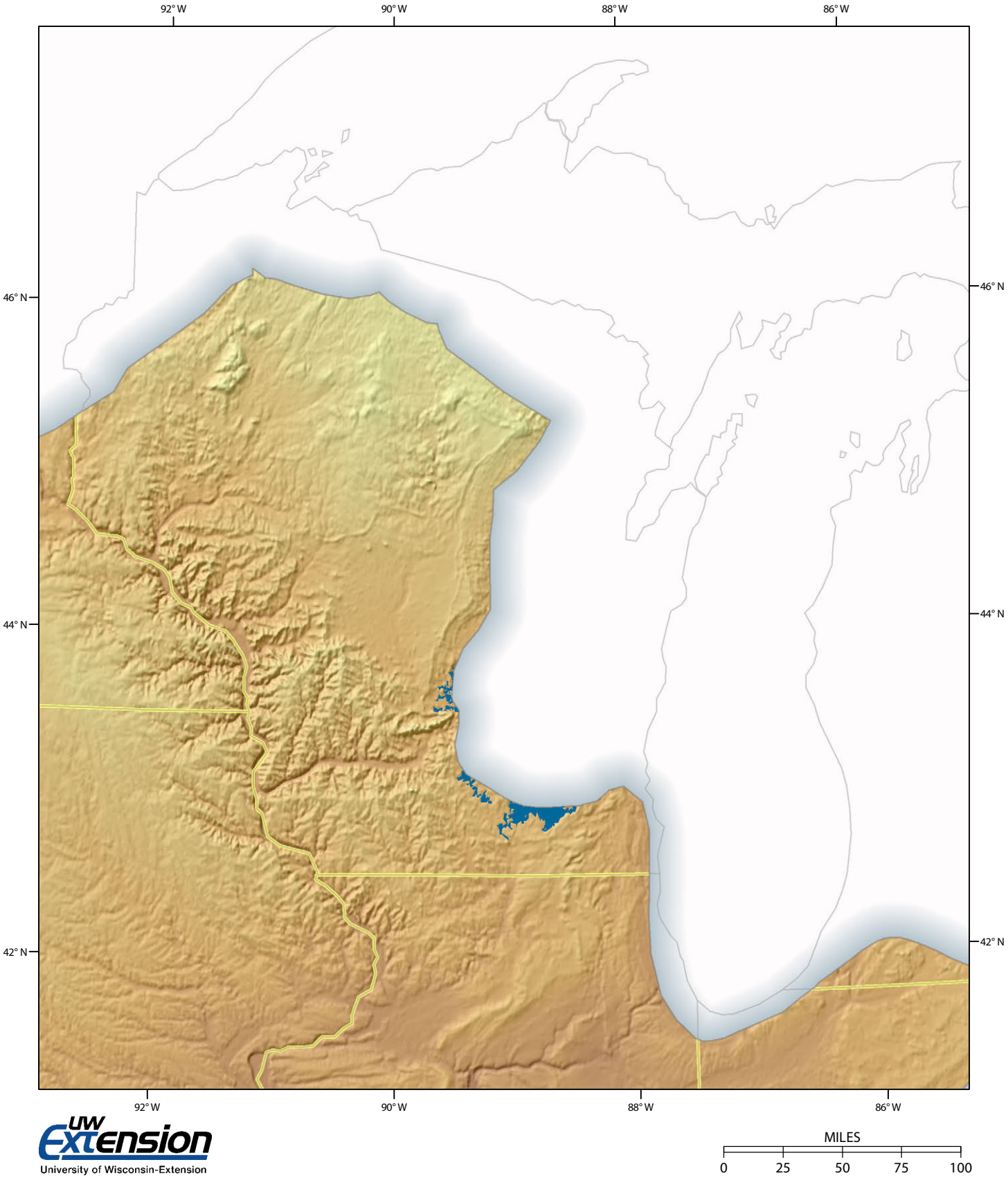
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

19,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Slight recession, glacial Lake Wisconsin drains.



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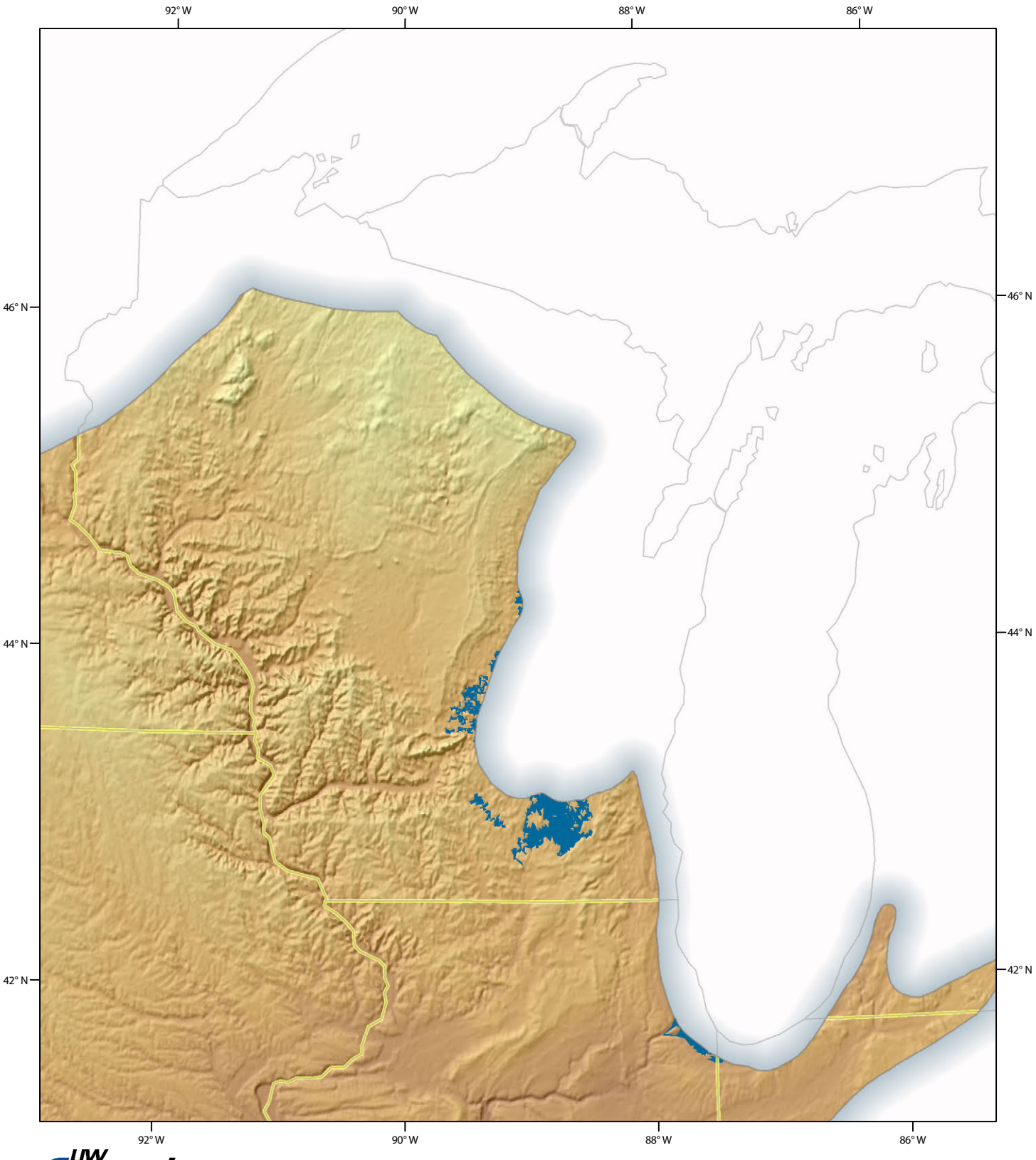
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

18,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession from east end of Baraboo Hills, ice margin at Lake Mills, West Chicago, Iroquois, Champaign positions; glacial Lake Scuppernong forms—several optical ages for Green Bay Lobe from Devils Lake area.



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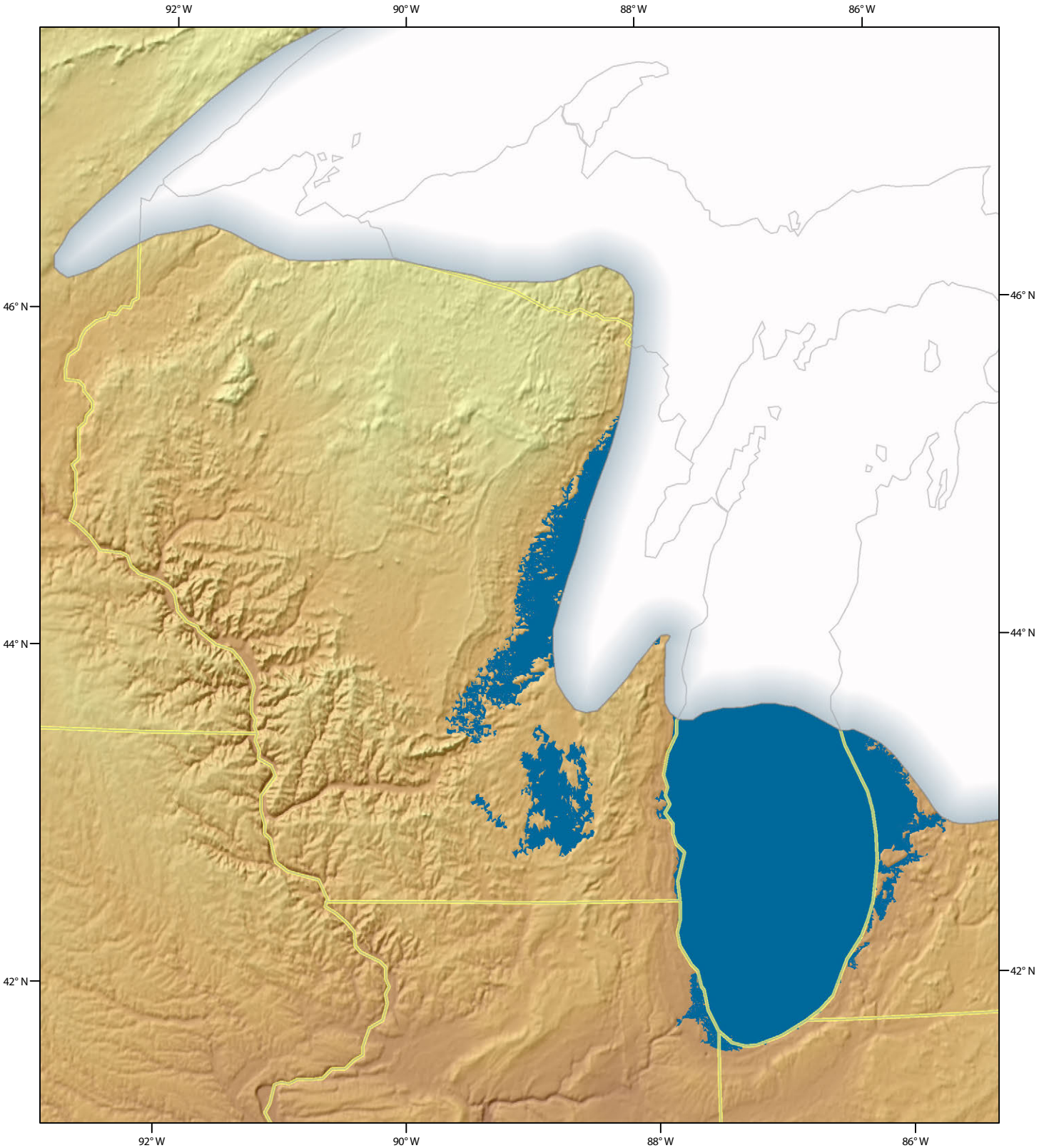
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

18,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession to near the Bowler and Green Lake positions of the Green Bay Lobe, glacial Lake Milwaukee forms in the Lake Michigan basin; glacial Lake Oshkosh forms.



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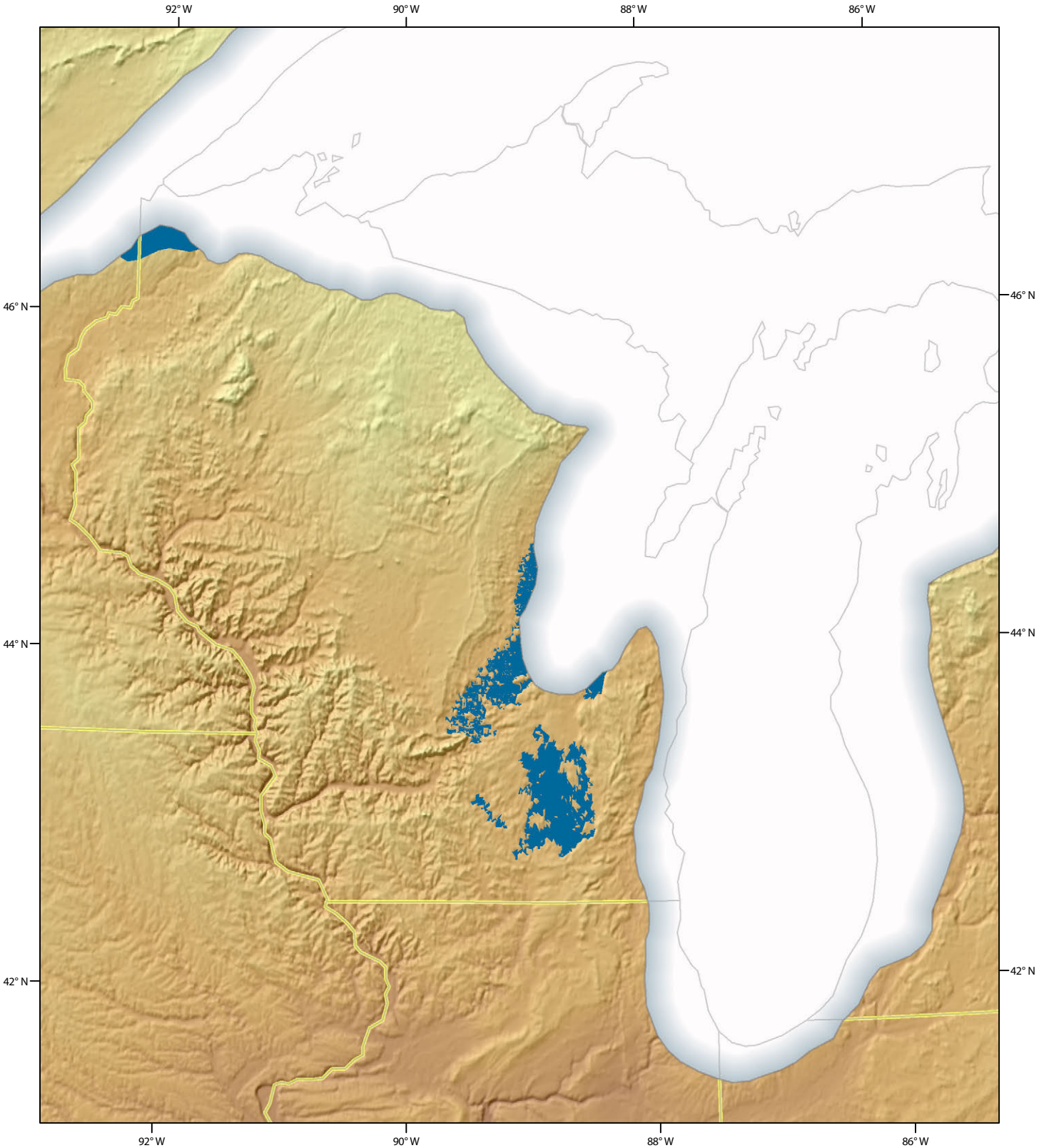
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

17,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Advance to Swiss, Glidden, Muskellunge, Bittersweet, and Elcho positions in northern Wisconsin, Green Bay Lobe at Green Lake position, and Lake Michigan Lobe at Valparaiso position.



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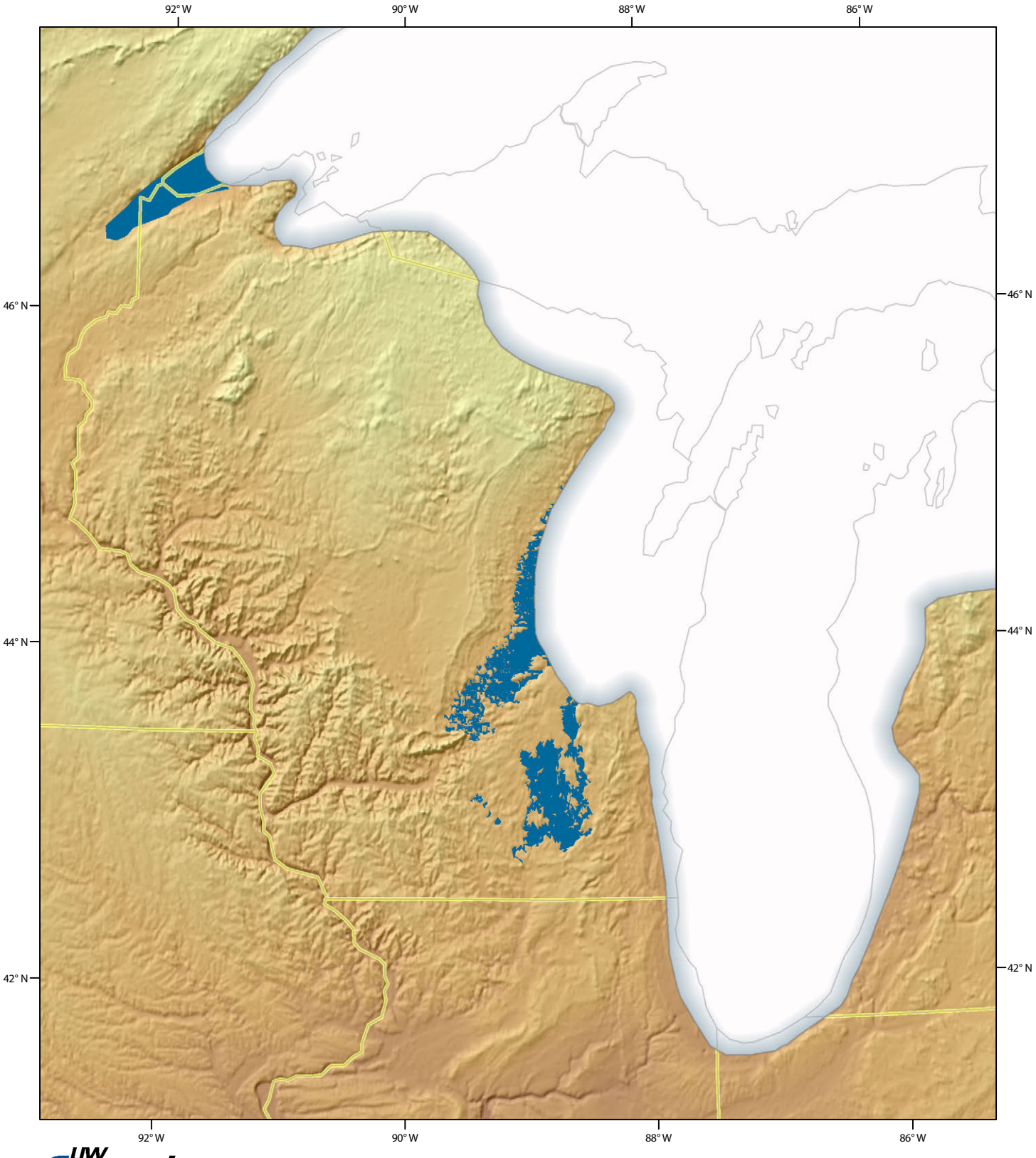
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

17,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession to Stormy Lake and Laona positions in northern Wisconsin, Lake Michigan Lobe at Lake Border position, high phase of Lake Superior.



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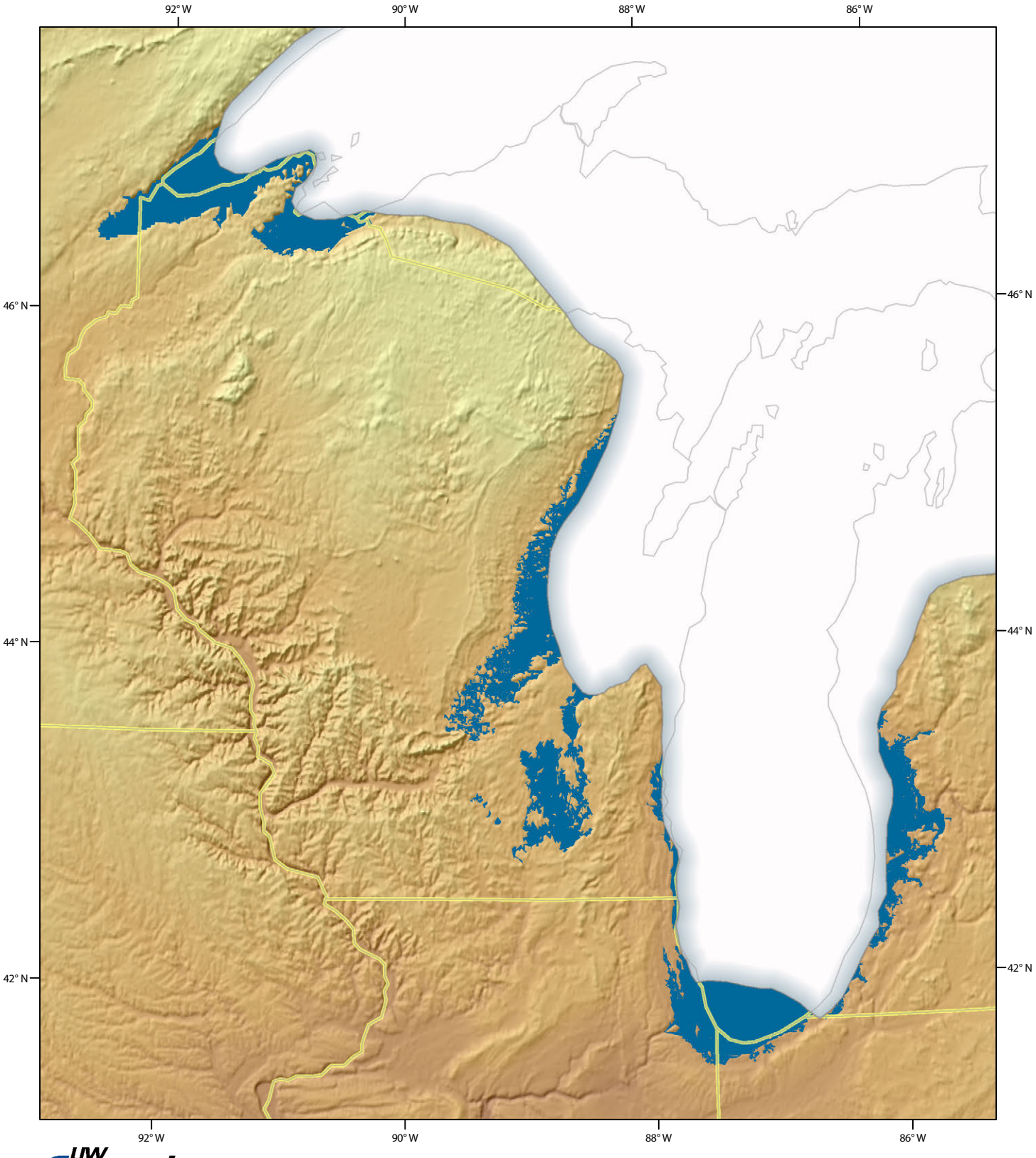
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

16,600 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession in northern Wisconsin, last of Lake Border moraines deposited, Lake Michigan at Glenwood level.



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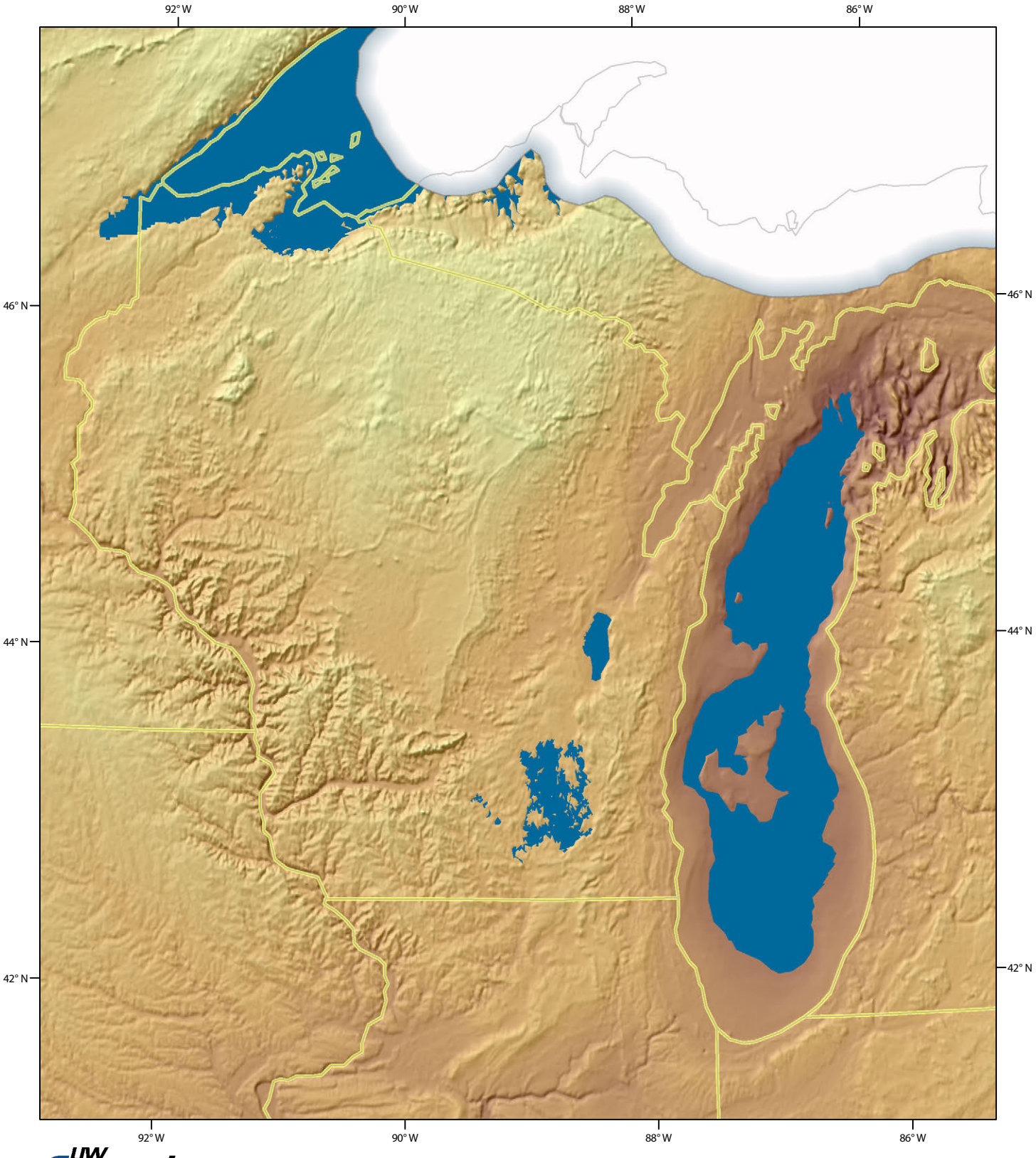
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

16,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Major recession of ice margin into the Upper Peninsula of Michigan, Lake Michigan below modern level.



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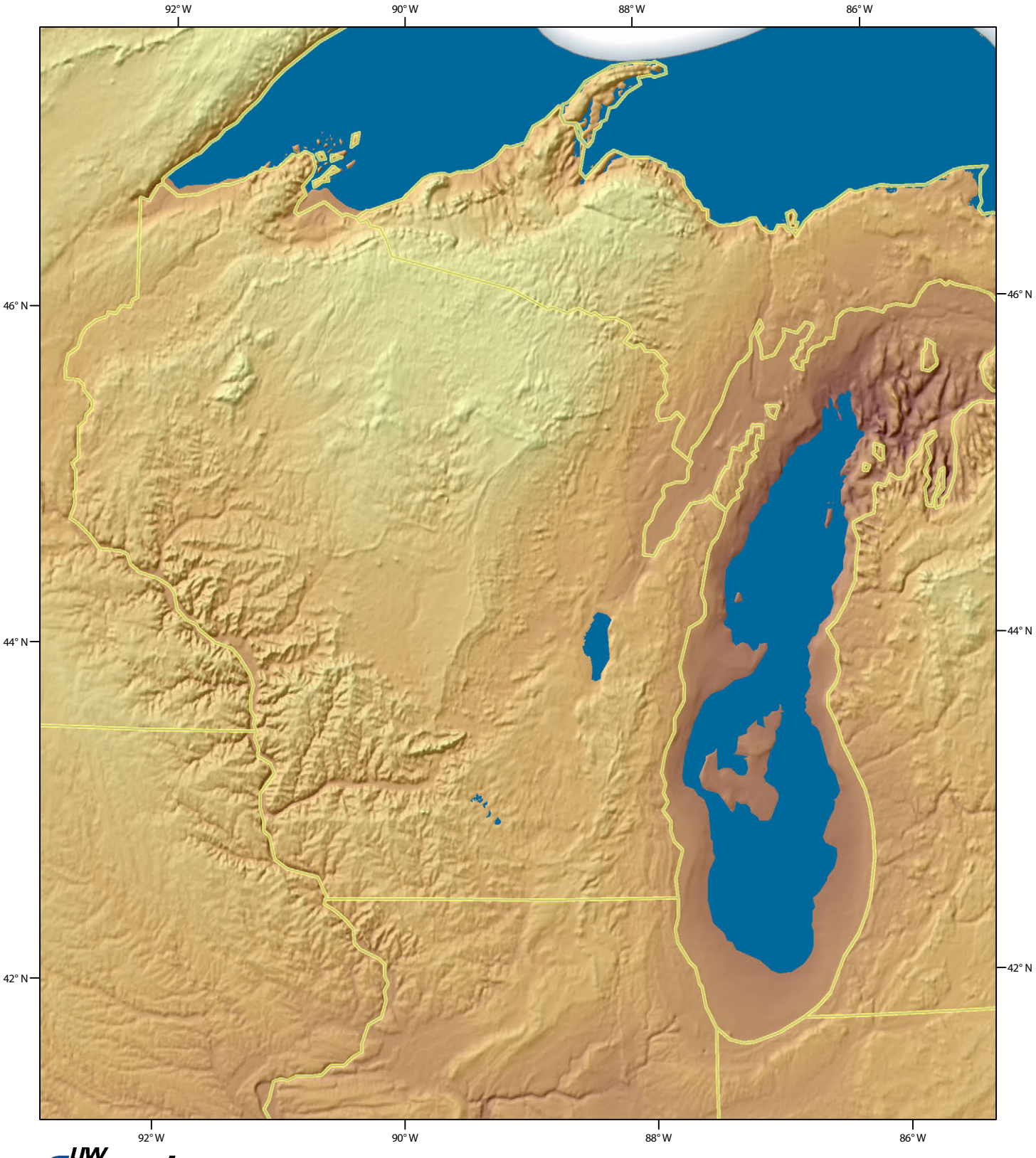
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

15,750 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Continued major recession, Mackinaw interstade—several radiocarbon dates in eastern Wisconsin.



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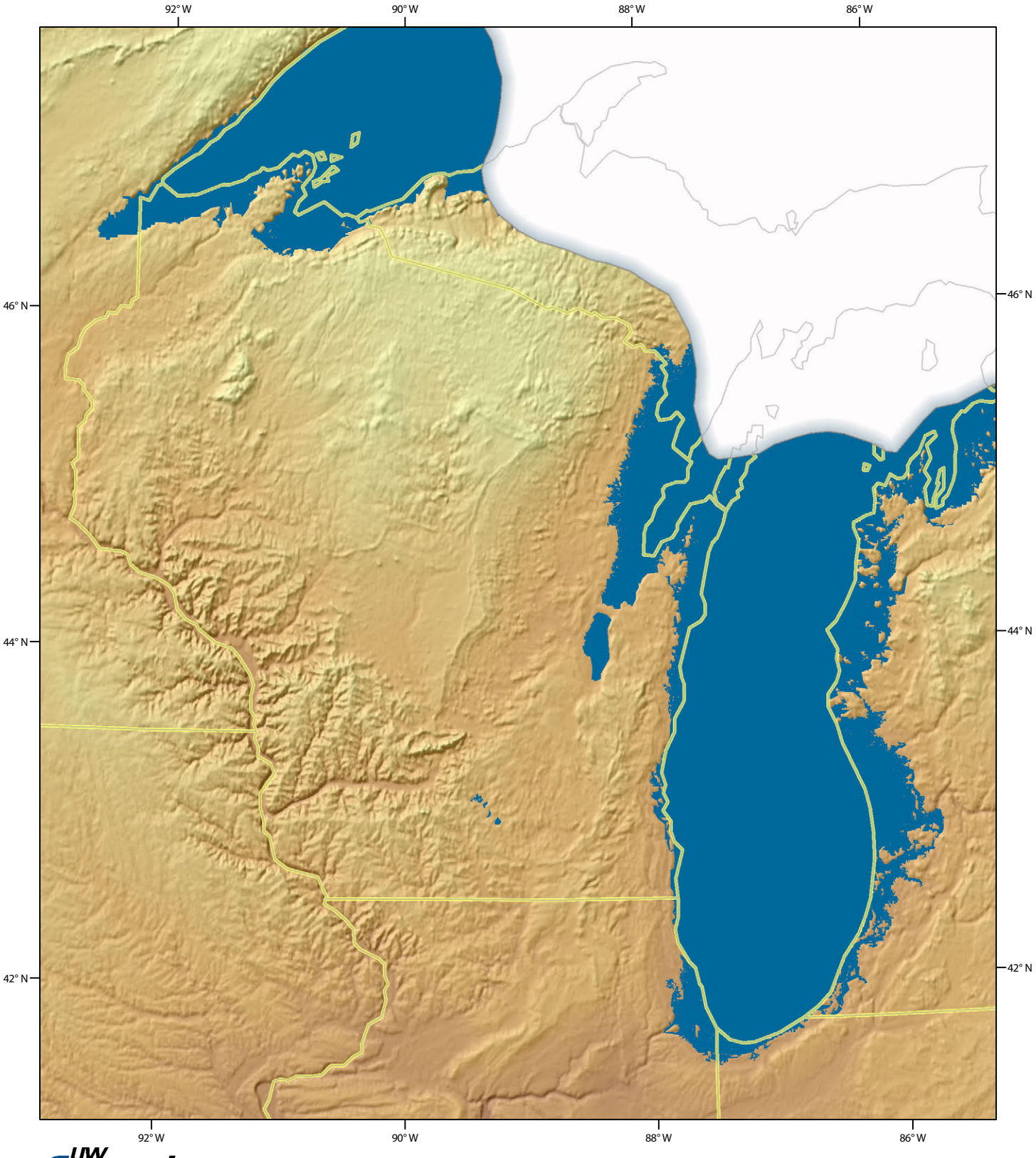
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

15,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice margin advancing toward Winegar and Early Port Huron positions, Lake Michigan rises to Glenwood level.



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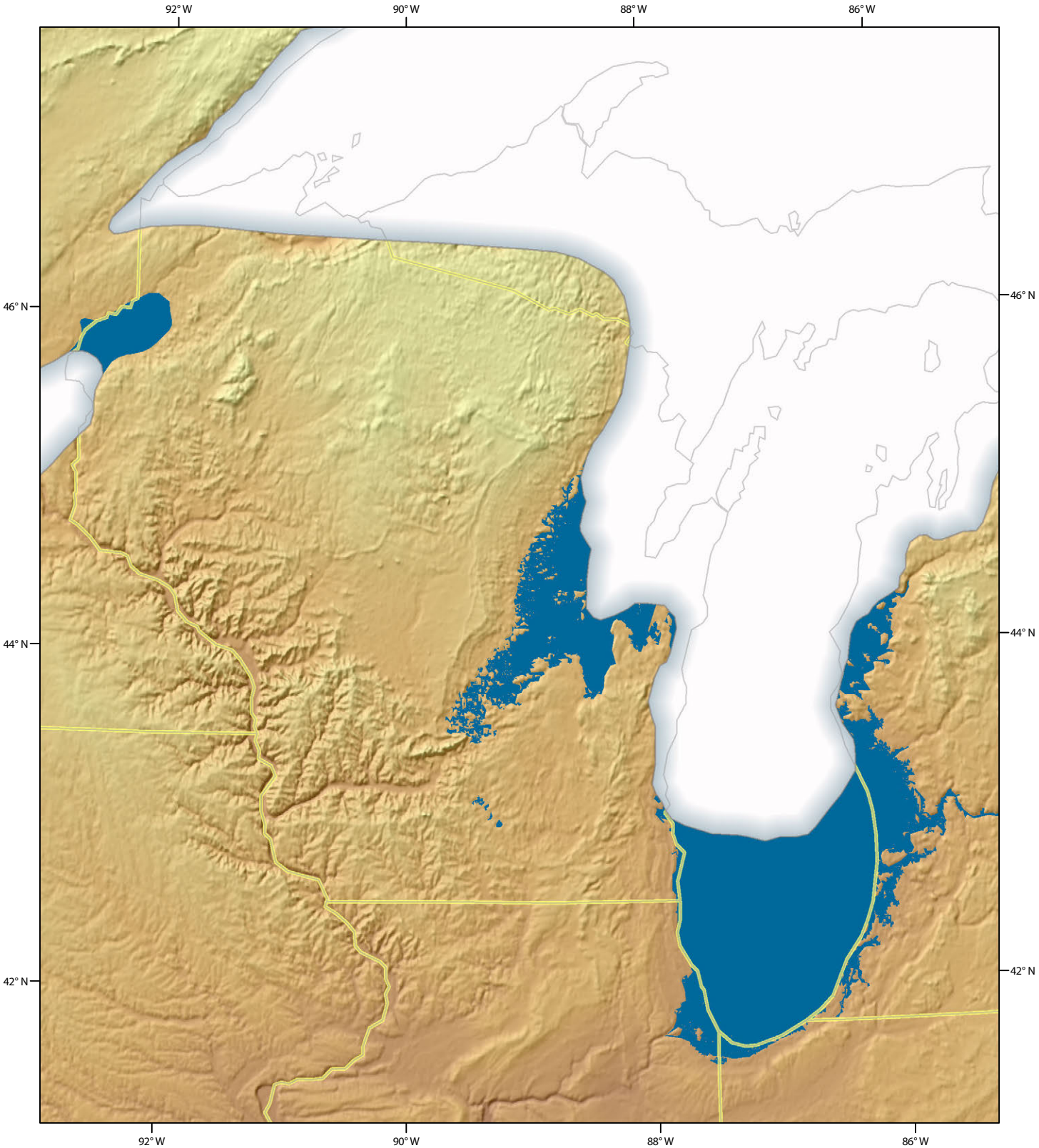
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

15,250 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice margin advances to Late Mountain and Early Port Huron positions, Grantsburg Sublobe advances in western Wisconsin, glacial Lakes Grantsburg and Oshkosh form.



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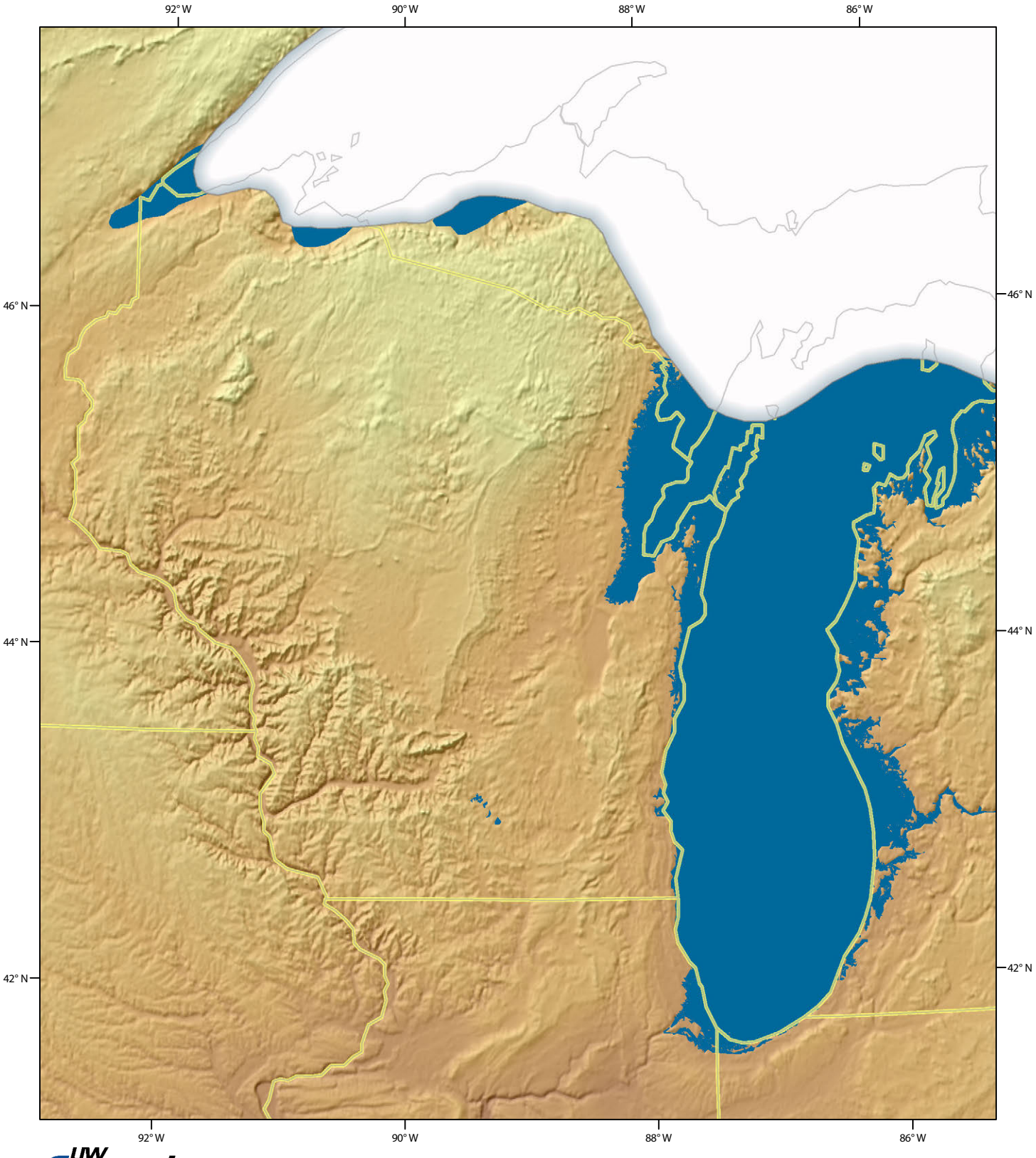
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

15,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession.



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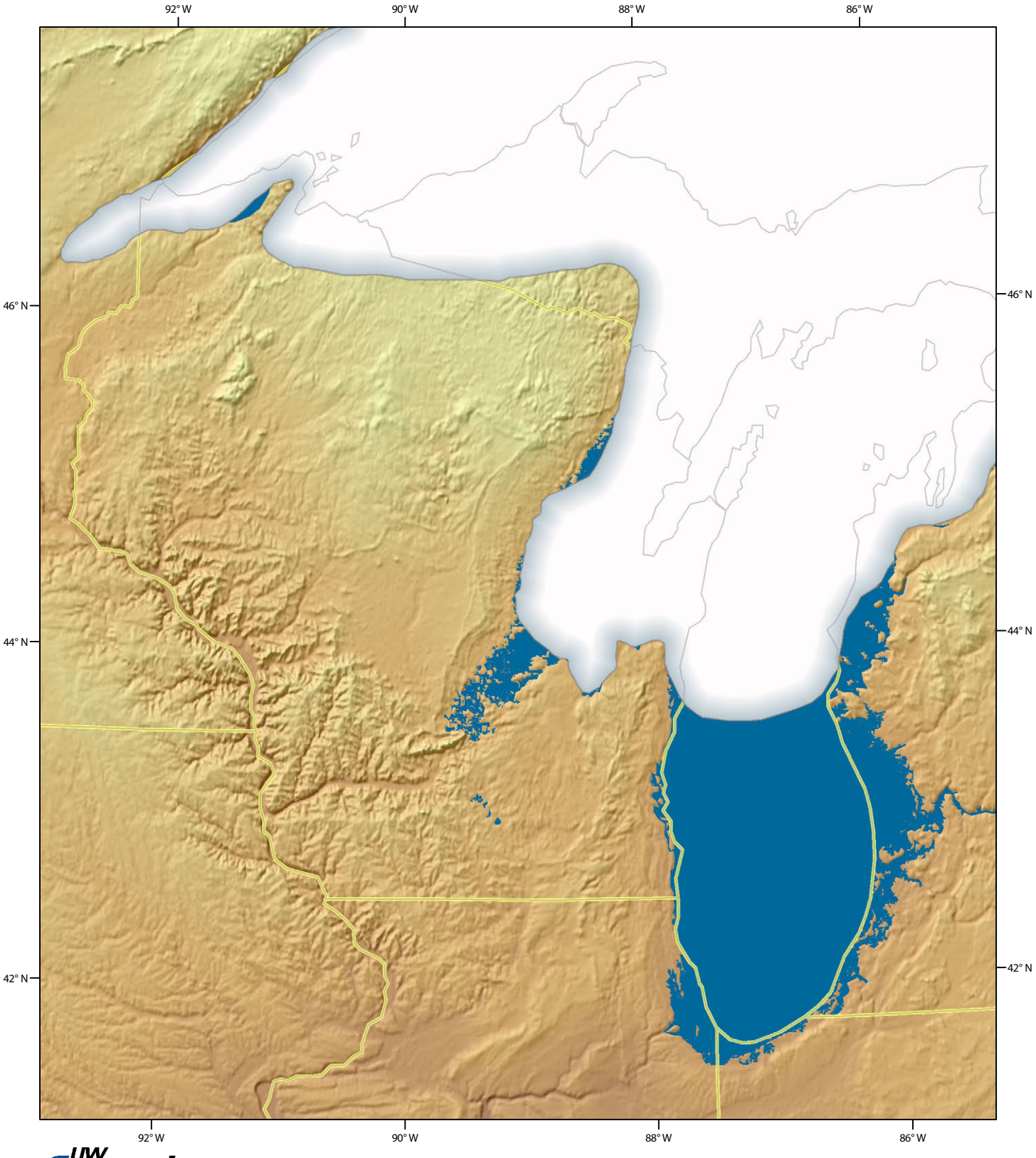
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

14,600 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice advances to Winegar and Valders positions.



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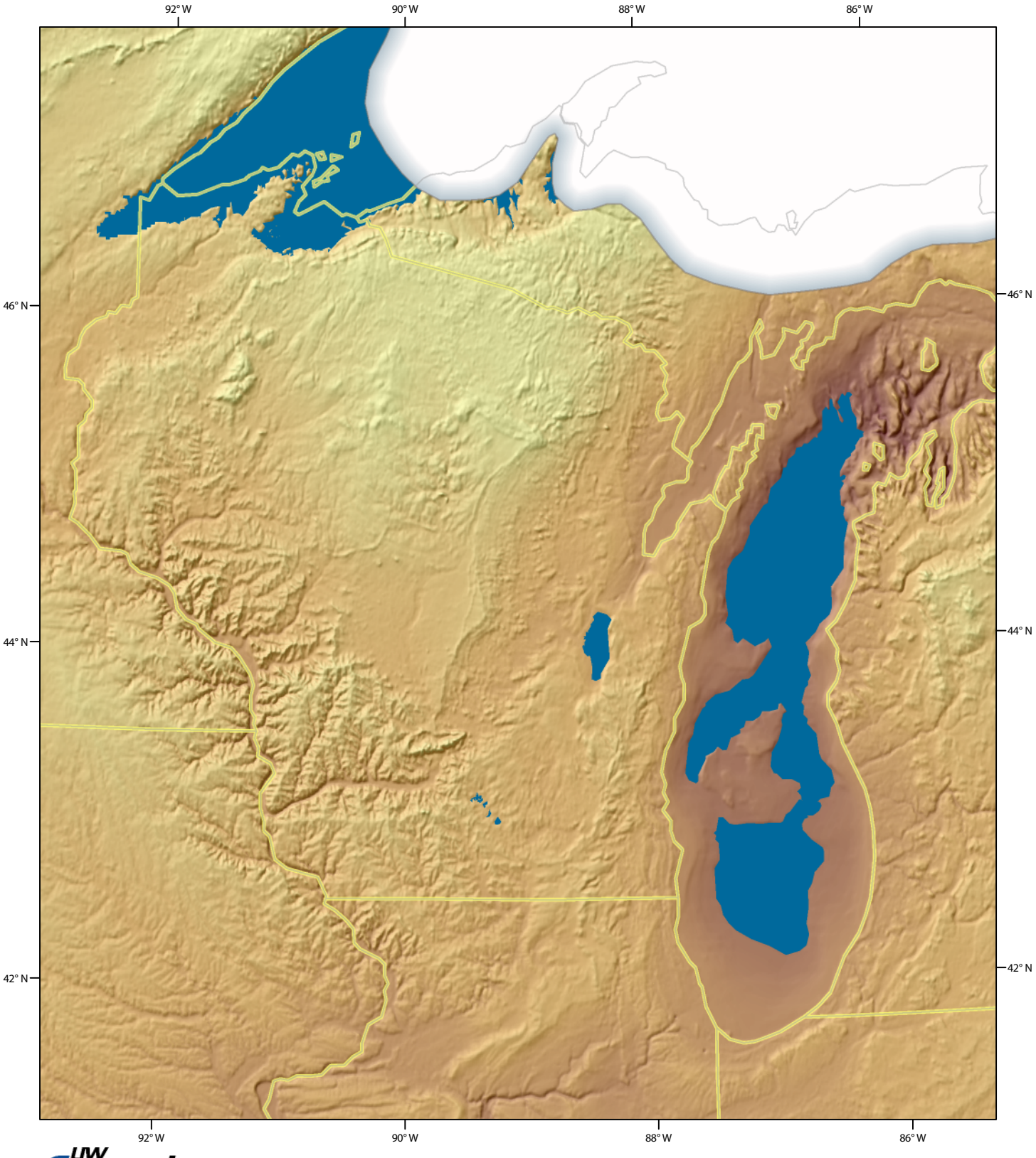
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

14,300 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Major recession, spruce forest grows in Wisconsin, Lake Michigan drops below present level—many radiocarbon dates.



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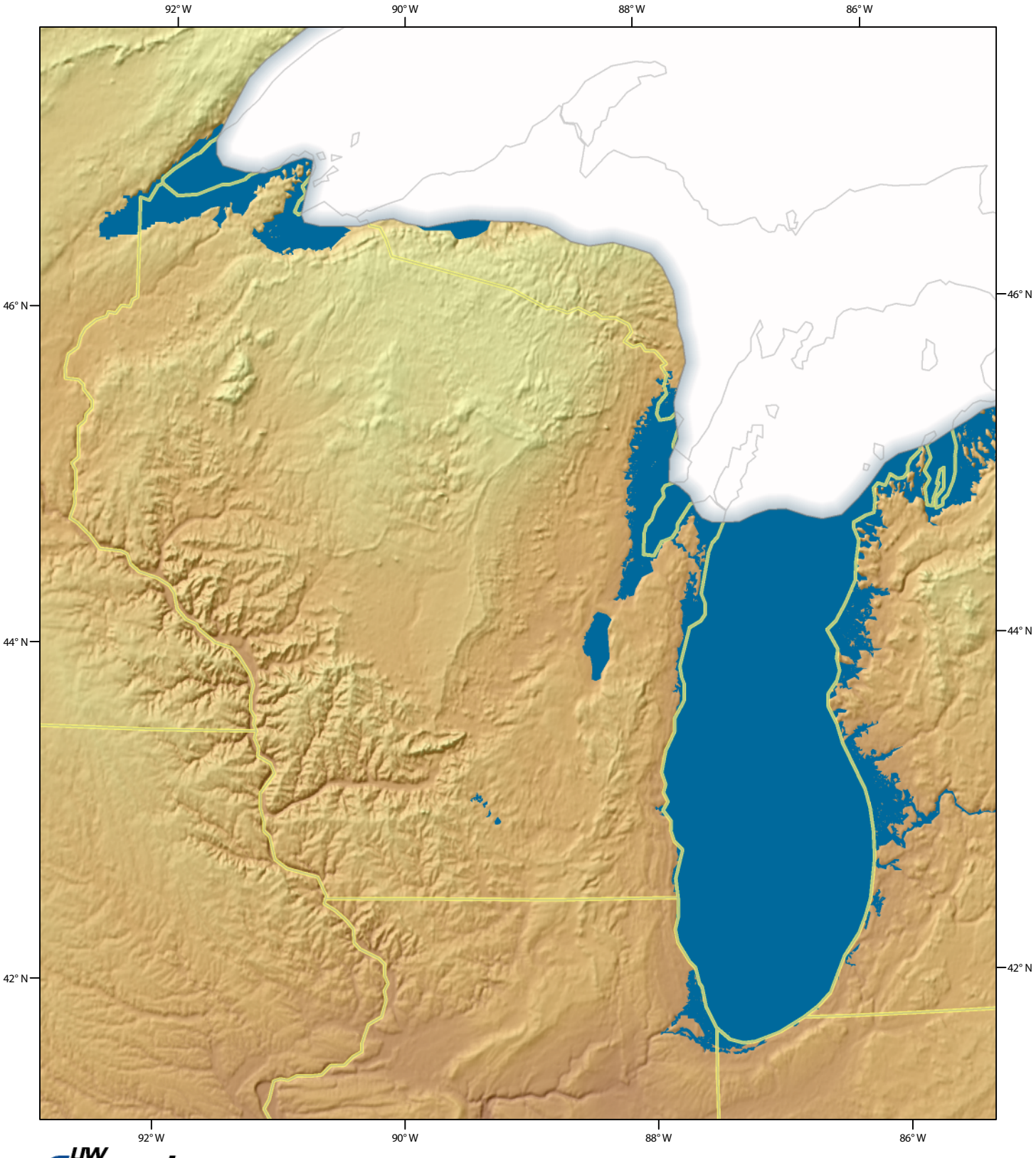
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

14,100 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice margin advancing toward Marenisco and Two Rivers positions —many radiocarbon dates on wood of the Two Creeks Forest buried by the glacier or rising lake level.



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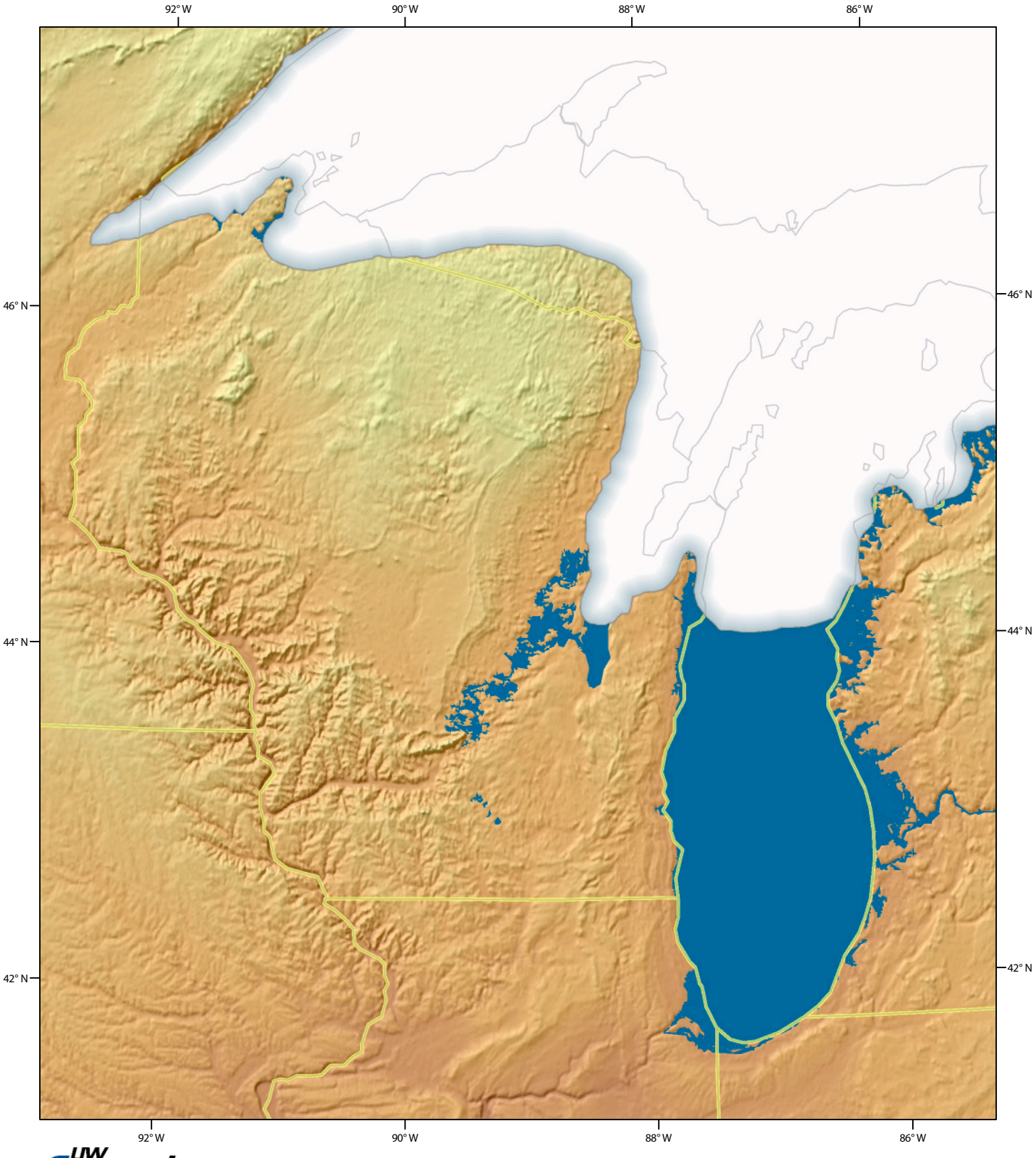
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

13,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice reaches Two Rivers and Marenisco positions, glacial Lake Oshkosh forms.



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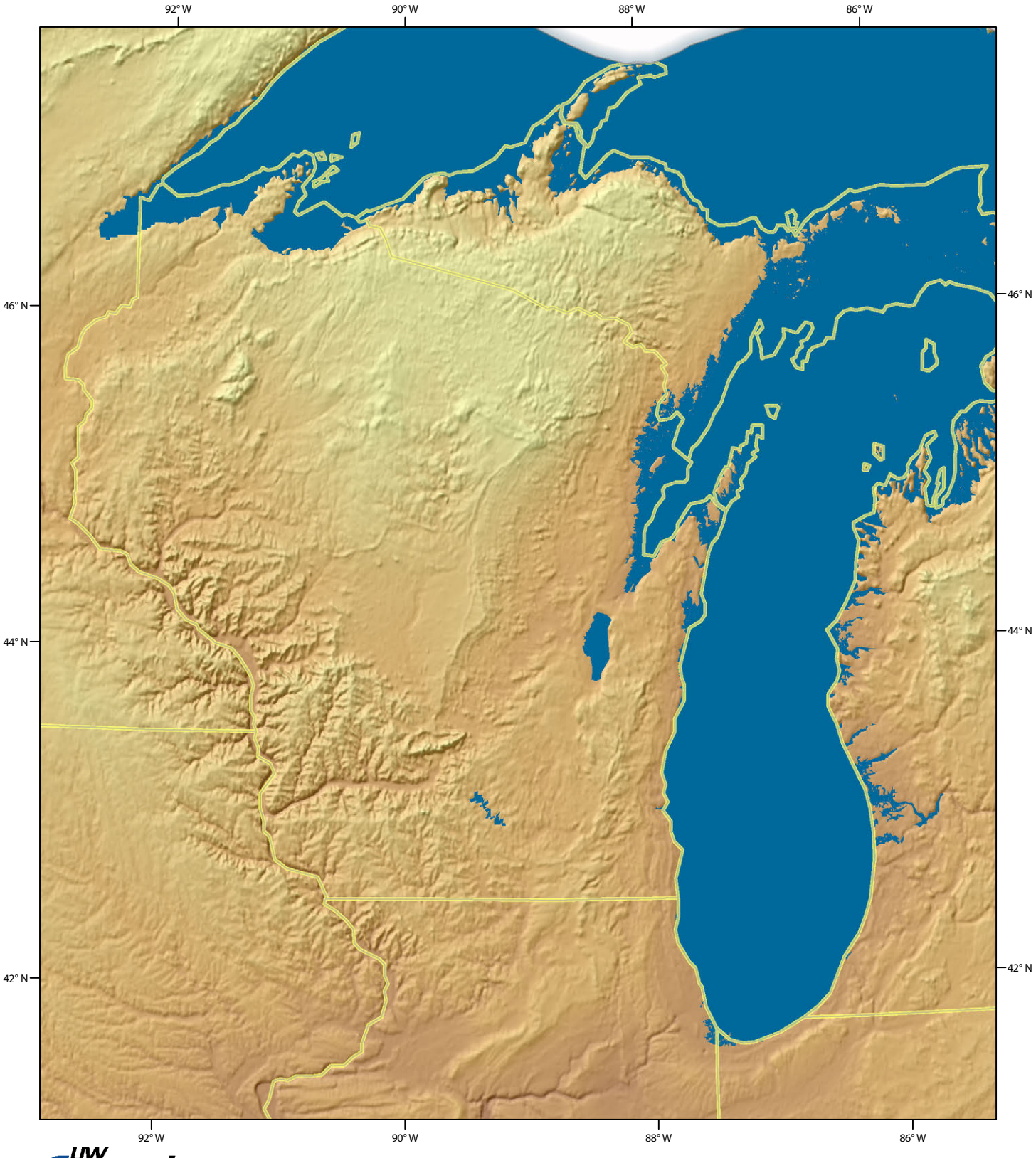
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

12,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Major recession into Lake Superior basin, present-day Lakes Michigan, Huron, and Superior are one lake at Algonquin level.



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WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

12,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice margin advances in the Lake Superior basin, Lake Michigan at Algonquin level.

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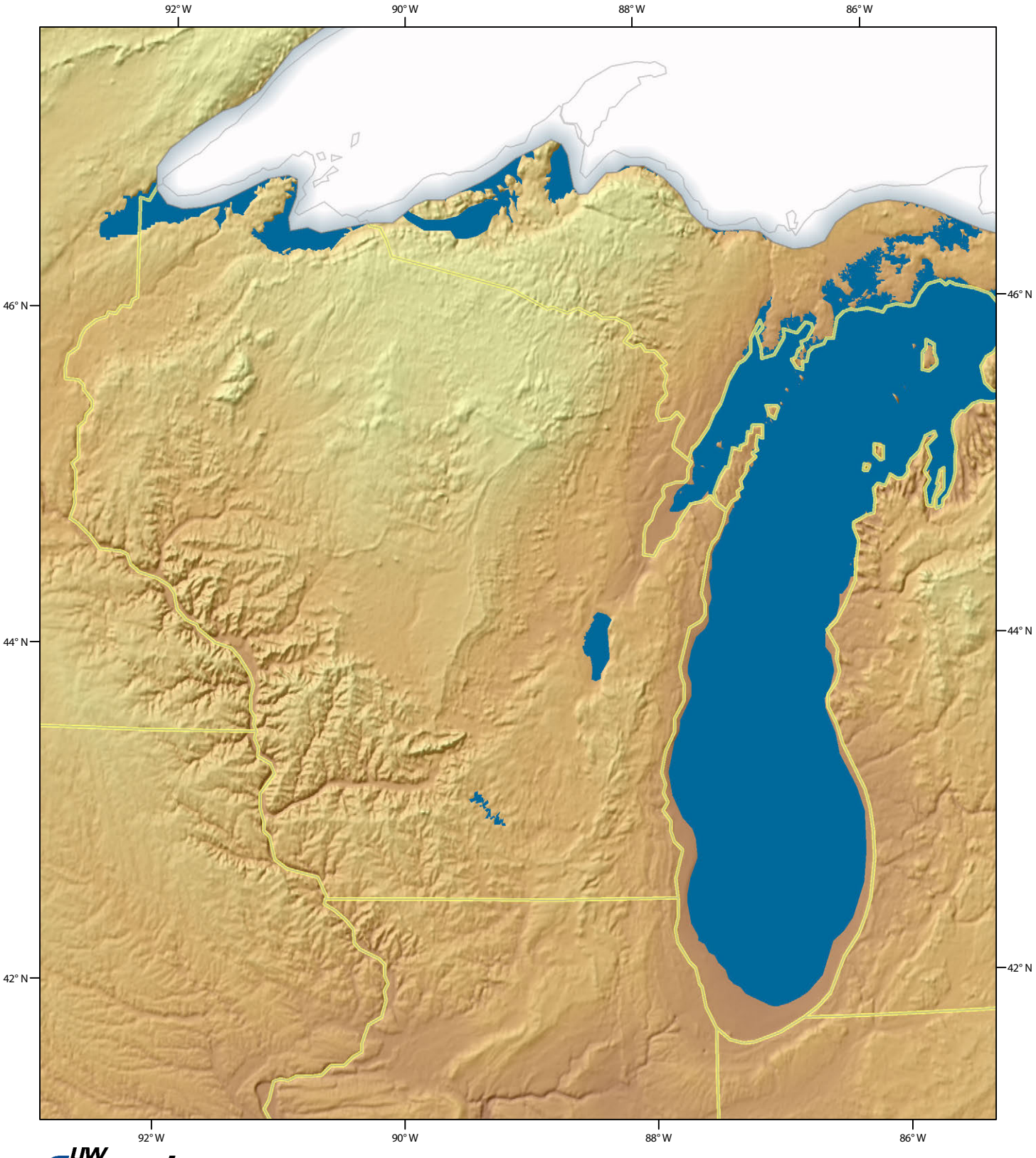
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

11,500 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Ice margin advances to Marquette position in the Lake Superior basin, St. Croix outlet opens, southern basin of Lake Michigan below modern level —many radiocarbon dates.



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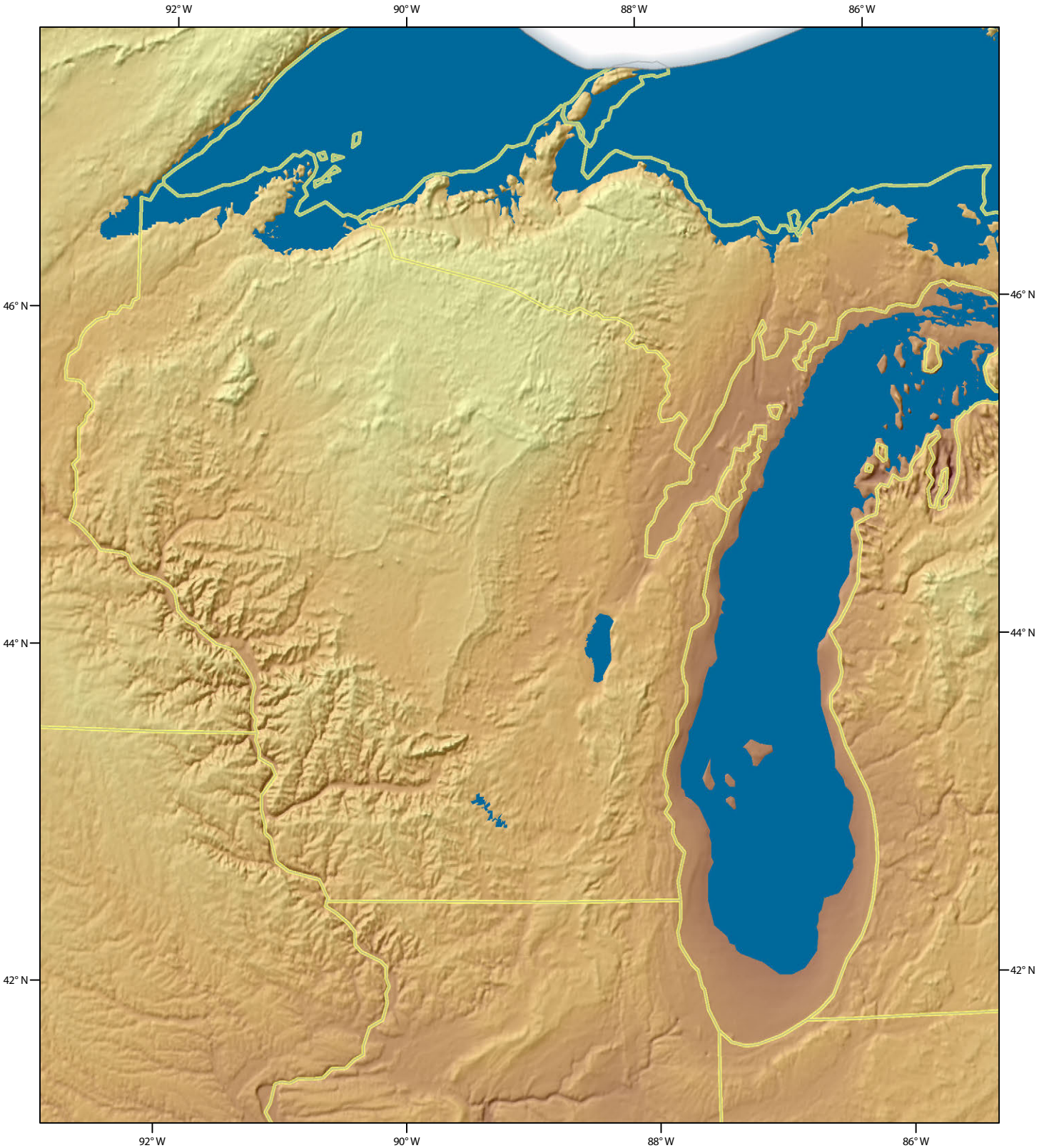
WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY

11,000 YEARS AGO

LAURENTIDE ICE SHEET: ICE-MARGIN POSITIONS

Recession from the Marquette position, Lake Michigan drops below present level. The ice sheet does not reach Wisconsin again, but survives in Canada for several thousand years.



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