

# Introducing Glacial Lake Roscommon, Central Lower Michigan, USA

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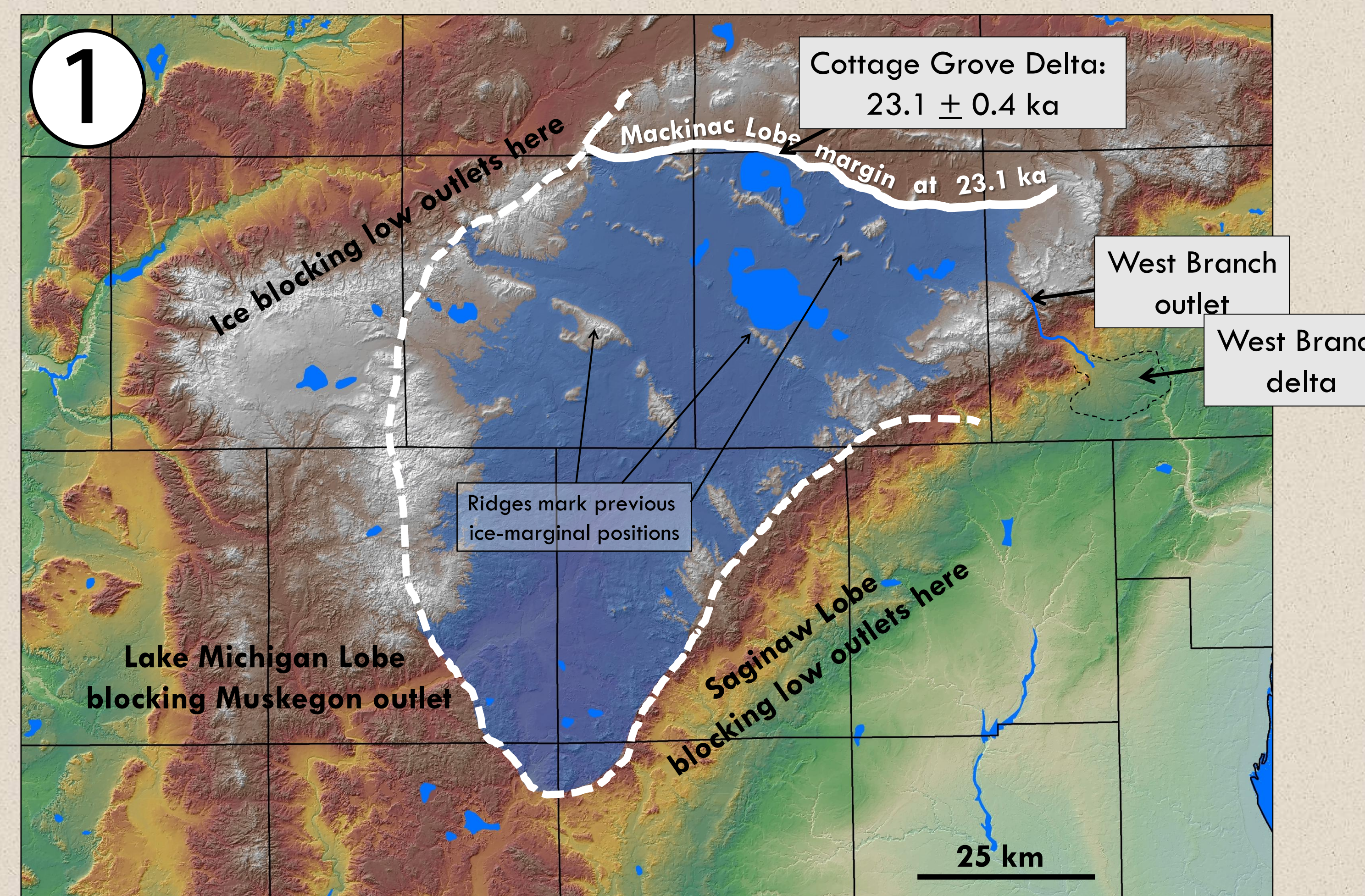
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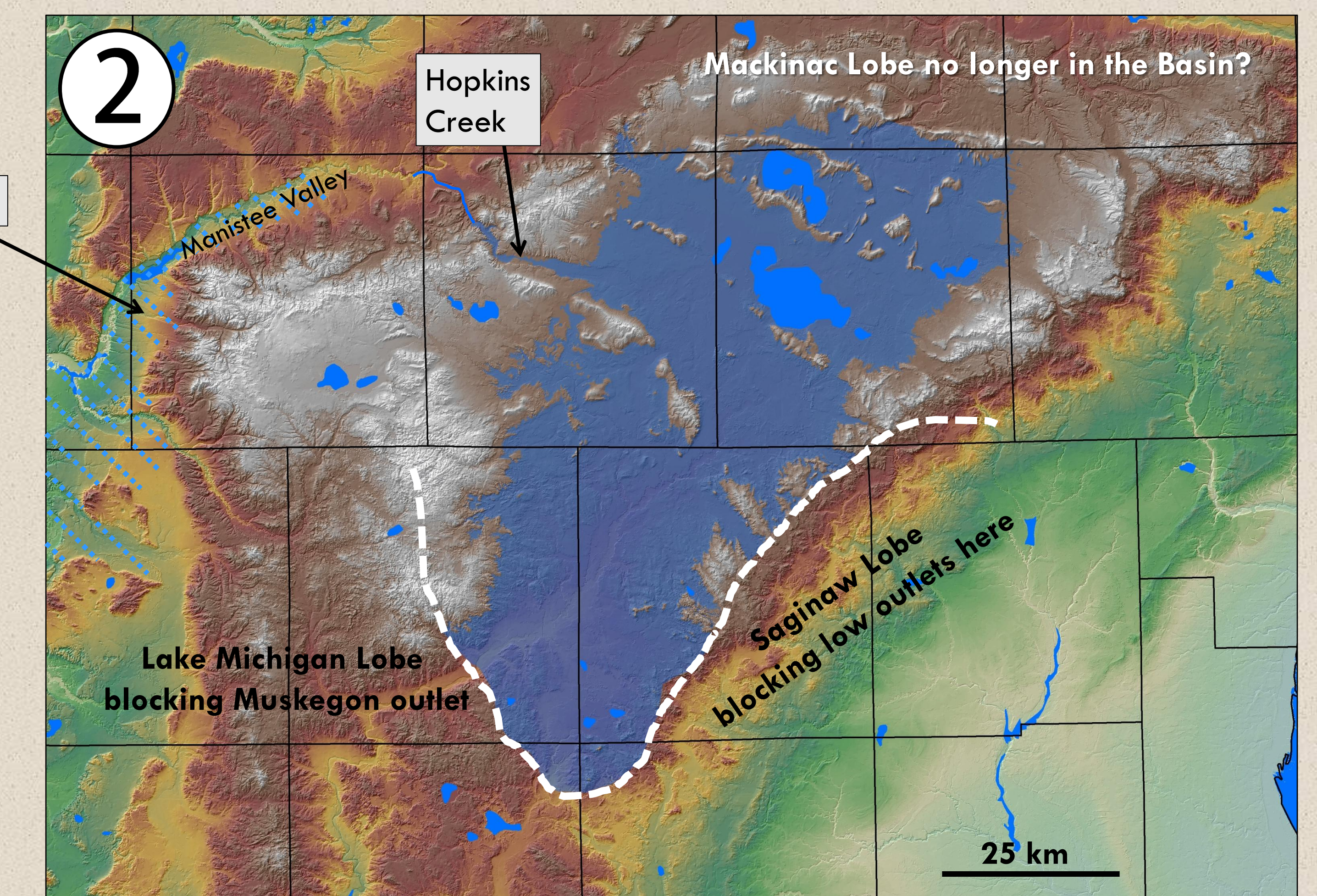
## ABSTRACT

In 2017, an article in the journal *Geomorphology* described a large, previously undocumented, paleolake that formed atop the interlobate uplands of central lower Michigan. This Pleistocene lake, named Glacial Lake Roscommon, was at times surrounded - partially or wholly - by ice of the Saginaw, Lake Michigan and Mackinac Lobes. The 2017 study of Glacial Lake Roscommon focused on a kame delta that had formed in the lake 23.1 ka ago, confirming that this part of Michigan was “open water” at about the time of the LGM. The five dates reported from this study were the first to confirm the very early existence of the lake, hundreds of kilometers north of the main ice margin to the south. Since then, an unpublished luminescence date on beach sands from a lower shoreline of the lake established that the lake was still present, but in a restricted part of the basin, at  $16.8 \pm 0.8$  ka ago. A second unpublished date on a higher shoreline ( $20.1 \pm 1.9$  ka ago) further confirmed the longevity and persistence of the lake. Together, these early dates establish that Glacial Lake Roscommon existed from about the time of the LGM until at least 16 ka ago – a span exceeding 7000 years.

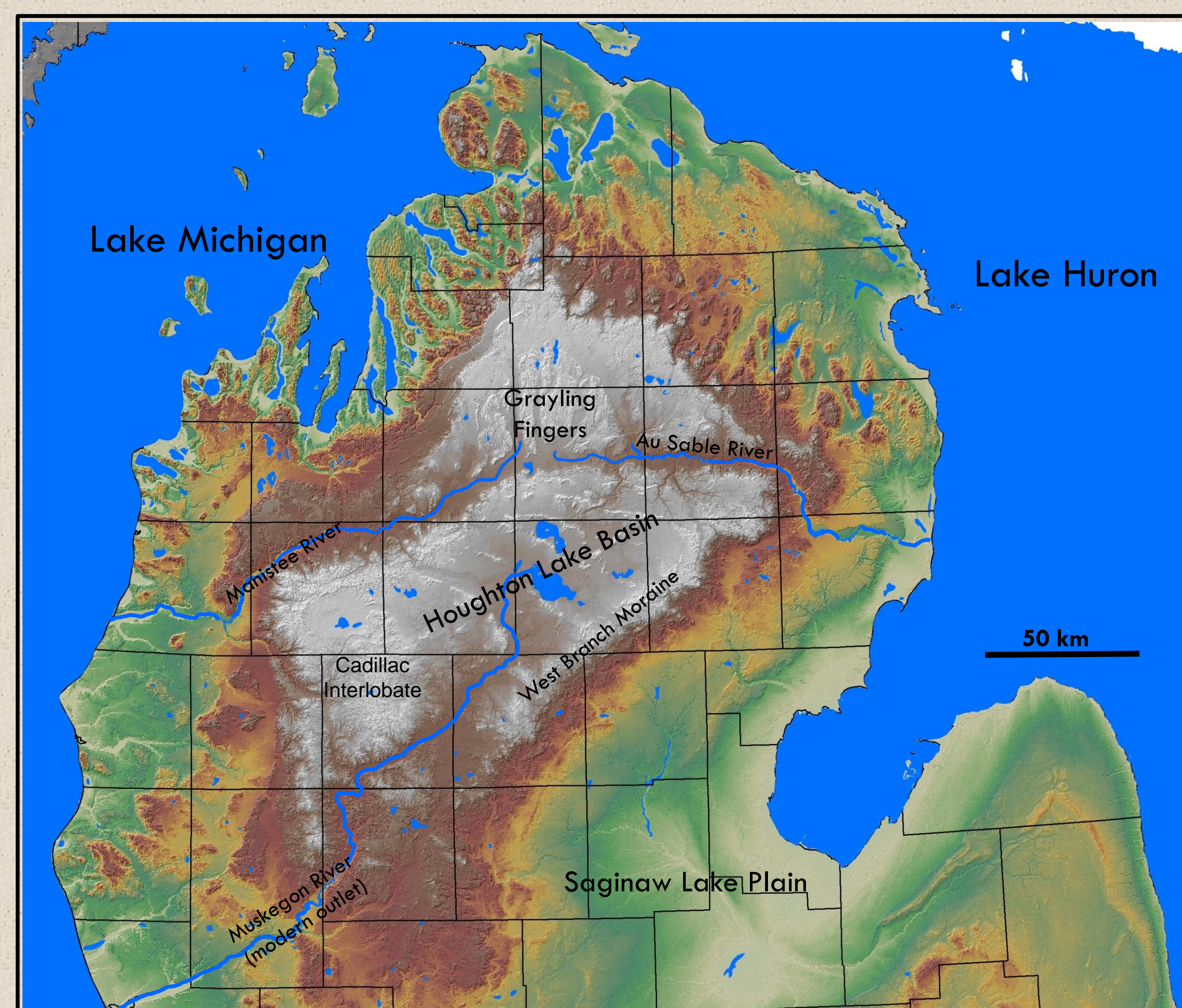
In this poster, we provide maps and graphics depicting the current state of knowledge about Glacial Lake Roscommon. Outflows of water from the lake formed large spillway channels, many of which end in paleodeltas in nearby paleolakes, and/or in subaerial fans. Glacial meltwater flowing into the lake from subaqueously grounded ice margins formed kame deltas, kame moraines, and fans - some of which demonstrate textbook-like stratigraphy. Shorelines and beach ridges suggest that Glacial Lake Roscommon had at least four or five different lake level stages. Recent work has confirmed that, subsequent to final lake drainage, a major dune-forming event occurred in the basin between 13 and 10 ka ago.



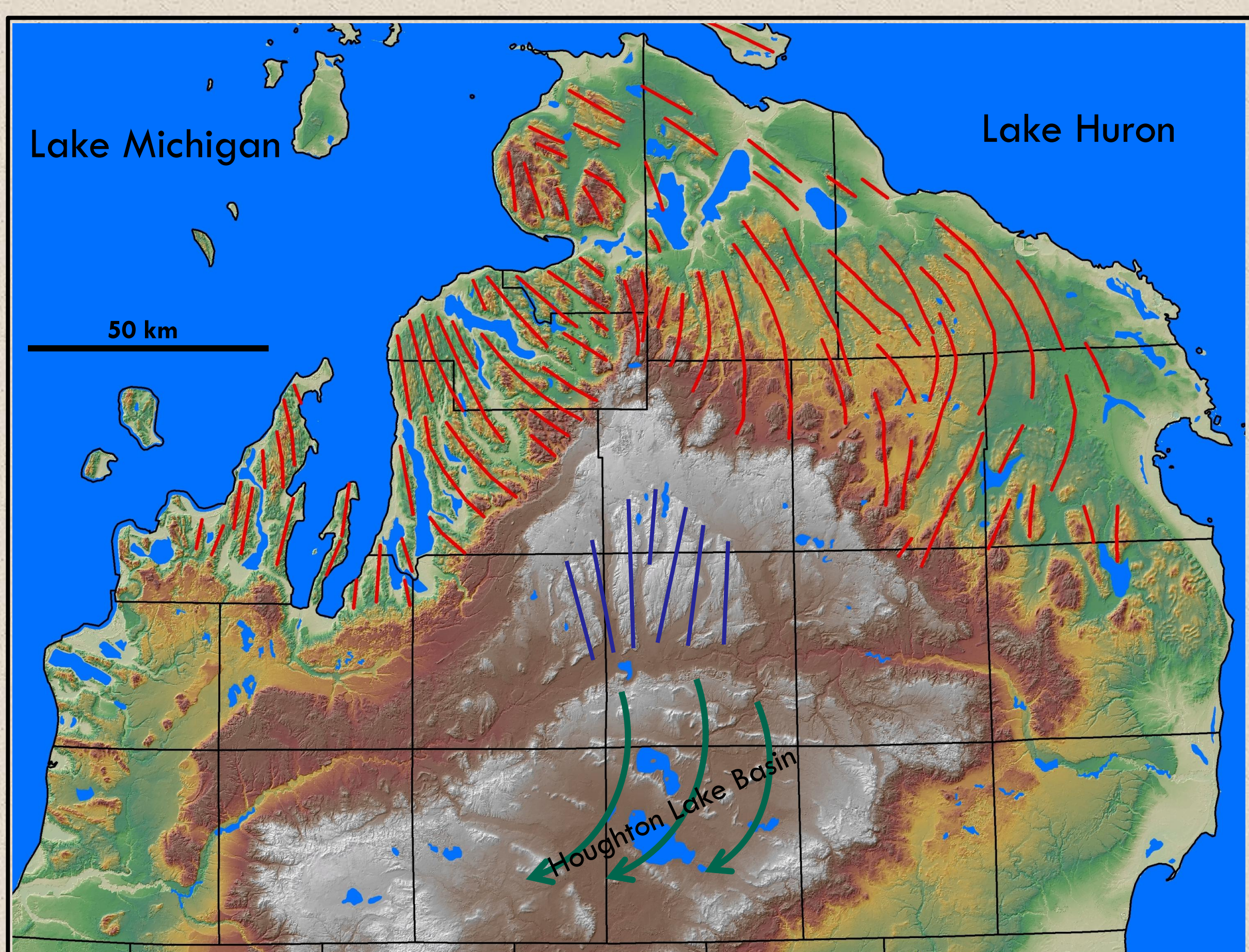
Glacial Lake Roscommon at 375 m, currently the highest known lake stage. Five OSL dates on the Cottage Grove Delta indicate that this stage was fully formed by 23.1 ka (Schaetzl et al. 2017). The likely outlet at this stage was via a channel near West Branch. Waters flowing through this outlet formed a large delta on the Saginaw Lake plain, implying that the Saginaw Lobe had retreated from this part of the West Branch moraine by this time. Here, as elsewhere, ice margin locations shown as dashed lines are only estimates.



Glacial Lake Roscommon at 366 m. By this time, ice had retreated from the northwestern part of the Basin, opening a lower outlet at Hopkins Creek, which flowed into the Manistee River. Evidence for extensive areas of ponded water downstream of this outlet, in the lower Manistee Valley, continues to accrue via USGS mapping efforts (K. Kincare, pers. comm. 2016). At present, we have no numeric dates for this stage.



General topographic framework of Northern Lower Michigan, showing the locations of some of the major physiographic features.

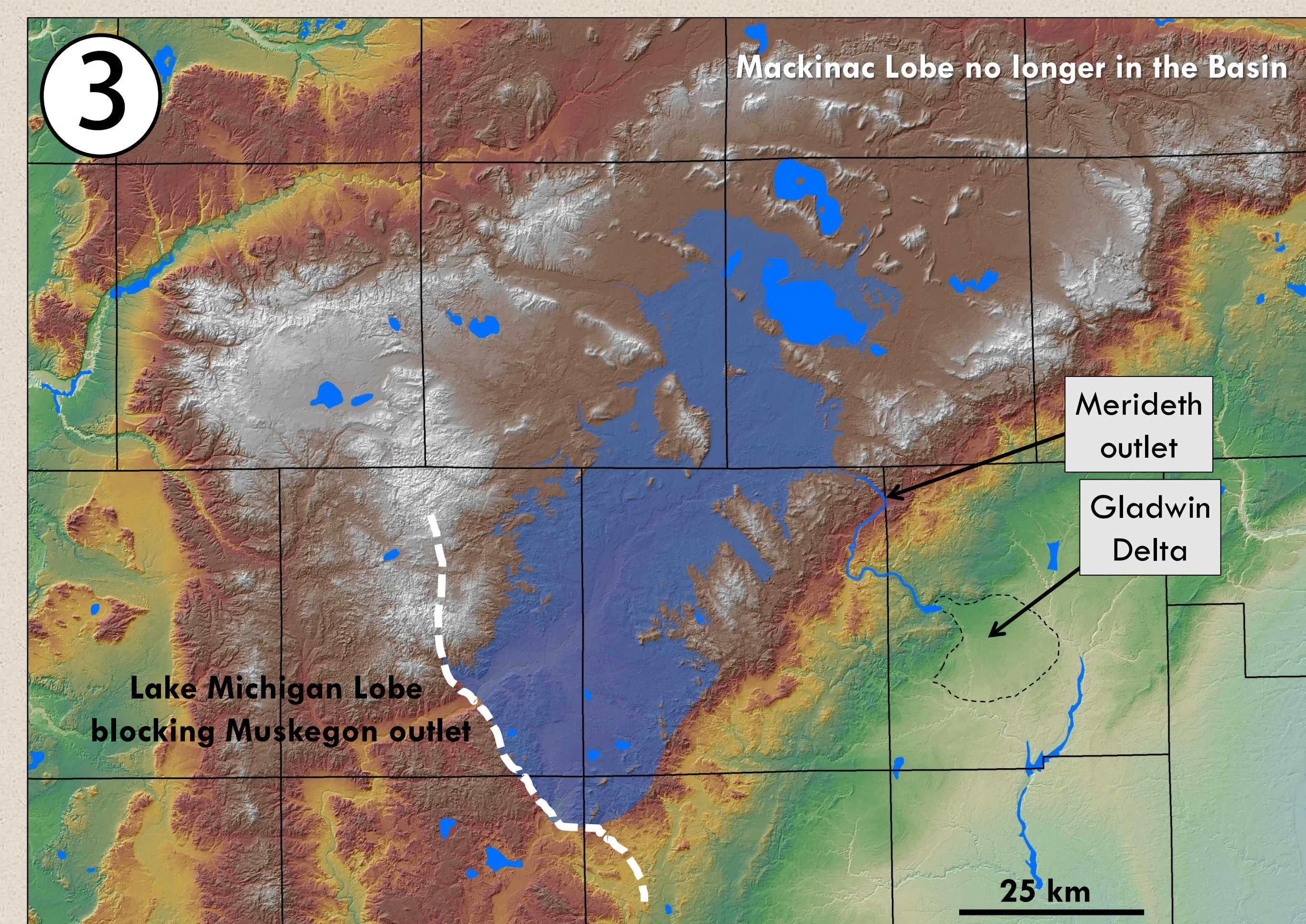


### Ice-flow directions in northern Lower Michigan.

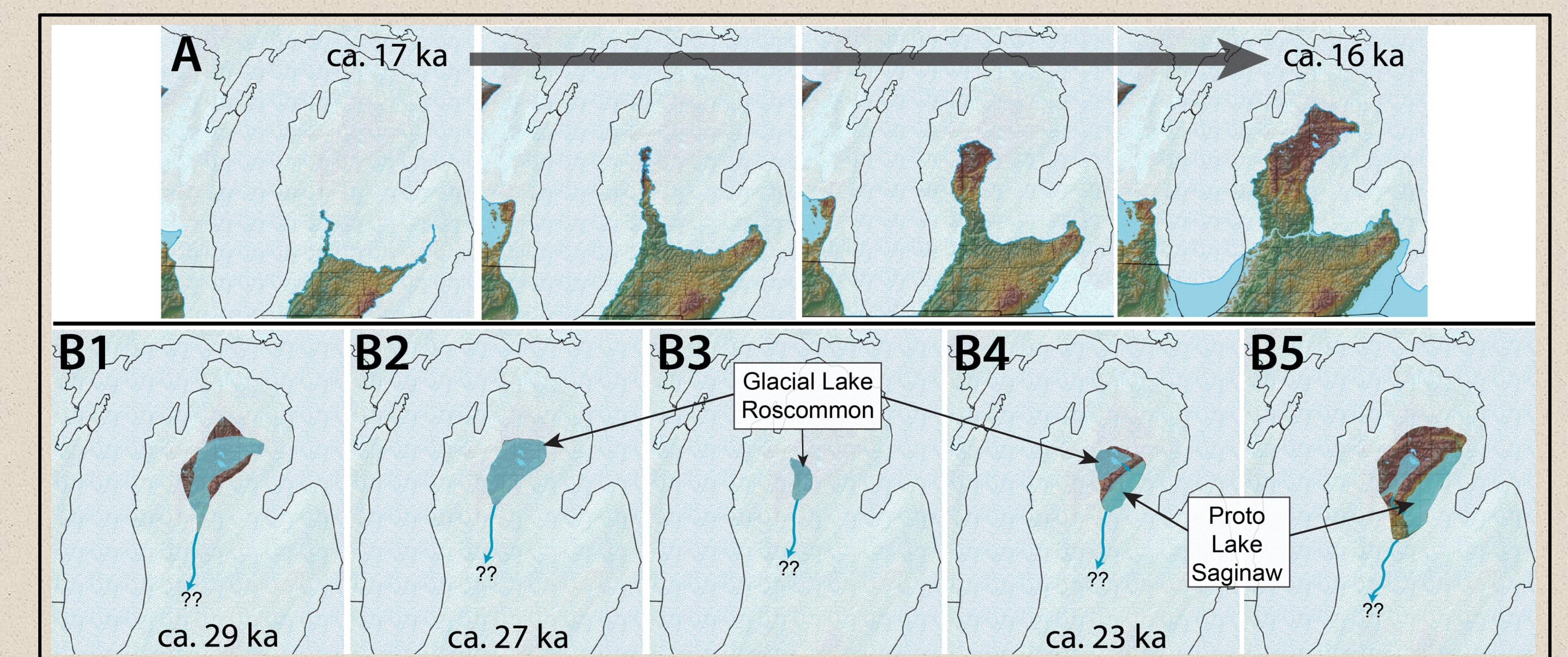
Straight purple lines are used in this figure to indicate the direction of ice advance by the newly documented Mackinac Lobe (Schaetzl et al. 2017), as it initially covered the region during MIS 2. These directions were derived from till fabric data in the Grayling Fingers (Schaetzl and Weisenborn 2004). Curving red lines are used in this figure to indicate the dominant trends in linear landforms (mainly eskers and drumlins) from later advances - Port Huron ( $\approx 16$ -15 ka) and Greatlakean ( $\approx 14$ -13 ka) (Schaetzl 2001). We assume that ice advance and retreat in this region was generally along similar pathways, regardless of age.

As the Mackinac Lobe entered the Houghton Lake Basin, we believe that it advanced along the same trajectory as it did over the Grayling Fingers, but eventually veered west due to interactions with the Saginaw Lobe (see figure; green lines). The Mackinac Lobe may have eventually filled the Basin, as it abutted the Cadillac Interlobate and/or the West Branch Moraine. The ultimate extent of the Lobe within the Basin is unknown at this time.

Retreat from the Basin is constrained by five OSL dates from a kame delta, named the Cottage Grove Delta (Schaetzl et al. 2017). The overall direction of retreat is based on the many ice-contact ridges (kame moraines) within the Basin proper.



Glacial Lake Roscommon at 355 m, which may have been the most long-lived stage, due to its prominent shoreline. The likely outlet at this stage was at the village of Merideth, which opened due to further retreat of the Saginaw Lobe from the West Branch Moraine. At the end of this channel the very large Gladwin Delta formed in Glacial Lake Saginaw. Unpublished dates on coastal sediments from this lake stage indicate that it existed between roughly 17 and 20 ka (OSL dates :  $16.8 \pm 0.8$  and  $20.1 \pm 1.9$  ka). Key to all these stages is the fact that the Lake Michigan Lobe blocks the Muskegon River outlet until very late, as suggested by traditional deglaciation models (see figure to right).



### Deglaciation scenarios.

A. Traditional view, in which an interlobate opens up in central Michigan at ca. 16 ka.

B. Current thinking on deglaciation, knowing that Glacial Lake Roscommon had been well established by ca. 23. This model implies that another, higher lake stage had also developed in the basin during the ice advance of 29 ka, as the Mackinac Lobe was advancing into the Basin. Thick sequences of lake clays in the Basin may have formed at this time.

## CONCLUSIONS

Glacial Lake Roscommon went undocumented by all previous glacial research. We have confirmed that it existed in the Houghton Lake Basin as a large proglacial lake, both while the Mackinac Lobe advanced into it and as it retreated from it. This period spanned from ca. 29 ka (based on OSL ages from the outwash of the Mackinac Lobe in the Grayling Fingers), to at least 23 ka (based on OSL dates from the Cottage Grove Delta). Thus, Glacial Lake Roscommon existed in central Lower Michigan for at least 6,000 years, at around the time of the Last Glacial Maximum. Opportunities exist for continued work on the lake, e.g., dating coastal sediments and establishing linkages between the lake and landforms outside of the Basin.

### References

Schaetzl, R.J. 2001. Late Pleistocene ice flow directions and the age of glacial landscapes in northern Lower Michigan. *Physical Geography* 22:28-41.

Schaetzl, R.J., Lepper, K., Thomas, S., Grove, L., Treiber, E., Farmer, A., Fillmore, A., Lee, J., Dickerson, B., and K. Alme. 2017. Kame deltas provide evidence for a new glacial lake and suggest early glacial retreat from central Lower Michigan, USA. *Geomorphology* 280:167-178.

Schaetzl, R.J. and B.N. Weisenborn. 2004. The Grayling Fingers geomorphic region of Michigan: Soils, sedimentology, stratigraphy and geomorphic development. *Geomorphology* 61:251-274.

### Acknowledgements

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