



Michigan Basin Geological Society

March MBGS Membership Meeting

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WHEN Wednesday March 25th, 2026 - FREE

Social: 6:30PM

Presentation - 7:00 PM - 8:00 PM

WHERE East Lansing Public Library

950 Abbot Rd, East Lansing, Michigan 48823

WHO Alan F. Arbogast

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The Geomorphology and Chronology of Sand Dunes in Michigan

ABSTRACT: Sand dunes are very common in Michigan. These eolian landforms occur along much of Michigan's coastlines as well as interior locations far from the modern shore. Collectively, they record episodes of environmental change that span the post-glacial history of the state. The oldest dunes are those within the interior, ranging from central Lower Michigan to the Upper Peninsula, that occur within now densely forested landscapes. Optical ages from these dunes indicate that they generally formed between 13 ka and 9 ka when the (then) recently deglaciated landscape was thinly vegetated, the regional climate was dry, and strong winds prevailed. Dune orientations consistently indicate that these winds were northwesterly across the region during this time. Some dunes in Michigan's Upper Peninsula yield optical ages in the middle Holocene, indicating local reactivation of interior dunes as recently as 5 ka.

The largest and best known of Michigan's dune fields occur on the shores of Lake Michigan and Lake Superior. Dune fields in the isostatically stable southern part of the basin are mostly transgressive systems on lake terraces, whereas those in the still rebounding northern basin are either perched on high (~ 90-m) glacial headlands or located at the head of embayments. Statistical analyses of over 200 combined radiocarbon and optical ages demonstrates that dune growth largely occurred in three phases between 1) ~ 5.0 and 3.8 ka, 2) ~ 3.0 and 2.0 ka, and 3) ~ 1.3 and 0.8 ka. These pulses were likely driven by a combination of factors related to fluctuations in sand supply due to lake-level fluctuations, storminess, and even relative drought during the Holocene Climate Optimum, Roman Climate Optimum, and Medieval Warm Periods, respectively. Additional research indicates that vegetation has expanded significantly across formerly barren surfaces and within blowouts in the past century, coincident with increasing annual precipitation and enhanced atmospheric CO₂ loading. The lack of new blowouts in this interval indicates they are legacy features, perhaps of the Little Ice Age.

BIO: Alan Arbogast is a Professor in the Department of Geography, Environment, and Spatial Sciences at Michigan State University in East Lansing, Michigan. He obtained his PhD at the University of Kansas in 1995 where he studied the origin and evolution of the Great Bend Sand Prairie in the south-central part of the state. His research demonstrated that sand dunes in the region formed largely within the past 2,000 years, with major periods of dune activation occurred during cycles of drought. After arriving at MSU the same year, Alan began investigating the evolution of landscapes in Michigan, particularly those of wind-blown, coastal, and stream origins. He is best known for his groundbreaking research on the age and formation of coastal sand dunes along Michigan's Great Lakes, which demonstrates that they formed in a more complex way than traditionally believed. Alan has published over 40 scientific papers, book chapters, and monographs related to this work. His research has been funded by the National Aeronautics and Space Administration, the National Science Foundation, and the State of Michigan.

Alan served as Department Chairperson from 2012 to 2021, a time of rapid growth in the unit and a rise to top-five status in the national academic rankings. He is an award-winning instructor at MSU where he teaches a variety of classes at the undergraduate and graduate levels. Most of these courses are related to physical geography, geomorphology, and human-environment interactions. Alan frequently teaches large lecture classes and is known as an enthusiastic instructor who uses innovative approaches. He also taught extensively in Australia and New Zealand in association with MSU's study abroad program. Alan is also the author of *Discovering Physical Geography*, which is an introductory textbook in its 5th edition that's used in over 50 colleges and universities in the country. He is a member of the American Association of Geographers, the Geological Society of America, and the St. George Geographical Society. Alan is married to Jennifer and has two daughters, Hannah and Rosie.

