Inland eolian sediments and the potential for archaeological site burial in the upper Midwest: What are we missing?

Matthew P. Purtill
State University of New York at Fredonia

Introduction

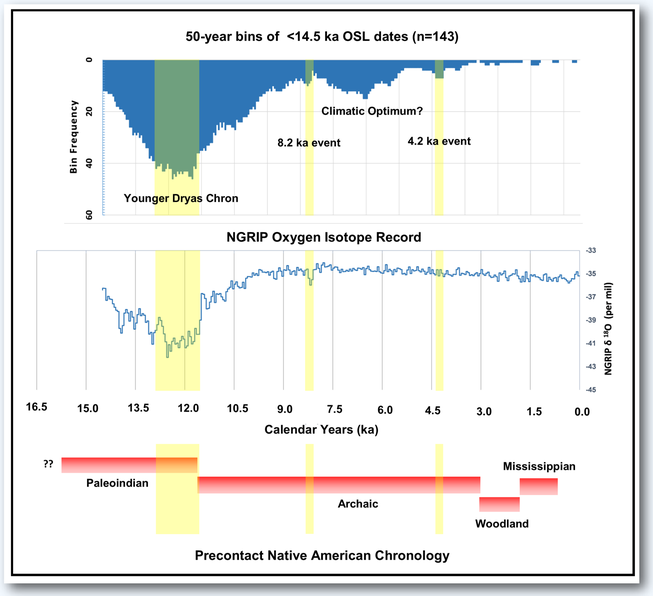
- Windblow, or eolian, sediments in the form of dunes and loess blanket portions of inland high terraces in alluvial valleys and upland settings in the upper Midwest (U.S.)
- Traditionally, eolian sedimentation processes were thought constrained to just after the Last Glacial Maximum (~21 ka) and largely prior to human occupation of eastern North America.
- Recent geochronological research, primarily optically stimulated luminescence (OSL), demonstrates that considerable reactivation or remobilization, and in some cases initial construction, of eolian landforms occurred throughout the late Pleistocene and Holocene.
- Such sedimentation is commonly interpreted as a response to periods of increased aridity or wildfire activity. Most notably is the association between eolian sedimentation and drought conditions such as the 4.2 ka climate event (e.g., Booth et al., 2005) or cold/dry conditions such as the 8.2 ka climate event (e.g., Lutz et al., 2007).
- Although archaeologist long have employed geoarchaeological methods in alluvial settings, the potential for site burial in other environs such as high terraces or uplands is rare.
- Since precontact Native Americans arrived in North America sometime after 16 ka, and certainly by 14.5 ka, we must consider the potential that late Pleistocene and Holocene eolian sedimentation cover archaeological resources.

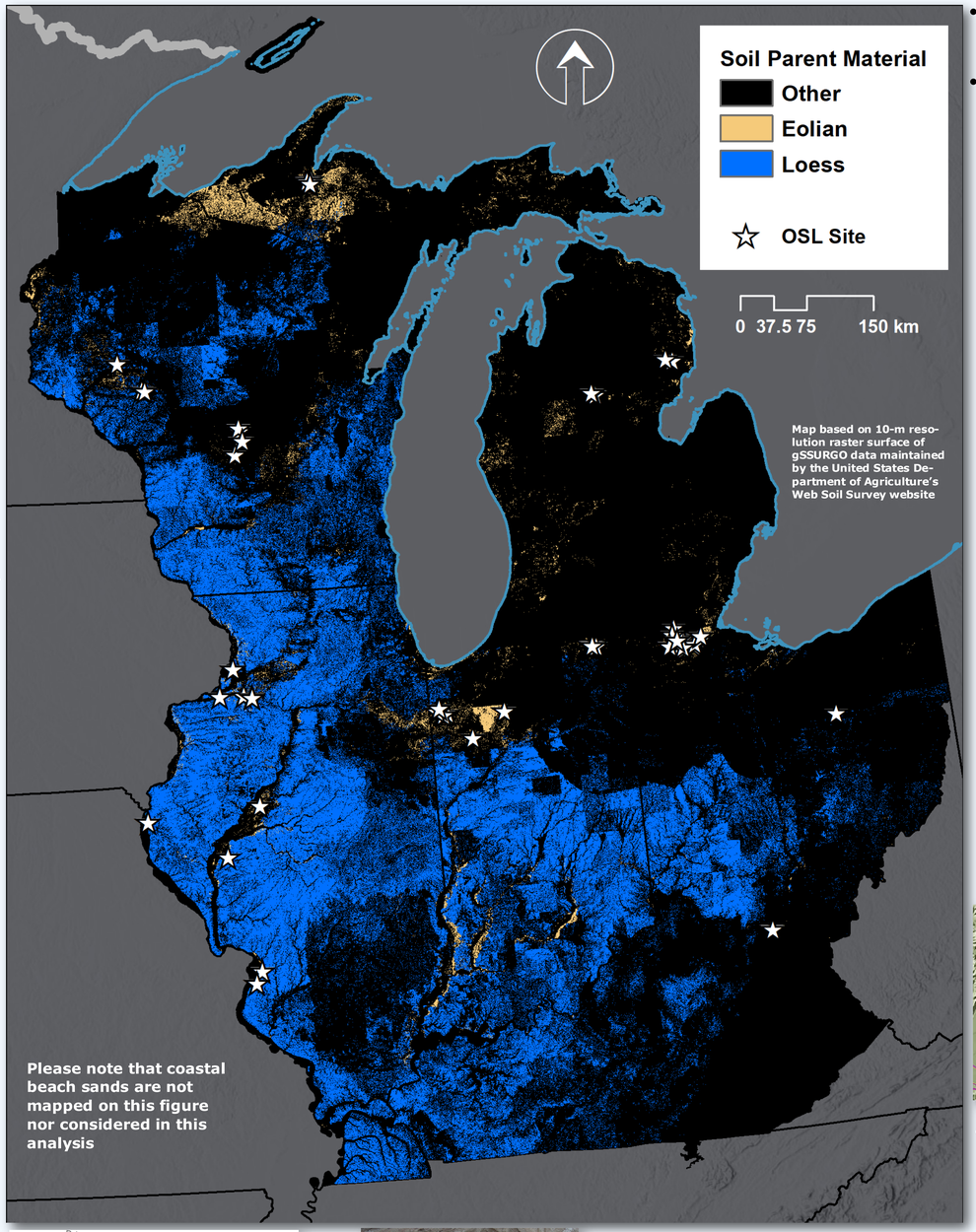
Purpose and methods

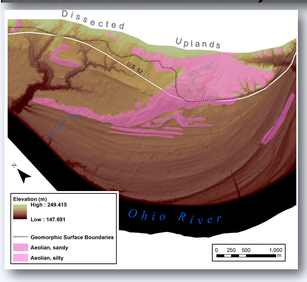
- The purpose of this poster was to update the on-going The Eastern United States Eolian Geoarchaeology (EUSEG) project which is evaluating the proposal that inland late Pleistocene-to-Holocene eolian deposits blanket currently undocumented portions of the archaeological record. Coastal dune systems was not considered here.
- This research included review of published OSL dates in the literature
- Possible correlation between <14.5 ka eolian activity and known paleoclimatic events were explored.

Results

- 143 OSL samples in the archaeological, geological, and geochronological literature that post-date 14.5 ka were identified. Sampled sites come both glaciated and deglaciated settings and five physiographic sections (Eastern Lake, Kanawha, Till Plains, Wisconsin Driftless).
- Creation of 50-year bins for OSL dates indicate chronological patterning with distinctive peaks in eolian activity at ~13.1—11.6, 8.35—8.25, 7.7—5.6, and 4.4—4.2 ka. These align with several known paleoclimatic events.





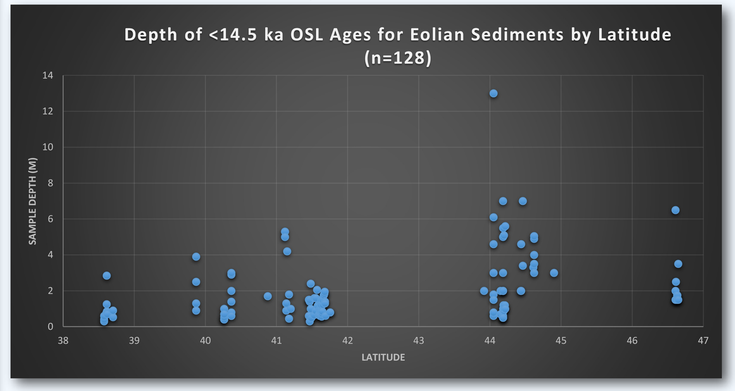


Left Lidar view of Sandy Springs dunefield which contains the Sandy Springs archaeological site. Various source bordering and climbing dunes evident. OSL dating indicate that much of the landscape was significantly reworked after 11.5 ka. (Purtill et al., 2019)

Upper. Clay-enriched lamellae banding at base of Holocene aged dune at Sandy Springs

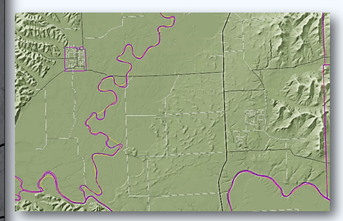
Right. Paleoindian projectile points from Sandy Springs..

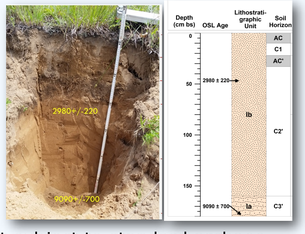
- Most OSL samples date remobilization or reactivation of older, often relict, dunes, although some evidence of new dune formation dating after <14.5 ka is indicated.
- Eolian sediments young enough to cover archaeological deposits vary widely in thickness with samples up to 13 m reported. Thicker deposits (>4 m) tend to occur in more northerly latitudes.



Discussion and Conclusion

- Inland eolian sediments, including dunes and loess, cover significant portions of the eastern U.S. where they are parent material for modern soils.
- Late Pleistocene through Holocene (<14.5 ka) reactivation and construction of eolian dunes and loess deposition was common in both glaciated and deglaciated regions of the Upper Midwest.
- Based on binned OSL results, increased eolian activity correlates with several well-known paleoclimate events that likely led to decreased vegetation cover and increased air density. These include the Younger Dryas, 8.2 event, Climatic Optimum, and 4.2 event.
- Many eolian units are young enough to potentially cover undocumented archaeological deposits. Post 14.5 ka eolian sediments occur up to 6 m below the modern ground surface in some settings with thicker deposits in more northerly latitudes.





Left View of the White River valley near Medora, Indiana, south of glacial margin. Note parabolic dune trains on high alluvial terrace to the east (downwind).

Right. Profile of tested parabolic dune adjacent Kankakee Valley in outwash plain. Holocene deposits, including a shallowly buried AC horizon, extend to over 1.6 m in depth (Purtill et al., 2021)

- Most <14.5 ka eolian units are in settings not subject to standard archaeological deep testing protocols such as high alluvial terraces, outwash and till plains, and uplands. This suggests that we may be missing portions of the archaeological record by assuming that no geological pathway exists for site burial in such settings.
- Since wind is ~800 to 1000 times less dense than water, archaeological preservation of buried sites would be enhanced.
- The EUSEG project is on-going and plans to document additional <14.5 ka eolian deposits in the upper Midwest, especially the upper Ohio Valley.

References

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