

Lessons from the Inland Seas: A Submerged Landscape Study in the Great Lakes

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ABSTRACT

The topic of this abstract fits best within Session 15 because it is a case study of 9,000-year-old archaeological sites on a submerged landscape under a lake. The case studies under consideration are the following 1) conducting prehistoric archaeology 30 meters below water, 2) studying a submerged landscape in an inland setting, in this case, a large freshwater lake, and 3) novel data preserved underwater in the Great Lakes challenges our previous ideas about hunter-gatherer societies. The resources available to conduct the work include funding from the National Science Foundation and National Oceanic and Atmospheric Administration (both based in the United States) and methods include sonar surveys, remote operated vehicle investigations, photogrammetry, scuba diving, environmental sampling, and virtual reality computer modeling. The research questions/approach/problems are 1) how can we conduct anthropologically relevant underwater archaeology, 2) how do you investigate sites 30 meters below water, and 3) what can submerged data tell us about prehistoric peoples? The [expected] results are stone tools and debitage, stone constructed hunting features, and ancient peat deposits.

Keywords: Submerged landscapes, North America, Great Lakes, Deep-water archaeology

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INTRODUCTION

The topic of this article fits best within Session 15, The Archaeology of Submerged Landscapes and Inland Waters because it is a case study of Early Holocene (9,500-8,900 cal. yr. BP) archaeological sites on a submerged landscape under an inland lake. Over the past 200,000 years the earth experienced several phases of glacial and interglacial climates and associated changes in global water level. During these periods, when large amounts of water were frozen, sea-level lowered by as much as 130 meters (Joy 2021). These global processes of sea level change, including glaciation, isostatic rebound, and fluctuating water levels are mirrored on a local level in the North American Great Lakes.

The North American Great Lakes is a region in the midcontinent of North America with five fresh bodies of water. Amongst the largest lakes in the world, the Great Lakes are often referred to as the “inland seas” given their size, depth, ecological habitats, and significant weather and waves. Today these lakes greatly impact communities in the region in terms of commerce, travel, subsistence, climate, and recreation. The same was true for these lakes in the past, where they have influenced, and been influenced by, the human communities on and around them for thousands of years.

The Great Lakes have been a region of study for nautical archaeologists for many decades, given the unique and varied vessels to sail across them and their long-standing role in transportation, trade, and conflict (e.g. Lardinois 2021). In addition to the rich maritime history of the area, the cold, fresh waters of the Great Lakes provide some of the best preservation habitats for archaeological remains, particularly wooden and metal ships given the lack of salt (and its corrosive properties), absence of ship worms (Teredinidae), and cold-water temperature. Indeed, the large numbers of shipwrecks and their immaculate state of preservation has resulted in two National Marine Sanctuaries in the Great Lakes, one in Lake Michigan, the Wisconsin Shipwreck Coast National Marine Sanctuary, and one in Lake Huron, the Thunder Bay National Marine Sanctuary.

Within the Thunder Bay National Marine Sanctuary in Lake Huron, this project seeks to move beyond shipwrecks and further back in time, to explore submerged landscapes in the Great Lakes, using Lake Huron as a test case. At the end of the last ice age, during the Lake Stanley time period, water levels in Lake Huron were 100 meters lower than modern sea level and exposed more than 250,000 hectares of previous lake bottom. These lower water levels created a long, narrow dryland feature called the Alpena-Amberley Ridge (AAR) that runs across the modern Lake Huron basin, splitting it in two (Figure 1). The AAR is ~145 kilometers long and between 12-16 kilometers wide, it now rests in an average of 25-30 meters of water. Between 9,500-8,900 cal. yr. BP this causeway was a dryland environment that connected mainland Michigan and Ontario on either side of the lake and served as a migratory pathway for caribou herds in the area which in turn attracted human hunter-gatherers.

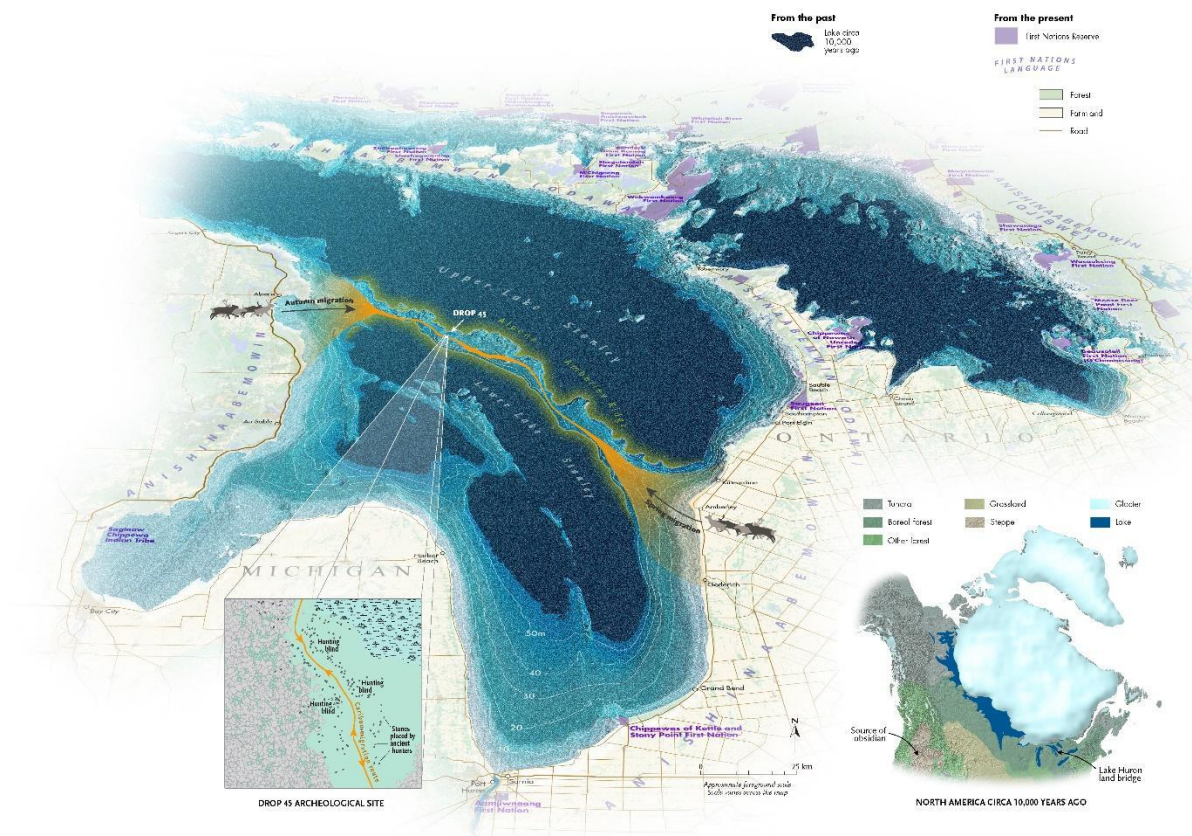


Figure 1. Lake Huron and the Alpena-Amberley Ridge.

Interdisciplinary research since 2008, including paleoenvironmental studies and computer science applications, but focusing on archaeology, has documented 9,000-year-old hunting sites for targeting caribou (Lemke 2022; O'Shea and Meadows 2009; O'Shea et al. 2014). Organic remains and stone artifacts have been collected including two lithic flakes fashioned out of an exotic obsidian from over 4,000 kilometers away (O'Shea et al. 2021 Figure 2).

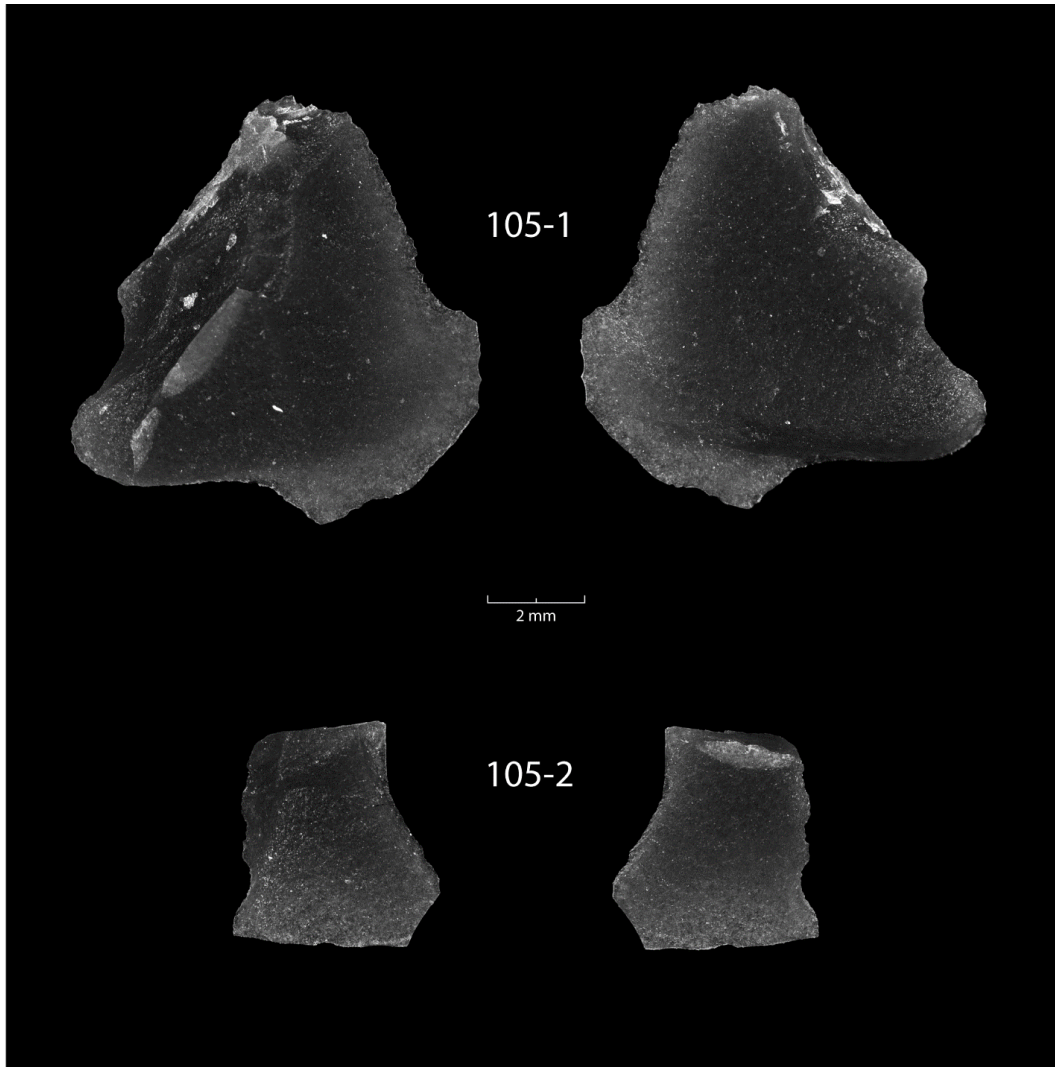


Figure 2. Two obsidian flakes (specimen numbers 105-1 and 105-2) recovered from a submerged landscape below Lake Huron, Great Lakes, United States (O'Shea et al. 2021).

CASE STUDIES

While one project, the case studies under consideration are the following: 1) conducting prehistoric¹ archaeology 30 meters below water, 2) studying a submerged landscape in an inland setting, in this case, a large freshwater lake, and 3) novel data preserved underwater in the Great Lakes challenges our previous ideas about hunter-gatherer societies in the region.

While submerged landscapes studies are now common across the globe (Bailey et al. 2020; Benjamin et al. 2011; Evans et al. 2014), it is still a small group of archaeologists working in prehistoric time periods within the larger field of underwater archaeology. As such, projects across the globe have targeted different regions, various time periods, diverse research questions, generated novel data, and have utilized unique methods while creating new research designs. While many approaches from nautical archaeology

¹ A note about the use of “prehistoric” here. While many archaeologists are using pre-contact to refer to ancient sites in the Americas, the author prefers the use of prehistoric, arguing that “pre-contact” obscures diversity and artificially creates a homogenous “pre-contact” North America that did not exist (akin to the use of “pre-colonial Africa” see Táíwò 2023)

can be adapted to older sites, submerged landscapes also present their own unique challenges, and project teams have often invented new techniques combined with standard methods to approach these archaeological records. For the Lake Huron project specifically, a new approach was applied that worked in iterative, multi-scalar levels, developed out of necessity for working in very old contexts in deep, fresh water, far offshore (55-80 kilometers).

Conducting prehistoric archaeology in water depths of 30 meters required a multi-scalar approach to submerged landscapes, to first understand the underlying landforms and their associated paleoenvironments to then make predictions about where hunting and gathering sites would be located. Therefore, the first research conducted was large-scale mapping of the central portion of the AAR using multibeam and side-scan sonars. The AAR was broken into 4 research areas, targeting unique geological aspects of the landform. Area 1 (56 kilometers squared) focused on high ground outcrops that may have included local chert/flint deposits, Area 2 (49 kilometers squared) has some of the deepest water on the AAR, thus representing evidence from the earliest stages of Lake Stanley (those areas that would have been exposed first after water levels lowered), Area 3 is a narrow section of the AAR with a pronounced slope (17 kilometers squared) and Area 4 is an large, flat area that likely would have had the best grazing/browse for migrating herds (165 kilometers squared). The central portion of the AAR was targeted for investigation because archaeological deposits offshore are less likely to be deeply buried by modern sediment and are less likely to be significantly impacted by coastline waves and weather (e.g. ice thrusts, erosion, etc.).

Once these large areas were mapped, investigations focused on targets of interest on the sonar surveys, and research focused on these smaller areas. Fortunately, the archaeological record on the AAR investigated thus far consists of stone-constructed hunting features, some of which are large enough to see on large-scale sonar surveys given their high reflectivity. These sites are similar to hunting architecture sites known from the terrestrial record (Lemke 2022) and are stone lines, rings, v-shapes, funnel-shapes, and other constructions used to attract and channel wild prey into predictable hunting areas. Many of the sites under Lake Huron have rocks with diameters of 1 meter and some rock line constructions are 30 meters long and thus are visible on side-scan surveys (O'Shea and Meadows 2008) and were chosen for more in-depth research. Once an area on the AAR is known to have a prehistoric structure, finer scale survey is conducted with scanning sonar, autonomous underwater vehicles (AUV) with side-scan sonar, and a remote operated vehicle (ROV) resulting in micro-regional investigations of 150-hectare areas (O'Shea 2021). Given the depth and temperature of the water, large-scale scuba surveys are not possible given limitations on bottom time, and these remote sensing methods coupled with the live video of the ROV have proven very successful at finding archaeological sites and conducting preliminary mapping and video surveys of features.

Once sites are fully photo-documented using the ROV and mapped using the scanning sonar and/or AUV, they are then sampled for cultural materials by scuba divers. Sampling on the AAR has taken a varied approach depending on the context. In general, archaeological sites and materials are shallowly buried (less than 10 centimeters of sediment overlay archaeological deposits). At large sites, preliminary sampling was conducted in a fashion similar to shovel testing in the United States where a small area, 30 centimeters squared, was hand excavated and screened and cultural material was collected every three meters. Once cultural material was recovered, further excavation was completed in one by one-meter square units. Locations of all samples are collected via the ROV which is equipped with a tracking sonar with real time geospatial coordinates. Other sampling methods include 100 mL plastic vials which are primarily used for collecting sediment for paleoenvironmental and geoarchaeological analyses, including pollen, testate amoebae, grain size, etc. These samples occasionally also collected cultural materials, such as the two obsidian flakes (O'Shea et al. 2014).

To date, numerous stone constructed sites have been documented and sampled on the AAR using the above methods. These include Drop 45, a long liner drive lane site that has associated hunting blinds and

stone artifacts (O'Shea et al. 2014), the Gap Locality, an area of hunting blinds and other constructed features that yielded the obsidian artifacts (O'Shea et al. 2021), and the Dragon Drive lane, a site with a long, liner drive lane feature and a hunting blind (O'Shea and Meadows 2009). In addition to the cultural material, paleoenvironmental data characterized this submerged landscape as a peri-glacial sub-arctic like environment with spruce and tamarack trees, freshwater lakes, bogs, and marshes. Most recently, a preserved peat bog was discovered. Radiocarbon dates from this peat layer ranged from 9678-9296 cal. yr. BP (Figure 3). Samples of the peat have been submitted for environmental DNA analyses which aim to further illuminate the flora and fauna present on this early Holocene now submerged landscape.



Figure 3. Sampling an exposed peat layer on a submerged landscape below Lake Huron, Great Lakes, United States. Photograph by John O'Shea, used with permission.

In general, the archaeological record on the AAR can be characterized as evidence of a modified, cultural landscape, where groups of foraging societies encountered caribou on their semi-annual migrations and used targeted hunting techniques in both the fall and spring using built structures. Hunting architecture sites increase the yield and predictability of wild animal resources and provide meeting areas on the landscape for people to come together for cooperative hunts while also likely trading goods, socializing, sharing foods, exchanging information, conducting rituals, etc.

Significantly, the archaeological evidence preserved on this inundated landform is notably different from terrestrial archaeological sites in the region. Historically the standard model of occupation for the area began with the Paleoindian time period (~13,000-10,000 cal. yr. BP) as the earliest occupants, characterized as highly mobile, big-game hunters, using distinctive fluted point projectiles, changing to lanceolate points during the later stages. Such technology is unique in the Americas and has been well-studied; although, regionally archaeological sites with this technology are not well dated due to

acidic soils and largely ephemeral deposits (Lothrop et al. 2016). The following Archaic period is characterized by notched and stemmed points in the Great Lakes, with the Hi-Lo variety often assumed to be transitional between these and the earlier fluted points. To date, no large bifaces have been recovered from submerged sites on the AAR. While the two obsidian flakes are likely the byproduct of bifacial manufacture/maintenance (O'Shea et al. 2021), other lithics from the AAR are more indicative of a microtool tradition, unknown from the terrestrial record in the region. The AAR archaeology therefore offers a unique window in diverse lifeways that characterize the late Pleistocene/early Holocene, a time period of immense environmental change, mosaicked flora and fauna, and likely small regional refugia such as the AAR (see Lemke and O'Shea 2019).

RESOURCES

The resources available to conduct the work include funding from the National Science Foundation and National Oceanic and Atmospheric Administration (both based in the United States) and methods include sonar surveys, remote operated vehicle investigations, photogrammetry, scuba diving, environmental sampling, and virtual reality computer modeling.

FRAMEWORK

The research questions/approach/problems are 1) how can we conduct anthropologically relevant underwater archaeology, 2) how do you investigate sites 30 meters below water, and 3) what can submerged data tell us about prehistoric peoples? First, submerged landscapes represent a fundamentally different problem than sunken wrecks (boats, ships, or airplanes), rather than a time capsule of a historical event, submerged landscapes are often palimpsests of longer periods more akin to most terrestrial archaeological sites (Lemke and O'Shea 2022). As such, they can be investigated like terrestrial archaeological sites, admittedly with some unique methods, such as those developed for the deep-water archaeology conducted on the AAR. The investigation of submerged landscapes also requires geoarchaeological, paleoenvironmental, and paleolimnological data to understand when sites were submerged, how long environments were habitable, and what type of climates and resources they provided to past peoples. Ultimately it is critical to investigate these landscapes from an anthropological archaeology perspective (Lemke 2021). The Great Lakes case study presented here also offers ideas for research designs in deep-water, offshore contexts, but it is important to stress that while theoretically submerged landscapes share many commonalities with each other and their terrestrial counterparts, site- and regional-level modeling must be done on a case-by-case basis. For example, most sea-level curves are not appropriate for wide-scale use, and water levels need to be reconstructed for specific areas keeping in mind their unique geomorphology. Additionally, methods that work well for one submerged site will not work at others, for example, an airlift that was designed to excavate ancient, submerged sites in Florida karstic sinkholes and rivers was used in Lake Huron and froze given the dramatic differences in water temperature. Lastly, it is important to note that data from submerged landscapes date to some of the most critical time periods in the human past, and rather than providing redundant data, they often preserve unique evidence about the past to better elucidate the lifeways of prehistoric peoples.

RESULTS

The [expected] results from this research are stone tools and debitage, stone constructed hunting features, and environmental DNA from ancient peat deposits. Taken together, this case study from the inland seas presents unique methodologies for conducting deep-water archaeology, a long-term regional study of a submerged landscape, and novel results that indicate a unique early Holocene environment, significant

modification of the landscape best characterized as niche construction by hunter-gatherers, and a mosaic of foraging lifeways in the ancient Americas.

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