

**APPROACHES TO THE ARCHAEOLOGY OF SUBMERGED LANDSCAPES:
RESEARCH ON THE ALPENA-AMBERLEY RIDGE, LAKE HURON.**

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Some of the most pivotal questions in human prehistory necessitate the investigation of archaeological sites that are now submerged. The advance and retreat of glacial ice and the associated global changes in sea level throughout the period of human development have exposed and then submerged significant coastal land masses repeatedly. As a result, questions as diverse as the origins of early human culture, the spread of hominids out of Africa and the colonization of the New World all hinge on evidence that is under water. While the discovery and investigation of such sites presents technological challenges, these contexts have unique potentials for investigating ancient sites that have not been disturbed by later human activity, and for preserving organic materials that typically do not survive on land.

While sharing obvious similarities, there are fundamental differences between conducting traditional marine archaeology focused on shipwrecks and the investigation of submerged prehistoric sites and landscapes. A shipwreck presents a known and focal target for discovery and investigation, while the bottom environment in which it now rests is largely irrelevant. By contrast, the bottom environment for submerged site archaeology is everything. It presents the vestiges of the ancient landscape that shaped the activities of the humans in the past, while virtually nothing is known a priori about the number, character, or locations of human occupation sites that may be present.

A second fundamental difference is funding. All underwater research is expensive. Yet the kinds of public and private funding that can be generated to find a Titanic or Spanish galleon are simply not available for the systematic investigations required by underwater prehistoric archaeology. In essence,

submerged site archaeology must meet the challenges of ‘big ocean’ research on a ‘bath tub’ budget. To meet these twin challenges it is necessary to adopt approaches and technologies that can cope with large areas of bottomlands and do so within the ‘bath tub’ budgetary constraints of normal terrestrial archaeology.

These challenges have shaped our current archaeological research in the Great Lakes. The focus of our work is the Alpena-Amberley Ridge (AAR), a submerged feature beneath Lake Huron which, during the Lake Stanley low stand (roughly 9900 and 7500 calibrated years BP), provided a dry land corridor linking northern Michigan with south central Ontario (Fig. 1). During this time period the AAR was a natural causeway for the semi-annual migration of caribou; a setting that was actively exploited by ancient hunters. The AAR offers a Pompeii-like archaeological context in which stone hunting structures and other features are preserved without disturbance or modification from later human occupation or modern development. The AAR, because of its mid-lake location, also lacks the thick overburden of sediment or the high energy remodeling that is characteristic of near shore areas. Yet to realize this unique archaeological potential the research must be conducted over an area of some 900 km² of lake bottom and 80 km offshore.

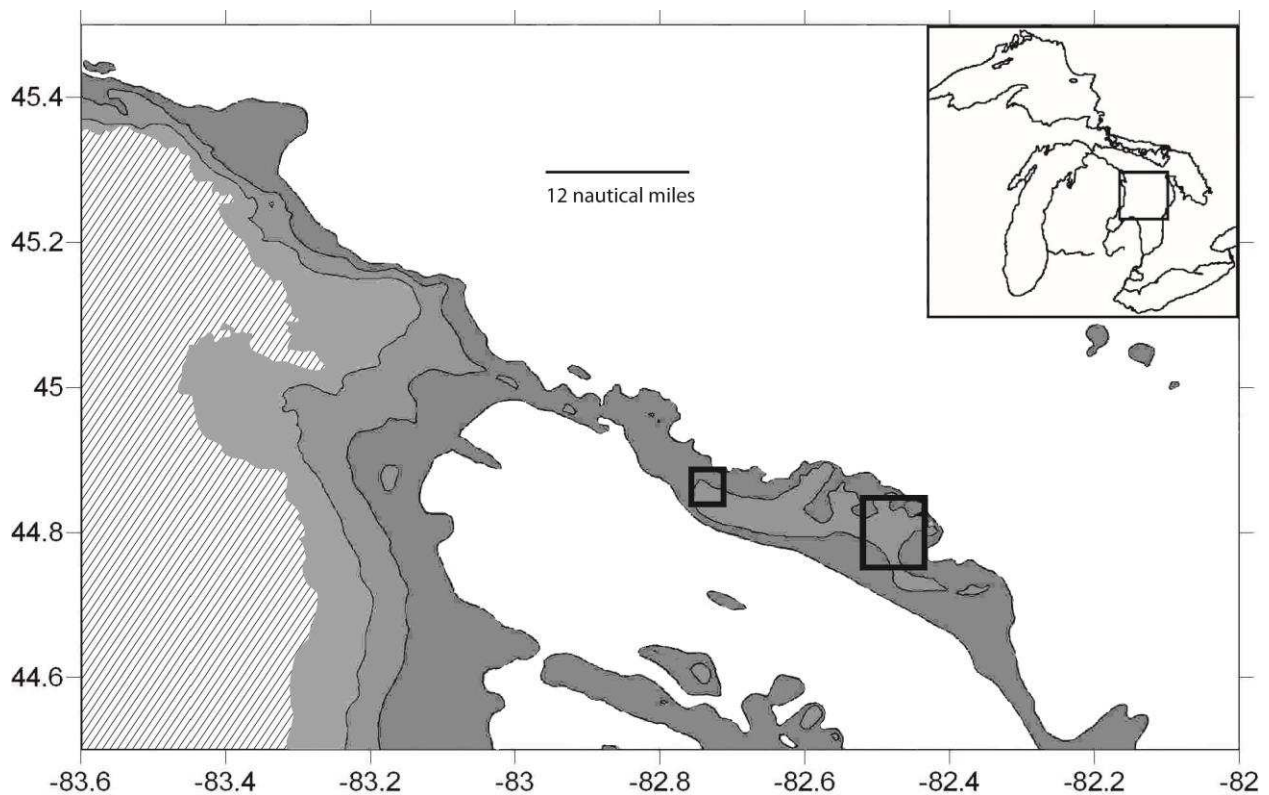


Figure 1. The Alpena-Amberley Ridge was a dry land corridor with an elevation of 140 m above mean sea level (modern lake datum is 176 m). The modern land surface is hatched and Lake Stanley stage water is shown in white. The contour interval represented by shading is 10 m. Figure coordinates are represented as degrees North Latitude and West Longitude. The map presents the western (American) half of the ridge and the black rectangles indicate the primary locations where research has been conducted.

We have developed a nested series of investigative techniques designed both to document the ancient landscape and to discover human occupation sites (Fig. 2). The research combines ethnographic research

and agent-based computer simulation, with acoustic and visual search techniques, and ultimately scuba-trained archaeologists.

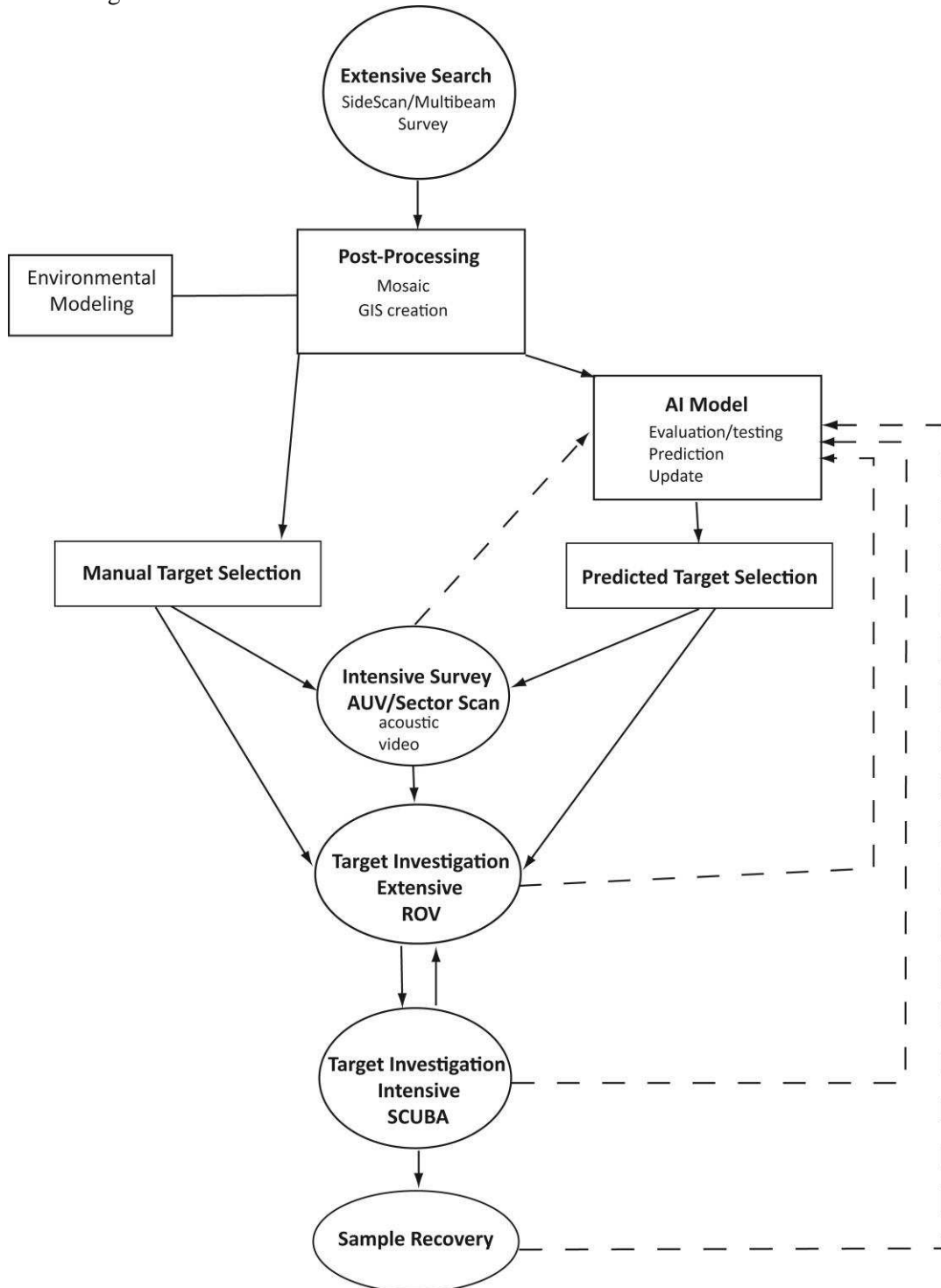


Figure 2. A schematic diagram illustrating the nested and recursive application of differing scales of search and analysis that guides research investigations on the Alpena-Amberley Ridge. Dashed lines reflect new information that is fed back into the simulation models.

The search efforts rely on the use of hand-deployable equipment that can be accommodated on a small vessel. A number of systems, including sidescan and multibeam sonars, remotely operated vehicles (ROVs), and autonomous underwater vehicles (AUVs), have been developed for small vessel use, while software developments now allow many of these systems to talk to each other and to onboard computer systems in real time. These hand-deployable systems offer unrivaled flexibility and synergistic benefits when employed together. For example, the transponder on the small ROV allows its location to be overlaid in real time on a computer representation of the ancient landscape. The boat-based operator can then lead deployed divers to specific sampling locations, make a video recording of the sampling event and location, and report back the precise three-dimensional location of the sample, which is immediately updated on the shipboard GIS.

Computer simulation is the critical second element in our approach to submerged site survey, since the size of the area places a premium on accurate predictive modeling. This involves two concurrent cycles of simulation, the first models the modern sea floor as a dry land environment, and the second uses the environmental model to predict the location of human activity. Both simulations are updated as new research data are generated, making them the effective repository of all that is known about the region.

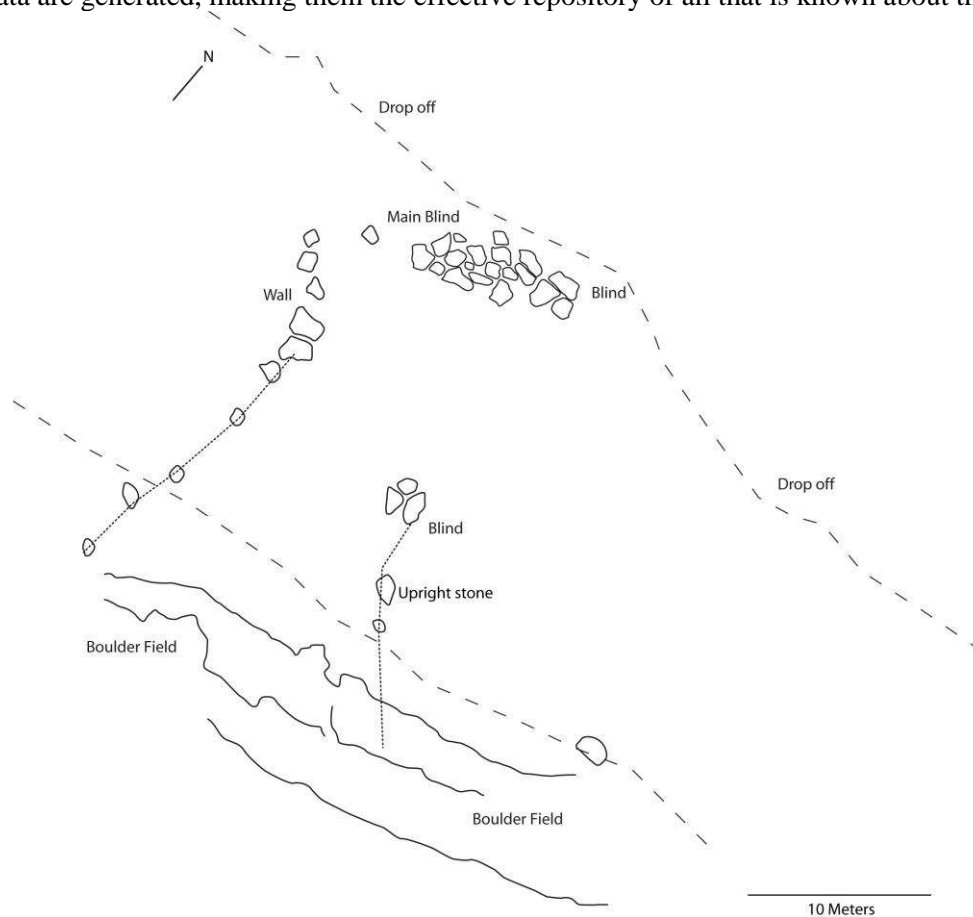


Figure 3. The Funnel Drive structure. The Funnel Drive is located at a depth of 22 m and is positioned on high ground above a marshy area. The apex of the two converging arms is at the upper left of the image. The feature is bounded by a boulder field at the bottom of the drawing that slopes upward to the south, and by a drop off behind and parallel to the main blind complex. Given the orientation of the structure, it was most likely used when animals were moving towards the northwest, which equates with the spring caribou migration. The contour lines represented in both areas are approximately 1 m.

The final step in the process is the deployment of scuba-trained archaeologists to evaluate and sample potential cultural features. By deploying divers in tandem with other surface assets the divers can concentrate on the archaeology while many of the burdens of mapping, photography and coordination are handled from the surface. One advantage of submerged-site archaeology from the perspective of diving is that most of the ancient land surfaces are relatively shallow. For our research on the ARR most areas of interest fall within the depth range of 18 to 45m.

To date, we have been able to document the 9,000-year old environment of the AAR in detail and to identify a number of stone hunting structures and associated features. Critical aspects of the past environment such as the location of lakes, streams and marshes have been identified along with evidence indicative of the vegetation (including a series of spruce, cedar and tamarack trees dating between 8,000 and 9,000 BP) and climate. The unique 'directional dependence' of many of the recorded hunting features has also enabled us to determine their season of use and to provide estimates for the size of hunting groups utilizing the structures (Fig. 3).

As our research continues we are investigating ways to better integrate the acoustic and visual search systems with the simulation models in real time. A particularly promising approach provides the ROV operator with a split screen display that presents both the modern lake bottom environment and the simulated ancient land surface in real time while the ROV is in use.