Chapter 2
Submerged Archaeological Landscapes and the Recording of Precontact History: Examples from Atlantic Canada

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Introduction

Atlantic Canada is a vast region of northeastern North America comprised of the Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island (PEI), the Island of Newfoundland, Labrador, and eastern Quebec, including the Magdalen Islands. (see Fig. 2.1). Undisputed human presence in North America is currently limited to the late Pleistocene and early Holocene (Waters et al. 2011). The presence of glaciers over most northern regions during the Last Glacial Maximum (LGM) postponed human settlement until these areas became ice-free. As a result, the earliest evidence of human presence in Atlantic Canada follows the northward disappearance of glacial ice (e.g., Fitzhugh 1978; MacDonald 1968; McGhee and Tuck 1975). The patterns of ice retreat and associated relative sea-level (RSL) changes are therefore intricately linked to the evolution of the paleolandscapes that Northeastern indigenous populations would have inhabited across Atlantic Canada during its precontact history.

Atlantic Canada was almost completely covered by Late Wisconsinan glacial ice, which at the height of the LGM, reached the edge of the continental shelf, now hundreds of kilometers offshore (Shaw et al. 2006). As ice began to retreat, multiple local ice dispersal centers became independent from the main Laurentide Ice Sheet.

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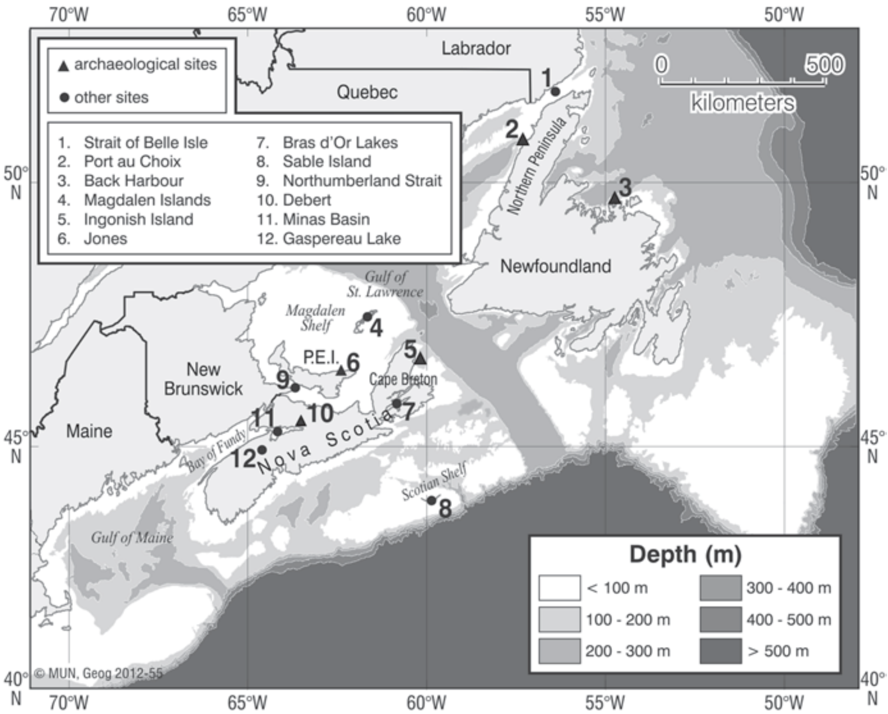

Fig. 2.1 Map of Atlantic Canada including the Maritime Provinces of New Brunswick, Nova Scotia, and Prince Edward Island (PEI), Newfoundland and Labrador, and eastern Quebec and its simplified offshore bathymetry

This resulted in variable local responses to ice unloading and a complex history of crustal readjustment across Atlantic Canada (Quinlan and Beaumont 1981). Therefore, the diverse interplay between isostatic responses and eustatic sea-level rise, at a local scale, has produced highly variable temporal and spatial patterns in local RSL histories (Shaw et al. 2002).

The following sections provide a broad overview of the major changes that have occurred to the paleolandscapes of Atlantic Canada, highlighting the areas that appear to offer the most potential for submerged landscape archaeology. Current evidence of human presence on these submerged landforms is reviewed and the factors influencing the preservation potential of a variety of submerged geomorphic features is examined. It is suggested here that submerged landscapes of Atlantic Canada are well-positioned to address a number of important research questions that can greatly advance our understanding of the precontact history of the region. Two case studies are presented: in one, the investigation of submerged archaeological landscapes helps archaeologists reinterpret portions of the region's precontact history, whereas in the other a similar focus reveals manners in which indigenous groups who witnessed the result of a catastrophic submergence-induced event have incorporated its memory into their oral histories.

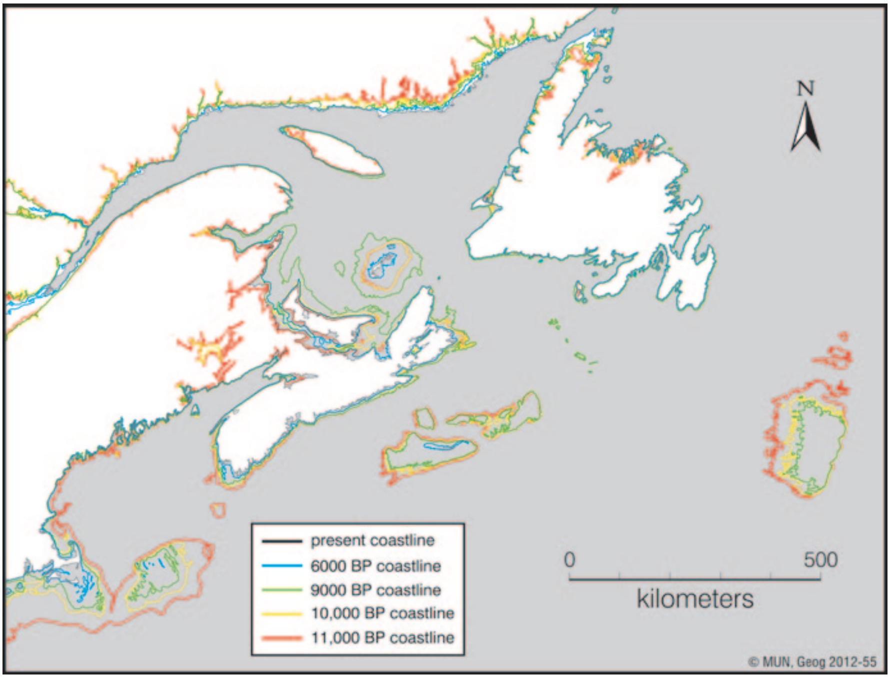

Fig. 2.2 Paleolandscape evolution of Atlantic Canada at various periods (simplified from Shaw 2005: Fig. 5; see Shaw et al. 2006 for the extent of glacial ice cover that would have prevented access to certain landscapes prior to 10,000 BP)

Early Holocene Paleolandscape Evolution

Atlantic Canada's complex response to deglaciation has resulted in three principal RSL patterns (Quinlan and Beaumont 1981). Coastal regions of the southern Labrador-Quebec Peninsula and Newfoundland's Northern Peninsula have been emerging since they became ice-free, and all former shoreline positions are found above the current sea level. The southernmost regions of Atlantic Canada, those formerly located at the very edge of the LGM ice cover, such as the main offshore banks, have been submerging throughout the postglacial period and all former shoreline positions are now located below current sea level. In the remaining regions, sea levels dropped to a local lowstand before rising to their modern position, although in certain areas postglacial shorelines were never above current sea level (see Figs. 2.2 and 2.3).

The paleogeography of Atlantic Canada has been discussed in detail elsewhere (Shaw et al. 2002; Shaw et al. 2006). The general outline of contemporaneous shorelines at selected time slices are presented in Fig. 2.2 and maps of the regional pattern of RSL values for the same time steps are presented in Fig. 2.3 (all dates provided in the text and figures are in uncalibrated radiocarbon years BP). The most dramatic changes to Atlantic Canada's paleolandscapes occurred in the first few thousand

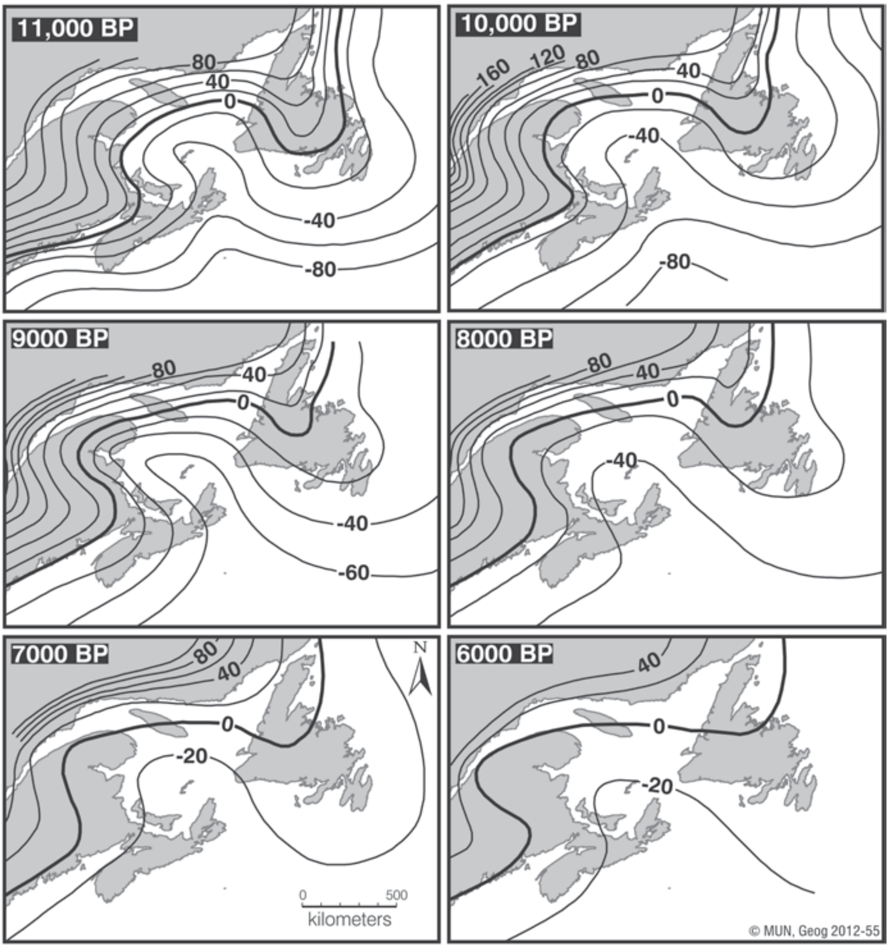

Fig. 2.3 Isobase maps for 11,000–6,000 BP, where lines [isobases] join points of equal emergence or submergence (negative) for each specified time period. (After Shaw et al. 2002: Figs. 5 and 6)

years that followed glacial retreat. At this time, large offshore islands existed along the edge of the continental shelf, although transgression almost immediately began in this area, greatly reducing their size until they completely disappeared, with the exception of Sable Island. The Magdalen Plateau was also occupied by a massive island extending off today's Magdalen Islands and reached its peak size ca. 9,000 BP. Another dramatic transformation created a land bridge between PEI and the mainland by 10,000 BP, which was maintained over the next 4,000 years. Important expanded coastal areas were also present at one time or another along the southern shores of New Brunswick, Nova Scotia, the perimeter of Cape Breton Island, and the central and southern regions of Newfoundland. The paleoenvironmental evolution of all regions, except those found at the northernmost extent of the study area, took the form of a more-or-less rapid succession from herbaceous tundra through shrub tundra and open woodlands to closed forests (Anderson 1980; Lamb 1984; Macpherson 1995; Mott 2011; Richard 1985).

Assessing Archaeological Potential

There are three simple criteria for a submerged archaeological landscape to exist: the sea level must have been lower at some point in the past, prehistoric humans must have been present and occupied the exposed land, and sedimentary processes during transgression must have preserved rather than eroded the landscape (Westley et al. 2011b). As the broad-scale paleolandscape evolution presented earlier indicates, large areas of Atlantic Canada were emergent at some point during the postglacial period. At this scale, the regions that appear to offer the most potential are the shelf-edge archipelago, the expanded southwestern tip of Nova Scotia, the enlarged Magdalen Islands, and the Northumberland Strait. Currently, there is no evidence of human presence on many of these former landscapes. Because of ongoing high-energy marine processes, many submerged landscapes have been reworked to a point where, if any archaeological material had been deposited, they would no longer be preserved in their original context. The following sections highlight which areas offer the best archaeological potential to advance an understanding of Atlantic Canada's precontact history.

Evidence of Precontact Human Presence on Submerged Landscapes

In Atlantic Canada, the earliest evidence of a coastal adaptation dates to ca. 8,500 BP, appearing with the earliest human presence in coastal areas found along the southern shores of the Quebec-Labrador peninsula (McGhee and Tuck 1975; Pintal 1998, 2006). South of the St. Lawrence Estuary, however, the first evidence of a truly coastal adaptation appears much later, ca. 5,000 BP, as sea-level rise brought contemporaneous coastlines near their current position (Bourque 1995; Sanger 2005; Tuck 1975). It is probable that the earliest inhabitants of the southern regions of Atlantic Canada made use of coastal resources due to the high productivity of coastal environments (Price 1995; Perlman 1980). Coastal settings offer numerous advantages, including access to a diversity of food and raw material resources, a high water table, and ease of transportation and communication along waterways (Benjamin 2010, p. 255; Andersen 1995). It is at the coast that the greatest population densities are found in all periods for which data are available (Maarleveld and Peeters 2004, p. 112).

The evidence for a precontact human presence on the now-submerged landscape is currently limited. In Atlantic Canada, archaeological research targeting precontact submerged heritage has been, at best, minimal (e.g., Davis 1991; Westley 2008) as most underwater efforts have focused on the historic period (e.g., Barber 1981; Bernier et al. 2007; Dagneau and Moore 2009, 2010; Fitzhugh and Phaneuf 2008; Roman and Mather 2010; Skanes and Deichmann 1985). The locations where precontact artifacts have been recovered from underwater contexts mainly reflect chance finds resulting from modern fishing and recreational diving activities. Therefore, in Atlantic Canada and adjacent regions of New England, the evidence of human presence on submerged landscapes is limited to the Gulf of Maine (e.g., Crock et al. 1993; Stright 1990; Price and Spiess 2007; Rice 1979; Spiess et al. 1983; Turnbull and Black 1988), the Bay of Fundy (e.g., Black 1997; Davis 1991), the greater Northumberland Strait (e.g., Deal et al. 2006, p. 263; Keenlyside 1983, 1984), and nearshore and intertidal areas of Newfoundland (e.g., Carignan 1975; Rast 1999; Westley 2008). The exception to the lack of research is the formulation of a seven-stage landscape research strategy that integrates computer modeling, geophysical surveys, paleolandscape interpretations, paleoenvironmental analyses, and archaeological prospection in order to pinpoint locations with the greatest chance of finding archaeological sites (Westley et al. 2011a). Until this strategy is applied at a much larger scale, the record of human presence on the now-submerged landforms will remain scant and rely mostly on anecdotal finds.

Preservation

The prime objective of submerged archaeological surveys is the identification of archaeological deposits in their primary context since this offers the most value to archaeological research. For a submerged site to be found in situ, however, it must first survive terrestrial burial, then one or multiple transgression episodes (Bailey and Flemming 2008). After inundation, numerous factors may affect the sediments holding archaeological remains. In Atlantic Canada, wave, current, and ice erosion are the principal destructive forces affecting submerged archaeological deposits (Flemming 1983). The greatest impact on archaeological deposits occur when the site is located either in the surf zone, where it is exposed to the direct impact of breaking waves, or in water only a few meters deep, where wave impacts at the seabed can still be violent (Bailey and Flemming 2008; Will and Clark 1996). Although constant exposure to these forces results in deposit disturbance, rare conditions may, in fact, cause the most damage to archaeological sites undergoing transgression (Flemming 2004, p. 13). These include tsunamis, extreme storms, iceberg grounding, and peak conditions such as highest tide, highest wave, and strongest current events.

Site preservation issues are illustrated along the emergent portions of the Sable Island Bank, which were once part of a large archipelago located at the edge of the continental shelf (see Fig. 2.2). As the sea level rose, these large islands progressively shrank in size and, today, Sable Island constitutes the only emergent portion of this former archipelago. Seismic stratigraphy of the deposits that form this and the majority of the other offshore banks, show that geological units associated with the postglacial period are made of reworked and unconsolidated sands due to high wave-energy conditions during transgression, followed by millennia of constant re-working by extra-tropical storms, hurricanes, and other marine processes (Amos and Miller 1990; Fader 1989; King and Fader 1986). Therefore, despite the occasional recovery of buried peat, providing pollen data and datable organic material (Mott 2011), there is only a very low likelihood that archaeological material, if ever present, has survived the early Holocene transgression.

Given the potential for site destruction, large-scale landscape survival is unlikely to be common in Atlantic Canada. Constant exposure to high-energy conditions, however, does not necessarily rule out site preservation. In British Columbia, multiple intertidal sites have been identified with undisturbed stratified deposits that have survived in the active beach zone on highly exposed locations, suggesting this may be the case elsewhere as well (Fedje et al. 2009). In fact, small pockets of in situ deposits have been identified by a number of researchers, often in association with favorable topographic settings, either lodged in peat layers, which are more resistant to erosion than marine deposits, or in sediments stabilized by sea grasses (e.g., Galili and Rosen 2011; Malm 1995; Momber 2000; Neumann et al. 2000; Wessex Archaeology 2008). Archaeological material recovered from reworked contexts can still provide valuable information to archaeologists (Grøn 1995; Hosfield 2007; Wessex Archaeology 2008; Westley et al. 2004). When medium-energy conditions dominate, affecting mostly fine-grained sediments, larger objects are likely to remain in position or in the vicinity of their original location (e.g., Brunning 2007; Faught 2004; Fischer 1995; Will and Clark 1996; Malm 1995).

Low-energy settings, however, are the most likely locations where in situ archaeological deposits can be identified; these include fossil estuaries and river valleys; the flanks of submerged banks and ridges likely to have peat layers; valleys, depressions, basins with wetland marsh deposits; nearshore creeks, mudflats, and peat deposits; low-gradient beaches with constructive onshore wave action; fossil archipelagos; erosional features protected by islands or found within an archipelago; submerged caves and rockshelters in re-entrant bays; fossil erosional shorelines; submerged rocky shores; and deposits of sediments formed within or washed into rocky gullies or depressions (Flemming 1983, 2004). Low-energy conditions can occur at a very local scale in the midst of high-energy environments, as a result of the particular geomorphology surrounding a given location. For example, during transgression in the Gulf of Maine, rocky islands sheltered basins from erosive wave action, protecting lakes and wetlands associated with evidence of human presence (Kelley et al. 2010). Here these environments were able to develop due to a slowstand period during which RSL rise was greatly reduced, underscoring the importance of relying on a well-constructed and locally specific chronology.

In Atlantic Canada, lowstands were generally of insufficient duration to develop large coastal landforms that could survive transgression and, therefore, there is only rare evidence of submerged shorelines (Shaw et al. 2009; Shaw 2005). However, few areas have a sufficiently detailed chronology to permit definite statements (Kelley et al. 2010). The most favorable setting encountered thus far is in freshwater lakes that once bordered coastal regions during the early Holocene and were rapidly submerged during the Holocene transgression. One of the best examples is found in the southern regions of the Bras d'Or Lakes, an inland sea on Cape Breton Island, Nova Scotia. The coastal regions of these freshwater lakes developed over more than 5,000 years, before being suddenly inundated as sea level rose above their rocky sill ca. 5,500 BP (Shaw 2005; Shaw et al. 2009). As seen in Fig. 2.4, multibeam imagery of the lake bottom reveals the presence of spits, barrier beaches, and lagoons in at least two different areas of the Lakes. Here, it is the rapid onset of transgression and the relatively restricted fetch within the lake that have helped preserve these coastal features.

Evidence of fluvial systems has also been identified near the modern coast, although the evidence is often minimal. Some of the best preserved fluvial systems have been found within the Bras d'Or Lakes, and also off the coasts of modern PEI (Forbes et al. 2004; Shaw 2005; Shaw et al. 2009). Multibeam bathymetry of the nearshore zone along the coasts of PEI indicates that relict fluvial features are still present on this open shoreline of the central North Shore (Fig. 2.5a), and provides clear evidence that a former lake and river system occupied the Northumberland Strait in the early Holocene when the Island was connected to the mainland (Fig. 2.5b). Deltaic systems have also been preserved in locations sheltered from wave action, although they appear to occur most frequently around Newfoundland, where early postglacial streams incised glacial deltas and outwash deposits at fjord heads, thus providing an ample sediment supply as the sea level dropped to local lowstands (Shaw 2005).

In summary, although large landforms were exposed at some point during the early Holocene, the most favorable settings for the preservation of submerged archaeological landscapes are found at the local scale, where a variety of factors combine to preserve these landscapes. A number of relict coastal, fluvial, and deltaic landforms are known to exist in Atlantic Canada, and through the targeted use of multibeam bathymetry, seismic profiling, and field sampling, areas with a fairly high archaeological potential can and have been identified in a variety of settings across the region.

People, Their Landscape, Their History, and Submergence

Despite the aforementioned evidence suggesting the existence of submerged archaeological landscapes in Atlantic Canada, there are no submerged precontact archaeological sites currently known beyond the intertidal zone. Dealing with submerged precontact landscapes in the absence of direct archaeological evidence from the seafloor necessitates a different approach to archaeological investigation. Forced to rely on patterns spanning wider regions, the human-landscape interactions then become the focus of attention. The following examines two study areas where the investigation of submerged landscapes offers insight into a variety of human-landscape interactions that were integral to the lives of the region's early

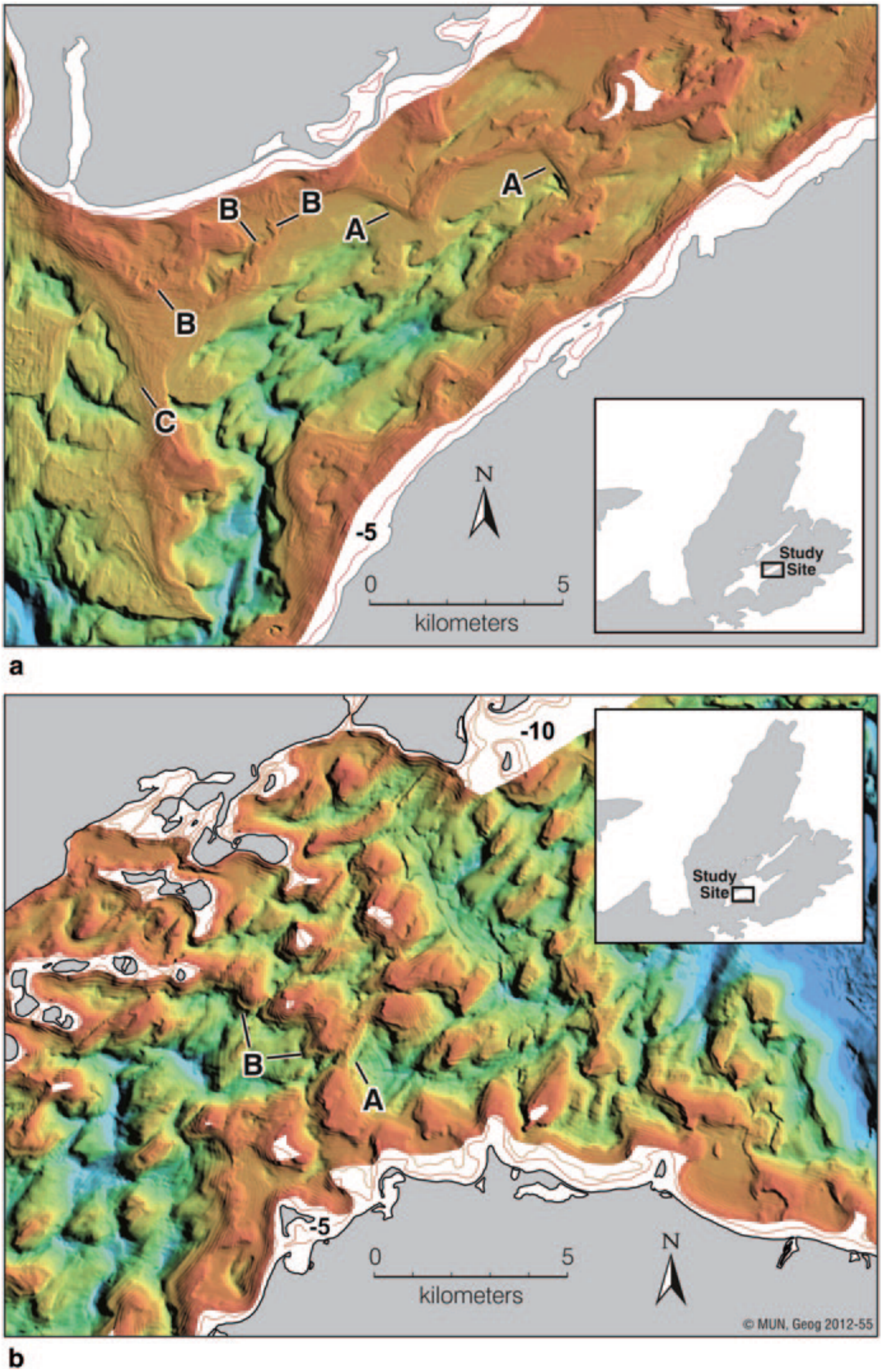

Fig. 2.4 Multibeam bathymetry of selected areas of the Bras d'Or Lakes showing evidence of preserved coastal features: **a** barrier beaches (*A*), spits (*B*), and tombola (*C*) in East Bay, and **b** submerged barrier beach (*A*) and erosional terraces (*B*) in West Bay. Shallow waters are represented by reds up to 25 m depth where yellows begin, and blues represent waters of 50 m depth or more (After Shaw et al. 2009: Figs. 8 and 9)

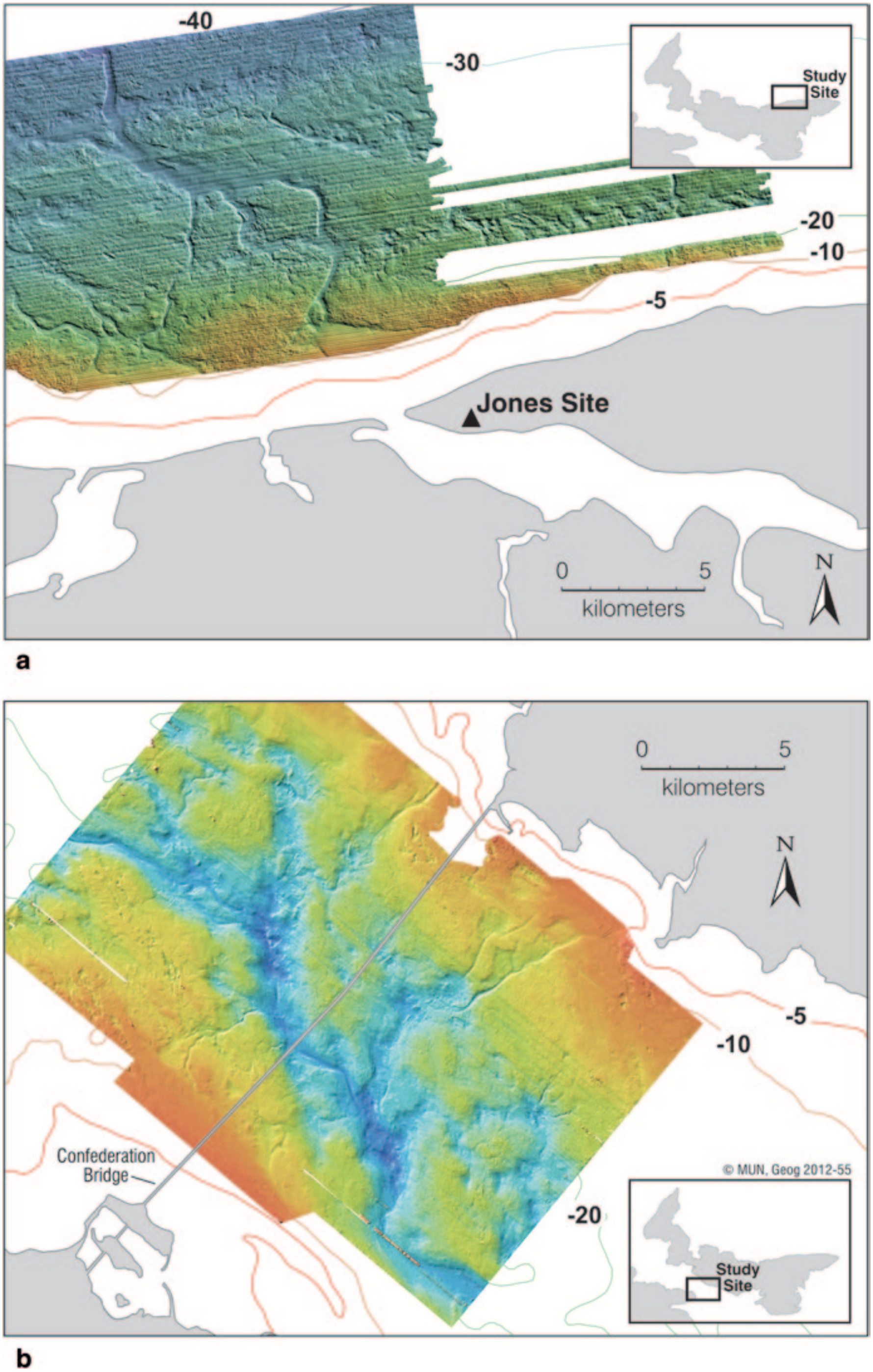

Fig. 2.5 Multibeam bathymetry off the coast of Prince Edward Island (PEI) showing preserved fluvial systems: **a** central North Shore and **b** Northumberland Strait. Note the definite inland location of the Jones site for any period where local sea-levels where more than 10 m below their current level. (After Forbes et al. 2004; Shaw et al. 2009)

inhabitants and which would not be evident otherwise. This demonstrates that researching human-landscape interactions that occurred on, or were influenced by, submerging landforms can help reinterpret the region's precontact history, and better understand how indigenous people developed their own histories. The now-submerged early Holocene coastal regions off PEI and the Magdalen Islands are especially well-positioned to inform archaeologists about the early development of seal hunting in the Northeast and re-evaluate current understandings of undated assemblages from the Magdalen Plateau. In contrast, the Minas Basin offers an interesting example in which rapid landscape submergence has led its indigenous inhabitants to develop their interpretation of a particular event, incorporating the social memory of the catastrophic event into their oral histories.

The Magdalen Plateau Hunting Ground

The Magdalen Plateau occupies the central area of the Gulf of St. Lawrence and this central location likely made this region an important hub in the development of local marine resource exploitation by postglacial pioneering groups. Early human presence on the Plateau is attested by finds of Debert-form Paleo-Indian points along the Northumberland Strait (Davis and Christianson 1988; Keenlyside 1985b, 1991). Over time, the descendants of these original families likely intermingled with other populations, such as the Plano-like Late Paleo-Indian population occupying the southern shores of the St. Lawrence Estuary (Dumais 2000), and the various Archaic groups inhabiting other coastal regions of Atlantic Canada.

An aspect of the developing coastal adaptation would have been the harvest of the large harp seal herd returning to the Magdalen Plateau every winter. This migratory species' summer range is found in Greenland, but two main breeding herds return to Atlantic Canada every winter, moving with the advancing sea ice front, and arriving between November and January via the tip of the Northern Peninsula (Sergeant 1991). The "Gulf" herd passes through the Strait of Belle Isle and into the Gulf of St. Lawrence, while the "Front" herd breeds off northeast Newfoundland. In early winter, harp seals must be intercepted in open water, necessitating a specialized technology. Harp seals reach their highest level of fat content and buoyancy in early winter, facilitating their capture with harpoons and providing an indispensable source of winter fat to their human captors (Spiess 1993). The seals remain in open water until the females are ready to calve, by early March, when they move onto the ice and can be hunted with simple clubs. The presence of sea ice is therefore an important factor influencing seal presence. Reconstructed sea-ice cover (SIC) conditions, inferred from fossil dinoflagellate assemblages preserved in marine sediments, suggest that during the early and mid Holocene, the Gulf of St. Lawrence was characterized by SIC conditions similar to the present (de Vernal et al. 1993). Therefore, just as today, the expanded regions of PEI and the Magdalen Islands during the early Holocene would have been ideally suited for a harp seal harvest.

New technology developed for the open water hunt would have revolved around harpoon design. These technological developments would not have occurred in a vacuum and would have been influenced by the people's own cultural traditions, as well as by ideas exchanged with other groups also developing their marine mammal hunting toolkit. Therefore, a certain level of similarity between assemblages in the region is to be expected. Small triangular and basally thinned points, with sharp barbs and a deeply indented base, have been identified from undated contexts on the Magdalen Islands and the northeastern coast of PEI and appear to predate the Woodland period (ca. 2,500–500 BP). These points are almost exclusively made of Ingonish Island rhyolite from Cape Breton and bear an important morphological resemblance to the Early Paleo-Indian Debert form of fluted projectile points seen in the Maritimes (Keenlyside 1991). A very general resemblance between the Magdalen–PEI point style and those from Early Archaic contexts north of the Gulf of St. Lawrence has also long been noted (Keenlyside 1985a, b, 1991, 2011), and this superficial resemblance probably attests to ongoing exchanges between the various groups inhabiting the shores of the Gulf of St. Lawrence.

Given their size (width: 2–5 cm, length: 3–9 cm; Keenlyside 1991: Table 2.2), these points were clearly intended for large animals, and very few large animals would have frequented the Magdalen Islands except for marine mammals (Cameron 1962; Dumais and Rousseau 1986). Within Atlantic Canada, the most striking morphological similarities between these points and other assemblages occur with Dorset Paleo-Eskimo endblades. While the workmanship, choice of raw material, and size standardization differ greatly between the two traditions, the two-point styles share a very similar shape outline. Although they are the result of independent development histories, we suggest this similarity may be, in part, functionally driven by the adoption of similar techniques to secure endblades to removable harpoon heads. This type of composite technology first appears in North America as a part of the Paleo-Indian big-game hunting toolkit (Boldurian and Cotter 1999). The Magdalen–PEI point style would then represent a local reinterpretation of the composite lance technology brought by Paleo-Indian pioneers to hunt caribou in Atlantic Canada, reimagined into harpoons for the in-water harvest of marine mammals. Although Keenlyside (1991, 2011) has suggested that these points tipped spear-thrower darts, it is more likely that they were used as harpoon endblades (Rousseau 1986, p. 26).

All known Magdalen–PEI endblades have been recovered from undated contexts, but were tentatively assigned to the Late Paleo-Indian period, ca. 10,000–9,000 BP, based on the stylistic considerations discussed above and a single undated stratigraphic context at the Jones site (Fig. 2.5a; Keenlyside 1985a, b, 1991, 2011). Recent work at the Jones site, however, has shown this context to be disturbed down to its basal stratum (MacCarthy 2003), leaving only stylistic similarities to support Keenlyside's original assessment. The patterned location of the finds further casts doubt on the Late Paleo-Indian assignation. The endblades were all recovered along the modern shorelines of the islands (Keenlyside 1991; McCaffrey 1992), far inland from the contemporaneous shoreline present during the Late Paleo-Indian period. As seen in Figs. 2.2 and 2.5, the northern shores of PEI and the shorelines of the Magdalen Islands extended far beyond their current limit until ca. 6,000 BP. This is especially true of the Magdalen Islands, which were already very large, long before PEI was fully deglaciated. The earliest traces of the marine-oriented technological development then had to occur some distance away from the current coastlines. Therefore, the current endblade assemblage is unlikely to date to the Late Paleo-Indian period, unless one is willing to extend its coverage to ca. 6,000 BP as McCaffrey (1992) has suggested. Instead, they likely represent an Archaic-period assemblage quite unlike those present either north or south of the Magdalen Plateau. This does not, however, negate that these points may represent a reinterpretation of an ancestral Early Paleo-Indian pattern by a descendant population. Any transitional material, likely similar to the finds already recovered, would now be in submerged contexts.

Archaeological evidence of the earliest developments, therefore, lies offshore from the current islands. Multibeam bathymetry coverage off the central north shores of PEI show relict valleys extending from the inner shelf (see Fig. 2.5a; Forbes et al. 2004). Furthermore, the smooth surface and low relief of the Magdalen Plateau, visible in the paleolandscape reconstructions, is due to reworked sediments that have been filled, and now mask, a complex system of buried channels and basins of various ages (Josenhans and Lehman 1999). Some of these relict systems may still preserve buried traces of the seal hunting development. A single offshore artifact find has been reported for this area. It consists of a Late Archaic ground slate semilunar knife, estimated to date to 5,000–4,000 BP, recovered from the nets of a scallop dragger (Keenlyside 1984). By this time, however, the contemporaneous shoreline would have been in close proximity to the modern coastline and the artifact was likely lost from either a boat or land-fast ice and, thus, is not a good indicator of human presence for the period of interest.

A number of precontact sealing stations are known in Atlantic Canada and provide information on the nature of the archaeological record expected on the now-submerged landforms. In Newfoundland, at least two sites were likely the focus of intense sealing activities. The first is Back Harbour, on the northeast coast, where the intensity of occupation was such that the entire modern community is considered one large archaeological site (Temple 2007; Wells and Renouf 2008). There are more than 20 sites recorded within this small community, with a peak presence during the Archaic which included a significant burial ground, a large habitation area, and a large activity area where heavy woodworking ground-stone tools dominate. The second is Phillip's Garden, found near the modern community of Port au Choix on the Northern Peninsula. Here, seal skeletal elements are abundant, and the site is pockmarked by the remains of at least 68 dwellings (Renouf 2011). These sites clearly were significant places to the families living in these regions, and their presence has made an important impact on the local landscapes. Therefore, precontact human presence targeting the mass exploitation of harp seal on the extended regions of PEI and the Magdalen Islands can be expected to have left significant traces of their presence, and a targeted search strategy would likely be successful in identifying a true Late Paleo-Indian-Early Archaic presence on the Magdalen Plateau.

In summary, submerged landscape research focusing on the Magdalen Islands allows archaeologists to begin to address issues related to the antiquity of coastal adaptations in this region. The local development of harpoon endblades can be seen as a reinterpretation and reinvention of the ancestral Paleo-Indian big-game hunting pattern, which was repackaged for large sea mammals. The similarity between the assemblages recovered from the Magdalen Islands and PEI, which cluster at the point of shortest crossing, strongly suggests a close relationship existed between the two areas by the Late Archaic. The presence of groups on the Magdalen Islands also suggests precontact seafaring abilities, as large open-water crossings were always necessary to reach this area. Finally, in the process of reevaluating the impacts submergence has had on the archaeological record it becomes evident that an assemblage assigned to the Late Paleo-Indian, is in fact more likely to date to the Late Archaic or possibly even later.

The Storied Minas Basin

Changes linked to submergence were not always gradual. These sometimes dramatic changes would have had a direct impact on the lives of the people inhabiting areas experiencing sea-level transgression. Popular and anecdotal evidence for large-scale floods that swallowed land and impacted human life are prevalent among many cultures. Among Western cultures, two stories are particularly well-known. The first involves the legendary Atlantis that was swallowed up by the sea and vanished in a day, and the second, the Biblical flood that wiped the world clean of the wickedness of man. In Europe, fossils and drowned forests (Noah's Woods, see Gaffney et al. 2009, p. 2) were attributed to the great deluge. Flood myths are also present among indigenous cultures in Canada. The Haida of northwestern British Columbia have oral histories that remember a world of mostly water and catastrophic flooding events (Kii7iljuus and Harris 2005). Within the framework of the archaeology of submerged landscapes, these myths can become an important interpretive tool and provide insight into the responses humans have had to sea-level change.

One example of a dramatic change that has occurred in Atlantic Canada, and left an important mark in the psyche of the culture that witnessed it, is the catastrophic tidal expansion that occurred when the megatidal regime of the Bay of Fundy finally reached the Minas Basin. This basin is found at the southeastern end of the Bay of Fundy where the basin and the bay are connected by a narrow channel (Fig. 2.6). Human presence in this area has a great time depth. The oldest dated site in Atlantic Canada, the Debert Paleo-Indian site, is located only 10 km from the shores of the Minas Basin, although at the time of its occupation, it would have been at least 25 km away from the contemporaneous coastline (Borns 2011). This basin has long been an important hub of human movement, being at the head of a number of important interior travel routes, including the Gaspereau Lake and River system which itself exhibits evidence of a continuous human presence dating back to the Paleo-Indian period (Laybolt 1999). As a result, the Minas Basin has clearly been an important place for the communities that inhabited this landscape.

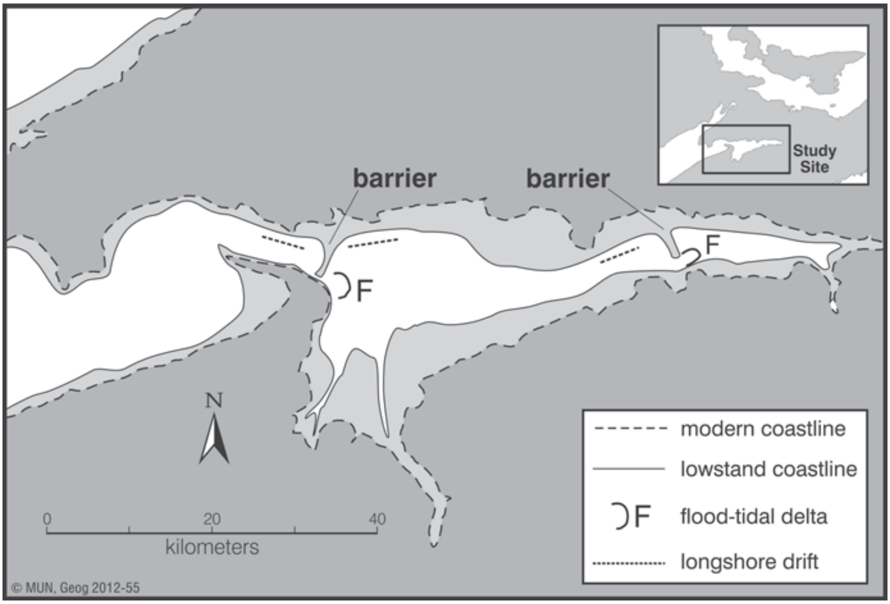

Fig. 2.6 Early Holocene configuration of the Minas Basin, including the sand and gravel barrier that restricted water exchange between the Basin and the Bay of Fundy. (After Shaw et al. 2010: Fig. 7)

Over the course of precontact history, the Minas Basin has seen important changes in its topography due to sea-level rise. A submerged forest of pine and hemlock dated to 4,400 BP has been documented along its southwestern shores (e.g., Goldthwait 1924; Grant 1970; Harrison and Lyon 1963; Lyon and Goldthwait 1934). This forest was eventually capped by an immense salt marsh as sedimentation kept pace with rising high tide. By 3,800 BP, an outlet of the Gaspereau River became subtidal and an extensive oyster bed developed off Boot Island. Relatively young oyster shells measuring up to 25 cm in length have been recovered, suggesting optimal growing conditions, and three specimens have produced radiocarbon dates near 3,800 BP (Bleakney and Davis 1983).

At the time these beds developed, the Minas Basin was likely lagoonal to mesotidal, protected from the megatidal cycles of the Bay of Fundy by a sand and gravel barrier at the Minas Passage (Shaw et al. 2010). With the rapid breakdown of this barrier ca. 3,400 BP and near-instantaneous tidal expansion into the basin, water temperature dropped, tidal currents and turbidity increased, and the environment of the inner estuary became macrotidal. This rapid change is reflected in the undisturbed context of the buried oyster bed, indicating they died in situ due to high turbidity and heavy sediment loads (Bleakney and Davis 1983). According to Shaw et al. (2010), the impact this catastrophic change had on the people of the area appears to have been remembered for over three millennia in the form of a Mi'kmaq legend in which Glooscap, their culture hero, had Beaver build a large dam in order to form a bath in the Minas Basin, reducing water flow and angering Whale in the process, which eventually resulted in Whale rupturing the dam with its tail with such force that water still flows back and forth to this day.

Places are not just points on a map, they are remembered locations where action transpired and memories linger. They are the materialization of memory within the landscape, a memoryscape (Nuttall 1992; Kahn 1996; Knapp and Ashmore 1999; Van Dyke 2008). In an illiterate world, memories are transmitted through storytelling. Narratives associated with particular places are often linked to important social information (Cruikshank 1990). They provide mythical accounts for the creation of a landform; describe important historical events for the group; delineate codes of ethical conduct; provide important messages for travelers; define the relationship of people to the land and its resources; describe particular harvesting or processing activities; and bring songs, friends, or encounters back to mind. Narratives are of prime importance and place names help locate narrated events in the physical setting where they occurred. As stories and myths repeatedly unfold against a geographical backdrop, they become an integral part of those places. Places themselves become mnemonic pegs that help recall their associated narratives. Story and place dialectically help construct each other. Events are given meaning through retelling and re-enactment, establishing bonds between people and features of the landscape that can endure for millennia.

In the Minas Basin, ongoing submergence led to a catastrophic event that greatly impacted the lives of the people inhabiting the region. While travelling across the Minas Basin, generations of people inhabiting the region came into direct contact with evidence of the catastrophic transformation that occurred thousands of years before, further reinforcing elements of the familiar story. As the ancestors of today's indigenous nations journeyed along the now-submerged forest, they would have recalled the story associated with its dramatic creation, transmitting its memory across many new generations. Over the last 3,400 years, the repeated retelling of this particular story, with its association to the local culture hero and the visible evidence of his actions all intermingled to transform the submerged landscape of the Minas Basin into a memoryscape, a process reflecting the active role precontact indigenous groups took in the recording of their own history.

Conclusion

Local patterns of sea-level change have greatly impacted the evolution of the paleolandscapes of Atlantic Canada. During the Holocene, large tracts of land became exposed by ice retreat and vegetated, before disappearing as a result of sea level rise. The most dramatic examples include the creation of a chain of large offshore islands at the edge of the continental shelf, the remarkable expansion of the Magdalen Islands, the creation of a large interior landscape replete with lakes and river systems around PEI, and the seaward migration of tens of thousands of kilometers of coastlines as sea levels dropped to their local lowstand. Only a few regions, however, have concrete evidence of a human presence on now-submerged landscapes. These include the coastal regions of Newfoundland, the Northumberland Strait, the Bay of Fundy, and adjacent regions of the Gulf of Maine. As discussed above, many inundated regions revealed through a broad-scale paleolandscape reconstruction have been impacted by marine processes to such an extent as to greatly limit their potential for archaeological research. The highest potential resides at the local scale, where the interplay between a variety of factors can result in the preservation of submerged archaeological landscapes.

The evolution of Atlantic Canada's paleolandscapes after the LGM has greatly impacted both the colonization of the area by human populations and the archaeological visibility of their presence. Throughout the Holocene, sea-level change has allowed people to explore and settle new regions, also forcing them to rescind their use of ancestral landscapes as sea level rose. These changes are still ongoing today. As once-emergent landscapes disappear through transgression and once-inhabited worlds are lost, they become part of the social memory of the groups who formerly inhabited these regions as they are actively involved in the recording of their own histories. Submerged landscape research can also help write and revise our interpretations of the precontact history of Atlantic Canada, providing insights into the antiquity of coastal adaptation in the Northeast, human mobility, interaction networks, precontact seafaring abilities, and human responses to changing coastal environments. The study cases presented attest to the importance of continued archaeological research targeting the submerged landscapes of Atlantic Canada.

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