From Silver Lake to Deer Lake: Variability in the Early Holocene Human Occupation of Michigan's Upper Peninsula

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Abstract

The current study seeks to evaluate potential sources of variability within the early Holocene archaeological record of Michigan's Upper Peninsula by examining variability in site density and assemblage richness between the Deer Lake and Silver Lake basins. Contrasting measures of site density and assemblage richness indicate there are significant differences in the early Holocene archaeological records of the two lake basins examined here. Although intended to be a first approximation, these data reflect the likelihood that individual lake basins were perceived by early Holocene populations as being unique features on the landscape and not simply redundant ecological niches. Consequently, patterned variability in the archaeological record observed here may have resulted from differences in the organization (e.g. residential vs. logistical) of human activities occurring in individual lake basins. Building upon these results, a framework for future research investigating early Holocene human adaptations in the Upper Peninsula is offered.

By the late 1980s the pre-contact history of Michigan's Upper Peninsula was unequivocally extended back to the onset of the Holocene (ca. 10,000 B.P.) when diagnostic Late Paleoindian hafted bifaces were recovered from the Gorto Site (20MQ39) located in the Deer Lake basin (Buckmaster and Paquette 1988). Archaeological research since that initial discovery continues to expand and refine our understanding of the early Holocene human occupation in the Upper Peninsula (Buckmaster 1989; Buckmaster and Paquette 1996; Carr 2009; Clark 1989), and emerging from this research has been a generalized model of early Holocene human settlement focusing on interior lake basins (Anderton et al. 2004). While research identifying chronological relationships and presenting a generalized picture of the early Holocene land use has been invaluable, the current study is intended to build upon this previous research and seeks to evaluate potential sources of variability within the early Holocene archaeological record of the Upper Peninsula.

More specifically, this paper examines the archaeological record from two interior lake basins; Deer Lake and Silver Lake (Figure 1). Both lake basins are located in central Marquette County and have been the subject of intensive pedestrian surface surveys (Buckmaster and Paquette 1988, 1996). Moreover, lithic assemblages recovered from Deer Lake and Silver Lake constitute the two single largest datasets documenting the early Holocene human occupation of the Upper Peninsula. The current analysis will evaluate variability in measures of site density and tool class richness between the two lake basins. The goal of such an analysis is to provide a

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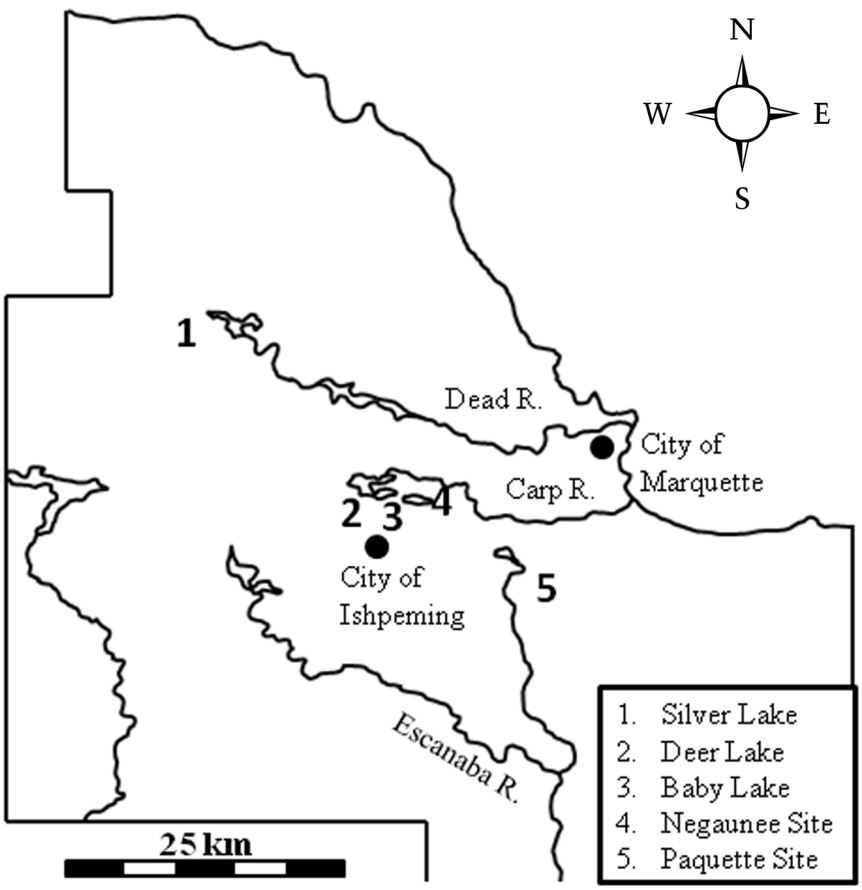

Figure 1. Location of sites mentioned in text.

more informed understanding of economic and social life among the earliest inhabitants of Michigan's Upper Peninsula. Additionally, because this analysis is intended to be a first approximation, a framework for future research investigating early Holocene human adaptation in the Upper Great Lakes region is offered.

Early Holocene Archaeology in the Upper Peninsula

Active interest in the early Holocene archaeological record of Michigan's Upper Peninsula began as part of a collaborative effort between Dr. Marla Buckmaster and local avocational archaeologist James Paquette. As a result of this collaboration early Holocene sites in the Upper Peninsula are now recognized at several localities and are distinguished by a consistent suite of material cultural characteristics including bifacial tool forms and the presence of Hixton Silicified Sandstone (HSS). Elements of this early Holocene archaeological signature were initially identified during excavations at the Negaunee site (20MQ32), a lithic workshop and quarry locality located on the shores of Teal Lake in central Marquette County, where large ovate bifaces and flakes of HSS were recovered (Buckmaster 1985). Although no diagnostic artifacts were recovered at the Negaunee site, Buckmaster (1985) did note similarities between the Negaunee site lithic assemblage and materials from Late Paleoindian age Flambeau phase sites in northern Wisconsin (e.g. Salzer 1974).

Subsequent to the Negaunee site excavations, a drawdown of lake levels in the adjacent Deer Lake basin exposed 22 archaeological localities along the pre-dam Deer Lake shoreline. First identified by James Paquette and John Gorto, one of these localities, the Gorto Site,

proved to be a spectacular biface cache consisting primarily of diagnostic hafted bifaces related to the Late Paleoindian Cody Complex (Buckmaster and Paquette 1988). A distinguishing feature of the Gorto cache is that the bifaces are manufactured almost exclusively from HSS, which reinforces the pattern observed at the Negaunee site. Moreover, the bifaces are heavily fragmented and discolored as a result of thermal shock. Emergency excavations in advance of rising water levels established the tight spatial clustering of the burned, biface fragments and documented the presence of two post molds in the midst of the artifact cluster. Buckmaster and Paquette (1988) suggest that these post molds represent the remains of a platform upon which the artifacts were placed prior to burning. More importantly, the Gorto Site demonstrated conclusively that the earliest human occupation of Michigan's Upper Peninsula dated to the onset of the Holocene.

Additional early Holocene components in the Upper Peninsula were identified at the Paquette site (20MQ34), located at the outlet to Goose Lake approximately 15 km southeast of Deer Lake (Buckmaster 1989), and along exposed shorelines in the Silver Lake basin some 20 km to the northwest (Buckmaster and Paquette 1996). Insight gained from research at both localities, combined with the earlier excavations at the Negaunee and Gorto sites, served to establish that the initial occupation of the Upper Peninsula; 1) began at the onset of the Holocene, 2) was significant enough to produce an archaeological signature at multiple localities, 3) is characterized by the use of HSS, an exotic lithic raw material that outcrops 300 km to the southwest, and 4) is focused around interior lake basins in the central highlands.

Buckmaster's pioneering work has set a solid foundation upon which variability in Paleoindian land use within the Upper Peninsula can now be examined. Previous research has been necessarily directed toward chronological issues regarding the cultural affiliation of early sites (Buckmaster 1985, 1989; Buckmaster and Paquette 1988, 1996), the ability of archaeologists to recognize those sites through the occurrence of HSS (Carr 2009, Clark 1989, Gorto et al. 1992), and most recently the geomorphological setting of early sites (Anderton et al. 2004). However, our data sets are now sufficiently robust to begin reconstructing how Late Paleoindian and Early Archaic populations were utilizing the early Holocene landscape in the Upper Peninsula. An important first step to evaluating how populations were utilizing the early Holocene landscape of the Upper Peninsula is to assess variability in the archaeological record at the regional scale. It is from this perspective that the current analysis examines the density of probable early Holocene occupations within the Deer Lake and Silver Lake basins.

Geographic and Environmental Setting

The lake basins examined here constitute the two largest data sets pertaining to the early Holocene occupation of the Upper Peninsula. Equally as important is the fact that both localities have similar depositional histories, meaning these data sets should be comparable. In both basins soil erosion due to modern flooding and the consequent lowering of modern lake levels have led to the exposure of large expanses of ground surface, a highly unusual occurrence in this heavily forested region. In both instances exposed ground surface was subjected to exhaustive pedestrian surface surveys.

The study area encompasses the interior portion of Marquette County, a region distinguished by exposed bedrock ridges, poorly drained basins, and broad, well-drained outwash plains (Regis 1997). The entire region is underlain by Precambrian bedrock that has been discontinuously capped by a thin layer of Pleistocene deposits of glacial origin (Dorr and Eschman 1970). Outcrops of Precambrian bedrock are commonplace and scattered widely across the region, often as east-west trending ridges that become near vertical. In central Marquette County, such ridges reflect the eroded margin of heavily deformed bedrock synclines (Dorr and Eschman 1970). Between these prominent bedrock ridges are expansive lowlands dominated by lakes, ponds, and wetlands drained via several large tributaries of Lake Superior including the Carp and Dead Rivers, which drain Deer Lake and Silver Lake respectively.

During the late Pleistocene the study area would have become ice free following the onset of the Gribben phase (11,850 B.P.- 10,025 B.P.) when the southern margin of the Laurentian Ice Sheet began retreating northward into the Lake Superior basin (Karrow et al. 2000). The ice margin during the Gribben phase marks the last time the two lake basins would be covered by the Laurentian Ice Sheet. However, the southern margin of the Laurentian Ice Sheet would surge southward into the Upper Peninsula one final time shortly prior to the onset of the Holocene (Regis 1997). The Marquette phase reached its maximum extent around 10,025 B.P., burying the Lake Gribben forest bed under pro-glacial lacustrine deposits (Lowell et al. 1999; Pregitzer et al. 2000). The terminal moraine associated with the Marquette advance lies less than 25 km east of the two lake basins examined here, both of which would have remained ice free throughout

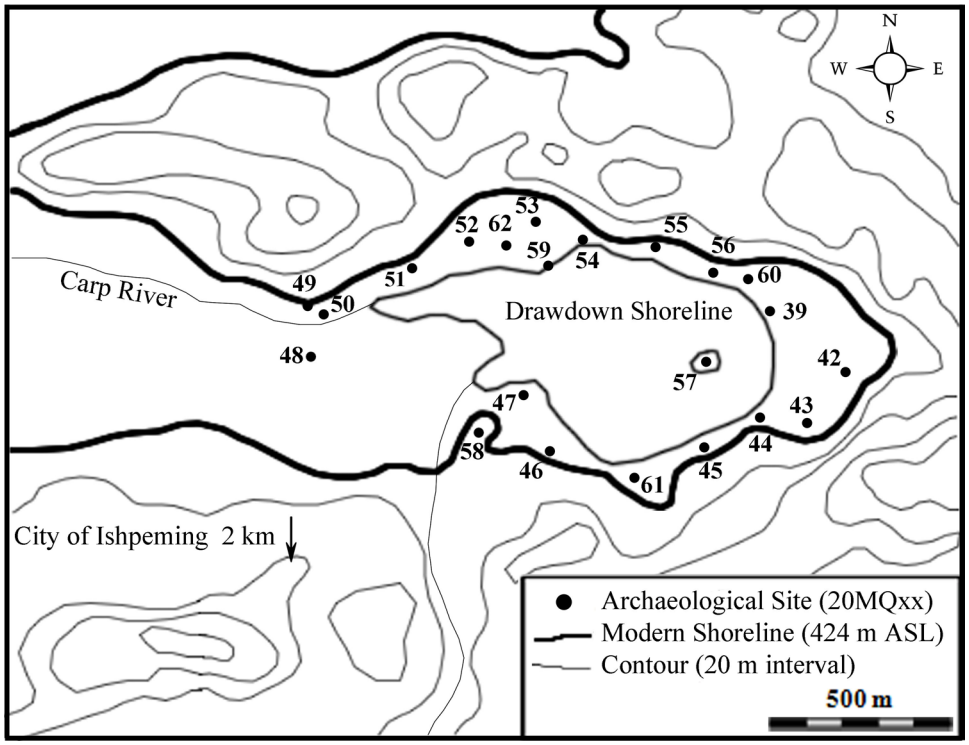

Figure 2. Archaeological sites identified in the Deer Lake basin.

this period (Anderton et al. 2004). After 10,025 B.P. the Laurentian Ice Sheet made its final retreat from the Upper Peninsula.

Buried tree stumps from the Gribben Forest Bed suggest the environment during the Gribben Interstade was a mosaic of spruce, pine and birch, however, unlike the modern boreal forest, vegetation during this period was likely patchy and restricted to specific microenvironments where local soil conditions would favor certain species over others (Pregitzer et al. 2000). It is unclear what effect, if any, advancing ice during the Marquette advance would have had in the study area. There is no data to infer the presence of tundra conditions, although certainly conditions would have cooled both globally (Lowe et al. 2008) and locally (Brubaker 1975). Pollen core data from Camp 11 Lake (Brubaker 1975) in the Upper Peninsula suggests the persistence of a cool, mixed forest biome throughout the terminal Pleistocene, including the Younger Dryas. In addition, climatic models have inferred the presence of a strong anticyclone over the ice sheet (e.g. Webb et al. 1998), which is confirmed by paleoshoreline features in the eastern Upper Peninsula indicating that prevailing winds throughout this period were from the east and southeast (Krist and Schaetzl 2001). One effect of this anticyclone would be less rainfall and certainly increasing percentages of pine observed in both the Camp 11 Lake and Yellow Dog Pond pollen cores suggest that the landscape was drying out, which favored the expansion of pine populations throughout the region (Brubaker 1975; Shuman et al. 2002:1784-1785).

Deer Lake and Silver Lake Basins

Deer Lake and Silver Lake basins occupy similar geographic settings and both were originally small, interior lakes situated in a large natural basin bordered to the north by a bedrock ridge and to the south by broad till and outwash plains. In both instances modern human activity has resulted in the artificial raising of lake levels to flood significantly larger areas. The impact of this flooding has been severe soil erosion along both the former pre-dam lakeshores and adjacent sections of stream terrace.

Deer Lake is situated along the eastern edge of a "U" shaped basin bounded by outcrops of Precambrian bedrock (Figure 2). The Carp River flows into the lake from the south and outlets a short distance away along the lake's western shore. A dam, built along the Carp River in the early 1900s for hydroelectric purposes, is located downstream from Deer Lake and has artificially raised water

levels to impound a roughly 1000 acre basin (Anderton et al. 2004). Currently, much of the original Deer Lake shoreline lies under about 2-3 m of water. Archaeological sites within the Deer Lake basin were first identified after the lowering of modern lake levels during the mid 1980s. The drawdown was part of an effort to remove mercury contamination from lake sediments and while this environmental project met with mixed success, the incidental benefit of reducing lake levels to the archaeology of the region has been significant.

In 1986, while water levels in the basin were lowered, avocational archaeologists James Paquette and John Gorto undertook an extensive pedestrian reconnaissance survey of nearly 4850 meters of shoreline (Paquette 2005). Their efforts focused on the original, pre-dam Deer Lake shoreline and did not include adjacent portions of the Carp River that are also normally submerged. Mr. Paquette and Mr. Gorto were able to identify 22 archaeological sites along the pre-dam Deer Lake shoreline. Each site represents a dense concentration of lithic artifacts that include debitage, formal and informal tools, and FCR. Recorded sites are separated by large sections of shoreline that lack visible archaeological materials aside from an occasional isolated piece of debitage or fragment of FCR (Clark 1989; Paquette 2005).

Silver Lake basin is situated within a similar geographic context approximately 20 km to the northwest of Deer Lake. Located near the headwaters of the Dead River, the original pre-dam Silver Lake occupies the eastern edge of a large natural basin and drained southward into the Dead River (Figure 3). The lake is fed by runoff from a near vertical bluff of Precambrian bedrock that forms the northern margin of the basin. A hydroelectric dam originally built in 1910 is positioned a short distance downstream from where Silver Lake flows into the Dead River. This dam has flooded a large basin that encompasses both Silver Lake and a 4.5 km long segment of the Dead River (Buckmaster and Paquette 1996).

A persistent drought in the region between 1986 and 1989 resulted in a significant drop of lake levels at Silver Lake basin. Consequently, heavily eroded sections of the original Silver Lake shoreline and sections of stream terrace along the Dead River were exposed. James Paquette conducted an initial pedestrian reconnaissance survey of archaeological sites within the basin and these sites were later systematically surveyed by Buckmaster prior to the lake returning to modern levels (Buckmaster and Paquette 1996). Then in 2002 a levee at Silver Lake burst resulting in a catastrophic discharge of water from the basin, which once again exposed archaeological sites along the

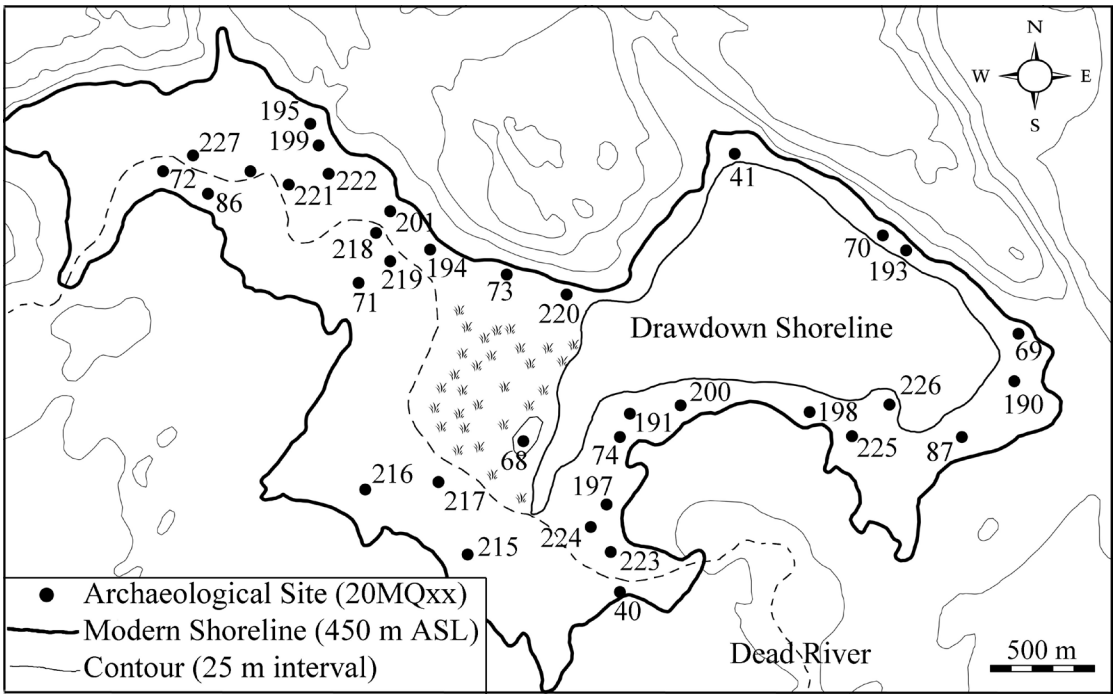

Figure 3. Archaeological sites identified in the Silver Lake basin.

pre-dam Silver Lake shoreline and an adjacent section of the Dead River. The following year a more focused evaluation of archaeological sites was undertaken (Buckmaster and Carr 2004).

Survey work within the Silver Lake basin during 1989 and 2003 differed from the Deer Lake survey in one important regard. Within the Silver Lake Basin 8950 meters of stream terrace located along the Dead River was surveyed along with 5850 meters of shoreline around the original pre-dam Silver Lake. Analyzed here are 36 archaeological sites that have been identified during the surveys 1989 and 2003 surveys, including 16 sites along the pre-dam Silver Lake shoreline and an additional 20 sites upstream along the Dead River. Comparable to the Deer Lake survey, each site identified in the Silver Lake basin represents a dense concentration of lithic artifacts separated by areas of very light or no cultural materials.

Methodology and Data Considerations

The legacy of modern flooding in both Deer Lake and Silver Lake basins is one of severe soil erosion. In most cases, judging from the current height of exposed roots on submerged tree stumps, upwards of a half-meter of soil has been lost. Despite this widespread erosion, some landform features of the pre-dam landscape such as stream terraces and beach ridges remain visible. One obvious effect of this erosion has been the deflation of archaeological materials, which are easily visible on the ground surface during low water stages. The exact degree to which erosion has disturbed archaeological materials remains unknown. However, given consistency in lithic raw material types present at individual sites I feel it is reasonable to suggest that these sites do, in fact, reflect loci of prehistoric activity instead of being the product of re-deposition. In other words, it is hard to envision a circumstance where geomorphological processes selected quartz from quartzite and deposited those materials non-randomly in close spatial proximity to one another. As encouraging as this observation is, it still must be assumed that no vertical integrity exists for any locality in the Deer Lake or Silver Lake basins and that only very coarse grained (e.g. site level) horizontal integrity remains. Similar impacts to archaeological resources within modern impounded basins have been reported elsewhere (Loring et al. 2003; Mulholland et al. 1995).

Archaeological sites within both lake basins were identified through intensive pedestrian reconnaissance surveys, however, these surveys were not systematic in the traditional sense of archaeological sampling. Nevertheless, it can be said that the result of multiple visits to each basin has been an approximately 100% sample of exposed ground surface (Buckmaster and Paquette 1988; 1996; Paquette 2005). Individual sites were delineated based on informal criteria related to changes in artifact density. As this method does not differ appreciably from how sites in plowed agricultural fields are often identified during modern cultural resource management practices I am confident that each site included in the analysis reflects a spatially distinct cluster of archaeological materials.

The final methodological consideration that merits discussion is the non-systematic collection of archaeological materials. Collection of artifacts has been principally undertaken by avocational archaeologist James Paquette who has painstakingly recorded site location, and in many instances GPS coordinates, for each recovered artifact. Along with Mr. Paquette, John Gorto has made similar collections of sites within the Deer Lake basin. These collections have predominantly focused on the recovery of formal tools, exotic lithic raw materials, and occasionally a random sampling of lithic debitage that are typical of each site. Typically, all diagnostic artifacts and each occurrence of HSS, when encountered, have been collected. While the available data permits a chronological assessment of individual sites, any further analysis is restricted to coarse grained (e.g. basin or regional scale) comparisons. The Paquette collection from Silver Lake has been made available for analysis by the author and these data are summarized here. In addition, artifacts collected by John Gorto from the Deer Lake basin (originally detailed in Clark 1989, see also Carr 2009) are currently housed in the Great Lakes Archaeological Consortium at Michigan State University and were re-examined by the author.

Identification of Early Holocene Sites

Early Holocene components in the study area are recognized through the presence of HSS and diagnostic hafted bifaces that bear close morphological similarities to the Agate Basin and Scottsbluff / Eden types (Justice 1995). Bifaces morphologically similar to these types occur throughout Wisconsin, northern Minnesota, northern Ontario, and Michigan's Upper Peninsula (e.g. Harrison et al. 1995; Mason 1997; Ross 1995; Salzer 1974). These diagnostic biface comprise two chronologically distinct Late Paleoindian complexes; an earlier Agate Basin complex and a later dating Cody complex (Hofman and Graham 1998). Radiocarbon dates suggest that the Agate Basin type was being manufactured by peoples inhabiting the northern Plains between 10,600 – 10,000

B.P., while point types related to the Cody complex did not appear until around 9,900 – 9,000 B.P., shortly after the onset of the Holocene (Hofman and Graham 1998). Excavations at Metzig Garden in eastern Wisconsin have recovered Agate Basin and Cody complex materials in separate stratigraphic contexts, which support the valid use of both point types as chronological markers in the western Great Lakes region (Behm 1986).

Within the Upper Peninsula diagnostic Late Paleoindian bifaces are manufactured exclusively from HSS; a lithic raw material utilized extensively during the western Great Lakes Paleoindian (Carr and Boszhardt 2009). In addition to sites identified through the presence of diagnostic hafted bifaces, Clark (1989) suggests that sites lacking diagnostic bifaces but possessing debitage and other tools out of HSS could be reasonably affiliated with the early Holocene occupation of the region. A subsequent analysis of the technological organization of sites in the Deer Lake basin supports the notion that sites possessing HSS artifacts can be reasonably inferred as being early Holocene in age. (Carr 2009). These observations confirm the commonly held view that HSS was a favored lithic raw material utilized by Paleoindian populations throughout the western Great Lakes region, as evidenced by its widespread occurrence at sites ranging from northern Minnesota and adjacent portions of Ontario (Harrison et al. 1995; Ross 1995); Wisconsin (Carr and Boszhardt 2009; Mason 1997); and northern Illinois (Loebel 2005).

Assessing Variability

Lacking convincing evidence to the contrary within the present study area, sites containing artifacts manufactured out of HSS (but not necessarily diagnostic bifaces) are assigned to an early Holocene date. Within the Silver Lake basin, 14 of the 36 sites (39%) evaluated here are identified here as having probable early Holocene components (Table 1). Over half (n = 9) of the early Holocene sites within the Silver Lake basin are identified through the occurrence of diagnostic Late Paleoindian biface types, while the remaining sites are distinguished here through the presence of artifacts manufactured from HSS. The Deer Lake basin contains substantially less sites with minimally four of the 22 localities (18%) identified here as containing probable early Holocene com-

Table 1. Summary of Probable Early Holocene Sites in the Study Area.

Site #	Site name	Basin	Diagnostic artifacts
20 MQ 35	Water's Findspot	Silver Lake	Agate Basin Point (HSS)
20 MQ 40	Silver Lake Dam	Silver Lake	Base of a Scottsbluff point (HSS)
20 MQ 41	North Bay	Silver Lake	Late stage biface (HSS)
20 MQ 68	Silver Lake #3	Silver Lake	Hell Gap point (HSS)
20 MQ 69	Silver Lake # 4	Silver Lake	Base of a Scottsbluff point (HSS)
20 MQ 70	Silver Lake # 5	Silver Lake	Un-resharpened end scraper (HSS)
20 MQ 71	Silver Lake #6	Silver Lake	Uniface resharpening flake (HSS)
20 MQ 72	Silver Lake #7	Silver Lake	Tip of a obliquely flaked lanceoloate point (HSS)
20 MQ 74	Silver Lake #9	Silver Lake	Refit Scottsbluff point (HSS)
20 MQ 87	Marta	Silver Lake	HSS debitage
20 MQ 190	Allison	Silver Lake	Agate Basin Point (HSS)
20 MQ 197	Silver Lake Arrowhead	Silver Lake	Reworked tip of an Scottsbluff/Eden point (HSS)
20 MQ 216	Voelkers Creek	Silver Lake	HSS debitage
20 MQ 219	Sand Point III	Silver Lake	HSS debitage
20 MQ 39	Gorto Site	Deer Lake	Burned Scottsbluff /Eden points (HSS)
20 MQ 44	Deer Lake #4	Deer Lake	HSS biface preform[a]
20 MQ 47	Deer Lake #7	Deer Lake	HSS biface fragment[a]
20 MQ 48	Deer Lake #8	Deer Lake	End Scraper (HSS), Alt. beveled biface (Quartzite)
20 MQ 49	Deer Lake #9	Deer Lake	HSS debitage, End Scraper (HSS)

ponents, although as many as six sites potentially may be included. The estimate for Deer Lake used here differs from the eight probable early Holocene sites suggested by both Clark (1989:106) and Anderton et al. (2004:258-261). The reason for this discrepancy is that reanalysis of the Deer Lake materials was not able to verify the presence of HSS artifacts at four sites originally listed in Clark's (1989) analysis. In two of these instances (20MQ54, 20MQ55), artifacts originally identified as HSS by Clark (1989:102-103) appear to be fine grained Precambrian quartzite and not HSS. The remaining two sites (20MQ44, 20MQ47) were documented by Clark (1989:95-99) as each possessing a single biface fragment manufactured from HSS, however, neither artifact was ever curated at the Great Lakes Archaeological Consortium at Michigan State University and therefore their positive identification as HSS cannot be verified at this time. If the two sites with missing HSS bifaces are considered as early Holocene based on their identification in Clark's (1989) analysis then the total count for Deer Lake increases to six of 22 (27%) sites.

Of the 18 (or possibly 20) early Holocene sites identified in both basins, 11 are identified through the presence of diagnostic Late Paleoindian bifaces manufactured from HSS. Furthermore, artifacts from the probable early Holocene sites that lack diagnostic Late Paleoindian biface types include biface thinning flakes exhibiting complex, heavily ground platforms, end scraper resharpening flakes, an alternately beveled biface, and several end scrapers, including a narrowed end scraper. While none of these artifacts are themselves diagnostic, they are all related technologically to artifact types commonly found on Great Lakes Paleoindian sites (e.g. Ellis and Deller 1988, 1990).

Density of Early Holocene Sites

Because of the strong similarities in survey methodology and depositional context discussed above, data pertaining to site density should be comparable between Deer Lake and Silver Lake basin. Likewise, the criteria through which sites are assigned an early Holocene date, such as diagnostic biface types and occurrences of HSS, has been consistently applied to sites within both basins. The only obvious difference is that the Silver Lake survey covered both the pre-dam lakeshore and an upstream portion of the Dead River, while the Deer Lake survey focused solely on the pre-dam lakeshore and did not survey adjacent portions of the Carp River. To avoid obscuring a potentially important source of variability, the larger Silver Lake basin sample will be divided into pre-dam lakeshore and Dead River sub-samples.

Table 2 summarizes site density data for each of the lake basins examined here. From these data, it is clear that Silver Lake basin has both more overall sites and more sites assigned an early Holocene date. This observation is hardly surprising given that the Silver Lake basin is the larger of the two basins and one would expect a higher overall number of sites. However, in spite of size differences between the two basins, Silver Lake also has a higher percentage of archaeological sites possessing a probable early Holocene component (38.9%). Moreover, sub-dividing the Silver Lake basin sample into lakeshore and river zones shows that the highest frequency of early Holocene sites occurs around the pre-dam Silver Lake shoreline (61.5%), and is particularly evident when compared to both the Deer Lake (18.2%) and Dead River (26.1%) samples.

Another dimension through which variability in site density can be evaluated is by standardizing the number

Table 2. Summary of Archaeological Site Density In Study Area

	Deer Lake	Silver Lake		
		Shoreline	Dead River	Basin total
Archaeological Sites	22	13	23	36
Early Holocene Sites	4 (6)a	8	6	14
% Early Holocene Sites	18.2% (27.3%)	61.5%	26.1%	38.9%
Shoreline Surveyed (m)	4850	7750	10350	18100
Sites / 1 km	4.54	1.68	2.22	1.99
Early Holocene Sites / 1 km	.83 (1.24)	1.03	.58	.77

aNumber of early Holocene sites increases to 6 if 20MQ44 and 20MQ47 are included.

of sites on the basis of the amount of shoreline surveyed. Standardizing the number of sites per kilometer of shoreline implies that, at slightly less than one site per kilometer, the overall density of early Holocene sites is similar between the two basins. Within the Silver Lake basin, the pre-dam Silver Lake shoreline exhibits the highest density of early Holocene sites at 1.03 sites per kilometer and contrasts with the Dead River sample that exhibits a substantially lower density of .58 sites per kilometer surveyed. Interestingly, if 20MQ44 and 20MQ47 in the Deer Lake basin are also considered here as early Holocene sites, based on Clark's (1989) identification, then the density of early Holocene sites along the pre-dam Deer Lake shoreline increases to 1.24 sites per kilometer, a level that exceeds the density observed for the pre-dam Silver Lake shoreline. The implication of these data is that early Holocene populations may have been preferentially utilizing interior lakeshore habitats as opposed to, at least minimally, the upper Dead River.

Explaining variability

Several alternative explanations can be offered to account for the differing measures of site density. For instance, the most obvious argument is that observed differences between the basins are not significant and are instead the product of sampling. Without question the low sample size makes it difficult to compare the two basins statistically. However, I am less inclined to view sample error as the primary reasons for the observed variability since there is a high degree of consistency in both surface visibility and survey methodology. Likewise, post-depositional processes resulting from modern flooding have undeniably had an effect on these archaeological sites. Nevertheless, sites within both basins would have been subjected to similar post-depositional processes making it unlikely that such processes are the primary cause of the observed variability. In fact, there is even variability within parts of the same basin (e.g. Silver Lake shoreline and Dead River samples). This would suggest to me that at least some of the observed variability has resulted from differences in the human use of interior lake basins during the early Holocene.

The greater density of early Holocene sites per kilometer surveyed within the Deer Lake basin certainly reflects the importance of that locality to the early Holocene inhabitants of the region and would, at least superficially, suggest Deer Lake represents a more favored or persistent locus of occupation. However, a greater density of sites per kilometer does not necessarily mean a greater intensity of human occupation. One plausible alternative explanation is that the topography around Silver Lake might be more circumscribed, thus forcing the reoccupation of one or more sites by early Holocene peoples. Certainly the lower overall density of sites observed around Silver Lake (1.68 sites/km) would support this conclusion. In other words, while the intensity and structure of land use may have been similar between the two basins, the number of archaeologically recognizable "sites" could potentially be greater around Deer Lake where the exposed northern shoreline of Deer Lake is more homogenously broad and flat when compared to the steeper, rocky, northern shore of the Silver Lake. These northern shorelines, with their southward oriented exposures, would have absorbed a greater amount of direct sunlight and dried out quicker than other sections of shoreline. Perhaps coincidentally, there are 11 sites situated along the northern shoreline of Deer Lake and conversely only four identified along the northern shoreline of Silver Lake.

Archaeological evidence in favor of this explanation would include differences in site size and measures of assemblage richness and evenness. For instance, if reoccupation of sites within the Silver Lake basin were conditioned by local topography then one would expect sites there to consistently exhibit a greater number of artifacts when compared to the Deer Lake sites. Yet, in spite of differences in site size, the expectation also would be for sites in both basins to possess similar indices of assemblage richness and evenness. Similarities in the richness and evenness of tool classes mean that the diversity (i.e. number of different tool classes) and relative proportion (i.e. distribution of artifacts across the represented tool classes) of artifacts in the assemblages would be comparable. Patterning in this direction would suggest that the organization of early Holocene human activity occurring in both basins is similar.

A second alternative explanation is that the observed variability does, in fact, correspond to differences in land use between the two lake basins. For instance, if the early Holocene use of the Deer Lake basin reflected primarily short-term, logistically organized activities, then there would also be the potential for more, albeit smaller, sites per kilometer (e.g. Binford 1980). In much the same way, the residential occupation of Silver Lake would result in fewer, but overall larger, sites. The implications archaeologically would be for the number of sites per kilometer to be smaller within the Silver Lake basin. However, individual sites in the Silver Lake basin would not only be larger, but also likely to contain a greater number (richness) of artifact classes when compared to the Deer Lake sites. A greater richness of tools in an assemblage is often interpreted as reflecting more residentially organized

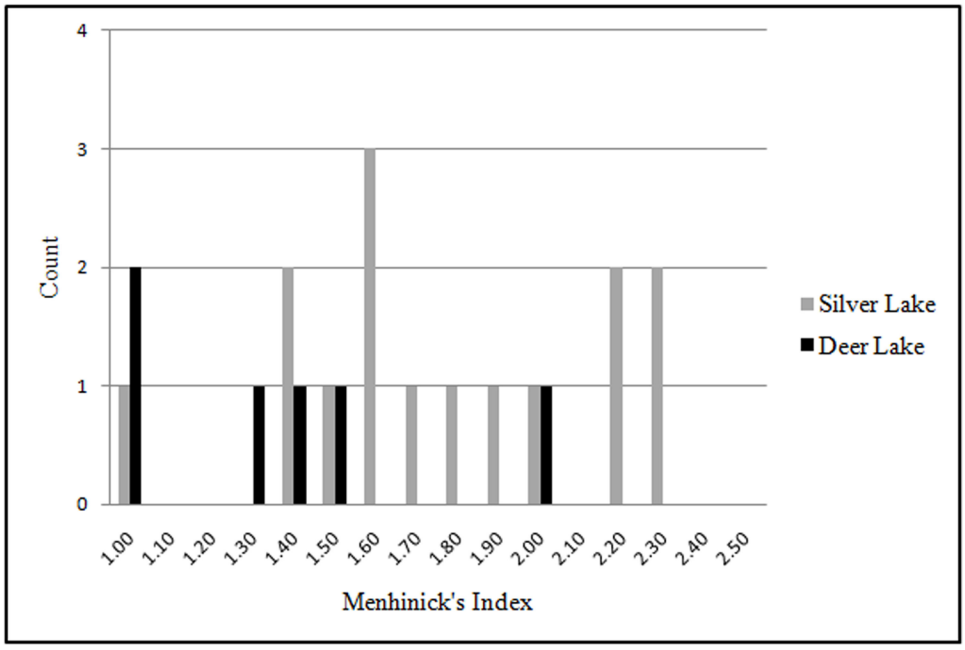

Figure 4. Summary of site richness indices for the Deer Lake and Silver Lake basins.

activity (Kaufman 1998; Meltzer 1988; see also Binford 1980).

Assemblage richness and evenness

To evaluate the applicability of these alternate hypotheses, measures of lithic tool assemblage richness and evenness were calculated for each of the early Holocene sites identified in the study area (Table 3). Unfortunately, reliable data pertaining to site size is not available from either lake basin. Assemblage richness is calculated here by employing Menhinick's (1964) Index.

Menhinick's Index is a commonly applied measure of assemblage richness that accounts for the affect of differing sample sizes (e.g. Jones et al. 1983), with higher values representing assemblages with a greater number of classes relative to overall size of the sample (Kaufman 1998:77). Richness is calculated based on overall number of tools (N) and number of tool classes (k) present in an individual assemblage. Evenness reflects how well distributed tools are in a given assemblage. Assemblage evenness is estimated here by using the coefficient of variation (C.V.), a measure of variation that is calculated by dividing the standard deviation by the sample mean (Kaufman 1998: 77-78). For example, a C.V. of 0 would represent an assemblage with an equal number of artifacts present in all classes, while a C.V. of 1.0 would reflect an assemblage with many tool classes, yet is overwhelmingly dominated by one or two artifact classes. To help facilitate statistical comparison, sites 20MQ44 and 20MQ47 are included as probable early Holocene sites within the Deer Lake basin sample. Although surface collections of the 20 sites evaluated here were non-systematic, as noted above, those collections focused on the recovery of formal tools, which is the dimension of the lithic assemblages being compared.

The measures of assemblage richness and evenness calculated for the two basins are compared here using a Student's t-test, which examines the means from two samples in order to determine the probability that they were drawn from the same population (Ho 2006:41-45). The distribution of richness and evenness both satisfy the requirements to assume equal variance and the results of the t-tests indicate that, while measures of evenness did not vary significantly ($t = -.854$; $df = 16$; $p = .41$), there is a significant difference ($t = 2.126$; $df = 18$; $p < .05$) observed between the richness of early Holocene sites within the two lake basins. Examining the distribution of richness values between both basins shows that the observed difference in richness primarily results from lower indices in the Deer Lake sample when compared to the Silver Lake sample (Figure 4).

These data are seemingly support the hypothesis that observed variability in site density resulted from differences in the way interior lake basins in the central Upper Peninsula were being utilized by human populations during the early Holocene. However, because of the non-systematic nature of artifact collections and the lack

Table 3. Summary of Assemblage Richness and Evenness Indices for the Study Area

Site #	Sample	Tool Classes (k)	# of Tools (N)	Menhinik's Index (Richness)	C.V. (Evenness)
20MQ35	Silver Lake	1	1	1.00	-
20MQ40	Silver Lake	9	32	1.59	1.49
20MQ41	Silver Lake	13	35	2.20	.63
20MQ68	Silver Lake	3	3	1.73	.00
20MQ69	Silver Lake	17	89	1.80	.91
20MQ70	Silver Lake	2	2	1.41	.00
20MQ71	Silver Lake	6	14	1.60	.65
20MQ72	Silver Lake	4	4	2.00	.00
20MQ74	Silver Lake	11	27	2.12	.97
20MQ87	Silver Lake	9	16	2.25	.55
20MQ190	Silver Lake	13	98	1.31	1.22
20MQ197	Silver Lake	3	5	1.34	.69
20MQ216	Silver Lake	10	19	2.29	.58
20MQ219	Silver Lake	5	10	1.58	.71
20MQ39	Deer Lake	13	78	1.47	1.66
20MQ48	Deer Lake	5	14	1.34	.89
20MQ49	Deer Lake	3	6	1.22	.50
20MQ52	Deer Lake	1	1	1.00	-
20MQ44	Deer Lake	6	9	2.00	.37
20MQ47	Deer Lake	6	48	.87	.87

of comparable data regarding site size and artifact density, none of the hypotheses offered above can be fully evaluated at this time. Nevertheless, the results presented here are encouraging from the perspective that there is now evidence to suggest that the use of interior lake basins by early Holocene populations may have differed from basin to basin and that future research exploring the scope and behavioral causes underlying such variability is warranted.

Discussion

Although slightly more than two decades old, the early Holocene archaeology of Michigan's Upper Peninsula has matured to a point where the region now forms an important locality in efforts to reconstruct human behavior in the Great Lakes region during the Pleistocene to Holocene transition. Earlier work by Buckmaster and Paquette (1988, 1996) has helped establish regional patterns for the early Holocene occupation of the Upper Peninsula that include a focus on interior lake basins and the use of a curated tool kit dominated by HSS. Subsequent work by Anderton et al. (2004) has further linked the selection of interior lake basins by early Holocene peoples with their proximity to the margin of the Laurentian Ice Sheet during the Marquette advance.

At this regional scale, the homogenized picture of early Holocene land use is accurate. Still, as examined here, there is local variability in site density, which may reflect the diverse use of lake basins by early Holocene populations. Likewise, data pertaining to assemblage richness suggest that the early Holocene occupation of the region was far from homogenous. Measures of assemblage richness were consistently lower within the Deer Lake basin when compared to probable early Holocene sites within the Silver Lake basin. In fact, within the Deer Lake basin only the Gorto Site (20MQ39) exhibited greater than ten classes of artifacts and the exceptional nature of the Gorto Site is perhaps better demonstrated through the presence of a large cache of heat-fractured, Late Paleoindian bifaces (Buckmaster and Paquette 1988).

Such differences in site density and assemblage richness are a testament to the strong likelihood that individual lake basins in the central Upper Peninsula were understood to be different, unique features of the early Holocene landscape and not simply redundant ecological niches. The uniqueness of these landscape features is further accentuated by activities such as the deposition of the Gorto cache that served to mark Deer Lake as a distinct place within the cultural landscape of early Holocene peoples occupying the region (Carr 2009). Ethnographic data from northern Ontario certainly shows that, among the local Cree, the traditional practice of naming interior lake basins is an important cultural device that serves to anchor social memory to familiar geographic places (Schreyer 2003). In other words, while interior lake basins may occupy similar geographic settings, they also possess enduring senses of place through which local inhabitants come to experience, remember, and dwell within them as distinctive places (e.g. Ingold 2000:153-156; Stewart et al. 2004; Tuan 1974).

The preliminary analysis of site density presented here is intended to be a first step toward evaluating how early Holocene populations were utilizing the Upper Peninsula landscape. In order to further clarify the scope of behavioral variability between individual lake basins in the Upper Peninsula it is imperative that future research be directed toward collecting and evaluating quantitative and qualitative data at increasingly finer scales of analysis. First, site level data pertaining to artifact density and, if possible, spatial patterning is needed to assess the relative intensity of human occupation within and between sites. Secondly, as demonstrated here, indices such as assemblage richness can help identify the scope of human activity that occurred within individual lake basins (e.g. logistical vs. residentially organized activities). To build upon these preliminary results, systematic collection of individual sites is necessary in order to facilitate the accurate comparison of site assemblages. Lastly, functional analyses of individual artifacts, including lipid and blood residue analysis, are required to ascertain the specific range of economic activity undertaken by early Holocene peoples inhabiting the Upper Peninsula of Michigan.

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