

**Report on the Archaeology
of the Shiawassee National Wildlife Refuge:
The 2016 Field Season**

Jeffrey D. Sommer

Historical Society of Saginaw County, Inc.

Submitted to:
Shiawassee National Wildlife Refuge
United States Department of the Interior
Fish and Wildlife Service

18 January 2017

Federal Archaeological Permit No. 2014-MI/3-1

ATTENTION!

This document contains sensitive archaeological site location information. This information is intended for Cultural Resource Management purposes. Appendices should be removed before distributing this document to unauthorized personnel.

ABSTRACT

This report summarizes the results of the 2016 field season of archaeological investigations carried out by the Historical Society of Saginaw County, Inc., in the Shiawassee National Wildlife Refuge (NWR), Saginaw County, Michigan. These continuing field investigations, conducted under Federal Archaeological Permit No. 2014-MI/3-1, included site monitoring and salvage excavation. The project director contributed a total of three days (approximately 20 hours) of fieldwork.

Five archaeological sites were surveyed/monitored during the 2016 field season. Four objects were collected from site 20SA1251. In addition, two flotation samples, totaling 12.5 liters, were salvaged from an apparent hearth feature found eroding out of the riverbank at site 20SA722. The samples contained prehistoric ceramics, lithics, FCR, and floral and faunal remains. No previously unrecorded sites were located.

Artifacts recovered in 2016 include non-diagnostic prehistoric and Middle Woodland material. This project continues to demonstrate that significant archaeological resources are present within the boundaries of the Shiawassee NWR.

TABLE OF CONTENTS

ABSTRACT	iii
LIST OF FIGURES	v
INTRODUCTION.....	1
Project History.....	2
Acknowledgements	3
PROJECT SETTING.....	4
Quaternary Geology	5
Soils.....	6
Paleoecology	6
Climate.. ..	7
Culture History.....	7
History of Archaeological Research.....	8
METHODS.....	10
Field Methods.....	10
Lab Methods.....	10
ANALYSIS AND EVALUATION.....	12
20SA15.....	12
20SA722, Clunie Site.....	12
20SA1251, Shiawassee #2	15
20SA1253, Shiawassee #8, #21	18
20SA1276, Shiawassee #13	18
DISCUSSION.....	19
SUMMARY AND RECOMMENDATIONS.....	25
Recommendations	25
BIBLIOGRAPHY	27
APPENDICES	
Appendix A. Archaeological Resources Protection Act Permit No. 2014-MI/3-1	

- Appendix B. Site Location Map
- Appendix C. GPS Coordinates
- Appendix D. 2016 Artifact Catalogue
- Appendix E. General Information Forms

LIST OF FIGURES

Figure 1: Project Area.....	4
Figure 2: 20SA722, concrete foundation piers.....	13
Figure 3: 20SA722, well casing.....	13
Figure 4: 20SA722, riverbank erosion.....	14
Figure 5: 20SA722, Feature 32.....	14
Figure 6: 20SA1251, riverbank erosion.....	16
Figure 7: 20SA1251, grit-tempered ceramic sherds.....	17
Figure 8: 20SA1251, flaked stone artifacts.....	17

INTRODUCTION

This report summarizes the results of the eighteenth season of archaeological investigations carried out by the Historical Society of Saginaw County, Inc. in the Shiawassee National Wildlife Refuge (NWR), Saginaw County, Michigan. The field investigations, conducted under Federal Archaeological Permit No. 2014-MI/3-1, included site monitoring and salvage excavation. The project director contributed a total of three days (approximately 20 hours) of fieldwork.

The goals of the survey/salvage portion of this project continued to be to document and collect artifacts from archaeological sites that are being exposed through processes of erosion. Erosion, whether by natural or cultural means, exposes artifacts making them vulnerable to removal by persons untrained in archaeological recording techniques and unmindful of the irreparable damage that is caused by removing artifacts from their archaeological context. This project aims to limit such damage by recording the provenience of exposed artifacts and collecting them for future study. An assessment of the amount of erosion observed at each of the sites monitored in 2016 is presented in the Analysis and Evaluation section of this report. Erosion is described using somewhat subjective terms such as minor/minimal, moderate, and severe. Along this continuum, minor/minimal indicates that non-vegetated riverbank was present, but no actual slumping of the riverbank was observed. Severe erosion indicates that portions of the riverbank, at least 30-50 cm thick, have slumped down to the water's edge. Erosion described as moderate would be somewhere between these two extremes.

In addition to monitoring five previously recorded sites, two flotation samples were salvaged from a hearth feature found eroding out of the riverbank at site 20SA722. Four objects were collected from the surface of 20SA1251, one of the five sites that were monitored during the 2016 field season. The two flotation samples from 20SA722 yielded 430 catalogued objects along with additional material (light fraction and heavy fraction <2mm), which has not been catalogued.

Of the 44 archaeological sites/findspots monitored during the 18 field seasons of this project (five during the 2016 field season), 30 are being exposed by fluvial erosion. Because subsurface testing has been conducted at only six sites, and in most cases this testing has been only minimal, site areas for most cannot be reliably calculated. However, the 24 sites that are being exposed by fluvial erosion extend for over 7,200 meters along the Cass, Tittabawassee, and Shiawassee rivers. It is not known how far inland from the rivers most of these sites extend. Shovel testing at 20SA722 has shown that site deposits extend at least 40-60 meters inland over a portion of the site. Shovel testing at 20SA1251 has revealed that, at least along one part of its length, this site extends over 100 meters inland. Previously recorded sites/findspots that are not currently eroding in the river include 20SA1257 (Shiawassee #9), 20SA1276 (Shiaw. #13), and 20SA1277 (Shiaw. #14). Artifacts from these sites were originally found exposed in the "backdirt" of animal burrows and/or "tree throws". Extensive shovel testing at 20SA1276 has identified apparent site boundaries indicating a site area of approximately 2.54 hectares. Shovel testing at 20SA1277 has shown that this site is quite large, at least 90 meters along a north/south transect (Sommer 2002), but site boundaries have not yet been determined. Most of the 10 sites identified in the Refuge's farm units are findspots or extremely low-density lithic scatters. Notable exceptions are 20SA315, which contains a scatter of flaked stone objects, FCR, ceramics, and faunal remains; 20SA 1305, which includes a scatter of late 19th / early 20th century debris; and 20SA1307, which, in addition to a findspot of a retouched flake and two unmodified flakes, includes a scatter of late 19th / early 20th century debris.

Prehistoric artifacts recovered from the various sites on the refuge represent primarily Middle and early Late Woodland occupations (ca 100 BC – AD 1000). However, a few Late Archaic/Early Woodland period (ca. 3000-100 BC) artifacts and several later Late Woodland and Late Prehistoric (ca. A.D. 1000-European contact) items are also present in the recovered assemblages. Site 20SA722 is an

exception in that most of the material appears to date to the Late Woodland to Late Prehistoric period. Historic period artifacts date primarily from the mid-19th century through the 20th century, though a few earlier historic/protohistoric items have also been recovered. A thin scatter of mid-20th century to modern debris is present on nearly all of the sites (as well as on non-site areas). This recent material is not considered archaeologically significant and in most instances was neither noted nor collected.

Combining the materials recovered from the surface of 20SA1251 and the flotation samples from 20SA722, 434 objects were catalogued from the 2016 field season (Appendix D). All artifacts, field notes, and associated materials will be curated in the archaeological repository of the Historical Society of Saginaw County, Inc., per the 1983 Cooperative Agreement (14-16-0003-83-922) between the Historical Society and the United States Fish and Wildlife Service. Less than one ft³ of artifacts and less than one linear foot of notes and other documentation were produced during the 2016 field season.

Project History

The initiation of this project can be traced to concerns about the erosion of archaeological sites on Shiawassee NWR property voiced by local avocational archaeologist Robert R. Clunie. As early as 1995, Clunie noted the presence of prehistoric and historic archaeological materials eroding into the Tittabawassee River on refuge property. In 1999, in an effort to address this problem, we proposed to monitor archaeological sites in the refuge. Site monitoring was to include: "1) looking for evidence of illegal collecting/looting activities and reporting any such evidence to refuge managers; 2) recording provenience information for exposed archaeological remains; and 3) collecting exposed artifacts to prevent their removal by non-authorized individuals" (Sommer 2000). The proposed project was not intended to be a systematic survey designed to locate new archaeological sites. However, it was recognized that new sites would likely be discovered while trying to relocate previously recorded sites. Indeed, this turned out to be the case and 27 "new" archaeological sites were documented during the 1999 through 2002 field seasons (Sommer 2000, 2002, 2003a).

The 2000 field season was started with the same goals in mind. However, the project was expanded slightly to include shovel testing. Shovel testing is necessary to better assess the nature, state of preservation, and extent of the archaeological deposits. Due to constraints of time and personnel, shovel testing was limited to two sites, 20SA1251 and 20SA1254.

In 2001, the scope of the project was once again expanded, this time to include exploratory test excavations at 20SA1251 and 20SA1276. A limited amount of shovel testing was also conducted at these two sites, in part, to help determine appropriate locations for the test excavations. Because of the focus on test excavations and shovel testing, surface survey was not conducted as intensively as in the two previous field seasons of this project (Sommer 2000, 2001).

In 2002, priority was again given to conducting test excavations at 20SA1251. However, a limited amount of shovel testing was conducted at 20SA214 and 20SA1276, several previously recorded sites were monitored and surface collected, and the survey area was expanded to include portions of the bank of the Cass River and some farm units in sections 21 and 22 in Spaulding Twp. (Sommer 2003a).

The 2003 field season included site monitoring and surface survey at several sites and excavations at sites 20SA1276 and 20SA1306. The limited test excavations at 20SA1306 indicated that this site is probably not eligible for inclusion on the National Register of Historic Places. Based on surface survey alone, it was argued that three other sites in the farm units, 20SA1304, 20SA1305 and 20SA1307, were likewise ineligible for the NRHP (Sommer 2004a).

The 2004 field season continued the practice of surface survey and monitoring of known sites on the refuge. Shovel testing was begun at site 20SA722 in order to begin investigating the late Prehistoric component at that site. Finally, additional shovel testing and test excavations were conducted at site 20SA1276 (Sommer 2005).

Priority was given during the 2005 and 2006 field seasons to shovel testing at sites 20SA722 and 20SA1276 and conducting test excavations at 20SA722. Surface survey/site monitoring continued, but to a lesser extent than in previous years (Sommer 2006, 2007).

The 2007 field season included survey/monitoring of 13 sites, with collections being made at five sites. A 50 X 50 cm column sample was taken from site 20SA1276. The column sample consisted of 10 flotation samples totaling 141.5 liters. The majority of the 2007 field season was spent excavating 27 square meters at site 20SA722 (Sommer 2008).

Excavations at the Clunie site (20SA722) were the focus of fieldwork throughout the 2008-2013 seasons. Seventy-five square meters were excavated at this site over this six year span, bringing the total excavated area to 118 m². Surface survey was also conducted to a limited extent and one additional site (20SA1367) was recorded in 2009 (Sommer 2010).

For the first time in many years, the 2014 field season was confined to surface survey and site monitoring. Despite the limited fieldwork, one new site (20SA1402) was recorded and one site (20SA315) was relocated (Sommer 2015). This latter site had been previously recorded (Butterfield 1961), but a prior recent attempt to relocate the site was unsuccessful (Robertson et al. 2000).

The 2015 field season included site monitoring and shovel-testing between sites 20SA214 and 20SA315 (Sommer 2016).

Acknowledgements

Thanks are due to the managers and staff of the Shiawassee NWR for their continuing concern for the archaeological resources of the refuge.

PROJECT SETTING

The Shiawassee NWR encompasses portions of James, Saginaw, Spaulding, Swan Creek, and Bridgeport Townships, Saginaw County, Michigan, just south of the City of Saginaw (Figure 1). It contains over 9,800 acres of marshlands, grasslands, and mixed hardwood forest. Waterways running through the refuge include the Cass, Flint, Shiawassee, and Tittabawassee Rivers, as well as the Birch Run, Bullhead, and Swan Creeks. Water levels on the refuge are intensively managed for wildlife habitat, especially for migrating waterfowl. This is accomplished using a combination of dikes, ponds, dams, and pumps.

The project area is located in a region informally known as the Shiawassee Flats. This region generally conforms to the area covered by the mid-Holocene Nipissing level of the Great Lakes. Because most of the area lies only a few meters above the present level of the Great Lakes, even minor lake level fluctuations in the past would have had important repercussions for local inhabitants.

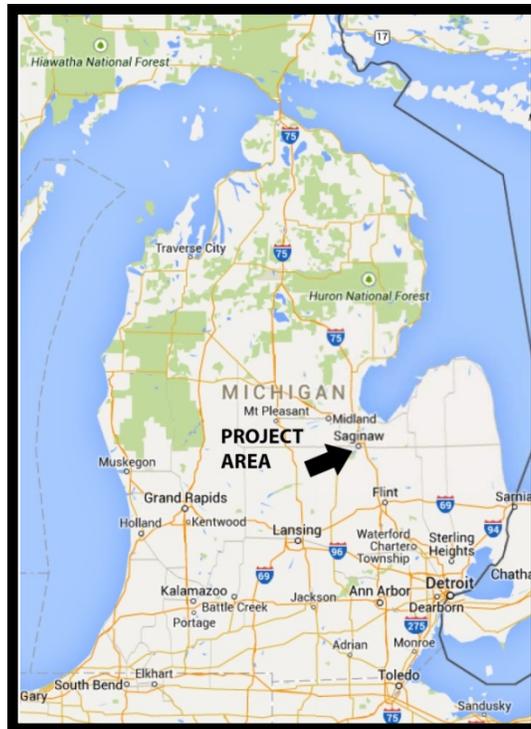


Figure 1: Project Area.

Quaternary Geology

Like the rest of the Great Lakes region, the landforms in the project area are a result of geological processes associated with the Quaternary Period. Repeated glacial advances over the last 2.5 million years gouged out the less-resistant bedrock leaving behind the basins of the present Great Lakes. Wasting ice deposited assorted tills and lacustrine sediments were deposited in proglacial lakes. The processes of glacial advances and retreats, lake formation, and lake level fluctuations resulted in the landforms now present in the Saginaw basin. Several authors discuss these glacial and postglacial events (c.f. Butterfield 1986; Dorr and Eschman 1970:164-179; Eschman and Karrow 1985; Larsen 1985a, 1985b, 1987; Monaghan 1995; Monaghan and Lovis 2005; Shott and Welch 1984:6-20). In the following discussion, dates are presented as radiocarbon years before present (B.P.).

During the latter stages of the Late Wisconsinan glaciation, the Saginaw lobe of the Laurentide ice sheet began to retreat, forming a series of arcuate moraines, which ring the Saginaw basin. The Port Huron moraine, on which the city of Saginaw is located, was formed when the ice front was temporarily stabilized ca. 13,000-12,800 B.P. The moraine at Bay City formed slightly later. Meltwater from the retreating glacier collected in the Saginaw basin, giving rise to Lake Saginaw (Dorr and Eschman 1970).

At approximately 11,000 B.P., following a series of advances and retreats of the glacial margin and the resulting lake level fluctuations, the Main Lake Algonquin stage was reached. The water level at this time is traditionally thought to have been approximately 184 meters above mean sea level (a.m.s.l.). Other research suggests that it may have been significantly lower (Larsen 1987).

Continued northward retreat of glacial ice exposed a series of progressively lower, isostatically depressed, outlets, thus allowing Lake Algonquin to begin draining. The lowest of these outlets was exposed around 10,300 B.P., initiating the Lake Stanley low phase of the Huron Basin sequence. Lake level at this time was more than 100 meters below the present level of 176.5 m (Eschman and Karrow 1985:90; Monaghan 1995:2.4).

As the isostatically depressed outlets began to rebound, lake level began to rise, reaching a maximum level of 184 m around 4,500 B.P. (Larsen 1985a:68). This is known as the Nipissing I stage of Lake Huron. In the Saginaw Valley, the boundaries of Nipissing I were similar to those of the Main Algonquin stage (Butterfield 1986:106). Incision of the outlet at Port Huron led to a recession of the Nipissing I stage. At approximately 4,200 B.P., this recession was interrupted by a brief transgression referred to as Nipissing II. The Nipissing II stage reached an elevation of approximately 181 m. Following the Nipissing II stage, water level fell again to an elevation that has not yet been determined, but by around 3,200 B.P., the lake level rose to the Algoma stage of 179 m (Larsen 1985a, 1987:26). Recent work by Monaghan (1995) and Monaghan and Lovis (2005) in and around the Saginaw Valley has slightly altered the perceived timing of this sequence. They suggest that Nipissing I reached a maximum between 4,800-4,700 B.P., Algoma reached a short-lived maximum of 181 m just after 4,000 B.P., with a fall to modern levels by 3,400 B.P. Several minor climate-driven fluctuations of the lake level took place following the Algoma stage including: a Post-Algoma low stage, around 3,000 B.P., during which lake levels fell to as much as three meters below modern; a Post-Algoma high period, around 1,800 B.P., during which levels rose as much as three meters above modern levels; a Pre-Modern low period, beginning after 1,500 B.P.; and finally, a Pre-Modern high period, lasting from around 500-250 B.P., with levels once again reaching an elevation up to three meters above modern.

The Quaternary Geology of the region is included on a map compiled by Farrand (1982). The major sediment/landform illustrated for the project area consists of Lacustrine Clay and Silt. This sediment is typically gray to dark reddish-brown. It generally underlies extensive, flat, low-lying areas, which were formerly inundated by glacial Great Lakes. This landform also includes small areas of lacustrine sand and clay-rich till (Farrand 1982).

Soils

The *Soil Survey of Saginaw County, Michigan* lists five soil types for the project area (Jaquinta 1994). These soil types include the following: Sloan-Ceresco complex, frequently flooded; Chesaning-Cohoctah complex, frequently flooded; Fluvaquents, frequently flooded; Zilwaukee-Mistequay complex, rarely flooded; and Zilwaukee-Mistequay complex, frequently flooded. These are all floodplain soils described as poorly or very poorly drained, nearly level areas on alluvial plains, with 0 to 2 percent slopes.

Paleoecology

The Saginaw Bay drainage basin is that area of Michigan drained by the Cass, Tittabawassee, Saginaw, Shiawassee, Flint, Bad, and Kawkawlin Rivers as well as many other smaller rivers and streams. The topography of the drainage basin is primarily comprised of lacustrine deposits exhibiting little relief. This relatively flat topography is broken by a series of fossil beach ridges and end moraines. Due to the low relief and the often poorly drained lacustrine sediments, the valley contains many sizable wetlands, including much of the project area.

Dice (1943) designated continuous regions of North America having similar climatic and ecological factors as biotic provinces. In Michigan, the Canadian province covers the Upper Peninsula and the northern Lower Peninsula, while the southern Lower Peninsula is covered by the Carolinian province. A transition zone, containing some elements of each of the larger communities, separates these two provinces. Cleland (1966) refers to transition zones such as this as edge communities. He suggests that they contain a number of features that make them favorable habitats for humans and other animals. Egan (1990) points out that this transition zone contains small communities from each of the larger biotic provinces in a patchy configuration, resulting in a wide selection of plant and animal resources available to prehistoric people. However, the dispersed nature of these resources may have caused logistic problems for prehistoric people attempting to utilize them.

The Saginaw Valley spans the northern edge of the Carolinian biotic province and the transition area between the Carolinian and Canadian provinces. Cleland (1966) gives a detailed description of both of these provinces. The climate, geology, and physiography combine to create a unique ecosystem in the Saginaw Bay drainage basin, which has been called the Saginaw District (Albert et al. 1986:18). Because of its location in the transition area between two biotic provinces, the Saginaw Valley can support animals from both provinces, and thus, has a wide variety of faunal species. Egan (1990) notes this diversity and points out that 77 percent of the northern coniferous forest mammal species, 87 percent of the southern deciduous forest mammal species, all of the inter-biome species, and 71 percent of the Great Plains grasslands species found in Michigan historically occurred in the Saginaw Valley. Baker (1983), Burt (1957), and Kurta (1995) provide additional information on mammals present in Michigan. Bailey and Smith (1981) and Hubbs et al. (2004) provide information about fish species native to Michigan. The abundance of faunal species available to prehistoric people in Michigan is attested by the many faunal remains recovered in archaeological sites in Michigan. Cleland (1966) discusses archaeological evidence of the use of animals by prehistoric people in the Great Lakes region.

The vegetation sequence following deglaciation can be divided into four periods. The following description of this sequence was derived from maps of the vegetation history of the "Thumb area" of Michigan (Shott and Welch 1984: figures 10-14). A spruce forest dominated the period lasting from 11,200 to 10,400 B.P. A pine-fir-spruce forest followed this and lasted until 8,000 B.P. From 8,000 B.P. until 4,000 B.P. an elm-maple-beech forest characterized the vegetation. A mixture of elm-maple-beech and oak-pine forests dominated much of the region until historic period land clearing activities. Prior to logging and agriculture, the clay soils of the Saginaw District supported beech and sugar maple forests, with wetter areas supporting hemlock, white pine, bur oak, swamp white oak, red ash, and American elm (Albert et al. 1986:18). Using General Land Office surveys, Comer and Albert (1997) have mapped the vegetation of

Saginaw County as it existed circa 1800, prior to widespread land clearing activities. For the immediate project area, their map indicates mixed hardwood swamp, beech-sugar maple forest, shrub swamp/emergent marsh, and a small amount of wet prairie. Yarnell (1964) discusses the use of plants by the aboriginal inhabitants of the Great Lakes region.

Climate

The present climate of the Saginaw Valley is relatively mild and fairly uniform, and with a growing season of up to 153 days, it is comparable to southern portions of the state (Albert et al. 1986:18). Iaquina (1994:2) summarizes climatic conditions for Saginaw for the period 1955-1980. The average daily winter temperature in Saginaw for this period was -4.5°C with an average daily minimum of -8.75°C . The average summer temperature in Saginaw was 20.9°C with an average daily high of 27.4°C . The climate in the Saginaw region is considered to have been sufficient for prehistoric agriculture (Yarnell 1964).

Culture History

Because of the large-scale interactions that obtained between human groups in the past, culture history must be viewed at a regional rather than local level. Several reviews of the regional cultural developmental sequence have been prepared (Cleland 1992; Fitting 1975; Halsey 1999; Mason 1981). The cultural history presented below is discussed in terms of discrete chronological stages. In reality, the stages grade into one another and there are no distinct boundaries between them.

The initial human colonization of the Great Lakes region occurred during Paleo-Indian period (ca. 11,500 - 10,000 B.P.). These nomadic hunters and gatherers lived in small bands following herds of large game animals such as caribou and mastodon. In addition to hunting, Paleo-Indians probably utilized a variety of plant species. Paleo-Indian sites are recognized by the presence of diagnostic flaked stone tools (especially fluted projectile points) and their manufacturing debris. Examples of Paleo-Indian sites in the Saginaw Valley region include the Gainey and Butler sites in Genesee County (Simons 1997; Simons et al. 1984; Simons and Wright 1992) and the Barnes site in Midland County (Wright and Roosa 1966).

Coincident with the end of the Pleistocene Epoch and the beginning of the Holocene Epoch, the Archaic period inhabitants of the Great Lakes region began to exploit a wider variety of plant and animal resources. The Archaic period is divided into Early (ca. 10,000 - 8,000 B. P.), Middle (ca. 8,000 - 5,000 B. P.), and Late (ca. 5,000 - 3,000 B. P.) phases. In comparison to their Paleo-Indian predecessors, Archaic bands may have moved over somewhat restricted territories. However, they continued to be highly mobile, periodically moving in order to exploit seasonally available resources. Towards the end of the Late Archaic period, people in the Great Lakes region began experimenting with horticultural practices as is shown by the presence of wild *Cucurbita* (squash) at around 3840 B.P. at the Marquette Viaduct site in Bay County, Michigan, and domestic *Cucurbita* by around 2820 B.P. at the Green Point site in Saginaw County, Michigan (Monaghan et al. 2006). Archaeological sites of this period are identified by a variety of diagnostic flaked stone artifacts including a variety of notched and stemmed projectile points. The Archaic period also saw the first use of copper and ground stone technologies. Early Archaic sites are not well known in the Saginaw Valley and none have been excavated and reported on. Middle Archaic sites are also little known from this region, with the Weber I site probably the best known excavated example in Saginaw County (Lovis 1989). Two other Saginaw County sites with excavated Middle Archaic Components include the Ebenhoh (Dobbs and Murray 1993) and Bear Creek sites (Branstner and Hambacher 1994). Late Archaic sites are well known in the Saginaw Valley and include locations such as the Andrews site (Papworth 1967), Schmidt site (Fairchild 1977; Harrison 1966) and Feeheley site (Taggart n.d.).

The first use of fired-clay ceramics marks the beginning of the Woodland period in the Great Lakes region. Like the Archaic, the Woodland period is divided into Early (ca. 3,000 - 2100 B.P.), Middle (ca. 2,100 - 1,600 B.P.), and Late (ca. 1,600 - European contact) phases. The period from 600

B.P. until European contact is sometimes referred to as the Late Prehistoric period. Throughout the Woodland period, mobility continued to decrease and cultigens such as squash, maize, and a variety of native seed plants became more important in the diet. By the latter part of the Late Woodland period permanent agricultural villages were established in many parts of the Great Lakes region. Woodland period archaeological sites are identified by the presence of diagnostic flaked and ground stone tools including a variety of notched, stemmed, and triangular projectile points, fired-clay ceramics, and cultivated plant remains. The Schultz site, located immediately adjacent to the present project area, is the best example in the state of a stratified site spanning the entire Woodland period (Fitting 1972a).

The initial contact between Native Americans and Europeans marks the end of the Late Woodland period and the beginning of the Historic period. It is during the Historic period that we can first associate tribal names with specific Native American groups living in the Great Lakes region. Groups living in this region between the 17th and 19th centuries included, among others, the Ojibway, Sauk, Fox, Potawatomi, Miami, and Ottawa (Cleland 1992; Tanner 1987). France claimed much of the Great Lakes region in the 17th century. As a result of the French and Indian War, in 1763 the area fell under British rule. The British period was relatively short-lived and by the end of the 18th century control of the Great Lakes region was established by the United States. Early Historic period habitation sites are not well known in the Saginaw Valley. The Fletcher site in Bay County is an example of an 18th century Native American cemetery (Mainfort 1979). The Cater site in Midland County is a good example of both an early 19th century Native American occupation and a mid-19th century European settler occupation (Beld 2002).

History of Archaeological Research

The Saginaw Valley has more documented archaeological sites than any other comparable region in Michigan. For over a century, the richness of the archaeological resources in this region has drawn considerable attention from avocational and professional archaeologists alike. During the late 19th century, William R. McCormick, a local pioneer settler, made and recorded the first known observations of archaeological remains found in the Saginaw Valley (McCormick 1883). Between 1891 and 1906 Eliza Golson collected hundreds of "Indian relics" near her home in Saginaw County and described her finds in her diary (Klisch and Klisch 1980). A portion of her collection is still intact and is curated at the Historical Society of Saginaw County. Professional archaeology also got its start in the late 19th century when Saginaw native Harlan I. Smith became the first professional archaeologist to conduct research in the region (Smith 1894, 1901a, 1901b, 1901c). Although, Smith's earliest archaeological interests and studies focused on the Saginaw Valley, his attention soon turned to other regions.

Despite the significance of earlier archaeological contributions by McCormick, Golson, Smith, and others, it is Fred Dustin who must be considered the founder of Saginaw Valley archaeology (Peebles 1978:86). In addition to his extensive and well-documented collection of artifacts from the region and his numerous publications, notes, and manuscripts, Dustin was an inspiration and a model for other avocational archaeologists and historians of his and later generations (Fitting 1968). It is largely through his efforts and influence that much of the early history and archaeology of the Saginaw Valley has been preserved.

In addition to the long history of contributions by avocational archaeologists, professional archaeologists have shown considerable interest in the Saginaw Valley. Professional interest in the Saginaw Valley peaked during the late 1950s and 1960s. Several sites were excavated during this period including Andrews (Papworth 1967), Stroebel (Papworth 1967), Hodges (Binford 1963), Feeheley (Taggart n.d.), Green Point (Wright 1964), Schultz (Fitting 1972a; Ozker 1982), Schmidt (Fairchild 1977; Harrison 1966), Bussinger (Halsey 1976), Mahoney (Bigony 1970:167-192), Stadelmeyer (Bigony 1970:115-166) and several others. Field crews from the University of Michigan excavated all of these sites, usually with assistance from several local amateur archaeologists. Most archaeological fieldwork in

the Saginaw Valley during the 1970s, '80s, and '90s was directed not so much by research interests, but primarily by cultural resource management concerns. Notable projects during these more recent decades include work at the Weber I and Weber II sites in Frankenmuth Township (Lovis 1989), the Bridgeport Township site (O'Shea and Shott 1990), site 20SA1034 (Dobbs et al. 1993), The Shiawassee River and Bear Creek sites (Branstner and Hambacher 1994) and the Casassa Site (Branstner and Hambacher 1995).

In addition to the projects listed above, at least six contract reports discuss archaeological surveys conducted within Shiawassee NWR boundaries. The first of these was an "Archaeological Survey of the Saginaw Reservoir Area" (Papworth 1959). The purpose of Papworth's survey "was to discover the presence of historic houses or other historic structures of significance, and to locate prehistoric aboriginal occupational sites, monuments, or pictographs of such nature that they would merit archaeological investigation and salvage by recording prior to the flooding of the land by reservoir waters." Papworth's project map depicts the location of 23 sites, seven of which are within the present boundaries of the Shiawassee NWR.

A second survey was designed to assess the impact of dike construction and other flood control measures proposed for the Shiawassee flats (Fitting et al. 1977). Although, through a combination of field and library research, 89 archaeological sites were located, most of the survey areas were outside of the Shiawassee NWR boundaries. However, two sites, 20SA15 and 20SA361, were recorded within the refuge boundary. Site 20SA15 was surveyed during this and previous field seasons of the present project. Site 20SA361 was reported as a Late Woodland site located adjacent to the Cass River (Fitting et al. 1977:37). This site was relocated during the 2002 field season and a Late Woodland temporal placement was confirmed.

A third project, involving library research and minimal field survey, was conducted within the Shiawassee NWR in 1978. This project was designed to "provide only a general impression of the refuge's cultural resources" (Whittier et al. 1978). Site 20SA361 was relocated and several historical sites, including one located at 20SA722, were recorded. Prehistoric materials were not noted at 20SA722. In 1980, a small-scale test investigation by the Saginaw Archaeological Commission, failed to locate any archaeological remains (Brunett 1980).

In 1993, Commonwealth Cultural Resources Group, Inc. (CCRG) contracted with the United States Fish and Wildlife Service to complete a "Baseline Artifact Inventory Survey of Museum Property and Indian Interests in National Wildlife Refuges Located in Michigan" (Robertson et al. 1993). This survey noted 14 archaeological sites within the Shiawassee NWR. The results of a second contract between CCRG and the U.S. Fish and Wildlife Service are presented in "Overview Study of Archaeological and Cultural Values on Shiawassee, Michigan Islands, and Wyandotte National Wildlife Refuges in Saginaw, Charlevoix, Alpena, and Wayne Counties, Michigan" (Robertson et al. 2000). This project was designed to identify and describe the known archaeological and cultural values of the three Wildlife Refuges listed in the title. Regarding the Shiawassee NWR, the study area included lands within the current refuge boundary, lands within the proposed expansion areas, and adjacent areas. In all, 244 archaeological sites are discussed for the Shiawassee NWR study area, most of which are not within the current boundaries of the refuge. Discrepancies between the data reported by CCRG and the data derived from previous field seasons of this project are discussed in Sommer (2001).

METHODS

Field Methods

Surface survey conducted during the 2016 field season consisted of monitoring previously recorded sites by walking along portions of the banks of the Shiawassee and Tittabawassee Rivers, and in adjacent areas away from the rivers, looking for exposed artifacts and noting the extent of erosion in site areas. Artifact locations were recorded using a hand-held GPS device (Garmin GPSMAP 64st) (Appendix C).

While monitoring site 20SA722, a probable hearth feature was discovered eroding out of the riverbank. The location was recorded on two occasions using the hand-held GPS device (Appendix C). Loose material was removed from the exposed slumping face of the feature and the deposit was photographed. A 5.5 liter flotation sample was then collected from the slumping feature, while scraping it back to make a vertical face. At this stage, the feature was drawn and additional photographs were taken. Finally, a 7 liter flotation sample was excavated from the vertical face. An undetermined, but likely substantial, portion of the feature remained, but not wishing to further destabilize the bank, it was left in place.

The locations of sites previously recorded during this project had been plotted on 7.5' U.S.G.S. topographic maps using the DeLorme 3-D Topoquads computer program. Other sites were plotted by uploading GPS coordinates into Google Earth and overlaying the image on the appropriate topographic map. Topographic maps used include the Saginaw, Shields, and Alicia quadrangles.

Lab Methods

Collected artifacts and flotation samples were taken to the archaeological laboratory at the Historical Society of Saginaw County, Inc. for processing. After sorting, the artifacts were carefully washed and fully air-dried prior to analysis. Artifacts from the 2016 field season of this project were catalogued under Accessions F16-1 and F16-2. Each artifact was assigned a catalogue number according to the provenience and type of object. Several objects may be assigned the same catalogue number if they are same type of object and are from the same provenience. Catalogue numbers contain three parts separated by dashes. The first two parts are the Accession Number. These are followed by a dash and then a sequential number starting with 1. For the purposes of the database, placeholder zeroes are added in front of the third part of the catalogue number to create a three or four digit number, e.g. F16-2-001. The third part of the catalogue number, without the placeholders, is used in this report to number the artifacts depicted in the figures. A Catalogue Record was filled out for each object catalogued during this project. These records include the Catalogue #, Provenience, and Description of each artifact.

Prior to processing, flotation samples were thoroughly dried to increase buoyancy of charred material. The soil was slowly dumped into a screen with window screen sized mesh immersed in a one hundred gallon tub. Water jets spraying up from the bottom of the tub into the screen provided gentle agitation, which was aided by hand mixing. Agitating the water in this way helped the sediment fall through the screen where the heavy fraction- ceramics, stone artifacts, bone, etc., were collected. The light fraction, buoyant objects such as charcoal, seeds, etc., flowed out through a two-inch pipe located near the top of the screen and were collected in a very fine-mesh paint filter. The light and heavy fractions were labeled with their provenience information and dried. Prior to sorting and cataloguing, the light and heavy fractions were size-sorted by passing the material through nested geological sieves of 4mm and 2mm. This process yields size categories of >4mm, 2<4mm, and <2mm. Material from the two larger size categories has been sorted and, the heavy fraction, catalogued.

Prior to being photographed, artifacts were labeled with their catalogue number written with permanent black or white ink on a layer of clear Acryloid B-72, and sealed with a layer of clear B-72.

Any refitting of broken artifacts is accomplished using clear B-72 as an adhesive. Artifacts will be stored in the archaeological repository at the Historical Society of Saginaw County, Inc., in roughly one cubic foot, acid-free boxes.

ANALYSIS AND EVALUATION

Five archaeological sites were monitored during the 2016 field season. All of these sites were recorded during previous years of this project. Artifacts were collected from site 20SA1251 and flotation samples were salvaged from site 20SA722. The objects/samples recovered in 2016 are described in this section along with comments about each of the monitored sites.

20SA15

Site 20SA15 extends approximately 154 meters along the Tittabawassee River (Appendix B). Yearly monitoring since 1999 has shown that a light scatter of FCR, flakes, Late Woodland pottery and Historic period material covers the eroding edge of the site. A visit in May of 2016 revealed minor to moderate erosion over much of the site with significant erosion in one 5 X 0.3m area. High water limited visibility and no artifacts were observed or collected. Even in the absence of periodic high water (currently annual in spring), continued erosion of the fairly high, steep bank is expected. Diagnostic artifacts recovered in 1999, 2002, and 2004 indicate that Late Woodland and Historic period components are present (Sommer 2000:10, 2003:12, 2005:12). A 1955 aerial photograph of the site area shows that it was under active cultivation at that time.

20SA722, Clunie Site

This large site extends for approximately 960 meters along the bank of the Tittabawassee River (Appendix B). During the 2000 field season, a site datum was driven into the ground to serve as the beginning of Segments 1 East and 1 West. Wooden stakes were placed every one hundred meters to the west marking the beginning point of each segment (Sommer 2001:14). Because all of the stakes have now been lost due to flooding and/or erosion, surface finds since 2002 have been plotted by GPS or have been given grid coordinates based on the Shovel Test grid set up in 2004 (Sommer 2005).

Eighty-five 50X50 cm shovel-test pits were dug on this site between 2004 and 2005 (Sommer 2005:13-15, 2006:14-18). These shovel-tests demonstrated that, at least in the area tested, the site extends inland from the riverbank 40-60 meters. In addition to the shovel-tests, between 2006 and 2013, 118 square meters were excavated in seven Excavation Blocks.

From ca. 1908-1940, around 40 cottages and dozens of houseboats formed a community known as Fitzhugh Beach Colony along the Tittabawassee River opposite Riverside Park (Kilts 1958). In previous years of this project, cottage remnants and associated debris have been noted in passing in the northwest portion of 20SA722, but had never been plotted. In 2016, remnants of a brick and concrete structure/foundation, 11 concrete foundation piers (Figure 2), additional concrete foundation fragments, and a large well casing (Figure 3) were plotted with a GPS over a ca. 250 meter stretch in the northwest part of the site (Appendix C). The well casing is a vitrified clay pipe, approximately 1.5 m in diameter, extending 30 cm above the ground surface. It is currently empty to an estimated depth of 1-1.5 meters.

The relatively high and steep riverbank was subject to moderate to severe erosion over much of the site area in 2005-2007, 2009, 2011, and again in 2013. Only minor to moderate erosion was noted during the 2008, 2010, 2012, 2014, and 2015 field seasons. Unfortunately, 2016 saw a return to more extensive erosion along portions of the site (Figure 4), including one area where a hearth feature, Feature 32 (Figure 5), was exposed (Appendix C). Several flakes, FCR, and small grit-tempered ceramic sherds were observed in the eroded areas, but were not collected.



Figure 2: 20SA722, concrete foundation piers.



Figure 3: 20SA722, well casing.



Figure 4: 20SA722, riverbank erosion.



Figure 5: 20SA722, Feature 32.

As described in the methods section above, two flotation samples, totaling 12.5 liters, were salvaged from Feature 32. Material from the heavy fraction was size-sorted and the >4mm and 2<4mm classes were catalogued. Catalogued material >4mm includes five grit-tempered sherdllets, 11 chert flakes, six small FCR, four fish scales, 29 bone fragments, one bivalve shell fragment, one charred nutshell (*Juglans* sp.), and one charred wood fragment. One of the chert flakes is a burnt fragment of either Bayport chert or a pebble chert. The rest of the flakes are Bayport chert. The bone assemblage includes 20 fish bones, at least one of which is from the catfish family (Ictaluridae), one medium mammal bone, three medium/large mammal bones, one of which is calcined, and five unidentified bone fragments. The medium mammal bone is an unfused epiphysis from the left ulna of a beaver (*Castor canadensis*).

Catalogued material from the 2<4mm size class of the heavy fraction includes eight grit-tempered sherdllets, 36 chert flakes, 26 fish scales, 198 bone fragments, five bivalve shell fragments, and 99 pieces of charred organics. One of the chert flakes may be Wyandotte chert, three are either Bayport or a pebble chert, and the rest are Bayport chert. One of the fish scales is from a gar (*Lepisosteus* sp.). The other scales have not been identified. The bone assemblage includes 95 fish bones, eight of which are calcined or partially burnt, three small mammal bones, two small/medium mammal, two medium mammal bones, one of which is calcined, and 96 unidentified bone fragments. Twenty of the unidentified specimens are calcined or burnt. Four of the five bivalve shell fragments are also burnt. The charred organics are mostly wood charcoal, but the assemblage also contains five seeds, four of which may be maize kernels.

The light fractions were sorted into the same size classes as the heavy fractions. Although they have not been catalogued, a preliminary sort of the >4mm and 2<4mm size classes has been done. As expected, the light fractions contain primarily charred organic material. The >4mm size class yielded 111 fragments (6.99g) of wood charcoal and two probable maize kernels (0.04g). The 2<4mm size class yielded 608 pieces (3.30g) of wood charcoal, 3 maize cob/cupule fragments (0.04g), 22 seed fragments (0.17g), all of which are probably maize kernels, and three unidentified fragments (0.02g) of charred organic material. In addition to charred organics, the 2<4mm size class of the light fractions also yielded 46 small snail shells, which are almost certainly incidental inclusions.

Feature 32 is consistent with the Late Prehistoric material previously excavated from 20SA722. The location and morphology of the feature itself, along with the presence of maize cob/cupule and kernel fragments and grit-tempered ceramics supports this temporal placement. Based on the material recorded and recovered in 2016 and previous fieldwork, this site represents a series of occupations that occurred during the Woodland, Late Prehistoric, and Historic periods, with a possible earlier Late Archaic occupation.

20SA1251, Shiawassee #2

This site consists of a scatter, dense in places, of FCR and other artifacts, which extends along the Shiawassee River for over a kilometer (Appendix B). It is bordered on either end by low marshes. Most of the riverbank along the site has become covered with vegetation in recent years resulting in increased surface stability and minimal bank erosion in some areas of the site. However, moderate to severe erosion was observed along some portions of the site each year from 2004 through 2016. In fact, during 2015 and 2016, the site experienced the worst erosion I have seen since we began the project in 1999 (Figure 6). In some areas of the site, up to a meter or more of riverbank was lost to erosion over the year. During most years, including 2016, the moderate to severe erosion was located primarily along the highest density portion of the site.

A 1955 aerial photograph of this site indicates that it was cleared and under cultivation at that time. According to the state site map, this site overlaps with the eastern portion of 20SA125. Papworth's (1959) project map shows almost a complete overlap between 20SA125 and 20SA1251. A new site number was assigned because of the lack of precise information on the location of 20SA125.



Figure 6: 20SA1251, riverbank erosion.

Thirty-one 50X50 cm shovel test pits (STP 1-STP 31) were dug on this site during the 2000 and 2001 field seasons (Sommer 2001:17-20, 2002:13-14). Shovel testing has revealed that large areas of relatively intact site deposits exist away from the eroding edge of the riverbank. In addition, 50 square meters were excavated at this site between 2001 and 2002 (Sommer 2002:25-27, 2003:23-28). Work in 2016 was confined to surface survey.

A visit to the site in May 2016 revealed numerous flaked stone artifacts, FCR, and a few grit-tempered pottery sherds. Four artifacts were collected. They are included in Accession F16-1 and were assigned Catalogue Numbers F16-1-001 through F16-1-004 (Appendix D). Collected artifacts include two grit-tempered ceramic sherds, one modified flake blank/preform, and one retouched flake (Figures 4-6).

The ceramic sherds collected in 2016 are both decorated body/neck sherds, one with incised (zoned) and dentate rocker-stamped decoration on a smooth exterior and one with plain rocker-stamping on a smooth exterior (Figure 7, #s 1 and 2 respectively). These two sherds are consistent with Middle Woodland Green Point Ware (Fischer 1972). The two flaked stone artifacts collected in 2016 include a unifacially retouched Bayport chert decortication flake and a modified “trimmed” Bayport chert flake blank/preform (Figure 8, #s 3 and 4 respectively).



Figure 7: 20SA1251, grit-tempered ceramic sherds.



Figure 8: 20SA1251, flaked stone artifacts.

Based on material from this and previous field seasons, 20SA1251 appears to contain Late Archaic/Early Woodland, Middle to early Late Woodland, Late Woodland, and Historic components. However, diagnostic artifacts indicate that the majority of the occupation debris found on the surface is probably derived from the Middle to early Late Woodland component. A Middle Woodland age AMS radiocarbon date of 1960±40 BP (2 Sigma cal. BC 40 to AD 120) was obtained from a sample of charred organic residue scraped from the interior of a Green Point Incised, Cross Hatched vessel excavated from this site in 2002 (Sommer 2003b, 2004b). Artifacts collected from this site indicate that a variety of prehistoric activities were conducted ranging from flaked stone tool and ceramic manufacturing and use, to woodworking, food storage and/or preparation, and probably hunting and fishing and on-site butchery. Finally, the presence of fairly large quantities of FCR indicates that fire was being used for heat and/or food preparation.

20SA1253 Shiawassee #8, #21

This site extends for nearly 400 meters along the Shiawassee River, beginning at its original confluence with the Cass River (the Cass River was straightened at its mouth in the mid-19th century to facilitate log rafting) and extending downstream (Appendix B). The 1955 aerial photograph of the area does not depict any obvious historic disturbance in the immediate vicinity of the site. One of the natural features of this site is a dense gravel and cobble deposit that overlaps with the eastern end of the site and continues several hundred meters to the east. This deposit appears to represent material eroded out of glacial till. This appears to be the only, or at least the most readily accessible, source of cobbles in the immediate region. This cobble deposit may be the source of the FCR and possibly of pebble cherts that were used prehistorically.

A cluster of grit-tempered ceramics and FCR was recorded during the 1999 field season and marked with a rebar datum in 2000 (Sommer 2000:19-20, 2001:21). Prehistoric and 19th century debris is very lightly scattered across this site.

In May 2016, an unsuccessful attempt was made to relocate the iron rebar datum that was placed in 2000. Relatively high water levels prevented walking along the bank and the site area away from the bank is now covered with nearly impenetrable brush. Thus, visibility was extremely limited. No artifacts were observed or collected.

The low diversity of artifact types previously recovered from this site makes it difficult to infer site function. Artifacts recovered during previous field seasons date to the Late Woodland period and the 19th century.

20SA1276, Shiawassee #13

This site is located approximately 250 meters north of the Shiawassee River (Appendix B). The site was originally located by observing artifacts in the backdirt piles from several animal burrows (Sommer 2001:26). These burrows are primarily located on and adjacent to an east/west trending linear ridge that crosscuts the site roughly around the 480-490 N line. The ridge itself is cut through by an old road that runs roughly north/south at approximately the 515-520 E line.

One hundred and nineteen 50X50 cm shovel test pits (STPs) were dug on the site between 2001 and 2006 in order to ascertain the nature and extent of intact site deposits and to identify an appropriate area for more extensive test excavations (Sommer 2002, 2003a, 2005, 2007). Test excavations, totaling 65 square meters, were conducted in 2001, 2003, and again in 2004 (Sommer 2002, 2004a, 2005). Two additional column samples, each 50X50 cm, were excavated in 2004 and 2007 (Sommer 2005, 2008). The shovel test pits indicate that the main site area is flanked on the west by a low swale that appears to be an old channel or drain running north/south between the Shiawassee and Tittabawassee Rivers. During

the period we were actively working on the site, we were prevented from fully testing this assumption by high water levels, though decreasing artifact density near the edge of the swale supports the assumption. An eastern boundary was determined along the 520N line at approximately 580E, at 560N the eastern boundary is at 590E, and at 600N the eastern boundary is at 620E. The eastern boundary varies from approximately 580E at 680N to 560E at 760N. Shovel testing has revealed that the northern boundary at the 540E line is approximately 830N. Along the 500E line, the southern boundary is at approximately 430N. Therefore, the site extends for approximately 400 meters in a north/south direction, and up to 130 meters in an east/west direction, covering a total of around 2.54 hectares.

A visit to the site in May 2016 revealed the continued presence of active animal burrows at approximately 518N 499E and 518N 497E. Several FCR were observed in the “backdirt” from these burrows. No artifacts were collected. A hand-held GPS was used to record the location of the site datum (500N 500E). Coordinates are listed in Appendix C.

Previous work at 20SA1276 indicates that this site dates between the Late Archaic and Late Woodland periods. The great majority of the previously recovered artifacts and three radiocarbon dates indicate that the main period of occupation occurred during the Middle Woodland time period.

DISCUSSION

The continuing goals of the surface survey/monitoring portion of this project, to document and collect artifacts from archaeological sites exposed on Shiawassee NWR property, were met during the 2016 field season. Over the past 18 field seasons, this project has clearly demonstrated that significant cultural resources are present within the boundaries of the Shiawassee NWR, including extensive buried archaeological deposits, which, at least in a portion of 20SA722, are stratified.

Although no evidence for it was found during the 2016 field season, the earliest period of occupation documented at the refuge is the Late Archaic or transitional Late Archaic/Early Woodland. Greywacke flakes found in 1999 provide possible, though certainly not conclusive, evidence for Transitional/Late Archaic occupations at 20SA722, 20SA1254, and 20SA1255 (Sommer 2000). More suggestive is the cannel coal gorget and side-notched/expanding stemmed point with a ground base from 20SA1255 (Sommer 2000), a corner-notched/side-notched point with a heavily ground base found at 20SA1251 (Sommer 2002), and three “Ace of Spades”/“Ground base” points from the surface and excavations at 20SA1276 (Sommer 2004a, 2005). Other Late Archaic/Early Woodland material recovered during previous field seasons include Meadowood bifaces recovered from the surface of 20SA214 and 20SA722 and a corner-notched point made of Onondaga chert from 20SA1251 (Sommer 2002). Comparable Late Archaic/Early Woodland material is discussed by Beld (1991), Garland and Beld (1999), and Granger (1978). The paucity of Late Archaic age material from the refuge is certainly a result of the fact that most of the sites that have been found on the refuge would have been inundated by the Shiawassee embayment from sometime before the Nipissing maximum around 4,800 B.P. to after the Algoma maximum around 3,800 B.P (Monaghan and Lovis 2005).

Early Woodland material from the refuge includes Adena and Adena-like stemmed points, two broad-bladed stemmed points, and a stemmed Kramer-like point found at 20SA1251, and two large stemmed knives from the excavations at 20SA1276. Fragments of at least one Early Woodland Shultz Thick ceramic vessel and one late Early Woodland to early Middle Woodland Shiawassee Ware vessel were found at site 20SA1252 (Sommer 2013a:6-7). The interior cord-roughened sherds recovered in 2011 on the surface of site 20SA722 may also date to the Early Woodland period.

The Middle Woodland Period is well represented at several sites in the refuge and the ceramic sherds recovered from 20SA1251 in 2016 fall into this timeframe. Middle Woodland Period artifacts and

features containing floral remains, faunal remains, and habitation debris have been excavated at 20SA722, 20SA1251, and 20SA1276. Despite the preponderance of stylistically later Middle Woodland artifacts at several of the sites from the refuge, radiometric dating indicates a strong early Middle Woodland presence.

An AMS date of 1930 +/- 40 BP (2 Sigma Calibrated BC 10 – AD 140) on organic residue scraped from a ceramic sherd recovered in 2010 at the Clunie site (20SA722) falls clearly into the first half of the Middle Woodland time period (Sommer 2011:38). This date also marks the earliest habitation evidence so far obtained at the Clunie site.

As reported previously (Sommer 2004a:16, 32), the AMS radiocarbon date of 1960 +/- 40 BP (2 Sigma cal. BC 40 to AD 120) that was obtained from the sample of charred organic residue scraped from the interior of a Green Point Incised, Cross Hatched vessel excavated from 20SA1251 has implications for our understanding of the Middle Woodland ceramic chronology and for our understanding of cultural processes in the Saginaw Valley. This vessel type, and the ware group that includes it, were originally defined at the nearby Schultz Site (Fischer 1972:161-165, 279-280) and are generally thought to date from the latter portion of the Middle Woodland period, from AD 300-500 (Kingsley 1999:151). The early Middle Woodland date from 20SA1251 indicates that the stylistic elements characterizing this type were introduced into the Saginaw Valley on a timeframe consistent with the spread of this style into other parts of Michigan (Sommer 2003b, 2004b).

Recently, two AMS dates taken from charred organics found adhering to ceramic sherds recovered from 20SA1276 have been reported. As part of her dissertation research into the introduction of maize into the Saginaw Valley, Raviele (2010) examined food residues on ceramic vessels for the presence of phytoliths and starch grains. Several sherds from 20SA1276 and 20SA1251 were borrowed for this research and two sherds from 20SA1276 were dated. One sherd recovered from Feature 26 (see Sommer 2005) yielded a date of 1920 +/- 40 BP (2 Sigma cal. AD 10-140). Another sherd, recovered from ceramics associated with Feature 27 (see Sommer 2005), yielded a date of 1980 +/- 40 BP (2 Sigma cal. BC 50-AD 90) (Raviele 2010:97, Appendix D). Maize starch, along with wild rice phytoliths, was identified on the sherd associated with Feature 27, making it some of the earliest evidence for the use of maize in the Saginaw Valley, or elsewhere in Michigan. These findings not only demonstrate the archaeological research potential of the Shiawassee National Wildlife Refuge, they highlight the continuing importance of well-curated archaeological collections for future research.

These early Middle Woodland dates also highlight the dynamic nature of local lake level fluctuations. Archaeologists have previously hypothesized that the early part of the Middle Woodland period was a time of relatively high lake levels, possibly as high as two or three meters above the modern mean (Fitting 1972a:257-258; Monaghan and Lovis 2005; Speth 1972:72-73). This high water stage has been cited as a possible explanation for the distribution of Middle Woodland sites in the Saginaw Valley (Lovis 1993:227; Lovis and Davis 1993:119). Given their low elevations, sites 20SA722, 20SA1251 and 20SA1276 would have been inundated under such conditions. The dated ceramics from these sites make it clear that although lake levels may have been high during a portion of the Tittabawassee Phase, conditions were dynamic and even low-lying areas were available for occupation during some parts of the early Middle Woodland.

An AMS date of 1710 +/- 40 BP (2 Sigma cal. AD 230 to AD 410, intercept AD 330) on a nutshell from Feature 5 at 20SA1276 not only dates a later Middle Woodland period of the site's occupation, it also suggests that the associated Ruben Linear ceramics may date a couple centuries or more earlier than previously expected (Sommer 2004a:30). Additional radiocarbon dates are sorely needed to help sort out the complex occupation sequence at 20SA722, 20SA1251 and 20SA1276 and to continue to refine the ceramic sequence from the Saginaw Valley.

Middle and/or Late Woodland occupations are indicated at all of the sites for which diagnostic materials are available. The presence of late Middle Woodland, transitional Middle to early Late

Woodland, and early Late Woodland artifacts, including Green Point, Ruben Linear, and Wayne Ware ceramics, cut and engraved turtle carapace bowls (Halsey 1966), and Snyders-like, Jack's Reef, Raccoon Notched, and a variety of expanding stemmed points (Fitting 1972b), at several sites suggests that the project area holds great potential for research into the poorly understood transitional period between the Middle and Late Woodland Periods (Kingsley 1999:171-172).

The Late Prehistoric/Upper Mississippian Period is another poorly understood portion of Saginaw Valley prehistory (Halsey 1999:263). Several sites located in the Shiawassee NWR have yielded artifacts that appear to date from this late period. A collared rimsherd with a dowel or finger impressed lip from 20SA15 is stylistically consistent with late Prehistoric ceramics (Sommer 2000:10). Excavations at 20SA1276 yielded a late-looking grit-tempered rimsherd with a possible strap handle attachment (Sommer 2004a). Triangular Madison points were recovered from the surface of 20SA214 in 2003 (Sommer 2004a:13), 20SA1251 in 2000, 2001 and 2003 (Sommer 2001:18, 2002:15, 2004a:15) from 20SA1254 in 2002 (Sommer 2003a:17) and from 20SA1274 in 2000 (Sommer 2001:26). A triangular projectile point recovered from site 20SA1367 in 2009 may also date to this late period (Sommer 2010). Madison points are associated with Late Woodland/Mississippian cultural phases across much of eastern North America (Justice 1987:224-226). Late Prehistoric items derived from test excavations conducted at 20SA1251 during the 2001 and 2002 field seasons include shell-tempered and limestone-tempered ceramics and triangular Madison Points (Sommer 2002).

Although Late Prehistoric items have been found at several sites in the project area, they typically consist of only a few scattered artifacts in predominately earlier assemblages. The Clunie Site (20SA722) is an important exception. At this site, Late Prehistoric/protohistoric material is widespread and abundant. During previous field seasons, several Late Prehistoric artifacts were recovered from the surface of 20SA722, including shell-tempered potsherds with smooth and cord-roughened exteriors, a shell-tempered rimsherd with a strap handle, an additional strap handle from another shell-tempered vessel, grit-tempered rimsherds with finger-pinched lips, and triangular projectile points (Sommer 2000, 2001, 2004a, 2005, 2011). A green glass bead recovered *in situ* in Feature 24 is compelling evidence for a protohistoric component at 20SA722 (Sommer 2012:22). Recent chemical analysis using Laser Ablation – Inductively Coupled Plasma – Mass Spectrometry (LA-ICP-MS) of an “early blue” glass bead from the site suggests a pre-AD 1670 date, also consistent with a protohistoric occupation (Walder 2015). Eleven copper beads and scraps were also analyzed using LA-ICP-MS and/or portable XRF to determine if they were comprised of native copper or smelted European copper. All but one of the scraps proved to be native copper. One scrap was identified as smelted European copper, providing additional evidence of a protohistoric component (Dussubieux and Walder 2015; Walder and Dussubieux 2014).

Shovel testing conducted at 20SA722 in 2004 and 2005 revealed that Late Prehistoric material is distributed, at a minimum, over an area nearly a hectare in extent (this assessment reflects the size of the area tested, not the boundaries of the Late Prehistoric component). Shovel testing also revealed the presence of several trash pit and possible hearth features. Some of the features encountered in the Shovel Test Pits appeared to contain abundant floral and faunal remains that could be critical for investigating subsistence practices and seasonality of site occupation. Later excavation of some of these features confirmed the presence of these materials.

The excavation of Feature 1 in 2005 and 2007 (Sommer 2006, 2008), Feature 9 in 2006 and 2007 (Sommer 2007, 2008), Feature 11 in 2007 (Sommer 2008), Feature 19 in 2009 (Sommer 2010), and Feature 28 in 2012 and 2013 (Sommer 2013b, 2014) confirmed the presence of at least four trash pit features containing abundant floral and faunal remains, as well as artifacts including ceramics, stone tools, and modified bone artifacts. Features 22, 24, and 27, excavated in 2011 and 2012, are examples of smaller trash pits containing a lower density of material. The hearth features excavated in 2006, 2008, 2009, 2011, and 2012 including Features 3, 6, 7, 12, 13, 16, 17, 18, 21 and 23 contain less bone and other artifacts than the trash pits. Intensive burning in some of the hearths reduced most of the organics to ash

and caused oxidation of the surrounding soil. Feature 32, which was partially salvaged from the eroding riverbank in 2016, also appears to have been a hearth feature. Feature 10, excavated in 2007, appears to have been used both as a trash pit and a hearth. Feature 5, excavated in 2009, and Feature 29, excavated in 2013, are also multi-function features. They served initially as storage pits. Charred tubers tentatively identified as Fragrant Water-Lily (*Nymphaea odorata*), were found near the bottom of Feature 5, providing evidence of one of the materials that were stored. Both storage pits were likely later used as hearths before finally serving as receptacles for trash. Finally, Feature 30 likely represents a burial feature. However, given the limited amount of excavation conducted on this feature and the lack of any elements other than disarticulated foot bones, it is impossible to adequately assess the nature of the deposit (Sommer 2014:39). In terms of temporal placement, we can say with certainty that it predates the formation of the plowzone and postdates the formation of the buried A-horizon through which the pit was dug. Stratigraphically, it is entirely consistent with the Late Prehistoric/Protohistoric component at the site.

Though not abundant, maize cob fragments have been identified in preliminary analysis of flotation samples taken from Features 1, 9, 11, 17, 22, 23, 28 and 32. Maize kernels have been identified from in flotation samples from Features 3, 9, 11, 14, 17, 28 and 32. Additional maize kernels and a charred bean (*Phaseolus* sp.) fragment were recovered in the vicinity of disturbed Feature 13 material in 2008 and additional maize kernels were found in general excavation material from Excavation Blocks B and C in 2009. Recently, paleoethnobotanist Kathryn E. Parker has examined a small amount of material from Features 3 and 11. She confirmed the presence of maize in both features and another domestic bean fragment in Feature 3. In addition, she identified acorn, black nightshade, knotweed, and possibly chenopodium seeds in Feature 11 along with ash, oak, maple, and willow/poplar wood charcoal. Chenopodium seeds were also identified in Feature 3 including a few that appear at ordinary microscopy, to have smoother and thinner seed coats than is typical for wild forms (though they are not the classic domesticated *Chenopodium berlandieri* either). They may represent a regional cultivated variant (K. E. Parker, personal communication 2010). Whether or not the presence of cultigens in several features implies on-site horticultural practices is debatable. Further analysis of floral remains from the flotation samples will be required to assess the abundance of maize, beans, and other possible cultigens at this site.

The occurrence of specialized trash disposal areas and the abundance of faunal remains suggest fairly long-term occupations (perhaps several weeks or months). However, compared with the amount of faunal remains recovered, other categories of material culture such as flakes, stone tools, and ceramics are less abundant, arguing against long-term occupation. Radiocarbon dates from Features 1, 3, 9, 11, and 19 place the Late Prehistoric occupation(s) in the period of AD 1400-1680. At least two separate occupations are indicated, one in the AD 1400-1470 period and one in the period from 1470-1680. It is possible that the site actually represents a series of many relatively short-term occupations that span much of the 280 year period identified.

Because surface collections, and collections derived from limited shovel testing, cannot be assumed to provide representative samples of artifacts, it is difficult to assign most sites identified at the refuge to functional categories (i.e. base camps, resource extraction locales, etc.) However, the wide range of artifact types and faunal remains recovered during the past 17 field seasons indicate that the prehistoric inhabitants of these sites participated in multiple activities. Artifacts such as flakes, bipolar and other cores, as well as anvils and hammerstones, all clearly indicate that flaked stone tool manufacturing, including early stages of nodule reduction, was an important activity at most of the sites describe above. The manufacture and use of groundstone tools/ornaments at several sites is indicated by the presence of finished and unfinished ground slate, shale, cannel coal, and schist objects and possibly by the presence of sandstone abraders. Ceramics found at many of the sites suggest activities including ceramic vessel manufacture and food storage and/or preparation. Hunting is indicated by the presence of several of the notched/stemmed and triangular bifaces. FCR is ubiquitous at most of the sites indicating

that fire was being used for heating and/or food preparation. The density of occupation debris, the high degree of artifact fragmentation apparently caused by trampling, the abundant and varied stone tool manufacturing debris, and the wide range of tool types recovered from the excavations at 20SA1251 and 20SA1276 indicate that these sites probably served as base camps occupied by family groups rather than resource extraction camps occupied by specialized task groups such as hunting parties.

When they are fully analyzed, the relatively large faunal assemblages derived from the test excavations conducted at 20SA722 in 2005-2013, 20SA1251 in 2001 and 2002, and 20SA1276 in 2001, 2003, and 2004 (Sommer 2002, 2004a), are expected to provide a more complete picture of subsistence practices than has been available from surface and shovel test data. This is particularly true of the faunal remains recovered from the fine-screened and flotation samples taken from features at 20SA722, 20SA1251, and 20SA1276. Preliminary non-quantitative assessment of a sample of the faunal remains recovered from 20SA1251 and 20SA1276 suggests that while large mammals such as White-tailed Deer probably accounted for the largest percentage of the meat portion of the diet, fish and small aquatic mammals such as muskrat and beaver were also extremely important. Initial assessment of faunal remains from 20SA722 indicates that fish may rival large mammals in importance. This undoubtedly would have varied seasonally and detailed comparisons of the faunal contents of discrete features, or even zones within features, will likely shed much light on this topic.

Data from the test excavations at 20SA722, 20SA1251, and 20SA1276, particularly floral and faunal data, are also expected to allow an assessment of season of occupation. The presence of numerous charred hickory nuts and walnuts in several features at 20SA1276 strongly suggests a fall season of occupation. The maize starch and wild rice phytoliths identified by Maria Raviele from cooking residue adhering to ceramic sherds at 20SA1276 also supports this seasonal assessment (Raviele 2010:97). Charred nutshells were also observed in flotation samples and from general excavation contexts at 20SA1251. Large quantities of spring spawning fish such as suckers, walleye, and sturgeon have been recognized in the samples from 20SA722 suggesting that this site was occupied during the spring. Turtle and mollusk shells also suggest warm season occupations. Other data, including the presence of shed deer antlers, the deer skull with shed antlers found in Feature 28 in 2013, beaver, river otter, and other fur-bearing animals, charred acorns, and even charred maize cobs and kernels may suggest fall and winter occupations. However, assessment of these hypotheses awaits detailed analyses of the floral and faunal remains recovered from flotation samples.

Based on the limited shovel-testing conducted at 20SA214, 20SA722, 20SA1251, 20SA1254, 20SA1276, and 20SA1277 during the 2000-2002, 2004-2006 field seasons (Sommer 2001, 2002, 2003a, 2005, 2006); the test excavations conducted at 20SA1276 during the 2001, 2003 and 2004 field seasons, at 20SA1251 during the 2001 and 2002 field seasons, and at 20SA722 in 2005-2013 buried or otherwise relatively intact archaeological deposits are probably the rule rather than the exception in the refuge. It is quite possible that Late Archaic/Early Woodland deposits are stratified below Middle and Late Woodland deposits at some of the sites, but this has yet to be demonstrated and it does not appear to be the case for 20SA722 or 20SA1251. The presence of a few typologically Late Archaic/Early Woodland bifaces at 20SA1276 leaves open the potential for some stratified deposits at this site. Additional analysis of artifact distributions and, perhaps, additional radiocarbon dates may help sort this out. The 2006-2013 excavations at 20SA722 revealed clearly stratified late Prehistoric and Middle/early Late Woodland components. The relative scarcity of Late Archaic remains probably reflects the fact that much of the low-lying refuge would have been under water during large portions of this period. Further, if they are indeed present, deposits of this age are likely deeply buried and less subject to exposure through erosion. Buried archaeological deposits, especially stratified deposits, are extremely important because they are relatively undisturbed, often well-preserved, and in the case of stratified deposits, they allow detailed assessment of changing use of a particular landscape through time. Archaeologists have not had many opportunities to investigate buried or stratified deposits in the Saginaw Valley, thus adding to the

potential significance of some of the archaeological sites recorded here.

Several of the artifacts recovered during the seventeen years of this project are indicative of interactions with cultural groups in surrounding regions. The presence of small amounts of Norwood chert suggests influence from cultural groups to the northwest. Interactions to the south and west are indicated by the presence of Illinois Havana/Hopewell-inspired Tittabawassee and Green Point Ware ceramics. The presence of Younge or Western Basin Tradition Macomb-like ceramics, of Pipe Creek chert, Upper Mercer Chert, and Flint Ridge chalcedony from the Ohio region, Burlington chert from the Illinois/Missouri region, and Wyandotte chert from Indiana points to southern, southeastern, and southwestern connections. Finally, interactions to the east are suggested by the presence of a small amount of Onondaga and Kettle Point chert from southern Ontario and New York. Sorting out the nature, frequency, and timing of the interactions with cultural groups in other regions remains an important area for future continuing research.

In addition to prehistoric components, eighteen years of fieldwork on this project have also identified significant 19th and 20th century historical materials. Many of the 19th century artifacts are related to the late 19th century logging industry in the region. Logging artifacts, including a variety of rafting pins and chain dogs, are primarily associated with activities surrounding the rafting of logs to transport them down the rivers. Some of the late 19th and early 20th century artifacts along the riverbanks are likely associated with houseboats. Scatters of late 19th / early 20th century debris are also present at 20SA1305 and 20SA1307, two sites identified in 2002 and 20SA1367, identified in 2009. Site 20SA722 also contains a sizeable early to mid-20th century assemblage associated with the Fitzhugh Beach Colony, a row of “cottages” and house boats that extended along the bank of the Tittabawassee River (Kilts 1958; Sommer 2000, 2001). Several gunflints, a couple of glass beads, and a possible “trade axe” offer tantalizing evidence for 18th century or possibly earlier Historic period occupations in the project area. Even earlier historic/protohistoric material is discussed above.

Finally, illegal collecting of archaeological materials from sites within the Shiawassee NWR boundaries has been a problem in the past. Footprints observed on several sites in 1999, 2000 and 2004 suggested that it *may* be an ongoing problem. Very troubling was a report by one of the project volunteers that on 4 May 2006 two individuals were observed metal detecting and surface collecting on site 20SA722. The individuals left after being confronted and no evidence was ever found of their return, so it may have been an isolated incident. Indeed, since 2006, we have witnessed no evidence of illegal collection of archaeological material anywhere on the refuge. However, continued vigilance is warranted. Although the extent is highly variable, fluvial processes are eroding most of the sites documented during this project. One of the effects of these processes is that occasionally archaeological materials are clearly visible on the river edges, making them susceptible to collection by persons untrained in the methods and importance of archaeological documentation. For example, in May of 2011 there was clear evidence that one or more individuals had been fishing from an actively eroding, high density portion of site 20SA1251. While there is no reason to believe they were searching for artifacts, they were in a location where artifacts are frequently exposed on the surface. We are working to alleviate this problem through our outreach/education efforts, whereby community members are learning of the importance and cultural value of the archaeological record preserved within the wildlife refuge. It is believed that this community education, along with our continued field presence while monitoring these sites, serves as a deterrent.

SUMMARY AND RECOMMENDATIONS

This report summarizes the results of an eighteenth season of archaeological investigations carried out in the Shiawassee National Wildlife Refuge (NWR), Saginaw County, Michigan. The field investigations, conducted under Federal Archaeological Permit No. 2014-MI/3-1, included surface survey/site monitoring and salvage excavation of an eroding prehistoric feature. Four objects were collected from the surface of 20SA1251, one of the five sites that were monitored during the 2016 field season. An additional 430 objects were catalogued from two flotation samples salvaged from an eroding hearth feature at 20SA722. No previously unrecorded sites were located in 2016.

Prehistoric artifacts recovered from the various sites on the refuge during 2016 and previous field seasons indicate that Middle and early Late Woodland occupations (ca. B.C. 100 – A.D. 1000) predominate at most sites. However, Late Archaic/Early Woodland period (ca. 3000-100 B.C.) artifacts and several later Late Woodland and Late Prehistoric (ca. A.D. 1000-European contact) items are also present in the recovered assemblages. Historical artifacts date primarily from the mid-19th century through the 20th century. A few protohistoric artifacts may date to the late 16th or early 17th century. A thin scatter of mid-20th through early 21st century debris is present on all of the sites (as well as on non-site areas). This material is not considered archaeologically significant and in most instances was neither specifically noted nor collected.

This project continues to demonstrate that significant archaeological resources are present within the boundaries of the Shiawassee NWR. It is clear that archaeological sites in the project area hold considerable research potential. This potential is heightened by the demonstrated presence of intact archaeological deposits containing cultural features and culturally/temporally discrete deposits, some of which are stratified. Important research topics that could be addressed by sites in the project area include among others: 1) the nature of the Middle Woodland to Late Woodland transition period in the Saginaw Valley; 2) the nature of Late Prehistoric/Upper Mississippian adaptations in the Saginaw Valley; 3) the nature and frequency of interactions between cultural groups in the Saginaw Valley, and those in other regions, including the timing, nature, and impact of the initial Native American and European contact in the region; 4) human responses and adaptations to long and short term fluctuations in lake levels; 5) prehistoric subsistence practices and the role of horticulture/agriculture in resource-rich wetland environments; and 6) human-environmental interactions through time. Finally, late 19th and early 20th century activities and land use patterns in the refuge area have been left largely unexplored from an archaeological perspective. Possible avenues of fruitful research include various aspects of lumbering, coal mining, farming, and leisure activities.

Recommendations

The recommendations made in previous reports for this project are still applicable (Sommer 2000-2015). They are repeated below. Based on the results of the past eighteen seasons of fieldwork, the following recommendations are made:

- 1) Many of the sites that have been recorded on the refuge are documented primarily on the basis of artifacts exposed on the surface. Additional shovel testing should be employed to determine the spatial extent of the sites that have been documented. This information is important both for cultural resource management and research purposes.
- 2) In addition to shovel testing to determine site boundaries, additional test excavations are needed to determine the extent of intact site sediments, to look for possible stratified deposits, and to determine whether cultural features are present and preserved. Test excavations will also provide more detailed information about the time periods represented and the nature of the activities conducted at the sites.

Larger scale excavations will be needed at several of the sites to address a variety of questions including the potential research topics listed above.

3) Varying degrees of fluvial and other forms of erosion continue to impact most of the sites discussed in this report, exposing additional artifacts. For this reason, monitoring of these sites, including collecting and documenting exposed artifacts, should continue.

4) Continued survey involving walking exposed river banks and agricultural fields, and shovel testing in wooded areas is recommended in order to locate additional sites on the refuge. Because the processes that expose artifacts are variable even areas where archaeological sites have not been found should be periodically monitored.

5) This project has demonstrated that portions of the project area have a high density of archaeological sites. Several sites, including 20SA388, 20SA1252, and 20SA1270 appear to have been significantly impacted by past dike construction. For this reason, all proposed activities that will disturb the ground surface, including the construction of dikes, ditches, trails, roads, restrooms, other buildings, observation decks etc., should be preceded by an archaeological assessment of the area to be disturbed.

6) Illegal collecting of archaeological materials from sites within the Shiawassee NWR boundaries continues to be a concern. For this reason, continued efforts should be made to educate people about the irreparable damage that can result from removing artifacts from archaeological sites. A continued field presence, along with a sustained effort to monitor locations with known archaeological sites should reduce the potential of this problem.

7) Low-density prehistoric sites such as 20SA1304, 20SA1306 probably represent single, short-term, task specific occupations (Sommer 2003a, 2004a). As such, they represent an important aspect of prehistoric cultural systems. Despite the fact that limited test excavations at 20SA1306 and surface survey at 20SA1304 indicated that these sites are probably not eligible for the National Register of Historic Places (because a lack of intact cultural features and the low probability of finding temporally diagnostic artifacts), these sites and others potentially located in the farm units on the refuge should continue to be monitored. Given the nature of these deposits, the only real chance of recovering diagnostic artifacts that would allow us place these sites in a specific cultural context is to search for materials exposed by plowing.

BIBLIOGRAPHY

- Albert, Dennis A., Shirley R. Denton, and Burton V. Barnes
1986 *Regional Landscape Ecosystems of Michigan*. University of Michigan School of Natural Resources, Ann Arbor.
- Bailey, R. M., and G. R. Smith
1981 Origin and Geography of the Fish Fauna of the Laurentian Great Lakes Basin. *Canadian Journal of Fisheries and Aquatic Sciences* 38(12): 1539–1561.
- Baker, Rollin H.
1983 *Michigan Mammals*. Michigan State University Press.
- Beld, Scott G.
1991 *Two Terminal Archaic/Early Woodland Sites in Central Michigan*. Technical Report 22. University of Michigan Museum of Anthropology.

2002 A Preliminary Report on the Cater Site, 20MD36, Midland County, Michigan: Early and Mid-Nineteenth Century Occupations in Central Michigan. *The Michigan Archaeologist* 48(1–2): 1–86.
- Bigony, Beatrice Anne
1970 Late Woodland Occupations of the Saginaw Valley. *The Michigan Archaeologist* 16(3–4): 115–214.
- Binford, Lewis R.
1963 The Hodges Site: A Late Archaic Burial Station. In *Miscellaneous Studies in Typology and Classification*, pp. 124–148. Anthropological Papers 19. University of Michigan Museum of Anthropology, Ann Arbor.
- Branstner, Mark C., and Michael J. Hambacher
1994 *1991 Great Lakes Gas Transmission Limited Partnership Pipeline Expansion Projects: Phase III Investigations at the Shiawassee River (20SA1033) and Bear Creek Sites (20SA1043), Saginaw County, Michigan*. Great Lakes Research Associates, Inc., Williamston, Michigan. Office of the State Archaeologist, Lansing, Michigan.

1995 *1991 Great Lakes Gas Transmission Limited Partnership Pipeline Expansion Projects: Phase III Investigations at the Casassa Site (20SA1021)*. Great Lakes Research Associates, Inc., Williamston, Michigan. Office of the State Archaeologist, Lansing, Michigan.
- Brunett, F. V.
1980 *A Cultural Inventory Report of a Portion of Section 4 and 8, T.11N R.4E within the Boundary of the Shiawassee National Wildlife Refuge*. Cultural Resources Inventory Report. Saginaw Archaeological Commission. Historical Society of Saginaw County.

- Burt, William Henry
1957 *Mammals of the Great Lakes Region*. The University of Michigan Press, Ann Arbor.
- Butterfield, I. W.
1961 *Excavations - Schemm Site*. Office of the State Archaeologist, Lansing, Michigan.
- Butterfield, Ira W.
1986 Water Configurations in the Human Environment from the Main Algonquin to the Nipissing I Stages of the Great Lakes in the Saginaw Valley, Michigan. *The Michigan Archaeologist* 32(2): 101–137.
- Cleland, Charles E.
1966 *The Prehistoric Animal Ecology and Ethnozoology of the Upper Great Lakes Region*. Anthropological Papers 29. University of Michigan Museum of Anthropology, Ann Arbor.
1992 *Rites of Conquest: The History and Culture of Michigan's Native Americans*. University of Michigan Press, Ann Arbor.
- Comer, P. J., and D. A. Albert
1997 Vegetation Circa 1800 of Saginaw County, Michigan: An Interpretation of the General Land Office Surveys. Michigan Natural Features Inventory, Lansing, Michigan.
- Dice, Lee Raymond
1943 *The Biotic Provinces of North America*. The University of Michigan Press, Ann Arbor.
- Dobbs, Clark A., Craig Johnson, Kathryn Parker, and Terrence Martin
1993 *20SA1034: A Late-Prehistoric Site on the Flint River in the Saginaw Valley, Michigan*. Reports of Investigations. Institute for Minnesota Archaeology, Minneapolis, Minnesota.
- Dobbs, Clark A., and Matthew L. Murray
1993 *Ancient Native American Occupation at 20SA596 in the Saginaw Valley, Michigan*. Reports of Investigations. Institute for Minnesota Archaeology, Minneapolis, Minnesota.
- Dorr, John Adam, and Donald F. Eschman
1970 *Geology of Michigan*. University of Michigan Press, Ann Arbor.
- Dussubieux, Laure, and Heather Walder
2015 Identifying American Native and European Smelted Coppers with pXRF: a Case Study of Artifacts from the Upper Great Lakes Region. *Journal of Archaeological Science* 59: 169–178.
- Egan, Kathryn C.
1990 Paleoecology of the Bridgeport Area. In *The Bridgeport Township Site: Archaeological Investigation at 20SA620, Saginaw County, Michigan*, edited by J. M. O'Shea and M. J. Shott, pp. 11–20. Anthropological Papers 81. University of Michigan Museum of Anthropology, Ann Arbor.

- Eschman, Donald F., and Paul F. Karrow
 1985 Huron Basin Glacial Lakes: a Review. In *Quaternary Evolution of the Great Lakes*, edited by P. F. Karrow and P. E. Calkin, pp. 79–93. Geological Association of Canada Special Paper 30. Geological Association of Canada.
- Fairchild, Jerry D.
 1977 The Schmidt Site: a Pre-Nipissing Village in the Saginaw Valley, Michigan. Unpublished Master's Thesis, Western Michigan University, Kalamazoo.
- Farrand, William R.
 1982 Quaternary Geology of Michigan. State of Michigan, Department of Natural Resources, Geological Survey Division, Lansing.
- Fischer, Fred W.
 1972 Schultz Site Ceramics. In *The Schultz Site at Green Point: a Stratified Occupation Area in the Saginaw Valley of Michigan*, edited by J. E. Fitting, pp. 137–190. Memoirs 4. University of Michigan Museum of Anthropology, Ann Arbor.
- Fitting, James E. (editor).
 1968 Saginaw Valley Archaeology by Fred Dustin. *The Michigan Archaeologist* 14(1–2): 1–130.
- (editor).
 1972a *The Schultz Site at Green Point: a Stratified Occupation Area in the Saginaw Valley of Michigan*. Memoirs 4. University of Michigan Museum of Anthropology, Ann Arbor.
 1972b Lithic Industries of the Schultz Site. In *The Schultz Site at Green Point: a Stratified Occupation Area in the Saginaw Valley of Michigan*, edited by J. E. Fitting, pp. 191–224. Memoirs 4. University of Michigan Museum of Anthropology, Ann Arbor.
 1975 *The Archaeology of Michigan: a Guide to the Prehistory of the Great Lakes Region*. Cranbrook Institute of Science, Bloomfield Hills, Michigan.
- Fitting, James E., Curtis E. Larsen, and C. Stephen Demeter
 1977 *Cultural Resources Survey of the Shiawassee Flats Flood Control Project*. Commonwealth Associates, Inc., Jackson, Michigan.
- Garland, Elizabeth B., and Scott G. Beld
 1999 The Early Woodland: Ceramics, Domesticated Plants, and Burial Mounds Foretell the Shape of the Future. In *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State*, edited by J. R. Halsey, pp. 125–146. Cranbrook Institute of Science, Bloomfield Hills, Michigan.
- Granger, Joseph E.
 1978 *Meadowood Phase Settlement Pattern in the Niagara Frontier Region of Western New York State*. Anthropological Papers 24. University of Michigan Museum of Anthropology, Ann Arbor.

Halsey, John R.

1966 Additional Hopewell Engraved Turtle Shells from Michigan. *Papers of the Michigan Academy of Science, Arts, and Letters* 51: 389–398.

1976 The Bussinger Site: a Multicomponent Site in the Saginaw Valley of Michigan with a Review of Early Late Woodland Mortuary Complexes in the Northeast Woodlands. Unpublished PhD Dissertation, University of North Carolina, Chapel Hill.

(editor).

1999 *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State*. Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Harrison, Sidney

1966 The Schmidt Site (20SA192), Saginaw County, Michigan. *The Michigan Archaeologist* 12(2): 49–70.

Hubbs, Carl L., Karl F. Lagler, and Gerald Ray Smith

2004 *Fishes of the Great Lakes Region*. University of Michigan, Ann Arbor.

Iaquinta, James L.

1994 *Soil Survey of Saginaw County, Michigan*. United States Department of Agriculture, Soil Conservation Service.

Justice, Noel D.

1987 *Stone Age Spear and Arrow Points of the Midcontinental and Eastern United States: A Modern Survey and Reference*. Indiana University Press, Bloomington, Indiana.

Kilts, Don

1958 Only Trees, Brush Mark Once-Popular Resort: Saginawians in Early '20s Frolicked at Fitzhugh Beach. *The Saginaw News*, March 23.

Kingsley, Robert G.

1999 The Middle Woodland Period in Southern Michigan. In *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State*, edited by J. R. Halsey, pp. 148–172. Cranbrook Institute of Science, Bloomfield Hills, Michigan.

Klisch, Margaret E., and Theo A. Klisch

1980 Eliza Golson's Diary. Unpublished Introduction and Transcription of 1891-1906 Diary.

Kurta, Allen

1995 *Mammals of the Great Lakes Region*. University of Michigan Press, Ann Arbor.

- Larsen, Curtis E.
 1985a Lake Level, Uplift, and Outlet Incision, the Nipissing and Algoma Great Lakes. In *Quaternary Evolution of the Great Lakes*, edited by P. F. Karrow and P. E. Calkin, pp. 63–77. Special Paper 30. Geological Association of Canada, St. John's, Newfoundland.
- 1985b Geoarchaeological Interpretation of Great Lakes Coastal Environments. In *Archaeological Sediments in Context*, edited by J. K. Stein and W. R. Farrand, pp. 91–110. Center for the Study of Early Man, Orono, Maine.
- 1987 *Geological History of Glacial Lake Algonquin and the Upper Great Lakes*. U. S. Geological Survey Bulletin 1801. United States Government Printing Office, Denver, Colorado.
- Lovis, W.A. (editor).
 1989 *Archaeological Investigations at the Weber I (20SA581) and Weber II (20SA582): Sites, Frankenmuth Township, Saginaw County, Michigan*. Michigan Cultural Resource Investigation Series Vol. 1. State of Michigan.
- Lovis, William A.
 1993 Discussion and Conclusions. In *The Archaic, Woodland, and Historic Period Occupations of the Liberty Bridge Locale*, edited by W. A. Lovis, pp. 225–229. Michigan Cultural Resource Investigation Series Vol. 3. State of Michigan.
- Lovis, William A., and Ruth M. Davis
 1993 The Ceramic Assemblage from Sites 20BY77, 20BY78, and 20BY79, Bay City, Michigan. In *The Archaic, Woodland, and Historic Period Occupations of the Liberty Bridge Locale*, edited by W. A. Lovis, pp. 98–123. Michigan Cultural Resource Investigation Series Vol. 3. State of Michigan.
- Mainfort, Robert C.
 1979 *Indian Social Dynamics in the Period of European Contact: Fletcher Site Cemetery, Bay County, Michigan*. Anthropological Series Vol. 1 No. 4. Museum, Michigan State University.
- Mason, Ronald J.
 1981 *Great Lakes Archaeology*. Academic Press, New York.
- McCormick, William, R.
 1883 Mounds and Mound-Builders of the Saginaw Valley. *Michigan Pioneer and Historical Collections* 4: 379–383.
- Monaghan, G. William
 1995 Physiographic Environment. In *1991 Great Lakes Gas Transmission Limited Partnership Pipeline Expansion Projects: Phase III Investigations at the Casassa Site (20SA1021)*, edited by M. C. Branstner and M. J. Hambacher, pp. 2.1-2.22. Great Lakes Research Associates, Williamston, Michigan.

- Monaghan, G. William, and William A. Lovis
2005 *Modeling Archaeological Site Burial in Southern Michigan: a Geoarchaeological Synthesis*. Environmental Research Series Vol. 1. Michigan State University Press, East Lansing, Michigan.
- Monaghan, G.W, W.A Lovis, and K.C Egan-Bruhy
2006 Earliest Cucurbita from the Great Lakes, Northern USA. *Quaternary Research* 65(2): 216–222.
- O’Shea, John M., and Michael J. Shott (editors).
1990 *The Bridgeport Township Site: Archaeological Investigation at 20SA620, Saginaw County, Michigan*. Anthropological Papers 81. University of Michigan Museum of Anthropology, Ann Arbor.
- Ozker, Doreen
1982 *An Early Woodland Community at the Schultz Site 20 SA2 in the Saginaw Valley and the Nature of the Early Woodland Adaptation in the Great Lakes Region*. Anthropological Papers 70. University of Michigan Museum of Anthropology, Ann Arbor.
- Papworth, Mark L.
1959 Archaeological Survey of the Saginaw Reservoir Area. Unpublished Manuscript and Notes.
- Papworth, Mark Lincoln
1967 Cultural Traditions in the Lake Forest Region During the Late High-Water Stages of the Post-Glacial Great Lakes. Unpublished PhD Dissertation, University of Michigan, Ann Arbor.
- Peebles, Christopher S.
1978 Of Archaeology and Archaeologists in Saginaw County, Michigan. *The Michigan Archaeologist* 24(3–4): 83–129.
- Raviele, Maria E.
2010 Assessing Carbonized Archaeological Cooking Residues: Evaluation of Maize Phytolith Taphonomy and Density through Experimental Residue Analysis. Unpublished PhD Dissertation, Michigan State University, East Lansing, Michigan.
- Robertson, James A., K. C. Taylor, M. J. Hambacher, W. A. Lovis, and G. W. Monaghan
2000 *Overview Study of Archaeological and Cultural Values on Shiawassee, Michigan Islands, and Wyandotte National Wildlife Refuges in Saginaw, Charlevoix, Alpena, and Wayne Counties, Michigan*. Commonwealth Cultural Resources Group, Inc., Jackson, Michigan.
- Robertson, James A., K. C. Taylor, W. A. Lovis, and J. M. McClurken
1993 *A Baseline Artifact Inventory Survey of Museum Property and Indian Interests in National Wildlife Refuges Located in Michigan*. Commonwealth Cultural Resources Group, Inc., Jackson, Michigan.
- Shott, Michael J., and Paul D. Welch
1984 Archaeological Resources of the Thumb Area of Michigan. *The Michigan Archaeologist* 30(1): 1–79.

Simons, Donald B.

1997 The Gainey and Butler Sites as Focal Points for Caribou and People. In *Caribou and Reindeer Hunters of the Northern Hemisphere*, edited by L. J. Jackson and P. T. Thacker, pp. 105–131. Worldwide Archaeology Series 6. Ashgate Publishing LTD, Averbury, England.

Simons, Donald B., Michael J. Shott, and Henry T. Wright

1984 The Gainey site: Variability in a Great Lakes Paleo-Indian Assemblage. *Archaeology of Eastern North America* 12: 266–279.

Simons, Donald B., and Henry T. Wright

1992 Butler 1991: Excavations at a Fluted Point Site in the Central Great Lakes Region. *Current Research in the Pleistocene* 9: 35.

Smith, Harlan I.

1894 Caches of the Saginaw Valley, Michigan. *Proceedings of the American Association for the Advancement of Science* 42: 300–303.

1901a Summary of the Archaeology of Saginaw valley, Michigan. *American Anthropologist* 3(2): 286–293.

1901b Summary of the Archaeology of the Saginaw Valley, Michigan - II. *American Anthropologist* 3(3): 501–512.

1901c Summary of the Archaeology of the Saginaw Valley, Michigan - III. *American Anthropologist* 3(4): 726–736.

Sommer, Jeffrey D.

2000 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 1999 Field Season*. Historical Society of Saginaw County, Inc., Saginaw, Michigan.

2001 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2000 Field Season*. Historical Society of Saginaw County, Inc., Saginaw, Michigan.

2002 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2001 Field Season*. Historical Society of Saginaw County, Inc., Saginaw, Michigan.

2003a *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2002 Field Season*. Historical Society of Saginaw County, Inc., Saginaw, Michigan.

2003b A Middle Woodland AMS Date from Saginaw County, Michigan. *The Michigan Archaeologist* 49(3–4): 87–95.

2004a *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2003 Field Season*. Historical Society of Saginaw County, Inc., Saginaw, Michigan.

2004b A Middle Woodland AMS Date from Saginaw County, Michigan. *Saginaw Valley Archaeologist* 1: 6–12.

- 2005 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2004 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2006 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2005 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2007 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2006 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2008 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2007 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2010 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2009 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2011 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2010 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2012 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2011 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2013a 20SA1252: A Woodland and Historic Period Site Located in the Shiawassee National Wildlife Refuge. *Saginaw Valley Archaeologist* 1: 5–15.
- 2013b *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2012 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2014 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2013 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2015 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2014 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.
- 2016 *Report on the Archaeology of the Shiawassee National Wildlife Refuge: The 2015 Field Season.* Historical Society of Saginaw County, Inc., Saginaw, Michigan.

Speth, John D.

- 1972 Geology of the Schultz Site. In *The Schultz Site at Green Point: A Stratified Occupation Area in the Saginaw Valley of Michigan*, edited by J. E. Fitting, pp. 53–76. Memoirs 4. University of Michigan Museum of Anthropology, Ann Arbor.

Taggart, David, W.

- n.d. The Feeheley Site: A Late Archaic Site in the Saginaw Valley. Unpublished manuscript. University of Michigan Museum of Anthropology, Ann Arbor.

Tanner, Helen Hornbeck

- 1987 *Atlas of Great Lakes Indian History.* University of Oklahoma Press, Norman, Oklahoma.

- Walder, Heather
2015 "...A Thousand Beads to Each Nation:" Exchange, Interactions, and Technological Practices in the Upper Great Lakes c. 1630-1730. Unpublished PhD Dissertation, University of Wisconsin, Madison.
- Walder, Heather, and L. Dussubieux
2014 Identifying American Native and European Smelted Coppers with pXRF: a Case Study of Artifacts from the Upper Great Lakes Region. Unpublished Poster presented at the Society for American Archaeology Annual Meeting, Austin, Texas.
- Whittier, Herbert L., C. E. Larsen, and C. S. Demeter
1978 *Archeological/Historical Reconnaissance Survey of the Shiawassee National Wildlife Refuge, Saginaw, Michigan* Unpublished Limited Distribution Report. Commonwealth Associates.
- Wright, Henry T.
1964 A Transitional Archaic Campsite at Green Point (20SA1). *The Michigan Archaeologist* 10(1): 17–22.
- Wright, Henry T., and William B. Roosa
1966 The Barnes site: A Fluted Point Assemblage from the Great Lakes Region. *American Antiquity* 31(6): 850–860.
- Yarnell, Richard A.
1964 *Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region*. Anthropological Papers 23. University of Michigan Museum of Anthropology, Ann Arbor.