Honors Thesis in the Department of Anthropology, University of Michigan

Investigating Famine Chronology Through Ecological Variation and Ethnohistorical Analysis in the North American Great Lakes Region

Advisor-Dr. Henry Wright

Matt Michalski
Winter 2024

Acknowledgements

The concept and completion of this thesis would not have been possible without the guidance and support of an abundance of people. I would like to thank University of Michigan Graduate student Alexandra Norwood for planting the idea in my head to begin with. Without her, I would not have begun to think about tackling an honors thesis. I would also like to thank Dr. Henry Wright for the superb guidance and many hours of fascinating conversation that helped guide me through my thought process as well as giving me a wealth of resources to read through and learn from. I would also like to thank University of Michigan Graduate students Brendan Nash and Kimberly Swisher for their support and encouragement in pursuing my interests in such a large project, and Hannah Hoover for her help during my first field school as well as the continued support since. A special thanks to Dr. Lisa Young for guiding me to develop a project that worked within my limitations as a father of two high schoolers with a host of other responsibilities. I also cannot forget to thank my wife and kids for their patience and support throughout this process and for helping me whenever I needed it.

Abstract

Understanding the dietary and subsistence patterns of past societies is an important and ever-growing aspect of archaeological analysis. Famine-or the inability to obtain food when needed- is an important part of these patterns throughout the world and specifically in the Great Lakes region of North America. Famine occurred on an almost yearly basis due to many intrinsic and extrinsic factors such as lack of sufficient harvest, low hunting yields, or even in time of war and raiding. Cycles of famine are a poorly documented and poorly understood aspect of early life in this region. When we investigate famine and its effect on a population, we can gain a sense of how that community organized themselves. In doing so, we can better understand a community's use of the natural world around them.

During archaeological analysis, sorting and identifying plant remains is an omnipresent, but difficult task that must be completed with each site excavated. Within the context plant macro-remains, or macro-botanical, analyses, we can use the identification of plants to assist in understanding the overall subsistence of a community. Proper reporting and the identification of a site's plant remains is a crucial step to increasing our understanding as well as the accuracy of historic and prehistoric communities' subsistence practices. Subsistence can be described as the absolute minimum standard of living in a productive society (Sharif. 1986). With archaeological remains, nutritional analysis, and through studying the ethnohistoric record, we may assess not only at which point famine may occur, but also which foods were consumed. This can help us understand agricultural and storage practices of Great Lakes people during times of stress. Creating easier access to standardized databases of macro-remains can also help archaeologists who are not trained in paleoethnobotany to more easily identify the remains found at their sites. Also, including and identifying those macro-botanicals that are famine related will help not just the Great Lakes region, but other temperate sites as well.

This thesis aims to better inform current and future archaeologists of the necessity of thorough archaeobotanical examination of the material collected from their sites, not just for information on famine, but for constructing the entire picture of subsistence within their site. While fauna often makes up a majority of archaeological remains, I will focus on botanicals to label and identify commonly misidentified or misconstrued plant remains within archaeological

sites. I identify potential plants utilized during famine through ethnographic and historical records, compare these to the nutritional requirements of our early ancestors, and to the nutritional value of storage caches to understand at what point famine might occur. Knowing when famine occurred and what foods were utilized is an important aspect in reconstructing the subsistence and mobility patterns of past communities. Through this information, we may both understand mobility patterns in the Great Lakes as well as identify potential sources of nutrients that help small groups and entire societies survive.

Table of Contents

List of Tables and Figures

1. Introduction

Manabus and his family are nearly starving during February and March. Manabus goes to visit his friends, the Elk family. The usual social amenities are exchanged. The Elk's wife puts on water to heat in a kettle. The Elk cuts squares of flesh from his wife's back and tenderloins from close to her backbone; half of the meat is cooked for the evening meal, half saved for the morning. The Elk heals her wounds by rubbing earth into them. His wife is not startled or in pain. Manabus is very much amazed. The Elk offers meat and broth to Manabus with the statement, "This is all I have to offer you, it is just what we eat ourselves. I am very nearly in want." Manabus remarks that it is the hardest time of the year. Manabus sleeps in the Elk lodge that night, has another meal of Elk meat, and starts home. Manabus forgot his mittens; the Elk's children bring them to him, and he tells them to invite their father to come over to his lodge soon, for the Elks seem to be in real need. The Elk comes to visit Manabus in a few days, and there is some exchange of host-guest amenities. Manabus tells his wife to hang up the kettle while he is sharpening his knife. Manabus tries to cut flesh from the back and shoulders of his wife, as the Elk did, but she is very much startled and afraid and will not allow him to do it. The Elk heals the wound with earth from the floor and then slices meat from her back as easily as he did from that of his own wife. Manabus' wife cooks half of the meat for the evening meal, and the rest for the morning meal. Manabus is still very puzzled (Curtis. 1954).

This summary from Menominee folklore regards Manabus, their hero deity. Manabus is said to have arrived bearing food for the Menominee, a northern Wisconsin community living within the Great Lakes region. Amongst the large number of plants and animals for daily consumption, three items in particular were to act as famine foods; “the onion, the bittersweet, whose inner bark was used to make a soup, and the lichen, also used as the basis of a soup.” (Curtis. 1954). Martha E. Curtis was an early anthropologist and professor from Eastern Michigan University who spent much of her career studying native folklore. This piece of folklore is just one of the many she encountered in her studies.

Famine has been a constant, albeit unwanted, companion of humankind for its entire existence. Folklore is one of the many ways we relay that to future generations, but how exactly do we define famine? Famine could simply be defined as “extreme scarcity of food” (Merriam-Webster. N.D.), though this does very little to capture the totality of how and why famine occurs. There are many factors that contribute to famine depending on the area of the world that is affected. From war to poverty, from climatic reasons to social inequities, famine exists through the lack of an ability to procure the proper resources to fulfill one of life's basic necessities, nutrients. In the Great Lakes region, ecological factors may have played a large role in the cause of yearly famine. In his book “*Famine Foods*,” Paul Minnis (2021) describes famine foods as fitting two criteria. “First, it has to be edible to some degree, and second, it has to be available when more preferred foods are unobtainable in the needed quantities.” Many foods that fit this description might not be considered very nutritious and many potentially taste bad or could in some way be bad for you, take *Calla palustris*, for instance. Also known as Bog Arum or Wild Calla, it contains high levels of oxalic acid, which is rather poisonous, but when the tubers are properly processed, they can offer vital nutrients when no others are available. Even the health effects of consuming certain meats, when left to rot for some time, are debated. Speth postulates that early hunter-gatherers may have subsisted from time to time on putrid meat. We have much ethnographic evidence from modern times that documents the consumption of these types of foods (Speth. 2017). Though putrid meat is not specifically a famine food, there are certain instances when scavenging rancid meat may become necessary. So, when does one reach this point of hunger?

For the second part of Minnis' description, we can ask questions from both an ecological and a societal standpoint. Does the seasonal shift from summer lodging to winter lodging alter the landscape enough to decrease the production of storable resources? What about climate or pest factors and how do they alter the ability to store enough food for the winter? What are the nutritional requirements needed for each individual and how does that relate to the amount stored for winter survival? What about external societal factors such as raiding and trading and how do those affect the ability to maintain proper levels of food throughout the winter season? Most importantly, how much of this can we monitor with archaeology? In this thesis I investigate these questions through the analysis of archaeological sites, human nutritional requirements, and specific famine foods recorded in ethnohistoric accounts. Within the framework of macro-botanical remains and with an air of proper excavation techniques, my hope is to help current and future archaeologists properly interpret their data.

Of course, a variety of factors are required to understand the overarching cause of famine in any given context. Though luck is not a scientific determining factor, there are instances of what may seem like luck on the part of one group or another achieving success in procuring food. In the late 1600s, a group of Mississauga starved to death due to lack of game while nearby a group of Ottawa were surrounded by abundant game (White. 1991). This example may not appear based on scientific fact, but through a well-structured study, one could determine why each group encountered the number of animals they did. Through archaeological analysis, the answers to this litany of questions as well as others may become evident if the proper techniques are utilized to recover as much archaeological material as possible.

Botanical and faunal remains can offer, at the very least, a potential glimpse of the season of occupation of an archaeological site. If we know the season a specific species of fish spawns, then their presence at a site may indicate during which season the site was occupied. Importantly, their presence could just as easily be a dried version of the fish with the bones deposited during a different season. Other mammals such as deer, bear, and beaver, are known to have been foods in the Great Lakes. Yet again, their presence does not imply a specific season during which a camp or village was occupied. There are of course various seasonal growth cycles of these animals, thus aiding our ability to interpret the season in which they were taken or consumed. In the realm of botanicals, one might infer seasonality based on which resources are excavated at the site. This could be due to when specific plants grow and when they are harvestable. Acorns, for example, a well-known staple food among many indigenous North American people, are typically collected during the fall, though when they are processed varies from community to community. Once again, the interpretation of site seasonality from botanical evidence is just as complicated as with faunal remains. For the purpose of this thesis though, the nutritional density and storability of plants may have a greater impact on the overall determination of famine identification and thus will be the focus. Plant use specifically in autonomous communities will be analyzed to avoid intra-societal issues that may arise such as trade and forcible extraction of food from the defenseless by hierarchs such as chiefs or priests. This does not discount the possibility of raiding or trade from outside autonomous communities. Of course, analyzing nutrition of plants does not give us the entire picture and thus an examination of human nutritional requirements will be necessary. In examining archaeobotanical data, is it possible to determine the cause of famine through analysis of site ecology? To begin, let us shift to a brief overview of the regional geology and geography of the Great Lakes region.

2. Regional Geology and Geography

The Great Lakes region encompasses a large area in which today Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and the Canadian Provinces of Ontario and Quebec are located. For this thesis, I will focus generally on Michigan, Wisconsin, and Ontario. The lakes themselves were carved by advancing and retreating glacial activity. Each advance and retreat cut areas of the Michigan, Huron, Erie, and Ontario basins a little deeper and created much of the modern terrain around them, some in the form of moraines and eskers, and between them, kettle lakes nestled throughout the region. This repetition of glacial events deposited layers of clay, silt, gravel, and large boulders called erratics over much of the area (Eschman. 1985). As the Holocene arrived, the ice retreated as temperatures warmed allowing the tundra to transform into a coniferous landscape. To the South, Carolinian forests of broadleaf trees were advancing northward (Kapp. ed. Halsey. 1999. pgs. 31-58). The many millennia that made up the Holocene allowed for different soils to form from the various sediments left by the retreating glaciers. The subsequent fertility of the soil can therefore be deduced as variable and thus depends upon the location within the region. This variability became important to early communities in that it determined prime locations for hunting, foraging, and cultivation. To focus more fully on specific archaeological locations, I draw data from archaeological sites located in Michigan's Upper and Lower Peninsula as well as parts of Ontario that are directly adjacent to the Great Lakes, with special focus on the area known as the Straits of Mackinac which "joins Lakes Michigan and Huron into what is effectively one large lake, controlled during the last millennia by the outlet at Port Huron/Sarnia" (H. Wright, personal communication, 2024). The Straits were one of the most highly active areas in the region during the 1600s and 1700s.

The earliest occupation of the Great Lakes currently dates archaeologically to the Clovis people around 13,000 BP and persists through the present day. Many Paleoindian, Archaic, and Woodland sites dot the landscape offering a wealth of information to analyze. To slim down the evidence provided in this thesis, I focus on Late Woodland and Historic sites. A small selection of sites from the Middle Woodland will also be examined. This will include occupations from ca 300 BCE through ca 1800 CE (Table 1). Throughout this time, many Algonquian and Iroquoian speaking groups thrived in the area. In the early 1600s, the first long-term European settlers arrived, starting with the French followed by the British. It is through their records that we know that some of the Iroquoian-speaking groups in Ontario were; the Huron, the Mohawk, and the Iroquois. Some of the Algonquin-speaking groups included the Potawatomi/Boudewaadamii, the Ojibwe, the Odawa/Ottawa and the Chippewa of Michigan and Wisconsin, the Nipissing of Ontario, and the Winnebago and Menominee of Wisconsin (Tooker. 1964). This by no means encompasses all the peoples, nor all their territories, in fact, this is just a tiny sample of the many hundreds of communities that existed and traded with each other throughout the Great Lakes region. Between the archaeological record and the ethnohistoric record, we can learn a great deal about their roles during times of stress and famine.

Era	**Dates**
Middle Woodland	300 BCE-600 CE
Late Woodland	600 CE-1400 CE
Pre-Contact	1400 CE-1600 CE
Contact	1600 CE-1800 CE
Historic	1670 CE-1940 CE
Modern	1800 CE-Present

Table 1. List of eras and dates.

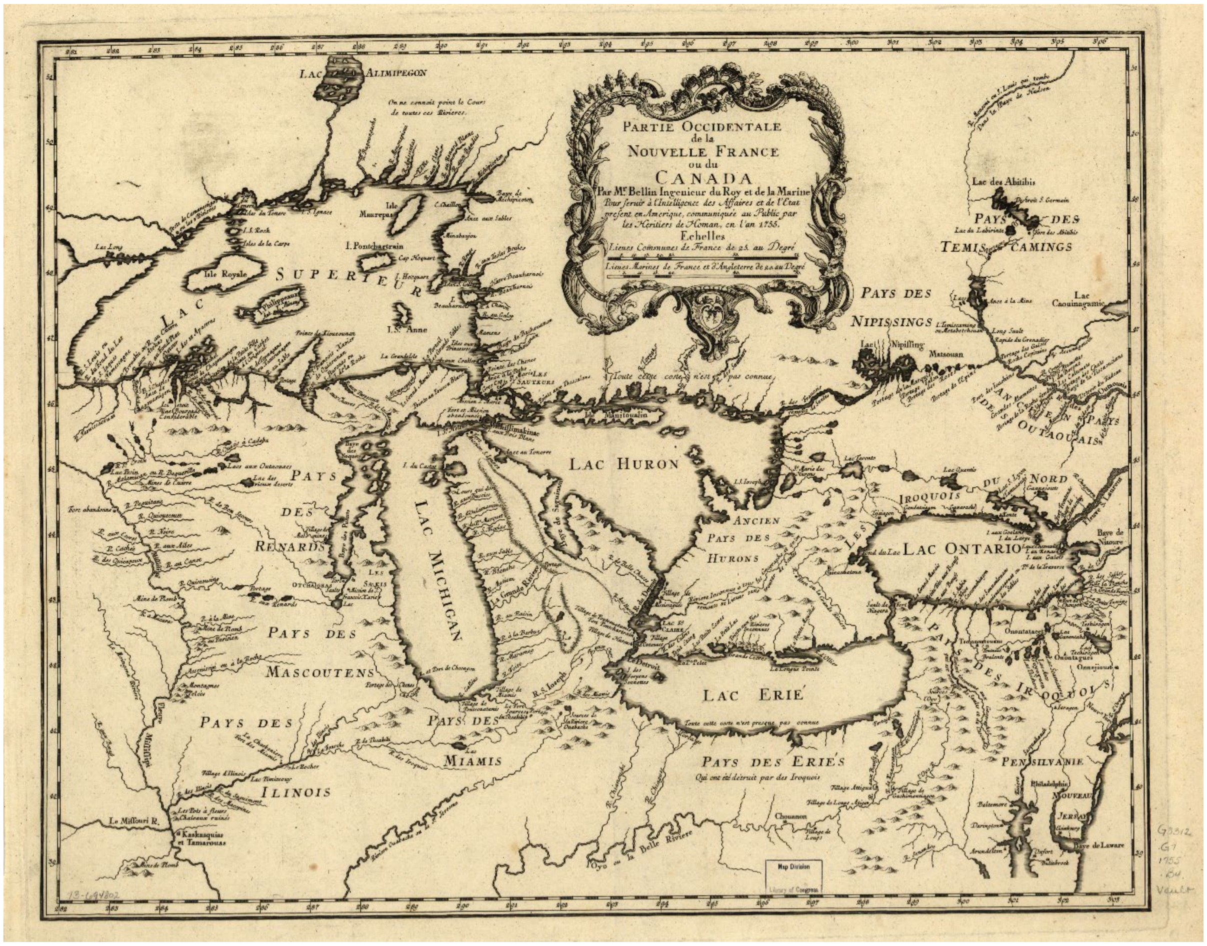

Figure 1. *Partie occidentale de la Nouvelle France ou du Canada (Western part of New France or Canada).* Created by Jacques Nicolas Bellin in 1755 (Bellin and Homann. 1755).

3. What is Famine?

Famine foods are foods utilized in times of scarcity. These are usually not consumed on a daily basis and are reserved for times when access to common, or everyday foods is incredibly difficult or nearly impossible. Common foods for the purpose of this thesis will refer to foods consumed either daily or those that are harvested and processed for future use. Some of the foods utilized in both categories may also have been used for medicinal or ceremonial purposes. Defining famine foods is also a bit trickier than the simple definition given earlier. Minnis (2021) argues that what constitutes a food of necessity in one part of the world may be a staple or daily food in another part of the world. He highlights sago (*Metroxylon* spp.), a plant utilized in the Pacific Islands. For some communities, the starch of the plant is used only in times of famine, whereas for others it is a regular part of the diet, even though the energy cost of processing is negative, or in other words, the means to produce it takes more energy than it gives when consumed. Through my own deductions, famine seems to have most typically occurred in the Great Lakes region under several circumstances: 1) late winter, when stored food supplies ran out, 2) during rough climatic conditions, when crop yields were not very high, causing stored food amounts to remain low, 3) during certain times of year when the hunting of local fauna yielded insufficient amounts, either due to migration patterns or emaciation due to inadequate diet, or 4) during times of war and/or raiding, which consequently diminished stores for winter through the destruction of growing crops and loss of stored goods. The relative importance of each of these was dependent upon many factors and specifying a certain cause may or may not be conducive to understanding the plants chosen by these early communities.

The Great Lakes region during the Early Contact period was colder than it is today with higher amounts of snowfall as is suggested by many ethnographic accounts (JR. 1896, Henry. 1809, Kellog. 1917). Dendrochronology determined that from 1602-1899, the average temperature was about 0.5°C below present day temperatures. There is also evidence showing that a particularly high precipitation event occurred between 1610 and 1650. This 40-year episode was remarkable for its magnitude (Quinn and Sellinger. 2006). This created a significant need to store and preserve food during the cold months of late fall and winter. Many ethnographic resources from the 1600s contain a section concerning 'hard times' or 'food scarcity,' but most of these sources fail to elucidate the specifics of what was eaten. Depending on the source, they typically focus on religious ceremony, or if they do mention food, they do not mention specific types. How do we go about determining what foods were used for famine and what were common, everyday foods in this region, and how can we use these historic records to understand when the need for foods specific to famine were used?

If we use ethnohistoric records as a base point and follow up with well-excavated archaeological sites, we can attempt to answer this question. What is a 'well-excavated' archaeological site though? While more detail will be given below on proper procedures of paleoethnobotanical collection, one important step is to properly analyze the evidence recovered for signs of botanicals. Understanding the stratigraphy of the site is another. Determining the full scope of what a site contains is important. Many sites in the Great Lakes from the Middle Woodland period through the Historic period have evidence for storage caches, or pits that were dug a few feet deep, lined with bark or leaves and filled with corn, berries, medicinal plants, and other food items (Blackbird. 1887). A study conducted in 2016 by Meghan C. L. Howey, et al. found that using Lidar was a way to increase the potentiality of finding these caches. Their study showed that while storage caches are common in community and household environments, they were utilized extensively by hunter-gatherers during precontact times along uninhabited paths (Howey, et al. 2016). Caches weren't relegated strictly to precontact times, though. Andrew Blackbird was an 1800s historian and Odawa tribal leader who wrote of them in his book *In History of the Ottawa and Chippewa Indians of Michigan: a Grammar of Their Language, and Personal and Family History of the Author.* In it he states, "These were put in the ground in a large cylinder made out of elm bark, set in deep in the ground and made very dry, filling this cylinder full and then covering it to stay there for winter and summer use" (Blackbird. Pg 26. 1887). Understanding the stratigraphy of a site can help determine the purpose of a culture's features. Likewise, having historical records such as Blackbirds' can allow archaeologists to make more sense of the variation in soil texture and coloration upon excavation. Ultimately, the combination of the features and evidence from the entirety of the site must be examined in order to draw any conclusions as to the activities important on a site.

Famine in Ethnohistory

In the early 1600s, French Jesuit missionaries arrived in what is now Quebec, Canada. As they traveled and explored the region with their 'mission' to convert the "*sauvages*" to Catholicism, they took detailed notes about what they encounter and wrote them in their diaries and letters which they sent back home and to their superiors. These documents were compiled by Ruben Gold-Thwaites in 1896, into a 73-volume set entitled *The Jesuit Relations and Allied Documents*. These documents provide insights into what type of plants were grown and foraged, as well as agricultural and other subsistence practices of the Indigenous peoples of the region. They also provide clues to understanding famine and famine foods:

A kind of moss growing on the rocks [Rock Tripe, or tripe de roche] often served them in place of a good meal. They would put a handful of it into their kettle, [101 i.e., 91] which would thicken the water ever so little, forming a kind of foam or slime, like that of snails, and feeding their imaginations more than their bodies. 3 Fish-bones, which are carefully saved as long as fish are found in plenty, also served to beguile their hunger in time of need. There was nothing, even to pounded bones, which those poor starvelings did not turn to some account. Many kinds of wood, too, furnished them food. The bark of the Oak, Birch, Linden or white-wood, and that of other trees, when well cooked and pounded, and then put into the water in which fish had been boiled, or else mixed with fish-oil, made them some excellent stews. They ate acorns [102 i.e., 92] with more relish and greater pleasure than attend the eating of chestnuts in Europe; yet even of those they did not have their fill. Thus passed the first Winter (JR, Vol. 48, pg 119).

All those poor people had for some time been suffering from a famine, and I found them reduced to a fir-tree diet. I never would have believed that the inner bark of that tree could serve as food, but the Savages told me that they liked it. I know not whether it would always be so, but I do know very well that, when [118 i.e., 120] hunger forced me to seek some sort of food to keep me from dying, I could not swallow fir -bark. I did indeed eat some bark of another tree, and hunger made me find therein the taste of bread and the substantial quality of fish;

> but my stomach has become used to other and much more meager viands than the above, and even to dispensing almost entirely with food for a considerable time (JR, Vol. 55, pg 135).

Having access to texts that document a period when so many Indigenous people, fur traders, and explorers did not keep records is a critical aspect of investigating what happened in the past. However, we must be cautious of how much weight we give this information since the Jesuits intended to convert people and not to write a history of the past or a biography of local Indigenous peoples. The Jesuits, however, arguably were and still are well known for their dedication to education as is evident by the large number of primary and secondary schools as well as colleges that they have established around the world.

Though few explorers and fur traders kept detailed records, an example of one who did was Alexander Henry. Henry was an Englishman who received the sole rights to trade fur on Lake Superior and spent time at both Fort Michilimackinac and Sault Ste. Marie. These two places being critical trading points along the Straits of Mackinac. He traveled extensively throughout the Great Lakes region from 1760 to 1776 and the diary he kept was published in 1809. In it, he describes much of the trials and tribulations of his treacherous travels and the difficulties he encountered when meeting new Native groups. He mentions his time at Fort Michilimackinac during Pontiac's uprising, and also hints at enduring famine during this sixteen-year period. One such example isn't due to weather, or lack of hunting, but due to a fire that broke out at Sault Ste. Marie in December of 1762. The fire destroyed most of the fort, including a large portion of the winter provisions. This forced Henry and those in the fort to endure the journey to Fort Michilimackinac to avoid starvation. They left in two separate groups with the troops garrisoned at the Sault departing some time before Henry and a few others. “On consultation, the next day, it was agreed, that the only means which remained, at this late period of the season, to preserve the garrison from famine, was that of sending it back to Michilimackinac.” (Henry, 1809, pg 65). This was remedied not through food labeled as “famine foods”, but through a time sensitive journey by a single member of the group who went ahead quickly to Fort Michilimackinac and returned with provisions. This outlines nonetheless, one of many possible causes of scarcity that could occur. Also, outlining the types of food that ethnohistory tells us were used during times of scarcity will help us determine what we are finding in our macro-botanical analyses. Having a solid grip on these famine foods will help us further our understanding of indigenous practices of subsistence.

4. Macro-botanical Remains

Before I list the foods I have placed into the categories of Famine or Non-Famine foods, let us take a moment to understand what constitutes the plant remains retrieved from archaeological contexts. Macro-botanical remains are the remains of plants that have been preserved within the archaeological record. There are many ways they can be preserved, as well as many ways they can be deposited. Often, these remains are excavated in the form of carbonized remains. Carbonized remains are organic materials which have been heated in a reducing atmosphere and are thus rendered into a carbon "version" of the original form. This can happen through extended periods of time, or through the most common means, fire. Most carbonized remains are remnants of burning activity, whether intentional or accidental. The possibility of non-carbonized remains is also just as important. These remains include pollen samples, phytoliths, and non-carbonized macro-remains. Phytoliths, the silicate remnants of internal plant structures, are also recoverable after a fire. In order to capture these remains within an excavation there are several methods. Pollen samples and phytoliths are typically retrieved through core sampling or soil collection. When a site is first located, one of the initial procedures is to take a core sample of the surrounding soil. This allows for analysis of not just the type of soil, but also gives a history of the site through the sediment layering evident in the sample. Nestled amongst the layers is also a clear record of the pollen from surrounding plants. Each plant species produces a specific pollen shape, and these shapes can be analyzed to determine what plants inhabited the landscape. Phytoliths are another way to analyze the diversity of plant species native to a site. Phytoliths are opaline silica bodies that have formed from groundwater rich in monosilicic acid which is deposited in both epidermal tissue as well as other plant cells

(Pearsall. Pg 356. 2000). These are also uniquely shaped, and each plant species can produce multiple shapes. Phytoliths are recoverable from most contexts and can help identify the species or genera within the area. Most macro-botanical remains are recovered through a process known as flotation. Developed in 1960 by Alice and Stuart Struever, flotation has become the premier way to separate plant remains from their matrix. While the process has advanced considerably since 1960, the standard amounts of sediment sampled from a specific area of a site can vary from 5 to 60 liters. This sediment is then slowly dried, added to water, and manually agitated. There are many mechanical methods that have been developed as well. During this process, lighter materials such as wood, seeds, charcoal, and other plant or carbonized material float to the top and can be skimmed off, this is called the 'light fraction'. The heavier, denser material such as stone, clay, sherds, bone, and heavier plant material such as carbonized nutshell sinks to the bottom. This heavy material is then passed through a sieve and what remains is called the 'heavy fraction'. These two fractions are then analyzed further, and the macro-botanical remains are isolated through a series of gradually reduced sifting and sorting procedures. These are then analyzed by hand for remains and sorted accordingly (Struever. 1968, Fritz & Nesbitt. 2014, Pearsall. 2000). By understanding and following these processes we are able to gain more data that will help interpret the behavior and patterning of subsistence and mobility within an archaeological site. The following chapter outlines various types of plants that can be recovered using methods such as flotation.

5. List of Foods: Famine and Common Types

It is important to know what constitutes famine food in the Great Lakes region based upon ethnohistoric accounts. It provides a frame of reference and helps us separate famine from non-famine foods. Determining food types from Indigenous accounts is also an important task, as many non-famine foods also played a role in subsistence practices during famine. Many of the plants I discuss in this section have multiple uses and therefore were not strictly reserved for famine. Likewise, many foods that were used for famine may have been used during non-famine times as medicines, for ceremony, or for other uses. This is also not an all-encompassing list of famine foods, just those that have been specifically encountered within my research that were referenced as such. There are also a few that are relevant as potential famine foods, such as the algae *Spirogyra,* but are not specifically mentioned in any sources. Richard Asa Yarnell illustrates this point in an early paper:

> In several cases it is not known how many species within a particular genus were actually utilized, that is, thorn apple, blackberry, grape, oak, chenopod. Probably all available members of these genera were used to some extent. Thus the actual number of species used would be somewhat higher than the figures given here. Also there are probably a number of plants whose uses have been forgotten or simply have not been reported. Thus 400 to 500 native plant species perhaps were utilized aboriginally in the Upper Great Lakes region alone (Yarnell. 1964).

The plants below are not listed in any particular order and may not have been utilized by all peoples of the region during famine. Before discussing each of them, it is important to understand how we know what foods were considered famine foods. Prior to the arrival of any European peoples, the Native population already had a vast knowledge of local flora and its usage for many things including as medicine, for ceremony, and both famine and non-famine foods. When Europeans arrived, they were very much interested in the knowledge of the Native people concerning their usage of plants. Most of this knowledge was and still is passed down from generation to generation. Through the hard work of researchers spanning the last several hundred years, there is now a compendium of information related to the use of these plants. Most of the plants are known from histories and folktales of Native peoples. As mentioned in Martha Curtis's folktale retelling in the Introduction, the Menominee received onion, bittersweet vine, and lichen from Manabus, but she is not the only scholar to relay this information; Michael Weiner, Richard Asa Yarnell, and Volney Jones also mentioned these specific plants as being utilized by Indigenous people in the Great Lakes (Jones. 1965, Weiner. 1972, Yarnell. 1964). The Jesuits also mentioned many different foods used during times of famine (Thwaites. 1896). Tables 2 and 3 follow the list and display famine and common foods along with their nutritional values. These values will be used later to help determine the potential timing of famine.

Famine-Foods: Flora

Rock Tripe (Tripe de Roche)

Rock Tripe (*Umbilicaria*) is the name given to the many lichen species utilized strictly for famine. There are more than a dozen species in the Great Lakes that were prepared by boiling excessively to remove the bitterness and to make the texture more palatable. Rock Tripe gets its name from its general appearance being similar to the European delicacy tripe, which is the inner lining of the stomach of typically sheep, or cattle, and, of course, the fact that it grows on rocks. Unfortunately, since lichen is a symbiote of fungus and algae, the chance of its preservation is slim. An account by Pierre Esprit Radisson, one of the founders of the Hudson Bay Company, from the 1650s mentions eating rock tripe during a particularly difficult time of hunger:

> The kittle was full with the scraping of the rocks, which soone after it boyled became like starch, black and clammie and easily to be swallowed. I think if any bird had lighted upon the excrements of the said stuff, they had stuckt to it as if it weare glue. In the fields we have gathered severall fruits, as goosberyes, blackberrys, that in an houre we gathered above a bushell of such sorte, although not as yett full ripe. We boyled it, and then every one had his share (Kellog. Pg 41. 1917).

Moss (By Name Only)

Reindeer Moss (*Cladonia rangiferina*) and Iceland Moss (*Cetraria islandica*) are two species mentioned specifically by Weiner. Reindeer moss may have been eaten after boiling or dried and baked into a kind of bread (Weiner. Pg 191. 1972). Both are found throughout the Great Lakes region, as well as much of North America, with Icelandic Moss favoring colder climates and being more abundant in tundra-like environments. Reindeer Moss, traditionally known as Reindeer lichen, is not a true moss. It grows on humus primarily in boreal pine forests and takes its name from both the fact that it is a favorite food of caribou, or reindeer, as well as its physical appearance which is similar to antlers. Iceland moss is also not a true moss, but a lichen. It varies in color and can be found in similar habitats to reindeer moss (Yusaf. 2020). As a lichen, the preservation ability of this plant is also not very good, though potentially found in colder climates with permafrost present.

Tree Bark

Mentioned in many historic and academic accounts, the inner bark, or cambium layer, of trees were eaten. It may have been eaten raw or boiled in a soup. Numerous species were consumed: almost all species of Pine (*Pinus spp*.), Fir (*Abies* spp.), Oak (*Quercus* spp.), Birch (*Betula* spp.), Linden (*Tilia* Spp.), Slippery Elm (*Ulmus* rubra), Basswood (*Tilia americana*), Hemlock (*Tsuga* Spp.), Sugar Maple (*Acer saccharum*), and many types of Arborvitaes, but mainly White Cedar (*Thuja occidentalis*). A study conducted in Northern Fennoscandia, the northernmost area of Scandinavia and its surrounding regions, on Scots Pine *(Pinus sylvestris L.)* indicates that the nutrient content of the inner layer contained “285 kcal/100g dry weight” which was “mostly due to the carbohydrate content” (Rautio, *et al*. 2013). Some species even indicated high levels of proteins. Understanding evidence left at archaeological sites on the other hand is tricky. Cambium layer material is more porous and more prone to decay, but even if it was excavated at a site, understanding the context may be difficult since many people used all parts of trees for many applications. However, since many accounts indicate the cambium layer was boiled in a soup (Weiner. 1972), pottery residue analysis and phytolith analysis would be a good place to start.

Algae

Unfortunately, no specific species of algae were mentioned in any of the sources encountered, but certain algae have a history of being edible throughout the world. Green algae are said to be among the edible species whereas blue-green species are not. Currently, in the

Great Lakes, there is an abundance of non-edible species due to agricultural and industrial runoff, but in the past, there would have been large colonies of green algae that may have been utilized. Also, in the Great Lakes region, there are two types of green algae that may have been consumed, *Spirogyra* and *Cladophora,* though their growth during the times of year when famine hit most often, would have been minimal to non-existent. These green algae would have been easy to obtain during their normal growth cycle. They grow in abundance in most freshwater systems, are packed with nutrients, and are easy to obtain. They also could potentially have been dried for reconstitution in soups. Identifying archaeological evidence for algae is difficult as well as they do not grow from seed and therefore, the parts that would be identifiable are easily prone to decay (Higgins, *et. al.* 2008).

Bittersweet Vine

Bittersweet vine (*Celastrus scandens)* was mentioned more than once. While not consumed as a regular food during its primary flowering month of June or July due to a slight toxicity, the bark of the vine itself could be sought in winter. It was typically able to grow rather large with vines up to an inch or more in diameter, making for a good ingredient when boiled. Volney Jones wrote in *The Michigan Archaeologist* in 1965 about two separate ethnographic accounts, one from Pierre Esprit Radisson, and the other from Capt. John G. Anderson. Both claimed it had restorative properties and was nutritious. The vine was boiled until the bark separated and either boiled longer to make a broth or the bark was simply eaten. The Menominee and Dakota Sioux were said to have provided Bittersweet to these two explorers. It is also said to have "poisonous saponin" in its bark which is removed through the boiling process. Chippewa and Potawatomi are also said to have utilized it, but Jones noted a single account of it as famine food in contrast to its many uses as a medicine. Its usage seems to be localized west of Lake

Michigan in Wisconsin and Minnesota. Jones also conducted testing and isolated the carbohydrate mannan. Mannan-oligosaccharide is a non-digestible short chain carbohydrate in the mannose group. Most softwoods are high in mannose as it makes up a large portion of a plant's biomass. Bittersweet vine was discovered to have it in abundance, indicating that it is a viable source of energy (Jones. 1965).

Cattail

Typha angustifolia is one of three species that grows in North America and grows contiguously with multiple other species of cattail (Smith. 1967). From ethnographic sources, "The tuberous roots of cattails were cooked and eaten as a starchy potato-like food when Grandma Black Eagle was a poor young mother... This is a starvation food that was resorted to for feeding a family during some of the financially hardest times the LTBB [Little Traverse Bay Bands] Odawa survived through during the early and late 1900s" (Herron. 2002). Cattail is a plant that is available all winter, the rhizomes propagate slowly beneath the water and can be harvested at any time of year. *Typha* spp. has also been found in many archaeological sites throughout the region, indicating that it was harvested and utilized often. This may have been as a common food item for immediate consumption or prepared for future use.

Bog Arum

Also known as Wild Calla, *Calla palustris* is native to cool, temperate regions such as Canada, the Northeastern United States, and parts of Europe. All parts of the plant are poisonous due to the high oxalic acid content, but in extreme cases, the tubers can be utilized. As with most plants that are used as a food source that have any sort of toxicity, extensive processing is required to render the plant fit for consumption. It would have been dried during the Spring, Summer, or Fall, and saved for future use. Bog Arum was discovered at only one of the archaeological sites, the Schwerdt site (20AE127), as I will explore later. As a spring occupation site and being found along with American Lotus, it is possible that it was a remnant from a particularly difficult winter.

Common Food Used During Famine: Flora

The plant foods below were typically harvested during warmer months and were prepared for storage over the winter months. Many of the above may well have been also.

Onion

As the Menominee folktale from Curtis mentions, Onion was given to them by Manabus as one of the three famine foods. I have already mentioned Lichen, Rock Tripe, and Bittersweet Vine. Onion though, is not specifically described in detail in any source. It is also only mentioned as a specific famine food in this one instance. In the Great Lakes, one of the dominant Onion, or *Allium,* species that grows throughout the region is *Allium canadense.* Also known as the Canada onion, *Allium canadense* would fit with a food used during famine. While onions grow and flower during spring and summer, the bulbs are available year-round and they over-winter for growth the next spring. If one knew where to find it, there would be continual access. The stalks of some green onion varieties also can continue to grow and are harvestable through December, albeit at a stunted rate. Richard Asa Yarnell mentions in *Aboriginal Relationships Between Culture and Plant Life in the Upper Great Lakes Region* (1964) that both Wild Onion, *Allium cernuum*, and Wild Leek, *Allium tricoccum*, were available in late autumn and early spring and used as both fresh food and dried for future use. Evidence of *Alliums*, though, has not been identified in the archaeological sites profiled below.

Jerusalem Artichoke

Helianthus tuberosus is a member of the sunflower family, it originates in the North Central United States and grows between 40° and 55° N Latitude (Kays & Nottingham. 2008). Jerusalem artichokes have a long and storied history. They were first mentioned by Champlain as being cultivated by Native Americans in the early 1600s and have since been cultivated worldwide. Even Claude Monet painted *Jerusalem Artichoke Flowers* in 1880, which is on display at The National Gallery of Art in Washington D.C. Though they are neither an artichoke, nor have any association with Jerusalem, these tubers have been consistently utilized as a high source of carbohydrates in the form of "inulin, a fructose polymer." Yet another aspect that makes them suitable as famine food is the fact that they can be left attached to the plant and kept buried for extended periods of time (Kays & Nottingham, 2008). This offers a natural storage method that isn't available from most plants. Jerusalem artichokes were typically cooked and used the same way potatoes would be. Archaeologically, the tubers are not prone to preservation unless carbonized. Thankfully, there are quite a few instances where they have been successfully excavated, giving us an idea of when they were commonly utilized on sites.

Solomon's Seal

Polygonatum spp. is a plant genus with over 60 species, but only a few are native to Eastern North America. "The alternate leaves of Solomon's seal are carried on long, upright to arching stems. The linear to broad, egg-shaped leaves zigzag their way up the unbranched stalks, each pair offset slightly along the stem. Most species have solid green leaves, but some have variegated leaves" (Mahr. 2023). Typically, the rhizomes or young shoots were eaten. This mostly occurs in spring. Solomon's Seal tubers may also have been dried for future use like Bog Arum and American Lotus tubers were. Solomon's Seal unfortunately did not show up within any of the archaeological sites analyzed later but is mentioned numerous times throughout many famine references.

American Lotus

Nelumbo lutea tubers were typically harvested once the Lotus flowers in late Spring through early Summer. Almost all parts of the plant are edible, but the rhizome, which is tuber-like, was utilized most and was usually dried and saved for future use. *Nelumbo lutea* grows in both lakes and swamps as well as flooded areas. Its range encompasses most of Eastern North America into South America and the Caribbean. Typically, only the flower and leaves are seen while the rhizomes take root in the mud. Lotus shows up repeatedly in archaeological sites, and although was sought after in times of scarcity, was also well utilized during non-famine times (Hall & Penfound. 1944)

Juniper berry

Juniperus communis or, the Common Juniper, is an evergreen conifer found throughout the Northern Hemisphere. The "berry" is most commonly used as a source of food and is in many traditional recipes throughout the world. It gives Gin its distinctive flavor and is used in everything from pastrami to poached pears. In the case of famine, juniper berries specifically grow in fall and winter, which is the ideal time to harvest when one might be in need. One thing to note is that the juniper berry is not an actual berry, but a pinecone that grows in on itself and has the appearance of a berry, thus the nutritive value is quite different than that of most berries.

While finding juniper berries archaeologically seems like it would be a common occurrence, in the Great Lakes, it seems to be a challenge. There were not any recovered at the sites analyzed below despite the uniqueness of the seed (Poddar & Lederer. 1982).

Broadleaf Arrowhead

Sagittaria latifolia grows in large clusters near aquatic environments and is native to much of North and South America and the surrounding islands.

> The Indian method of gathering these bulbs was unique. The women entered the water, sometimes up to their necks, supported themselves by hanging on to a canoe, and rooted out the tubers with their toes. The loosened bulbs immediately rose to the surface of the water and were gathered. It is not possible to secure these tubers by pulling the plant from the water, as they break off readily and remain lodged in the muddy bottom (Weiner. Pg 194. 1972).

The tubers can be eaten raw or cooked. The leaves are arrow-shaped, the flowers are arranged in threes, and the plant is readily available in most of its distribution zones throughout the year. This is a plant that seems to be archaeologically absent from the sites analyzed (Weiner. 1972)

Evening Primrose

Oenothera biennis is native to North America and has been used as a food and emergency food for much of history. Most *Oenothera* subspecies are edible. The young stems and leaves were mostly consumed in early spring through summer. During times of shortage, the small, thick roots can be eaten and though tough, soften when boiling. They "reportedly taste best when gathered in late fall, winter, and early spring" (Weiner. Pg 197. 1972). A unique identifier of Evening primrose and a source for its name lies in the fact that during the daytime, the leaves wilt and the plant has an overall bedraggled appearance, but when the evening comes, it springs to life and a silky flower or flowers open. Primrose seems to have been utilized by many indigenous groups but is also archaeologically absent within the sites analyzed (Steckel, *et al.* 2019)

Common Milkweed

Asclepias syriaca is available in the spring and summer and most of the plant was utilized. Yarnell states that: "Shoots used by Ojibwa, buds and flowers by Ojibwa, who dry them for winter food, and by Menomini, Potawatomi, Winnebago, Sauk-Fox, and Iroquois" (Yarnell. 1964). Milkweed tends to grow in many types of soils. It generally occurs along banks lakes, ponds, and other waterways. Milkweed, according to the United States Department of Agriculture, is also mildly poisonous when ingested. Early communities would boil it first to make medicinal remedies. Boiling milkweed reduces the cardiac glycosides that are present which are the source of toxicity. It grows in much of the Eastern half of North America. The seeds and pods are rather unique and therefore should not be difficult to discern archaeologically. Though much of the organic material may deteriorate, the distinct patterning of the seed structure in the pod should be good evidence of the species (Stevens. 2023).

Nutritional Values of Ethnographic Famine Foods.																	
Common Name	**Scientific Name**	**Part analyzed**	**kCal/100g**	**Water (%)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamine (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
American Lotus	*Nelumbo lutea*	Root/Rhizome	3.74	NV	13.1	5.25	NV	NV	10.3	NV	NV	NV	NV	NV	NV	NV
Bittersweet Vine	*Celastrus scandens*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Bog Arum	*Calla palustris*	Root/Rhizome	NV	NV	30	1.1	41	NV	NV	390	820	43	3600	NV	NV	NV
Broadleaf Arrowhead	*Sagittaria latifolia*	Leaves	99	72.5	5.33	0.29	20.2	NV	1.67	10	174	2.57	922	0.17	0.073	1.65
Cat-tail	*Typha angustifolia*	Root/Rhizome	367	7.6	6.9	3.1	79.8	NV	2.6	NV	NV	NV	NV	NV	NV	NV
Common Milkweed	*Asclepias syriaca*		NV	NV	20.63	NV	NV	37.03	NV	NV	NV	NV	NV	NV	NV	NV
Evening Primrose	*Oenothera biennis*	Leaves	NV	NV	11.78	NV	NV	12.45	NV	NV	NV	NV	NV	NV	NV	NV
Green Algae	*Cladophora glomerata*	Entire Plant	161.8	87.5	1.6	0.3	7.4	NV	3.2	0.054	0.0013	NV	0.086	NV	NV	NV
Groundnut	*Apios americana*	Tuber	109	70.7	4.1	1	18.6	3.5	2.1	16	39	0.414	101	NV	NV	NV
Iceland Moss	*Cetraria islandica*	Lichen Body	NV	NV	3	2.6	50	NV	NV	4.8	50	530	250	NV	NV	NV
Jerusalem Artichoke	*Helianthus tuberosus*	Root/Rhizome	73	78	2	0.01	17.4	1.6	2.54	14	78	3.4	429	0.2	0.06	1.3
Juniper berry	*Juniperus communis*	Ripe Berry	0.5165	42.1	3.3	17.6	45.8	NV	NV	NV	NV	NV	NV	NV	NV	NV
Onion	*Allium spp.*	Entire Plant	95.6	67.9	2.2	0.4	20.8	6.1	2.6	4.377	3.096	0.85	27.2	NV	NV	NV
Pine	*Pinus spp.*	Cambium	51	87.6	6.25	0.61	10.6	1.41	NV	1.11	33.7	0.27	191	< 1	<1	0.3
Reindeer Moss	*Cladonia rangiferina*	Lichen Body	NV	NV	NV	NV	NV	NV	NV	5.15	610	79	260	NV	NV	NV
Rock Tripe	*Umbilicaria spp.*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Solomon's seal	*Polygonatum spp.*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Sugar Maple	*Acer saccharum*	Cambium	343.8	5.75	2.65	0.43	82.33	NV	NV	NV	NV	NV	NV	NV	NV	NV
Water Silk	*Spirogyra*	Entire Plant	NV	NV	16.7	18.1	55.7	NV	NV	445.9	NV	141.3	NV	NV	NV	NV
White Cedar	*Thuja occidentalis*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Daily Intake																
All values are per 100g unless otherwise noted.																

Table 2. List of Famine foods in comparison with their Nutritional information.

Non-Famine Foods

The following foods were not necessarily considered famine foods. They were harvested throughout the spring, summer, and fall, and specifically dried and saved in either household storage or in underground storage caches for usage overwinter. When these ran out or low, resorting to the Famine Foods listed above became necessary. However, some of these could very well be considered famine foods by certain communities and saved specifically for use only when famine occurred. These are also all commonly found at archaeological sites throughout the Great Lakes region. Including them within this list helps add context to the macro-botanical remains recovered from archaeological sites by allowing the analysis to determine which category to place the species recovered. Most of these macro-botanicals are found as carbonized remains in the form of seeds and many of the nuts survive archaeologically in the form of nutshell remnants or oil residues left on pottery.

Groundnut

Apios americana, also referred to as “rosary root’ by the Jesuits, is a flowering vine that grows small tubers along a string of roots that are similar to potatoes. These tubers are found in abundance in most of Eastern North America in moist and boggy areas. Groundnut is usually harvested in the winter, but the tubers can be gathered all year. They are best when harvested from late fall through early spring. They can be eaten raw or cooked, or sometimes they would be dried and ground for flour. Many times, the roots were boiled, peeled, and dried for winter storage (Stevens. 2023). The discovery of *A. americana* remains archaeologically is difficult, but many sites do show evidence through carbonization. Unfortunately, though, no groundnut was identified in the sites analyzed in this thesis.

Juneberry, Currants/Gooseberries, Raspberries, Blackberries

Amelanchier spp., *Ribes* spp., and *Rubus* spp. A vast number of different species within these genera grow in the Great Lakes region and the Ojibwa, Huron, Mascouten, Sauk-Fox, Menominee, Iroquois, Potawatomi, and many other groups used these berries by drying and saving for winter use (Yarnell. 1964). Juneberry (aka Serviceberry) is a shrub that can reach 8m in height, is found throughout Northeastern North America, and the berries are small, purplish-black and sweet (Sheahan. 2015). *Ribes* spp., known as currant or gooseberry, includes many species that grow throughout the region and grows in moist areas such as along streams, in wet meadows, or even floodplains (Knudson. 2010). *Rubus* spp. includes raspberries and blackberries and grow in abundance throughout the Great Lakes. *Rubus spp.* is found in many places such as wet areas or even around disturbed areas such as in clearings or places that have burned (Favorite. 2003). The seeds of all three genera are easily identifiable and have been recovered from most Great Lakes archaeological sites.

Sand cherry, Chokecherry, Fire Cherry, Wild Plum, Black Cherry

Prunus spp. These members of the *Rosaceae* family are found throughout the Great Lakes region and much of Northeastern North America. "The leaves, bark, stem, and stone (seed pit) of chokecherry are all toxic" (Geyer. *et al.* 2023), though the flesh of the fruit itself is not poisonous. Evidence of many of these examples from the *Prunus* genus has been found throughout many Great Lakes archaeological sites.

Blueberry and Cranberry

Vaccinium spp. There are more than 20 species of blueberry that grow in the Great Lakes region. Of these, *Vaccinium angustifolium*, the Low Sweet Blueberry, is "apparently the most important blueberry in the Upper Great Lakes region and one of the most important berry foods in season and dried for winter" (Yarnell. 1964). Cranberries are highly prized due to their ability to survive unscathed while buried under snow allowing them to be harvested throughout the winter if needed. "In the Northeastern United States, pemmican was made by pounding cranberries into a mixture of dried, smoked game meat, animal fat, and seeds" (Anderson. 2011). Pemmican will be discussed below in more detail.

Hazelnut

Corylus americana is available in fall and was used by many groups throughout the year. It was stored for winter usage as with many other nuts. It was primarily utilized for both the nut meat as well as the oils. Hazelnut grows in many types of environments, growing best in rich, well-drained soil. It can grow in both deep shade and in open clearings (Nesom. 2007). Hazelnuts are common archaeobotanical remains that are found at archaeological sites throughout the Great Lakes region. They are typically found carbonized or as oil residue.

Squashberry, Mooseberry, Nannyberry, Highbush Cranberry

Viburnum spp. berries are in the *Adoxaceae* family and are typically available in Fall and were often dried for winter use. Nannyberry specifically is found in moist, rich, loamy soils. It prefers swampy or riverine areas but can also grow in wooded areas. The clusters of 'berries' are not actual berries but are drupes that ripen from July through September and have a bluish-black color (Nesom. 2002). While none of these were found in the archaeological sites analyzed, their usage is mentioned in multiple references.

Hawthorn

Crataegus spp. is also known as Thornapple and the "Fruits [are] available in September and October (thorns for sewing gathered in summer). Used by Ojibwa, Potawatomi, Sauk-Fox, and Iroquois; dried for winter. Grows north to James Bay in thickets, rocky ground, stream banks, open woods, open ground, and borders of woods" (Yarnell. 1964). There are roughly two dozen species that grow in the region and Hawthorn is found at many archaeological sites as well.

Beech

Fagus grandifolia is also found at many archaeological sites throughout the Great Lakes. The nuts are available in late Fall but are "primarily obtained by collecting chipmunk and deer mouse stores in winter" (Yarnell. 2014). Found throughout the Eastern half of North America, it has lately seen difficulty through Beech Bark Disease, a combination of an insect and fungal infection which often results in the death of the tree. Beechnut usage was widespread throughout the Woodland period and into the contact era.

Corn/Maize

Zea mays has a deep history in the Americas and has been found archaeologically across the Eastern half of the United States as early as 200 CE but was not considered a staple until post 900 CE and arguably much later. Thus, corn was considered a gradual but important part of subsistence. In the Great Lakes region, archaeologists discovered phytoliths consistent with *Zea mays* dating to 200 calibrated BCE. Susan Kooiman (2021) discovered through residue analysis on the interior of cooking pots from the Cloudman site, located on Drummond Island in northern Lake Huron, that evidence of corn shows up in all occupations of the site including the occupation from 59-180 CE, though this evidence is sparse. The usage of *Zea mays* is written of consistently throughout the many ethnographic accounts mentioned throughout this article. Corn was grown in abundance and made up a large portion of each person's yearly caloric intake, especially in the Late Woodland period and onward.

Miscellaneous: Flora, Fauna, Fungi

In an effort to understand how some plants were utilized in combination with other ingredients, the items listed below describe several different foods that show a combination of ingredients from above. Many of the items listed below were prepared ahead of time and carried with someone as they traveled away from their community. There are also a few miscellaneous items that are included here that I did not represent above but did not want to exclude.

Fungi

Another Kingdom missing from this list is fungi. Mushrooms are an essential part of most human diets. Archaeologically, fungi are difficult to detect. If one stumbled across mycelium while excavating, could they be sure it was from the period of occupation or is it part of the vast network of mycelium that constantly lives underground? Though stable isotope analysis of skeletal material has been demonstrated by O'Regan *et. al* (2016) to be an acceptable way to retrieve evidence of mushroom usage dating as far back as the Neolithic, this was mainly within animal populations. Analysis of human dental calculus also indicates potential mushroom consumption dating to the Upper Paleolithic. Aside from puffballs excavated at UK sites (O'Regan, *et. al*. 2016), the preservation ability of fungi is not readily detectable in the archaeological record. It is safe to assume that Great Lakes communities foraged for and consumed mushrooms on a regular basis. Many species fruit year-round and many dry easily and thus are storable for usage during the winter. Since there is little archaeological evidence of mushrooms, the kingdom of fungi will have to wait for future research.

Fish Bones

Though fauna is not a specific focus of this thesis, I will include fish bones as a famine food source. Many sources also mention the use of fish bones (see JR, Vol. 48, pg 119) added to soups along with some of the plants listed above during difficult times to add as many extra nutrients to their meal as possible. These were also very common and easy to preserve, store, and carry when traveling. The difficulty with fish bones lies in interpreting their purpose when found archaeologically.

Acorn Bread

There is no concrete evidence that acorn bread was made in the Great Lakes region, but the item is worth noting. In a study on Blue Zones-which are areas around the world of special interest due to their high concentration of Centenarians (people over 100)- and foods unique to Sardinian famines, I discovered the use of acorns to make something called "Pan' Ispeli." Due to the mild toxicity from the tannins in acorns, the bread is prepared a certain way, "acorns are crushed and soaked in water to leach out some of the tannins and reduce the toxicity. Clay is then mixed with the acorn meal to further counter the toxicity of tannin and the bitter taste. The clay also provides the pitch black color of the Pan' Ispeli." (Wang, et al. 2022). What was once a famine food has become part of the traditional diet, and now is consumed during "Festivities and celebrations" (Wang, et al. 2022). In North America, there is evidence in Round Valley, CA that when preparing acorn bread, the dough is mixed with red clay prior to baking. A roughly 1:20 mix of clay to dough both 'makes the bread sweet' and acts 'like yeast' (Weiner. Pg 148. 1972). The concept of Geophagy, or the eating of stones, has been around for centuries and has been practiced throughout the world. It is possible that something like Sardinia and California may have developed in the Great Lakes with the overall dependence upon acorns for subsistence.

Pemmican

Pemmican is a traditional food that was made by many different cultures throughout the world. Many indigenous people made use of this food en masse. Pemmican is dried meat such as venison, beef, or even fish that has been shredded and mixed with tallow and sometimes fruit and/or nuts. It can then be cut into bars for easy travel. Early fur trade era Algonquin groups such as the Ojibwe, Potawatomi, and Menominee were known to utilize Pemmican during winter hunting (Rynski. 2000). It is easy to see why this highly nutritious form of meal replacement was consistently utilized by so many different people for so long.

6. Method and Theory

Famine and Nutrition

While a list of famine foods and their non-famine counterparts is a helpful tool in understanding what plants were used by Indigenous people in the Great Lakes, it is also important to understand the relationship these foods have with the human body. The following section delves into the nutritional composition of many of these foods. It also delves into what nutritional requirements humans generally require to sustain life, and how that relates to what foods these communities prepared for the winter months. In examining rations from a 15th century voyage undertaken by Alexander Henry to analyzing storage cache data from a specific archaeologic site, we can compare nutritional variation and estimate potential amounts of food needed for survival over the harsh winter months of a Great Lakes winter.

Nutritional Values of Common Indigenous Foods															
Common Name	**Scientific Name**	**Part analyzed**	**kCal/100 g**	**Water (%)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamin (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
Acorn	*Quercus alba*	Nut	387	27.9	6.15	23.9	40.8	-	1.35	41	79	0.79	539	0.112	0.118	1.83
Beechnut	*Fagus grandifolia*	Nut	576	6.6	6.2	50	33.5	-	3.7	1	0	2.46	1020	0.304	0.371	0.877
Blueberry	*Vaccinium angustifolium*	Fruit	64	84.21	0.7	0.31	14.6	8.8	0.24	12	13	0.34	86	-	-	-
Common bean	*Phaseolus vulgaris*	Fruit	31	90.3	1.83	0.22	6.97	2.7	0.66	37	38	1.03	211	0.082	0.104	0.734
Corn	*Zea mays*	Kernels	386	8.1	9.88	5.22	74.9	-	1.86	15	337	1.92	511	0.2	0.068	3.3
Cranberry	*Vaccinium oxycoccos*	Fruit	46	87.3	0.46	0.13	12	3.6	0.12	8	11	0.23	80	0.012	0.02	0.101
Currant, Gooseberry	*Ribes spp (Ribes rubrum).*	Fruit	56	-	1.4	0.2	13.8	4.3	-	33	44	1	275	0.04	0.05	0.1
Goosefoot	*Chenopodium spp.*	Seed	320	13.4	13.3	5.6	45.9	14.6	7.2	-	-	-	-	-	-	-
Goosefoot	*Chenopodium spp.*	Leaves	43	84.3	4.2	0.8	7.3	4	3.4	309	72	1.2	452	0.16	0.44	1.2
Hazelnut	*Corylus americana*	Nut	641	4.31	13.5	53.5	26.5	8.4	2.21	135	321	3.46	636	-	-	-
Hickory	*Carya spp.*	Nut	696	2.2	11	72.7	10.6	1.5	2	-	-	-	-	-	-	-
Juneberry	*Amelanchier spp.*	Fruit	84.85	79.55	9.7	4.2	18.48	19	0.63	44	16	0.675	122	-	-	-
Raspberry, Blackberry	*Rubus spp.*	Fruit	57	85.6	1.01	0.19	12.9	50.9	0.35	16	27	0.45	156	-	-	-
Squash	*Cucurbita pepo*	Seed	553	4.4	29	46.7	13.1	1.9	4.9	51	1144	11.2	-	0.24	0.19	2.4
Squash	*Cucurbita pepo var. turbinata*	Flesh	40	87.8	0.8	0.1	10.4	1.5	0.8	33	36	0.7	347	0.14	0.01	0.7
Squashberry, Mooseberry, Nannyberry, Highbush cranberry	*Viburnum lentago.*	Fruit	-	5.71	2.09	-	-	5.9	-	-	-	-	-	-	-	-
Staghorn Sumac	*Rhus typhina*	Root		6.64	4.31	11.56	31.57	32.9	5.37	309.8	103.2	18	557.6	2.399	2.441	-
Sunflower	*Helianthus annus*	Seed	609	4.87	18.9	48.4	24.5	7.2	3.31	116	732	4.37	657	-	-	-
Walnut	*Juglans spp.*	Nut	730	3.14	14.6	69.7	10.9	5.2	1.64	88	365	2.24	424	0.23	-	1.22
Beaver	*Castor canadensis*	Meat (raw)	146	71	24	4.8	0	0	1	15	237	6.9	348	0.06	0.22	1.9
Beef Tallow	*Bos taurus*	Tallow	902	0	0	100	0	0	0	0	0	0	0	0	0	0
Black Bear	*Ursus americanus*	Meat (raw)	155	71.2	20.1	8.3	0	0	0.4	-	162	7.2	-	0.16	0.68	3.2
Raccoon	*Procyon lotor*	Meat (cooked)	255	54.3	29.2	14.5	0	0	1.5	14	261	7.1	398	0.59	0.52	4.68
Sturgeon	*Acipenser fulvescens*	Meat (raw)	105	76.6	16.1	4.04	0	0	1.1	13	211	0.7	284	0.07	0.07	8.3
White-tail Deer	*Odocoileus virginianus*	Meat (raw)	157	71.2	21.8	7.13	0	0	0.88	11	201	2.92	330	0.547	0.287	5.7
Whitefish	*Coregonus clupeaformis*	Meat (raw)	134	72.8	19.1	5.86	0	0	1.12	26	270	0.37	317	0.14	0.12	3
Daily Intake																
All values are per 100g unless otherwise noted.																

Table 3. List of Common foods in comparison with their Nutritional information.

Human Energy Requirements

However, the relationship between population size and food supply is not a simple matter of equating grams of food with grams of human flesh. All foods are not equivalent in their costs (i.e. effort required to obtain them), their seasonal availability, their annual yield, their symbolic value in the culture, or their effect on the consumers who also are not a homogeneous lot. The members of any community have different physiological needs, produce different quantities of work for a specified amount of food, and are differentially susceptible to deficiencies. In addition, individuals are allocated different quantities and

> varieties of food by age, sex, and prestige criteria as well as biological needs (Wetterstrom. 1976).

Determining the daily energy needs of people is not as straightforward as one might think. Wilma Wetterstrom’s 1976 Doctoral research focused on the Pueblo Arroyo Hondo, but we can adapt the information and technique and apply it to the Great Lakes. There is an array of variables to consider in the calculation of total energy expenditure and thus energy requirements. It is safe to say that the people living in a community together might have similar energy requirements with some of the variabilities being: each person's role in the community, what sort of physical expenditure that causes, as well as age, sex, and body size. Climate factors and other ecological factors also play a significant role in these requirements. The National Institute of Health in the United States suggests that females should consume 2000 calories per day and males should consume 2500 calories per day (Osilla. 2022). This should be considered a loose estimate, Table 4 shows the current recommended amount for both males and females as well as the requirements for their general age groups per the Food and Nutrition Board at the Institute of Medicine. This is in relation to a much more sedentary industrial society though and may differ from the actuality of the requirements for Great Lakes Native American villagers from 300 BCE to 1800 CE. The demand for energy per person for villagers in this period was arguably much greater, but we can utilize the active calorie requirements for our analysis.

Dietary Reference Intakes (DRIs):													
Recommended Dietary Allowances and Adequate Intakes: Adapted from Food and Nutrition Board, Institute of Medicine, National Academies													
e-Stage Group	kCal/Sedentary	kCal/Active	Water (Liters)	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Fiber (grams)	Calcium (milligrams)	Phosphorus (milligrams)	Iron (milligrams)	Thiamine (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)
Infants													
0–6 mo	NV	NV	0.7	9.1	31	60	NV	NV	NV	NV	NV	NV	NV
7–12 mo	NV	NV	0.8	11	30	95	NV	NV	NV	6.9	NV	NV	NV
Children													
1–3 y	1000	1000	1.3	13	NV	130	19	500	380	3	0.4	0.4	5
4–8 y	1200	1400	1.7	19	NV	130	25	800	405	4.1	0.5	0.5	6
Males													
9–13 y	1600	1800	2.4	34	NV	130	31	1,100	1,055	5.9	0.7	0.8	9
14–18 y	2000	2400	3.3	52	NV	130	38	1,100	1,055	7.7	1	1.1	12
19–30 y	2600	2800	3.7	56	NV	130	38	800	580	6	1	1.1	12
31–50 y	2400	2600	3.7	56	NV	130	38	800	580	6	1	1.1	12
51–70 y	2200	2400	3.7	56	NV	130	30	800	580	6	1	1.1	12
> 70 y	2000	2200	3.7	56	NV	130	30	1,000	580	6	1	1.1	12
Females													
9–13 y	1400	1600	2.1	34	NV	130	26	1,100	1,055	5.7	0.7	0.8	9
14–18 y	1800	2000	2.3	46	NV	130	26	1,100	1,055	7.9	0.9	0.9	11
19–30 y	2000	2200	2.7	46	NV	130	25	800	580	8.1	0.9	0.9	11
31–50 y	1800	2000	2.7	46	NV	130	25	800	580	8.1	0.9	0.9	11
51–70 y	1600	1800	2.7	46	NV	130	21	1,000	580	5	0.9	0.9	11
> 70 y	1600	1800	2.7	46	NV	130	21	1,000	580	5	0.9	0.9	11
Pregnancy													
14–18 y	2674.5	2674.5	3	71	NV	175	28	1,000	1,055	23	1.2	1.2	14
19–30 y	2674.5	2674.5	3	71	NV	175	28	800	580	22	1.2	1.2	14
31–50 y	2674.5	2674.5	3	71	NV	175	28	800	580	22	1.2	1.2	14
Lactation													
14–18 y	2622.2	2622.2	3.8	71	NV	210	29	1,000	1,055	7	1.2	1.3	13
19–30 y	2622.2	2622.2	3.8	71	NV	210	29	800	580	6.5	1.2	1.3	13
31–50 y	2622.2	2622.2	3.8	71	NV	210	29	800	580	6.5	1.2	1.3	13
Daily Intake													

Table 4. Daily Recommended Allowance of Nutrients per The Institute of Medicine.

Determining Timing of Famine Through Nutritional Requirements

To determine the point at which famine would likely impact daily life, we need to assess the nutrients of common foods as well as the requirements for individuals. Through this information we can then hypothesize the approximate time of year that stored food may “run out.” For those during the protohistoric and historic periods of the Great Lakes, this was a particularly difficult time to survive with what one could imagine would be more energy output than intake in many instances. Though it may not be what the body requires, much of the time, what was available was what was consumed. For this analysis, let us look at two different scenarios. One regarding the rations of a canoe voyage where lack of food could be a factor, and the second a look at an archaeological cache site.

The specific context of this passage is from Alexander Henry's journals and relates to a voyage by canoe from Fort Michilimackinac in Northern Michigan to Montreal, Canada during the fur trade era. In the 1700s, Alexander Henry reckoned it took upwards of fourteen months to complete. This may seem a bit long though, a quick tally of the miles shows it was roughly a 630-mile trip. If someone walked this at an average of 30 miles per day, it would only take a little over 21 days. With access to canoes, it would make more sense that it should take 14 days. We will calculate our data below though with Henry's estimate of 14 months as well as 14 days to see what would occur.

> The village of L'Arbre Croche supplies, as I have said, the maize, or Indian corn, with which the canoes are victualled…. The allowance, for each man, on the voyage, is a quart a day; and a bushel, with two pounds of prepared fat, is reckoned to be a month's subsistence. No other allowance is made, of any kind; not even of salt; and bread is never thought of. The men, nevertheless, are healthy, and capable of performing their heavy labour (Henry. pg 55. 1809).

In his journal, Henry appears to be surprised that this rationing is enough nutrition to supply someone for the duration of this trip from Michilimackinac to Montreal. Table 5 below breaks down the nutritional value of both corn and beef tallow. Beef tallow was chosen for this analysis as it is today a common fat utilized, though most likely bear tallow would have been the choice amongst indigenous populations since during winter the fat content of bears was quite high, deer tallow may have also been a likely choice. Also in Table 5, the supplies noted by Henry have been broken down into their nutritional output and a comparison of nutritional requirements has been attached with calculated amounts necessary for both a 14-day and 14-month journey. We can see that as a base, the calories provided by just corn and tallow are enough to sustain an individual throughout the journey. It can be inferred that there would have been supplemental intake through hunting and foraging along the travel route as well. This additional nutritional intake would ensure the health of the travelers on a trip of this magnitude by supplementing any missing vitamins, minerals, and other nutrients not supplied by the rations provided.

As we can see from the results, Alexander Henry would potentially have been more surprised at the surplus energy for each person. With just one bushel, or about 1qt per day, and 2 lbs. of fat, or about 1 oz per day, a 19–30-year-old active male could potentially have had a kcal surplus of over 1000 calories per day. While this seems high, it is very likely that surplus would have been expended each day during Henry's aptly described "heavy labour." This heavy labor would have included the long hours of canoeing, carrying the canoe and its cargo over portages, and hunting and foraging while at camp. This also does not take into account the large deficit of vitamins by consuming such a limited selection of food. While this does not directly relate to storage of consumables, it does give us an indication of some of the usage and requirements of a typical trip across the landscape during the era.

Nutrition Of Alexander Henry Rations														
"The allowance, for each man, on the voyage, is a quart a day; and a bushel, with two pounds of prepared fat, is reckoned to be a month's subsistence." (Henry. 1809)														
	kCal/100g	**Water (%)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamin (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
1 Month Ration														
Corn-31 quarts	~1qt/day		1 qt=946 grams		31qt=29326 grams									
Daily Value	3652	77	93	49	709	0	18	142	3188	18	4834	2	1	31
Tallow-2 lbs.	~1oz/day		1oz=28.35 grams											
Daily Value	256	0	0	28	0	0	0	0	0	0	0	0	0	0
Total Daily Value of Corn and Tallow Combined	3908	77	93	78	709	0	18	142	3188	18	4834	2	1	31
Fort Michilimackinac to Montreal (14 Months=426 days)	1664687	32643	39816	33113	301891	0	7493	60449	1358097	7737	2059310	806	274	13299
Fort Michilimackinac to Montreal (14 days)	54708	1073	1309	1088	9921	0	246	1987	44632	254	67677	26	9	437
Human Requirements for 19y-30y/Active-	**kCal/100g**	**Water (%)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamin (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
Male-														
Daily Required Intake	2800	3.7	56	NV	130	38	NV	800	580	6	NV	1	1.1	12
Fort Michilimackinac to Montreal (14 Months=426 days)	1192800	1576.2	23856	NV	55380	16188	NV	340800	247080	2556	NV	426	468.6	5112
Fort Michilimackinac to Montreal (14 days)	39200	51.8	784	NV	1820	532	NV	11200	8120	84	NV	14	15.4	168
Female-														
Daily Required Intake	2200	2.7	46	NV	130	25	NV	800	580	8.1	NV	0.9	0.9	11
Fort Michilimackinac to Montreal (14 Months=426 days)	937200	1150.2	19596	NV	55380	10650	NV	340800	247080	3450.6	NV	383.4	383.4	4686
Fort Michilimackinac to Montreal (14 days)	30800	37.8	644	NV	1820	350	NV	11200	8120	113.4	NV	12.6	12.6	154
Variance Between Requirement and Intake														
Male														
Daily Required Intake-Daily Required Value	-1108	-73	-37	NV	-579	38	NV	658	-2608	-12	NV	-1	0	-19
Fort Michilimackinac to Montreal (14 Months=426 days)	-471887	-31066	-15960	NV	-246511	16188	NV	280351	-1111017	-5181	NV	-380	195	-8187
Fort Michilimackinac to Montreal (14 days)	-15508	-1021	-525	NV	-8101	532	NV	9213	-36512	-170	NV	-12	6	-269
Female														
Daily Required Intake-Daily Required Value	-1708	-74	-47	NV	-579	25	NV	658	-2608	-10	NV	-1	0	-20
Fort Michilimackinac to Montreal (14 Months=426 days)	-727487	-31492	-20220	NV	-246511	10650	NV	280351	-1111017	-4287	NV	-423	109	-8613
Fort Michilimackinac to Montreal (14 days)	-23908	-1035	-665	NV	-8101	350	NV	9213	-36512	-141	NV	-14	4	-283
NV=No Value														

Table 5. Nutrition of rations described by Alexander Henry in comparison with Human Nutritional Requirements. 1 bushel=31 quarts. (Henry. 1806, NASEM. 2019)

In Newaygo County, Michigan, there is a multi-component site called The Ne-con-ne-pe-wah-se Site (20NE331). Archaeologists recovered evidence of both Late Woodland occupation ca. 800-1100 CE as well as Historic Period occupation during the Mid-Late 19th century. During the survey, 20 circular surface depressions were identified and plotted. They were roughly 1 m to 2.5 m in diameter and the depressions were approximately 15cm to 40cm below the surface. Excavation determined these to be storage caches, of which 8 were bisected, 2 fully excavated, and 3 (Caches pits 5, 9, and 17) were processed with flotation. These three caches were found to contain large amounts of both carbonized and uncarbonized botanical material (Table 6). Cache pits 5 and 9 had 30L and 20L of material analyzed, respectively. Cache pit 17 had 12L analyzed and had the largest amount of botanical remains (Dunham. 2000).

Let us use these three pits in a hypothetical scenario to model the nutritional value of all cache pits at the site. With 20 pits located at this site, we can use it as a base point to model other sites in determining timing of famine. The results are presented in Table 7 below. There are several things to note, this is only a small representation of the material that would have been in each cache. It also only represents what was recovered through flotation of part of three of the 20 storage caches at Ne-con-ne-pe-wah-se. The calculations are for 21 caches, an arbitrary number, and water calculations show a surplus. Most of the food would have been dried prior to the burial in a cache, and the resulting water loss would most likely be a deficit. Corn is also rare in the flotation results. However, dried corn would have been a large portion of the food saved for use throughout the winter. This lends high probability of multiple types of storage methods utilized by each group, or a greater concentration of corn in another cache pit that was not excavated. Alternate storage methods are not calculated in these totals, nor are the variations in botanical species that would be in each of the cache pits.

The results show that a set of 21 caches would provide enough kcal of energy for either a single female or a single male for the duration of winter. Since winter could variably last 89 days and the amount of energy stored in a cache would appear to cover 162 days per individual female and 125 days per individual male with a larger number of days for children depending upon age. These calories would easily be addended by hunting, the primary activity during the winter months. For a family of 4 or larger, a series of caches greater than 21 per site would invariably be required. If only 21 caches were indeed utilized for a hypothetical family of 4 (1 adult male, 1 adult female, and 2 children, 1 aged 1-4 years and the other 4-8 years), onset of famine would occur relatively quickly. Each person in an active family requires a specific number of calories per day with adult males requiring 2,800, females 2,200, Children 1-4 years 1,000, and 4-8 years 1,400 totaling 7,400 calories per day. If the collective calorie count of these caches does equal 323,988 kcal, then the nutrition available from this storage method would last for around 48 days. Again, the very concept of a storage cache implies that there would have been regular food storage for daily use leading up to the need to retrieve food from the caches.

Ultimately, determining the time famine would occur requires variables we do not have data for at present. Famine onset depends upon overall harvest totals, number of cache pits per person, hunting success during winter, as well as a combination of many other factors. Future research still needs to take place as there are many variables still unaccounted for within the cache pits themselves. Only a small portion of 3 total cache pits out of 20 were analyzed. This leaves a large amount of material unrecovered. We can also use experimental archaeology to help examine the purpose of certain material that was utilized for lining cache pits as well as determining longevity of certain food items. The current model in this thesis is a good starting point to initiate follow-up research.

Ne-con-ne-pe-wah-se Site Paleoethnobotanical Remains								
Site Name	**Site#**	**Period**	**Phase/Tradition**	**Season of occupation**	**Botanical remains (as reported)**	**Year(s) excavated**	**Location**	**Citation**
Ne-con-ne-pe-wah-se	20NE331	Late Woodland, Historic			Cache pit 5-30L: 1 Bunchberry (Cornus canadensis), 7 Pin Cherry (Prunus pennsylvanica), 5 Black Cherry (Prunus serotina), 1 Sumac (Rhus spp.), 14 Raspberry (Rubus spp.), 1 Elderberry (Sambucus canadensis), 5 Nightshade Family (Solanaoeae), 5 Grape (Vitis spp.); Cache pit 9-20L: 4 Bunchberry (Cornus canadensis), 3 Black Cherry (Prunus serotina), 1 Sumac (Rhus spp.), 2 Grape (Vitis spp.), 1 Corn (Zea mays); Cache pit 17-12L: 3 Chokeberry (Aronia arbutifolia), 72 Bunchberry (Cornus canadensis), 62 Beechnut (Fagus grandifolia), 1 Witch Hazel (Hamamelis virginiana), 2 Spicebush (Lindera benzoin), 1 Honeysuckle (Lonicera spp.), 7 Cinquefoil (Potentilla spp.), 106 Pokeweed (Phytollaca americana), 74 Pin Cherry (Prunus pennsylvanica), 7 Black Cherry (Prunus serotina), 48 Sumac (Rhus spp.), 36 Raspberry (Rubus spp.), 28 Elderberry (Sambucus canadensis), 7 Nightshade Family (Solanaoeae), 1 Mountain Ash (Sorbus americana), 40 Grape (Vitis spp.)		Newaygo County, MI	*Dunham, S. (2000, January). Cache Pits: Archaeology, Ethnohistory and Continuity of Tradition. Interpretations of Native North American Life. University Press, Florida.*

Table 6. Ne-con-ne-pe-wah-se Site Archaeobotanical results.

Nutritional Values of Cache Pits																
Common Name	**Scientific Name**	**Part analyzed**	**kCal/100g**	**Water (%)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamin (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
Cache Pit 5-30L																
5 Black Cherry	*Prunus serotina*	Berry (Raw)	63	82.2	1.06	0.2	16	2.1	0.48	13	21	0.36	222	0.027	0.033	0.154
1 Sumac	*Rhus spp.*	Root	NV	6.64	4.31	11.56	31.57	32.9	5.37	309.8	103.2	18	557.6	2.399	2.441	NV
1 Elderberry	*Sambucus canadensis*	Berry (Raw)	73	79.8	0.66	0.5	18.4	7	0.64	38	39	1.6	280	0.07	0.06	0.5
5 Grape	*Vitis spp.*	Berry (Raw)	67	81.3	0.63	0.35	17.2	0.9	0.57	14	10	0.29	191	0.092	0.057	0.3
14 Raspberry	*Rubus spp.*	Berry (Raw)	57	85.6	1.01	0.19	12.9	50.9	0.35	16	27	0.45	156	NV	NV	NV
Medicinal/Remedy																
7 Pin Cherry	*Prunus pensylvanica*															
5 Nightshade Family	*Solanaceae*															
1 Bunchberry	*Cornus canadensis*															
Cache Pit 9-20L																
1 Corn/Maize	*Zea mays*	Kernels	386	8.1	9.88	5.22	74.9	NV	1.86	15	337	1.92	511	0.2	0.068	3.3
3 Black Cherry	*Prunus serotina*	Berry (Raw)	63	82.2	1.06	0.2	16	2.1	0.48	13	21	0.36	222	0.027	0.033	0.154
1 Sumac	*Rhus spp.*	Root	NV	6.64	4.31	11.56	31.57	32.9	5.37	309.8	103.2	18	557.6	2.399	2.441	NV
2 Grape	*Vitis spp.*	Berry (Raw)	67	81.3	0.63	0.35	17.2	0.9	0.57	14	10	0.29	191	0.092	0.057	0.3
Medicinal/Remedy																
4 Bunchberry	*Cornus canadensis*															
Cache Pit 17-12L																
62 Beechnut	*Fagus grandifolia*	Nut	576	6.6	6.2	50	33.5	NV	3.7	1	NV	2.46	1020	0.304	0.371	0.877
7 Black Cherry	*Prunus serotina*	Berry (Raw)	63	82.2	1.06	0.2	16	2.1	0.48	13	21	0.36	222	0.027	0.033	0.154
48 Sumac	*Rhus spp.*	Root	NV	6.64	4.31	11.56	31.57	32.9	5.37	309.8	103.2	18	557.6	2.399	2.441	NV
36 Raspberry	*Rubus spp.*	Berry (Raw)	57	85.6	1.01	0.19	12.9	50.9	0.35	16	27	0.45	156	NV	NV	NV
28 Elderberry	*Sambucus canadensis*	Berry (Raw)	73	79.8	0.66	0.5	18.4	7	0.64	38	39	1.6	280	0.07	0.06	0.5
3 Chokeberry/Aronia Berry	*Aronia arbutifolia*	Berry (Dried)	375	NV	0.7	0.14	83.3	25	NV	167	NV	3	NV	NV	NV	0.3
40 Grape	*Vitis spp.*	Berry (Raw)	67	81.3	0.63	0.35	17.2	0.9	0.57	14	10	0.29	191	0.092	0.057	0.3
Medicinal/Remedy																
7 Nightshade Family	*Solanaceae*															
1 Mountain Ash	*Sorbus americana*															
106 Pokeweed	*Phytollaca americana*															
7 Cinquefoil	*Potentilla spp.*															
1 Honeysuckle	*Lonicera spp.*															
2 Spicebush	*Lindera benzoin*															
1 Witch Hazel	*Hamamelis virginiana*															
72 Bunchberry	*Cornus canadensis*															
Nutritional Values Per Pit Based on Archaeological Evidence																
Common Name	**Scientific Name**	**Part analyzed**	**kCal/100g**	**Water (%)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamin (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
Cache Pit 5-30L																
5 Black Cherry	*Prunus serotina*	Berry (Raw)	315.00	411.00	5.30	1.00	80.00	10.50	2.40	65.00	105.00	1.80	1110.00	0.14	0.17	0.77
1 Sumac	*Rhus spp.*	Root	NV	6.64	4.31	11.56	31.57	32.90	5.37	309.80	103.20	18.00	557.60	2.40	2.44	NV
1 Elderberry	*Sambucus canadensis*	Berry (Raw)	73.00	79.80	0.66	0.50	18.40	7.00	0.64	38.00	39.00	1.60	280.00	0.07	0.06	0.50
5 Grape	*Vitis spp.*	Berry (Raw)	335.00	406.50	3.15	1.75	86.00	4.50	2.85	70.00	50.00	1.45	955.00	0.46	0.29	1.50
14 Raspberry	*Rubus spp.*	Berry (Raw)	798.00	1198.40	14.14	2.66	180.60	712.60	4.90	224.00	378.00	6.30	2184.00	NV	NV	NV
Medicinal/Remedy																
7 Pin Cherry	*Prunus pensylvanica*															
5 Nightshade Family	*Solanaceae*															
1 Bunchberry	*Cornus canadensis*															
Cache Pit 9-20L																
1 Corn/Maize	*Zea mays*	Kernels	386	8.1	9.88	5.22	74.9	NV	1.86	15	337	1.92	511	0.2	0.068	3.3
3 Black Cherry	*Prunus serotina*	Berry (Raw)	189	246.6	3.18	0.6	48	6.3	1.44	39	63	1.08	666	0.081	0.099	0.462
1 Sumac	*Rhus spp.*	Root	NV	6.64	4.31	11.56	31.57	32.9	5.37	309.8	103.2	18	557.6	2.399	2.441	NV
2 Grape	*Vitis spp.*	Berry (Raw)	134	162.6	1.26	0.7	34.4	1.8	1.14	28	20	0.58	382	0.184	0.114	0.6
Medicinal/Remedy																
4 Bunchberry	*Cornus canadensis*															
Cache Pit 17-12L																
62 Beechnut	*Fagus grandifolia*	Nut	35712	409.2	384.4	3100	2077	NV	229.4	62	NV	152.52	63240	18.848	23.002	54.374
7 Black Cherry	*Prunus serotina*	Berry (Raw)	441	575.4	7.42	1.4	112	14.7	3.36	91	147	2.52	1554	0.189	0.231	1.078
48 Sumac	*Rhus spp.*	Root	NV	318.72	206.88	554.88	1515.36	1579.2	257.76	14870.4	4953.6	864	26764.8	115.152	117.168	NV
36 Raspberry	*Rubus spp.*	Berry (Raw)	2052	3081.6	36.36	6.84	464.4	1832.4	12.6	576	972	16.2	5616	NV	NV	NV
28 Elderberry	*Sambucus canadensis*	Berry (Raw)	2044	2234.4	18.48	14	515.2	196	17.92	1064	1092	44.8	7840	1.96	1.68	14
3 Chokeberry/Aronia Berry	*Aronia arbutifolia*	Berry (Dried)	1125	NV	2.1	0.42	249.9	75	NV	501	NV	9	NV	NV	NV	0.9
40 Grape	*Vitis spp.*	Berry (Raw)	2680	3252	25.2	14	688	36	22.8	560	400	11.6	7640	3.68	2.28	12
Medicinal/Remedy																
7 Nightshade Family	*Solanaceae*															
1 Mountain Ash	*Sorbus americana*															
106 Pokeweed	*Phytollaca americana*															
7 Cinquefoil	*Potentilla spp.*															
1 Honeysuckle	*Lonicera spp.*															
2 Spicebush	*Lindera benzoin*															
1 Witch Hazel	*Hamamelis virginiana*															
72 Bunchberry	*Cornus canadensis*															
Total Nutritional Value of all 3 Caches			46284.00	12065.60	511.53	3149.09	4628.80	2896.80	301.31	3333.00	3603.00	251.37	91978.00	25.81	27.98	89.48
Total Nutritional Value of 21 Caches (One more cache than count at the Ne-con-ne-pe-wah-se Site)			323988.00	84459.20	3580.71	22043.63	32401.60	20277.60	2109.17	23331.00	25221.00	1759.59	643846.00	180.65	195.89	626.39
Water Value Conversion: 100g=0.01L				844.592												
Human Daily Intake Requirements	**e-Stage Group**	**kCal/Sedentary**	**kCal/Active**	**Water (Liters)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Ash (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Potassium (milligrams)**	**Thiamin (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
Female	19-30 y	2000	2200	2.7	46	NV	130	25	NV	800	580	8.1	NV	0.9	0.9	11
Male	19-30 y	2600	2800	3.7	56	NV	130	38	NV	800	580	6	NV	1	1.1	12
Child	1-3 y	1000	1000	1.3	13	NV	130	19	NV	500	380	3	NV	0.4	0.4	5
	4-8 y	1200	1400	1.7	19	NV	130	25	NV	800	405	4.1	NV	0.5	0.5	6
Days of Nutrition at Current Value-Female		162	147	313	78	NV	249	811	NV	29	43	217	NV	201	218	57
Days of Nutrition at Current Value-Male		125	116	228	64	NV	249	534	NV	29	43	293	NV	181	178	52
Days of Nutrition at Current Value-Child 1-3 y		324	324	650	275	NV	249	1067	NV	47	66	587	NV	452	490	125
Days of Nutrition at Current Value-Child 4-8 y		270	231	497	188	NV	249	811	NV	29	62	429	NV	361	392	104
Total Familial Daily Nutritional Requirements		6800	7400	9	134	NV	520	107	NV	2900	1945	21	NV	3	3	34
Days of Nutrition at Current Value-Family of 4		48	44	90	27	NV	62	190	NV	8	13	83	NV	65	68	18

Table 7. Nutritional Values of Botanical evidence retrieved from the Ne-con-ne-pe-wah-se Site in Comparison with DRI to Determine Famine Timing Potential.

7. Archaeological Sites of the Great Lakes

Archaeological Site Seasonality

Something that will assist in the determination of the timing of famine is site seasonality. Determining the season of occupation of a site is not an easy task, but there are a few key things that can help determine when a site was occupied. Based upon the archaeological evidence recovered such as floral and faunal remains, one can begin to assess a potential season of occupation. Faunal remains are typically easier to interpret than floral remains. As mentioned above, turtle remains at a site would most likely not indicate a winter occupation, fish remains could be interpreted as any season since fish were typically smoked as a means of preservation, also fishing sites were chosen based on spawning season which occurred at different times for different species. There would however be evidence of the smoking process and the quantity of remains can determine a spawning site, which can help determine seasonality more accurately. Acorn remains usually, but do not necessarily, mean a fall occupation, even though that is the most common time of harvest. Acorn remains could be from any point as well due to storage and processing habits. To determine when a site was occupied, a thorough investigation of all remains collectively is necessary. Spring sites offer a chance to analyze the period directly after the most common point of famine. Through these sites we can gain a sense of possible famine food usage through the macro-botanical remains of specific famine foods. Winter sites, though more rare, also offer the chance to analyze specific macro-botanical remains. The storage caches mentioned above are also a good place to analyze macro-remains for evidence of seasonality. Summer and Fall sites, while not obliquely relevant to famine, do offer an opportunity to infer the procedures used in preparing for winter, i.e. the harvest and processing in preparation for storage. In the next section, we will analyze several archaeological sites, some with known seasons of occupation, as both a way to try and infer potentiality of famine, and to highlight the methods undertaken to gather paleoethnobotanical data.

Archaeological Site Analysis

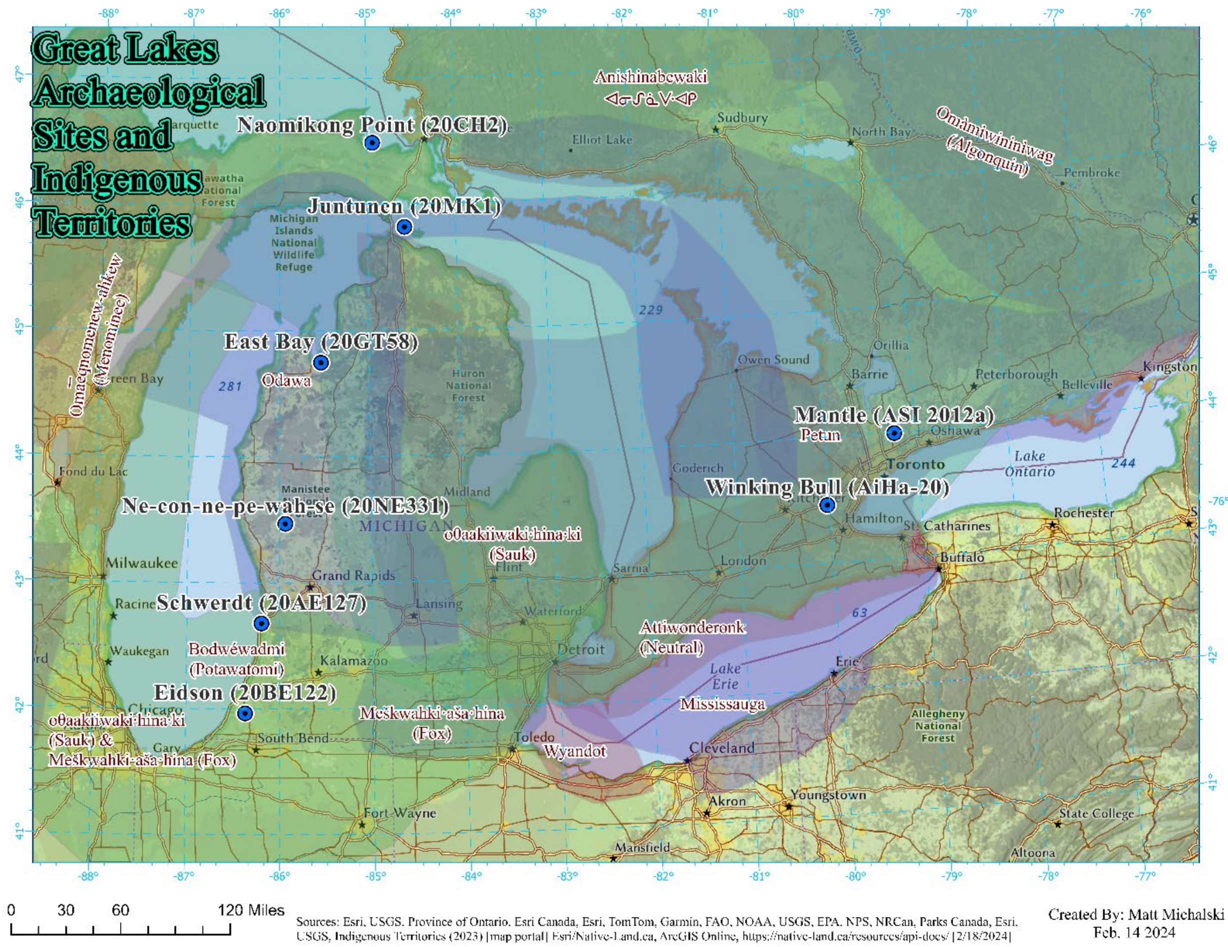

Figure 2. Map of Great Lakes Archaeological sites profiled below as well as territories of Great Lakes Indigenous groups.

Appendix I shows the list of Great Lakes archaeological sites analyzed with the botanical remains found at each site. While many sites on the table in Appendix I are in Michigan and

Canada, there are also a few sites from Ohio as well as one each from Pennsylvania and New York for contrast. Here, I will analyze several sites from Michigan and Ontario. These are two Great Lakes regions that could be considered comparable due to their latitude as well as the various habitation practices recorded for the period in this study. During the process of analysis, we will consider the procedures used and the archaeobotanical remains recovered for further study. I also attempted to determine the season of occupation if one was not already given. After the analysis, Table 8 shows the full scope of archaeobotanical remains recovered from each site listed below. The sites below are chosen to show how archaeological practices vary over time and in procedure. There is a distinct contrast between the sites that are excavated properly and those that are not in what they can tell us about subsistence practices of early communities.

The Schwerdt site (20AE127) was originally mapped in 1976 during the Kalamazoo Basin Survey Project. Dr. William Cremin undertook the first series of excavations the following year. In 1979, excavations continued revealing 46 cultural features of which 40 were recorded as pits. Radiocarbon dating of two of the features placed the occupation of the site to around 1420-1422 CE. Faunal assemblage analysis determined the site was situated as a spring-spawning sturgeon location. The Schwerdt site is a prime example of how to appropriately excavate and plan for future analysis. "167 samples totaling 2,534 liters of feature fill were processed…Entire zones were removed as flotation samples to ensure adequate data recovery" (Walz. 1991). Due to the thorough excavation practices of Cremin and the team, the resulting botanical remains were well reported. American Lotus (*Nelumbo lutea*) and Bog Arum (*Calla palustris*) were two species found that fall into the famine category and this site was determined to be a spring occupation by Cremin and his team. At least 27 species were found at the site that span a range of flowering seasons indicating a potential for dried foods (Walz. 1991). Unfortunately, this site is an example of one that has not mentioned the importance of a species as 'culturally significant'. While many of the species that were analyzed had great emphasis placed on them, such as *Nelumbo lutea, Calla palustris* is not recorded within the analyzed Schwerdt pits, though it is well-documented as a famine food.

Winking Bull (AiHa-20) is a site in the Mountsberg locality of Ontario. It was determined to be a Middleport site occupied by the Iroquois sometime between 1350-1400 CE. Mountsberg is located west of Crawford Lake, an area with extensive research conducted due to the abundance of botanical remains recovered from the lake sediment. After the initial sediment survey of Crawford Lake and the subsequent evidence was analyzed, many Iroquoian villages were located nearby (Ekdahl, et al. 2004). Winking Bull is one of these sites and contains 17 different botanical species, not including recovered arboreal evidence. Through the species encountered, the site could easily be considered a late Spring, Summer, or even Fall occupation. Maize (*Zea mays),* Beans (*Phaseoulus vulgaris),* Squash (*Cucurbita pepo*), Purslane (*Portulaca oleracea*), Goosefoot (*Chenopodium* spp.), Grape (*Vitis* spp.), and Strawberries (*Fragaria virginiana*) were all present. Goosefoot seeds are on average 1mm in diameter and thus easy to miss if improperly excavated. The vast array of botanical material recovered gives us an indication of not just what they were eating but how they acquired it and how they processed it as well. Winking Bull is another example of a site that was carefully excavated using proper procedures and the abundant archaeobotanical material can tell us much about the people that inhabited the area (Finlayson. 1998).

The East Bay site (20GT58) is located in the Grand Traverse Bay area of Michigan's lower peninsula. Determined to have occupations during the Middle Woodland and Early Late Woodland periods, it was initially excavated in 1981 and again between 1990 and 1992 for the Michigan Department of Transportation and the Federal Highway Administration as part of the Rails to Trails program which converts abandoned logging railroads into hiking and biking trails. East Bay is a roughly 4-acre site and assemblage analysis placed occupation of the site from ca. 400-1100 CE. Unfortunately, due to commercial development, only small areas of the site were still intact upon final excavations. These excavations were "limited to a narrow 15 ft to 30 ft wide strip." Though the size of the site was limited, the excavation was well-executed. Soil samples of 10L were taken from each 1m² unit. All samples were then processed and,

> The results of the flotation from 20GT58 were somewhat disappointing, but nonetheless, still informative. The Most abundant and ubiquitous artifact type represented in the flotation samples were small cinders originating from the adjacent railroad line. The distribution of samples containing the small cinders clearly indicated that contamination of the prehistoric deposits with modern materials associated with the Michigan Northern railroad line through the site was more extensive than indicated by the field-collected historic artifacts. This cast into doubt the association of the small amount of carbonized floral and faunal material present in the flotation samples with the prehistoric occupation of the site. As a result, it was decided that formal analysis of the small floral assemblage was not warranted (Hambacher, *et al*. n.d.).

Due to the nature of the site location, the surrounding commercial development, and the resulting lack of quantifiable material, the remains recovered from flotation were minimal. The East Bay site is a prime example of well executed archaeology without the botanical material present to properly assess the subsistence of the people who inhabited the site (Hambacher, et al. n.d.).

The Mantle Site (ASI 2012a), located on the Niagara peninsula overlooking Lake Ontario was first documented in 2002. After surface collections recovered 18,000 artifacts, and the outer extent of the site was located;

> …excavations resulted in the documentation of ninety-eight longhouses, one large midden feature on the slope adjacent to the creek, a multirow perimeter palisade that was constructed in three separate phases, and a linear trench midden situated parallel to the late phase palisade. More than 150,000 artifacts, 60,000 individual palisade and house posts, and over 1,500 features were recorded (Birch & Williamson. 2013).

This evidence allowed the principal investigators to separate the occupation into two periods. The Early Village, inhabited ca. 1500 CE with an estimated population of 1730, and the Late Village, inhabited ca. 1530 CE with an estimated population of 1338. Due to the sheer quantity of archaeological material recovered, a detailed snapshot of subsistence practices could be generated through the analysis of the archaeobotanical material. While many common items such as maize (*Zea mays)*, squash (*Cucurbita spp.)*, sunflower (*Helianthus anuus),* and sumac (*Rhus spp.)* were noted, the only two references made to winter were the large amount of berry seeds discovered within the longhouses, and the discovery of a large quantity of cattail (*Typha latifolia*). The investigators imply that the quantity may have been due to winter storage. Though more structure could have been given to the data obtained regarding the archaeobotanical material, the subsequent analysis of the evidence and interpretation of such makes this all-season site an example of one that was well excavated (Birch & Williamson. 2013).

The Naomikong Point Site (20CH2) is located in the Upper Peninsula of Michigan roughly 46 km west of Sault Ste. Marie. Excavated in the late 1960s by Donald Janzen, most of the material recovered was in the form of ceramics and lithics. The original site report shows no mention of the recovery of archaeobotanical material, just a small section of modern flora of the region. The initial, single, uncalibrated ^{14}C date recovered in Janzen's excavation was returned as "AD 430 ± 400." This large error made dating difficult, but thanks to the typology of the ceramics, the occupation was determined to be Middle Woodland (Janzen. 1968). It wasn't until 2016 when Susan Kooiman conducted residue analysis on ceramics that some information was able to be gathered regarding plant usage. Though no specific species was determined through the analysis, the composition of lipids showed evidence of both animal and plant content. The results also showed that of the vessels analyzed, nut oil and fish oil were likely not contained in the residues, which is surprising due to the consistent evidence from other sites in the region having an abundance of both (Kooiman. 2016). Naomikong is a prime example of a lack of thorough excavation and reporting which required further analysis more than 50 years later.

The Juntunen Site (20MK1) is an example of a site in the early years of flotation that recorded archaeobotanical material extensively. This site was not utilizing flotation though.

Situated on the northern tip of Bois Blanc Island in Mackinac County, Michigan, the Juntunen site was originally discovered in 1932 and extensive excavations were conducted from 1960-1963 by the University of Michigan. With multiple occupations ranging from 800 CE -1400 CE, Juntunen displays a large range of subsistence practices (McPherron. 1967). Richard Asa Yarnell oversaw analyzing the archaeobotanical material. He describes painstakingly hand sorting all samples to identify any potential plant remains. His patience and hard work paid off and he recorded many native plants that were common foods of the region. Plants that were noticeably different than the usual taxa identified throughout the region are Bearberry (*Arctostaphylos uva-ursi*), Sumac berry (*Rhus typhina*), Dock/Sorrel (*Rumex* spp.), and an unidentified tuber. The unidentified tuber is intriguing since many tubers were indeed utilized in times of famine. Labeled as a Summer site, the inhabitants would therefore most likely have been utilizing the surrounding environment to prepare for the winter. The Juntunen site is well excavated and recorded and site shows that even prior to modern techniques, a multitude of information can still be gathered properly (Yarnell. 1964).

The final site I will analyze is the Eidson Site (20BE122), located in Berrien County, MI. This site was chosen to be analyzed not due to the inaccuracy of excavation, but due to the fact that sometimes, things are just out of our hands. Identified prior to 1948 as an Adena-Hopewell site, it was said to originally have been excavated by the Southwest Chapter of the Michigan Archaeological Society. No site name was given at the time, and only lithics were reported. Elizabeth Garland and William Mangold were tasked with surveying the site in 1980 prior to the construction of US 31. Described as a 20-acre site with several "hot spots," the only known archaeological material was in the possession of the landowner. No concentrations were able to be rediscovered by Garland and Mangold, nor did any surface surveys find anything worth opening test units. “One retouched flake and a small side-notched point” (Garland & Mangold. 1980), were the only artifacts recovered during their survey. A large cache of what were identified as Late Archaic projectile points was at that time in the possession of the landowner. With much research and several surface surveys, Garland and Mangold were unable to locate the original site. This was not an instance of improper excavation but an unfortunate aspect of archaeology that can sometimes occur (Garland & Mangold. 1980).

Great Lakes Region Archaeological Sites with Associated Paleoethnobotanical Remains								
Site Name	**Site#**	**Period**	**Phase/Tradition**	**Season of occupation**	**Botanical remains (as reported)**	**Year(s) excavated**	**Location**	**Citation**
Schwerdt	20AE127	Pre-Contact	Upper Mississippian/ Oneota, Berrien	Spring	Raspberry/blackberry (*Rubus* spp.), Flowering dogwood (*Cornus florida),* Hawthorne (*Crataegus* spp.), Greenbriar (*Smilax hispida),* Cherry (unknown species)(*Prunus* spp.), Sunflower (*Helianthus annuus),* Blueberry *(Vaccinium* spp.), Grape (*Vitis* sp.), American Lotus (Tuber)(*Nelumbo lutea),* Beechnut (*Fagus grandifolia),* Hazelnut, (*Corylus americana),* Walnut or Butternut (*Juglans* spp.), Acorn (*Quercus* spp.), Buckthorn (*Rhamnus alnifolium*), Chokeberry (*Aronia* sp.), Bog Arum (*Calla palustris),* Black Mustard (*Brassica nigra)* , Copperleaf (*Acalypha* sp.), Jack-in-the-pulpit (*Arisaema triphyllum)* , Mayapple/American mandrake (*Podophyllum peltatum*), Nightshade (*Solanum* sp.), Tumble mustard *(Sisymbrium altissimum*), Whiteflower leafcup (*Polymnia canadensis*), Hackberry (*Celtis occidentalis)* , Sedges (C*yperaceae), Grasses (Gramineae)* , Daisy family (C*ompositae/Asteraceae*)	1977-1979	Allegan County, MI	*Walz, Gregory. R. (1991). The Paleoethnobotany of Schwerdt (20AE127): An Early Fifteenth Century Encampment in the Lower Kalamazoo River Valley, Kalamazoo MI: Western Michigan University Master's thesis*
Winking Bull	AiHa-20	Middle Woodland, Late Woodland	Middleport		Corn (Zea mays), Bean (Phaseolus vulgaris), Squash (Cucurbita pepo), Sunflower (Helianthus annuus), Tobacco (Nicotiana spp.), Sumac (Rhus spp.), Raspberry (Rubus spp.), Strawberry (*Fragaria virginiana*), Purslane (Portulaca oleracea), Bush Honeysuckle (Diervilla lonicera), Elderberry (Sambucus spp.), Gooseberry (Ribes spp.), Goosefoot (Chenopodium spp.), Nightshade (Solanum nigrum), Grape (Vitis spp.), Pin cherry (Prunus pennsylvanica)		Mountsberg Locality, Ontario	*Finlayson, William D. (1998). Iroquoian Peoples of the Land of Rocks and Water A.D. 1000-1650: A Study in Settlement Archaeology (pp. 91-176). London ON: London Museum of Archaeology.*
East Bay	20GT58	Middle Woodland	Lake Forest	unknown	None, Minimal, not reported	1990-1992	Grand Traverse County, MI	*Hambacher, Michael J., Duham, Sean B., & Branstner, Mark C. (n.d.). Archaeological Investigations at the East Bay Site (20GT58). The Michigan Archaeologist 58: 1-203*
Mantle	ASI 2012a	Pre-Contact	Wendat	All season	558g Corn kernel, 69g cob (*Zea mays*),[<1g; Common bean *(Phaseolus vulgaris*), Squash (*Cucurbita pepo*), Tobacco (*Nicotania rustica*)], 3g Sunflower (*Helianthus annuus)* , Bramble (*Rubus* sp.), Strawberry (*Fragaria* sp.), Cattail (*Typha latifolia*), Sumac seed (*Rhus typhina*), Chenopod (*Chenopodium* sp.), Spikenard (*Aralia* sp.), A small grass (cf. *Echinochloa*), Purslane (*Portulaca oleracea*), Black nightshade (*Solanum americanum*), Hawthorn (*Crataegus* sp.), Canada plum (*Prunus* sp.), Ironwood (*Carpinus caroliniana*), Erect knotweed (*Polygonum erectum*), Pincherry (*Prunus pensylvanica*), Cleavers (*Galium aparine*), Delta seed (*Leucadendron* sp.), Grape (*Vitus labrusca*), Peppergrass (*Lepidium virginicum*), Knotweed/Sedge (*Carex* sp.), Amaranth (*Amaranthus retroflexus*), Barnyard grass (*Echinochloa crus-galli*), Pokeweed (*Phytolacca americana*), Serviceberry (*Amelanchier arborea*), [Charcoal: Maple (*Acer saccharum*), Beech (*Fagus grandifolia*), Ash (*Fraxinus* sp.), Elm (*Ulmus americana*), Ironwood (*Ostrya virginiana*), white pine (*Pinus strobus*), Cedar (*Thuja occidentalis*), Red and White Oak (*Quercus rubra* and *Q. alba*)	2003-2005	Ontario, Canada	*Birch, Jennifer & Williamson, Ronald F. (2013). The Mantle Site: An Archaeological History of an Ancestral Wendat Community. : AltaMira Press*
Naomikong Point	20CH2	Middle Woodland	Lake Forest		Conifer (*Pinophyta* spp.), (Ceramic residue analysis points to animal fat and plant content. It also indicates likely not nut oil nor fish due to lipid signatures. Vessels were concluded to have been utilized for multiple species. (Kooiman 2012))	1966-1967	Chippewa County, MI	*Janzen, Donald E. (1968). The Naomikong Point Site and Dimensions of Laurel in the Lake Superior Region University of Michigan University Museum of Anthropology, Anthropological Papers, No. 36; Kooiman, Susan M. (2016). Woodland Pottery Function, Cooking, and Diet in the Upper Great Lakes of North America. Midcontinental Journal of Archaeology, 41(3), 207–230. https://doi.org/10.1080/01461109.2016.1198876*
Juntunen	20MK1	Late Woodland, Pre-Contact	Upper Mississippian/ Oneota	Summer	Birchbark (*Betula Papyrifera*), Hazelnut (*Corylus rostrata*), Corn (*Zea mays*), Fire Cherry (*Prunus pennsylvanica*), Blackberry (*Rubus* spp.), Cleavers (*Galium* spp.), Elderberry (*Sambucus pubens*), Unidentified tuber, unidentified large seed, Chenopod (*Chenopodium* spp.), Bearberry (*Arctostaphylos uva-ursi*), Sumac berry (*Rhus typhina* ?), Beechnut (*Fagus grandifolia*), Acorn (*Quercus* spp.), Pepperoot (*Dentaria laciniata*), Cherry (*Prunus* spp.), Canada Plum (*Prunus nigra*), Grape (*Vitis* spp.), Blueberry (*Vaccinium* sp.), Dock/Sorrel (*Rumex* spp.)	1960, 1961	Mackinac County, MI	*McPherron, Alan. (1967). The Juntunen Site and the Late Woodland Prehistory of the Upper Great Lakes, University of Michigan Museum of Anthropology, Anthropological Papers No. 30, Ann Arbor.; Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Eidson	20BE122	Middle Woodland	Norton		None Collected	1980	Berrien County, MI	*Garland, Elizabeth, & Mangold, William (1980).1-Final Report of the Archaeological Site Examination of the Proposed Route of U.S. 31, Matthew Road to I-94, Berrien County, Proposed Route. : Western Michigan University Department of Anthropology, Technical Report No 1.*
Middle Woodland=300 BCE-600 CE; **Late Woodland**=600 BCE-1400 CE; **Pre-Contact**=1400 CE-1600 CE; **Contact**=1600-1800; **Modern**=1800-Present								

Table 8. Archaeological sites analyzed.

8. Future Archaeology: Site Collection, Methods of Analysis, and the Importance to Subsistence

Since the inception of flotation in the 1960's, the technology, methods, and procedures available to archaeologists has increased dramatically. In the past 60 years we have seen the advent of stable isotope analysis as well as the use of X-Ray fluorescence and electron microscopy to analyze materials. Various dating methods have also been developed such as Optically Stimulated Luminescence (OSL) and Thermoluminescence (TL), as well as many others which have allowed for more precise dating to be achieved. Even dental calculus analysis has seen a greater range of usage. In fact, dental calculus analysis within ossuaries throughout the Great Lakes region has yielded interesting results concerning the diet and habits of indigenous populations. In Southern Ontario, Schwarcz et al. utilized stable isotopes on nine sites representing 13 different occupations from 2300 BCE to 1636 CE. They discovered that the ^{13}C ratios analyzed in the bone collagen indicated that levels of C_4 found were evidence of Corn (*Zea mays*) in the diet of the individuals analyzed. Their results altered the original hypothesis of when corn arrived as a cultigen (Schwarcz, et al. 1984). Through strontium and other stable isotopes, we can gain a better understanding of when maize agriculture took root and how that affected overall populations. We know that the adoption of maize was not uniform across time and space and the results from these types of analyses can help us infer where and when the transition occurred. Pathological analysis of bones can also lend information on past diets. In 1984, Susan Pfeiffer published an article regarding the Uxbridge Ossuary. Located east of Toronto, it has an uncalibrated radiocarbon date of 1490 ± 80 CE. Of the 457 estimated individuals interred, roughly 5% were observed to contain lytic lesions consistent with tuberculosis. Tuberculosis is typically found in unhygienic environments with lack of proper nutrition (Pfeiffer. 1984). Understanding the frequency of tuberculosis throughout the Great Lakes region could help pinpoint potential famine prone areas. With dental calculus, analyzing what is essentially calcified plaque can yield not only trace amounts of DNA from the individual, but also phytoliths, pollen, and other material that can be studied through stable isotope analysis. Calculus can also potentially give us clues to starvation through ketone bodies produced during these periods. When humans experience prolonged periods of starvation, the body produces ketone bodies that are transferred throughout the bloodstream. These ketone bodies are also water-soluble and can be exhaled. The exhalation of ketone bodies can potentially be deposited on plaque, coating the teeth (Owens, *et al.* 1983). Through these types of analyses, archaeologists can reconstruct past dietary patterns of certain groups. Also, according to Salazar (2023), analyzing dental calculus is potentially a less destructive way to perform tests of this nature without risking damage to bone and is a respectful way to conduct research on indigenous skeletal remains without damaging the remains as plaque is deposited from outside sources. Another useful method of tracking human migratory patterns and living conditions is in a small subfield of archaeology called Archaeoparasitology or Paleoparasitology. This field studies parasite-host relationships through remains recovered from coprolites, latrine sediments, or even sediment from the stomach area of human burials (Bouchet, *et al.* 2003). With all of these variations in analysis methods, there is a wealth of information that can be learned from the material we excavate.

Collection and Analysis

In order to properly account for archaeobotanical evidence and to understand as many aspects as possible of what has been excavated, the associated material collected should be thoroughly examined for traces of all potential botanical taxa. Properly obtaining multiple soil samples from each unit in the order of 10L increments allows for enough material to be analyzed. Obtaining more than one sample per unit allows for present and future analysis. As mentioned above, the last 60 years has brought about much change in the technology and techniques utilized to analyze archaeological material and it is safe to assume that in another 60 years there will be yet undeveloped methods to analyze soil samples for archaeobotanical remains that can ensure we retrieve more material. Once macro-remains have been identified, it is essential to report everything. We see an example of this from the Elam Site (20AE195), a Mississippian site in southwest Michigan. Poison Ivy (*Toxicodendron radicans*) was found and reported amongst the archaeological material. This was the only time this species was reported within the sites analyzed for this thesis even with the prevalence of poison ivy throughout the environment. An unknown *Fabaceae* was also found at the Elam site (DeRoo. 1991), while this could be the common bean (*Phaseolus vulgaris)*, the lack of corn (*Zea Mays),* which usually occurs with beans, could indicate the unknown *Fabaceae* could simply be one of any number of flowers in the *Fabaceae* family that are native to the Northeastern United States. Knowing the whole story allows archaeologists to properly infer the potential settlement-subsistence strategies of a particular site and, while not always possible, determining all plant species present can help determine local flora of the period of occupation, allowing us to determine which plants were local and which may have been transported to the site. If specific food plants were transported to a site, this is a good indicator of storage practices. This can also indicate the mobility of the people that occupied the site and give us a base point to infer their seasonal subsistence practices. Knowing specific species can also give us a rough estimate of the time period based on point of origin. Certain plants were introduced as animal fodder from Europe only after the arrival of the Europeans for instance, clues such as these can give us a starting point in our investigation.

Quantity of macro-remains can be a very important indicator to the purpose of a site as well. If there are very few archaeobotanical remains, an inference can be made that the duration of occupation was most likely relatively short. In contrast, the presence of large amounts of macro-remains could indicate many things, including but not limited to, multi-family occupation, extended duration occupation, or even feasting. Of course, the context of the surrounding artifacts and the contexts they are recovered from are just as important, if not more important, as the quantity of archaeobotanical remains excavated.

Conducting a thorough investigation of the local flora, both past and present, is also a crucial step in determining the purpose of occupation. Through this type of analysis, a view of the landscape can be drafted to understand which plants are native to the area and why the macro-remains found are relevant to the overall scope of the site. It is important to understand the local fauna as well to gain a basic understanding of which animals may transport the local flora to and from the site. Again, gathering the information and evidence from across a site is pertinent to gaining as close to a complete understanding as possible through the evidence collected at an archaeological site. With this information, a clearer inference can be made as to the practices of the inhabitants of the site.

9. Discussion

Upon beginning this research, the general thought was to create a list of famine foods that may be overlooked during excavations. The intent was to look through a series of excavations throughout the years to pinpoint archaeobotanical remains that were discounted and labeled along the lines of "no known value," or "not subsistence related." The subsequent analysis uncovered a wide array of variation in collection procedures, a distinct focus during excavations on a specific goal, whether that be pottery, faunal remains, or lithics, and the complete omission of anything that did not fit the narrative. This occurred most often prior to the 1970's, which can be explained in part by the lack of flotation as well as unfortunately a lack of general interest in botanical remains. As the 1980's and 1990's approached, the overall meticulousness of archaeological site collection techniques and standards increased significantly. This allowed for a much clearer understanding of subsistence and mobility practices through the analysis of the recovered evidence. What we still need to do though, is to revisit our questions from earlier. Can we answer any with the information we now have?

As we have now gained the understanding that many of the native groups in the Great Lakes would spend the Summer in larger communities and separate to smaller hunting land during the winter, can we now infer that there might be a decrease in local resources? Is there a chance that the seasonal shift in living situations for many of these Great Lakes communities altered the landscape enough to decrease the production of storable resources? Analysis of archaeobotanical material as well as isotopic analysis can help us determine whether this was the case. Through analyzing the calculus of human teeth, we can determine where a person grew up as well as the environmental conditions they endured, the foods consumed, (Stutz. 2002) and whether starvation played a role in their lives (Owen, *et al.* 1983). While this doesn't necessarily mean that they stayed where they grew up their entire life, it is a starting point. This analysis can help us understand their early life diet and allows us to compare with the archaeobotanical material recovered. The results of these analyses can help us determine the potentiality of plant variation from site to site.

Another question I asked was, what climate factors affected the growing seasons and thus their ability to potentially store enough food to last the winter? This is a question that has a different answer for different time periods. Through archaeobotanical analysis, we can determine the maturity level of the plants stored. This means that since the archaeobotanical remains are a snapshot of the moment they were preserved, we should be able to infer the maturity level of the plant that produced them. If we couple these results with either dendrochronology-or the study of tree rings as both a dating and climatological analysis method (Dean. 1997)- records or speleothem records, we can better learn how climate may have altered the maturity, growth, and therefore storability of a season's harvest. Speleothems, or mineral deposits such as stalagmites or stalactites, have recently piqued the interest of archaeologists not only because of their ability to be utilized in Uranium dating or their record of past climates when near cave entrances, but also because of their ability to capture pollen during formation. This helps archaeologists analyze local flora at specific periods in time (McGarry, Caseldine. 2004). As mentioned above, the 40-year period between 1610 and 1650 CE was exceptionally cold with higher-than-average precipitation (Quinn and Sellinger. 2006). During this period, we can most likely infer that the summer growing periods were shorter, the yields were lower, and thus the plant foods would be less available. If climate didn't alter the ability to store food for the winter, then the potential for other factors to cause issues arose. Specifically, what pests may have elicited a detriment to already stored foods? Field mice are well known in the Great Lakes region, and it is safe to infer they would have wrought havoc on the stores of early communities given the opportunity. High faunal evidence, such as tooth marks or feces, coupled with low floral evidence, such as shells or seeds could be an indicator of this.

The nutritional requirements needed for each individual and how that related to the amount stored for winter survival is an important analysis in determining when famine would have occurred. While we can't necessarily know the exact quantities of each item eaten by every individual at each meal, having a base point for what the body requires and how the body can cope is an important step and having a proxy for groups that lived in the past is critical. We must also consider external societal factors such as raiding and trading, and how did those affect the ability to maintain proper levels of food throughout the winter season? The turmoil endured and inflicted upon one another throughout the region between many native groups, the Iroquois, the Wendot, the Neutral, the Erie, and many others, not to mention the Europeans, was extensive (Trigger. 1990, 1969). It is likely that a significant number of crops and winter stores were destroyed or stolen. The effect this had on the people was no doubt a detriment. We can see evidence of this archaeologically when we take the time to properly collect and analyze the data retrieved from an archaeological site. These data can even give us an indication of the societal requirements pertaining to the storage and procurement of food, which in turn, can show us how that plays a role in the amount of food stored for the winter. With this mountain of data, we can see the importance of this research.

10. Conclusion

Richard White, a Historian and the author of *In the Middle Ground: Indians, Empires, and Republics in the Great Lakes Region,* utilized both ethnographic and archaeological information to note that corn and fishing were among the most important aspects of subsistence in the Great Lakes, with the delicate balance of seasonal variation determining how hungry communities were over winter (White. 1991). This points to an interesting dynamic of productivity during the warm weather months. It also focuses on the order of importance in procurement for storage purposes.

Ultimately, through the analyses conducted within this thesis, several things have been determined. First, while early excavation procedures lacked the structure and disposition of large-scale sampling, we see an increase in the importance of these procedures diachronically. Second, full reporting of all botanical remains recovered is essential to proper site analysis in terms of subsistence. Third, the results of these analyses can help pinpoint a period at which famine may occur. Of course, to properly conduct these analyses, the development of a standardized online national database for the identification of Macro-remains would be ideal.

Certain scenarios such as Alexander Henry's voyage from Michilimackinac to Montreal in which a seemingly paltry quantity of rations was allotted can serve to inform us of just how important the choice of ration is. While corn and fat together may seem to hold enough nutrition, the overall caloric value indeed leaves a surplus, but a deficit in other valuable vitamins and minerals. This helps inform us that rations for voyages such as these were determined to provide as many necessary nutrients as possible so that only supplemental hunting and foraging were required to ameliorate any shortage in nutritional requirements.

We have also discovered through analyzing the results of a cache site that the usage of caches is crucial to combating famine, the quantity of caches per site coupled with other variables can help determine the point at which famine would occur. While 21 caches for a family of 4 may last half of the winter, the remainder of the families' subsistence still needs to be accounted for, either through storage within the home, additional cache pits, or through supplemental hunting as well as rare winter foraging. The concept of raiding and theft also plays a large role in the quantities preserved for use throughout the winter.

Why is knowledge of famine foods and the periods that utilized them important? This is a question that drove the initial research of this thesis. While many of us currently have no association with famine, it has been a regular part of life for most of human existence. Yes, there are still people in the world who suffer from daily hunger, but a majority of the planet does not. With the state of our climate, political upheaval, and numerous other factors, the probability of widespread famine in the future is not out of the realm of possibility. If we can learn from the way the people of the past utilized their natural world to combat this issue and how it in turn can allow for the continuation of our species were this to occur again in the future, the information would be crucial to survival.

11. References

Airaksinen, M.M, Peura, P., Ala-Fossi-Salokangas, L., Antere, S., Lukkarinen, J., Saikkonen, M., Stenbäck, F. (1986) Toxicity of plant material used as emergency food during famines in Finland, *Journal of Ethnopharmacology*, Volume 18, Issue 3, Pages 273-296

Anderson, M. (2011). *Plant Guide for small cranberry (Vaccinium oxycoccos)*. USDA-Natural Resources Conservation Service, National Plant Data Center. Greensboro, NC 27401.

Asch, D. L., & Asch, N. B. (1978). The Economic Potential of Iva annua and its Prehistoric Importance in the Lower Illinois Valley. *The Nature and Status of Ethnobotany*. Richard I Ford, Ed. *Anthropological Papers, Museum of Anthropology, University of Michigan*, *67*, 301-341. Ann Arbor, MI.

Ball, J. (1993). Ethnobotany, Land Use Patterns, and Historic Landscape Evaluation: Grand Island, Michigan. *Heritage Program Monograph* ed., Vol. 2. Washington D.C: United States Department of Agriculture.

Bellin, J. N. & Homann Erben. (1755) Partie occidentale de la Nouvelle France ou du Canada. [Nürnberg] [Map] Retrieved from the Library of Congress, https://www.loc.gov/item/73694802/.

Bhatta, S., Ratti, C., Poubelle, P.E. *et al.* (2018) Nutrients, Antioxidant Capacity and Safety of Hot Water Extract from Sugar Maple (*Acer saccharum* M.) and Red Maple (*Acer rubrum* L.) Bark. *Plant Foods Hum Nutr* 73, 25–33 . https://doi.org/10.1007/s11130-018-0656-3

Birch, J & Williamson, R. F. (2013). *The Mantle Site: An Archaeological History of an Ancestral Wendat Community*. : AltaMira Press

Blackbird, A. (1887). Andrew Blackbird, 1814-1908. In History of the Ottawa and Chippewa Indians of Michigan: a Grammar of Their Language, and Personal and Family History of the Author (pp. 1-3). Ypsilanti, MI: Ypsilantian Job Printing House

Bouchet, F., Harter, S., Le Bailly, M. (2003). The State of the Art of Paleoparasitological Research in the Old World. Memórias do Instituto Oswaldo Cruz. 98 Suppl 1. 95-101. https://doi.org/10.1590/S0074-02762003000900015.

Boyd, C. E. (1968). Fresh-Water Plants: A Potential Source of Protein. *Economic Botany*, *22*(4), 359–368. http://www.jstor.org/stable/4252996

Brose, D. S. (2016). *The Dunn's Farm Site; 20LU22 A Late Middle Woodland Event in Northwest Michigan*. : Imprints from the Past, LLC.

Brose, D. S. (1970). Summer Island III: An Early Historic Site in the Upper Great Lakes. *Historical Archaeology*, 4, pp3-33. https://www.jstor.org/stable/25615134.

Brose, D. S. (1970). The Archaeology of Summer Island: Changing Settlement Systems in Northern Lake Michigan *Anthropological Papers, Museum of Anthropology, University of Michigan*, No.*67*. Ann Arbor, MI: The University of Michigan.

Cremin, W. M. (Ed.). (1990). *Archaeological Investigations in the Lower Galien River Valley of Southwest Michigan*. : Western Michigan University: Archaeological Technical Report No.23, Kalamazoo MI.

Curtis, M. E. (1954). Folklore of Feast and Famine Among the Menomini. *Papers of the Michigan Academy of Science, Arts, and Letters*, *39*, 407-419. Ann Arbor, MI.

Dean, J.S. (1997). Dendrochronology. In: Taylor, R.E., Aitken, M.J. (eds) Chronometric Dating in Archaeology. Advances in Archaeological and Museum Science, vol 2. Springer, Boston, MA. https://doi.org/10.1007/978-1-4757-9694-0_2

DeRoo, B. D. (1991). Flotation data sampling strategies in archaeological research: An experiment at the Elam Site (20AE195), Allegan County, Michigan, Kalamazoo: (Master's thesis) Western Michigan University, Kalamazoo, MI.

Dilbone, M., Turner, N. J., & von Aderkas, P. (2013) Lodgepole Pine Cambium (*Pinus contorta* Dougl. ex Loud. var. *latifolia* Engelm. ex S. Wats.): A Springtime First Peoples' Food in British Columbia, *Ecology of Food and Nutrition*, 52:2, 130-147, doi:10.1080/03670244.2012.706013

Donchenko, L., Bityutskaya, O., & Glubokovskikh, J. (2020). Research of the Nutritional Value of Macrophytes of the Sea of Azov. *KnE Life Sciences*, 5(1), 371–378. doi:https://doi.org/10.18502/kls.v5i1.6089

Dunham, S. (2000, January). Cache Pits: Archaeology, Ethnohistory and Continuity of Tradition. *Interpretations of Native North American Life*. University Press, Florida.

Dunham, S. B. (2009). Nuts about Acorns: A Pilot Study on Acorn Use in Woodland Period Subsistence in the Eastern Upper Peninsula of Michigan. *The Wisconsin Archeologist*, 90

Dunham, S. B. (2014). *Late Woodland Settlement and Subsistence in the Eastern Upper Peninsula of Michigan* (Doctoral Dissertation). East Lansing MI: Michigan State University

Ekdahl, E. J., Teranes, J., Guilderson, T., Turton, C. L., McAndrews, J. H., Wittkop, C., Stoermer, E. F. (2004, August 5). A Prehistorical Record of Cultural Eutrophication from Crawford Lake, Canada. *Geology* 32, 9: 745-748.

Eksi Karaagac, H., Cavus, F., Kadioglu, B., Ugur, N., Tokat, E., & Sahan, Y. (2021). Evaluation of nutritional, color and volatiles properties of currant (Ribes spp.) cultivars in Turkey. *Food Science and Technology (Campinas)*, 41(2), Apr-Jun, doi:https://doi.org/10.1590/fst.29119

Ellis, C. J., & Ferris, N. (Eds.). (1990). *The Archaeology of Southern Ontario to A.D. 1650.* : Occasional Publications of the London Chapter, Ontario Archaeological Society Inc., Publication Number 5.

Esarey, M. E. (1991). *Socio-Economic Variation at American Forts in the Upper Great Lakes: An Archaeological Perspective from Fort Gratiot (1814-1879), Port Huron, Michigan* (Doctoral dissertation) East Lansing MI: Michigan State University

Eschman, D. F. (1985). Summary of the Quaternary History of Michigan, Ohio and Indiana. *Journal of Geological Education*, 33(3), 161-167. doi:https://doi.org/10.5408/0022-1368-33.3.161

Favorite, J. (2003) *American Red Raspberry, Rubus idaeus L*. USDA, NRCS. The PLANTS Database (http://plants.usda.gov, 12/20/2023). National Plant Data Team, Greensboro, NC USA

Fitting, J. E. (Ed.) (1968). The Prehistory of the Burnt Bluff Area. : *University of Michigan Museum of Anthropology Anthropological Paper* No. 34, Ann Arbor, MI.

Ford, Richard I. (Ed.). (1994). *The Nature and Status of Ethnobotany*, 2nd ed. *University of Michigan Museum of Anthropology Anthropological Paper* No. 67, Ann Arbor, MI. doi:https://doi.org/10.3998/mpub.11396367

Fritz, G., & Nesbitt, M. (2014). Laboratory Analysis and Identification of Plant Macroremains. Marston, J., d'Alpoim Guedes, J., Warinner C. (Eds.), *Method and Theory in Paleoethnobotany* (pp. 115-145). : University Press of Colorado, Denver CO.

Garland, E., & Mangold, W. (1980). 1-Final Report of the Archaeological Site Examination of the 1-Final Report of the Archaeological Site Examination of the Proposed Route of U.S. 31, Matthew Road to I-94, Berrien County, Proposed Route. *:* Western Michigan University Department of Anthropology, *Technical Report No 1.* Kalamazoo, MI.

Geological Survey of Canada (Ed.). (1989). *Geology of Canada*. Geological Survey of Canada.

Geyer, W. A., Broyles, P. J., Row, J. M. (2003) *Chokecherry, Prunus virginiana L.* USDA, NRCS. The PLANTS Database (http://plants.usda.gov, 12/20/2023). National Plant Data Team, Greensboro, NC USA

Gilmore, M. R. (1933). Some Chippewa Uses of Plants. *Papers of the Michigan Academy of Science, Arts, and Letters*, 17, pp 119-143. Ann Arbor, MI.

Hall, T. F., & Penfound, W. T. (1944). The Biology of the American Lotus, Nelumbo lutea (Wild.) Pers. The American Midland Naturalist, 31(3), 744–758. https://doi.org/10.2307/2421417

Halsey, J. R. (Ed.). (1999). *Retrieving Michigan's Buried Past: The Archaeology of the Great Lakes State* (Bulletin 64). Bloomfield Hills MI: Cranbrook Institute of Science.

Hambacher, M. J., Duham, S. B., & Branstner, M. C. (n.d.). Archaeological Investigations at the East Bay Site (20GT58). *The Michigan Archaeologist* 58: 1-203

Havard, V. (1895). Food Plants of the North American Indians. *Bulletin of the Torrey Botanical Club*, 22(3), 98. doi:https://doi.org/10.2307/2477757

Henry, A. (1809). *Travels and adventures in Canada and the Indian territories, between the years 1760 and 1776*. : J. Riley. https://archive.org/details/cihm_35677/page/n5/mode/1up?view=theater

Herron, S. M. (2002). *Ethnobotany of the Anishinaabek Northern Great Lakes Indians* (Doctoral Dissertation), Southern Illinois University at Carbondale. Carbondale, IL.

Higgins, S.N., Malkin, S.Y., Todd Howell, E., Guildford, S.J., Campbell, L., Hiriart-Baer, V. and Hecky, R.E. (2008), *An Ecological Review of Cladophora Glomerata (Chlorophyta) In the Laurentian Great Lakes*. Journal of Phycology, 44: 839-854. https://doi-org.proxy.lib.umich.edu/10.1111/j.1529-8817.2008.00538.x

Howey MCL, Sullivan FB, Tallant J, Kopple RV, Palace MW (2016) Detecting Precontact Anthropogenic Microtopographic Features in a Forested Landscape with Lidar: A Case Study from the Upper Great Lakes Region, AD 1000-1600. *PLoS ONE* 11(9): e0162062. https://doi.org/10.1371/journal.pone.0162062

Howell, P. D., Van der Pluijm, B. A. (1990) Early history of the Michigan basin: Subsidence and Appalachian tectonics. *Geology*; 18 (12): 1195–1198. doi:https://doi.org/10.1130/0091-7613(1990)018<1195:EHOTMB>2.3.CO;2

Janzen, D. E. (1968). The Naomikong Point Site and Dimensions of Laurel in the Lake Superior Region*, University of Michigan University Museum of Anthropology, Anthropological Papers, No. 36,* Ann Arbor, MI.

Jones, V. H. (1965). The Bark of the Bittersweet Vine as an Emergency Food Among the Indians of the Western Great Lakes Region. *The Michigan Archaeologist*, 11 (3-4).

Judprasong, K., Archeepsudcharit, N., Chantapiriyapoon, K., Tanaviyutpakdee, P., Temviriyanukul, P. (2018) Nutrients and natural toxic substances in commonly consumed Jerusalem artichoke *(Helianthus tuberosus L.)* tuber, *Food Chemistry*, Volume 238, Pages 173-179

Kays, S. J., & Nottingham, S. M. (2008). *Biology and Chemistry of Jerusalem Artichoke Helianthus tuberosus L* (pp. 1-6). : CRC Press, Boca Raton, FL.

Kellogg, L. P. (Ed.). (1917). *Early Narratives of the Northwest: 1634-1699*. : New York, NY: Charles Scribner's Sons

Kindscher, K., Martin, L., Corbett, S., Lafond, D. (2018). Nutritional Properties of Native Plants and Traditional Foods from the Central United States. *Ethnobiology Letters*, *9*(2), 214-227. https://www.jstor.org/stable/26607690

Kinietz, W. V. (1940). *The Indians of the Western Great Lakes: 1615-1760.*: University of Michigan Press. Ann Arbor, MI.

Knudson, M. (2010). *Plant guide for American black currant (Ribes americanum)*. USDA-Natural Resources Conservation Service, Plant Materials Center, Bismarck, ND.

Kooiman, S. M., Albert, R. K., & Malainey, M. E. (2022). Multiproxy Analysis of Adhered and Absorbed Food Residues Associated with Pottery. *Journal of Archaeological Method and Theory.* doi:https://doi.org/10.1007/s10816-021-09537-3

Kooiman, S. M. (2016). Woodland Pottery Function, Cooking, and Diet in the Upper Great Lakes of North America. *Midcontinental Journal of Archaeology*, 41(3), 207–230. doi:https://doi.org/10.1080/01461109.2016.1198876

Kulling, S. E., & Rawel, H. M. (2008). Chokeberry (Aronia melanocarpa) - A Review on the Characteristic Components and Potential Health Effects. *Planta Medica*, *9*. https://doi.org/10.1055/s-0028-1088306

Li, X., Ma, R., Zhang, F., Ni, Z., Thakur, K., Wang, S., Zhang, J. & Wei, Z. (2023) Evolutionary research trend of *Polygonatum* species: a comprehensive account of their transformation from traditional medicines to functional foods, *Critical Reviews in Food Science and Nutrition*, 63:19, 3803-3820, doi:10.1080/10408398.2021.1993783

Li, Y., Zhou, S., Zheng, X., Chu, Q. (2021) Apios Americana Medicus: A potential staple food candidate with versatile bioactivities, *Trends in Food Science & Technology*, Volume 112, Pages 735-75

Lovis, Jr., W. A. (1971, June). The Holtz Site (20AN26), Antrim Co., Michigan; A Preliminary Report. *The Michigan Archaeologist*, *17*(2).

Lovis, Jr., W. A. (2008). Revisiting the Johnson Site (20CN46): A Winter Camp in a Cedar Swamp on Mullett Lake, Michigan. *The Michigan Archaeologist*, *54*

Mahr, S. (2023). Solomon's Seal, Polygonatum spp. *Wisconsin Horticulture: Division of Extension*. Retrieved December 18, 2023, from https://hort.extension.wisc.edu/articles/solomons-seal-polygonatum-spp/

Mangold, W. L. (2009). *The Middle Woodland Occupations of the Kankakee River Valley and Beyond: The Goodall Tradition Revisited and Reinterpreted* (Master's thesis). Department of Anthropology, Indiana University

Mazza, G. (2005) Compositional and Functional Properties of Saskatoon Berry and Blueberry, *International Journal of Fruit Science*, 5:3, 101-120, doi: 10.1300/J492v05n03_10

McGarry, S. F., & Caseldine, C. (2004). Speleothem Palynology: An undervalued tool in Quaternary studies. Quaternary Science Reviews, 23(23–24), 2389-2404. https://doi.org/10.1016/j.quascirev.2004.06.007

McPherron, A. (1967). The Juntunen Site and the Late Woodland Prehistory of the Upper Great Lakes, University of Michigan Museum of Anthropology, *Anthropological Papers No. 30*, Ann Arbor, MI.

Merriam-Webster. (n.d.). In Merriam-Webster.com. Retrieved March 30, 2024, from https://www.merriam-webster.com/dictionary/famine

Minnis, P. E. (2021). *Famine Foods: Plants We Eat to Survive*. Tucson: University of Arizona Press

Monet, C. (1880). *Jerusalem Artichoke Flowers.* The National Gallery of Art. Washington D.C.

Mueller, N. G., Fritz, G., Patton, P., Carmody, S., and Horton, E. (Eds.). (2017) Growing the lost crops of eastern North America's original agricultural system. *Nature Plants* 3, 17092. doi:https://doi.org/10.1038/nplants.2017.92

National Academies of Sciences, Engineering, and Medicine; Health and Medicine Division; Food and Nutrition Board (NASEM). (2019) *Committee to Review the Dietary Reference Intakes for Sodium and Potassium*; Oria, M., Harrison, M., Stallings, V.A., (Eds.) Washington (DC): National Academies Press

Nesom, G. (2007) *American Hazelnut, Corylus americana Walt.*. USDA, NRCS. The PLANTS Database (http://plants.usda.gov, 12/20/2023). National Plant Data Team, Greensboro, NC USA

Nesom, G. (2002) *Nannyberry, Viburnum lentago L.,* USDA, NRCS. The PLANTS Database (http://plants.usda.gov, 12/20/2023). National Plant Data Team, Greensboro, NC USA

Ontario Biodiversity Council. (2021). State of Ontario's Biodiversity [web application]. Ontario Biodiversity Council, Peterborough, Ontario. Retrieved from http://ontariobiodiversitycouncil.ca/sobr

O'Regan, H. J., Lamb, A.L., & Wilkinson, D. M. (2016). The Missing Mushrooms: Searching for Fungi in Ancient Human Dietary Analysis. *Journal of Archaeological Science*, 75, 139–143. doi:https://doi.org/10.1016/j.jas.2016.09.009

Osilla, E.V., Safadi, A.O., Sharma, S. *Calories*. [Updated 2022 Sep 12]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK499909

Owen, O. E., Caprio, S., Reichard, G. A., Mozzoli, M. A., Boden, G., & Owen, R. S. (1983). Ketosis of starvation: A revisit and new perspectives. Clinics in Endocrinology and Metabolism, 12(2), 359-379. https://doi.org/10.1016/S0300-595X(83)80046-2

Ozker, D. (1982). An Early Woodland Community at the Schultz Site 20SA2 in the Saginaw Valley and the Nature of the Early Woodland Adaptation in the Great Lakes Region. *Anthropological Papers No. 70,* University of Michigan Museum of Anthropology, Ann Arbor MI, doi:https://doi.org/10.3998/mpub.11396356

Pearsall, D. M. (2000, 1989). *Paleoethnobotany: A Handbook of Procedures* (2nd ed.). Academic Press

Perera, G. (2004). *Antioxidant activity and nutritional values in fruits of viburnum lentago* (Master's Thesis). South Dakota State University. Brookings, SD.

Perrot, N. (1911). Indian Tribes of the Upper Mississippi and the Great Lakes Region. In E. H. Blair (Ed.), Vol. I (pp. 316-333). Cleveland: The Arthur H. Clark Company.

Pfeiffer, S. (1984). Paleopathology in an Iroquoian ossuary, with special reference to tuberculosis. *American Journal of Physical Anthropology 65, no. 2*: 181-189

Poddar, S., & Lederer, R. J. (1982). Juniper Berries as an Exclusive Winter Forage for Townsend's Solitaires. *The American Midland Naturalist*, *108*(1), 34–40. doi:https://doi.org/10.2307/2425289

Quimby, G. I. (1963, December). The Gros Cap Cemetery Site in Mackinac County, Michigan. *The Michigan Archaeologist*, *9*(4), 50-57. https://babel.hathitrust.org/cgi/pt?id=ien.35556009013152&seq=249

Quimby, G. I. (1962). A Year with a Chippewa Family, 1763-1764. *Ethnohistory*, *9*(3), 217–239. doi:https://doi.org/10.2307/480889

Quinn, F. H., & Sellinger, C. E. (2006). A Reconstruction of Lake Michigan–Huron Water Levels Derived from Tree Ring Chronologies for the Period 1600–1961. *Journal of Great Lakes Research*, 32(1), 29-39

Rautio, A., Norstedt, G., & Östlund, L. (2013). Nutritional content of scots pine inner bark in northern fennoscandia (Nutritional content of scots pine inner bark and ethnographic context of its use in northern fennoscandia). *Economic Botany*, 67(4), 363-377. doi:https://doi.org/10.1007/s12231-013-9254-3

Rynski, B. (2000). *The Metis--A Unique Culture Created by the Canadian-French Explorers and the Native American Woodland Peoples* (Master's thesis).

Salazar-García, D.C., Warinner, C., Eerkens, J.W., Henry, A.G. (2023). The Potential of Dental Calculus as a Novel Source of Biological Isotopic Data. In: Beasley, M.M., Somerville, A.D. (Eds.) *Exploring Human Behavior Through Isotope Analysis. Interdisciplinary Contributions to Archaeology*. Springer, Cham. doi:https://doi.org/10.1007/978-3-031-32268-6_6

Schulz, M., Freitas Chim, J. (2019) Nutritional and bioactive value of Rubus berries, *Food Bioscience*, Volume 31

Schwarcz, H. P., Melbye, J., Katzenberg, M.A., and Knyf, M. (1985) Stable isotopes in human skeletons of southern Ontario: reconstructing palaeodiet. *Journal of Archaeological Science* 12, no. 3, pages 187-206

Scott, E. M. (1991). *"Such Diet as Befitted his Station as Clerk:" The Archaeology of Subsistence and Cultural Diversity at Fort Michilimackinac*. (Doctoral Dissertation) Minneapolis, MN: University of Minnesota.

Sharif, M. (1986). The Concept and Measurement of Subsistence: A Survey of the Literature. World Development, 14(5), 555-577. https://doi.org/10.1016/0305-750X(86)90124-5

Sheahan, C.M. (2015). *Plant guide for Canadian serviceberry* (*Amelanchier canadensi*s). USDA-Natural Resources Conservation Service, Cape May Plant Materials Center, Cape May, NJ

Silbernagel, J., Martin, S. R., Landon, D. B., & Gale, M. R. (1998). Paleoethnobotanical Inquiry of Early Euro-American and Ojibwa Gardens on Grand Island, Michigan. *Northeastern Naturalist*, 5(3), 249. doi:https://doi.org/10.2307/3858624

Smith, B. A., & Egan, K. C. (1990). Middle and Late Archaic Faunal and Floral Exploitation at the Weber I Site (20SA581), Michigan. *Ontario Archaeology* 50: 39-54

Smith, S. G. (1967). Experimental and Natural Hybrids in North American Typha (Typhaceae). *The American Midland Naturalist*, *78*(2), 257–287. doi:https://doi.org/10.2307/2485231

Speth, J. D. (2017). Putrid Meat and Fish in the Eurasian Middle and Upper Paleolithic: Are We Missing a Key Part of Neanderthal and Modern Human Diet? *PaleoAnthropology*, 44-72

Spero, G. B. (1979). *The Allegan Dam Site: An Upper Mississippi Occupation in the Lower Kalamazoo River Basin*, (Master's thesis) Western Michigan University Department of Anthropology. Kalamazoo, MI.

Spinner, G. P., & Bishop, J. S. (1950). Chemical Analysis of Some Wildlife Foods in Connecticut. *The Journal of Wildlife Management*, *14*(2), 175–180. doi:https://doi.org/10.2307/3796328

Steckel, L.E., Sosnoskie, L.M., Steckel, S.J. (2019) *Common evening-primrose (Oenothera biennis L.).* Weed Technology. doi:10.1017/wet.2019.53

Stevens, M. (2023) *Common Milkweed Asclepias syriaca L*. USDA, NRCS. The PLANTS Database (http://plants.usda.gov, 12/20/2023). National Plant Data Team, Greensboro, NC USA

Stevens, M. (2023) *Groundnut Apios americana Medik*. USDA, NRCS. The PLANTS Database (http://plants.usda.gov, 12/20/2023). National Plant Data Team, Greensboro, NC USA

Stout, C. B. (1984). *A Distribution Analysis of the Cultural Materials from the Mushroom Site (20AE88), Allegan County, Michigan.* (Master's thesis) Kalamazoo MI: Western Michigan University

Stutz, A. J. (2002). *Pursuing Past Seasons: A Re-evaluation of Cementum Increment Analysis in Paleolithic Archaeology* (Doctoral dissertation) University of Michigan Department of Anthropology. Ann Arbor, MI

Struever, S. (1968). Flotation Techniques for the Recovery of Small-Scale Archaeological Remains. *American Antiquity*, 33(3), 353–362. doi:https://doi.org/10.2307/278703

Thwaites, R. G. (Ed.). (1896). *The Jesuit Relations and Allied Documents: Travels and Explorations of the Jesuit Missionaries in New France, 1610-1791* (Vols. 1 - 73). Cleveland OH: Burrows Brothers. https://rla.unc.edu/Louisiane/jesuit.html.

Tooker, E. (1964). *An Ethnography of the Huron Indians, 1615-1649* (*Smithsonian Bureau of American Ethnology Bulletin 190*, pp. 58-71).Washington DC: U.S.

Trigger, B. G. (1990, 1969). *The Huron: Farmers of the North*. New York, NY Harcourt Brace Jovanovich

U.S. Department of Agriculture, Agricultural Research Service. FoodData Central, (2019). fdc.nal.usda.gov. Accessed December 29 2003.

Walz, G. R. (1991). *The Paleoethnobotany of Schwerdt (20AE127): An Early Fifteenth Century Encampment in the Lower Kalamazoo River Valley*, (Master's Thesis) Kalamazoo MI: Western Michigan University

Wang, C., Murgia, M. A., Baptista, J., Marcone, M.F. (2022). Sardinian dietary analysis for longevity: A review of the literature. *Journal of Ethnic Foods*, 9(1), 33. doi:https://doi.org/10.1186/s42779-022-00152-5

Wang, S., Zhu, F. (2017) Chemical composition and biological activity of staghorn sumac *(Rhus typhina), Food Chemistry*, Volume 237, Pages 431-443

Weiner, M. A. (1972). *Earth Medicine-Earth Foods: Plant Remedies, Drugs, and Natural Foods of the North American Indians* (pp. 145-200). New York (NY): Macmillan

Wetterstrom, W. E. (1976). *The Effect of Nutrition on Population Size at Pueblo Arroyo Hondo, New Mexico* (Doctoral dissertation), University of Michigan Department of Anthropology. Ann Arbor, MI.

White, R. (1991) *In The Middle Ground: Indians, Empires, and Republics in the Great Lakes Region*, 1650-1815 (1991): ix-93

Yarnell, R. A. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, *Anthropological Paper No.23,* Ann Arbor MI doi:https://doi.org/10.3998/mpub.11396699

Yusuf, M. (2020). A Review on Trends and Opportunity in Edible Lichens. In Lichen-Derived Products, M. Yusuf (Ed.). https://doi-org.proxy.lib.umich.edu/10.1002/9781119593249.ch8

12. Appendices

Appendix I.

Table of Great Lakes archaeological sites with paleoethnobotanical remains. This table covers Michigan, Ontario, Pennsylvania, Ohio, and Indiana. The table is broken down into site name, State site number, Occupation phase, tradition, and season (when available), the botanical remains recovered from the site by count, common name, and Latin binomial (if any were indeed recovered), the year excavated, location and citation.

Great Lakes Region Archaeological Sites with Associated Paleoethnobotanical Remains								
Site Name	**Site#**	**Period**	**Phase/Tradition**	**Season of occupation**	**Botanical remains (as reported)**	**Year(s) excavated**	**Location**	**Citation**
20BE405	20BE405	Pre-Contact	Upper Mississippian/ Oneota		Maple (*Acer* spp.), Hickory (*Carya* spp.), Oak (*Quercus* spp.), Elm *(Ulmus* spp.), *(Rubus* spp.), Dogwood *(Cornus* spp.*),* Cleavers *(Galium* spp.), Greenbriar *(Smilax hispida),* Jerusalem artichoke *(Helianthus tuberosus)*	1990	Berrien County, MI	*Cremin, William M. (Ed.). (1990). Archaeological Investigations in the Lower Galien River Valley of Southwest Michigan. : Western Michigan University: Archaeological Technical Report No.23, Kalamazoo MI.*
20BE410	20BE410	Pre-Contact	Upper Mississippian/ Oneota		Maple (*Acer* spp.), Hickory (*Carya* spp.), Cedar (*Cupressaceae* spp.), Ash (*Fraxinus americana*), Tulip tree/ Yellow Poplar (*Liriodendron tulipifera)* , Hop hornbeam (*Ostrya virginia),* Oak (*Quercus* spp.), Elm *(Ulmus* spp.), *(Rubus* spp.), Yellow (American?) Lotus *(Nelumbo lutea),* Cleavers *(Galium* spp.), American hornbeam *(Carpinus caroliniana),* Cherry or Canada plum? *(Prunus* spp.), Buckwheats *(Polygonaceae),* Tinker's weed/ Late horse gentian *(Triosteum perifoliatum),* Pine *(Pinus* spp.)	1990	Berrien County, MI	*Cremin, William M. (Ed.). (1990). Archaeological Investigations in the Lower Galien River Valley of Southwest Michigan. : Western Michigan University: Archaeological Technical Report No.23, Kalamazoo MI.*
20BE411	20BE411	Pre-Contact	Upper Mississippian/ Oneota		Maple (*Acer* spp.), Hickory (*Carya* spp.), Cedar (*Cupressaceae* spp.), Beech (*Fagus grandifolia),* Oak (*Quercus* spp.), Elm *(Ulmus* spp.), *(Rubus* spp.), Dogwood *(Cornus* spp.*),* Cleavers *(Galium* spp.), Riverbank grape *(Vitis riparia),* Tinker's weed/ Late horse gentian *(Triosteum perifoliatum), P* epper grass/ Pepper weed *(Lepidium campestre),* Daisy family *(Compositae/Asteraceae),* Bayberry *(Myrica* spp.)	1990	Berrien County, MI	*Cremin, William M. (Ed.). (1990). Archaeological Investigations in the Lower Galien River Valley of Southwest Michigan. : Western Michigan University: Archaeological Technical Report No.23, Kalamazoo MI.*
Allegan Dam	20AE56	Pre-Contact	Upper Mississippian/ Oneota	Spring/Summer	Acorn (*Quercus* spp.), Butternut (*Juglans cinerea*), Pokeberry (*Phytolacca americana*), Blackberry (*Rubus* spp.), Black Walnut (*Juglans nigra*), Hickory shell (*Carya* spp.), Sumac (*Rhus* spp.), Cleavers (*Galium* spp.), Grasses (*Gramineae*), Fungal nodules	1968	Allegan County, MI	*Spero, George B. (1979). The Allegan Dam Site: An Upper Mississippi Occupation in the Lower Kalamazoo River Basin, Western Michigan University Department of Anthropology Master's thesis. https://www-proquest-com.proxy.lib.umich.edu/docview/302948383/1171F60EE23C4FF3PQ/1?accountid=14667*
Ash Cave,		Middle Woodland, Late Woodland			Hickory nut (*Carya spp.*), Walnut (*Juglans spp.*), Butternut (*Juglans cinerea*), Hazelnut (*Corylus* spp.), Chestnut (*Castanea* spp.), Acorn (*Quercus* spp.), Grape (*Vitis* spp.), Chenopod (*Chenopodium* spp.), Bulrush (*Cyperaceae*), Indian hemp (*Apocynum cannabinum*), Corn (*Zea mays*), Squash (*Cucurbita pepo*), Gourd (*Lagenaria siceraria*), Blackberry (*Rubus* spp.), Cattail (*Typha* spp.)		Ohio	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Baldwin		Middle Woodland, Late Woodland	Fort Ancient		Plum (*Prunus* spp.), Hickory nut (*Carya* spp.), Corn (*Zea mays*)		Ohio	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Burnt Bluff	20DE3	Late Woodland			Cave site, Shelter B-95, None reported	1965	Delta County, MI	*Fitting, James E.ed. (1968). The Prehistory of the Burnt Bluff Area. : University of Michigan Museum of Anthropology Anthropological Paper No. 34, Ann Arbor.*
Canter's Caves,		Middle Woodland, Late Woodland			Hickory nut (*Carya* spp.), Walnut (*Juglans* spp.), Butternut (*Juglans cinerea*), Hazelnut (*Corylus* spp.), Chestnut (*Castanea* spp.), Acorn (*Quercus* spp.), Grape (*Vitis* spp.), Chenopod (*Chenopodium* spp.).		Ohio	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*

Castle Creek		Middle Woodland, Late Woodland			Butternut (*Juglans cinerea*), Hickory nut (*Carya* spp.), Acorn (*Quercus* spp.), Corn (*Zea mays*)		New York	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Cloudman	20CH6	Middle Woodland	Lake Forest		15 Strawberry/Cinquefoil (*Frageria/Potentilla* spp.), 6 Raspberry (*Rubus* spp.), 28 Elderberry (*Sambucus* spp.), 1 Grape (*Vitis* spp.), 1 Aster (*Asteraceae*), 17 Bedstraw/Cleavers (*Galium* spp.), 2 Violet (*Viola* spp.), Nutshells: 5 Hazelnut (*Corylus* spp.), 1 Walnut family (*Juglandaceae*), 115 Acorn (*Quercus* spp.), Nutmeat: 2 Acorn (*Quercus* spp), Other: 15 kernels Corn (*Zea mays*), 3 Chenopod, (*Chenopodium* spp.), 2 Knotweed (*Polygonum* spp.), 1 Wild rice (*Zizania aquatica*), Ceramic residue analysis: Nut oil, likely acorn.		Chippewa County, MI	*Kooiman, Susan M., Albert, R. K., & Malainey, M. E. (2022). Multiproxy Analysis of Adhered and Absorbed Food Residues Associated with Pottery. Journal of Archaeological Method and Theory. https://doi.org/10.1007/s10816-021-09537-3*
Dunn's Farm	20LU22	Middle Woodland, Late Woodland	Lake Forest, Laurel, Havana, Hopewell		Wild rice (*Ziziana aquatica),*	1973-1999	Leelanau County, MI	*Brose, David S. (2016). The Dunn's Farm Site; 20LU22 A Late Middle Woodland Event in Northwest Michigan. : Imprints from the Past, LLC.*
East Bay	20GT58	Middle Woodland	Lake Forest	unknown	None, Minimal, not reported	1990-1992	Grand Traverse County, MI	*Hambacher, Michael J., Duham, Sean B., & Branstner, Mark C. (n.d.). Archaeological Investigations at the East Bay Site (20GT58). The Michigan Archaeologist 58: 1-203*
Eidson	20BE122	Middle Woodland	Norton		None Collected	1980	Berrien County, MI	*Garland, Elizabeth, & Mangold, William (1980).1-Final Report of the Archaeological Site Examination of the Proposed Route of U.S. 31, Matthew Road to I-94, Berrien County, Proposed Route. : Western Michigan University Department of Anthropology, Technical Report No 1.*
Elam	20AE195	Pre-Contact	Upper Mississippian/ Oneota	Fall	Blackberry (*Rubus* spp.), Cleavers (*Galium* spp.), Cherry (Prunus spp.), Trifolium? (*Fabaceae*), Strawberry (*Fragaria virginiana)* , Nightshade (*Solanum* spp.), Goosefoot (*Chenopodium* spp.), Sumac (*Rhus* spp.), Poison ivy (*Toxicodendron radicans*), Juneberry/serviceberry (*Amelanchier* spp.), American Hornbeam (*Carpinus caroliniana*), Knotweed (*Polygonum* spp.), Violet (*Viola* spp.), Grasses (*Poaceae*), Butternut (*Juglans cinerea*), Black Walnut (*Juglans nigra*), Hickory (*Carya* spp.), Acorn (*Quercus* spp.), Unidentified nutshell, American lotus (*Nelumbo lutea*)		Allegan County, MI	*DeRoo, B. D. (1991). Flotation data sampling strategies in archaeological research: An experiment at the Elam Site (20AE195), Allegan County, Michigan, Kalamazoo: Western Michigan University, Master's thesis.*
Ferrier	20MK24	Middle Woodland	Lake Forest		7 Corn kernel (*Zea mays*), No count available: White ash (*Fraxinus americanus*), Birch (*Betula* spp.), Sugar maple (*Acer saccharum*), Maple (*Acer* spp.)		Mackinac County, MI	*Dunham, Sean B. (2014). Late Woodland Settlement and Subsistence in the Eastern Upper Peninsula of Michigan (Doctoral Dissertation). East Lansing MI: Michigan State University.*
Fort Gratiot	20SC41	Historic	Euro-American		Corn (*Zea mays*), Acorn (*Quercus* spp.), Huckleberry (*Gaylussacia* spp.), Mint (*Mentha* spp.), Rose (*Rosa* spp.), Blackberry (*Rubus* spp.), Cherry (*Prunus* spp.), Rice (*Oryzeae* ? zizania?), Beans (*Phaseolis* spp.), Peas (*Pisum* spp.), Hickory Nut (*Carya* spp.), Beechnut (*Fagus grandifolia*), Squash (*Cucurbita* spp.), Tubers (Unknown), Walnut (*Juglans* spp.)	1974, 1986	Saint Clair County, MI	*Esarey, M. E. (1991). Socio-Economic Variation at American Forts in the Upper Great Lakes: An Archaeological Perspective from Fort Gratiot (1814-1879), Port Huron, Michigan, East Lansing MI: Michigan State University Doctoral dissertation*
Fort Michilimackinac	20EM52	Contact	Euro-American	Year-round (1761-1781)	1003 fragments of Corn (*Zea mays*), 11 fragments Squash (*Cucurbita* spp.), 1 fragment Wheat (*Triticum* spp), 2 Common bean (*Phaseolus vulgaris*), 5 Chokecherry (*Prunus virginiana*), 29 Wild cherry (*Prunus* spp.), 811 Pin Cherry (*Prunus pensylvanica*), 1 Sand Cherry (*Prunus pumila*), 2 Wild Plum (Prunus spp.), 189 Raspberry/Blackberry (*Rubus* spp.), 10 Elderberry (*Sambucus* spp.), 5 Blueberry (*Vaccinium* sp.), 1 Grape (*Vitis* sp.), 1 Hazelnut (*Corylus* spp.), 8 Sumac (*Rhus* spp.), 1 Bouncing Bet (*Saponaria officinalis*), 4 (*Brassica* spp.), 3 Radish (*Raphanus sativus*)	1983	Emmet County, MI	*Scott, E. M. (1991). "Such Diet as Befitted his Station as Clerk:" The Archaeology of Subsistence and Cultural Diversity at Fort Michilimackinac. Minneapolis: University of Minnesota Doctoral Dissertation.*
Franz-Green Mound	12PR22	Middle Woodland	Norton	unknown	None	1915	Porter County, Indiana	*Mangold, William L. (2009). The Middle Woodland Occupations of the Kankakee River Valley and Beyond: The Goodall Tradition Revisited and Reinterpreted (Master's thesis).*
FS-09-10-03-803	20AR348	Middle Woodland	Lake Forest		Wood Charcoal: 2 Birch (*Betula* spp.), 1 Conifer, 1 Oak (*Quercus* spp.)		Alger County, MI	*Dunham, Sean B. (2014). Late Woodland Settlement and Subsistence in the Eastern Upper Peninsula of Michigan (Doctoral Dissertation). East Lansing MI: Michigan State University.*
Gros Cap Cemetery	20MK6	Contact	Euro-American		None recovered, Burial site	1962	Mackinac County, MI	*Quimby, George I. (1963, December). The Gros Cap Cemetery Site in Mackinac County, Michigan. The Michigan Archaeologist, 9(4), 50-57. https://babel.hathitrust.org/cgi/pt?id=ien.35556009013152&seq=249*
Holtz	20AN26	Middle Woodland	Lake Forest		None, minimal, Not reported	1967	Antrim County, MI	*Lovis, Jr., William A. (1971, June). The Holtz Site (20AN26), Antrim Co., Michigan; A Preliminary Report. The Michigan Archaeologist, 17(2).*
Johnson	20CN46	Middle Woodland, Late Woodland	Lake Forest	Winter	Not reported	1974	Cheboygan County, MI	*Lovis, Jr., William A. (2008). Revisiting the Johnson Site (20CN46): A Winter Camp in a Cedar Swamp on Mullett Lake, Michigan. The Michigan Archaeologist, 54*
Juntunen	20MK1	Late Woodland, Pre-Contact	Upper Mississippian/ Oneota	Summer	Birchbark (*Betula Papyrifera*), Hazelnut (*Corylus rostrata*), Corn (*Zea mays*), Fire Cherry (*Prunus pennsylvanica*), Blackberry (*Rubus* spp.), Cleavers (*Galium* spp.), Elderberry (*Sambucus pubens*), Unidentified tuber, unidentified large seed, Chenopod (*Chenopodium* spp.), Bearberry (*Arctostaphylos uva-ursi*), Sumac berry (*Rhus typhina* ?), Beechnut (*Fagus grandifolia*), Acorn (*Quercus* spp.), Pepperoot (*Dentaria laciniata*), Cherry (*Prunus* spp.), Canada Plum (*Prunus nigra*), Grape (*Vitis* spp.), Blueberry (*Vaccinium* sp.), Dock/Sorrel (*Rumex* spp.)	1960, 1961	Mackinac County, MI	*McPherron, Alan. (1967). The Juntunen Site and the Late Woodland Prehistory of the Upper Great Lakes, University of Michigan Museum of Anthropology, Anthropological Papers No. 30, Ann Arbor.; Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Kettle Hill Cave		Middle Woodland, Late Woodland			Hickory nut (*Carya* spp.), Walnut (*Juglans* spp.), Butternut (*Juglans cinerea*), Hazelnut (*Corylus* spp.), Chestnut (*Castanea* spp.), Acorn (*Quercus* spp.), Grape (*Vitis* spp.), Chenopod (*Chenopodium* spp.), Squash (*Cucurbita pepo*), Corn (*Zea mays*), Cattail (*Typha* spp.), Indian hemp (*Apocynum cannabinum*)		Ohio	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*

Mantle	ASI 2012a	Pre-Contact	Wendat	All season	558g Corn kernel, 69g cob (*Zea mays*),[<1g; Common bean *(Phaseolus vulgaris*), Squash (*Cucurbita pepo*), Tobacco (*Nicotania rustica*)], 3g Sunflower (*Helianthus annuus)* , Bramble (*Rubus* sp.), Strawberry (*Fragaria* sp.), Cattail (*Typha latifolia*), Sumac seed (*Rhus typhina*), Chenopod (*Chenopodium* sp.), Spikenard (*Aralia* sp.), A small grass (cf. *Echinochloa*), Purslane (*Portulaca oleracea*), Black nightshade (*Solanum americanum*), Hawthorn (*Crataegus* sp.), Canada plum (*Prunus* sp.), Ironwood (*Carpinus caroliniana*), Erect knotweed (*Polygonum erectum*), Pincherry (*Prunus pensylvanica*), Cleavers (*Galium aparine*), Delta seed (*Leucadendron* sp.), Grape (*Vitis labrusca*), Peppergrass (*Lepidium virginicum*), Knotweed/Sedge (*Carex* sp.), Amaranth (*Amaranthus retroflexus*), Barnyard grass (*Echinochloa crus-galli*), Pokeweed (*Phytolacca americana*), Serviceberry (*Amelanchier arborea*), [Charcoal: Maple (*Acer saccharum*), Beech (*Fagus grandifolia*), Ash (*Fraxinus* sp.), Elm (*Ulmus americana*), Ironwood (*Ostrya virginiana*), white pine (*Pinus strobus*), Cedar (*Thuja occidentalis*), Red and White Oak (*Quercus rubra* and *Q. alba*)	2003-2005	Ontario, Canada	*Birch, Jennifer & Williamson, Ronald F. (2013). The Mantle Site: An Archaeological History of an Ancestral Wendat Community. : AltaMira Press*
Muntz (Sugar Run)		Middle Woodland			Hickory nut (*Carya* spp.), Walnut (*Juglans* spp.), Butternut (*Juglans cinerea*)		Warren County, Pennsylvania	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Mushroom	20AE88	Middle Woodland	Unknown		Acorn (*Quercus* sp.), Cleavers (*Galium* sp.), Pine bark (*Pinus* sp.), Greenbriar (Smilax sp.), (Also see Elam Site as it is within walking distance)	1978	Allegan County, MI	*Stout, Charles B. (1984). A Distribution Analysis of the Cultural Materials from the Mushroom Site (20AE88), Allegan County, Michigan Kalamazoo MI: Western Michigan University Master's thesis.*
Naomikong Point	20CH2	Middle Woodland	Lake Forest		Conifer (*Pinophyta* spp.), (Ceramic residue analysis points to animal fat and plant content. It also indicates likely not nut oil nor fish due to lipid signatures. Vessels were concluded to have been utilized for multiple species. (Kooiman 2012))	1966-1967	Chippewa County, MI	*Janzen, Donald E. (1968). The Naomikong Point Site and Dimensions of Laurel in the Lake Superior Region University of Michigan University Museum of Anthropology, Anthropological Papers, No. 36; Kooiman, Susan M. (2016). Woodland Pottery Function, Cooking, and Diet in the Upper Great Lakes of North America. Midcontinental Journal of Archaeology, 41(3), 207–230. https://doi.org/10.1080/01461109.2016.1198876*
Ne-con-ne-pe-wah-se	20NE331	Late Woodland, Historic			Cache pit 5-30L: 1 Bunchberry (Cornus canadensis), 7 Pin Cherry (Prunus pennsylvanica), 5 Black Cherry (Prunus serotina), 1 Sumac (Rhus spp.), 14 Raspberry (Rubus spp.), 1 Elderberry (Sambucus canadensis), 5 Nightshade Family (Solanaoeae), 5 Grape (Vitis spp.); Cache pit 9-20L: 4 Bunchberry (Cornus canadensis), 3 Black Cherry (Prunus serotina), 1 Sumac (Rhus spp.), 2 Grape (Vitis spp.), 1 Corn (Zea mays); Cache pit 17-12L: 3 Chokeberry (Aronia arbutifolia), 72 Bunchberry (Cornus canadensis), 62 Beechnut (Fagus grandifolia), 1 Witch Hazel (Hamamelis virginiana), 2 Spicebush (Lindera benzoin), 1 Honeysuckle (Lonicera spp.), 7 Cinquefoil (Potentilla spp.), 106 Pokeweed (Phytollaca americana), 74 Pin Cherry (Prunus pennsylvanica), 7 Black Cherry (Prunus serotina), 48 Sumac (Rhus spp.), 36 Raspberry (Rubus spp.), 28 Elderberry (Sambucus canadensis), 7 Nightshade Family (Solanaoeae), 1 Mountain Ash (Sorbus americana), 40 Grape (Vitis spp.)		Newaygo County, MI	*Dunham, S. (2000, January). Cache Pits: Archaeology, Ethnohistory and Continuity of Tradition. Interpretations of Native North American Life. University Press, Florida.*
Schulz	20SA2	Middle Woodland	Saginaw	Fall?	Acorn (*Quercus* spp.), Walnut (*Juglans nigra)* , Butternut (*Juglans cinerea)* . Hickory (*Carya ovata)* , Maple (*Acer* spp.), Red oak (*Quercus rubra*), Eastern Hemlock (*Tsuga canadensis*)	1959-1965	Saginaw County, MI	*Ozker, Doreen (1982). An Early Woodland Community at the Schultz Site 20SA2 in the Saginaw Valley and the Nature of the Early Woodland Adaptation in the Great Lakes Region. Memoir No. of the University of Michigan Museum of Anthropology, Ann Arbor MI, https://doi.org/10.3998/mpub.11396356*
Schwerdt	20AE127	Pre-Contact	Upper Mississippian/ Oneota, Berrien	Spring	Raspberry/blackberry (*Rubus* spp.), Flowering dogwood (*Cornus florida),* Hawthorne (*Crataegus* spp.), Greenbriar (*Smilax hispida),* Cherry (unknown species)(*Prunus* spp.), Sunflower (*Helianthus annuus),* Blueberry *(Vaccinium* spp.), Grape (*Vitis* sp.), American Lotus (Tuber)(*Nelumbo lutea),* Beechnut (*Fagus grandifolia),* Hazelnut, (*Corylus americana),* Walnut or Butternut (*Juglans* spp.), Acorn (*Quercus* spp.), Buckthorn (*Rhamnus alnifolium*), Chokeberry (*Aronia* sp.), Bog Arum (*Calla palustris),* Black Mustard (*Brassica nigra)* , Copperleaf (*Acalypha* sp.), Jack-in-the-pulpit (*Arisaema triphyllum)* , Mayapple/American mandrake (*Podophyllum peltatum*), Nightshade (*Solanum* sp.), Tumble mustard *(Sisymbrium altissimum*), Whiteflower leafcup (*Polymnia canadensis*), Hackberry (*Celtis occidentalis)* , Sedges (*Cyperaceae), Grasses (Gramineae)* , Daisy family (*Compositae/Asteraceae*)	1977-1979	Allegan County, MI	*Walz, Gregory. R. (1991). The Paleoethnobotany of Schwerdt (20AE127): An Early Fifteenth Century Encampment in the Lower Kalamazoo River Valley, Kalamazoo MI: Western Michigan University Master's thesis*
Spider Cave	20DE3	Middle Woodland	Lake Forest		"Despite the excellent conditions for preservation in Spider Cave, no evidence of hearths, charcoal or human food remains were encountered."	Surface Only (per landowner) 1963	Delta County, MI	*Fitting, James E.ed. (1968). The Prehistory of the Burnt Bluff Area. : University of Michigan Museum of Anthropology Anthropological Paper No. 34, Ann Arbor.*
Spoonville		Middle Woodland	Hopewell		Butternut (*Juglans cinerea*), Walnut (*Juglans* spp.), Acorn (*Quercus* spp.)		Ottawa County, MI	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Stroebel	20SA14	Late Woodland			Acorn (*Quercus* spp.)		Saginaw County, MI	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Summer Island	20DE4	Middle Woodland, Pre-Contact	Upper Mississippian/ Oneota	Summer	23 Chokecherry seeds (*Prunus virginiana*), Present with no count: Cherry *(Prunus* spp.), 28 Charred squash seeds (*Cucurbita pepo*), 12 Hazelnut (*Corylus* spp.)	1967	Delta County, MI	*Brose, David S. (1970). The Archaeology of Summer Island: Changing Settlement Systems in Northern Lake Michigan , Anthropological Papers, Museum of Anthropology, University of Michigan, No.67. Ann Arbor, MI: The University of Michigan.*

Thunder Lake 2	20ST109	Late Woodland, Pre-Contact	Upper Mississippian/ Oneota		6 Bedstraw (Galium spp.), 2 Bullrush (Scirpus spp.), 2 Violet (cf. Viola spp.), 2 Hazelnut nutshell (Corylus spp.), 1 Acorn nutshell (Quercus spp.)		Schoolcraft County, MI	*Dunham, Sean B. (2014). Late Woodland Settlement and Subsistence in the Eastern Upper Peninsula of Michigan (Doctoral Dissertation). East Lansing MI: Michigan State University.*
Verchave II	20MB181	Middle Woodland, Late Woodland		Spring, Fall	Corn (*Zea mays*), Acorn (*Quercus* spp.), Grape seed (*Vitis* spp.), Thornapple (Hawthorn) (*Crataegus* spp.), Walnut (*Juglans* spp.), Hickory nut/nutshell (*Carya* spp.), Plum pit (*Prunus* spp.), Hazelnut *(Corylus cornuta*)		Macomb County, MI	*Yarnell, Richard Asa. (1964). Aboriginal Relationships between Culture and Plant Life in the Upper Great Lakes Region. University of Michigan Museum of Anthropology, Anthropological Papers No. 23, Ann Arbor MI https://doi.org/10.3998/mpub.11396699*
Winking Bull	AiHa-20	Middle Woodland, Late Woodland	Middleport		Corn (Zea mays), Bean (Phaseolus vulgaris), Squash (Cucurbita pepo), Sunflower (Helianthus annuus), Tobacco (Nicotiana spp.), Sumac (Rhus spp.), Raspberry (Rubus spp.), Strawberry (*Fragaria virginiana*), Purslane (Portulaca oleracea), Bush Honeysuckle (Diervilla lonicera), Elderberry (Sambucus spp.), Gooseberry (Ribes spp.), Goosefoot (Chenopodium spp.), Nightshade (Solanum nigrum), Grape (Vitis spp.), Pin cherry (Prunus pennsylvanica)		Mountsberg Locality, Ontario	*Finlayson, William D. (1998). Iroquoian Peoples of the Land of Rocks and Water A.D. 1000-1650: A Study in Settlement Archaeology (pp. 91-176). London ON: London Museum of Archaeology.*
Wymer	20BE132	Middle Woodland, Pre-Contact	Norton, Upper Mississippian/ Oneota	All season	Knotweed (*Polygonum* spp.), Trifolium (*Fabaceae*), Cleavers (*Galium* spp.), Chenopod (*Chenopodium* spp.)	1980	Berrien County, MI	*Garland, Elizabeth, & Mangold, William (1980). 1-Final Report of the Archaeological Site Examination of the 1-Final Report of the Archaeological Site Examination of the Proposed Route of U.S. 31, Matthew Road to I-94, Berrien County, Proposed Route. : Western Michigan University Department of Anthropology, Technical Report No 1.*
Middle Woodland=300 BCE-600 CE; **Late Woodland**=600 BCE-1400 CE; **Pre-Contact**=1400 CE-1600 CE; **Contact**=1600-1800; **Modern**=1800-Present								

Appendix II.

Table with all paleoethnobotanical remains recovered from all Great Lakes sites.

Archaeobotanical Remains Recovered By Plant Name	
Latin Binomial First	Common Name First
Acalypha spp. (Copperleaf)	Acorn (*Quercus* spp.)
Acer spp (Maple)	Amaranth (*Amaranthus retroflexus*)
Amaranthus retroflexus (Amaranth)	American hornbeam (*Carpinus caroliniana*)
Amelanchier arborea (Serviceberry)	Ash (*Fraxinus americana*)
Amelanchier spp. (Juneberry/serviceberry)	Aster (*Asteraceae*)
Apocynum cannabinum (Indian hemp)	Barnyard grass (*Echinochloa crus-galli*)
Aralia sp. (Spikenard)	Bayberry (*Myrica* spp.)
Arctostaphylos uva-ursi (Bearberry)	Beans (*Phaseolis* spp.)
Arisaema triphyllum (Jack-in-the-pulpit)	Bearberry (*Arctostaphylos uva-ursi*)
Aronia sp. (Chokeberry)	Beech (*Fagus grandifolia*)
Asteraceae (Aster)	Birch (*Betula* spp.)
Betula Papyrifera (Birchbark)	Birchbark (*Betula Papyrifera*)
Betula spp. (Birch)	Black Mustard (*Brassica nigra*)
Brassica nigra (Black Mustard)	Black nightshade (*Solanum americanum*)
Brassica spp.	Black Walnut (*Juglans* nigra)
Calla palustris (Bog Arum)	Blackberry (*Rubus* spp.)
Carex sp. (Knotweed/Sedge)	Blueberry (*Vaccinium* sp.)
Carpinus caroliniana (American hornbeam)	Bog Arum (*Calla palustris*)

Carya spp (Hickory)	Bouncing Bet (*Saponaria officinalis*)
Castanea spp. (Chestnut)	Bramble (*Rubus* sp.)
Celtis occidentalis (Hackberry)	*Brassica* spp.
Chenopodium spp. (Chenopod)	Buckthorn (*Rhamnus alnifolium*)
Chenopodium spp. (Goosefoot)	Buckwheats (*Polygonaceae*)
Compositae/Asteraceae (Daisy family)	Bullrush (*Scirpus* spp.)
Cornus spp. (Dogwood)	Bulrush (*Cyperaceae*)
Corylus americana (Hazelnut)	Bush Honeysuckle (*Diervilla lonicera*)
Corylus cornuta (Hazelnut)	Butternut (*Juglans cinerea*)
Corylus rostrata (Hazelnut)	Canada Plum (*Prunus nigra*)
Corylus spp. (Hazelnut)	Cattail (*Typha latifolia*)
Crataegus spp (Thornapple/Hawthorn)	Cattail (*Typha* spp.)
Cretaegus spp. (Hawthorn)	Cedar (*Cupressaceae* spp.)
Cucurbita spp. (Squash)	Chenopod (*Chenopodium* spp.)
Cupressaceae spp. (Cedar)	Cherry or Canada plum? (*Prunus* spp.)
Cyperaceae (Bulrush)	Chestnut (*Castanea* spp.)
Cyperaceae (Sedges)	Chokeberry (*Aronia* sp.)
Dentaria laciniata (Pepperoot)	Chokecherry (*Prunus virginiana*)
Diervilla lonicera (Bush Honeysuckle)	Cleavers (*Galium* spp.)
Echinochloa (small grass)	Common bean (*Phaseolus vulgaris*)
Echinochloa crus-galli (Barnyard grass)	Conifer (*Pinophyta* spp.)
Fabaceae (Trifolium)	Copperleaf (*Acalypha* sp.)
Fagus grandifolia (Beech)	Corn (*Zea mays*)
Fragaria virginiana (Strawberry)	Daisy family (*Compositae/Asteraceae*)
Frageria/Potentilla spp. (Strawberry/Cinquefoil)	Delta seed (*Leucadendron* sp.)
Fraxinus americana (Ash)	Dock/Sorrel (*Rumex* sp.)
Fungal nodules	Dogwood (*Cornus* spp.)
Galium spp. (Cleavers)	Eastern Hemlock (*Tsuga canadensis*)
Gaylussacia spp. (Huckleberry)	Elderberry (*Sambucus* spp.)
Gramineae (Grasses)	Elm (*Ulmus* spp.)
Helianthus annuus (Sunflower)	Erect knotweed (*Polygonum erectum*)
Helianthus tuberosus (Jerusalem artichoke)	Fragment Wheat (*Triticum* spp)
Juglandaceae (Walnut family)	Fungal nodules
Juglans cinerea (Butternut)	Gooseberry (*Ribes spp*.)
Juglans nigra (Black Walnut)	Goosefoot (*Chenopodium* spp.)
Juglans spp. (Walnut)	Gourd (*Lagenaria siceraria*)
Lagenaria siceraria (Gourd)	Grape (*Vitis labrusca*)
Lepidium campestre (Pepper grass/ Pepper weed)	Grape seed (*Vitis* spp.)

Leucadendron sp. (Delta seed)	Grasses (*Gramineae*)
Liriodendron tulipifera (Tulip tree/ Yellow Poplar)	Grasses (*Poaceae*)
Mentha spp. (Mint)	Greenbriar (*Smilax hispida*)
Myrica spp (Bayberry)	Hackberry (*Celtis occidentalis*)
Nelumbo lutea (Lotus)	Hawthorn (*Cretaegus* spp.)
Nicotania rustica (Tobacco)	Hazelnut (*Corylus cornuta*)
Oryzeae? zizania? (Rice)	Hazelnut (*Corylus rostrata*)
Ostrya virginia (Hop hornbeam)	Hazelnut (*Corylus* spp.)
Phaseolis spp. (Beans)	Hazelnut, (*Corylus americana*)
Phaseolus vulgaris (Common bean)	Hickory (*Carya* spp.)
Phytolacca americana (Pokeberry)	Hop hornbeam (*Ostrya virginia*)
Pinophyta spp (Conifer)	Huckleberry (*Gaylussacia* spp.)
Pinus spp. (Pine)	Indian hemp (*Apocynum cannabinum*)
Pisum spp. (Peas)	Jack-in-the-pulpit (*Arisaema triphyllum*)
Poaceae (Grasses)	Jerusalem artichoke (*Helianthus tuberosus*)
Podophyllum peltatum (Mayapple/American mandrake)	Juneberry/serviceberry (*Amelanchier* spp.)
Polygonaceae (Buckwheats)	Knotweed (*Polygonum* spp.)
Polygonum erectum (Erect knotweed)	Knotweed/Sedge (*Carex* sp.)
Polygonum spp. (Knotweed)	Lotus (*Nelumbo lutea*)
Polymnia canadensis (Whiteflower leafcup)	Maple (*Acer* spp.)
Portulaca oleracea (Purslane)	Mayapple/American mandrake (*Podophyllum peltatum*)
Prunus nigra (Canada Plum)	Mint (*Mentha* spp.)
Prunus pennsylvanica (Pin Cherry/Fire Cherry)	Nightshade (*Solanum nigrum*)
Prunus pumila (Sand Cherry)	Nightshade (*Solanum* spp.)
Prunus spp. (Cherry or Canada plum?)	Oak (*Quercus* spp.)
Prunus spp. (Wild cherry)	Peas (*Pisum* spp.)
Prunus virginiana (Chokecherry)	Pepper grass/ Pepper weed (*Lepidium campestre*)
Quercus spp. (Acorn)	Pepperoot (*Dentaria laciniata*)
Quercus spp. (Oak)	Pin Cherry/Fire Cherry (*Prunus pennsylvanica*)
Raphanus sativus (Radish)	Pine (*Pinus* spp.)
Rhamnus alnifolium (Buckthorn)	Poison ivy (*Toxicodendron radicans*)
Rhus spp. (Sumac)	Pokeberry (*Phytolacca americana*)
Rhus typhina (Sumac seed)	Purslane (*Portulaca oleracea*)
Ribes spp. (Gooseberry)	Radish (*Raphanus sativus*)
Rosa spp. (Rose)	Raspberry (*Rubus* spp.)

Rubus sp. (Bramble)	Rice (*Oryzeae*? *zizania*?)
Rubus spp. (Blackberry)	Riverbank grape (*Vitis riparia*)
Rubus spp. (Raspberry)	Rose (*Rosa* spp.)
Rumex sp. (Dock/Sorrel)	Sand Cherry (*Prunus pumila*)
Sambucus spp. (Elderberry)	Sedges (*Cyperaceae*)
Saponaria officinalis (Bouncing Bet)	Serviceberry (*Amelanchier arborea*)
Scirpus spp. (Bullrush)	small grass (*Echinochloa*)
Sisymbrium altissimum (Tumble mustard)	Spikenard (*Aralia* sp.)
Smilax hispida (Greenbriar)	Squash (*Cucurbita* spp.)
Solanum americanum (Black nightshade)	Strawberry (*Fragaria virginiana*)
Solanum nigrum (Nightshade)	Strawberry/Cinquefoil (*Frageria/Potentilla* spp.)
Solanum spp. (Nightshade)	Sumac (*Rhus* spp.)
Toxicodendron radicans (Poison ivy)	Sumac seed (*Rhus typhina*)
Triosteum perifoliatum (Tinker's weed/ Late horse gentian)	Sunflower (*Helianthus annuus*)
Triticum spp (fragment Wheat)	Thornapple (Hawthorn) (*Crataegus* spp.)
Tsuga canadensis (Eastern Hemlock)	Tinker's weed/ Late horse gentian (*Triosteum perifoliatum*)
Typha latifolia (Cattail)	Tobacco (*Nicotania rustica*)
Typha spp (Cattail)	Trifolium (*Fabaceae*)
Ulmus spp (Elm)	Tulip tree/ Yellow Poplar (*Liriodendron tulipifera*)
Vaccinium sp. (Blueberry)	Tumble mustard (*Sisymbrium altissimum*)
Viola spp. (Violet)	Violet (*Viola* spp.)
Vitis riparia (Riverbank grape)	Walnut (*Juglans* spp.)
Vitis spp (Grape seed)	Walnut family (*Juglandaceae*)
Vitus labrusca (Grape)	Whiteflower leafcup (*Polymnia canadensis*)
Zea mays (Corn)	Wild cherry (*Prunus* spp.)
Zizania aquatica (Wild rice)	Wild rice (*Zizania aquatica*)

Appendix III.

Table with nutritional values for a 30-day period. Includes DRI for all ages, 30-day values of famine foods and common foods.

Nutritional Requirements for a 30 day Period (1 Month)													
Dietary Reference Intakes (DRIs):													
Recommended Dietary Allowances and Adequate Intakes: Adapted from Food and Nutrition Board, Institute of Medicine, National Academies													
e-Stage Group	**kCal/Sedentary**	**kCal/Active**	**Water (Liters)**	**Protein (grams)**	**Fat (grams)**	**Carbohydrate (grams)**	**Fiber (grams)**	**Calcium (milligrams)**	**Phosphorus (milligrams)**	**Iron (milligrams)**	**Thiamine (milligrams)**	**Riboflavin (milligrams)**	**Niacin (milligrams)**
Infants													
0–6 mo	NV	NV	21	273	930	1800	NV	NV	NV	NV	NV	NV	NV
7–12 mo	NV	NV	24	330	900	2850	NV	NV	NV	207	NV	NV	NV
Children													
1–3 y	30000	30000	39	390	NV	3900	570	15000	11400	90	12	12	150
4–8 y	36000	42000	51	570	NV	3900	750	24000	12150	123	15	15	180
Males													
9–13 y	48000	54000	72	1020	NV	3900	930	33000	31650	177	21	24	270
14–18 y	60000	72000	99	1560	NV	3900	1140	33000	31650	231	30	33	360
19–30 y	78000	84000	111	1680	NV	3900	1140	24000	17400	180	30	33	360
31–50 y	72000	78000	111	1680	NV	3900	1140	24000	17400	180	30	33	360
51–70 y	66000	72000	111	1680	NV	3900	900	24000	17400	180	30	33	360
> 70 y	60000	66000	111	1680	NV	3900	900	30000	17400	180	30	33	360
Females													
9–13 y	42000	48000	63	1020	NV	3900	780	33000	31650	171	21	24	270
14–18 y	54000	60000	69	1380	NV	3900	780	33000	31650	237	27	27	330
19–30 y	60000	66000	81	1380	NV	3900	750	24000	17400	243	27	27	330
31–50 y	54000	60000	81	1380	NV	3900	750	24000	17400	243	27	27	330
51–70 y	48000	54000	81	1380	NV	3900	630	30000	17400	150	27	27	330
> 70 y	48000	54000	81	1380	NV	3900	630	30000	17400	150	27	27	330
Pregnancy													
14–18 y	80235	80235	90	2130	NV	5250	840	30000	31650	690	36	36	420
19–30 y	80235	80235	90	2130	NV	5250	840	24000	17400	660	36	36	420
31–50 y	80235	80235	90	2130	NV	5250	840	24000	17400	660	36	36	420
Lactation													
14–18 y	78666	78666	114	2130	NV	6300	870	30000	31650	210	36	39	390
19–30 y	78666	78666	114	2130	NV	6300	870	24000	17400	195	36	39	390
31–50 y	78666	78666	114	2130	NV	6300	870	24000	17400	195	36	39	390

Nutritional Values of Ethnographic Famine Foods.

Common Name	Scientific Name	Part analyzed	kCal/100g	Water (%)	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Fiber (grams)	Ash (grams)	Calcium (milligrams)	Phosphorus (milligrams)	Iron (milligrams)	Potassium (milligrams)	Thiamine (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)
American Lotus	*Nelumbo lutea*	Root/Rhizome	112.2	NV	393	157.5	NV	NV	309	NV	NV	NV	NV	NV	NV	NV
Bittersweet Vine	*Celastrus scandens*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Bog Arum	*Calla palustris*	Root/Rhizome	NV	NV	900	33	1230	NV	NV	11700	24600	1290	108000	NV	NV	NV
Broadleaf Arrowhead	*Sagittaria latifolia*	Leaves	2970	2175	159.9	8.7	606	NV	50.1	300	5220	77.1	27660	5.1	2.19	49.5
Cat-tail	*Typha angustifolia*	Root/Rhizome	11010	228	207	93	2394	NV	78	NV	NV	NV	NV	NV	NV	NV
Common Milkweed	*Asclepias syriaca*		NV	NV	618.9	NV	NV	1110.9	NV	NV	NV	NV	NV	NV	NV	NV
Evening Primrose	*Oenothera biennis*	Leaves	NV	NV	353.4	NV	NV	373.5	NV	NV	NV	NV	NV	NV	NV	NV
Green Algae	*Cladophora glomerata*	Entire Plant	4854	2625	48	9	222	NV	96	1.62	0.039	NV	2.58	NV	NV	NV
Groundnut	*Apios americana*	Tuber	3270	2121	123	30	558	105	63	480	1170	12.42	3030	NV	NV	NV
Iceland Moss	*Cetraria islandica*	Lichen Body	NV	NV	90	78	1500	NV	NV	144	1500	15900	7500	NV	NV	NV
Jerusalem Artichoke	*Helianthus tuberosus*	Root/Rhizome	2190	2340	60	0.3	522	48	76.2	420	2340	102	12870	6	1.8	39
Juniper berry	*Juniperus communis*	Ripe Berry	15.495	1263	99	528	1374	NV	NV	NV	NV	NV	NV	NV	NV	NV
Onion	*Allium spp.*	Entire Plant	2868	2037	66	12	624	183	78	131.31	92.88	25.5	816	NV	NV	NV
Pine	*Pinus spp.*	Cambium	1530	2628	187.5	18.3	318	42.3	NV	33.3	1011	8.1	5730	NV	NV	9
Reindeer Moss	*Cladonia rangiferina*	Lichen Body	NV	NV	NV	NV	NV	NV	NV	154.5	18300	2370	7800	NV	NV	NV
Rock Tripe	*Umbilicaria spp.*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Solomon's seal	*Polygonatum spp.*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
Sugar Maple	*Acer saccharum*	Cambium	10314	172.5	79.5	12.9	2469.9	NV	NV	NV	NV	NV	NV	NV	NV	NV
Water Silk	*Spirogyra*	Entire Plant	NV	NV	501	543	1671	NV	NV	13377	NV	4239	NV	NV	NV	NV
White Cedar	*Thuja occidentalis*		NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV

Nutritional Values of Common Indigenous Foods

Common Name	Scientific Name	Part analyzed	kCal/100g	Water (%)	Protein (grams)	Fat (grams)	Carbohydrate (grams)	Fiber (grams)	Ash (grams)	Calcium (milligrams)	Phosphorus (milligrams)	Iron (milligrams)	Potassium (milligrams)	Thiamin (milligrams)	Riboflavin (milligrams)	Niacin (milligrams)
Acorn	*Quercus alba*	Nut	11610	837	184.5	717	1224	NV	40.5	1230	2370	23.7	16170	3.36	3.54	54.9
Beechnut	*Fagus grandifolia*	Nut	17280	198	186	1500	1005	NV	111	30	0	73.8	30600	9.12	11.13	26.31
Blueberry	*Vaccinium angustifolium*	Fruit	1920	2526.3	21	9.3	438	264	7.2	360	390	10.2	2580	NV	NV	NV
Common bean	*Phaseolus vulgaris*	Fruit	930	2709	54.9	6.6	209.1	81	19.8	1110	1140	30.9	6330	2.46	3.12	22.02
Corn	*Zea mays*	Kernels	11580	243	296.4	156.6	2247	NV	55.8	450	10110	57.6	15330	6	2.04	99
Cranberry	*Vaccinium oxycoccos*	Fruit	1380	2619	13.8	3.9	360	108	3.6	240	330	6.9	2400	0.36	0.6	3.03
Currant, Gooseberry	*Ribes spp (Ribes rubrum).*	Fruit	1680	NV	42	6	414	129	NV	990	1320	30	8250	1.2	1.5	3
Goosefoot	*Chenopodium spp.*	Seed	9600	402	399	168	1377	438	216	NV	NV	NV	NV	NV	NV	NV
Goosefoot	*Chenopodium spp.*	Leaves	1290	2529	126	24	219	120	102	9270	2160	36	13560	4.8	13.2	36
Hazelnut	*Corylus americana*	Nut	19230	129.3	405	1605	795	252	66.3	4050	9630	103.8	19080	NV	NV	NV
Hickory	*Carya spp.*	Nut	20880	66	330	2181	318	45	60	NV	NV	NV	NV	NV	NV	NV
Juneberry	*Amelanchier spp.*	Fruit	2545.5	2386.5	291	126	554.4	570	18.9	1320	480	20.25	3660	NV	NV	NV
Raspberry, Blackberry	*Rubus spp.*	Fruit	1710	2568	30.3	5.7	387	1527	10.5	480	810	13.5	4680	NV	NV	NV
Squash	*Cucurbita pepo*	Seed	16590	132	870	1401	393	57	147	1530	34320	336	NV	7.2	5.7	72
Squash	*Cucurbita pepo var. turbinata*	Flesh	1200	2634	24	3	312	45	24	990	1080	21	10410	4.2	0.3	21
Squashberry, Mooseberry, Nannyberry, Highbush cranberry	*Viburnum lentago*	Fruit	NV	171.3	62.7	NV	NV	177	NV	NV	NV	NV	NV	NV	NV	NV
Staghorn Sumac	*Rhus typhina*	Root	0	199.2	129.3	346.8	947.1	987	161.1	9294	3096	540	16728	71.97	73.23	NV
Sunflower	*Helianthus annus*	Seed	18270	146.1	567	1452	735	216	99.3	3480	21960	131.1	19710	NV	NV	NV
Walnut	*Juglans spp.*	Nut	21900	94.2	438	2091	327	156	49.2	2640	10950	67.2	12720	6.9	NV	36.6
Beaver	*Castor canadensis*	Meat (raw)	4380	2130	720	144	0	0	30	450	7110	207	10440	1.8	6.6	57
Beef Tallow	*Bos taurus*	Tallow	27060	0	0	3000	0	0	0	0	0	0	0	0	0	0
Black Bear	*Ursus americanus*	Meat (raw)	4650	2136	603	249	0	0	12	NV	4860	216	NV	4.8	20.4	96
Raccoon	*Procyon lotor*	Meat (cooked)	7650	1629	876	435	0	0	45	420	7830	213	11940	17.7	15.6	140.4
Sturgeon	*Acipenser fulvescens*	Meat (raw)	3150	2298	483	121.2	0	0	33	390	6330	21	8520	2.1	2.1	249
White-tail Deer	*Odocoileus virginianus*	Meat (raw)	4710	2136	654	213.9	0	0	26.4	330	6030	87.6	9900	16.41	8.61	171
Whitefish	*Coregonus clupeaformis*	Meat (raw)	4020	2184	573	175.8	0	0	33.6	780	8100	11.1	9510	4.2	3.6	90