An Archaeobotanical Analysis of the Iler Earthworks Macro Remains

by

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Author's Declaration

I declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Abstract

This thesis examines the archaeobotanical remains from the Iler Earthworks, a Springwells-Wolf phase site within the Western Basin Tradition (WBT) of Southwestern Ontario. Excavations between 2015 and 2018 resulted in soil samples from pit feature contexts that were floated as part of this study to collect archaeobotanical remains. Archaeobotanical data are underrepresented in Western Basin Tradition scholarship but can contribute to a better understanding of foodways and the interrelationships between humans and their environments. Subsistence strategies for WBT populations have been associated with seasonal mobility, with a low reliance on cultigens. This analysis suggests that the Iler community was engaging in cultigen use, and this is the first report where four out of five identified cultigens in Ontario are present at a WBT site. Yet, the analysis also suggests that the people of Iler remained committed to exploiting wild species. This suggests that while the Iler community was invested in horticultural practices as part of their foodways, so too were practices that emphasized gathering within the region. This may be connected to local ecological engineering practices which sought to maintain a highly diverse and rich resource environment.

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1.1 Introduction

As Indigenous peoples seek to restore traditional lifeways, rematriation has emerged as an important foil to centuries of settler-colonial violence. Led by women, it seeks to restore connections with ancestral lands and ways of life that are governed by Indigenous laws and sociopolitical frameworks such as matrilineality and matrilocality (Gray 2022). One example of rematriation comes in the form of seed stewardship, which promotes Indigenous food sovereignty, creates biodiversity, and leads to more sustainable agricultural practices. Seed stewardship recognizes that plants are both teachers and kin, and through nurturing plants Indigenous women may simultaneously protect both mother earth and future generations. This initiative is deeply significant to many Indigenous women as it forefronts traditional values and cultural knowledge as part of a broader respect for the earth.

While nascent, rematriation is a multi-layered paradigm involving themes of restoration, reconnection, and reclamation of relationships and identities. As noted above, it primarily turns on Indigenous notions of the feminine and maternal and brings these into alignment with care for mother earth, the water, and air (see https://rematriation.com). In discourse (https://rematriation.com; White 2019), it is often positioned as the antithesis of repatriation, or the return of a cultural patrimony that includes artifacts and other items. Instead, to rematriate is to pursue Indigenous ways of life that may eschew modern western ontologies, practices, and temporalities (https://rematriation.com; White 2019), or may include multiple lenses. It is often framed as a form of healing (White 2019) that takes shape through collaboration, along with an open sharing of ideas, knowledge, and respect. As well, since Indigenous lifeways continue to evolve, it is important to understand that rematriation does not mean to return to all pre-colonial beliefs and practices but rather those that promote balance, harmony, and respect for the earth.

It is through rematriation that seed stewardship efforts have emerged as prominent and vital for Indigenous communities. Owing to relocation/resettlement, the destruction of Indigenous gathering practices, and the replacement of traditional ecosystems with agricultural fields, various plants (some of which are considered sacred) have for some time now been missing from communities (Gwin 2019; White 2019). Heirloom or landrace seeds “from the vaults of public institutions, seed banks, universities, seed keepers’ collections, or sometimes [the] dusty pantries of elders” (White 2019:186) have begun to be reclaimed by various communities and encouraged to grow in their environments. As described in some detail in the following sections, Indigenous women from many communities are committed to seed sovereignty and eager to serve as stewards.

1.2 The Cherokee Nation Seed Bank and Native Plant Site

In 2006, Cherokee Nation member Pat Gwin was tasked with finding heirloom seeds to “reclaim [our] place as North America’s first and foremost agriculturalists” (Gwin 2019:199). Specifically, Gwin sought the Cherokee Purple Tomato and the seeds from other heirloom plants so that they could be placed in the Svalbard Global Seed Vault (SGSV). Through the help of individuals across the United States and researchers at the Science Museum of Minnesota, Gwin (2019:202) was able to collect “four varieties of corn, more than twenty varieties of beans, a squash variety, and ceremonial tobacco”. With this modest collection in hand, the Cherokee Nation Seed Bank was formed.

Unfortunately, the Cherokee Nation Seed Bank faced numerous challenges early on in caring for its collection. To keep a viable sample of seeds replete with genetic variability, and to plant these seeds using traditional methods, the Seed Bank required land to plant. Initially, the land that was available for planting was a disturbed and garbage-filled swamp that had been used to build the Cherokee Centre in the 1960s (Gwin 2019). Through painstaking efforts on the part of the community, including soil remediation and lots of manual labour, this land was made viable for growing. In recent years, with a "plant-grow-harvest-store-repeat" process and choosing seeds for curation, the site has been able to provide bags of excess seeds for the community. The difficulties, however, have not ended with successful harvests. Throughout each growing season, staff at the seed bank deal with issues such as genetic expression, politics, climate change, and hybridization, and in response have developed skills in dealing with these and other issues. Gwin began and finished this narrative with a question that all who grow plants and depend on them for food have probably asked themselves: "what if the seeds do not sprout"? The Cherokee ancestors from 1491 would have asked this question, and as Gwin states "I believe they asked that question because it was the plants that kept them alive, and in fact, what made them Cherokee. One could not exist without the other" (Gwin 2019:208).

1.3 Food Sovereignty: Rematriation and Seed Stewardship

During the 2007 Forum for Food Sovereignty, a declaration was made which stated, "food sovereignty is the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems" (Declaration of Nyeleni 2007:1). This declaration identifies the need for communities to define their own contextual sovereignty, based on social, environmental, and economic sustainability. Various authors, Indigenous and non-Indigenous alike, declare that what is required is to remove governments or ruling parties from involvement and to instead return power to the hands of the people and allow individual groups to define sovereignty (Martens et al. 2016; Morrison 2011; White 2019). Food sovereignty balances power that enables communities to be in control of their living and traditional systems, and to produce and distribute food according to their laws and systems (Goodluck 2022).

Disruption to traditional Indigenous foodways has led to numerous community-based health issues. As noted by Goodluck (2022), "one in four Native Americans suffers from food insecurity, compared to one in eight Americans overall". Moreover, members of Indigenous communities are prone to suffering from diabetes and obesity. While the declaration noted above establishes the right for communities to culturally appropriate and healthy foods, it also raises many issues with the current system of food production today. Food sovereignty points to the need for more sustainable production to reverse decades of environmental degradation, social and economic inequality, and the increasing famine. Indigenous Food sovereignty, developed and defined within the framework of an Indigenous lens, seeks to "re-connect to land-based food and political systems" and to continue "sacred responsibilities to nurture relationships with our land, culture spirituality, and future generations" (Martens et al. 2016:18; Morrison 2011:111).

Essentially, Indigenous food sovereignty is attempting to make the connection between healthy food and healthy land. Rematriation and Indigenous food sovereignty, developed through similar Indigenous lenses, focus on the reciprocal relationships that take hold between the land and plants, and seek to return communities to traditional knowledge systems. The ability to grow, nurture, learn from, and adapt with the seeds and the land is also a part of this process; there is an importance to returning the seeds "back [to a] living context" (White 2019:195). In this way, land rematriation – the returning of responsibility for ancestral lands – goes hand in hand with food sovereignty and seed stewardship. However, it too requires more than a return over control of the land; it requires the land itself be returned to a state by that would allow communities to survive and, indeed, thrive. As noted above, colonization has disrupted the ability of the land to produce viable crops, and to support communities' food sovereignty. Waterways and soil fertility have been disturbed and contaminated, and plant and animal species that would support diversity have been altered or removed. Rematriation is therefore more than the return of tangible 'land': it is a return to and reclamation of Indigenous knowledge systems and laws, along with the removal of settler systems of control and enforcement. Rematriation of plants and land promotes Indigenous food sovereignty along with values such as collaboration, sharing, respect, and understanding. Re-establishing reciprocal relationships with the land and non-human kin reclaims an identity that was once taken and lost for centuries in layered colonial systems.

1.4 Archaeobotanical Support for Rematriation

Colonial systems that promoted western agricultural methods in residential schools, along with relocation and resettlement of communities and crop destruction, forced seeds and communities apart for centuries (White 2019). Palaeoethnobotany can help to restore these connections through archaeobotanical analyses of plants recovered from the archaeological record. In doing this work, information on landraces or heirloom species can be reclaimed by Indigenous communities that identify as stewards of that land. Information regarding the presence of past plants can also speak to the kinds of landscapes that once fostered these species. Likewise, palaeoethnobotany can contribute to information about how communities interacted with these landscapes and plants and can support efforts to re-establish these plants in varied ecological contexts. This can only be completed through a collaborative framework involving partners such as palaeobotanists, archaeologists, Indigenous communities, seed banks and university seed collections, and local governments. It is important, as part of these frameworks, that information be shared across groups to facilitate local gardens, conservation, and revitalization programs.

In the second chapter of this thesis, I will examine the archaeobotanical remains from the Iler Earthworks site and discuss how palaeoethnobotanical information can contribute to our understanding of Western Basin Tradition subsistence lifeways, and how the communities interacted with the landscape.

It is my intention to publish this work in the *Canadian Journal of Archaeology*. This analysis provides new evidence for both human and nonhuman (plant) populations in the distant past of what is now southwestern Ontario – populations that are not well understood and yet can contribute significantly to our understanding of Indigenous pasts in the region. As archaeobotany is an underrepresented component of archaeology, this journal will help disseminate this information to a national and even international audience.

2.1 Introduction

Despite an opaque understanding of the timing and effects of food production among past Indigenous populations in southwestern Ontario, archaeobotanical analyses of sites has been limited. This thesis seeks to remedy this situation, in part, by examining the archaeobotanical macro remains from features found at the Iler Earthworks, a large Late Woodland Western Basin Tradition (WBT) Springwells Phase occupation in Essex County, Ontario. Working with plant remains recovered through flotation, it provides an analysis framed around the foodways that once characterized human-plant interactions in the landscapes associated with the Iler site. This work will be contextualized by examining past WBT research that discusses the archaeobotanical record of known WBT sites. To date, most research related to the WBT has been guided by interests in ceramic, lithic, and faunal remains. This leaves a gap in the archaeological record regarding botanical data, and it is hoped that this thesis will contribute to the plant-based foodways narrative to better understand WBT peoples, especially during the transitional period between the Springwells and Wolf phases.

This thesis will begin with a review of Western Basin Tradition lifeways, focusing on settlement and subsistence strategies. It then examines previous archaeobotanical data from sites within the region with an emphasis on those occupations associated with the Springwells and Wolf phases. The archaeobotanical analysis will include a qualitative and quantitative component and will outline through a discussion the differing species found. In discussing the results of the analysis, I ultimately turn to a framework of Traditional Ecological Knowledge (TEK) and Lifeway Niche Construction (LNC) to better understand the subsistence strategies and interrelationships of the Iler communities with the landscape.

2.2 Previous Research on the Western Basin Tradition

2.2.1 Establishing Culture Historical Frameworks

While underexplored when compared to the neighbouring Ontario Iroquois Tradition, the Western Basin Tradition (WBT) provides a framework for understanding Late Woodland cultural developments in southwestern Ontario, southeastern Michigan, and northwestern Ohio (Murphy and Ferris 1990:189). Centered on the drainages of western Lake Erie, Lake St. Clair, and lower Lake Huron, this Tradition is divided into four phases: Riviere au Vase (ca. 600 to 800 or 900 CE); Younge (ca. 800 or 900 to 1200 CE); Springwells (ca. 1200 to 1400 CE); and, lastly, Wolf (ca. 1400 to 1550 or 1600 CE). While this framework was originally constructed using archaeological data recovered from sites in Michigan and Ohio (see Fitting 1965; see also Stothers and Pratt 1981) data recovered from southwestern Ontario has aided in expanding the known geographical extent and cultural characteristics of the Tradition (see Murphy and Ferris 1990).

When examining this framework in more detail, it is imperative to begin with the work of James Fitting (1965) and his definition of what was then known as the Younge Tradition. Initially, in defining this Tradition, Fitting (1965) utilized data from several sites and collections in southeastern Michigan and adjacent areas, principally changes in ceramic designs, burial practices, and site contexts. Stothers and Pratt (1981) expanded upon the Younge construct by including developments in northwestern Ohio and renamed this tradition for the ‘western basin’ of Lake Erie. Later, more processually-oriented research undertaken by James Krakker (1983) sought to illuminate the ‘sociocultural systems’ of Western Basin groups using several lines of evidence involving intra- and inter-site variability. Western Basin ‘culture’ was discussed in relation to inputs and outputs that would affect the hierarchal, regulatory subsystems that acted adaptively to accommodate disruption, whether positive or negative, to the overall system. According to Krakker, one important input that contributed to sociocultural change was the necessity for exchange network development during the earlier Late Woodland period. This set the tone for a greater need for exchange of utilitarian items, such as maize or local cherts, that would have increased the demand for interaction between populations, at different levels. Krakker notes that reliance on corn became more prevalent in the northern region of the Great Lakes during this period.

In 1990, Carl Murphy and Neal Ferris completed an in-depth analysis of Late Woodland archaeology in southwestern Ontario with an eye toward defining the eastern extent of the WBT. They noted that settlements associated with the Riviere au Vase phase are similar in nature to those of the preceding Middle Woodland (Couture) complex. Campsites were associated with seasonal resources, with a high degree of mobility needed for resource exploitation (Murphy and Ferris 1990). The settlement pattern moving into the Younge phase is difficult to assess, in part because there are few sites and those that are know contain earlier Riviere au Vase components (Murphy and Ferris 1990). It appears, however, that earlier subsistence-settlement strategies continued through the Younge phase, with sites oriented to locations along waterways during warm weather months and interior locales during the cold season. At the time, Murphy and Ferris (1990) did not think Younge communities were heavily reliant on maize, however, more recent research has disrupted this assessment (see e.g., Dewar et al. 2010; Watts et al. 2011).

By the Springwells phase, to which Iler has been assigned, the ecological locations of sites begin to change along with the length of occupation as suggested by an increase in summer settlement sites with more permanent structures, and with a continued need for winter camps in differing locations. Murphy and Ferris (1990:263) suggest this is a result of an increasing reliance on cultigens but it could also result from Iroquoian groups moving in from the east, pushing settlements further west. Later Wolf settlements are mostly located along the shores of the Detroit and St. Clair River, in the extreme western end of the southwestern Ontario region (Murphy and Ferris 1990). The Wolf phase appears to exhibit early and later stages that exhibit differences in settlement strategies and lifeways. Reasons for this will be discussed below.

More recently, Lindsay Foreman (2011) undertook to characterize WBT subsistence-settlement practices by way of a detailed faunal analysis. Foreman's dissertation used faunal assemblages to outline inferences on subsistence strategies for the WBT populations, specifically procurement and processing activities. Foreman suggests that both pursuits contributed to the need for sites with sandy soils that were close to various resources while at the same time suitable for cultigens. In a similar vein, Krakker (1983) discussed the possibility that groups may have been in competition for nutrient rich soils that would have provided the needed return on investment to sustain a specific population. Larger and more numerous dwellings on these sites add to the evidence of change in the Springwells period. The Wolf phase has the fewest known sites, yielding minimal information regarding settlement. Known Wolf sites appear to be in areas that would have provided rich soils and high horticultural yields. According to Krakker, this was an important aspect that guided decisions and contributed to the changes in subsistence and settlement strategies. Like Krakker, Foreman suggests subsistence strategies that included mobility and seasonality were more flexible than previously assumed, both at the intra-site and regional level. This indicates that, contrary to Iroquoian communities to the east, WBT groups maintained a high degree of mobility while relying on cultigens and previous foraging patterns (Foreman 2011).

It has been assumed that past populations who relied heavily on cultigens adhered to more sedentary forms of settlement, as it was important to maintain proximity to horticultural fields. Examining site locality as part of the faunal analysis, Foreman (2011) noted that groups who are more mobile will make settlement decisions based on many variables including environmental ecology and the introduction of cultigens. Murphy and Ferris (1990) attribute this to the richness of southwestern Ontario environments where it was not necessary to travel long distances to find necessary resources.

2.2.2 Subsistence Strategies of the Western Basin Tradition

WBT subsistence practices have typically been characterized as highly mobile and seasonal, particularly during the first half of the Tradition, with groups dividing their time between spring-summer and late fall-winter camps (see e.g., Murphy and Ferris 1990:244). In general, WBT populations are thought to have focused on fishing practices between the spring and fall, placing their settlements near lakes or rivers. Foreman's (2011) analysis narrows down these time periods based on the type and abundance of fish and migratory animals prevalent at each site. Foreman uses the "geographic distribution, habitat preferences, timing of migration, mating, birthing, and growth cycles, and rearing practices of fauna" to "predict the annual availability of archaeologically important species" (Foreman 2011:7). For example, Cherry Lane, previously identified as an Autumn settlement, contains high frequencies of "fall spawning salmonids and winter spawning burbot", and combined with the presence and nature of the mammal faunal remains, pushes this to a cold weather winter settlement (Foreman 2011:44). In the winter, while it appears the focus shifts to a heavier reliance on mammals and birds, where interior settlements would be best placed, some settlements remained near aquatic resources (Foreman 2011). Cold weather sites are not well documented, and appear to show variation in locality, potentially due to the size of the community that was occupying the sites, or possibly due to variation in subsistence strategies at a smaller group level. The variation in settlement patterns brings into question the overall subsistence lifeways of the WBT, and the level and size of community that were practicing similar strategies (Murphy and Ferris 1990). As will be examined below and given the work by Krakker (1983) and Foreman (2011), it may be necessary to begin looking at these strategies from the bottom-up.

Until recently, and unlike their Iroquoian neighbours to the east, it was assumed that WBT populations were never heavily reliant on cultigens due to their highly mobile settlement practices and exploitation of specific species of animals and plants (Foreman 2011; Murphy and Ferris 1990). While maize does show up in the archaeological record by the Riviere au Vase phase, as suggested by an eighth-century date for this cultigen from the Sissung site in Michigan (see Crawford et al. 1997:114), it remains unclear if this constitutes its earliest appearance in the region. Isotopic analyses from the Younge phase Krieger and Great Western Park sites, however, indicate that maize was consumed in significant quantities by the close of the thirteenth century (Dewer et al. 2010; Watts et al. 2011). Cultigens are thought to become more prevalent as we move from Younge to Springwells times but a lack of quantitative archaeobotanical data limits our inferences. Sadly, only a few Wolf phase sites contribute to the subsistence narrative of the WBT, but they are marked by the appearance of earthen enclosures and larger sites (Lennox and Dodd 1991). Maize has been found at Libby (Fecteau 1993), but in very low numbers when compared to earlier Younge or Springwells sites. Wolf communities, while becoming more sedentary are located further to the west, still depended on wild species to supplement their foodways.

2.2.3 Western Basin Tradition: Past Archaeobotanical Evidence

As comprehensive palaeoethnobotanical analyses are rarely undertaken on WBT sites, much of our understanding of past plant use in the region comes from consulting work or cultural resource management projects. Unfortunately, this literature rarely finds its way into print, and while reports are submitted to and held by the Ontario government, it is difficult to know the extent to which archaeobotanical work has been conducted.

As part of the background research for this study, numerous articles and reports encompassing nine WBT sites were examined: Krieger, Great Western Park, Dick, Cherry Lane, Dymock, La Salle-Lucier, Liahn I, Libby, and the Neutral Wolfe Creek site (see Cooper 1982; Fecteau 1981, 1985, 1991, 1993; Fecteau and McAndrews 1977; Kenyon 1988). These sites are found in Essex, Kent, Lambton, and Middlesex Counties. While no palaeoethnobotanical studies could be identified for Riviere au Vase sites in Ontario, six sites associated with the Younge phase have evidence for maize including Krieger and Great Western Park, as noted above, as well as Dick Farm, Cherry Lane, Dymock, and LaSalle-Lucier. Palaeoethnobotanical samples from Cherry Lane provided the first instance of sunflower from a WBT site (Fecteau 1985) while work at Dymock provided the first appearances of squash (Cooper 1982). Dick Farm has the first reported evidence of bean, while both Cherry Lane and Dymock contain the first evidence of Chenopodium at a WBT site. Meanwhile, the Springwells phase occupations at La Salle-Lucier provided the first recorded appearance of tobacco at any WBT site (Lennox and Dodd 1991). The Wolf phase Libby Site has evidence of maize, as noted above, while the Neutral Wolfe Creek has evidence of maize, bean, squash, sunflower, and tobacco (Fecteau 1981). While the Neutral are not considered part of the WBT, the Wolfe Creek is examined here by virtue of its close proximity in the Chatham area.

Despite the appearance of these cultigens, wild plants continued to play a part in the subsistence strategies of WBT communities. For example, grass, Chenopodium, raspberry, blackberry, hawthorn, strawberry, elderberry, sumac, purslane, and cherry were all found at the Younge phase Dymock site (Cooper 1982). At the Springwells phase occupation of La Salle-Lucier, grass, bramble, black cherry, hawthorn, and nightshade were all found (Lennox and Dodd 1991). At the Wolf phase Libby site, hawthorn, knotweed, sumac, raspberry, elderberry, grape, cherry, and bedstraw were recorded. Nuts also played an important role in the subsistence strategies of the WBT communities as hickory, butternut, black walnut, oak, and hazelnut were found at most sites throughout the WBT in both the United States and southwestern Ontario.

2.3 Ecology of the WBT Region and the Iler Earthworks

Southwestern Ontario falls into the Carolinian biotic zone, which includes vegetative areas of oak-hickory, pine and spruce-fur, and northern hardwood (birch-beech-maple-hemlock) forests (Crawford and Smith 2003; Yarnell 1964). The northern hardwood region includes homogenous coniferous areas with high quantities of balsam fir, white spruce, black spruce, and paper birch. Deciduous areas are more complex, however, with differing hardwood species including oak, hickory, beech, and black walnut (Yarnell 1964). Evidence of wood types are an important component of the archaeobotanical record. Wood identifications help to better understand the nature of the vegetation areas that past communities were inhabiting and utilizing. These vegetation zones follow patterns of soil and drainage types that can reveal specific settlement patterns. This region of southwestern Ontario is comprised for the most part of the St. Clair Clay Plains, which remain wet for a good portion of the year and support species such as ash and elm. Other areas contain “well-drained, sandy-loam soils” that "support a wide variety of nut, berry, and seed producing trees and shrubs" (Murphy and Ferris 1990:231). Oak and hickory grow along the borders of grasslands (Murphy and Ferris 1990:230).

Using pollen analysis, general strata zones (See Appendix, Table A5) have been identified in Ontario that help to determine the climate of this region and period (Crawford and Smith 2003). Iler falls in the final phase of Zone 3d, dated from 650 to 1850 CE which Crawford and Smith (2003:185) characterize as containing "very low beech percentages and high oak (*Quercus alba*) and white pine pollen percentages". During the occupation of Iler, in the mid-fifteenth century, "a mixed pine-oak-birch forest succeeded a mainly hardwood forest. Zone 3d is thought to reflect a period of relative cooling following the mild era" (Crawford and Smith 2003:185-186). This period, known as the Little Ice Age, represents a time of cooler temperatures, a change of forest vegetation, and a drop in crop production (Crawford and Smith 2003).

2.4 Background and Archaeology of Iler Earthworks (AaHr-22)

Located 2 kilometres north of Lake Erie and approximately 700 metres south of a branch of Cedar Creek, the Iler Earthworks are situated along a low NE-SW ridge comprised of Tuscola Sandy Loam, in the northern half of Lot 36, Township of Colchester South, Essex County (see Figure 1). The sandy loam soils found at Iler are unusual for Essex County given the relative prominence here of the St. Clair Clay Plains. After relocating the site in 2013, Christopher Watts returned to Iler in 2015 to conduct remote sensing preparatory to exploratory excavations. By the end of the 2015 field season, 116 one-meter square units had been excavated, a sample of Springwells phase pottery and other artifacts had been recovered, and a preliminary site plan had been made. In 2016 and again in 2018, mechanical topsoil stripping was undertaken to expose the western extent of the earthen enclosure and interior use of the site. Fourteen features along with various post moulds were documented as part of this work (See Figure 2). With the recovery of additional decorated pottery sherds, the site was thought by Watts (2018) to date to the Springwells through early Wolf phases.

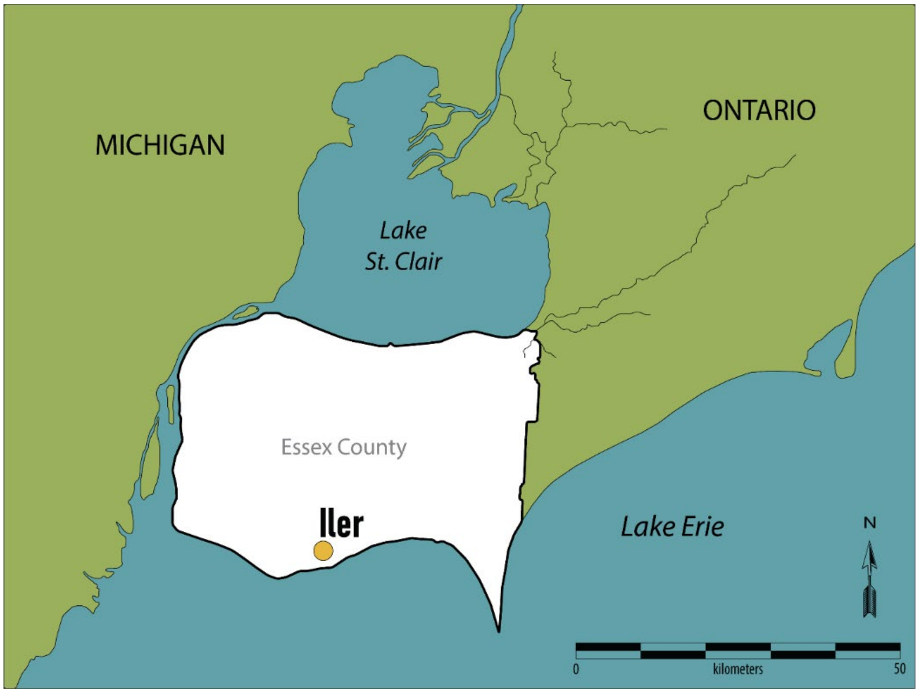

Figure 1. Location of Iler Earthworks in Essex County, provided by Dr. C. Watts

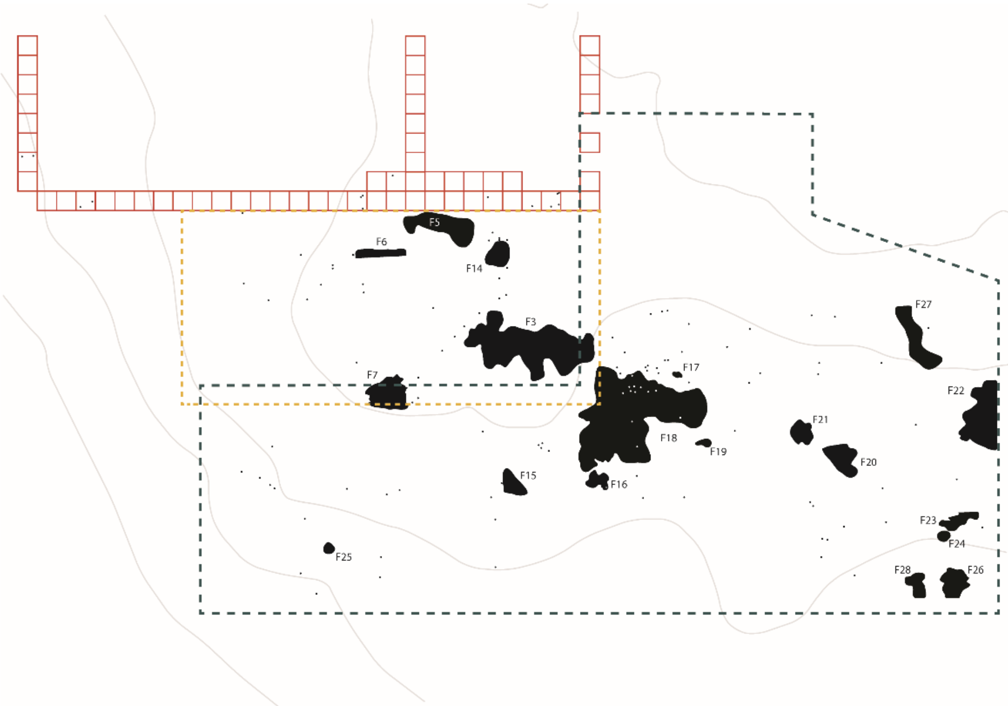

Figure 2. Plan View of the Iler Earthworks, provided by Dr. C. Watts

2.5 Field and Lab Methodology

2.5.1 Field Methodology: Soil Sampling for macro remains at Iler Earthworks

Archaeobotanical samples take two main forms – macroremains and microremains – and require different sampling techniques. Macroremains are larger, generally visible to the naked eye, and typically require only a low-power microscope for examination (Pearsall 2019, 2015). Examples of these include seeds or endocarps, fruits, nuts and shells, wood (charcoal), roots, and tubers. These remains enter the archaeological record in a variety of ways and are mainly preserved through the process of charring. Microremains, on the other hand, are microscopic and are usually only identifiable with a microscope. These include pollen, phytoliths, starch, and spores. These remains are preserved in several ways, usually in soils and on artifacts like pottery (e.g., starches in fabrics) and grinding stones. As only macroremains have been recovered to date at Iler, they comprise the focus of this study.

The macrobotanical sample from Iler was obtained from the remains of cultural features found below the ploughzone. Soil samples were taken from Features 1, 3, 7, 18, 20, 22 and 23, (see Figure 2) typically from a single part of the feature where it was possible to obtain a sample of 12 or more litres. This technique is known as point or bulk methodology (see Banning 2022; Guedes and Spengler 2014; Pearsall 2015). A list of sampled features appears in the Appendix, Table A2. Feature 1 was comprised of soil fills associated with the ditch used to make the enclosure and a 62 L sample was taken. Feature 3, which in plan view appeared as an irregular shaped surface stain, consisted of (~24L) and was revealed during excavations to be a series of overlapping pit features. Feature 7 was also deemed to be a pit, and a soil sample of 54.4 L was collected. Feature 18, meanwhile, was found to be a large and complex series of overlapping pits that produced a sizable quantity of artifacts and likely articulated with Feature 3. Two soil samples were taken from this feature, totaling 22.4 litres. Feature 20, from which two samples were taken for a total of 12.5 litres, was selected for sampling due to its large size and high quantities of carbonized wood. A sample of 8.8 litres was collected from Feature 22, a pit which was not fully explored as portions of it fell outside of the 2018 excavation area, and 16.7 litres were collected from another pit (Feature 23). Flotation methodologies for these soil samples will be discussed in the next section.

2.5.2 Lab: Soil Flotation and the Qualitative and Quantitative Botanical Analysis

Flotation of soil samples, which requires the use of water and either a manual or mechanized flotation device, relies on differences in density between inorganic and organic materials and results in the separation of two fractions: light and heavy (Pearsall 2019:46). Further, as Pearsall

(2019:47) notes, “recovery of botanical remains is dependent on a variety of factors, including screen mesh size in the flotation bucket” and “the consistency of agitation, and the range of densities of charred materials”. To facilitate recovery of most botanical remains, a mesh size of 0.3mm or smaller is suggested.

Some of the plant remains analyzed as part of this study were floated in 2016 by Watts (samples from Features 1, 3, and 7) with the remainder floated by the author in 2022. In both instances, a Flote-Tech mechanized flotation device was employed. Using water recirculated between a reservoir and the flotation tank, and aided by diffused air (froth), botanical remains are extracted from soil samples (Hunter and Gassner 1998:143). In preparation for the flotation of samples 18, 20, 22, and 23, a float sheet was developed and the sample numbers along with their volumes were recorded. A 0.3mm mesh filtration cloth was used to collect the light fraction and attached to the light fraction lattice tray, while drying racks with newspaper lining were laid out for the completed floats. Samples were then poured into the flotation tank, where the aeration system helped to break up the soil and separate the light and heavy fractions. Once it was clear that the sample had been sufficiently agitated, the flotation box with the heavy fraction was carefully lifted out of the machine and a spray hose was used to wash the heavy fraction into the drying rack tray. The two fractions were placed on the drying rack with the original provenience tag to ensure the correct information was kept with the sample. The drying racks were then transported to the University of Waterloo archaeological lab, where they dried for five days before processing. Similar methods were employed by Watts when floating Features 1, 3, and 7 in 2016.

For archaeobotanical lab analysis, there are differing qualitative and quantitative methodologies essential for research. On the qualitative side, this includes correct identification and classification of the archaeobotanical remains through sorting and tabulation, which is imperative to understanding what plants are present in the archaeological record and the use of those plants by past populations (Fritz and Nesbitt 2014). Quantitative analysis will include measurements, weights, counts, ratios, and simple statistical methods, and will use non-multivariate methods. Relative methodologies compare count value of taxa to one another, either in the same sample or that of another site and include "comparative ratios and diversity indices" (Marston 2014:164).

Once proveniences are documented, an important first step in the qualitative analysis is sorting the dried (heavy and light) fractions. Dry sieving was chosen for this analysis and six nested geological sieves (sized 6.3, 5.6, 4, 2, 1, and 0.6mm) were employed. The various aperture sizes aided in the identification process. Previous sorting of 2016 samples from Features 1, 3, and 7 had been completed using a 2mm mesh geological sieve which were then handpicked into proveniences and placed in a bag for later analysis. If samples were larger than 1g, these were further sorted using the six nested sieves. Owing to its small size, any feature subsample that weighed less than 1g was not divided using the geological sieves.

Heavy fractions that were larger than 1g were sorted into two sizes: < 2.0mm and >2.0mm. If a heavy fraction was found to have a large amount of organic material, it was further divided using the six nested sieves. Light fractions that weighed more than 1g were sorted using all six sieves. Weights were recorded from each screen size prior to picking and examination of the carbonized remains. For the purposes of this study, only carbonized remains were deemed archaeologically significant as uncarbonized items may have been deposited through natural processes including bioturbation. During the picking process, particle sizes were classified according to categories such as inorganic, wood charcoal, bone, shell, and carbonized seed and fruit typologies (Monckton 1994).

For each of the feature samples, 100 percent of the 6.3mm, 5.6mm, 4mm, 2mm, and 1mm fractions were examined. Owing to time constraints, the <0.6mm fraction was not examined as part of this study and some of the 0.6mm light fraction remains required subsampling. If the weight of the 0.6mm sample was less than 1g, the entire sample was examined. If the weight was greater than 1g, ten percent of the sample was examined through subsampling. The qualitative analysis then proceeded with the identification of plant types or taxa present in the collection. The analysis of the 2mm, 1mm, and 0.6mm samples was conducted with the help of a high-power stereo microscope using 8-32x magnification, which aided in the identification of plant structure and morphology. Seed identification was also aided using several reference books (e.g., Fecteau 2019, 2020; Delorit 1970; Martin and Barkley 1960; Montgomery 1977). The qualitative analysis included classification of plant taxa and grouping species into categories such as crops, grains and greens, fleshy fruits, nuts, and other seeds. Samples of charred wood (charcoal) from the 6.3mm fraction were examined to determine species using the transverse cross section. Rudy Fecteau guided this analysis and aided in the identification of charred wood taxa. Samples were broken if necessary to get a fresh edge to support identification. Random sampling occurred using 10 and 20 count subsamples. The charcoal taxa were identified using wood identification from various sources that included both modern and carbonized images.

Quantitative analysis involved enumerating all plant seeds, nuts, and wood species, the last of which was also weighed. Data were entered into an Excel file to help with the quantitative analysis.

2.6 Results of the Qualitative and Quantitative Analysis by Feature

Following processing, a total of 222 botanical remains were available for analysis (see Table 1 and Figure 3). Taxa from Feature 1 are mostly limited to nut remains. Unknown nut fragments (n=4, 50%), acorn (*Quercus* sp.) (n=1, 13%), and *Juglans* sp. (butternut/walnut) (n=1, 13%) are the predominant botanical material from this feature. Unknown fungi (n=1, 13%) and unknown seeds (n=1, 13%) were also present in Feature 1. The wood taxa found include red oak (*Quercus rubra*) (n=1, 5%), ash (*Fraxinus* sp.) (n=4, 20%), *Juglans* sp. (n=1, 5%), *Ulmaceae* (elm) (n=1, 5%), and indeterminate ring porous (n=13, 65%). Feature 3 revealed a maize (*Zea mays*) kernel fragment (n=1, 6%) and embryo (n=1, 6%), and wild species of hawthorn (*Crataegus* sp.) (n=1, 6%), two possible species of *Polygonaceae* (n=2, 12%), unknown thorn (n=1, 6%), a possible hickory (*Carya* sp.) fragment (n=1, 6%), unknown nut fragments (n=2, 12%), fungi (n=2, 12%), and *Chenopodium* sp. (n=2, 12%). Much of the charred wood found in this feature was *Juglans* sp. (n=11, 55%). Ash (n=2, 10%), oak (n=1, 5%), red oak (n=1, 5%), black cherry (*Prunus* sp.) (n=3, 15%), an indeterminate diffuse porous (n=1, 5%) and an indeterminate remain (n=1, 5%) were also present. Feature 7 had sunflower shell fragments (*Helianthus* sp.) (n=2, 22%), an unknown nut fragment (n=1, 11%), fungi (n=3, 33%), and unknown seeds (n=3, 33%). The charred wood sample has red oak (n=1, 14%), beech (*Fagus grandifolia*) (n=3, 43%), and sugar maple (*Acer saccharum*) (n=3, 43%). Feature 18 has a mix of cultigens and wild species that include fleshy fruits and grains. The cultigens include tobacco (*Nicotiana* sp.) (n=1, 4%) and maize kernel fragments (n=3, 12%) while wild species consist of fleshy fruits of blueberry (*Vaccinium* sp.) (n=1, 4%), *Rubus* sp. (n=1, 4%) and cherry (*Prunus* sp.). The grains and greens in Feature 18 include *Polygonaceae* (n=3, 21%) and sorrel (*Oxalis* sp.) (n=1, 7%). Other species include a possible mustard (*Brassicaceae* sp.) (n=1, 7%) and an unknown type of thorn (n=1, 7%). The charred wood includes black cherry (n=3, 30%), birch (*Betula* sp.) (n=1, 10%), indeterminate ring porous (n=2, 20%), and indeterminate (n=1, 10%). Feature 20 had the highest number of botanicals. The cultigens include maize (kernel n=3, 3%; cupule fragment n=1, 1%; embryo n=2, 2%), and possible bean fragments (*Phaseolus vulgaris*) (n=5, 4%). The wild species include the fleshy fruit of *Rubus* sp. (n=16, 14%) while the greens and grains include *Polygonaceae* (n=30, 27%) and *Chenopodium* sp. (n=22, 19%). Other species include a form of fern or Bulrush (*Scirpus* sp.) (n=1, 1%) and a red cedar (*Juniperus virginiana*) seed (n=1, 1%). There are 21 (19%) unknown seeds or fragments in Feature 20. Charred wood from Feature 20 includes red oak (n=11, 55%), sugar maple (n=1, 5%), *Juglans* sp. (n=3, 15%), pine (n=2, 10%), indeterminate diffused porous (n=2, 10%), and indeterminate coniferous (n=1, 5%). Feature 22 had carbonized wood and a tobacco seed (n=1, 100%). The carbonized wood from Feature 22 is in small fragments and analysis of these remains was difficult. The botanical remains in Feature 23 include a maize kernel fragment (n=1, 3%), *Juglans* sp. (n=16, 43%) and unknown nut fragments (n=1, 3%). Fleshy fruits include *Rubus* sp. (n=5, 14%) while and the greens include *Chenopodium* (n=4, 11%). Charred wood remains from Feature 23 will be analyzed as part of a future publication and will not be included in this thesis.

When quantitative data are compared across the various botanical categories, cultigens account for 9.46 percent of the total sample analyzed (see Table 2 and Figure 4). The wild species portion of the sample is 60.36 percent, split between fleshy fruits (11.26%) (see Table 3), greens and grains (29.73%) (see Table 4), nuts (12.16%) (see Table 5) and other (7.21%) (see Table 6). Unknown or unidentifiable seeds and fragments make up 30.36 percent (see Table 4). The unknown seeds and fragments will be examined at a future date to determine if identifications can be made.

Table 1: Botanical Remains by Category and Feature

	Feature 1	Feature 3	Feature 7	Feature 18	Feature 20	Feature 22	Feature 23	Totals
Cultigens	0	2	1	5	11	1	1	**21**
Wild Species - Fleshy Fruits	0	1	0	3	16	0	5	**25**
Wild Species - Greens and Grains	0	5	0	4	53	0	4	**66**
Wild Species – Nuts	6	3	1	0	0	0	17	**27**
Other	1	3	3	2	7	0	0	**16**
Unknown	1	3	3	29	21	0	10	**67**
Totals	**8**	**17**	**8**	**43**	**108**	**1**	**37**	**222**

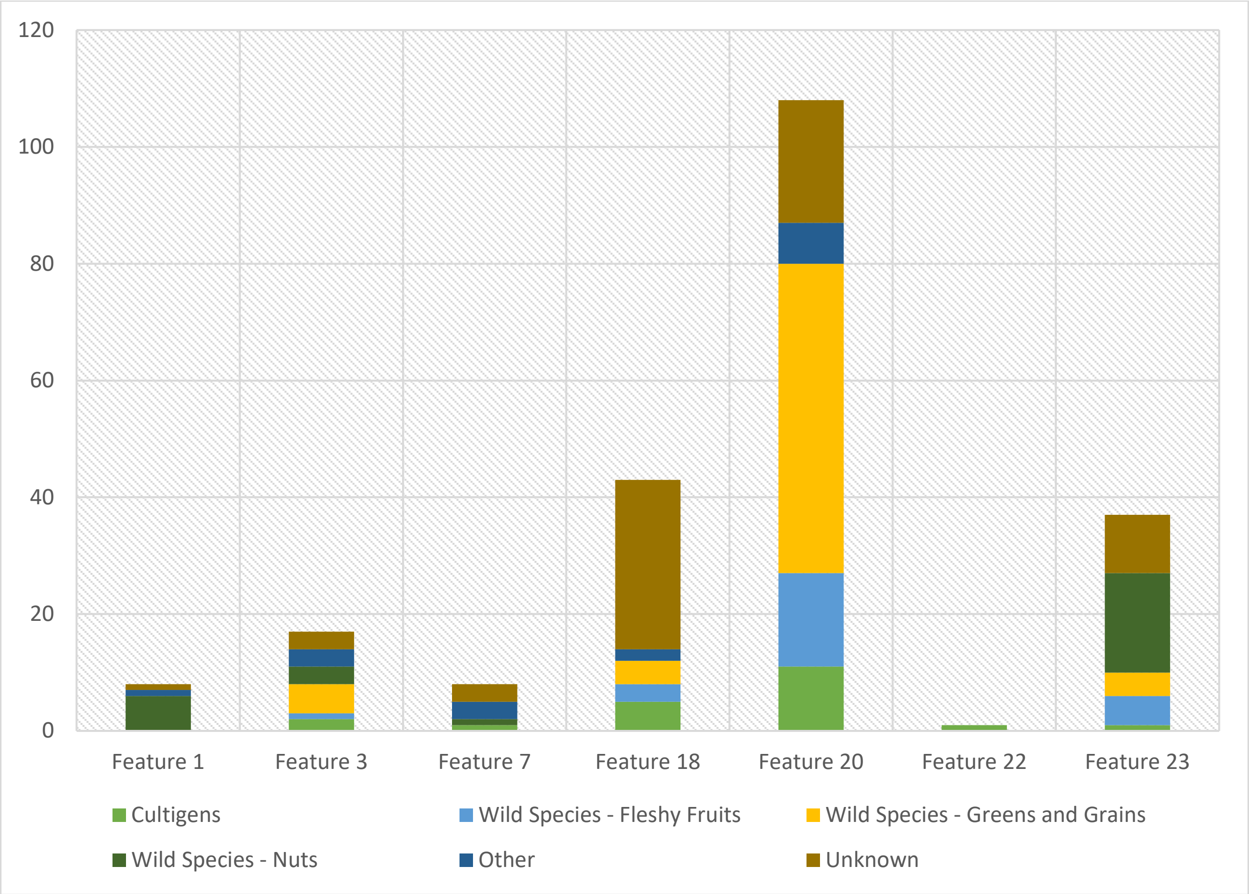

Figure 3. Quantitative Data for Taxa by Feature

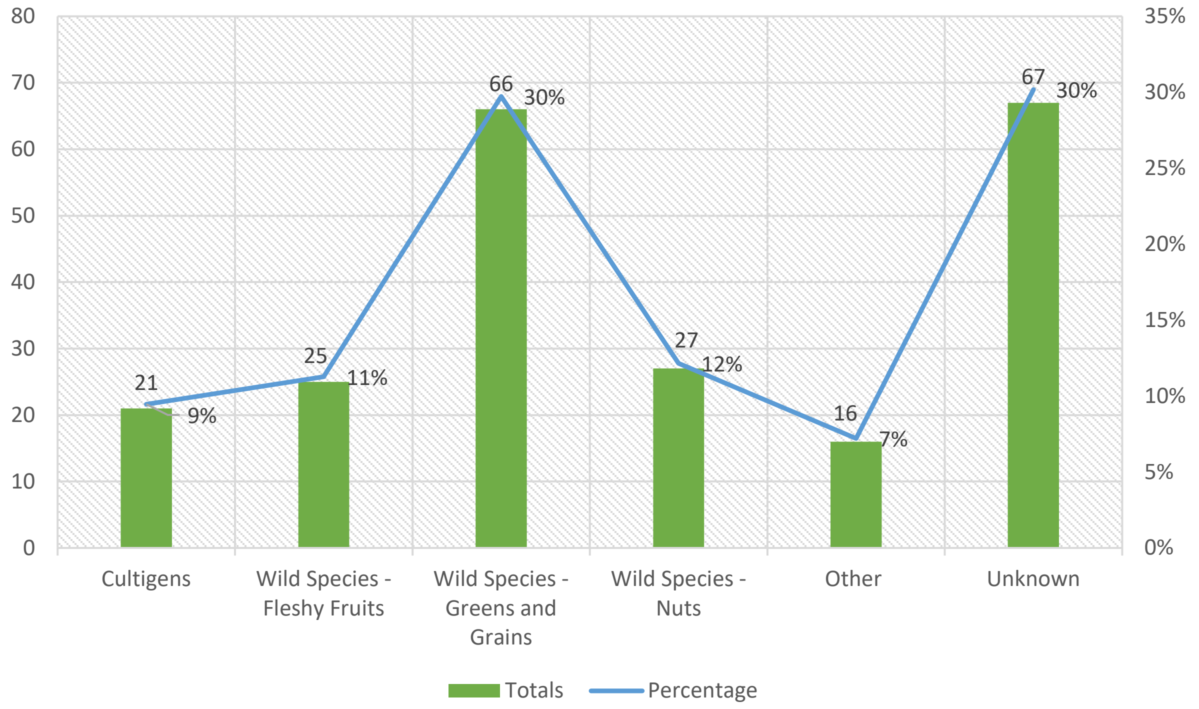

Figure 4. Quantitative Data by Botanical Categories

2.7 Discussion

The archaeobotanical remains from Iler contribute to the narrative of WBT lifeways and diet as outlined earlier in this thesis. During the Springwells phase, the limited archaeobotanical record from other sites suggests an increase in the use of cultigens with a reliance on wild species like fleshy fruits, greens and grains, and nuts for a mixed economy (Murphy and Ferris 1990).

2.7.1 Cultigens

By the time of the Springwells phase, maize, beans, sunflower, cucurbit, and tobacco were all being grown in Ontario. None of these species occurs naturally in the region. Maize is the dominant cultigen at Iler, appearing in four of the seven features that were sampled; however, it is found in low frequencies and is fragmentary (see Figure 9). No full kernels or cupules were documented, and no cob fragments were found. As such, it is difficult to identify the type of corn found at Iler. The Eastern 8-Row variety, either Northern Flint or Eastern Complex (Crawford and Smith 2003) has been recovered from other WBT sites in southwestern Ontario including the Younge phase Dymock site as well as the Wolf phase Libby site, suggesting that this is likely the maize variety present at Iler (see Figure 5). The Northern Flint variety is also known to be able to withstand the harsher climates of the Great Lakes and would have grown well in areas where there were 120 or more frost free days (Arnason et al. 1981; Yarnell 1964). Given the possibility that mobility remained a part of Springwells phase lifeways, maize may have been relied upon in different ways when compared with Iroquoian groups to the east.

Figure 5. Maize kernel fragment

As noted above, the remains of sunflower were recovered from Feature 7 at Iler (see Figure 6). Sunflower was domesticated in the Midwest as part of the Eastern Agricultural Complex beginning in the Early Woodland, well before the introduction of maize to the region, and the cultigen may also have been used in the southern Great Lakes (Crawford and Smith 2003; Yarnell 1964). Indeed, evidence from the Eidson site in Michigan indicates that sunflower was present here by 1000 BCE (Crawford and Smith 2003; Fecteau 1985). In addition to Iler, sunflower has been found at the Younge phase Cherry Lane site (Fecteau 1985). To better identify the variety of sunflower cultigen, standard archaeobotanical practice is to measure the size and shape of the recovered seed. Sunflower achenes became larger as cultivation of the plant expanded, and communities would select the larger seeds during harvest time to plant the following year. Due to the fragmentary nature of the sunflower achene at Iler, measurements would not result in any significant information. Sunflower is harvested after its blooms die down, typically between August and October, depending on specific growing factors. According to ethnohistoric information, sunflower seeds were used mostly for their oils. Yarnell (1964) speculates that in many regions, sunflower may have become less important with the introduction of maize. This may also have been the case for other cultigens such as Chenopodium and Polygonum (Yarnell 1964).

Figure 6. Sunflower Achene

Tobacco was also found in low numbers at Iler (see Figure 7). However, given that only 10 percent of the 0.6mm sample was examined, the presence of this plant is likely to increase with additional analysis. Tobacco was used, as it is today, mainly for smoking purposes. The transmission of tobacco into Ontario is not fully understood; it is believed to have arrived in the Northeast by way of the Midwest after originating in Texas (Fecteau 1985; Yarnell 1964). It has been found in the Midwest as early as the Early Woodland period, and first appears in Ontario sometime after the tenth century CE during the Late Woodland Early Iroquoian period (Fecteau 1985). In the WBT, tobacco has been found at La Salle-Lucier and at the Neutral Wolfe Creek site ca. 1550 CE. Its absence at other WBT sites might be due in part to recovery methods as tobacco requires a flotation technique that uses filter cloth with an aperture of 0.3mm or smaller (the seeds are on average 0.5mm).

Figure 7. Tobacco Seed from Feature 22

The analysis also documented a small number of possible bean fragments from Iler (see Figure 8). While the structure of these fragments closely matches that of modern examples, they are small and therefore difficult to positively identify. It is not unusual for archaeologically derived cultigens to vary in size from modern samples as seeds become larger. However, older cultigens may also behave differently under burning conditions.

Figure 8 Possible Bean Fragment

Given the low number of cultigens found at Iler, along with the complete absence of squash, it may be that cultigens did not contribute significantly to the diets of community members. Cultigens, however, were present in six of the seven features documented during the 2015-2018 excavations suggesting at least some commitment to horticulture. There is also the consideration of preservation and deposition. Burning experiments discussed by Yarnell (1964) indicate that corn, beans, and sunflower seeds are more likely to survive than either squash or gourd. Given this, the absence of gourd at Iler may simply be a function of preservation. We know from Indigenous practices that corn, bean, and squash were regularly grown together to improve crop yields as well as maintain the integrity of the soil. However, this may not be true for all Indigenous communities that grew these species. As mentioned earlier, Iler is located on sandy loam soils surrounded by the heavy clays of the St. Clair Clay Plains. It may be that the Iler community took advantage of this workable and well-drained soil for horticultural purposes. As well, clearing fields for crop production would have created opportunities for other plants to grow, especially those that thrive in disturbed areas and at the periphery of agricultural fields such as Chenopodium, Polygonum and grasses. Chenopodium and Polygonum will be examined below.

Table 2: Summary of Cultigens by Count and Frequency

Common Name (Scientific names)		
Cultigens	Totals	Percentages
Sunflower (*Helianthus sp.*)	1	5%
Tobacco *(Nicotiana sp.)*	2	10%
Maize Kernel Fragment (*Zea mays)*	9	43%
Maize Embryo (*Zea mays*)	3	14%
Maize cupule Fragment (*Zea mays*)	1	5%
Bean Fragment (*Phaseolus vulgaris*)	5	24%
Totals	21	100%

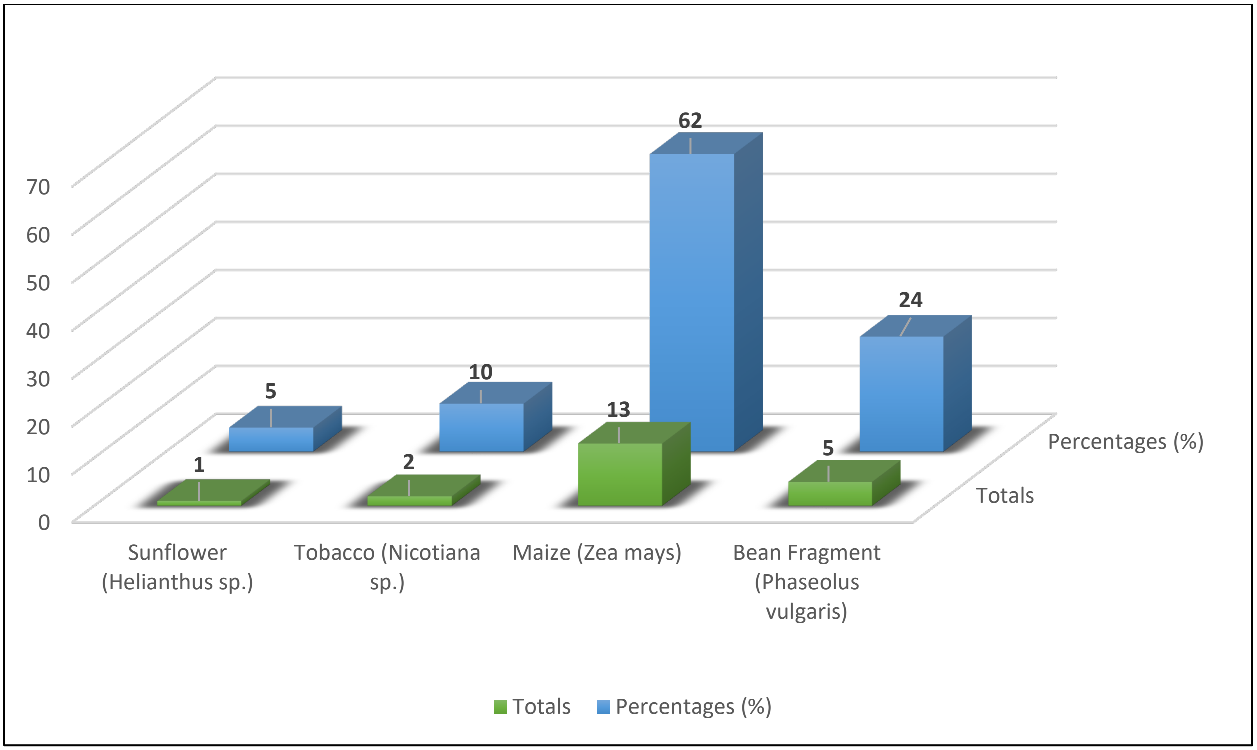

Figure 9. Total Number and Relative Frequencies of Cultigens from Iler

2.7.2 Wild Plant Species

Wild plants may be defined as those taxa that are indigenous to the area and grow without the intervention of humans. As communities became aware of how these plants reproduced, they may have encouraged the growth of species that were considered economically or medicinally valuable. Wild taxa will be examined here using the botanical categories of fleshy fruits, greens and grains, nuts, and other. These are typical designations when looking at archaeological remains, but it should be noted that qualitative assessments do affect palaeoethnobotanical interpretations. Different categories may emphasize seasonality, uses, or traditional knowledge.

2.7.2.1 Fleshy Fruits

Four different taxa of fleshy fruits are found in the archaeobotanical remains from Iler (see Table 3). *Rubus* sp. is the most abundant, which could include raspberry, bramble, or blackberry (see

Figure 10). Blueberry is the second most abundant. Hawthorn is the third taxon, with only one confirmed identification, and five potential remains. Half of a *Prunus* sp. seed was also found, which could include choke cherry or black cherry. The latter seems likely as black cherry wood was found in the sample of wood charcoal, but a definitive determination cannot be made at this time. *Rubus* sp. accounts for 88 percent of the fleshy fruits at Iler and has been found at Dymock, La Salle-Lucier, Libby and Wolfe Creek. *Rubus* sp. can be harvested for several months, from the beginning of summer to the beginning of autumn, and the seeds occur in high numbers at many sites because of their nature and structure as a drupe. Any one berry could potentially have 100 seeds. *Rubus* sp., hawthorn, and cherry are all species that could be considered anthropogenic as they "are forest-edge plants that are quite productive and would have thrived at the perimeters of fields or within them, if fields were patchy" (Crawford and Smith 2003:240). Yarnell (1964:99) even goes so far as to speculate that "it is not unlikely that Indian activities had a lot to do with the present proliferation of species in these particular genera". Given the high percentage of fleshy fruits in the remains, it may be that Iler communities relied heavily on gathering wild species as a subsistence strategy, and this category may have contributed more to diets than that of cultigens.

Figure 10. Rubus sp.

Table 3: Fleshy Fruit Counts by Feature

Fleshy Fruits	**Feature 1**	**Feature 3**	**Feature 7**	**Feature 18**	**Feature 20**	**Feature 22**	**Feature 23**
Raspberry/blackberry/bramble (*Rubus sp.*)				1	16		5
Blueberry (*Vaccinium sp.*)				1			
Hawthorn (*Crataegus sp.*)		1					
Cherry (*Prunus sp.*)				1			
Totals	**0**	**1**	**0**	**3**	**16**	**0**	**5**

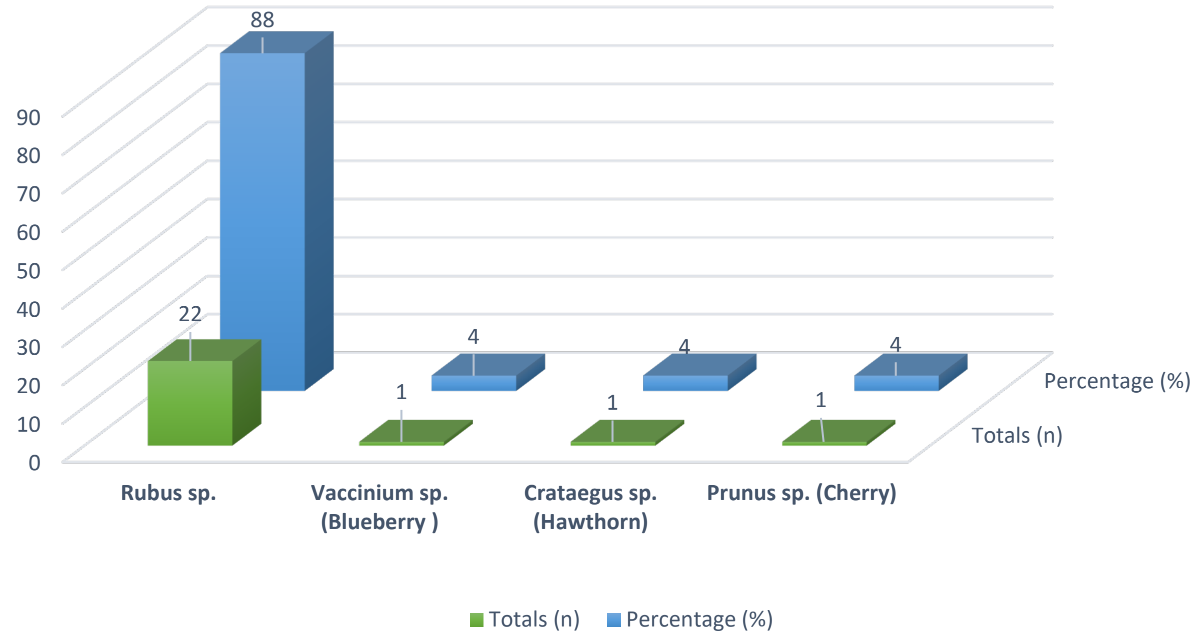

Figure 11. Composition of Fleshy fruits by Species (Counts and Relative Frequencies)

2.7.2.2 Greens and Grains

According to Crawford and Smith (2003:214) "undomesticated greens generally are a poorly understood food resource in the native North American diet". These greens, sometimes referred to as 'weeds', include *Chenopodium* sp. (see Figures 12 and 13) and *Polygonum* sp., both of which are found in high frequencies within the Iler plant remains. The presence and use of *Chenopodium* in Ontario has been widely debated and is not well understood (Crawford et al. 2018). The earliest example of the species in the archaeobotanical record of Ontario comes from the Early Woodland Tutela Heights site in Brantford, where a cache of domesticated seeds was found dating to 930-915 BCE. It is believed that this cache was a part of a trade network with communities from the Mid-South (Crawford et al. 2018). *C. berlandieri* and *Polygonum erectum* were domesticated species within the Eastern Agricultural Complex and comprised an important part of the diet during the Early Woodland in the southern United States (Crawford et al. 2018;

Crawford and Smith 2003). There is little evidence to show this same importance and domestication in more northerly areas (Crawford et al. 2018; Crawford and Smith 2003). The weedy species of *C. berlandieri* and *Polygonum* sp. appear in higher numbers at Ontario sites in the later Late Woodland period. The presence of these species as native plants in Ontario is also debated. *Chenopodium album,* a species thought to have been brought into Ontario through European contact, is also fueling debates as to its presence and use in earlier times by pre-contact Indigenous communities. Yarnell (1964), for example, notes the presence of *C. album* at an Indigenous site that had no indication of European contact. This does not necessarily prove that *C. album* was present prior to European contact, only that there is still much that is not known about the appearance and use of *Chenopodium* as both a food source and potentially a cultigen in Ontario.

Figure 12. Small Chenopodium sp. *with Thicker Testa*

Figure 13. Large Chenopodium sp. *with Thinner Testa*

The *Chenopodium* sp. found at Iler ranges from less than 1mm to almost 3mm in size. This is a large range for only one species of *Chenopodium*. If two species are present, this may indicate that groups at Iler may have been cultivating a genus of *Chenopodium* and collecting a wild species. The *Polygonum* sp. may also have two species present – knotweed and smartweed. To prove a native species was used as a cultigen, certain indicators must be present in archaeologically derived samples including “increased seed size, reduced germination inhibitors, and more robust seed attachments*”* (Mueller 2017:314). For the purposes of this paper, both these taxa will be treated as wild species. The presence of *Chenopodium* and *Polygonum* at Iler indicates further reliance on wild species and may be an indicator of an anthropogenic environment altered by horticultural commitments. Both *Chenopodium* sp. and *Polygonum* sp. can grow and thrive in clearings and along the edges of fields (Crawford and Smith 2003; Yarnell 1964) and are available from the beginning of summer to early fall. *Chenopodium* and

Polygonum leaves were used in similar ways as spinach and could be collected anywhere from mid-summer to early fall. Some ethnohistoric information indicates that *Chenopodium* seeds may have also been used as a form of grain, and that both species may have been used medicinally (Arnason et al. 1981; Yarnell 1964). *Polygonum* leaves were also smoked to attract wildlife, such as deer (Yarnell 1964). There are two sites in the Ontario WBT (Dymock and Cherry Lane) where *Chenopodium* seeds have been found. Two *Polygonum* remains were found at Wolfe Creek.

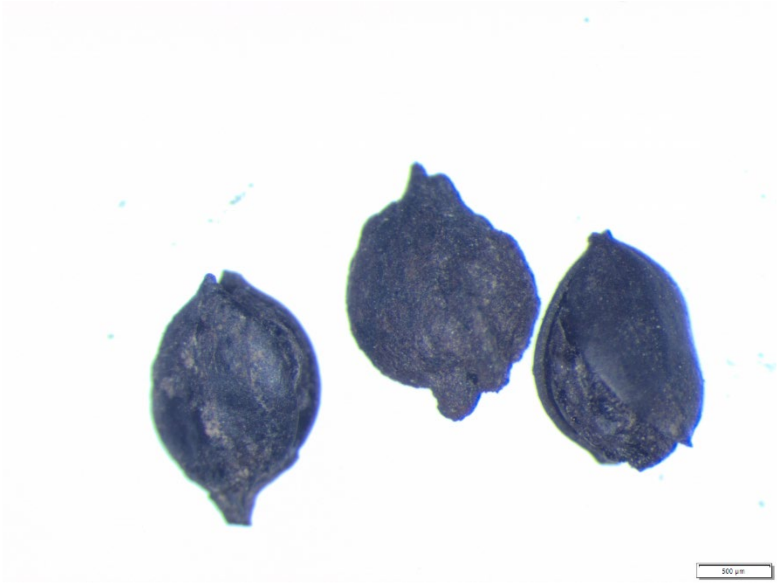

Figure 14. Polygonum Seeds

Two *Oxalis* sp. (sorrel) remains were found in the Iler archaeobotanical assemblage. This taxon has not previously been identified in the archaeobotanical record of the WBT. Sorrel could be used for their greens, available in late spring and summer.

Table 4: List of Greens and Grains within Wild Species

Wild Species – Greens and Grains	Totals	Percentage (%)
Goosefoot (*Chenopodium sp.)*	28	42
Smartweed/Knotweed (*Polygonum sp.*)	36	55

Sorrel (*Oxalis sp.*)	2	3

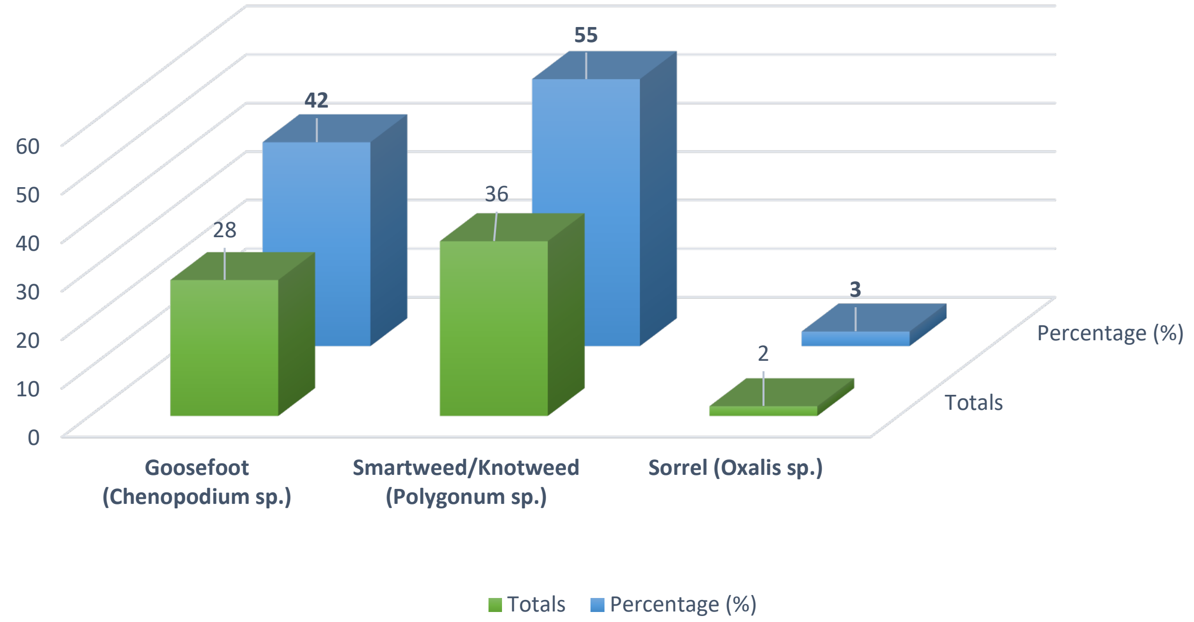

Figure 15. Count and Frequency Data for Greens and Grains

2.7.2.3 Nuts

Two types of nuts were positively identified: *Juglans* sp. (see Figure 17) and *Quercus* sp. (acorn) while a possible hickory nut is also present in the Iler samples (see Table 5). *Juglans* sp. has a long presence in botanical assemblages recovered from Ontario Indigenous sites and includes black walnut and butternut. It is likely that the samples found are black walnut, as that type of wood taxon was also present in the Iler sample and was better distributed than butternut in this region (see Figure 16; see also Crawford 2014) though butternut is found at other WBT sites.

Nut trees “are productive on forest edges and in openings” (Crawford 2014:152), environments potentially created naturally or by lifeway strategies, and black walnut and butternut are available during the early fall season in October (Yarnell 1964). Iler is in the Northern hardwood region, which offers the opportunity for communities to use many species for food and technology, such as dyes. As black walnut grows at the edge of forested areas, it may have found a suitable environment at Iler if horticultural fields had indeed been cleared. As noted above, a small fragment of acorn was also identified at Iler. Acorn was important to Indigenous communities in Ontario and is available from September to November (Crawford and Smith 2003; Yarnell 1964). Like black walnut, *Quercus* (acorn) grows in clearings and forest edges (Crawford 2014), and it was used for both food and medicine, though it requires deep cleaning to remove its bitterness (Arnason et al. 1981; Yarnell 1964). The presence of both *Juglans* sp. and *Quercus* sp. could be indications of tree management, representing a form of niche construction within the Springwells Phase as discussed below. The possible hickory remains from Iler fit with other WBT sites where hickory has also been identified both from nut and wood remains. The only WBT site in Ontario where all three species of nut have been found is Libby. Black walnut has been found at earlier WBT sites in the US, such as the Riviere au Vase and Younge phase Doctor and Hartmann sites (Fecteau 1977). Oak (acorn) has been found at the Younge phase Cherry Lane site. Hickory has been reported at several other Ontario WBT sites, including the Younge phase Dick and Cherry Lane sites, as well as the Springwells phase occupations of La Salle-Lucier. Yet the absence of a species at a site does not mean it was not used by past communities. Given the nature of deposition and preservation, and the increase in archaeobotanical analysis since the 1970s, taxa that have not been reported may still have been an important aspect of past lifeways.

Table 5: Nut Remains (Counts and Frequencies)

	Total	**Percentage (%)**
Acorn (*Quercus* sp.)	1	4
Butternut/Black Walnut (*Juglans* sp.) Fragment	17	63
Unknown Nut Fragment	8	30
Hickory (*Carya sp.)*	1	4

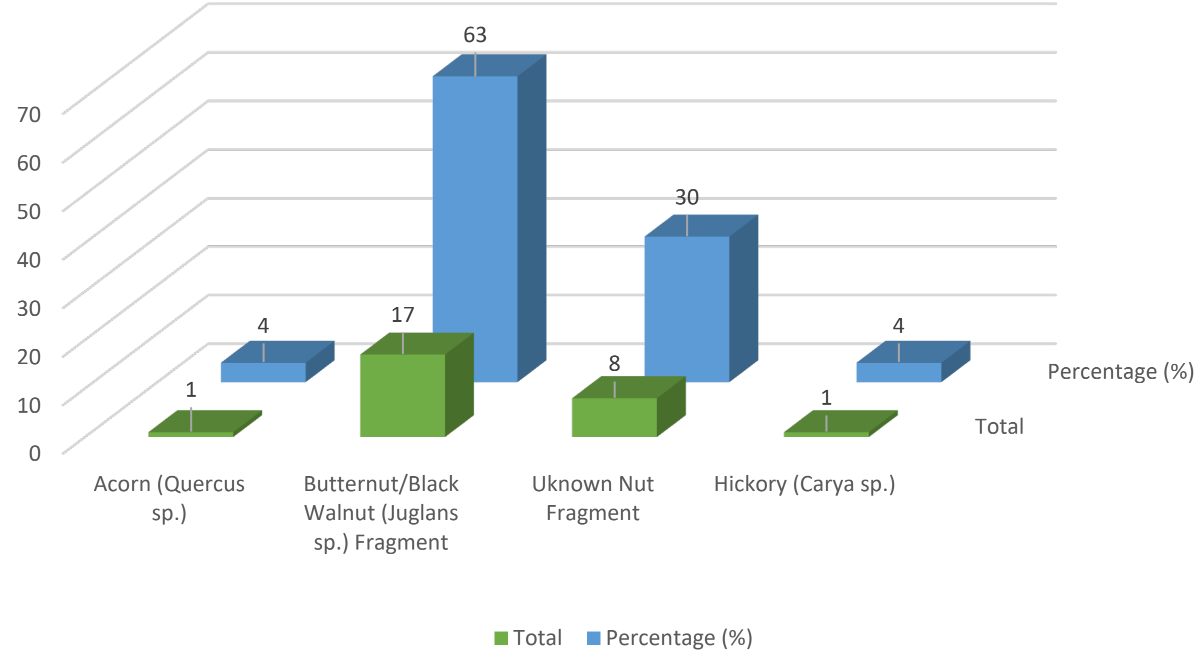

Figure 16. Summary of Nut Remains (Counts and Frequencies)

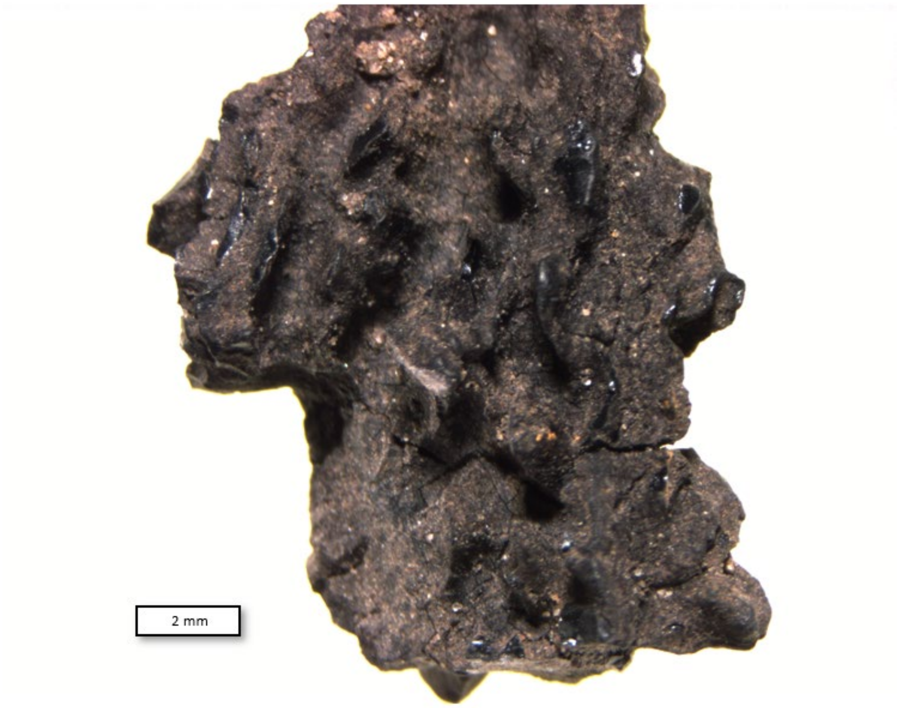

Figure 17. Juglans sp. *Fragment*

2.7.2.4 Other

Although remains classified as ‘other’ may not seem particularly important, this does not mean they cannot tell us something about past foodways. An interesting find in this category is the Red Cedar seed. *Juniperus virginiana. L* (Red cedar) is not an abundant species in this area, and it may have been brought into the area from some distance away. *Juniperus virginiana. L* (Red cedar) has not been reported from any WBT site, either in Ontario or the United States. This seed belongs to an eastern red cedar, which is present in Ontario but is not generally found in the Northern Hardwood forests. In the modern environment of southwestern Ontario, red cedar can be found dotted along the shorelines of Lake Erie and may be a consequence of migratory birds depositing seeds from great distances (https://www.ontario.ca/page/eastern-redcedar). If this is true, it is likely that some of these trees were present during the Springwell phase. Red cedar bark could have been used for weaving and medicine.

One possible *Scirpus* sp. or similar wetland species (bulrush or fern) was also found in the Iler botanical remains. Although the identification of this item is still to be determined, it does resemble a wetland species and would fit into the landscape of Iler. Iler is located close to Cedar Creek, not to mention Lake Erie, and small marsh areas would have existed in this area. Wetland species stems have been used in the past for weaving, and tubers were used for food. No wetland species have been reported from an Ontario WBT site.

Figure 18. Possible Bulrush or Fern Seed

The last possibly identified species of seed within the Iler botanical sample is that of the Cruciferae, potentially a *Brassica* sp. (mustard). This species has also not yet been reported at an Ontario WBT site and it is unclear if it is indigenous to Ontario.

Table 6: Summary of ‘Other’ Taxa within Wild Species

	Total	Percentage %
Red Cedar Seed (*Juniperus virginiana*)	1	6
Mustard (*Brassica* sp.*)*	1	6
Unknown Fungi	6	38
Thorn	7	44
Bulrush (*Scirpus*)	1	6

2.7.3 Charred Wood

Charred wood from an archaeological context can speak to many aspects of a past community’s lifeways. The presence of certain tree species can indicate the environment at the time a community was occupying a site, as well as materials that were available for use in structures, as firewood, and for medicines. Ten definitive taxa were identified in the Iler Earthworks charred wood samples (see Table 7, Figures 19 and 20) with indeterminate diffuse porous as the highest by frequency. Indeterminate diffuse porous (IDP) and indeterminate ring porous (IRP) are partial identifications of deciduous species (Fecteau 2020). Deciduous species are hardwood and include *Acer saccharum* (sugar maple), *Fargus grandifolia* (beech), *Betula* sp. (birch), and *Prunus serotina* (black cherry) from the Iler charcoal remains (Fecteau 2020). IDP could be any of those species that were found, or possibly other hardwood species from the area, such as Ironwood, sycamore, or poplar. *Juglans* sp. (butternut/black walnut) was the second highest percentage of wood taxa found (see Figure 21). An assumption could be made that the species is black walnut, as that would fit with the probable black walnut remains identified, which was also the highest percentage identified of the nut species. Red oak was the third highest percentage identified. Although only two acorn fragments were found, red oak would present an opportunity for use of both the wood and nuts. Ash and black cherry are represented by eight percent of the charred wood, followed by sugar maple, beech, and IRP. Birch, oak, and elm (*Ulmaceae*) each represent one percent of the taxa.

There are two forms of coniferous taxa in the sample. Pine represents three percent (see Figure 22) and unidentifiable coniferous (IC) represents one percent. The low frequency of pine is not unexpected as pines do grow close to the edges of water and prefer sandy, gravely soils. However, stands of pine forest are found in southwestern Ontario and groups at Iler would have been able to access these trees.

The identified wood taxa represent the heterogenous vegetation zone into which Iler falls. This type of environment would support agriculture, as well as provide fuel during the drier seasons (Lennox and Dodd 1991; Yarnell 1964). *Juglans* sp., red oak, and beech would or could have provided nuts, fuel, and dye and are species that are found in high frequency in southwestern Ontario. Maple trees provided sap that could have been used as food or for various technologies. The fact that coniferous tree remains are found in low numbers may be due to many reasons. It may have been that these trees were not growing in high numbers in the region of Iler, as they require wet and poorly drained (boggy) conditions in the form of subclimaxes (Yarnell 1964). It may also have been that these trees were cleared out in much earlier periods as they did not provide a high yield of food, opening areas for agricultural uses (Yarnell 1964).

A change in tree species use occurs between the Younge and Springwells phases, where "the distribution of tree species from the two components may also be a reflection of land use" (Lennox and Dodd 1991:52). During the Younge phase, elm and ash were highly represented species, finding equality in the archaeological record with the oak-hickory-beech stands (Lennox and Dodd 1991). A shift occurs in the Springwells phase, most represented by Oak-hickory-beech. Oak-Beech represent 22 percent, where ash-elm represents nine percent of the total remains at Iler. Oak-Beech grow in drier, well-drained soils potentially used for horticulture, whereas ash-elm grow in poorly drained soils (Lennox and Dodd 1991).

Table 7: Wood Taxa by total and percentages

Species	Feature 1	Feature 3	Feature 7	Feature 18	Feature 20	Species Totals	Percentage
IDP	13	1		2	2	18	23%
Juglans sp.	1	11			3	15	19%
Red Oak	1	1	1		11	14	18%
Ash	4	2				6	8%
Black Cherry		3		3		6	8%
Sugar Maple			3		1	4	5%
Beech			3			3	4%
IRP				3		3	4%
IND (Indeterminate)		1		1		2	3%
Pine					2	2	3%
Birch				1		1	1%
IC					1	1	1%
Oak		1				1	1%
Ulmaceae (Elm)	1					1	1%
Feature Totals	20	20	7	10	20	77	100%

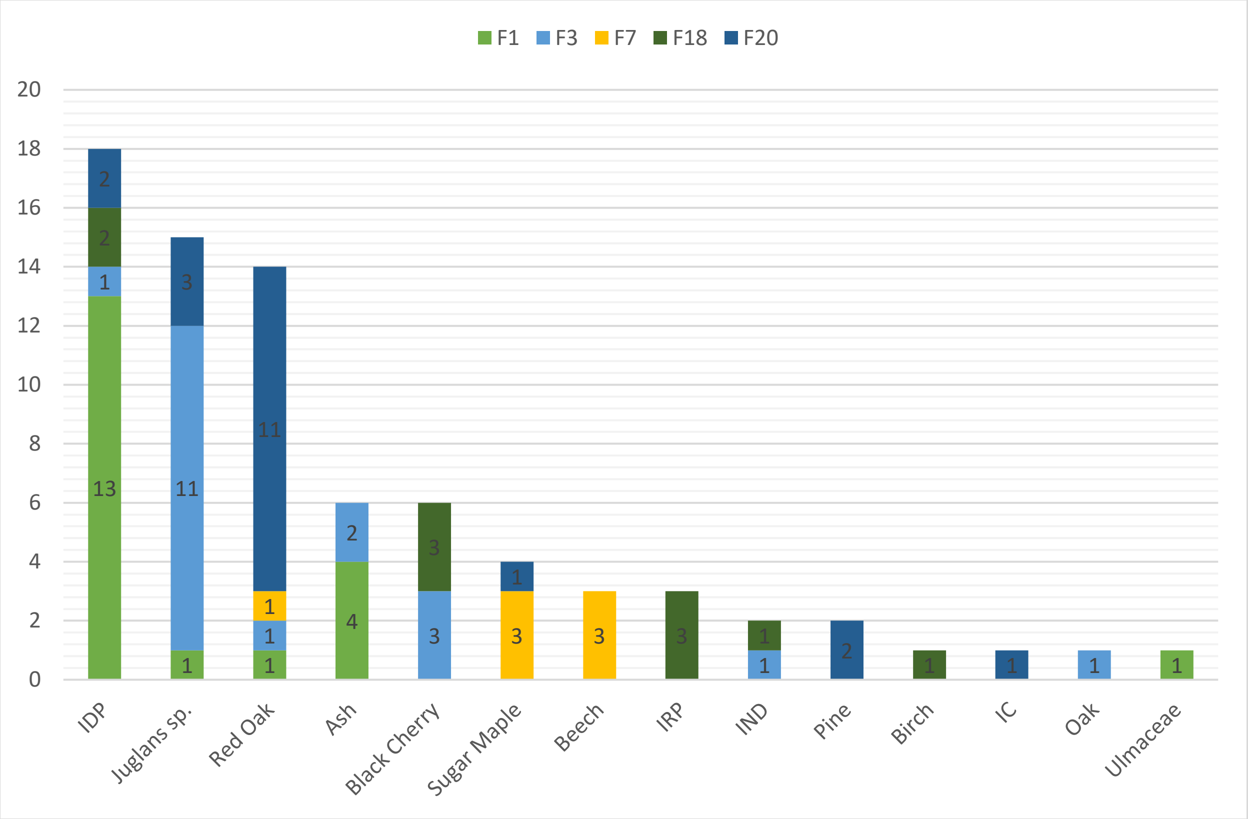

Figure 19. Charred Wood Taxa by Feature

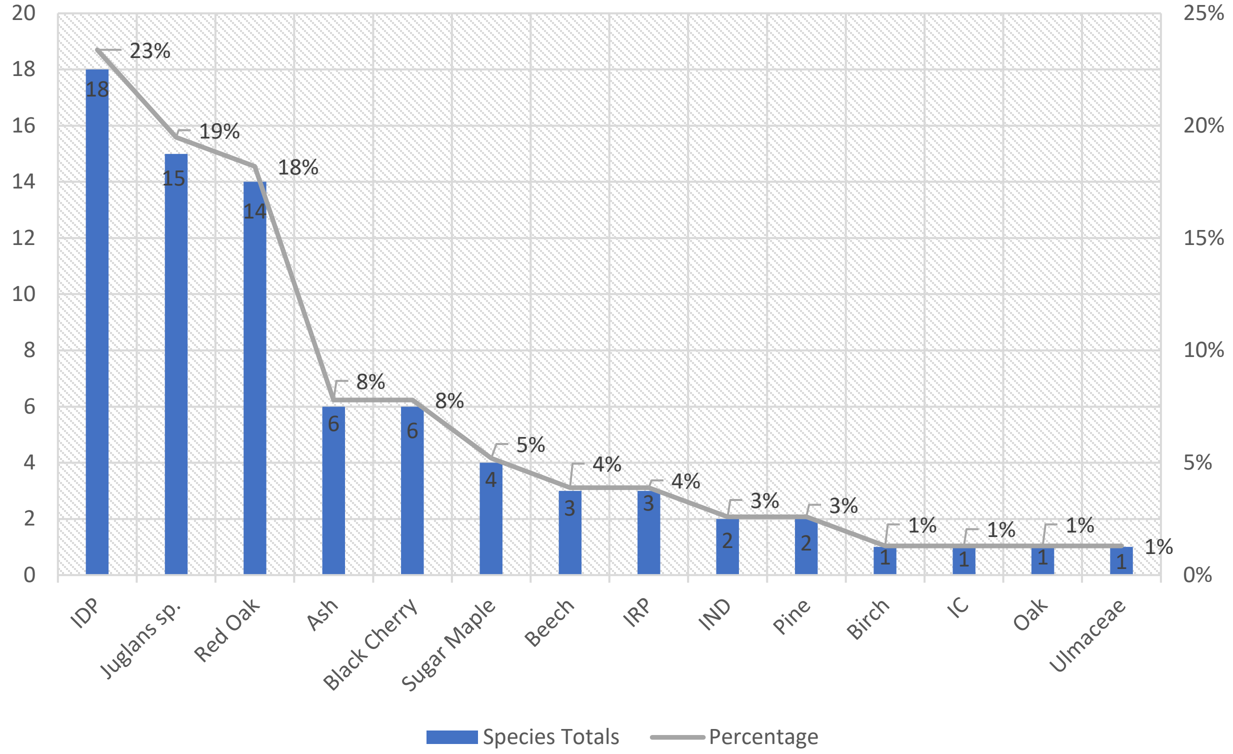

Figure 20. Charred Wood (Counts and Frequencies) by Taxa

Figure 21. Juglans sp. *Charred Wood Fragment*

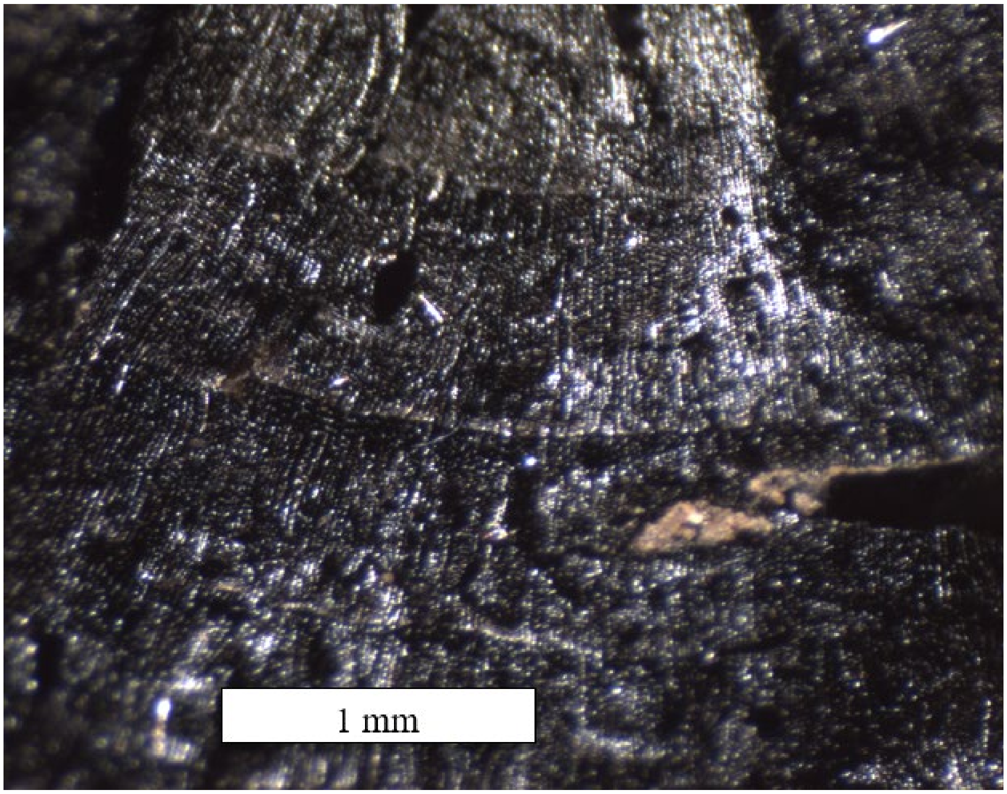

Figure 22. Pine Charred Wood Fragment from Feature 20

2.7.4 Environmental Frameworks: Traditional Ecological Knowledge (TEK) and Lifeway Niche Construction

The data presented above provide an opportunity to discuss two conceptual orientations – Niche Construction Theory and Traditional Ecological Knowledge (TEK) – for understanding human-plant interactions in the past. Over the last 40 years, evolutionary theory has evolved to recognize that living organisms have complex relationships with their environments. Niche Construction Theory (NCT), developed within the discipline of evolutionary biology, removes the notion of unidirectional adaptation to include a multilevel symmetrical system of relational adaptation and ecological inheritance between organisms (Kendal et al. 2011). Living organisms construct, deconstruct, and change the flow of energy as part of their interaction with their environments (Laland and O'Brian 2011; Odling-Smith et al. 2003). This relationship effects changes to the environment, which reciprocates this change and "modifies the selection pressures acting on them, their descendants, and on the unrelated populations" (Odling-Smith et al. 2003:2). Niche Construction then becomes a second evolutionary process (Laland and O'Brian 2011; Odling-Smith et al. 2003).

In effect, within the NCT framework, this means that organisms act as co-directors of their own evolution as well as that of other organisms (Kendal et al. 2011; Laland and O'Brian 2011; Odling-Smith et al. 2003). For example, plants modifying levels of atmospheric gases and nutrient cycles (Laland and O'Brian 2010:304) will impact other plants and animals that share the environment. This aligns with approaches that favour cultural ecology, which takes a top-down approach to understanding the human-environment relationship. However, as suggested by Krakker's (1983) work, a bottom-up approach to understanding the evolution of WBT environmental interactions should be implemented. Lifeway niche construction provides such an approach by accounting for the individuality of lifeways and bringing together a whole picture from the specific experiences of communities as they engage with their environments. This dovetails nicely with the emphasis placed on long-established patterns and practices given by Traditional Ecological Knowledge.

The community of Iler was deeply knowledgeable of their environment, of the land and soils, and how different plants interacted with the community and non-humans. This is known as Traditional Ecological Knowledge (TEK). TEK has been characterized as cumulative, dynamic, historical, local, holistic, embedded, moral, and spiritual (Ho and Tsuji 2002; Menzies and Butler, 2006) in its approaches. Knowledge builds through the continuous experience of earlier generations and adapts to new societal changes of the present (Ho and Tsuji 2002). Like niche construction, TEK understands that non-humans are co-creators of the natural world (Nelson and Shilling 2018).

Niche construction in the WBT has not been thoroughly examined (but see Crawford 2014). According to Crawford (2014), WBT communities engaged in niche construction to an extent that was similar to more sedentary (Iroquoian) communities. As he writes of the botanical remains, "the predominance of maize, herbaceous plants, grasses, and some fleshy fruits, as well as tree fruits and nuts, although not as diverse as in other periods and cultures, fits the food-producing niche and is comparable to the Iroquoian niche" (Crawford 2014:155). If we take Crawford's (2014) assessment to suggest that WBT groups were creating rather than 'chasing' niches through a combination of cultigen use and mobility, we can begin to understand how the richness of this region was maintained. This can be furthered by TEK, and the archaeological evidence as outlined earlier, which speaks to a pattern throughout the Tradition of exploiting seasonally rich resources in key environments.

A good example of this is the species *Rubus*. Perhaps due to inter-hybridization, identification of *Rubus* sp. in archaeobotanical samples can be challenging in the absence of genetic testing. This can potentially be both an example of TEK and a form of lifeway niche construction. Given the various species of plants found at Iler, it seems likely the community was creating a resource-rich niche around horticultural fields to balance the diet and provide adequate resources. This can be seen in the high frequency of *Chenopodium* sp. and *Polygonum*, which grow at the edges of open fields and may have been encouraged to develop by Iler residents.

2.8 Conclusions

The Iler Earthworks present a unique opportunity for the study of WBT foodways. As few WBT sites are known, and even fewer have received palaeoethnobotanical study, this assemblage can be used as a baseline for better understanding the transitional period between

Springwells and Wolf. As described in this study, there is evidence at Iler for four of the five commonly documented Late Woodland cultigens in Ontario, a first to be reported for a WBT site dating to this time. That these cultigens may have been grown on site is supported by the presence of sandy loam soils. As well, these soils would have made building the enormous earthen enclosure at Iler less difficult when compared to the neighbouring St. Clair Clay Plains and offered the opportunity for success in horticultural practices.

The archaeobotanical remains from Iler support earlier assessments that an increase in cultigen use occurred during the transition between Springwells and Wolf, along with a growing investment in horticultural economies. This investment may have contributed to more sedentary lifeways by the end of the Wolf phase, as evidenced by the increase in housing structures found at other sites. However, during this transition, horticulture does not appear to have significantly impeded the mobility of WBT communities. This is evident in the high frequency of wild plant and nut species in the samples, and perhaps in the lack of evidence for structures at Iler. Also, given that several features at Iler (e.g., Features 5 and 6) are similar to storage pits documented at other WBT sites in the region, it may be Iler was occupied in a similar, seasonal pattern.

Fleshy fruits, grains, greens, and nuts were important at Iler and represent the highest category in the botanical assemblage. *Chenopodium* and *Polygonum* have been reported in high numbers at other archaeological areas of Ontario, and during earlier periods. These species could represent two differing foodways. Being indigenous to the area, and prone to colonizing edge environments, and it may be they were a consequence of the increase in land clearing for horticulture. They may also represent a cultigen as both these species were cultivated in the southern United States well before maize. *Chenopodium* also grows well in undisturbed, shaded areas (Crawford 2014).

Given the nature of some of these wild species, not to mention the presence of the earthworks at Iler, the landscape was likely anthropogenically modified to some extent. LNC through TEK would have influenced the foodways at Iler communities and may be evident in samples of plant remains recovered from other WBT sites. While niche construction was likely present in earlier periods, and among more sedentary communities, it is possible that WBT communities were mobile niche constructers, modifying the ecology and landscape as part of a seasonal round entailing resource rich areas. Both LNC and TEK show great promise for future work involving quantitative data from other sites in southwestern Ontario.

Due to the incomplete excavation of Iler, there are limitations to the conclusions that can be reached about the archaeobotanical remains. First, further analysis is needed on the extant collection, most notably the remaining 0.6mm, 0.465mm and <0.465mm sieve samples, in order to better understand the foodways and environments present at the site. As well, *Chenopodium* and *Polygonum* seeds should be further investigated for the potential of cultigen species through measurements and the use of a scanning electron microscope (SEM). The smaller *Chenopodium* seeds appear to have a thick testa, where the larger seeds have a thinner one. Through measurements and SEM, it may be possible to further the discussion and information regarding *Chenopodium* and *Polygonum* as cultigens in Ontario.

This study has been valuable in learning about the foodways of the Iler community and how these strategies fit into the Western Basin Tradition. The diversity of the wild species found at Iler reflects the importance of archaeobotanical analysis for understanding past dietary regimes and other practices involving plants. The wood sorrel, red cedar seed, possible mustard, and bulrush or fern reflects how knowledgeable the residents of Iler were about the ecology and environment. The four cultigens identified in the sample also reflect the growing importance of horticulture during this period. Through a consideration of the cultigens and wild species found in the botanical remains, it seems Iler was likely occupied during warm weather months (i.e., from early summer to mid fall). It is likely that during the transition from Springwells to Wolf, communities were growing multiple cultigens while maintaining some degree of mobility. This analysis highlights the diversity of plant use at Iler, which can be seen as part of broader pattern of ecological engineering in creating resource rich locales.

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Appendix A

Table A1: Qualitative Data of seed, nut, and fruit remains per feature and botanical categories according to taxon

Common Name (Scientific names)	F 1	F 3	F 7	F 18	F 20	F 22	F 23
Cultigens							
Sunflower (*Helianthus sp.*)			x				
Tobacco *(Nicotiana sp.)*				x		x	
Maize Kernal Fragment (*Zea mays)*		x		x	x		x
Maize Embryo (*Zea mays*)		x			x		
Maize cupule Fragment (*Zea mays*)					x		
Bean Fragment (*Phaseolus vulgaris*)					x		
Wild Species - Fleshy Fruits	F 1	F 3	F 7	F 18	F 20	F 22	F 23
Raspberry/blackberry/bramble (*Rubus sp.*)				x	x		x
Blueberry (*Vaccinium sp.*)				x			
Hawthorn (*Crataegus sp.*)		x					
Cherry (*Prunus sp.*)				x			
Greens and Grains	F 1	F 3	F 7	F 18	F 20	F 22	F 23
Goosefoot (*Chenopodium sp.)*		x			x		x
Smartweed/Knotweed (*Polygonum sp.*)		x		x	x		
Sorrel (*Oxalis sp.*)				x			
Nuts	F 1	F 3	F 7	F 18	F 20	F 22	F 23
Acorn (*Quercus* sp.)	x						
Black Walnut (*Juglans* sp.) Nut Fragment	x						x
Uknown Nut Fragment	x	x	x				x
Hickory (*Carya sp.)*		x					
Other	F 1	F 3	F 7	F 18	F 20	F 22	F 23
Sorrel (*Oxalis sp.*)				x	x		
Red Cedar Seed (*Juniperus virginiana*)					x		
Mustard (*Brassica sp.)*				x			
Unknown Fungi	x	x	x				
Thorn		x		x			
Unknown Seed/Fragment	x	x	x	x			
Bulrush (*Scirpus*)					x		

Table A2: Sample Information by Feature

Sample Catalogue Number	No. of samples	Weight of samples (g)	Feature	Comment	Fraction (LF/HF)
016.130.4.1	7	7.1	1	170CM due SE of Unit 590-225 Stake, Heavy Fraction	HF
016.130.4.2	1	0.2	1	170CM due SE of Unit 590-225 Stake, Light Fraction	LF
016.130.4.3	7	21.5	1	170CM due SE of Unit 590-225 Stake, Light Fraction	LF
016.131.4.1	3	0.49	1	220cm west of 550-225, Light Fraction	LF
016.131.4.2	4	0.2	1	220cm west of 550-225, Light Fraction	LF
016.131.4.3	6	7.7	1	220cm west of 550-225, Heavy Fraction	HF
016.131.4.4	1	0.1	1	220cm west of 550-225, Heavy Fraction	HF
016.111.4.1	1	0.2	3	Light Fraction, float bag 1	LF
016.111.4.2	7	4	3	Light Fraction, float bag 1	LF
016.111.4.3	1	0.1	3	Heavy Fraction, Float bag 4	HF
016.111.4.4	1	1.3	3	Heavy Fraction, Float bag 4	HF
016.111.4.5	1	0.01	3	Heavy Fraction, Float bag 4	HF
016.111.4.6	7	12.4	3	Heavy Fraction, Float bag 4	HF
016.111.4.7	7	12.1	3	Light Fraction, Float bag 1	LF
016.111.4.8	1	0.1	3	Light Fraction, Float bag 3	LF
016.211.4.1	6	5.1	7	Light Fraction, Bags 1,3,4,5	LF
016.211.4.2	1	0.7	7	Light Fraction, Bags 1,3,4,5	LF
016.211.4.3	1	0.1	7	Heavy Fraction, Bag 2	HF
016.211.4.4	6	3.9	7	Heavy Fraction, Bag 2	HF
	7	268.4	18	LF - 545 270	LF
	2	32.3	18	HF - 545 270	HF
	7	46.3	18	LF - 550 270	LF
	2	13.1	18	HF - 550 270	HF
	7	125.6	20	LF - 545 280	LF
	2	21.9	20	HF - 545 280	HF
	7	245.1	20	LF - 545 280	LF
	2	10	20	HF - 545 280	HF
	7	93.4	22	LF - 550 290	LF
	2	19.1	22	HF - 550 290	HF
	7	109.5	23	LF - 540 285	LF
	2	81.7	23	HF - 540 285	HF

Table A3: Charred Wood Quantitative Data by Feature

Species	**F1**	**F3**	**F7**	**F18**	**F20**	**Species Totals**	**Percentage**	**# Of Features**
IDP	13	1		2	2	18	23%	4
Juglans sp.	1	11			3	15	19%	3
Red Oak	1	1	1		11	14	18%	4
Ash	4	2				6	8%	2
Black Cherry		3		3		6	8%	2
Sugar Maple			3		1	4	5%	2
Beech			3			3	4%	1
IRP				3		3	4%	1
IND		1		1		2	3%	2
Pine					2	2	3%	1
Birch				1		1	1%	1
IC					1	1	1%	1
Oak		1				1	1%	1
Ulmaceae (elm)	1					1	1%	1
Feature Totals	20	20	7	10	20	77	100%	
Total Taxon	14							

Table A4: Seasonality of taxon from Iler, information provided by Crawford and Smith 2003, Fecteau 1985, Yarnell 1964

Species	**Availability**											
	J	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**
Nut Remains												
Hickory			S						🟦	🟦		
Black Walnut/Butternut									🟦	🟦	🟦	
Quercus sp. (oaks)								🟦	🟦	🟦	🟦	🟦
Large fleshy berries												
Prunus sp. (Black Cherry)							🟦	🟦	🟦	🟦		
Crataegus sp. (Hawthorn)							🟦	🟦	🟦			
Small Fleshy fruits												
Rubus sp.						🟦	🟦	🟦				

Vaccinium sp. (Blueberry)						🟦	🟦	🟦	🟦			
Miscellaneous												
Scirpus (Bulrush/fern)			🟦	🟦	🟦				🟦	🟦	🟦	
Brassicaceae (mustard)				🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	
Grass and Grains												
Chenopodium sp.								🟦	🟦	🟦	🟦	
Polygonum						🟦	🟦	🟦	🟦			
Rumex sp. (Dock)						🟦	🟦	🟦	🟦			
Oxalis sp. (Sorrel)					🟦	🟦	🟦	🟦				

Table A5: Pollen Stratigraphy Zones of Ontario, information provided by Crawford and Smith 2003

Zone #	**Ecology, Temperatures, Time period**
1	Deglaciated area, spruce, and herbaceous plants, mean temperatures -2 degrees C or less
2	Dominated by pines, red pine, jack pine, white pine
3a	hemlock, beech percentages increased, ended with a decline in hemlock, 9 degrees C, 6000-~4500 BCE
3b	Prairie was replacing forests, began ~4500-3500BCE
3c	Return of hemlock and decrease in beech, 3500BCE-650CE, mean temperature 4 degrees C
3d	Very low beech percentages and high oak (Quercus alba) and white pine pollen percentages, 650-1850CE, relative cooling, little ice age
4	high proportions of grass and ragweed, tree pollen declines, high anthropogenic, 1850-present day