"A PLEASURE GARDEN IN THE DESERT, TO WHICH I KNOW NO COMPARISON IN THIS COUNTRY": SENECA IROQUOIS LANDSCAPE STEWARDSHIP IN THE 17TH AND 18TH CENTURIES

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“A PLEASURE GARDEN IN THE DESERT, TO WHICH I KNOW NO COMPARISON IN THIS COUNTRY”: SENECA IROQUOIS LANDSCAPE STEWARDSHIP IN THE 17TH AND 18TH CENTURIES

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In this dissertation I model dynamism in 16th–18th century Seneca Haudenosaunee landscape practices through a multiscalar approach that combines archaeological data, textual sources, insights from Haudenosaunee scholars, and Geographical Information Systems (GIS) mapping. This landscape was formed by indigenous processes at the ‘periphery’ of colonial control where the effects of colonial military actions variably affected Seneca communities. Within the context of the 200-year Seneca site sequence, my material analyses focus on identification of archaeologically-recovered charcoal from three sites—Ganondagan, White Springs, and Townley-Read—successively occupied by the same community under variable political and economic conditions (ca. 1670–1754 CE). Finding strong evidence for contextually different uses of wood and forms of Seneca landscape stewardship, I conclude that that the Seneca community maintained and re-created certain kinds of relationships with the landscape through a period of difficulty and change. This research emphasizes the agentive action of Haudenosaunee people and highlights the necessity of addressing the role of past human-landscape processes in shaping not only environments encountered by early colonial figures but also those we live with today.

BIOGRAPHICAL SKETCH

Peregrine Gerard-Little received her B.A. in Environmental Science and Archaeology from Columbia University in the City of New York in 2008, an M.A. in Archaeology from Cornell University in 2011, an M.A. in Anthropology from Cornell University in 2013.

For Tatyana

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I am thankful that my parents did not try too hard to dissuade me from getting a Ph.D., and to my grandmother for giving me the archaeology bug a long time ago. Of course, I bear sole responsibility for any and all errors in this work (and attempting it in the first place).

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

In the summer of 1700, a person approaching Ganundasaga from the southeast, beginning on the western shore of what is today Seneca Lake, would likely have first found themselves in a swampy area, populated by northern hardwood trees such as black ash, red or silver maple, and perhaps American elm, yellow birch, and basswood. As they walked the several kilometers inland from the lake shore and climbed the gradual rise of 30 meters up to the hilltop town, they would have moved through open northern hardwood forest. Mixed stands of tall maples, smooth-barked American beech, and birch, with basswood and wild black cherry interspersed would have let dappled sunlight through and provided a respite from the summer sun. Movement would have become easier as they walked, as the forest floor was covered in fewer dead branches and undergrowth than the area a day's travel to the south. They would pass hemlock and sycamore trees taking advantage of the shade and damp of creeks dribbling toward the lake, the water level low due to the summer heat. Soon, as they climbed, the trees would begin to thin out, and they would be moving through an open forest toward a visible edge.

Finally, at the base of a large hill, a broad open area extending at least a kilometer beyond the edge of the woods would have opened up, filled with waving crops—intercropped corn, beans and squash growing out of small mounds. Toward the center of the clearing, at the top of the ridge, a curving palisade made of a single line of large, upright wooden posts could be seen. This clearing would have been punctuated by some standing tree trunks, stripped of branches and bark. Women and children of the town might be intermittently visible, working at weeding around the mounds, or resting, eating some food, beading, or smoking a pipe near small field houses. Depending on where the visitor came from and whether their arrival was expected, they might have paused here, at the edge of the woods to wait for acknowledgement of their arrival at the town of Ganundasaga.

This description is speculative, but it is based on archaeological data from the Seneca Haudenosaunee (Iroquois) site of White Springs, near present-day Geneva, NY, as well as a variety of other ethnographic, historic, environmental, and comparative sources that pertain directly or analogically to this time period, community, and location. Fifty years after this speculative description, and 35 years after the community who had lived at White Springs had moved to another location, the Moravian missionaries Johann Cammerhoff and David Zeisberger walked through this same place. White Springs was identified as 'Ganechstage' by these two Moravians, apparently a variant on the Seneca word Ganundasaga, which was used for multiple settlements and roughly translates to "new town" (Jordan 2008:99).

Upon their visit to the hilltop location, Cammerhoff observed that "the surrounding country is very pleasant, like a garden in the desert, to which I know no comparison in this country" (Beauchamp 1916:67). Having traveled through much more densely forested regions as well as through swamps and across waterways, the missionaries found the landscape at White Springs a welcome respite from their difficult traveling conditions. The likelihood that a former Seneca town location was connected to the sudden appearance of this pleasure garden amid an apparently harsh environment went unmentioned in their accounts of the journey.

The description of Cammerhoff and Zeisberger highlights the *experiential* overlap of Moravian travelers who encountered this place and Seneca residents who had lived there. However, their underlying understanding of how the place and surrounding landscape came into being, and the relations and processes involved, diverged significantly. This overlap is an opening for a reconsideration of the epistemology that caused Cammerhoff to ignore the intertwined pasts of people and place that led to this landscape, and which has influenced archaeological understanding of indigenous landscapes in the Americas. Using data drawn from archaeological, historical, environmental, and ethnohistoric sources, I determine the extent of the physical impact of Seneca practices on the landscape over time and tie these lived conditions to perceptions and conceptions of the landscape and Seneca territory. In this dissertation, I use the word 'landscape' to encompass both the spatial and temporal elements of land which has been inhabited, affected by and affected human activity for millennia, and which may encompass places, "specific locations invested with meanings," and the spaces in which people live (Smith 2003:32). The Seneca landscape in the seventeenth and eighteenth centuries was formed by indigenous processes in Haudenosaunee homelands—areas at the 'periphery' of colonial control or what Panich and Schneider (2015) would term "colonial hinterlands"—where the effects of French, Dutch, and English colonial military actions variably affected Seneca communities. Although traders, merchants, colonial emissaries, military forces, and missionaries were intermittently present in Seneca territory during this period, there were no sustained Euroamerican settlements present in Seneca territory until after the American Revolution (Jordan 2013a).

Setting

During the sixteenth through eighteenth centuries, the Seneca were the westernmost member of the Haudenosaunee, with territory extending from present-day Buffalo to the western shore of Seneca Lake (Figure 1). They and their ancestors were shifting agriculturalists who had relied heavily on domesticated maize and squash (with a later addition of beans[1]) since approximately 900 CE (Engelbrecht 2003; Hart 2000a, 2008; Hart et al. 2003; Thompson et al. 2004). Also known as the 'three sisters,' these crops were often grown together, and contemporary research has shown polycropping of these species was productive as well as highly nutritionally and energetically efficient for Haudenosaunee people (Mt. Pleasant and Burt 2010; Mt. Pleasant 2016). The Seneca settlement pattern, beginning ca. 1550, consisted of paired eastern and western principal towns which were relocated every 15–30 years (Engelbrecht 2003; Jordan 2004a, 2008; Vandrei 1987; Wray 1973; Wray and Schoff 1953). Community relocations were undertaken for a variety of reasons, one of which was local resource depletion of fuelwood (Engelbrecht 2003; Mt. Pleasant and Burt 2010; Starna et al. 1984). Satellite villages were often associated with these principal towns, and the location and number of regional and extra-regional[2] settlements varied through time.

Throughout the work I will refer to a number of other groupings of people that relate to the Seneca in a variety of ways. The Seneca are a member of the Haudenosaunee Confederacy; Haudenosaunee is a self-name meaning 'people of the longhouse,' and refers to the traditional domestic structures which were common across the tribal territories of the original five member tribes. The Haudenosaunee are also sometimes referred to as the Five Nations because the founding tribal nations of the confederacy were the Seneca, Cayuga, Onondaga, Oneida, and Mohawk. 'Iroquois' is a commonly used outsider's term to refer to the same tribal groups,

[1] Beans, despite earlier conclusions (Ritchie 1973), do not seem to be present in New York until the fourteenth century, so the relationship between the three sisters would not have developed until then (Hart 1999a, 2000a).

[2] For the purposes of this dissertation I use Jordan's (2013d) definition of regional as distances between 20 and 80 km from a locale and extra-regional as greater than 80 km from a locale. These distances are based on travel times that would have been possible for Haudenosaunee people on foot given the network of routes, trails, and paths present in their territory. Local distances are those under 20 km.

however I avoid the exonym in favor of the self-name. When the Tuscarora joined the Iroquois in the eighteenth century, they became the sixth nation, a term used to describe this confederacy post-Tuscarora adoption, and that is used generally today and is used at the Six Nations Reserve at Grand River, Canada where members of all six nations reside.

The six nations of the Haudenosaunee speak, and spoke, different but mutually intelligible dialects of Northern Iroquoian (Engelbrecht 2003). Iroquoian refers to the language grouping, which diverges into a Northern group (including the languages spoken by Huron-Wendat populations and other indigenous groups of Southern Ontario and Pennsylvania) and a Southern group, of which Cherokee is the only surviving language (Chafe 1976; Martin 2008). Iroquoia is the term used to encompass the physical territory occupied by all of these Northern Iroquoian-speaking groups. Scholars generally agree that Northern Iroquoian populations developed *in situ* in the Southern Ontario area prior to the introduction of maize agriculture and the associated suite of lifeways. Distinct tribal identities which conform with the original five nations known historically have often been projected into the distant past, but archaeological data suggests a solidification of tribal identities in the sixteenth century (Hart and Engelbrecht 2012).

A study of protohistoric and colonial-era landscape in North America is metaphorically located at the nexus of contemporary scholarship on Native American sovereignty, debates about wilderness/re-wilding/sustainability (Cronon 1996; Heneghan 2013), a critical anthropological understanding of "nature" (Descola 2013; Escobar 1999; Kohn 2013)—especially as historically situated in European enlightenment thought and the process and logic of colonialism, and archaeological theorizations *of* and methodologies *for* understanding landscape (Fowles 2010; Kosiba and Bauer 2013; Smith 2003). Archaeology, through its ability to illuminate human action over time via the material traces of those actions and practices, is uniquely situated to investigate what kind of relationship between Haudenosaunee people and their territory might produce a landscape perceived by Euroamerican settlers as both horrifying and beautiful, and to chart the dynamism in this connection. This requires beginning not with the forward-looking observations of Europeans, but with a methodology and data firmly situated within Haudenosaunee space that can address the temporal depth of the Haudenosaunee involvement with this landscape.

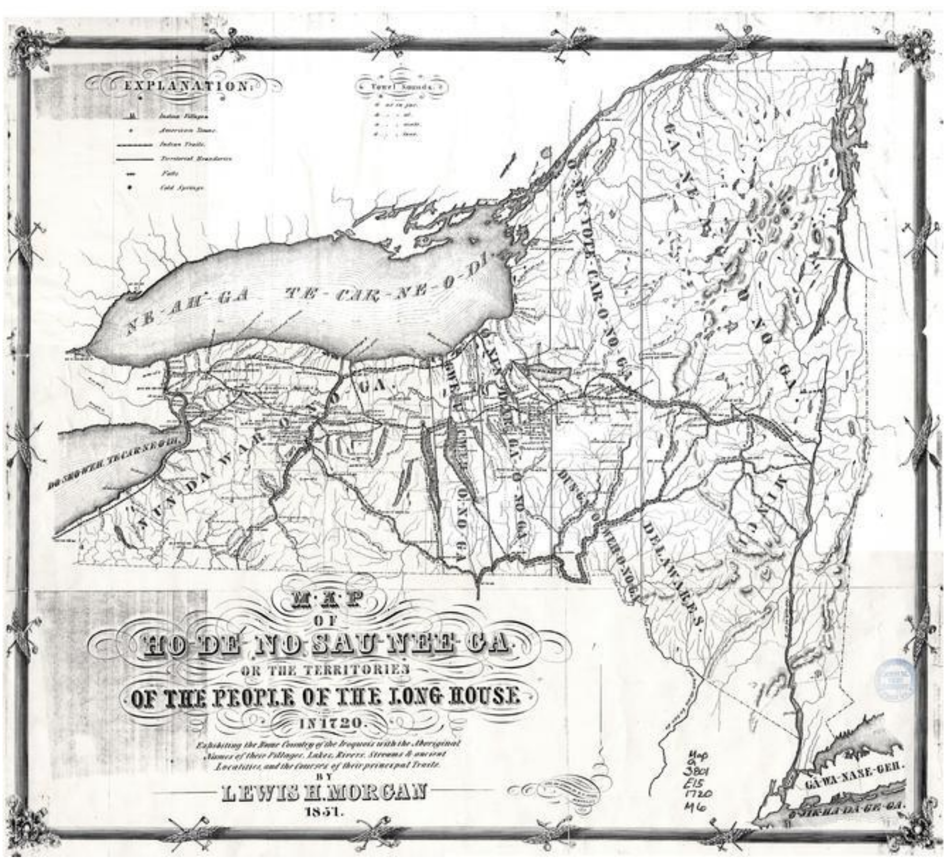

Figure 1. Lewis Henry Morgan's (1851) map of Haudenosaunee territories in New York State as of 1720.

In this dissertation I model dynamism in sixteenth- through eighteenth-century Seneca Haudenosaunee landscape practices using a multiscalar approach that combines archaeological data, textual sources, insights from Haudenosaunee scholars, and Geographical Information Systems (GIS) mapping. Within the context of the 200-year Seneca site sequence, I focused my material analyses on identification of archaeologically-recovered charcoal from three sites—Ganondagan, White Springs, and Townley-Read—that were successively occupied by the same Seneca community, under variable political and economic conditions, between ca. 1670 and 1754. The identification of charcoal recovered from carefully contextualized domestic features from these sites, as well as the relative abundance and presence/absence of certain taxa allows me to draw conclusions about construction materials, Seneca selection of wood for specific purposes, and the changing forests around these sites, as impacted by Seneca practices.

This form of analysis allows me to examine Seneca landscape practices in detail at the scale of individual sites, at the scale of three sites occupied under different historical conditions, and then more broadly across the Seneca sequence. I contextualize these three sites and their charcoal data within the known Seneca site sequence: identifiably Seneca sites that were occupied between ca. 1500 and 1779 and which have been investigated to varying degrees by archaeologists. I emphasize the agentive action of Haudenosaunee people, countering colonial presentations of indigenous people as passive recipients of environmental bounty, and scholarship that limits indigenous agency to reactions to colonialism. This research highlights the necessity of addressing the role of past human-landscape processes in shaping not only environments encountered by early colonial figures but also those we live with today.

Archaeological Interpretation of Landscape Practices

In the second chapter I provide an archaeologically-based framework for investigating Haudenosaunee landscapes which relies upon a relational ontology of space (Smith 2003). By approaching the archaeological records at Ganondagan, White

Springs, and Townley-Read as palimpsests of dynamic, agentive processes driven by Seneca people in the seventeenth and eighteenth centuries, it is possible to answer questions about how Seneca people responded to change as well as what processes were necessary in order to maintain stability in the face of political, military, and economic instability that was at least partially driven by European involvement. My approach knits together ecology, spatial analysis, charcoal analysis, and the various spatial domains Seneca people moved in and through in the past. I also argue that it is not only appropriate but critical to draw from the works and perspectives of Haudenosaunee scholars in this research, both because of my own outsider status and because of the historical disenfranchisement by mainstream scholars of one of the most studied Indigenous populations from their own past. Implementing this framework requires investigation at a number of scales and incorporating a variety of sources and methodologies, which are described in the third and fourth chapter.

Iroquoian Landscapes Through Time

Following the overview of my theoretical framework, I provide a survey as well as a critique of previous archaeological work in Iroquoia as it pertains to the relationship between Haudenosaunee people and the landscape in the Protohistoric (ca. 1500–1630) and Post-Columbian eras (ca. 1630 to present). Iroquoian researchers have often been limited by a lack of integration between domains of inquiry. The separation of studies of agriculture and domestication from settlement patterning and internal site layout, combined with a superficial integration of environmental records has prevented holistic consideration of these datasets. I review these studies and place archaeological data in conversation with climatological and environmental data to make the case for longstanding, active Haudenosaunee modification of their surroundings and a stewardship relationship.

Troubles with Text

In Chapter Three I focus on the archaeological data rather than the historical documents that pertain to Iroquoia, in order to begin with the direct material traces of Haudenosaunee action. The particular history of the processes of colonization and colonialism[3] in Haudenosaunee region, as well as the modes and content of early ethnographic and ethnohistorical research have produced two general bodies of texts 1) those penned by Euroamericans prior to the reservation era; and 2) reservation ethnographies, broadly construed. Archaeologists often draw heavily from these two categories of documents, relying on the information they contain to construct interpretive analogies about earlier time periods or to provide greater information about a closely related time and/or place. While these sources can be valuable when understood within the social contexts they were created, they must be used carefully and in concert with material evidence of Haudenosaunee actions and practices. Many historians and archaeologists have made use of these documents to varying degrees. Especially in the case of Seneca landscape practices, the widely-held assumptions about indigenous people described above would have hindered Euroamerican observation and understanding, assumptions which can be corrected and refined by studying the material record. Below, I lay out some of the issues with these sources, which also frame my own use of texts in later chapters.

The long history of European colonial documentation of Iroquoia results primarily from the missionary efforts of the Jesuits (Thwaites 1959), colonial military campaigns (Olds 1931), and trading relationships between Europeans and Native

[3] I distinguish colonization, which involves the establishment of colonies and the presence of colonists (Jordan 2009a; Stein 2002), but may not indicate control of or significant impact on indigenous populations, from colonialism, which “involves relationships of intercultural domination” (Jordan 2009: 32).

people (Parmenter 2010; van den Bogaert 1988). The Jesuit Relations, as accessed by Anglophone researchers today, is a translated compilation of missives from Jesuit missionaries in New France (the territories in present-day Canada as claimed by France) between 1610 and 1790. They were published close to annually in France from 1632 onward and originally disseminated through the Jesuit network of institutions. The volumes were available in France and were also circulated back to New France shortly after publication, in a pattern than has been argued to have influenced missionaries' compositions for subsequent volumes (True 2012). I have used the Ruben Gold Thwaites translation (1959 [1896–1909]), although scholars have pointed to missed nuances in the Thwaites translations or word choices that amplify negative stereotypes of indigenous people that may not have been present in the same form in the original French or Latin text (Korp 1995).

Jesuit efforts were largely focused in Wendat territory, especially in the earlier years of the mission. Because of the dearth of early to mid-seventeenth century texts written from direct observation of Haudenosaunee groups in what is today New York State, the Jesuit relations provide potentially valuable observations of a linguistically related group. However, there are clear historical, archaeological, ecological, and climatological differences between these Northern Iroquoian groups and their home territories and the Haudenosaunee of the same period. These variances need to be considered when analogically applying information from Jesuit accounts of other Northern Iroquoian groups to Haudenosaunee people and communities.

Aside from their limited geographic focus, the Jesuit Relations emerge from a specific perspective influenced by Church thinking and intellectual currents in Europe at the time. In her examination of the Jesuit use of the term *sauvage* for many of the Native inhabitants of New France, Maureen Korp (1995) argues that Jesuit descriptions and observations of Native peoples and their way of life fit into a preexisting template of the ‘wild man,’ a medieval European idea of man outside of normal human moral sense, living in a state of nature, but feasible to convert to Christianity. The apparent natural state of the land observed by colonists in the New World took on different valences—for some, the deep forests were literally home to the devil, full of danger and ominous, pagan forces which needed to be cleared to be both beautiful and safe (Bradford 1899:60; Dennis 1993:15–16; Schama 1996:191, 201); for other colonists, settling in the seventeenth and eighteenth centuries, these lands were unspoiled, primordial, and a true state of nature that could only be inhabited by truly wild people who lived with minimal impact on the land. These initial assumptions of a New World primordial state of nature, whatever its moral or philosophical importance, obscured for observers the possible impacts of the Haudenosaunee way of life on the landscape.

Other textual sources on Haudenosaunee people and lifeways in the seventeenth and eighteenth centuries come from colonial officials looking to assess the military strength of the Haudenosaunee as well as an assortment of travelers, traders, and other folk who either encountered Haudenosaunee people on their travels or ventured into the area that until the late eighteenth century was firmly controlled by Haudenosaunee people (Jordan 2009a). [4]

These early sources are supplemented by a later set of sources including Lewis Henry Morgan’s *League of the Haudenosaunee* (1996 [1851]), and further ethnographic research on reservation populations by twentieth century researchers (Abler 2006; Fenton 1941; Herrick 1997; Parker 1910; Waugh 1991 [1916]). Following the Revolutionary War, the rapid but incomplete push of Haudenosaunee

[4] In this case, I am specifically referring to the Seneca homeland, which as the westernmost of the Haudenosaunee core territories was relatively distant from colonial centers along the eastern seaboard and up the Hudson Valley. Mohawk territory, which abuts these areas to the east had a somewhat different history of intercultural relations and timing of settlement.

people out of their traditional homelands in New York and onto reservations (Preston 2009; Tiro 2011) has had significant implications for how these documents have been read, archaeology has been conducted, and research has proceeded (or not). The territorial disenfranchisement of the Haudenosaunee people after the Revolutionary War seems to have largely curtailed scholarly thinking about the relationships between the Five Nations and their landscapes. The spatial removal of Haudenosaunee populations from ancestral territories has contributed to the rise of ethnographies that have focused on political organization and social dysfunction of Haudenosaunee reservation life (Fenton 1941), clearly very different conditions than Haudenosaunee people of prior 300 years would have experienced.

When it comes to exploring the relationship between Seneca people and their landscape in the Protohistoric and Postcolumbian eras, relying upon textual sources written from the perspective of Euroamericans and from much later or has clear issues. Later sources, which were penned after Haudenosaunee populations were forced into circumscribed territories and dispossessed almost entirely or entirely of their land (Hauptman 1999; Mano 1994; Tiro 2011), provide information about people who have experienced a radical disjunction in a number of areas of life. This is not to imply complete cultural loss or acculturation, but to highlight that the loss of some political autonomy, of territory, and the imposition of colonial governmental conditions cannot be assumed to have had no effect. Therefore, it would be misleading to rely heavily on ethnographies on modern reservation communities living under very different conditions in interpretive analogies to past lifeways, or at least without acknowledging and considering these very different conditions.

Landscape Lifecycles

In Chapter Four, I use a combination of archaeological, historic, ethnohistoric, and comparative ethnographic sources to synthesize a narration of the lifecycle of a generalized Seneca site in the seventeenth century. I describe the cycle of clearance, settlement, and departure that would have accompanied Seneca community movement, compiling the possible actions by Seneca people over time and correlating these actions' effects on the landscape, as it was experienced by the Seneca as well as the way these processes could be interpreted from wood charcoal recovered from features at Seneca sites. This chapter also discusses the ways in which the locations of settlements could become *places* on the Seneca landscape, through everyday practices and the rhythms of life and death tied to specific locations.

Within this chapter I introduce plant (particularly tree) species which will be of importance throughout the work, and provide Latin, colloquial English, and Seneca equivalents for those plants. My inclusion of the Seneca language terms is both an ethical and practical move: an attempt to explicitly link this study to the descendent community rather than tacitly exclude their presence and language simply because at the time under inquiry Haudenosaunee record keeping and communication was primarily oral, rather than textual.[5] Thanks to support from Cornell's American Indian and Indigenous Studies Program I was able to consult with Jamie Jacobs, Seneca language speaker and educator, about the Seneca language inclusions and confirm their accuracy and appropriateness for inclusion.

Communities on the Move

Expanding outward from site-level concerns, Chapter Five turns to the sequence of Seneca sites occupied between ca. 1550 and 1779. I propose that the lifecycle of a site, playing out repeated at successively relocated Seneca settlements,

[5] Dennis (1993:1) begins his examination of Iroquois-European encounters with a Jesuit dismissing the depth of time represented in Haudenosaunee oral history as well as the value of its content for publication.

had a long-lasting effect on the areas around these sites and created a network of places. After presenting a review of the ways in which Geographic Information System (GIS) platforms have been used to analyze Iroquoian settlement patterns and sites, I discuss the modeling parameters for estimating the forest clearance around sites in the Seneca sequence. I first present existing evidence for population, and any pertinent evidence for landscape practices, historical context, and climate for each known Seneca site, because of the connection between population size and wood usage. I then present the results of a GIS model of forest clearance around the known Seneca settlements of this period.

Within the sequence of Seneca sites, I introduce Ganondagan, White Springs, and the Townley-Read component of New Ganechstage in greater detail as preparation for the material analysis reported in Chapters Seven and Eight. This chapter also integrates the findings from a 1.4 ha non-collecting surface survey that I directed in the area to the south of White Springs. These results demonstrate the benefit of integrating multiple scales of investigation to more completely revealing the locations and effects of landscape practices outside of the settlement core. Modeling clearance across the Seneca sequence demonstrates not only the extent of landscape modification by Seneca community life and relocation but also the longstanding nature of the settlement pattern which was disrupted by colonial military incursion into Seneca territory in 1687 and 1779.

Charcoal and Its Possibilities

Having presented the archaeological, historical, and theoretical background and developed a model for the impacts of the Seneca site sequence, I turn to the further contributions of wood charcoal. I present the archaeological and theoretical justification for using wood charcoal as a material class for understanding both the past landscape and related human actions. I detail the data collection and analytical methods I used for the identification of charcoal subsamples from Ganondagan, White Springs, and Townley-Read. Materials from Ganondagan were collected as part of 1983–1984 excavations at the site by Dean and Barbour Associates, and I gained access to the collections through the New York State Office of Historic Preservation. I have been involved in the excavations at White Springs since 2009, first as a teaching assistant for a field course and as of 2014 as a co-director of the project. These materials are currently stored at Cornell University. Materials from the Townley-Read component of New Ganechstage, originally excavated as part of a field project directed by Dr. Kurt Jordan, are also currently stored at Cornell University. Upon completion of full analysis of the White Springs and Townley-Read materials they will be repatriated to the Seneca-Iroquois National Museum in Salamanca, NY for permanent curation. Because these materials come from three different field projects carried out with slightly different methodologies, I detail the collection methods of each projects, the effects these methods may have on the comparability of the charcoal data from each site, and the lab methods and procedures I used in my identification and analysis of wood charcoal from each site.

The Pleasure Garden

Chapter Seven presents the charcoal assemblages I examined from post molds, fire-related features, plowzone contexts, and pit and midden features at Ganondagan, White Springs, and Townley-Read. Organized by feature class, my analysis focuses on the material processes which contributed to the formation of each of these feature types and the information that careful charcoal identification can contribute to a broader analysis of features and spatial organization of domestic areas on Haudenosaunee sites. My analysis shows the utility of charcoal identification for determining construction materials, changing forest cover and forest type, the presence of plants accessible from a site (including 'exotic' or introduced species), and producing testable hypotheses for future research about feature types and site formation processes.

Conclusions

After building my analysis from the scale of single post molds, to spatial loci, to a site, and finally to a comparison of the practices/landscapes at each site, I conclude that the Seneca community encountered very different conditions and affordances at White Springs than at Ganondagan, and that through a period of difficulty and change, a relationship of stewardship between the eastern Seneca community and landscape they inhabited was re-created and maintained. While 'stewardship' has more commonly been used in the context of present-day indigenous communities, I make a case for its specific application to the Seneca past. The idea of humans being given a role—one that includes the ability and power to affect the plants, animals, and landscape that supports them, and the responsibility to do so thoughtfully—resonates with both the Haudenosaunee Thanksgiving Address and Creation Story[6]. These ancient and deeply important traditions continue to guide Haudenosaunee people today.

Additionally, different choices made by the eastern and western Seneca communities during this period highlights the range of possibilities open to Seneca people. The Eastern Seneca relationship of stewardship was created and re-created through the conscious and repeated choices made by Seneca people. This dissertation demonstrates that using direct evidence pertaining to Seneca Haudenosaunee landscape practices provides a holistic insight into the dynamism and maintenance in

[6] I am grateful for Jamie Jacobs' identification of this similarity.

relationships between people, places, and landscape. These findings differ from ecologically deterministic explanations for the actions of indigenous people and unilineal decline narratives which posit immediate and irrevocable changes for indigenous populations following 'contact' and colonial interventions.

This dissertation makes contributions to three major areas. First, it develops a clearer understanding of Haudenosaunee site formation processes to create a firm foundation for the interpretation of an under-considered yet prevalent element of the archaeological record: wood charcoal. This is an especially important material class on Iroquoian sites that possess little in the way of durable architecture, as charred wood remains can be the only way of identifying construction materials. Second, this project charts the resilience of an indigenous community in their ancestral homeland, which is at first peripheral to colonial control and later is a more actively desired colonial hinterland. I examine processes and tactics used by the Seneca to respond to, and recover from, colonial military incursions within the context of preexisting Seneca landscape practices. Doing so avoids casting Seneca people as either in decline or only reactive, and centers concerns of agency, territory, and process. Finally, I develop an archaeological framework for identifying a meaningful and ongoing reciprocal relationship between people and their landscape and demonstrate how taking this relationship seriously affects analysis of a whole suite of other concepts and concerns.

CHAPTER 2

PROCESS AND PERMANENCE: A FRAMEWORK FOR ARCHAEOLOGICAL INTERPRETATION OF LANDSCAPE STEWARDSHIP

Iroquoian archaeology has been hampered by a prioritization of what David Harvey (1996) has called 'things'—sites, forests, structures, environments, social organizations, locality, and institutions —that are assumed to exist prior to the whole of the society/system under examination, are treated as internally homogenous, and considered as things which can be examined independently from the processes that create, maintain, and potentially change them. These things, despite how they have been treated in the literature, are interconnected and contingent, and treating them as such produces a more dynamic view of the past. In his own work, Harvey pursues a dialectic approach that foregrounds the interrelations of entities and the processes which constitute, sustain, and potentially dissolve them[7]. By foregrounding process and assuming flux, we are forced to ask not *why* things change, but "how, when, and into what?" (Harvey 1996:55). Equally, it requires a push for explanations for why these processes and relations sometimes solidify, for a time, into entities which seem to be stable, permanent things. He terms these moments of stability maintained by relations and processes 'permanences,' which do not exist independently of the processes which maintain them.[8]

There is a strong base of knowledge about specific Iroquoian sites and places,

[7] The reason Harvey is interested in 'environment' and 'nature' ultimately stems from his interest in social justice and the ways in which these concepts are always being mobilized in political projects tied in with dominant power systems (1996:174). Comaroff and Comaroff (2001) provide an excellent example of these kinds of processes in present-day South Africa.

[8] The idea of arrangements, permanences constituted and maintained by fluxes and flows, is somewhat akin to archaeologist Ian Hodder's (2012) 'entanglements,' although Hodder places a greater emphasis on materiality than does Harvey's analysis.

based on a combination of archaeological investigations, colonial-era texts, and oral traditions of Haudenosaunee people. However, a theoretical archaeological framing that focuses on stable things and categories analytically inhibits our understanding of their interrelations, how they come to be, how they are maintained, and when, how, and why they might change. The dual questions of maintenance and change are especially important in seventeenth and eighteenth century Haudenosaunee history because of the ongoing colonial efforts of the Dutch, French, and English. Although these efforts were at least initially spatially located largely at the edges of Iroquoia, the ongoing entanglement between Haudenosaunee political, economic, and military affairs and colonial concerns in the greater region mark unique conditions for Haudenosaunee decision-making, action, and practices. By addressing the complexity of change in an interrelated set of processes, this approach also avoids falling into the common trope of colonialism resulting in immediate, externally produced change in Native communities.

Archaeology is uniquely placed among disciplines to investigate how some of these processes and relations occurred in the seventeenth and eighteenth centuries because it engages with the remnants of people's material practices. These material practices provide an entry point into an examination of how people create and re-create their world and their place within it (Harvey 1996:93). My investigation is concerned with this question in a somewhat literal way: what was the relationship between people and their landscape, the places in their world. The archaeologist's access to long swaths of time, as well as varying temporal and spatial resolutions, reveals information that may not be available solely through comparison or ethnographic observation (Lyman 2007:145) and allows for multiscalar investigation which centers processes and permanences rather than things. Working as I do on the seventeenth and eighteenth centuries, I am able to investigate the various ways Seneca

Haudenosaunee practices formed conceptions *of* and relationships *with* landscape through not only archaeological materials and survey techniques, but also historic documents, ethnographies, and the insights of Haudenosaunee scholars descended from these very communities. In this chapter I describe a theoretical framework for interpreting the archaeological remains of Haudenosaunee landscape practices, while remaining mindful of the colonial processes that operated in the past and continue in various forms to the present.

Politics of Archaeology

Bruce Trigger (1984, 1993, 2006) has argued that archaeology is "inherently political and situated" (Pearce et al. 2006:126), a position at least partially informed by his work with indigenous communities in North America. Any study of the Haudenosaunee past which hopes to avoid re-inscribing colonial relationships and modes of description requires an engagement with the issues raised by the study of an indigenous past produced within present-day settler colonial society (Veracini 2010). Part of attending to colonialism in the past is an awareness of continued colonial processes in the present, including scholarship which explicitly or tacitly relies on tropes of disappearing/vanished/timeless Indians (Deloria 1998), narratives of indigenous decline, or settler colonial techniques of using academic authority to (re)write definitive narratives about an indigenous past (Gerard-Little 2015; Hinsley 1996; Veracini 2010).

There is a long Iroquoian tradition of treaty-making in nation-to-nation relations with colonial entities that provides historical precedent for frameworks predicated on political, legal—and some would also argue—spiritual responsibilities on behalf of both parties (Benedict 2007). Instead of the collaborative form of landscape archaeology that involves non-Native archaeologists and descendent communities, which Severin Fowles (2010) identifies in the Southwest, in the Northeast it is perhaps possible to demarcate what Kurt Jordan has called, following Mohawk intellectual leader Salli Benedict, ‘two-row archaeology’ (Benedict 2007; Jordan 2011).

Rather than attempting to stake out a middle ground, the two-row model articulates an agreement where Native and non-Native people are metaphorically moving down the same river in different, independent vessels. Neither Native nor non-Native occupants are supposed to attempt to control the path of the other vessel, but they are joined by bridges of peace, friendship, and respect (Benedict 2007:429). Mohawk scholar Deborah Doxtator also clarifies that these two groups are understood to meet and interact as equals, and differences between Native and European concepts are not an excuse or reason for the marginalization and exclusion of Native intellectual concepts:

> if the primary basis for denying the equal compatibility of two knowledge systems is that Native concepts are different from western history's culturally determined categories, then perhaps the categories of history need to be re-examined, revised, and enlarged.” (2001:46–47)

Metaphorically, my research approach acknowledges that any view of Haudenosaunee society from the Euroamerican boat may be partial and that Haudenosaunee people may wish to keep it that way (Simpson 2007), but that taking Haudenosaunee scholarship and concepts seriously as part of writing the past is an important practical, theoretical, and ethical commitment. This commitment also arises from taking seriously a formulation of landscape in which perception and imagination of space are as important as experience, and are critical to understanding change, maintenance, and the importance of landscape through time.

In this chapter, I suggest a reorientation of landscape concerns, and introduce theoretical and practical refinements to the investigation of Haudenosaunee landscapes. Ultimately, Iroquoian landscape archaeology is overdue for a refinement which de-centers static units such as forest, clearing, site/locality, and wilderness and focuses on what William Cronon (1983:13–14) has called "the dynamic and changing relationship between environment and culture, one as apt to produce contradictions as continuities." Additionally, a more explicit linkage of analyses of colonialism and the archaeology and history of indigenous landscapes in Haudenosaunee territory is a necessary development that has not been fully realized (Sluyter 2002). Finally, a refined archaeology of landscapes during this time and in this place must better articulate the processes by which landscape is entwined in Native responses to colonialism and cultural entanglement, as well as is integral to cultural maintenance and reproduction. I draw upon recent approaches to landscape, from both within and outside Iroquoia, as well as scholarship by members of the Haudenosaunee community to lay out how archaeological data revealing material processes can be used to understand landscape processes, change, and the effects of colonialism on indigenous communities and archaeological methodologies.

Some scholars and historians of this era in North America have previously called for a 'decentering of the Renaissance' in understanding colonial impositions on indigenous contexts through a problematization of the categories on which a colonial history of North America has been based (Warkentin and Podruchny 2001). In using a combination of archaeological and textual sources throughout this work, as well as those created by members of the descendent community, I attend to Native histories and categories both practically and theoretically. An interpretive framework that emerges from a relational approach to landscapes (Smith 2003) that is grounded both in the material realm and cultural understandings relevant to the Iroquoian context (Silliman 2009, 2011; Vitelli 2011) presents decolonial archaeological possibilities. This project illuminates people and landscape intertwined in a relationship which shaped both, materially and culturally. However, I do not purport to apply an indigenous perspective to this archaeological examination. As the two-row framework sets out, as a non-indigenous person who has not been immersed in Haudenosaunee culture in the present, let alone the past, my approach offers informed interpretations perceived, conceived, and lived Seneca landscapes. I aim to leave space for Haudenosaunee perspectives, as well as to trouble some of the 'things' archaeologists have set up as loci of investigation, by focusing my investigation on the processes implicated in their creation and interrelation.

Theoretical Framing

A relational ontology of space, as outlined by Adam T. Smith (2003), provides a useful basis for developing a theoretical framework for understanding the relationship between Seneca people and their landscape rather than pursuing questions about how Seneca people adapted to an environment or how Iroquoian society emerged from a specific biome. The same principles can be applied to authority and community in less hierarchical[9] societies. Thinking of space as comprised of lived, conceived, and perceived elements, which Smith draws from Henri Lefebvre (1991), allows for social forms to exist in a relationship with space rather than being inscribed onto something preexisting.[10] Instead, space is both a "precondition and a result of social superstructures", a product and means of production (Lefebvre 1991:85). This orientation shifts research questions away from identifying a single cause and effect—which in the Iroquoian case has sometimes located the cause singularly in the environment—and toward an examination of moments in a cycle of social production and re-production, concurrent with human construction and modification of space.

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[9] John Creese (2016) highlights the necessity of differentiating between complexity and inequality in the Iroquoian context. He argues that while leadership and power were nested hierarchically in a scalar sense, power was configured from the bottom up.
[10] Ingold (2000) has also argued something similar, although from a considerably different framework.

While much of Lefebvre's analysis focuses on what an analysis of the production of space brings to light in the recent history of Western, capitalist nations, his drive to produce a 'science' of space elucidates some concepts that are useful to think of in a spatialized political economic analysis of non-capitalist systems as well as ecological systems. Because space is produced by actors, the kind of production and the social relations of production leave traces in the product (Lefebvre 1991:46). For Seneca people experiencing colonial entanglement of varying degrees and with varying effects over the course of the seventeenth and eighteenth centuries, the production of space and landscapes across this period must be considered alongside the additional forces which affected the dynamics of communities as well as the processes by which space was lived, conceived, and perceived.

Smith (2003:75) explicitly conveys the way archaeology, as a technique for investigating the material remains of spatial practices, can orient research toward "integrating dimensions of spatial practice across scales and media" by articulating these practices through examination of their material correlates. Repeated activities of past actors have left traces on the landscape, and while the past indigenous emic meaning of these practices may not be completely accessible (or appropriate for me to represent as a non-indigenous scholar), their effects can be interpreted in terms of how actions shaped the landscape, and potentially people's experience of that landscape. Textual sources, both ethnographic and historical, as well as information from indigenous scholars contributed to other aspects of landscape which may be less accessible archaeologically.

In the case of charcoal, as I will argue in Chapter Six, this humble and ubiquitous material, when identified by taxa, quantified within features and relative proportions determined, can act as an immense repository of information. Charcoal analysis can inform interpretations of Seneca land clearance, agricultural practices, movement at various scales, as well as community choice of and preference for certain kinds of wood for a suite of activities related to foodways, construction, and community location.

In addition to the archaeological evidence, some archaeological work uses ethnohistoric information and travelers accounts, as well as information from Native people themselves, in order to address aspects of landscape that previous generations of archaeologists may have perceived as too far up Hawkes' (1954) ladder of inference. This includes identity formation (Creese 2011, 2012a, 2013), indigenous agency (Jordan 2009a, 2010, 2013a, 2013d), thought-worlds (Carpenter 2004), ancestral or memorial landscapes[11] (Birch and Williamson 2015; Van Nest 2013), mobility (Lelièvre 2012; Parmenter 2010), and gendered landscapes (Allen 2010; Conger and Allen 2013; Katz and Allen 2013; Venables 2010). In discussing some of these new directions, I highlight the ways in which they intersect with a relational, multiscalar approach to Iroquoian landscapes and how a consideration for permanences rather than things has the potential to re-orient certain archaeological and historical approaches.

John Creese's (2011, 2012a, 2013) recent work on Northern Iroquoian sites from a period of community reorganization has shown the applicability of this spatial approach at the level of space and place. He provides a very detailed and place-based exploration of how identity, both cultural and personal, is constantly negotiated, created, and subject to change through spatial practice. Creese is intent to bring the material world into this process, advocating for a perspective that takes seriously the role of the built environment in the constitution and maintenance of organizational

[11] Unlike the Southwest or even the Midwest, where monumental architecture or landscape constructions lend themselves easily to thinking about memory work (Pauketat and Alt 2003; Van Dyke 2008, 2009), features of the Northeastern anthropogenic landscape have not traditionally inspired the same musings.

units such as clans or family groupings. Place-making is critical in Creese's discussion of communities in the transition to increased sedentism and reliance on agricultural products, not as a conscious inscription of a social order into the landscape but as a partial reflection of how categories of practice operated within the lives of village inhabitants at different times, in different locations. He makes clear that social and ideological order are never completely spatially realized and that he is particularly interested in the frictions or mismatches visible between arrangement of built space and social experience, the territory that generates the visible social change in the archaeological trajectory of these communities.

Creese can draw these conclusions because of the kind of archaeological data to which he has access: detailed full house plans in the form of well-documented postmolds from several different sites which span this shift in food procurement and settlement structure. This kind of fine-grained spatial analysis is precluded at sites where full house plans are not or cannot be recovered due to the impacts of Euroamerican plow agriculture, landscaping, and construction. However, this direction of Iroquoian research shows great promise in integrating the previous studies of settlement organization with trends toward landscape studies and interest in past practice by considering these various scales and levels of action. While for a given site or period some of those scales will need to be accessed through a combination of methods including analogy, artifact distribution analysis, and historical documents the rich repository of information on Iroquoian sites can be used to supplement new excavations, even in areas where preservation is an issue.

Along similar lines, Kurt Jordan's (2010, 2009b, 2013d) attention to multiscalar indigenous processes—of trade, provisioning, hunting, territorial expansion, and political engagement—as well as consideration of qualitative relationships between sites—has important implications for exploring how

Haudenosaunee people both used and created their landscape. His work combines an attachment to the material realities of the archaeological remains at specific sites as well as willingness to carefully reorient a disciplinary and cultural perspective that has had a tendency to see happenings in Iroquoia as processes on the periphery. Although his work does not explicitly take a 'landscape perspective', places are an important component of landscapes "as geographic or built aesthetics that attach meanings to locations" (Smith 2003:11) and charting the change of places and processes over time is critical to understanding the broader landscape.

Historian Roger Carpenter (2004), working in the period between 1609 and 1650, is concerned with explicating the 'thought worlds' of the Haudenosaunee and Wendat. He frames the interactions and conflicts between Europeans and Iroquoian people within a misunderstanding or lack of recognition of fundamental principles shaping Iroquoian worldview, namely that people were responsible for the renewal of the world and that out of destruction, the world could be restored (Carpenter 2004: xiv). He uses examples from Iroquoian dream-guessing ceremonies, captive adoption and integration, and condolence rituals, as observed by Jesuit priests and others, to highlight how these aspects of Iroquoian societies fit into a larger worldview.

While this represents an important step forward in considering thought worlds of the Haudenosaunee, Carpenter still comes to his analysis bound to 'things.' In particular, his treatment of the so-called gendered spaces of clearing and forest begins with an understanding that "the domain of Iroquois women extended from the center of the village to the edges of the cornfields" (Carpenter 2004:31), while the woods were the domain of men. Male space and female space are treated as firmly bounded spatial locations, even throughout a discussion of women traveling long distances into the forest to collect firewood, and in the face of evidence that Iroquoian women "regularly took to the "forest" for a variety of purposes" (Carpenter 2004:13). By taking these bounded spaces as things which exist in the world, Carpenter inhibits our understanding of the flows of possibly gendered action that maintained the ideological relevance of this spatial heuristic through changing patterns of Iroquoian movement and landscape practices.

The recent work of Jennifer Birch and Ronald Williamson (2012, 2015) on 'ancestral landscapes' of the Wendat in Southern Ontario has begun considering the ramifications for living communities of landscapes with multiple settlements conceived of as inhabited by both the living and the dead. Beyond drawing conclusions from the association of settlements with ossuaries or cemeteries, they push archaeologist to consider the boundaries of 'community' as understood by Iroquoian people, an important consideration in an archaeological culture-area where so much of the investigation and analysis is at the level of sites, which are often equated with communities. Ethnographically, this has a corollary in the direct relationship Fenton (1951) sees between locality and social structure. Community as an analytical category has been incredibly significant in archaeological research, and recent work has pushed for a consideration of how communities were socially produced by non-homogenous actors (Isbell 2000; Varien and Potter 2008). Birch and Williamson also take care to investigate and model the human scale of landscape modification and successive occupation of closely linked locations in Southern Ontario, which allows them to investigate social change along with landscape use, albeit during a period prior to significant colonial intervention.

Drawing from a broader geographical and cultural context, Michelle Lelièvre's work to revitalize 'mobility' in the anthropological literature, not simply as movement across terrain but in a way that questions "how movement operates and is productive of social relationships" (2012:41), is another critical reexamination necessary to a relational and processual view of Seneca people and their landscape[12]. Lelièvre's consideration of colonialism in a) the past treatment of indigenous people by colonial government and b) present modes of thought that assume a "sedentarist ideology…that stasis is the norm and movement is a secondary displacement of that position of rest" (2012:66) aligns well with my project's attempt to investigate practices of settlement relocation as they intersect with landscape relationships over time. The typological characterization of Iroquoian groups as agriculturalists[13], even if the modifier 'shifting' is appended, tends to foreground aspects of sedentism and frame movement, whether daily, seasonal, or associated with relocation, as secondary and possibly disruptive of a social structure and community tied to sites and localities.

An awareness of the importance and scale of mobility is a key element of historian Jon Parmenter's (2010) reexamination of Iroquoia between 1534–1701. It also stands as an example of a study that, while not necessarily landscape-centric, provides valuable perspective on related issues by integrating multiple lines of evidence and re-reading colonial accounts with an eye toward clarifying the Iroquoian world-view. Perhaps most notably, Parmenter provides an innovative look at the ways in which Iroquois people knew and moved across their territories, and how this was related to the strength and maintenance of the league organization in the face of European colonialism. Parmenter presents a more complete idea of the scope of Iroquoian population mobility, at both the community and individual level. He also highlights continued community connections to migrants who moved out of the core

[12] Some of the work on mobility (e.g. Oetelaar and Meyer 2006) makes recourse to implicit arguments about efficiency, even when they are explicitly disavowed. Careful and considered integration of phenomenological elements is also not widespread in mobility studies, although Oetelaar and Meyer attempt this.

[13] Despite a tendency to associate increased sedentism with increased reliance on maize, new dating of domestic structures from the Iroquoian area, as well as macrobotanical remains, indicate that sites were clustering in regional nexuses *before* maize was widely used as a food source (Hart 2001; Hart et al. 2003). Increased sedentism then needs to be investigated as a choice, rather than a forced response to increasingly intensified maize agriculture.

of Haudenosaunee territory, which has significant implications for inferring the Iroquoian experience and perception of landscapes at Ganondagan, White Springs, and Townley-Read. My study takes place at a more local scale than the comparatively broad spatial and geographic scope of Parmenter's book, and through archaeology can demonstrate some of the less textually visible relationships between Seneca communities and landscape.

Some Iroquoian archaeologists are beginning to analyze artifacts and their spatial distribution with an eye toward 'gendered landscapes' and Haudenosaunee perceptions of gendered domains, drawing from both documentary records and ethnographically collected Haudenosaunee worldviews. This can be seen as a further extension of the attention to gender that has accompanied studies of maize domestication and Iroquoian migration (Fritz 1999; Smith 2001). Archaeologically, these domains are often binarized into male and female spaces (Baugher and Spencer-Wood 2010; Conger and Allen 2013; Jordan 2014; Katz and Allen 2013; Rodriguez and Allen 2016; Williams-Shuker 2005). While the addition of gender as a variable factor in the analysis of landscapes and space is an overdue development, much of the work treats gendered space as a 'thing' or conception held by Haudenosaunee people that preexists and is independent of human action. These attempts too stridently divide landscapes into static, binary gendered spaces based on creation stories, Jesuit accounts of Iroquoian practices, and ethnographic analogy from the observation of reservation communities after the Revolutionary War.

Given the shifting settlement pattern of Haudenosaunee people, some of these spaces quite literally had to be re-created at least once in most people's lifetimes. The actions of clearance, wood collection, and agriculture; movement by individuals and groups who enacted certain gender identities; as well as ceremony, ritual, and political protocol which defined and maintained the boundaries of certain spaces were all part of the processes and actions which defined these spaces. To treat them as already in existence is to deny both the reality of Haudenosaunee settlement and the import of past actors and their choices.

Writing in a volume about the archaeological investigation of gendered landscapes, historian Robert Venables (2010) applies this term to spaces related to domestic structures (female), places such as towns no longer occupied by a living community (male), and to the broader landscape (divided, mostly male). Although he stresses throughout his treatment of European documentary sources, twentieth century reservation ethnographies, and conversations with present-day Haudenosaunee interlocutors, that Haudenosaunee placed (and continue to place) a high value on balance, reciprocity, and flexibility in light of experienced conditions, this sense of negotiated movement and action is not always represented in his discussions of archaeologically and historically investigated gendered spaces. While generalizations are certainly useful when discussing complex ideas like gendered practice, on the whole, the archaeological and historical literature seems to have an overreliance on the simplification of a complex and negotiated area of Haudenosaunee life, which was contingent upon many factors in addition to the gender expression of members of society (c.f. Jordan 2014).

Addressing 'Things' in Iroquoian Archaeology

Reliance on a number of 'things'—such as wilderness, clearing, female space/male space, food, medicine, abandoned places, natural, and cultural—often received uncritically from early observers or imposed by western Enlightenment categories, has shaped archaeological and historical investigations of Iroquoian landscapes. This reliance highlights the difficulty of describing the past via reference to documents produced within the colonial power matrix (Grosfoguel 2008), by people like celibate Jesuit missionaries steeped in Christian thinking, traveling through a foreign place with imperfect knowledge of the language, and often quite alone. Archaeological investigation of landscape and practice has the potential to address and possibly contradict rather than merely confirm the received knowledge about the state of Iroquoian landscapes as noted by missionaries, colonists, and other early observers through an examination of the remnants and patterning of human practice and a focus on the constructedness of spaces, places, and landscapes.

The idea of village or town space as separate and distinct from forest space emerges from nature/culture and wild/cultivated dualisms, both those assumed by early colonial visitors and those of modern researchers. Accounts by travelers, officials, military men, and colonists describing the New World assume certain compositions of nature or culture as well as certain abilities, or lack thereof, of Native people to affect their surroundings. This is particularly clear in sources like land survey documents from the eighteenth century and the accounts of travelers moving through Haudenosaunee territory, which discuss the positive physical characteristics of the landscape and lament the poor or incomplete use by the indigenous inhabitants, or fail to attribute the amenable conditions to Haudenosaunee habitation and modification (Beauchamp 1916:74; Conover 1887:85; Pyne 1982:81).

Especially during earlier periods of description, this can be tied to European perception of Northeastern North America as 'unimproved' and a pristine wilderness on the frontier of colonization[14] (Nye 1994; Williams 1989). In my project, which seeks to understand the changing relationship over time between a specific indigenous community and a landscape, it is critical to acknowledge this as well as the ways in which academic studies have in the past minimized or misrepresented indigenous

[14] These observations, brought back from the New World, also contributed to ongoing European theorization of nature and culture (Glacken 1967).

agency in the creation and maintenance of landscapes (Johnson 2014; Seischab 1992). This landscape cannot be investigated as a preexisting condition or thing, only through its interconnections with the community integral to its production.

Following from this issue are modes of analysis structured by these Western categories, which have become the assumed standard (Sluyter 2002:184). In studying and theorizing the relationship between people and landscape, an analysis structured by acceptance of nature/culture categorizations, especially extended to the categories of clearing and forest, forestalls acknowledging the constructedness of nature/forest and combating what anthropologist Arturo Escobar (1999) calls the 'modern ideology of naturalism,' especially in the study of Native peoples. It also contributes to a reification of the separation of these two domains when, as Cronon (1991) has shown with his examination of the construction of city and country on the American frontier, the two are intimately related and inseparably co-constitutive.

Severin Fowles, writing about the archaeology of Puebloan communities and what some anthropologists have called 'religion,' elaborates a more sensitive approach to dualisms and categories that is centered on the non-translatability of post-Enlightenment concepts to pre-Columbian indigenous pasts. Fowles interprets the archaeological record considering ethnography and ethnohistorical research that suggests Puebloan people of the thirteenth century had an entirely different ontology, and therefore analyzing their past practices in light of our conceptual divisions of economy, religion, and politics does little to explore or understand their total world (2013:7). There are significant ramifications of this reorientation for interpreting archaeologically discovered spaces. Because of the incommensurability Fowles finds between the archaeological concept of religion and what Puebloan people were doing (and thinking about what they were doing) in the past, modern archaeological attempts to distinguish 'secular' and 'sacred' spaces, for example, merely serve a researcher's impulse toward neatness. This is not however to say that dualisms are unimportant or false. By attending to dualisms relevant to Puebloan practice and ontology as organizing principles rather than "purified categories of opposition" (2013:178) he is able to explore the alterity of a non-Western past without wedging this past into ethnocentric Western categorizations[15].

Approaches to Iroquoian landscapes, both those that rely upon mapping/analysis software and otherwise, are improved spatially and conceptually by focusing on a whole landscape rather than either 'wilderness' or the settlement core—both typical approaches in past studies of Iroquoia. Given what Eric Wolf describes as "social clusters that expend labor cumulatively and transgenerationally upon a particular segment of the environment," (1982:92), I center on landscape processes carried out by Haudenosaunee communities at a series of sites. This avoids binding my interpretations to 'things' derived from Enlightenment modes of analysis and categorization, and produces a less colonial understanding of the Haudenosaunee relationship to the landscape. Especially for the examination of an era in which European colonists and Native people interacted in a spectrum of ways from cooperative diplomacy to violence, approaches to pre-Columbian and entanglement-era landscape in the Northeast would benefit from incorporating the relations of past landscapes to social life, place, environment, and their role in the interaction between Native and colonial populations.

Haudenosaunee Perspectives

While archaeological materials provide evidence of human action, alone they cannot address conceptions or perceptions. Historical archaeologists use a range of

[15] Although within settler colonial studies there has been some work "Recuperating Binarism" (Wolfe 2013), this scholarship largely pertains to binaries whose complication or effacement by academics masks a continuation of an underlying settler/indigenous relationship.

other sources in the effort to translate and understand the past. In the case of the Haudenosaunee past, this translation has largely been performed by Euroamerican archaeologists and historians, based on European and early American textual accounts, although Haudenosaunee (and particularly Seneca) scholars like Arthur C. Parker (1881–1955) have been involved in archaeological investigation since the beginning. The input and perspectives of the descendent community, especially scholars explicitly writing to correct the dominant narrative of their present and their past, is invaluable to the effort to interpret the archaeological materials. This is especially true given issues with colonial-era sources, the relatively few generations between the Seneca of the eighteenth century and today's descendent community, and the language and cultural barriers which prevent me and many other archaeologists from experiencing things like the Haudenosaunee creation story in an untranslated form. In the spirit of the two-row, I take the insights publicly provided by Haudenosaunee scholars to inform my archaeological interpretations.

Mohawk scholar Deborah Doxtator, whose 1996 dissertation explores the changes in the Rotinonhsyonni[16] social organization and clan system pre- and post-European colonization and reservationization, delves into the underlying concepts, conventions, and understandings that structured this system and how it was altered by colonialism. Rather than seeing the present and the past as separated by a large gulf, she interprets them, following Native concepts of history, change, and time as "part of the same incorporated universe," albeit one that was seriously affected by colonialism (Doxtator 2001:37). Interweaving historical documents, public elements of Haudenosaunee cosmology, personal knowledge, and ethnographic investigations, Doxtator (1996) explicates the social and symbolic importance of several interconnected spatial and ideological realms, in which the clan system plays a

[16] This is one transliteration of the Mohawk rendering of 'Haudenosaunee'.

significant role.

Doxtator sketches a series of nested domains that are held in mutually dependent binaries. On one side there is home/clearing/"mother's side" and on the other there is external/forest/"father's side." While difference exists between these categories, they are complementary, and each side has responsibilities to the other (Doxtator 2001:39). She interprets these domains as instrumental in shaping societal reactions to the change experienced by Haudenosaunee people in the nineteenth century, but this could easily be true for transformations experienced by earlier Haudenosaunee communities. These distinctions in domain and responsibility were understood and enacted by people in the past. Both men and women constructed home/clearing spaces each time a settlement relocated, but authority over domestic space was the responsibility of women. Both men and women moved through the forest and between settlements, but responsibility for the area outside the clearing fell traditionally to men.

In examining forest and clearing more specifically, Doxtator explores the ways in which these relationships were mutually constitutive, situational, and neither static nor possessing some set of essential characteristics. Contrary to other historians' positions, Doxtator makes sure to clarify that the spatial domains of forest and clearing were not *exclusively* gendered and the association was based on an

> idea of balance between two spatially differentiated groups: those who had special connections with the hinterland outside the clearing, and those who spent a great deal of time there, and those who had special authority and responsibilities within the local domestic scene of the village and clearing. (Doxtator 1996:71)

These spatial relationships were important in terms of differential access to various categories of resources, as well as the reciprocal responsibilities of mother's and father's clans to individuals. Identity for all people was articulated through varying degrees of internal and external connections.

Doxtator’s exploration of the role of leaders or ‘elders’ in several domains (clans, political leadership, in the context of cosmology and the Thanksgiving Address) places leadership in relation to various spatial areas within a cultural context (1996:84). Clan matrons represented the clearings, as well as the “extended contacts with other clearings” (Doxtator 1996:85) and an individual’s connection to place was typically reckoned through the maternal clan system. Clan war chiefs, typically male, were based in the forest and oriented toward external concerns; this becomes particularly significant during periods of stress and conflict with both other indigenous groups and with European colonial forces. The local clan chiefs operated in the clearings, but the confederacy clan chiefs (royaner) “were based in the forests between the clearings and were referred to metaphorically as “trees”” (Doxtator 1996:87).

The association of leaders with different spatial domains is also linked with spatial mobility of Haudenosaunee populations, whether for internal or externally motivated reasons. Doxtator maintains that the movement of people to unfamiliar terrain gave greater power to the externally-oriented, father’s side, forest leadership. When people were able to stay closely connected to a particular homeland, the mother’s side, internally-oriented, clearing leadership held greater sway. Because of the mobility patterns of Haudenosaunee people after ca. 1550, the clearing and forest periodically switched locations as old community locations were abandoned and new areas were cleared. This shifting leadership model is relevant to exploring differences between Seneca settlements relocated short distances during times of relative peace and those, like White Springs, which were settled in response to military violence from colonial forces.

Mohawk scholar Amber Adams’ (2013) dissertation, *Teyotsi'tsiahsonhátye; Meaning and Medicine in the Haudenosaunee (Iroquois) Story of Life's Renewal,* uses the Haudenosaunee creation story as an entry point into an analysis of the interconnectedness of health, medicine, and ecology. Adams uses her linguistic and cultural insight to re-read several versions of the Haudenosaunee creation story, as well as records produced by Euroamerican ethnography in reservationized and colonized communities. Her analysis of these stories and their cultural context allows her to elaborate on a system where

> human beings and plant life exist mutualistically according to onkwehonwenéha, traditional Haudenosaunee culture: humanity practices certain behaviors toward plants, wild and cultivated (in particular kayenthóhsera, the maize, bean, and cucurbits planted for the backbone of the Haudenosaunee diet) which, in turn use anthropogenic microhabitats to thrive and furnish human beings with the species they need to remain healthy. (Adams 2013:116)

She critiques scholarly approaches solely focused on goals like identifying plant and animal species referred to in the creation story or determining the 'medicinal' uses of plants, because they miss the critical and necessary interconnections and mutual dependencies which make things meaningful for the Haudenosaunee. Adams draws a connection to the way in which "Haudenosaunee grammar depends on the awareness and acknowledgement of actors participating, jointly, in the action of the verb"—the meaning is in the relationship between what may be treated as two separate parts of language (Adams 2013:105). Her work brings a culturally-relevant valence to considerations of entanglement and landscape processes by providing insight into Haudenosaunee values and priorities drawn from deep and longstanding cultural traditions which guided life.

There is resonance between the Haudenosaunee understandings of the relationship between people and others as explored by Adams, which sees humans, animals, and environment mutually participating in an ecosystem and Harvey's exhortation that ecosystems "both instantiate and reflect…the social systems that gave rise to them, though they do not do so in noncontradictory (i.e. *stable*) ways" (1996:185). Broadly then, we must understand anthropogenic landscapes as created transgenerationally by shifting Haudenosaunee settlement patterns, kinship-based modes of production, and the kinds of social and community relations outlined above. This is a starting point for examining these systems in ways that are productive of understanding about social relations, modes of production, and changes related to historical circumstances and coping with encroaching colonialism that move beyond the simply spatial and environmentally deterministic. Within this framework, change does not need to be unidirectional, final, or a prelude to decline, but can be found in the interstices of historical, ecological, political, and social processes.

Binaries of humans and nature, or of wild or cultured ecosystems, dissolve in this framework because of the necessity of taking humans as an integral part of the place, environment, landscape they inhabit. While it may not be possible or appropriate for me to attempt to interpret the Haudenosaunee past as a cultural 'insider,' as Patrick Wolfe's (2013) recuperation of colonist/indigenous binary makes clear, I can approach the archaeological record with methodologies that are sensitive to publicly-stated Haudenosaunee values and priorities, that attempt to understand the practices of past actors and communities as responsive to and productive of certain kinds of landscapes, and that provide insight into possible indigenous responses to colonialism/cultural entanglement without assumptions of inevitable decline.

In the next chapter, I use archaeological sources pertaining to the Haudenosaunee during the Protohistoric and Postcolumbian periods to demonstrate how a consideration of various domains, when studied together as contingent and interconnected, reveal changing landscapes and landscape practices over these periods. I begin with a review of the material, archaeological evidence to assess the state of knowledge somewhat independent of European perceptions and conceptions of indigenous landscapes preserved in various other forms of documentation. After focusing on the existing archaeological data for the Haudenosaunee generally, I turn to interlocking landscape processes at and around a single site, as revealed through a broader set of sources: archaeological, ethnohistoric, colonial documentary, and comparative. This sense of landscape time, as something stewarded and effected by Seneca people, then informs the analysis of an accumulation of spaces, places, into a Seneca settlement landscape ca. 1550–1779.

CHAPTER 3

ARCHAEOLOGY OF IROQUOIAN LANDSCAPES

Land use and landscape modification have often been obliquely if not directly addressed by archaeological and historical study of Iroquoian people and sites in New York State. In the tripartite formulation of landscape introduced in the last chapter these sources largely deal with the lived landscape of the Haudenosaunee, without integrating the material aspects with conception or perception. Data on lived landscapes are found in the form of artifactual and settlement pattern data, faunal and macrobotanical information recovered from archaeological sites, palynology, paleoenvironment/ecology reconstructions, and wood charcoal/dendroecological information. My focus in this chapter is evidence from the Protohistoric and Postcolumbian periods, although I incorporate relevant information from the preceding Woodland time periods. In some cases, it is necessary to discuss the evidence for practices of previous periods as these are often referenced, either directly or indirectly, in sources dealing with later eras. I present the existing data from each period pertaining to landscapes and synthesize these sources to illustrate both the possibility of landscape-oriented research and the necessity for further landscape-focused investigation.

Repurposing Existing Data

The long history of investigation of Iroquoian sites means that even when researchers have not focused on landscape practices, an extensive body of data pertaining to settlement patterning, foodways, paleoenvironment, and ecology exists. By corralling evidence from these disparate realms and assessing the current state of information on land use and modification in the Iroquoian area of the Northeast, I hope to more clearly reveal the opportunities for new work which investigates Seneca, and more broadly Haudenosaunee, stewardship of landscapes. This sets the stage for an archaeological interpretation in which the activities of communities of people do more than overlay a set of ecological variables, where human practices alter and prepare the landscape and bring into being the conditions beneficial for a particular way of life. In providing a review of existing information I hope to show the malleability and changeable nature of Haudenosaunee practices, and how they were affected by and also maintained despite colonial intervention.

This chapter also includes data from Southern Ontario, the traditional homeland of non-Haudenosaunee Northern Iroquoian nations and their precursors. As discussed in Chapter One, these groups seem to have been connected to populations in New York State by language, trade networks, and population movement. In taking a geographically-bounded approach[17] to what later definitively become Iroquoian landscapes, I hope to highlight both the *in situ* development of some of these practices (Jordan 2013b) as well as the deep ancestral connections today's descendent populations feel with the territory (Benedict 2007).

The table below summarizes the chronology used in this chapter. Because sites discussed are found in both present-day New York State and Southern Ontario, I avoided regionally-specific finer-grained chronologies and used more widely relevant time periodization. This also avoids the issue of using complexes, phases, traditions, and stages—each of which has a specific meaning and relies on different data and organizing heuristics—that have often been used variably across Iroquoia as organizing principles. Because traits associated with the subcategories have been used, uncritically, as temporally significant markers even in the absence of firm dates, the

[17] Ramsden (1996:101) uses a similar tactic for Huron archaeology: he explores the issues within a defined area of Ontario in which sites are "culturally ancestral to historic Huron sites."

periods used herein are chronologically based rather than trait-based (Smith 1997; Willey and Phillips 1958). Dates were drawn from Gremillion's (2003) overview of the Eastern Woodland chronology and Jordan's (2013b) overview of Prehistoric and Protohistoric Iroquoian archaeology.

Table 1. Date ranges for named periods.

Time Period	Dates
Woodland	1200 BCE–1500 CE
Early	1200 BCE–100 CE
Middle	100–900 CE
Late	900–1500 CE
Protohistoric	1500–1630 CE
Postcolumbian	1630 CE–present

Within the Protohistoric and Postcolumbian I reorient data pertaining to: settlement structure(s), important flora and fauna, evidence for anthropogenic burning practices, and evidence of dominant climate or climatic variation toward a more integrated landscape perspective. These domains are archaeologically visible, have been part of Iroquoian research programs in the past, and provide evidence for how humans both modify and respond to their local surroundings. Evidence of flora and fauna found at specific places provides insight into processes of food procurement[18], associated mobilities, and in some cases longer range connections or introductions of new plants, animals, and associated tasks. Anthropogenic burning evidence addresses a kind of extensive, although not always intensive, form of landscape modification which has implications for understanding the environments around Iroquoian sites. When available, data on climate and climatic variation are critical factors in understanding the practices and actions of shifting agriculturalists who are reliant on seasonal conditions within certain thresholds for their livelihoods and survival. Foregrounding landscape and landscape practice in each of these subsections reorients

[18] I avoid using the term 'subsistence' because it fails to encompass the range of ways fauna and flora were used and interacted with. For later periods 'subsistence' implies barely subsisting rather than accounting for practices like maintaining surplus stores or trading with other groups.

preexisting studies which may have been focused more narrowly on single sites or ‘subsistence’ practices to the interconnections between people and landscapes in this region over time.

The sources included here also rely on primary data and research results rather than analysis of ethnohistoric documents for reasons outlined in Chapter One. When possible I also avoid sources that speak more generally to the Northeast, because it encompasses a wide range of cultures, specific histories, and climatological and physiographic zones. Despite researchers’ awareness of colonial imposition from European arrival onward, scholarly treatment of historical sources can be inexact with respect to time period as well as assumed implications for understanding the broad contours of Haudenosaunee culture and lifeways through time. Analysis often misses the temporal scales of individual lifetimes, whether because researchers assume 1) a static, change-resistant culture and worldview which keeps lifeways and social organization the same or 2) that rapid and radical change was highly likely following the arrival of Europeans in North America, a view that was most common in early acculturation models of colonialism but persists in other forms.

Integrating ecological or palynological datasets presents another difficulty because these data need to be parsed and contextualized on the human rather than solely geological timescale. Many ecological studies refer to time periods such as the ‘late Holocene,’ which covers everything from approximately 3000 BP (ca. 1050 BCE) to present. The beginning of the Late Holocene can roughly be located in the archaeologically-defined Early Woodland period, but the Holocene encompasses such a broad swath of societal change for Haudenosaunee people is difficult to connect to the human scale. Portions of these records have been included in the subsections where finer distinctions or trends can be identified.

Most of the lake core climate proxies relevant to the Haudenosaunee region present information that is relevant on a centennial or millennial timescale, such as climate effects of Milankovitch[19] cycles, and are therefore not useful for examining smaller-scale changes (Meyers 2002; Mullins 1998). This is partially to do with the nature of the record—accumulation rates of lake sediment, as well as bioturbation and other post-depositional processes, affect the resolution sediment cores can provide.

Protohistoric (1500–1630 CE)

The Protohistoric period begins with the coastal presence of Europeans in North America, when European influence on and interaction with Haudenosaunee people was indirect and no colonies were located in the ancestral Haudenosaunee homeland. It ends as contacts between Haudenosaunee people and Europeans were increasing, through the fur trade as well as other economically and politically based transactions, and as European materials began to have a greater effect on Haudenosaunee life (Engelbrecht 2003). This is still prior to significant colonial settlement or intervention in Haudenosaunee territory. I have used ‘Protohistoric’ for this period, following William Engelbrecht (2007), because it speaks directly to the kinds of sources that are available for this period in Iroquoia: limited texts often composed at a distance. “Contact” or “Pre-contact” by contrast, implies direct contacts between Haudenosaunee people and Europeans were common and effectual. It speaks to the orientation of Iroquoian archaeology that there is no commonly used, archaeologically based, term for this period that does not reference the arrival of Europeans in some way. By prioritizing the archaeological data in this period where it provides the most direct evidence of Haudenosaunee practices, I hope to avoid making archaeology the handmaiden to history that has not yet happened.

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[19] “Milankovitch cycles refer to long term variations in the orbit of the Earth which result in changes in climate over periods hundreds of thousands of years and are related to ice age cycles” (Lee 2012).

A number of scholars (Engelbrecht 2003:128–131; Kuhn and Sempowski 2001; Parmenter 2010; Tooker 1978) agree that the alliance between the five Haudenosaunee nations was cemented into the League some time during the Protohistoric. There are those who place the date of formation much earlier in the fourteenth or fifteenth centuries or even as far back as 1000 (Rossen 2015; Snow 1994), but all agree that it was a gradual formation, and Haudenosaunee oral traditions also attest to this processual view of political alliance formation. A social network analysis of pottery decoration demonstrates that the five member nations, which seem to have still been in formation through the middle of the Late Woodland, were also culturally and politically interconnected across the region between 1350 and 1650 (Hart and Engelbrecht 2012). Both in archaeological estimation and in oral tradition, the Seneca seem to be the last of the five nations to formally join the league (Kuhn and Sempowski 2001).

Settlement Structure

Across Haudenosaunee territory, settlement distribution models relying on environmental variables to predict community choice have linked Five Nations settlements from the Protohistoric to favorable soil types as well as areas with fewer frost-free days for maize agriculture (Engelbrecht 2003; Hasenstab 1996a; Jones 2008, 2016). In the case of the Seneca, the site sequence prior to 1500 has not been well explored, although after 1550 a pattern of two large paired sites with smaller satellites is well established archaeologically and will be discussed in much greater detail for the Postcolumbian period and in Chapter Five (Jordan 2008; Vandrei 1987; Wray 1973, 1983; Wray and Schoff 1953). This patterning, also generally shared by the sites of this period in Onondaga territory (Bradley 1987; Tuck 1971:141), suggests community creation of localized anthropogenic landscapes within the area of short-distance settlement relocations.

Both Seneca and Onondaga sites from this period typically have burials outside the settlement (Wray 1973). Jennifer Birch and Ronald Williamson have specifically considered Wendat 'communities of the dead'—those who had lived and died at settlements[20]—as well as communities of the living. Birch and Williamson highlight evidence from excavation of burials that these individuals were tended—even after the community had moved to a new location—indicating that previously occupied sites retained some cultural significance (2012:127). Interestingly, in Southern Ontario, sites from this period and later in the seventeenth century seem not to be reoccupied, indicating that there was some strong reason to avoid areas that had regained agricultural fertility. This may have been due to the nature of those places either in memory, practicality (as good locations for hunting deer) or both (Birch and Williamson 2015:143).

Although archaeological evidence for maintenance of burial grounds and the continued interaction with the interred that exists in Southern Ontario is not as readily available in New York, we can still perhaps think of people of drawing on memories of the resting places of ancestors, informing their conception of important places within the landscape. Recent studies also show that Senecas participated in condolence rituals for other nations during the late sixteenth and early seventeenth centuries (Sempowski and Saunders 2001:709–712). This signals participation in both a nation and in the creation of an *inter*tribal landscape through ritual consolation of the living (Parmenter 2010:17).

The continuing relevance of former settlement locations is attested to by Eric Jones' (2006) examination of Onondaga settlement patterns that makes use of

[20] For the Wendat this was limited to individuals who had not been included in an ossuary. New York State Iroquoian groups generally did not use ossuary burials.

viewshed analysis to estimate of Onondaga site intervisibility. Based on the four earliest sites in the sequence[21], he concludes that the intervisibility of sites was an important consideration for the Onondaga for reasons of communication between contemporaneously occupied settlements in the event additional help was needed for defense. However Jones' focus on landscape features as enabling or hindering either defense, with agriculture an important secondary consideration, limits the complexity of how Haudenosaunee inhabitants may have conceived of the landscape in the past (Jones 2006:537). 'Communication' may not only have been important for reasons of warfare, but also for social connections between the living (as well as between the living and the dead), resource sharing, and collective rituals, as attested to by ethnohistoric texts and the mobility of Iroquoian populations.

In the major works on both the Oneida site sequence (Pratt 1976) and the Mohawk area (Snow 1995a), settlement patterns are understood as direct responses to climate, soils, and European-borne diseases, and there is a strong focus on dating, determining site size, and assessing the intensity of occupation in the pursuit of a better understanding of demography. Use of ecological terms like 'carrying capacity' and a focus on the mechanisms of subsistence given particular environmental inputs are typical in this approach.

Dean Snow's *Mohawk Archaeology: The Sites* (1995a) is the most comprehensive compilation of Mohawk archaeology published. Although there is a brief synthesis of each period at the beginning of their respective sections, this work largely focuses on cataloguing the sites, their sequential ordering, and their main artifact assemblages (often ceramic). Snow notes a slow but regular population growth

[21] Of the two earliest sites in the Onondaga sequence—McNabb and Nursery, dating to ca. 1500—Jones (2006:528) finds that the latter site offers views of all sites occupied immediately following this pair. In turn, those next sites (occupied beginning ca. AD 1520–1530) are intervisible from each other.

in Mohawk territory that occurred through the fifteenth and sixteenth centuries, coinciding with coalescence into larger villages. These ‘larger’ settlements of ca. 1400–1525 were still small enough that they could have persisted in the same location indefinitely without exhausting the soils (Snow 1995a:90). In fact, Snow notes that many excavated sites from this period display deeper middens and higher artifact counts than larger sites, perhaps indicating longer occupation periods possible with smaller populations which do not deplete nearby firewood and other resources as quickly. Snow also notes in passing that a number of Mohawk sites from the sixteenth century overlie an earlier component. Aside from the difficulty this type of reoccupation creates for dating sites by assemblage or radiocarbon dating, the presence of an earlier component could also indicate conscious re-use of locations on the collective cultural landscape, as has been noted in Hart’s reanalysis of sites dating between 1000 and 1400 such as Bates, Kelso, and Sackett (Hart 2000b).

Flora

By the protohistoric, shifting polycropping of maize, beans, and squash is the dominant agricultural pattern, supported by additional hunting and gathering practices. This combination of crops had longstanding use, even by 1500. Squash (*Cucurbita pepo*) was present in the Northeast as early as 1100 BCE (Hart et al. 2007; Hart and Brumbach 2009; Hart et al. 2011; Thompson et al. 2004). Maize (*Zea mays*) spread to the Northeast[22] later, but phytolith evidence from New York indicates that it was used as early as 300 BCE. However, at this early date it may not have been grown locally and it did not become a principal resource until over 1,000 years later (Hart and Lovis 2012; Katzenberg 2006). After 900 CE maize is the “predominant plant food remain in…assemblages across much of the Eastern Woodlands of North America” (Smith

[22] Often defined by researchers as including portions of present-day Ohio and Illinois.

and Cowan 2003:118). Archaeologists generally agree that by 1000–1200 CE maize was a major food resource for Northern Iroquoian peoples (Crawford et al. 2006; Katzenberg 2006; Martin 2008; Smith 1989). Beans (*Phaseolus vulgaris*), despite earlier claims (Ritchie 1973), do not seem to have joined the other two sisters until the fourteenth century (Hart 1999a, 2000a).

Maize seems to have stabilized at approximately 50% of the Iroquoian diet, and hunted and gathered resources continued to be relied upon for the remainder of dietary contributions (Katzenberg 2006). New isotopic research on ancestral Huron-Wendat teeth from Southern Ontario provides further evidence of a stable level of maize consumption between the fourteenth and sixteenth centuries (Pfeiffer et al. 2016).

In addition to domesticated crops, flotation of soil samples from Iroquoian sites inhabited in the fifteenth and early sixteenth centuries indicate that foraged resources such as strawberries, raspberries, elderberries, blueberries, acorns, plums, and others were being exploited (Birch and Williamson 2012; Crawford and Smith 2003; Finlayson 1975; Minnis 2003; Wagner 2003). Analysis at Ostungo, a Mohawk site, also recovered sunflower seeds, tobacco seeds, and seeds of berries such as strawberries and elderberries, as were ethnographically-known plants used for wellness, such as nightshades (Kuhn and Funk 2000:38). Many of these species favor edges and open woods, and their consumption is an indicator of local mobility, between clearing and forest. Relatively short-distance community relocations allowed people to easily return to cleared areas associated with the previous settlement and to harvest foods from these locations.

Fauna

The longstanding reliance of Iroquoian populations on white-tailed-deer

(Engelbrecht 2003; Kuhn and Funk 2000; Somerville 2014; Tuck 1971) has implications for seasonal mobility as well as hunting ranges. Birch and Williamson also estimated the hunting territories for the ancestral Wendat site of Mantle (ca. 1500–1520) at 1428 km^2, assuming a 35% predation rate (Birch and Williamson 2012:117). They based these calculations on population numbers, estimates of the hides required for making and maintaining clothing, and pre-Columbian deer population estimates for Southern Ontario. This works out to a radius of 21 km, only slightly beyond Jordan's 'local' radius for travel from a site (2008:42). Pfeifer and co-authors (2016) also present evidence that deer eaten by ancestral Huron-Wendat populations were not eating maize and were therefore likely hunted away from settlements and agricultural fields.

While researchers have not calculated hunting radii for settlements in traditional Five Nations territory, there is general conformity in the exploited species: reliance on white-tailed deer with exploitation of a wide range of other species that could have been exploited for food, pelts, and other qualities (Kuhn and Funk 2000; Ritchie and Funk 1973:329; Snow 1995a:160). This overview effaces temporal variation within sequences (e.g., broad-spectrum exploitation during particularly difficult years versus with 'typical' white-tailed deer hunting) but some of this generality is due to the incomplete or coarse-grained nature of existing faunal analyses. Many sites also have a component of "garden-hunted species," or animals that would have been found in and around agricultural fields taking advantage of the crops (Birch and Williamson 2012:107; Kuhn and Funk 2000; Somerville 2013). The faunal collection from the sixteenth century Cayuga site of Corey, which combines materials from excavation and from flotation, presents a more complete picture of animals consumed, including frog, fish, chipmunks, and elk and indicates the broad-spectrum diet pursued by people living at the site (Rossen 2015). The fur trade and colonial interaction also had a significant effect on the faunal assemblages of sites toward the end of the Protohistoric, demonstrably driving up the percentage of beaver and bear bones at Mohawk sites (Snow 1995a:169).

Burning

Articles written by ecologists about forest disturbance and burning sometimes emphasize the large impact of Euroamerican settler colonialism on woodlands and forest composition, to the detriment any exploration of pre-colonial variation (e.g. Abrams 1992; Buell et al. 1954; Fuller et al. 1998). Especially for the period immediately prior to extensive Euroamerican colonization of Haudenosaunee territory, sparse ethnohistorical sources are granted a great deal of authority in speaking for past practices. Here, I rely primarily on the archaeological and ecological sources and only introduce primary-source texts for subsequent time periods when they represent direct observations.

Scholars have debated about the extent to which anthropogenic fires affected the forests in the pre-colonial Northeast (Abrams 1992; Abrams and Nowacki 2008), however much of this debate centers on the validity or applicability of early European accounts of Indian burning rather than forestry data or specific references to forest dynamics (e.g., Russell 1983). Because these case studies are limited to small areas and regional data are difficult to come by, significant extrapolation (however warranted) occurs when discussing Iroquoia as a territory. Here, I focus as much as possible on Haudenosaunee territory and related areas.

Crawford Lake, located to the west of Lake Ontario, is one relatively well studied watershed, due to the preservation of stratigraphy in its lake sediments. Iroquoian occupation of the area around Crawford Lake begins ca. 1280 and lasts until ca. 1650 (Clark and Royall 1995:2). Based on charcoal in lake sediments, Clark and

Royall argue that prior to Native adoption of intensive agricultural practices, the fire frequency in this locale matches the periodicity observed under natural fire regimes. Forest fires and ignitions in a natural fire regime are caused by lightning strikes and other non-human causes (Clark and Royall 1995, 1996:381). However, intensive reliance on maize was associated with changes in Iroquoian landscape practices. Geographer Roger Brown (2002) demonstrated through a reconsideration of Clark and Royall's data, along with another study from Southern Ontario (Munoz and Gajewski 2010) and analysis of a larger sample of pollen cores from lakes in northern New York and Southern Ontario, that there were changes in fire frequency and forest composition due to anthropogenic activity. These changes are distinct from larger-scale alterations in forest composition due to gradual Holocene climate trends.

In Southern Ontario, the past 2000 years have been marked by trends in cooling and increased moisture, which adversely affected the viability of species like beech, maple, elm, and hemlock. Munoz and Gajewski found that at sites influenced by human activity, the tree species that replaced declining beech, maple, elm and hemlock populations were more likely to be pine and oak: "mid-successional species typically found in warmer, drier locations where fires are more frequent" (2010:974). They also compared all available charcoal diagrams from cores in Southern Ontario and found that after 1200, the charcoal influx at sites near Native settlements increased. Frequent low-level burning explains the persistence of oak near settlements, because the fire allows oaks to compete more successfully with other deciduous taxa for sunlight, in addition to negatively affecting fire-intolerant species like hemlock and beech (Fowells 1965). A recent forestry study has found that it may be possible to identify the locations of Iroquoian sites based on indicator species that are more likely to persist atop or around settlements (Johnson 2014)[23].

Brown also identifies five patterns in forest community change that are associated with shifting agriculture: 1) a marked fluctuation in beech throughout the period from 1200–1575; 2) an increase in pine, oak, birch, and poplar either concurrent with or following a decrease in beech; 3) an increase in hickory and walnut; 4) an increase in species that thrive in cleared areas such as alder, blackberry and hophornbeam; and 5) a higher charcoal accumulation rate during the Iroquoian period (Finlayson and Byrne 1975; Brown 2002). His analysis is based on comparison of pollen cores from three lakes in northern New York, two of which have no known history of indigenous habitation in the surrounding area. These patterns are *not* observed in pollen cores from the lakes with no known local sites. In addition, the combination of trends like the increase in hickory and walnut—both species with typically more southern ranges—and the concurrent decrease in beech, which is sensitive to cooling temperatures, strongly suggests that human impact and management were at play in these shifts in forest composition (Brown 2002:217; Wykoff 1991). While the effects of burning do appear to be concentrated in time and space, they are visible in the pollen records of the region as distinct from climate trends (Brown 2002).

Hickory trees may also have been deliberately planted in some areas, a practice that has been inferred from fossil pollen evidence from a marsh core on Hunter Island, Bronx County, New York (Loeb 1998). A lack of hickory on the island before Siwanoy settlement, and then a sharp increase in hickory pollen following pollen evidence for cornfields, suggests that these trees were deliberately planted for nut resources. High incidence of hickory and walnut has also been observed in historic

[23] This study is occasionally unclear about cause, effect, and the landscape practices associated with settlement as well as those that occurred afterward making the findings of somewhat dubious utility for understanding Iroquoian landscape practices.

land surveys taken between 1715 and 1725 and 1735 and 1755 in Susquehannock territory in what is today Pennsylvania (Black and Abrams 2001).

Native use of fire for field clearance and forest management in Pennsylvania has been documented by Ruffner and Abrams (2002), based on radial growth analysis of old growth trees. They were able to determine the extent of sixteenth and seventeenth century stand disturbances in the Allegheny area, which is today within the Allegheny National Forest. Occupation in this area includes seventeenth century settlements along the river, "prehistoric" campsites or structures, Hopewell mounds, and a European (French) trading post (Ruffner and Abrams 2002:252). The tree rings showed a 26-year burning cycle, which aligns with estimates for understory burning cycles of Native communities attested to by ethnographic accounts, and is more frequent than fires set by natural ignitions (Ruffner and Abrams 2002:256).

Not only is there support for Haudenosaunee use of fire for land clearance and forest management, evidence from across the East Coast that suggests anthropogenic burning at higher than natural frequencies has significant effects on forest composition. Abrams and Orwig (1996) show that white pine growth in hemlock-dominated forests is dependent on large disturbances that can be caused by humans. Gaps in the canopy allow the pines access to sunlight that is in short supply in hemlock-dominated forests. In lowland areas typically dominated by hemlock, regular burning would have also influenced the proportion of white pine.

Based on this evidence it is nearly certain that Haudenosaunee people in the Protohistoric were using fire as part of a suite of landscape practices associated with shifting settlement patterns and agriculture. Although this may have occurred in earlier periods, the demographic concentration of people and increasing Haudenosaunee population would have meant these practices had an increasing effect on the areas around settlements.

Climate

Climate reconstructions for North America, based on tree-ring data, show that there were dry conditions 1496–1505, followed by a wet period between 1512 and 1521, and then another dry period between 1530 and 1539 (Buckley et al. 2004). This variability within a relatively short time scale may have affected maize yields, although Birch and Williamson suggest that surpluses would have been enough for communities to weather more difficult agricultural years (2012:98). The possibility of connections between stressful environmental conditions and archaeological evidence of significant violence at sites like Alhart (late fifteenth or early sixteenth century) (Williamson 2007) argues strongly for new and more accurate dating of these sites and a reconsideration of the processes of conflict and alliance taking place at this time.

Postcolumbian (1630–1779 CE)

The arrival of European explorers and then colonists in North America had an undeniable effect on indigenous populations, although increasing colonial presence in the Americas is an insufficient framing device for the range of changes and events of this period. As Jordan (2008, 2010, 2013d) has argued, it is both overly simplistic and minimizing of indigenous agency to perceive inevitable and unidirectional decline after the arrival of Europeans. Archaeological evidence from the Postcolumbian supports increasing political unity and strength among the tribal constituents of the League as well as innovation in material culture and adoption of trade goods into existing systems of valuation and symbolism. At the start of the seventeenth century, France expanded its colonies and trading posts into the St. Lawrence River, increasing contact with Native groups and intensifying the fur trade. To the southeast, Henry Hudson's 1609 voyage up the Hudson River began a more intensive Dutch interest in the Hudson River Valley and the location that would become New Amsterdam. These events, however, did not immediately precipitate more direct contact between Europeans and Haudenosaunee people, and the start of this period is defined by this increased interaction. I end this period in 1779 because in the late summer of this year an expedition led by the Americans Major General John Sullivan and General James Clinton, carried out a campaign against Haudenosaunee nations allied with the British. The goals were "the total destruction and devastation of their settlements and the capture of as many prisoners of every age and sex as possible" (Washington 1779). The campaign wreaked havoc on the Haudenosaunee settlements and settlement structures, locations, and patterning changed drastically after this point.

Settlement Structure

Archaeological investigation of Postcolumbian sites is more thorough than for earlier time periods, although it varies by tribal area and site size. While dating the formation of the League may be controversial, it is universally agreed upon to have been fully formed by the early seventeenth century, and in the process of formation much earlier (Engelbrecht 2003, 1979; Kuhn 2004; Parmenter 2010: xliv). Scholarship dealing with the Postcolumbian period is therefore much more likely to discuss patterns or trends across a unified Five Nations. In many cases the settlement patterns established within tribal territories before the mid sixteenth century persist in some form. Over the course of the sixteenth and seventeenth centuries there is a trend toward larger settlements, many of which were enclosed by wooden palisades. However, examples of dispersed settlements occupied during peacetime (Jordan 2008), organization of satellite communities to accommodate adopted or affiliated populations (Jordan 2010), and other patterns that do not strictly follow the 'norm' are common.

Although there was significant continuity in Iroquoian settlement form during the Postcolumbian, communities were responding to new and different conditions of Euroamerican interaction, settlement, and colonialism. At the broadest level, Jon Parmenter shows that there was important variability in the overall extent of settlements in Haudenosaunee territory over the course of the seventeenth and eighteenth century, and the overall trend was a rapid increase in territory from 1668 onward, despite relative consistency in the number of settlements contained in the league (Parmenter 2010:285–287). Parmenter's overall argument for this period is that seventeenth century interactions with colonial forces had a significant and not entirely negative effect on the shape of Haudenosaunee homelands, one that was profoundly influenced by the cultural patterns and practices of Haudenosaunee mobility and political action. Given that these were highly variable processes in what follows I provide an archaeologically-based evaluation some of the resulting variability.

For Seneca settlements occupied after 1600 proximity to "contemporary and recently inhabited sites" was an important consideration both negatively, in terms of resource depletion, and positively in terms of and cooperation for defense and aid (Vandrei 1987:13). The average distances for village relocation are well within an afternoon's walk (3.3 km for the western community and 5.5 km for the eastern), suggesting ease of access to previously occupied areas and family members interred there. Vandrei establishes for the Seneca, as others have done more generally (Mt. Pleasant 2006; Mt. Pleasant and Burt 2010; Sykes 1980), that village movement was unlikely to be due to depleted soils as all the Seneca settlements are on class A or B soils[24] which would have remained productive beyond the lifetime of a typical habitation period.

[24] Eric Jones (2016) has established that well-drained soils are potentially a factor in Haudenosaunee settlement location, but less important than distance to trade routes and average annual solar radiation.

Cores recovered from Cayuga Lake sediments show a greater influx of terrestrial material into the lake in the early seventeenth century, a signature similar to the one observed to be associated with later Euroamerican settlement (Mullins et al. 2011). This indicates significant clearance of agricultural land in the Cayuga watershed leading to soil runoff and erosion into the lake. Although similar evidence has not yet been found in lakes in Seneca territory, commensurate population trends may have produced similar effects. Although populations may have consolidated in the core settlement area, on the whole Haudenosaunee territory expanded through the end of the seventeenth century (Parmenter 2010).

During this period, especially for more eastern Haudenosaunee nations, there were likely new and different pressures from colonial settlements and outposts. In Onondaga territory, settlement patterns switch from paired large and small settlements to a single, consolidated site with outlying hamlets and cabins, which are occupied for shorter durations (Bradley 1987:116). A similar trend is observable in Mohawk territory between 1715 and 1755 (Snow 1995a:471). Bradley also notes that the criteria for new settlement locations clearly change from earlier time periods, with the principal site location moving between multiple river drainages rather than shifting within a single drainage. Although he does not provide concrete answers, Bradley (1987:118) speculates that some of these changes may be related to an increasing European presence in Onondaga territory. It seems likely that a complex interplay of factors is responsible for the more frequent relocation of settlements.

Across Haudenosaunee territory, repeated community relocation within the same or nearby river valleys would have created longstanding anthropogenically modified environments as well as a familiar landscape (Jordan 2009a). The more dispersed nature of some eighteenth-century settlements, as well as what have been described as more European-style or hybrid dwellings, would also have had an impact on how the landscape surrounding these hamlets was used and modified by populations that maintained otherwise similar lifeways.

Flora and Fauna

Information about plant and animal resources used by Haudenosaunee people in the Postcolumbian era comes from a mixture of sources; research tends to rely heavily on documents written by Jesuits or other European observers. While these sources are important for our understanding of the past, this section will focus on the *archaeological* evidence, even though the quality and prevalence of archaeological data about flora and fauna varies widely by tribal territory and site. Because this period encompasses a great deal of change and variability in terms of 1) territory 2) availability of European trade goods including tools such as hoes, guns, and axes and 3) introduction of new crops and domesticated livestock, a general summary misses some of the most interesting and pertinent developments. My approach here will be to look across the Five Nations at select archaeologically visible variations, as well as some of the issues with archaeological literature on plant and animal resources during the Postcolumbian era.

Flora

European colonists introduced new plants wherever they settled, both intentionally in the form of imported crops and unintentionally in the form of weeds and species that tagged along in ballast soil and by other means (Allen 1998b). As Newsom and Gahr (2011) point out, introduction is merely the first step in a complex process that can involve adaptation, adoption, spread, or failure depending on a number of different factors, not least of which is the willingness and choices of Native people to take up certain plants (Crosby 1986; Sauer 1993). The spread of introduced flora can also happen with or without a population presence from Europeans, making an examination of archaeological information about the adoption and adaption of these crops by Native people all the more valuable. Weeds are an aspect of the colonial package, although they tend to be less well considered archaeologically in the Northeast than domesticated crops. Because of the rarity with which complete macrobotanical assemblages are considered, let alone weedy plants and non-domesticates, the introduction of weedy plants has only been considered theoretically in Iroquoia.

The sixteenth century Cayuga Corey site has one of the most thoroughly-examined macrobotanical assemblages from the early portion of this era[25]. The botanical remains from this site suggest a mixture of cultivated and seasonally collected wild species were in use at the site, for food and wellness purposes (Rossen 2015). The presence of well-preserved nutshell remains as well as numerous plants that have known medicinal uses, may indicate the deliberate encouragement of these resources near the site. Additionally, the presence of pawpaw, indicated by charred seeds suggests "either long-distance procurement or adaptation of outside plants to the local setting" (Rossen 2015:171).

In his examination of the botanical materials from three early seventeenth century Wendat sites in Southern Ontario, Monckton (1990) performed one of the earliest complete analyses of materials recovered systematically with flotation. His findings confirmed assumptions about Wendat use of maize, beans, and squash as staple cultigens, with maize estimated to contribute approximately 58 percent of the overall dietary calories (Monckton 1990:115). He also produced additional evidence for reliance on wild or gathered resources. Of the 48 plant taxa identified from the

[25] The possibility has been raised that the lack of European trade goods on this site may mean that it is even earlier than 1534 CE, but this is not *directly* supported by the radiocarbon dates (Rossen 2015).

sites, 90 percent were wild, and many were from fleshy fruits that grow well at the forests' edge, such as strawberry (*Fragaria* spp.) and blackberry[26] (*Rubus* spp.). This also highlights the bias of the textual sources by missionaries and travelers, which focus on agricultural products rather than the wide range of gathered and collected resources that were apparently used for flavoring, to supplement the diet, and for wellness purposes.

Critically, the early seventeenth century Auger Site, which is thought to have burned during a conflict, preserved a much greater range of seeds and botanical remains as well as a greater quantity of beans than midden deposits from the other sites examined (Monckton 1990). This work not only highlights how necessary careful recovery practices are for macrobotanical materials, but also how important site formation processes are for archaeological interpretation. Even in a period for which texts exist, the archaeological materials contribute critical knowledge about foodways and landscape use that are not recorded elsewhere.

In terms of non-local cultigens, Monckton was able to identify three specimens of Old World Pea (*Pisum sativum*) from Saint Marie I, a Jesuit-founded settlement, but was unable to identify Old World crops at any of other early seventeenth century Wendat settlements he examined (Monckton 1990:61). It was not until later in the seventeenth century that watermelon was introduced to Ontario (Blake 1981).

In Seneca territory, textual sources report enthusiastic adoption of apples (Kerrigan 2008), but this is based on observations of travelers and eighteenth century military expeditions and not archaeologically recovered food remains. Archaeological and textual evidence from Townley-Read (ca. 1715–1754) suggests that at least in this location, orchards may have been planted toward the end of the site's occupation and

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[26] Monckton identifies seeds from *Rubus* spp. as "bramble," thus avoiding the debate about raspberry vs. blackberry drupes.

returned to as a resource after the community relocated (Jordan 2008:213–218).

At Mohawk sites like Klock, Smith-Pagerie and Garoga where charred plant remains were collected as part of normal excavation and screening procedures, excavators recovered large quantities of charred corn kernels and cobs as well as a sample of charred squash seeds and nutshells. Although very little space is devoted to these results, they are assumed to represent a mixture of maize/beans/squash agriculture and supplemental reliance on gathered resources like nuts and wild berries. Interestingly, Funk and Kuhn (2003), in describing subsistence remains at three Mohawk sites, group freshwater mussels with their discussion of floral remains. This implicit separation of *hunted* animal resources from *gathered* animal resources underplays the importance of food sources other than large game, and implicitly minimizes the role of women and children in the food economy (Gifford-Gonzales 1993).

Especially for Haudenosaunee sites occupied in the latter half of the seventeenth century and the eighteenth century, the study of plant remains has been of secondary interest even to faunal analysis. Combined with the fact that many later sites have been less intensely investigated than earlier settlements, this results in a dearth of floral evidence from the Postcolumbian era. A more complete examination of the archaeologically recovered flora and fauna remains from White Springs will address a significant lacuna in the field.

Fauna

Faunal remains reflect longstanding patterns of hunting and trapping that varied seasonally and were dependent on food availability from other sources and trade relations and hunting for furs. Faunal materials also provide evidence for the introduction of European domesticates. The appearance or integration of these animals, in addition to mandating a new and different kind of human-animal relationships, could have had a significant effect on the landscape surrounding settlements in terms of trampling and animal foraging and feeding (Anderson 2004). Research in other areas of North America has done an excellent job of describing the way European domesticates alter Native North American ecosystems as well as indigenous land-use and agricultural practices (Allen 1998b; Cronon 1983; White and Cronon 1988).

Faunal collections from a series of Seneca sites occupied between 1540 and 1675 have been analyzed as part of dissertation research by Kyle Somerville (2014). He specifically notes the general lack of faunal research on Postcolumbian sites, observing that even within this sample there are few studies that treat faunal remains as products of a total cultural system whose variation may relate to factors like changes in climate, intensity of human habitation and hunting, occurrence of warfare, and trade relations. Although there are issues with using the older collections he examines, including incomplete or poorly detailed excavation records, small sample sizes, and incommensurate recovery practices, Somerville takes a conservative, descriptive approach to analyzing these materials (2014:104). Even taking a descriptive approach does not eliminate issues resulting from an unclear context of recovery, however. Faunal materials recovered from surface collection or plowzone contexts cannot be taken as indicative of Haudenosaunee animal use given the later emplacement of Euroamerican farms nearby or overtop nearly all of these sites, which Somerville does in several instances[27].

[27] Somerville identifies the Marsh site, occupied between 1655 and 1675 as possessing significant evidence for pig, sheep, horse, and cow. As the location of a 1656 Jesuit-established mission he theorizes that it may well have been a locus of livestock introduction (Somerville 2014:223). Closer inspection of the contexts from which these remains were recovered reveals that the majority faunal remains from these European domesticate species come from surface refuse and surface survey. These cannot be taken as representative of Seneca faunal usage given the potential for contamination from later agricultural endeavors. It is not clear then whether the dearth of remains from European domesticates is real or an artifact of recovery and recording techniques.

Overall, Somerville notes an increase in the presence of fur-bearing species on Seneca sites, including beaver, fox, marten, mink, fisher, and otter (2014:214). This may suggest an increasing participation in the fur trade across this period. The post-1620 sites also show an increase in deer cranial and foot remains which indicate likely processing of deer hides (Somerville 2014:282).

Faunal evidence of European livestock, largely pig and horse, is present in low quantities beginning on sites that date to the early seventeenth century (Somerville 2014:221), although not in quantities that suggest Seneca-managed populations. Understanding when and where European livestock may have been present, either in a managed, semi-managed, or feral population is important for understanding the spatial organization of settlements as well as the landscape around them.

Somerville (2014) also tentatively observes deer butchering patterns that indicate the return of entire deer carcasses to settlements and the regular processing of long bones for bone grease. Adam Watson and Stephen Cox Thomas (2013) have convincingly argued that bone grease extraction may have been a regularly pursued "buffering" strategy that allowed Seneca people to preserve a valuable resource for lean times. Somerville's analysis of earlier Seneca assemblages may extend our understanding of this practice into the past. Although there are other minor variations in the faunal assemblages, potentially showing a slightly higher reliance on small rather than medium mammals during times of warfare, overall the pattern of hunting predominantly white-tailed deer and a variety of other small mammals, fish, and birds holds true for this portion of the Seneca sequence despite other political and economic changes.

Faunal evidence from a single Onondaga site, Pompey Center (ca. 1600–1620) suggests a reliance on white-tailed deer as well as exploitation of a wide range of other animals including small mammals, fur-bearing animals, fish, waterfowl, game birds, and freshwater mussels (Bradley 1987:119). Current analysis on collections from Onondaga sites occupied between 1650 and1696 notes a broadening in exploited species, possibly due to an increase in meat procurement by smaller groups of women, children, and the elderly who were not involved in military conflicts of the time (Bradley in press, cited in Somerville 2014).

In Mohawk territory, not only were some European domesticates introduced by the late 1600s (Anderson 2004; Smith 2011), the variety of exploited game decreased after 1525 and more exotic species (such as moose or wolverine) appeared on Mohawk sites. Additionally, Socci (1995) identifies a downward trend in the quantity of deer remains in faunal assemblages from Mohawk Valley sites occupied between 1400 and 1666. She attributes this decrease to a higher intensity of warfare at the time, which decreased the availability of men for hunting.

Overall, faunal assemblages of Five Nations sites from this period are under considered, especially with respect to factors other than resource availability. As recent work on old collections demonstrates, there is a certain amount of information that can be recovered from older, less methodologically rigorous excavations and surveys, but some questions can only be securely answered with more thorough recovery and recording methods.

Burning

Research on the likelihood and frequency of anthropogenic burning in the Postcolumbian period relies most heavily on European accounts of indigenous practices, however incomplete, biased, or otherwise geographically scattered they may be. While European observations certainly contribute valuable information, analysis of eighteenth and nineteenth century land survey records, examination of old tree stands, and palynological records take some of the interpretive burden off historical sources and provide concrete substantiation for past practices.

One way to understand past forest dynamics is to study fire scars and the age composition of presumed climax forest; it increases in effectiveness for more recent time periods because of reliance on standing trees (Lutz 1930). Fire scars are the identifiable traces of forest fires left on trees that survive an event, and have been used productively to deduce fire histories and correlate them with calendar years and other metrics like precipitation (Swetnam 1993; Westerling et al. 2006). In Northwestern Pennsylvania, Harold Lutz found that particularly the hemlock-beech association in a 'virgin stand' was marked by white pine trees more than 200 years old, fire scars in trees going back at least 200 years, and in some places a "considerable accumulation" of charcoal in the hemlock-beech forests (Lutz 1930:19). While Lutz noted no fire scars noted that were older than 200 years, many of the older trees had begun to rot at the center, obscuring what fire scars may have existed. He interpreted the lack of young or intermediate aged white pine in the stand as a result of the lack of recent burning or logging and the unsuitability of the moist, cool environment for nurturing young white pine, consistent with the conclusions of Abrams and Orwig (1996). Lutz concludes that there was likely a history of localized burning in this stand that encouraged the white pine trees at the beginning of their growth and scarred standing trees. While not purporting to describe an area beyond this single area of forest in Northwestern Pennsylvania, this study provides a model of the types of evidence that clearly suggest localized pre-colonial burning of woodlands and lingering effects of indigenous practices in forests today.

Land Surveys

Eighteenth and nineteenth century American land-surveys of Haudenosaunee territory are another source of information about the immediately preceding period. Following the Revolutionary War, white settlers increasingly pushed into previously sparsely occupied areas west of the Hudson River. Large tracts of land, like the Phelps-Gorham purchase (McKelvey 1939; Osgood 1891) and the Military Tract (Marks et al. 1992) were acquired as large tracts and surveyed and subdivided into smaller parcels for sale to settlers. As part of survey procedures surveyors recorded tree species, soil quality, terrain, evidence of burning, and other features of interest along the boundaries of the tracts. Researchers have been able to use these records, in concert with mathematical algorithms, to model the likely forest composition prior to intensive Euro-American settlement.

Many of the publications that reconstruct forests prior to intensive Euroamerican settlement are concerned with assessing later changes in forest structure and understanding barriers to restoring these forest types. However, embedded in these hastily jotted and often incomplete original field notes by surveyors (Marks and Gardescu 1992:5) are hints of the effects of indigenous people on the environment of their long-inhabited territories. After these territories were opened to settlement, forest clearance associated with Euroamerican agriculture and demand for timber progressed rapidly, and by the late nineteenth century forested land was at an historic low (Nyland et al. 1986:115).

The Military Tract—which stretched from the Allegheny Plateau to Lake Ontario and from the east shore of Seneca Lake to the western shore of Oneida Lake—was created to promote settlement and repay New York veterans of the Revolutionary war with land grants (Marks and Gardescu 1992:1). This tract covers traditional Cayuga territory, including what is today Ithaca, NY. In reexamining the survey data from the 1790 team, Marks and Gardescu enumerate the issues with documentary sources of this nature: 1) different surveyors recorded tree species to varying levels of specificity and sometimes used colloquial or conflicting terminology; 2) some notes have been lost, and others have been copied, introducing errors; 3) especially in terms of clearings, telltale signs of fire or burning were not necessarily recognized as such.

Despite these issues, Gardescu and Marks conclude that some of the areas identified by surveyors as "open oak woods" or "open oak plains" were likely the result of burning associated with Haudenosaunee people, whether it was intentional or accidental (1992:24). Unlike other regions where the oak plains were associated with poor or dry soils, in this tract they were more likely to occur on silt loams than exist as edaphic prairie (prairie in which the vegetation type is due largely or entirely due to the underlying soil conditions/types).

Geographically, open wooded areas were mostly observed on upland and west facing slopes along Seneca Lake, and a large cleared area was found around the location of the Seneca settlement at Kendaia, or Appletown (ca. 1704–1779) (Jordan 2008). 'Scrub oak' in the surveyor's notes was taken to mean small or stunted oak growth rather than true scrub chestnut oak (*Quercus prinoides*); the occurrence of small oak is identified by the authors as likely associated with regular burning. The oak forest canopy trees observed by surveyors largely dated to the late 1700s, and in the opinion of Cornell University professor of Forest Soils Dr. Earl Stone Jr., were likely the legacy of frequent understory burns by Native Americans (Marks and Gardescu 1992:29).

Interestingly, the authors also note that at the time of the 1790–1798 survey, white settlers had mostly moved into areas that were previously cleared by Iroquois inhabitants (1992:127–128), presumably because it made the first phase of settlement slightly less arduous. Combined with the fact that surveyors assumed visible crops like wheat were associated with European settlements, eighteenth century survey methods may have minimized the presence of Haudenosaunee people in the land tract—both historically and at the time of survey itself. However, given that approximately 99 percent of the Military Tract was forested in 1790 (Smith et al. 1993), the

Haudenosaunee impact is not accurately quantified by measures of total clearance percentage.

The Holland Land company, a consortium of Hollander[28] banking houses, purchased over two million acres of land in western New York in 1793 (Silsby 1961). As with the Military Tract, this parcel was surveyed prior to white settlement, providing a baseline for this territory prior to intensive Euroamerican settlement and agriculture.

Seischab (1992) used a slightly different methodology than Marks and Gardescu to assess tree species distribution throughout the tract, but produced fairly similar species community designations. In terms of landscape modification, based on the Holland Land Company survey records there is "no evidence of fire as a disturbance" (Seischab 1992:50) however Seischab is not as explicit as Marks and Gardescu about his assessment of descriptions of clearings or "scrub oak" in surveyors' notes. He does mention that the open 'plains' near the Tonawanda reservation were likely due to anthropogenic burning and that there were also many oaks along the borders of the Allegany Reservation. Seischab's (1990, 1992) conclusion that because surveyors did not indicate clearings or remnants of Native settlements the Haudenosaunee impact on the forests must have been relatively minimal is uncritical and somewhat problematic; given the evidence gathered previously mentioned researchers, this is difficult to believe.

The Allegheny Plateau area of what is today Pennsylvania was also traditionally Seneca territory and was surveyed in 1814–1815 by the Dale Survey. G.G. Whitney (1990) has subsequently assessed these records with much the same

[28] These banking houses were specifically from the County of Holland, a region in the western Netherlands. Throughout the colonial era, individual counties within what is today a unitary Netherlands had varying degrees of independence as well as different allegiances and affiliations with other kingdoms in Europe. The term 'Hollander' is used here for specificity with respect to a complicated political history.

methodology used for the aforementioned land tracts in New York, with an eye toward reconstructing the forest prior to extensive timbering of white pine and hemlock—for building materials and tannin extraction, respectively. The Allegheny Plateau has somewhat different edaphic and weather conditions than the Southern Tier; forest communities are also dissimilar. These forests were mostly dominated by "slower-growing, shade-tolerant beech and hemlock" that were encouraged by a less-severe disturbance regime that created small, regular gaps in the canopy (Whitney 1990:443). What researchers have found, however, is that "brushy oak" and chestnut were located in close proximity to old Seneca settlements on the flats of the Allegheny River and may have been due to Seneca-set fires (Whitney 1990:449). Other researchers have suggested that over the long-term, Native landscape practices selected for oak, hickory, and chestnut through burning and landscape clearance (Black et al. 2006). Oak species were not only present near former settlements, but along the river and its tributaries, something that may be attributable to a higher incidence of intentional or unintentional fires along these corridors for movement and loci of activity (Marquis 1975:3).

These studies from the 1990s have been augmented by more detailed modeling of the data from land surveys, in combination with GIS mapping of variables largely responsible for forest growth conditions (elevation, soil drainage, etc.), and what Tulowiecki and Larsen call "Native American Variables" (the locations of sites and trails). Tulowiecki and Larsen (2015), specifically working in Chautauqua County, show that reconstructions of historic forest are more accurate when the locations and effects of Iroquoian settlements are taken into account, particularly for nut-bearing species and species which respond positively to fire and clearance. This strongly argues for an observable and persistent effect of Native settlement on forest landscapes.

Climate

Beginning approximately 200 years ago, lake cores from the Finger Lakes indicate a higher rate of sediment accumulation, carbon and nitrogen peaks, and a rise in calcite precipitation (Mullins et al. 2011; Mullins and Halfman 2001; Wellner and Dwyer 1996). These observations are all linked to increased deforestation by colonists, which led to increased runoff of vegetable material into the lakes. Although this does not speak directly to indigenous landscape modification in the region before extensive European settlement, it does indicate that Haudenosaunee clearance for agricultural purposes, particularly around Seneca Lake, was not drastic enough to produce a visible signal in lake sediments across the Finger Lakes.

Conclusions

An examination of research pertaining to land use and landscape modification in Iroquoia highlights ways landscape use, modification, and connections to perceived and conceived landscape elements over time can be drawn out of earlier reports and discussions. Based on the existing wood charcoal and palynological information, as well as land survey records and settlement patterning information, it is clear that indigenous people have impacted the landscape of the northeast for longer and more significantly than has been assumed, especially by non-archaeologists[29]. Although this review has separated information into categories such as 'flora' and 'settlement patterning,' further research must integrate these concerns more fully in order to assess questions like the impact of European domestic pigs on the Haudenosaunee landscape.

The archaeological evidence from the Protohistoric period indicates that

[29] For example, Hubeny et al. (2011:17896) wonder why lake sediment laminations increase in thickness after 1600 without any suggestion they have considered pre-European settlement as a possible cause, despite acknowledging that colonial settlement after the Revolutionary War shows up clearly as increased sedimentation rate due to run off.

Iroquoian communities were building on longstanding practices as well as innovating new ones as part of the process of political alliance making and coalescence of dispersed populations into larger sites. Variability in practices of site selection (e.g., reoccupation of old sites or avoidance of previously occupied locations) in conjunction with foodways that combined a heavy reliance on maize/beans/squash agriculture and the hunted and gathered resources created a mosaic of interconnected places and a particularly Haudenosaunee landscape. Flora and fauna were procured at special-purpose sites like fishing camps as well as in previously occupied areas and zones affected by low-level surface burns in and around rotating agricultural fields. Seasonal mobilities, and practices like burning, created interlinked and equally necessary resources for health. Relatively stable dietary habits and landscape practices from pre-1500 suggest that changing community perception of landscapes, places, and their significance were important to decision making and settlement pattern changes during this time, as sites often ceased to be reoccupied and the shifting settlement pattern most common in the Postcolumbian period became more typical.

The Postcolumbian period demonstrates that even with the influx of trade goods from European colonists, Iroquoian communities maintained a strong continuity in some areas of landscape practice. European livestock and crops were not immediately and widely adopted, and the most commonly incorporated biota were those which fit into existing Iroquoian agricultural practices. Other effects of trade with Europeans can be observed in the changing proportions of faunal remains of indigenous species found on Iroquoian sites, which do not vary in a linear way but seem to respond to the vagaries of trade relationships, the condition of alliances or tensions, and the ecological availability of some species. Forests and landscapes around Iroquoian sites continued to be impacted by a suite of practices, evident in the changing proportions of tree species and the direct data for burning. Changes in the landscape of this period, given its proximity to the post-Revolutionary War Euroamerican settlement of Haudenosaunee territory, persisted and were directly experienced by many of the settler colonists who came to the region. Understanding variability and dynamism in Haudenosaunee landscape practices in a holistic sense requires an approach which disarticulates change from being necessarily associated with colonialism and responses to colonialism. In my reevaluation of archaeological work on Iroquoian sites and environmental data from the surrounding area, I have shown how critical it is to understand these datasets in concert—not just with each other, but also with an idea of the lived experience and concerns of Haudenosaunee people in the past.

CHAPTER 4

NIGAY¨ËNO'D¨Ë:H, THE STEPS TAKEN: UNDERSTANDING THE LIFE-CYCLE OF A SENECA LANDSCAPE

Introduction

Combining the existing knowledge of Haudenosaunee landscape practices from the archaeological record with other sources of information, The archaeological wood remains from Ganondagan, White Springs, and Townley-Read are remnants of many interlocking practices and processes both cultural and natural—from the agentive choices of seventeenth and eighteenth century Seneca people, later disturbance by Euroamerican agriculture and landscape modification, and unevenly distributed effects of decay and post-depositional processes. These processes occur at multiple scales, from whole settlements (e.g., clearance of a town site and associated agricultural fields) all the way down to individual post molds (e.g., decay and subsequent replacement of a single house post). Distinguishing variation in the assemblages from Ganondagan, White Springs, and Townley-Read first requires an understanding of the broad contours of Seneca stewardship and use of the land, specifically forests and wood. These practices are responsible for a large portion of the landscape modification surrounding nucleated or dispersed settlements and provide a framework for understanding variation that may occur due to different environmental, politico-economic, or social conditions at each site. In this chapter I offer a view of these processes through archaeological and documentary evidence which follows the trajectory of one settlement over time, although interlocking processes on different timescales (annual, seasonal, etc.) are also critical. The next chapter will further explore the specific implications of these practices across 200 years of the Seneca site sequence, at multiple sites occupied between circa 1550 and 1754.

The three Seneca sites of Ganondagan, White Springs, and Townley-Read were occupied between ca. 1670 and 1754. As outlined in the introductory chapter, these sites were occupied after the formation of the League of the Haudenosaunee, under conditions that Jordan has termed ‘cultural entanglement,’ before settler colonialism bore down on the region (Jordan 2008, 2009a). Although in the previous chapter I covered current archaeological knowledge of indigenous landscape modification practices, here I narrow the focus to considerations relevant to the period in which Seneca people occupied Ganondagan, White Springs, and Townley-Read. My central concern is how daily practices, seasonal practices, and events associated with the Haudenosaunee shifting settlement pattern carried out across multiple settlements over hundreds of years, are influenced by and help create a specific kind of landscape. Additionally, who carried out these processes and how might they be evident in archaeological remains?

A clear understanding of landscape produced by single as well as successive Seneca occupations requires a consideration of material constraints, like firewood availability, as well as how these locations became *places*, connected both by filaments of memory and the ways daily practices of hunting, gathering, wood collection, and agriculture implicate a much broader, dynamic landscape than is typically discussed archaeologically. This, in turn, produces a better-informed analysis of the domestic archaeological assemblages that result from these practices. Wood identified in archaeological contexts reflects choice by Seneca people as well as availability, and the interplay of these factors cannot be teased out without exploring the effects a whole suite of daily, seasonal, and annual practices on the physical landscape that encourage or discourage certain ecological communities. Implications of changing forest communities for archaeological assemblages are explored throughout the chapter.

I also illustrate the inaccuracy of treating old Seneca settlement locations as 'abandoned' and quantify, based on forest type, the length of time people could expect to collect firewood from the deadwood within five kilometers of their homes, both incredibly important considerations for moving beyond a single site-based understanding of Seneca landscapes.

Writing the Lifecycles of Seneca Landscapes

Writing the lifecycle of a landscape, particularly a past landscape, requires consideration of numerous factors and sources. This chapter draws upon a wide range of information including: primary source accounts of travelers, missionaries, and military men; ethnography; archaeological data; comparative ethnographic material; modern forestry studies; historical land surveys; and historical ecology. While all of these sources present different perspectives, from varying time periods, and come with their own biases, the aim is not to bend them to a unitary, Euroamerican-based perspective (Doxtator 2001:40). Rather, I hope to use these varied sources to produce a description of a landscape at multiple physical and temporal scales, one that takes into account the constant and cyclical interplay between Senecas and their surroundings. It is also my aim to, as much as possible, identify ways in which general processes and practices discussed for Iroquoian groups would have been affected by the specificities at play in the Seneca context between ca. 1670 and 1754. Changing material culture, interaction with colonists, missionaries, and altercations with colonial forces should neither be overemphasized as sources of change, as in some previous scholarship, nor ignored. In some cases, this requires reading sources in light of other information, or reading against the grain of primary source accounts written by European colonists.

Archaeologists have a history of interdisciplinarity, and data from other disciplines like forestry and environmental science have been used in concert with archaeological data. In this chapter I draw on some archaeological studies; however, I critically assess their conclusions considering new avenues of interdisciplinary research. In some cases, very early archaeological work on Iroquoian peoples is more beholden to primary textual accounts and 'upstreaming' ethnohistorical work than it is to detailed examination of archaeological evidence (Abler 2006; Parmenter 2010: xxxi). Although his interests lie outside the Iroquoian culture area, archaeologist Stephen Silliman's work on practice and memory on the Eastern Pequot reservation (2009; see also Cipolla, Silliman, and Landon 2007) provides a welcome shift in ways of thinking about change and continuity among Native populations in colonial situations, whether in subsistence, housing, or the use, understanding, and modification of the surrounding landscape. He notes that the archaeological practice of establishing a 'baseline' culture historical description in the pre-European past and then marking deviations from this unmoving baseline over time does not align with people's experience within their own historical context, especially after several centuries of interaction with Europeans. Examples of flaws with this method come particularly readily from interpretation of material culture. Styles of European ceramics that may have been in use within a Native family or community for three generations would not necessarily be experienced as foreign or non-traditional by users. In this chapter I describe a temporally and spatially located set of practices, with the inclusion of sources from other times and locations justified in their relevance to the processes under examination.

Landscape Clearance and Settlements

The shifting settlement pattern of Seneca people during this time period (Engelbrecht 2003; Jordan 2008; Sempowski and Saunders 2001; Wray and Schoff

1953) meant that at regular intervals, a site for a new town location and surrounding agricultural fields needed to be prepared. This involved clearance of existing vegetation, often in advance of the full community relocation (Engelbrecht 2003). In 1790, surveyors recording forests and land cover in military tracts to be granted to Revolutionary War veterans observed that 99.7 percent of the Finger Lakes region was forested (Smith et al. 1993). Because there had not been significant European settlement in this region prior to the Revolutionary War, what clearance was present (0.3 percent of the tract area) was due to Haudenosaunee activity. Because the forested percentage includes areas regrown after community relocation, as well as less significantly affected but still modified areas, this number does not fully reflect the Haudenosaunee impact on the landscape. It is useful, however, for confirming the highly-forested nature of this region even after centuries of habitation by an agricultural society. Any new principal settlement location, whose domestic area could range from approximately two to five hectares (see Table 3), would need to be cleared of trees. Additionally, agricultural fields surrounding the town would have been cleared to some degree, even if not in a single clearance episode.

Domestic areas would have been completely cleared of trees and underbrush in preparation for construction. Although ethnohistoric accounts more often contain observations about field clearance, they do speak to the use of a combination of tactics including the use of chopping tools, adzes, and fire, to take down trees and reduce underbrush. Archaeologists have made varying estimates of the speed and efficiency of stone and metal tools for cutting down trees. Some of this variability depends on the type of trees being felled, their size and dryness, the skill of the user, and technological aspects of the chopping tool—such as the durability of tool's material, the shape of the axe blade, and the way the axe is hafted[30]. A comparative study from Amazonia which compares the use of stone versus metal axes (Denevan 1992) found that the added durability and hardness of steel axes makes a significant difference in how quickly a live tree can be brought down. Drawing on earlier work by Robert Carneiro (1979), who quantified tree hardness and felling time for steel versus stone axes, William Denevan points to the increased efficiency of forest clearance afforded by steel tools. The distinction between stone and metal axes is further confirmed by Mathieu and Meyer (1997).

In Haudenosaunee territory in the seventeenth and eighteenth centuries, axes could have been stone or iron, with iron axes becoming increasingly more available over time through trade with Europeans. In later periods, the percentage of iron axes in Haudenosaunee territory is in fact overwhelming. The trade axes acquired by Haudenosaunee people were iron rather than steel, but metal of any hardness seems to provide some advantages over stone in cutting trees (Mathieu and Meyer 1997). Another important consideration for the Haudenosaunee use of iron trade axes is people's willingness to adopt foreign tool types into their repertoire. James Bradley argues convincingly that what has been interpreted as re-use of worn out axes on the early seventeenth century Onondaga sites was actually purposeful "dismemberment" prior to use (1987:146). Axes were broken down into parts that would be more similar to traditional tools such as celts, adzes, and ovate knives; wear or breakage was not necessarily a prerequisite. It seems that Haudenosaunee tool forms may have been maintained for some time while material types were replaced (Rogers 1990). Assuming an immediate shift to 'more efficient' iron axes for felling trees does not do justice to the complexity of technological change during this time.

[30] For a good overview of axe comparison studies and some of the issues with expanding estimates from experiments with narrow parameters, see Mathieu and Meyer (1997).

Experimental archaeology has not, to my knowledge, tested the efficiency of re-worked iron axes compared to stone tools. Additionally, many of the comparative axe studies, as Mathieu and Meyer note, fail to consider the skill of the axe-wielders (in many cases, the archaeological researcher and their students). Both skill and axe material could be significant modifiers in the Seneca context. Even sources discussing later Euroamerican settlement in western New York disagree on the speed with which 'pioneers,' focused on clear-cutting that reproduced European agricultural landscapes, could clear their acreage:

> One writer estimated that it took the typical pioneer in western New York 10 years to clear between 30 and 40 acres. At the other extreme were those who averred that a skilled axe man could clear an acre a day and those who said that it took from 7 to 10 days to do the same (Williams 1989:63).

Experiments in Denmark—which have traditionally focused on determining the ability of men or a group of men to clear large areas with stone axes rather than felling time for a single tree (Mathieu and Meyer 1997:334)—have demonstrated that three *skilled* men with stone axes could clear 200 square meters of forest in four hours (Pyne 1982; Spurr and Barnes 1980). At this rate, a small Seneca settlement of two hectares could be cleared by nine skilled axe-wielders with a combined 30 hours of effort. It seems as though a Seneca person skilled with an axe would have been able to do well with either stone *or* iron tools to chop down trees that needed to be cleared.

It is likely that both men and women would have participated in land clearance, although perhaps with different tasks, at different times of year, and for different purposes. Gabriel Sagard, a French Recollect friar who lived with the Wendat from 1623–1624, notes that in this Northern Iroquoian context land clearance for agriculture was performed by men (Sagard 1939:101). He observed that:

> They cut down the trees at the height of two or three feet from the ground, then they strip off all the branches, which they burn at the stump…in order to kill them, and in the course of time they remove the roots (Sagard 1939:103–104).

However, writing from a broadly Northeastern (largely Algonquian) perspective, environmental historian William Cronon describes field clearance by women that involved “setting fire to wood piled around the base of standing trees,” which killed the trees, created an open canopy, and left the stumps standing for later removal (Cronon 1983:48). Both of these accounts deal with clearing agricultural fields rather than settlement locations, and describe the use of chopping tools in concert with fire to remove branches and cut the tree down to a stump. Whether the axes or chopping tools were stone, iron, or steel would have changed over time as Haudenosaunee people, and Senecas more specifically, gained increasing access to and preference for European trade goods like iron axes.

Not all trees needed to be immediately and fully removed; those left partially standing in agricultural fields could be girdled, a process in which a broad strip of bark is removed in order to kill the tree over time. Strips of bark were a byproduct of this process, and were a significant resource for Iroquoian peoples for construction materials and for fiber cordage (Poplawski et al. 2012). Axes or adzes of either stone or iron could be used to strip bark from the lower portions of trees as an alternative to or in concert with burning the trunks (Williams 1989:35). If branches and foliage were removed from stumps in agricultural fields prior to spring planting, crops would have full sun exposure.

The high labor investment of removing stumps and clearing fields over multiple seasons is more characteristic of an intensive agricultural system than of one typically termed ‘swidden’ agriculture (Doolittle 1992). Swidden agriculture, which is also called slash-and-burn, is most commonly applied to agriculture in tropical areas where plots are abandoned and left to regenerate after several years of use. Although Iroquoian agricultural fields were cleared out of forest, as Doolittle (1992) points out, this is largely where the similarities end. Despite the periodic shift of Haudenosaunee settlement locations, during the habitation of a particular settlement agricultural areas around the site were used intensively and regularly for the duration of the community's time in that place.

Fire would likely have played a seasonal role in clearance, possibly in the fall after harvest and/or before planting in the spring, although archaeologists and other researchers have debated how regularly and deliberately Iroquoian people used fire explicitly for clearing fields or underbrush (Abrams 1992; Buell et al. 1954; Day 1953). In the late eighteenth century surveys of central New York military tracts, areas that surveyors described as 'open oak woods' and 'open oak plains' may have been the result of anthropogenic fires in those areas (Marks et al. 1992). Today, fire is the common denominator in the maintenance of upland oak forests in the eastern United States (Abrams 1992). Regular fires would have encouraged fire-tolerant trees such as black walnuts (*Juglans nigra* [jo:nyo'gwa:k]), chestnuts (*Castanea dentata* [onye'sta']), and oaks (*Quercus* spp., see Table 2 for Seneca), all species useful for their edible nuts (Engelbrecht 2003:9; Wagner 2003:155). Conversely, species with low fire resistance like sugar maple (*Acer saccharum* [wahda' owä:nö']), dogwood, birch, and aspen might decrease in the surroundings (Wagner 2003:155). Palynological studies of landscape disturbance caused by agricultural Native groups in the northeast have found similar patterns: an abrupt decline in maple, beech, and elm pollen coupled with an increase in oak and poplar pollen (Munoz and Gajewski 2010:972)

In adjacent Cayuga territory, late nineteenth century interviews with Ithaca residents who remembered the early 1830s found that "the Indian oak clearings were still characteristic of the hillsides about Ithaca and that the hilltops retained their forests of white pine and hemlock" and that there were still clearings around the site of the town destroyed by the Sullivan Clinton expedition in 1779 (Dudley 1886: xx;

Oglesby 1978:14)[31]. Additionally, oak forest canopy trees in the military tracts were found to date to the 1700s, meaning those standing trees had begun all their growth at the same time, during a period of intense habitation (and possibly burning) by the Haudenosaunee (Marks et al. 1992:29).

Later observations of oak plains resulting from anthropogenic burning around the Tonawanda and Allegany Seneca Reservations (Seischab 1992) suggest some continuity of practice in understory burning[32]. While researchers generally agree that "brushy oak" and chestnut ridges in the Allegheny region could have been due to Seneca-set fires along the flats of the Allegheny River (Marquis 1975:3; Whitney 1990), how intentionally and regularly these fires were set remains a question in much of the aforementioned work.

Adriaen Van der Donck (1968 [1655]), a Dutch colonial officer who wrote fairly extensively about New Netherlands, also observed understory burning in the Hudson valley. Unfortunately, he only occasionally distinguishes between Native groups, and more commonly describes Native people with the catchall term *wilden*, so it is not entirely clear which group he is referring here, although he describes the process of understory burning at length:

> The Indians have a yearly custom (which some of our Christians have also adopted) of burning the woods, plains and meadows in the fall of the year, when the leaves have fallen, and when the grass and vegetable substances are dry. Those places which are then passed over are fired in the spring in April. This practice is named by us and the Indians, "brush-burning," which is done for several reasons: First, to render hunting easier, as the bush and vegetable growth renders walking difficult for the hunter, and the crackling of the dry

[31] Euroamerican settlement in the area of no-longer-occupied Native settlements was not only common in central New York, but was practiced throughout New England (Anderson 2004:153). Dudley was at the Botanical Laboratory at Cornell University and at least one of his sources was local Doctor Samuel J. Parker who was born in Danby in 1819 and grew up in Ithaca.

[32] Others have also suggested, based on reported conversations with Seneca people, that forests along the Allegheny River were burned to keep down numbers of dangerous pests like rattlesnakes (Whitney 1990:449).

> substances betrays him and frightens away the game. Secondly, to thin out and clear the woods of all dead substances and grass, which grow better the ensuing spring. Thirdly, to circumscribe and enclose game within the lines of the fire, when it is more easily taken, and also, because the game is more easily tracked over the burned parts of the woods. (Van der Donck 1968 [1655]:20–21)

Because one of Van der Donck's main goals was to boost the profile and proclaim the qualities of New Netherland, he also stresses that this method of burning does not destroy the timber stock[33]. Whether or not Seneca people carried out large-scale intentional burning, today's forests contain evidence for anthropogenic modification of local environments as byproducts of clearance practices used in the founding of a settlement site. Recent forestry studies have shown that even without repeated burns over the course of several years, fires can cause long-lasting and meaningful changes in forest composition—including encouraging oak and hickory species—with medium to high intensity burning in the spring or summer (Brose 2010).

Methods for calculating the cleared catchment area around a Seneca settlement of this era are discussed in Chapter Six, but a brief mention of some of the general estimates of catchment area are important for understanding the scale of the modification around settlements. In his GIS-based study of Five Nations Haudenosaunee sites between 1500 and 1700, Eric Jones (2008:116) defines catchment as two kilometers in every direction from settlement border, stating that "energetic studies that have shown this distance to have been the maximum people would have traveled with a load of maize, firewood, or building supplies." While this may be adequate for a general estimate, Jones' calculations do not consider agricultural production above the subsistence level, and some travelers' accounts suggest two kilometers may dramatically underestimate the cleared area for some long-inhabited sites. Wentworth Greenhalgh, an English colonial official who traveled

[33] Of particular interest were the tall conifers which could provide masts and spars for ships (Van der Donck 1968 [1655]:22).

through Haudenosaunee territory in 1677, observed cornfields extending for two miles (3.2 km) at Onondaga, also noting that they planted more corn than they need to provide surplus to the neighboring Oneidas (Denonville 1849).

Table 2. Listing of pertinent tree species with scientific, American colloquial, and Seneca names. All Seneca words and comments from Bardeau 2011 unless otherwise noted.

Scientific	English/colloquial	Seneca
Acer saccharum	Sugar maple	wahda’ owä:nö’
Acer rubrum	Red maple	ogöhso’
Acer pensylvanicum	Striped maple	yeisdayë:dahgwa’
Alnus sp.	Alder	?
Asimina triloba	Pawpaw	hadi’ot[34]
Betula papyrifera	White birch	degä:wisodaöh
Carya ovata	Shagbark hickory	jisdagö:o’
Carya cordiformis	Bitternut hickory	onyo’gwajiwagëh
Castanea dentata	American chestnut	onye’sta’
Celtis occidentalis	Hackberry	?
Cercis canadensis	Redbud	?
Corylus americana	Hazelnut	osdodi’shä’
Craetagus sp.	Hawthorn	aweoek
Diospyros virginiana	Persimmon	?
Fagus grandifolia	American beech	degä:wisdaöh
	Beechnut	osgë’e’
Fraxinus nigra	Black ash	yëödagwä:sös
Fraxinus americana	White ash	ga’nyoh
Lindera benzoin	Spicebush	da’ja’s
Liriodendron tulipifera	Tulip tree	sga:ok
Malus domestica	Apple	ganyo’o:ya’
Ostrya virginiana	Hophornbeam/ironwood	gasnö:në:’
Pinus strobus	White pine	o’soä’
Platanus occidentalis	Sycamore	gë:në:s
Populus	Poplar/cottonwood	ganö’gä:’
Juglans nigra	Black walnut	jo:nyo’gwa:k
Prunus americana/ Prunus nigra	Plum/Black or Canadian Plum	gä:eh
Prunus persica	Peach	gäë:dä:e’
Prunus serotina	Wild cherry	e:i’
Prunus virginiana	Chokecherry	hanöjok
	Peach stone	gasgë’ë’

[34] from Parker (1910:194–195).

Quercus alba	White oak	gaga'da'
Quercus rubra	Red oak	ogo:wä'
Rhus sp. (glabra or typhina)	Staghorn or smooth sumac	otgo'da'
Salix nigra	Black willow	gwëhdä'ë:'osehda'
Sassafras albidum	Sassafras	onösda'shä
Thuja occidentalis	Northern White Cedar	deyoëdä'kwëhad:ha't
Tilia americana	Basswood	o:osä'
Tsuga canadensis	Hemlock	onë'da'
Ulmus americana	American elm	gaögä:'
Ulmus rubra	Slippery elm	o:sgä'

The three sisters (maize, beans, squash [dewënödë:node;']) agricultural system of the Haudenosaunee has been investigated extensively and experimentally by Jane Mt. Pleasant of Cornell University. Her findings suggest that when planted together—especially maize and beans—these crops will not deplete the soil nutrients (Engelbrecht 2003:31; Mt. Pleasant 1989, 2006, 2011; Mt. Pleasant and Burt 2010). Mt. Pleasant suggests that corn hills were formed 0.6–1.5 m (2–5 ft.) apart, 76 cm (30 inches) high, and were likely somewhat irregularly placed (Mt. Pleasant 2006; Ritchie 1980:280; Starna et al. 1984:201; Waugh 1991 [1916]). The main threat to crops was pest infestation and depredation by animals (Starna et al. 1984)[35]. Fields may also have been rotated to allow for regeneration or to avoid pests, were not always located immediately adjacent to the town (Denonville 1849:13), and may have been placed in varying microclimates to minimize risk to crops given variable weather conditions.

It would be a mistake to understand the agricultural fields surrounding the town as solely places of cultivation, however. There is significant evidence suggesting cabins or small outlying residences were constructed in the fields for summertime use, although these structures have not been located archaeologically in New York State (Bursey 2004; Engelbrecht 2003:33; Thwaites 1959, 42:127, 157; 52:165; Tuck

[35] The introduction of domesticated European livestock that fed on un-fenced crops caused issues in areas where colonists settled near Native American settlements (Anderson 2004; Cronon 1983).

1971:3). The Moravian missionaries John Cammerhoff and David Zeisberger, on their visit to Haudenosaunee territory in 1750, found that at one Cayuga town their previous host could not be located because she “had moved to the plantation” (Beauchamp 1916:98). Another Moravian journey to Onondaga in 1752 observed a chief’s “miserable hut” in late August on his “plantation” (Beauchamp 1916:123). Both observations were made in the summertime, when attention to pest control and weeding efforts were likely to be intensified. Given the distance of some of these fields from the core of the settlement, seasonally relocating to temporary or smaller shelters closer to these efforts would have decreased travel time and saved energy. Because of their more ephemeral and dispersed nature, these field structures have not been widely investigated archaeologically, but their role in the landscape deserves more attention.

Identifying Archaeological Signs of Clearance

In discussing clearance for settlement or for agricultural fields, my focus has been on the methods and practices by which trees were removed from the landscape rather than on the end destination of the wood that may have resulted from these processes. Now I turn to some possible signatures of the clearance process that might be identifiable in wood charcoal assemblages.

The initial efforts at creating a clearing for the construction of houses would likely have resulted in trees being cut down or burned regardless of tree species or size. The overall resulting assemblage would depend on the forest composition at time of clearance, which varies based on physiographic environment as well as any past anthropogenic influence. We can also think of the resulting timbers as being used for multiple purposes: as firewood for cooking/heating, as building materials, and as fuel for burning the stumps of larger trees. Preference would certainly play a role within these categories of use, but broad-spectrum clearance of trees as well as brush and shrubs would presumably result in a wider range of species and tree/branch sizes employed in fire-related contexts. This might also have been true for wood harvested in the course of clearing agricultural fields surrounding the domestic area.

After initial clearance, firewood would have to be collected from surrounding forested areas. Both the likely processes of firewood collection, and constraints on this practice are critical to interpretation of fire-related charcoal assemblages. Wood would have been collected as part of daily routines and was an “enduring category of routine landscape practice” (Picornell Gelabert et al. 2011:375) which put people, most likely women, in daily contact with the interface between forest and clearing (Heizer 1963). Wood collection shaped people’s perception of the landscape as they shaped the landscape itself through their practices. Evidential support for women’s dominant role in firewood collection comes from later ethnographic observations of normative gendered activities (Wallace 1969; Fenton 1978, 1998: 19–33) as well as the occurrence of iron hatchets in female Iroquoian burials (Engelbrecht 2003:62 n. 13; Wray and Schoff 1953:58) and Jesuit and explorer accounts of Haudenosaunee lifeways (Seaver 2001 [1877]:71; Lafitau 1977:54–56). Jesuits observed that a Wendat woman “bore the whole burden of the house, cultivates the fields, cuts and carries the firewood, does the cooking, and loads herself, on the journeys, with provisions, etc., for the husband” (Thwaites 1899, J.R. 38:255 in Engelbrecht 1987: 16).

Firewood would most likely have been drawn from deadwood available in the vicinity of the settlement, as no ethnographic “studies have indicated that live trees (even of taxa identified as ‘preferred fuels’) are cut for the purpose of fuel provisioning” (Picornell Gelabert et al. 2011:381). Geographer Michael Williams, writing on American forests, notes that firewood initially would have come from deadwood within a five kilometer radius and then finally “[i]n the last resort it became reasonable to fell trees in close proximity to the village rather than walk the long distance to collect such a bulky item" (Williams 1989:37). Other researchers have found that the abundance (or dearth) of deadwood is the most influential factor in firewood collection across cultures (Asouti and Austin 2005:8; Smart and Hoffman 1988), especially for groups without pack animals.

While taking into account these generalizations, most based on 'small-scale' societies, it is important to consider the specifics of the Haudenosaunee case as further illuminated by other sources. Although the Haudenosaunee did not have domesticated pack animals prior to the arrival of Europeans, the wintertime use of sleds for gathering firewood is attested to by later missionary accounts. Presbyterian minister Samuel Kirkland, during his stay in Iroquoia in the 1760s, notes in his journal that the lack of snow in February has hampered efforts to collect firewood from farther afield on sleds and led to a shortage of wood in the town (Pilkington 1980:66). It is also clear from the discussion of clearance that girdling trees was a common Haudenosaunee practice, and people may have created and managed deadwood near their communities. This could have greatly increased the availability of desirable deadwood without necessitating the chopping of live trees (Conover 1887:208). Archaeologists have developed the "firewood indifference hypothesis" (Asch and Asch 1976, 1985; Rossen 1991), which argues that due to the difficulty of transporting wood without pack animals, firewood at Native American sites will generally reflect the forest environment surrounding a site.

Ethnographic studies of societies of swidden agriculturalists, for example the Fang society in Equatorial Guinea, have found that species does not heavily impact regular firewood selection. However in the case of trips specifically conceived of as involving more effort—such as cutting down standing trees or a trip solely for firewood—species selection provides an additional justification for the break from routine practice (Picornell Gelabert et al. 2011:381). Selection in girdling, both in terms of harvesting bark and creating deadwood of preferred species, could easily have been standard practice among Haudenosaunee people. Additionally, there are clear suggestions that within an available deadwood supply, certain types would have been preferred for specific purposes. Properties of some wood, such as smokiness or tendency to create flying sparks, would make them less suitable for burning inside an enclosed longhouse, for instance[36]. This issue will be discussed more completely in the treatment of the charcoal remains from the three sites.

Old-growth forest stands provide more deadwood resources than more recent growth because they contain greater numbers of fallen branches, standing dead trees (or snags), and boles and/or downed logs as modeled by forestry studies (Evans and Kelty 2010). It is important that these numbers not be taken at face value, however, because the deadwood category quantified by forestry studies includes some wood that would not have been suitable for firewood. Wood that was too decayed or moist would not have been desirable for fuel.

Deadwood concentrations vary with decay rates and other soil and climate conditions, and modern-day studies from regions with similar forest types and climates show that deadwood density for northern hardwood and oak-hickory forest is highest in old-growth forests and very young forests that have recently been clear-cut (Evans and Kelty 2010). Northern hardwood forests are comprised mostly of maple (*Acer* spp.), beech (*Fagus grandifolia* [degä:wisdaöh]), and birch (*Betula* spp. [degä:wisodaöh]) In forests of Nova Scotia, researchers found that dead wood was most prevalent (in small sizes) one to two years after harvest (Moroni and Ryan 2010). In middle-aged forests, because of a high decay rate, deadwood concentrations were

[36] One small example is the ethnographic observation that Athapaskan-speaking Deg Xit'an (Ingalik) people of the Yukon never burned birch inside because of the smoke it produces (Minnis 1978; Osgood 1958:163).

lower. These observations, although made in forests logged with modern technologies, suggest that Haudenosaunee people would have been able to make use of not only old-growth forests surrounding new settlement locations (where present), but also the younger growth at the location of previous town locations.

Estimates of firewood usage by people in the past are just that: estimates. A 'reasonable' number can be produced by estimating family usage based on a combination of early Euroamerican firewood usage, modern usage, and information from experts. Although heating needs would have varied by season, fire for everyday cooking and other tasks would likely have been relatively constant. Additionally, firewood would have been required for the firing for pottery, bone grease manufacture, some stages of hide processing, curing and drying meat, and possibly maple sugaring. At the height of Euroamerican firewood usage in the Mid-Atlantic states, it is estimated that four and a half cords[37] of wood per capita per year was standard for heating and cooking (Williams 1989:78). Farther north, in the 1790s:

> A family…might use from 10–15 cords of firewood a year to heat its home. These fireplaces were prodigiously wasteful of energy, some allowing as much as 80 percent of the heat generated to escape up the chimney (Cox et al. 1985:62).

Cronon notes that colonists in Massachusetts and New England perceived Indian use of fire as profligate because they preferred to use fire instead of bedding for nighttime warmth (Cronon 1983:49). Based on these numbers, and information from Seneca forester Mike DeMunn (DeMunn 2012), an estimate of 20 cords per year per nuclear family of six people is on the high side of possible Seneca wood usage. For an earlier period in Southern Ontario, Fecteau et al. (1994) estimate 1.2 cords of wood per person, per year which might be taken as the absolute lowest bound, and one that is separate from wood requirements for outdoor fires and activities, building materials,

[37] Cords are volumetric units and one cord is equal to 3.62 m^3. The heat or energy produced by a cord of wood is dependent on the type of wood.

and so on.

Forests around Ganondagan, White Springs, and Townley-Read were likely considerably variegated, given the different soils, topographies, and physiographic features surrounding each site. Relatively undisturbed northern hardwood forests (primarily maple, American beech, and birch) can be taken as an acceptable proxy for early occupation surroundings and oak-hickory forest, which is relatively common in central New York today (Stout 1958), provides a proxy for later surroundings. These two forest types can provide a case study for examining the firewood demands of a Seneca town.

As previously discussed, the quantity of deadwood in any given forest depends on the stand age, as well as factors such as decay rate. A forestry survey carried out in an upland oak-hickory forest in Indiana (Idol et al. 2001) found 137 Megagrams per hectare (Mg/ha) dead wood in a 1-year-old stand, 40 Mg/ha in a 31-year-old stand, and 59 Mg/ha in a 100-year-old stand. A study of standing deadwood in northeastern forests (Tritton and Siccama 1990), not divided by forest type, found 13 Mg/ha of deadwood in an 80-year-old stand. Northern hardwood forests in the Acadian forest region (New England and Nova Scotia) were found to have a total of 95 m^3/ha of deadwood in old forests, in low states of decay (Moroni and Ryan 2010). McGee et al. (1999), studying hardwood stands in the Adirondack Mountains, found that maturing forest contained almost no woody debris greater than 50 cm in diameter. So, while there may be a large quantity of deadwood by weight in this type of forest it is not necessarily useful as long-lasting firewood. The wide range in these numbers should be taken as a caution that anything more than a general estimate of deadwood presence for the past cannot be done in the absence of better knowledge of seventeenth and eighteenth century forests.

Taking a cautious approach to estimation, the deadwood in one hectare of a 31-

year-old stand of oak hickory forest, based on the average weight of dried oak and hickory, is approximately equivalent to 24.5 cords. This is slightly less cordage than an old-growth northern hardwood forest assumed to be a mixture of beech, red maple, and yellow birch, which would produce 26.2 cords per hectare. That means, within a five-kilometer radius around a site, an area of 7,854 ha, there would be about 192,894 cords of wood in a predominantly oak-hickory forest and 206,113 cords in a northern hardwood forest. This is assuming half oak and half hickory for the former and one third each beech, red maple, and yellow birch for the latter, that the area encompassed is all the same stand age and forest composition, and that all the dead wood is usable for firewood. These assumptions make it likely that the resulting estimates are on the high side of what may have been present, considering the much of the forest would have been older than 31 years given the nature of the Seneca settlement relocations after AD 1550.

That being said, the deadwood quantities estimated with these parameters would have been able to support a settlement of 2,000 people for about 28 years, given the upper bound of family wood usage of 20 cords per year. This is on the outside limit of the duration of settlement occupation for the known Seneca site sequence. Based on this estimate, between re-growth, deliberate creation of deadwood, and clearance for agricultural fields, the wood supply within a five-kilometer radius could certainly have supported a community for approximately 30 years. Given that the above calculation uses numbers solely for dominant species of large trees and is based on the forestry definition of deadwood (which includes substantially decayed material and total mass rather than just firewood sized pieces), it is likely that both the deliberate creation of deadwood and chopping down trees would have been necessary to provide enough fuel for the settlement. Moravian missionaries' accounts of their journey to Onondaga support this as well—several times the Moravians were asked by women to cut down trees that had been allowed to remain standing in agricultural fields (Beauchamp 1916:174). The timing of these requests is also significant: they were made in late June, when the majority of the men were on the hunt, at fishing camps, or at war, away from the settlement. It is not entirely clear whether the requests were made because this was an activity typically carried out by men, because the Moravians had the appropriate tools, because the Moravians were being asked to reciprocally provide some service to the community, or because venturing outside of the town boundaries to cut down trees was dangerous at this particular juncture.

There are several other seasonally specific activities that would have required significant amounts of fuel wood, although it would not necessarily have been sourced from directly around the main settlement. Maple sugaring and the harvesting of salt from salt springs (Beauchamp 1916:132; Ritchie 1963:6), both used fire to concentrate desirable substances.

Construction

Drawing back to the area immediately around the settlement, procurement of building materials is another critical process for understanding Seneca domestic assemblages of wood charcoal. I have drawn information on materials used to construct domestic structures from both archaeological excavations and historical sources (Prezzano 1992; Wright 1995). In these sources, there is limited information from any single tribal territory or period, and caution must be used in generalizing, lest assumptions about construction style, materials, or forest types be carried unreasonably across time and environmental and cultural differences.

Based on historical and archaeological information from the Wendat area, Heidenreich (1971:152) estimates that a 2.4 ha palisaded village with 37 longhouses would have required 20,000 saplings and 162,000 square feet of bark. This estimate is based on a model of longhouse construction in which exterior walls were formed with closely spaced, small, straight, saplings interwoven with bark. Larger central support posts held the majority of the structure's weight, and additional saplings running the length of the house anchored everything together (Heidenreich 1971:120). Pratt (1977:12) calculates that wood for Oneida fortifications at the Protohistoric Olcott site could have been acquired by clearing roughly 12 acres (4.9 ha) of woodlot for both large logs and smaller posts[38].

Because at least one of the sites discussed in this dissertation—Townley-Read—clearly had house forms that diverged from this earlier type (Jordan 2003), it is important to keep in mind that both the quantity and type of wood needed for domestic structures likely changed over time. Changing Seneca stylistic preference and increased use of technology like iron nails for domestic construction are just two factors that would have resulted in different construction methods and different wood needs.

Critically, sapling-sized construction materials (under 30.48 cm in diameter) mandated by Heidenreich's estimates are not prevalent in old-growth forests, but rather occur more frequently in areas of secondary growth (Heidenreich 1971:153). Generalizing about construction materials, Wright (1995) assumes that vertical longhouse posts would have been eastern white cedar (*Thuja occidentalis* [deyoëdä'kwëhad:ha't]) because of its rot-resistant qualities. In an investigation of village duration in Ontario, Gary Warrick (1988:37) notes that untreated eastern white cedar has the longest average use life (26.9 years) with white pine (*Pinus strobus* [o'soä']) and red oak (*Quercus rubra* [ogo:wä']) coming in a fairly distant second and

[38] Larger logs are taken to be 20 inches (50 cm) in diameter and smaller posts are 3–5 inches in diameter (7.6–13 cm).

third[39]. Cedar is relatively scarce in the Cayuga and Seneca heartlands and even if preferred, it would not necessarily have been feasible to acquire for most construction (Prezzano 1992).

Transverse beams used in typical longhouse construction would have to be strong yet flexible, and rot-resistance would have been less of a concern since they would have been protected from the elements by bark roofing. Elm (*Ulmus* spp., see Table 2 for Seneca), maple, and ash (*Fraxinus* spp., see Table 2 for Seneca) could all have been feasibly used for this purpose (Wright 1995). Bark siding and roofing, harvested by stripping sheets of bark from elm trunks could be taken from smaller and larger trees (Engelbrecht 2003; Heidenreich 1971:152). Heidenreich estimates that in the long-inhabited Huron homelands, all the building materials for domestic structures could have come from immature forest within half an hour walk of a town site (1971:153). This is a useful point for a broad understanding, but the very different conditions under which Seneca sites were inhabited during the late seventeenth and early eighteenth centuries necessitates a more granular application of some of these principles and processes.

Evidence for longhouse construction materials is relatively slim. Prezzano (1992:257) cites seventeenth century Dutch colonist Adriaen van der Donck's observation of hickory posts as vertical supports in a Mohawk longhouse as one of the rare specific firsthand observations by a European source. She also mentions possible cedar house posts at the Wendat Le Caron site (Johnston and Jackson 1980:193 in

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[39] Oddly, Prezzano (1992:239) compresses two of Warrick's tables on average use-life of different wood species into a single table which summarizes "Decay Onset." The reference to the onset of decay in Warrick's original work is very generalized dealing as it does with broad groupings of species by use life (from Purslow 1976). Even if a post *begins* to decay within a year of emplacement, it seems more significant to know how long that post will feasibly last before it actually needs to be replaced for structural or aesthetic reasons. Decay rates and onset from Purslow (1976) is also based on the assumption of untreated posts, which will be discussed at greater length in Chapter Seven.

Prezzano 1992:257), but her reference is to a footnote in the original site report that reads “In all instances where wood remains have been found in postholes at Le Caron, it has been cedar” (Johnston and Jackson 1980:193 n. 18). The footnoted sentence is referring to palisade posts and makes no reference to domestic structure posts. At Hood, a seventeenth century Neutral site, Lennox (1984:130) identified cedar as preferred for house construction based on its presence in 12 out of 14 samples recovered from postmolds. Other than the data from Townley-Read, which I reconsider in Chapter Seven, there are no other domestic post species identifications from New York State Haudenosaunee sites.

Iroquoian palisades, perhaps because of their connection to perennially popular topics of defense and warfare, have also been discussed at length in the literature. Piotr Poplawski, Joshua Kwoka, and William Engelbrecht summarize the process of palisade construction, from the harvesting of materials to construction, with careful attention to the seasonality and feasibility of various stages of the process (2012:81–83). As with house construction, some variables depend on the style of construction. In general, it seems that posts used for palisade construction had a greater diameter than the majority of posts in domestic structures (Hopkins 2010:28). Smaller saplings and branches were likely interwoven between these larger posts, and sheets of bark may also have been used (Heidenreich 1971:140; Poplawski et al. 2012; Ritchie and Funk 1973:259). White Springs is the only site of the three under detailed consideration in this dissertation that was probably palisaded (Gerard-Little 2011). Based on artifact density distribution it appears the palisade may have been ovate rather than straight-walled. Estimates for the amount of wood required for an Iroquoian palisade suggest that “a village needed at least 7 acres of woodlot for a single stockade and nearly 15 acres for a double stockade” (Hopkins 2010:28). This estimate is based on two sizes of palisade posts: 50.8 cm in diameter and 7.62–12.7

cm in diameter. A comparative example from Cahokia (Krus 2011) proposes that open gorge bastions were potentially favored during times of less wood. At Cahokia, it is estimated that 15–20,000 posts were used in each construction episode.

Eastern white cedar is a highly rot resistant building material (Jones 2008) and has been found at Kelso and Garoga (Ritchie and Funk 1973), the Porteus site[40] (ca. 900 AD) (Stothers 1977:126), Le Caron (Johnston and Jackson 1980:193), and Hood[41] (Lennox 1984:130–131) in palisade remnants. The Onondaga Atwell Fort site had one post containing identifiable material from an eastern hemlock (*Tsuga canadensis* [onë'da']) (Bradley 1987:223). A Jesuit account of St. Ignace II from the 1640s mentions pine posts in the palisade (Thwaites 1959:123–125). Around the same time, Van der Donck identified oak posts in Mohawk fortifications (Van der Donck 1968 [1655]:81). Later investigators also claim to have identified oak post stumps at the Seneca Fort Hill site (Barber 1964:60; Coates 1893:12–13; Squier 1851:86), which the Senecas began to prepare during the occupation of Ganondagan. The range of archaeological evidence for wood used in Iroquoian palisades suggests that regardless of the 'ideal' material for construction, a variety of tree species were used for fortification, depending on availability as well as preference.

In the broader Iroquoian world, there is also evidence for the construction of large pens/structures for deer drives. This practice is documented among people of the Neutral Confederacy between 1520 and 1650, when they seem to have carried out large, collaborative deer drives and may even have held captured deer in pens separated by age and sex (Noble and Crear 1993:22, 35). Zooarchaeological evidence

[40] Not all the posts at Porteus were cedar; the cedar posts seem to have been singled out because they fit a pattern, but white oak, elm, hickory, and maple were also found on the site.

[41] Lennox determined that eastern white cedar was preferred for palisade construction based its presence in three out of three sampled palisade posts. He also raises the possibility that there is a possible bias toward preservation of non-carbonized cedar in the coarse, sandy, well-drained soils at the Hood Site (Lennox 1984:130).

from 4 historic-period Neutral sites indicate 1:1 ratio of male/female deer and a more extensive exploitation of deer younger than 14 months and older than 52 months—a selective process that is unusual in its specificity. This particular strategy preserved the sex balance of the live population and the critical reproductively active deer, which kept the population as a whole healthy, and "bears no similarity to modern ages-at-death for 'hunted' or 'live' deer" (Noble and Crear 1993:29). Interestingly, the Mohawk word for hunting- *dequoquoha* or *tewakoha* translates to 'let's go and get it,' implying harvesting of things from a landscape that was 'cultivated' more broadly (Dennis 1993:38).

Fruits of the Forest

Researchers have also investigated the possibility that some tree species were cultivated or at least encouraged by Haudenosaunee people for the food resources they could provide, like nuts. Some researchers, especially those in forestry or botany, use 'mast' instead of 'nut' to refer to the fruits of forest trees. The word mast has historically been used for natural history and for describing fallen nuts eaten by livestock ("Mast" 2015) and both of these dominant usages haunt the word, minimizing the humanity and agency of Native people in the past. In addition to providing food for people, the preservation of nut-producing trees (especially beech) could have attracted spring passenger pigeon populations looking for food for themselves and their young (Madrigal 2001:72). During the years that Ganondagan, White Springs, and Townley-Read were occupied, some European crops, domestic animals, and cultigens had been taken up by Seneca people. This may have included non-local fruit trees and orcharding practices. Practices at these sites combined European-introduced non-local species with longstanding processes of introduction, cultivation, and management of plants and animals that had an earlier (Native) origin.

Many species of nut trees have a biological resistance to cultivation (Cowan 1985), but can be encouraged by various management processes; hickory (*Carya* spp., see Table 2 for Seneca), hazelnut (*Corylus americana* [osdodi'shä']), and plums (*Prunus americana or Prunus nigra* [gä:eh]) are prime candidates for this kind of treatment. Abrams and Nowacki (2008) argue that the promotion of nut production, rather than cultivation of the trees[42], is the most likely type of relationship between native people of the northeast and nut-producing trees. By reducing competing vegetation through burning, creating single-species 'orchards,' and passive promotion through field abandonment, Native people managed—either directly or indirectly—"the vast majority of vegetation in the eastern USA" (Abrams and Nowacki 2008:1134). For example, hazelnut is a "colonizer of abandoned fields or poorly tended pastures," exactly the kinds of environments created by a shifting settlement and agriculture pattern (Talalay et al. 1984:338). In his treatment of factors affecting Haudenosaunee settlement location, Eric Jones notes that "Haudenosaunee people were bringing the wild resources to them through environmental modification, suggesting that the ranges of most wild resources were not factors considered when choosing a settlement location" (Jones 2008:115–116).

A number of varieties of hickory[43] grow in the northeastern United States, and several produce edible nuts, although they vary in taste and bitterness. Hickory is susceptible to fire and grows well on upland slopes, sometimes in single-species

[42] 'Cultivation' is a word used by Abrams and Nowacki (2008), both of whom are forest ecologists and presumably not overly concerned with archaeological debates surrounding the terminology of cultivation, horticulture, and agriculture (Rindos et al. 1980; Watson and Kennedy 1991).

[43] "Hickory" seem to be a loan word, probably from Powhatan, which was first introduced into the English language via a 1612 account of John Smith's time in Virginia (Cutler 1996). Botanist William Bartram also observed "a cultivated plantation of native shellbark hickory (*Carya lacinosa*) near an Indian village in the south" (Wykoff 1991: 7), although Wykoff (1991) also acknowledges that European observers may have conflated black walnut, butternut, and various hickory species.

stands (Talalay et al. 1984:338). The nuts have also historically been a more important food source to the Haudenosaunee than bitter acorns, which require more extensive processing (Engelbrecht 2003). Iroquoian groups boiled acorns in ash-treated water to remove tannins (Petruso and Wickens 1984). Detailed quantification of available nut resources and apparently gathered nut resources at the Middle Woodland site of Scovill, in Illinois, also indicates that other varieties of nuts like hazelnuts, walnuts, and hickory nuts occur on this site in proportions commensurate with their availability in the surrounding environment[44], while acorns occur on the site at a much lower rate (Munson et al. 1971:426). Although Scovill is not an Iroquoian site, the preference for non-acorns in a similarly nut-rich environment confirms that preference and taste must play a role in considering managed resources.

Archaeologically it can be difficult to distinguish between hickory subspecies, depending on preservation and fragmentation of wood or nutshell. At the late 1500s Cayuga Carman site, the most common floral specimens were hickory and black walnut in the form of nutshell (Allen 1998a). Spring burning, in areas where roots of hickory have been allowed to develop, does seem to encourage the growth of hickory saplings/trees in the subsequent year (Brose 2010), and this is likely when understory burning would have been carried out by the Haudenosaunee, prior to spring planting. Black walnut trees produce a substance that is toxic to other trees and therefore they tend to appear in pure stands (Talalay et al. 1984:340). Most interestingly for Seneca sites is Wykoff's (1991) suggestion that the distribution of black walnut trees in central New York specifically lines up with the locations of Five Nations settlements. The co-occurrence of intensely inhabited Haudenosaunee territory with black walnuts,

[44] Munson et al.'s (1971) examination of the subsistence ecology at Scovill is laudably detailed, and there does not seem to have been extensive clearance for agricultural crops around the seasonally-occupied site. This means that the authors are freed from considering that their modern tally of nut-bearing trees surrounding the site may actually be the result of native landscape practices rather than a naturally-occurring 'baseline.'

which naturally have a more southerly distribution, suggests that Haudenosaunee people may have deliberately planted these trees, along with species like hackberry (*Celtis occidentalis*) and hickory. The prime nut collection season is August through October (Munson et al. 1971). Although yield differs by species, nut trees do not generally produce a regular crop each year. Rather, they produce a variable quantity of nuts in a three- to five-year cycle, which makes it difficult to quantify the annual harvest.

Another plant that was likely introduced prior to extensive European settlement in central New York is the pawpaw (*Asimina triloba*), which produces the largest fruit indigenous to North America. In the present-day, pawpaw has isolated populations that correspond to known locations of Haudenosaunee sites (Keener and Kuhns 1997; Wykoff 1991:14). While there is a Jesuit account of an informant stating that pawpaws were brought back to Onondaga after fighting with the Erie between 1654–1656 (Thwaites 1896–1901, 43: 259), this does not reflect the earliest date for the pawpaw in Haudenosaunee territory. Pawpaw seeds have been identified from the sixteenth century Corey site, in traditional Cayuga territory, although it is not clear whether the seeds are from fruits grown around the site or were brought to the site by some other means (Rossen 2015). Although native to areas at least 240 km south and west of central New York, in the present day pawpaws can be successfully grown in this area with care (Merwin et al. 2003). Today pawpaws are grown largely in orchards, but informal planting patterns—which Kerrigan makes a case for later apple growing—may have been more compatible with Haudenosaunee mobility patterns (Kerrigan 2008:38). Large, organized planting systems for fruit trees that may take years to mature demand greater commitment to a single location than may have been feasible during relatively frequent settlement relocations.

Despite the fact that orchards required a greater investment in a single locale, the Seneca adoption of apples (*Malus domestica* [ganyo'o:ya']) was known to be particularly enthusiastic, and William Kerrigan theorizes that orchards, along with other changes, may have contributed to longer stays at village sites in the mid eighteenth century (2008:35). In 1791, traveler and businessman Elkanah Watson crossed Seneca Lake from Geneva to the former site of a Seneca village (Kendaia, or Appletown) and found extensive apple orchards. Apple orchards could have been planted or grafted, although peaches (*Prunus persica* [gäë:dä:e']) would have been grown directly from pits. Kendaia was occupied as a regional satellite for nearly 75 years, and Seneca people were forced to leave 12 years before Watson made his observations. Townley-Read and the other components of the New Ganechstage site complex (occupied ca. 1715–1754) were observed to have orchards of apple trees and butternut trees in the nineteenth century, although there is very little macrobotanical archaeological evidence for their use during the occupation of the site. Jordan suggests that "orchards may have been planted primarily in *abandoned* areas rather than near inhabited locations" (2008:218). In this case, residents of the succeeding settlement may have been the primary users of these orchards, even as the time Senecas spent living in settlements was lengthening. Although probably not commonly used for firewood, if plantings of fruit trees and nut trees were maintained near settlements, we should expect to see some small representation in the charcoal sample, and other macrobotanical evidence like charred seeds or pits might suggest their inclusion in diet.

Tulowiecki and Larsen's modeling of land survey data, although it does not demonstrate causality, shows that there is a greater association between nut-bearing trees and Iroquoian settlements in Chautauqua county—the westernmost county in New York State abutting Lake Erie—than would be predicted by other environmental factors alone. This includes chestnut, black oak and white oak, hickory species, and black walnut. Additionally, they found that ironwood (*Ostrya virginiana*) distribution could be statistically associated with Iroquoian settlement.

Maple Sugaring

Researchers have debated the intensity and extent of maple sugaring practices among Native people prior to the arrival of Europeans. Maple sugar and syrup are both reduced forms of the sap from sugar maple, and are created after sap is tapped in the early spring. This is a difficult season for humans, when many other food sources have been exhausted and most game is lean and or scarce (Madrigal 2001; Watson and Thomas 2013). These maple products have the advantage of being shelf stable for at least a year (Densmore 1974) and maple syrup may also be used as a preservative (Kohl 1956). The concentration of maple sap into maple sugar or syrup can be carried out by several means, and these methods have various requirements and constraints. Maple sugar is created when the sap is reduced beyond the point necessary for creating maple syrup. Experimental production of syrup using freezing, stone boiling, and direct fire evaporation in a variety of vessels (birch containers, metal kettles, pottery vessels) produced several relevant findings (Holman and Egan 1985). Freezing and skimming off the ice doubled sugar content in the remaining liquid overnight and may have been a useful first step. Experimentation also found that there was no major increase in efficiency for metal kettles over 'prehistoric vessels' of the same size, meaning that access to European-manufactured kettles was not required to concentrate maple sap.

Even with efficient vessels and freezing as a first step however, a "backyard" sugaring operation requires about one cord of wood to boil 40 gallons of sap into one gallon of syrup (Holman and Egan 1985:68). Early sugaring was likely done in birch bark pans or wooden troughs, with freezing as a first step. Historic-era maple sugar production was tied into the fur trade economy, so researchers have had difficulty extending those sources into the past (Holman 1986:125).

Carol Mason (1990) has also been eager to argue for Native maple sugaring, and she draws associations between maple sugaring and independence from European trade networks that were heavily taxed for American consumers in the eighteenth and nineteenth centuries. In her contention, sugaring is unique to the colonial economic framework. Margaret Holman (1986) skirts this problem by attempting to determine whether sugaring fit into hunting-gathering rounds that would have already been in place, foregrounding the seasonality and scheduling settlement systems of the Huron. Ultimately, she determines that the Huron settlement system was not particularly conducive to maple sugaring given clearance around settlements and location near second growth forests (Holman 1986). In an earlier paper, she acknowledges that maple sugaring may still have fit into early spring cycles of agriculturists because of lack of other food sources or activities at this time of year (Holman and Egan 1985:69).

Franciscan friar André Thevet (2011 [1557]), apparently recounting information from one of Jacques Cartier's expeditions, describes Native people collecting large quantities of maple sap as observed by Cartier on one of his expeditions to what is today Canada (in either 1536 or 1542)[45] (Pendergast 1982:8). Pendergast uses this evidence to argue that even if Native people did not produce enormous quantities of maple sugar at this early time, their knowledge of maple sap predated European colonization. He also points out that sap can be concentrated without massive amounts of boiling, and that there is linguistic support for the

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[45] Pendergast addresses the criticism commonly made of Thevet's work as an historical source— that he exaggerates and misrepresents secondhand information as first-hand observation—by indicating that he likely met and talked with Cartier, acquiring details he could not have known any other way and which match up with other first-hand observations of Canada.

antiquity of the maple industry in the Iroquoian area.

Re-growth and Field Systems

So far, I have described the way a landscape might have been cleared and the area surrounding a settlement actively used during occupation by Haudenosaunee people in the seventeenth and eighteenth centuries. Because not all fields would have been in use concurrently, and because of the shifting settlement pattern followed by Seneca people between ca. 1500 and 1779, it is also important to consider other forms of use that tie fallow fields, partially re-grown clearings, and less easily categorized spaces into a total system.

Old field systems, originally cleared for maize-beans-squash agriculture, provided ready environments for a number of opportunistic and useful plants. Indian Hemp (*Apocynum cannabium*, distinct from *Cannabis sativa*), which was used for cordage, grew well in on old corn fields (Kalm 1966:277) and could have provided a easily accessible raw materials. Hawthorn (*Crataegus* spp. [aweoek])[46] is

> Abundant in disturbed and cleared areas, along streams and fencerows, and in clearings and pastures…Plants of this genus freely invaded newly cleared land as settlement spread in eastern North America and may even have begun their evolutionary diversification in areas cleared for agriculture by Indians before the arrival of European settlers (Soper and Heimburger 1982:170).

Hawthorn fruits are edible, and many species of hawthorn have documented uses among Native people. Dotted Hawthorn (*Crataegus punctata* Jacq.) was used by Haudenosaunee people as a gastrointestinal aid, to stop menstrual flow, and as a way to counteract witchcraft (Herrick 1997:351; Rousseau 1945:46). As introduced in Chapter Three, Herrick's list of 'medicines,' like other scholarship on the Haudenosaunee, comes from a western categorization of 'medicine' and 'food' as

[46] There are hundreds of species of Hawthorn trees/shrubs worldwide, and there are at least 50 that are native to New York State, according to the United States Department of Agriculture Natural Resources Conservation Service (United States Department of Agriculture 2015).

separate. This division ultimately inhibits understanding of the broader cultural context in which these plants were consumed and used (Adams 2013:114).

Hawthorn is also a good example of the kind of quick-growing tree species that takes advantage of the light available at clearings' edges. These kinds of 're-colonizers' may provide an easy renewable source of smaller firewood nearby when deadwood is not as readily available in the surrounding forest (Asouti and Austin 2005). The fast-growing recolonizing species, as mentioned earlier, may have been explicitly exploited for building materials appropriately sized for longhouse construction[47] (Heidenreich 1971:113). Humans control the frequency and location of these secondary sites and can contribute to ecological adaptation of some species (Unruh 1994).

Iroquoian people would certainly have taken advantage of sites of previously occupied settlements nearby, given that forests in areas of Southern Ontario would need 35–50 years to generate trees with the necessary 25.4 cm diameter for longhouse construction (Dennis 1993:26 n. 33; Heidenreich 1971:187–188). Smaller re-growth would certainly be possible sooner, and forestry studies have shown that "from the mid-Atlantic Coast northward, abandoned sites needed about 20 years to regain their vegetation, and the interval was somewhat less toward the South" (Williams 1989:39). This is further confirmed by an early account from the Hudson Valley in which a local informant told van der Donck:

> I see that you are clearing that piece of land to cultivate it. It is very good soil and bears corn abundantly—which I well know because it is only 25 or 26 years ago that we planted corn there and now it has become wooded again (Gastel 1990:414; Van der Donck 1968:20 in Dennis 1993:26).

Domestic firewood charcoal deposits created toward the end of a settlement's

[47] Hawthorn might have been overrepresented in fields Heidenreich (1971) examined to gauge successional species since modern fields no longer used for agricultural purposes are often repurposed for grazing domestic livestock and could show an overrepresentation of unpalatable species like Hawthorn and pine versus other re-colonizers that are more appealing to grazers (Campbell and Campbell 1994).

occupation, then, might be expected to contain more small branches of re-colonizer or successional species that take advantage of burned-over or cleared lands.

When fields in both Five Nations territory and further north into Ontario are allowed to re-grow completely, they are often dominated by oak and pine. This has been observed in a detailed charcoal and palynological study of lake cores from Crawford Lake in Ontario, Canada where Native settlements are known to have been located based on archaeological survey and excavation (Finlayson 1998:58, 62; Monckton 1992:59). Regrowth over previously cleared Iroquoian sites produces uniform stands of pine or oak because (rather than partial clearance of trees for firewood or through natural decay) all of the trees were removed and re-growth occurred in a single event (Day 1953:338). Of course, complete regrowth only happens in the absence of continued involvement and stewardship of that land, which often was not the case in Haudenosaunee territory.

The settlement landscape of the Senecas also altered the local faunal populations and distribution. As previously discussed, white-tailed deer were a major food source for Haudenosaunee people. Low deer populations are sometimes linked to closed canopy forest surrounding a site, whereas old clearance areas in proximity to a settlement would result in more accessible, larger deer populations drawn by abundant browse at the edge of clearing and forest (Rayner-Herter 2001:33). In the southeast, Foster and Cohen have argued that forest-fire/understory burning was also used to "increase early succession plant species for browse" (Foster and Cohen 2007:37)[48].

As alluded to in the discussion of deer, hawthorn, and wood regrowth, edge areas at the boundary of clearance and forest were bountiful resource areas for Haudenosaunee people. Far from being 'abandoned'—a word I have avoided—old

[48] They also argue that fire was significant in the southeast for hunting and group drives of deer, however this has been countered fairly convincingly by Piker (2010).

field systems, settlement locations, and wood collection areas would have been locations of ongoing activity and use, even after they ceased to be used for their original purpose. Parmenter (2010:300 n.38) cites a number of instances where direct evidence of this continued connection was recorded, including: feasting near the graves of ancestors (JR 8:21, 10: 305–11), use of old domestic space for lacrosse fields and orchards (Rayner-Herter 2001:82–83), and suggested use for attracting deer to browse and provide good conditions for berries (Engelbrecht 2004:132). Land surveyors of Phelps and Gorham purchase, creating and observing township boundaries between 1789 and 1792, found 'grass' in the area just to the north of White Springs, between White Springs and Kanadesaga to the Northeast, well after the living community had relocated (Seischab 1990).

Conclusions

Over the course of a Seneca community's formation and residence at a settlement, the larger processes of site clearance, construction, agriculture, and population departure combined with myriad daily and seasonal tasks associated with sustaining communities to create particular conditions in the surrounding area. Some processes, like understory burning and the maintenance of clearings, would have deliberately encouraged specific relationships between Seneca people and certain plant and animal communities (Lewis 1982:65; Wagner 2003:127). Other processes, like collection of firewood for daily cooking, heating, and light needs would have altered forest composition and created new ecotones as a byproduct of relatively mundane but vital (female) labor. Is it any wonder that these places—which had been inhabited by family members and ancestors and that represented their cumulative labor and relationships with the landscape—remained important even after the core population had relocated elsewhere? Moving outward, spatially and temporally, from the founding of a settlement the long-lasting and far-reaching effects of Haudenosaunee landscape practices become clearer. To understand the interactions between humans and a landscape it is insufficient to examine a single material class or aspect of a site because this relationship is comprised of so many processes.

A story from the eighteenth-century Oneida Primes Hill Site illustrates the multiple registers touched upon by Haudenosaunee people visiting an ancestral site. The excavator, Monte Bennett, recounts a conversation with the farmer who owned the property around Primes Hill:

> Mr. Strain also remembers that in past years, members of the Iroquois tribe had visited his farm in the early days. They would ask his permission to pick berries, etc, on the hill near the Primes Hill Site…Mr. Strain always felt that they were in fact aware of the site of their ancestors and either were stepping across the fence to surface hunt the site or remember their forefathers with a few hours of meditation (Bennett 1988:9).

Here, Haudenosaunee people are both doing something fairly prosaic—picking berries—and something that requires a conception of the landscape as more than patches of resources but as a way to interact with ancestors.[49] A more complete theorization the Seneca relationship to landscape can lead to a better interpretation of landscape modification processes and the archaeological assemblages that result. The next chapter will deal more completely with primary source documents and the work of indigenous scholars to explore this idea and its ramifications for the archaeology of Ganondagan, White Springs, and Townley-Read.

[49] See also Seneca Faithkeeper Peter Jemison's words on the importance of ancestors today (2007:407).

CHAPTER 5

SAIDINÖNDAYË:´, THEY RESETTLED

EXPLORING THE SENECA SEQUENCE THROUGH GIS

The previous chapter described the effects of Seneca processes of clearance, domestic occupation, agriculture, and eventual community relocation on the landscape surrounding settlement locations, as far as they are known from archaeological, ethnohistoric, and historic sources. Because these processes occurred at successively occupied settlements a multiscalar perspective, which examines the conditions created by Seneca people across the sequence of sites as well as the conditions at individual settlements, is critical. The scales under consideration here are both spatial and temporal, and include those scales pertinent to archaeological analysis of the community as well as the effective scale of past Seneca action (Crumley 1987; Marquardt 1992). Geographic Information Systems has been used by researchers examining Iroquoian site sequences and settlement patterning both for analysis and for display of information. This chapter will explore some of the ways GIS has been utilized by researchers in Iroquoia, provide background on the Seneca settlement sequence as it is currently understood by archaeologists, and present a case study that centers on the Seneca site sequence from 1550–1779, providing the most detail on three later sites in that sequence—Ganondagan, White Springs, and the Townley-Read component of the New Ganechstage site complex—that are the focus of the remainder of the dissertation. The case study illustrates both the necessity and utility of a reorientation of GIS for a multiscalar approach to human-landscape interactions, and how GIS can provide a means for contextualizing archaeological analyses from settlement excavations.

GIS and Iroquoian Archaeology

Since the 1990s, Geographic Information Systems (GIS) software platforms have been critical to the investigation of landscape, space, and place in Iroquoia, and the possibilities and limitations of the software have, to a certain extent, intertwined with archaeological approaches to landscape. For this reason, it is important to specifically examine the approaches encouraged by GIS. A Geographic Information System is a computer system that stores, manages, integrates, visualizes, and analyzes spatial geographic information. It allows researchers to layer data onto space and to analyze patterning and the interplay between datasets and location. GIS is not a methodology in and of itself, but rather a tool that can be used in many ways and may encourage particular usages (Seibert 2006). In the years since the introduction of GIS, Iroquoian researchers have used increasingly detailed datasets to accomplish several goals related to settlement location and patterning across the landscape. Although a tacit connection with the bird's eye, distal, seemingly objective cartographic model of spatial understanding is inherent in GIS usage, archaeologists are not always so concerned with making this point explicit, or with exploring the effects that different scales of framing have on analysis and conclusions (Gillings 2012:603). Among other critiques, phenomenologically-oriented researchers have problematized the way this cartographic model simplifies places as experienced by specific bodies to a non-bodily, abstracted 'position' (Casey 1997:138).

The mid-1990s saw an increase in Iroquoianist researchers working with GIS in the exploratory mode, largely making use of the software's processing power to determine which environmental and economic variables were the most significant in settlement placement decisions (Allen et al. 1990; Allen 1996; Hasenstab 1990, 1996a, 1996b; Hunt 1992; Knoerl 1991, 1988). GIS studies have often been framed as ways to understand the changing locations of settlements in different tribal territories or changes across Haudenosaunee territory. These approaches compile immense amounts of data including site size, population numbers, site setting, and many other physical variables such as soils, climate, forests, wetland, and waterways and trail locations as a method of analyzing site selection processes[50]. With this accumulated mass of data, researchers interpret settlement location as the outcome of numerous, ranked factors at play in a decision-making process. Many of the GIS-centric approaches rely on an organic absolutist understanding of space in which the local factors (input variables) are responsible for historical variation in evolutionary process (Smith 2003:50). The analytical responsibility of the archaeologist is then to tease out the most significant of these factors.

Because these approaches are concerned with how communities, at the scale of an entire region, choose new locations for settlement, analysis is necessarily focused on the relatively static and quantifiable characteristics that GIS frameworks can incorporate. Some researchers have separated these characteristics into 'natural' and 'cultural' categories. So-called 'cultural' components have been defined as occurrence of warfare, trade, and supernatural factors (Jones 2008:102–105), while the term 'natural' is more commonly applied to availability of resources—such as hardwood trees or waterways—and physical terrain features such as slope, quality of soil drainage, and annual frost-free days. This perpetuates an understanding of landscape as a relatively static bundle of resources[51] and physical characteristics that can be

[50] There can also be a strong undercurrent of environmental determinism in Northeastern archaeology (e.g. Jones 2008) as well as continued implicit usage of the "pots equal people" paradigm (e.g. Snow 1995; Snow 1996; c.f. Hart and Brumbach 2003; Hart 2011) and a reliance on old readings of ethnohistorical accounts that do not adequately assess their original context fail to situate them in a 'downstream' narrative (Parmenter 2010: xxxv).

[51] Variables such as hardwood distribution across entire regions are particularly problematic in this kind of archaeological context. I assume, although Jones (2008) does not say, that these are either based on relatively few palynological reconstructions of hardwood distribution prior to Euro-American field clearance and logging practices or they are representative of *current*

exploited or adapted to by certain populations. Approaches that highlight the use-value of settlement surroundings have been typical in Iroquoian archaeology more generally, especially for cultural materialist orientations in which social organization is seen as a functional adaptation for more efficient use and manipulation of the environment (Schutkowski 2006:11–12). There is a difference between interpreting these factors as constraints versus determining factors, as the latter over privileges models of functional adaptation. It also leads to a 'snapshot in time' orientation that privileges the founding or abandonment of settlements as moments rather than viewing life in these locations as ongoing processes, which is especially concerning given that ecological conditions at settlements might have been widely variable over the course of their occupation.

Robert Hasenstab's work (1990, 1996b, 1996a) displays some of the tensions in GIS-based research. He uses more than 50 data layers of physical variables (soils, climate, forests, wetland, waterways, etc.) that potentially were related to site location choices across New York. In the hopes of analyzing what he terms 'macrosettlement' change, defined as patterns that "involve the distribution of whole communities over a landscape, reflecting their adaptation to the environment—both natural and cultural" (Hasenstab 1996a:17), he uses statistical analyses to determine which of these physical factors are most strongly correlated with settlement location. Hasenstab gestures toward cultural components in his organizing statement, and identifies them as separate from natural components. His conclusion is that culturally relevant factors—for Hasenstab elements such as distance from navigable waterways[52]—are the most important for settlement location. The lack of clarity about what is natural, what is

hardwood distribution, which I would be wary of giving too much weight to given the extent of change that may have occurred since the sixteenth century.

[52] This is a notoriously difficult variable to determine accuracy for given the mutability of waterways even on relatively short timescales (Parmenter 2012, personal communication).

cultural, and how to quantify the latter ultimately leads to sentences where “cultural” factors seem tacked on, such as "The location of a village is seen as an adaptation of a society and its economy to the surrounding environment—both natural and cultural" (Hasenstab 1996a:23). Generously, this phraseology attempts to address the interdependent and recursive nature of the relationship human groups have with their surroundings, but in practice it lumps all factors into ‘the environment,’ calling to mind equilibrium models for understanding human/environment interactions.

More recently, Eric Jones has worked with GIS software and relatively more complete datasets to produce a series of works that examine Haudenosaunee site patterning from a settlement ecology perspective (2006, 2008, 2010c, 2016). Jones undertook an enormous project in gathering together data from many disparate sources for all the known major Six Nations sites in New York State. This includes site size, estimated population numbers, variables pertaining to the site setting such as slope and soil type, and several other physical variables. Although Jones works with somewhat incomplete data that comes from surface survey and pedestrian exploration rather than excavation, he concludes that Haudenosaunee settlement patterns can be interpreted as “a result of the confluence of transportation/communication needs, agricultural needs, and defensive needs” as they change over time (Jones 2008:160). He purports to follow Glenn Stone’s (1996) settlement ecology theory, and interprets settlement location as the manifestation of interactions of numerous complex systems (Jones 2008:5).

Jones’ main critique of previous GIS analyses is that they begin with environmental factors and only proceed to sociopolitical factors when the former do not satisfy the researchers’ questions. In reaction to this deficit, Jones aims to include both environmental and sociopolitical or natural and cultural (there is some slippage in terminology) without allowing analytical primacy of one or the other. Jones seeks to assess a variety of factors to access some part of the acknowledged complexity of Haudenosaunee culture and people's "relationship to their natural and cultural surroundings" (2008: 5). This reference to 'natural and cultural' is repeated throughout the work—in describing landscape features, in dividing the kinds of subsistence resources, and in factors influencing settlement—and it assumes that the division between these two concepts is both clear to the analyst and pertinent to the relationship being analyzed. Ultimately, Jones' work would have been stronger with an acknowledgement of the limitations of GIS, as well as being clear that he was modeling physical factors with an assumed or interpreted cultural importance. Although some of these issues are addressed in a 2016 publication the point largely stands.

These two examples illustrate some of the limitations in how GIS has been used in the past. This is not to say that researchers making use of this tool have implied secure and instantaneous foundation or end dates of settlements, or have refused to acknowledge the potential for continuous Haudenosaunee adaptive management of local environments, but rather that the software by its nature encourages static approaches. Therefore, when using GIS methodology must be expanded to address dynamic processes. Turning GIS to the project of understanding landscape *processes* is compelling, but it is not something that can be accomplished simply by incorporating different datasets. It requires a more complete consideration of the way GIS structures our understanding and an examination of the reified categorizations that might be applied to inputs, especially in the context of enlightenment-derived binaries which may be inappropriate for Haudenosaunee contexts. In order to build on the work that has already been done and to additionally incorporate the time-scale of individual actions and the change of ecosystems over time, projects must be linked to a careful and considered implementation of GIS. This is directly related to the theoretical orientation laid out in Chapter Two, which begins from the position of dialectical human-landscape relations.

The Seneca Sequence

Although there is some variability in the extent of archaeological and historical knowledge about the sequence of Seneca sites occupied in the sixteenth, seventeenth, and eighteenth centuries, the considerable effort others have made (Houghton 1912; Jones 2008, 2010c; Jordan 2010; Parmenter 2010; Vandrei 1987; Wray and Schoff 1953) to draw together information on chronology, site area, and population provides an excellent basis and allows for inferences about some of the lesser known sites. Given also that the sites were sequentially occupied by the successive iterations of the Eastern and Western Seneca communities, use of analogical inference to fill in some of the gaps is well supported by the existing data. In the discussion below I build on these sources by integrating new environmental data as well making interpretations based on plant remains recovered from these sites; these data have traditionally been included in list form as a foot-note to discussions of material culture.

As discussed in the first chapter, the Seneca settlement pattern generally consisted of paired eastern and western principal communities (Jordan 2004a; Wray 1973; Wray and Schoff 1953). These settlements were roughly coeval and were relocated every 15–30 years (Allen 1996; Engelbrecht 2003; Jordan 2008:3). Seneca towns also tended to have affiliated smaller satellite settlements, although the number, location, and purpose of satellite communities varied through time (Jordan 2013d; Vandrei 1987; Wray 1973). Due to several factors, including their relatively smaller size, this category of sites has been archaeologically neglected and there is much less existing information about their domestic space.

In the previous chapter, I focused on the everyday practices of Seneca people and how they affected their surroundings over time. Principal communities were often relocated due to the depletion of local resources, particularly firewood, which were a consequence of cumulative everyday practices. Firewood as the principal resource constraint on occupation length has replaced a previous narrative where soil nutrient depletion was seen as the main reason Haudenosaunee people shifted settlements (Mt. Pleasant 2006; Starna et al. 1984). By modeling the potential clearance around Seneca settlements over time based on firewood demands of specific communities, GIS can provide a diachronic visual reference for Seneca-induced changes in both local and regional landscapes. The parameters for this modeling are discussed in the next section and are based on a combination of archaeological, ecological, and ethnohistoric information. However, this modeling alone cannot capture the complexity of conditions encountered by Seneca communities through time. In the final section of this chapter I present qualitative exploration of the sequential movement of the eastern and western Seneca communities, with a focus on other factors which may have played a role in community decision making.

Modeling Parameters

Although local resource depletion was certainly important to some settlement relocations, it cannot be used to explain the entirety of the Seneca sequence given the myriad other factors at play, such as the late fifteenth and early sixteenth century drought/wet conditions discussed in Chapter Three. Resource depletion also varied with population density and length of occupation. Additionally, any existing dynamics were further complicated by increasing European involvement in Haudenosaunee affairs, exerted unevenly spatially and through time. Table 3 presents a schematic overview of the Seneca principal settlements and known satellite communities occupied between 1550–1779. This table shows the approximate dates of occupation, the total area of domestic space as estimated by several researchers, approximate populations, and the total area of clearance around the settlement at the end of its occupation based on the wood demands from a given population. A range of sources and assumptions go into both the calculations and presentation of this information, background that is critical to placing reasonable explanatory and interpretive limits on the results of GIS modeling of this sequence.

The dates in the table represent approximate beginning and ending dates of major occupation. As discussed in Chapter Four, I reject the term ‘abandoned’ as a misnomer and prefer discuss community relocation in a way that reflects the agency of community members as well as the possibility of later return to old settlement locations for other purposes. Relocation might also have involved phased moving of the population, with some deciding not to make the move at all and remaining at the settlement (Engelbrecht 2003:101–102), meaning that a site could be home to various communities of the living and the dead throughout its existence.

In the absence of accurate documentation, records, or archaeological evidence of settlement populations, the domestic area of Haudenosaunee settlements has proved useful in estimating population because of the relationship researchers have observed between total domestic space and the number of longhouse compartments/hearths at fully excavated sites in the Mohawk Valley (Snow and Starna 1989; Snow 1996a). Based on ethnohistoric observations, each hearth represents two nuclear family groups that occupied a single longhouse compartment (Engelbrecht 2003:77; Snow 1995a:45; Wright 1995:16), and therefore the number of hearths within a total settlement area in theory provides an archaeologically verifiable rough population estimate. Snow and Starna (1989:143) found that 20 m^2 of domestic area per inhabitant was a good approximation, and later checks on this number from other sixteenth century sites indicated that during times of difficulty, stress, or crowding the ratio was more like 12

m^2 per person (Snow 1995a, 1996a). It is important to keep in mind that both ratios were developed based on Mohawk sites, although they have been checked against some of the better-preserved sites from other tribal areas, such as Ganondagan in Seneca territory (Snow and Starna 1989:143), and against some sites from Onondaga and Oneida territory with both area estimates and population estimates from colonial sources (Jones 2010c).

In the Northern Iroquoian area, Warrick (2003:265) has found trends that mirror the numbers derived from the Mohawk area—20 m^2 per person for most of the history of the Wendat-Tionontate but dropping to 70 hearths per hectare (or 14.3 m^2 per person) during the period between 1550 and 1625. Estimating the population of a settlement based on domestic area can be beneficial for sites whose full extent is only known through surface survey or sites that have been disturbed or even destroyed so that the even full excavation of domestic areas would not provide a full accounting of hearths and longhouse structures. The methods used to estimate the domestic area of a site are critical for this approach because incomplete surveys, or area calculations based on topographic features erroneously assumed to bound or shape the site, may have dramatic effects on the estimated population for a site.

Population estimates for Haudenosaunee sites, especially those occupied after European arrival, have also been based on or checked against colonial documentation and/or census taking. Jones (2008, 2010a, 2010b) has made use of house and warrior counts to estimate populations of Seneca, Onondaga, and Oneida sites occupied ca. 1500–1700, in conjunction with previous archaeological excavations and surveys, his own GPS-based walk-overs of some of the sites, and manuscript maps and other historic documentation. In calculating total populations from European counts of warriors, historians and archaeologists' assumption is that the ratio of the total population to warrior is four to one, and numbers can be scaled up accordingly (Jones

2008:363; Parmenter 2010:290; Richter 1983:542–543 n57; Snow 1994:110). However, warrior counts by Europeans are somewhat unreliable to begin with because they "originated only occasionally from direct observation, and were also susceptible to manipulation for political interests" (Parmenter 2010:290).

Estimated population at a site can then be linked to both the agricultural land required to support a community of a particular size and the wood needed to construct, maintain, heat, and fuel a Haudenosaunee settlement. Copious scholarship estimated the amount of agricultural land, given pre-plow corn yields of 22 to 76 bushels/acre (1155 to 4127 kg/ha), that would have been required to support Haudenosaunee communities of different sizes (Heidenreich 1971; Mt. Pleasant 2010; Mt. Pleasant and Burt 2010). This, combined with Seneca forester Mike DeMunn's (2012) assessment of Haudenosaunee single-family annual wood usage—as much as twenty cords per year—allows for at least a rough estimate of the extent of heavily cleared and modified space surrounding a site. Although New England colonists perceived Indian use of fire as profligate, especially their preference for fire instead of bedding for nighttime warmth (Cronon 1983:49), the estimates I use for Seneca wood usage are less than those for per capita Mid-Atlantic Euroamerican wood use during its peak in the early eighteenth century, when families used four and a half cords of wood per person/year (Williams 1989:77).

Ethnographic work in a number of geographic areas has shown that people without pack animals or other means of cargo transportation gather fuelwood largely from the deadwood supply in the five kilometers surrounding a location (Asouti and Austin 2005:8; Picornell Gelabert et al. 2011:381; Williams 1989:37). As described in greater detail in the previous chapter, forestry studies provide useful estimates of the amount of deadwood present in different kinds of forest stands. These numbers come as a result of forestry's interest in effects of stand-age on biodiversity and in determining the environmental impacts of different logging strategies (Idol et al. 2001). Although the numbers provided by these studies are useful for roughly estimating available deadwood in a particular kind of forest, not all downed and dead wood would necessarily have been suitable for firewood, such as buried or partially rotted deadwood[53] (Moroni and Ryan 2010).

These studies do show that deadwood is more prevalent in old-growth forests, and that it also varies with forest composition and the age distribution of the stand. In estimating clearance around Haudenosaunee settlements however it is important to consider several interlocking needs: agricultural land—potentially used on a rotating basis; firewood for heating and cooking, both indoor and outdoor; and construction materials, including bark for structures or fiber cordage (Heidenreich 1971:108; Hopkins 2010:28; Krus 2011; Poplawski et al. 2012). Due to the initial demands for both small and large timbers for the establishment of a settlement between two and five hectares in size, the quantity of agricultural land required to feed site inhabitants over the life of the settlement, the estimates of deadwood per hectare from modern forestry studies, and that understory burning and tree girdling were likely part of Haudenosaunee clearance practices, wood collection had the greatest impact on land clearance around sites[54]. Modeling clearance/landscape modification based on the 20 cords/year/family, which is at the high end of wood usage estimates is sufficient for approximating the impact of *all* of these factors on the regional landscape.

[53] Although there are records of rotting trees being burned by missionaries and their Haudenosaunee guides to ward off gnats (Beauchamp 1916:14).

[54] Fecteau et al. estimate semi-circular clearance areas around smaller Northern Iroquoian villages based on the required wood for indoor heating and cooking. Given that these estimates are for a different geographic area, smaller settlements, an earlier time period in which steel axes were not available, and only take into account heating and cooking and not outdoor processing areas or pottery firing it is not an ideal analogue for the seventeenth and eighteenth century Seneca.

Table 3. Principal and satellite Seneca sites ca. 1550–1779.

Site Name	**Dates**[i]	**Area (ha)** (Jordan 2010)	**Population based on Jordan**[ii]	**Area (ha)** (Jones 2008)	**Jones (2008) population**[iii]	**Vandrei** (1987) **Population**	**Population used to estimate clearance**	**Radius of clearance (km)**[iv]
				Western Sequence				
Richmond Mills	1550–1565	2	1000	1.7	1417		1000[v]	1.79
Adams	1565–1590	4	2000	3.958	1979	1500–2500	1000	2.31
Brisbane	1580–1610						250[vi]	1.27
Dutch Hollow	1605–1625	4.2	2100	4.74	2370	1600–2700	1100	2.17
Lima	1626–1640			0.84	700	1300–2200	1300	1.98
Power House	1641–1655	3.2	1600	1.68	840	1300–2200	1600	2.19
Dann	1656–1675	4.7	2350	4.6	1852	1700–2800	2350	3.10
Rochester Junction	1676–1687	4.6	2300	6.124	1482	2000–3300	1482	1.87
Snyder-McClure[vii]	1688–1715	2	1666[viii]				1666	3.11
Huntoon	1710–1741						1200[ix]	2.32
Fall Brook	1742–1775							
Genesee Castle	1775–1779							
				Eastern Sequence				
Belcher	1550–1565	2	1000	1.16	969		1000	1.79
Culbertson	1565–1590	2.1	1750	2.18	1092	1300–2200	1000	2.31
Tram	1580–1595	4.1	2050	2.08	1041	1300–2200	1000	1.79
Cameron	1600–1610	1.9-3.0	1225	2.208	1104	1700–2700	1225	1.62
Factory Hollow	1611–1625	3.4	1700	2.055	1712	1100–1900	900	1.64
Warren	1626–1645	2.9	1450	2.717	1359	1300–2200	1300	2.30
Steele	1646–1654			5.475	2738	1300–2200	1750[x]	1.73
Marsh	1655–1675				1852	2000–3300[xi]	1852	2.82
Ganondagan	1676–1687	3.7	1850	3.735	1867	1200–2000	1850	2.09
White Springs[xii]	1688–1715	3.7	1850	6.25	3125		1850	3.27
Townley-Read	1715–1754						200	1.3

Table 3 Continued

Other components (Rupert, Zindall, Hazlett)	1715–1754						100[xiii]	0.9
Kanadesaga	1754–1779						500	1.6
				Satellite Communities				
California Ranch	1550–1565						250	0.90
Harscher	1550–1565						250	0.90
Ely-Burgett	1550–1565						250	0.90
Phelps	1550–1565						250	0.90
Johnston	1565–1590						250	1.16
Fugle	1605–1625	1	500	1.11	558	330–550	500	1.47
Bosley Mills	1626–1640	0.7	350	0.728	607	240–400	350	1.03
Menzis	1641–1670	0.6	300	.81	405	200–330	300	1.37
Kirkwood	1676–1687	1	500	2.229	1115	330–550	500	1.09
Alva Reed	1565–1590			1.795	898		898	2.20
Cornish	1626–1645	0.8	400	.566	472	270–450	400	1.28
Wheeler Station	1651–1669				370		370	0.80
Cherry Street	1670–1671			2.41	370		370	0.28
Beale	1672–1687			1.948	975–1200		372[xiv]	1.09
Bunce	1670–1687						250	0.95
Damasky	1687–1688						250	0.23
Kendaia	1704–1779						250	2.00

[i] From Parmenter (2010: Appendix 1) and Jordan 2010.

[ii] Calculations based on estimate of 20 m^2/person (Snow 1996a; Snow and Starna 1989).

[iii] These are populations provided by Jones (2008: Appendix A) based on a variety of sources and calculations. The population numbers he determines are most reliable are reproduced in this z.

[iv] Based on families of 6 people, 10–20 cords of wood per family per year and 10–20 cords of wood per acre (if clear-cut). $A_{circle}=\pi r^2$

[v] Jordan's estimate was used here given the population at the succeeding site and likelihood of less crowding at this early date.

[vi] Population estimate of 250 was used for these calculations based on likelihood that this community was more similar in size to a 'satellite' community.

[vii] Onaghee in Jones (2008).

[viii] I based these population calculations on an estimate for 12 m^2/person (Snow 1996; Snow and Starna 1989) because of the crowding that likely occurred as populations coalesced and moved after French-led forces attacked Ganondagan and a number of other Seneca settlements to the west.

[ix] Because there is so little information for Huntoon, 'principal settlement' estimate of 1200 people was used here.

[x] This is the median of Vandrei's range.

[xi] Based on estimated area of 15 acres (or 6 hectares).

[xii] Jones conflates White Springs and Kanadesaga, leaves out the intervening settlement of New Ganechstage, and improperly assigns a date of 1690–1732.

[xiii] Estimated populations given the better-understood Townley-Read component and the population of preceding and succeeding eastern communities (White Springs and Kanadesaga, respectively).

[xiv] Documentary sources compiled by Jordan (2008, 170) make this estimate for Beale relatively secure.

Seneca Community Relocation, 1550–1779

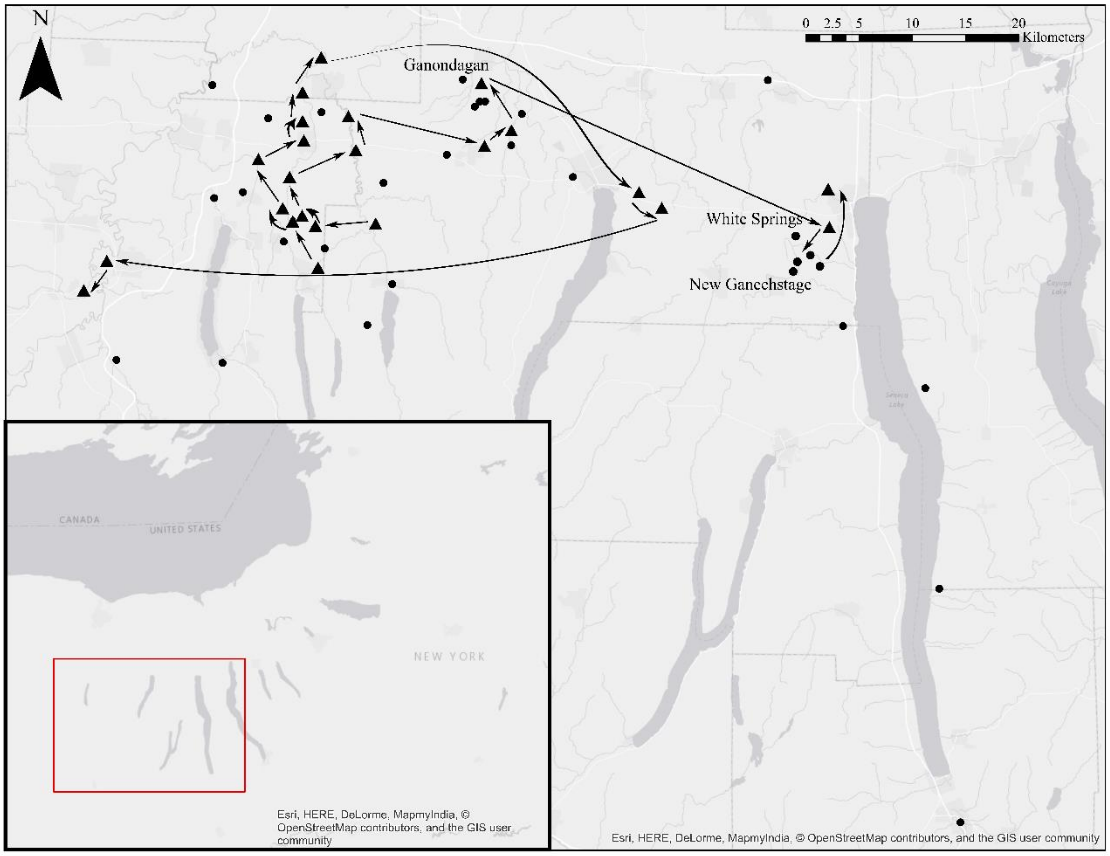

Figure 2. Seneca Site Sequence ca. 1550–1779. Principal settlements are represented by triangles and satellite communities and smaller neighborhoods are represented by circles.

Richmond Mills, Belcher, and Harscher (ca. 1550–1565); Adams and Culbertson (ca. 1565–1590)

The sequence of sites that can reliably be termed Seneca (Figure 2, Table 3) begins ca. 1550 between Conesus and Canandaigua lakes at the sites of Richmond Mills, Belcher, and Harscher. These sites are all relatively small compared to later ones, and appear to be population consolidations from earlier settlements in the area (Wray et al. 1987) as well as possibly people from the area around Cayuga Lake (Niemczycki 1984:37), and potentially other groups incorporated by force (Jordan

2010:92). There are very few European goods recovered from these sites through excavation of burials and surface survey, but a relatively high number of exotic materials acquired through Native trade networks; this indicates a relative lack of involvement in the nascent European trade but not an overall isolation (Jordan 2010). The early decade of occupation at these sites had slightly higher than average summer precipitation (Buckley et al. 2004:2551), which likely would have increased corn yields, depending on the timing and the distribution of that precipitation over the course of the summer (Shin et al. 2009).

Adams and Culbertson (to the west and east respectively) were the next two sites in the Seneca sequence. Both were considerably larger in both area and population than the preceding sites, likely reflecting further population consolidation (Jordan 2010:92–93; Vandrei 1987:10; Wray et al. 1987). These sites were both excavated and written up by researchers at the Rochester Museum and Science Center and their area and population estimates are somewhat more reliable that other sites investigated solely with surface survey. Excavations at both sites focused on burials; some additional domestic area excavations at Adams were carried out, revealing the presence of a defensive palisade surrounding the site.

Most of the information related to plant usage at Adams comes from burials, whether in the form of food offerings or other items buried with individuals. Basswood cordage was found in some burials, both as a cord for beads and for tying items together, substantiating ethnographic accounts of the usage of this tree (Wray et al. 1987:128). The plant remains recovered from the burials at Adams included red raspberry[55] (*Rubus strigosus* [dogwa'dä"në']), the seed and outer shell of

[55] In the later Tram and Cameron volume researchers report "current opinion holds that this species [*Rubus strigosus*] represents a European introduction and is therefore most likely erroneous" (Wray et al. 1991:144). I have left the identification as *Rubus strigosus* because a number of sources suggest that *Rubus strigosus* is in fact native to North America (Anderson and Bailey 1979; Oleskevich et al. 1996; Scarry 2003; United States Department of

squash/gourd (*Cucurbitaceae* family [onyöhsa’]), wild plum pit (*Prunus americana*, [gä:eh]), wild cherry pit (*Prunus* sp.)[56], hickory nut (*Carya sp*.), witch hazel seed (*Hamemelis virginiana*, [dagwa’syö:nih]), and a sprig of eastern white cedar (*Thuja occidentalis*, [deyoëdä’kwëhad:ha’t]). Information on plant and animal usage from burials at Culbertson is more minimal and includes red raspberry, squash, and hickory nuts from multiple burials, as well as bark containers and hammer and anvil stones (Wray et al. 1987:214).

Data from skeletal analysis provide more control on the population figures from this era as well as suggesting that ethnically diverse groups were incorporated into the population at Adams (Wray et al. 1987:243). Sempowski and Saunders (2001:675), based on Saunders’ Annual Mortality Rate calculations from mortuary data (Wray et al. 1987:24–25), find population estimates for Adams based on domestic area too high and suggest a number closer to 800–1000 people in residence, halving populations estimated by Vandrei (1987), and Jones (2008: Appendix A) and those calculated based on areas reported by Jordan (2010).

Martha Sempowski (1989) has also noted an increase in exotic marine shell on these sites from earlier periods, and Jordan (2010:93) stresses that although artifacts of European material origin were present at the site, they seem to have come indirectly by way of Susquehanna Valley trade networks and were “significantly altered by indigenous artisans.” While settlement location during this time might have been influenced by increasing populations, intensification of agriculture to provide for those

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Agriculture, Natural Resources Conservation Service 2003), despite similarities with European and Asian varietals, and different than Black raspberry (*Rubus occidentalis* L.) and blackberry (*Rubus allegheniensis* Porter x Bailey). The fact remains that it is difficult, due to local variation in plants even within a species, to identify seeds to a raspberry species based solely on the seeds without other botanical information.

[56] There are different words in Seneca for *Prunus serotina* [e:i’], *Prunus virginiana* [hanjök], *and Prunus pennsylvanica* [ganöjohgwanë’] and the RMSC report is only able to identify the pit to the family level.

increasing populations, and access to trade routes, it was not heavily impacted by European colonialism. The proximity of these two sites and their overlapping catchment areas (Vandrei 1987) also has implications for the distribution of the landscape modification created by the Seneca occupation at these two sites. This may have meant that the area between the two sites was used more intensely or its usage more contested; this was a spatial relationship that was not repeated at any later point in the sequence seemingly indicating an undesirable iteration of the Seneca settlement pattern.

Brisbane, Tram, Cameron (ca. 1580–1610)

The next eastern and western settlements occupied by the Seneca may be Brisbane and Tram, although Brisbane is not well understood. Wray (1983:42) originally identified Tram and Cameron as roughly contemporaneous, but reexamination suggests they were occupied sequentially by the eastern Seneca community and there was either no western community or it was considerably smaller and located at the unexcavated site of Brisbane (Sempowski and Saunders 2001:720). Burials and domestic areas were excavated at both Tram and Cameron, and Cameron was surrounded by a palisade, suggesting defensive concerns as well as implying greater labor and timber input into the site (Wray et al. 1991). Total cemetery population and village size data do not exist for the Tram site, but given Saunders' (1987) calculation of mortality rate and *known* dead, Wray et al. (1991:388) argue that a population of 800–1000 is reasonable. Jones' (2008) estimate of 1041 is also roughly comparable. Plant remains from Tram come entirely from excavation of burials, as at Adams and Culbertson, but present an idea of species in use during the occupation of the site. This includes raspberry (*Rubus* sp.), squash/gourd, charred corn, and Canadian plum (*Prunus nigra*). This is undoubtedly only a small sample, especially given the context of recovery, but there is clearly a mixture of grown and gathered plant resources (Wray et al. 1991:117, 144–145).

The assemblage of material excavated from burials at Cameron is relatively similar. *Rubus* sp. were the most commonly occurring plant remain in the burials excavated at Cameron (Wray et al. 1991:339). Wild strawberry (*Fragaria virginiana* [sesah]) was also recovered from burial, as were *Cucurbita* sp. seeds and rind, and one hickory nut and one acorn. Test excavations along the palisade at Cameron recovered charred corn, as well as beans (*Phaseolus* sp.) but neither of these were definitively identified in burial areas (Wray et al. 1991:341). Demographic evidence from the excavation of burials at Cameron showed high child/infant mortality that also indicates a disease episode sometime during occupation, whether European-borne or indigenous (Jordan 2010:94; Wray et al. 1991:386). Additionally, excavations of sections of the palisade line at Cameron indicate that the settlement expanded or contracted at some point during its relatively short occupation of potentially only 10 years, making population estimates for the entire occupation period somewhat difficult.

Interestingly, Buckley et al. (2004) posit summer precipitation below the decadal mean from 1599–1608, roughly coincident with the occupation of Cameron. Burial populations at both sites display signs of interpersonal violence (Wray et al. 1991:207–211). While the connection between drought or drier conditions and interpersonal violence has been explored more thoroughly in the American Southwest, due to both the severity of the resource shortages potentially caused by drought and the shock-factor of possible instances of cannibalism or execution of witches (Billman et al. 2000; Darling 1998; Lekson 2002), the shorter occupation of Cameron, combined with evidence for drier summer conditions and a severe disease episode, suggest that a few devastating events might have caused the community to relocate before local resources were depleted.

Dutch Hollow and Factory Hollow (ca. 1605–1625)

Following the short-lived Cameron site, the pattern of clearly paired eastern and western settlements resumes with Dutch Hollow and Factory Hollow, both un-palisaded. The location of Factory Hollow has long been noted for its natural defensibility, however, and it has been suggested through the years that this was sufficient for defensive purposes even without a palisade (Parker 1919). Some, but not all, of the graves associated with Dutch Hollow were excavated, over a period of years by a number of excavators, and no domestic context excavations were carried out (Sempowski and Saunders 2001:19–20). This means the burial data is not appropriate for applying Annual Mortality Rate calculations. Sempowski and Saunders (2001:676) propose the 'crude inference' that "we can presumably assume a minimum population of 800–1000 individuals (perhaps more for the case of Dutch Hollow) living in each of the large villages" during this time. Population estimates based on domestic areas of Dutch Hollow and Factory Hollow are significantly higher than Sempowski and Saunders' estimates. The smaller population estimates are based on population precedent from Adams as well as the disease episodes observed in burial populations.

Concurrent with the principal eastern and western communities' occupation of Dutch Hollow and Factory Hollow, there is evidence that non-local people from present-day Pennsylvania or Ohio occupied Fugle (1605–1625)[57] and there are other less-completely investigated satellite communities in the area. These less well-known sites could also be locations where non-local communities resided away from the principal Seneca communities, although this is a matter for further investigation (Sempowski and Saunders 2001:674–675). A burial from Fugle was found to contain a number of plant remains, including sunflower achenes, squash seeds, strawberry

[57] Vandrei (1987:10) uses the alternate spelling 'Feugle.'

seeds, and a plum pit (Bodner 1999:36).

The plant remains from Factory Hollow come from both the domestic area and the burials, although in many cases botanical remains were observed in the field but not collected in burial contexts and are thus difficult to confirm. The total assemblage contains *Rubus* sp. seeds, *Fragaria* sp. seeds, carbonized corn, cherry and wild plum pits, three squash remains—one identifiably *Cucurbita pepo* and one calabash (*Lagenaria siceraria*)—as well as two hickory nuts and two beans.

Lima, Warren, Bosley Mills, and Cornish (ca. 1626–1645)

The next two sites in the sequence, Lima[58] and Warren, occupied ca. 1626–1640, are not well investigated archaeologically. Lima is within the present-day town of Lima and is thus not particularly archaeologically accessible (Wray and Schoff 1953), and excavations at Warren have taken place only in burial areas, shedding little light on domestic space or community organization (Jones 2008:355). It is unclear how Vandrei arrives at a 10-acre (4.05 ha) site area for Lima, given the limitation on excavation or survey; Jones (2008:351–352) estimates the site area at 0.84 ha based on the locations of cemeteries discovered during construction and recorded by the Rochester Museum and Science Center as well as possible topographic constraints on the site area. Jones also justifies a small site size by assuming that the Western Seneca community lived concurrently in two relatively equally sized small settlements: Lima and Bosley Mills (2008:67). Bosley Mills was described as surrounded by an earthen embankment by nineteenth century observers, and may have been palisaded, although excavations were not complete enough to substantiate this possibility (Jones 2008:353)

Material culture from burials at Warren, as described by Wray (Wray and

[58] Parmenter (2010:282, 367) notes the Seneca place name of Skahasegao.

Schoff 1953:56; Wray 1983:43–44), indicates that community members participated in trade for glass beads as well as brass items, but continued to produce ceramic containers and pipes locally. Items related to food production include grinding stones, plum pits, gourd fragments, and unidentified seeds (Jones 2008:355). Jordan (2010) theorizes, based on data from other areas of Northern Iroquoia (Snow 1992; Warrick 2003) that epidemics of European disease might have reached Seneca territory by the 1620–1645 period, although Jones' (2010b:397–398) work on Onondaga and Oneida population levels suggests sometime between 1620 and as late as 1645–1650 for the first severe population decrease in the center of Haudenosaunee territory, and Saunders (1994) finds no archaeological evidence of Seneca population decline during this time. Jones and DeWitte have estimated Seneca population decrease due to disease was approximately 35%, in the early to mid-seventeenth century (Jones and DeWitte 2012: Table 2)[59]. The lower end of Vandrei's population estimate was used to calculate clearance around Lima. While there's strong evidence for other tribal areas that European diseases were affecting Haudenosaunee populations, given the lack of direct archaeological evidence for population decline in this period from Seneca sites (Saunders 1994:105), as well as the populations of the contemporaneous and previously occupied sites, Jones' population estimate of 700 seems overly low.

When burials at the eastern satellite community at Cornish were excavated in 1938 and 1939 (Hayes 1967a:94) the orientation of the majority of the burials suggested to scholars that this might also have been a settlement inhabited by non-Seneca allies or adoptees (Jordan 2010:96). Excavations in 1964 and 1965 also uncovered palisade lines (Hayes 1965a, 1966), providing the only firm archaeological evidence for a palisaded satellite settlement. Flotation was not part of the excavations

[59] This is based on Jones' other work, which uses site size estimates to more specifically identify two *separate* possible disease events which may have affected the eastern and western Seneca communities at different times (2010a:13–14).

at this site, but records show that some charred maize was recovered from pit features both inside and outside the palisade (Hayes 1967a:91) Parmenter calls Haudenosaunee activities at this time “an extraordinary geographic and scalar expansion of their military campaigns in search of adoptees to replenish their numbers and facilitate access to new spaces of resource procurement” (2010:41) as warfare and European diseases affected population levels.

Power House and Steele (ca. 1641–1655)

Power House[60] and Steele, along with apparently a single satellite community at Menzis, were the next Seneca community locations, occupied in the 1640–1660 period. At the principal settlements of Power House and Steele, *only* burials have been excavated, providing a limited window into daily life at these sites (Jones 2008). Up to this point in the sequence, the paired eastern and western settlements were at most 9 km apart; when the Seneca founded these settlements 17.6 km apart they set a new precedent for Seneca settlement patterning, one which was maintained until the middle of the eighteenth century (Jordan 2010:90–91). A RMSC excavation map (Somerville 2014:180 Figure 23) indicates a line of palisade posts was recovered along the western margin of the site. Jesuit documents record the destruction of a Seneca town by an Erie war party in 1654 (Thwaites 1959: 41:81 in Jordan 2010), and that this was a period when the Five Nations waged far-reaching warfare (Parmenter 2010:80), suggests defensibility would likely have been a concern. Parmenter (2010:369 n. 16) identifies Steele as probably Sononteeonon, “visited by Pierre Esprit Radisson in 1653” which suggests it might be the “‘village of Sonnonteohronnon Iroquois’ burned and abandoned at the ‘first approach’ of an Erie army in 1654.” Ryan and Dewbury (2010:5) intimate that Power House may have been the burned settlement given its

[60] Jones (2008) sometimes renders this site as ‘Powerhouse.’

more westerly location. The estimated end dates for both Power House and Steele roughly line up with the date of this attack, also indicating that the relocation of the eastern and/or western community may have been a response to violence from other indigenous groups and not a peaceful and planned depopulation.

Because of the nature of excavation on these sites, botanical remains are minimal. Plant remains of note recovered from Steele include: melon seeds (species not specified), corn cobs, turtle shell, and sunflower seeds (probably *Helianthus ambiguus* [awë'öhsa']) (Jones 2008:361). Melons were introduced to North America by Europeans and because of their particular characteristics, were integrated more easily into existing native food procurement strategies than other European crops. Melons have similar growing requirements to native squash and gourds and were taken up, by various routes of dispersal, across Eastern North America (Blake 1981; Newsom and Gahr 2011).

Dann and Marsh (ca. 1656–1675)

From Power House and Steele, the eastern and western communities relocated to the Dann[61] and Marsh[62] sites respectively, and occupied these locations for approximately twenty years between 1655 and 1675 CE. Increasing interaction between Seneca communities and Europeans during this period resulted in both changes in availability of materials and goods for the Seneca as well as a greater number of textual sources, penned by Europeans, which comment on some aspects of life in Seneca towns (Jordan 2010:97). There is a known eastern satellite community, made up of non-Seneca people, probably Huron of the Tahontaenrat Nation (JR 44:

[61] Jones uses Gandachioragou, the name known from Jesuit documents of 1669 (JR 54:121), instead of Dann, which comes from the name of one of the property owners where the site is located. Parmenter (2010:282) renders the place-name as Gandachiorágon from a 1672 Jesuit document (JR 56:59).
[62] Parmenter (2010:282) has the place name as Gandagan, Jones (2008:365–366) uses Gandagaro possibly confusing it with another, later site.

25-27; 52: 195-197, Sempowski and Saunders 2001:3), at Wheeler Station, and there may have been a western satellite community whose location has not been discovered (Jones 2008:363). The population estimate of 370 at Wheeler Station is based on Wentworth Greenhalgh and Galinée's estimates of 30 cabins at the site (Coyne 1903:20–39).

Excavations by Wray and Cameron at Dann revealed that the site was likely enclosed by an ovoid palisade (Somerville 2014:208, Figure 30), but the other archaeological knowledge about the site largely comes from excavation of burials and surface collection rather than excavation of domestic spaces (Ryan and Dewbury 2010). Documentary records as well as excavation and collection suggest that Dann was home to non-Seneca people producing non-local pottery wares (Wray and Schoff 1953:58) and possibly refugee populations from a site on the Niagara frontier that was burned by the Cat Nation (Ryan and Dewbury 2010:5). Dann was also the likely location of the Jesuit mission, probably more appropriately termed 'chapel,' of La Conception[63] (Hamell 1980:96; Ryan and Dewbury 2010:8; Thwaites 1959), indicating the increase in at least temporary presence of Europeans in Seneca territory at this time.

The large collection of gun parts found at Dann, in both burials and through surface collection (Puype 1985) also highlights the military and defensive concerns during the occupation of the site, as well as the increasing trade connections with Europeans which provided firearms as well as the means to maintain and repair them. Although there is very little information about plant materials potentially recovered from the site, an iron hoe was noted (Jones 2008:364), indicating that European tools were being used to assist Seneca food procurement at this time. Bodner (1999:36)

[63] Jones discusses La Conception as a separate site that has not yet been located archaeologically, possibly the unknown western satellite community (2008:364).

identified two sunflower achenes in the collections from Dann, only one of which had contextual information noting that it was recovered from "the burial of a small child or infant."

Population numbers for this site are approximations because domestic area calculations range from 16.5 acres (or 6.68 ha) based on Wray's excavation map (Ryan and Dewbury 2010:11), to 12.5 acres (or 4.7 ha) based on Vandrei's (1987) calculations. This results in a range of population estimates for the site. Population at Dann can also be estimated based on European counts of Haudenosaunee warriors. I have used a larger population estimate for this site because even at the smaller areal estimate it is the largest site to this point in the Western Seneca sequence. Additionally, the Seneca Nation seems to have been taking in both refugees and captives during Dann's occupation, and the population of the Five Nations was increasing overall leading up to 1670 (Parmenter 2010:291; Snow 1994:110).

Excavations at Marsh also focused on burials (Jones 2008:366), although documentary records do provide some information about the area and layout of the domestic space at the site. Marsh[64] is described by Galinée as "in the midst of a large clearing about two leagues in circumference" (Coyne 1903:23) and the terrain around the site is described as a mixture of grassy meadows and oak plains (Coyne 1903:25).

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[64] Scholars have disagreed about whether Galinée's account of the easternmost Seneca town in 1669 refers to Ganondagan or to Marsh. The site is described as located on a small hill, surrounded by a "perfectly square" … "palisade of poles 12 of 13 feet high, fastened together at the top and planted in the ground" (Coyne 1903:23). Ganondagan is located on relatively flat ground, while Marsh is located on a slight rise. Additionally, excavation at Ganondagan never revealed any evidence of a palisade surrounding the site. Even if it was palisaded in 1669 and that palisade was disassembled later, that would mean the palisade was only in place for 8 years, since Greenhalgh did not observe a palisade at Ganondagan in 1677 (Greenhalgh 1849). Galinée's account also notes that while they were waiting, two Seneca men brought him and La Salle to a burning spring, four leagues (*lieue ancienne*, equivalent to 3.257 km (Cardarelli 2012:79)) south of the town. Given the placement of Marsh near the banks of Mud Creek, the same waterway which feeds into the burning spring area, and that the straight-line distance from Ganondagan to the same area is greater than four leagues, not accounting for terrain and non-linear travel, Marsh is more likely the settlement from which they set out.

Interestingly, Marsh is described as being surrounded by a straight-walled palisade (Coyne 1903:20–39), in contrast to the ovoid palisade which apparently existed at Dann at the same time. Marsh also hosted Jesuits at the mission of St. Jacques (Jones 2008:365; Parmenter 2010:282, 369 n18), which may have lacked a chapel. Jordan (2010) does not provide a size estimate for Marsh, and Vandrei (1987) provides what seems like a very rough estimate of 15 acres (or 6 ha). Jones (2008:365) comes up with a population estimate of 1,852 people based on warrior counts, which also squares with Galinée's estimate of 150 houses at Marsh (Parmenter 2010:369 n. 18). Any information about botanical remains from Marsh is also decidedly slim—RMSC files note the presence of gourd rattles and berry seeds (Jones 2008:366) and Bodner (1999:36) identified sunflower achenes likely from an adult burial.

Rochester Junction and Ganondagan (ca. 1675–1687)

The northward trajectory[65] of the paired communities continued ca. 1675 with relocations to Rochester Junction[66] and Ganondagan[67]. During this period there was increasing Haudenosaunee settlement and hunting activity in the areas around Lake Ontario as people took advantage of opportunities in the St. Lawrence River Valley and an easing of relations with Algonquian groups (Parmenter 2010: Chapter 4). In the west, Rochester Junction was associated with the satellite site of Kirkwood[68], and in the east Cherry Street, Bunce, and Beale were occupied for varying duration in the area around Ganondagan (Jordan 2010:91, also see Table x). Cherry Street is the suspected location of the Huron community that relocated to Seneca Territory in the

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[65] Although Hasenstab (1996b:22) argues that the most consistent shift in settlements is eastward, rather than northward.
[66] Totiakton in Jones (2008) and Tiottohatton, Tegarondies, or Totiakton in various historic documents assessed by Parmenter (2010: 282).
[67] Ganondagan is the name of the current State Historic Site and the Seneca's own name for this town. In earlier publications it has also been called Gannagaro and Boughton Hill.
[68] Also called Keint:he (Jones 2008, Parmenter 2010: 282).

1650–1670 period, first located at Wheeler Station (Jordan 2010:97; Sempowski and Saunders 2001:675). This is a good reminder that even at sites in Seneca territory there may be significant variability in the identity of both the collective communities and individual occupants of these sites.

Documented excavations have not been carried out in the domestic areas of Rochester Junction; only burial areas have been collected and excavated. Because of this, and the uncertainty of estimating site size from surface scatter of artifacts distributed by modern agriculture, Jones' population estimate of 1482 people for Rochester Junction is largely based on New York official Wentworth Greenhalgh's 1677 observations of 120 houses at the site as well as the total number of Seneca warriors at this time (1000) (Greenhalgh 1849). Greenhalgh was sent to Haudenosaunee territory to curry favor for an alliance, and directly observed the towns and populations of the Five Nations (Jordan 2008:50; Snow et al. 1996). His observation, presumably of Rochester Junction, that it "lyes on the brincke or edge of a hill" and "has not much cleared ground" (Greenhalgh 1849:13) likely also reflects the gradual clearance of the territory around Seneca settlements, given the estimated 1676 start date of the community's occupation at that location. The previously-explained relationship between warrior counts and total population puts the entire Seneca population at 4000 people during this time period, and Jones (2008:64) and Jordan (2008) use this number to calculate site-specific populations based on the number of longhouses present at each, even in the absence of well-documented domestic context excavations.

Ganondagan is currently a State Historic Site and has been thoroughly investigated compared to other sites from this period. The thorough documentation and contextual information about this site makes it an excellent place to begin a more detailed diachronic study of Seneca landscape use, which I do through the analysis of archaeological materials discussed in the next chapter. Although it attracted collectors and avocational archaeologists for years, there were no coherent excavation or survey efforts prior to the 1970s, and the 17th century burials held the major interest for both looters and academics (Dean 1986). In 1976–77 the Rochester Museum and Science Center (RMSC) laid in a total of 680 ft^2 (63 m^2) of test units across the site. While they found substantial evidence for the 17th century occupation at the site, they located only one post mold and no other subsurface features (Dean 1986:12). Geophysical survey (Bevan 1982; 1983) and systematic excavation (Dean 1984) from 1982-1984 exposed numerous features and artifacts[69]. Features were found in all the initial trenches, however Trench 4 (Figure 3) was expanded because features in this area had been protected from plowing by a hedgerow.

An expansion exposed posts delineating a short longhouse floor plan with three hearths, five storage pits, and seven additional exterior basin-shaped pits (Dean 1986:13). This is the area from which my macrobotanical subsample is drawn. Because the domestic area of Ganondagan is more completely known, scholars (Jones 2008; Jordan 2008; Snow and Starna 1989) have been able to show that the method of warrior and cabin counts for calculating population is commensurate with the population estimates based on area that have been used for earlier and less well-documented sites in the Seneca sequence.

[69] A total of 1525 ft^2 (or 141.7 m^2) was excavated as part of these initial efforts. Further test excavations based on magnetometry data (five 5 x 5 ft. units) were carried out in 1984, with inconclusive results, and I have not included these materials in my study.

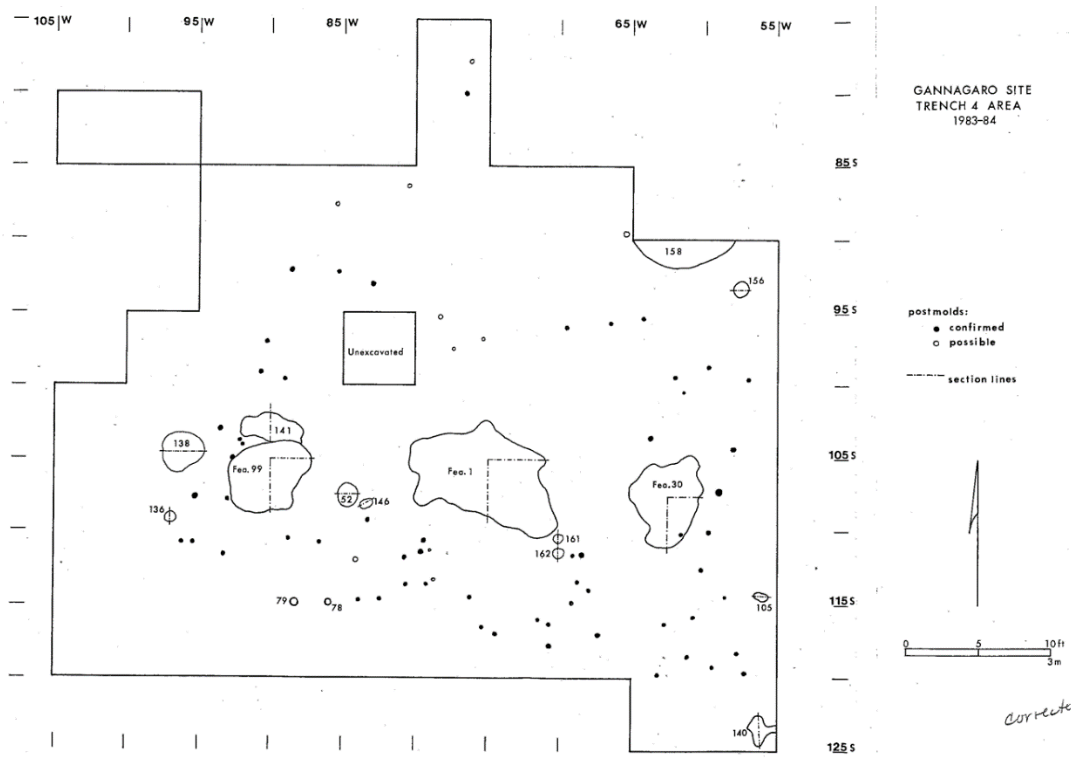

Figure 3. Plan map of Ganondagan Trench 4, from Dean 1984.

Jordan (2008:51) makes a case that the post-1680 Senecas were significantly involved in far-ranging conflicts with other Native groups as well as the French, who had been supporting Haudenosaunee enemies (Aquila 1983; Brandão 1997; Richter 1992). The ongoing military efforts in which the Seneca were involved, as well as the increasing tension between English and French colonial efforts, entangled Seneca and colonial affairs. In 1684, the Seneca built a fortification on a hilltop 1.8 km from the site of Ganondagan[70] based on reports of a coming French attack (Brodhead 1855a:254, 261). Fort Hill, as the site is now known, apparently never held any domestic structures, but may have been prepared as a possible new settlement location.

[70] A French source identifies Fort Hill as "a distant retreat in the depths of the forest," which over-states its remoteness from other Seneca settlements but is revealing about how the French perceived the Seneca homeland (Brodhead 1855a:254).

The increasing entanglement of Seneca and colonial affairs was coupled with the increasingly wide distribution of Haudenosaunee settlements across a greater area than in the sixteenth or even early seventeenth century, even as the principal Seneca sequence remained situated within the same two river drainages the communities had occupied for over one hundred years (Jordan 2013d; Parmenter 2010).

In 1687, a French-led force commanded by the Marquis de Denonville and made up of French regular troops, Canadian militia, and Native allies of the French, traveled to Seneca territory from Montréal with the purpose of destroying Seneca towns and food stores (Parmenter 2010:190) to teach "the most insolent" member of the Five Nations a lesson (O'Callaghan 1849:196). The Seneca were warned of Denonville's approach and many of the Seneca women and children left for the relative safety of Cayuga territory before the French closed in, although five Seneca women were said to have stayed at the town (Brodhead 1853:447; Parmenter 2010:193). The occupants of Ganondagan burned the town before the French military forces arrived, escaping with relatively minor casualties but a very significant loss of agricultural supplies. Denonville's forces also directly or indirectly caused the destruction of the Beal, Rochester Junction, and Kirkwood before heading back to Montréal around the west side of Lake Ontario. The French also destroyed the unoccupied site of Fort Hill, which was noted by the expedition in 1687 as lacking any domestic structures but possessing a palisade and food stores (Barber 1964).

Snyder-McClure and White Springs (1688–1715)

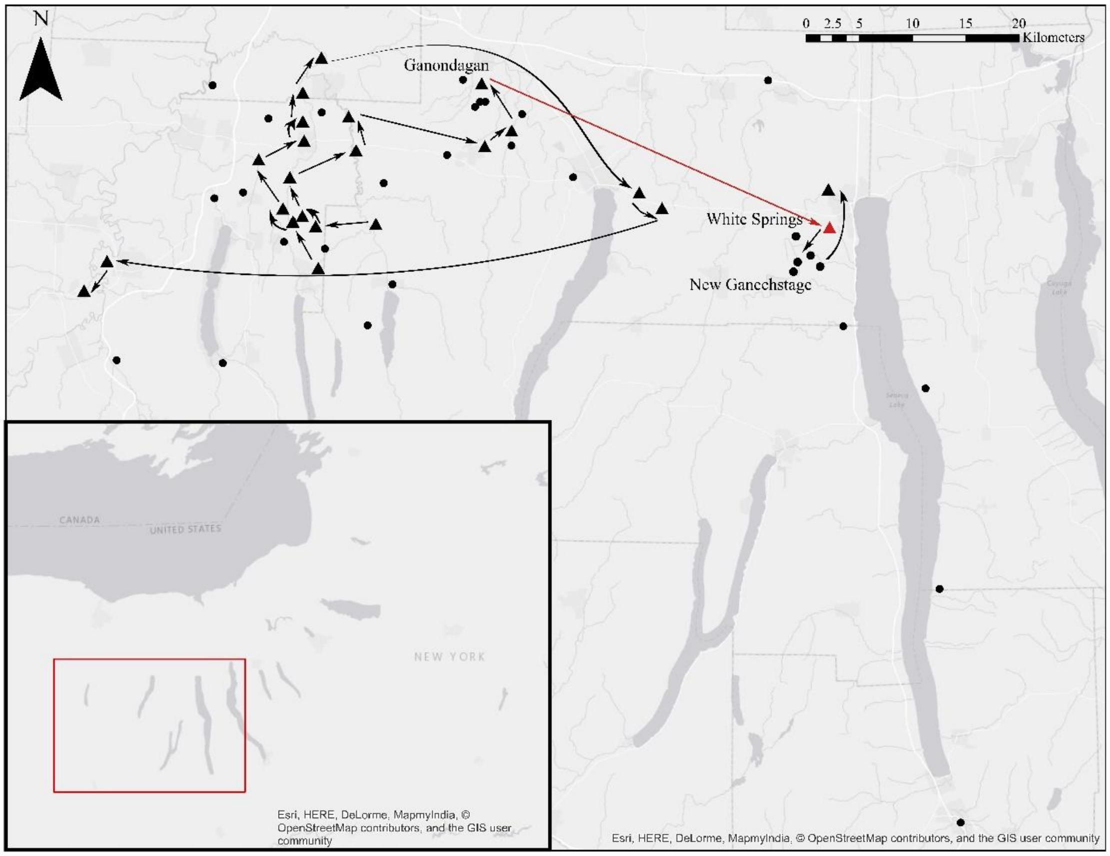

Figure 4. Seneca site sequence ca. 1550–1779. The move from Ganondagan to White Springs is highlighted in red.

Although the loss of human life was minimized for the Seneca communities in Denonville's 1687 attack by forewarning and skillful response, they were forced to relocate an unprecedented distance without the usual preparations. The next two sites occupied by the western and eastern communities, beginning in 1688, were Snyder-McClure and White Springs. White Springs is 35 km southeast of Ganondagan and Snyder-McClure is approximately 32 km southeast of Rochester Junction, both much greater distances than the relatively short (under five kilometer) moves communities had been making in the Spring Brook, Honeoye Creek, and Mud Creek drainages between Canandaigua and Conesus Lakes.

Snyder McClure has been very minimally investigated archaeologically, other than removal of burials, again limiting our knowledge of the domestic area of the site (Jordan 2008:174). Jordan (2010) estimates the site size at 2 ha, and based on an estimate for 12 m^2/person (Snow 1996; Snow and Starna 1989), the resulting population is approximately1,666. I applied this ratio due to the crowding that likely occurred as populations coalesced and moved after French-led forces attacked the Seneca settlements to the west and forced contraction into two principal sites with no known satellites. Kendaia, an outlying semi-dispersed community, may have been settled beginning in circa 1705, but its location across Seneca Lake from White Springs means that it was not in easy communication with or necessarily reliant on the principal community at White Springs in the way that was common for satellite communities from earlier eras (Jordan 2004a, 2008, 2009a, 2010).

Although analysis of the archaeological materials recovered from White Springs is ongoing, it is one of the most thoroughly examined nucleated sites in the Seneca sequence in terms of its domestic area. It is situated on a ridge on the west shore of Seneca Lake near a reliable spring, is defensibly placed, and presents a unique location for examining Seneca reactions to hardship created by colonial interactions. White Springs—like Ganondagan and many other Iroquoian sites in the region—has been subject to looting and collecting as well as more professional archaeological investigations (Trubowitz 1976). Dr. Kurt Jordan of Cornell University directed excavations at the White Springs Site from 2007 to 2015; I am currently co-director and have been part of the project since 2009. More than 150 m^2 total area has been excavated, largely in 1 x 1m units but also in two large trenches. We also dug 139 shovel tests, and 0.3 ha of surface survey has been conducted in surrounding agricultural fields. Five hectares were surveyed with archaeogeophysical equipment between 2009 and 2011, in cooperation with Dr. Michael Rogers of Ithaca College. This provided us with a more complete understanding of the large-scale landscape features, the site size, and the extent to which the site had been impacted by nineteenth and twentieth century agriculture and landscape modification (Gerard-Little 2011; Gerard-Little et al. 2012, 2016). This archaeological investigation is complemented by the contextualization of the site within a sequence of community relocations and landscape modifications.

In the summers of 2014 and 2015 I also directed a crew of 8 people in 1.4 ha of non-collecting pedestrian surface survey over agricultural fields to the south of the core of the White Springs settlement area. This survey was designed to gather data about the Seneca use of space outside the main domestic area, in what would have likely been clearance and agricultural fields. In areas that at the time were covered by newly planted apple orchards, each person was responsible for the area between freshly planted tree rows and in non-planted areas, surveyors were placed 1.5 meters apart. Increased orchard plantings between 2014 and 2015 resulted in slightly different orientations of survey transects because they constrained the path of pedestrian survey. We did not collect artifacts during survey due to the possibility of Seneca-era burials to the south of the site, but each find was marked with a flag and then recorded using a handheld Garmin Oregon 650 handheld GPS. This model of GPS is generally accurate to three meters within the United States. Artifacts clearly from later agricultural activity (beer bottles, drainage tile, etc.) were not logged. Results are reported in the next section.

Huntoon and New Ganechstage (ca. 1710–1754)

Ultimately, White Springs was peaceably depopulated after approximately 27 years and the eastern Seneca community moved to the dispersed site complex at New Ganechstage where households were scattered along low-lying land adjacent to a small waterway (Jordan 2008). To the west, the community at Snyder-McClure relocated to the site of Huntoon, which is poorly understood archaeologically, but has spatially similar small groupings of burials to New Ganechstage, suggesting it may also have been a dispersed settlement. Although we have no population estimates for Huntoon based on archaeological data, given the population at the immediately preceding Snyder-McClure and White Springs sites, it is likely that Huntoon was larger than New Ganechstage, if not as large as White Springs. Although it is difficult to provide a population estimate based on such sparse information, I used a potentially high estimate of 1200 people, based on the average principal settlement population across time of 1400 people and the likelihood that Huntoon was a dispersed rather than nucleated settlement with a lower population overall, commensurate with the total population of the various neighborhoods of New Ganechstage.

The unique configuration of New Ganechstage as neighborhood groupings of short longhouses (Jordan 2003, 2004a, 2008) has interesting implications for the arrangement of domestic and agricultural space, as well as the overlap and configuration of site catchment areas. This settlement was dispersed, and rather than being situated on defensible high ground was scattered along a stream course where people had easy access to their fields and a regular water source. Townley-Read was also occupied for an unprecedented 39 years, reflecting both the relative political peace the Senecas enjoyed during this time as well as landscape use that allowed them to remain in place longer.

As with many other sites in the sequence, avocational and hobbyist archaeologists had made collections at Townley-Read throughout the twentieth century. Excavations at Townley-Read took place between 1996 and 2000, directed by Jordan, and were written up in his 2008 monograph *The Seneca Restoration 1715–1754: A Local Political Economy*. Investigation of the site using geophysical techniques, soil core survey, 6.5 ha of surface survey, and shovel test and test unit excavations (Jordan 2004b, 2008:124–125) located and explored four domestic refuse clusters (DRC). DRC 1 was the most completely excavated of the four, through a combination of shovel tests, 1x1 m test units, and eventually plowzone stripping of a 14 x 43 m area. This revealed the plan of a short longhouse and the surrounding area, including 71 possible post molds (33 of which were excavated), a large outdoor firepit, smaller basin shaped pits, and two "repeatedly used, special purpose hearths" located away from the structure (Jordan 2008:144). Excavations in DRC 2 were less extensive, however they did reveal a definite informal hearth as well as two other definite Seneca-era features of unclear function (Jordan 2008:147). Domestic refuse cluster three was identified as a buried midden from the Seneca occupation of the site that had been plowed after the introduction of Euroamerican agriculture. Two features were uncovered in the subsoil beneath the plowed midden layer.

Based on Jordan's (2008:212) research, the population at each of the components or neighborhoods of this dispersed community was significantly lower than at White Springs, approximately 150–200 people at Townley-Read. Although not all the components of the site complex are well understood or have been archaeologically investigated, Jordan's work on Townley-Read provides an interpretive jumping off point and a means for estimating populations across the complex. It seems that in total there were fewer people settled in the complex—Jordan estimates that the Rupert component may have been similar to Townley-Read in size, but the others have not been investigated or well surveyed and rough estimates have been used for clearance calculations.

Plant remains from Jordan's excavations at Townley-Read include evidence that Seneca were growing maize, beans, and squash through extensive farming techniques as well as the use of gourds as containers (2008:214). No European domesticated crops were identified in the botanical assemblage from Townley-Read, although there were apparently apple and plum orchards present at the site, based on later documentary records (Jordan 2008:216). Earlier collections from Townley-Read recovered sunflower achenes preserved in a brass kettle (Bodner 1999:36).

Fall Brook and Kanadesaga (ca. 1742–1779)

The eastern community which had been living in dispersed fashion at New Ganechstage, relocated a short distance northward to Kanadesaga in 1754, and the western community moved significantly west to the Fall Brook site in the Genesee Valley in 1742, potentially to take advantage of French connections at Niagara (Jordan 2004a, 2010). These two sites potentially represent prioritization of different aims in the community's location selection, which will be discussed further in light of the GIS modeling of clearance around sites.

In the summer of 1779 an American expedition led by Major General John Sullivan and Brigadier General James Clinton carried out a campaign against Haudenosaunee nations that had allied with the British during the Revolutionary War. The goals were "the total destruction and devastation of their settlements and the capture of as many prisoners of every age and sex as possible" (Washington 1779). This military campaign "burned at least twenty-eight Seneca villages and their orchards and crops in the Finger Lakes and the Genesee, Chemung, and Allegheny Valleys," including these principal sites as well as numerous local and regional satellite villages in the Seneca homeland (Jordan 2010:104).

Modeling the Sequence

Esri's ArcGIS 10.2, a widely available GIS platform, was used for this study. The locations of the Seneca principal and satellite communities in Table 3 were taken from a variety of publications (Houghton 1912; Jordan 2008; Niemczycki 1988;

Parker 1910) as well as personal communications with Kurt Jordan (2014–2016). I then compiled all available credible area and population data for those sites to produce reasonable population estimates for each of these settlements, explained in the previous section. Based on population numbers, the estimate of ten to twenty cords of wood per family per year, and ten to twenty cords of wood present on an acre of land, I calculated the approximate area that would have been cleared of trees around each site, given the population size and the duration of their occupation. I used the 'buffer' function of ArcMap to visualize the resulting clearance area as circles with the domestic area of each site as a midpoint.

Table 3 presents the data used for estimating the end-of-occupation clearance around the principal and satellite communities in the Seneca sequence, beginning in 1550. On its own, this is useful and interesting information. Incorporating this spatially based data into a GIS framework, however, allows for a more complete visualization of the landscape of these sites through time, and gives us a better idea of what Gillings (2012:606) calls 'relational affordances': "features of whole situations" in which the combination of the abilities of the people and the features of the situation allow for certain possibilities. In this case, a GIS model will not tell us exactly why Seneca people placed sites exactly as they did, but will provide insight into the conditions and parameters of situations Seneca people faced and patterns of change over time. The additional information about the social and economic elements tied to landscape allows for the analytic incorporation of agro-ecological constraints in a non-deterministic way (Stone 1996).

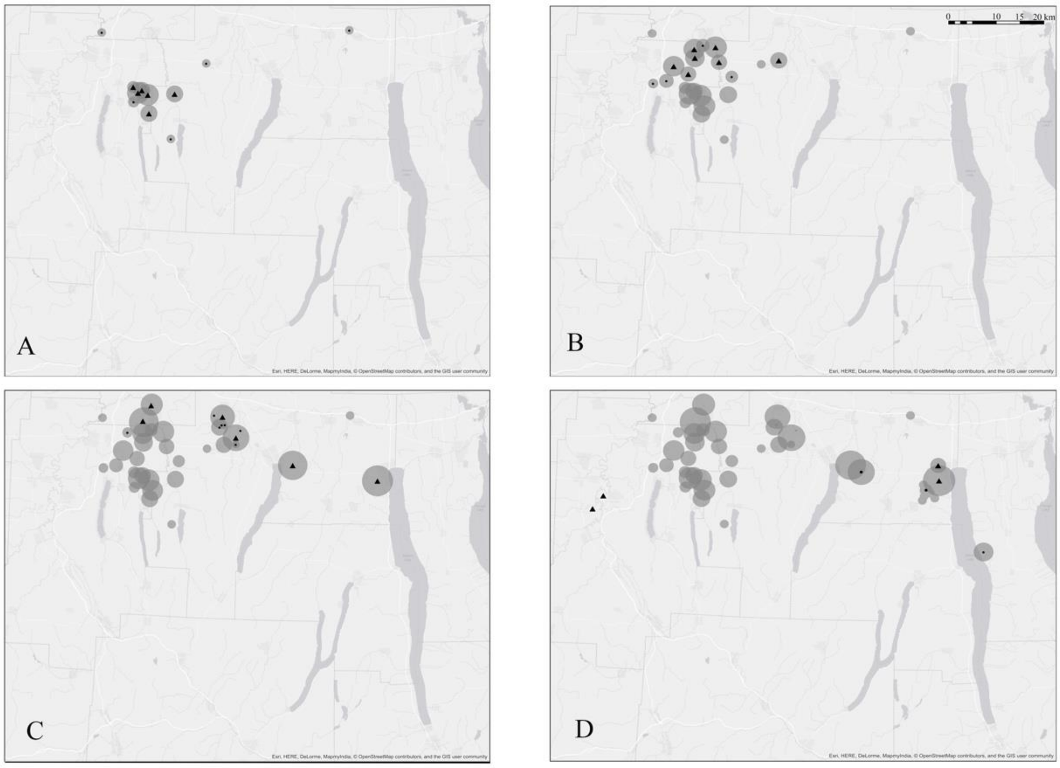

Figure 5. Progression of clearance in Seneca territory ca. 1550–1779 (A. 1550–1600; B. 1601–1650 C. 1651–1700; D. 1701–1779).

Figure 5 shows the progression of clearance in Seneca territory and the gradual expansion of an anthropogenic niche to the west of Canandaigua Lake. In all the snapshots, I have used circles to depict the cleared area. In a given period, settlements which were occupied are marked by triangles for large principal towns and circles for small and satellite villages. The Townley-Read component of the New Ganechstage site complex is also represented by a circle. Clearance from previously occupied sites remains gray on the map. This is intended to make clear that these images are *suggestions* for thinking about the landscape rather than precise representations of past conditions. Making the GIS model of cleared areas dependent on slope, presence of waterways, soil types, or some other variable gives a false impression of certainty, especially given the possible error in many of the variables discussed in the previous sections. I also do not take into account pre-1550 clearance; although there was village-level habitation in this region prior to that date, it was not at the scale of later sixteenth and seventeenth century sites.

While there is significant uncertainty built into the calculation of forest clearance, several methods provide checks on these calculations. Take, for example, the 1688–1715 CE White Springs site. This site was occupied after Denonville's forces attacked Ganondagan, 35 km to the northwest. The community destroyed Ganondagan in defense and relocated to White Springs, an unprepared location (red arrow, Figure 4). The violent impetus for leaving, combined with the unprecedented distance of the shift to White Springs, reveals the abruptness and unusual nature of the move (Jordan 2010:23). Over the course of 27 years at White Springs, the estimated 1800 inhabitants would have cleared approximately 36.3 km^2 for firewood, or a circular area with a radius of 3.27 km (Table 3). One confirmation of this number is a comparison of the area of clearance with an estimate of the agricultural acreage needed to support 2000 people given average family size (Snow and Starna 1989), calories from maize (Katzenberg et al. 1995), and maize productivity calculations (Schroeder 1999). Jones (2008:117) comes up with a maximum catchment radius of two kilometers for Iroquoian sites more generally. This is smaller than my calculations for firewood clearance, likely because this area exceeded clearance required for agricultural land by the end of a site's occupation. The relationship between cords of wood and acreage cleared in my model is predicated on clear-cutting and a relatively high density of wood per hectare; the area affected by the Seneca in less intense ways could have been larger still. The larger catchment for firewood is also more commensurate with ethnographic sources than Jones' two-kilometer radius.

Another check on the calculations is comparison with travelers' and soldiers' accounts from the eighteenth century. According to documents written by Sullivan-Clinton expedition members in 1779, there was still a cleared area 6–8 km across at

Huntoon, a principal Seneca site likely occupied ca. 1710 to 1745 (Conover 1887:90, 160; Jordan 2008:216), 35 years after its ‘abandonment’. Although we have no population estimates for Huntoon based on archaeological data, the estimated population of 1200 people based on preceding sites suggests that the clearance estimates for the more populous White Springs are generally accurate, and potentially slightly low. The fact that Sullivan-Clinton expedition members observed a large cleared area at Huntoon considerably after its use as a central town also speaks to a lasting Seneca impact on the territory local to their settlements. At several other 18th century sites (such as Kendaia and Kanadesaga) encountered by the Sullivan-Clinton expedition, soldiers note the necessity of dismantling Iroquois structures for firewood, indicating that there was none quickly or easily accessible in area around the settlements (Beatty 1887:29–32).

Non-collecting surface survey to the south of White Springs revealed little in the way of material remains of Seneca settlement except for a consistent scatter of fire-altered rock (Figure 6). Red stone and red slate, both unworked and worked, are slightly more common toward the north end of the survey area closest to the domestic space of White Springs, but are absent from locations further away from the domestic area. Nearly one kilometer away from the site however, we did discover two items clearly temporally consistent with the Seneca occupation of White Springs: a glass bead, fire altered chert, and red slate in close proximity to each other (Figure 6: Insets A and B). A piece of native pipe stem was also found relatively distant from the domestic precinct of the site. The lack of midden and other material in the intervening area between the settlement core and these outlying finds confirms that the occupation area of White Springs was confined to the 3.7 ha determined through other forms of investigation. The regular occurrence of fire-altered rock throughout this area also suggests that at some point burning took place outside of the settlement core, although this is much more difficult to tie to the Seneca-era due to the lack of temporally diagnostic artifacts and the nature of surface survey and multi-component sites. The location of the bead, red slate, and fire-altered chert could be consistent with an agricultural field house, as discussed in Chapter Four and provides a suggestion of a little-explored aspect of Iroquoian sites.

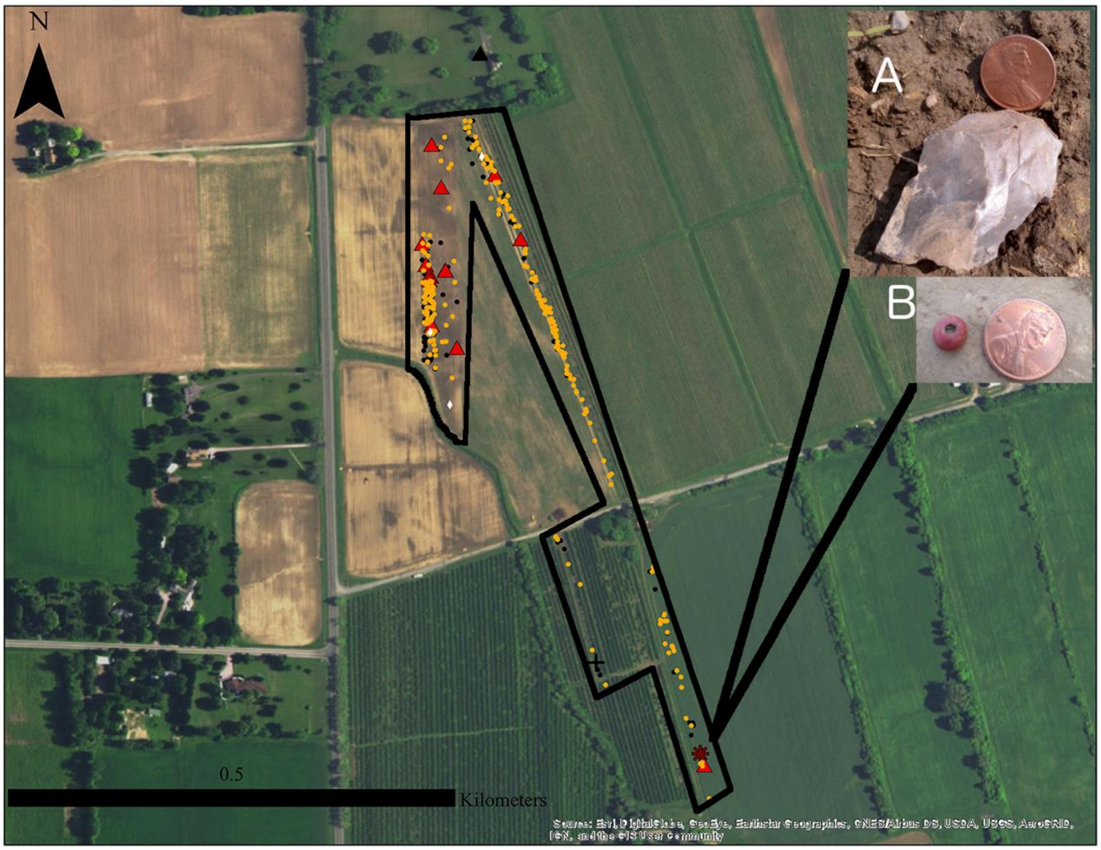

Figure 6. Surface survey finds south of White Springs, total area outlined in black. Orange dots represent fire-altered rock, black dots represent chert, red triangles are red slate or redstone, white diamonds are bone, the black cross indicates the location of the Native-made pipestem fragment, and the red star toward the bottom of the image represents the single bead found during survey.

Understanding the lasting impact of Haudenosaunee landscape practices is especially important in the context of the events of 1687. Not only did the French-led force attack and destroy the food stores and most of the standing crops at Ganondagan (Denonville 1848, 1849:239; Olds 1931; Parmenter 2010:194), when the community was forced to relocate to White Springs they left more than a single settlement. The estimation of cleared spaces around settlements to the west (Figure 7) can help conceptualize the intensely modified landscape Seneca people left when they moved eastward. When the eastern Seneca community settled at White Springs it seems the region had not been inhabited for nearly a century[71]. The hasty move would have precluded preparation of the site prior to the founding of White Springs and made the community's relocation that much more difficult.

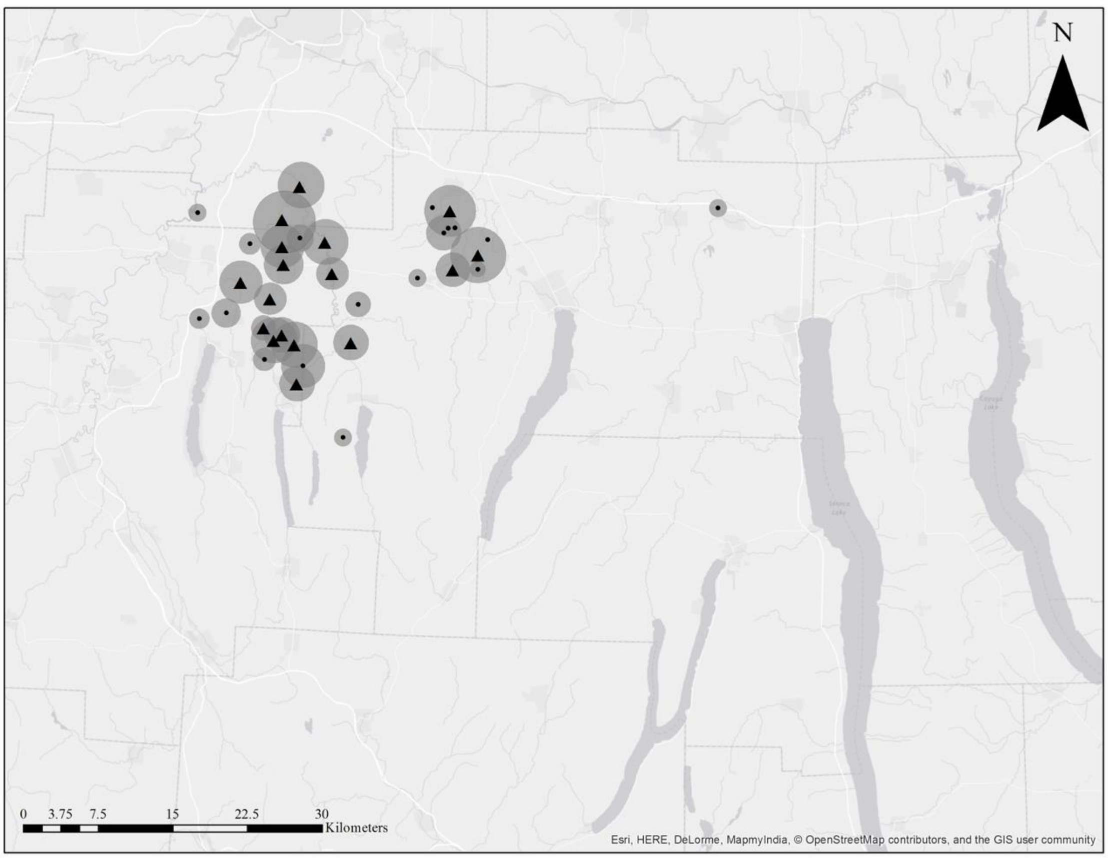

Figure 7. Clearance around Seneca Sites up to ca. 1687.

Moving forward then, White Springs must be interpreted with the

[71] Although Jordan's investigations at Townley-Read, a New Ganechstage component, did reveal some evidence of Precolumbian activity to the west of Seneca Lake, likely dating to ca. 1450–1550, possibly associated with the Woodley village site (Jordan 2008:125–126) the occupation gap was long enough for forests to have substantially regenerated by 1688.

understanding that the French not only destroyed the town of Ganondagan, but in forcing a move of this magnitude removed people from a wide range of landscape features including the cleared areas of former settlements, the rich ecotones at the transition between forest and clearing (Dennis 1993:35), the frequently visited graves of ancestors, and perhaps affected the balance of leadership within communities privileging the leadership concerned with outward movement and outward facing connections (Doxtator 1996). As we can see from an exploration of the full Seneca sequence, this is the first time that direct European military action forcefully impinged on the site selection and relocation processes of the Seneca communities[72]. While a difficult climatic regime during the occupation of Cameron and Tram may have contributed to difficulties and relocation, it is possible that European diseases affected the populations at Cameron and Warren, and settlement destruction had taken place before at Rochester Junction or Steele, the devastation of all major Seneca settlements in 1687 represents a unique set of circumstances and hardships. The elimination of crops and seed stores, specifically, would likely have been a hardship for the Seneca community.

As discussed in Chapter Two, Haudenosaunee scholars assert that the leadership structure of their ancestral communities was theoretically spatially balanced between those concerned with the hinterland and external connections and those concerned with the domestic space within the clearing; these domains tended to be associated with male and female leadership, respectively (Doxtator 1996:71). A significant long distance move, under foreign duress, during a period of political instability in Haudenosaunee/European relations may have led to a significant reorientation of the leadership structure of the community, at least momentarily

[72] Twenty years prior the Mohawk experienced a similar French-forced destruction and abandonment of their principle settlements (Parmenter 2010:122–124), an event which would certainly have been a cautionary tale or perhaps a model for the Seneca.

prioritizing male royaner (clan chief) influence—the trees between the clearings (Doxtator 1996:86).

Ganondagan, and to an even a greater extent Rochester Junction, were situated within drainage systems which had been populated and familiar for probably the entire living memory of the communities. Their placement near waterways in these drainages would have facilitated access to these previously occupied sites for a suite of activities including, as discussed in Chapter 4, hunting, gathering, and visiting with ancestors who still resided in these places (Birch and Williamson 2015).

Even as we acknowledge the initial hardship of this move from Ganondagan to White Springs, it is also imperative to chart the resiliency of the Seneca people. When the community voluntarily moved from White Springs they relocated to New Ganechstage, of which Townley-Read was a component, and remained there for roughly 39 years. Figure 8 shows the cleared areas that could have surrounded the New Ganechstage site complex by the end of its use-life, as well as the area cleared around the preceding White Springs site. Again, the circles only roughly model the areas most likely heavily impacted, and the spaces between and around New Ganechstage and White Springs should not be assumed to be anything like 'virgin forest.'

The buffer of clear-cut areas around New Ganechstage visualized in GIS also agrees with a 1788 account by missionary Samuel Kirkland. In a description of journeying from Kanadesaga (ca. 1754–1779) to Canandaigua Lake, he mentions walking through four miles (6.4 km) of old field systems (Pilkington 1980:139 in Jordan 2008:215). Measuring the buffer area around New Ganechstage produces distances that range from 5 to 6.5 km—variable because of the distribution of the components. Again, correlation with travelers' accounts lends additional credence to these clearance calculations and makes evident that impacts were visible at least 35 years after the community had moved on.

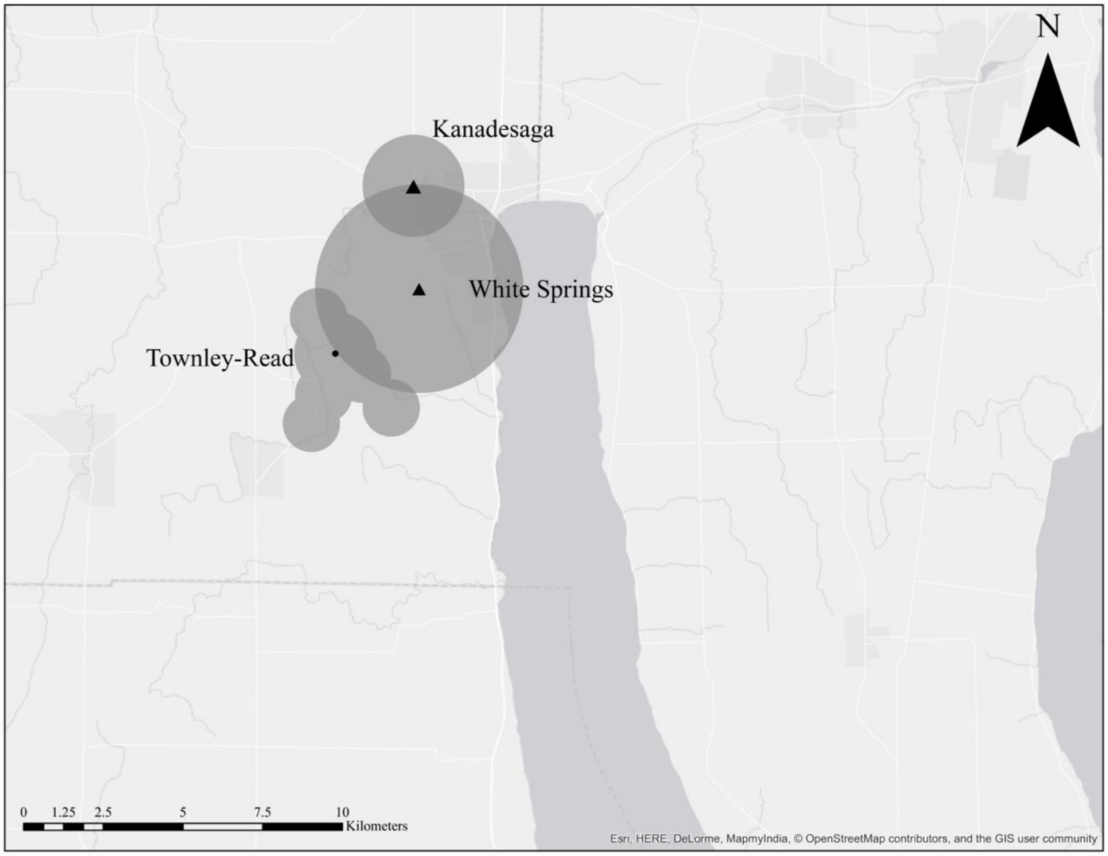

Figure 8. Modeled Clearance around White Springs, New Ganechstage (Townley-Read), and Kanadesaga, ca. 1779.

Figure 8 makes clear the necessity of understanding the space between the White Springs, New Ganechstage, and Kanadesaga sites as eminently passable and anthropogenically modified. These three successive community locations can then be conceived of (and mapped) not as separate sites emplaced on a terrain of resources, but components in a landscape that became increasingly familiar and filled with significance over time. As the temporal scope is expanded to include Kanadesaga (the principal site occupied following New Ganechstage) the area along the north-west side of Seneca Lake begins to look more and more like a well-developed anthropogenic niche, a restoration of the one Senecas had been forced left to the west in 1687.

The contrasts between the eastern and western Seneca sequences after 1687 are also interesting to view at this scale. While the series of short-distance community relocations on the west side of Seneca Lake can in some ways be viewed as a recreation of the familiarity with the landscape as well the types of places the eastern community had access to on the west side of Canandaigua Lake, the relocation of the western community to the Genesee River circa 1742 may reflect different community priorities, both in terms of preferred political alliances and trade relationships and in landscape practices and lifeways. While the location of Fall Brook and Genesee Castle are closer to some of the earliest sites in the Seneca sequence, they remain quite distant from the northern portion which was occupied more recently and might have provided access to resources typically available on or around recently cleared land.

Discussion

This examination is merely the first step in a larger process. Understanding the ways that Seneca settlement movement and agriculture modified the landscape provides an entrée into thinking in a multi-scalar way about sites, site interactions, and continued relations with landscapes. These landscapes were not only vessels for resources, but were comprised of former homes, places where family members and ancestors are buried, current hunting grounds, as well as locales tied to origin stories and the deep past. Oneida scholar Deborah Doxtator (1996) notes that in Rotinonhsyonni (Haudenosaunee) thought the clearing is the focus of both inward and outward movement as well as a key component of individual identity. The landscape then, might be considered as a series of centers connected by filaments of memory, ongoing practice, and affective connections to place. GIS, when used cautiously and explicitly, can powerfully illustrate some of these ideas (or at least push in the right direction). Integrating anthropological approaches to landscape studies and a focus on datasets that may have been overlooked in the past because of their indirect importance to the core of domestic settlements provides a path toward a more complex understanding of Seneca relationships with landscapes across time and space. Significantly, it also provides a context for the finer-grained examination of archaeological material from three sites where landscape practices and lifeways are likely to have been substantially different: Ganondagan, White Springs, and Townley Read, the sites discussed in detail in the remainder of this dissertation.

CHAPTER 6

CHARCOAL METHODS AND DATA COLLECTION

In Chapter Five I situated the Seneca sites of Ganondagan (ca. 1670–1687), White Springs (ca. 1688–1715), and Townley-Read (ca. 1715–1754) within the sequence of Seneca settlements occupied between 1550 and 1779, as well as the ways Seneca relocations may have been influenced by climate, disease, resource depletion, and the political and economic repercussions of European colonialism through time. These three sites, occupied by the same Eastern Seneca community, have all been excavated with well-documented archaeological procedures that collected and preserved organic materials. As a series, they span what historian Richard Aquila (1983:43) has termed the Twenty Years' War (1680–1700)—conflict between the Iroquois and western native groups, along with their French allies— and the period of relative peace that followed the signing of the Grand Treaty in Montréal in 1701. Because of their exceptional historical position, these three sites provide a unique window into the changes and continuities in Seneca landscape practices as revealed by the examination of macrobotanical remains, particularly charred wood.

In this chapter I explain the ways in which charred wood can provide information on forest composition and its change in response to human practices, choices and decisions made by Seneca people with respect to building materials, firewood for different purposes, and several other practices which involve fire and foodways. First I lay out the justifications for examining wood charcoal, both generally for archaeology, and specifically for the Haudenosaunee context. I then describe the methodology of my study of wood charcoal for each of the three sites, particularly as they differ slightly in their scope of excavation and states of analysis. Finally, I present the data on the recovered charred wood by site, as well as across single feature classes. A discussion of these data is presented in the next chapter.

Charcoal Analysis

Anthracology, or charcoal analysis, has considerable methodological and theoretical overlap with the fields of paleoecology, dendrology, and archaeobotany. While pedoanthracology fits more comfortably with the domain of soil sciences and is concerned with 'natural' charcoal deposits, archaeoanthracology specifically deals with anthropogenically created charcoal deposits, usually by examining materials recovered from archaeological sites. Here I use 'charcoal analysis' rather than 'anthracology,' as the latter term has not been used commonly except by European/French practitioners (Scott and Damblon 2010). Charcoal analysis methodologies and techniques developed in the mid twentieth century, as microscope technology improved researchers' ability to quickly and methodically identify charcoal samples. Although charcoal does not retain all the identifiable features of fresh wood, the combination of radial and transverse sections and past tree distributions often allow specimens to be identified to the family or species group level due to the unique internal structures possessed by trees of different types (Rossen and Olson 1985; Scott 2010).

French researchers (e.g. Chabal 1992; Théry-Parisot 2002; Théry-Parisot et al. 2010; Thiébault 2002; Vernet 1999) have largely been responsible for creating a systematic framework for collecting and analyzing representative samples of charcoal from archaeological sites, a process which has also coincided with the rise of archaeobotanical work and the integration of flotation sampling into common archaeological practice (Hart 1999b). How many charcoal fragments from a feature or stratigraphic layer need to be identified depends on the intended purpose of the analysis, type of site and setting, and varies by individual practitioners. For paleoenvironmental analysis, researchers maintain that 250–400 fragments of charcoal from each stratigraphic layer should be identified, and when possible the emphasis should be on the greater than 4mm size fraction (Asouti and Austin 2005; Théry-Parisot et al. 2010). Early anthracological interest was focused on paleo-forest reconstruction; the collection of a *representative* sample, one which could promise to eliminate or reduce the problem of anthropogenic selection and filtering, was critical to the undertaking. These researchers were largely working in pre-agricultural contexts in which anthropogenic influence on forest communities was less extensive, so the aim was to collect samples which represented more than a single activity.

The last ten years have also brought increased attention to the ways charcoal may be affected by taphonomic processes on archaeological sites (Théry-Parisot et al. 2010). Théry-Parisot and colleagues take a broad view of taphonomy—any steps in the progression from a branch or tree to charcoal recovered by an archaeologist are included under this rubric. Initial wood selection, burning temperature (Scott and Damblon 2010:4), deposition, and numerous post-depositional processes both natural and cultural (Schiffer and Rathje 1973) all shape the charcoal sample recovered archaeologically. The length of occupation of a site, the amount of material allowed to accumulate in certain features, and the use of wood for particular purposes such as fuel or building material are all important considerations (Bernard and Thibadieu 2002). In addition, post-depositional processes such as bioturbation and decay of wood charcoal due to soil alkalinity may figure into analysis at a given site (Braadbaart et al. 2009).

Although there has been considerable debate within the field about the utility of archaeological charcoal samples for reconstructing paleo-forest composition (Asouti and Austin 2005; Chabal 1992; Fiorentino and Magri 2008) it is widely accepted that charcoal from secure archaeological contexts represents some combination of human activities and local ecology. If the aim of analysis is to reconstruct the past human selection of wood at a site, at least 20 fragments from each sample should be identified (Johannessen and Hastorf 1990; Miller 1985) and a representative number of samples from across an occupation phase should be analyzed. Sampling strategies will differ depending on the goal of the research: single-purpose features such as hearths, pits, and post molds are better for understanding anthropogenic wood choice and use, while areas of long-term, multi-episode charcoal deposition across a single stratigraphic layer are more useful for reconstructing the surrounding environment. Samples of both types are available at White Springs and Townley-Read, although single-purpose features are more heavily represented in the materials from Ganondagan. Some studies have fruitfully combined information on relative frequencies of tree species from archaeological contexts and from palynological data (Dillon et al. 2008). These datasets complement each other because they represent different combinations of biases—ranging from human selection to high pollen production and dispersion.

There is potential for future pollen research around Ganondagan and Townley-Read. Soil cores were taken from just north of Ganondagan but have not yet been analyzed (Daniel Cadzow, personal communication 2016). Soil samples from the excavations at Ganondagan, specifically collected for palynology, are also stored at The Peebles Island facility, although no one has analyzed these materials. Additionally, Cornell undergraduate Daniela Salinas Abarca (2011) developed a senior honors thesis project based on an examination of charcoal from bog cores near the Seneca sites in the Geneva area. Although the cores she collected showed very low sedimentation rates and proved difficult to interpret with respect to more recent occupations of the area, as a proof of concept this study indicates that future research on the local paleoecology around Native sites in upstate New York has the potential to illuminate more recent history as well as examine a record extending 12,000 years into the past (Salinas Abarca 2011:30).

Especially in the case of hearths, firepits, and secondary refuse from fire-related features, charcoal is the remnant of domestic fuel consumption and associated procurement practices. People collecting firewood in the past chose the wood whose remnants are found in these contexts, whether because of proximity, availability, dryness, size, species, ease of collection, cultural preference, special use, or any number of other overlapping reasons. While the collection of firewood is often explicitly or implicitly approached from a utility perspective or from the principle of least effort (Rubiales et al. 2011; Shackleton and Prins 1992), others have attempted to move to behavioral ecology perspectives to approaches that incorporate cultural frameworks and human decision-making (Asouti and Austin 2005; Marston 2009). Picornell Gelabert et al. (2011) note that even as archaeologists have increasingly pursued questions of relationships between past societies and their environments, trees have received limited archaeological attention when compared to animals.

The interlocking processes of burning firewood, construction, agricultural clearance, and firewood collection (discussed in greater detail in Chapter Four) are reflected in wood charcoal assemblages and represent an “enduring category of landscape practice” that is directly tied to human perception of landscape and its affordances (Picornell Gelabert et al. 2011:375). Wood charcoal species identification from tightly recorded contexts can contribute information about firewood selection, preferred construction materials, and changing availability of tree species in the surrounding environs (Berger and Thiébault 2002; Carrion 2002; Jacobucci et al. 2007; Marguerie 2002; Piqué and Barcelo 2002). However, it is difficult to relate the amount of charcoal preserved and recovered archaeologically to the amount of wood burned, and as will be discussed in the case of specific features, understanding site formation processes is closely linked with an interpretation of charcoal from certain contexts (Smart and Hoffman 1988). It may however be possible to discern changing patterns in wood use and progressive clearance of forested area around a site given constraints of availability and the specific histories of the three sites, as laid out in the preceding chapter and explored further here.

Field Methods

Ganondagan

Ganondagan (called Boughton Hill at the time) was declared a National Historic Landmark on July 19, 1964, and was formally dedicated as a State Historic Site in 1987 (Hayes 1965b; Friends of Ganondagan 2016). As outlined in the last chapter, although various forms of investigation and collecting had been going on at the site prior to its inclusion on the register of Historic Landmarks, larger-scale, well-documented archaeological investigations were spurred at least in part by these designations. Test square excavations in 1976–77 were designed to determine the extent and area of concentration of Seneca domestic materials within the bounds of the State Historic Site, as well as the level of disturbance from Euroamerican agriculture, construction, and collecting and excavation (Hayes et al. 1978). One-foot by one-foot test squares (30.48 x 30.48 cm) were excavated in a systematic way across the presumed domestic area of the site, previously known from collecting and the activity of avocational archaeologists. Artifacts were recovered through troweling and screening was only used "when the retrieval validity of troweling was questioned" (Hayes et al. 1978:26). I did not examine any of this material because charcoal largely went un-collected due to the nature of artifact recovery and because only one feature was discovered in the excavation of 680 tests (Dean 1984:7). Due to these factors, macrobotanical remains from securely Seneca contexts were lacking from this phase of the investigation.

The next excavations were fairly limited and were carried out in 1982 specifically to test anomalies identified by a geophysical survey (Bevan 1982); it was concluded that targeting excavation based on ground-penetrating radar and proton magnetometry was not particularly effective for locating subtle features like the post molds associated with domestic areas on Seneca sites (Dean 1984:8–9). In 1983–84 Dean and Barbour Associates was contracted by the New York State Office of Parks, Recreation and Historic Preservation to do a more thorough investigation of the site. For this project, four 5 x 40-foot (1.52 x 12.19 m) test trenches were initially laid in based on results from the test excavations in the 1970s, the site's topography, and the locations of hedgerows which might have protected the underlying soil from plowing (Figure 9). Trench 4 was the only area in which a significant number of Seneca-era features was discovered, and it was expanded in 1983 and then again in 1984 to expose 1700 ft^2 (157.935 m^2) around a section of a longhouse structure. Trench 5 contained three post molds, one of which was identified as the remains of a later Euroamerican fence post. Many of the soil stains in other trenches which were initially thought to be features were incredibly shallow and non-diagnostic, suggesting that perhaps plowing at the site, in some places 48–51cm deep, destroyed many features. This disturbed stratum, mixed by plowing, will be referred to as plowzone throughout this work. My sample from Ganondagan is drawn from Trench 4, due to the fact that features in this area are definitively spatially and functionally related to the Seneca domestic occupation at the site, often have known functions (e.g. wall post, interior hearth, etc.), and are the best-preserved features excavated at the site of Ganondagan, likely due to extensive and deep plowing across the rest of the site (aside from several isolated post molds).

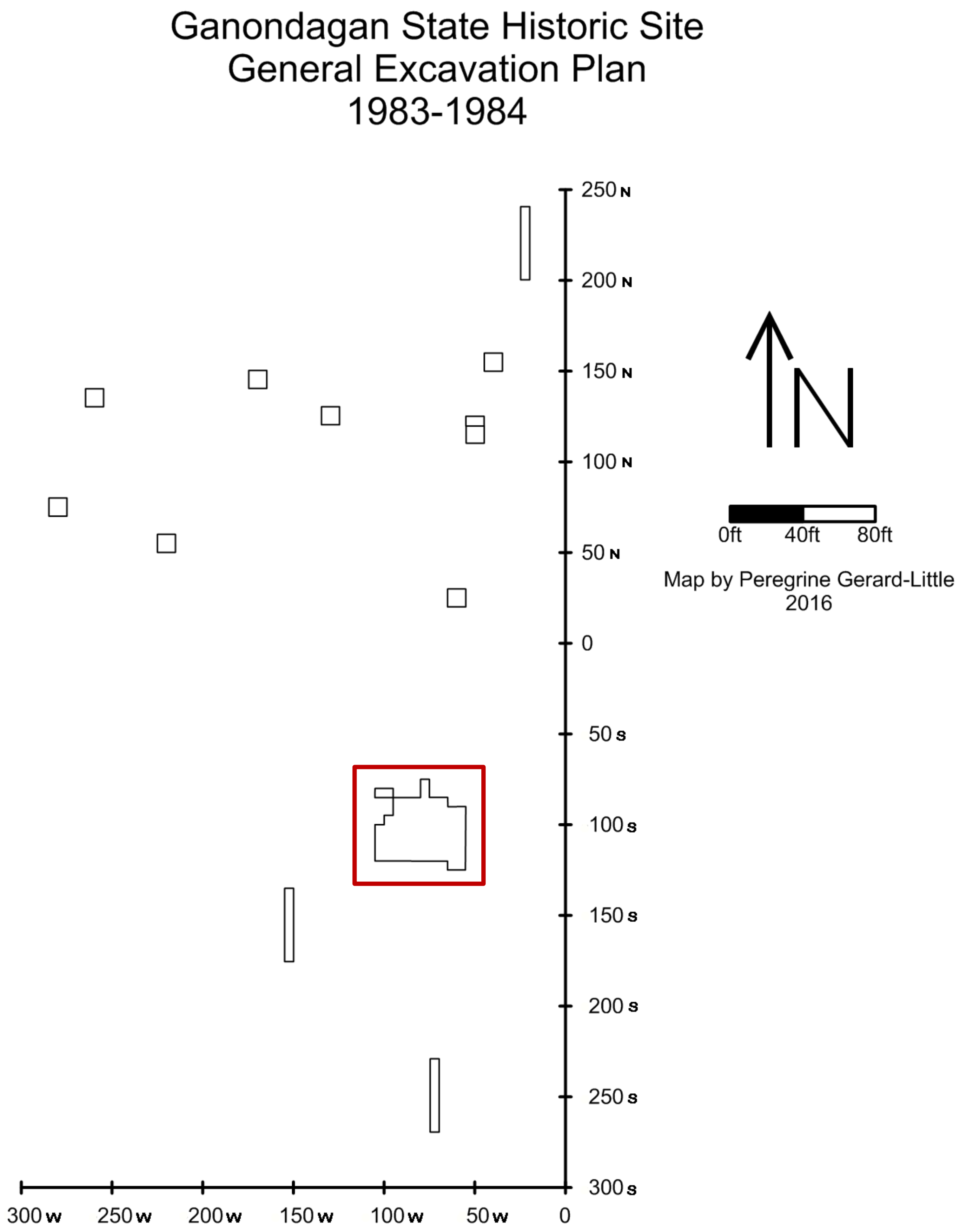

Figure 9. Ganondagan Excavation Plan. Trench 4, the largest contiguous area of excavation, surrounded by red box. Units are in feet, as per original excavation.

Field procedures for the excavation at Ganondagan are described in the report prepared by Dean and Barbour associates (1984:12–13). Plowzone soil was screened through quarter inch mesh, and waterscreening samples were taken during plowzone removal. All subsoil stains were treated as potential cultural features, and after documentation each feature was sectioned to determine its nature. Features thought to be post molds were sectioned in half and one side was excavated. Soil from this half was screened or reserved for "later waterscreening or flotation" (Dean 1984:13); although the size of the mesh is not specified it seems likely that quarter inch mesh continued to be used. Larger features, such as presumed hearths or pit features, were sectioned in quarters and documented. Feature soil was screened or bagged for later processing.

Not all the soil samples taken from Trench 4 were floated following the excavation. In 2013, I gained permission from the NYS Office of Parks, Recreation and Historic Preservation to float eight five-liter samples from the Trench 4 excavations which had not been processed following the 1983–84 seasons, as well as to transfer to Cornell all the catalogued macrobotanical remains from Trench 4 features for analysis. This included materials from 66 different contexts. Some records suggest that soil samples of the type I floated were screened with quarter inch mesh into a five-quart bucket (the location of the screening is unclear) as part of the collection procedure, which suggests that the resulting sample may significantly underrepresent those larger fragments of charcoal which might have originally been present due to breakage. It is also unclear from records what would have happened to the material from the quarter inch mesh in this scenario.

My total sample from Ganondagan included material from 66 separate contexts within Trench 4, including three fire-related features, one pit, four post molds, and three features deemed non-cultural by excavators. Overall I was able to identify 215 charcoal fragments from these contexts.

White Springs

Between 2007 and 2015, investigations in the domestic area of the White Springs site took place in several zones across private property in Geneva, NY (Figure 10). Along the Ridgetop area excavations were carried out with hand tools in largely in 1 x 1m units; investigation in this area encountered solidly domestic materials and posts which possibly form some part of one or multiple longhouse structures. East Lawn excavations, also in the form of 1x1m units, with the addition of shovel test transects, were designed to explore the boundaries of the domestic area and locate a possible palisade enclosing the site. On the West Lawn of the property, excavations included shovel tests, 1x1m units excavated with hand tools, and two large trenches. The placement of these excavations was aided by geophysical survey data (Gerard-Little et al. 2012) and targeted both archaeological evidence for longhouse construction at the site and site boundaries (possibly in the form of a palisade). Many of the excavation locations in the 2011 and 2014 seasons were selected based on geophysical survey data, and these units did not provide us with substantiation of or information about Seneca domestic architecture, site boundaries, or fortifications.

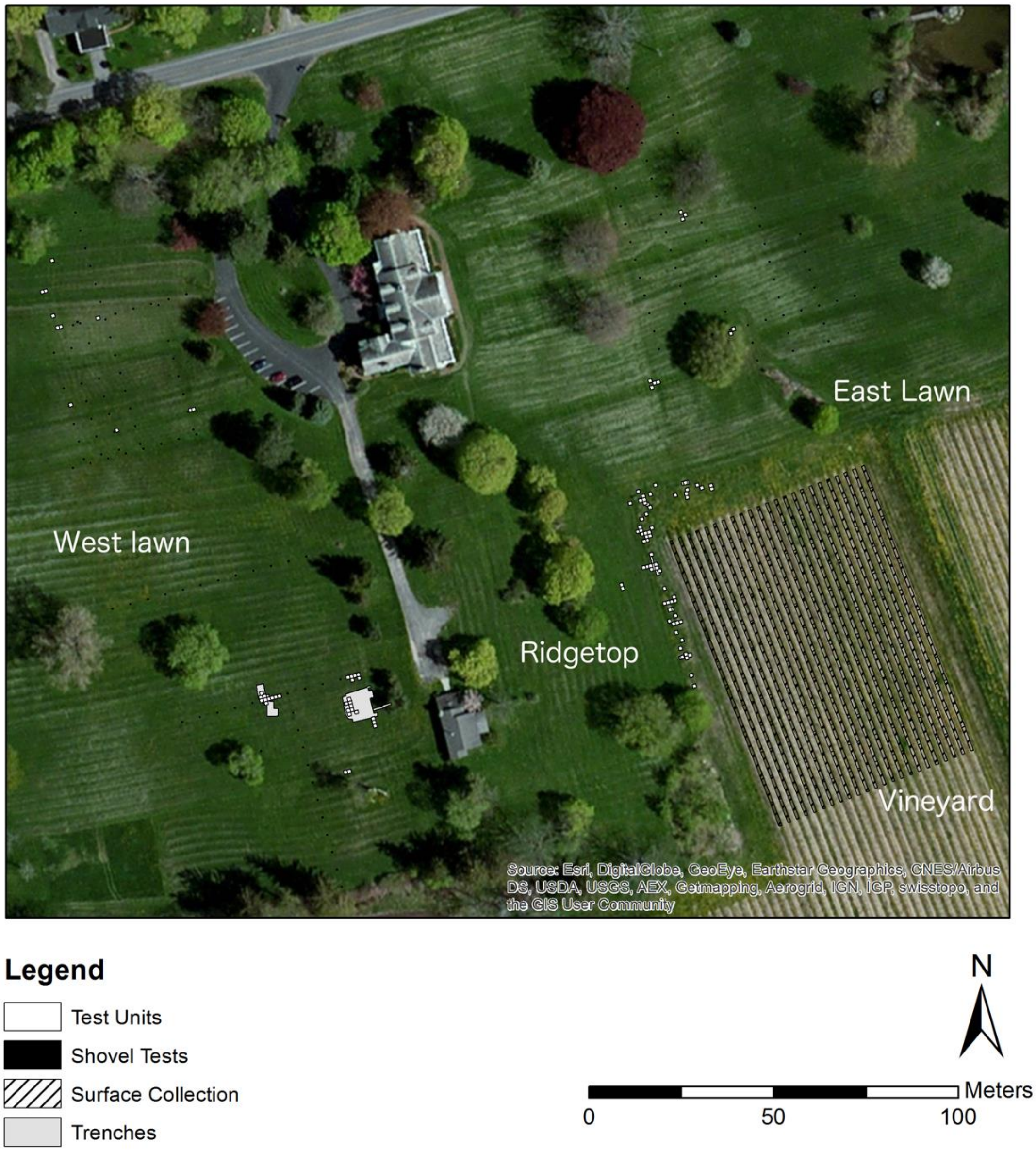

Figure 10. Map of areas of investigation at White Springs Site. Created by Andrew Crocker, 2016.

Excavations included the removal of plowzone soil with hand tools, screening of that soil with quarter inch mesh, and recovery of a total of two plowzone control flotation samples. Charcoal was saved across all contexts, whenever it was recovered from screens. When possible features were encountered during excavation they were assigned feature or post mold numbers and sectioned to reveal the profile and determine the origin of the feature. If it was not immediately clear whether a feature was a post mold or another type of feature it was given a feature designation. Some of these later resolved into post molds and they will be included in the post mold category for data reporting and analysis. For post molds and smaller features, at least one half of the feature was taken as a flotation sample, unless the volume of this soil was less than 0.3 liters, in which case it was screened through eighth inch mesh. For larger features, flotation samples were taken from either half of the feature or from a subset of each level of the feature, as is the case for some of the large firepits. The remainder of feature soil was excavated using eighth inch mesh.

In the 2015 season at White Springs, the project obtained the permission of both the landowner and Seneca representatives to perform plowzone stripping with a Bobcat excavator over a 7 x 7 m area of the site that was known from the 2014 season to be domestic, and where a number of deep Seneca-era post molds had been confirmed (Trench 1). A second trench (Trench 2) of approximately 10 x 3 m was hand excavated to the west, where 2014 excavations suggested the edge of the settlement was located and where a palisade might have been placed. In both Trench 1 and 2, a subsample of this removed plowzone was screened with quarter inch mesh and artifacts saved, but the vast majority of the plowzone backdirt from these excavations was not screened. After the trench surface was cleaned, features were identified at the subsoil interface, approximately 31 cm below ground level. Because of the area of the excavations and the number of potential features located, not all the features assigned numbers in the trench were excavated in the summer of 2015. Feature excavation procedures followed the same format as they had for previous summers.

Overall, 125 flotation samples were collected at White Springs; 35 were taken from likely or definitely Seneca-era post molds, 30 from fire-related features, 15 from intact Seneca-era pit features, 14 from possible buried Seneca-era horizons or living surfaces, and one from a possible smudge pit, while the remainder came from features which subsequently were determined to be Euroamerican tree-planting pits or post molds, rodent burrows, and a variety of other contexts not relevant to the current study.

Townley Read

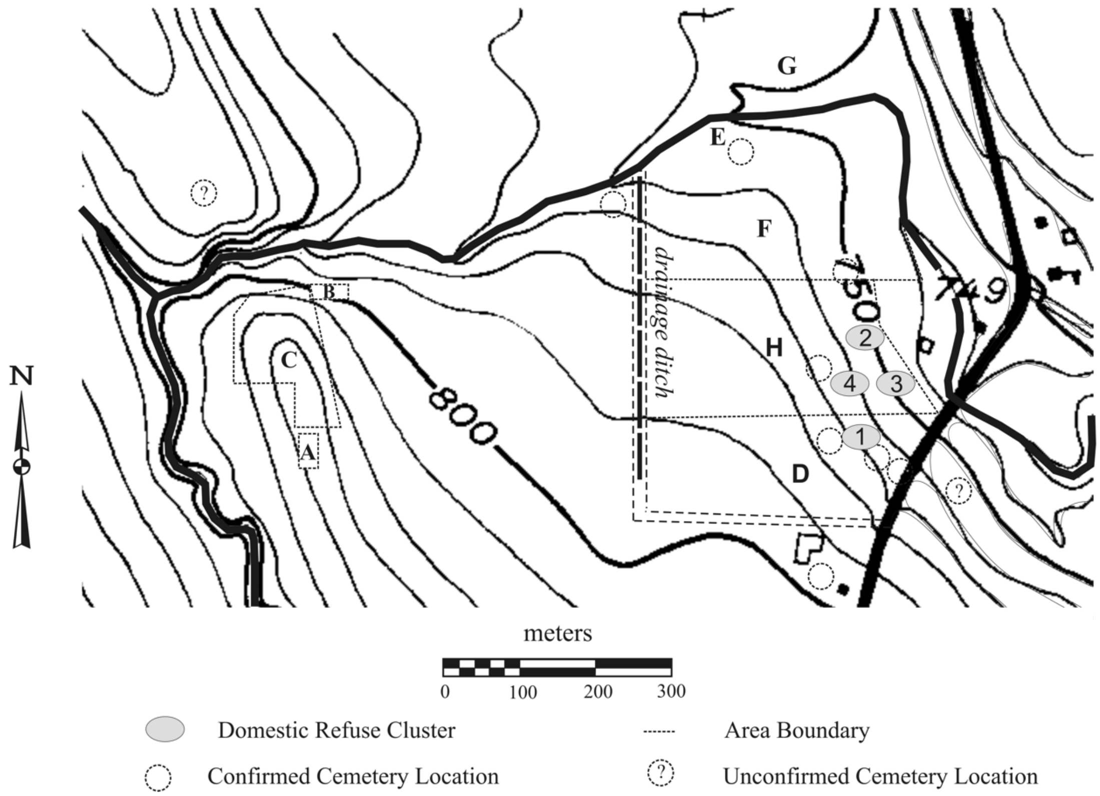

Figure 11. Map of Townley-Read excavation area from Jordan 2008.

Archaeological investigations at Townley-Read were also directed by Kurt Jordan, and largely employed the same field procedures as at White Springs, so the recovery methods and sampling strategies for flotation at the two sites are highly comparable. As introduced in the last chapter, excavation of three domestic refuse clusters (DRC) associated with house lots at the dispersed settlement (Figure 11) encountered 23 cultural features and 34 post molds and 75 flotation samples were taken at the time of excavation. Test Units excavated at Townley-Read were typically 1 x 1 m, plowzone soil was screened through quarter inch mesh, and charcoal was saved from these contexts. The area of DRC 1 was eventually cleared to the subsoil interface through mechanical plowzone stripping, after which features were located and excavated with hand tools. Plowzone soil that was mechanically stripped was not screened, but opportunistic finds from backdirt were bagged and catalogued.

Feature excavation procedures at Townley-Read were very similar to those at White Springs. After locating, mapping, and designating smaller features, excavators bisected the feature and screened the first half of the soil through eighth inch mesh. The second half of the feature, if it was determined to be likely or possibly cultural, was removed as a flotation sample. Larger features contained fully in 1 x 1 m units were excavated in five centimeter arbitrary levels, providing good stratigraphic control of samples from within larger features. Plowzone and subsoil control samples were also taken in all areas of archaeological activity at the site. In areas of the site with a confirmed eighteenth century component there were 18 flotation samples from post molds, 7 from exterior fire features, 17 from Seneca-era pit features or small fire pits, and 14 from the buried plowed midden. Volume measurements were not taken for non-flotation feature soil.

State of Analysis

The three sites under discussion all exist at different states of analysis, a factor that has implications for the contextual information available and level of conclusions that I may draw. The additional information about Seneca occupation of these sites that can be gathered from analysis of the charcoal strongly argues that further analysis of some of these collections and a more complete synthesis of *all* the material and spatial information from these successively occupied sites would be a valuable and productive endeavor.

Ganondagan

Materials from the excavations at Ganondagan are stored at the Peebles Island facility of the NYS Office of Parks, Recreation and Historic Preservation in Waterford, NY. The initial excavation report (Dean 1984) describes some of the more 'high status' material classes recovered from the site such as glass beads and metal objects. Other publications (Kroup et al. 1986) have dealt with some of the more spectacular finds recovered from the site over the years, although somewhat removed from other finds and contextual information. This is largely the extent of the reporting on the site for a scholarly audience, however, and a significant amount of analysis remains to be done. This is particularly true for more quotidian remnants of daily life and possible records of surrounding landscapes through palynological records, material categories like macrobotanical remains, and greater archaeological attention on areas outside settlement cores, including satellite communities associated with principal settlements. Preliminary cataloging has been performed on the collections and a digital database of this information was provided by the New York State Office of Parks, Recreation, and Historic Preservation.

The catalog of materials from the 1980s excavations indicates that there are over 113,000 faunal specimens which have not been identified or analyzed, and as previously mentioned soil samples taken for pollen analysis remain in storage at Peebles Island. The Dean report also makes clear that it deals very minimally with materials from the 1984 excavation, the year when the majority of the excavations in and around the longhouse took place. Considering this is the only clear spatial locus discovered at the site, it is deserving of much more in-depth analysis than the report was able to provide given their funding situation and deadlines at the time. Jordan's 2008 book includes a re-interpretation of the some of the features discovered in Trench 4—based on principles of longhouse construction and the spatial distribution and size of features—but ultimately much more work is required to bring the analysis of this site in line with the next two sites in the sequence.

White Springs

Excavations at White Springs were only completed in the summer of 2015 and analysis of the site is ongoing. Although some material classes have been assessed (Gerard-Little 2011; Gerard-Little et al. 2016; Jordan 2013c; Jordan et al. 2012; Jordan and Gerard-Little; Krohn 2010), the full assemblage from the site has not been fully analyzed. Features and artifacts from the early years of investigation are more thoroughly described, quantified, and analyzed. Dr. Adam Watson and his zooarchaeological analysis class at Columbia University have examined faunal remains from several of the large pit features discovered in the Ridgetop area (Bishop 2013; Hall 2013; Hitchcock 2013; Miller 2013; Oppenheimer 2013; Vencino Gazabon 2013), but analysis of faunal materials from the other areas of the site has not begun. The large pit features have also been the subject of analysis for the Spring 2012 Cornell University course Field and Analytical Methods in Archaeology (Gerard-Little 2012; Shim 2012). Dr. Paula Turkon of Ithaca College has identified plant remains from 20 flotation samples. Any of her identifications will be included in a separate table, where relevant to the discussion.

I selected features for charcoal analysis at White Springs to build a dataset comparable in size to the one which exists for Townley-Read, as well as based on which features were interpreted as definitively Seneca-era and somewhat clear in their function. This limited my selection largely to features from the Ridgetop and obvious post molds from the West Lawn, due to the state of analysis of the materials for the site. Until the spatial loci have been fully defined and the nature of a greater number of features at White Springs identified, this analysis will remain somewhat preliminary and subject to change upon new information. I have identified charcoal fragments from five fire-related pits, two intact Seneca-era pit features, 25 Seneca-era post molds, one likely smudge-pit, and a possible buried Seneca-era horizon.

Townley-Read

As the subject of Jordan's 2008 monograph, as well as several other works (Jordan et al. 2012; Jordan 2014; Krohn 2010; Watson and Thomas 2013) Townley-Read is the most completely analyzed of the three sites. Archaeological materials for the site are fully cataloged; lithic, faunal, and botanical assemblages have been examined by specialists in those fields, and Jordan has generated an interpretive synthesis which includes historical documents and multi-scalar spatial and temporal contexts. Because of this thorough investigation, Townley-Read is positioned as an incredibly useful point of comparison for Ganondagan and White Springs, especially given the incomplete spatial understandings or analytical processes at those preceding two sites.

Lab Methods

Flotation, the use of agitated water to separate soil samples into a heavy fraction and a light fraction, has revolutionized the collection aspect of paleobotanical and charcoal analyses by assembling an unbiased sample (e.g., not pieces most visible or easiest to pick up) from a feature or stratigraphic level. For this dissertation, I supervised and participated in the flotation of eight soil samples from Ganondagan and was involved with the flotation of samples from White Springs from 2009 until present. Whenever possible, the charcoal examined for this project was drawn from flotation samples. The soil samples from Ganondagan were processed using mechanically-assisted flotation at Ithaca College on Dr. Jack Rossen's Model A Flote-Tech Machine, thanks to research money from the Cornell Institute for Archaeology and Material Studies. Light fractions were collected in mesh bags with 0.25 mm openings and 1 mm mesh was used for the heavy fractions. The flotation samples from White Springs were floated both on the Ithaca College machine and by the Public Archaeology Facility (PAF) at Binghamton University on a similar Flote-Tech Machine. Samples from the Townley-Read excavations were also floated by PAF shortly after their excavation as part of Jordan's project.

In my own analysis, I focused on identifying wood pieces larger than 2 mm (divided with a lab-grade dry sieve) wherever possible so as to emphasize the most likely identifiable segment of the samples. A razor blade was used to expose fresh radial, transverse, and cross sections. This was preferable to manual breaking as it limited the fragmentation of the sample. All the charcoal samples from Ganondagan and White Springs were individually temporarily mounted to a slide using florists' clay. A Leica light microscope with attached Canon Eos Rebel T2i camera and 4-way LED illumination was used to examine the fragments at magnifications from 6–50x.

Photographs were taken of a majority of individual specimens (Figure 12), and the number of rings present, whether pith or bark was visible, and whether the sample was a twig was also recorded for each sample in order to record useful information for any future isotopic or radiocarbon-based research programs. In the course of examination, I made identifications to the most specific level possible. Because some samples were only identifiable to a family or group level, in tallying identifications for analysis in the next chapter I have used the level of classification which is most broadly relevant (e.g. *Carya* spp. to encompass specimens which have been identified as *Carya* sp., *Carya cordiformis*, and *Carya ovata*). However, the full range of identifications is presented by feature in this chapter.

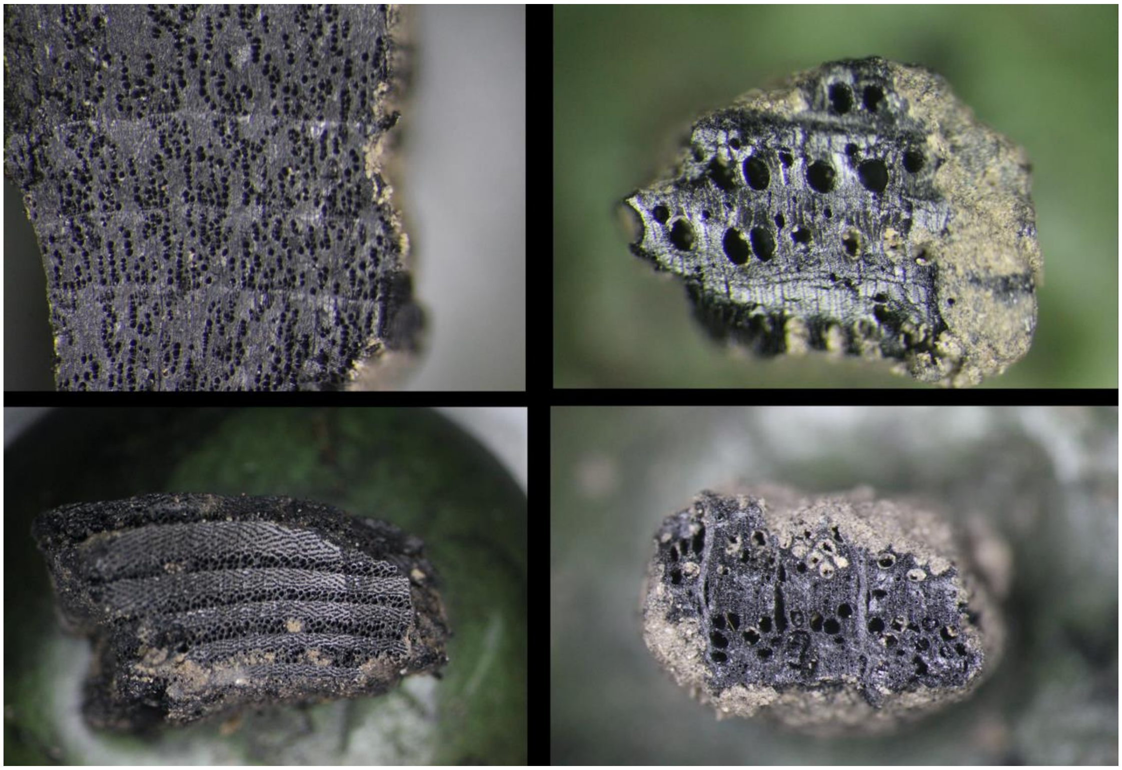

Figure 12. A range of charcoal structures, observed microscopically in cross section at 12–25x magnification. Clockwise from top left: hophornbeam, hickory, oak, and elm.

Macrobotanical material from the Townley Read site initially was examined by Dr. Jack Rossen in 2006, associated with Dr. Kurt Jordan's work on the site. While a sub-sample of these specimens were reexamined (discussed more completely later in the chapter), for the most part I relied on Rossen's identifications and report for these materials. Rossen used a subsampling strategy of 20–50 fragments from each sample to extrapolate proportional representation within the total sample of charcoal in each flotation sample (Kurt Jordan 2016, personal communication). This means that instead of being reported as the number of specimens identified to a certain taxon, proportions were reported (e.g. maple 20%, red oak 10%, sycamore 70%) in association with the full count of the charcoal sample. Rossen also identified seeds, nutshell, and plant tissues from the Townley-Read flotation samples. His identifications, which I draw from both Jordan's 2008 book and Rossen's 2006 report, are presented in separate tables and clearly labeled.

From within the Townley-Read assemblage, I selected certain samples for reexamination which had been taken from features of confirmed Seneca domestic nature, especially those which had been reported by Rossen as possessing fragments of only a single taxon or those labeled wholly or in part 'unidentified.' Rossen states in his original report that he would label a sample "unidentified" if a brief examination indicated the majority of charcoal fragments were twigs and branches or were in other ways overly deformed by the burning process. I examined four samples which had been labeled 'unidentified' and an additional five samples which were recorded by Rossen as being comprised of a single taxon. An assessment of these samples was deemed sufficient for checking inter-analyst comparability at the two sites, especially since the field methods were so similar at White Springs and Townley-Read.

A number of features at White Springs contained massive amounts of charcoal and a subsampling strategy was designed to speed up analysis while maintaining the representativeness of the sample. The effect of sample size on diversity and richness of taxa present has been explored particularly thoroughly in zooarchaeological analysis, another realm where field recovery methods and sample selection procedures can have a significant effect on the identification and interpretation of the taxa present (Cruz-Uribe 1988; Grayson 1981; Payne 1975). Because sample size directly affects the examined diversity of taxa, determining a representative sample size is critical if differences across time periods, features, or sites are to be rigorously compared. Grayson's (1981) critical study showed quite clearly that perceived changes in abundance of taxa across phases at a site could be due to recovery and sample differences more so than actual differences in subsistence or environment between these phases.

To determine what size subsample would be sufficient for gleaning representative data from White Springs, I used a light fraction with a high proportion of charcoal from one of the flotation samples. For this sample (context WH 438) I identified over 100 fragments in order to track the point at which the number of taxa identified plateaued and proportions equilibrated (Smart and Hoffman 1988:176). Charcoal pieces were chosen in a random grab sample of pieces larger than 2 mm. For this particular sample that point was around 50 identified fragments. I then did a similar test with another large light fraction sample from a comparable fire-related feature (WH 68) and found that the presence/absence information ratios did not change significantly between 50 and 60 identified fragments. From this point forward then, whenever possible 50 fragments were identified from each examined context, and when fewer than 50 fragments were present, all were examined. This means that for larger pit features from which multiple flotation samples were taken, there are over 50 fragments identified from each stratigraphic level and hundreds from the feature as a whole.

This method was also used in my examination of samples labeled ‘unidentified’ from Townley-Read. In the case of samples where Rossen had previously examined a subsample, I examined 20 fragments; for examination of ‘unidentified’ samples I examined 50 or the entirety of the sample larger than 2mm. Other studies of wood use from different cultural contexts and time periods have used 20 fragments per sample or excavation unit at a site (Johannessen and Hastorf 1990; Miller 1985). It is important to note that because Rossen did not sequester those samples he examined from the unexamined portion of the sample, I cannot know for certain that we examined the same or even overlapping selections of charcoal fragments, especially because he does not specify his exact subsample size for each sample in his botanical report (Rossen 2006). When reporting results from Townley-Read, samples I (re)examined are in separate tables and are designated by a star (*) next to the context number.

Ubiquity represents how frequently a taxon appears within a grouping of samples—for example all samples from a site, or a time period, or feature class. Because the Seneca features at Ganondagan, White Springs, and Townley-Read are from a single phase of occupation this is a useful metric for observing species trends across features at the sites as well as comparing sites (Popper 1988). Because the presence or absence of a taxon can be significantly affected by sample size and recovery method, as discussed earlier, only flotation samples have been used to calculate ubiquity at the three sites. This presents some limitations for the comparison of taxon ubiquities at Ganondagan, because context/catalog numbers were apparently not differentiated based on sample processing procedure, meaning that it is not entirely clear what came from a flotation or water screened sample and what was gathered from normal, dry-screened feature excavations.

Ratios are also a useful analytic for the charcoal data from these three sites. Relative species frequency, calculated as a percentage of total identified specimens from a sample is widely used for archaeological analysis (Miller 1988; Popper 1988). Various comparisons have been shown that fragment counts nearly always co-vary with weight measurements (Asouti and Austin 2005:4). Weight may also be a problematic metric if samples are too small and/or light or are encrusted with sediments (Miller 1985). Slightly more complicated techniques for deriving ratios that rely on total number of species present across a site have been developed to close the gap between plots that show a total number of fragments over time and those which depict species percentages of total identified specimens (Fiorentino and Magri 2008).

Ratios of charcoal to other classes of macrobotanical remains, such as nutshell, have been used in analytically fruitful ways at other sites, but the relative dearth of nutshell at all three sites precluded this possibility for analysis.

In this chapter I have detailed the various ways this dataset of identified wood charcoal was created, from the field procedures to the identification process, through the inclusion of identification work carried out by Dr. Paula Turkon, Dr. Jack Rossen, and myself. The full list of my identifications from all the sites can be found in Appendix A. In the next chapter I present an analysis of each of the features and feature categories both inter- and intra-site. Although there are clearly some limitations based on the type of data recovered and the inexact comparability of features excavated at Ganondagan, White Springs, and Townley-Read, the large quantity of material identified from such a range of features at these thoroughly documented sites provides a uniquely strong foundation for the analysis which follows.

CHAPTER 7

A "PLEASURE GARDEN IN THE DESERT": WOOD CHARCOAL EVIDENCE OF WOOD USE, LANDSCAPE PRACTICES, AND CHANGE FROM GANONDAGAN, WHITE SPRINGS, AND TOWNLEY-READ

Having explored Seneca landscape practices through the lens of previously collected archaeological data, ethnohistoric documents and travelers' accounts, and a GIS-based examination of the Seneca site sequence, I now turn to the specific evidence of Seneca wood use, landscape practices, and landscape change offered by the wood charcoal recovered from archaeological features at Ganondagan, White Springs, and Townley-Read. Materials that I have examined from each of these three sites have their own interpretive possibilities and constraints given the field methods used, extent of excavation, and state of analysis at the sites. In what follows, the presentation and discussion of data is organized by feature type rather than by site to better compare practices and choices made by the Seneca community across the three sites within similar contexts. Each feature class presents unique interpretive possibilities—some features may be tied to practices which occurred over the entire occupation of the site, while others represent much briefer moments within that time span. The analysis that follows attempts to trace the range of Seneca activities that led to the creation and use of these features, as well as those practices and decisions which were tied to the features' eventual disuse—placing features, practices, and sites within a multiscalar framework of Seneca action.

The types of archaeological features present at these sites are generally similar in their formation processes and range of uses, as they were created by the same community of Seneca people drawing on a longstanding repertoire of practices and lifeways. However, this community also experienced unique political, economic, and environmental conditions at each site and in this variation, where community was a constant factor, both continuities and differences in practice emerge. In what follows, I separate my charcoal analysis into discussions of postmolds, fire-related features, non-comparable features from each site, and plowzone charcoal in order to juxtapose practices in similar areas of Seneca life across the occupation of Ganondagan prior to its destruction, the difficult times at White Springs, and finally the restoration of some stability at Townley-Read.

Postmolds

On Iroquoian sites, postmolds are usually identified as dark, circular soil stains (tubular in three dimensions) filled with decayed organic material, infilling from habitation debris, or burned-in-place material which are less than 30 cm in diameter. Their recovered depth can differ based on the original depth of the post and how much it has been impacted by later plowing and disturbance (Abel 2000:189; Prezzano 1992:244–248). Charcoal recovered from postmold contexts was identified at all three sites, although quantities found in each postmold varied widely. Possible taphonomic, excavation-based, and contextual explanations for this discrepancy are explored below.

As discussed in Chapter Four, posts would have been used for domestic structures, including wall posts, bench supports, and interior support posts, as well as in palisade construction. Posts also would have been used for the creation of drying racks and other constructions that could occur within or outside domestic-area structures. To determine the spectrum of interpretive options for archaeologically recovered wood charcoal, it is critical to understand the 'life-cycle' of, and formation processes associated with postmolds across these functions and areas.

Postmolds, as often one of the few remnants of the almost entirely organic architectural superstructures built by Iroquoian groups, have long been a significant source of information for archaeologists. Warrick (1988) proposed a method of estimating the length of time Northern Iroquoian (principally Wendat) houses were occupied based on the rate of post decay and evidence for longhouse wall post replacement. Given an adequate sample of well-preserved postmolds from the walls of longhouses, this method can be extended to estimate the length of occupation for a site as a whole (Warrick 1988:48–49). Creese (2012a, 2012b), also working in the Canadian context, has used the arrangement of postmolds in domestic space to draw conclusions about social organization and the nature of Iroquoian personhood. He also maintains that the observed Iroquoian social order that accompanied increasing sedentism and agricultural productivity was created through bottom-up organization of paired family units based in longhouse organization, drawing in understandings of Iroquoian personhood from both ethnographic sources and anthropological analogy. A constant thread in this work is the acknowledgement that identity, both cultural and personal, is constantly negotiated and created through repetitive practice but nonetheless subject to change. Creese is intent to bring the material world into this process, advocating for a perspective that takes seriously the role of the built environment in the constitution and maintenance of particular organizational units. Directly related to the sites under examination in this dissertation and the life-cycle of posts, Jordan (2008:135–137) has been able to posit either decay in place or removal of posts in the short longhouse at Townley-Read based on artifact contents.

Archaeologically, posts that were allowed to decay in place can be expected to display certain characteristics. First, we should not expect to find evidence of construction materials in those posts molds. Unburned wood (and other organic material) does not preserve well in the relatively well-drained silt-loams of central

New York[73] unless its decay is slowed or prevented by association with copper alloy artifacts which inhibit microbial activity (Jakes and Sibley 1983), or in the relatively unlikely event of a site being submerged under water. In the Iroquoian context more generally this is evident in the preservation of items like wooden spoons in association with brass kettles or other copper-alloy materials in burial contexts (Wray et al. 1991:162) and the complete lack of recovery of unburned wood from domestic areas of these and similar sites. Although postmolds that rotted in place would not contain charcoal from the original post, they could contain charcoal and/or artifacts from the surrounding area that had been pushed in around the base of the post. The amount and type of introduced material are dependent on the spatial location of the post and activities that took place in the surrounding area. The charcoal in such postmolds can be definitively tied to Seneca activity and burning, although no more specifically than to domestic fire-related activities and disposal of fire-related waste.

Heidenreich (1971) and Snow (1995a:100) both raise the possibility that posts that were still in good condition at the time of a community relocation could have been taken out of the ground and re-used at the next settlement. In this situation, postmold contents identified by archaeologists would have been created when the empty post hole was filled in with darker soil falling in from the surrounding living floor, incorporating other debris or refuse that may have been present. As with posts that rotted in place, the contents of these postmolds will represent Iroquoian activities in the surrounding area. Posts which were removed at the end of the use-life of a

[73] Soils around Ganondagan, White Springs, and Townley-Read are a mixture of loamy soil types. At Ganondagan these include Honeoye loam, Palmyra gravelly loam, Dunkirk-Arkport complex, Schoharie silty clay loam, Odessa silty clay loam, Dunkirk silk loam, Arkport fine sandy loam and Collamer silt loam. At White Springs surrounding soil types include Palmyra gravelly loam, Honeoye loam, Lima loam, Odessa silt loam, Lakemont silty clay loam, Cayuga silt loam, and Kendaia loam. At Townley-Read soil types are predominantly Ontario, Honeoye, and Lima loams with smaller areas of Kendaia loam, Wayland soils complex, and Hemlock silty clay loam (United States Department of Agriculture and Natural Resources Conservation 2013).

structure likely would be filled in with domestic debris like animal bone fragments and charcoal.

We should not expect, therefore, the wood used for a majority of posts to be identifiable from postmolds. Excepting some questionable nineteenth century reports of *in situ* rotting palisade posts (Barber 1964; Squier 1850), archaeological evidence of post construction material is limited to two possibilities: 1) posts that burned in place; and 2) posts whose exteriors were charred before being placed in the ground. In the case of posts that burned in place, the depth of the posts as well as the soil conditions at the time of the fire both influence the archaeological signature. Many of the posts at Ganondagan, White Springs, and Townley-Read penetrate more than 20 cm below the plowzone into the subsoil; depending on the intensity of a fire, the moisture of the soil, and where the fire was initiated, it is unlikely that the whole depth of a deeply embedded post would have charred even if a post was burned in place to the surface level. In a given area or structure, posts may not all have burned in the same manner and could manifest in different ways archaeologically. Experimental burning of a wattle and daub structure in Serbia demonstrated that fire can burn posts below ground level, although in this case the fire did not leave charred wood but rather a thick layer of ash within the postmold (Bankoff and Winter 1979:13).

An archaeological case of a Mississippian-period wood and bark structure that was known to have been burned provides a counter-example. Preserved roof beams and heavily heat-altered soils indicate the structure was burned, but no distinctively burned postmolds were recovered despite excellent preservation of other structural elements (McConaughy et al. 1985). An examination of photographs of modern wooden fence posts burned by wildfires suggests that a rapidly moving blaze in a relatively open space would be most likely to burn a post to the ground surface and not below. This whole range of possibilities must be considered in interpreting postmold charcoal.

Given this variability there could be a range of signatures for posts burned while they were standing. Posts could be partially burned, leaving the bottom portion of the post to rot in situ with a cap of ash, but very little charcoal. Posts could have burned to the ground surface. In this case, the charred portions would have been at ground surface and could have fallen into the post hole as the unburned wood rotted. It is even possible that some or all of the portion of the post in the ground was charred. The amount of charcoal found in the postmolds would also depend on how much of the post depth had been plowed out, since it is somewhat unlikely that charcoal from the burning of the post would migrate fully to the base of the post. Due to the military duress and destruction associated with the departure from Ganondagan, there is a greater likelihood of encountering posts burned in place at this site. However, the Haudenosaunee combination of bark and wood structures and open fires means that structures may have accidentally burned down at any of the three sites.

The possibility that Haudenosaunee people intentionally charred the bases of posts to prevent rot has been repeatedly alluded to in the literature, although its demonstrable utility has been debated ("Charring Does Not Preserve Wood" 1920; Prezzano 1992; Warrick 1988). If a post had been intentionally charred prior to emplacement in the ground, one would expect to find a significant quantity of charcoal distributed throughout the postmold, as well as charred bark or waney edge wood (the waney edge is the boundary between the wood and the bark).

Ganondagan

Although 66 Seneca-era postmolds were identified in Trench 4 at Ganondagan by excavators, botanical materials were recovered from only three: Feature 81, Feature 92, and Feature 110. At Ganondagan, all the postmolds from which I analyzed material were associated with the longhouse discovered in Trench 4, meaning I can securely interpret these posts as domestic and representing household construction and activities. Only one postmold (Feature 81) contained charcoal sizeable enough to identify, totaling only seven pieces. The two other postmolds produced a total of two fragments of nut shell and two corn kernels (Appendix A: Table 1).

All three of the postmolds from which botanical material was recovered (Feature 81, Feature 92, Feature 110) have relatively small artifactual contents. Feature 110, located in the east wall of the structure, contained no charcoal, two corn kernels, three pieces of burned bone, a brass fragment, and a piece of native-made pottery. Feature 92, although not included on the list of postmolds associated with the Trench 4 structure in the Dean report (1984:20–23), is located just off the east wall, on the interior of the structure and seemingly could have been a part of the wall. This postmold contained no charcoal, one piece of unidentifiable nutshell, and two pieces of burned bone, suggesting it was further away from debris-producing domestic activities than Feature 110.

Feature 81, identified by the excavators as being part of the south wall of the structure, contains seven fragments of oak and, based on the data from the preliminary Ganondagan cataloging efforts, one piece of burned bone and two pieces of deer antler. This is the only single-species postmold identified at Ganondagan, and although there is small quantity of charcoal in Feature 81, I tentatively identify it having contained an oak post. The relatively low quantity of artifactual material is consistent with a post located away from a heavily-trafficked area, and the single species charcoal content suggests it was burned, either in place or prior to emplacement. The small quantity of charcoal, less than one gram, does not suggest significant charring of the post before it was placed in the ground. Oak recovered from this postmold currently represents the only direct evidence of construction material from Ganondagan.

Although not located in relation to a specific wall of the structure in the Ganondagan report or reinterpreted in Jordan's (2008) discussion of the structure, Features 68, 69, and 70 may have served as minor bench support posts. None has as large a diameter as a typical bench support post, but all three are aligned roughly five feet (1.52 m)[74] from the south wall, generally consistent with side platform widths across Iroquoia through time (Creese 2011:247; Jordan 2008:266; Prezzano 1992:277–282). These postmolds contain more 'domestic' debris including bone, a gunflint, and a piece of brass, but no charcoal.

Across all the postmolds excavated in Trench 4 at Ganondagan, it was most common for no material to be recovered (49 postmolds); the next most common find was small quantities of bone (fewer than 10 pieces). One postmold (Feature 153, along the north wall) contained an iron file. Overall, the lack of material in the posts from the Trench 4 structure indicates posts probably rotted in place rather than being removed and the holes filling in with local debris. It is also unlikely that Seneca people, pressured by the French into leaving the settlement, pulled posts and transported them to the next settlement location approximately 35 km to the east. Because of the depth of plowing at Ganondagan it is difficult to determine whether this particular structure may have been burned. I can tentatively say that the entirely oak contents of Feature 81 may indicate at least one construction material, providing some further information about this incompletely understood locus.

Feature 165, identified by excavators as a postmold, contained by far the greatest quantity of material of any postmold from Trench 4. The depth and dimensions of this feature are not given in the Ganondagan excavation report.

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[74] All dimensions for Ganondagan are given in feet, the original units of excavation and publication, with the metric conversion in parentheses.

Excavators recovered one iron fragment, a Jesuit-style ring, one piece of worked chert, one piece of antler, over one hundred pieces of animal bone, and one tooth/tooth fragment. Feature 165 is located very close to Feature 99, a large fire-related feature analyzed further below. The quantity of material within Feature 165 more closely resembles the signature for a pulled post where material could collect. This characterization, as well as the proximity to a large fire feature, might indicate that Feature 165 may have been a post that pre-existed the structure at Ganondagan and was pulled and filled in prior to house construction.

White Springs

Compared to the relative dearth of charcoal recovered from postmolds at Ganondagan, many of the Seneca-era postmolds from White Springs contained at least low densities of charcoal; this is evident in the data reported in Appendix A. At White Springs, the excavations in the ridgetop area did not recover any single coherent longhouse floor plan, although postmolds found here are within what is clearly a domestic area, based on artifact density mapping. Because this excavation area was more disturbed by nineteenth and twentieth century activities than other areas of the site (Gerard-Little et al. 2016) it is thus far unclear how or whether the ridgetop postmolds cohere into one or multiple structures. No analysis has yet been carried out on the non-charcoal plant remains from any of these postmolds.

The ten ridgetop posts (PM 5, PM 8, PM 12, PM 17, PM 18, Feature 18, PM 22, PM 25, PM 27, and PM 32) contain a mixture of several species which can be interpreted as the mixed remnants of fires in the domestic area (Appendix A: Table 2). The large quantity of charcoal from varied species contained within these postmolds also indicates it is likely that posts were pulled at the end of the Seneca community's occupation of White Springs. Because these posts are within the same spatial zone, definitively date to the Seneca era, do not provide information on specific construction material, and at this moment cannot be further separated into more fine-grained loci, summing the identifications from these contexts produces a dataset which is reflective of general domestic activities and debris in this area (Table 4). Contrasting with the minimal quantity of charcoal from the domestic postmold assemblage at Ganondagan, charcoal is common in White Springs ridgetop postmolds. The assemblage is a mixture mostly ash, hickory, and hophornbeam: all species which can thrive together in mixed oak and northern hardwood forests dominated by oak and hickory (Iverson et al. 1999). A smaller portion of the assemblage comes from 17 other taxa, suggesting that wood came from a range of locations around the site.

Table 4. Proportional representation of taxa found in 10 ridgetop postmolds (PM 5, PM 8, PM 12, PM 17, PM 18, Feature 18, PM 22, PM 25, PM 27, and PM 32. See Appendix A: Table 2 for full record of identifications from individual postmolds).

Identification	**N**	**Weight (g)**	**% by count**
Ash (*Fraxinus* spp.)	90	6.87	28.66%
Hickory (*Carya* spp.)	72	3.43	22.93%
Hophornbeam (*Ostrya virginiana*)	33	2.88	10.51%
Maple (*Acer* spp.)	27	0.71	8.60%
Beech (*Fagus grandifolia*)	22	0.38	7.01%
Elm (*Ulmus* spp.)	16	1.47	5.10%
Oak (*Quercus* spp.)	11	0.39	3.50%
Basswood (*Tilia americana*)	10	0.55	3.18%
Yellow Poplar (*Liriodendron tulipifera*)	8	0.17	2.55%
Birch (*Betula* spp.)	7	0.18	2.23%
Hawthorn (*Crataegus* spp.)	5	0.35	1.59%
Persimmon (*Diospyros virginiana*)	3	0.12	0.96%
Alder (*Alnus* spp.)	2	0.03	0.64%
Pine (*Pinus* spp.)	2	0.05	0.64%
American chestnut (*Castanea dentata*)	1	0.12	0.32%
Hackberry (*Celtis occidentalis*)	1	0.02	0.32%
Black walnut (*Juglans nigra*)	1	0.06	0.32%
Sycamore (*Platanus occidentalis*)	1	0.03	0.32%
Cherry (*Prunus* sp.)	1	0	0.32%
Black willow (*Salix nigra*)	1	0.06	0.32%
Sum	314	17.87	

If posts have only a few fragments of charcoal I do not take this to be representative of construction material, and these relatively 'clean' posts are most likely the ones which were left to rot in place, potentially also away from high traffic or activity areas[75]. In the ridgetop zone, this includes PM 5, PM 22, PM 25, and PM 32. PM 5 contained one tooth, PM 22 contained two pieces of bone, PM 25 contained no material other than charcoal, and PM 32 contained five pieces of bone.

The 2014 and 2015 excavations on the west lawn, which involved larger block excavations followed by mechanical plowzone stripping, recovered much more clearly spatially patterned postmolds. The largest trench (Trench 1) exposed what appears to be the end of a multi-compartment longhouse with a rounded vestibule, termed House 3. Although the full house plan was not recovered due to nineteenth and twentieth century disturbance from drainage systems, tree planting, and utility and road construction, it is strongly suggestive of the vestibule of a longhouse. Postmolds from this area are designated as associated with House 3 (Appendix A: Table 3).

The eight postmolds from the House 3 area (PM 49, PM 53, PM 63, PM 68, PM 76, PM 93, PM 95, PM 101) contain much less charcoal on average than those from the ridgetop. These posts were found located in likely outer longhouse wall and vestibule areas, away from high traffic zones. Again, no single species postmold has more than two fragments of charcoal, so these posts were likely not charred prior to emplacement or burned in place, and their contents probably represent domestic activities undertaken in the area. Unlike the posts on the ridgetop that are relatively close to the large exterior fire-pits, no large exterior fire pits of the scale of those on the ridgetop were located in the western area of the site. One fire-related feature (Feature 62) was located just to the south of House 3, but it was relatively shallow—in

[75] Although Snow notes in the description of excavations at the fifteenth century Mohawk site of Otsungo that the greatest accumulation of materials was along longhouse walls, it is unclear whether this occurred from the interior or the exterior (1995a:127).

some areas only four centimeters in depth below the plowzone—and is not likely to have served the same functions as the firepits located on the ridgetop. Additionally, its spatial separation of only approximately one meter from the south wall of House 3 suggests we need to be cautious about assessing the phasing of these two areas.

Although the sample size for each individual postmold, as well as the total from the postmolds as a whole was smaller, the House 3 postmolds contain a smaller range of species and are almost entirely dominated by ash, beech, oak, and hickory (Table 5). Aside from charcoal these postmolds were relatively 'clean,' indicating that the wooden posts were probably not removed at the end of the site's occupation and suggesting functional differences between this area and the ridgetop zone of White Springs.

Table 5. Proportional representation of taxa from eight House 3 postmolds (PM 49, PM 53, PM 63, PM 68, PM 76, PM 93, PM 95, PM 101).

Identification	**N**	**Weight (g)**	**% by count**
Ash (*Fraxinus* spp.)	8	0.13	23.53%
Beech (*Fagus grandifolia*)	7	0.22	20.59%
Oak (*Quercus* spp.)	7	0.13	20.59%
Hickory (*Carya* spp.)	5	0.10	14.71%
Maple (*Acer* spp.)	3	0.04	8.82%
Birch (*Betula* spp.)	2	0.01	5.88%
Hawthorn (*Crataegus* sp.)	1	0.04	2.94%
Hophornbeam (*Ostrya virginiana*)	1	0.03	2.94%
Sum	34	0.70	

To the north of the House 3 excavations, a smaller area of excavation revealed several posts which did not align with the orientation of House 3 (see Figure 10 for excavation areas). Although we did not uncover a full plan, the number of posts in alignment as well their spatial location in a firmly domestic area of the site suggest strongly that they are in some way associated with a separate structure. These two posts are labeled as being in association with what was designated House 2 (Appendix A: Table 4).

The House 2 area, although less completely exposed than the area around House 3, had two postmolds that are single-species: A red oak post (PM 58) and a hophornbeam post (PM 73). The red oak post was 23 cm in diameter and contained a total of 5.19 g of charcoal[76], strongly suggesting that this post burned in place. The hophornbeam post was smaller, only nine cm in diameter, and the charcoal density for the feature soil removed was three and a half times less than for PM 58. This post may also have been burned, but the density of charcoal suggests some difference in the formation processes of PM 58 and 73. Together, these two posts may indicate that at least portions of House 2 burned, a hypothesis that can be tested in the upcoming analysis of the artifacts from these test units.

As part of the efforts to locate the edge of the White Springs settlement, another series of units was excavated to the west of Trench 1, where shovel test-pits revealed that artifact density decreased precipitously. Excavations in this area revealed postmolds which may have been associated with a palisade enclosing the domestic area at White Springs; the three excavated posts from this area which contained charcoal are labeled ‘possible palisade’ (Appendix A: Table 5).

The possible palisade area at White Springs is interesting because we know that it is separated, at least in places, from any domestic architecture or features by at least three meters, due to three 1 x 1 m excavation units devoid of any features between the palisade line and the domestic area to the east. It is therefore unlikely that this was a primary depositional context for any household material and it also suggests a clear spatial and experiential delineation between domestic space and the boundary of the settlement. One postmold (PM 56) along the possible palisade line seems to have been charred before being placed in the ground. In total, the 3.3 L of fill removed

[76] Note that the total amount of charcoal from the post is greater than the quantity identified in Appendix A: Table 4 due to the subsampling strategy discussed in Chapter Six.

from the postmold contained 129.20 g of charcoal throughout the removed soil, 49.02 of which was removed as part of a flotation sample. The vast majority of this sample I identified as pine (Appendix A: Table 5). In addition, there is a significant quantity of charred bark, suggesting that the outside of the post was also burnt before it was placed in the ground. This practice has only been observed in the palisade area, and seems to produce a much higher density of charcoal in a postmold. A 1640s Jesuit account of a Huron palisade describes it as constructed with pine posts (Thwaites 1959: v. 34 123-125), suggesting this may have been a common or at least preferred practice. Herrick (1997:20–21) briefly describes the spiritually and medically powerful nature of white pine and its ability to resist or act as a preventative against various forces and “the use of the great pine, the “Tree of Peace,” as a symbol of the invulnerability of the Iroquois Confederacy.” These characteristics, not visible in the archaeological record, may partially explain preference for white pine palisade posts.

Pine is relatively rarely found at White Springs in architectural contexts, although it is unclear whether this is due to lack of easy access—it is not common in the area today—or to a strong preference against using pine as support posts in domestic structures at the site. Prezzano’s (1992) review of longhouse construction materials finds very little evidence for pine house posts, especially in Haudenosaunee tribal territories, although she cites the fact that the Huron word for roofing pole contains the noun for pine (Steckley 1987). This may indicate that pine *was* used for some aspect of domestic structures that is not archaeologically recoverable. The other single-species posts from House 2 suggest that at White Springs, red oak and hophornbeam were used for domestic structure wall posts/support.

Townley-Read

At Townley-Read I focused my (re-)identifications on four postmolds from the short longhouse structure—one which had not been analyzed (PM 4), one for which the proportions of taxa had not been quantified (PM 6), and two which Rossen reported as single-species (PM 29, PM 34) (Appendix A: Table 6). Although other postmolds were discovered in the houselot area, the associations and purposes of these features was somewhat less clear-cut than the purpose of those postmolds that comprise the floor plan of the only structure identified at the site. The total quantity of charcoal in the short longhouse posts was generally greater than at Ganondagan, as can be seen in the data from Rossen's original report (reproduced in Appendix A: Table 7). His data and identifications also show low quantities of maize and other seeds scattered among the short longhouse support posts.

The findings from postmolds at Townley-Read have already been discussed by Jordan (2008). However, my re-identification of some of the posts which Rossen's identifications suggested were single species indicates that this is not the case (Appendix A: Table 7). In fact, the range of species present in the posts original reported as single species more closely resemble the range of species recovered from ridgetop posts at White Springs. Mixed postmold contents, consistent with structural posts being removed before community relocation, also fits with the peaceable nature of the community move from White Springs to New Ganechstage and from New Ganechstage to Kanadesaga.

The material examined from posts at these three sites makes clear how relatively uncommon it is, for a variety of taphonomic and site formation reasons, to discover the construction material of Haudenosaunee architecture via charcoal. The presence of possible oak posts at both Ganondagan and White Springs, and specifically red oak at White Springs, suggests that this might have been a preferred or at least regularly chosen material. Although two posts from three sites is a small sample, it begins to substantiate the idea that relatively rot-resistant hardwoods like oak were preferred for structural support through time and in relatively different forest environments, and provides a counterpoint to some of the literature's focus on cedar posts for Iroquoian construction across geographic areas (Heidenreich 1971; Snow 1995a: e.g. 124). Additionally, red oak, although marginally less durable than white oak over long periods of time (Highley 1995:415), produces bitter acorns that are less desirable as a food source because of the length of time they take to mature and the amount of leaching they require to be edible (Scarry 2003:65–66)[77]. Thus, the use of red oak for construction materials would not have impinged on or limited an otherwise desirable food source. This is just one way to consider the selection of construction materials as part of a total suite of landscape practices which involved agentive choice by Seneca people in the past, and integration of various spheres of action which had a cumulative effect on ecologies around Seneca sites.

Fire-Related Features

Fire-related features across the three sites can be compared using several criteria to tease out both availability of certain kinds of wood and choice within that availability. The Seneca language contains several words for different *kinds* of fires (for example council fires vs. fires in a fireplace with a chimney[78]) and it is necessary to understand that people differentiated between fires and fuels based on both practical considerations *and* social significance. The indoor and outdoor features at these sites are the result of different processes of use, re-use, and disuse which has implications for the interpretation and comparison of their contents. The analysis of the wood charcoal foregrounds these processes and finds that there were significant differences

[77] Parker (1968:99–101) discusses the use of acorns as a food source, and notes that hickory and chestnuts were generally preferred.
[78] *Gajisdayë'* (council fire); *ode:ka'* (Fire, flaming); *gaje:od* (Fire, standing flame) from Bardeau (2011). Chafe (1967) also lists a number of terminological distinctions.

in how these types of features were formed across sites and through time.

Relative to other kinds of features at the three sites, fire-related features contain both a greater quantity of charcoal and provide more easily accessible phasing of deposits due to their internal stratigraphy. This makes the results of charcoal analysis from fire-related features particularly useful for examining differences in wood use over time and for different tasks, based on the type of deposition which created each stratum of the features.

Ganondagan

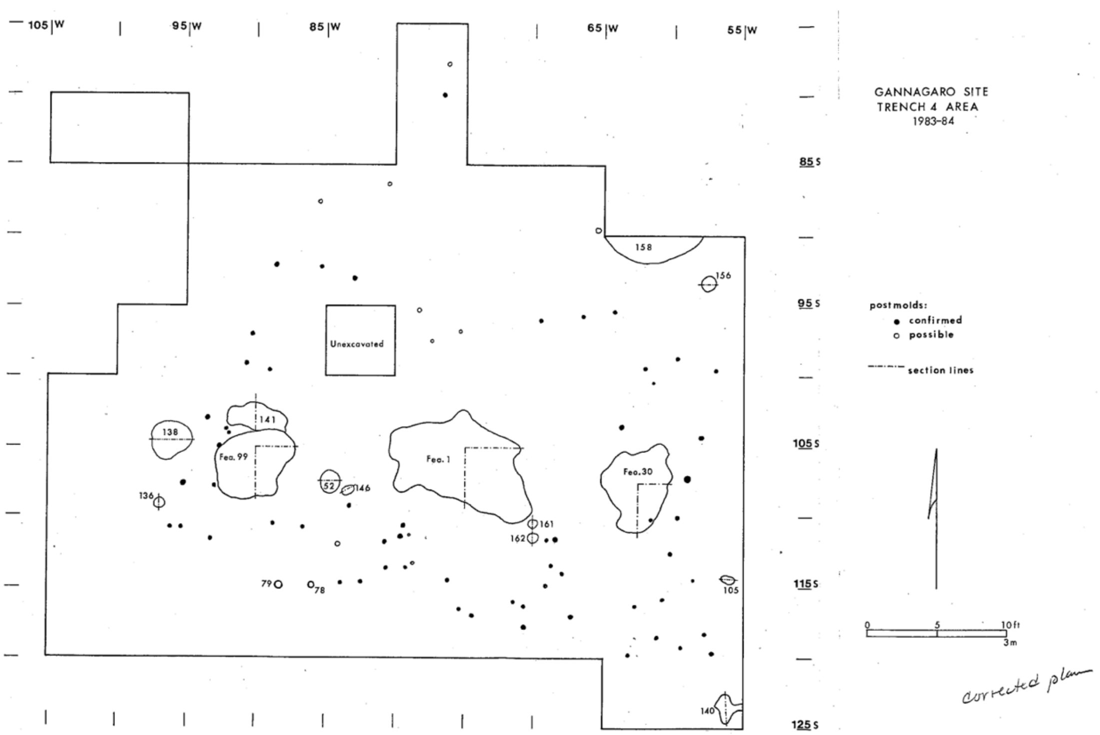

Figure 13. Plan map of Trench 4 at Ganondagan, reproduced from Dean 1984.

At Ganondagan, three features from within the Trench 4 longhouse were identified as hearths by excavators. Feature 1, the largest of the three at approximately 10 ft. by 5 ft. (3 m by 1.5 m, with depth unspecified in the report), was identified as a central hearth due to its placement despite its lacking fire-reddened subsoil and displaying significant rodent disturbance. It is also considerably larger than interior hearths identified at other sites. Feature 1 contained relatively few identifiable pieces of charcoal, and there were less than three grams of charcoal in the materials transferred to Cornell (Appendix A: Table 8).

Feature 99, the western feature, contained significantly more identifiable fragments of charcoal than Feature 30, to the east, but much less charcoal by weight (4.86 g compared to 8.01 g from Feature 30), and both features contained more charcoal than Feature 1 (Appendix A: Table 8). Both of these features were quite large as measured at the base of the plowzone—Feature 30 was 6 ft. long by 5 ft. wide (1.8 m x 1.5 m), and Feature 99 was 6 ft. long and "4 to 4.5 feet wide" (1.8 m x1.3 m)—and located very near what were identified as the eastern and western walls, respectively, of the longhouse (Dean 1984:24). Feature 30 extended only 3.6 inches (9.14 cm) into the subsoil, while Feature 99 displayed a more hearth-like basin shape which extended 0.2–1.1 ft. (6.1–33.5 cm) below the subsoil. These dimensions do not fit with hearth comparanda from other Iroquoian sites, and the large size of these features combined with their proximity to purported longhouse walls calls their identification as interior hearths into question, although they are no doubt fire-related features of some kind. This analysis suggests a reconsideration of the phasing of these features and/or their spatial relationship to the longhouse identified based on the postmolds recovered in Trench 4 is needed.

Indoor fire features are defined as those which can be conclusively placed within a domestic structure; they are most typically central hearths of longhouses or short long houses. Due to plow agriculture, the preservation of Iroquoian hearths is uneven in New York State as well as in Canada (Creese 2011:253–254). Fully excavated sites roughly contemporaneous with Ganondagan, such as the late seventeenth century Onondaga Weston site, provide some constraint on the characteristics of hearths. Sohrweide (2001:10) reports the hearths from Weston are 10 ft. (or 3 m) from the closest wall, are approximately two feet (0.61 m) in diameter, and extend shallowly (2.5–5 cm) into fire-reddened subsoil[79]. Plowzone depths at Weston range from 6–10 inches (15.2–25.4 cm), shallower than many areas of White Springs and Ganondagan. And while Creese's (2011, 2012a) focus is more on hearth *spacing* and the proportional relationships between elements of Northern Iroquoian longhouses through time, he includes depictions of a number of longhouse floor plans where the hearth diameters are in the range of 1–2 m. Huron hearths have been recorded as ranging from 4–22 cm in depth below subsoil surface (Varley and Cannon 1994:88). Because plowing impacts the upper portion of these bowl or basin-shaped features, the remnants encountered by archaeologists after plowing have smaller diameters and are shallower than they would have been in their original dimensions.

The three features described as hearths inside the structure identified at Ganondagan fit none of these models. In order to explain the presence of these large fire features apparently inside a structure, some have suggested that the structure was either not fully exposed by excavation or was not residential (Jordan 2002:306, 395–396; Jemison and White 1997, cited in Jordan 2008:248). Because of the limited dimensions of the Trench 4 excavation area, my analysis will not be able to determine whether the structure was fully excavated. Differences in the charcoal recovered and identified from these features do, however, suggest some refinements to their interpretation and other possibilities for interpreting the sole structure uncovered at Ganondagan.

The charcoal from the westernmost fire-related feature, Feature 99, is mostly maple, birch, and oak (Table 6), with minor contributions from other taxa.

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[79] Other hearth analogues for Ganondagan can be found in (Hayes 1967a, 1967b; Snow 1995a).

Table 6. Proportions of identified charcoal from Feature 99 at Ganondagan.

Identification	**N**	**Weight (g)**	**% by count**
Maple (*Acer* spp.)	11	1.91	33.33%
Birch (*Betula* spp.)	11	1.16	33.33%
Oak (*Quercus* spp.)	4	0.09	12.12%
Hophornbeam (*Ostrya virginiana*)	3	0.36	9.09%
Ash (*Fraxinus* spp.)	2	0.15	6.06%
Beech (*Fagus grandifolia*)	1	0.16	3.03%
Persimmon (*Diospyros virginiana*)	1	0.16	3.03%
Elm/Hackberry (Ulmaceae)	1	0.01	3.03%
Sum	33	3.99	

According to the site artifact catalog, this feature also contained a large quantity of artifactual material that is not temporally distinctive but fits with other material assemblages from the site (Table 7). Drawings of this feature show a roughly basin-shaped profile ranging in depth from 0.2–1.1 ft. (6–33.5 cm) below the subsoil surface (Dean 1984:25). If some of the top of the feature extended into what is now plowzone, which ranged from 1.0–1.1 ft. (30.7–34 cm) over the feature, Feature 99 was likely even larger than its excavated dimensions, and definitely extended beneath the area that Jordan (2008:248) identifies as a likely bench area. Postmolds identified as structural in the 5 x 5 ft. units surrounding Feature 99 penetrate more shallowly in the subsoil, on the scale of 20 cm.

Table 7. Material contents of Feature 99 (A.GA.1984.1241).

Material	**Count**
Antler/bone comb	1
Bead, round black glass	1
Bead, round blue glass	1
Bead, round green glass	1
Beads, blue seed glass	4
Beads, round red glass	6
Beads, white seed glass	3
Bone	195
Bone, burned	285
Tooth	14
Deer antler	14
Brass bead, tubular	1
Brass fragment	2
Brass kettle lug	1

Chert	2
Chert flakes	5
Gunflint	1
Iron awl	1
Lead birdshot	1
Lead fragment	1
Smoking pipes, Euroamerican-made	1
Smoking pipes, Native-made	6
Pottery, Native-made	6
Lithic projectile point/drill	1
Quartz	4
Shell	19

One of the postmolds closest to Feature 99 (Feature 165) was also found to contain one piece of chert, one piece of antler, 101 pieces of bone, one tooth, one iron fragment, and a Jesuit-style ring. Although the depth of Feature 165 is not reported in the Ganondagan report, its contents are materially congruent with what was recovered from Feature 99, as well as the signature of a postmold which was formed by the infilling of refuse after the post was removed. The fact that the base of the fire-related feature was deeper than many the surrounding structural posts, that it is associated with a potentially pulled post, and that destruction by plowing has obscured the possibly larger dimensions which would place it even closer to the southern and western walls of the structure suggests that Feature 99 (and possibly Feature 165 as well) may have preexisted the construction of the building.

Only five pieces of charcoal were recovered from the excavated portion of Feature 1, the proposed central hearth of the structure at Ganondagan. The report also notes that there was no fire-reddened earth around the excavated portion of this feature and that there was "considerable rodent disturbance…across the feature" (Dean 1984:24). The excavated southeast quadrant of the feature also contained a high number of artifacts (Appendix A: Table 9), including over 2500 pieces of faunal material and many pipe fragments, both Native- and European-made. Although the artifact counts in Appendix A: Table 9 cannot be presented as a density figure because the amount of soil removed from the feature was not recorded by the excavators, the signature of the artifacts removed from this feature suggests that it was used more as a secondary refuse location than as a fire-related feature. A refuse area would be unlikely in the center of a structure which was inhabited and strongly indicates this feature was either emplaced prior to the construction of the structure or that the structure was not a residence at the time of the community's departure from Ganondagan and this was an area of refuse disposal.

Feature 30, the easternmost fire-related feature within the structure at Ganondagan, displayed more typical fire-reddened earth at its base and in the surrounding subsoil. This feature was significantly shallower (Dean 1984:24) than the other two, and the excavated portion contains less artifactual material and more charcoal than Feature 99 (Appendix A: Table 8). Again, charcoal in this feature is dominantly maple and birch, with smaller contributions from beech, sycamore, oak, and basswood.

Table 8. Proportions of Identified Charcoal from Feature 30 at Ganondagan.

Identification	**N**	**Weight (g)**	**% by count**
Maple (*Acer* spp.)	8	1.14	33.33%
Birch (*Betula* spp.)	7	0.12	29.17%
Beech (*Fagus grandifolia*)	3	0.18	12.50%
Sycamore (*Platanus occidentalis*)	3	0.07	12.50%
Oak (*Quercus* spp.)	2	0.02	8.33%
Basswood (*Tilia americana*)	1	0.08	4.17%
Sum	24	1.61	

Both Feature 30 and Feature 99 contain wood which could have come from a climax maple-beech forest, which is a forest type that develops in the long-term absence of disturbance, through the replacement of successive communities of vegetation.[80] If representative of surrounding forests at the time this wood was

[80] The assumption that climax forest represents an equilibrium state, following a series of successional vegetation communities which take over an area that has been disturbed (Horn 1974; Scoones 1999:481) has been problematized in recent years in the ecological literature

collected, forests around Ganondagan were not made up of fire resistant or early successional species which colonize recently disturbed areas. Although not a confirmation that these fire features preceded the construction of the short longhouse at Ganondagan, the charcoal analysis suggests that the wood in these features came from early clearance of the site and that a more detailed analysis of the artifact contents of these features should be carried out to clarify the phasing of the features in Trench 4. Feature 30 and Feature 99 also had a relatively low diversity of taxa (4–6 present) compared to the overall taxonomic diversity from Trench 4 (17 present), which suggests Seneca selectivity about wood to be burned in these features or lower diversity of species available early in the site's occupation.

White Springs

Outdoor fire features were identified at White Springs both by their size—larger than the typical Iroquoian hearth and in several cases of a size that would have been dangerous to enclose in bark and timber construction, the absence of surrounding postmolds that form a house plan, and as artifact distribution in and around these features. At White Springs, because of the careful methods used for excavating features, we have good internal stratigraphic control for three large pits: Features 2, 3 and 6. The stratigraphic control allows me to place charcoal-based interpretations of wood use in a chronological relationship as well as one based on possible different uses.

The three large, outdoor, fire pit features at White Springs have a greater diversity of taxa within each stratum than all the fire-related features at Ganondagan taken together. These stratified features at White Springs had initial uses as firepits

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(Costanza et al. 1993; Scoones 1999), especially over longer time scales. In this case, it can be used as a proxy for lesser amounts forest disturbance, anthropogenic or otherwise.

and were later filled in with mixed discarded material and possibly hearth dumps from around the site. Although a more fine-grained analysis of the possible phasing of these large fire pits cannot be completed without in-depth faunal and artifact analysis, an analysis of the charcoal can provide hypotheses to be tested as work goes forward. Preliminary faunal analysis by Dr. Adam Watson's zooarchaeology class at Columbia University suggest that these large, outdoor, firepits were used for a combination of hide processing, bone grease extraction, and other cooking activities (Bishop 2013; Miller 2013; Oppenheimer 2013; Vencino Gazabon 2013). Due to the lack of Native-made ceramic at the site it is unlikely that these features were used for firing pottery other than smoking pipes.

Feature 2

Feature 2 is an almost completely excavated fire-related pit feature, 1.96 m long and 0.48 m wide; a small baulk remained unexcavated although the full extent of the feature was determined. The base of the feature is a full 29 cm below the plowzone; plowzone depth varied across the area but extended approximately 30 cm below surface level in most areas. Analytically, it was possible to subdivide the feature into (1) Stratum I, an upper level which is minimally disturbed and contains some intrusive Euroamerican materials from the later component of the site, and from which only one context can been securely attributed; (2) Stratum II, a dark core of the feature characterized by significant quantities of animal bone, charcoal, some Seneca-era material culture, and thermally altered rock; and (3) Stratum III, a lighter base which contained less charcoal per cubic meter of soil and lower quantities of the same materials as the stratum above. Additional samples were identified from mixed strata within the feature whose exact placement is unclear.

Even though some Euroamerican material was pushed or settled into the uppermost, minimally disturbed stratum, the feature appears to be largely intact, and the taxa represented are commensurate with other Seneca-era contexts from the site. The nature of Euroamerican farming practices and the much lower density of charcoal in the plowzone in this area also makes it unlikely that there was intrusive charcoal from the later component of the site. For these reasons, I treat the charcoal assemblages from all the Feature 2 contexts as Seneca-era. I also identified charcoal from mixed strata within the feature which I will discuss more generally because of their unclear relationship to the clearly defined strata of Feature 2 (Appendix A: Table 10).

Overall, the most striking characteristic of the charcoal contents of Feature 2 is the wide diversity of taxa, dominated by hardwoods but also incorporating smaller understory species like sassafras, redbud, and some form of cherry. Hickory, ash, oak, and maple dominate the assemblages, with an additional component of tulip poplar in Stratum II (Tables 9, 10, 11). All these species grow well on margins between forests and clearings and in areas that experience a disturbance in vegetation (Iverson et al. 1999). Windfalls, lightning strikes, and other natural disasters which take down larger trees, could have created these ecotones but the mix of species within Feature 2 indicates that the wood used in this feature (as well as deposited within it) was collected after some regrowth and forest community alteration. Temporally, this may have been after initial clearance for the town and agricultural fields, or at least along the margins of those clearings created by the Seneca community. Thus, the entire use-life of this fire pit falls somewhat after the initial settlement of the community. This mixture of species and the forest cover that it represents contrasts with some of the other large fire pit features excavated at White Springs.

The mixed strata, although not as temporally targeted as materials which clearly come from one of the three strata in Feature 2, can still provide useful information about Seneca practices at the site. These samples contain no softwoods, which is concordant with the domestic-area debris found in postmolds from both the ridgetop, House 3, and House 2 areas. The lack of softwoods in these contexts either reflects the relative absence of softwoods in the environs of White Springs, or Seneca choice to focus on hotter and more steadily burning hardwoods for domestic-area fire-related activities. Pine in general produces roughly half the BTUs of shagbark hickory, and in addition may contain sap which causes pops and sparks ("Sweeps Library" 2016). Researchers have also identified hardwood ash as a common nixtamalization[81] agent across Eastern North America (Briggs 2015; Lovis et al. 2011) and one preferred by Iroquoian people (Parker 1910; Waugh 1991 [1916]). The dominance of hardwood charcoal at White Springs points to a synergy between the types of wood likely used in hearths and the types of ash which were most desirable for the critical production of nutritionally superior hominy. Rachel Briggs (2015) has argued for the treatment of hominy as a *foodway*, rather than simply a *food*. Considered as a foodway, hominy entangles associated practices, meanings, and rules or habits which reach into practices like firewood collection, selection of wood for burning, and appropriate and necessary resources for feeding a community that likely got upwards of 60 percent of its calories from maize at certain times of year.

Table 9. Proportional representation of species from mixed strata within Feature 2 at White Springs.

Identification	**N**	**Weight (g)**	**% by count**
Hickory (*Carya* spp.)	90	4.70	27.95%
Ash (*Fraxinus* spp.)	73	1.96	22.67%
Oak (*Quercus* spp.)	69	1.91	21.43%
Maple (*Acer* spp.)	28	0.69	8.70%
Hophornbeam (*Ostrya virginiana*)	11	0.28	3.42%
Elm (*Ulmus* spp.)	10	0.71	3.11%

[81] Nixtamalization is the process of using a highly alkaline (or basic) material to soften corn pericarp and increase the bioavailability of amino acids and B vitamin (Briggs 2015:114). Populations that rely upon maize that has not been nixtamalized can end up with niacin deficiencies resulting in Pellagra, a relatively common occurrence when maize was extricated from the foodways alongside which it developed and spread to Europe (Briggs 2015:119).

Beech (*Fagus grandifolia*)	8	0.15	2.48%
Birch (*Betula* spp.)	7	0.10	2.17%
Basswood (*Tilia americana*)	6	0.22	1.86%
Pawpaw (*Asimina triloba*)	5	0.08	1.55%
American chestnut (*Castanea dentata*)	3	0.11	0.93%
Sycamore (*Platanus occidentalis*)	3	0.04	0.93%
Sassafras (*Sassafras albidum*)	3	0.09	0.93%
Redbud (*Cercis canadensis*)	2	0.03	0.62%
Tulip poplar (*Liriodendron tulipifera*)	2	0.03	0.62%
Persimmon (*Diospyros virginiana*)	1	0.01	0.31%
Hemlock (*Tsuga canadensis*)	1	0.01	0.31%
Sum	322	11.12	

Charcoal from persimmon, *Prunus* sp., and grape were found in small quantities across the strata of Feature 2. The presence of grape at White Springs is confirmed in the identifications made by Paula Turkon of two *Vitis* sp. seeds from Stratum II of Feature 2 (Turkon notes, 2012). Although identification of seeds from White Springs is ongoing, no persimmon seeds or plum or cherry pits have yet been identified. Cherry pits were relatively common in sampled feature contexts from Trench 4 at Ganondagan, so their apparent absence at White Springs is interesting.

Table 10. Proportional representation in the dark core of Feature 2 (Stratum II) at White Springs.

Identification	**N**	**Weight (g)**	**% by count**
Ash (*Fraxinus* spp.)	20	0.44	16.67%
Tulip poplar (*Liriodendron tulipifera*)	20	2.45	16.67%
Hickory (*Carya* spp.)	18	0.67	15.00%
Maple (*Acer* spp.)	15	0.54	12.50%
Oak (*Quercus* spp.)	13	0.87	10.83%
Birch (*Betula* spp.)	9	0.97	7.50%
Elm (*Ulmus* spp.)	9	2.51	7.50%
Beech (*Fagus grandifolia*)	8	0.56	6.67%
Hophornbeam (*Ostrya virginiana*)	3	0.05	2.50%
Persimmon (*Diospyros virginiana*)	2	0.04	1.67%
Sycamore (*Platanus occidentalis*)	1	0.01	0.83%
Cherry (*Prunus* sp.)	1	0.02	0.83%
Sassafras (*Sassafras albidum*)	1	0.01	0.83%
Sum	120	9.14	

Additionally, the mixed strata (Table 9) and Stratum III (Table 11) both contain small quantities of pawpaw, indicating that this resource was present at White Springs over the course of the use-life of this firepit. Because of the primary importance of this fruit-bearing tree as a food resource, it makes sense that the wood is not found in large quantities as fuelwood. The presence of a small quantity of pawpaw wood in this pit feature provides information about food resources available to White Springs inhabitants that may not be attested to in the other macrobotanical remains and confirms the presence of pawpaw trees and not just transported or imported pawpaw fruit.

Table 11. Proportional representation from the base of Feature 2 (Stratum III) at White Springs.

Identification	**N**	**Weight (g)**	**% by count**
Ash (*Fraxinus* spp.)	34	1.79	26.15%
Oak (*Quercus* spp.)	22	0.44	16.92%
Hickory (*Carya* spp.)	16	0.19	12.31%
Maple (*Acer* spp.)	11	0.27	8.46%
Poplar (*Populus* spp.)	9	0.1	6.92%
Birch (*Betula* spp.)	8	0.13	6.15%
Elm (*Ulmus* spp.)	6	2.07	4.62%
Alder (*Alnus* spp.)	5	0.11	3.85%
Beech (*Fagus grandifolia*)	5	0.22	3.85%
Hophornbeam (*Ostrya virginiana*)	3	0.04	2.31%
Pine (*Pinus* sp.)	3	0.02	2.31%
Pawpaw (*Asimina triloba*)	2	0.02	1.54%
Persimmon (*Diospyros virginiana*)	2	0.09	1.54%
Tulip poplar (*Liriodendron tulipifera*)	2	0.06	1.54%
Grape (*Vitis* sp.)	2	0.23	1.54%
Sum	130	5.78	

The charcoal identifications from Feature 2 support the initial interpretation of this feature as an outdoor firepit which may have been used for several purposes over the course of its use-life. The mixture of wood types indicates that no specific species of wood was desirable or necessary for the activities which took place here, but that the dominantly hardwood charcoal in this feature reflects the firewood resources which were available around the town, likely some time after it had been initially settled.

<u>Feature 3</u>

Feature 3 (Appendix A: Table 11) at White Springs was less completely excavated than Feature 2, but extends 1.91m in length, is at least 1.10 m wide, and the base was located 34 cm below the base of the plowzone. Within the feature, three strata were differentiable based on artifact content, charcoal density, and soil changes observed at the time of excavation.

The base of Feature 3, Stratum III, had the highest density of charcoal of all the layers, contained 90 percent less animal bone by count than Stratum II, and had no diagnostic artifacts. Over 1.3 kg of fire altered rock was recovered from this basal layer, probably rocks which were emplaced at the beginning of the usage of the pit. Interestingly, the diversity of tree taxa is much higher in this initial stratum than in later strata (Table 12), not only reflecting a lack of wood selectivity by the people using this pit, but also possibly changing availability of wood over the period in which Seneca people used this feature. The dominance of beech and maple in this initial level is more akin to the climax forest assemblages identified at Ganondagan, possibly placing the first use of this large firepit during the early days of the occupation at White Springs.

The contributions of oak, hickory and ash to this basal layer indicate the availability of these species in the surrounding area, and additionally, practices such as understory burning and clearance which encouraged fire resistant seedlings of oak, hickory, and tulip poplar over seedlings with low resistance to fire such as sugar maple, birch, and aspen[82] (Wagner 2003:155). This basal stratum of Feature 3 also

[82] Although I did not definitively identify any charcoal from White Springs as quaking aspen (*Populus tremuloides*), I did identify fragments to the genus level (*Populus* spp.) which in this region could include aspen, eastern cottonwood (*Populus deltoides*), and eastern balsam poplar (*Populus balsamifera*). *Populus* spp. prefer light, moist, riparian environments, and trees under 20 years old do not thrive in areas with regular burning (Iverson et al. 1999).

contains one fragment of pawpaw wood, continuing the pattern of small but consistent representation of fruit tree wood in Seneca-era features across the site.

The presence of pawpaw wood in this stratum might also indicate that this feature was in use some time after the initial clearance and settlement of the site, given that pawpaws require five to seven years to mature before they bear fruit (Murphy 2001:102), assuming they were planted by Seneca people near the settlement. Keener and Kuhns (1997) proposed that Haudenosaunee people cultivated pawpaw on the basis of mentions in the Jesuit Relations and a northern distribution of pawpaw which is roughly coterminous with Iroquoian sites, but without clear archaeological evidence. Taking a counter position, Murphy disputes the idea that pawpaw was distributed intentionally or unintentionally by human movement and posits that pawpaw was distributed through animal consumption and transport toward the northern edge of its natural range. He maintains that pawpaw is a "natural though usually uncommon constituent of the Carolinian Zone of Beech Maple Forest" (Murphy 2001:110). Although pawpaw seeds have not commonly been found on New York sites[83], my identification of pawpaw wood at White Springs in central New York makes clear that at the time of Seneca occupation there were pawpaw trees near the site. Pawpaw prefers enriched alluvial soils of bottomlands (Layne 1996), environments which can be found around White Springs, so this does not clarify whether pawpaw was naturally found in the area or cultivated by Seneca people. The association with later stages of the occupation at White Springs indicates to me that it was specifically cultivated by Seneca people.

[83] One pawpaw seed was identified at the Corey Site (Rossen 2015:143) which dates to the sixteenth century or earlier, either indicating natural occurrence of pawpaw in this area or earlier human introduction of pawpaw than proposed by Keener and Kuhns.

Table 12. Proportional representation in Stratum III of Feature 3 at White Springs.

Identification	N	Weight (g)	% by count
Beech (*Fagus grandifolia*)	18	0.89	18%
Oak (*Quercus* spp.)	17	0.79	17%
Maple (*Acer* spp.)	17	0.81	17%
Hickory (*Carya* spp.)	13	2.09	13%
Birch (*Betula* spp.)	9	0.42	9%
Ash (*Fraxinus* spp.)	9	0.62	9%
Hophornbeam (*Ostrya virginiana*)	8	0.58	8%
***Populus* spp.**	3	0.14	3%
Basswood (*Tilia americana*)	2	0.04	2%
Alder (*Alnus* spp.)	2	0.09	2%
Pawpaw (*Asimina triloba*)	1	0.23	1%
Tulip poplar (*Liriodendron tulipifera*)	1	0.05	1%
Sum	100	6.75	

The middle stratum of Feature 3 (Stratum II) seems to represent in-place cooking-related activities, and contains large fragments of animal bone, a lower density of artifacts, and a higher density of charcoal and fire-altered rock than in other strata of the feature (Table 13). This layer is 76 percent hickory, with every other taxon under 10 percent of the total sample. The very high percentage of hickory in the stratum associated with cooking implies singular preferential use of this wood for outdoor cooking fires or another task like hide smoking. Depending on the species of hickory, it may produce more heat per volume unit than various species of oak, and more than beech, birch, or oak ("Sweep's Library" 2016). Based on my examination of charcoal from other areas of the site as well as features of the same type, many other species were available to Seneca people and were burned in other contexts. Thus far, this stratum of Feature 3 is the only analytic unit which exhibits people's strong preference for a single type of wood at White Springs.

Table 13. Proportional representation of taxa in Stratum II of Feature 3 at White Springs.

Identification	N	Weight	% by count
Hickory (*Carya* spp.)	76	9.67	76%
Ash (*Fraxinus* spp.)	7	0.65	7%

Black walnut (*Juglans nigra*)	6	0.83	6%
Maple (*Acer* spp.)	5	0.79	5%
Slippery elm (*Ulmus rubra*)	4	0.18	4%
Tulip poplar (*Liriodendron tulipifera*)	1	0.03	1%
Oak (*Quercus* sp.)	1	0.04	1%
sum	100	12.19	

The top 10 cm of Feature 3 (Stratum I) contains what seem to be midden or redeposited materials—a mixture of animal bone, fire-altered rock, and a range of other artifacts—which resulted from cumulative practices of burning and refuse gathering and disposal across the site (Table 14). This stratum of redeposited material represents hearth dumps or secondary refuse from elsewhere on the site, and the mixture of taxa in these contexts provides evidence for general Seneca indoor firewood usage and practices of firewood gathering for domestic purposes. This is especially useful information given the lack of definite hearths recovered at White Springs, and the destruction of hearths on Iroquoian sites by Euroamerican farming techniques more generally.

Filling large firepit features within an apparently tightly packed domestic area with secondary refuse makes sense in the context of planned community relocation to New Ganechstage and changing use of domestic space as the population relocated. Over 50 percent of the identified pieces in this uppermost stratum were hickory, and together with ash and oak these species are consistent with an oak-hickory forest type providing the source for firewood at White Springs during the later stages of this feature's use. Thus, within the charcoal sampled from this single feature it is possible to observe local forest composition changes encouraged by Seneca landscape practices. Because these species are more fire-resistant, in a seasonal burning regime they would have been able to out-compete other species at various life-stages. This means that the trees available to the Seneca community could have been a mixture of newly encouraged growth and older growth which persisted more successfully.

Table 14. Proportional representation of taxa in Stratum I of Feature 3 at White Springs.

Identification	N	Weight (g)	% by count
Hickory (*Carya* spp.)	58	10.19	58%
Oak (*Quercus* spp.)	14	0.58	14%
Ash (*Fraxinus* spp.)	11	0.43	11%
Black walnut (*Juglans nigra*)	8	0.74	8%
Slippery elm (*Ulmus rubra*)	4	0.58	4%
Hophornbeam (*Ostrya virginiana*)	3	0.12	3%
Maple (*Acer* spp.)	2	0.05	2%
Sum	100	12.69	

<u>Feature 6</u>

Feature 6 was the smallest of the large outdoor fire-related features from which I examined charcoal at White Springs. It measured approximately 1.24 long, 1.0 m across, and 33 cm deep below the plowzone. The length is approximate because it is based on soil color differences at the plowzone/feature soil interface rather than excavation of the full length of the feature. Below the plowzone, three strata were identified: a minimally mixed layer (Stratum I); the undisturbed top 10cm of the feature (Stratum II); and a basal portion which contained very little in the way of artifacts but a much greater quantity of charcoal (Stratum III). Two identifiably different sets of practices may have contributed to the formation of this feature. Initially, the pit was used for cooking, which produced large amounts of charcoal, thermally altered rock, and preserved large pieces of bone in relatively high quantities (especially when compared to surrounding domestic space). Subsequently, the existing pit was used as a location for the deposition of clean-up or trash from the surrounding area which resulted in inclusion of beads, fragmented bone, and scraps of brass, all items that appear in much lower quantities or are entirely absent from the bottom stratum (Appendix A: Table 12).

This is also supported by the preliminary finding that only approximately 16 percent of the bone in Stratum II of the feature is burned or calcined, as opposed to roughly 28 percent of the bone in Stratum III (Gerard-Little 2012). Most broken bone present in Stratum II was deposited in Feature 6 without being directly exposed to fire, meaning there was no fire present in the feature at the time of deposition and the material was not exposed to fire after it had been deposited. These bone fragments may have been the by-product of other cooking or carcass processing activities, discarded in an unused firepit. Although this data has not been subject to detailed faunal analysis—for instance bone fragments were not separated by fragment size, overall preservation, recovery method, or extent of burning—it is suggestive of changing depositional environments over the course of Seneca use of this feature.

The minimally disturbed layer at the top of the feature (Stratum I) has a lower density of charcoal than the undisturbed upper 10 cm and the lowest portion of the feature. This may reflect the mechanical mixture via plow of low charcoal density overburden with the higher charcoal density upper level of Feature 6, but the charcoal present is likely still from the contents of Feature 6 and indicative of Seneca-era activities at the site.

Although preliminary analysis on material from Feature 6 suggests its usage followed a similar trajectory to Features 2 and 3, these taxa included in Feature 6 diverge considerably from those in Features 2 and 3, especially in Stratum III of Feature 6. Stratum III of Feature 6 (Table 15) is more than 50 percent beech and the next most common taxa are maple and ash. This distribution of taxa is much more similar to the mixture of taxa identified from large fire features at Ganondagan, which I proposed were created at the beginning of the site's occupation when climax forest was still available in the surrounding area and being cleared or collected for firewood. Compared even to the earliest strata in Features 2 and 3—which contain lower quantities of beech and higher proportions of hickory and oak—in Feature 6 hickory does not appear in the basal stratum at all, and oak only occurs in a relatively small quantity. Interestingly in this feature, all of the oak was identifiable as red oak; these trees produce acorns that are less desirable as a food source because of their bitterness and their long maturation time compared to acorns from white oaks (Scarry 2003:65). White oak was one of the species that showed the greatest increases in evaluative statistics for modeling historic forests when the locations and effects of Iroquoian settlements in Chautauqua County were considered (Tulowiecki and Larsen 2015).

Table 15. Proportional representation of taxa in Stratum III of Feature 6 at White Springs.

Identification	N	Weight (g)	% by count
Beech (*Fagus grandifolia*)	30	1.55	50.85%
Maple (*Acer* spp.)	7	0.41	11.86%
Black ash (*Fraxinus nigra*)	6	1.41	10.17%
Hophornbeam (*Ostrya virginiana*)	5	0.10	8.47%
Grape (*Vitis* spp.)	3	0.11	5.08%
Birch (*Betula* spp.)	2	0.14	3.39%
Red oak (*Quercus rubra*)	2	0.06	3.39%
Persimmon (*Diospyros virginiana*)	1	0.06	1.69%
Tulip poplar (*Liriodendron tulipifera*)	1	0.08	1.69%
Sassafras (*Sassafras albidum*)	1	0.12	1.69%
Basswood (*Tilia americana*)	1	0.05	1.69%
Sum	59	4.09	

The upper undisturbed 10 cm of Feature 6 (Stratum II), which I determined in a preliminary analysis of the feature was likely comprised of secondary refuse, contains a greater density of charcoal than the basal layer of the feature, indicating that a significant quantity of this material must have come from other fire-related contexts around the site. This stratum contained a wide range of taxa, including wood from two fruit-bearing tree species: mulberry and a *Prunus* species.

Table 16. Proportional representation of taxa in Stratum II of Feature 6 at White Springs.

Identification	N	Weight (g)	% by count
Ash (*Fraxinus* spp.)	32	1.47	29.91%
Beech (*Fagus grandifolia*)	17	0.44	15.89%
Hickory (*Carya* spp.)	15	1.24	14.02%
Red oak (*Quercus rubra*)	11	0.52	10.28%
Birch (*Betula* spp.)	10	0.36	9.35%

Hophornbeam (*Ostrya virginiana*)	6	0.19	5.61%
Sycamore (*Platanus occidentalis*)	6	0.17	5.61%
Maple (*Acer* spp.)	3	0.08	2.80%
Basswood (*Tilia americana*)	3	0.09	2.80%
Red mulberry (*Morus rubra*)	1	0.03	0.93%
***Prunus* sp.**	1	0.02	0.93%
Sassafras (*Sassafras albidum*)	1	0.04	0.93%
American elm (*Ulmus americana*)	1	0.10	0.93%
Sum	107	4.75	

The upper portion of Feature 6 (Stratum I) was minimally disturbed by Euroamerican plowing and overall contained a lower diversity of taxa than Stratum II and Stratum III. The two taxa that appeared with the highest frequency in this stratum were hickory and red oak (Table 17), followed by birch and ash. The remaining taxa in total made up less than 25 percent of the subsample. As with the other large pit features at White Springs, it appears the later strata in Feature 6 reflect the composition of oak-hickory forest types, and that the composition of the charcoal is reflecting the changes in the availability of (dead)wood around the site by the time of the end of the community's occupation.

Table 17. Proportional representation of taxa in Stratum I of Feature 6 at White Springs.

Identification	**N**	**Weight (g)**	**% by count**
Hickory (*Carya* spp.)	25	0.53	46.30%
Red oak (*Quercus rubra*)	8	0.12	14.81%
Birch (*Betula* spp.)	5	0.14	9.26%
Ash (*Fraxinus* spp.)	5	0.17	9.26%
Elm (*Ulmus* spp.)	4	0.05	7.41%
Maple (*Acer* spp.)	3	0.18	5.56%
Hophornbeam (*Ostrya virginiana*)	2	0.05	3.70%
Beech (*Fagus grandifolia*)	1	0.01	1.85%
Basswood (*Tilia americana*)	1	0.01	1.85%
Sum	54	1.26	

All three of the large exterior firepits from which I examined charcoal at White Springs are of similar dimensions and were potentially used for similar activities of cooking, bone grease extraction, and hide processing. The dissimilar proportions and inclusions of taxa, reflecting changing availability in the surrounding area, may indicate these three large firepit features were in use primarily during different times in the community's occupation of White Springs. An analysis of diagnostic artifacts may further clarify the stratigraphy and relationship between these figures, but thus far an analysis of glass beads from the large pit features has been inconclusive (Shim 2012). Although detailed analysis of all faunal remains from this feature and the others from White Springs have not been completed, these datasets could also provide further insight into the phasing of these three fire-related features within the span of the Seneca occupation at White Springs. Zooarchaeologists have shown that deer can decrease in size with intense hunting over a period of time (Rayner-Herter 2001:33), and from preliminary analysis at White Springs and research at Townley-Read, it is clear that deer were significant resources for food and hides for the trading economy at this time (Bishop 2013; Hall 2013; Hitchcock 2013; Miller 2013; Oppenheimer 2013; Vencino Gazabon 2013; Jordan 2008:298–300). It may be possible to see a decrease in bodily size of white-tailed deer over the course of the occupation of White Springs if they were being locally hunted intensely enough. Differences in size either within or between pits might provide another source of evidence for phasing, confirming or contradicting the interpretation that the forest around White Springs was increasingly comprised of fire-resistant taxa like oak and hickory.

Townley-Read

Excavations at Townley-Read in the yard around the identified short longhouse uncovered one large exterior fire feature (Feature 5). Two other exterior fire features were excavated in the house lot area at Townley-Read—Features 13 and 14—and Jordan interpreted these as "repeatedly used, special purpose hearths" (2008:144), perhaps cooking fires away from the short longhouse (2008:145). Feature 5 displayed a clear internal stratigraphy that was well-sampled for flotation. The samples from Feature 5 had been examined by Rossen for botanical materials; I reexamined three contexts from two different strata that contained wood samples labeled 'unidentified' in Rossen's report (2440.TR525 from Feature 5 Stratum I, and 2440.TR490 and 2440.TR523 from Feature 5 Stratum IV) (Appendix A: Table 13). I also re-examined one of the flotation samples taken from Feature 13 (2440.TR612) to confirm Rossen's report that this feature contained entirely sycamore charcoal.

Feature 5 is at the center of Jordan's (2014b) examination of the gendered dynamics of daily practice at Townley-Read, specifically those practices that took place around this prominent feature nearby the short longhouse. His analysis was based on faunal remains, botanical data from Rossen's (2006) analysis and report, assessment of the artifacts found within the four stratigraphic layers of the feature, and artifacts found in the plowzone above the feature. Jordan determines that this was a special use feature primarily used for hide processing as well as plant processing (Jordan 2014:69–70) and makes the argument that these activities were largely directed and controlled by women and girls, with less regular participation by young boys, captives of either gender, and elderly men (2014b:77–78). He takes the mixture of plant taxa in this feature as indicative of women's firewood gathering activities and their movement into and through ecologically different areas around the site, based on the likely growing environments of trees like sycamore and maple.

My additional identifications from Townley-Read from Stratum I and Stratum IV contribute further information on the likely activities of women associated with this feature over the course of its use-life. No charcoal from the base of the feature, Stratum IV, had been identified previously. My examination of a sample from this level found that the most common taxa associated with the earliest use of the feature were maple, tulip poplar, and ash, and that there was also some wood from *Prunus* spp., persimmon, and hackberry. Although Herrick's *Iroquois Medical Botany* does not mention persimmon, *Prunus* (especially *serotina and virginiana*) and hackberry had many uses in preparations for supporting health (Herrick 1997:130, 165). This further supports Jordan's assertion that the plant and artifact remains represent labor associated with

> key contributions to subsistence, trade, and health. These processes were undertaken outdoors, in full view of other members of the community, in a setting where Seneca women's productive accomplishments and control over other personnel (such as youth and captives) would have been quite visible. (2014b:77)

I also identified additional material from Stratum I that had not previously been analyzed. Although it is difficult to compare the data from my work and the analysis performed by Rossen due to different recording and reporting methodologies, my work suggests that there is a greater diversity of wood taxa present in Feature 5 than highlighted in the 2006 analysis. My identifications doubled the number of taxa found in the feature to from seven to fourteen, including previously undetected understory species such as ironwood and grape.

Rossen's identifications of Features 13 and 14 (Appendix A: Table 16) indicate that the charcoal in both consisted entirely of sycamore and that the two features contained little else in the way of macrobotanical material. The sample I reexamined from Feature 13 consisted entirely of sycamore (Appendix A: Table 15).

Compared with the plethora of plant remains and multiple taxa of wood found in Feature 5, the mono-species composition of Features 13 and 14 presents a stark contrast. Sycamore is a relatively light wood and, although seasoned sycamore burns cleanly, it does not produce a great deal of heat compared to other woods such as maple, ash, or oak ("Sweep's Library" 2016). The houselots at Townley-Read are spread along Burrell Creek, an ideal growing environment for sycamore, which prefers floodplains and moist soil along waterways (Iverson et al. 1999:196). The proximity of this ecological zone to the houselot area implies that desire for easily and quickly available wood outweighed any need for hotter or longer-burning wood for the activities carried out in and around Features 13 and 14. In the case in the larger firepit, which was used for deerhide processing, bone grease extraction (Watson and Thomas 2013), and preparation and processing of plants (Jordan 2014), denser hardwoods were preferred. Wood for these purposes was potentially collected from further away from the houselot area, meaning there was a greater labor investment in the conditions necessary for these processes.

The analysis of charcoal from these features highlights the contribution that taxa identification can make to the interpretation of feature purpose, as well as the necessity of identification of charcoal from across contexts and features at a site. Although Features 5, 13, and 14 can be glossed as fire-related, there are clear differences in the labor (likely of women) implied by archaeological charcoal, and information about the different areas and environments women moved through to create desired conditions in each of these contexts.

Other Types of Features

The features discussed in this section are either singular within the assemblage of features at the three sites or of unclear purpose due to the state of analysis or interpretation. In either case, charcoal identification can be useful to develop a model of the signature of a certain type of feature, or to contribute to the determination of the original nature and use of a feature based on similarity to other features. At the very least, charcoal analysis provides data to develop hypotheses which can be tested with data from other material categories.

Ganondagan

Trench 4 excavations at Ganondagan also encountered a feature identified in the Dean and Barbour Associates report as a pit (Feature 52), 1.7 ft. (0.52m) deep and

1.3 ft. (0.41m) wide at the top (Dean 1984:27). Less than one gram of charcoal was recovered from this feature, and identifiable fragments totaled 0.32 g, including the only piece of pine from the entire site (Appendix A: Table 17). Aside from the pine, the taxa recovered—maple, beech, and birch—fit with taxa identified from other features within Trench 4. The Ganondagan catalog notes 49 pieces of burned bone, 66 pieces of bone, two teeth (or tooth fragments), and one piece of mica were also recovered from the pit. Because of the nature of the Ganondagan collections and the preliminary state of the catalog it is not clear what size or species these pieces of bone are, but because of the low quantities of charcoal this was probably not a location for secondary refuse disposal from hearths or other fire features, and was relatively well-protected from living surface debris.

The second pit feature within Trench 4 identified by excavators at Ganondagan, Feature 146, presents interpretive questions. Although originally described as a pit in the excavation report (Dean 1984:26–27), Jordan (2008:248) re-examined the spatial distribution of posts and the dimensions of the Ganondagan structure and determined that Feature 146 might have been a bench support post, based on its oval plan, long axis diameter of 1.35 ft. (41.15 cm), and distance from the western wall. Extending 2.35 ft. (71.63 cm) below the plowzone, this feature was more deeply embedded in the subsoil than any of the other identified postmolds in the trench, and I have included in here with the other features given the multiple perspectives on its origin.

Feature 146 contained a total of 2.96 g of charcoal and at least eight different species (Appendix A: Table 18). If it was a bench support, it would have been exposed to material from the central aisle of the longhouse. Beech, maple, and hickory occur with the greatest frequency in this feature with smaller contributions from basswood, birch, hemlock and oak (Table 18). This feature also contained 42 pieces of bone, one iron fragment, five teeth, one shell fragment, a bone claw, one round red glass bead, one piece of native-made pottery, and an iron awl. Because this feature was excavated in 1984, these finds unfortunately are not described in the Ganondagan report. The awl especially is intriguing—depending on the placement within the feature and its size and condition, it could indicate that this was either a pit feature or a postmold that filled in with debris after the wooden post was removed or rotted.

Species	**N**	**Weight (g)**	**% count**
Beech (*Fagus grandifolia*)	5	0.27	25%
Maple (*Acer* spp.)	4	0.25	20%
Hickory (*Carya* spp.)	4	0.15	20%
Basswood (*Tilia americana*)	2	0.12	10%
Birch (*Betula* spp.)	2	0.07	10%
Hemlock (*Tsuga canadensis*)	2	0.06	10%
Oak (*Quercus* sp.)	1	0.06	5%

Table 18. Species from Feature 146 at Ganondagan.

White Springs

At White Springs, the analysis of features and the spatial organization of the site is ongoing. This section discusses two features, one which has been assigned a tentative purpose and one whose purpose was unclear at the time of excavation.

Postmold 16 is located in what seems to be exterior, domestic space in the ridgetop area. Although at the time of excavation it was designated as a postmold because of its shape and dimensions, preliminary analysis of the plant remains performed by Paula Turkon suggested that the feature might be a smudge pit (Turkon personal communication to Jordan August 2011; Table 19). The quantity of charred material recovered from this feature was greater than for many of the postmolds discussed above, and most that material was deliberately charred corn cob (*Zea mays*). Ithaca College undergraduates, identifying charcoal as part of a senior seminar course on Iroquois land management practices and traditional ecological knowledge, purported to have identified pine in this feature, but I reexamined this material I found that it was all charred corn cob.

Smudge pits have been defined by archaeologists based on contents and morphology. They are pits with a plan-view width of approximately 30 cm that contain the remnants of the primary deposition of deliberately charred materials. These materials are found in large quantities at the base of the pit, overlaid by a gray loam created by intentional infilling (Binford 1967; Skibo et al. 2007). The smudge pits Lewis Binford identified at a Mississippian site in Illinois contained carbonized corn cobs, empty of kernels. Skibo et al. (Skibo et al. 2004, 2007) also argue that they have identified smudge pits at a Postcolumbian site on Lake Superior that contain pine cones and other non-corn materials. The possible range of purposes for smudge pits, which seem designed to emit smoke based on their morphology and contents, has been debated over the years, with ideas ranging from mosquito control, to hide smoking (Binford 1967), to pottery smudging (Munson 1969). While there was very little pottery production occurring at White Springs, as discussed previously, preliminary faunal analysis has suggested the importance of the deerskin and fur trade to the residents of White Springs (Bishop 2013; Hall 2013; Oppenheimer 2013).

Table 19. Botanical identifications from PM 16 at White Springs by Paula Turkon.

Context No.	**Feature**	**Identification**	**N**	**Weight (g)**
1952.WH329	PM 16	Corn cupules and cob fragments (*Zea mays*)	Quantity	13.23
		Corn glumes	Quantity	0.13
		Corn kernels	Quantity	0.22
		Raspberry/blackberry (*Rubus* sp.)	1	--
		Unexamined light fraction		19.03

I also identified material from Feature 7, identified in the field as a probable Seneca-era small, ovoid pit feature (Table 20). The long axis of the feature was 40 cm, the shorter axis was 26 cm, and it extended four centimeters into the subsoil, suggesting that it may be the base of a storage pit or hearth. Because the purpose of this feature was less certain based on morphology and spatial locus, it is a good context in which to test whether charcoal quantity and species could be used to narrow down feature function at White Springs.

Table 20. Proportional representation of taxa from Feature 7 at White Springs.

Identification	**N**	**Weight (g)**	**% by count**
Maple (*Acer* spp.)	11	0.51	31.43%
Hophornbeam (*Ostrya virginiana*)	8	0.18	22.86%
Hickory (*Carya* spp.)	5	0.11	14.29%
Ash (*Fraxinus* spp.)	3	0.09	8.57%
Sycamore (*Platanus occidentalis*)	3	0.06	8.57%
poss. *Prunus* spp.	2	0.07	5.71%
Alder (*Alnus* sp.)	1	0.03	2.86%
Ironwood (*Carpinus caroliniana*)	1	0.01	2.86%
Red oak (*Quercus rubra*)	1	<0.01	2.86%
Sum	35	1.06	

The dimensions of Feature 7 at the plowzone subsoil interface are similar to those of the pit feature of ambiguous function (Feature 52) excavated at Ganondagan discussed earlier, although Feature 7 was considerably shallower. The quantity of charcoal contained in Feature 7 at White Springs was also much greater than what was recovered from Feature 52 at Ganondagan. This discrepancy could be attributed to the shorter occupation of and hasty departure from Ganondagan which meant that there was less opportunity for charcoal to accumulate in that pit. However, the plowzone above Feature 7 was only 31 cm deep, meaning that the feature originally could have at most been 35 cm in depth, while the pit feature at Ganondagan was 52 cm deep. Other examples of storage pits from across Iroquoia range widely in depth depending on the impact of plowing as well as the type of pit (storage, personal cache, etc.), but a range of 35–55 cm of recovered depth is typical (Hayes 1967a; Johnston and Jackson 1980; Snow 1995a:132). Given these conditions, the quantity of charcoal in a relatively small area, and the location of Feature 7 in a block of 1 x 1 m units on the ridgetop where several postmolds were located, it is possible that Feature 7 is the base of a hearth, the overlying portions of which have been plowed out. If this is the case, the spatial relationship between Feature 7 and other identified postmolds on the ridgetop at White Springs will be very important for determining the placement of Seneca structures in this heavily disturbed area.

Townley-Read

Excavations in Area H at the Townley-Read site excavated nine square meters of what was termed a buried plowed midden (BPM) deposit. Excavation of this deposit revealed plow scars at its base, indicating that portions had been plowed, although analysis showed that while the midden itself may have been jumbled it had not been significantly mixed with later Euroamerican materials (Jordan 2008:150). I did not reexamine any of the samples from the BPM and all of the identifications I cite from this locus were made by Rossen (2006, reproduced in Table 20, Appendix A). Two contrasting interpretations for this area at Townley-Read have been proposed. Jordan (2008) interprets this area as an area of secondary refuse deposition possibly associated with a short longhouse which was not identified during excavation. He bases this interpretation on density of faunal remains and the range of artifact contents. If this is the case, charcoal identification should find the taxa identified in this feature broadly match the sum of other contexts at Townley-Read. Because no plowzone control flotation samples were taken in the short longhouse area it is difficult to compare the density of charcoal in the possible midden with surfaces in other areas of the site which may have been plowed out.

In a differing interpretation, Matthew Krohn (2010:42–43), in his analysis of the lithic assemblages from Townley-Read, suggests that this is in fact a plowed living surface. His interpretation is based on the high level of late-stage, small lithic flakes, the varied density of flakes within the excavation area defined as the BPM, as well as the presence of a postmold and fire-related feature within the trench. Were this area a living surface, I would expect to find a charcoal range and density commensurate with the features within the short longhouse because in Krohn's scenario these would have been plowed out and mixed into the buried stratum. Because we have no interior hearths at Townley-Read to compare the proportional representation of taxa with, it is difficult to say how the taxa of an 'interior' context would look, except that they might be similar to those found in flotation samples taken from removed posts of the identified structure.

The density of wood charcoal in the BPM at Townley-Read ranged from 0 to 638.57 g/m^3 of flotation sample soil, with an average of 122.33 g/m^3 for all the samples taken from the BPM. This is on the order of 10 times lower than the charcoal densities from large outdoor firepits at both White Springs and Townley-Read and, at the lower end, commensurate with charcoal densities of plowzone and subsoil control flotation samples which range from 0 to 33.33 g/m^3 across Townley-Read. The average charcoal density of features from within the short longhouse is 930.42 g/m^3, rather higher than the average from the BPM; plowzone controls are not available in this area.

Although I cannot quantify the proportions of taxa across the BPM based on Rossen's data, it is significant that he does note the presence of pine in one of the samples (Appendix A: Table 20). The only other area of the site in which pine was identified was the upper ash layer of the large, outdoor firepit—Feature 5. This strongly suggests, along with the dearth of pine from household contexts and firepit contexts at White Springs and Ganondagan, that the charcoal from the BPM was not from *in situ* interior, domestic contexts, but from multiple use-areas across the site, some of which were exterior. Because the BPM at Townley-Read was spread across at least nine square meters, this variability in charcoal density makes sense: rather than secondary refuse deposited in a relatively tightly bounded feature like an outdoor firepit going out of use (and thus protected from the elements), all manner of domestic refuse was deposited variably across this area, perhaps with a greater density of hearth dumps in certain places. Rossen's identification of charcoal from the BPM includes maple, red oak group, sycamore, pine, and American elm—all taxa that are found in other contexts at the site and represent wood-gathering labor in a range of ecological zones. This midden likely represents the household refuse from a smaller number of people than refuse deposits at nucleated sites like White Springs or Ganondagan, given that it was associated with a 'neighborhood' of the dispersed settlement at Townley-Read, and possibly with an individual house that has not been located conclusively. With this functional identification, the incidence of wood charcoal taxa in a refuse area can be compared to those from contexts with specific or known uses.

This feature at Townley-Read suggests that a model for a Seneca midden at a dispersed site should have a variable charcoal density, although not as high as the density of charcoal within fire-related features (below 1000 g/m^3), and that the taxa in the feature should reflect the taxa found in other areas across the site. At White Springs, this model for a buried plowed midden based on charcoal density could be useful given that at least two areas of possible midden were located but due to time and excavation constraints were not exposed to the same extent as the BPM at Townley-Read. These constraints developed based on the BPM at Townley-Read may be used to help determine whether these areas at White Springs are midden; given the differences in site structure and population between Townley-Read and White Springs, relative density variation of other classes of artifacts between loci at a single site and between these two sites will also play an important role in this determination. This could be used in combination with faunal analysis that assesses weathering, gnawing, and other post-depositional signatures of midden contexts.

Plowzone

Plowzone charcoal, because it cannot be definitively linked with the Seneca-era occupation of these sites and could easily represent a mixture of burning and depositional practices from the seventeenth century onward, is described generally here. At sites or areas where the plowzone is deeper, such as areas of Ganondagan, there is likely more Seneca-era feature soil incorporated in this layer. Specific identifications and weights for plowzone contexts are reported in Appendix A. The presence or absence of species in these levels should not be taken as indicative of any practices during the Seneca occupations of Ganondagan, White Springs, and Townley-Read. For this reason, as well as the generally small size of the charcoal recovered, I did not identify charcoal from the eight samples from Ganondagan that I floated[84]. However, I did identify hand-collected charcoal from 14 contexts at the site, and unidentifiable charcoal from these contexts was useful for calculating charcoal density in plowzone soil. Quantification of charcoal recovered from plowzone samples will be used to compare charcoal density in soil over domestic contexts across the three sequentially occupied sites.

At Ganondagan, the quantity of charcoal recovered from plowzone contexts via hand collection as well as water-screening ranged from 0 to 22.40 g/m^3 with an average of 3.84 g/m^3 (Appendix A: Table 21). While plowzone areas above features did generally contain charcoal, most plowzone samples with charcoal from Trench 4 contained less than 1 g/m^3. Of the identifiable charcoal in the plowzone samples transferred from Peebles Island, 27.19 percent was beech and 20.18 percent was maple, and most of the other species identified from features were also found in the plowzone in some quantity (Table 21). Black willow (*Salix nigra*) was only found in a

[84] A.GA.1984.1283, A.GA.1984.1302, A.GA.1984.1305, A.GA.1984.1306, A.GA.1984.1307, A.GA.1984.1312, A.GA.1984.1313, A.GA.1984.1314

plowzone context, as was black walnut (*Juglans nigra*), yellow or tulip poplar (*Liriodendron tulipifera*), poplar (*Populus* sp.), and the only fragment of cherry (*Prunus* sp.) identified from the samples from Trench 4. Given that this plowzone charcoal could easily be a mix of material from Seneca features and living surfaces and later natural or human-set fires it is not possible to take it as representative of any particular period or Seneca activity.

Table 21. Plowzone identifications from Ganondagan.

Identification	**N**	**Weight (g)**
Maple (*Acer* sp.)	23	1.75
Birch (*Betula* sp.)	11	0.63
Hickory (*Carya* spp.)	13	0.76
Persimmon (*Diospyros virginiana*)	2	0.07
Beech (*Fagus grandifolia*)	31	2.46
Black walnut (*Juglans nigra*)	1	0.13
Yellow poplar (*Liriodendron tulipifera*)	1	0.02
Hophornbeam (*Ostrya virginiana*)	5	0.48
Sycamore (*Platanus occidentalis*)	2	0.12
Poplar (*Populus* sp.)	1	0.04
Plum (*Prunus* sp.)	1	0.06
Oak (*Quercus* sp.)	5	0.45
Black willow (*Salix nigra*)	2	0.16
Basswood (*Tilia americana*)	11	0.74
Elm (*Ulmus* sp.)	5	0.44
Unidentifiable/unexamined	--	17.64
Sum	114	25.95

Fewer plowzone flotation samples were deliberately taken at White Springs, although often flotation samples from the tops of feature contexts were later determined to be a combination of plowzone and feature soil or largely plowzone. The plowzone control flotation sample taken away from the core domestic area was deliberately collected for comparative purposes and does not contain any portion of feature soil. It contained four unidentifiable fragments of charcoal and the density of charcoal in this sample was 14.0 g/m^3, higher than Ganondagan and on par with Townley-Read. Tabulating hand-recovered charcoal from plowzone contexts at White Springs provides an average density across all test units of 27.38 g/m^3, which includes plowzone from atop a range of feature and non-feature contexts[85].

Plowzone flotation control samples from Townley-Read, examined by Rossen, have relatively low quantities of wood charcoal, between 0 and 88.89 g/m^3. The only plowzone context which contained identifiable fragments (2440.TR922), was taken from soil above the buried plowed midden; this sample also had the highest density of charcoal of any plowzone control at Townley-Read. Rossen attributes the entirety of this sample to the red oak group (*Quercus rubra*).

Table 22. Rossen's identifications from Townley-Read plowzone control flotation sample.

Context #	Feature	Identification	N	Weight (g)
2440.TR922	Plowzone control (above Feature 5)	Wood (red oak group)	75	0.80
		Corn – cupule (*Zea mays*)	3	<0.01
		Blackberry/raspberry (*Rubus* sp.)	4	--
		Walnut/butternut (Juglandaceae)	1	--

There are several possible explanations, not mutually exclusive, for the much lower density of handpicked charcoal density from plowzone contexts at Ganondagan than at White Springs and Townley-Read: 1) excavators were less diligent about recovering plowzone charcoal during excavations at Ganondagan; 2) features and living surfaces at Ganondagan were relatively cleaner of charcoal at the time the community left the site, meaning that when mixed with a relatively charcoal-free overburden by plowing the overall density is much lower; 3) higher population density at White Springs had a significant effect on the overall density of fire-related refuse; and 4) the range of activities captured by sampling at Townley-Read and White Springs were not captured in the sample from Trench 4 at Ganondagan.

Given that the other feature types are commensurate across the three sites, the fourth explanation is less than satisfactory. The third explanation is also unlikely,

[85] Materials from three test units (TU 111, TU 112, and TU 113) were excluded from the average as extreme high outliers. These units may represent Euroamerican deposits, but at this stage in the analysis it is unclear.

because Townley-Read, a fully dispersed site, still had an average plowzone charcoal density higher than the one at Ganondagan. It is likely that a combination of explanation one and two—less diligent collection of plowzone charcoal by excavators and cleaner living surfaces at Ganondagan—are responsible for the discrepancy in plowzone charcoal densities between Ganondagan and the two succeeding sites, occupied by the same community following similar practices. This conclusion is significant for interpreting other material classes as well.

Discussion

This feature-class and site-based analysis of the charcoal from Ganondagan, White Springs, and Townley-Read demonstrates that archaeologically recovered charcoal is valuable for examining potential construction materials, daily practices of firewood collection and wood burning activities, site formation processes, the origin and type of unknown features, presence of fruit trees not otherwise attested to, and the changing availability of certain taxa around a site due to the human use and manipulation of the landscape.

At White Springs, we have evidence for oak used in the construction of a domestic structure and pine used in the construction of the palisade. Fire-related features from all three sites reveal that over time Seneca practices of landscape clearance and possibly controlled understory burning affected forests in the surrounding area. This is most noticeable at White Springs where a high degree of stratigraphic control, three large firepits, and a long occupation provide strong evidence of a shift from a more mixed northern hardwood forest to an oak-hickory dominated forest toward the end of the community's occupation of the site. Firepits, in both their phases of initial use and re-use as a location for secondary refuse, show Seneca selectivity in firewood choices. The lack of pine used for indoor fires, inferred from the distribution of charcoal around the sites, is a stable practice over time and can also be potentially linked to foodways given the ethnographically attested preference of hardwood ash for maize nixtamalization. Features from Townley-Read and White Springs which contain a high proportion (75–100%) of single taxa charcoal indicate that special purpose activities which required care in firewood selection were occurring in the domestic and houselot areas, but in none of these cases was the wood rare or exotic—the presence of these taxa in lower quantities in other features and areas of the site indicate their use in non-specialized practices as well. Inter-feature comparison of charcoal characteristics also provides another set of criteria to assess similarity or difference in features beyond dimension and artifact contents, and contributes to the determination the nature of a previously unidentified feature—Feature 7 at White Springs.

A detailed examination of the charcoal data by feature class and site has been necessary to explain and explore some of the variation in formation of features as well as the many factors which influence the interpretation of individual features at each of the three Seneca sites. Next, I take a step back and place this information within the framework of Seneca landscape practices of clearance, maintenance, and re-use and the historical and political context of the community's move from Ganondagan, to White-Springs, and ultimately to Townley-Read.

CHAPTER 8

CONCLUSION

Now that I have gone through the site-by-site evidence for various types of wood and wood usage at Ganondagan, White Springs, and Townley-Read, it is useful to return to the idea of landscape and the particular kind of relationship between Seneca people and landscape that is suggested by this data and the other sources compiled in this dissertation. Landscape as I am using it encompasses lived, conceived, and perceived elements, and to delve into the dynamic relationship between the inhabitants of Ganondagan, White Springs, and Townley-Read and their surroundings means uniting multiple scales and domains of inquiry. I proposed earlier that this relationship is one of 'stewardship,' a term commonly used in present contexts of traditional ecological knowledge (TEK) and indigenous resource management (Berkes et al. 2000; Houde 2007; Inglis 1993; Kimmerer 2002), but problematized in its uncritical or overly sweeping application to any and all indigenous groups in the past and present in ways which reinforce stereotypes of 'ecologically noble Indians' (Deloria 1998; Nadasdy 2005). In this chapter I make the case for stewardship specifically in the context of these three Seneca sites through archaeological evidence for practices which affected the environment, Seneca conceptions of their surroundings, and perceptions and uses of different landscapes.

'Stewardship' implies a conception of human responsibility *to* but not necessarily power *over* a territory or local ecosystem and its components. Through a parallel examination of the European perception of Haudenosaunee, and more specifically Seneca, landscapes I will demonstrate how a framework of stewardship is an important break with colonial descriptions and presents a different way of understanding Seneca territory as well as indigenous landscapes more generally.

The operation of colonialism makes stewardship invisible in the documentary record, but it is recognizable in versions of the Haudenosaunee Thanksgiving Address that are used by communities today. The Ganö:nyök, which is often translated as 'Thanksgiving Address,' or 'the words that come before all else', "covers not only the conventionalized amenities of both thanking and greeting, but also a more generalized feeling of happiness over the existence of something or someone" (Chafe 1961:1). Although this address may have undergone some alterations following the adoption of the Code of Handsome Lake in the early nineteenth century (Tooker 1968), the core message remains that of mutual responsibility and obligation of people to each other, the earth, the plants, the water, the trees, the animals, the birds, the three sisters, the wind, the thunderers, the moon, the sun, the stars, and the four beings. While people have power to do certain things with plants, trees, animals, etc., they have mutual obligations that constrain this power. Returning to the analysis of Creese (2016): power may be nested hierarchically in a scalar sense, but power is not concentrated hierarchically in this form of stewardship.

Ganondagan, the home to the eastern Seneca community from roughly 1670 until the attack by French forces in 1687, presents a unique case in the Seneca sequence: a location that was hastily abandoned under military duress, which has been investigated through archaeological excavation, and is today the only State-designated Historical Site in New York dedicated to Native American history. Additionally, the State Historic Site and associated museum are managed and run by the descendent Seneca community. At the time of Denonville's attack on Ganondagan, French officials held significant fears about the ability of the Haudenosaunee, and particularly the Seneca, to disrupt trade, relationships and alliances with other Indian groups, and the balance of colonial power in the Americas between England and France. This site was occupied during a peak in Haudenosaunee power vis-à-vis colonial England and

France and within the time of greatest territorial expanse of the Haudenosaunee as a whole (Jordan 2013d; Parmenter 2010). Denonville's fear, expressed in a letter to the French Minister of the Navy, the Marquis de Seignelay, was that:

> should we destroy only one village without being sufficiently strong to proceed against all the others at the same time, we may oblige the enemy to take up a position in the depths of the forest within twenty leagues of us, a distance that would not be the least obstacle to their coming and finding us, whilst they would be beyond our reach to chastise them, which would be a great misfortune for us (Brodhead 1855b:350).

Although my examination of wood charcoal from Trench 4 at this site adds considerably to the interpretation of the site and the Seneca occupation, the vast majority of the collections from the 1983–1984 excavations remain to be analyzed and interpreted. The immense potential of these collections for contributing to our knowledge of the material realities of life at Ganondagan has only been partially realized. Analysis of materials from this site, which reflect the practices and processes of a community that was part of a powerful nation, neither merely in contact with European colonists nor colonized by these new populations (Jordan and Gerard-Little, in review), can produce narratives that powerfully contradict assumptions of Native decline, swift and universal colonization, and the attendant loss of sovereignty.

As previously elaborated, Ganondagan was placed within local distance of a series of previously occupied Seneca settlements in the area between Conesus and Canandaigua Lakes. It was also located within a local distance (15.4 km) from the principal western Seneca community of Rochester Junction (Jordan 2010:94). This provided the community with easy access to the areas of re-growth at sites of previous clearance, ecological zones which particularly favored important resources such as berries, flexible saplings used for certain forms of construction (Heidenreich 1971), a wide variety of plants for health[86] whose growth was encouraged by the Seneca pattern of shifting agriculture and continued management of places, and another active Seneca community.

There is a growing recognition that even non-agriculturalists can be active managers of resources (Wagner 2003:126–127). In functional language, they can make resource availability predictable (O'Brien 1987), or phrased with a greater emphasis on the agency of past people, they "create local environments of their own design" (Lewis 1982:65). As agriculturalists, Seneca landscape practices at work in the seventeenth century, as laid out in Chapter Four, produced an even more varied and bountiful landscape. The charcoal evidence from Trench 4 at Ganondagan provides insight into the lived landscape of the Seneca community at Ganondagan by revealing the strong possibility that domestic structures were created using rot-resistant oak poles for support.

Interestingly, the fire-related features located within the structure at Ganondagan may represent some of the preparatory activity at the site, before full community relocation. My analysis of the charcoal from Feature 30 and Feature 99 indicates that not only are they larger and closer to structural walls than hearths at other Iroquoian sites of the seventeenth century, they are deeper than many of the wall posts of the short longhouse structure, and the charcoal recovered from within these features appears to have been drawn from a climax beech-maple forest without preference for any one taxon. Even without more spatially extensive excavations opening a larger window into the phasing of construction at Ganondagan as a whole, as was possible at the ancestral Wendat Mantle site (Birch and Williamson 2012), it has been possible to distinguish an earlier phase of activity at Ganondagan that

[86]For example: Indian hemp (*Apocynum canabinum*), giant puffball mushrooms (*Calvatia gigantea*), Lamb's quarters (*Chenopodium album*), horsetail (Equisetaceae), Trout lilly (*Erythronium americanum*), and Sassafras (*Sassafras albidum*).

preserves the signature of surrounding forests not yet modified by agricultural clearance and burning. The wealth of artifacts recovered from both fire features, as well as the likely associated Feature 165 (a postmold), present an intriguing avenue for further investigation of practices and activities associated with Seneca preparation of a site for community habitation. I also determined through a lack of charcoal and the rough tally of artifacts from Feature 1, the supposed central hearth, that this was likely an area of secondary refuse which either pre-dates the structure or indicates the structure was not in use at the time of the community's departure from Ganondagan.

By the time Wentworth Greenhalgh visited Ganondagan in 1677, the site had been inhabited for approximately seven years. As a colonial official interested in an alliance with the Haudenosaunee, his perception of the site and its surroundings was more focused on features of military and political use. He observed that none of the Seneca towns were stockaded at the time of his visit (Greenhalgh 1849:13), fitting with what is known archaeologically from Ganondagan. His other perceptions of the site revolve around his observations of various forms of savagery: feasting, sexual promiscuity, and the torture of prisoners. He writes of his visit to the Senecas:

> Here y^{e} Indyans were very desirous to see us ride our horses, w^{ch} wee did: they made great feasts and dancing, and invited us y^{t} when all y^{e} maides were together, both wee and our Indyans might choose such as liked us to ly with. (Greenhalgh 1849:13)

Later, Greenhalgh and his party encountered prisoners in transit who he describes having their fingers cut off, being slashed with knives, and burnt, until seven hours later the finally died and their hearts were eaten (Greenhalgh 1849:13).

European documentary focus on the perceived savagery and depravity of Native people aligns with contemporaneous European intellectual currents which exalted (European) man's ability to civilize or modify nature or wilderness (Glacken 1967), an unwillingness to attribute these abilities to indigenous people, and a concomitant inability to perceive the effects of landscape stewardship (Dennis 1993).

Similarly, Denonville's account of the military approach to Ganondagan notes the open woods present in the area made marching in formation easier, but makes no explicit connection between the open woods and the nearby settlement (Brodhead 1855b:338).

The worry of a reciprocal negative influence of indigenous 'wilderness' on colonists is also evident in letters such as Denonville's 1687 annual report that followed the summertime attack on Seneca towns. He frets that young men allowed to live in the woods, without serving in a structured military, will become bad and undisciplined; even soldiers who spend too much time at an isolated fort, where they rely on trade rather than agricultural labor for their living, are prone to 'turning Savage' (Brodhead 1855b:339, 344). Denonville's articulation of this fear, of French men becoming undisciplined and idle, juxtaposed with observations of the amount of agricultural stores his troops destroyed at Ganondagan earlier in the year[87], lays bare the biased and gendered colonial perception of Haudenosaunee people.

It is clear historically, archaeologically, and ethnohistorically that Haudenosaunee people relied heavily on agricultural products for food, and through various practices of clearance, settlement relocation, and daily life, altered local environments. These practices, as discussed in Chapter Four were likely distributed among Haudenosaunee men and women, with women responsible for much of the

[87] "I deemed it our best policy to employ ourselves in laying waste the Indian corn, which was in vast abundance in the fields, rather than follow a flying enemy to a distance, and excite our troops to catch only some straggling fugitives…We remained until the 24th at the four Seneca villages; the two larger being distance 4 leagues, and the others, 2. All that time was spent destroying the corn which was in such great abundance that the loss, including the old corn in cache which we burnt, and that standing, was computed, according to the estimate afterwards made, at 400 thousand Minots. These four villages exceed 14 to 15 thousand souls. There was a vast quantity of hogs which were killed; and a great many both of our Indians and French were attacked with a general rheum, which put every one out of humor" (Brodhead 1855b:338).

agricultural labor and firewood collection and men taking part in field clearance practices. Seventeenth century Jesuit observations of Northern Iroquoian populations ignore the reciprocal and distributed nature of gendered labor and maintained that the men "glory in their idleness, and actually spend more than half their lives in doing nothing, from a persuasion that daily labour degrades a man, and that it is only proper for women" (Charlevoix 1761:121). Due to a combination of a core assumption of indigenous difference and lack of civilization and a European conception of male labor mixing with some natural state to produce property, even agriculture on the scale that would produce excess stores of corn was insufficient to alter European perceptions of Haudenosaunee landscapes.

This European perception of Ganondagan and the landscape around it can be contrasted with Senecas' own perceptions and conceptions of the place and the landscape, from oral histories, textual fragments, and present-day traditions and understandings surrounding the site. In Haudenosaunee tradition, the Seneca are the keepers of the western door; their "role in the council was to guard and protect the league by preventing strangers from entering the Rotinonhsyonni Longhouse or territories in secret" (Doxtator 1996:94). The name 'Ganondagan' is translated for present-day interpretive materials as 'Town of Peace,' a welcoming place for those passing through ("Iroquois White Corn Project"; Kroup et al. 1986). This however, is a general conception, particularly appropriate to the site's current incarnation as a State Historic Site and home to a public museum and interpretive center. In the late seventeenth century, Ganondagan's location and the Haudenosaunee involvement with larger geopolitical currents would have had additional valences.

Within Haudenosaunee symbolic thought the forest, the clearing, and the boundary between have significant spatial and metaphorical significance. As Parmenter (2010) demonstrates for the period 1534–1701, the "Edge of the Woods" literally and metaphorically demarcated “the secure/civilized/home [clearing] and the dangerous/uncivilized/outlands in Iroquois symbolic thought” (Parmenter 2010: xlvii). Seneca towns, as the westernmost of the Five Nations, held a place at the edge of the domestic clearing that was comprised of the territories of all the allied groups. Monitoring and maintaining those spatial and metaphorical boundaries, even in time of increased tension and conflict with western Native groups and the French, was the Seneca responsibility. Hamell (1992:454) also refers to the arrangement of Haudenosaunee settlements as a microcosm of the world itself, with the “Wood’s-edge” present around the settlements analogous to the “World’s Rim,” the edge of the human world and the threshold between that realm and the domain of “other-than-human man-beings.”

The materiality of the landscape and its composition also had conceptual importance. Amber Adams’ (2013, 2016) has drawn on various versions of the Haudenosaunee creation story to demonstrate that the story and the potential lessons it holds for listeners are intimately connected to specific ecologies; humans and the components of their biome are held to be in mutually responsible social relations. In her discussion of medicine and the meaning of the creation story Adams offers that “narrative, as it develops within the context of a specific biome, allows us to find ways of responding to that biome” (2013:3–4). Within the Haudenosaunee story of the creation of people and the earth is a story of ecological succession and change, from a barren world to one which bountifully supports the Haudenosaunee people. This transformation involves people, animals, and other powerful beings, and leads to a world which provides for human people if they fulfill certain responsibilities. By the time of Ganondagan’s occupation, the integrated growing of maize, beans, and squash agriculture had been a staple of the Seneca diet for at least 200 years, as had the practices associated with their cultivation[88]. It is possible to conceive of the sequence of Seneca sites and settlement relocations leading up to Ganondagan as a series of attempts to fulfill this relationship, an effort that was spatially ruptured by Denonville's campaign.

The core Haudenosaunee social values of "hospitality, condolence, and the renewal of reciprocal relationships" are identified by Parmenter in his examination of Haudenosaunee practices and politics, particularly in the relationships between humans and other humans (2010: xlix). When the extent of these priorities, especially the renewal of reciprocal relationships, is understood to extend beyond the sphere of human persons and applies to relationships between human and non-human persons, or human persons and the gifts with which they have been provided, as told in the Creation Story and the Thanksgiving Address, practices emerge which tend to create permanences of the stewarded landscape. In the case of the Seneca sequence prior to 1688, these are what John Creese (2012b) might call "polyvalent foci": not permanently or securely divided spaces, but differentially meaningful areas that spatially related daily practice and enacted identity.

The difficult resettlement of the Seneca population forced by Denonville's attack on their sites in 1687 was made more challenging by the loss of standing crops, food stores, and seed stock. Several traveling Mohawks noted as much to French colonial officials in the autumn of 1687 observing that "the Senecas will suffer for want of their corn which has been destroyed" (Brodhead 1855b:353). As shown in my charcoal analysis, it is very likely that the site of Ganondagan was prepared prior to a

[88] As my examination of the Seneca site sequence from 1550 onward demonstrates, even within this system Seneca settlement relocation allowed for flexibility and tinkering (Martindale 2009) with archaeologically visible elements such as site spacing, settlement organization, proximity to or distance from trading partners, and distribution of satellite communities. These spatial practices no doubt had social corollaries, and an in-depth historical examination of the practices and politics of the Five Nations (Parmenter 2010) demonstrates that conditions and Haudenosaunee responses were by no means static.

full community relocation and that the population shifted to this new location over time. This possibility was foreclosed in 1687 and after a winter spent with the Cayugas (Jordan 2008:52), the Seneca needed to more hastily prepare a new site location.

The new settlement at White Springs was situated on less hilly terrain than the area around Ganondagan, and outside a local travel radius from the series of Seneca sites occupied between ca. 1550 and 1687. It was located a similar distance to Cayuga sites on the east side of Cayuga Lake. Both Cayuga areas and the previously occupied Seneca sites were within what Jordan (2008, 2013d) terms regional space, but there-and-back travel between White Springs and these locations would not have been easily done within a single day. Pedestrian survey to the south of the core settlement area of White Springs revealed a regular scatter of fire-altered rock along the plowed surface of the field. The relative dearth of other dateable Seneca-era artifacts and the mixture with (un-recorded) nineteenth and twentieth debris like drainage tile and beer bottles makes it impossible to date the fire-alteration of the rock with any certainty. However, the regular scatter of this material across areas beyond the zones where refuse was deposited outside the settlement, suggests that it was associated with large-scale, low-level burning that could have been associated with the Seneca clearance of the site. This kind of survey also serves to graphically illustrate the fuzzy boundaries of activities in and around the site through the identification of a possible field house location approximately a mile from the settlement core. Depending on the threat of violence, areas in agricultural fields could either be safe domestic space where beading was accomplished during a lull in work or dangerous, exterior space beyond the safety of a narrowly defined clearing encompassed by the site's palisade.

Preliminary interpretations from the archaeological investigation of White Springs strongly suggest it was a compact, nucleated settlement placed in a defensible location (Gerard-Little, Rogers, and Jordan 2012; Jordan and Gerard-Little, under review.). My analysis of charcoal from a selection of features at the site provides evidence of construction materials, landscape modification, and preferential use of certain taxa in certain purposes. Analysis of other material categories at White Springs is ongoing; the ultimate union of these data with charcoal identifications will prove even more valuable for overall analysis of the site and the texture of Seneca life during a difficult period of the seventeenth century.

At White Springs, as at Ganondagan, oak posts may have been used in house construction. Additionally, White Springs revealed evidence for the use of hophornbeam as a post for a domestic structure. I also argue that one of the palisade posts at White Springs was made of pine, and potentially charred before it was embedded in the ground. Pine is not common in the area today and is not found in significant quantities in any other area of the site, suggesting it was specially sought out for use in palisade construction and was avoided for firewood. Of course, as highlighted earlier, it is possible that pine was used in the superstructures of longhouses which do not survive in the archaeological record. Although perhaps unsurprising, these identifications from White Springs demonstrate that there were some consistent preferences in construction materials among Seneca people, and Haudenosaunee groups more generally, despite the changing circumstances of settlement construction.

The charcoal evidence from the large, outdoor firepits at White Springs is comprised of largest sample of charcoal analyzed from the site and reveals interlocking processes of firewood selection, landscape modification, and within-site depositional practices. The very high incidence of hickory (76 percent of the identified sample) in the stratum of Feature 3 associated with Seneca use of this feature as a firepit indicates a clear preference for this type of wood for a particular usage, possibly bone grease extraction. This interpretation comes from a preliminary examination of a portion of the faunal remains from this feature (Oppenheimer 2013; Watson and Thomas 2013), and it is important to conceive of the processes in and around the firepit not as standalone but interlinked with other foodways, such as the nixtamalization of corn, and guidelines and beliefs which were held about how to maintain bodily health.

Based on the incidence and proportion of early and late successional tree taxa within different strata of the features, a tentative phasing of these large firepits can be suggested in which the principal use of Features 6 and 3 precede the use of Feature 2. This is tentative and could be affected by further analysis of the faunal and artifactual material recovered from these features. The change in forest types represented in the wood chosen for use in these features, and the later the wood types represented in the fill in these features, demonstrates the effect of Seneca agricultural clearance, burning, and tree selection on the dominant tree types available for firewood within a five-kilometer radius. When the Seneca arrived at the unprepared, well-drained, hilltop location that would become White Springs, it was likely forested with a combination of beech, maple, and ash trees as well as smaller understory species such as hophornbeam and basswood. As this wood was cleared and used, and agricultural clearance and understory burning progressed on an annual, seasonal scale, the combination of a more open canopy—through removal of some trees—and a forest floor kept clearer of branches and accumulated dead vegetation via low-level burns, resulted in a forest community dominated by oak and hickory and other opportunistic species such as wild cherry and sassafras. This is similar to the long-term pattern observed by Brown (2002) around Native settlements in New York state prior to European presence in the area as well as the pattern of regeneration observed by scientists in northwestern Pennsylvania after later, Euroamerican clearcutting (Whitney and DeCant 2003). Because White Springs was occupied by the Seneca community for about 27 years, this change would have been stewarded, observed, and experienced within the lifetime of many of the site's residents.

Table 23. Ubiquity of species from examined flotation samples at White Springs.

Taxa	**N**	**% by count**	**ubiquity**
Hickory (*Carya* spp.)	415	30.76	0.88
Ash (*Fraxinus* spp.)	276	20.46	0.76
Maple (*Acer* spp.)	132	9.79	0.76
Oak (*Quercus* spp.)	150	11.12	0.65
Hophornbeam (*Ostrya virginiana*)	66	4.89	0.47
Beech (*Fagus grandifolia*)	65	4.82	0.47
Elm (*Ulmus* spp.)	50	3.71	0.35
Birch (*Betula* spp.)	49	3.63	0.29
Tulip poplar (*Liriodendron tulipifera*)	34	2.52	0.18
Black walnut (*Juglans nigra*)	15	1.11	0.18
American chestnut (*Castanea dentata*)	6	0.44	0.18
Sassafras (*Sassafras albidum*)	4	0.30	0.18
Basswood (*Tilia americana*)	20	1.48	0.12
Poplar (*Populus* spp.)	12	0.89	0.12
Alder (Alnus spp.)	9	0.67	0.12
Pawpaw (*Asimina triloba*)	8	0.59	0.12
Pine (*Pinus* spp.)	5	0.37	0.12
Persimmon (*Diospyros virginiana*)	11	0.82	0.06
Sycamore (*Platanus occidentalis*)	6	0.44	0.06
Hackberry (*Celtis occidentalis*)	2	0.15	0.06
Redbud (*Cercis canadensis*)	2	0.15	0.06
Black willow (*Salix nigra*)	1	0.07	0.06
Peach (*Prunus persica*?)	5	0.37	<0.01
Hawthorn (*Crataegus* spp.)	3	0.22	<0.01
Hemlock (*Tsuga canadensis*)	1	0.07	<0.01

The ubiquity of different taxa from flotation samples I examined from White Springs (Table 23) shows that hickory, ash, maple, and oak occurred in the majority of contexts I examined. These samples were drawn, as discussed in Chapter 6, largely from field-identified postmolds and fire features, with a few samples from features of indeterminate function and possible pits. Although the measure of ubiquity across contexts at White Springs will change as analysis continues, this table demonstrates the dominance of hardwoods preserved in the archaeological record as well as the mixture of taxa burned in a domestic context; the sample encompasses understory species, fruit-bearing trees, and trees whose preferred growing environments range from moist bottomlands to well-drained slopes and from shade to full sun. The range of taxa present across all of the examined flotation samples also provides a contrast to some of the contexts in, for example, Features 2 and 3, where many fewer taxa are present. Although the Seneca people were clearly taking advantage of the variable terrain around the settlement for wood, once returned to the site there was another level of selection that determined where it would be best used.

Charcoal from across White Springs also provides evidence for the presence of pawpaw, persimmon, and likely other fruit trees of the *Prunus* genus[89] at or around the site. While fruit seeds may not be preserved if they are not intentionally or unintentionally charred, small quantities of fruit tree wood indicate the presence of the trees around the site and not just transported fruit from elsewhere. While there are disagreements about whether the cultivation and selection of pawpaw trees by Iroquoian populations is responsible for the discontinuous nature of pawpaw presence in New York (Keener and Kuhns 1997; Murphy 2001), their presence in Haudenosaunee territory extends at least as far back as the sixteenth century (Rossen 2015) and in the present day pawpaw is not commonly grown in the area without human intervention.

Fruit trees do not immediately produce fruit; pawpaws take five to seven years to bear fruit after establishment (Murphy 2001:102), apple trees often take closer to ten years (Kerrigan 2008:29), and peaches can take three to five years, depending on the variety. It is likely that fruit trees planted by the Seneca would have been grown from seed, increasing the amount of time to fruiting over modern orchards, which

[89] This includes native species of wild cherry as well as peach (*Prunus persica*) and both New and Old World plum species. The microscopic structure of these woods is difficult to differentiate.

often start with cuttings or year-old trees from nurseries. A commitment to fruit trees accessible by residents of White Springs signals long-term planning and an intention to remain in the area, even beyond the occupation of a single settlement. The practices of the Seneca community at White Springs are identifiably oriented toward re-creating and re-inventing the anthropogenically stewarded mosaic of plants, animals, and people they had been forced to leave in 1687.

It is unclear to what extent Seneca people at White Springs were making use of hickory nuts as a food source; Parker (1910:99) notes that hickory and chestnut were valued above other kinds of nuts which required more processing to be edible/palatable. Unless charred, however, these nuts and/or nutshells are unlikely to be recovered archaeologically. Parker also mentions that nut stones, used for cracking nuts and removing shell, were often located near the nut trees. This offsite processing makes it even less likely for nutshell to be found on site, and there is certainly a dearth of nutshell recovered from archaeological features at White Springs. Under 0.25 g of very small fragments of nutshell were recovered from 20 flotation samples examined from the ridgetop area, the majority of which were from large outdoor firepit feature contexts (Turkon 2010). Given the difficult adjustment period the Seneca likely experienced as they settled in a new area and rebuilt their food stores, as well as the tentative evidence for the processing of animal bone for the collection of bone grease (Oppenheimer 2013; Vencino Gazabon 2013), it is likely that at some point during the site's occupation nut grease, milk, and meats were a valuable food source for the Seneca. Watson and Thomas (2013) have argued based on data from Townley-Read that bone grease extraction was useful as a buffering strategy in times of decreased wintertime food availability, and it is possible nut resources could have been used in the same way.

The archaeological evidence makes clear that Seneca people, during their time at White Springs, were drawing on longstanding practices—such as those associated with maize, beans, and squash intercropping and agriculture—and adapting to their circumstances in this relatively unmodified landscape by working toward a future that was perceived as both possible and desirable. The move away from Ganondagan may also have affected the leadership and the distribution of responsibility within the community. In addition to being a difficult period for the Seneca due to the material loss of a site, crops, stored food, and a familiar landscape, the period of White Springs' occupation was marked by tumultuous relationships with other Indian nations and with French and English powers (Aquila 1983; Brandão 1997; Brandão and Starna 1996; Jordan 2008; Parmenter 2010). These conditions persisted until at least 1701, and Jordan (2008: 63) argues that instability and violence did not markedly improve until 1713, this may have put a greater stress on outward facing concerns and relations for the Seneca.

Although she is primarily concerned with the later reservation era, Doxtator (1996) argues that forced community relocation, in addition to increased dealings with external nations and political actors, would have prioritized outward-facing 'forest' leadership in Haudenosaunee communities. This could have shifted the balance of power away from clearance-based, likely female leadership in terms of community decision making. The 1687 relocation would also have removed the Seneca community somewhat from clearings conceived of as populated by ancestors and previous community leaders. Birch and Williamson (2015), working in a Wendat context, encompass these features in the term 'ancestral landscapes.' They press for the consideration of "people (both living and dead) that are entangled (Hodder 2012) or bundled (Pauketat 2012) together" with other aspects of the landscape in important and affective ways (Birch and Williamson 2015:140). The Seneca relocation was not only a removal from material aspects of the landscape but a distancing from an ancestral landscape, which had effects on how communities lived and potentially the distribution of power within the community.

When Seneca left White Springs and relocated a short distance to the New Ganechstage site complex around 1715, White Springs remained easily accessible and eminently useful to that population. Records of European perceptions of White Springs were recorded approximately 35 years after the community had relocated. The Moravian missionaries David Zeisberger and Johann Cammerhoff passed through White Springs on their way to New Ganechstage and noted that "the surrounding country is very pleasant, like a pleasure garden in the desert, to which I know no comparison in this country" (Beauchamp 1916:67). In addition to a single dwelling, they also saw "several Indians who had been hunting with bows and arrows" (Beauchamp 1916:82) in the cleared and open forest of the area, making use of the fact that clearings and edge areas attract animals searching for easy browse and cover[90]. Evidently there were also people who had continued to occupy or had re-occupied the site, making it far from abandoned. In fact, Seneca people maintained contact with the site; documents from 1909 note that after a newly constructed barn had disturbed some of the burials[91], "the Seneca Nation has called upon [the owner] to inquire if he would respect the graves of their fathers" (New York State Legislature 1909:175). In Zeisberger and Cammerhoff's observations throughout their travels, the landscape is presented as a preexisting substrate for their discovery and naming; they imply, through the juxtaposition of this location with a horrible wilderness adjacent, that the Seneca people chose this spot because of its natural beauty. The possibility

[90] This observation also indicates a continued usage of bows and arrows, at least for hunting, despite the increased availability and usage of European-manufactured firearms (Given 1988; Russell 1957). Although stone projectile points were not relatively rare at White Springs and Townley-Read (Krohn 2010), brass points were relatively common.
[91] Conover (1880) recorded a similar attention to the burials at Kanadesaga by Seneca descendants.

that this ‘pleasure garden in the desert’ was a byproduct of the Seneca landscape stewardship is not considered.

At the time of Cammerhoff and Zeisberger’s travels, the eastern Seneca community was living at the New Ganechstage site complex, with a portion of the community residing in a ‘neighborhood’ of short longhouses at Townley-Read. As Jordan (2008) argues, the material remains and spatial distribution of this settlement evidence a Seneca restoration, where politically peaceful conditions allowed for an innovative arrangement of short longhouses in clusters, spread out along a waterway. A diminished threat of violence in the vicinity of the site allowed house lots and people to be placed closer to both water sources and to agricultural fields, easing the (likely female) labor demands associated with the tasks of cultivation of crops and getting water and firewood.

Jordan (2008:233–235, 263–269) also demonstrates that the short longhouses at Townley-Read were intercultural/creolized structures, whose construction methods relied on the use of European tools and hardware but retained fundamental Haudenosaunee domestic design elements such as the central hearth and sleeping benches. My reexamination of the charcoal from postmolds of Structure 1 at Townley-Read found that excavations did not recover evidence of construction materials, as original partial identification suggested. I found that two postmolds that were originally identified as single-species (PM 29 and PM 34) in fact contained a total of 15 taxa (Appendix A: Table 6). While disappointing for the effort to determine whether similar construction materials were used by Seneca people in intercultural/creolized houses as longhouses, it demonstrates the importance of sample size and potential of careful examination for wood charcoal identification.

The environment around Townley-Read differed somewhat from both White Springs and Ganondagan due to the site’s location on low-lying terrain along a small waterway (Figure 14). The predominance of sycamore in many contexts at Townley-Read reflects the trees readily available in the area around the site. The variety of species I was able to identify (Table 13, Appendix A), especially in the charcoal from the large firepit, Feature 5, shows however that firewood collection was not limited to a single area and that wood was procured by women from a variety of zones around the site as they moved freely in and through these environments.

Figure 14. Terrain at Townley-Read. Photograph by Kurt Jordan, 1999.

While Feature 5 represents the female-controlled center of a number of processes associated with health, food, and production of goods for trade (Jordan 2014), the purpose(s) of Features 13 and 14 remain more obscure. These two features contained only sycamore charcoal, which I noted produces a lower heat output and was likely available closer to the houselot. There are any number of reasons a relatively small, expedient fire in the vicinity of a house might have been useful or necessary. Although it may be impossible to archaeologically determine the purpose of these features, it is important to allow for the possibility that these single-wood fires were created with a motivation beyond expediency or utilitarian concerns such as the heat-value of the wood. In a very different context, identification of charcoal from Iron Age Ireland has been used to demonstrate that some fires using a single type of wood were ritually associated with specific aspects of the environment (Dillon et al. 2008). A reconstruction of the choices and processes which went into the creation of Features 13 and 14, possible through charcoal analysis, leaves their meaning open while identifying the conditions and constraints present at the time of their creation and use.

The Seneca community at Townley-Read also continued to invest time and labor in orchards, in this case apple and butternut trees, as observed in the nineteenth century (Conover 1882 in Jordan 2008, 217). Despite this later evidence of orchards associated with the Seneca site, there is relatively little macrobotanical evidence of the consumption of the fruits of these orchards. Jordan (2008:219) suggests this is because "the planting of fruit and nut orchards may have been an element in the intentional, long-term transformation of the local landscape," a process I have demonstrated began approximately 30 years earlier at White Springs. Numerous Seneca sites, of a range of sizes, attacked by the Sullivan-Clinton campaign in 1779 were observed to be surrounded by orchards at the time of their destruction (Jordan 2008:199). The lack of nutshell at Townley-Read may also be attributable to the shelling of nuts in or near the butternut orchard, as I discussed for White Springs. Interestingly, there was no butternut wood charcoal identified from Townley-Read, meaning either these trees were entirely avoided as a source of firewood (even from downed branches) or they were not established until after the community moved on from the site.

When the data from the sites of Ganondagan, White Springs, and Townley-Read are placed within the context of post-1687 Seneca relocations discussed in Chapter Five a larger scale of processes, permanences, and possible motivations can be observed. Both the eastern and western Seneca communities were forced to relocate in 1687 by the incursion of colonial and allied forces into the Haudenosaunee ‘clearing.’ This move placed Seneca people at a significant remove from a familiar landscape, made so by “routinized passage through material settings, including buildings, palisades, fields, trails” and the entirety of the mosaic of biomes created by longstanding Seneca habitation and actions embedded in these places (Birch and Williamson 2015:140).

Within the relatively well-understood eastern portion of this sequence, non-linear change can be charted in a variety of areas of Seneca life including access to trade networks (Jordan et al. 2012; Jordan and Gerard-Little), architectural style (Gerard-Little 2011; Jordan 2003, 2004a), relationships with vying colonial powers (Parmenter 2007, 2010), and adoption and incorporation of goods, materials, and crops of European origin. What seems to remain stable until at least 1754, and probably to and beyond the Sullivan-Clinton Campaign against the Haudenosaunee in 1779, is a Seneca relationship with the surrounding environment, which relied upon a longstanding understanding of human persons as responsible to and in a mutualistic relationship with other elements of the landscape. This relationship entangled Seneca people in the landscapes they created through their practices, encouraging certain adoptions from Europeans—for example pigs, melons, apples, peaches, and iron nails for durable construction—and discouraging many others. Thus far the only evidence of European crops at White Springs has been a single grain of wheat and a possible grain of barley (Turkon 2010) and there is no evidence of European grains or pulses at Townley-Read. Although colonial intervention forced Seneca people to reconsider the location of their sites and their need for defense or alliance, it did not fundamentally reconfigure their relationship to the landscape prior to 1779.

The western Seneca community, about which there is less archaeological information, followed their 1688 relocation to Snyder-McClure with a return to the west in 1742. Rather than committing to another long-term local landscape stewardship as the eastern Seneca community chose to do, they opted for a different trajectory. Others (Jordan 2013d; Parmenter 2010) written about the faulty reasoning at work in arguing that Haudenosaunee communities or people who relocated were somehow cut-off or separated from their families, clans, and tribes; likewise, I am not arguing that this post 1742 ~45 km separation of the eastern and western Seneca communities represents a break within the nation. What it does show is that within the Seneca tradition of shifting settlement location, different conditions and goals can be prioritized, even under the same historic conditions. The continued landscape stewardship of the eastern Seneca community was not an unavoidable trajectory or one mandated by an inherent indigenous identity; it was a series of entangled practices that had to be chosen, by both individuals and the community, in the face of conditions which made it just as likely they could prioritize something else. The 'pleasure garden' observed by Zeisberger and Cammerhoff may not have been as evidently created by the hands of man as the pastoral landscapes of England or the man-made canals of Amsterdam, but these two missionaries were observing the result of a series of longstanding choices and acceptance of Seneca responsibilities to stewardship as they played out on the landscape.

The framework I developed for investigating Haudenosaunee landscapes and landscape processes in the seventeenth and eighteenth centuries incorporates multiple datasets to access the lived, perceived, and conceived elements of a dynamic, Seneca landscape. First, this provides valuable insights into site formation processes on Iroquoian and other northeastern sites. As demonstrated, wood charcoal—although often overlooked in archaeological collections—can contribute valuable and otherwise inaccessible information. Second, considering the means by which Seneca people at Ganondagan, White Springs, and Townley-Read carried out their landscape stewardship, despite variability in their political relations and experience of colonial force, places the focus on Seneca territory, Seneca homelands, and choices made by Haudenosaunee people and communities. I argue that the resilience of this community following attack by Denonville's forces was in part tied to their ability to recreate the beneficial stewardship relationship with the landscape.

Third, this framework was developed with a local intent, making use of the metaphor of the two-row agreement between colonists and Haudenosaunee people, as well as the scholarship and advice of Haudenosaunee individuals and scholars. This in itself is an attempt to counteract the frequent de-spatialized, de-temporalized, use of indigenous people as the basis for universally applicable theories of human or societal development, and enfolds the historical and ethnohistorical sources in a matrix of materials from Haudenosaunee sites, Haudenosaunee language, and contextualized Haudenosaunee practices. Although the specifics of this project may not be immediately translatable to another geographic area or time, these elements that resist aspects of the colonial project can be adapted to other investigations.

APPENDIX A

Charcoal identifications in all tables are listed alphabetically by Latin genus/species name.

Table 1. Post mold botanicals from Trench 4 at Ganondagan

Context No.	Feature (Type)	Identification	N	Weight (g)
A.GA.1983.1232	Feature 92 (Post mold)	Charred nutshell	2	0.04
A.GA.1983.1239	Feature 81 (Post mold)	Oak (*Quercus* spp.)	7	0.69
A.GA.1983.1250	Feature 110 (Post mold)	Corn kernels (*Zea mays*)	2	0.22

Table 2. Identification of charcoal from ridgetop excavation area post molds at White Springs. More than one context number per feature indicates addition of identifications from multiple excavation episodes or methods.

Context No.	Feature	Zone/Locus	Identification	N	Weight (g)
1952.WH199 1952.WH200	PM 5	Ridgetop	Hickory (*Carya* sp.)	1	0.01
			Oak (*Quercus* sp.)	1	0.03
1952.WH274 1952.WH276	PM 8	Ridgetop	Maple (*Acer* sp.)	20	0.51
			Birch (*Betula* sp.)	1	0
			Beech (*Fagus grandifolia*)	17	0.28
			Ash (*Fraxinus* spp.)	9	0.17
			Yellow Poplar (*Liriodendron tulipifera*)	1	0.09
			Hophornbeam (*Ostrya virginiana*)	7	0.15
			Cherry (*Prunus* sp.)	1	0
			Oak (*Quercus* spp.)	2	0.02
			Basswood (*Tilia americana*)	3	0.08
			Unidentifiable charcoal	--	1.30
			Unexamined charcoal	--	5.51
1952.WH301	PM 12	Ridgetop	Hickory (*Carya* spp.)	6	0.32
			Ash (*Fraxinus* spp.)	7	0.12
			Hophornbeam (*Ostrya virginiana*)	2	0.12
			Pine (*Pinus* sp.)	1	0
			Black willow (*Salix nigra*)	1	0.06

			Unidentifiable	--	0.16
			Root	--	0.58
1952.WH319 1952.WH322	PM 17	Ridgetop	Maple (*Acer* sp.)	1	0.01
			Birch (*Betula* sp.)	1	0.01
			Pignut hickory (*Carya glabra*)	1	0.08
			Hickory (*Carya* spp.)	11	0.16
			Persimmon (*Diospyros virginiana*)	1	0.01
			Beech (*Fagus grandifolia*)	3	0.09
			Ash (*Fraxinus* sp.)	4	0.04
			White oak (*Quercus alba*)	1	0
			Oak (*Quercus* sp.)	1	0.01
			Elm (*Ulmus* sp.)	1	0.01
			Unidentifiable	--	0.30
			Unexamined	--	7.19
1952.WH387 1952.WH390	PM 18	Ridgetop	Maple (*Acer* sp.)	1	0
			Birch (*Betula* sp.)	1	0.01
			Pignut hickory (*Carya glabra*)	4	0.09
			Shagbark hickory (*Carya ovata*)	5	0.15
			Hickory (*Carya* spp.)	15	0.24
			Black ash (*Fraxinus nigra*)	10	0.29
			Ash (*Fraxinus* spp.)	12	0.13
			Red oak (*Quercus rubra*)	1	0.01
			Elm (*Ulmus* sp.)	1	0
			Unidentifiable	--	0.32
			Unexamined	--	4.17
1952.WH435 1952.WH438	Feature 18	Ridgetop	Maple (*Acer* sp.)	1	0.13
			Alder (*Alnus* sp.)	1	0.01
			Birch (*Betula* spp.)	2	0.15
			Bitternut hickory (*Carya cordiformis*)	1	0.17
			Pignut hickory (*Carya glabra*)	2	0.08
			Hickory (*Carya* spp.)	30	2.24
			American chestnut (*Castanea dentata*)	1	0.12
			Hackberry (*Celtis occidentalis*)	1	0.02
			Hawthorne (*Crataegus* sp.)	5	0.35
			Persimmon (*Diospyros virginiana*)	2	0.11
			Beech (*Fagus grandifolia*)	2	0.09
			Ash (*Fraxinus* spp.)	48	6.1
			Black walnut (*Juglans nigra*)	1	0.06
			Yellow Poplar (*Liriodendron tulipifera*)	5	0.05
			Hophornbeam (*Ostrya virginiana*)	24	2.61
			Pine (*Pinus* sp.)	1	0.05

			Red oak (*Quercus rubra*)	1	0.06
			Oak (*Quercus* spp.)	4	0.26
			Basswood (*Tilia americana*)	4	0.34
			American elm (*Ulmus americana*)	1	0.02
			Slippery elm (*Ulmus rubra*)	6	0.29
			Elm (*Ulmus* spp.)	7	1.15
			Unidentifiable	--	0.26
			Unexamined	--	25.83
1952.WH466	PM 22	Ridgetop	Beech (*Fagus grandifolia*)	1	.01
1952.WH444	PM 25	Ridgetop	Ash (*Fraxinus* sp.)	1	.05
1952.WH462 1952.WH465	PM 27	Ridgetop	Maple (*Acer* sp.)	5	0.07
			Alder (*Alnus* sp.)	1	0.02
			Birch (*Betula* spp.)	3	0.02
			Hickory (*Carya* sp.)	1	0.06
			Beech (*Fagus grandifolia*)	1	0
			Ash (*Fraxinus* spp.)	2	0.01
			Yellow Poplar (*Liriodendron tulipifera*)	2	0.03
			Sycamore (*Platanus occidentalis*)	1	0.03
			Basswood (*Tilia americana*)	1	0.09
			Unidentifiable	--	1.02
			Unexamined	--	1.90
1952.WH488	PM 32	Ridgetop	Oak (*Quercus* sp.)	1	0.01

Table 3. Identification of House 3 area post molds from White Springs

Context No.	**Feature**	**Zone/Locus**	**Identification**	**N**	**Weight (g)**
1952.WH656	PM 49	House 3	Hickory (*Carya* sp.)	2	0.06
1952.WH665 1952.WH668	PM 53	House 3	Maple (*Acer* sp.)	1	0.01
			Hickory (*Carya* spp.)	2	0.03
			Beech (*Fagus grandifolia*)	6	0.21
			White ash (*Fraxinus americana*)	6	0.1
			Hophornbeam (*Ostrya virginiana*)	1	0.03
			Red oak (*Quercus rubra*)	1	0.09
			Unidentifiable	--	0.01
			Unexamined	--	1.61
1952.WH714 1952.WH717	PM 63	House 3	Maple (*Acer* sp.)	2	0.03
			Beech (*Fagus grandifolia*)	1	0.01
			Black ash (*Fraxinus nigra*)	1	0.02
			Oak (*Quercus* spp.)	2	0.01
			Unidentifiable	--	0.02
			Unexamined	--	1.42

1952.WH741	PM 68	House 3	White ash (*Fraxinus americana*)	1	0.01
			Hickory (*Carya* sp.)	1	0.01
			Unidentifiable	1	0.01
1952.WH765	PM 76	House 3	Red oak (*Quercus rubra*)	1	0.01
			Unidentifiable	1	0.01
1952.WH846	PM 93	House 3	Birch (*Betula* sp.)	1	0
			Hawthorne (*Crataegus* sp.)	1	0.04
1952.WH853	PM 95	House 3	Birch (*Betula* sp.)	1	0.01
			Unidentifiable	--	0.03
1952.WH864 **1952.WH865**	PM 101	House 3	Red oak (*Quercus rubra*)	1	0.01
			Oak (*Quercus* spp.)	2	0.01

Table 4. Identification of House 2 area post molds from White Springs.

Context No.	Feature	Zone/Locus	Identification	N	Weight (g)
1952.WH701	PM 58	House 2	Ash (*Fraxinus* sp.)	1	0.01
			Red oak (*Quercus rubra*)	48	0.83
			Elm (*Ulmus* sp.)	1	0.03
			Unexamined	--	4.32
1952.WH757	PM 73	House 2	Hophornbeam (*Ostrya virginiana*)	9	0.27
			Unidentifiable	--	0.15

Table 5. Identification of charcoal from post molds in Palisade area.

Context No.	Feature	Zone/Locus	Identification	N	Weight (g)
1952.WH693	PM 56	Palisade	Ash (*Fraxinus* spp.)	4	0.06
			Pine (*Pinus* sp.)	46	5.21
			Larch (*Larix laricina*)	2	0.41
			Unexamined	--	43.34
1952.WH727	PM 61	Palisade	Beech (*Fagus grandifolia*)	2	0.01
			White ash (*Fraxinus americana*)	2	0.01
			Black ash (*Fraxinus nigra*)	1	0.01
			Sycamore (*Platanus occidentalis*)	1	0.01
			poss. American hornbeam (*Carpinus caroliniana*)	1	0.01
			Unidentifiable	--	0.04
1952.WH728 **1952.WH731**	PM 79	Palisade	Possible red oak (*Quercus rubra*)	1	0.01
			Unidentifiable	1	0.01

Table 6. Gerard-Little charcoal identifications from Townley-Read Post molds

Context No.	Feature	Identification	N	Weight (g)
2440.TR529*	Post mold 4 (NW main support post)	Maple (*Acer* sp.)	15	0.71
		Ash (*Fraxinus* spp.)	11	0.22
		Tulip Poplar (*Liriodendron tulipifera*)	3	0.06
		Hophornbeam (*Ostrya virginiana*)	1	0.01
		Sycamore (*Platanus occidentalis*)	4	0.09
		Red Oak group (*Quercus rubra*)	3	0.07
		Elm family (*Ulmaceae*)	3	0.06
		Unidentifiable hardwood	10	0.18
2440.TR624*	Post mold 6 (post at SW corner of structure)	Maple (*Acer* sp.)	10	0.14
		Hophornbeam (*Ostrya virginiana*)	1	0
		Sycamore (*Platanus occidentalis*)	1	0.06
		Cherry (*Prunus* sp.)	1	0
		Red Oak group (*Quercus rubra*)	3	0.02
		Possible grape (*Vitis* sp.)	2	0.01
		Unidentifiable hardwood	2	0.02
2440.TR642*	Post mold 29 (post on east wall of structure)	Maple (*Acer* sp.)	3	0.05
		Birch (*Betula* sp.)	1	0
		American chestnut (*Castanea dentata*)	1	0.02
		Beech (*Fagus grandifolia*)	1	0
		White ash (*Fraxinus americana*)	2	0.04
		Sycamore (*Platanus occidentalis*)	1	0
		Red Oak group (*Quercus rubra*)	5	0.2
		Slippery elm (*Ulmus rubra*)	3	0.04
		Unidentifiable hardwood	4	0.05
2440.TR654*	Post mold 34 (NE main support post)	Maple (*Acer* sp.)	4	0.02
		Birch (*Betula* spp.)	9	0.04
		Hickory (*Carya* sp.)	3	0.02
		American chestnut (*Castanea dentata*)	1	0.02
		Hackberry (*Celtis occidentalis*)	2	0
		Black ash (*Fraxinus nigra*)	1	0
		Walnut (*Juglans* sp.)	3	0.01
		Hophornbeam (*Ostrya virginiana*)	1	0
		Pine (*Pinus* sp.)	1	0.01
		Red Oak group (*Quercus rubra*)	9	0.06
		grape (*Vitis* sp.)	2	0
		Unidentifiable hardwood	14	0.08

Table 7. Rossen's identifications from Townley-Read post mold contexts (2006).

Context No.	Feature	Taxon	N	Weight (g)
2440.TR529	Post mold 4 (NW main support post)	Wood (unidentified)	336	4.7
		Corn cupule (*Zea mays*)	8	0
		Hickory nut (Carya sp.)	4	.1
		Bean (*Phaseolus vulgaris*)	1	0
		Gourd- rind (*Lagenaria* sp.)	1	0

		Blackberry/Raspberry (*Rubus* sp.)	7	--
		Sumac (*Rhus* sp.)	1	--
		Unidentified seed	1	--
2440.TR566	Post mold 5 (SE main support post)	Wood American elm (*Ulmus americana*) 30% Sycamore (*Platanus occidentalis*) 25% Maple (*Acer* spp.) 20% Red Oak group (*Quercus rubra*) 10% American chestnut (*Castanea dentata*) 5% Cedar (*Thuja occidentalis*) 5% Unidentified 5%	304	3.6
		Corn-cupule (*Zea mays*)	7	0.1
		Corn-kernel fragment	1	0
		Blackberry/raspberry (*Rubus* sp.)	2	--
		Unidentified- general	1	0
2440.TR624	Post mold 6 (post at SW corner of structure)	Wood (maple, sycamore, red oak group, American chestnut, unidentified)	48	0.8
		Gourd – rind (*Lagenaria* sp.)	1	0
		Hickory (*Carya sp*.)	1	0
2440.TR575	Post mold 22 (west wall post)	Wood (unidentified)	69	0.7
2440.TR642	Post mold 29 (post on east wall of structure)	Wood (red oak group)	120	1.0
		Butternut (*Juglans cinerea*)	11	0.2
		Corn – cupule (*Zea mays*)	2	0
		Blackberry/raspberry (*Rubus* sp.)	2	--
2440.TR644	Post mold 30 (SW main support post)	Wood Maple (*Acer* spp.) 60% White oak group (*Quercus alba*) 30% Sycamore (*Platanus occidentalis*) 10%	335	6.5
		Corn – cupule (*Zea mays*)	5	0
		Corn-kernel fragment	4	0
		Hickory (*Carya* sp.)	3	0
		Butternut (*Juglans cinerea*)	1	0
2440.TR652	Post mold 32 (SE corner post)	Wood (maple, unidentified)	25	0.2
		Corn – cupule (*Zea mays*)	2	0
		Hickory (*Carya* sp.)	1	0
2440.TR654	Post mold 34 (NE main support post)	Wood (red oak group)	79	0.6
		Corn – cupule (*Zea mays*)	2	0
		Corn-kernel fragment	1	0

Table 8. Fire-related features from Trench 4 at Ganondagan.

Context No.	**Feature**	**Identification**	**N**	**Weight (g)**
A.GA.1983.997	Feature 1 (Central	Pignut hickory (*Carya glabra*)	5	2.55
		Charred corn (*Zea mays*)	12	0.85

	hearth?)	Cherry pit (*Prunus* sp.)	1	0.11
		Burned seed	1	<0.01
		Seeds	108	0.09
		Nutshell fragments	12	1.3
A.GA.1983.1118	Feature 30 (Hearth?)	Nutshell fragments	7	0.02
		Charred corn (*Zea mays*)	quantity	0.19
		Maple (*Acer* sp.)	7	1.14
		Beech (*Fagus grandifolia*)	3	0.18
		Basswood (*Tilia americana*)	1	0.08
		Unidentifiable charcoal	8	0.16
		Unexamined charcoal	quantity	6.24
A.GA.1983.1241	Feature 99 (Hearth?)	Maple (*Acer* sp.)	11	1.91
		Birch (*Betula* spp.)	11	1.16
		Beech (*Fagus grandifolia*)	1	0.16
		Ash (*Fraxinus* spp.)	2	0.15
		Hophornbeam (*Ostrya virginiana*)	1	0.36
		Persimmon (*Diospyros virginiana*)	1	0.16
		Oak (*Quercus* spp.)	4	0.09
		Ulmaceae	1	0.01
		Unidentifiable charcoal	8	0.28
		Unexamined charcoal	quantity	0.58
		Nutshell fragments	2	0.02
		Charred corn kernel (*Zea mays*)	1	0.01

Table 9. Artifacts from Feature 1 at Ganondagan, from catalog information.

Material	Quantity
17th century glass	3
Beads, black glass seed	5
Beads, blue glass seed	6
Glass Bead, color not given	1
Beads, black glass	8
Beads, red glass seed	1
Beads, round blue glass	6
Beads, round red glass	15
Beads, round white glass	1
Beads, white glass seed	4
Brass fragments	17
Brass kettle	1
Brass kettle bale	1
Chert flakes	10
Chert fragments	42
Faunal (Bone/Teeth)	2,833
Gunflint	2
Iron awl	1
Iron nail	2

Iron rim	1
Iron screw	1
Jesuit-style heart ring	1
Lead fragments	5
Mussel shell	6
Pipes, Native-made	25
Pipes, clay	7
Pottery, Native-made	10
Shell	17
Shell pendant	1
Wampum, purple	12
Wampum, white	6

In the tables below, identifications are presented by feature, with stratigraphic association of each grouping noted, from the most recent strata to the earliest. Unidentifiable and unexamined charcoal weights which are included in the tables are only for the contexts listed, not for all the contexts which were ultimately determined to be part of a particular stratum.

Table 10. Identifications from Feature 2 at White Springs.

Context No.	Feature	Stratum	Identification	N	Weight (g)
1952.WH61	Feature 2	Minimally disturbed (Stratum I)	Birch (*Betula* spp.)	2	0.04
			Hickory (*Carya* spp.)	6	0.14
			Beech (*Fagus grandifolia*)	1	0.02
			Ash (*Fraxinus* spp.)	3	0.30
			Oak (*Quercus* sp.)	1	0.01
			Basswood (*Tilia americana*)	1	0.01
			Unidentifiable	--	0.49
WH1952.28 **WH1952.30** **WH1952.33** **WH1952.34** **WH1952.37** **WH1952.75** **WH1952.77**	Feature 2	Dark Core (Stratum II)	Maple (*Acer* spp.)	15	0.54
			Birch (*Betula* spp.)	9	0.97
			Bitternut hickory (*Carya cordiformis*)	1	0
			Pignut hickory (*Carya glabra*)	4	0.38
			Hickory (*Carya* spp.)	13	0.29
			Persimmon (*Diospyros virginiana*)	2	0.04
			Beech (*Fagus grandifolia*)	8	0.56
			Ash (*Fraxinus* spp.)	20	0.44
			Yellow Poplar (*Liriodendron tulipifera*)	20	2.45
			Hophornbeam (*Ostrya*	3	0.05

			virginiana)		
			Sycamore (*Platanus occidentalis*)	1	0.01
			Cherry (*Prunus* sp.)	1	0.02
			Oak (*Quercus* spp.)	13	0.87
			Sassafras (*Sassafras albidum*)	1	0.01
			Elm (*Ulmus* spp.)	5	0.07
			Slippery elm (*Ulmus rubra*)	3	0.02
			Elm/Hackberry (Ulmaceae)	1	0
			Unidentifiable	--	1.39
			Unexamined	--	35.22
WH1952.40 WH1952.41 WH1952.72 WH1952.80	Feature 2	Light Base (Stratum III)	Maple (*Acer* spp.)	11	0.27
			Alder (*Alnus* spp.)	5	0.11
			Pawpaw (*Asimina triloba*)	2	0.02
			Birch (*Betula* spp.)	8	0.13
			Bitternut hickory (*Carya cordiformis*)	1	0.04
			Pignut hickory (*Carya glabra*)	2	0.04
			Hickory (*Carya* spp.)	13	0.3
			Persimmon (*Diospyros virginiana*)	2	0.09
			Beech (*Fagus grandifolia*)	5	0.22
			Ash (*Fraxinus* spp.)	34	1.79
			Yellow Poplar (*Liriodendron tulipifera*)	2	0.06
			Hophornbeam (*Ostrya virginiana*)	3	0.04
			Pine (*Pinus* sp.)	3	0.02
			Poplar (*Populus* spp.)	9	0.1
			Oak (*Quercus* spp.)	22	0.44
			American elm (*Ulmus americana*)	4	0.3
			Slippery elm (*Ulmus rubra*)	1	0.32
			Elm (*Ulmus* sp.)	1	0
			Grape (*Vitis* spp.)	2	0.23
			Unidentifiable	--	0.93
			Unexamined	--	9.07
1952.WH62 1952.WH65 1952.WH66 1952.WH67 1952.WH68 1952.WH69 1952.WH71	Feature 2	Mixed strata within feature	Maple (*Acer* spp.)	28	0.69
			Pawpaw (*Asimina triloba*)	5	0.08
			Birch (*Betula* spp.)	7	0.1
			Bitternut hickory (*Carya cordiformis*)	1	0.02
			Pignut hickory (*Carya glabra*)	1	0.03
			Hickory (*Carya* spp.)	88	4.65
			American chestnut (*Castanea dentata*)	3	0.11
			Redbud (*Cercis canadensis*)	2	0.03
			Persimmon (*Diospyros*	1	0.01

			virginiana)		
			Beech (*Fagus grandifolia*)	8	0.15
			Ash (*Fraxinus* spp.)	73	1.96
			Yellow Poplar (*Liriodendron tulipifera*)	2	0.03
			Hophornbeam (*Ostrya virginiana*)	11	0.28
			Sycamore (*Platanus occidentalis*)	3	0.04
			White oak (*Quercus alba*)	4	0.13
			Oak (*Quercus* spp.)	66	1.78
			Sassafras (*Sassafras albidum*)	3	0.09
			Basswood (*Tilia americana*)	6	0.22
			Eastern hemlock (*Tsuga canadensis*)	1	0.01
			American elm (*Ulmus americana*)	2	0.27
			Slippery elm (*Ulmus rubra*)	5	0.40
			Elm (*Ulmus* spp.)	3	0.03
			Unidentifiable charcoal	--	4.68
			Unexamined charcoal	--	20.28

Table 11. Identifications from Feature 3 at White Springs.

Context No.	**Feature**	**Stratum**	**Identification**	**N**	**Weight (g)**
WH1952.99 WH1952.106	Feature 3	Upper 10cm (Stratum I)	Maple (*Acer* spp.)	2	0.05
			Hickory (*Carya* spp.)	58	10.19
			Ash (*Fraxinus* spp.)	11	0.43
			Black walnut (*Juglans nigra*)	8	0.74
			Hophornbeam (*Ostrya virginiana*)	3	0.12
			Oak (*Quercus* spp.)	14	0.58
			Slippery elm (*Ulmus rubra*)	4	0.58
			Unidentifiable	--	0.51
			Unexamined	--	55.16
WH1952.110 WH1952.120	Feature 3	Next 10cm (Stratum II)	Maple (*Acer* spp.)	5	0.79
			Hickory (*Carya* spp.)	76	9.67
			Ash (*Fraxinus* spp.)	7	0.65
			Black walnut (*Juglans nigra*)	6	0.83
			Yellow Poplar (*Liriodendron tulipifera*)	1	0.03
			Oak (*Quercus* sp.)	1	0.04
			Slippery elm (*Ulmus rubra*)	4	0.18
			Unidentifiable	--	0.16
			Unexamined	--	205.10
WH1952.124 WH1952.126	Feature 3	Lowest portion (Stratum	Maple (*Acer* spp.)	17	0.81
			Alder (*Alnus* spp.)	2	0.09
			Pawpaw (*Asimina triloba*)	1	0.23

		III)	Birch (*Betula* spp.)	9	0.42
			Hickory (*Carya* spp.)	13	2.09
			Beech (*Fagus grandifolia*)	18	0.89
			Ash (*Fraxinus* spp.)	9	0.62
			Yellow Poplar (*Liriodendron tulipifera*)	1	0.05
			Hophornbeam (*Ostrya virginiana*)	8	0.58
			Poplar (*Populus* spp.)	3	0.14
			Oak (*Quercus* spp.)	17	0.79
			Basswood (*Tilia americana*)	2	0.04
			Unidentifiable	--	0.37
			Unexamined light fraction	--	98.52

Table 12. Identifications from Feature 6 at White Springs.

Context No.	**Feature**	**Stratum**	**Identification**	**N**	**Weight (g)**
1952.WH230 1952.WH231	6	Minimally Disturbed (Stratum I)	Maple (*Acer* spp.)	3	0.18
			Birch (*Betula* spp.)	5	0.14
			Pignut hickory (*Carya glabra*)	1	0.05
			Shagbark hickory (*Carya ovata*)	4	0.09
			Hickory (*Carya* spp.)	20	0.39
			Beech (*Fagus grandifolia*)	1	0.01
			White ash (*Fraxinus americana*)	2	0.11
			Black ash (*Fraxinus nigra*)	3	0.06
			Hophornbeam (*Ostrya virginiana*)	2	0.05
			Red oak (*Quercus rubra*)	8	0.12
			Basswood (*Tilia americana*)	1	0.01
			Elm (*Ulmus* spp.)	4	0.05
			Unidentifiable	--	0.21
			Unexamined light fraction	--	49.04
1952.WH232 1952.WH234	6	Upper 10 cm (Stratum II)	Maple (*Acer* spp.)	3	0.08
			Birch (*Betula* spp.)	10	0.36
			Pignut hickory (*Carya glabra*)	2	0.31
			Shagbark hickory (*Carya ovata*)	12	0.93
			Hickory (*Carya* sp.)	1	0
			Beech (*Fagus grandifolia*)	17	0.46
			Ash (*Fraxinus* spp.)	32	1.44
			Red mulberry (*Morus rubra*)	1	0.03
			Hophornbeam (*Ostrya virginiana*)	6	0.19
			Platanus occidentalis	6	0.17
			Possible cherry (*Prunus* sp.)	1	0.02

			Red oak (*Quercus rubra*)	11	0.52
			Sassafras (*Sassafras albidum*)	1	0.04
			Basswood (*Tilia americana*)	3	0.09
			American elm (*Ulmus americana*)	1	0.10
			Unidentifiable	--	0.89
			Unexamined	--	120.76
1952.WH241	6	Lowest portion (Stratum III)	Maple (*Acer* spp.)	6	0.12
			Birch (*Betula* spp.)	2	0.04
			Persimmon (*Diospyros virginiana*)	1	0.02
			Beech (*Fagus grandifolia*)	25	0.50
			Black ash (*Fraxinus nigra*)	4	0.08
			Yellow Poplar (*Liriodendron tulipifera*)	1	0.02
			Hophornbeam (*Ostrya virginiana*)	5	0.10
			Red oak (*Quercus rubra*)	2	0.04
			Sassafras (*Sassafras albidum*)	1	0.02
			Grape (*Vitis* spp.)	3	0.06
			Unidentifiable	--	0.19
			Unexamined	--	147.32

Table 13. Gerard-Little identifications from Feature 5 at Townley-Read.

Context #	Context	Identification	N	Weight (g)
2440.TR525*	Feature 5 Stratum I	Maple (*Acer* sp.)	1	0.01
		Birch (*Betula* sp.)	1	0.01
		Ironwood (*Carpinus caroliniana*)	1	0.01
		White ash (*Fraxinus americana*)	11	0.74
		Black ash (*Fraxinus nigra*)	1	0.01
		Sycamore (*Platanus occidentalis*)	2	0.02
		poss. grape (*Vitis* spp.)	3	0.04
2440.TR490* **2440.TR523***	Feature 5 Stratum IV	Maple (*Acer* spp.)	7	0.14
		Birch (*Betula* spp.)	3	0.07
		Hackberry (*Celtis* sp.)	1	0.03
		Persimmon (*Diospyros virginiana*)	3	0.05
		Beech (*Fagus grandifolia*)	3	0.09
		Black ash (*Fraxinus nigra*)	1	0.02
		Ash (*Fraxinus* spp.)	6	0.06
		Yellow Poplar (*Liriodendron tulipifera*)	7	0.23
		Hophornbeam (*Ostrya virginiana*)	4	0.13
		Sycamore (*Platanus occidentalis*)	3	0.05
		Possible cherry (*Prunus* sp.)	1	0.02
		Red oak (*Quercus rubra*)	1	0.01
		unidentifiable hardwood	17	0.35

Table 14. Rossen's identifications from Feature 5 contexts at Townley-Read.

Context #	Context	Identification		N	Weight (g)
2440.TR521	Feature 5 Stratum I	Wood Unidentified Maple (*Acer* spp.) Ash (*Fraxinus* spp.) Pine (*Pinus* spp.) Cedar (*Thuja occidentalis*)	 40% 35% 15% 5% 5%	1969	44.30
		Corn- cupule (*Zea mays*)		1232	19.1
		Corn – kernels/fragment		37	1.30
		Blackberry/raspberry (*Rubus* sp.)		171	--
		Butternut (*Juglans cinerea*)		29	0.30
		Grape (*Vitis* sp.)		10	--
		Sumac (*Rhus* sp.)		9	--
		Gourd—rind (*Lagenaria* sp.)		6	0.0
		Small-seeded nightshade (*Solanum* sp. cf. *americanum*)		3	--
		Squash – seed (*Cucurbita* sp.)		2	--
		Squash –peduncle		1	0.0
		Hawthorn (*Crategus* sp.)		1	--
		Morning glory (*Convulvus*/*Ipomoea* sp.)		1	--
		Unidentified seed fragments		9	--
2440.TR525	Feature 5 Stratum I	Wood (unidentified)		127	1.6
		Corn—cupule (*Zea mays*)		14	0.1
		Corn –kernel fragment (*Zea mays*)		2	0.1
		Hickory (*Carya* sp.)		2	0
		Unidentified		3	0
2440.TR487	Feature 5 Stratum III	Wood Maple (*Acer* spp.) Sycamore (*Platanus occidentalis*) Red oak group (*Quercus rubra*) Unidentified	 50% 20% 10% 20%	730	8.4
		Corn –cupule (*Zea mays*)		11	0.2
		Blackberry/raspberry (*Rubus* sp.)		4	--
		Gourd—rind (*Lagenaria* sp.)		1	0
		Hawthorn (*Cretaegus* sp.)		1	--
		Unidentified seed fragments		6	--
2440.TR515	Feature 5 Stratum III	Wood Maple (*Acer* spp.) Unidentified Ash (*Fraxinus* spp.) Red oak group (*Quercus rubra*) American chestnut (*Castanea dentata*)	 55% 20% 15% 5% 5%	1463	13.9
		Corn –cupule (*Zea mays*)		32	0.4
		Corn—kernel fragment (*Zea mays*)		3	0
		Gourd –rind (*Lagenaria* sp.)		3	0
		Grass (Poaceae)		20	--

		Blackberry/raspberry (*Rubus* sp.)	19	--
		Butternut (*Juglans cinerea*)	5	0.1
		Hackberry (*Celtis* sp.)	4	--
		Cherry (*Prunus* sp.)	3	--
		Sumac (*Rhus* sp.)	1	--
		Hazelnut? (*Corylus* sp.)	1	--
		Grape (*Vitis* sp.)	1	--
		Unidentified—general	2	0
		Unidentified –seed	7	--
2440.TR490	Feature 5 Stratum IV	Wood (unidentified)	776	6.2
		Fungus	73	0.4
		Gourd –rind (*Lagenaria* sp.)	9	0.2
		Sumac (*Rhus* sp.)	3	--
2440.TR523	Feature 5 Stratum IV	Wood (unidentified—hardwood branches)	1304	12.4
		Corn –cupule (*Zea mays*)	51	0.8
		Grass (Poaceae)	9	--
		Cherry (*Prunus* sp.)	7	--
		Blackberry/raspberry (*Rubus* sp.)	6	--
		Sumac (*Rhus* sp.)	3	--
		Gourd –rind (*Lagenaria* sp.)	1	0
		Unidentified—seed (fragments)	13	--
2440.TR483	Feature 5 Stratum V	Sample misplaced		

Table 15. Re-identification of sample from Feature 13.

Context #	Context	Identification	N	Weight (g)
2440.TR612*	Feature 13	Sycamore (*Platanus occidentalis*)	20	0.89

Table 16. Rossen's identifications from Features 13 and 14 at Townley-Read.

Context #	Context	Identification	N	Weight (g)
2440.TR611	Feature 13 FL 1	Wood (Sycamore, *Platanus occidentalis*)	410	10.7
		Black walnut (*Juglans nigra*)	1	0.2
		Unidentified	15	0.4
2440.TR612	Feature 13 FL2	Wood (Sycamore, *Platanus occidentalis*)	200	5.3
2440.TR613	Feature 13 FL3	Wood (Sycamore, *Platanus occidentalis*)	340	3.9
2440.TR615	Feature 14 FL 1	Wood (unidentified)	125	1.4
2440.TR616	Feature 14 FL 2	Wood (Sycamore, *Platanus occidentalis*)	78	0.5
2440.TR617	Feature 14 FL 3	Wood (Sycamore, *Platanus occidentalis*)	45	0.3
		Fungus	55	0.3
		Corn –cupule (*Zea mays*)	1	0

		Blackberry/raspberry (*Rubus* sp.)	1	--

Table 17. Botanical remains from other features in Trench 4 at Ganondagan.

Context No.	Feature	Identifications	N	Weight (g)
A.GA.1983.1171	Feature 52 (Pit)	Maple (*Acer* spp.)	2	0.1
		Birch (*Betula* spp.)	2	0.1
		Beech (*Fagus grandifolia*)	2	0.07
		Pine (*Pinus* sp.)	1	0.05
		Unidentifiable charcoal	8	0.38

Table 18. Identifications from Feature 146 at Ganondagan.

Context No.	Feature	Identification	N	Weight (g)
A.GA. 1984.1324	Feature 146	Maple (*Acer* spp.)	4	0.25
		Hickory (*Carya* spp.)	3	0.10
		Pignut hickory (*Carya glabra*)	1	0.05
		Birch (*Betula* spp.)	2	0.07
		Beech (*Fagus grandifolia)*	5	0.27
		Oak (*Quercus* sp.)	1	0.06
		Eastern Hemlock (*Tsuga Canadensis*)	2	0.06
		Basswood (*Tilia americana*)	2	0.12
		Unidentifiable charcoal	20	1.84
		Corn cupule (*Zea mays*)	22	0.84
		Corn kernel (*Zea mays*)	7	0.22
		Charred nutshell	5	0.35
		Waterscreen charcoal sample	--	0.15

Table 19. Feature 7 identifications from White Springs.

Context No.	Feature	Identification	N	Weight (g)
WH1952.255 WH1952.257 WH1952.258	7	Maple (*Acer* spp.)	11	0.15
		Alder (*Alnus* sp.)	1	0.03
		Ironwood (*Carpinus caroliniana*)	1	0.01
		Bitternut hickory (*Carya cordiformis*)	3	0.07
		Pignut hickory (*Carya glabra*)	2	0.04
		Black ash (*Fraxinus nigra*)	2	0.09
		Ash (*Fraxinus* sp.)	1	>0.01
		Hophornbeam (*Ostrya virginiana*)	8	0.18
		Sycamore (*Platanus occidentalis*)	4	0.06
		Possible cherry (*Prunus* sp.)	2	0.07
		Red oak (*Quercus rubra*)	1	>0.01
		Unidentifiable	--	0.17
		Unexamined	--	5.30

Table 20. Rossen's identifications from the Buried Plowed Midden at Townley-Read.

Context #	Feature	Identification	N	Weight (g)
2440.TR900	BPM	Wood (unidentified, maple, red oak group)	21	0.30
		Blackberry/raspberry (*Rubus* sp.)	17	--
2440.TR901	BPM	Wood (unidentified)	21	0.10
		Blackberry/raspberry (*Rubus* sp.)	24	--
		Elderberry (*Sambucus canadensis*)	1	--
2440.TR902	BPM	Wood (unidentified)	49	0.40
		Blackberry/raspberry (*Rubus* sp.)	10	--
		Corn – cupule (*Zea mays*)	1	0.00
		Walnut/butternut (Juglandaceae)	2	0.00
2440.TR903	BPM	Wood Red oak group 50% Sycamore 50%	40	0.40
		Blackberry/raspberry (*Rubus* sp.)	7	--
		Gourd – rind (*Lagenaria* sp.)	4	0.00
2440.TR908	BPM	Wood (unidentified)	25	0.20
		Corn – kernel fragment (*Zea mays*)	1	0.00
		Blackberry/raspberry (*Rubus* sp.)	6	--
		Butternut (*Juglans cinerea*)	3	0.00
		Elderberry (*Sambucus canadensis*)	1	--
2440.TR909	BPM	Wood (maple)	165	1.60
		Gourd – rind (*Lagenaria* sp.)	22	0.00
		Corn – cupule (*Zea mays*)	4	0.00
		Blackberry/raspberry (*Rubus* sp.)	11	--
		Hickory (*Carya* sp.)	2	0.00
2440.TR914	BPM	Wood (maple, pine)	92	0.70
		Corn – cupule (*Zea mays*)	1	0.00
		Blackberry/raspberry (*Rubus* sp.)	5	--
		Walnut/butternut (Juglandaceae)	2	0.00
2440.TR915	BPM	Wood (maple)	89	1.10
		Corn – kernel fragment (*Zea mays*)	1	0.00
		Blackberry/raspberry (*Rubus* sp.)	5	--
		Hickory (*Carya* sp.)	1	0.00
		Elderberry (*Sambucus canadensis*)	1	--
2440.TR916	BPM	Wood Sycamore 50% Unidentified 40% Maple 10%	521	4.40
		Blackberry/raspberry (*Rubus* sp.)	12	--
2440.TR922	BPM	Wood (red oak group)	75	0.80
		Corn – cupule (*Zea mays*)	15	0.10
		Gourd – rind (*Lagenaria* sp.)	1	0.00
		Blackberry/raspberry (*Rubus* sp.)	19	--
		Hickory (*Carya* sp.)	2	0.00
		Butternut (*Juglans cinerea*)	1	0.00

2440.TR923	BPM	Wood Sycamore 50% Maple 50%	211	2.60
		Corn – cupule (*Zea mays*)	15	0.10
		Gourd – rind (*Lagenaria* sp.)	1	0.00
		Blackberry/raspberry (*Rubus* sp.)	19	--
		Hickory (*Carya* sp.)	2	0.00
		Butternut (*Juglans cinerea*)	1	0.00
2440.TR931	BPM	Wood (unidentified)	5	0.00
		Blackberry/raspberry (*Rubus* sp.)	9	--
		Elderberry (*Sambucus canadensis*)	1	--
2440.TR932	BPM	Wood (unidentified)	16	0.10
		Blackberry/raspberry (*Rubus* sp.)	14	--
		Walnut/butternut (Juglandaceae)	1	0.00
		Elderberry (*Sambucus canadensis*)	1	--
2440.TR933	BPM	Wood (American elm, unidentified)	41	0.50
		Corn – cupule (*Zea mays*)	1	0.00
		Gourd – rind (*Lagenaria* sp.)	1	0.00
		Blackberry/raspberry (*Rubus* sp.)	21	--
		Elderberry (*Sambucus canadensis*)	1	--

Table 21. Plowzone identifications from Ganondagan.

Context #	**Feature**	**Identification**	**N**	**Weight (g)**
A.GA.1983.985	Plowzone	Red maple (*Acer rubrum*)	2	0.15
		Beech (*Fagus grandifolia*)	2	0.25
		Elm (*Ulmus* spp.)	2	0.07
A.GA.1983.990	Plowzone	Black willow (*Salix nigra*)	2	0.16
A.GA.1983.1004	Plowzone	Charred pits (*Prunus* sp.)	5	0.30
A.GA.1983.1042	Plowzone	Charred corn (*Zea mays*)	6	0.12
		Pits (*Prunus* sp.)	6	0.47
		Beech (*Fagus grandifolia*)	2	0.11
		Hophornbeam (*Ostrya virginiana*)	1	0.13
A.GA.1983.1043	Plowzone	Maple (*Acer* sp.)	2	0.14
		Birch (*Betula* sp.)	1	0.07
		Hickory (*Carya* sp.)	2	0.06
		Beech (*Fagus grandifolia*)	3	0.12
		Unidentifiable	3	0.05
A.GA.1983.1074	Plowzone	Nutshell	3	0.20
		Charred corn (*Zea mays*)	1	0.06
		Maple (*Acer* sp.)	4	0.53
A.GA.1983.1075	Plowzone	Charred pits (*Prunus* sp.?)	7	1.87
A.GA.1983.1076	Plowzone	Charred nutshell	3	0.17

		Charred corn (*Zea mays*)	1	0.09
		Unidentifiable charcoal	3	0.39
		Maple (*Acer* sp.)	4	0.23
		Birch (*Betula* sp.)	3	0.22
		Hickory (*Carya* sp.)	1	0.03
		Beech (*Fagus grandifolia*)	8	0.65
		Black ash (*Fraxinus nigra*)	1	0.03
		Sycamore (*Platanus occidentalis*)	1	0.12
		American elm (*Ulmus americana*)	1	0.07
A.GA.1983.1083	Plowzone	Maple (*Acer* sp.)	1	0.03
		Birch (*Betula* sp.)	2	0.08
		Hickory (*Carya* sp.)	4	0.15
		Beech (*Fagus grandifolia*)	6	0.36
		Hophornbeam (*Ostrya virginiana*)	2	0.11
		Poplar (*Populus* sp.)	1	0.04
		Oak (*Quercus* sp.)	3	0.27
		Basswood (*Tilia americana*)	3	0.28
		Elm (*Ulmus* sp.)	1	0.12
		Seeds	39	0.13
		Charred corn (*Zea mays*)	3	0.23
		Nutshell	4	0.03
A.GA.1983.1084	Plowzone	Charred pits (*Prunus* sp.)	1	0.11
		Charred nutshell	2	0.17
		Maple (*Acer* sp.)	4	0.45
		Hickory (*Carya* sp.)	4	0.20
		Beech (*Fagus grandifolia*)	2	0.17
		Basswood (*Tilia americana*)	4	0.32
		Elm (*Ulmus* sp.)	1	0.18
		Unidentifiable charcoal	13	0.56
A.GA.1983.1090	Plowzone	Unidentifiable charcoal	Quantity	0.20
A.GA.1983.1092	Plowzone	Corn (*Zea mays*)	1	0.11
A.GA.1983.1094	Plowzone	Charred nutshell	2	0.10
		Charred corn (*Zea mays*)	1	0.07
		Maple (*Acer* sp.)	3	0.19
		Birch (*Betula* sp.)	1	0.10
		Hickory (*Carya* sp.)	1	0.02
		Beech (*Fagus grandifolia*)	1	0.03
		Basswood (*Tilia americana*)	1	0.06
A.GA.1983.1110	Plowzone	Modern root	1	2.47
		Corn (*Zea mays*)	2	0.11
A.GA.1983.1111	Plowzone	Maple (*Acer* sp.)	4	0.3
		Beech (*Fagus grandifolia*)	1	0.04
		Basswood (*Tilia americana*)	1	0.03
		Unidentifiable charcoal	3	0.09
A.GA.1983.1112	Plowzone	Unidentifiable charcoal	Quantity	0.10

		Nutshell	1	0.02
A.GA.1983.1129	Plowzone	Charred nutshell	2	0.30
		Unidentifiable charcoal	44	0.10
		Seeds	2	<0.01g
A.GA.1983.1130	Plowzone	Seeds	1	0.15
		Pit (*Prunus* sp.?)	2	0.15
A.GA.1983.1143	Plowzone	Nutshell	3	0.40
		Maple (*Acer* sp.)	1	0.14
		Beech (*Fagus grandifolia*)	1	0.42
A.GA.1983.1146	Plowzone	Bean	1	0.09
		Charred pits (*Prunus* sp.)	1	0.05
A.GA.1983.1185	Plowzone	Charred botanicals	6	0.41
		Pit (*Prunus* sp.)	1	0.03
		Maple (*Acer* sp.)	1	0.07
		Oak (*Quercus* sp.)	1	0.11
A.GA.1983.1212	Plowzone	Charred corn (*Zea mays*)	1	0.08
		Charred corn cupule (*Zea mays*)	1	0.09
		Maple (*Acer* sp.)	1	0.05
		Black walnut (*Juglans nigra*)	1	0.13
		Hophornbeam (*Ostrya virginiana*)	2	0.23
		Oak (*Quercus* sp.)	1	0.07
A.GA.1983.1257	Plowzone	Charred pits (*Prunus* sp.)	6	1.20
		Charred pit (*Prunus* sp.)	1	0.02
		Unidentified pit	1	0.18
		Nutshell fragments	2	0.15
		Birch (*Betula* sp.)	3	0.10
		Beech (*Fagus grandifolia*)	5	0.31
		Persimmon (*Diospyros virginiana*)	1	0.03
		Basswood (*Tilia americana*)	1	0.03
A.GA.1984.1306	Plowzone	Corn kernel (*Zea mays*)	1	0.07
A.GA.1984.1310	Plowzone	Plum pits (*Prunus* sp.)	2	0.10

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