AN ANALYSIS OF FAUNAL MATERIALS FROM THE WHITE SPRINGS SITE, A 17TH–18TH CENTURY SENECA TOWN IN UPSTATE NEW YORK

A Thesis

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ABSTRACT

This thesis is a zooarchaeological study of key loci from the Seneca archaeological site of White Springs. Occupied from 1688-1715, the town was settled by Senecas displaced from the town at Ganondagan, in the wake of violent upheaval by French forces. Over 30,000 animal bone, tooth, and shell fragments are analyzed, making this the largest faunal study of a Haudenosaunee site ever conducted. I interpret the faunal material with a decolonial lens, in an attempt to combat harmful narratives of Indigenous decline. One such trope is that the Seneca naturally adopted Eurasian domesticates as their primary source of meat. Results refute this, showing that the White Springs Seneca maintained traditional foodways of hunting deer. The assumption that the Seneca were starving as a result of catastrophic violence is also refuted. The absence of beaver remains on site is also addressed, suggesting local extirpation, which has implications for colonial trade.

BIOGRAPHICAL SKETCH

Sam Disotell is a master's candidate in archaeology at Cornell University. His primary research interests focus on social zooarchaeology of the Near Eastern Neolithic, but have expanded to include zooarchaeology of Haudenosaunee peoples in 17th-18th century New York, his home state. He combines the archaeological science techniques of faunal analysis with theoretical and ethical approaches that center on Indigenous ingenuity, agency, and autonomy.

Sam received his BA in Anthropology from New York University, with minors in German and European and Mediterranean Studies, graduating *cum laude*. As an undergraduate, he excavated and conducted faunal analysis at the Iron Age site of Dún Ailinne in Co. Kildare, Ireland. This work would go on to become the basis of his Honors thesis, where he examined ritual feasting, inequality, tribute, and dairying practices at the site. under the advisement of Dr. Pam Crabtree. He has also excavated at the UNESCO world heritage site of Hohle Fels in Blaubeuren, Baden-Württemberg, Germany.

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I would like to thank Nerissa Russell and Kurt Jordan for their patience and guidance throughout this process. Nerissa's tutelage and help identifying some of the more puzzling bones was invaluable as I spent long hours in her lab. I thank Kurt for welcoming this newcomer to the field of North American archaeology, and helping me to understand the intricacies of Haudenosaunee history, ontology, and archaeology, as well as for keeping me employed as a research assistant. Everyone involved in the Whites Springs project, particularly Alexandra Walton, Alice Wolff, Kaitlin LaGrasta, Nick Perez, and Dusti Bridges, were amazingly helpful in understanding the nuances and context of White Springs. I also want to thank Matt Velasco for helping me with those potential human remains, and for reminding me to get some fresh air once in a while. I thank Charles Dardia and Casey Dillman for being so accommodating with the collections over at the Museum of Vertebrates. Additional thanks to my entire cohort for their support. Special thanks to Brooke Laskowski for her moral support and friendship throughout this process. Extra special thanks to my cat Memphis and my dogs Brienne and Temujin. This thesis is dedicated to the memory of Temujin, the best dog to ever roam this Earth.

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Introduction and Site History

The multi-component archaeological site of White Springs is located near the city of Geneva, close to the northern tip of Seneca Lake, in the Finger Lakes region of upstate New York. The primary Seneca occupation dates to between 1688-1715 C.E., with the town being founded by displaced Senecas in the midst of a period of conflict with the French (Gerard-Little et al. 2016: 39). In 1687, a French military campaign under the leadership of the Marquis de Denonville invaded Seneca territory, which resulted in the destruction of their communities and forced the eastern Senecas to relocate from their community of Ganondagan, currently a New York State Historic Site and the location of the Seneca Art and Culture Center (Jordan 2008:51). The Seneca were and are known by the endonym Onödowa'ga:', meaning “People of the Great Hill”. In the late seventeenth century, the Haudenosaunee Confederacy was the most influential Native American polity in the region. At the time, it consisted of five nations; the Seneca, Onondaga, Mohawk, Oneida, and Cayuga, with a sixth nation, the Tuscarora joining later in 1722. The Seneca Nation comprised the largest group in this confederacy, occupying the role of “Keeper of the Western Door” of their proverbial longhouse. This metaphor depicts the Haudenosaunee confederacy as a single longhouse, with each nation playing an integral part as they strive for internal peace. Just as literal longhouses provide shelter and protection to many families living under one roof, and can be expanded to welcome others, the metaphorical longhouse, and each nation therein, provides for the greater unity and common defense of the entire confederacy (Williams 2018:188, 236).

White Springs’ Seneca occupation occurred at a time when the transatlantic fur trade was booming, and Indigenous peoples throughout eastern North America were producing and selling massive amounts of beaver, marten, and other mammal furs for export to European markets

(Cutcliffe 1981; Lapham 2004). This trade was central to the Haudenosaunee economy, allowing for extensive exchange of European and Indigenous trade goods and prestige items. However, with this exchange came conflict with both neighboring Indigenous nations and European colonists, as the Haudenosaunee Confederacy expanded its hunting and trapping territory and exerted its influence throughout much of the Great Lakes region, reaching as far west as Illinois and north and east to Quebec. This series of conflicts was known as the Beaver Wars, and ultimately culminated in Denonville's scorched earth campaign and the razing of Ganondagan (Jordan 2008).

The settlement at White Springs was situated near a "reliable and prolific spring" (Gerard-Little et al. 2016:36). It was organized as a densely-populated nucleated town of roughly 1,700-2000 inhabitants (Jordan 2018:6) that was possibly surrounded by a defensive palisade, as it was created in the wake of violent conflict. Its primary occupation lasted approximately 27 years, somewhat longer than most Haudenosaunee villages, which were known from historical, archaeological, and ethnographic sources to be relocated roughly every 20 years as resources, particularly firewood, became scarce (Gerard-Little et al. 2016:39). While the Haudenosaunee were known to clear and prepare fields and stock up on raw materials for houses and palisades well in advance of settlement (Engelbrecht 2003:101), this was likely not an option in the case of White Springs due to the rapid displacement of Ganondagan's inhabitants. The White Springs Senecas seemed to have moved into a mostly unaltered, mature deciduous forest landscape. While the most intensive and population-dense occupation occurred between 1688 and 1715 C.E., it is likely that sporadic episodes of less intensive Indigenous occupation occurred afterward. Based on historical accounts, Gerard-Little and co-authors posit continual Seneca usage of the White Springs fields until the highly destructive American Sullivan-Clinton campaign in 1779 (Gerard-Little et al. 2016:39).

In 1806, nearly a century after the primary occupation of the site, a Euroamerican-style mansion was built on the formerly Seneca land. The manor was constructed by a wealthy Virginian named John Nicholas who endeavored to build a Southern-style plantation in Central New York. Nicholas brought with him enslaved African Americans for labor, as well as Euroamerican-style agricultural practices. This included the raising of Eurasian domestic animals, principally sheep. Eventually, in the 1870s, the original mansion burned down, to be replaced three decades later in 1901 by a second one, built by Alfred Lewis. Lewis raised poultry and, starting in 1905, ran a dairy operation, and continually cultivated the land around the house until the 1950s (Gerard-Little et al. 2016:36,54).

The Excavation at White Springs

Excavation of White Springs was conducted under the direction of Dr. Kurt Jordan of Cornell University. The excavation was operated as a field school in partnership with Cornell's American Indian and Indigenous Studies (AIIS) program. The Seneca descendant community is heavily involved in the White Springs project (Jordan 2018). Collaboration with the Seneca community has not been limited to the minimum consultation required by NAGPRA but remains fundamental to the project as a whole. Indigenous students were encouraged to participate through free tuition, food, and accommodation. Eighteen Indigenous students participated in the excavations, nine of whom were of Haudenosaunee background (Jordan 2018:4). The selection of the site itself was based on Seneca interests. The Seneca community primarily wishes to investigate what happened to their ancestors after their violent relocation and how they adapted in the aftermath. To what degree did Seneca society change in the wake of conflict with the French? Were the local Seneca able to maintain their traditional lifeways or did circumstances necessitate change towards Euroamerican lifestyles (Jordan, 2018:1)?

The White Springs project was designed to be minimally invasive, in keeping with Seneca wishes. This meant fieldwork would rely heavily on geophysical survey, and digging, when necessary, was to be restricted to hand tools such as trowels and shovels (Dewbury and Broadrose 2011:107). A total of 161 circular shovel-test pits, each roughly 35cm in diameter, were excavated, as were 116 1x1meter test units. Large trenches were excavated to investigate the House 3 locus and the possible palisade (Jordan 2018), 67m^2 for House 3, and 23.5m^2 for the Palisade Area. Heavy excavation equipment was eventually brought in to a limited extent in 2015, as the sheer amount of Euroamerican building material overpowered the magnetometry signals of the Seneca-associated features below the plowzone, forcing the team to rely in two instances on plowzone stripping to recover Seneca activity areas. Mechanical excavation was used to expand the House 3 trench. Despite these adjustments, excavation remained minimally destructive, with only 249 square meters excavated out of an estimated 34,000 square meters (less than 1%), and material recovery was carefully and meticulously conducted (Jordan 2018:5-6).

All recovered artifacts and ecofacts were donated by the site's landowners to the Seneca-Iroquois National Museum and eventually will be repatriated there, as per the descendant community's wishes (Jordan 2018:10). However, for the sake of archaeological analysis, much of this material is currently stored in Cornell's McGraw Hall, including beads, botanical samples, metal artifacts, and central to this thesis, faunal remains.

All plowzone and disturbed-context layers, as well as shovel-test pits, were screened with a 1/4" mesh. When encountered, secure feature context units were screened through 1/8" mesh or processed via flotation. This screening method, at least for feature contexts, should reduce the number of small bones/fragments lost during recovery, as it has been shown that 1/4" screens tend to underrepresent small taxa such as rodents, fish, and small birds, as well as the smaller elements of larger animals, such as carpals, tarsals, sesamoid bones, and caudal vertebrae (Gordon 1993:453). It is likely that plowzone layers, disturbed contexts, and shovel-tests are biased towards larger animals and elements, especially considering the wealth of carpals, sesamoids, fish vertebrae, and small mammal bones found in feature levels. Plowing and construction in the Manor era and beyond disturbed a significant portion of the soil, resulting in many mixed Seneca-Manor era contexts. However, the Manor-era contexts and more heavily disturbed mixed contexts of the plowzone are not the primary focus of this analysis, as these contexts tend to be dominated by Manor-era fauna, artifacts, and construction debris that are unrelated to the Seneca occupation. Instead, this thesis focuses more narrowly on contexts confirmed to primarily contain material from the Seneca occupation of the site.

Research Questions

In this thesis, I provide a general overview of the fauna present at White Springs. I focus on three excavation loci: House 3, Feature 3, and the alleged Palisade Area. Due to the large scale of the excavation and the wealth of faunal remains recovered, only a portion of the site could be analyzed within the scope of this project. The loci were selected by Dr. Jordan for zooarchaeological analysis as areas of particular interest. House 3 represents a sample of a domestic area (a longhouse), while Feature 3 possibly represents a midden and cooking-related feature, and due to its depth, is relatively undisturbed by Manor-era debris. The Palisade was investigated to determine if it truly is a defensive fortification, as well as to shed light on which, if any, economic or cultural activities occurred in the peripheral area of this densely-populated town. I analyzed over 22,000 bone fragments from these loci in detail, roughly 16 percent of the 134,000 faunal remains recovered from the site across all components. As paid research, I also analyzed another 10,000 remains from various other loci, making this faunal analysis the largest ever conducted of a Haudenosaunee site, followed by Pipes' (2010) faunal report of the 16th century Erie Eaton site with 21,383 specimens and Watson's (2000) thesis on Townley-Read with 15,998 specimens.

A portion of the faunal data from Feature 3 comes from contexts analyzed by undergraduate students of Adam Watson at Columbia University as part of two faunal analysis courses (hereafter referred to as the New York City analysts), and later checked and corrected by Madeleine Strait in 2018. This totals over 4,700 specimens. I also analyzed 2958 specimens from Feature 6 as part of the supplemental assemblage, while the NYC analysts examined 3152 specimens from this same locus. Much of this material was checked again by myself in order to maintain consistency, and their data were harmonized with my own to create a complete, comprehensive data set to be analyzed together. Watson was also the primary faunal analyst for the Townley-Read project (Watson 2000), an archaeological site fundamentally linked to White Springs. The settlement of Townley-Read was founded in 1715, immediately following the White Springs occupation by the same community of Senecas. Faunal analysis of White Springs fills in the gap in this particular sequence, which traces back to Ganondagan. This continuous sequence will provide a rare opportunity to understand this community over the course of roughly 100 years, and shed light on Seneca adaptation and socioeconomic change during a turbulent time.

This thesis acts as a faunal report for a large portion of the assemblage, describing the hunting and subsistence strategies as well as the animal component of the diet of the Seneca inhabitants of White Springs. In addition to a general overview of the utilization of animal resources at White Springs, a primary consideration of this thesis is if, and to what extent, Eurasian domestic animals were being adopted by the local Seneca population. Was Eurasian livestock kept on site? If so, how common was this practice? Did domestic animals become a major component of the diet, or did the Seneca maintain more traditional lifeways, opting to hunt wild game? If domesticates were not raised, were they introduced to the site in some other way? This analysis elucidates Seneca adaptation as they were forced to relocate to a new, relatively unimproved environment following catastrophic violence. The ultimate goal is to explain how they adapted, survived, and even thrived, in a world forever altered by colonial entanglement.

I investigate whether the local Senecas were experiencing any nutritional stress. Following conflict and displacement, were there episodes of starvation and dietary stress? Was there a particularly high proportion of “famine foods” compared to normal dietary staples? Were they selectively hunting optimal, prime-aged deer, or opportunistically hunting any individuals regardless of size? Was bone-grease production a major subsistence strategy, and did this practice necessarily entail nutritional desperation or starvation?

In addition to diet, I explore the significance of furs and hides, principally those of beaver and deer, and explore whether the European-North American fur trade was a significant factor in the local economy at White Springs. Were beaver skins a particularly important trade good for the local Seneca? Were deer hides being processed for European markets, local use, or perhaps both? Analysis of cut mark patterns, species representation and element distribution are coupled with historic accounts, archaeological evidence from other sites, and ethnographic evidence to answer these questions.

Another goal of this analysis is to shed light on the use of space in the domestic areas of White Springs. In addition to the aforementioned investigation of economic activities in the Palisade Area, I intend to determine if the upper levels of Feature 3 constitute a midden. I analyze the species representation, element distribution, bone surface condition, heat alteration, butchery, and fracture patterns of bones found within this locus. These factors, alongside a comparison of the faunal assemblages from other areas and other Haudenosaunee sites, may help determine if the feature served as a midden, and can shed light on the layout of White Springs and local utilization of space.

Indigenous Agency, the Decline Trope, and Cultural Entanglement

As a Westerner, and an archaeological scientist whose primary training lies in European and Near Eastern prehistory, it is essential that I challenge my preconceived notions. Colonialist archaeology, as defined by Trigger (2008), pervades archaeology, and particularly the archaeological sciences, by dismissing the perspectives and knowledge of Indigenous peoples and claiming that only Western epistemologies and methodologies are valid. This often comes in the form of looting sacred materials for analysis and display in museums, as well as destructive testing of these items. The colonialist mentality maintains that such so-called stewardship (in reality just looting) is for the benefit of the all peoples, when it actually just serves Westerners.

In order to properly analyze Seneca fauna in a Seneca setting, a shift in “vantage point” is necessary (Jordan 2016). Western conceptions of material culture and animals cannot be assumed to be completely objective nor appropriate for understanding Seneca society. While there certainly is room for Western scientific methodologies and frameworks, and this thesis obviously heavily incorporates them, many interpretations must be made utilizing a combination of Indigenous and Western knowledge, instead of attempting to achieve an impossible “gaze from nowhere” (Jordan 2016:67). This means not privileging Western empiricism and observations over Indigenous experience and knowledge, but putting them in conversation with each other (Atalay 2006).

As part of a fundamentally collaborative project, I attempt to recenter the discussion of Haudenosaunee faunal analysis around Indigenous agency. While decolonization is a laudable goal, I have recently become skeptical of the extent to which this is truly possible, as many efforts are little more than token gestures or "metaphors" (Tuck and Yang 2012). Many attempts at decolonial discourse are more accurately described as "settler harm reduction" (Tuck and Yang 2012: 21-22). The model of settler harm reduction they describe assuages white guilt but does not offer any progress towards true decolonization. In an effort to avoid this model, I focus interpretations on the agency of Indigenous people.

In an attempt to recenter discourse around Seneca agency, one of the principal goals of this thesis is to reject insidious notions of Indigenous decline following European colonization. Specious, overly prescriptive ideas that Indigenous societies immediately fell into disarray and were either forced to assimilate to Western society or succumbed to disease and warfare once Europeans arrived in America pervade the popular imagination, and even academic discourse. The prevailing paradigm around Indigenous North Americans has been that they were a people in decline, doomed to extinction by the tenets of social Darwinism. Rather than highlighting Indigenous achievement, survivorship, ingenuity, and adaptability, the emphasis has been on their tragic downfall. They were, and to a degree still are, the ultimate symbol of victimhood: a people that the public could feel good about feeling guilty about, and as such were on the receiving end of much pity and many empty gestures. David Hurst Thomas (2000:42) calls this the "Vanishing American" framework.

This trope of decline presupposes that Indigenous people were by nature passive recipients of foreign culture. It assumes that Indigenous North Americans naturally adopted allegedly superior Western technology, material culture, lifeways, and culture without resistance or reckoning (Wilcox 2009:52). This trope reinforces racist notions of white supremacy and deprives Indigenous peoples of any sense of agency, and adaptability. This narrative assumes that the use of European goods means Indigenous people were aspiring to embrace European identity, whereas Indigenous people could, and most certainly did, modify European trade goods to their own ends, as has been demonstrated at White Springs by the reworking of iron, brass, and glass trade goods (Walton 2021; LaGrasta 2021). The Seneca were capable of reckoning with European materials and material culture on their own terms, using them for their own cultural needs and practices. This idea applies not only to inanimate objects, but to livestock as well.

Under the decline trope, it is easy to think of the Seneca as a conquered or colonized people. However, the Seneca, and indeed the entire Haudenosaunee Confederacy, maintained autonomy and sovereignty throughout White Springs' occupation, and well beyond. They famously resisted European control and maintained their traditional lifeways. Therefore, I prefer the term "cultural entanglement" to colonization. "Entanglement" is value-neutral and does not presuppose a power dynamic, instead treating both the colonists and Indigenous peoples as autonomous groups with their own agency (Jordan 2009).

Additionally, "cultural entanglement" (Jordan 2009) is a better descriptor of the centuries-long relationship between Europeans and the Haudenosaunee. The Haudenosaunee Confederacy regularly traded with British, French, and Dutch settlers and merchants, and became embroiled in conflicts alongside and against them. This complex series of relationships and interdependencies makes "Contact Period" an inaccurate term, as it downplays the length, extent, and nuances of these relationships and "ignores the process and heterogeneous forms of colonialism and the multifaceted ways that Indigenous people experienced them" (Silliman 2005:55). "Historic Period" is also a problematic term, as it implicitly disregards and diminishes the epistemological value of non-written Indigenous knowledge ways and oral histories. Instead, for the purposes of this thesis, I reject both of these terms, using calendrical dates whenever possible and referring to this time period as one of Indigenous-European entanglement.

The lens of cultural entanglement allows for Indigenous adaptation and ingenuity. It does not presuppose European dominance or passive adoption of European material culture. This framework is paramount to an interpretation of the fauna and economy at White Springs. The presence of European domestic animals should not automatically be taken as a sign of European-style pastoral agriculture, as there are myriad other ways of exploiting these animals. On the opposite end of this assumption of passivity, it should not be assumed that the local Senecas did not exploit Eurasian domesticates to some degree. Some previous interpretations of faunal remains from Haudenosaunee sites deny Haudenosaunee peoples agency by assuming that any domestic animal remains were either left over from Jesuit missions (Somerville 2014) or introduced as trade items (Pipes 2009a). It is important to contend with the presence of such animals (sheep/goat, cattle, pigs) in Seneca terms, in a manner befitting Seneca cultural and economic practices. While the possibility of this type of pastoral economy should not be immediately dismissed, any interpretation along these lines should be met with a preponderance of evidence, as a hypothesis to be proven, not as a baseline to be assumed.

Materials and Methods

An extensive faunal analysis was performed on every faunal specimen from the three selected loci, with the exception of specimens from flotation samples recovered via 1mm and 2mm mesh. These finer-meshed flotation materials were not examined as the specimens were too small to be reliably identified. All recovered via 3.35mm mesh were identified to the lowest possible taxonomic level, typically species or genus. However, due to the high level of fragmentation, as well as other confounding factors such as weathering, burning, and digestion, a significant amount of bone fragments were not identifiable to species or genus and instead were placed into broader categories (e.g., “large mammal”, “fish”, “deer-sized”) as indicated by the codebook created by Adam Watson for his analysis of the fauna from Townley-Read (another Seneca town excavated by Dr. Jordan, occupied from 1715-1754), which itself was modeled after Dr. Nerissa Russell’s coding system. Since Watson’s students were responsible for some of the previously identified fauna and used his system, I used the same coding system to maintain consistency. For the purposes of this thesis, large mammals include anything deer-sized or larger, while medium mammals represent a range from beaver- to sheep/goat-sized. The small mammal category consists of mammals smaller than beaver.

Number of Identified Specimens (NISP) is the primary unit of quantification used in this analysis. Due to the extreme degree of bone fragmentation, likely redeposition of remains into middens, and soil disturbance from multiple construction episodes and plowing, Minimum Number of Individuals (MNI) was not calculated. Additionally, MNI has a tendency to drastically overrepresent rare taxa, making it less appropriate for this analysis (Gifford-Gonzalez 2018). For the purposes of element distribution analysis (principally used for deer and pig), elements are placed into body zone categories, described in Table 1.

Table 1: Ungulate Body Zone Definitions

Body Zone	Elements
Antler	Antler
Skull	Cranium, Mandible, Teeth
Neck	Atlas, Axis, Hyoid
Axial	Ribs, Vertebrae, Sternum
Upper Front Limb	Scapula, Humerus, Radius, Ulna
Lower Front Limb	Carpals, Metacarpals
Pelvic Girdle	Ilium, Ischium, Pubis
Upper Hind Limb	Femur, Patella, Tibia, Fibula (Os malleolare)
Lower Hind Limb	Tarsals, Metatarsals
Foot	Phalanges, Sesamoids

Whenever possible, through an analysis of epiphyseal fusion and tooth wear and eruption, as well as general histological structure, specimens were assigned to age categories, although some could only be described more generally as "young". Epiphyseal fusion follows Bökönyi (1972) and Silver (1969), as well as Spiess and Lewis (2001) for white-tailed deer (*Odocoileus virginianus)*.

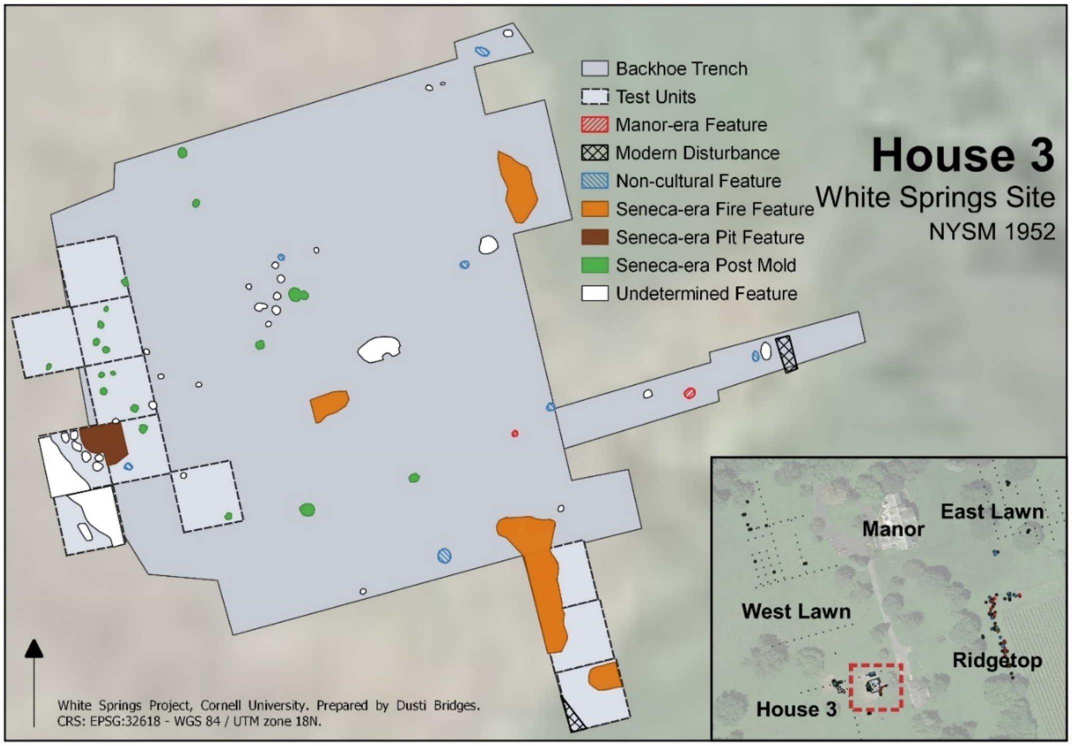
The fragment size of every indeterminate specimen was measured and placed into size-graded categories (e.g., <1cm; >1cm, <2cm, etc.), alongside other analytical criteria such as weathering stage, burning type, and breakage pattern. Surface condition was recorded following Behrensmeyer (1978), while breakage patterns were recorded in accordance with Villa and Mahieu (1991). Spiral fracturing was noted whenever observed, as this is a common practice of Seneca butchery and marrow extraction, particularly noted at Townley-Read (Watson 2000). Pathologies, while rare, were also recorded. Digestion and cut marks were noted. After analysis all faunal remains were assigned catalogue numbers and re-bagged by catalogue lots, to be stored in Dr. Kurt Jordan's lab until they can be repatriated to the Seneca-Iroquois National Museum.

The majority of the bones and teeth, except for a portion of those from Feature 3, were analyzed at Cornell University's Human and Animal Bone Lab (HABLab), using Dr. Nerissa Russell's comparative osteological collection for reference. Numerous osteological atlases were referenced, including Elisabeth Schmid's *Atlas of Animal Bones* (1972), Diane France's *Human and Nonhuman Bone Identification* (2009), Miles Gilbert et al.'s *Avian Osteology* (1981), and Tamela Smart's "Carpals and Tarsals of Mule Deer, Black Bear and Human: an Osteology Guide for the Archaeologist" (2009). A select few (mostly small North American mammals) were taken to Dr. Pam Crabtree's faunal lab at New York University for identification. Many small mammal and bird bones were analyzed at Cornell's Museum of Vertebrates, while fish and amphibian bones were analyzed with the help of Dr. Casey Dillman, the curator of fish and herpetology at the same museum. In keeping with the White Springs project's ethical goals and the Seneca community's wishes, any bones or teeth that could possibly be identified as human were examined by several osteology experts following recovery, including Dr. Nerissa Russell and Dr. Jennifer Mueller. Additionally, bioarchaeologist Dr. Matthew Velasco helped verify any questionable osteological material I examined in the HABLab. If identified as possible human remains, these specimens would have been repatriated to the descendant community and reburied immediately following Seneca burial customs. All human remains accidentally recovered by the project were repatriated and reburied prior to the beginning of my research, and no further human specimens were identified during my data collection.

Unfortunately, restrictions to laboratory access due to the outbreak of the COVID-19 pandemic limited my ability to verify some specimens. While most identification had been completed, this meant that some specimens were recorded with low certainty (indicated in the database) or only identified to higher taxonomic categories. Most affected by this lack of resolution are microfauna, birds, and fish. Further analysis when resources such as the Lab of Ornithology are available again could (potentially greatly) increase the represented species diversity of White Springs.

Measurements of bones were taken in millimeters accurate to two decimal points whenever possible using digital sliding calipers, in accordance with criteria set forth by von den Driesch (1976). For larger bones, particularly complete long bones/metapodials from larger mammals, an osteometric board was used; these could only be measured accurate to the nearest millimeter.

House 3



The House 3 Area of White Springs is located east of the Palisade Area, approximately three meters south of House 2 on the Southwest Lawn. A substantial area of nearly 67 m^2 was excavated within this locus, including a total of eight test units and a trench excavated via Bobcat. Features and post mold soils were screened through a 1/8” mesh or floated, while plowzone and subsoil contexts were principally screened with 1/4” mesh. The total volume of backhoe trench dirt excavated exceeded 694.6 liters; a total of 546.1 liters were screened and 157.5 liters were floated, most of which came from features. Most plowzone soil from the backhoe trench was not screened. The structure is believed to have been a longhouse that ran east-west with a large vestibule or storage area attached. Jordan interprets the spacing and frequency of posts as evidence that the longhouse was built to be a sturdy, permanent structure. The size of the vestibule area suggests that it was attached to a large, multi-hearth longhouse, larger than the "short longhouses" found at Townley-Read (Jordan 2018).

The fauna from House 3 reflects a Seneca profile (Table 2), although the proportion of deer to minor taxa is particularly high compared to other Seneca and Haudenosaunee assemblages. Roughly 94% of specimens (N=6359) are indeterminate bone fragments, while the remaining 6% (N=418) could be placed into size or taxonomic categories. Of this portion of remains, 159 could be identified to genus or species level (Table 2).

White-tailed deer are by far the majority, making up nearly 90% of the identified specimens. Canids (*C. familiaris* and *Canis* sp.) are the next most prominent taxon, followed by pigs, the only Eurasian domestic species. Other minor taxa include raccoon, black bear, beaver, a bird of the genus *Larus*, a turtle of unknown species, and interestingly, a moose. Four medium-sized bird bones and two amphibian remains were also identified. Eight fish specimens were identified, but none to the level of species due to COVID restrictions shutting down access to the comparative ichthyology collections at the Museum of Vertebrates. These will be reexamined with the help of a fish specialist in the near future. Additionally, 47 mussel shell fragments are present, although they have not yet been identified to species or even saltwater/freshwater origin.

In addition to the species noted above, 35 cattle and 2 sheep/goat bones were identified. These species were ultimately omitted from analysis, as both sheep/goat remains and 27 of the 35 cattle remains showed evidence of Euroamerican butchery. The remaining eight cattle bones that do not clearly display Euroamerican butchery were found in various deposits with heavy Manor-era intrusion and subsequently omitted. Similarly, three pig remains show clear Euroamerican butchery and were omitted; however, four pig specimens may represent Seneca use and have been included in the data set.

Table 2: House 3 Taxonomic/Size-Class Representation by NISP of Seneca-era fauna

Taxon	Common Name	NISP	%NISP	%NISP of Identified Assemblage
Odocoileus virginianus	White-tailed Deer	143	2.11	89.94
Canis sp.	Dog/Wolf	6	0.09	3.77
Sus scrofa	Pig	4	0.06	2.52
Procyon lotor	Raccoon	2	0.03	1.26
Alces alces	Moose	1	0.01	0.63
Castor canadensis	American beaver	1	0.01	0.63
Larus sp.	Gull	1	0.01	0.63
Ursus americanus	American black bear	1	0.01	0.63
Rodent		20	0.30	
Fish		8	0.12	
Amphibian		2	0.03	
Turtle		1	0.01	
Large Mammal		92	1.36	
Artiodactyl	Even-toed ungulates	17	0.25	
Small Mammal		15	0.22	
Medium Mammal		11	0.16	
Medium bird		4	0.06	
Sheep-size		3	0.04	
Beaver-size		2	0.03	
Medium carnivore		2	0.03	
Rabbit-Size		1	0.01	
Small carnivore		1	0.01	
Small canid		1	0.01	
Small felid		1	0.01	
Snail		31	0.46	
Mussel		47	0.69	
Indeterminate		6359	93.83	
Total		6777		

White-tailed Deer

Although white-tailed deer is by far the most abundant identified species in House 3, sex data are scarce. Only three specimens could be sexed, with low certainty: two possible females and one possible male, with the two female specimens being from the same individual, as they articulated to each other. Sex profiles here cannot elucidate hunting strategies. However, significantly more age data are available (Table 3). This subadult- and adult-biased age profile is consistent with a typical prime-dominated hunting strategy (Stiner 1990) in which full or nearly full-sized individuals are preferentially hunted for their high meat and hide yield. Such a hunting strategy helps to refute an interpretation of dietary stress and meat scarcity, and fits with a model in which deer hides are valued. Furthermore, it supports the interpretation that White Springs was initially settled in a relatively unaltered mature-forest environment that would support a healthy, thriving population of deer.

Table 3: House 3 White-tailed Deer Age

Age Class	NISP	%NISP
Young	1	4.35
Infantile	1	4.35
Infantile/Juvenile	1	4.35
Juvenile	1	4.35
Juvenile/Subadult	1	4.35
Subadult/Adult	8	34.78
Adult	9	39.13
Old	1	4.35
Total	23	

Deer bone body part representation for House 3 is presented in Figure 2 and is heavily skewed towards lower limb and foot elements, as well as cranial elements (including mandibles and teeth). However, raw element distribution can be misleading, as certain elements (such as phalanges and ribs) exist in larger numbers in the body than others, so to correct for this, I "normed" each by zone (Table 4) dividing the NISP of recovered elements per body zone by the number of occurrences of that element per body zone in a complete carcass (Figure 2). The resulting index, normed number of identified specimens (NNISP), still shows significantly higher amounts of lower front and hind limb bones but drastically reduces the prevalence of foot bones and cranial elements.

Figure 2 displays the %NISP of the House 3 deer assemblage compared to the %NISP expected in a complete deer carcass. The proportion of axial remains is rather low. If primary butchery occurred at an offsite kill location, many of these low meat-yielding elements (primarily ribs and vertebrae) may not have been hauled to White Springs. Upper limb bones are meat-heavy, but the relative proportion of recovered upper limb bones is not much different from the expected value. Lower limbs, however, are extremely prevalent despite low meat-yield, and foot bones are slightly more prominent than expected despite their low utility.

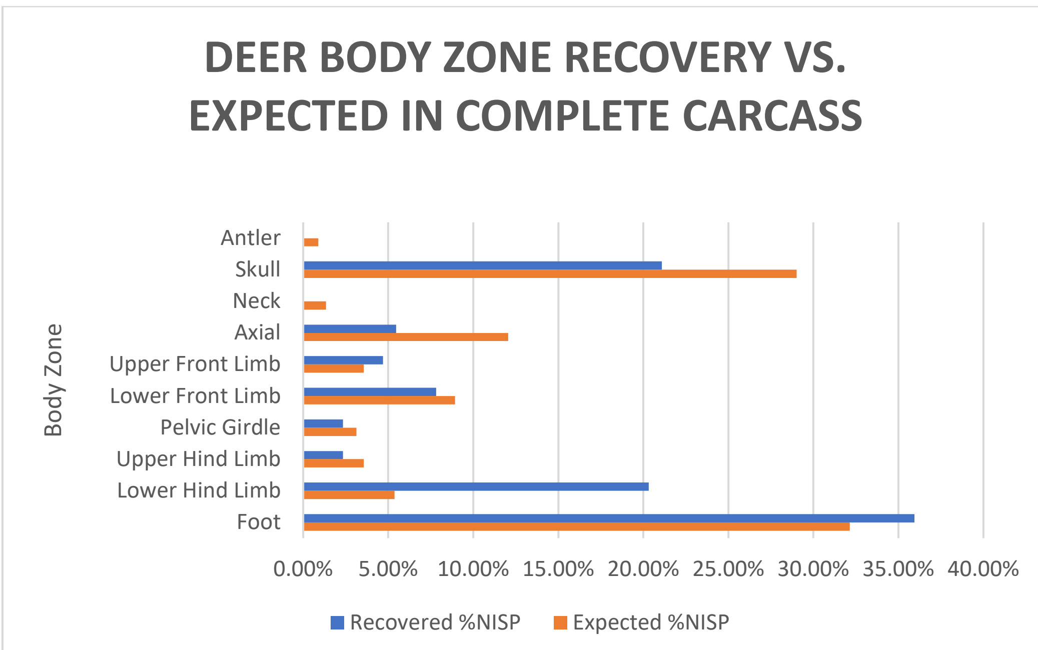


Figure 2: Recovered Deer Elements vs. Expected Number of Elements

Table 4: Number of Elements per Body Zone in White-tailed Deer

Body Zone	Elements	Number of elements in body zone	Expected %NISP
Antler	Antler	2	.89
Skull	Cranium, Mandible, Teeth	65	29.02
Neck	Atlas, Axis, Hyoid	3	1.34
Axial	Ribs, Vertebrae, Sternum	27	12.05
Upper Front Limb	Scapula, Humerus, Radius, Ulna	8	3.57
Lower Front Limb	Carpals, Metacarpals	20	8.93
Pelvic Girdle	Ilium, Ischium, Pubis	7	3.13
Upper Hind Limb	Femur, Patella, Tibia, Os malleolare	8	3.57
Lower Hind Limb	Tarsals, Metatarsals	12	5.36
Foot	Phalanges, Sesamoids	72	32.14

It is likely that many of these lower limb and foot remains represent refuse from skinning. In their study of butchering practices at the Susquehannock Eschelman site (occupied approximately 1600-1625), Guilday et al. (1962) have noted that skinning often begins around the dew claw, an area where skin adheres closely to bone. Dismemberment would occur after the skin was removed from the muscle. Forelimbs were then cut from the shoulder and pelvis and separated at the elbow and tarsal/carpals (Guilday et al. 1962). The process of dismembering at the wrist would leave many carpals, tarsals, and metapodials still attached, but leave very few visible cut marks. The more desirable, meat-laden areas like the upper limbs might then be shared or transported elsewhere. However, element distribution may be biased by alteration, differential preservation, and taphonomic factors, discussed later in this section. Cooking, further butchery, and splitting and crushing of long bones for marrow and bone grease production results in a greater degree of fragmentation and destruction of diagnostic features, thus underrepresenting these elements compared to the more robust survivable compact bones, such as those of the wrist (Marshall and Pilgram 1991). It should also be noted that the fused 3rd and 4th metapodials are particularly common in this assemblage, and although they are included in the lower limb body zone, they are long bones that would be useful for marrow and grease production. They may be overrepresented compared to other long bones due to the fact that their shafts are often recognizable even as small fragments.

Minor Taxa

Canids were the second most common taxon found in the House 3 area. While one tooth was definitively identified as a dog, the other remains could not be differentiated as dog or wolf. Only one specimen could be aged, and only to the broad category of juvenile to adult. No canids could be identified to sex, and none of the canid remains showed any signs of butchery, despite historical, ethnographic, archaeological evidence demonstrating that dogs were not an uncommon food source (Kuhn and Funk 2000), and were the subject of sacrifices, particularly as preparation for war and in the sacred "White Dog Ceremony" (Tooker 1965).

Pigs are the only Eurasian species identified in the House 3 assemblage. No sex data could be derived. One specimen was identified as an adult between four and six years old based on tooth wear. All four specimens were recovered from upper level plowzone contexts that contained a great deal of both Seneca and Manor-era fauna and artifacts, making their time period of origin uncertain. It is likely that these pigs date to the Manor Era, but this cannot be entirely confirmed, so they could not be confidently omitted from this analysis.

The single moose from House 3 was identified from a dew claw. While moose are known to live as far south as the Finger Lakes region, they are quite rare. It is likely that it was introduced to the site via long-distance hunting or trade. As the only specimen is a dew claw, it is possible that this specimen is a "rider" (*sensu* Binford 1978) that was introduced to the site attached to a skin.

The *Larus* sp. specimen's provenience as Seneca-era is questionable. The specimen was recovered from an upper plowzone level, in a mixed context containing both Seneca and Manor-era fauna and artifacts. While gulls are abundant in the Finger Lakes and Great Lakes region today, this may not have always been the case, as populations in the area dramatically increased only in the 1960s (Ludwig 1974). Unfortunately, no data on this genus' population in the 17th and 18th century exists to determine if they were present in the Finger Lakes area during White Springs' occupation.

Taphonomy

Heat alteration is common among remains from the House 3 Area, occurring on nearly 40% of all remains (Table 5). This amount of burning is much higher than the expected signature from cooking, suggesting bones were deposited into firepits. Weathering is not severe in the House 3 Area. The overwhelming majority displaying very slight weathering (Table 6). The assemblage is heavily fragmentary and dominated by predepositional breakage with very few complete remains (Table 7). The good surface condition means bones were rapidly buried, suggesting that the high fragmentation rate is deliberate. This fits with a signature of bone grease manufacturing.

Table 5: House 3 Heat alteration

Burning Type	NISP	%NISP
Unburned	4168	61.50
<50% Carbonized	17	0.25
>50% Carbonized	1	0.01
Fully Carbonized	947	13.97
Fully Calcined	1415	20.88
Mostly Carbonized, Some Calcined	128	1.89
Mostly Calcined, Some Carbonized	101	1.49
Total	6777	

Table 6: House 3 Weathering

Weathering Stage	NISP	%NISP
Very Slight	6484	98.77
Slight	75	1.14
Moderate	5	0.08
Heavy	1	0.02
Total	6565	

Table 7: House 3 Origin of Fragmentation

Origin of Fragmentation	NISP	%NISP
Complete	45	0.69
Predepositional	6191	94.30
Postdepositional	138	2.10
Modern	147	2.24
Mostly Predepositional, some recent	18	0.27
Mostly recent, some Predepositional	2	0.03
Mostly Predepositional, some postdepositional	24	0.37
Total	6565	

Digestion is not particularly common among House 3 bones. Only 12 bones show gastric etching. All digested remains that could be identified to species were cervid (white-tailed deer or moose) phalanges, dew claws, or carpals, elements small enough to be swallowed whole by dogs. Gnawing by carnivores is also not very common, occurring on only five specimens, one indeterminate fragment, two large mammal long bones and two ruminant astragali. This lack of gnawing and digestion is likely linked to the high degree and intensity of heat alteration, as the Haudenosaunee were known to place bones in fire pits and cover them with ash to prevent dogs from consuming them (Tooker 1960). Rodent gnawing is only present on one indeterminate fragment.

Clear signs of butchery are also relatively rare in this assemblage, likely obscured by the high degree of fragmentation. A total of seven fragments, mostly long bones, displayed clear spiral fractures. This type of marrow extraction fracture is first described by Guilday et al. (1962) at Eschelman, and similarly noted at Townley-Read (Watson and Thomas 2013). Nine remains display cut marks, four of which are indeterminate fragments, three are large mammal long bones, one is a deer calcaneus, and one is a large mammal radius. Additionally, one deer scapula has evidence of filleting, a clear sign of meat removal. One deer metatarsal displays a percussion mark, possibly consistent with an axe blow, perhaps an attempt to extract marrow.

Notable Features in House 3

While many features in the House 3 Area contain very few faunal remains, and even fewer identifiable, some have large enough sample sizes and enough diagnostic data to warrant further discussion. All materials presented below have been included and discussed in the above presentation of the entire House 3 assemblage, but are further analyzed and contextualized as distinct features

Feature 35 contains the greatest amount of faunal remains of any feature from House 3, at 819 specimens. Located within the 1x1 meter TU 85, the feature is described as a dark stain when compared to the light matrix of a 20th century pipe trench. While the entire feature is made up of dark plowzone soil and suggested to not be a Seneca-era feature, artifacts are primarily Seneca-era, and the fauna is indicative of Seneca material, with no evidence of Manor-era intrusion. 801 of these fragments were indeterminate. Three white-tailed deer remains were recovered: one worn upper right P2 attributed to an adult, one left humerus distal epiphysis, and one cuneiform tarsal. Additionally, two carnivore teeth were found; a dog's lower 3rd molar and small carnivore's (likely a red fox) lower 2nd molar. One large mammal vertebra, six rodent bones, one sheep-sized and one beaver-sized caudal vertebra were identified. 501 specimens were unburned, 2 were partially carbonized, 79 were fully carbonized, 226 were fully calcined, and 11 showed a mixture of carbonization and calcination. Weathering is light and most breakage is predepositional. This extreme degree of burning and fragmentation, with the majority of remains being broken into 1-2cm fragments, may be indicative of grease production. No other forms of alteration, such as cut marks, digestion, or gnawing were found.

Feature 41 is located within TU 84 and TU 89, both 1x1 meter test units. The feature is described as a concentration of cobble within plowzone soil, and is likely a Seneca-era rock feature that has been disturbed by plowing. However, the fauna from this feature is strictly Seneca-era. 221 of the 236 remains are unidentifiable. Identified specimens include four white-tailed deer remains, three of which are tarsals: two astragali and one lateral cuneiform tarsal. The other deer specimen is an unfused humerus belonging to a juvenile individual. Other identified remains include one rodent long bone, one large mammal ischium, and one fish vertebra. 145 of the remains are unburned, 20 are fully carbonized, 62 are fully calcined, and nine show a mixture of carbonization and calcination. Again, most remains were broken predepositionally and weathering is light. Two fragments showed signs of digestion, one being the deer cuneiform, probably swallowed by a dog. Additionally, one indeterminate fragment contains a single cut mark.

Feature 55 is located just outside the main structure area of House 3 and is the only Feature in the exterior area to yield a significant amount of faunal remains. Located within Trench 1, Feature 55 was identified as a circular feature, and was excavated in conjunction with Feature 56. The two features when combined measured 80cm across. Interestingly, while Feature 55 contained nearly 300 bone fragments, Feature 56 only contained one. 285 of the 295 remains are indeterminate, but the few identified species suggest a Seneca profile. Two deer dew claws were identified, as well as one canid tooth, possibly a fox (*Vulpes vulpes* or *Urocyon cinereoargenteus)*. Other identified remains include two fish, one bird, and one rodent. Size-classed remains include one small, medium, and large mammal. This feature has a particularly high rate of burning. 162 fragments are unburned, 76 are carbonized, 49 are calcined, and eight are both carbonized and calcined. Weathering is light, and fragmentation is mostly predepositional.

Unfortunately, most Seneca-era post molds from the House 3 Area lack significant amounts of faunal material, the largest containing only 31 fragments. Only two yielded identifiable remains: PM 49 contained one deer dew claw, while PM 53 contained one deer phalanx and one fish vertebra. PM 81, a Euroamerican post mold, yielded a significant number of sawed bovid ribs. These were not analyzed any further due to their provenience as strictly Manor era.

Feature 3

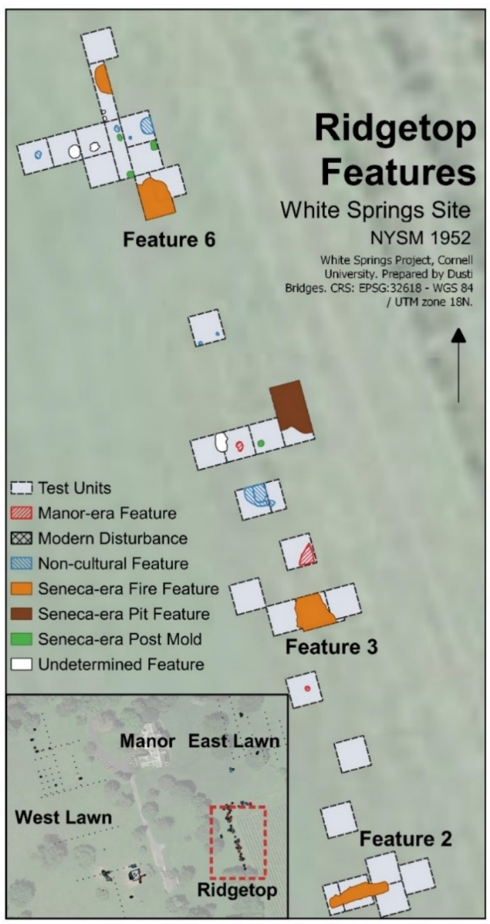


Figure 3: Ridgetop Locus Map (prepared by Dusti Bridges)

Feature 3 is a large Seneca-era pit feature, measuring 1.91 meters long and 1.10 meters wide, encompassing TU 6 as well as TU 9 and TU 17 and their respective extensions. Presumably an outdoor firepit, Feature 3 is located in the Ridgetop area of the site (represented in Figure 3). Excavators suggested that the feature likely consists of two distinct layers, an upper midden level and a lower cooking pit. Plowzone levels were screened using 1/4" mesh, while feature levels were screened through 1/8" mesh or floated. The majority of faunal remains were recovered from feature levels.

The fauna from Feature 3 represents a definitive Seneca profile, but once again disproportionately dominated by deer (Table 8). This assemblage is significantly larger than either the Palisade Area or House 3 assemblage, with the greatest species diversity (although this can be explained by sample size, preservation, and the greater quantity of unplowed soil). Over 91% (N= 13144) of fragments were unidentifiable due to extreme fragmentation, while the remaining 9% (N=1246) could be placed into size-classes or taxonomic groupings. 541 remains could be identified to genus/species level.

Table 8: Feature 3 Full Taxonomic/Size-Class Representation

Taxa/Category	Common Name	NISP	%NISP	%NISP of Identified
Odocoileus virginianus	White-tailed Deer	475	3.30%	88.29%
Sus scrofa	Pig	19	0.13%	3.53%
Ursus americanus	American black bear	9	0.06%	1.67%
Canis sp.	Dog/Wolf	7	0.05%	1.30%
Castor canadensis	American beaver	7	0.05%	1.30%
Procyon lotor	Northern raccoon	5	0.03%	0.93%
Canis familiaris	Dog	4	0.03%	0.74%
Marmota monax	Woodchuck/Groundhog	2	0.01%	0.37%
Sylvilagus floridianus	Eastern cottontail	1	0.01%	0.19%
Vulpes vulpes	Red fox	1	0.01%	0.19%
Microtus pennsylvanicus	Meadow Vole	1	0.01%	0.19%
Ectopistes migratorius	Passenger Pigeon	3	0.02%	0.56%
Ictaluridae	Catfish family	3	0.02%	0.56%
Salmonidae	Salmon/Trout/Char	1	0.01%	0.19%
Rodent		45	0.31%	
Beaver-size		1	0.01%	
Small Mammal		46	0.32%	
Medium Mammal		96	0.67%	
Large Mammal		206	1.43%	
Artiodactyl		13	0.09%	
Small carnivore		8	0.06%	
Medium carnivore		7	0.05%	
Bird		6	0.04%	
Small Bird		3	0.02%	
Medium bird		1	0.01%	
Large bird		3	0.02%	

In terms of NISP, white-tailed deer are again the dominant species in the assemblage to an extreme degree, followed distantly by pigs (Table 8). Species representation becomes less diverse and more weighted towards deer in each lower stratum, as shown by Figures 4 and 5. White-tailed deer show an increase in prominence as depth increases. Simultaneously, there is a slight decrease in pig remain frequency by depth. Bear remains are only present in the upper 10cm stratum, while *Canis sp.* remains are consistent between the upper two layers. The lowest portion of the feature contains the smallest amount of identified faunal remains, of which only deer were identifiable to species level.

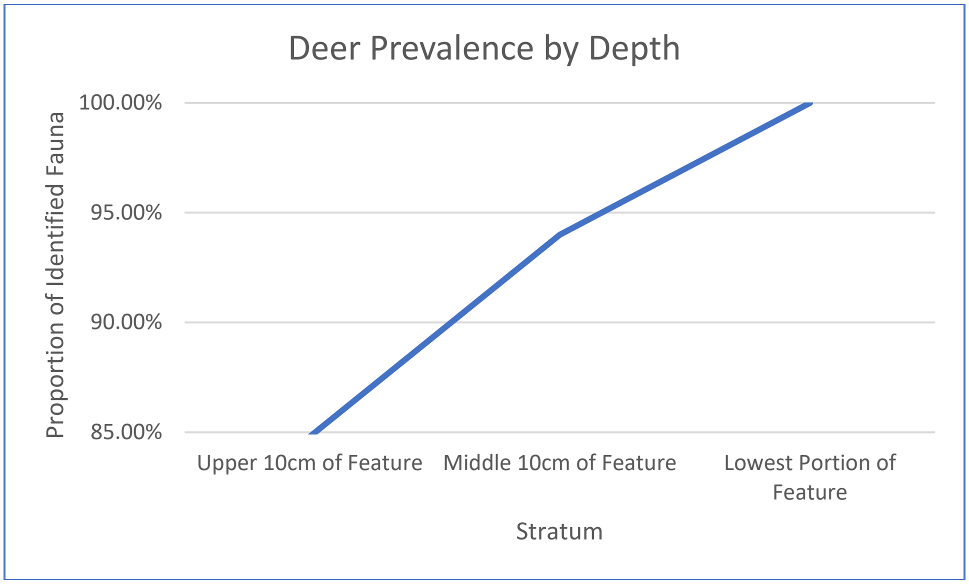


Figure 4: Prevalence of Deer by Feature Depth

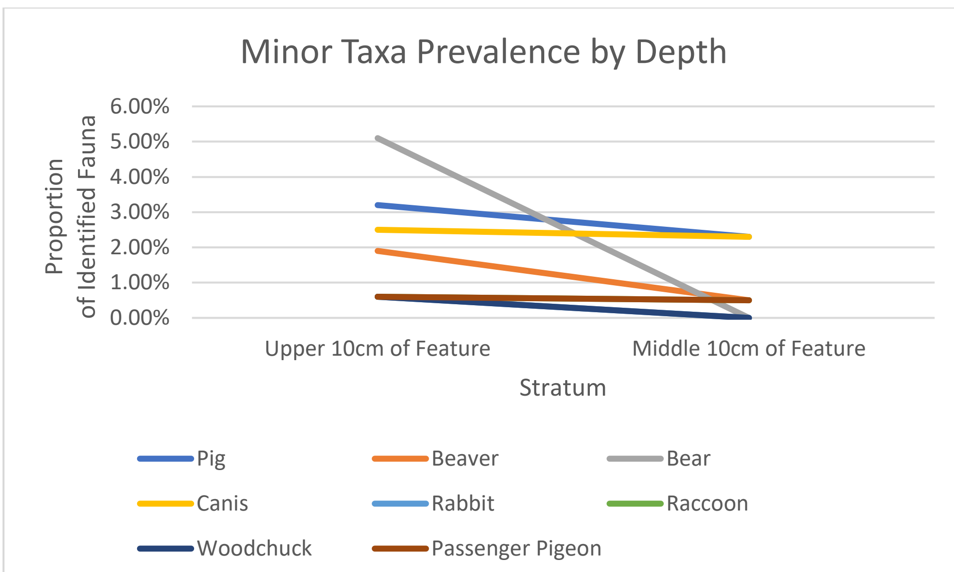


Figure 5: Prevalence of Minor Taxa by Feature Depth

White-tailed Deer

White-tailed deer age and sex profiles from Feature 3 suggest a prime-dominated hunting profile. A total of 19 specimens could be sexed, primarily based on pelves and crania, skewing heavily towards male or probable male individuals (Table 9). Age data are more abundant for deer, heavily favoring adults, and subadults to a lesser degree (Table 10).

Table 9: Feature 3 White-tailed Deer Sex

Sex	NISP	%NISP
Male	11	57.89
Probable Male	7	36.84
Female	0	0.00
Probable Female	1	5.26
Total	19	

Table 10: Feature 3 White-tailed Deer Age

Age Class	NISP	%NISP
Young	2	1.18
Infantile/Juvenile	2	1.18
Juvenile	8	4.73
Juvenile/Subadult	15	8.88
Subadult	31	18.34
Subadult/Adult	10	5.92
Adult	101	59.76
Total	169	

In contrast to the House 3 assemblage's bias towards lower limbs, element distribution of deer remains in Feature 3 is more skewed towards upper limb bones (Table 11). When normed, it becomes clear that upper limbs are overrepresented compared to other body zones, while cranial and foot remain prevalence drop significantly.

Table 11: Feature 3 Deer Body Zone Raw and Normed Distribution

Body Zone	NISP	%NISP	NNISP	%NNISP
Antler	1	0.25	0.50	1.80
Skull	97	24.13	1.49	5.36
Neck	2	0.50	0.67	2.39
Axial	14	3.48	0.52	1.86
Upper Front Limb	68	16.92	8.50	30.52
Lower Front Limb	35	8.71	1.75	6.28
Pelvic Girdle	25	6.22	3.57	12.82
Upper Hind Limb	52	12.94	6.50	23.34
Lower Hind Limb	41	10.20	3.42	12.27
Foot	67	16.67	0.93	3.34

Figure 6 displays deer body part distribution by depth. The upper 10cm level contains a NISP of 148 deer bones, the middle 10cm contained a NISP of 215, while the lowest portion of the feature only contained 9. When analyzed by depth, there appears to be a higher prevalence of meat-bearing elements, namely the upper front and hind limbs, in the upper 10cm of Feature 3, suggesting the remnants of meals. The next 10cm increment favors cranial elements, with somewhat less emphasis on meat-laden bones. The lowest portion heavily favors lower limb and foot elements, however the sample size is significantly lower. Element distribution here cannot be used to reliably delineate the purported lower cooking-related feature from the upper-level midden. This must be done through taphonomy and burning analysis.

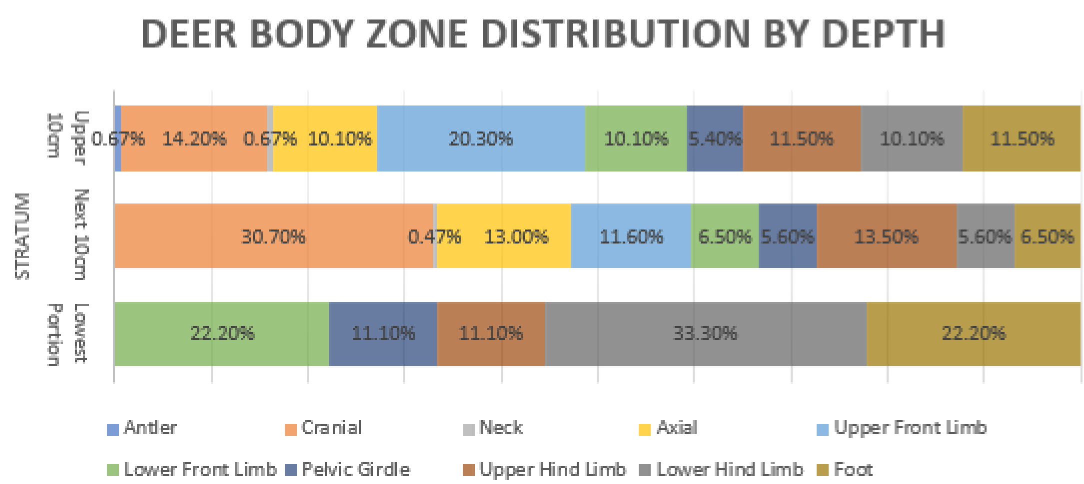


Figure 6 Deer Body Zone Distribution by Depth

A total of 15 deer long bones were recorded as showing clear spiral fracturing/marrow extraction. The actual rate of this type of butchery is probably significantly higher, as the New York City analysts did not record this type of butchery. They did, however, record 40 specimens, most of them long bones, with curved fracture outlines on at least one end, possibly referring to spiral fracturing. Cut marks are extremely common among Feature 3 deer, occurring on 169 specimens (Table 12). The high rate of cut marks on long bones and scapulae could be the result of numerous types of butchery, including meat removal, dismemberment, or skinning (Binford 1981). The majority of cut marks on crania are located on the frontal and parietal bones, with two instances noted on the antler pedicle itself, which is indicative of skinning, as hide-production often involves skinning around the antlers (Guilday et al. 1962: 75; Binford 1981: 107).

Table 12: Deer Cut Mark Distribution

Element	NISP	Element	NISP
Cranium	26	Astragalus	3
Scapula	22	1st Phalanx	3
Humerus	16	Mandible	2
Metacarpal	14	Sacrum	2
Pelvis	12	Rib	2
Radius	11	2nd Phalanx	2
Tibia	11	Antler	1
Femur	9	Naviculo-Cuboid	1
Metatarsal	7	3rd Phalanx	1
Calcaneus	4	Dew Claw	1
Ulna	3		

Minor Taxa

Pigs are the second most common species in the Feature 3 assemblage. No sex data are available for pigs; however, nine specimens could be aged via tooth wear or epiphyseal fusion (Table 13). The slight prevalence of infantile and juvenile pigs over adults tentatively suggests an attritional profile (Stiner 1990). This perhaps represents opportunistic hunting, in which pigs were hunted when encountered rather than the largest individuals being selectively sought after, or garden hunting, the practice of hunting animals that threaten crops. However, this sample size is too small to draw confident conclusions on the matter. Element distribution suggests the entire carcass was present, as body parts represented include a generally even assortment of teeth, long bones, and ribs. The majority of pig remains (N = 15) were found in feature levels, the remaining

4 found in plowzone. Single cut marks are found on two specimens, both ribs. No pig remains showed any signs of Euroamerican style butchery, but one carbonized radius is split longitudinally in a spiral fracture pattern, indicating a break when the bone was fresh, likely an indication of marrow extraction. Based on provenience, taphonomy, and butchery, the majority of these pig remains can be confidently placed in Seneca contexts. Considering the lack of Manor-era fauna and minimal Manor-era artifact intrusion in the plowzone, the plowzone pig remains likely date to the Seneca era.

Table 13: Feature 3 Pig Ages

Age	NISP	%NISP
Infantile	2	22.22
Infantile/Juvenile	2	22.22
Juvenile	1	11.11
Adult	4	44.44
Total	9	

Canis sp. is the most common carnivore taxon in Feature 3, represented by seven *Canis* sp. and four *C. familiaris* specimens. Only three specimens could be aged, all adults. One of these adults showed particularly heavy tooth wear, suggesting an older age. Six of the eleven elements are teeth, while the remaining five elements include three ulnae, one astragalus, and one atlas. Evidence of burning was found on only one bone. Two specimens show cut marks, one atlas and one ulna. This may suggest dog meat consumption occurred, although how commonly is still in question.

Black bears, although often abundant in Haudenosaunee assemblages (Kuhn and Funk 2000), are only represented by nine specimens. Six of these specimens are mandible fragments that conjoin, suggesting an MNI of two individuals. One tooth, tibia, and metatarsal are also present. This element distribution may represent body parts left behind after butchery, as it is entirely made up of head, lower leg, and foot elements. No sex data are available, but two specimens were identified as adults. Butchery is found on two specimens. Six specimens are partially carbonized.

Beavers, despite their importance in the fur trade, are only represented by seven specimens. No age or sex data are available. Identified elements include three phalanges, one metatarsal, two cheek teeth, and one tibia. Although this sample size is small, the element distribution tentatively suggests butchery/skinning refuse, as it is weighted towards foot (for beaver, foot includes metatarsals) and head elements. The tibia shows evidence of butchery, and one phalanx is gnawed and digested, likely by a dog.

Only one sheep specimen was identified, but to a low confidence level, suggesting it may actually be another species. As it was recovered from a mixed-era Lower Plowzone/Feature context, it cannot be positively said to hail from the Seneca occupation. Instead, it may represent Manor-era intrusion. Two other sheep remains from Feature levels were originally identified by the NYC crew, but subsequent analysis confirmed by Dr. Russell showed they are in fact two fragments from a single deer mandible. This suggests a complete lack of sheep remains dating to the Seneca occupation.

Taphonomy

The majority of remains from Feature 3 are unburned (Table 14). As the excavators were unable to discern clearly visible stratigraphic boundaries during excavation, it could not be analyzed by distinct feature levels, but rather is analyzed in segments each with a range of 10 centimeters (Figure 7). There is a noticeable increase in heat alteration in the upper levels, with the upper 10cms experiencing the highest rate of burning, at just over 40%. The following 10cm increment has a much lower rate of burning at ≈18%, and the lowest 10cms of the feature has a burning rate of ≈14%.

Table 14: Feature 3 Heat Alteration

Type of Burning	NISP	%NISP
Unburned	10,145	70.61
<50% Carbonized	170	1.18
>50% Carbonized	110	0.77
Fully Carbonized	2,021	14.07
<50% Calcined	3	0.02
>50% Calcined	8	0.06
Fully Calcined	1,650	11.48
Mostly Carbonized, Some Calcined	192	1.34
Mostly Calcined, Some Carbonized	68	0.47
Total	14,367	

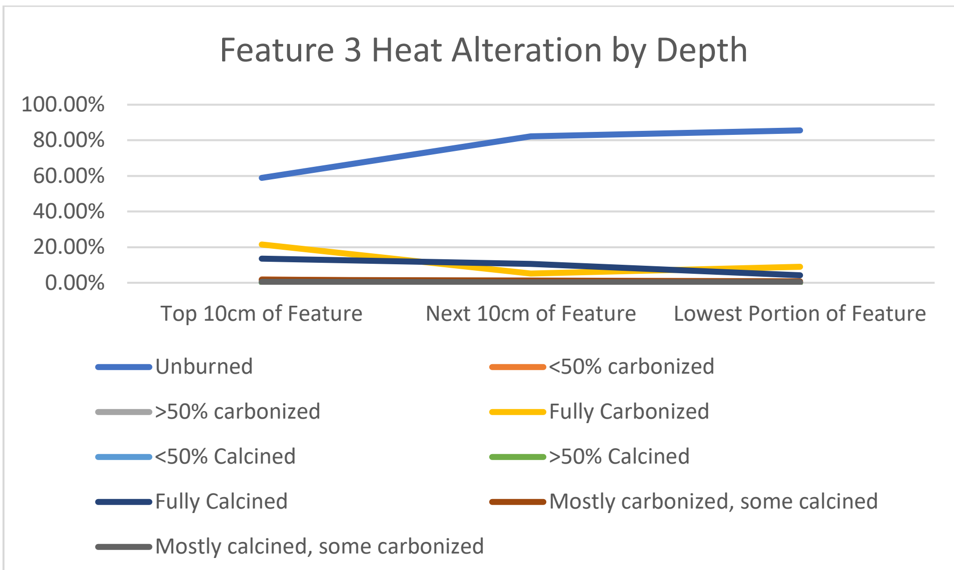


Figure 7: Feature 3 Heat Alteration by Depth

Weathering in Feature 3 is not severe (Table 15), with the vast majority of remains displaying very slight weathering. Breakage patterns are similar to the House 3 and Palisade area assemblages (Table 16), showing mostly predepositional breakage with very few complete specimens.

Table 15: Feature 3 Weathering

Weathering Stage	NISP	%NISP
Very Slight	13087	93.43
Slight	848	6.05
Moderate	70	0.50
Heavy	2	0.01
Very Heavy	1	0.01
Total	14008	

Table 16: Feature 3 Fragmentation

Origin of Fragmentation	NISP	%NISP
Complete	194	1.39
Predepositional	12739	91.50
Postdepositional	401	2.88
Modern	265	1.90
Mostly Predepositional, Some Modern	74	0.53
Mostly Modern, Some Predepositional	23	0.17
Mostly Predepositional, Some Postdepositional	167	1.20
Mostly Postdepositional, Some Predepositional	59	0.42
Total	13922	

Cut marks are much more prevalent in Feature 3 than any other locus, although overall rather low. The rate of cut marks is greatest in the middle 10cm stratum of the Feature, and least in the lowest portion (Table 17)

Table 17: Feature 3 Cut Marks by Stratum

Stratum	NISP w/ Marks	%NISP w/ Cut Marks	Total Number of Fragments in Stratum
Top 10cm of Feature	65	1.34	4833
Next 10cm of Feature	82	2.23	3684
Lowest Portion of Feature	2	0.40	499

Cut marks are few and far between at White Springs, most likely obscured by severe fragmentation. Instead, a look at spiral fracturing is warranted to elucidate local methods of food preparation. Spiral fracturing, a telltale sign of marrow extraction, is common in Seneca-style butchery. This type of fracture is relatively rare in Feature 3, being highest in the upper two strata, accounting for just over 1% of fragments (Table 18). This is in contrast to the disturbed plowzone levels, in which only .65% of fragments display spiral fracturing, and the lowest portion, which features only .20% spiral fractured remains. Spiral fracturing may not be as visible in this assemblage due to fragmentation, a signature that may relate to bone grease rendering.

Table 18: Feature 3 Spiral Fracturing by Stratum

Plowzone	Spiral Fracture NISP
Top 10 cm of Feature	53
Next 10cm of Feature	49
Lowest Portion of Feature	1

The volume and density of faunal remains recovered from Feature 3 does suggest the presence of a midden as proposed by Jordan and Gerard-Little. They posit that the lower levels of Feature 3 represent primary in-place cooking and butchery-related refuse, while the upper layers represent secondary midden deposits. The sheer volume of faunal material coupled with the severe predepositional fragmentation and higher rates of spiral fracturing tentatively supports the interpretation of the upper levels as a midden. The significantly higher quantity of artifacts recovered from the upper 10cm of Feature 3 includes shell-working debris, beads, pipe stems, ceramics and a great variety of other debitage and artifacts. This stands in stark contrast to the lowest portion of the feature, which primary consists of faunal remains and charcoal and contains minimal artifacts. While at a cursory glance it appeared the lowest portion of the feature contained larger, more complete bone fragments, analysis of fragment size shows only a marginal difference, trending in the opposite direction (Table 19).

Table 19: Bone Fragment Size by Depth

Fragment Size	Upper 10cm of Feature	Middle 10cm of Feature	Lowest Portion of Feature
<1cm	47%	52%	56%
>1cm, <2cm	35%	35%	35%
>2cm, <3cm	5%	4%	4%
>3cm, <4cm	2%	1%	1%
>4cm	1%	1%	1%

The higher rate of burning in the upper 10cms of Feature 3 could represent secondary deposition of bones that were covered with ash to prevent gnawing by dogs, a common Iroquoian practice noted by Tooker (1960). It is difficult to interpret the presence of a cooking-related feature from the fauna alone in the lowest stratum due to small sample size and secondary deposition into middens.

The Palisade Area

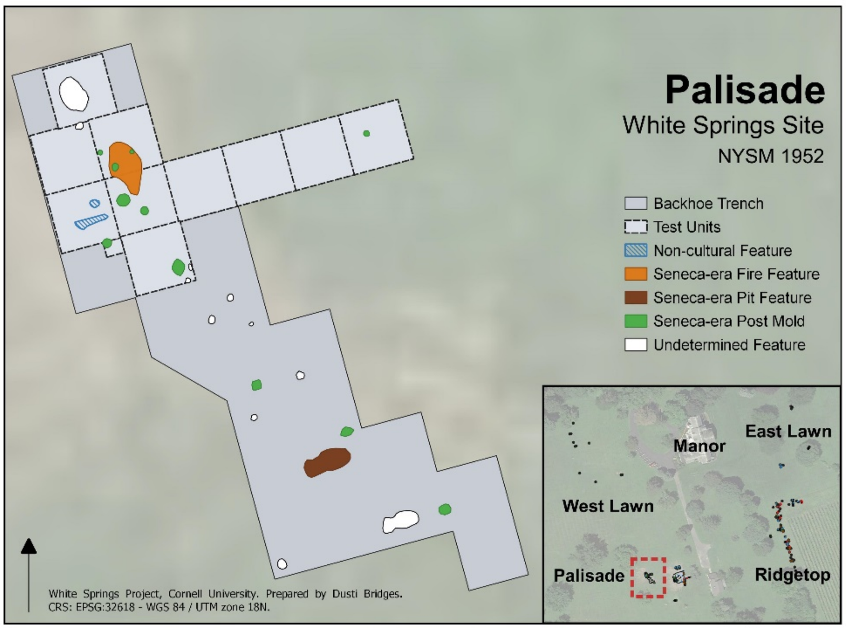


Figure 8: Palisade Area site map (prepared by Dusti Bridges)

The perimeter of White Springs contains what may be a defensive palisade, although the exact purpose of the post-molds and features in this area is still in question. Geophysical surveys, as well as excavations of an area west of House 3 identified numerous post molds forming a line (Bridges 2020). Interpretation of this area as a palisade is largely based on the fact that it is located in an area with a drastically lower density of artifacts, and that the orientation of post molds does not reflect a house structure. Bridges (2020) describes the locus as an “artifact-sparse” corridor, with fewer food remains and fire-related activities than in House or Pit Feature loci. Faunal remains recovered from this area are extremely scarce, and many likely date to the Manor era.

Only a few Palisade post mold contexts contained faunal material: PM 55, PM 56, PM 108, PM 109, PM 110, and PM 114. Additionally, a combined total of three bone fragments were recovered from Feature 44, a Seneca fire-related feature located directly above two post molds, and Feature 49, a large Seneca post-mold. The majority of faunal remains were recovered from mixed-era Plowzone layers and are of questionable origin.

Most remains from the Palisade Area are extremely fragmentary and unidentifiable. Out of 840 total bones and fragments, 816 could not be identified to even broad size categories. The species representation of those that could be identified shows a relatively even mix of European and native fauna, represented in Table 20. White-tailed deer are most common with a NISP of 6, accounting for half of the identified assemblage. Pigs are the next most represented species with 3 specimens, and beaver with 2. Sheep/goat is represented by a single specimen. No fish were identified; however, this could be the result of recovery bias, as most soil from this area was only screened through 1/4" mesh (except for some postmolds and features). The only non-mammalian bone identified was a medium-sized galliform bird.

Table 20: Palisade Taxonomic/Size-Class Representation by NISP (All Components)

Taxon	Common Name	NISP	%NISP	%NISP of Identified Assemblage
Odocoileus virginianus	White-tailed Deer	6	0.71	50
Sus scrofa	Pig	3	0.36	25
Castor canadensis	American Beaver	2	0.24	16.67
Ovis/Capra	Sheep/Goat	1	0.12	8.33
Artiodactyl	Even-toed ungulates	5	0.60	
Large Mammal		3	0.36	
Medium Mammal		1	0.12	
Rodent		1	0.12	
Galliform Bird	Landfowl	1	0.12	
Snail		1	0.12	
Indeterminate		816	97.14	
Total		840		

Age, Sex, and Element Distribution

With such a small sample, it is impossible to construct an accurate age or sex profile for white-tailed deer. Only one specimen could be identified to sex, a male, identified via the ilio-pectineal eminence of the pelvis (Schroeder and Robb 2005). Additionally, one tooth was complete enough to be determined to belong to an adult. Identified elements include one metatarsal, one pubis, two molars, and one malleolus; far too small a sample size for a proper analysis of element distribution. Beaver is represented by a single digested 2nd phalanx. No age or sex data could be determined for this individual.

The single sheep/goat from the Palisade was identified by an unfused distal tibia, making age discernible only to a range of infantile-juvenile. No sex data are available. Pigs were identified by two deciduous premolars and one unfused distal humerus, all of which indicate infantile-juvenile age ranges. Like sheep/goat, sex was unidentifiable. This sample size is far too small to construct an age profile.

Burning, Breakage, and Taphonomy

Burning is particularly common in the Palisade Area, occurring on slightly under half of specimens, with carbonization being the most prominent type of burning (Table 21).

Table 21: Palisade Area Heat Alteration (All Components)

Burning Type	Count	Percent
Unburned	470	55.95
Partially Carbonized (<%50)	2	0.24
Partially Carbonized (>%50)	0	0.00
Fully Carbonized	197	23.45
Partially Calcined (<%50)	0	0.00
Partially Calcined (>%50)	0	0.00
Fully Calcined	138	16.43
Mostly Carbonized, Some Calcined	13	1.55
Mostly Calcined, Some Carbonized	20	2.38
Total	840	

Weathering is not severe among Palisade fauna. 837 fragments displayed very slight weathering, while three displayed slight weathering. Fragmentation, presented in Table 22, is overwhelmingly predepositional with a moderate degree of modern breakage. Complete bones and postdepositionally damaged remains each only account for less than 1% of the assemblage. No butchery of any kind was identified within the Palisade Area. Only one bone showed signs of digestion – the beaver phalanx.

Table 22: Palisade Area Origin of Fragmentation (All Components)

Origin of Fragmentation	Count	Percent
Complete	6	0.72
Predepositional	689	83.21
Postdepositional	5	0.60
Modern	108	13.04
Mostly predepositional, some recent	17	2.05
Mostly recent, some predepositional	1	0.12
Mostly predepositional, some postdepositional	1	0.12
Mostly postdepositional, some predepositional	1	0.12
Total	828	

The general dearth of faunal remains from the Palisade Area suggests that the area was not commonly used for animal processing or refuse disposal by the Seneca. This is corroborated by artifactual and botanical evidence (Bridges 2020), and directly supports Gerard-Little's (2017: 197) claim that the Palisade Area "[delineates] between domestic space and the boundary of the settlement". It is likely that a large portion, perhaps the majority, of remains found in this were deposited during the Manor era and mixed with Seneca-era material due to plowing or construction. The few remains found in post molds suggest they were not intentionally deposited. Their presence could be the result of Manor-era plowzone disturbance, soil collapse from the post rotting or burning in place, backfill after pulling a post, or a number of other factors (Gerard-Little 2017:189, 192).

Furthermore, all Palisade specimens identified to species level come from upper plowzone layers. This calls into question the origin of many of the specimens, notably the sheep/goat and pig. It is possible all of these remains date to the Manor era. The mixture of Seneca and Manor-era artifacts throughout most contexts, lack of clear signs of butchery, high degree of fragmentation, and generally small amounts of data make it impossible to differentiate Seneca from Manor-era fauna. As such, the presence of Eurasian domestic animals in this area should be interpreted cautiously. This does not provide evidence of Seneca practices of animal husbandry, but it also does not serve to refute this possibility.

A comparison of the prevalence of wild species in the Palisade Area to previously discussed loci supports the idea that the assemblage represents a mixture of Seneca and Manor-era fauna. While deer are still most prevalent, consistent with a Seneca profile, they make up only about half the identified species, but around 90% of House 3 and Feature 3. This ratio suggests a significant amount of Manor-era disturbance, and is corroborated by the high degree of fragmentation, which is consistent with redeposition. In general, faunal and artifactual evidence shows that the Palisade Area is quite different from Feature 3 and House 3, as it appears not to have been an area of major economic or domestic activity.

Comparison of House 3 and Feature 3

Unfortunately, the Palisade Area's small sample size and mixed assemblage prevent any in-depth comparison of it to the other primary loci. However, a comparison of remains between House 3 and Feature 3 can shed light on the use of space as well as the various economic activities occurring on-site Species ratios between the two loci are remarkably similar, both heavily skewed towards white-tailed deer. Feature 3 has a greater diversity of represented species, although this is likely owing to a significantly larger sample size (Table 23). Clearly, locus has little bearing on the species representation. However, deer element distribution does vary noticeably. House 3 contains a much greater proportion of lower limb and foot elements than Feature 3. This tentatively suggests that House 3 served as a primary site for skinning. Jordan posits the vestibule area of House 3 could have been opened during warm weather by removing walls, and could have served as a primary work site for butchery, skinning, and hide preparation. Feature 3's deer element representation is skewed more towards the long bones of the front and hind limbs, elements that would yield large amounts of meat, marrow, and grease. This suggests that Feature 3 remains may be the refuse from cooking and grease manufacture. Taphonomic data can further clarify this interpretation.

Table 23: Feature 3 vs. House 3 Species Representation

Taxa	Common Name	Feature 3 % NISP	House 3 %NISP
Odocoileus virginianus	White-tailed Deer	87.80	89.94
Sus scrofa	Pig	3.51	3.77
Canis sp.	Dog/Wolf	1.66	2.52
Ursus americanus	American black bear	1.29	1.26
Castor canadensis	American beaver	1.29	0.63
Procyon lotor	Northern raccoon	0.92	0.63
Canis familiaris	Dog	0.74	0.63
Ectopistes migratorius	Passenger Pigeon	0.55	0.63
Ictaluridae	Catfish family	0.55	
Marmota monax	Woodchuck	0.55	
Microtus pennsylvanicus	Meadow Vole	0.37	
Salmonidae	Salmon/Trout/Char	0.18	
Sylvilagus floridanus	Eastern cottontail	0.18	
Vulpes vulpes	Red fox	0.18	

While frequency and degree of burning are rather consistent between these two loci, with both favoring unburned remains, fragment size varies noticeably between the two major loci. As displayed in Table 24, modal fragment size in House 3 is larger than in Feature 3. Feature 3 has a far greater proportion of remains less than 1cm in length, with a comparable number of remains between 1 and 2cm. House 3, however, favors remains between 1 and 2cm, and has a much higher proportion of remains longer than 2cm. This overall smaller fragment size for Feature 3 suggests that this was likely an area of secondary deposition, and coupled with the long-bone-favoring element distribution, supports the idea that these remains represent refuse from grease production (Saint-Germain 1997; Outram 2001). This further supports Jordan's interpretation of the upper levels of Feature 3 as a midden. However, it is possible that this difference is skewed by recovery method, as a much greater amount of Feature 3's soil was floated as compared to House 3. While this would not refute any interpretation of Feature 3 as a midden, it may have implications for secondary deposition of faunal material in the House 3 locus.

Table 24: Feature 3 vs. House 3 Fragment Size

Fragment Size	Feature 3 %NISP	House 3 %NISP
<1cm	44.3	24.0
>1cm, <2cm	39.9	50.1
>2cm, <3cm	6.1	14.4
>3cm, <4cm	1.4	4.6
>4cm	0.6	3.5

Comparison to Contemporary Haudenosaunee Sites

At a glance, White Springs appears remarkably similar to other roughly contemporaneous Iroquoian sites. Table 25 presents the sample size and dates from each site discussed in this section.

Table 25: Sample size and dates for contemporary sites

Site	Eaton	Marsh	Dann	Indian Hill	Jackson-Everson	White Springs	Weston	Townley-Read
Culture	Erie	Seneca	Seneca	Onondaga	Mohawk	Seneca	Onondaga	Seneca
Dates	16th C.	1650-1670	1650/55-1675	1663-1682	1683-1693	1688-1715	ca. 1696	1715-1754
Sample Size	21383	3019	1898	3704	2056	32268	Not provided	15998

Most Haudenosaunee sites of the 17^{th}- 18^{th} century are dominated by white-tailed deer remains (Figure 9). The identified assemblages from Jackson-Everson (NYSM 1213), a Mohawk site occupied from 1666-1679, (Kuhn and Funk 2000: Junker-Anderson:1986) and Townley-Read (Watson and Thomas 2013) both consist of 66% white-tailed deer, while the Marsh site (Somerville 2014) consists of 68% deer. Most faunal material from Jackson-Everson was recovered from midden contexts, which Kuhn and Funk (2000) suggest is secure in its dating to Mohawk occupation. Although Euroamerican settlements existed in the area of Townley-Read in the 18^{th} century, thanks to meticulous recovery methods, excavated contexts are secure to the Seneca occupation from 1715-1754. Pipes (2010; n.d.) does not provide the overall proportion of deer for the Onondaga at Indian Hill or Weston sites in the faunal reports, however Bradley (2020) states them to be 39% and 44% respectively, quite low in comparison to other sites. The faunal reports from Weston and Indian Hill do not provide information about the integrity of the assemblages or recovery methods, so I urge caution when interpreting species representation at these two sites.

The proportion of white-tailed deer at White Springs is much higher than at the above sites, over 88%. This number may be lower as bird and fish remains are identified with greater resolution, but only by a maximum of 10%. However, White Springs' proportion of deer is not the highest among late 17th century Haudenosaunee sites, as the Seneca Dann site (Hne 3-2) is significantly higher with nearly 97% of the identified assemblage being deer (Somerville 2014). However, Somerville (2014) notes that this species ratio is likely biased by excavation method. He notes that faunal analysis was performed well after the site's initial excavation, "as an afterthought ... with little to no thought given to their spatial distribution" (Somerville 2014: 106). Somerville's presentation of animal class by MNU suggests the proportion of deer to be lower, as only 87% of remains are mammalian.

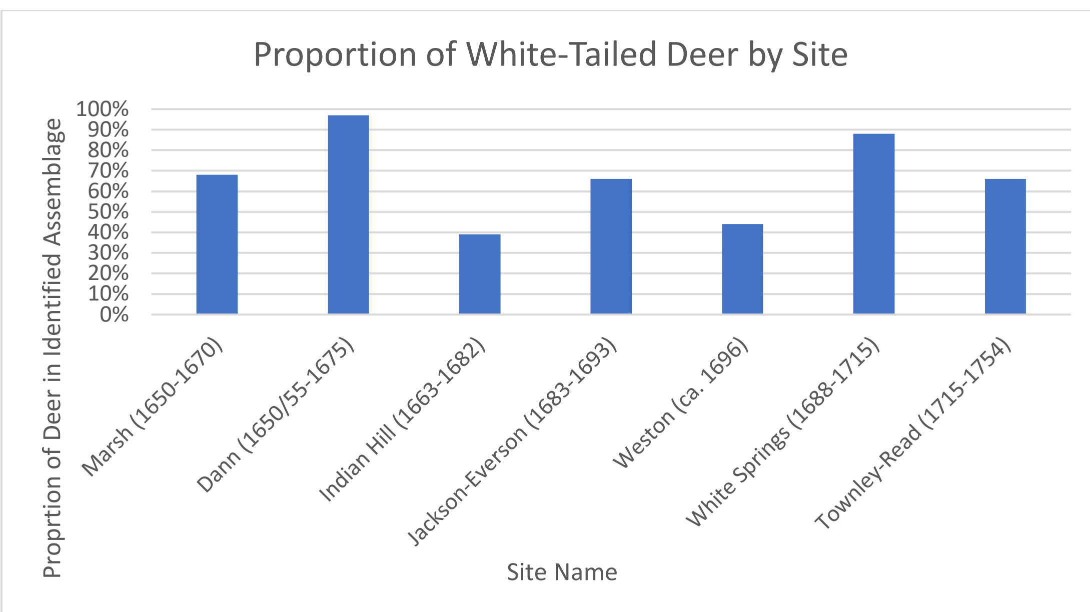


Figure 9: Comparative Proportion of White-tailed Deer by site

Bradley (2020:434) notes a decline in deer consumption over time in the Onondaga Indian Castle-Indian Hill-Weston sequence. However, this pattern is not broadly reflected across the Confederacy, since the later sites of White Springs and Townley-Read maintain deer-dominated faunal profiles. Bradley also notes that "elk have virtually disappeared by the end of 17th century" (Bradley 2020:434). This is supported by the fact that no elk appear in White Springs or Townley-Read, but appear in abundance at the 16th century Eaton site, a likely Erie town located in West Seneca, NY (Pipes 2009), as well as Jackson-Everson.

White Springs beaver representation is low in comparison to other sites. While certainly not abundant at Townley-Read, they still make up roughly 3% of the assemblage, compared to the 1% at White Springs. Beaver remains make up 8% of the Jackson-Everson assemblage, 4% at Marsh, 4% at Indian Hill, and 2% at Weston.

Passenger Pigeon numbers are low for both White Springs and Townley-Read, at <1% and 2% respectively. This is in stark contrast to the hundreds of passenger pigeon bones found at Indian Hill and Weston. This may be explained by seasonality, attrition, location along migration routes, different types of deposits, or different recovery methods. Determining why this is the case may be a promising area of future research.

Dogs are present in similar proportion at White Springs and Townley-Read, but these numbers are low in comparison to the Indian Hill (11%) and Weston (9%), in which Bradley (2020) purports them to be of increased dietary significance. This increase in dog consumption, coupled with a decline in deer consumption, may suggest periods of dietary stress at those sites that did not occur in White Springs or Townley-Read.

Pigs are the only Eurasian domesticate confirmed to have been exploited by the Seneca at White Springs. They are actually the second most abundant species, at 4% compared to 2% of

Townley-Read. They are present at Jackson-Everson, Indian Hill, and Weston, but only in small amounts. Only a single pig bone, a butchered astragalus, was identified at the Dann site. While Pipes (2010) notes that based on its provenience deep in a post mold it is non-intrusive, she suggests it was introduced via trade, an assumption I find dubious and lacking in evidence.

At the Marsh site, Somerville (2014: 195) claims that there is a “large number of historic livestock remains including pigs, sheep, cattle, and horse”, in addition to an abundance of rodent and small carnivore teeth and deer cranial elements, which he suggests to be evidence of “renewed participation in the fur trade”. However, evidence of Eurasian domesticate remains amounts to a total NISP of 8 pig, 7 cattle, 6 sheep, and 2 horse remains, in aggregate less than 2% of the entire identified assemblage of 1819 remains. He claims these to be left over from a Jesuit mission, and not evidence of these species being introduced into the Seneca economy (Somerville 2014). I am skeptical of this claim, as it seems based on the harmful notion of Seneca passivity and denies them a sense of agency. While some of these remains could have been from the Jesuit mission, it seems unlikely that they all were. The Marsh assemblage likely represents a limited degree of Seneca exploitation of Eurasian domesticates, with perhaps some Eurasian domestic animals originating from the Jesuit mission. In addition, the integrity of the contexts at Marsh is not reported, so these Eurasian domesticates could actually date to later a Euroamerican component.

Table 26: Comparison of select taxa at White Springs and Townley-Read

Common Name	Species Name	White Springs	Townley-Read
White-tailed deer	*O. virginianus*	88%	66%
Pig	*S. scrofa*	4%	2%
Dog/Wolf	*Canis sp.*	2%	1%
Beaver	*C. canadensis*	1%	3%
Black Bear	*U. Americanus*	1%	2%
Moose	*A. alces*	<1%	0%
Raccoon	*P. lotor*	<1%	3%
Woodchuck	*M. monax*	<1%	0%
Meadow Vole	*M. pennsylvanicus*	<1%	3%
Passenger Pigeon	*E. migratorius*	<1%	2%
Sheep/Goat	*Ovis/Capra*	<1%*	0%
Porcupine	*E. dorsatum*	0%	<1%
Cattle	*B. taurus*	0%	<1%

*Sheep remains derive from mixed-era contexts and likely do not reflect Seneca usage

Interpretations

The faunal assemblages recovered from the House 3 Area and Feature 3 stray from expected Seneca and Haudenosaunee profiles. Most contemporary sites, with the notable exception of Dann (Somerville 2014), tend to be more broad-spectrum (albeit still heavily favoring deer), with a higher relative proportion of minor taxa, particularly dog and bear, and a supposedly increasing number of European domesticates (Kuhn and Funk 2000). Instead, the assemblages at White Springs are dominated by white-tailed deer with a very small minority of minor taxa.

Age distribution for both loci suggest prime-dominated hunting strategies for these animals (Stiner 1990). While few sex data are available for House 3, Feature 3 deer are overwhelmingly male, further supporting this interpretation. Deer were clearly the primary meat source of the local diet, as well as the largest source of skins and hides. This is in line with faunal studies of other 17th and 18th century Haudenosaunee sites, such as Watson and Thomas' (2013) analysis of Townley-

Read and Kuhn and Funk's (2000) multi-site study of the Mohawk valley. Other taxa commonly found in Haudenosaunee assemblages, such as dog, raccoon, beaver, and bear are present only in small numbers at White Springs. While bear and canids were notable food sources for the Haudenosaunee, their scarcity here suggests they did not comprise a large portion of the diet. Even correcting for the larger meat yield of black bear, roughly 2.3 times that of deer (Watson 2000; Silva and Downing 1995), it is clear they were not a major protein source.

Passenger pigeon (*Ectopistes migratorius*) is curiously absent from the House 3 Area, and minimally present in Feature 3, despite this being an abundant, readily available staple hunted *en masse* in the springtime and commonly found in the Haudenosaunee archaeological record (Kuhn and Funk 2000; Watson and Thomas 2013). Watson and Thomas' (2013) analysis of Townley-Read does identify passenger pigeon in the assemblage, and they are abundant (numbering in the hundreds) at Indian Hill (Pipes 2010). It is possible many of the unidentified bird bones (particularly those designated as small birds) may be passenger pigeons. Further analysis awaits these specimens at the Lab of Ornithology. However, these make up an insignificant amount of the assemblage, totaling 13 fragments across the three primary loci and less than 30 site-wide. This relative absence of passenger pigeon may best be explained as a result of heavy attrition, as the Haudenosaunee were known to preferentially exploit squabs (Watson and Thomas 2013:96), and juvenile bird bones do not preserve well.

It is also notable that only 10 beaver remains were identified across the three primary loci; seven in Feature 3, two in the Palisade Area, and one in House 3. Beaver meat was a valuable protein source among the Haudenosaunee in the winter months (McManus 1972), and its fatty tail was considered a delicacy by both the Haudenosaunee and the Dutch (Waugh 1916; Kuhn and Funk 2000). Beaver fur was highly valued by Europeans, who engaged in large-scale trade with the Haudenosaunee and other Indigenous peoples for them. The lack of beaver remains found on site is curious, but it cannot be taken as evidence that the White Springs Seneca were not involved in the beaver fur trade. To the contrary, Waterman (2008), in his translation of the Albany-based Wendell family's transactions with Indigenous people, provides direct historical evidence for White Springs residents trading in beaver pelts. Detailed accounts of transactions are listed, with numerous named Seneca individuals, many of whom hailed from *Canosedaken*, a place-name believed to refer to White Springs (Waterman 2008; Jordan 2008: 100). These accounts, and a subsequent analysis by Waterman, show that instances of beaver pelt transactions were extremely common between 1697 and 1710, second only to marten (which may include weasel as well) furs, which similarly do not appear in the White Springs assemblage. Every recorded transaction with a Seneca included beaver pelts, most often traded for rum, textiles, lead, gunpowder, and metal blades (Waterman 2008: 21-22; Waterman and Noel 2013: 48-49). Additionally, statistics provided by Cutcliffe (1981) demonstrate that beaver was still dominant in the New York fur trade during White Springs' entire occupation (except for the curious exception of the year 1706 in which beaver fur numbers sharply drop, presumably in favor of other furs like marten). Unfortunately, these data are not region-specific, but rather represent materials exported from the whole colony of New York (Figure 10). It should also be noted that these numbers do not indicate where beavers were procured, just where they were traded, which would include major trading posts such as Albany.

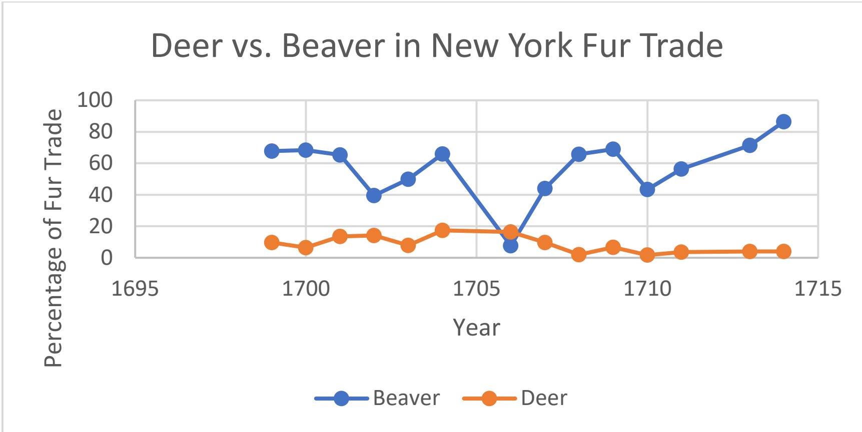


Figure 10: Deer vs. Beaver New York Fur Trade Statistics (adapted from Cutcliffe 1981)

In light of this solid documentary evidence for local Seneca involvement in the beaver fur trade, an alternate explanation for the lack of beaver remains at White Springs is necessary. The most likely scenario is that the local beaver population was greatly diminished, although not entirely extirpated from the region due to overexploitation, a phenomenon also seen contemporaneously in the Mohawk Valley (Kuhn and Funk 2000). This would seem to make sense given White Springs' settlement during the "Beaver Wars", a series of conflicts that saw the Haudenosaunee expand their hunting territories to keep up with colonial demands for beaver furs, spreading as far west as Illinois (Starna and Brandao 2004). As Jordan (2008: 54) notes, by 1700 "beaver had begun to become scarce in the western Indians' own hunting territories". If beaver populations in territories contested by the Haudenosaunee were in decline, it stands to reason that populations in the Seneca heartland would have been depleted even earlier, providing an impetus for expansion of trapping territory westward. White Springs Senecas likely had to travel far to procure beaver for trade, rendering them near invisible in the town's archaeological assemblage. The few beaver elements present are tentatively representative of skinning refuse but are too scarce to support large-scale beaver skinning in the town itself.

The lack of beaver remains is probably not a result of taphonomic bias, as aquatic mammals (excluding cetaceans and pinnipeds) are known to have generally higher bone density than terrestrial mammals, an adaption for reducing buoyancy (Wall 1983). Beaver bones would preserve well particularly well due to their density (Lyman 1984). The larger amount of beaver remains in Feature 3 compared to House 3 is probably a result of a drastically higher sample size and not related to taphonomy or economic activities.

Deer hides would have been readily available at White Springs considering the overwhelming representation of white-tailed deer. The overrepresentation of deer lower limb bones in House 3 suggests this was an area where skin and hide processing took place. The abundance of adult-aged male deer suggests they would have been of rather high quality, granted they were procured in the late fall or early winter, when hides are thickest. While buckskins would have fetched a high price among British merchants in the Southeast (Lapham 2004), Wendell's accounts (Waterman 2008) demonstrate that deer hides were not commonly traded in upstate New York, noting only 34 instances of deer hide trade compared to the 934 instances of beaver fur trade between 1697 and 1710. Very few of the Seneca in Wendell's accounts traded in deerskins, and Waterman's analysis suggests they were not particularly valuable to European traders. The deerskin trade, while bustling in the Southeast and Chesapeake Bay regions (Lapham 2004; Pavao-Zuckerman 2007), simply was not as prominent in the Northeast at the time White Springs was occupied. However, following White Springs' occupation, there is a noted shift from beaver to deer hide trade (Jordan 2008; Watson and Thomas 2013). Perhaps White Springs represents a transitional period in this trade.

Deer hides were probably more valuable for local use at White Springs than for trade during this time period. This high proportion of local food and hide use suggests a large measure of self-sufficiency. While Wendell's accounts show some evidence of Indigenous people trading peltry for foodstuffs, this only amounts to a total of six transactions. Furthermore, there are only six accounts of Indigenous people trading goods for European-procured deerskins (Waterman 2008: 55). Wendell's accounts do not mention Senecas trading meat for European goods, further suggesting venison and deerskins were primarily obtained for local subsistence. There also does not appear to be evidence of European need for Indigenous-procured meat. This model of local self-sufficiency contrasts greatly with decline-trope-driven models that assume a desperate need to engage with European traders to make ends meet. Accounts described in Kuhn and Funk's study of the Mohawk, albeit much later than the White Springs' occupation, mention that the Mohawk had "nothing to eat" in the winter of 1755-56 (Kuhn and Funk 2000: 36) and were desperate to procure horses to aid in their hunting. Given the complete lack of horse remains at White Springs (and little to no evidence of horse-related artifacts), as well as lack of evidence of nutritional stress, it can be confidently asserted that a similarly dire interpretation is not appropriate for White Springs.

The assemblages of House 3 and Feature 3 help to refute the idea that White Springs Seneca were under nutritional stress, a common part of the narrative of decline. Large, adult deer are quite abundant, and would have provided a great deal of protein. Additionally, there is not significant evidence of traditional "famine foods" present in this assemblage. These typically include energetically high cost, low-yield species such as muskrat, freshwater mussel, and small birds (Watson and Thomas 2013).

These data do not provide evidence for large-scale Seneca adoption of Euroamerican-style animal husbandry. Cattle are restricted to Manor-era contexts of House 3 and entirely absent from Feature 3 and the Palisade. Sheep/goat are present in small numbers in Feature 3 and the Palisade area, but none are securely datable to the Seneca occupation. Historic and linguistic evidence suggest some European domesticates were initially looked upon with disdain. Bradley notes an account of a Mohawk referring to pigs as “stinking hogs” (Bradley 2020), while the Seneca word for goat literally translates to “its body stinks” (Chafe, n.d.). While proponents of a European assimilation model might expect to see an increase in Eurasian domesticate exploitation over time at Haudenosaunee sites, the faunal sequences do not support this. Jordan demonstrates that while Ganondagan had an abundance of pig remains, later sites saw a decrease, noting the “presence and proportion of European domesticated animals certainly did not build in a steady linear fashion over time” (2008: 293-294).

The only Eurasian domestic species definitively present is pig, actually the second most abundant species in the assemblage. Four of these specimens are from the House 3 assemblage, but none of them can be securely dated to the Seneca occupation, as they are all from mixed-era contexts. This is also the case for the three specimens from the Palisade Area. Feature 3, however, does provide definitive evidence of pig exploitation in the Seneca era. As a pit feature with little Manor-era disturbance, most of Feature 3 can be considered securely Seneca. This pit feature contains a total of 19 pig remains, one of which shows unequivocal signs of bone marrow extraction, indicative of Seneca-style butchery.

Aged specimens are few and far between, but the few pigs from Feature 3 are generally split between infantile/juvenile and adult-aged individuals. However, there are simply not enough data to accurately construct a kill-off profile. While White Springs lacks any signs of penning structures, pigs could have been raised by the Seneca on-site roaming freely, or perhaps within the confines of the palisade. It is also possible that feral or semi-feral pigs would have been occasionally hunted in the wild, herded loosely in the nearby woods and lured to the settlement with feed or salt, or opportunistically killed as they threatened crops in a practice of garden hunting. In her study of metal artifacts from White Springs, Walton (2021: 59) notes that a total of six musket balls showed evidence of chewing indentation. While Witthoft (1951) suggested similar indentations to have been caused by human teeth as they “bit the bullet”, Sivilich (2016: 102) demonstrates that this is not possible given the biting force of the human jaw, suggesting pigs to be the cause of the indentations. This suggests that pigs were present within the confines of the town itself, chewing on and consuming refuse as pigs are known to do. Alternatively, pigs could have been taken as spoils of war in raids, a Seneca practice noted by Denonville’s soldiers (Kuhn and Funk 2000). Regardless of how these pigs were raised and managed, whether kept on-site or feral, applying a European system of property ownership would be inaccurate at best, and highly problematic at worst (Jordan 2008: 295). Clearly, pigs were not a major focus for the local economy at White Springs.

The lack of other Eurasian domesticates is similar to observed species representation at Townley-Read, in which only one cattle phalanx was present, suggested to be a rider, and pigs were similarly scarce, suggested to be feral or semi-feral (Watson and Thomas 2013: 93; Jordan 2008: 295).

The fragmentation patterns of remains in the Feature 3 and House 3 assemblages are consistent with the same type of bone grease production Watson and Thomas (2013) interpret at Townley-Read. A number of long bones display spiral fracturing, a common method of marrow extraction. The actual prevalence of spiral fracturing may have been much higher, as this extremely high degree of fragmentation may obscure spiral fractures or other signs of butchery done at earlier processing stages. However, this fragmentation does in itself suggest the possibility of grease rendering, as in order to extract grease split bone is crushed further and simmered. Outram (2001) notes that, as a result of grease manufacturing, bones (particularly long bone diaphysis) are likely to be splintered into small pieces. This certainly matches the Feature 3 assemblage, which is largely made up of highly fragmented long bones. Bone grease is a long-lasting and calorie-dense resource purported to be extremely valuable in the late winter, when game is scarce (Vehik 1977: 170-171; Watson 2000: 61). Grease production, along with stored bear fat (Watson and Thomas 2013; Socci 1995), could possibly make up for the lack of beaver meat available in the winter as a result of local overexploitation. Additionally, bone grease could be used as a field ration for individuals engaged in long-distance trade or hunting/trapping excursions, either on its own or as an additive to dried meat (Saint-Germain 1997).

Studies of bone grease manufacture date back to the 1950s, in which high quantities of small bone fragments have been equated with grease production (Leechman 1951). Crushing of bones into small fragments has been considered a necessary step in bone grease production (Janzen et al. 2013), although what degree of crushing is necessary to maximize caloric yield from fat has been the subject of some debate. Church and Lyman (2003) show that there is no statistically significant difference in quantity of grease produced by simmering long bone fragments of varying sizes: 5cm, 4cm, 2cm, and 1cm. Furthermore, they show that 80% of grease is extracted from long bones within the first 5 hours of simmering. From a purely caloric standpoint, it would therefore be energetically inefficient to crush the bones in the White Springs assemblage to such small pieces (modally, 1-2cm). However, it has been suggested that fragmentation into extremely small pieces has the additional benefit of releasing trace amounts of vitamins and minerals (Church and Lyman 2003). Furthermore, Janzen et al. (2013) demonstrate that smaller fragments come to a boil faster and require less water to do so, and consequently less firewood. This suggests a trade-off, requiring more physical labor for less fuel, which makes sense in a Haudenosaunee context, in which firewood is such a fundamental resource that settlement patterns are planned around it.

As Watson and Thomas (2013) demonstrate, marrow extraction and grease production should not be interpreted as indicators of nutritional stress or famine, but rather as a valuable source of fat. Vehik (1977) emphasizes that, at least among Midwestern Indians, there is no evidence to support that bone grease was consumed strictly as a response to nutritional stress. While bone grease is a valuable resource in lean times, the presence of this industry must be examined within the larger cultural and historical context of the site (Outram 2005). Watson and Thomas suggest that the lack of famine foods and high degree of predepositional fragmentation at Townley-Read indicates "planned accumulation of resources rather than an *ad hoc* response to seasonal food shortfalls" (Watson and Thomas 2013:115). A strikingly similar pattern of fragmentation is found in the assemblages at White Springs and should be interpreted similarly. While initially assumed to be a labor-intensive endeavor with relatively low caloric yield (Speth and Spielman 1983), Church and Lyman (2003) note that bone grease could be "considered an 'unearned resource'", since the animal would have already been skinned for its hide or fur, butchered for its meat, and had its bones split for marrow, greatly reducing the effort required to crush them. Bone grease would thus be extremely pragmatic: an easily obtained bonus resource that would be valuable in the winter months, rather than something produced out of desperation at great energetic cost, an interpretation shared by Jordan (2008) in reference to Townley-Read. Bone grease has the additional utility of being used to tan hides, which was certainly a common economic activity at White Springs (Grinnell 1972; Vehik 1977). It was also used for medicine and ritual purposes, as an ingredient and flavoring in cooking, and as an oil for frying (Jordan 2008:286).

Additional Features, Test Units, and Loci

While the primary focus of faunal analysis and interpretation for this thesis is on Feature 3, House 3, and the Palisade Area, I was able to conduct additional faunal analysis as a paid researcher through funding by Cornell University's American Indian and Indigenous Studies Program (AIISP). While due to time constraints I am not able to present this data at the same level of detail I provided for House 3, Feature 3, and the Possible Palisade Area, summary information from this additional work is presented here and compiled in Appendix A, a master table combining all examined loci.

The largest of these is Feature 6, which is one of the loci partially analyzed by Madeleine Strait. Feature 6 is located in the Ridgetop area north of Feature 3, totaling 6107 fragments, 313 being identifiable to species. Similar to House 3 and Feature 3, this assemblage is overwhelmingly comprised of white-tailed deer, with minor representation of dog, black bear, raccoon, pig, beaver, cottontail rabbit, and short-tailed shrew.

House 1 is the second largest of these additional loci, containing 1955 fragments, but only 72 identifiable to genus/species level. House 1's faunal profile reflects a mixed Seneca-era/Manor-era locus. While deer remain the most prominent identified species in this locus, there is a relatively high proportion of pig, as well as two sheep bones. Artifactual evidence shows manor-era intrusion, and butchery in this area similarly reflects a mixed pattern, showing a combination of spiral fracturing, steel blades, and sawing. Due to the mixed nature of this locus, the presence of pig and sheep cannot be assumed to represent Seneca use. As such, interpretation of this locus' faunal profile as evidence of Seneca adoption of Eurasian domesticates would be inappropriate.

Feature 13 is a Seneca-era pit feature located in the Ridgetop Domestic Locus. Faunal material here reflects a securely Seneca profile with no evidence of manor-era intrusion. Only 20 specimens were attributed to species/genus, 17 deer, 1 gray wolf, and 2 *Canis* (either wolf or dog). Spiral fracturing is common on long bones from this assemblage. Similar to other loci, element distribution is disproportionately skewed towards limb bones. However, this feature is unique in that fish are unusually common, with a total of 14 specimens. Unfortunately, lockdown restricted access to the fish and herpetology collection at the Museum of Vertebrates, making identification to species impossible. This area will be examined further with the help of a fish specialist.

Feature levels of TU 38/45 yielded a total of 412 fragments. This unit has a relatively low diversity of species, comprised of 12 white-tailed deer fragments, 2 *Canis* fragments, 1 pig and 1 sheep/goat. The faunal profile suggests a mixture of Seneca-era and Manor-era material. Feature 4, part of the Ridgetop Domestic locus, is purported to be a Seneca-era post. Only 22 bone fragments were recovered, none of which were identifiable to species. Feature 33, located in the Northwest Lawn Exterior Artifact Cluster, is purported to be an intact Seneca midden or living area. While it yielded a significant amount of bone at 904 fragments, this material was extremely fragmentary and burned, and as such only 16 specimens were identifiable, 15 deer and 1 *Canis* sp.

Overall, these additional loci show remarkably similar patterns to the primary loci analyzed for this thesis. Inclusion of this data does not change interpretation of the site's faunal profile, as it remains heavily deer-dominated with minor representation of other native species. Loci with a heavier presence of Eurasian domesticates, notably House 1 and TU 38/45, show evidence of significant Manor-era intrusion. Similar to the Palisade Area, presence of such species cannot be used as evidence of Seneca adoption of European pastoralism. This lessens the need for faunal analysis of the remaining loci, since those faunal profiles would likely be remarkably similar to the rest of the site. A far more lucrative avenue for continued faunal analysis involves identifying fish, bird, and microfauna bones to a finer level.

Conclusion

The 17th-18th century town of White Springs serves as a striking example of Seneca adaptation and ingenuity during an era of immense sociopolitical change and entanglement with European colonial powers. The faunal remains from the domestic areas of this site shed light on the subsistence strategies and trade patterns of the town's inhabitants. Despite the violent upheaval immediately preceding White Springs' occupation, faunal analysis shows a maintenance of traditional lifeways. The local Seneca continued to extensively hunt white-tailed deer, perhaps even intensifying this focus, as well as hunt other local fauna, as they had before Europeans arrived in America.

Abundance of prime-aged deer remains and a lack of so-called famine foods suggests they were not under nutritional distress, contrary to what the mainstream colonialist decline paradigm would imply. Fragmentation and butchery patterns suggest that bone grease production was a common economic activity, and rather than being a response to famine, was a planned, regular part of their diet for the winter months.

While there is little direct evidence of deer-hide trade at White Springs from documentary sources, other authors have suggested an economic shift towards commercial deer-hide trade following White Springs' occupation (Jordan 2008; Watson and Thomas 2013). Earlier Seneca (and other Iroquoian) sites tend to reflect more broad-spectrum hunting strategies, with white-tailed deer still being most the most abundant species, but to a far less degree than at White Springs. This intensification of deer-hunting is likely a result of two factors. The first being that as White Springs Senecas settled into their new mature-forest environment, white-tailed deer would have been abundant. Over time, as woodlands were cut for firewood, this would have expanded deer habitats, as they tend to live near forest edges, and as Elder (1965) shows, Indigenous prime-dominated hunting strategies do not put stress on deer populations. Second, with the abundance of prime-aged deer available in the environs of White Springs, it is possible the populace was beginning to shift from local deer-hide use towards commercial trading of these hides, as is suggested to have occurred at Townley-Read, which has a substantially lower deer ratio than White Springs (Watson and Thomas 2013).

While cattle and sheep/goat remains are notably absent from Seneca contexts, the presence of pig remains with Seneca-style butchery suggests pigs were indeed exploited by the Seneca, although not in great numbers, and not as a major protein source of their diet. It is possible they were hunted as feral resources, perhaps killed as they threatened crops, or claimed in warfare and raids. Limited husbandry of pigs cannot be ruled out, as pigs can be raised loosely without penning structures within settlements. Historical accounts by French soldiers suggest this occurred within the palisaded area of Fort Hill near Ganondagan, and it is equally likely at White Springs (Jordan 2008: 292).

This extremely limited exploitation of Eurasian domesticates serves to counter colonialist assumptions that European-style husbandry is the superior economic system that Indigenous peoples would passively adopt. It also goes against the equally insidious settler-colonial paradigm of Indigenous people as static and unchanging, set in their ancient ways. Rather, it is clear from the limited exploitation of pig that the Seneca of White Springs engaged with newly introduced species on their own terms, incorporating them into their economy to a limited degree, without supplanting white-tailed deer as their primary source of meat. This could represent different strategies of subsistence employed by different members of the community, as no community is a monolith. A promising area of future research could be on gendered practices of hunting and pig-raising, or other social divisions of labor.

This kind of adaptation to changing times and landscapes is also reflected by historical records of the beaver fur trade. While beaver remains are scarce in White Springs itself, the historical records show that beaver furs were still an important trade item (Waterman 2008). Seneca went to great lengths to procure beaver furs for trade with European colonists, despite this species' local overexploitation and diminished population. Clearly, the Seneca valued this new and highly lucrative trade opportunity, and if the pelts were not available locally, they would travel far to get them, entering into conflict with other Indigenous groups if need be.

While the primary focus of this investigation was on the House 3, Feature 3, and Palisade Area loci, additional analysis of other loci yielded remarkably similar results sitewide. The heavily deer-dominated faunal patterns and general dearth of Eurasian domesticates found in House 3 and Feature 3 appears to extend to the other loci. Extensive faunal analysis of the few remaining loci and test units may not be necessary due to these similarities, as it is unlikely that they would substantially change current interpretations. However, it is possible that increased sample size could permit new analyses, particularly those of the rare taxa, such as pigs. Further analyses of the fish, microfauna and bird remains is planned, and may now be conducted as resources become available and collections reopen as COVID-19 restrictions end. These studies could certainly prove fruitful and can provide more insight into seasonality and local environmental changes. While the total number of bird and fish bones is relatively small in comparison to mammalian remains, and thus would not greatly impact interpretation of overall diet and economy, identifying bird and fish remains to finer levels may increase the diversity of White Spring's species representation and provide more insight into seasonal subsistence strategies.

This thesis represents the largest faunal study of a single Haudenosaunee archaeological site ever conducted, at well over 30,000 bone, tooth, and shell fragments analyzed. Faunal analysis of Haudenosaunee sites is sorely lacking, and many previous investigations were conducted as part of cultural resource management projects that have not been published. These often lack much in the way of interpretation, and many reflect the settler-colonialist paradigms of aspiring Europeanness or inevitable assimilation. This thesis represents an attempt to rectify this issue and contribute more broadly to the corpus of Haudenosaunee zooarchaeology, with the hopes of helping to decolonize this fascinating and often overlooked subject, and do justice to the descendant communities who have been gracious enough to allow us to examine their past.

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Appendix A: Master table of identified species NISP by locus/feature/test unit

	Locus	Feature 3	House 3	Palisade Area	House 1	Feature 4	Feature 6	Feature 13	Feature 33	Feature 62	TU 38/45	Site-Wide Total
Native Species												
White-taled Deer	*O. virginianus*	475	143	6	32	0	274	17	15	2	12	976
Dog/Wolf	*Canis sp.*	11	6	0	4	0	12	3	1	0	2	39
American black bear	*U. americanus*	9	1	0	0	0	9	0	0	0	0	19
North American Beaver	*C. canadensis*	7	1	1	1	0	2	0	0	0	0	12
Northern Raccoon	*P. lotor*	5	2	0	0	0	9	0	0	0	0	16
Woodchuck	*M. monax*	2	0	0	0	0	0	0	0	0	0	2
Red Fox	*V. vulpes*	1	1	0	0	0	0	0	0	1	0	3
Eastern Cottontail	*S. floridianus*	1	0	0	0	0	1	0	0	0	0	2
Meadow Vole	*M. pennsylvanicus*	1	0	0	0	0	0	0	0	0	0	1
Moose	*A. alces*	0	1	0	0	0	0	0	0	0	0	1
Northern short-tailed shrew	*B. brevicauda*	0	0	0	0	0	3	0	0	0	0	3
Eurasian Domesticates												
Domestic Pig	*S. scrofa*	19	4	3	6	0	3	0	0	0	1	36
Sheep/Goat	*Ovis/Capra*	0	0	1	2	0	0	0	0	0	1	4
Birds												
Mourning Dove	*Z. macroura*	0	0	0	1	0	0	0	0	0	0	1
Gull	*Larus. Sp*	0	1	0	0	0	0	0	0	0	0	1
Passenger Pigeon	*E. migratorius*	3	0	0	0	0	0	0	0	0	0	3
Fish												
Salmonids	*Salmonidae*	1	0	0	0	0	0	0	0	0	0	1
Catfish	*Ictaluridae*	3	0	0	0	0	0	0	0	0	0	3
	Number of Fragments	14390	6869	840	1955	22	6107	474	904	295	412	32268
	Total Identified to Genus/Species	538	160	11	46	0	313	20	16	3	16	1123