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Seeing the Forest and the Trees: Tracing Fuel Use and Landscape Change on the Eastern Pequot Reservation 1740-1850

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SEEING THE FOREST AND THE TREES: TRACING FUEL USE AND LANDSCAPE CHANGE ON THE EASTERN PEQUOT RESERVATION 1740-1850

A Thesis Presented

by

KALILA HERRING

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ABSTRACT

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TRACING FUEL USE AND LANDSCAPE CHANGE ON THE EASTERN PEQUOT RESERVATION 1740-1850

May 2017

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Gathering fuel wood was a regular chore for most people throughout time and certainly was a part of life for people living in 18th- and 19th-century Connecticut. During this period, the landscape was being altered due to rapidly expanding agriculture and, by circa 1850, would be at the peak of deforestation. During this period, the Eastern Pequot, a Native American nation in North Stonington, were living on their reservation (established in 1683) in a colonial environment and dealing with timber theft, a reduced land base, overseer control, and the overall environmental changes occurring in Connecticut. This thesis examines the charred wood found at four Eastern Pequot sites occupied from the 1740s to the 1850s, with a focus on what fuel use tells us about their interaction with the land at a household level over time, including if they could access and use high-quality fire wood, how they collected wood, and if they were affected by the deforestation taking place across Connecticut.

My research contextualized the tree taxa found by reviewing the environmental condition of Connecticut during this period, as well as the archival documents derived

from the Eastern Pequot's interactions with the state and overseer system. I ranked taxa by abundance and compared those ranks, and I assessed the use of the Principle of Least Effort by comparing the wood to the historical forest composition as ascertained by witness tree data. My interpretation of the charred wood found at these sites was that the Eastern Pequot were still able to access high-quality firewood at least through the end of the 18th century. The last site examined provides a different picture than the first three, and could indicate either a "least effort" fire, that the reservation was deforested, or that wood supplied to the reservation (derived from elsewhere) shows the deforestation of Connecticut. This research may help us better understand strategies for acquisition that are part of the everyday life of a community and how people negotiated the intersection between environmental resources and the social, political, and broader environmental aspects of colonialism.

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CHAPTER 1

INTRODUCTION

There are few environments people have not altered in some fashion, few places where nature has been untouched by history (Escobar 1999:1; Moran 2006:57). The events that make up human history are not free-floating against a neutral backdrop, but rather are firmly grounded on the earth; paths and places and human choices have been structured by the temporal layout of the environment and in turn human impacts have structured the makeup and layout of multiple scales of nature (Mrozowski 2006:23). Focusing on understanding this integrated relationship is critical when looking at the interconnected nature of societal structures, individuals, and the landscape (Escobar 1999; Knapp and Ashmore 1999:2; Moran 2006:7; Mrozowski 2006:35, 2010:120; Pauls 2006:67). In this thesis I study this integrated relationship by examining the use of fuel wood on the Eastern Pequot reservation in southeastern Connecticut from the 1740s to the 1850s, with a particular focus on what fuel use tells us about their interaction with the land at a household level over time.

Throughout history, people have needed to obtain fuel. It has, of course, come in different forms, including dung and peat, but the task of gathering wood has been part of daily life for many people. The routine nature of the task, carried out consistently within a familiar landscape, can be understood as part of the production of *habitus*, the often unconscious rules that structure the routines of a society and governs what is considered normal (Bourdieu 1977:72). The study of charred wood thus has more to offer us than the identification of a utilitarian resource, or the opportunity to study the historical environment (Dufraisse 2006b). Fuel wood can also be examined as a long-lasting landscape practice that was just as much a part of people's daily lives as cooking food, creating shelter, and crafting tools. While using trees for fuel did not result in creative output, gathering fuel can still be interpreted as a "socially mediated…landscape practice" (Gelabert et al. 2011:375). However, fuel cannot be detached from the overall landscape. The taxa chosen and changes in taxon use through time can help us gain a better understanding of the choices people made as they gathered wood on a daily basis and how they reacted over time to changes in the broader environment. Fuel wood can thus act as a helpful axis through which we can examine interactions between people and the environment in which they lived.

The Eastern Pequot are a Native American Nation from southeastern Connecticut who retain a reservation in North Stonington, Connecticut. The Colony of Connecticut divided the initial Pequot nation into separate Eastern and Western tribes in the aftermath of the Pequot War. After a period of being sold into slavery and otherwise persecuted by the Colony of Connecticut, those who had lived among the Narragansett in Rhode Island and had begun to reoccupy some of their original territory secured a reservation in 1683. However, in the centuries that followed, they fought numerous instances of settler theft, encroachment, and boundary disputes. The population on the reservation declined in the 18th and 19th century due to migration for military service and new economic opportunities. The state installed overseers to oversee the tribe's financial situation and manage accounts. At best, most overseers spent little time on tribal affairs, and at worst, acted—or attempted to act—against the tribe's best interest (Campisi 1990:126-131). This thesis examines four sites occupied during the 18th and 19th centuries, when the Eastern Pequot were living on their reservation in a colonial environment and dealing with theft of timber, a reduced land base, overseer control, and the overall environmental changes and deforestation occurring in Connecticut.

Colonialism and the Environment

Colonialism is the process “by which a city-or nation-state exerts control over people—termed indigenous—and territories outside of its geographical boundaries” (Silliman 2005:58). The processes of colonialism create the context for intersections and entanglements of identities and relationships in a realm where individuals needed to negotiate the processes of “domination, resistance, and accommodation” (Silliman 2005:61). Colonialism was a wide-spread and long-term process that had multiple impacts—environmental and otherwise—and brought about myriad changes (Escobar 1999; Mrozowski 1999b; Silliman 2005:62).

Colonialism is interwoven with the history of the families and individuals who lived at the Eastern Pequot reservation sites, and of course is related to the history of the Pequot War; the creation, placement, and reduction of reservation boundaries; the use of overseers; and the laws that attempted to circumscribe Native peoples’ movements. While colonialism played a drastic role in shifting the overall landscape to one where human modification became the primary disturbance factor, a focus on colonialism can also help to highlight its political impact on the landscape. Related intersecting issues include the creation of reservations and a reduction in territory size, encroachment and theft by nearby settlers, overseers who attempted to reduce their land base still further, overseers selling trees, requests for firewood to subsidize the costs of colonial education, and the often off-reservation labor which would perhaps have made gathering wood on the reservation difficult (Den Ouden 2005; Campisi 1990; Joseph Fish's First Eastern Pequot Journal 1775).

It is in this context that the Eastern Pequot needed to access fuel wood for their daily lives. We can see the importance of the forest to the Eastern Pequot through the documentary record, including their vocal opposition to nearby settlers cutting their timber and the reduction of reservation boundaries that they knew would reduce their firewood supply. The reservation land was valued in and of itself, but also for the resources it could provide. Trees not only supplied the raw material for creating items like tools and baskets, but fuel, which was a critical daily need that would allow for cooking, warmth, and even some tasks that required heat or burning (e.g. tanning leather). Were they able to access fuel wood themselves? How did they collect wood and choose what kinds to use? What did this daily task look like? How did individuals and families go about gathering fuel in a landscape and political situation so affected by large-scale colonial decisions? In this thesis, I attempt to identify what factors played into the selection of the wood taxa now preserved in charred remains, and particularly whether the model of the "Principle of Least Effort," or PLE, holds true at this site.

Anthracology Studies and Assumptions

The PLE assumes that most fuelwood would be gathered where it was easiest, and thus species were collected "in direct proportion to their occurrence in the surrounding environment," with people moving further away only when fuel in the area was depleted (Asouti and Austin 2005:2; Shackleton and Prins 1992:632). Debate around this assumption—whether observed wood frequencies accurately reflect their actual proportions in past vegetation—has been present since the earliest anthracological (focusing specifically on charcoal and/or charred wood) studies (Asouti and Austin 2005:2; Chabal et al. 1999:58; Godwin and Tansley 1941). Prins and Shackleton characterize this assumption as a processualist approach that emphasized human adaptation to the environment and ignored "cultural rules" and ethnographic observations. However, this principle has been at the core of a number of anthracological studies. While some studies testing this principle have found species-based selection (Huebert et al. 2010) or intentional cultivation of trees for fuel (Johannessen and Hastorf 1990) to be the mode of choosing fuel, many other studies have found the PLE to be the most likely selection factor for fuelwood, suggesting that people prioritized time or morphological characteristics over other species-specific factors (Asouti and Austin 2005; Bônhote et al. 2002; Byrne et al. 2013; Dufraisse 2006a; Fletcher 2002:9; Ludemann 2002; Marston 2009; Salisbury and Jane 1940; Willcox 2002). Chabal's (1997) study also found this principle to hold and set a protocol for conducting environmental reconstruction that recommends a large number of charcoal samples from a long-term context rather than a smaller number of samples from a short-term context (e.g., a hearth) where the environmental background may not be as accurately represented due to the transitory nature of the last event(s) (Chabal 1997; Chabal et al. 1999; Théry-Parisot et al. 2010:144).

Godwin and Tansley's (1941) early critique of Salisbury and Jane (1940) asked specific questions of the assumption that charred wood accurately represents the immediate environment, including whether woody species burn equally well in open fires, if some species are more likely to become charred wood, if the way species differentially shed branches and twigs had a role on the resulting collection, and if we can assume people did not select or reject wood based on species. Whether the archaeological charred wood assemblage reflects the quantity of initially burned wood has been addressed through experimental archaeology, and found to be greatly dependent upon the size of the wood used and the humidity and state of the wood. This means that in order to look at the reasons why wood would be chosen, not only must the species be identified, but also the caliber, water content, and physical state, the latter three of which are rarely identifiable in the archaeological record (Chabal et al. 1999:53; Py and Ancel 2006; Théry-Parisot 2002; Théry-Parisot et al. 2010:144). However, addressing the taphonomic concerns of bias due to either human behavior or the combustion process, anthracologists have found some evidence supporting a correlation between the archaeological assemblage and the forest environment (Chabal et al. 1999:90). In addition, anthracologists found that wood, regardless of the species, fragments into many small pieces and a small number of big pieces, and studies have shown that a sufficiently large sample of over 400 pieces can counter any bias (Asouti and Austin 2005:3; Chabal et al. 1999:66).

The importance of context has been recently emphasized when interpreting paleoethnobotanical assemblages, as not all contexts have the same value when attempting to understand the use of wood or site environment (Chabal et al. 1999:61; Kasper and McBride 2010). Determining the intended goal of the material, whether for timber, fuel, or another purpose, can help identify what factors might have been considered when the wood was chosen. It appears specific taxa were preferred when selecting wood for timber (Marston 2014), as well as when gathering wood for specialized kiln-based activities (Marguerie 2002:189). Other studies of house posts have identified differences in construction material as stemming from household status and site function (Kahn and Coil 2006:342). When considering fuel wood, the question of whether the context is a primary deposition (with charred wood deposited directly from the activity that produced the assemblage) or secondary (with charred wood moved at least once from the place of production) must be considered to help us understand how the wood was used and if there is a loss of information (such as only some taxa being transferred, or knowledge of the fire's purpose) associated with it (Chabal et al. 1999:61; Pozo 2002:115).

While we might not have a firm context for charred wood in secondary deposits, the fragments in middens and other non-hearth contexts should provide more of an amalgamated, long-term, and representative portrait of the former forest, in contrast to a hearth where it is impossible to know the duration represented by the assemblage and which may reflect only a brief "flash" in time (Chabal et al. 1999:62; Dufraisse 2006a:57; Heinz 2002:95; Théry-Parisot et al. 2010:144). It has also been observed that short-term features usually contain lower taxonomic diversity than occupation levels due to the number of events that the latter samples cover, which might lead to distorted proportions that should not be used to reflect the totality of the site's wood use, even while providing interesting insights into the composition of a single firing event (Chabal et al. 1999:62). In contrast, the higher taxonomic diversity typically found in longer-term or secondary deposition features is usually seen as more representative of the overall environment and thus a longer-term perspective on fuel use and historical environmental composition

(Fletcher 2002:89; Scheel-Ybert 2002:163). However, charred wood recovered from both primary and secondary deposition features are clearly the work of human-influenced selection, and examining both can help provide insights into the use of fuel wood and the environment from which it was gathered (Huebert et al. 2010:86-88).

In contrast to the idea of wood being gathered simply as a function of its abundance in the environment, the question of whether people selected or rejected wood based on species-specific criteria, availability, or environmental constraint remains an ongoing research topic (Théry-Parisot 2002). Chabal et al. (1999) note that it is often assumed past people had mastered a knowledge of the qualities of specific taxa and used this knowledge as a prime motivation—which is then seen as a sign of adapting to the environment and working with local, traditional knowledge—rather than simply taking what was easiest from a limited number of species (Chabal et al. 1999:47). Others have focused on the various parameters people would navigate in daily situations including various geographically-distinct selection factors (Théry-Parisot et al. 2010:145; Théry-Parisot 2002). Still others have highlighted the fact that charred wood results from human activity, and that labor that is often regulated and organized. Similarly, researchers note that while the environment obviously factors into the available species, it obviously does not determine how it would be used (Piqué and Barecló 2002:1).

The question of taxon-based selection becomes more difficult still when it is considered in light of the many suitable purposes for which species can be used—we do not know which desired outcome (heating value or smoke flavor? low, long-burning fire or higher flames?) was in mind when the wood was chosen, nor do we know the condition of the wood, which would also alter its suitability (Chabal et al. 1999:55;

Théry-Parisot 2002; Théry-Parisot et al. 2010:144). Indeed, other studies have pointed to the availability of dry wood as the most important factor, which is influenced by some species dropping branches at a more frequent rate than others, along with the age of the tree stands (Asouti and Austin 2005:8). One study used traditional ethnographical models with a modern-day population to understand what they considered good fuel, what their gathering practices were like, and how firewood functioned as a subsistence activity (Gelabert et al. 2011). It concluded that good fuel depended upon the physical properties of wood such as moisture content and diameter and was gathered during other routine tasks and activities. The idea of species-specific "ideal" fuel did exist, but was only called upon into action when an extra measure was required, such as chopping down trees for feasts (Gelabert et al. 2011:381). Forbidden species were not avoided because of intrinsic morphological characteristics of the wood but rather due to cultural beliefs—e.g., some trees hosted spirits that, if burned, would cause quarrels or affect the fertility of family members and orchards (Gelabert et al. 2011:381).

Anthracological studies provide information on the vegetation of the area and insight into the changing functions of the past landscape, demonstrate the existence of traditional plant management systems, and can point to dynamic moments such as the "opening up" of woodlands (Gaudin 2002:232). Combining the abilities of anthracology to detect small-scale changes in vegetation at a "local and precise temporal scale" with textual and oral sources on wood use is critical to understanding historical land use (Montanari et al. 2002:240).

Thesis Organization and Argument

I assess how the Principle of Least Effort applies to the Eastern Pequot with perhaps some species avoidance. I examine this by comparing the taxa identified at each site to the arboreal landscape of the Eastern Pequot reservation as interpreted from witness tree studies. Assessing selection criteria in collecting firewood provides us with a household-level view of how Eastern Pequot families and individuals integrated fuel and firewood into their daily lives during this period and, potentially, how they approached and interacted with their surrounding environment. In addition, I use ranking by abundance to compare and contrast the usage of fuel-wood taxa through time, and I compare the diversity at each site. Having some sites which overlap in time helps confirm that we are not improperly extrapolating trends from single households to the entire reservation. We would expect a similar pattern of fuel use to continue unless there was disruption or interference. Like others, I assume stress and a lack of access might appear in the record as an increase in diversity of taxa in similar contexts over time and/or a rise in lower-quality fuel wood, (Huebert et al. 2010:85; Johannessen and Hastorf 1990:82; Trigg and Bowes 2007:21) or a shift to different fuel taxa that were not present in other periods (Asouti 2003:1200). I evaluate this by analyzing changes in the presence or absence of taxa, or shifts in the quantities of those taxa, over time.

In chapter two, I place this study in its historical and environmental context. In chapter three, I explain the methodology to analyze this data set and describe the archaeological contexts from where the samples were obtained. In chapter four, I describe the results of my laboratory analysis, including the counts, weights, and proportions of identified taxa for each site. In chapter five I rank taxa at each site by abundance in order to see if the households had access to high quality fuel wood. In order to ascertain how they collected wood and choose what kinds to use, I assess the use of the Principle of Least Effort by comparing the wood recovered at these sites to the historical forest composition as ascertained by witness tree data using Kendall's τ-b coefficient. In order to see evidence of deforestation, or lack of access to fuel, I compare ranks ordered by abundance to see how taxon use changed over time and look at the number of taxa present with the assumption that rising/falling diversity levels might provide clues to scarcity. Finally, in chapter six I present my interpretations and conclusions about the Eastern Pequot use of fuel during the period of these sites' occupation.

CHAPTER 2

BACKGROUND

Early Environment and Native American History

Before 13,500 years ago, the American Northeast was uninhabitable (Chapdelaine and Boisvert 2012:1). Approximately 18,000 years ago BP, at the peak of the last ice age, towering glaciers covered southern New England. However, as the ice melted, an advancing zone with alpine/tundra conditions in the north followed, with mixed hardwood forests following in the south (Chapdelaine 2012:159; McWeeney 1999:5; Reeve and Forgacs 1999:42-43). Studies of pollen in southern Connecticut show that the landscape 14,300-12,150 years ago supported herbaceous plants, willow, pine, spruce, oak, and poplar (Davis 1969:415). However, arboreal pollen is proportionally rare, and these species were identified from very few grains (Davis 1969:415). Approximately 12,150-11,700 years ago the environment transitioned into a spruce zone with more birch, spruce, and poplar, though all these species are still represented by lower rates of pollen compared to later periods (Davis 1969:415). Similar findings were also reported from pollen samples gathered from New London, Connecticut, which also showed an early period (approximately 13,290 years ago) defined by primarily nonarboreal pollen, followed by a spruce-dominant period (12,780-10,480 years ago) (Beetham and Niering 1961:70).

Interpretations and reconstructions of the lifeways of the first settlers who lived in these conditions have been varied and contested (Moeller 1999:73-74; Robinson 2012:182; Spiess et al. 1998:223). Research has often characterized them as hunters covering large tracts of land as they followed caribou herds, and while this theory has been criticized, the characterization of Paleoindians as highly mobile and covering large amounts of territory—whether to follow game or obtain other resources—seems to hold (Chapdelaine 2012:159; Jones 1997:76; Robinson 2012:182). An ever-growing body of research continues to shed light on the choices they made in terms of locating settlements or choosing lithic materials. However, the intervening eras have resulted in a paucity of data from which we can gather a full picture of their lives (Spiess et al. 1998:223).

Around 10,000-8,000 years before present, the climate became milder and more stable as it transitioned into the Holocene, which ended the era of glacially mediated climates. This time also marks the transition to the Early Archaic and the end of the wide-spread game-based foraging model for the people living throughout New England (Forrest 1999:78). The vegetation changed to a mix of pines, spruces, fir, hemlock, beech, oak, maples, hickories, and birches (Patterson and Sassaman 1988:107). In southern Connecticut, spruce-oak forests emerged 10,200-11,700 years ago and were followed by spruce-fir forests 9,100-10,200 years ago, the latter of which was characterized by a decline in oak pollen compared to the previous period, along with higher percentages of spruce, fir, birch, alder, and jack and/or red pine. This is followed by a period approximately 7,900-8,100 years ago when white pine seems to dominate the landscape (Davis 1969:418). For example, one pollen sample from this period contained nearly 50% white pine pollen (Davis 1969:418). Pollen deposition rates are also higher during this period, though it is unknown if forest cover was at current levels (Davis 1969:415-418). Pollen from New London, Connecticut, recorded a decline in spruce and an increase in pine, which researchers interpreted as an indicator of warmer and drier climate approximately 10,460 years ago to approximately 8,320 years ago (Beetham and Niering 1961:73).

The Middle Archaic period aligns with the mid-Holocene shift to drier and warmer weather patterns, and is again seen archaeologically to correspond to a change in lifeways, including more sites, seasonal fishing locations, use of more regionally-available lithic materials, and other artifact-based distinctions (Jones 1999:100; Lavin 1988:104). During the Woodland Period, the use of ceramics began to increase, as well as horticulture. It’s thought that as soon as the climate and environment would support it, people started growing maize, with early radiocarbon dates ranging from circa 900 AD to 1500 AD (Cassedy and Webb 1999:91, 95; Chilton 1999:157; Hart 2008:89; Juli 1999:141,143; Sidell 2008:30). The people of the Middle/Late Woodland period had access to maize, which they integrated within a subsistence network that included hunting, fishing, shellfish, and gathering plants and nuts. However, the extent and intensity with which they cultivated maize remains much debated (Cassedy and Webb 1999:96; Bragdon 1996:66-67,83; Dincauze 1990:30; Stein 2008). The transition to the Late Woodland is often interpreted as dependent upon location with three regional patterns: mobile hunter-gatherers in the north, river-centric villages based around agriculture, and small-scale coastal societies (Bragdon 1996:31,78). While Late Woodland settlement patterns were often interpreted as larger, more sedentary sites or villages (Bragdon 1996:35; Lanvin 1988:110), other researchers have disputed this, instead characterizing the people during this period as continuing to rely upon seasonal mobility and non-intensive horticulture (Chilton 1999:157,163; Chilton 2008:53).

From 4,800 years ago to European colonization, a shift to more deciduous trees occurred with oak, chestnut, and hickory (or, in some places, birch or hemlock rather than hickory) dominating the Connecticut landscape (Beetham and Niering 1961:71; Davis 1969:419; Leopold 1956:866). The differences in forest composition seem to be related to specific characteristics of soil, landform, and fire-history, which resulted in regional variations (Fuller et al. 1998:76; Parshall et al. 2003:744). In southern Connecticut, chestnut pollen began to increase by a large degree starting 2,000 years ago (Davis 1969:419; Jacobucci 2006:79-80). Approximately 1,000 years ago to 250 years before present, multiple pollen cores taken from Connecticut and lowland Massachusetts show a landscape primarily covered by deciduous trees with oak, chestnut, hickory, and other taxa (Deevey 1939; Fuller et al. 1998:82; Leopold 1956). Pollen taken from New London, Connecticut, was similar to a series of cores taken from central Massachusetts (Davis 1958) that showed oak, birch, chestnut, maple, hemlock, and beech rather than the expected combination of oak, chestnut, and hickory (Beetham and Niering 1961:74). These differences were postulated as perhaps due to the coastal-swamp sampling location (Beetham and Niering 1961:74). Close to the project itself, pollen data from the Eastern Pequot reservation dated to 6,040 to 650 years before present records a decrease in alder and increases in birch, maple, pine/spruce, willow, oak, and chestnut, with the increase in oak attributed to a partially open canopy (Jacobucci 2006:68). Hickory also appears for the first time during this period, like it did at Rogers Lake, Connecticut (Jacobucci 2006:69; Jacobucci et al. 2007).

Environment and Life in 16th and 17th-Century New England

Europeans began appearing along the shores of New England in the late 1500s and sent back reports that spoke glowingly of multitudes of fish, fowl, game, a lack of disease, good grounds, and excellent timber (Bragdon 1996:5; Cronon 1983:35). They declared the land empty and open, a *vaccuum domicilium,* where its empty status meant new occupants could rightfully take possession (Cronon 1983:57). This conception at the founding of the "New World" would still hold a hundred years later when writers continued to reiterate that settlers came to unused lands, bringing cultivation (and implied civilization) with them (Eliot 1760).

However, this abundance was not the "natural" state of the land, but rather a result of Native presence and ecological management in southern New England. Those who visited the south of New England spoke of extensive open areas and forests that could be traversed easily by large groups of people, with vast areas free from trees. Francis Higginson (1588-1630) spoke of a hill from where people could view thousands of acres without any trees (Cronon 1983:25, 26; Russell 1976:4). This open effect is often cited as resulting from the intentional use of fire to consume low, brushy plants and leave large trees standing (Bragdon 1996:108; Cronon 1983:49-51; Dincauze 1990:30). Oak, chestnut, and hickory in particular benefit from burning regimes (Abrams 1992; Brown 1960). Intentional, wide-spread burning of the forests by Native people is cited in multiple primary documents. However, the geographical extent and effect of burning, who specifically practiced wide-spread intentional burning, and for how long this practice occurred, is debated (Day 1953; Foster et al. 2002; Parshall et al. 2003; Russell 1983). Some researchers have concluded that while Native Americans clearly affected the landscape, evidence of fire can more likely be explained by climatic conditions (Parshall and Foster 2002) or a combination of climate and infrequent burning set by people (Foster et al. 1998:114). Others have interpreted the higher concentrations of sedimentary charcoal concentrations in areas where the largest Native populations lived as most likely due to concentrated land-use practice, with Native presence elevating the number of fires above the number to be expected from natural or lightning-induced fires (Abrams 1992:350; Patterson and Sassaman 1988; Russell 1983). Roger Williams recounted instances of accidental fires started by sparks falling onto dry wood and pointed out that the Native people recognized this as helpful, since the burning would get rid of “vermin” and reduce the underbrush (Williams 1643:125-126). Loskiel (1794) notes fires were both started accidentally and intentionally kindled in the spring and sometimes autumn to burn the grass.

Regardless of the intent or origin of fire in New England, studies of sediment charcoal and forest composition point to a likely correlation between some level of fire and a greater abundance of oak, chestnut, and hickory in the Northeast before European settlement (Abrams 1992; Foster et al. 2002; Fuller et al. 1998:89; Russell 1938:86). In fact, pollen cores taken from the Eastern Pequot reservation show an increase of charcoal during the period of 1504-1714 as well. Coupled with a decline in herbs and grasses during this period, this might point to an increase in the use of fire as a land-management tool, which could have also impacted the rise in chestnut seen in the pollen record. Alternatively, this increase may simply be due to chestnut expanding the arboreal canopy (Jacobucci 2006:79, 82, 56; Jacobucci et al. 2007).

Native people also affected the landscape through their need for fuelwood. Observers claimed that indigenous residents added wood to fires in abundance while they slept, regardless of season (possibly for warmth in winter and relief from mosquitos in summer), and these writers opined that fire was used in place of bedclothes (Loskiel 1794; Williams 1643:19). Native people rotated their locations to take advantage of the shifting cycles of bounty, moving between inland woods, field locations, and the coast. By the time snow arrived, villages moved to heavily wooded valleys that not only provided easy fuel, but were also somewhat protected from the weather (Williams 1643:60). Lack of fuel was also noted as a reason to move to new places, with a pattern of using all the fuel wood in an area before moving on to a new location with more wood (Loskiel 1794; Mather 1702:192).

This mobile, seasonal lifestyle reduced the impact on the land. Colonists viewed the land, with its lack of extensive fencing and comparatively minor disturbance, as unimproved and natural, which resulted in many conflicts. Francis Higginson sums up this belief when he noted that “The Indians, are not able to make use of the one fourth part of the Land, neither have they any settled places, as Townes to dwell in, nor any ground as they challenge for their owne possession, but change their habitation from place to place” (Cronon 1983:55). While Roger Williams defended the Native peoples’ right to their land and acknowledged burning regimes as a legitimate form of use, few others were willing to grant Native landscape management the same status as English methods (Cronon 1983:57).

Seeing the woods as a commodity offered another source of tension, though both Native and English people understood the importance of having enough wood to provide heating and cooking fuel. The Narragansetts hypothesized that the English came because "they want firing: for they, having burnt up the wood in one place (wanting draughts to bring wood to them) they are faine to follow the wood; and so to remove to a fresh place for the wood's sake" (Cronon 1983:49). Fuel was an immediate need in Plymouth. Since early English villages were laid out on land left open by the Native people, the nearest firewood could be as much as an eighth of a mile away—and gathering firewood for the winter thus was not an insignificant task (Russell 1976:44). Similarly, Boston had to have its firewood supplied from Braintree and Weymouth in the early to middle 1600s, with wood being brought in via oxcart, or from the shore in small boats (Russell 1976:62, 65). While many trees were protected by order of the Crown, this was often ignored and timber was often cut legally or illegally from commons, highways, other public areas. It was also often used for building materials, fencing, farm tools, and tanning, with large amounts of wood used for heating and cooking (Russell 1976:64). In 1689 there were restrictions on cutting any trees of less than one foot around for firewood—but whether these were followed is another matter entirely (Russell 1976:66). As more and more land transitioned into private ownership the amount of land under these restrictions also fell away (Russell 1976:66). Forest reconstructions indicate that by the mid-to-late 1700s, trees in woodlots were being constantly cut for pole-sized trees (Foster 1992:763).

Colonists' wanton use of the environment, along with their inability to recognize the ways in which Native people used the land, created conflict around the access, use, and maintenance of the environment. In addition, colonial efforts to subdue their "new land" via environmental reorganization was often accompanied by various political goals and military campaigns. This colonial matrix of seizing land, restricting traditional subsistence methods, making war, and using politics to disenfranchise Native people would be met by a variety of Pequot strategies and negotiations through the intervening centuries.

Pequot History through the 19th Century

The Mohegan-Pequots are related to other Algonquian-speaking people in southern New England and have occupied the Thames River drainage basin for centuries, if not much longer (Starna 1990:33). Their land base, while not precisely defined, seems to have begun at West Niantic near New London, ran north along the divide between the Connecticut and Thames rivers to the headwaters of the Thames, then eastward to the present border between Connecticut and Rhode Island, then south along the border to the coast. At the beginning of Dutch/English and Pequot interaction in the 1630s—the first recorded interaction is in 1632—they had gained control of the Connecticut Valley as far north as Windsor and as far east as the eastern end of Long Island (a total of approximately two thousand square miles) and had fifteen villages along the coast between Niantic Bay and the Pawcatuck River and along the Thames and Mystic rivers (Starna 1990:33-34; Hauptman 1990:71). Some plagues passed through other regions, sparing the Pequot, but others, including smallpox and influenza, hit with devastating results; the smallpox epidemic of 1633 is the background for the events leading up to the Pequot War, which lasted from 1634 to 1638 (Cave 1990; Starna 1990:40; 45-46).

A series of disputes, retaliatory murders, and raids set in motion the events leading up to the Pequot War, which pitted the Massachusetts Bay, Plymouth, and Saybrook Connecticut colonies, the Mohegans, and the Narragansetts, against the Pequots. The war ended with an assault on the Pequot Fort at Mystic that resulted in the deaths of 400-600 Pequots, primarily women, children, and older people (Cave 1990; Hauptman 1990:73). At its conclusion, the surviving Pequots were either sold into slavery to Bermuda and the West Indies or divided between the Mohegans, Narragansetts, and Niantics (Cave 1990). The Treaty of Hartford declared the Pequots extinct, their lands forfeit, and their places re-named, with the Colony of Connecticut taking the right to appropriate their cornfields and hunting grounds (Cave 1990; Hauptman 1990:76; O'Brien 2010:31,170; Russell 1976:107). However, legislating a people out of existence did not change Pequot identity, and they continued to return to their land and call themselves by their own name. The Colony of Connecticut was forced to acknowledge that Pequot people were still present and still a people only five years after they were deemed extinct.

In 1651 the Colony of Connecticut gave the group who would become known as the Mashantucket Pequots a reservation at Noank, but after just seven years their soil was exhausted, and the remaining trees could not meet their firewood needs (Den Ouden 2005:15; McBride 2005:36, 1990:97). In 1666, they were also given a reservation at Mashantucket comprised of 2,500 acres, and in 1678 they obtained 600 acres at Walnut Hill (Campisi 1990:119; McBride 2005:36; McBride 1990:106-107). The Eastern or Paucatuck Pequots were initially given a 500-acre reservation in North Stonington, on the eastern side of Long Pond, but encroachment by Rhode Island settlers drove some Eastern Pequot onto additional land in Stonington. These 280 acres were given to the Eastern Pequot in 1683 (Campisi 1990:118-119; McBride 1990:105; O'Brien 2010:31). In 1698 the Pequots were separated into two distinct tribes through the Connecticut General Court's decision to put them underneath the authority of the colonial governor

(Campisi 1990:119).

The early 18th century saw increasing harassment and encroachment by settlers trespassing on both Mashantucket and Eastern Pequot reservations, as well as on other reservations across southern New England (Den Ouden 2005:68). The European population boomed in the early years of the eighteenth century, and with twice as many towns founded between 1690-1720 as 1660-1690, colonists found themselves in need of additional pasture for cattle, more woodlots for fuel and timber, and more fertile planting grounds (Den Ouden 2005:66,68; McBride 2005:36). Settlers did not go about gaining land in an organized and legal fashion, but as they saw fit. As seen through a number of Pequot grievances brought before the Connecticut General Assembly and towns of Groton and Stonington, these encroachers did not acknowledge or respect Native land rights (Den Ouden 2005:66; McBride 2005:36). In 1713 Mary Momoho protested encroachment on the Eastern Pequot Stonington reservation, re-telling the story of how they obtained their reservation base (Complaint of Mamoho's Widow 1713). Ten years later she and eight other Eastern Pequots challenged a report that listed just 3 men, 4 women, and 24 children on the reservation—a report which was used to justify a recommendation that they only needed a small amount of land upon which to plant (Den Ouden 2005:71). In response, the Pequot reminded the assembly that the court had granted their land to them forever, lamented that they would soon wear out their land with such a small quantity, and corrected their census by asserting that there was over 130 Eastern Pequot (Den Ouden 2005:71; Petition on behalf of Mamoho's Men 1723).

By 1749 the Eastern Pequot were embroiled in a bitter property dispute, and they submitted a petition complaining of their frequent mistreatments (Den Ouden 2005:73-

74). A subsequent report found in favor of the Eastern Pequot, and asserted that they had the right to use and improve the land for growing crops and keeping livestock (Committee Report on Pequot Land 1749). An additional report written the following year in October 1750 reported that a fence had been illegally put up across their land, their timber was cut, cattle and sheep had destroyed their corn and beans, they had been beaten when they had attempted to fence their land, and their corn was stolen (Committee Report on Pequot Land 1749). In response to this, the committee commissioned yet another investigation (Connecticut General Assembly Resolve regarding Mary Mamoho's Complaint 1750; Den Ouden 2005:76). Unfortunately, the investigation did not address the Eastern Pequot grievances or consult with them in their effort for a solution, and the committee granted the trespassers 35 acres at the south end and 20 acres to the east of the reservation (Committee Report on Mary Mamoho’s Complaint 1751). For the land left to the Eastern Pequot, they marked the boundaries from a white oak tree which marked the northeast corner of the reservation (Committee Report on Mary Mamoho’s Complaint 1751; Den Ouden 2005:76).

Throughout the 18th century, the number of Pequot living on their reservations declined with some were killed in colonial wars, and others leaving to find work as laborers on farms, whalers, industrial workers, and seasonal laborers, loggers, trappers, or guides (Calloway 1997:7-9; Campisi 1990:127; Den Ouden 2005:70; McBride 1990:107-108; O’Brien 1997:154). Women sold berries and baskets and raised families on the reservation or worked elsewhere for wages (Calloway 1997:9; Campisi 1990:128; O’Brien 1997:150). A stereotype of the Indian as a wanderer or an unwelcome transient developed alongside what can now be seen as a “mobile labor force” (Calloway 1997:9).

Through at least the early part of the 18th century, Pequots were cultivating maize, hunting, and making seasonal movements to coastal areas to procure resources. Seasonal moves to Noank to fish, fowl, and collect shellfish still occurred in the late 17th and early 18th centuries, as implied by the rights granted in the 1714 agreement (McBride 1990:108). However, agriculture and subsistence methods were shifting. In 1732 a visitor mentioned the traditional method of planting a field until it was worn out and then beginning another; a visitor in 1780 described corn plants planted in what was described as “Indian style with neither circles nor any divisions,” along with the presence of apple trees, which were then an important food supply. By the 1750s cattle were present, as evidenced by the Eastern Pequot dispute over the ability to put animals out to pasture (Memorandum of Stock Allowed in Indian Town Pasture 1816). In addition, evidence of animal husbandry is archaeologically present at sites dating from the late 18th century and 19th century with cattle, pigs, and sheep appearing in both the documentary and archaeological record (Cipolla 2005; Fedore 2008; McBride 1990:109; Memorandum of Stock Allowed in Indian Town Pasture 1816).

By the 19th century, overseers’ reports show large quantities of foodstuffs purchased for tribal members. Native Americans in southern New England were on reservations located on inferior farmland, without the same access to animals to hunt or fish, and had to adjust to these ecological changes in a setting that could not live up to the bounty they had once experienced (Cronon 1983:164). Timothy Dwight in his *Travels in New England and New York* (published 1823) described the Eastern Pequot as a people where “some of them live in wigwams; and others, in houses resembling poor cottages, at the best small, ragged, and unhealthy. Others still live on the farms of the white inhabitants in houses built purposely for them, and pay their rent by daily labor" (Campisi 1990:125). By the mid-1800s, women had assumed political control. Labor patterns continued from the 18th century. Men were often off-reservation whaling and working on other farms, while women picked berries for sale, made splint baskets, worked as domestic servants off-reservation, and carried out the political responsibilities (Campisi 1990: 128,133). Tribes often had three sources of income: lease of land, the sale of firewood, and interest from its bank account (Calloway 1997:4; Campisi 1990: 128,133; Den Ouden 2005:70; Vickers 1997).

Tribal members often did not have direct access to these funds, which were under control of the overseers, who were paid to collect money for the tribe, sue others as necessary, and act as a payee for tribal members (Campisi 1990:129; Farley 2013). Overseers ranged in ability. Some did very little—overseers from 1813-1819 spent between one and three days a year on tribal affairs, while others were highly dishonest. For example, the Mashantucket Pequots brought charges against Amos L. Latham in 1855 who sold wood for "small and ruinous prices," and the Mashpee Revolt of 1833 was partially due to their overseers who auctioned wood shares, with profits going directly into their pockets (Mandell 2007:94). Others were more involved, as George Ayer's list of tasks—including prosecuting an individual for illegally removing firewood—show (Campisi 1990:130). Both the Eastern Pequot and Mashantucket Pequot saw overseers as their agents, requested changes, and made recommendations for who they wanted to work for them (Campisi 1990:126; Connecticut General Assembly Resolve on the Petition of the Pequots in Stonington 1766; Farley 2013).

Colonial Environment through the 19th Century

While the clashes between the Pequots and their immediate neighbors were one source of conflict, broader environmental factors also played into the larger history of Connecticut. Land in southern New England during this period was primarily used for agriculture, animal pasture, and woodlots (Foster et al. 1998:102; Fuller et al. 1998:77). Wind and fire were once the predominant natural disturbances in New England. After European settlement, this disturbance regime changed to one dominated by consistent and large-scale human activity over a 300-year period (Fuller et al. 1998:77; Thompson et al. 2013). Europeans began to clear the forest on a large scale from 1750 to 1780, but the pace at which the land was cleared abruptly increased from 1840 to 1850, when open land peaked (Foster 1992:763). This dramatic reduction in forest cover resulted in greater rates of erosion and soil movement (Fuller et al. 1998:85). The careless use of the woods and the increasing problems associated with growing numbers of livestock eventually led some colonists to recognize that their ways of engaging with the land were not sustainable. In 1760, Connecticut writer Jared Eliot wrote of the European settlers: "Their unacquaintedness with the Country, led them to make choice of the worst Land for their Improvement, and the most expensive and chargeable Methods of Cultivation: They thot themselves obliged to stuff all Staddle, and cut down or lop all great Trees; in which they expended much Cost and Time, to the prejudice of the Crop and impoverishing the Land" (Eliot 1760). In the 1790s proposals designed to promote forest conservation were initiated, including an idea for planting acorns because the "timber trees are greatly reduced, and quite gone in many parts…it is not uncommon for the builder to send at this day from thirty to forty miles for timber and planks, and the stock fast decreasing, not only from the demand of timber and planks, but from the scarcity of other fuel" (Cronon 1983:114).

Fuel wood was used to such an extent between 1630 and 1800 that it is estimated that more than 260 million cords of firewood were burned; families might burn 20 cords a year while ministers and wealthy families might burn 40 cords a year (Russell 1976:174-175). On a trip from Boston to New York Timothy Dwight (1752-1817) noted that travelers passed through twenty miles of wooded land out of fifty of sixty parcels (Cronon 1983:121). While earlier restrictions on the cutting of wood on undivided common lands were not unusual, they clearly did not result in an economy of conservation (Russell 1976:65-66). Fuel prices rose in result, and from 1794 to 1804 the price of wood and timber doubled across New England (Cronon 1983:121). By 1764 ship masts and timber were being shipped to England and stands of forest farther away were burned and turned into potash and pearlash (Russell 1976:117).

While other trees are individually the strongest, hardest, toughest, and most durable, oaks unite these qualities in one wood (Emerson 1846:121). Oak was highly valued as a wood for fuel and burned down to a hot bed of coals suitable for broiling. Some considered red oak as having little use as fuel, however, Hale lists it under the "best hardwood fuels" and Marcus Bull gives it a ranking of 73 out of 100 (Browne 1832:386; Hale 1933:8). White oak was considered the most valuable hardwood species of tree in the United States (Harlow 1957:146; Millikan 1969:339). It was also considered to have a high fuel value, made a "slow fire," was seen as valuable for charcoal. In terms of fuel value it is considered to be trumped only by chestnut, hickory, and chestnut white oak (*quercus montana*), though in terms of simply BTU per cord, white oak is second only to elm and is tied with hickory (Emerson 1846:130; Hale 1933:8; Panshin and De Zeeuw 1980: 571-572). Chestnut has a coarse-grained wood that is strong, elastic and durable. While some thought of chestnut as not well adapted for fuel except for close fires, since air in its innumerable small pores causes it to snap and pop, it was noted by others to form an excellent charcoal with younger trees being the best (Emerson 1986:167; Hale 1933:8).

In addition to fuel, nearly everyone in the colonial economy had use for one species or another: hickory made one of the hottest fires and was prized as a fuelwood, chestnut was easy to work and popular for timber and fence rails, butternut provided wood for fine furniture as well as dyes for textiles, and oaks and pines were used in shipbuilding. Ash had a long grain perfect for long tool handles and basket weaving, red cedar made high-quality fence posts, white cedar and white pine were used for shingles, cherry was valued for furniture, hornbeam's hard qualities were well-suited to a hayrake, and gray birch was used for brooms—and all this was in addition to the value of the mast the nut-bearing trees provided (Foster and Motzkin 1998:112; Russell 1976: 305-306). For farmers, the money they made selling small, wooden implements contributed to a more comfortable life, and provided additional income during the winter months (Russell 1976:385-386). Industries closer to home used plenty of wood as well, including ironworks (which preferred oak and hickory), bread bakers, brick-makers, and lime-burners in addition to farming families' need for many items they made out of wood during this time: frames, boards, furniture, fences, harrows, rakes, forks, pails, shovels, table dishes, bowls, spoons, buckets, milk pans, and other implements (Russell 1976:174-175). The nearly infinite need for wood, and the value of the products made from wood, meant that people highly appreciated and guarded their woodlots, treating them as a possession (Russell 1976:189). Yet while timber trees were reduced, apple trees proliferated. Grown primarily for cider and vinegar, within two generations cider was the most common beverage in New England (Russell 1976:91). Apples were well suited to New England's rocky soil, and by 1770 the 40 miles between Great Barrington and the Schaghticoke village at Kent were lined with apples trees. Lord Adam Gordon, just before the Revolution, claimed that every road was lined with apples and pears and that every farmer owned an orchard (Russell 1976:147).

During the 19th century, the population continued to grow. In 1790, Connecticut boasted 237,940 people, and by 1830, Connecticut's population had grown to 267,940 (Russell 1976:258). In addition to increased population, weather contributed an additional factor during this period. Weather during 1815 and 1816 was unusually violent in southern New England. The hurricane gale of September 23, 1815, leveled trees by the millions, knocked off the year's fruit crop, and destroyed apple orchards, stacks of hay, corn fields, and grain fields. The following "Year without a Summer" of 1816 blackened vegetation with frost every month of year with snow falling in June, July, and August, leading to crop failures and high prices.

The New England landscape is often talked of as a singular unit, or perhaps divided between the northern half and southern half. For example, it has been noted that much of the "New England landscape" was transformed with oaks and white pines gone, scarce cedars, rare hickory, the presence of sprout forest, and the replacement of moisture-loving species like beech and maple with the more tolerant oak (Cronon 1983:160). However, New England forests are not homogenous, and especially before intensive, large-scale agriculture, landform played a large role in what taxa grew in which areas, with the taxa distribution strongly correlated to growing degree days (Foster et al. 1998:108). Hemlock, beech, maple, and birch were more common in northern Massachusetts and more northern latitudes, increasing with higher elevations and lower annual temperature. Massachusetts' central hardwood forests were dominated by oak, hickory, chestnut, and pine with other species including red maple, pine, birch, and ash (Foster 1992:758). Pine and chestnut were very common (survey data indicates they were present in Massachusetts towns at rates of 100% and 91% respectively) and were not bound by the same climatic or topographical factors (Foster et al. 1998:108). Southern taxa such as oak and hickory were most abundant at low elevations in the eastern lowlands and southern-central uploads of Massachusetts and the Connecticut River Valley (Foster et al. 1998:108; Fuller et al. 1998:89). However, because the combination of oak (which was the most abundant), along with chestnut, white pine, and hickory, is found on a range of soils, there is a possibility that in addition to climate and growing season, the role of fire due to human activity contributed to their dominance in this region (Foster et al. 1998:113-114). Higher levels of charcoal (along with correspondingly high percentage of oak) recorded in Eastern Lowland pollen cores lend additional credence to fire's role in the dominance of oak in this region (Fuller et al. 1998:89).

Studies of witness tree records from 19th-century southern New England have shown evidence for little old growth timber, scarce firewood, and greatly deforested land (Bürgi et al. 2000:1128). The overall landscape was shifting towards open country and cleared fields and Connecticut was composed of three-fourths open land by 1860. The absolute nadir of forest coverage is usually cited as occurring between 1850 and 1875 depending on location, and usually at around 40%-20% forested land or less (Bürgi et al. 2000:1128; Foster 1992:763; Foster and Motzkin 1998:113; Foster et al. 1998:97). Pollen analysis of post-settlement forests in Massachusetts record an increase of herbaceous pollen that possibly indicates reduced forest cover along with increased organic content in lake sediments that point to erosion (Fuller et al. 1998:90).

Descriptions of forests, fuelwood consumption, and wood utilization from the 1800s suggest that woodlands during the period 1790-1880 were young, frequently-cut, sprouting species that were kept in a constantly sprouting or coppiced state. Forests during the period 1885-1895 were often 25-40 years old and were also often the first wave of trees to grow on abandoned fields or highly utilized woodlots (Foster et al. 1998:106-107). In 1831 the *Massachusetts Agricultural Journal* wrote: "we are fast consuming these rich treasures of our woods, and I fear that our prodigality will be followed…by the usual consequences of prodigality" (Russell 1976:386). In 1866, New Haven had to import 2,500 cords of firewood from Long Island and Maine. When Charles Dickens took the railroad north from Boston in 1842 he commented on the mile after mile of "stunted growth" that he saw (Russell 1976:386). The Harvard Forest decreased by two-thirds from 1831 to 1865, dropping from 9,270 acres to 3,385. Farmers were responsible for most of the clearing in southern New England, as the timber industry was concentrated farther north in New Hampshire, Vermont, and Maine. While cider continued to be a major product of New England apple orchards by 1840, many plantings had been cut down or abandoned. Good Baldwins, Greenings, Russets, and Pearmains continued to sell, with these varieties grafted on ordinary trees, or set in new fenced orchards. Baldwins especially were market favorites but suffered in the hard winter of 1833-34, and again in the 1850s (Russell 1976:372). By 1876 there was a foreign market for apples, and 1880 was a big apple crop, which saw particularly large shipments go abroad.

However, even during this period of deforestation, individual trees and stands remained in southern New England. Studies of historical land-use surveys (which used “boundary” or “witness” trees as references) of Massachusetts forests in 1830 show trees remained in the form of cut-over forest; forests that were previously cut and in the process of re-growing; wetlands and poorly drained locations; rocky land, outwash, or well-drained sandy soils; bedrock ridges and steep slopes; and otherwise unsuitable land (Foster et al. 1998:104-105). While the overarching context was agricultural, woodlots still remained, even if scattered and disturbed by cutting, burning, and grazing (Foster et al. 1998:115). In addition, individual trees were still found on farms, such as along fences or in pastures (Foster et al. 1998:115). Land use was related to the landform and soil characteristics as well as practical concerns such the distance of fields from roads and houses. At one lot in Massachusetts, the most easily accessible land was tilled and cleared for pasture, but 13% was left continuously wooded and slightly more than 1% was left as marshland. Three wooded swamps in the center of the parcel made up a sort of permanent woodland, and were connected by “poorly drained seepages and adjoining steep or rocky sites” (Foster 1992:763).

Pollen from the Eastern Pequot reservation also shows the presence of trees during this period of deforestation. During the years 1714-1784 there was perhaps an opening of the canopy as signified by rising percentages of grass (Jacobucci 2006:84). However, arboreal pollen increased to 69.4%, with chestnut representing 42.2% of that amount (Jacobucci 2006:87). Oak and pine/spruce percentages decreased during this period, which Jacobucci (2006:87) speculated was perhaps due to intentional logging for building materials. During the years 1784-1864, at the height of Connecticut's deforestation, arboreal pollen decreased from 69.4% to 65.7% (Jacobucci 2006:87). Chestnut declined by 11.1% and birch decreased by 2.8%, but alder, maple, hickory, pine/spruce, oak, and beech all increased, numbers which do not reflect large-scale environmental disturbance or deforestation (Jacobucci 2006:87).

In the 19th century, most of the population across New England still used great quantities of wood to cook and keep warm. In 1848 a writer wrote of millions of cords consumed for family and domestic purposes: Boston bought 120,000 cords in 1825 and Salem used 30,000 cords in 1840. The growing iron, glass, tanning, shipbuilders, farm, and other industries also required immense supplies of charcoal and cordwood for forges and furnaces (Russell 1976:339,461). The railways also increased the demand; Vermont's railways burned 63,000 cords yearly. It was the late 1850s before Connecticut railways tried coal, and while coal made headway during the 1860s as a fuel for factories and railways, the Civil War meant that prices for cordwood remained high. Railroads had an especially high demand for white pine, which was selectively logged for this purpose (Bürgi et al. 2000:1134).

This, however, was the height of deforestation and open land in Connecticut and by 1870 approximately half of the farm land in New England was abandoned (Donahue 2007:13). Forest cover increased steadily after its drop to around 40% coverage in the mid to late 1880s (Bürgi et al. 2000:1128). Pollen from fifty-five sites across New England was analyzed and showed a large increase in birch that stayed at a higher level than was present before colonization (Russell et al. 1993:659). Oak shifted to more northern locations and declined in the south. Hickory was less common overall while remaining most common in the Connecticut River Valley and Eastern Lowlands. The chestnut blight removed this tree from the landscape in the early 20th century (Foster et al. 1998:109). One study found that in central Massachusetts, from the colonial to the modern period, oak decreased from 28.6% to 21.7%, chestnut declined from 8.2% to 0%, beech declined from 6.7% to 0.9%, and ash from 3.7% to 2.0%, while white birch increased from 0.3% to 5.7% and cherry increased from 0.65% to 3.1% (Bürgi et al. 2000:1130-1131).

Industrialization during the latter part of the 19th century contributed to a decline in agriculture and led to farm abandonment (Foster et al. 1998:104). While agriculture and use of wood for materials and fuel has declined since this period, and the extent and age of the forest has increased, this does not mean that the forest has reverted to a "natural" state. There is no "baseline" from which changes can be measured as human and environmental factors have influenced the makeup and character of the forest for thousands of years in New England—change, and human-derived change, is a part of the landscape (Foster and Motzkin 1998). Indeed, the current forests that began to re-grow after the nadir of forest in the 1850s are different from the forests that grew before, without any indication that they will return to previous compositions (Foster and Motzkin 1998; Fuller et al. 1998:84). Current forests are characterized by a greater homogenization of taxa, a disconnect between vegetation and the environment as reflected in growing days per year, and the formation of ahistorical assemblages (Foster et al. 1998:96; Thompson et al. 2013). Though similarities exist between the species that grew in the past and the present, the previous relationship between the location of where taxa grew (and how abundantly) and the climate seems to have dissipated (Foster et al. 1998:109).

New England's environment has changed in many different ways since the glaciers first retreated, including alterations in weather, changes in flora and fauna, and temperature fluctuations. Yet the rate of environmental change after European settlement, the wide-spread nature of colonial impact, and the loss of so much territory set colonization apart as a unique environmental situation for Native people in the region. Such rapid changes were not met with acquiescence, however. Rather, the Pequot kept enough trees on the reservation for their continued use, continued to grow gardens in both "old" styles and "new," continued to use traditionally American crops and integrated early imports like apples that eventually became part of their forefather's environmental legacies, and continued to fight for the proper boundaries of their land (Den Ouden 2005:162; Campisi 1990: 120-123; McBride 1990:110-111). In addition, while colonists cut down trees in vast quantities that created problems with erosion in the environment as well as in supplying homes with firewood, we see from both the pollen study and charcoal studied for this thesis, that the Eastern Pequot seemed to have instead better stewarded their forests, resulting in access to high-quality wood during at least the 18th and early 19th centuries.

CHAPTER 3

METHODS AND SITE CONTEXT

Materials and Site Information

The data in this thesis derived from over a decade of archaeological work conducted on the Eastern Pequot reservation. In 2003, the Tribal Council sought to "document material aspects of their history to accompany what was already known through oral and written histories," which led to a collaborative partnership between Dr. Stephen Silliman at the University of Massachusetts Boston and the Eastern Pequot Tribal Nation (Silliman and Sebastian Dring 2008:71). During ten seasons of field school excavations as of 2015, sixteen sites have been identified, all but two through visible surface features. While soil samples were taken from all excavated sites, this thesis focuses on select soil samples from four sites: 102-124 (excavated in 2007), 102-123 (excavated in 2005 and 2006), 102-126 (excavated in 2011), and 102-128 (excavated in 2009) (Table 1). While this thesis was initially intended to be a broad macrobotanical study, I did not find enough charred plant remains to incorporate into my primary analysis. Additional information and further discussion of seeds, nutshell, and starchy parenchyma is provided in Appendix A.

Table 1. Sites, Contexts, and Samples

Feature Name	Description	No. Samples Analyzed	Volume Floated (L)
<u>102-124</u>			
Feature A	Rectangular Pit under wigwam living surface	3	10
Feature B	Circular Storage Pit under wigwam	2	7
Off-Feature B	North of Pit for comparison	2	7
Feature C	Trash pit south of wigwam	1	3
STP	STP	1	4
	102-124 Total Analyzed Samples	**9**	**31**
<u>102-123</u>			
	South House Hearth	4	12
	North House Hearth	1	3
	Cellar	3	7
	Root Cellar	3	7
	Rock/Shell Midden	11	38
	102-123 Total Analyzed Samples	**22**	**67**
<u>102-128</u>			
	Rock Hearth	7	26.5
	102-128 Total Analyzed Samples	**7**	**26.5**
<u>102-126</u>			
	Chimney Fall	4	14
	Cellar Pit	2	5
	Midden	27	103.5
	102-126 Total Analyzed Samples	**33**	**122.5**
Total		**71**	**238.5**

Site 102-124

Site 102-124 is unique in that it is the oldest house to date found on the Eastern Pequot reservation. Ceramics point to an occupation between 1740 and 1760 with an MCD of 1752 (Fedore 2008:27; Silliman and Witt 2010:58). The lack of above ground architectural remains suggests that this structure may have been a wigwam or a wooden framed structure without stone elements (Hayden 2012:55; Silliman and Witt 2010:44). Three pit features were found in the core of the site, two of which were under the presumed floor of the structure (Feature A and Feature B), and the third of which was 4-5 m south of the structure (Feature C). Eight potential posthole features were also identified (Hayden 2012:56). In Features A and B artifact densities are high, diminishing within 2 m to the north, west, and east, with moderate density connecting house structure and Feature C (Hayden 2012:59,69). In addition to the soil samples taken from Features A, B, C, two samples were taken from the unit adjacent to Feature B for comparison ("Off-B"), with another single sample taken from an STP ("STP 9") removed from the center of the site for a "background" charcoal comparison.

Feature A spread across four excavation units at approximately 25-58 cm depth. It was a semi-rectangular pit beneath the living surface of the wigwam, and was both the largest in size (1-x-.5 m) and contained the most artifacts. At its deepest level shellfish remains, faunal remains, and charred wood were found; the center levels contained largest percentages of ceramics, vessel glass, sewing pins, buttons, nails, and pipe fragments (Hayden 2012:60,61). The next 20 cm of fill included a uniform artifact distribution which was capped with a level of ashy debris (Hayden 2012:62-63). Feature B is interpreted to be a circular storage pit also located under the living surface of the wigwam/structure, and underneath the northern edge of Feature A (Hayden 2012:64). The fill was similar to Feature A with charred wood, shellfish remains, faunal remains, ceramics, nails, bottle glass, and other artifacts present, though in much lower artifact quantities and proportions. Due to the lack of substantial quantities of household objects, as well as the circular shape, Feature B is interpreted as a storage pit that was filled before Feature A was dug (Hayden 2012: 65-66).

Feature C is the only feature located outside the wigwam, and seems to have been utilized as a food trash pit, as evidenced by the lack of domestic artifacts and higher levels of shellfish, faunal remains, and charred wood (Hayden 2012:66). Unfortunately, the lack of datable material means it is unknown whether this pit is contemporary with the other features, or pre-/post-dates the wigwam (Hayden 2012:66). Two samples were taken from the outside of the perimeter of Feature B (Off-B) and one sample from the perimeter of the site (STP 9). Both were taken in order to provide a comparative sample from an area where there was no discernable feature.

Site 102-123

Site 102-123 is unique in that two structures are present, indicating multiple construction phases (Hollis 2013:32, 34; Silliman and Witt 2010:59). Located approximately 120 meters to the north of site 102-124, occupation for much of this site most likely begins at approximately the same time the residents of 102-124 left (Silliman and Witt 2010:59). After two excavation seasons, it was determined that the largest stone features were each a dry-laid fieldstone chimney representing two wood-framed houses (Hollis 2013; Silliman and Witt 2010). This is most likely the remains of two sequentially occupied houses or multiple construction episodes for the same household (Hollis 2013:33; Silliman and Witt 2010:59).

The core of the site is approximately 500 sq. m and is characterized by a large spread of associated artifacts and features surrounding the chimney fall rock piles (Silliman 2009; Witt 2007; Witt and Silliman 2010). The southern chimney fall is associated with a rock-filled cellar on its north side (Hollis 2013:34). The northern chimney collapse, approximately 7 m north of the south chimney collapse, is not associated with an adjacent cellar (Hollis 2013:34; Silliman and Witt 2010:59). A dense shell and rock midden was discovered approximately 10 meters to the east of the house remains (Hollis 2013; Silliman and Witt 2010). Another small stone pile to the south, approximately 4 m to the southwest of the south chimney and associated cellar, is close to a depression that has been interpreted as a root cellar (Hollis 2013:34-35; Silliman and Witt 2010:59).

Artifacts cataloged and identified from the site presented an unusual dating pattern. Overall, less than 5% of the site's ceramic assemblage was pearlware, and that small percentage was primarily found at the bottom of excavation units around the house foundation, leading to the conclusion that this site was probably not occupied before 1780 (Silliman and Witt 2010:61; Witt 2007:82). The foundation, perimeter, and cellar hole associated with the south chimney all contain pearlware and the majority of the site was interpreted to have a 1788/1790s MCD; however, the root cellar not only lacked pearlware, but contained a ceramic assemblage that featured earlier ceramics, including white salt-glazed stoneware, tin-glaze earthenware, and slipware, which gives this location an earlier MCD of 1768 (Witt 2007:82-83; Silliman and Witt 2010:60). Since the top soil within the root cellar is a mottled A/B horizon, it is presumed that this depression was filled during a later period, perhaps with soil from the cellar hole dug in the house foundation. The difference between dates is attributed to a shift in spatial layout and activity around 1780, with the absence of refined pearlware, whiteware, transfer-prints and non-blue underglaze colors pointing to its occupants moving before 1800 (Silliman and Witt 2007:62).

Site 102-126

Site 102-126 is interpreted to have overlapped in use for approximately a decade with the site at 102-123. It is located approximately 450 m southeast of site 102-123 (Hunter et al. 2014:717). This site was identified by a chimney fall, around which a test pit survey was conducted at 5-m intervals. This led to the discovery of the midden where a 1m x 1m unit was opened south of the test pit. In total 4.75 sq. m—approximately 75% of the midden—was excavated. It appears to be an intentionally dug and filled pit covered by a spread of shells, bones, and artifacts. It covers approximately 1.5 sq. m with very little rock matrix and is overlain by a larger refuse deposit that extended up to 3 m north-south and 2 m east-west and to a maximum depth of 45 cm. It is located approximately 8 m from the house at the center of the site (Hunter 2012:34). Samples were also taken from around the chimney fall itself (Unit Q) just a few meters away as well as two samples from the cellar within the house (Units K and S).

Site 102-128

Site 102-128 was initially identified because of a chimney collapse stone feature (Hayden 2012:87). Unlike the other sites discussed in this thesis, where most artifacts came from feature contexts, this site had a wide-ranging scatter of artifacts–51% of faunal remains came from across the site, and 90% of the ceramics (Hayden 2012:92, 94). The mean ceramic date for the site is 1823, and this site features the only assemblage to contain whiteware, indicating occupation into the 1830s, with only a few artifacts dating to the mid-18th century, including a small amount of tin-glaze and brown/grey stoneware. A yellowware mug featuring a commemorative portrait of Lafayette's 1824 visit to America, along with a padlock dated to 1840-1901, both lend credence to the hypothesis that this site was occupied through the 1840s (Hayden 2012:90-92).

Laboratory Sampling

Seventy-one samples (totaling 247 L of soil) were selected for light fraction analysis and some heavy fraction scans. These soil samples were floated by students from Dr. Silliman's laboratory. I sifted the light fractions through four geologic sieves that separated each sample into 2 mm, 1-2 mm, .5-1 mm and <.5 mm categories to aid scanning and analyzed each portion separately. For most samples, I only minimally scanned the bottom <.5 mm (the scanned portion usually totaled under 1g), and then weighed and recorded it. The remaining larger fractions I fully scanned without subsampling. I scanned seeds and nutshells using a dissecting microscope at 10-40x magnification and initially viewed charred wood under the 10-40x microscope. If additional magnification was necessary, as it was for diffuse wood and softwood identification, then I used a compound microscope to look at cellular features at 200x-600x magnification. I removed and weighed starchy parenchyma from only the 2-mm sieve and I removed the charred wood, seeds, and parenchyma from the remaining sample and stored separately.

The comparative collection at the University of Massachusetts Boston was used along with printed reference guides to identify seeds and nutshell (Martin and Barkley 1973; Montgomery 1977). When identifying wood, each piece was manually fractured and examined on one or all of its three anatomical planes: the transverse, the longitudinal, and the tangential. Identifications were verified by comparison with the University of Massachusetts Boston Paleoethnobotany Lab's reference collection, as well as Hoadley

(1990), the Inside Wood website hosted by North Carolina State University and the Jefferson Patterson Park and Museum website. When no matching identifications could be found, additional comparative materials were collected to aid in charred wood identification.

Thirty pieces of charred wood (or all available pieces, if there were fewer than 30 in a sample) were selected via "grab-sample" methodology in order to avoid sampling biases (Smart and Hoffman 1987:176). When a piece of charred wood was determined to be either white oak or chestnut, but could not be confidently placed in either category, they were placed in an "oak-chestnut" category. Taking a more conservative approach to identification, pieces without a full ring present were automatically consigned to either "hardwood" or "softwood" category unless a secondary diagnostic feature was present to aid in genus identification, such as grid parenchyma for hickory, large rays for oak, banded parenchyma, or single-cell rays to distinguish between oak and chestnut (Marston 2009:2195).

Taphonomic Processes and Bias Factors

The macrobotanical remains identified in these samples do not represent a full portrait of the use of plants during the periods studied. Instead, both cultural and non-cultural factors have biased the remains recovered and the final pattern seen by the archaeologist (Théry-Parisot et al. 2010). Plants may be integrated into the archaeological record by both human and non-human sources, the latter of which includes seed rain and animals (Gallagher 2014). Those plants that have been brought into the site by human choice may or may not be preserved, as influenced by whether or not they would have been likely to encounter fire at the right temperature for charring, whether the depositional context was favorable to preservation, whether post-deposition disturbance, transportation, or secondary deposition occurred, and whether the plant itself was suited or ill-suited for preservation (Chabal et al. 1999:61; Dincauze 2000:331-332; Gallagher 2014; Pearsall 1989:224-225; Piqué and Barecló 2002:1; Popper 1988:55-58; Théry-Parisot et al. 2010:147).

The assemblage of preserved macrobotanical remains at the entire site is biased and reduced still further by excavation strategy, soil sampling strategy, recovery strategies (e.g., machine-assisted flotation or bucket-flotation), lab sampling or sub-sampling methodology, and the identification skills of the analyst (Dincauze 2000:336-342; Fritz and Nesbitt 2014:115-118; Popper 1988:58; White and Shelton 2014:111). Pearsall notes that depositional bias is part of every archaeological analysis, and points out that post-depositional biases are of the most concern to the paleoethnobotanist, since not all botanical material has an equal chance of being charred and preserved. Plants associated with fire are much more likely to become charred, and the morphological characteristics of the plant are relevant to whether it would be preserved in any identifiable form (Pearsall 1989:228-229).

CHAPTER 4

RESULTS

Scanning the 71 samples resulted in a total of 1,879 individual pieces of charred wood that represented 13 wood families and 21 genera (Table 2). From the 1,879 individual pieces of charred wood, 88 were unidentifiable. Many of these were too small to determine whether they were hardwood or softwood, some were knots, and others had a glossy, vitrified appearance that did not permit identification (see Chabal et al. 1999:51; Marco 2006:86; McParland et al. 2010 for possible causes of vitrified wood). The remaining 1,791 pieces (67.41 g) were at least identified as either hardwood or softwood with 1,294 (50.85 g) identified to the family level, and 1,092 (44.87 g) to the genus level. While many of the hardwood pieces were determined to be either ring-porous or diffuse-porous, these categories have been grouped together in the "hardwood" category for ease of analysis. Due to the identification issues between species, I have combined all oak, maple, and birch species (*cf.* Piqué and Barecló 2002:2). Because sites did not exhibit any signs of structural burning, all recovered charred wood is assumed to have been fuelwood rather than burned construction timbers.

Table 2. Common and Scientific Taxa Names of Identified Tree Families

Scientific Name	**Common Name**
Acer sp.	Maple
Betula sp.	Birch
Carpinus caroliniana	American Hornbeam
Carya sp.	Hickory
Castanea sp.	Chestnut
Chamaecyparis thyoides	Atlantic White Cedar
Fagus sp.	Beech
Fraxinus sp.	Black Ash
Juglans nigra	Black Walnut
Juniperus virginiana	Eastern Red Cedar
Malus sp.	Apple
Pinus sp.	Pine
Populus sp.	Aspen
Prunus sp.	Cherry
Quercus sp.	Oak

One species encountered most frequently in the 102-128 charred wood assemblage is currently unidentified using book, online, or reference collection references. It is a diffuse-porous wood with an even pore distribution, biseriate and triseriate rays, medium-sized intervessel pitting, simple perforation plates, and no spiral thickenings (Figure 1-Figure 4). After burning multiple varieties of modern apple (*Malus domestica)*, I identified this species as an unknown type of apple wood, though I did not encounter one with as many triseriate rays as I had seen in the pieces from the samples.

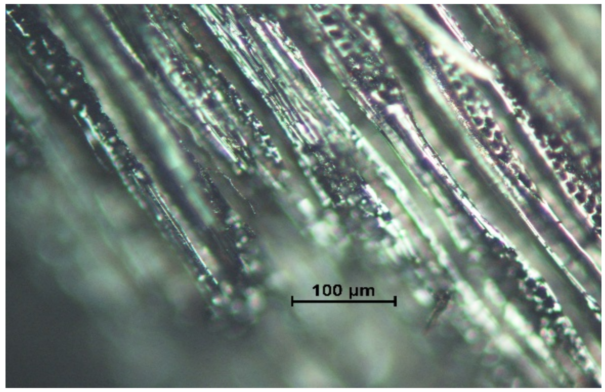

Figure 1. Charred wood from 102-128 identified as *Malus* sp. (rays)

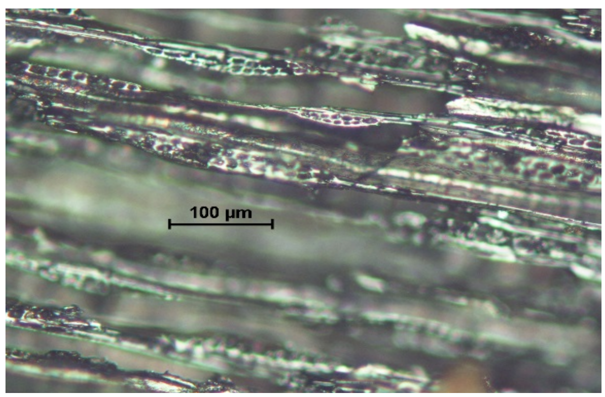

Figure 2. Another example of wood from 102-128 identified as *Malus* (rays)

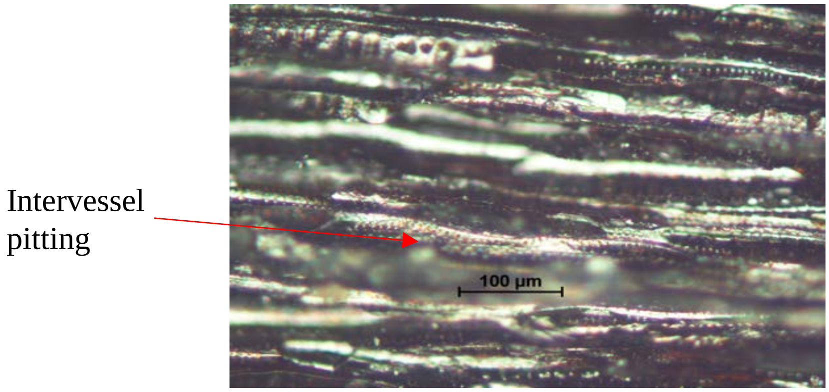

Figure 3. Charred wood from 102-128 identified as *Malus* sp. (Intervessel pitting)

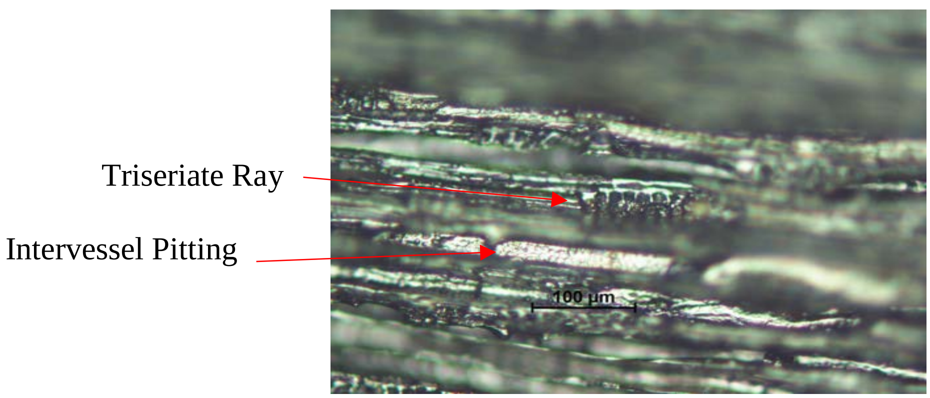

Figure 4. Charred wood from 102-128 identified as *Malus* sp. (triseriate ray and intervessel pitting)

Starchy parenchyma was the only macrobotanical remain other than charred wood to be found at all sites; the amount recovered totaled 30.44 g. Besides charred wood and starchy parenchyma, other recovered macrobotanical taxa were extremely sparse. A total of 21 other taxa were identified, most of which were recovered from the midden at site 102-126. The only taxa to appear at three out of the four sites were corn and raspberries.

Nutshell was also found at three of four sites, but most nutshells could not be identified to family or genus level. Bedstraw and huckleberry were each recovered at two sites (102-124 and 102-126 and 102-123 and 102-126, respectively); all other taxa were only present at one site. Excluding unidentified and unidentifiable seeds, plant parts, and buds, the raw count for seeds and nutshell was 10 at site 102-124, 3 at site 102-128, 17 at site 102-123 and 83 at site 102-126. These quantities are too low to support analysis other than presence/absence.

In this section, tables list counts and weights of charred wood recovered from each feature at each site as well as proportions based upon the number of pieces recovered from each feature. Different wood species fragment similarly into a large number of small pieces and a small number of large pieces, with pieces correlated to mass, and therefore counting pieces is a valid method of quantification (Asouti and Austin 2005:2; Byrne et al. 2013; Chabal 1990, 1992; Dufraisse 2002:20; Ludemann 2002:212). Proportions based on counts are often preferred due to a concern that relying on weight will over-represent more frequent taxa (which are usually over-fragmented) and hide rarer taxa (often under-fragmented) that are often represented by smaller pieces (Byrne et al. 2013:99). It is for this reason I base my proportions on counts. In relation to the charred wood studied for this thesis, many of the small fragments were too small to be identified further than hardwood or softwood. A Pearson's correlation of counts and weights for each feature at each site (Table 2) indicates a high degree of correlation (-1 is a strong negative correlation and +1 is a strong positive correlation) with one exception (Site 102-123), which is further discussed.

Table 3. Pearson Correlation of Counts and Weights by Feature at Each Site

Site	***r*=**
Site 102-124	0.8408
Site 102-123	0.4266
Site 102-126	0.9989
Site 102-128*	0.8870
All Sites:	0.9189

*Site 102-128 is composed of one feature. In lieu of comparing different features, I compared each sample within the feature.

When looking at the data by context, there is a very strong correlation between the total weight of the charcoal recovered and the numbers of liters floated (*r*=.945, *N*=14), however, much of that strength is due to one large sample from 102-126 (midden with 27 samples) and when that large site is removed as an outlier, the correlation is no longer significant (*r*=.458, *n*=13). Along the same lines, there is little correlation between the total weight of charcoal and the number of different taxa identified at a site (*r*=.240, *n*=14). The floatation sample amounts and total different taxa recovered from these contexts seem to fall into three groups (Figure 5). If 3L are sampled (the minimum), an average of 4 taxa was present (*N*=2). If between 4.5 and 7L were sampled, an average of 5.2 total different taxa were present (*N*=6, *SD*=1.9). If more than 7 liters were sampled, 7 taxa on average were present (*N*=6, *SD* = 2.3). The differences between the first two tiers are not statistically significant, but contexts with more than 7 liters had an average of 7 taxa, while those with 7 or fewer liters had an average of 4.9 taxa, which is statistically significant (*p*=.07, *DF*=12). The largest number of different taxa recovered was 11 which came from 7 samples recovered from 102-128 (26 total liters and 5 grams of total charcoal). These basic statistics suggest that neither the amount of charcoal recovered nor the total liters floated from a site are directly responsible for the species diversity (total number of taxa). Given this, it is likely that the variation in the total number of taxa recovered from a context is due to human and environmental factors, not archaeological sampling bias.

Thus, samples from features with less than 3L of soil floated are biased, and because of their small size they may not accurately reflect the actual diversity of the sampled deposit (unless the entire deposit was floated). On the other hand, features with more than 7L provide an accurate sample of the deposit. Smaller samples (in terms of L floated) have fewer taxa than larger samples up to a point, and that point would appear to be about 7 L. That being said, there is no correlation, either using all of the contexts (Figure 5) or just the contexts with 7 or fewer L sampled, between the total number of liters sampled and the number of different taxa recovered. This combination of statistics suggests that contexts with 7 or fewer L sampled may not be representative of their deposits, while those contexts with larger samples are probably representative of the species diversity in those deposits. However, positive results (i.e., increased species diversity) from the smaller samples should not be disregarded as the statistics suggest that sample size is not that critical a factor in determining the total number of species present. Conversely, negative results (i.e., low numbers of total taxa) from small samples, should not be considered representative of their deposit (unless the entire deposit was floated). That is, the absence of species from small samples is not a reliable indicator of their absence. Put another way, a correlation that would be expected if the features had been randomly sampled, is overwhelmed by the higher quality of the samples that were specifically picked in hopes they would be productive. As can be seen in Table 1, four of the fourteen features sampled were under the 7L threshold: Feature C (3L) and the STP (4L) at Site 102-124, the North House Hearth (3L) at Site 102-123 (which, as an abundantly productive sample, is an anomaly), and the cellar (5L) at Site 102-126.

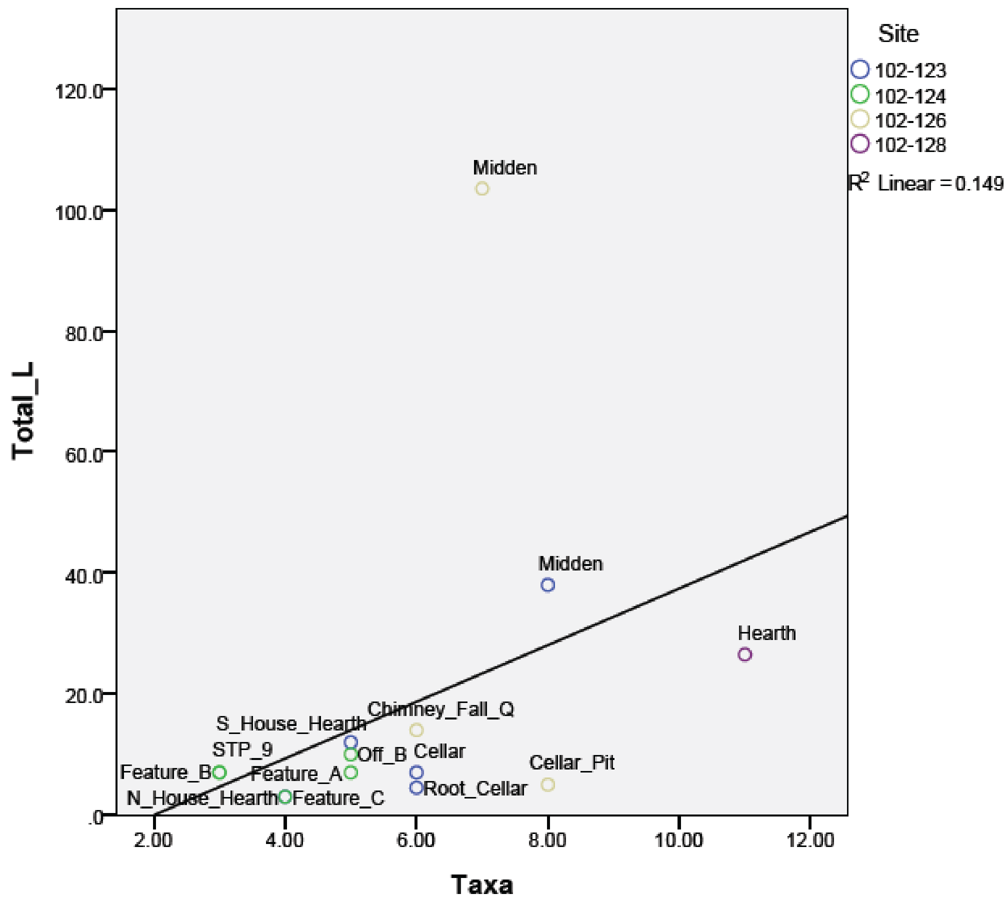

Figure 5. Graph of the relationship between total number of liters sampled and number of taxa present in each feature.

Results: Site 102-124

Nine samples from five different contexts were examined from Site 102-124, which yielded 270 pieces of charred wood from the three secondary-deposition features (Feature A, B,

C) with the Off-B and STP 9 samples taken to provide a background sample for comparison purposes (Table 4). With no sign of structural burning, the charred wood recovered from Feature A (a pit filled with trash), Feature B (a storage pit with some fill), and Feature C (a midden) is assumed to be fuelwood derived from hearths or other thermal features. The “Off-B” samples were taken from a higher level, closer to the ground surface, and may represent the very edges or scatter from the Feature B fill, or a mix of trampled charred wood from the site plus charred wood from environmental fires. The shovel test pit is away from both the structure and midden. Only very small pieces of charred wood were recovered from this unit, and may represent the very fringes of charred wood tracked around the site or environmental fires.

Table 4. Site 102-124 Counts and Weights by Feature

Common Name	**Feature A**	**Feature A**	**Off-B**	**Off-B**	**Feature B**	**Feature B**	**Feature C**	**Feature C**	**STP 9**	**STP 9**
Taxon	**Count**	**Weight(g)**	**Count**	**Weight(g)**	**Count**	**Weight(g)**	**Count**	**Weight(g)**	**Count**	**Weight(g)**
Apple	1	0.03	0	0	0	0	0	0	0	0
Ash	0	0	0	0	2	0.08	0	0	0	0
Beech	0	0	5	0.08	0	0	0	0	0	0
Birch	1	0.06	1	0.01	0	0	3	0.09	0	0
Black Walnut	4	0.16	0	0	0	0	0	0	0	0
Chestnut	7	0.25	0	0	1	0.03	2	0.11	1	0
Maple	0	0	1	0.12	0	0	0	0	3	0.01
Oak	36	2.18	7	0.08	18	0.27	6	0.15	3	0.03
Oak-Chestnut	14	0.51	4	0.03	11	0.20	1	0.02	6	0.05
Pine	0	0	0	0	0	0	2	0.06	0	0
Hardwood	25	1.20	37	0.20	24	0.19	13	0.15	11	0.06
Softwood	0	0	0	0	0	0	1	0.04	0	0
Unidentifiable	2	0.17	5	0.02	4	0.07	2	0.02	6	0.04
TOTAL	**90**	**4.56**	**60**	**0.54**	**60**	**0.84**	**30**	**0.64**	**30**	**0.19**
No. Samples	*3*		*2*		*2*		*1*		*1*	

Table 5. Proportions of Charred Wood Counts at Site 102-124

Common Name	**Feature A**	**Off-B**	**Feature B**	**Feature C**	**STP 9**
Maple	0.00	1.67	0.00	0.00	10.00
Birch	1.11	1.67	0.00	10.00	0.00
Chestnut	7.78	0.00	1.67	6.67	3.33
Beech	0.00	8.33	0.00	0.00	0.00
Black Ash	0.00	0.00	3.33	0.00	0.00
Black Walnut	4.44	0.00	0.00	0.00	0.00
Apple	1.11	0.00	0.00	0.00	0.00
Pine	0.00	0.00	0.00	6.67	0.00
Oak	40.00	11.67	30.00	20.00	10.00
Oak-Chestnut	15.56	6.67	18.33	3.33	20.00
Hardwood	27.78	61.67	40.00	43.33	36.67
Softwood	0.00	0.00	0.00	3.33	0.00
Unidentifiable	2.22	8.33	6.67	6.67	20.00
TOTAL	100.00	100.00	100.00	100.00	100.00
No. Samples	***3***	***2***	***2***	***1***	***1***
No of Pieces	***90***	***60***	***60***	***30***	***30***

I analyzed three samples from Feature A, which was the most of any feature at this site. I was able to obtain 30 pieces from each sample for a total of 90 examined pieces out of 10 L of soil. As a secondary-deposition feature, charred wood would have been deposited here after it was burned within a hearth or other place. Oak dominates the identified species of Feature A at 40%, and is followed by chestnut at 7.78% along with smaller proportions of black walnut, birch, and apple. At this site, this feature contained the most taxa.

Two samples (60 pieces) were examined from Feature B, which lay partially underneath Feature A. It is contextually very similar to Feature A as a secondary-deposition pit filled with trash; it is unclear whether the fill came from the same event or perhaps contained fuel wood tracked in from an earlier time or episode. Feature B also contained oak as the most dominant taxa (30%), but black ash is the second-most dominant taxa (3.33%) and is only present within this feature. Chestnut is also present in lower quantities (1.67%).

Feature C derives from a midden south of the structure containing Feature A and Feature B. In this feature, oak was again the most dominant taxa (20%), followed by birch (10%), and the same proportion of chestnut and pine (6.67%). Pine was the only softwood identified at this site and this feature contained the highest proportion of birch.

The “Off-B” samples (2 samples, 60 pieces) were taken from a higher level just outside of the boundary of Feature B, and thus could represent scatter from the filling episode or charred wood from later environmental fires. While unfortunately the majority of pieces from this area were too small to be identified further than hardwood (37 out of 60 pieces), it also contained oak as the most dominant taxa (11.67%), which was followed by a high proportion of beech (8.33%) and small proportions of maple and birch (1.67% each). The STP (1 sample- 30 pieces) also contained a large number of pieces that were unidentifiable or could only be identified as hardwood. Of those that could be identified to a species level, maple and oak were tied as the most dominant taxa (10%), and a small proportion of chestnut (3.33%) was found.

These proportions, with oak being the most populous taxa (or tied for that rank) across both feature and non-feature contexts supports the principle of least effort, assuming that oak is the most populous taxa in the environment. The two-control samples provide a somewhat different perspective with much smaller proportions of oak (11.67%

and 10.00% compared to 40%, 30%, and 20%) along with the presence of maple in only these features.

Results: Site 102-123

Twenty-two samples (558 individual pieces) from five contexts at site 102-123 were examined (Table 6). Two primary-deposition contexts were examined at this site (South Hearth and North Hearth) along with three secondary-deposition contexts (Midden, Root Cellar, Cellar). This allows a perspective on separate burning events representing multiple episodes and amalgamation of fuel wood in the secondary contexts, and theoretically short-term or single burning events in the primary contexts (Byrne et al. 2013:96). At this site, judging by the proportions calculated by the weight of recovered charred wood (Table 6), the South Hearth had been cleaned before abandonment, while the North Hearth contained the remains of a last fire. This site is interpreted as a likely multi-phase construction.

Table 6. Site 102-123 Counts and Weights by Feature

Common Name	Midden	Midden	S. Hearth	S. Hearth	Root Cellar	Root Cellar	Cellar	Cellar	N. Hearth	N. Hearth
	Count	**Weight (g)**	**Count**	**Weight (g)**	**Count**	**Weight (g)**	**Count**	**Weight (g)**	**Count**	**Weight (g)**
Apple	2	0.02	3	0.06	0	0	2	0.02	2	0.09
Aspen	1	0.01	0	0	0	0	0	0	0	0
Beech	0	0	0	0	0	0	1	0.02	0	0
Birch	1	0.02	0	0	1	0.01	1	0	0	0
Black Walnut	0	0	1	0.01	5	0.07	3	0.02	0	0
Cherry	2	0.04	0	0	0	0	0	0	0	0
Chestnut	24	0.28	3	0.02	7	0.05	2	0.1	1	0.05
Hickory	1	0.01	1	0.01	3	0.03	0	0	0	0
Maple	3	0.03	0	0	0	0	0	0	1	0.07
Oak	30	0.38	17	0.23	30	0.26	19	0.25	21	2.6
Oak-Chestnut	38	0.51	0	0	4	0	4	0.03	1	0.06
Pine	0	0	0	0	1	0.03	0	0	0	0
Hardwood	183	1.59	35	0.24	32	0.19	41	0.33	4	0.21
Unidentified	12	0.1	2	0	6	0	7	0.02	0	0
Total	**297**	**2.99**	**62**	**0.57**	**89**	**0.64**	**80**	**0.79**	**30**	**3.08**
No. Samples	*11*		*4*		*3*		*3*		*1*	

Table 7. Proportions of Charred Wood Counts at Site 102-123

Common Name	Midden	S. Hearth	Root Cellar	Cellar	N. Hearth
Maple	1.01	0	0	0	3.33
Birch	0.34	0	1.12	1.25	0
Hickory	0.34	1.61	3.37	0	0
Chestnut	8.08	4.84	7.87	2.50	3.33
American Beech	0	0	0	1.25	0
Black Walnut	0	1.61	5.62	3.75	0
Apple	0.67	4.84	0	2.50	6.67
Pine	0	0	1.12	0	0
Quaking Aspen	0.34	0	0	0	0
Black Cherry	0.67	0	0	0	0
Oak	10.10	27.42	33.71	23.75	70.00
Oak-Chestnut	12.79	0	4.49	5.00	3.33
Hardwood	61.62	56.45	35.96	51.25	13.33
Unidentified	4.04	3.23	6.74	8.75	0
Total	100	100	100	100	100
No. Samples	*11*	*4*	*3*	*3*	*1*
No. Pieces	*297*	*62*	*89*	*80*	*30*

North House Hearth

The North House Hearth was located approximately 8 m north of the foundation and South Chimney. Site forms note the presence of charcoal and a great quantity of artifacts mixed in with lots of ash and charred starch. As seen in Table 6, an incredible quantity of charred wood was recovered from this single sample, particularly when compared to the weight of the rest of samples from the Eastern Pequot reservation. While this sample represents just 3L of soil out of the total 67L, and 0.05% of the pieces counted, it accounts for 38.16% of the site's charred wood by weight with an average weight of .34g per piece. This I interpret to be indicative of a context where the charcoal wasn't cleaned out or broken down, e.g. the remains of a last fire. This feature brings the correlation between count and weight at this site to *r* =.42664, which is only moderately correlated (Figure 5) and the lowest of all sites. The assemblage was primarily composed of oak (70.00%), with apple (6.67%) and maple and chestnut (3.33% each) present.

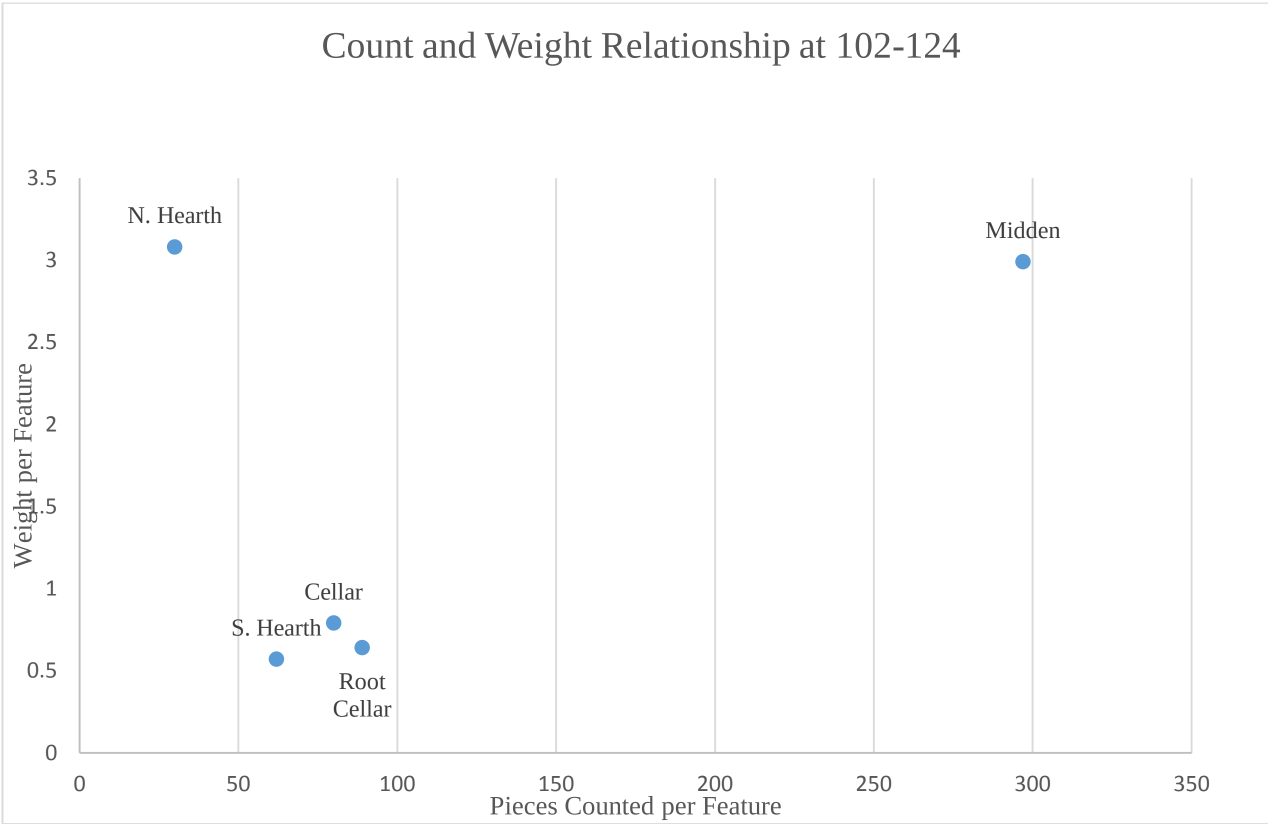

Figure 6. Illustration of the relationship between count and weight for each feature at Site 102-124

South House Hearth

The excavation of the South House Hearth provides a stark contrast to the North Hearth. This context was comprised of three samples totaling 9L of soil, yet the weight of charred wood recovered is much lower: only 7.06% of the site's total charred wood weight. In addition, I could not obtain the standard 30 pieces per sample from most of these light fractions: I found only 9 pieces from Level 4, 16 pieces from Level 6, 7 pieces from Level 6, and 30 from Level 7. The majority were too small to be identified. Out of the 62 total pieces, 35 (together weighing 0.24g—0.007g per piece) could only be identified as hardwood. Oak is again the most populous taxa (27.42%) followed by apple, chestnut, hickory, and black walnut. This context, while clearly cleaned out at some point, retains the same pattern of oak as the dominant taxon used for fuel wood, with a broader variety of secondary taxa. Chestnut and apple were present in both hearths in small quantities, which points to consistent taxa use during the houses' occupation. In addition, as smaller quantities of chestnut, apple, and black walnut were also present at site 102-124, this points to consistent taxa use spatially as well, with similar taxa being used in different locations (close as they are geographically).

Cellar

The cellar features are associated with the South Hearth chimney fall. I consider this feature as a secondary-deposition context because the cellar would presumably contain charred wood that fell through the floor as it was tracked around the house. The species recovered from this feature follow a similar pattern with higher proportion of oak (23.75%). Chestnut is usually the next most prevalent taxa at this site, but here black walnut takes that position (3.75%) followed by chestnut (2.50%), apple wood (2.50%), and smaller proportions of birch (1.25%) and beech (1.25%). Again, the preserved pieces were very small, and many pieces were unable to be identified to even a family level.

Midden

In terms of soil (38L floated from 11 samples) and pieces recovered (298) the midden was the largest assemblage scanned and examined for this site. However, it still ranks below the North House Hearth when considering the weight of the recovered wood.

Like the 102-123 contexts, many pieces were too small to be identified. For the pieces recovered from this feature, 183 were labeled only as hardwood, and together weighed only 1.59g—an average of 0.009g per piece. In spite of the identification issues, this midden does represent the most varied assemblage at site 102-124. This should not be due to the size of the sample, because according to the statistical analysis, this feature (38L-8 taxa), as well as the South Hearth (12L-5 taxa) are large enough (greater than 7 L) that the samples should contain the full range of taxa present within each feature. Indeed, the root cellar and the cellar contexts (7L each) contained 6 taxa in each, one more than the South Hearth. I interpret this as possibly meeting the expectation that secondary-deposition contexts contain a charred wood composition more reflective of the surrounding environment through long-term deposition of multiple firing events. While the pieces that could not be distinguished between oak or chestnut make up the largest identified category for this feature (12.79%), it contains relatively high proportions of oak (10.10%) and chestnut (8.08%) along with smaller quantities of cherry, maple, birch, hickory, and aspen.

Root Cellar

The root cellar is the oldest context at this site. Again, the small size of the pieces recovered led to difficulties in identification. Like the other contexts at this location, oak is the highest proportion at 33.71%, followed by chestnut at 7.87%. The other taxa identified align with those found in the other features across the site. Black walnut (5.62%) was present in small quantities in the South House Hearth and associated cellar, but not the North Hearth or midden. Hickory (3.37%) was present in the midden and South House Hearth, but not the North Hearth or cellar. Pine (1.12%) was only found in this context. Finally, birch (1.12%) was also present in the midden and cellar in addition to this root cellar. This context is also the only one at this site that did not contain apple. Apple was found at the earlier 102-124 site, so this appears to be a contextual difference rather than a diachronic change; the presence of pine was low at 102-124 and the following site 102-126, so this also appears to be a consistent with overarching site patterns through time.

Site 102-126

Site 102-126 contained three features that were analyzed: a midden, cellar, and chimney fall, which together totaled 33 samples and 990 pieces (Table 8). The midden and cellar are both secondary-deposition contexts. The chimney fall contexts I consider as a primary deposition context since the charred wood recovered from this context presumably came directly from the nearby fire, if not the hearth itself. At this site there is great disparity between the amount of soil examined for each feature.

Table 8. Site 102-126 Counts and Weights by Feature

Common Name	Midden	Midden	Chimney Fall	Chimney Fall	Cellar	Cellar
	Count	**Weight (g)**	**Count**	**Weight (g)**	**Count**	**Weight (g)**
Apple	0	0	0	0	1	0.01
Ash	5	0.42	0	0	1	0.31
Beech	0	0	0	0	2	0.2
Birch	4	0.11	3	0.12	0	0
Black Walnut	14	1.3	2	0.14	1	0.01
Cherry	0	0	0	0	1	0.01
Chestnut	145	6.65	10	0.89	5	0.12
Hickory	17	1.25	9	1.02	0	0
Maple	10	0.52	2	0.04	1	0.02
Oak	262	18.88	17	2.29	8	0.12
Oak-Chestnut	63	1.94	5	0.09	4	0.08
Hardwood	245	2.87	65	2.11	33	0.53
Unidentifiable	45	8.91	7	0.16	3	0.07
Total	**810**	**42.85**	**120**	**6.86**	**60**	**1.48**
No. Samples	*27*		*4*		*2*	

Table 9. Proportions of Charred Wood by Count at Site 102-126

Common Name	Midden	Chimney Fall	Cellar
Maple	1.23	1.67	1.67
Birch	0.49	2.50	0
Hickory	2.10	7.50	0
Chestnut	17.90	8.33	8.33
American Beech	0	0	3.33
Ash	0.62	0	1.67
Black Walnut	1.73	1.67	1.67
Apple	0	0	1.67
Cherry	0	0	1.67
Oak	32.35	14.17	13.33
Oak-Chestnut	7.78	4.17	6.67
Hardwood	30.25	54.17	55.00
Unidentifiable	5.56	5.83	5.00
Total	100	100	100
No. Samples	*27*	*4*	*2*
No. Pieces	*810*	*120*	*60*

Chimney Fall

This context contained oak (14.17%), along with high proportions of chestnut (8.33%) and hickory (7.50%) and smaller proportions of birch, black walnut, and maple. When excavated, two samples from the lower level featured higher quantities of oak, chestnut, hickory and all of the black walnut. Conversely, along with lower quantities of oak, chestnut, and hickory, the upper levels contained all of the birch and maple diffuse-porous wood.

Midden

Throughout eleven levels, the proportions of charred wood correlate with the shellfish and faunal remains, with the largest overall weights and the greatest counts of oak and chestnut found in Levels 6 and 7. Rather like a bell curve, levels 6 and 7 at the center have the greatest weight, followed by levels 5 and 8, which I interpret to reflect the peak of trash disposal at the site (Figure 7). Like other contexts, the midden contains a high proportion of oak (32.35%) followed by a large amount of chestnut (17.90%), and then smaller amounts of hickory, black walnut, maple, ash, and birch. This midden also contained the only identifiable nutshell fragments, including an acorn, black walnut, and hickory shell, plus one hazelnut shell fragment—a tree that was not found among the fuel wood. Interestingly, though this feature represents the greatest amount of soil and pieces examined, and as a secondary-deposition context is expected to provide the most representative portrait of taxa used by the people living at this site, the midden only contained 7different total taxa, one fewer than the cellar, and only one more than the chimney fall samples. This again illustrates how samples with smaller volumes can have greater species diversity than would be expected than if floated volume determined the number of taxa recovered. It also illustrates how samples over 7L are representative of the deposits they are sampled from – the number of different taxa did not rise even with the copious amount of soil analyzed, and the cellar (with only 5L floated) still resulted in one additional taxon.

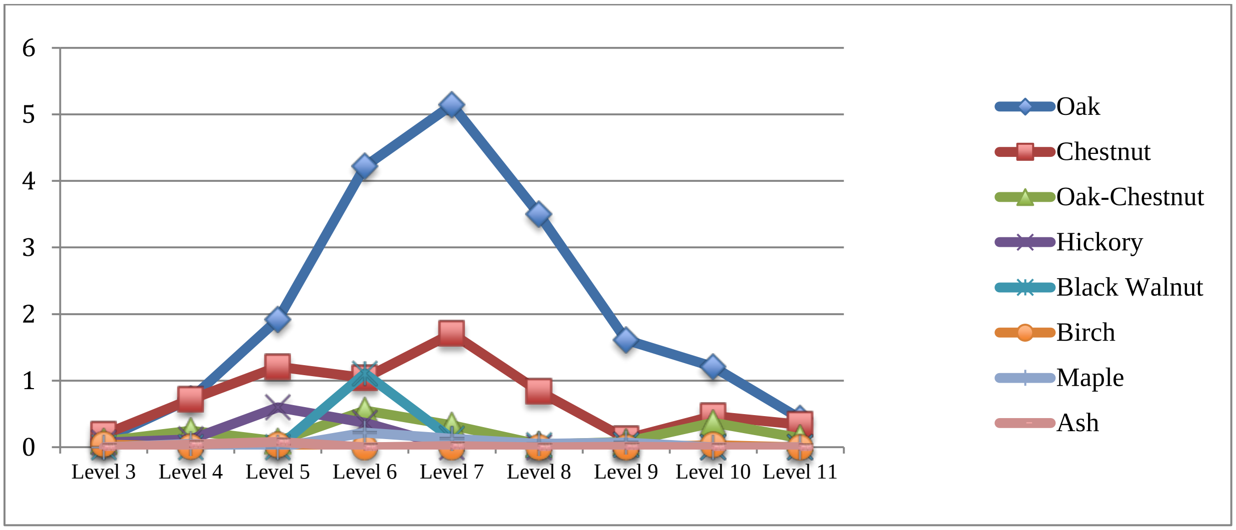

Figure 7. A graph representing taxa weights within the midden for each level

Cellar

The cellar contained the most taxa of all the contexts at the site. Like the other two contexts, oak and chestnut were the top two taxa (13.33% and 8.33% respectively), but it also had an abundance of taxa that included beech, maple, ash, black walnut, apple, and cherry. Birch and hickory were not present in this context, despite their presence in the midden and chimney fall.

Overall, this site's charred wood assemblage is very similar to sites 102-124 and 102-123. Oak again is the most populous taxon, and is followed by chestnut as the secondary taxon. Hickory is present in higher quantities here than at the other sites, and there was no softwood recovered from any feature at this site. The beech, cherry, and apple wood were all concentrated in the cellar contexts, with birch and hickory appearing in the chimney fall and midden. Ash was found in the midden and cellar samples but not in the chimney fall.

Site 102-128

Unlike the other sites, only a single context was examined at 102-128—a 1–x-.5-m hearth directly in front of chimney remains. Seven samples were examined which resulted in 181 individual pieces. As a hearth, this is a primary deposition context that could be assumed to represent a single or short-term series of fires comprised of fuel wood. This could in turn lead to a fear that this context does not provide a full representation of the fuel wood used at this house since it is not a secondary-deposition context presumed to more accurately reflect the surrounding environment. However, this context contains the most diverse assemblage of any feature studied with 11 taxa represented (Table 10).

Table 10. Counts and Weights and Proportion by Count at Site 102-128

Common Name	**Count**	**Weight(g)**	**Proportion by count**
Maple	2	0.06	1.10
American Hornbeam	3	0.06	1.66
Hickory	7	0.17	3.87
Chestnut	26	0.99	14.36
Atlantic White Cedar	4	0.11	2.21
Beech	3	0.17	1.66
Black Walnut	2	0.01	1.10
E. Red Cedar	1	0.01	0.55
Apple	46	1.83	25.41
Pine	2	0.01	1.10
Oak	11	0.42	6.08
Oak-Chestnut	4	0.02	2.21
Hardwood	62	1.05	34.25
Softwood	2	0.02	1.10
Unidentifiable	6	0.06	3.31
TOTAL	**181**	**4.99**	**100**

This site presents a much different portrait of fuel use than the earlier sites. Whereas oak completely dominated the charred wood found at the 18th-century sites, here we see it replaced by an extraordinarily large quantity of apple wood (25.41%), which is in turn followed by chestnut (14.36%). Chestnut was the most frequent species at a nearby Mashantucket Pequot site (MCD 1837) during this same period (Farley 2012:29). With oak dominating sites 102-124, 102-123, and 102-126, the drop in oak usage to 6.08% at this site (the lowest percentage of oak in any context examined, including the two non-feature contexts) presents a radical change in taxon use. Three additional taxa also appear for the first time at this site: two types of cedar (Atlantic and Red), as well as American hornbeam. On the converse, this site is also the only site that does not contain any birch. Hickory, maple, black walnut, and pine are found in proportions similar to at least some of the other sites.

These results provide a helpful perspective. We can see a general trend that the earliest three sites (102-124, 102-123, and 102-126) used primarily ring-porous hardwood taxa (oak and chestnut) with a variety of other hardwood trees, and did not use much softwood. The similarities in taxa at those same three sites also indicate we are not simply seeing household-level differences, but rather a general trend to which we can compare the changes in taxa and proportions at 102-128, as well as to the general environment.

CHAPTER 5

ANALYSIS

By comparing the abundance of taxa found on the Eastern Pequot reservation to other rankings, we may be able to identify what factors the Eastern Pequots were taking into account when gathering wood to burn. Other researchers have compared abundance ranks to caloric values of various species as well as to the distance one would have to travel to obtain it. In this instance, as I am interested in whether or not the Principle of Least Effort applies – whether or not wood use reflects the overall proportions in the landscape and thus presents what I would assume to be a prioritization on time and effort over other factors – I compare my ranked taxa for each site to a pre-colonial forest reconstruction based upon witness trees (Thompson et al. 2013). This particular reconstruction was a broad, regional study that encompassed data from 701 towns across nine states: Maine, New Hampshire, Vermont, New York, Massachusetts, Connecticut, Rhode Island, New Jersey, Pennsylvania (Thompson et al. 2013). This region was then further subdivided into ecoregions as defined by the U.S. Forest Service (Thompson et al. 2013). The Eastern Pequot site falls into the region they termed the “Eastern Broadleaf Forest,” which in this study is a region located primarily along the coast in parts of southern Maine and south-eastern New Hampshire, central-east Massachusetts, all of Connecticut, Rhode Island, and New Jersey, and the far-eastern regions of Pennsylvania and New York (with a few towns on the far-western sides) (Thompson et al. 2013:3). Out of the 701 overall towns studied, 177 are located in the "Eastern Broadleaf" ecoregion (Thompson et al. 2013: 8). It is this ranking, not the overarching ranking of the nine-states, that I use for comparison.

The current forest composition cannot act as an accurate representation of the forest during the period studied, as previously discussed. Pollen data reflect regional and local vegetation and cannot be used as an absolute representation for either. Differences in pollen production and dispersal, as well as the location from which the core was taken, also creates discrepancies between the actual forest environment and the pollen data, which means that pollen data cannot be used as an additional rank order with which to compare the data from this thesis (Jacobucci 2006:49).

The following rank order (Table 11) uses this witness tree taxa as a measurement for "pre-colonial" forest composition. Data was taken from town surveys completed from 1620 to 1825 for initial European settlement as well as from a variety of primary sources that include maps, file books, manuscripts, and other records (Thompson et al. 2013:2). That said, witness tree rank order also cannot provide a full portrait of the environment. The authors note that their data was based upon information that was not random, and therefore it is not known whether the assemblage is statistically strong, and in addition, the data were collected over 150 years using different survey methods. However, the authors have found their data to correspond with pollen studies, pointing to some level of accuracy. Their focus on the landscape before European settlement led them to exclude all towns that contained apple trees on the basis that apple trees represented colonial influence (Thompson et al. 2013:13). This, of course, is unfortunate for the Eastern

Pequot data set which reflects the integration of apple as a food and fuel source during the nearly two centuries during which these data were compiled.

Table 11. Precolonial Relative Abundance of Taxa from Broadleaf Forest Ecoregion from Thompson et al. 2013

Taxa	Pre-Colonial Broadleaf Forest %	Rank
Oak	40.5	1
Pine	9.8	2
Beech	9.7	3
Maple	9.2	4
Hickory	6.2	5
Chestnut	5.5	6
Hemlock	5.4	7
Birch	3	8
Ash	2.9	9
Hornbeam	1.3	10
Basswood	1.1	11
Elm	1.1	11
Poplar	0.9	12
Spruce	0.7	13
Cherry	0.4	14
Tulip Tree	0.4	14
Black Gum	0.3	15
Magnolia	0.2	16
Walnut	0.2	16
Cypress	0.1	17
Fir	0.1	17
Sycamore	0.1	17
Cedar	0	
Tamarack	0	

The chart below shows the results of comparing the ranks of species at each Eastern Pequot site compared to the witness tree data (Table 12). I used Kendall’s τ-b coefficient “which is an appropriate correlation coefficient for ordinal rank data on a variable scale with ties present in the ranks" (Marston 2009:2196). A score of 1.0 indicates perfect positive correlation and a score of -1.0 indicates negative correlation (Marston 2009:2196). The associated *p*-values were calculated with a 95% confidence interval. I used the free software program JASP to calculate these values. As seen below, none of my results were statistically significant. The rankings of all four sites were combined into one table and also compared; these numbers were again statistically insignificant with a Kendall's τ-b score of 0.257 with a *p*-value of .274 (Table 13). When looking at only the top 5 taxa (not including apple) in attempt to compare only the most dominant taxa, a similar pattern emerges (Table 14).

Table 12. Comparison of Rank Orders

Taxon	**Site 102-124**	**Thompson**
Apple	6	
Ash	5	9
Beech	3	3
Birch	3	8
Black Walnut	4	16
Chestnut	2	6
Maple	4	4
Oak	1	1
Pine	5	2
Kendall's τ-b		0.265
p-value		0.375
Taxa	**Site 102-123**	**Thompson**
Apple	3	
Aspen	8	
Beech	8	3
Birch	6	8
Black Walnut	3	16
Cherry	7	14
Chestnut	2	6
Hickory	4	5
Maple	5	4
Oak	1	1
Pine	8	2
Kendall's τ-b		-0.085
p-value		0.753

Taxa	**Site 102-126**	**Thompson**
Apple	9	
Ash	7	9
Beech	8	3
Birch	6	8
Black Walnut	4	16
Cherry	9	14
Chestnut	2	6
Hickory	3	5
Maple	5	4
Oak	1	1
Kendall's τ-b		0.278
p-value		0.358
Taxa	**Site 102-128**	**Thompson**
American Hornbeam	6	10
Apple	1	
Atlantic White Cedar	5	
Beech	6	3
Black Walnut	7	16
Chestnut	2	6
E. Red Cedar	8	
Hickory	4	5
Maple	7	4
Oak	3	1
Pine	7	2
Kendall's τ-b		0.077
p-value		0.797

Table 13. Combined Site Rankings Compared to Witness Tree Ranks

Taxa	**Combined Site Data**	**Thompson**
American Hornbeam	12	10
Apple	3	
Ash	9	9
Aspen	13	
Atlantic White Cedar	11	
Beech	8	3
Birch	7	8
Black Walnut	5	16
Cherry	12	14
Chestnut	2	6
E. Red Cedar	13	
Hickory	4	5
Maple	6	4
Oak	1	1
Pine	10	2
Kendall's τ-b		**0.257**
***p*-value**		**0.274**

Table 14. Comparisons of the Top 5 Taxa (Apple Excluded) Compared to Witness Tree Ranks

Site	**Kendall's τ-b**	***p*-value**
Site 102-124	0.265	0.375
Site 102-123	0.00	1.00
Site 102-126	.200	.817
Site 102-128	-0.333	1.00
All Sites	.200	.817

As noted above, the witness tree ranking was derived from data that does not purport to accurately represent the absolute proportions of trees in the environment. Statistically, these results do not meet the Principle of Least Effort expectation that the proportions of wood would match the overall environment. However, oak appears to have been the dominant taxa on reservation property as seen through the charred wood presented in this thesis and as supported by the witness tree data, which perhaps indicates the principle of least effort is generally being applied. The smaller taxa proportions may or may not match in actuality and could be a result of inaccuracies in the witness tree data or local variations in secondary taxa.

In examining fuel use on a diachronic scale, the focus shifts to whether Eastern Pequot fuel wood use changed over time. I hypothesize that if we encounter a household where access to high-quality fuel wood (such as hickory, oak, and chestnut) is problematic, for whatever reason, we will see the diversity of fuel wood increase and the quantity of prime woods used decrease. We find the highest diversity in terms of the number of taxa present in the 102-128 hearth, which is contra-expectation if we expect secondary-deposition contexts to contain a higher diversity than hearths. However, since this is the only context at this site, we can only compare it to the diversity of contexts from the other sites. It is possible that if a secondary-deposition context was present at this site, it might have contained even more taxa than this hearth. Or, perhaps this hearth was used for an extended period of time and thus contains a collection more similar to a midden. Regardless, this youngest dated hearth has the highest number of taxa found of any context studied for this thesis. This would support the interpretation that access seems to become more difficult at least at Site 102-128. As noted earlier, diversity and the size of the samples examined in each context do not correspond (Figure 5). The hearth at site 102-128 was the most diverse and represents just 9.05% of the total count of examined pieces, while the 102-126 midden represents 40.5% of all pieces studied.

Finally, I return to the proportions listed in Chapter 5, which I separated by primary-deposition contexts (Table 15), non-feature contexts (Table 16), and secondary-deposition contexts (Table 17). I have done this since the anthracology methodology predicts that primary deposition contexts contain more short-term fuel (helpful for understanding how people used wood on a daily basis), and secondary contexts contain a longer-term picture of site fuel use (that can be used to help reconstruct the overall environment) (Asouti and Austin 2005; Byrne et al. 2013:96; Chabal et al. 1999; Parisot et al. 2010:143; Pozo 2002:114). I wanted to be able to compare the diversity of the contexts to see if any major differences appeared between features in terms of represented taxa—and if so, whether I could explain them contextually. However, the diversity of taxa did not vary greatly between primary and secondary contexts, and the majority of both secondary- and primary-deposition contexts contained between 4 and 6 taxa. After the most diverse 102-128 hearth context, the next six most diverse contexts included 5 secondary contexts and 1 primary context, all but one with 7L or more analyzed per feature. While the 102-123 North Hearth that was not cleaned out (and contained just 4 taxa) possibly serves as an example of the how examining only primary-deposition contexts could under-represent the breadth of taxa used, it is just as likely that this is due to the fact that only 3L from this context was analyzed, which is below the statistical threshold that was established for obtaining most of the taxa in a feature. Overall it appears that both secondary and primary features analyzed contain a similar level of diversity as long as 7L or more was sampled. As seen below, oak is the top-ranked taxon in all features with the sole exception of the hearth at site 102-128 (11 out of 12 contexts). Chestnut is most often the second ranked taxon or tied for second (at nine out of fourteen contexts). There are two contexts where chestnut is not present, and at the remaining three contexts, chestnut is ranked third. The remaining taxa present are present in small amounts in often similar quantities that fall greatly below the proportions of oak present.

The witness tree data ranks the top six taxa as oak, pine, beech, maple, hickory, and chestnut. With oak's dominance in the charred wood, combined with the witness tree data, this may support the Principle of Least Effort where the most populous wood is the most commonly utilized. However, chestnut's presence as the second-highest taxa, rather than pine, challenges a straight-forward interpretation. Chestnut's high rank is a bit more challenging to figure out in relation to the surrounding environment because the question of the dominance of chestnut in the New England landscape is a difficult one. Chestnut has been identified as one of the major species in eastern forests (Faison and Foster 2014; Thompson et al. 2013:13). However, the witness tree data seems to point to a much lower percentage, with chestnut ranked beneath pine, beech, maple, and hickory. Across the East Coast, chestnut has been given a relative abundance of just 3.3%. Chestnut's most dominant stands were in Appalachia and even then are calculated to be as populous as just one-quarter of the abundance of oak in the same region (Thompson et al. 2013:13). Other studies have reached the same conclusion, with chestnut abundance always below 25% of the forest, and oak and beech the dominant species (Faison and Foster 2014). This discrepancy could be explained in multiple ways. There could have been a chestnut cluster on the Eastern Pequot reservation (perhaps intentionally cultivated), and the PLE might extend to cover chestnut as another locally populous species. Also, ethnographic studies have often pointed to wood being gathered not around homesteads, but instead along paths or locations related to work or other activities (Biran et al. 2004; Byrne et al. 2013; Dufraisse 2006b:95-96; Dufraisse 2008:199; Gelabert et al. 2011). It is associated with labor and movement and here may indicate that it is being gathered in other places where the inhabitants regularly lived and worked and walked. That is, chestnut could have been gathered from a wider catchment area, especially if chestnut mast was being intentionally sought (though, like most other food stuffs, no chestnut shells were recovered). It is also possible that while oak meets the PLE, chestnut was intentionally sought as a popular fuel source over the more widespread pine, which is generally thought to be less suitable for fuel wood. Or phrased in the reverse—pine was avoided intentionally, but chestnut happened to be the next-most-available option. This set of taxa could also be seen as a combination of the principle of least effort with a set of cultural standards overlaid. If the witness tree data is right that oak was the most populous taxa in the region, it seems the Eastern Pequot would not have had to go far out of their way to obtain a high-quality fuel wood. Combining the dominance of oak with the lack of pine, and the outsized presence of chestnut in comparison to pine, could perhaps indicate there was a cultural bias towards obtaining wood that was thought of as more suitable to burn.

Table 15. Taxa Ranked by Abundance by Count Proportions – Primary Deposition Contexts

Taxa	102-123 S. House Hearth	102-123 N. House Hearth	102-126 Chimney Fall	102-128 Hearth
Apple	2	2		1
Atlantic White Cedar				5
Beech				6
Birch			4	
Black Walnut	3		5	7
Chestnut	2	3	2	2
E. Red Cedar				8
Hickory	3		3	4
Hornbeam				6
Maple		3	5	7
Oak	1	1	1	3
Pine				7
Total No. Taxa	*5*	*4*	*6*	*11*
Liters	*12*	*3*	*14*	*26.5*
Pieces	*62*	*30*	*120*	*181*
No. Samples	*4*	*1*	*4*	*7*

Table 16. Taxa Ranked by Count Proportion – Non-Feature Contexts

Taxa	102-124 Off-B	102-124 STP 9
Apple		
Ash		
Aspen		
Beech	2	
Birch	3	
Black Walnut		
Cherry		
Chestnut		2
Hickory		
Maple	3	1
Oak	1	1
Pine		
Total Taxa	*4*	*3*
Total L	*7*	*4*
Total Pieces	*60*	*30*
Total No. Samples	*2*	*1*

Table 17. Taxa Ranked by Count Proportion - Secondary Deposition Contexts

Taxa	102-124 Feature A	102-124 Feature B	102-124 Feature C	102-123 Midden	102-123 Root Cellar	102-123 Cellar	102-126 Midden	102-126 Cellar
Apple	4			4		3		4
Ash							6	4
Aspen				5				
Beech		2				4		3
Birch	4	3	2	5	5	4	7	
Black Walnut	3				3	2	4	4
Cherry				4				4
Chestnut	2		3	2	2	3	2	2
Hickory				5	4		3	
Maple		3		3			5	4
Oak	1	1	1	1	1	1	1	1
Pine			3		5			
Total Taxa	*5*	*4*	*4*	*8*	*6*	*6*	*7*	*8*
Liters	*10*	*7*	*3*	*38*	*7*	*7*	*103.5*	*5*
Pieces	*90*	*60*	*30*	*297*	*89*	*80*	*810*	*60*
No. Samples	*3*	*2*	*1*	*11*	*3*	*3*	*27*	*2*

CHAPTER 6

INTERPRETATION AND CONCLUSION

Taking into consideration the proportions of recovered charred wood taxa, the comparison between the ranked charred wood taxa and the witness tree data, the diversity index results, and the rankings by abundance, what then can we understand of Eastern Pequot fuel use both at a household level, and over the course of more than 100 years?

Site 102-124 Household Interpretation

Occupied between 1740 and 1760, the inhabitants at this site were living in Connecticut just after the number of European settlers had more than doubled, and colonists were searching for more homesteads, woodlots, pasture, and planting grounds (Den Ouden 2005: 66-68; McBride 2005:36). In March 1757, Joseph Fish recorded sixteen houses and wigwams with seventy-one people, including twenty-one school-aged children, living on the Eastern Pequot reservation; he also observed that they did not have enough land to generate enough income to support a school, but rather were poor and living on “somewhat Profitable” lands from which they would “really need the most or all the Profits” (Letter from Joseph Fish to the Commissioners of Indian Affairs 1757). Encroachment was an ongoing problem on both the Mashantucket Pequot reservation (with petitions submitted in 1735, 1741, 1747 and 1751) and on the Eastern Pequot reservation (with petitions submitted in 1713, 1723, 1749, and 1750). The Eastern Pequot’s dispute with William Williams and Nathan Crery, which occurred during the occupation of this house, show the difficulty in keeping their fields of corn and beans (of at least an acre) from being either destroyed by roaming animals or stolen by Williams who “Gathered and Carried away the Same” (Committee Report on Pequot Land 1749). It also notes their need for pasture for their cattle, sheep, and hogs, and the fact that there had been “Considerable…Timber Cutt” by the encroachers during this period (Committee Report on Pequot Land 1749). The matter was “resolved” with 55 acres being given to Williams and Crery and the rest being left to the Eastern Pequot, which reduced further the land and resources available to the inhabitants of this site (Committee Report on Mary Mamoho's Complaint 1751).

Trigg and Bowes’ (2007) paleoethnobotanical study of a Mashantucket Pequot site from the 18th century provides an analogous study with which we can compare wood use at this time. There, they found 37% oak and chestnut, 10% conifers (including pine), 5% hickory, and smaller amounts of maple, willow, dogwood, and ash (Trigg and Bowes 2007:4). The analysis of a 17th-century site on the Mashantucket reservation provides yet another comparison. At that site, wood remains were divided into “prime” and “non-prime” categories, with prime wood making up just over 60% of the assemblage, with the remainder “non-prime” wood—an indicator that the Mashantucket during this period still had access to good firewood (Trigg et al. 2007).

The results of oak as the number one taxa across all Eastern Pequot contexts (26% of all pieces at 102-124), with smaller proportions of chestnut and beech (Figure 8), seem to reflect that the house’s inhabitants did not lack access to high-quality wood despite the cutting of wood on the reservation by encroachers, keeping in mind that 48% of pieces could not be identified to a family or genus level. The analysis of the off-B and STP samples at this site, with much lower proportions of oak, fewer taxa, and the only maple present on the site, provide a background that illustrates just how different the intentional use of fuel is from charcoal that perhaps is not derived from hearths or perhaps even intentional burning episodes. While there was not a statistical correlation between the witness trees and charred wood data, the high quantities of oak and chestnut recovered from these sites does match the witness tree data's conclusion that oak and chestnut were widely available (Figure 8).

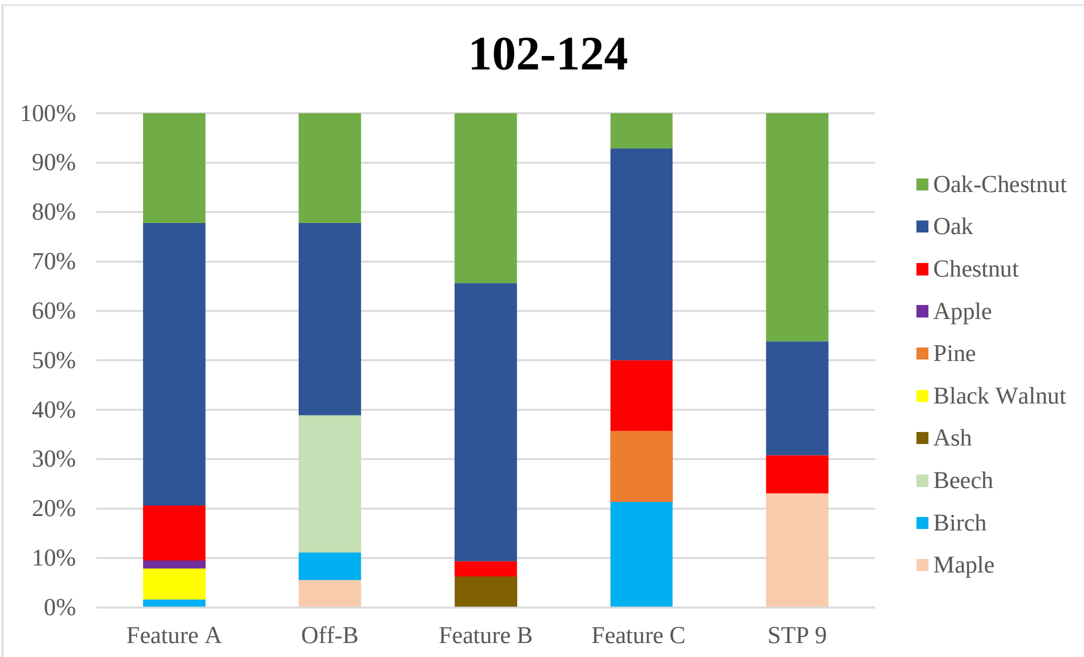

Figure 8. Bar chart of identified taxa in each feature at Site 102-124.

Site 102-123 Household Interpretation

Encroachment was still an issue during this period (1768-1790). A petition dated May 6, 1800 requested help from the Connecticut General Assembly since "the White people At pleasure turn in their Cattle, horses, & Sheep upon our lands, which eat and destroy the herbage thereon…there is A Number of Aged and helpless people in our tribe that suffer for want of food, and there is no provision for them" (Petition of Stonington Indians Regarding Encroachment on Their Lands 1800). Some Eastern Pequot men had left to join the American Revolution, which did not end until 1783. In addition, it is highly probable that some went west to join the Brothertown movement after the Revolutionary War ended in 1783 (McBride 1990:108).

Joseph Fish at this period was attempting to build a schoolhouse on the reservation, and went to Cyrus Wheeler's house to ask "the Favour of Timber" to build a school house (Joseph Fish's First Eastern Pequot Journal 1775). Wheeler agreed and re-confirmed his agreement to "give them Timber, off his Land, adjoining Indian Land, for the Frame of the School house & Logs & c.: of old Stuff, already down, enough to Cover the house, viz. Board shingle, Clapboards & c: We talked of 20 feet square" (Joseph Fish's First Eastern Pequot Journal 1775). This raises questions as to whether enough timber was available. Fish's note fifteen years prior (1757) concerning the Pequots' need for most or all the "profits" of their lands perhaps provides the answer (Letter from Joseph Fish to the Commissioners of Indian Affairs 1757). By the time the schoolhouse was built a few years later, Fish noted that the Pequots were "not Zealous to send the Children, nor to get Wood" (Joseph Fish's First Eastern Pequot Journal 1775). However, a little less than a month later, on February 14, 1774 he notes that there were seldom fewer than 7 pupils per day, and "that they had wood" (Joseph Fish's First Eastern Pequot Journal 1775). Rather than pointing to a simple scarcity of trees, this may instead speak to a reluctance to part with a valued resource, a disinclination for expending labor for the sake of a school, or a convenient excuse to not send the children at all. By the 1790s, colonists took note of "greatly reduced" timber trees that were "quite gone in many parts," and hickory was becoming scarce (Cronon 1983:114,160). These years also hosted numerous instances of plagues and bad weather, including a dry year in 1778, severe winters from 1779-1781, and summer droughts in 1780 and 1782 (Russell 1976:168-169).

At this site, the proportion of oak recovered was 46.10% (Figure 9). The North House Hearth provides an excellent example of what taxa might have comprised a typical fire, with a large proportion of oak bolstered by smaller quantities of other taxa like apple, maple, and chestnut. The South House Hearth contains a similar assemblage, with a larger quantity of oak followed by apple, chestnut, hickory, and black walnut. The secondary-deposition contexts mirror these hearths but include a higher diversity as befitting a longer history of charred wood deposition. While oak and chestnut were regionally dominant, the inclusion of apple alongside a number of other species lends credence to the idea that perhaps an apple orchard was growing at, or within a short distance of, the house during this period and suggests that "least effort," opportunistically exploited wood was also utilized.

The quantities of wood found continue to point to the quality of fuelwood the Eastern Pequot were able to access and burn. While deforestation was continuing in the region, they utilized oak, useful for a number of different uses, and also chestnut, valued for its rot-resistant properties, and hickory, which was widely prized as a high-quality fuel wood. If the request for off-reservation timber to build a school—and the note that the Eastern Pequot parents were reluctant to send wood to the school—is related to a scarcity of trees or fuel on the reservation, we certainly do not see it present in the archaeological record during this period.

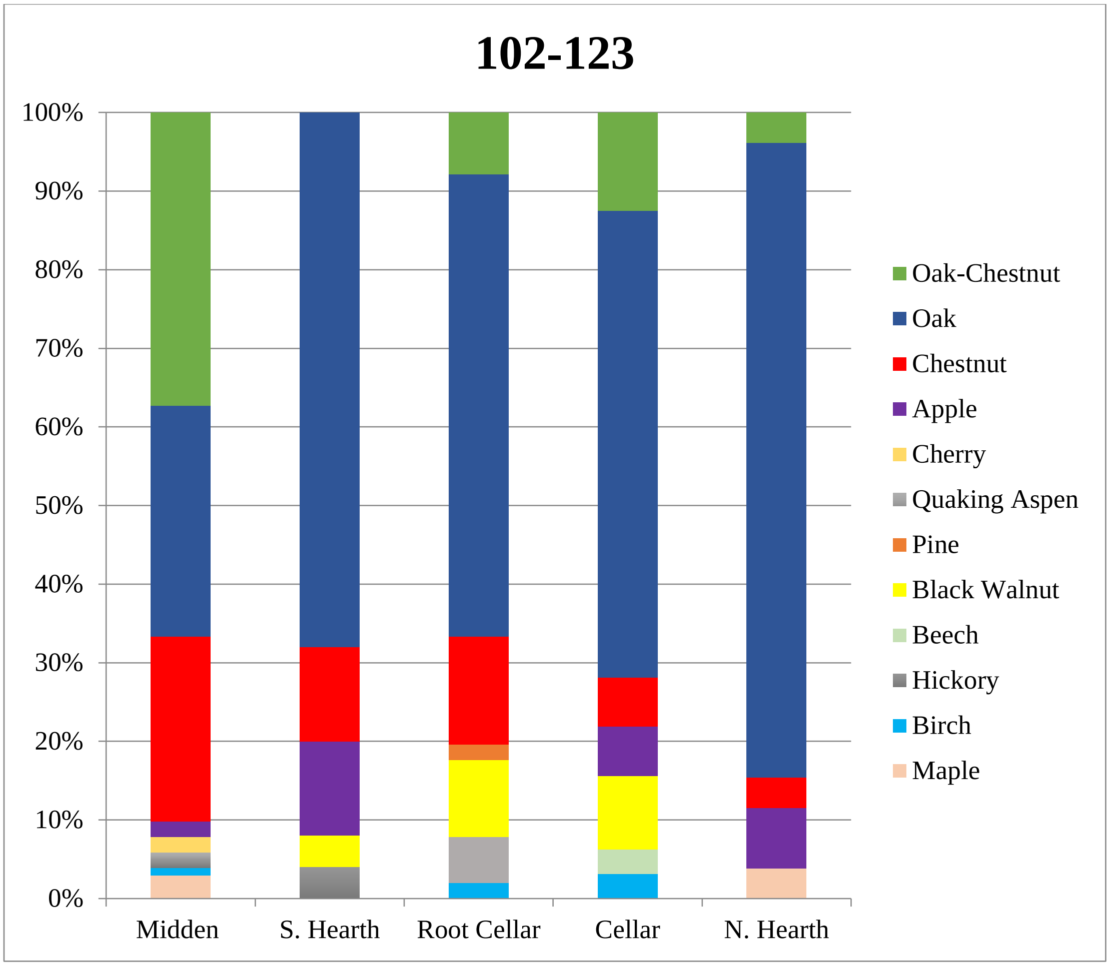

Figure 9. Bar chart of identified taxa in each feature at Site 102-123.

Site 102-126 Household Interpretation

Site 102-126 is interpreted to be closely contemporaneous with site 102-123, with its occupation interpreted as from 1775 to approximately 1800. As such, most of its social and historical context, as well as its environmental context, is identical to site 102-123. This also provides an excellent opportunity to compare assemblages and determine whether both sites represent their mutual surrounding landscape, or whether individual, hyper-local variations (the presence of a personal orchard) or other elements of synchronic variability appear. Between these two sites most taxa overlap; site 102-123 also contained pine and aspen, while site 102-126 contained ash. These similarities point to a very similar environment both households are utilizing for fuelwood, including apple. In addition, the similarities between the respective hearth and midden contexts at sites 102-126 and 102-124 help to assure us that extrapolations do not represent household-level idiosyncrasies. The taxa found at this site provides additional evidence for the argument that the Eastern Pequot reservation was not deforested during this period and they were still able to regularly access high-quality fuel wood (Figure 10).

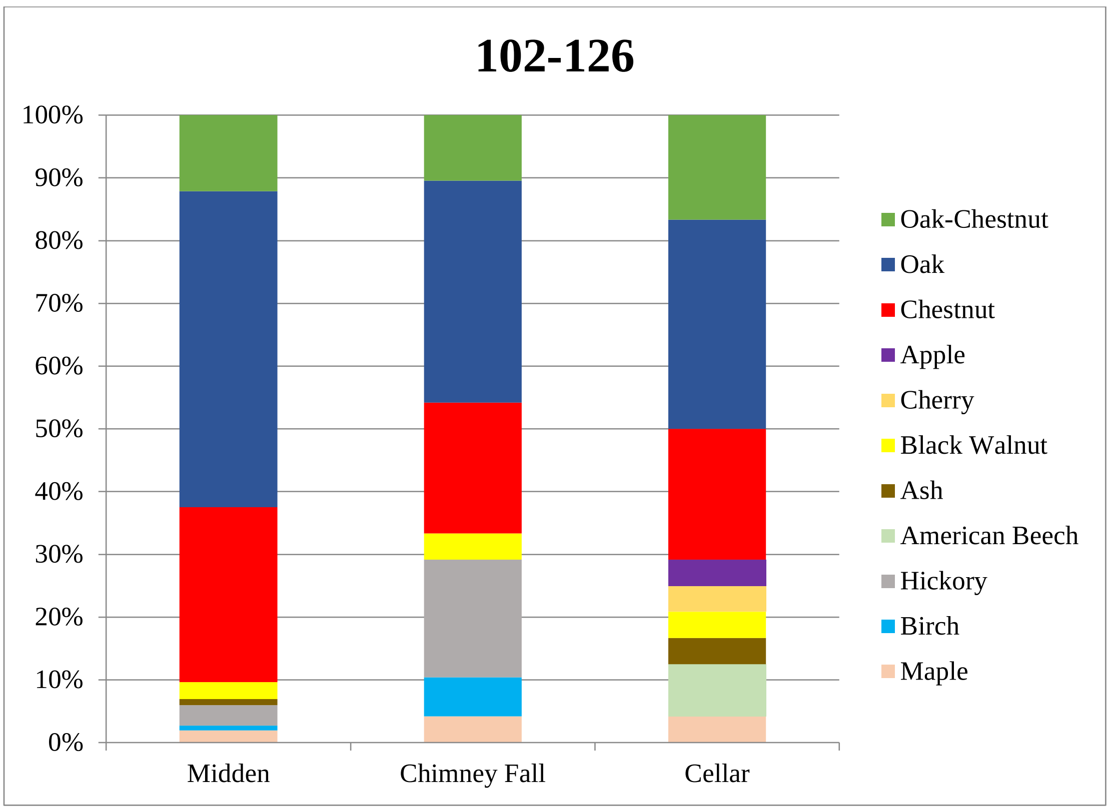

Figure 10. Bar chart of identified taxa in each feature at Site 102-126.

Site 102-128 Household Interpretation

The most recent site considered in this thesis, site 102-128 was occupied from 1830 to 1850 with a mean ceramic date of 1823. During this period, there were three overseers assigned to the Eastern Pequot: Silas Chesebrough (who acted from 1827 through his removal via the Eastern Pequot's petition in February 1834), Ezra Hewitt (1835-1844), and Elias Hewitt (1844-1850). In the petition for Silas' removal, the tribe is described as in a "destitute and helpless condition," which therefore necessitated that their "little" reservation be "managed in the most judicious and economical manner" (Eastern Pequot Petition of selection of North Stonington for New Overseer 1834). All three left detailed records of the transactions with which they were involved. While not all reservation inhabitants availed themselves of overseers, and the people who did often used them in different ways—from single types of resources (e.g., molasses, corn, fabric, apples, fish, meal, pork) to a broad spectrum of goods and services—these records provide a helpful, household-level insight into the daily practices, subsistence needs, and material objects of the Eastern Pequot (Farley 2013). Overseers recorded their transactions with varying levels of detail. While most included each item or service provided with exact quantities, the cost, and the name of the person requesting the good or service, others kept broad records that omitted various specifics. While records concerning the installment, rejection, and replacement of overseers exist from the late 1760s, the first detailed overseer report we have is that of William Williams and Enos Morgan, who kept records from 1813-1820.

The first mention of any type of wood is an entry for "timber to cover a cellar" (Henry and Silas Chesebrough 1825-1827). The first mention of fuelwood seems to be a series of temporary yearly deliveries for Cyrus Shelley: "cutting and carting 3 loads wood" for $1.50 in January 1829, "4 oxen and 1 hand 1 day each drawing wood" in March 1830, and "3 loads of wood oxen and one hand to get it" in December 1831

(Henry and Silas Chesebrough 1825-1827 and Silas Chesebrough 1827-1831). Whether these times represent a shortfall when wood was hard to come by, a temporary illness, a need upon re-arrival at the reservation, or another short-term issue is unknown. On February 6, 1836, a Charlotte Wheeler received two loads of wood for $2.25 (Ezra Hewitt 1835-1840). From January 1846 to December 1848 Molly Gardner received at minimum thirteen loads of wood (Elias Hewitt 1844-1850).

During this period, forest coverage in Connecticut is at its nadir with less than 30% of the state forested in 1860 (Irland 1999:123). The burgeoning railway and iron industries, farmers' cleared lands, the great quantities of firewood required for cooking and heating, and the need for many different farm tools and household utensils, all of which were made from wood, combined to create a context ripe for widespread deforestation during this period (Russell 1976:386). The deforestation period has been split into periods of speculation (1730-1750), low-intensity agriculture (1750-1790), commercial agriculture and small industry (1790-1850), and farm abandonment and industrialization (1850-1920). While this timeline is based on central Massachusetts history, Connecticut's history would have been roughly similar as the shifts follow the same pattern throughout the region (Foster 1992:755,768). By the mid-19th century, farmsteads were ubiquitous and forests had been harvested in large quantities with remaining woods "sprout forest." In 1909, over 95% of hardwoods in Connecticut were under the age of 41 years (Irland 1999:123).

A comparison between a Mashantucket Pequot household with a MCD of 1837 and a European household estimated to have been occupied from the late 1700s through 1880 can provide a comparative example of wood use during this period. The total wood proportions and ranks for the Mashantucket Pequot household were as follows: chestnut (85.50%), walnut/butternut (5.12%), oak (2.09%), maple (0.99%), hickory (0.23%), and smaller amounts of pine, beech, and hemlock (Farley 2012:45). The European household fuel-wood context contained oak (73.75%), hemlock (18.77%), chestnut (3.61%), white cedar (1.81%), and smaller amounts of pine, walnut/butternut, maple, birch, and hickory (Farley 2012:44). The greater number of taxa at the European household may point to a more diversified context, as it is known that this site was occupied for a longer period of time. Farley (2012) interpreted the large amounts of chestnut and hemlock to perhaps be related to tannin production, which was a household industry at the time.

Site 102-128 on the Eastern Pequot reservation is the only site with a single context: a primary-deposition hearth feature. Eleven samples (26.5 liters) were examined, which resulted in eleven identified taxa (Figure 11). Primary deposition contexts like hearths are theoretically supposed to contain *fewer* taxa, and thereby feature more bias towards a short-term picture or criteria-based gathering episode. The fact that this context contains the highest number of identified taxa in a single context—and along with site 102-123 has the most taxa overall (despite containing only 181 pieces in comparison to other contexts which contain nearly 300)—highlights how diachronic studies provide us with a helpful base line for what is and is not a high number of taxa. It also indicates an increase in diverse wood used for fuel, which may indicate scarcity of preferred or common wood taxa.

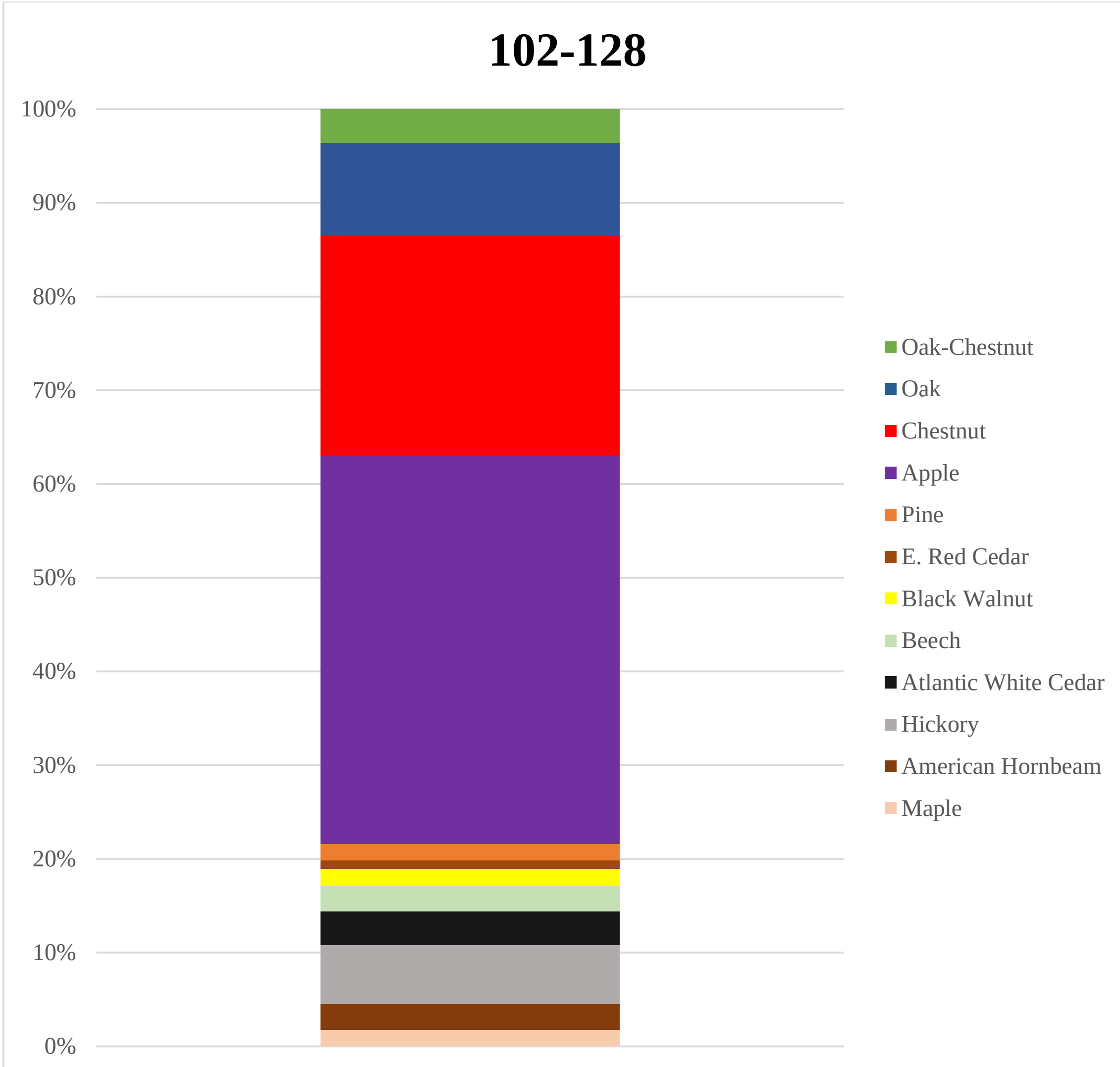

Figure 11. Bar chart of identified taxa in each feature at Site 102-128.

Looking at the relation between this context and the overall landscape, a case for deforestation does exist. We know that Connecticut would never be more deforested than during this period of 1830-1850, and this hearth does not contain the oak that was clearly a dominant fuel wood for over a century. The increase in softwoods can also be seen as a shift to less high-quality wood that had never been used in great proportions in the past. Softwoods can also grow quickly and colonize old fields (Heather Trigg 2016, pers.

comm.). We also see a much heavier utilization of apple wood, which at earlier sites appears to be a supplementary, minor part of the fuel-wood assemblage. Primary sources detail a lack of trees, though as we have seen this does not mean a complete absence of trees. Combined with the (perhaps overly negative and bleak) description of the Pequots as destitute and helpless, as well as the injunction that their new overseer manage their little land-based wealth judiciously, the archaeological record may well confirm that the Pequot were affected by the ongoing environmental conditions in Connecticut, and/or their financial state and circumscribed territory, resulting in at least one household's inability to access the same quality of firewood that had been gathered or chopped in the past. Trigg and Bowes' (2007:5) prediction of seeing deforestation through "a shift from preferred woods to less desired wood" and/or "a broader range of fuel types" certainly seems to fit perfectly with what we see here. In addition, the fact that chestnut instead of oak is the first ranked taxa at the Mashantucket Pequot site during this period lends additional weight towards the idea that the Pequot were broadly suffering from a lack of high-quality fuel wood. However, taking additional lines of evidence into account provides a caution towards a too-hasty acceptance of this explanation.

The arboreal pollen on the Eastern Pequot reservation did dip during this period—but only from 69.35% to 65.65%, which is more than the decline that was recorded from 1354-1504 (Jacobucci 2006). The overall conclusion of the pollen analysis was that the Eastern Pequot core sample did not reflect overarching environmental disturbance during this period, but perhaps did capture some minor disturbances and more climatic variations through the increases and decreases of the arboreal pollen species (Jacobucci 2006:87-88). In addition, if the reservation was deforested to the point where residents had trouble acquiring firewood, we would expect to perhaps see an increase in the number of people requesting overseer assistance, albeit with the caveat that not all people accessed overseer services, and others only used them for a narrow range of needs. Instead, during this period we see a single woman, Molly Gardner, requesting assistance (Elias Hewitt 1844-1847, 1847-1850).

While there is no recorded income from trees or timber at this time, we have a number of records of people “drawing” wood, presumably from reservation property, as records often link drawing wood with plowing gardens and note the same labor was used for both. We also see overseers selling fuelwood and timber from the reservation in the next decades (Isaac W. Miner, Leonard C. Williams, and Charles P. Chipman). While after the period this site was occupied, notations of “drawing wood” appear one or twice a year from 1861-1866 with additional entries in 1873-1875. In 1871, tribal income was generated by selling railroad ties and timber, with a particularly astounding notation that 400 chestnut trees were sold for $0.20 per tree, for a total of $80.00, along with $2.00 worth of “old logs.” This clearly illustrates that they have trees advanced enough to sell. A decade later, entries record eight cords of oak wood being sold for $32.00 and 6 1/8 cords of chestnut being sold for $18.37; additional entries for “timber,” “piles,” “one tree,” “wood from the land,” “poles,” “juniper posts” and bills for drawing and carting wood appear through the 1870s into the early 1900s (Leonard C. Williams Overseer Records 1868-1877; Charles P. Chipman Overseer Records 1877-1883; Herbert Billingsly Overseer Records 1900-1904).

These trees could be regrowth from seedlings that were too young to be used for firewood at the period this site was occupied. If the eight cords of oak sold were planted in 1850, they would be 31 years old at this point, which would be young, but acceptable for coppicing or cutting. There is no record of the size of the trees, and while oak grows at a “slow” 12-14 inches per year, chestnut is a fast-growing tree that can grow 18-24 inches per year. Chestnut could be cut in twenty-year intervals, oak was often chopped under the age of 60 years old, and young “poles” were often sold (Hawley and Hawes 1912:32).

In addition, we need to weigh the interests of the overseers in selling these resources. Leonard C. Williams and Charles P. Chipman attempted to sell all but 130 acres of the reservation with the funds to be placed in a bank account for the benefit of the tribe, an action which the Eastern Pequot met with a petition and remonstrance (Eastern Pequot Remonstrance Opposing Sale of Land 1774). Perhaps the reservation was not well forested to the point that timber sales would be of little consequence to the residents, or perhaps the overseers valued money in the bank above all else. However, the fact that such quantities of wood were present speaks to forestation that must have been present at some level.

If there is evidence that counters the idea that the Eastern Pequot reservation was experiencing extreme deforestation at this time, what else could then account for the fuel selected here? The hearth context could indicate that this is a “snapshot” of one moment in time that does not reflect the broader environment. Perhaps an apple orchard was directly outside the house, or was recently pruned, and there is simply an abundance of wood about so that there was no need to go out and gather oak. Perhaps temporality played a role where weather-related issues could have necessitated a close trip instead of a gathering expedition—in short, this hearth could represent an example of a “least effort” gathering trip. The higher taxonomic diversity would support the idea that there was little to no species-based selection involved, and simply the most convenient wood was gathered.

An additional possibility builds upon this same concept. Looking at the archival record, we have seen that the Eastern Pequot people requested assistance with fuel wood at various times. Most entries before this time have been few in number, from which it can be inferred that the need was infrequent and perhaps related to extenuating circumstances. This connection is confirmed in later cases, where Leonard Nedson and Eunice Cottrell, described as “a cripple” and “aged,” respectively, are the ones who receive assistance with wood and plowing/turning gardens at the same time —in other words, physical tasks.

In addition, the labor required to get the wood, drawn from the reservation, is noted. This is the case both before this site was occupied and afterwards, but it does not appear to be the case during this period. The average cost for a load of wood plus labor averaged to $2.20, with individual entries ranging from $1.00 to $3.75; these entries without exception name either the number of hands and oxen, or else the individual who chopped the wood. The entries for wood given to Molly Gardner (and the one 1836 entry for Charlotte Wheeler) include no labor costs or names, and average just $0.61 cents per load (excluding the two “grouped” entries, one of which was $6.00 for “sundry times” wood was delivered, and the other for $45.00 covering 15 weeks of care, supplies, furnishings, and fire-wood for when she was ill). Individual entries for Molly’s wood range from $0.34 to $1.25. In addition, while the entries’ wording could be attributed to the idiosyncrasies of language choice, Molly’s (and Charlotte’s) wood is the only fuel in the record which is described as being “delivered,” “furnished,” or simply as “to wood,” in comparison with “drawing,” “cutting,” “getting,” “carting,” and “chopping.” The lack of labor notation, the seemingly cheaper costs that seem to imply less labor was involved, and the verb choices in the entries, open the possibility that this was wood bought off-reservation and delivered, rather than deriving from the reservation itself.

While this line of logic could be considered tenuous at best, the dating provides some additional weight. Site 102-128 contained whiteware and transfer-print pearlware that places occupation into the 1830s. The excavation of a mug featuring Lafayette’s 1824 trip plus a padlock manufactured between 1840-1901 led to the hypothesized occupation of this site through the end of the 1840s. The overseers often recorded life events when they incurred costs. The first mention of Molly in 1845 notes that she was being cared for during an illness, which again would link fuel-wood requests to physical inability. She was sick again from July 2 through September, and then from September through December 28, 1848, during which time she was often confined to her bed, and during which period it took two people to take care of her. On January 15, 1849, she and her things were moved to Harry Gardner’s house, and on July 7, 1849, entries listing costs for her coffin, grave clothes, horses and a wagon to deliver the coffin, and a “beggar’s grave” finish her presence in the archival record. Her move and death coincide neatly with the abandonment of this site. While I certainly do not claim to have definitely identified the occupant of this house through charred wood remains, it at least needs to be considered as a possibility that the wood in this hearth does not represent deforestation on the Eastern Pequot reservation, but rather the deforestation of *Connecticut*. The presence of apple as the top-ranked species also makes sense. The 1830s brought cold winters that affected many trees, and by 1840 the apple trees that blanketed southern New England were being cut down or abandoned (Russell 1976:372). It would be logical that firewood peddlers would sell cheap and easily accessible wood, which it seems was the case with apple trees at precisely this period.

Conclusion

The criteria that Eastern Pequot households were using to select wood is open to multiple possibilities. The long-term integration of apple wood along with the numerous, more typically used, wood taxa like chestnut, black walnut, and cherry I would argue supports the principle of least effort to some degree, though perhaps with some cultural preferences for ring-porous hardwoods like oak and chestnut over softwoods like pine. The dominance of oak in the region as shown through witness tree data, combined with its number one rank in the charred wood record in both primary- and secondary-deposition contexts, points to oak being also the most populous taxa on the reservation. In regards to chestnut’s presence as the second most-used taxon, while it is possible that the reservation contained a chestnut cluster, it is probable that chestnut was present in sufficient quantities to still support the principle of least effort.

However, the lack of correlation to the witness tree data may point to least effort with still some selectivity involved. For example, pine is represented in very small amounts here despite its larger presence in pollen and witness tree rankings. It seems other taxa were so abundant that pine could be ignored in spite of its perhaps more prominent position in the landscape. This combination of employing the PLE along with the avoidance of certain commonly found taxa has been noted in other studies (Byrne et al. 2013; Gelabert et al. 2011). In addition, availability of wood may be determined in part by tree morphology rather than, or in addition to, abundance. Branches may have different vulnerabilities to breaking, related to the cube of branch diameter, as well as the presence of lateral branches that might help share the load of snow or ice (Cannell and Morgan 1989). “Bending failure” is also related to physiological properties such as low transverse compressive strength and the ratio between species’ longitudinal and tangential tensile strength (Casteren et al. 2011). Studies of different species identified the early wood in ring-porous wood to be a “mechanical weak point” in contrast to diffuse-porous wood, as the diffuse pores allow fractures to be diverted (Casteren et al. 2011). This may be another contributing factor to the “least effort” principle, where ring-porous branches (such as oak and chestnut) are easier to find in comparison to diffuse-porous branches (such as maple or apple). In addition, studies have found that characteristics that help trees resist ice storm damage include “excurrent (conical) branching patterns, strong branch attachments, flexible branches, and low surface area of lateral branches” (Hauer et al. 2006:10). Conifers (such as pine) have the excurrent branching patterns to help them resist breaking during ice storms. (Hauer et al. 2006:10).

This brings up the disjunction between gathering wood and cutting wood. No overseer records from the earlier periods record wood transactions. Punderson’s store records from the early 1720s and 1730s do record chopping and selling of logs, including some being chopped by local Native Americans for the store (Punderson Account Books 1773), but whether some, or many, chopped wood for their own purposes, in addition for commerce, is unknown. Here, the number of “useful” trees used for fuel—which includes nut trees, fruit trees, and maple, which was valued for sap—seems to point to at least some random gathering of common species’ branches. While gathering is the assumption, it is unknown whether the Eastern Pequot gathered dropped and dead branches, or whether they chopped them down. The question of chopping or gathering could perhaps be settled by future studies that use wood diameter analysis (Dufraisse 2006a, 2006b, 2008; Ludemann 2002; Marguerie 2011; Nelle 2002; Théry-Parisot et al. 2011).

I argue that the drop in oak and the high diversity found in the 102-128 hearth represents deforestation at some scale, though whether this can be confidently tied to the reservation, and thus an issue for all Pequots, or rather is related to an individual who was obtaining wood from off the reservation, cannot be conclusively determined. If additional contexts at site 102-128 had existed, or if another site from this same period is discovered and analyzed, it would help us to interpret whether we are seeing an individual household's situation, or a trend that could be extrapolated to the Pequot community. For sites 102-124, 102-123, and 102-126—three sites tightly situated geographically and temporally—the dominance of oak in addition to the primacy of other hardwood resources leads to the conclusion that deforestation and access were not issues during the middle to late 18th century, even with timber theft, encroachment, and land loss.

The inhabitants at sites 102-124, 102-123, and 102-126 could still access high quality wood such as oak, in addition to a variety of other ring-porous hardwoods. Site 102-128 I interpret as reflecting colonial impact that could not be fully mitigated, whether in a decrease in prime wood taxa on the reservation, the provisioning of inferior wood by a colonial overseer, or perhaps a physical difficulty which lead to only very local taxa being gathered. The possibility of illness or infirmity illustrates one of the many ways in which colonialism intersected with people's lives differently in different stages. While perhaps accessing oak wood independently was not an issue for healthy individuals, illness and age appears to have resulted in people into relying on overseers, an additional layer of colonial oversight and control they might have avoided in better health.

The landscape can be seen as mutually structuring. People impacted the landscape through removing and adding trees, and in turn, the lack of trees resulted in people's need to access fuel and wood from further distances—or the addition of trees provided a new resource from which to draw. Both mutually structuring impacts—another example of the full integration between people and their landscape—are particularly poignant at site 102-128. The Mashantucket Pequot had apple orchards by 1721 (McBride 2005:36), and the consistent findings of charred apple wood from even the earliest Eastern Pequot site indicate the widespread presence of this introduced crop. The discovery of apple wood used throughout these site occupations can be interpreted as evidence of Pequot influence upon their traditional landscape as they shaped it through the cultivation of orchards—and in turn gained a new resource to produce not only food, but also heat, light, warmth, or perhaps even monetary value. The shift of apple wood to the top-ranked taxa at 102-128—whether it came from on-reservation or off-reservation—highlights how this mutually structuring impact is felt both through a lack of oak and the presence of apple.

The impact of colonial systems of landscape management on the forest, even up through the present day, has been well documented through archival evidence, palynological studies, and witness tree data. Regardless of where the deforestation happened, we can still see its impact upon the fuel choices available to the household at 102-128. It also provides a longer-term view of the environment that acts as a stop to notions of environmental determinism—while humans might be seen to "adapt" to the environment by replacing one unavailable taxon with another more readily available one, a longer perspective sees the management of species in the past, the events that led up to the present environmental conditions, and the actions taken that assuredly changed the environment in the future years and decades. Neither the environment nor people are static and stationary groups, locked in some sort of ongoing oppositional relationship, but rather situated moments in time provide the basis for change in the future (Ingold 2010:59).

Firewood gathering for much of the world's people has been a common, necessary task that might require either planning, as to go gathering in groups, or was an ingrained chore such as picking up branches along common pathways (Biran et al. 2004; Dufraisse 2006b; Johannessen and Hastorf 1990; Türker and Kaygusuz 1995). When we examine either short- or long-term contexts, whether or not wood was collected according to the "principle of least effort," it was selected with intentionality as people made the decision to take *that* branch home. Many of the factors as to why wood was chosen might be difficult to see in the archaeological record: factors like size, humidity, and the state of the wood (Théry-Parisot et al. 2010:144). Perhaps it was gathered indiscriminately within acceptable boundaries—e.g. a preference for hardwoods—but with a prioritization on time management that made gathering primarily oak the easiest option, and maybe even primarily apple at the last site, if an abundance of apple branches happened to be nearby. Perhaps illness or age made the effort required to get out, search, and carry back wood difficult, so less favored species were gathered over a longer period. Perhaps we see temporal situations in hearths or more casual gatherings in between burning the last logs from a large load of wood and before the starting to gather or chop the next.

The charred wood found here is indeed a “testimony to” those who dwelt here, worked here, and left material traces behind (Ingold 2010:59). Movement across the landscapes, down familiar paths, to houses of friends and families and through the woods creates meaning and memory through the action as it is repeated through life. These are situated processes from which additional memories and meanings can be gathered as people move and retrace movements through the landscape (Ingold 2010:62-63). Memory is tied to production and value, and the ways in which we pick up the traits of our parents and grandparents lasts in a long line of memories and stories. Simmons (1990) records multiple Eastern Pequot uses for trees like white oak (dysentery), apple (dowsing), speckled alder (sprains/headache), slippery elm (colds and pregnant women), pine (gum and colds when mixed with cherry), spruce (gum, lungs), white pine (colds), cherry (colds), dogwood (blossoms as the signal to fish for shad), and older names like “popple” for poplar. Trees were good for more than fuel, and while we do not know all the uses of the wood recovered, or the multiple ways it could have been utilized before being burned, a history of knowledge and use stemming from a long occupation living in the land exists.

Environmental archaeology can help us to get at colonial issues such as how human decisions alter the directions of environmental change and how environmental resources intersected with colonial social structures (Simpson et al. 2003:1401). At Site 102-128 we may be seeing negotiation of environmental impacts wrought by a reduced land base and widespread deforestation due to European agricultural models, and perhaps even the direct impact of colonialism through provisioned wood supplies that may have been inferior to wood available on the reservation. Whether with different wood or the same, the practice of building a fire, whether for warmth, light, cooking, or all three, would have remained the same practice, the same action, carried out within the occupant's lifespan. Perhaps this occupant had earlier memories of personally using oak wood or knew of people intentionally looking for oak wood in the past. Maybe he or she remembered times of fuel scarcity before, and they had turned to apple orchards in that time as well. Perhaps, if provisioned by the overseer, it was judged as inferior and something to be borne—or perhaps the alteration was not noticed at all, the contents of wood less important in light of illness and health concerns.

Strategies for acquisition are usually acquired through community, with its habitus and knowledge of the environment, and the gathering of firewood was certainly a frequent, repetitive, and necessary task (Dufraisse 2006b:87). A focus on temporality and labor, along with an understanding that nature and culture are not divided, but rather mutually influential, can help frame an understanding of the use of wood that goes beyond listing taxa, understanding the woodlands, and charting the increases and decreases of trees, plants, weeds, nuts, and gardens, to examining how these site occupants lived and negotiated a colonial world.

APPENDIX A

MACROBOTANICAL REMAINS- SEEDS, NUTSHELL, PARENCHYMA

Starchy Parenchyma

Starchy parenchyma had a ubiquity of 78% at Site 102-124, 36% at 102-123, 39% at 102-126, and 100% at site 102-128. It is also clearly linked with primary-deposition contexts, as seen below (Table 18). Parenchyma—plant tissue that surrounds other morphological tissues—has been found to have diagnostic value (Hather 2009). Analysts can examine the "shape and size of individual starch grains, the spatial relationship of individual grains in a compound grain (where two or more grains grow together) and the characters of the hylum and annual ring" (Hather 2009:31). These features have been used by paleoethnobotanists to identify New World root and tuber crops (Hather 2009:31). However, undertaking a scanning electron microscope analysis of the parenchyma grains was not within the scope of this thesis. These grains remain unidentified as to what type of plant from which they derive, though potatoes and Jerusalem artichokes are possibilities.

Table 18. Starchy Parenchyma by Site and Feature

Site	Feature	Starchy Parenchyma
Site 102-123	N. Hearth	10.96g
Site 102-128	Hearth	9.11g
Site 102-126	Chimney Fall	8.03g
Site 102-123	S. Hearth	6.27g
Site 102-126	Midden	0.08g
Site 102-124	Feature A	0.07g
Site 102-126	Cellar	0.06g
Site 102-123	Midden	0.04g
Site 102-124	Feature C	0.03g
Site 102-124	Feature B	0.01g
Site 102-123	Cellar	0.00g
Site 102-124	Off-B	None
Site 102-124	STP	None
Site 102-123	Root Cellar	None

Seeds and Nuts

Following the example of other paleoethnobotanists, uncharred seeds were considered to be modern contaminants and were not counted, removed, or included in the final analysis. While uncharred seeds may be preserved in exceptionally dry or water-logged contexts, the areas sampled at the Eastern Pequot reservation do not meet either condition and it is therefore assumed that standard decomposition processes would have broken down any non-carbonized historic seeds (Dincauze 2000:333; Farley 2012:34; Fritz and Nesbitt 2014:121; Gallagher 2014:25; Pearsall 1989:115; Trigg and Bowes 2007:3).

At Site 102-124, Feature A contained two bedstraw, one sedge, one copperleaf, and one corn germ. Feature B contained one raspberry seed, and the Off-B units contained three nutshell/nutmeat fragments. The midden contained one bedstraw seed, and the STP contained no seed or nutshell (Table 19).

Table 19. Counts of Non-wood Macrobotanical Taxa Recovered at Site 102-124

Taxa	Feature A	Feature B	Feature C	Off-B	STP	Total
Starchy Parenchyma (in grams)	0.07	0.01	0.03	0	0	**0.11**
Copperleaf	1	0	0	0	0	**1**
Bedstraw	2	0	1	0	0	**3**
Corn germ	1	0	0	0	0	**1**
Raspberry	0	1	0	0	0	**1**
Sedge	1	0	0	0	0	**1**
Nutshell/meat	0	0	0	1	0	**1**
Nutshell	0	0	0	2	0	**2**
Cap	0	0	0	1	0	**1**
Unident. Plant Parts	2	2	0	0	0	**4**
Starchy Fragments	0	8	2	0	0	**10**
Unidentified Seed	0	1	0	0	0	**1**

At Site 102-123, there were no identifiable seeds or nuts in the North House Hearth. The South House Hearth contained one corn cupule and two raspberry seeds, the cellar contained one sumac seed, the root cellar contained one piece of corn, and the midden contained nine nutshell/ nutmeat fragments, three raspberry fragments, one huckleberry seed fragment, and half of a dogwood seed (Table 20).

Table 20. Non-wood Macrobotanical Taxa Recovered at Site 102-123

Taxa	Midden	Cellar	Root Cellar	S. Hearth	N. Hearth	Total
Starchy Parenchyma (in grams)	0.04	0	1.93	0	10.96	**12.93**
Corn	0	0	1	1	0	**2**
Dogwood	1	0	0	0	0	**1**
Huckleberry	1	0	0	0	0	**1**
Raspberry	3	0	0	2	0	**5**
Sumac	0	1	0	0	0	**1**
Nutshell/meat	9	0	0	0	0	**9**
Unidentifiable Seed	2	0	0	0	0	**2**

Site 102-126 contained the most seeds and nutshell (Table 21). The chimney fall contained a grass seed, huckleberry, hickory shell fragment, corn kernel fragment, twelve (out of twenty-two) raspberry seeds, five bedstraw seeds, one nutshell, one poison ivy seed, and one sumac seed. The cellar contained just one bedstraw and one unidentified seed. The midden contained the highest quantity of non-wood taxa: two watermelon seeds (Figure 12), twenty-five corn fragments (Figure 13), one bayberry seed, three grass seeds, one bedstraw seed, four buds, two hickory nutshells, two Juglandaceae shell (possibly either walnut or hickory) , and one each of black walnut, hazelnut, and acorn.

Figure 12. Watermelon seed

Figure 13. Corn kernel fragment

Table 21. Non-wood Macrobotanical Taxa Recovered at Site 102-126

Taxa	Chimney Fall	Midden	Cellar	Total
Starchy Parenchyma (in grams)	8.33	0.09	0.06	**8.48**
Bayberry	0	1	0	**1**
Blueberry/cranberry	0	4	0	**4**
Corn	1	27	0	**28**
Huckleberry	1	1	0	**2**
Raspberry	12	10	0	**22**
Rye	0	1	0	**1**
Watermelon	0	2	0	**2**
Bedstraw	5	1	1	**7**
Grass	1	3	0	**4**
Poison Ivy	1	0	0	**1**
Sumac	1	0	0	**1**
Acorn Nutshell	0	1	0	**1**
Black Walnut Shell	0	1	0	**1**
Hazelnut Shell	0	1	0	**1**
Hickory Shell	1	2	0	**3**
Juglandaceae Shell	0	2	0	**2**
Nutshell	1	0	0	**1**
Nutmeat	0	2	0	**2**
Possible Nutshell	0	1	0	**1**
Unidentified Seeds	6	13	1	**19**
Unidentifiable Seeds	2	2	0	**4**
Starchy Fragments	0	32	0	**32**
Plant Part	2	2	0	**4**
Buds	0	4	0	**4**

Finally, at site 102-128, one bean fragment and one elderberry was found (Table 22).

Table 22. Non-wood Macrobotanical Taxa Recovered at Site 102-128

Taxa	Hearth
Bean	1
Elderberry	1
Unidentified Seed	1

Discussion

Cooking, like the fires upon which meals are generated, is linked to daily routines of habitus and provides a window into the context of how Native people living in a colonial context negotiated and formed their social identities (Pezzarossi et al. 2012:201; Atalay and Hastorf 2006:283). In colonial contexts, where a newfound flexibility as far as food options often existed, the choices that colonists and Native people made help us to explore social identities and cultural relations (Trigg 2004:224). Corn was used in multiple ways. Cornmeal was boiled in water to make Aupuminea-naw-saump, puddings were mixed with berries, corn was parched and made into meal for travel and mixed to make a dough that was roasted in ashes, various types of hominy were made, and it was also eaten roasted whole (Bradgon 1996:104; Tantaquidgeon 1972:56). Raspberries, blueberries/cranberries, huckleberries, and nuts are gathered foods that also were part of traditional foodways.

The discovery of two watermelon seeds is interesting. To my knowledge, watermelon has not been recovered from other Native American sites after European settlement, nor is it mentioned in the Eastern Pequot overseers' records. Watermelons are mentioned growing in settler gardens in 1660 and in 1737, a crop, that like apple, also would have been familiar by the time of the sites in this thesis (Russell 1976:149; Sumner 2004:131-132). Rye is an introduced cereal and highlights how Native people were beginning to integrate European grains into foodways. However, foodways were incredibly fluid during this time, with substitutions, new dishes, and other alterations occurring for settlers just as much as they were for Native people. Europeans substituted blueberries for cherries or currants in English recipes (Sumner 2004:125; Leighton 1970:98). Wheat and other European grains did not adapt well to New England soil, and so Indian corn became a core crop of New England through the 1600s and 1700s (Russell

1976:135). Corn began to be thoroughly integrated into New Englander's palates and kitchens. It was soon considered to be New England's most valuable grain and included in recipe books as early as 1796 (Russell 1976:136; Sumner 2004:15). While the English used corn as replacements for English recipes, they also accepted and used Indian style dishes such as hominy, samp, and succotash (Sumner 2004:18,44; Leighton 1970:200).

Other contemporaneous studies have been conducted on New England Native foodways in the 17th through 19th centuries. Trigg and Bowes' (2007) study of an 18th-century Mashantucket site produced nutshell, maize, beans, wheat, and an apple or pear seed; over 150 fruit seeds including blueberry/cranberry, huckleberry, raspberry/blackberry, viburnum, dogwood, and grape; sumac, sweet fern, and a number of other plants like bedstraw, goosefoot, spurge, mint, buckwheat, wild lettuce, grass-seeds, and bayberry. Trigg et al. (2007) saw a reduction in cultigen use from the 17th to 18th century, with a greater proportion of seeds coming from gathered resources like blueberries and raspberries at the later site. By linking seeds to the habitats from which they came, they saw the plant remains pointing to suggestions of accelerating forest clearance or food stress, with the possibility that the inhabitants could not sustain themselves on cultivated plants alone (Trigg et al. 2007). Farley's (2012) thesis found wheat, an indeterminate European cereal, bayberry, sumac, goosefoot, purslane, dock, hornbeam, pondweed, and bittersweet in addition to nutshell taxa. Kasper's (2013) dissertation on ten Mashantucket Pequot sites dating from 1675-1800 resulted in a wealth of seeds and nutshell, which she separated according to habitat in order to study Mashantucket land use and the ways in which Mashantucket decision-making about plants was changing.

Normally seed proportions could be traced through time, with rises and falls in the data used to assess how land use or foodways might have altered. Unfortunately, the quantities here do not represent enough of an assemblage to conduct this level of analysis—and the wide record of foodstuffs in the overseer record act as proof of just what a small percentage of food was recovered in comparison to how much food was entering and being grown on the reservation.

APPENDIX B

HABITATS AND USES OF TREES FOUND IN SOUTHERN NEW ENGLAND

Oak – Fagaceae *Quercus* spp.

The 275 species of oaks (54 species in North America) thrive in the temperate zone around the world (Logan 2005; United States Forest Service 1948:299). Oaks are an important species and have wide-ranging values and uses. People have used their timber and bark in myriad ways as well as their acorns for meal or flour, even though acorns need leeching in order to remove tannins and make them edible (Harlow 1957:140-141). While other trees are individually the strongest, hardest, toughest, and most durable, oaks unite these qualities in one wood (Emerson 1846:121). However, oaks do not bear equal crops of acorns over time, and a consistent yield cannot be counted upon from one year to the next (Emerson 1846:128; Logan 2005:29-76; Sumner 2004:21). Oak is highly valued as a wood for fuel and burns down to a hot bed of coals suitable for broiling.

Red Oak – Fagaceae *Quercus rubra*

Red oak is a medium-sized tree with a comparatively short large trunk that grows to 60-70 feet in height and 2-3 feet in diameter. It thrives best on rich, moist, well-drained soils (Harlow 1957:157). Red oak wood is considered inferior to white oak but is used for similar purposes except when the wood is exposed to decay, such as for railroad ties, fence-posts and timbers (Harlow 1957:157; Panshin and De Zeeuw 1980: 568). Some consider it as having “little value for fuel,” however, Hale lists it under the “best hardwood fuels” with a gross caloric value of 27.3 (millions of BTU per air-dry cord) and Marcus Bull gives it a ranking of 73 out of 100 (Browne 1832:386; Hale 1933:8). The bark is considered to be of an inferior quality for tanning, and it corrodes iron spikes. However, it can be used for beams and timber and was often used when no other species of oak are available (Emerson 1846:149). Among the Delaware, red oak bark was steeped to make a tea for severe cough and used to relieve hoarseness (Tantaquidgeon 1972:30).

White Oak – Fagaceae *Quercus alba*

White oak is a medium to large sized tree with short stocky trunk and wide-spreading crown that reaches 80-100 feet in height and 3-4 feet in diameter (Harlow 1957:144; Millikan 1969:339). It grows on many soil types, but it grows best on deep, rich, well-drained soils that are moist and slightly acidic (Harlow 1957:144; Millikan 1969:339). It is considered to be the most valuable hardwood species of tree in the United States (Harlow 1957:146; Millikan 1969:339). Acorns sprout soon after they fall in autumn, and if harvested for food, they are first boiled in water to leech out tannins (Harlow 1957:144, 146; Millikan 1969:339). As one of the best hardwoods, white oak had a great many uses, some of which included: furniture, flooring, barrel staves, railroad ties, fuel, shipbuilding, axe handles, house frames, wheel spokes, plow handles, pumps, hoops, baskets, ox bows, tight cooperage, slack cooperage, fence posts, mine timbers, poles, exported logs and timber, doors, wainscoting, cabinets, pallets, caskets, coffins, handles, and buckets, with the bark often used for tannin (Harlow 1957:146; Emerson 1846:19,129-130; Panshin and De Zeeuw 1980:571-572; Sumner 2004:282).

White oak was also considered to have a high fuel value, to make a "slow fire," and was seen as valuable for charcoal; in terms of fuel value it was considered to be trumped only by chestnut, hickory, and chestnut white oak, though in terms of simply BTU per cord, white oak is second only to elm and is tied with hickory (Emerson 1846:130; Panshin and De Zeeuw 1980: 571-572; Hale 1933:8). The Delaware used the bark in many different compound remedies, including a tea steeped from the bark for a severe cough, a stronger liquid for gargling to help cure sore throats, and a liquid to cleanse bruises and ulcers (Tantaquidgeon 1972:30). The Mohegan steeped the inner bark to create an analgesic liquid used as a liniment for pain and also used the wood for axe and hammer handles and baskets made from "cut lengths of wood from young trees" (Moerman 1998:704; Tantaquidgeon 1972:75,80). The Pequot used it to cook, steep, and drink the bark as a powerful, "last resort," cure for dysentery (Simmons 1990:158, 172).

Chestnut – Fagaceae *Castanea dentata*

Chestnut is a medium to large sized tree 70-90 feet in height and 3-4 feet in diameter (Harlow 1957:136). It is a cousin to the oak and beech trees that are also in the Fagaceae family (McKay and Jaynes 1969:264). It is found in many soil types, but grows best in moist sandy loams (Harlow 1957:138). One of the most important eastern hardwood trees, chestnut was fast growing, and stump sprouts quickly produced new growth after logging (Emerson 1846:20, 166; Harlow 1957:138). In addition to timber value, its nuts were eaten in great quantities (Harlow 1957:138). Chestnut was called the "perfect tree" by some due to its great versatility; it was a lighter wood and so was less costly to ship, it contained a high amount of tannins that resisted rot and warping, and it was extremely common before the blight, though it was not as strong as oak nor did it have the visual appeal of black walnut or cherry wood (Emerson 1846:19; Freinkel 2007:1, 25). Before the blight, chestnut grew well in the temperate zone and could be found growing wild down the eastern seaboard and west to Ohio, Kentucky, and Tennessee (Freinkel 2007:13,15-16,20). In contrast to the oaks' highly variable acorn crops that require processing to become edible, chestnuts produced large crops that could be counted on each year, and one tree could produce as many as 6,000 nuts that could be eaten straight off the tree—it was said that families could help keep hunger at bay for the entire winter by gathering just one fall month's worth of mast (Emerson 1846:164-165; Freinkel 2007:16,19).

Chestnut had a coarse grained wood that was strong, elastic and durable, and like oak, it was used in a large number of ways: rail fences, telegraph poles, telephone poles, railroad lines, beams in mine shafts, frames and shingles for houses, interior trim, furniture, caskets, boxes, crates, pianos, slack cooperage, sashes, doors, packing crates. In addition, the tannins in the bark were used to turn hides into leather beginning in the late 1800s (Freinkel 2007:26; Emerson 1846:20,167; Panshin and De Zeeuw 1980:560). Some thought of chestnut as ill-suited for fuel except for close fires, since air in its innumerable small pores cause it to "snap disagreeably," and its value is given by Marcus Bull as 52 out of 100 (hickory), however, it was noted to form a good charcoal with younger trees preferred to older trees (Emerson 1986:167; Hale 1933:8).

Chestnut was used by the Mohegans to create an infusion of leaves to cure whooping cough and colds (Moerman 1998:705; Tantaquidgeon 1972:71). Among the Delaware, nuts were ground and mixed with sweet oil or mutton tallow in order to make a poultice for an earache, a chestnut carried in the pocket was believed to relieve rheumatism, and chestnut was used to poison fish in streams to catch more easily (Tantaquidgeon 1972:30). A variety of other remedies using chestnut also included making a tea of year-old trees for heart trouble; using leaves from young sprouts to cure sores; steeping cold bark tea with buckeye to stop bleeding after birth; applying warmed galls to make an infant's navel recede; boiling leaves with mullein and brown sugar for cough syrup; and dipping leaves in hot water to put on sores (Freinkel 2007:17).

Beech –Fagaceae *Fagus grandifolia*

Beech is a medium-sized tree 70-80 feet high (though it can grow to 100 feet high) and 2-3 feet in diameter (Harlow 1957:133). It sprouts from roots that often form thickets around older trees (Milliken 1969:342). It is found growing in a wide variety of soils with high moisture levels and also often found near birch and sugar maple and can grow quickly under thick forest cover (Emerson 1846:162; Harlow 1957:135-136). Beech is a hard, tough, close-grained, dense wood that was difficult to split, and which early settlers used primarily for fuelwood (Emerson 1846:162; Milliken 1969:342). Later, it was used for clothespins, brush-backs, pulleys, tool handles, spools, flooring, railroad ties, pulp, slack cooperage, boxes and crates, pallets, woodenware, chair posts, saw handles, cart bodies, and novelties (Millikan 1969:342; Emerson 1846:19, 162; Panshin and De Zeeuw 1980:558). In addition, the leaves can be used for bed-filling and the nuts for food, oil, and soap (Harlow 1957:135-136). Beech was a highly preferred fuel wood. According to Marcus Bull's table of the heating value of American woods, beech was ranked at 65 compared to hickory's score of 100 (Emerson 1846:162). It makes excellent charcoal and its ashes resulted in a lot of potash (Emerson 1846:162; Harlow 1957:135-136; Millikan 1969:342).

Black Walnut- Juglandaceae *Juglans nigra*

Black walnut is a medium to large-sized tree with a tall trunk free of branches and a high crown that rises to 70-90 feet in height and expands to 2-3 feet in diameter (Harlow 1957:99-100). It thrives best on moist, rich soils and its growth and crops are dependent upon good soil (Clark 1969:216; Harlow 1957:100). Black walnut is a dual crop tree valued for its timber and nuts (Zarger 1969:203). Uses for black walnut include cabinets, furniture, tables, chairs, bureaus, bedsteads, bookshelves, cornices, panels, veneer, fixtures, caskets, coffins, piano cases, doors, sashes, frames and finish with its bark and nuts were used for dye, and bark was a recommended cure for fevers and stomach complaints (Emerson 1846:181; Harlow 1957:100-101; Panshin and De Zeeuw 1980:540). Black walnut husks, twigs, bark, and leaves were used for green, brown, and black dyes (Sumner 2004:295). When used as a fuel, black walnut produced a bed of hot coals like other hardwoods (Harlow 1957:100-101).

Among the Delaware, three small branches at a time were roasted in the open fire and the bark was removed from peeling from the tip end and tied in separate bundles. By boiling the three bundles of bark together, a strong tea was made from which large quantities were taken over the course of two days in order to remove bile from the intestines. The leaves are scattered about the house to dispel fleas, while the sap was applied for inflammation. Juice from the green hull of the fruit was rubbed over the infected area to cure skin diseases (Tantaquidgeon 1972:29-30). In addition, oil was prepared from walnuts, thickened, and used in the preparation of food (Tantaquidgeon 1942:60).

Hickory – Juglandaceae *Carya* spp.

Hickories are large trees that grow well in moist, fertile woodlands and are often found in mixed hardwood stands along with ashes, oaks, and maples (MacDaniels 1969:190; US Forest Service 1948:111). Hickories are highly valuable trees for both the wood products that can be made from them, as well as their mast, and they are noted for their hardness, strength, toughness, and ability to stand up to shock (Harlow 1957:104; MacDaniels 1969:190; US Forest Service 1948:111). Hickory wood was used for walking sticks, hoops, screws, chisel handles, augers, gimlets, handspikes, wagon shafts, rake teeth, ladders, furniture, sporting goods, and handles for tools like hammers, axes, picks, and sledges (Emerson 1846:191; Panshin and De Zeeuw 1980:543). Nuts or bark of various hickories produced yellow, green, tan and brown dyes (Sumner 2004:295). Hickory was valuable for fuel (it was ranked first in fuel value among the common American woods) and is a dense wood that leaves a hot bed of coals, good charcoal, and ashes that were often used for soapmaking (Harlow 1957:105; MacDaniels 1969:190; Panshin and De Zeeuw 1980: 543). Hickory was often chosen as a fuel wood when smoking hams and bacons due to the flavor it imparted (Panshin and De Zeeuw 1980: 543; MacDaniels 1969:190). The nuts were used for curing stomach ailments, thickening venison broth, and making a fermented drink (Harlow 1957:105; Moerman 1998:141).

American Hornbeam- Betulaceae *Carpinus caroliniana*

American hornbeam is a small, often shrubby tree 20-30 feet high and 4-8 inches in diameter (Harlow 1957: 132; Emerson 1846:174-176). It is primarily found as an understory weed tree in hardwood forests and grows on nearly all soil types except the most sterile, but flourishes in moist or wet soils or along stream banks (Emerson

1846:176). It is a hard and heavy wood and is used for firewood, bows, handles, wedges, sled runners, levers, handles, farm vehicle parts, and for other proposes where strength and solidity are needed (Emerson 1846:176; Harlow 1957:132-133; Panshin and De Zeeuw 1980:550). The Canadian Delaware made a small bundle with the root or bark of the American Hornbeam, plus bark of juniper, white oak, wild cherry and hickory which is then put into about a pint of water and reduced by half and combined with the same amount of brandy. This is considered to be a month's treatment for treating one person of general weakness or of diseases related to women (Tantaquidgeon 1942:67).

Red Maple - Aceraceae *Acer rubra*

Red maple is a diffuse-porous hardwood considered a "soft maple" (Harlow 1957:236; Panshin and De Zeeuw 1980:607). It is a medium sized tree with a long trunk and irregularly shaped crown (it grows to 50-70 feet high and 1-2 feet in diameter) and typically grows in swamps and low ground, but can be found on higher, drier ground (Emerson 1856:483; Harlow 1957: 244). Branches are relatively brittle and decay occurs in exposed wounds unless treated. It makes a relatively poor bed of coals when used in the campfire but was still used frequently. It burned well when dry, though it is ranked as 5/8ths as valuable as rock maple and is ranked as about half as valuable as hickory according to Marcus Bull's index (Browne 1832:386; Emerson 1846:486-487; Harlow 1957:246). Red maple is often used for the same purposes as sugar/rock maple except when strength or hardness is the desired primary attribute, and was used for gun stocks, utensil handles, furniture, boxes, crates, pallets, paneling, and veneer (Emerson 1846:486-487; Panshin and De Zeeuw 1980:608).

Sugar Maple – Aceraceae *Acer saccharinum*

Sugar maple, in contrast to red maple, is considered a “hard maple” and to be the most important (and common) of maples (Harlow 1957:236; Panshin and De Zeeuw 1980:603). Medium to large sized (they grow to 60-80 feet and measure approximately 2 feet in diameter), sugar maples have a short trunk and a large, dense crown. They are extremely tolerant to shade and grow best on moist, rich, well-drained soils but can live on poorer sites (Harlow 1957:239). Maple is a hard, close-grained, smooth and compact wood and was used for: furniture, wardrobes, chairs, bedsteads, bureaus, desks, buckets, tubs, railroad ties, veneer, bowling pins, flooring, boxes, crates, pallets, woodenware, spools, bobbins, toys, butchers blocks, sashes, doors, sports goods, instruments, and picture frames (Emerson 1846:491; Harlow 1957: 241; Panshin and De Zeeuw 1980:604-605).

Sugar maple was considered one of the best fuel woods, leaving a bed of hot coals, and for some was considered second only to hickory. In addition, the wood leaves behind a lot of potash to be used in soap-making (Emerson 1846:492; Harlow 1957: 241). Of course, the use of sap in making maple sugar and maple syrup gave maple a unique use and value. Maple sap is a mixture of water and sugars that travel in the phloem that compose the inner tree bark. Only about 8 percent of maple sap is sugar, so Native Americans concentrated the sugar by freezing the sap and removing the ice or evaporating the water out of the sap. Once concentrated and crystallized, the sugar was stored in bark boxes and traded with colonists. In 1706 Governor William Berkley of Virginia wrote, “The Sugar-Tree yields a kind of Sap or Juice which by boiling is made into Sugar. This Juice is drawn out by wounding the Trunk of the Tree and placing a

Receiver under the wound." Sugaring-off became a colonial traditional practice and cornmeal mush flavored with map syrup became a traditional New England dish (Sumner 2004:203-204). Hannah Glasse included a "receipt" with instructions for tapping trees and boiling down the sap to make maple sugar and "maple molasses" in her 1747 cookbook "The Art of Cookery" (Sumner 2004:203-204). Aside from a sweetener, the Mohegan also used the inner bark from the south side of the tree to make a cough remedy, and the wood from young trees and logs was used for frames for dwellings, bowls, ladles, scoops, and stirring paddles (Moerman 1998:705; Tantaquidgeon 1972:69, 80).

Black Cherry - Rosaceae *Prunus serotina*

Black cherry is a medium-sized timber tree with spreading branches and is often found growing along roads (Harlow 1957:199-201). It grows to 50-60 feet high and 2-3 feet in diameter and grows best in rich, moist, deep soils (Emerson 1846:453). Considered to be one of the most valuable timber trees, black cherry had a beautiful, close-grained, compact wood that did not shrink or warp, and took polish well (Emerson 1846:454). It was used for furniture, tables, chests of drawers, cabinet work, window sashes, stair rails, doors, gun stocks, professional instruments, printers blocks, handles, woodenware, novelties, and toys (Emerson 1846:454; Harlow 1957:201; Panshin and De Zeeuw 1980:594). As firewood it produces a bed of hot coals.

The bark was used to make a tonic-tea and the fruit was often used for cherry brandy (Emerson 1846:455). The Pequot used the bark to make a drink that was good for colds (Simmons 1990:158). The Delaware used the bark as a remedy for diarrhea, combined with other roots and bark as a tonic, and the fruit was sometimes also used to make cough syrup (Tantaquidgeon 1972:32). The Mohegans kept ripe cherries in a jar to ferment for about a year, with the resulting liquid being used as a remedy for dysentery. Cherry bark and boneset leaves were steeped together made a tea for curing colds that was taken “hot at night and cold at morn” (Moerman 1998:704; Tantaquidgeon 1972:74).

Apple Rosaceae - *Malus*

Apple trees are native to Europe, but were quickly found to flourish in New England. By 1846 over 1400 were listed in the catalogue of the London Horticultural Society with new ones added each year (Emerson 1846:438). Trees were cultivated, and intentionally sown “wild,” and so were often found growing in the forest (Emerson 1846:439). The wood of the apple tree is smooth, fine grained, hard and light. It was often made into walking sticks, used as wheel cogs, and used to make shuttles and reeds for weaving (Emerson 1846:439). Apple wood logs and burls were used by Mohegans to make spoons, scoops, mortars, and bowls (Tantaquidgeon 1972:80).

Quaking Aspen - Salicaceae *Populus tremuloides*

Quaking aspen is a small to medium sized tree 30-40 feet high and 1-2 feet in diameter. It grows in a variety of sites but particularly in stands found on burned-over areas (Harlow 1957:87). It is short lived but provides a temporary cover after forest fires and protects other trees that grow under its shade. Since they require full light, after about 20 years they are often crowded out by more tolerant trees like birch and maple (Harlow 1957:88). They were used for pulp, matches, boxes and crates, clothespins, and cabin construction when kept away from the ground (Panshin and De Zeeuw 1980: 547).

Ash - Oleaceae *Fraxinus* sp.

The ashes consist of 65 species of deciduous diffuse-porous hardwoods (US Forest Service 1948:178). Black ash is a medium-sized tree 40-50 feet high and 1.5 feet in diameter and is usually found by a swamp, stream-bank or a spring. It is not the strongest wood, but has elastic properties and some hardness. Black ash integrates with white ash, but black ash is usually lighter and is greatly preferred for basket-making since the wood can be easily separated into thin slats when pounded (Panshin and De Zeeuw 1980:626-627; Emerson 1846:339). Ash wood can absorb shock without breaking and is easily worked due to the large diameter vessel elements in its spring-wood which allows the summer-wood to be separated easily into splints that could be used for chair seats and baskets (Sumner 2004:279). Ash wood was also used for floors, plows, axes, wheel rings, oars, palisade hedges, hop yards, poles, spars, cabinets, handles, stocks and drying racks (Harlow 1957:273; Emerson 1846:19,338). The Mohegans used black ash branches and twigs for bows, tool handles, brushes, bows, pipe stems, and arrows, and young trees for their basket splints (Tantaquidgeon 1972:80). When burned, ash turns to a bed of hot coals ideal for broiling and Hale lists it as a “fair” hardwood fuel (Hale 1933:9).

Pine - Pinaceae *Pinus strobus*

Eastern white pine can grow on different types of soil but grows best in sandy loam soils that lack moisture (Harlow 1957:34,38). It is found in both singular stands and in mixed-forests (Emerson 1846:56). Of great height, pine trees were still found to reach to 200 feet in 1846 and heights of 230 and 240 feet were found not much earlier than 1846 (Emerson 1848:47). Pines were the best masts and the most valuable ship timber and were reserved for the Crown after 1619 and marked with an R after 1719 (Emerson 1846:48; Harlow 1957:38).

Pine wood was a soft, durable, easily-worked wood well-qualified for construction and was also used for rosin, oil, wood tar, and turpentine (Harlow 1957:34, 38; Milliken 1969:343). White pine was used for timber, boards, masts, large beams, posts, clap-boards and shingles, door frames, wainscoting, frames of windows, doors, panels, tables, picture frames, cornices and moldings, joinings, boxes and crates, toys, signs, caskets, construction, matches, and blinds (Emerson 1846:48; Panshin and De Zeeuw 1980:441). As a softwood, it does not have the same fuel value as hardwoods, though it burned well when dry and could be used for kindling (Emerson 1846:64). In addition, pine was known to shoot hot sparks, produce black smoke, and leave only ash rather than then charcoal (Harlow 1957:34).

The Mohegan used an infusion of dried inner bark as a cough remedy, and the sap or gum was put on boils and abscesses as an analgesic aid (Moerman 1998:704, 705; Tantaquidgeon 1972:74). The Canadian Delaware steeped the twigs to make a medicine to treat the kidneys or made a pitch to apply to boils in order to draw out poison and reduce pain (Tantaquidgeon 1942:66). A Mashantucket Pequot woman used the pitch from pine as chewing gum and the bark combined with wild cherry bark was used for colds. noting that she made a tea for colds from the “pine tree in front of [the] house” (Simmons 1990:156).

Atlantic White Cedar - Cupressaceae *Chamaecyparis thyoides*

Atlantic white cedars are medium-to-large evergreen trees commonly found in pure dense stands within swamps and fresh water bogs (Emerson 1846:99; Harlow

1957:72; US Forest Service 1948:134). It resists moisture and dryness and so was commonly used for fencing in addition to shingles, wooden vessels, whale-boats, poles, posts, lumber, water tanks, siding, boxes, and crates (Emerson 1846:100; Panshin and De Zeeuw 1980:490).

Red Cedar - Cupressaceae *Juniperus virginiana*

Red cedar is a small to medium sized tree, 40-50 feet high and 1-2 feet in diameter. It can grow in many different soils but does best on limestone soils. The tree itself was used principally for posts, but also for cabinets, pencils, millwork, woodenware, cedar chests, pails, tubs, ships and boats (Harlow 1957:74-75; Emerson 1846:20,104; Panshin and De Zeeus 1980:492).

Birch - Betulaceae *Betula* sp.

There are over 40 species of birch in the Northern Hemisphere (US Forest Service 1948:99). Paper birches are medium-sized (50-70 feet high and 1-2 feet in diameter), and often occur in pairs of two or more (Harlow 1957:123). They are found mostly in moist sandy soils and are considered to be a pioneer species that quickly become established on cut-over and burnt lands, along with quaking aspen and cherry (Harlow 1957:125; US Forest Service 1948:99). Birch is easily worked and was used for canoes, tinder, writing paper, snowshoes, paddles, flooring, slack cooperage, railroad ties, furniture, kitchen cabinets, boxes and crates, woodenware, trim, sashes, doors, shuttles, spools, bobbins, butcher blocks, musical instruments, toothpicks, shoe pegs, and was used by colonists under their shingles (Emerson 1846:19,201,212; Harlow 1957:126; Panshin and De Zeeuw 1980:555) Yellow and black birch were said to produce better coals than grey and white birch (Harlow 1957:117).

Sumac - Anacardiaceae *Rhus typhina*

Sumac is a large shrub or small tree, and is one of the commonest woody plants from southern Canada and the northern United States. The fruit tastes like a sour apple and can be used to make Indian lemonade (Harlow 1957:228-229). The bark and leaves contain tannin, and leaves and fruits can be boiled down to ink (Harlow 1957: 230). The colonists used to boil it in beer and drink it for colds, the latter of which they learned from Native people (Leighton 1970:206). The Mohegans used the berries to make a gargle for sore throats and diluted it to serve as a beverage (Tantaquidgeon 1972:25). The Delawares combined it with other plants to use as a remedy for venereal disease (Tantaquidgeon 1972:33). The Canadian Delaware made a tea from the berries as a remedy for diarrhea (Tantaquidgeon 1972:67). The Mashantucket Pequot used the berries for a tea (Simmons 1990:157).

APPENDIX C

ARCHIVAL SUMMARY OF WOOD REFERENCES

Entry Date	Eastern Pequot Recipient/Clarification	Notation	Cost	Overseer Reference
January 5, 1829	Cyrus Shelley	Cutting + Carting 3 loads wood	$1.50	1825-1827 Henry & Silas Cheesebrough
March 7, 1830	Cyrus Shelley	4 oxen and 1 hand 1 day each drawing wood for Cyrus	$2.00	1827-1831 Silas Cheesebrough
December 21, 1831	Cyrus Shelley	3 loads of wood oxen and one hand to get it for Cyrus Shelley	$3.75	1831-1833 Silas Cheesebrough
February 6, 1836	Charlotte Wheeler	To paid for 2 loads wood for Charlotte Wheeler	$2.25	1835-1840 Ezra Hewitt
January 15, 1846	Molly Gardner	To wood for Molly Gardner	$0.50	1844-1847 Elias Hewitt
January 24 1846	Molly Gardner	To Load wood for Molly Gardner	$1.25	1844-1847 Elias Hewitt
March 1, 1846	Molly Gardner	To small load wood for Do. (Molly Gardner)	$0.75	1844-1847 Elias Hewitt
July 20, 1846	Molly Gardner	To wood delivered at 3 times for Molly Gardner	$0.75	1844-1847 Elias Hewitt
January 10, 1847	Molly Gardner	To 1 load wood for Molly Gardner	$0.75	1844-1847 Elias Hewitt
February 25, 1847	Molly Gardner	To small load wood for Molly Gardner	$1.17	1844-1847 Elias Hewitt
August 3, 1847	Molly Gardner	To wood for Molly Gardner	$0.40	1847-1850 Elias Hewitt
November 20, 1847	Molly Gardner	To wood for Molly Gardner	$0.34	1847-1850 Elias Hewitt
December 25, 1847	Molly Gardner	To wood for Molly Gardner	$0.75	1847-1850 Elias Hewitt
May 20, 1848	Molly Gardner	To wood furnished at sundry times from Dec. 25 1847 to June 20 1848 for Molly Gardner	$6.00	1847-1850 Elias Hewitt
December 28, 1848	Molly Gardner	to supplies…including lights + fire wood making 15 weeks at $3 per week	$45.00	1847-1850 Elias Hewitt
November 6, 1861		Drawing wood self and teame? Leune? one day	$2.00	1861-1863 Isaac W. Miner
December 26, 1862	M.D.? Miranda D?	Drawing wood and chopping	$1.50	1861-1863 Isaac W. Miner

January 3, 1863	Tribe	Chopping drawn + wood my self and Leune?	$2.00	1861-1863 Isaac W. Miner
December 3, 1863	Tribe	Drawing wood and 2 hands oxen (self?) day (Amero?) dollars for Tribe	$3.00	1863-1865 Isaac W. Miner
February 4, 1864		Drawing Wood2 hands oxen half day [illegible notes]	$1.85	1863-1865 Isaac W. Miner
September 26, 1865	Eunice Cottrell/Fagins	Paid William DeFleur? 2,3 off in Drawing Wood for E. Cotrell	$2.30	1863-1865 Isaac W. Miner
May 11, 1866	Eunice Cottrell/Fagins	Plowing yard and Drawing Wood E.C.	$2.75	1865-1867 Isaac W. Miner
May 5, 1873	Leonard Brown/Nedson	To Paid Paul W. Brown Esq. for Drawing wood in Dec 1872 and January 1873 for Leonard Brown or Nedson	$2.00	1868-1875 Leonard C. Williams
May 5, 1873	Leonard Brown/Nedson	To Paid Paul W. Brown Esq. for Drawing wood in Dec 1872 and January 1873 for Eunice Cottrell or Fagins	$2.00	1873-1874 Leonard C. Williams
February 10, 1874	Eunice Cottrell/Fagins	To paid Paul W. Brown Esq. for drawing wood in Dec. 1873 January + February 1874 For Eunice Cottrell or Fagins	$3.00	1873-1874 Leonard C. Williams
February 10, 1874	Leonard Brown/Nedson	To paid Paul W. Brown Esq. for drawing wood in Dec. 1873 January + February 1874 For Leonard Brown or Nedson	$1.25	1873-1874 Leonard C. Williams
March 5, 1875	Eunice Cottrell/Fagins	To [Paul W. Brown] getting 3 Loads Wood on Dec. 5, 1874	$1.00	1868-1875 Leonard C. Williams
d	Eunice Cottrell/Fagins	To 1/2 day getting wood January 2 1875	$1.50	1868-1875 Leonard C. Williams
March 5, 1875	Eunice Cottrell/Fagins	To 1/2 day getting wood January 29 1875	$1.50	1868-1875 Leonard C. Williams
March 5, 1875	Eunice Cottrell/Fagins	To 2/3 day getting Wood February 26 1875 for Eunice Cottrell or Fagins	$1.50	1868-1875 Leonard C. Williams
		(summarized: Eunice Cottrell of Ragins has had: From Paul W. brown in Getting Wood	$5.50	1868-1875 Leonard C. Williams
	Summarized:	Eunice Cottrell or Fagins has had: from Paul W. Brown in Drawing wood in 1872, 1873, 1874	$5.00	1868-1875 Leonard C. Williams
	Summarized:	Leonard Brown or Nedson has had from Paul W. Brown in Drawing wood in 1872, 1873, 1874	$3.25	1868-1875 Leonard C. Williams
February 27 ,1871	Income	Rec'd from Amos T. Barre? For Rail Road Ties	$4.50	1868-1875 Leonard C. Williams
April 26, 1872	Income	Rz cash received from Amos T Barnes for Timber Sold him in Oct 1871.	$7.00	1868-1875 Leonard C. Williams
April 26, 1872	Income	Rz cash Nee (d) from John H Copp for 400 chestnut Tis sold him in October 1871 20 a piece	$80.00	1868-1875 Leonard C. Williams
April 26, 1872	Income	Rz. cash Recd From John H. Copp for old logs sold him in 1871	$2.00	1868-1875 Leonard C. Williams
April 1, 1873	Income	Rec'd Cash of John H. Copp for 3 Chestnut Logs sold him January 11 1873	$3.00	1868-1875 Leonard C. Williams
April 1874	Income	Rec'd Cash of Amos T. Barees? For Timber and Pile sold him in Sept or Oct 1873	$25.00	1868-1875 Leonard C. Williams
July 11, 1884		Paid Calvin William for Juniper and brush clearing land		1868-1875 Leonard C. Williams
March 1884-April 1 1885	Eunice Cottrell/Fagins	Paid for cutting wood for Eunice Cottrell		
March 30, 1885	Eunice Cottrell/Fagins	Paid Elonzo Main for plowing garden and cutting wood for Eunice Cottrell for the year 1885		

April 9, 1886	Eunice Cottrell/Fagins	Paid Alonzo Main for Plowing Garden and Cutting wood for Eunice Cottrell	$5.00	
Jan 10, 1887	Eunice Cottrell/Fagins	Paid Alonzo Main for carting wood and cutting the same for Eunice Cottrell 3 weeks @ 1	$7.00	
1900	Income	Sold Timber	$134.00	Herbert Billingsly
December 20 1899		Paid Dwight Brown for drawing wood for Leonard Ned	$1.40	
Month of May - 1903	Income	Credit by Timber Sold	$20.00	Herbert Billingsly
January 1 1904	Income	Timber Sold	$8.00	
1877		Bill of CS Bennett H. Carting wood	$1.20	
Feb 26 1877		Bill of CS for Carting wood, 1 box matches	$2.36	
1881	Credit	Credits wood and Timber 1881	$57.87	1881-1882 Charles P. Chipman
April 17 1880		Bill of Frank Watson carting 1 load lumber	$2.00	1878-1881 Charles P. Chipman
March 10 1882		Bill of Alonzo Main for Carting Wood, Plowing Garden and Potatoes		1882-1883 Charles P. Chipman
February 9 1883		Bill paid Alonzo Main for Cutting Wood and Plowing Garden	$8.80	1882-1883 Charles P. Chipman
Summary of income received for benefit of said tribe from April 1 1878-April 1 1879 by Charles P Chipman 1879 March				
May 8 1878		From J.H. Copp for Poles	$1.00	1879 Mar. Charles P. Chipman
July 25 1878		Evard Whitford for Timber	$6.00	1879 Mar. Charles P. Chipman
Oct 11 1878		From Benajah Davis for Wood	$24.00	1879 Mar. Charles P. Chipman
December 6 1878		From Marbane Whitford for Juniper Posts	$3.80	1879 Mar. Charles P. Chipman
Feb 21 1879		Everard Whitford for Timber	$4.00	1879 Mar. Charles P. Chipman
March 7 1879		Everard Whitford for one tree	$1.00	1879 Mar. Charles P. Chipman
March 25 1879		F.A Chapman for Wood	$14.00	1879 Mar. Charles P. Chipman
March 25 1879		BF Banauken for Wood	$3.00	1879 Mar. Charles P. Chipman
That he has received from April 1 1879 to April 1 1880 the following ? And ? For the benefit of said tribe:				1880 April Charles P. Chipman
April 2 1879	Income	From John H. Copp Esq. for wood from land	$5.00	1880 April Charles P. Chipman
May 7 1879	Bill	Bill of Calvin Williams for clearning junipers from land	$15.00	1880 April Charles P. Chipman
January 2 1880	Eunice Cottrell	Bill of Underwood (Carting Wood	$1.50	1880 April Charles P. Chipman

January 19 1880	Eunice Cottrell	Bill of Mr. Law Carting Wood	$1.00	1880 April Charles P. Chipman
March 20 1880	Eunice Cottrell	Bill of Underwood (Carting Wood)	$1.75	1880 April Charles P. Chipman
July 12 1880	Bill	Bill of Calvin Williams (Clearing Land)	$2.00	1881 March Charles P. Chipman
Summary Feb 1880		Received from JH Copp (Wood)	$5.00	1880 Charles P. Chipman
That he has received for the support and benefit of said tribe from April 1 1880 to April 1 1881 the following:				1881 March Charles P. Chipman
March 2 1881		From Everard Whitford 1 stick timber	$1.50	1881 March Charles P. Chipman
March 2 1881		From Benajah Davis for 8 Cords Oak Wood	$32.00	1881 March Charles P. Chipman
March 2 1881		From Benajah Davis 6 1/8 Cords Chestnut Wd?	$18.37	1881 March Charles P. Chipman

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