Faunal and Floral Remains and Paleoenvironemental Studies

The Data Recovery investigations attempted to better define the role of faunal resources in the subsistence system of the occupants of the Muttock-Pauwating site. Faunal analysis research questions included the following:

-Can any temporal differences in the use of faunal remains be identified from absolutely (radiocarbon) or relatively (association with temporally identifiable artifacts) dated features?
-What is the nature of the shellfish resources used by the inhabitants?
-What can the faunal and shellfish remains tell us about the catchment areas used and subsistence patterns of the inhabitants of the site?
-Dogs retained a special place in the culture of New England's Native people. What do the canine remains recovered from Lot 6 tell us about Native use of canines?
-What do the faunal remains tell us about the seasonality of the occupation at the site?

Analysis attempted to gain fuller understanding and possible reconstruction of the subsistence system of the occupants of the site by combining the lithic and pottery studies together along with the shellfish and faunal analysis. Researchers hypothesized that the subsistence system practiced by the Transitional Archaic to Early Woodland inhabitants of the site was focal, intensive and specialized to a degree. This type of system focuses on a limited number of resources while excluding others. When a system such as this develops, preservation and storage technology to make this resource last for a substantial portion of the year also develops. Specialized technology is also developed to maximize the amount of return and minimize the amount of energy expended to procure it (Barber 1982: 96). For example, the use of nets or weirs allows fishermen to catch a great number of fish by merely knowing when and where to put these devices. This type of system seems appropriate for the period in question due to the first appearance of storage pits, pottery and the use of weirs at this time. This is the type of system used by the seventeenth century Wampanoag. Analysis compared the ethnohistoric data available about their system with the evidence recovered from the site as a way of helping to determine if they were similar.

This type of system contrasts with a generalized subsistence pattern that uses a broad range of resources with no great effort being placed on maximizing the return through technology or storing it for the winter. Diffuse or generalized systems are continually on the move to arrive at the next resource that is seasonally-scheduled to be exploited. Systems such as this have no true home bases and must acquire food as they can. This appears is the type of system practiced by the Micmac in the historic period and possibly by the users of Small Stemmed technology in the Connecticut River Valley.

The seventeenth century Wampanoag were practicing a mobile economy. They were seasonally migrational, they moved from place to place throughout the year to coordinate the resources of their territory. The resources they used were ill-distributed and they developed a specialized economy that maintained higher population numbers than could be done if they gathered those resources in isolation through the use of specialized groups (Higgs and Vita-Finzi 1982:28). In Frederick Dunford's view, the Cape Cod Natives practiced a unique human adaptation to the environment which he termed "conditional sedentism" (Bragdon 1996:58). This adaptation had the estuary as its primary focus with

its human community "joining and splitting like quicksilver in a fluid pattern within its bounds." (Bragdon 1996:59).

The Wampanoag exploited a variety of plant and animal species. A list of the plant and animal species collected, based on the writing of Roger Williams, indicates the people of southern New England collected 10 species of birds, 8 wild plant species, 4 cultivated plants, 8 wild mammal species, 16 fish species, and 5 shellfish species. This source gives a fairly complete inventory of the species but does neglect many wild species archaeologically recovered that Williams did not note. It shows that the Natives had a diverse diet of wild resources which they collected. At least 14 (Alewife, herring, bass, scup, eel, lampreys, chestnuts, acorns, walnuts, strawberries, lobster, clams, oysters, quahog) of the species noted, are known to have been extensively collected and stored for the winter by the Contact Period.

The hunting and collecting of any of these species and the storage of certain ones was an organized process. People scheduled where and when they would return to various sites to make use of resources. Winslow noted this as early as 1621 when he stated that "…by reason whereof, our bay affording many lobsters, they resort every spring-tide thither; and now returned with us to Nemasket.´(Young 1974:96). Morton also reported this springtime movement to the coast to catch lobster "…savages will meet 500 to 1000 at a place where they come in with the tide to eat and have dried a store, abiding in the place for 4-6 weeks feasting and sporting together." (Morton 1972: 90). According to William Wood, the drying of shellfish and fish took place in the spring and summer "In summer these Indian women, when lobsters be in their plenty and prime, they dry them to keep for winter" (Wood 1977:114).

After people dried the foods, they placed many of the vegetable foodstuffs in storage pits (Auqunnash), what the English termed "barnes". The best description of this is by Thomas Morton in 1637:

"They are careful to store food for winter, they eat freely of it but put away a convenient portion to get them through the dead of winter. Their barnes are holes made in the earth, that will hold a hogshead of corn a peece in the. In these (when their corn is out of the husk and well dried) they lay their store in great baskets (which they make of sparke) with matts under, about the sides and on top; and putting it into the place made for it, they cover it with earth.. to be used in the case of necessity and not else." (Morton 1972: 42).

These are the type of storage pits which the colonists found in 1620 on Cape Cod wherein they found "a bottle of oil, bag of beans...2 to 3 baskets parched acorns" and several bushels of corn (Young 1974: 155). During the Late Archaic storage pits make their first appearance in the archaeological record in New England, possibly marking a change in subsistence patterns by these people due to increased population pressure.

Analysis Techniques

Archaeologists analyzed the bone and shellfish remains in much the same way. Excavation collected large samples of all the anomalies for flotation and as a result, laboratory [processing recovered most of the remains from the soil samples. After cleaning and cataloging the faunal remains the analyst sorted the entire assemblage in identifiable versus non-identifiable elements.

Chartier identified the potentially identifiable pieces using his faunal collection and published identification manuals. The analyst identified individual pieces to species, element, side of body, and degree of fragmentation, weighed the pieces, and measured key anatomical features for comparative purposes.

Analysis divided the unidentifiable fragments into medium and small mammal flatbone and longbone fragments. Any evidence of burning and calcification was also noted. The high percentage of fragments which could not be identified was due to the high degree of fragmentation of most of the mammalian bones.

Analysis examined each of the identified species using documentary sources and modern field guides to determine what the habitat of these animals usually was, to what degree the harvesting of these species was seasonally determined, and what the seventeenth century sources state concerning their utilization by the local Native population. The goal of this analysis was that by looking at the animals from these three aspects, the season of occupation and utilization of the site and the features within the site could be determined.

The next question addressed by the researcher concerned the relative abundance and use of the various species at the site. Analysis quantified the remains using the Minimum Number of Individuals (MNI) present, the Number of Individual Specimens Present (NISP) which is essentially a count of the fragments of a species, and the weights of the bone fragments for each species. Depending on the quantification used for comparison the amount that the species contributed to the diet varies. This has been a long-standing dilemma in zooarchaeology. Taphonomic processes such as processing, disposal, scavenging, and excavation affect the NISP. This is compounded by the fact that fish bone, by its very nature, is thinner and less durable than mammal or even bird bone. This results in a lower probability of survival and recovery of fish remains. These factors also hold true for comparisons based on bone weight. The archaeological decay of bone that results in it losing much of its fresh weight will also hamper comparisons. The MNI is no better for comparisons due to the fact that one herring will not contribute the same amount to the diet as one deer.

As a way of compensating for the shortcomings of MNI and NISP comparisons, researchers recently have applied allometrical techniques to determine the contribution of species to the diet. Currently, this has only been done on collections from the southeastern United States (Reitz and Cordier 1983; Reitz and Quitmeyer 1988). There are no comparable sites for the northeastern United States.

Analysis proposed that the bone remains could corroborate some of the findings from the shellfish analysis with regards to season of capture, substrate identification, and the dietary importance of various faunal species to the inhabitants of the site. Analysis of the shellfish remains used many of the same techniques for the analysis of the fish remains. Researchers consulted modern guides that describe the habitat preferences and seasonality of the various species present. The author combined these with the ethnohistorical record of the seventeenth century documents with the hope that together they could provide a full picture of the position and importance of the various fish species to the Native people as well as their methods of capture. This information was then compared with the various

species present at this and other sites to see how well the documented preferences and techniques meshed with what had been found archaeologically.

Excavation recovered 11,357 pieces of prehistoric and historic faunal remains from data recovery excavations (Table 1). This number is deceptively large, as over 8000 of those pieces

Table 1. Faunal remains recovered

Species	Unburned	Burned	Calcined
Unknown	5		836
Mammal		3	146
Small mammal	2	1	13
Beaver	1		9
Woodchuck	1		
Mole			1
Gray Squirrel			1
Small to Medium Mammal			7
Medium Mammal	90	8	864
Deer	224	4	47
Bear	21		
Caprine	24		
Swine	14		14
Large Mammal	18		4
Cattle	136		1
Bird		1	13
Small Bird			2
Passenger Pigeon			6
Medium Bird	15		50
cormorant	3		
Canada Goose	1		1
Duck Sp.			1
Turkey	2		
Chicken	16		
Turtle		2	22
Box Turtle			24
Painted Turtle	1		40
Snapping Turtle			1

Table 1. (Cont.)

Species	Unburned	Burned	Calcined
Fish	1		1
Medium Fish	34		
Alewife	8005	12	102
Striped Bass	36		1
Sturgeon			1
Totals	**8731**	**36**	**2591**

were from one species, alewife (*Alosa pseudoharengu*). Analysis found most of the assemblage unburned, but other degrees of thermal alteration were present in the assemblage, ranging from slightly burned to complete calcinification. The presence of a large amount of unburned small fish remains in the assemblage is a testimony to the primary depositional nature of the material. Native inhabitants deposited the unburned alewife within the anomalies when the pits ceased to serve their principle functions and the inhabitants used them as refuse disposal areas. Excavation recovered 92.5% (N= 10, 509) of the total count of the remains from the anomalies while only 5.6% (N=633) came from the plowzone and a minor amount, .9% (N=105) from the subsoil.

Archaeologists recovered historic faunal remains predominantly from the cellar hole in L1HN, a recent deposit in L2H (swine, cattle, chicken), and a scattering of calcined fragments of cattle and swine in L5H associated with a coal ash deposit. The faunal remains from the cellar hole consisted of cattle (N=133) and caprine (sheep/ goat) (N=24) remains as well as a patch of reddish-brown cattle hair. Excavation recovered swine bones, chicken eggs and bones, and a small assemblage of cattle bones, from L2H, all representing recent domestic trash deposited in a woodchuck entrance hole.

Faunal remains were very similar across the entire project area. The overwhelming majority (n=8119) of the remains consisted of fragments of alewife scales, cranial elements and vertebrae fragments. Most of the remaining 3239 pieces, were too small for identification beyond the most basic levels. Testing found faunal remains concentrated in L4S (N=5698) and L6H (N=2546), with lesser amounts from L7SN (N=978) and L6H (N=68). Analysis found most of the bone unburned and analysis identified it as having come from a minimum of 30 individual alewife *(Alosa pseudoharengus*). The only locations that yielded faunal remains, but did not yield remains of alewife were L1H, L1HN, L1S, L2S, L8H, and L8HN. The lack of faunal remains in these locations may indicate occupation after the spring run of alewife , which currently is from late April to early June.

When analysis removes the alewife remains from the totals, locations L6H (N=950), L4S (N=868), L5H (N=448), and L2H (N=345) yielded the highest totals of recovered faunal remains (Table 2). Mammal, medium mammal and unknown calcined bone fragments composed the

Table 2. Gross faunal distribution with and without Alewife remains

Location	Total	Alewife	Without Alewife
L1H	23	0	23
L1HN	208	0	208
L1S	2	0	2
L2H	3	0	3
L4H	191	77	114
L4S	5698	4829	869
L5H	491	43	448
L6H	2596	1628	968
L6S	680	613	67
L7H	24	6	18
L7HN	4	1	3
L7SN	978	842	136
L8H	4	0	24
L8HN	6	0	6
L8S	71	67	4
Total	**11360**	**8119**	**3241**

largest amount of the non-alewife assemblage (N=2394) followed by deer (N=281) and cattle (N=137) with 133 of the cattle remains being recovered from the Wood house cellar in Lot 1HN.

Most of the burned bone was alewife (n=12) and medium mammal (n=8). Analysis found the calcined portion of the bone assemblage dominated by fragments that could not be confidently identified as anything other than unknown bone (n=836) or medium mammal (n=864).

Fish

Alewife

Alewives (*Alosa pseudoharengus)* can reach a maximum size of 44 centimeters and a weight of 1 kilogram. They migrate from the open ocean into fresh water rivers and streams to ponds to spawn with this migration beginning between April and June (Bigelow 1953:103). This is the only time that alewives may be caught close to shore, any other time they are out to sea. They feed chiefly on plankton but also may feed on fish smaller than themselves and are in turn are preyed upon by sharks, bluefish, cod, and hakes (Bigelow and Schroeder 1953:102, 103).

Herring and alewives are names which in the period, and to a degree today, are interchangeable even though they are two different species. Many of the seventeenth century reports on their occurrences may pertain to either species, although they did recognize a distinction in the period. These fish are best known as having been the fish of choice to manure fields of Native corn. This was due to their occurrence in great numbers. Winslow stated that when the herring and alewives travel into the Town Brook in April and May “The inhabitants during the said two months take them up every day in

hogsheads. And with those they eat not they manure the ground, burying two or three in each hill of corn- and may, when they are able, if they see cause, lade whole ships with them." (Young 1974: 07). This practice was also noted by Thomas Morton who stated that "Inhabitants dung their ground with them every acre taking 1000 fish. This practice is only for Indian maize, not for English grains." (Morton 1972: 89).

The settlers at Plymouth constructed a simple weir in this brook with which to catch the fish. They had it "shut in with planks, and in the middle with a little door, which slides up and down, and at the sides with trellice work, through which water has its course, but which they can also close with slides." (James 1963: 75). This would have been similar to the Native practice of shutting the river with a few stones to direct the fishes course. They then would have scooped the fish out of the water in front of the rocks with a "…net like a purse net put upon a round hooped stick with a handle." (Josselyn 1988: 100). The present study hypothesizes that the Natives at the Muttock-Pauwating site had a weir upon the Nemasket River, probably at or near the site of the present herring run at Oliver's Mills. While journeying to visit Massasoit at Pokanoket in 1621, Edward Winslow reported that they saw some men fishing from a weir in the Nemasket river where they got an abundance of bass (Heath 1963: 63). Souther New England Native people called fish such as herring, alewives and menhaden 'munnawhatteaug', which comes from 'munnohquohteau' (Trumbull 1903:69). This means 'the one that enriches the earth'.

Excavation recovered alewife remains from many lots (Table 3). The highest occurrences were i

Table 3. Alewife remains from anomalies with highest Alewife recovery occurrences

Location	**Anomaly**	**Type**	**NISP**	**MNI**
L4S	N148.3 E141.25	MMP	47	1
L4S	N148.8 E145.4	MMP	885	18
L4S	N149.1 E144.7	MMP	21	1
L6H	N104.85 E235.6	MSB	65	2
L6H	N109.3 E230.4	SMP	23	1
L6H	N113.75 E250.8	MMP	280	6
L6S	N114.3 E248.2	MMP	50	1
Total			**1371**	**30**

L4S (N=4829), L6H (N=1628), L7SN (N=842), and L6S (N=613). The alewife remains recovered from anomaly contexts took the form of scales, vertebrae, and cranial fragments. In the cases of the anomalies yielding the highest concentrations of alewife remains, Native people disposed of complete individual fish in the anomaly, often associated with one or two surf clam shells and a single large animal bone. The co-association of these remains and their significance is discussed further under the section of this report on anomaly analysis. Excavation recovered 1468 alewife vertebrae. The average alewife has 50-53 vertebrae meaning that there is evidence of a minimum of 28 individual fish. As this number represents only the alewife represented in the anomalies, it is assumed that the total number of alewife caught, processed and consumed at the site and consumed after the fall camp move, was much greater. Testing recovered most of the alewife fragments from seven anomalies from L4S, L6H and

L6S. Archaeologists recovered 1371 of the 1468 vertebrae (Table 3). The anomalies were mostly medium-sized medium depth pits but also included a medium-sized shallow basin and a small-size medium depth pit.. The estimated minimum number of individual fish present in these anomalies ranged from one to 18. Archaeologists believe that these fish were specifically deposited in these pits in the spring as a ceremonial offering possibly in thanks for the return of the alewife, This interpretation is further discussed in the report section on the anomalies.

Excavation found that of the 50 anomalies from ten locations where archaeologists recovered alewife remains, 44% were medium-size medium depth pits (N=22), 16% were large-size deep depth and large-size medium depth pits (N=8/ 16%), and 16% were natural (rodent and botanically derived) anomalies within which Native people deposited occupation refuse. The remaining 14% of the anomalies were hearth and FCR dumps, large and medium-sized basins and two small medium depth pits (Table 4).

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Table 4. Alewife recoveries from anomalies across the project area

Location	**Anomaly**	**Type**	**Count**
L2H	N268.1 E214.25	MMP	8
L2H	N269.5 E215.5	HD	4
L2H	N270 E213		1
L4H	N144.5 E129.8	N	1
L4H	N146.3 E126.55	MMP	60

Table 4. (Cont.)

Location	Anomaly	Type	Count
L4H	N152.3 E124.5	N	12
L4S	N142.2 E139.6		1
L4S	N142.65 E131.4	N	4
L4S	N144 E149.1		1
L4S	N145.75 E146	MMP	3
L4S	N146.8 E142.4	MMP	3
L4S	N147.1 E144.7		100
L4S	N147.2 E142.5	FCR	64
L4S	N147.55 E140.4	MMP	12
L4S	N147.8 E147.4	LMP	530
L4S	N148 E146.1	MMP	2
L4S	N148.2 E139.6	MMP	7
L4S	N148.3 E141.25	MMP	397
L4S	N148.8 E145.4	MMP	3069
L4S	N148.8 E145.5	MMP	1
L4S	N149.1 E144.7	MMP	639
L5H	N129.9 E189.8	N	1
L5H	N130.7 E178.7	MMP	4
L5H	N131 E181	MSB	13
L5H	N132.5 E194	MMP	5
L5H	N133.3 E178	N	3
L5H	N135 E186.5	LDP	11
L6H	N102.5 E235	N	3
L6H	N103.6 E238.75	MMP	16
L6H	N103.7 E238.75	MMP	10
L6H	N103.8 E244	LDP	3
L6H	N104.5 E243	LDP	10
L6H	N104.85 E235.6	MSB	588
L6H	N108.3 E241.6	N	1
L6H	N109.3 E230.4	SMP	342
L6H	N111.2 E228.2	LMP	23
L6S	N113.15 E251.5	LMP	1
L6S	N113.75 E250.8	MMP	661
L6S	N114.3 E243	MMP	32

Table 4. (Cont.)

Location	Anomaly	Type	Count
L6S	N114.3 E248.2	MMP	551
L7H	N68 E260	SNP	1
L7H	N68.9 E262.8	LMP	5
L7HN	N68 E266.8		1
L7SN	N70 E255	MMP	21
L7SN	N71 E252	MMP	2
L7SN	N72.3 E255.5	MMP	2
L7SN	N72 E253	LSB	1
L7SN	N74.5 E257.5	MMP	811
L7SN	N75.6 E256	LMP	5
L8S	N88 E317.1	N	66

The presence of alewife remains indicates occupation of the site in the spring between late April to early June. This seasonality assessment is supported by the presence of turtle remains associated with the alewife in many anomalies. The Nemasket River has the largest fish run of alewife in New England with over one million fish making the journey from the sea in Narragansett Bay to Assawompsett Pond and the present day herring run at Oliver Mills to the immediate north of the project area is evidence of the importance of this fishery to this portion of Middleborough

Analysis found 114 fragments of alewife vertebrae and a few cranial fragments burned or calcined indicating roasting or at least deposition of waste bones into the fire. After people caught alewife presumably using a weir, processing either for immediate consumption or for storage for winter occurred. The drying of the fish would follow a process similar to that described above for the drying of shellfish.

Ethnohistorically, Wood and Williams recorded the drying of lobster, bass and scup (Wood 1977:114; Williams 1971: 181). Native people probably ate larger fish, such as cod, hake and shark may soon after catching them or they may have cut them into strips and dried as Wood stated for bass. Speck stated that herring were still smoked and dried by the Wampanoag at Mashpee in the 1940s. Speck reported that in modern times, after salting, which is a modern practice, they were strung up on a stick run trough their eyes with about a dozen on one stick. These were then placed over a smoky fire of white oak, sugar maple, and sweet fern (Speck and Dexter 1948:263). Archaeological evidence of smoke drying may be represented at a site by a low occurrence of burned bones of smaller fish and possibly more fish cranial bones as opposed to vertebrae. The occurrence of more cranial bones would be due to their possible removal before smoking, possibly if they were larger fish.

Fish were also commonly roasted or boiled (Young 1974: 212; Morton 1972:56). Gookin, living near the Natives around Boston, gave the best description of the boiling of fish. He stated that “Their food is generally boiled maize or Indian corn, mixed with kidney-beans, or sometimes without. Also they frequently boil in this pottage fish and flesh of all sorts, either taken fresh or newly dried. These they

cut in pieces, bones and all, and boil them in the aforesaid pottage. I have wondered many times they were not in danger of being choked with fish bones; but they are so dexterous to separate the bones from the fish in their eating therof, that they are in no hazard." (Gookin 1972:10).

The present report presents anadromous fish exploitation as one of the factors that led to increased sedentism. Brumbach summarizes the potential importance of anadromous fish to sedentism as "The temporal and spatial predictability of the anadromous species is believed to have had a significant and creative impact in affecting and regulating human settlement and subsistence systems..." (Brumbach 1986:35). Knowing when and where a large biomass would be available for exploitation and knowing that the biomass would be available each year at the same location at the same time, may have led to increased sedentism while lessening the fear of starvation. Beginning in the Late Archaic, riverine locations, especially those near potential weir locations, began to serve as base camps from which groups of people would travel to exploit other resources, returning with the processed resources to that base camp. One of the reasons why Native people selected these riverine locations may have been the seasonal fish runs. The exploitation of the anadromous fish species may have helped to shape socio-spatial organization, the creation of seasonal base camps, and may have led to changes in preexisting settlement-subsistence systems (Brumbach 1986: 36; Carlson 1988: 47). The exploitation of anadromous fish would have allowed populations to increase both the total energy capture and feeding efficiency without increasing territory or mobility (Brumbach 1986: 37). The increase in sedentism that resulted from the exploitation, processing and storage of anadromous resources may have also helped to bring about the adoption of more fragile pottery, replacing the steatite bowl, and the eventual adoption of horticulture at what were originally pre-horticultural seasonal base camps.

Sturgeon

Atlantic sturgeon (*Acipenser slurio)* grow to a length of over 10 feet and inhabit salt and fresh water where they feed on small fish. They were available to Native people from May to July. The earliest reference to sturgeon was by Captain John Smith in 1614 who, in May to August of that year, saw sturgeon in New England (Parker 1968: 231, 242). Emmanuel Altham, visiting Plymouth Colony in 1623, noted a great abundance of sturgeon in the Plymouth area (James 1963: 25). Roger Williams noted that the Natives called them Kauposh, which is translated as "he is who shut up/ protected) (Williams 1971: 180). William Wood, Roger Williams, and John Josselyn all recorded Native techniques for catching sturgeon (Wood 1977: 107; Williams 1971: 180; Josselyn 1988: 100). Williams' description serves to illustrate the common methods "The natives venture one or two in a canoe, and with a harping iron, sticke this fish and haul it into the canoe, sometimes they take them by their nets, which they make of strong hemp." (Williams 1971: 180).

Fishermen used tidal nets to catch sturgeon. They were often set in a harbor between the shore and a sand bar at the mouth of a river (Josselyn 1988:140). Champlain's 1605 drawing of Nauset Harbor shows a conical tidal being used at the mouth of the Nemaquoit River **(Figure 1)**. The Native people also used them to catch bass as well as sturgeons (James 1963: 9; Williams 1971:180; Wood 1977: 107). The Wampanoag whom Speck interviewed in the 1940s still made nets with which to catch herring. The weave of nets was two fingers wide and he stated that the spacing was still measured with the fingers and not a wooden gauge (Speck 1948:263). Native people weighted tidal nets such as these with notch net sinkers, a practice that Speck noted was still being done in the 1940s (Speck 1948: 263).

Another technique catching fish was the use of spears to impale the fish. This was especially noted for catching sturgeon. Wood stated that the men would go out at night with torches and they would …"carry a 40 fathom line with a sharp bearded dart fastened at one end." (Wood 1977: 107). This was also noted by Williams, who stated that they would use a 'harping iron' to do so (Williams 1971:180).

Testing recovered one fragment of sturgeon scute from L4S anomaly N148.8 E145.4, a medium size medium depth pit. Also recovered from this anomaly were alewife remains, shell tempered pottery and a rhyolite biface.

Striped Bass

Striped Bass (*Morone saxatilis)* is an anadromous species that spawns in fresh water and lives the rest of its life in salt water. They can grow up to six feet long and weight up to 50 pounds. William Wood in 1634 noted that bass were "…one of the best fish, meat delicate, fine, fat, fast fish with a bone in its head which contains a saucerful of marrow, sweet and good, pleasent to the palate and wholesome to the stomach. When there is a great store we only eat the heads and store up the rest for winter." (Wood 1977: 55). Although he and other writers of the period do not make a distinction between striped bass (*Morone saxatilis*) and the black bass his description of the fineness of the fish could apply to either.

The seventeenth century sources are replete with European comments on the bass of New England. Unfortunately most of the "bass" descriptions are probably referring to the striped bass for they mention its tendency to pass up into the rivers and chase the smaller fish. Native fishermen used four techniques to catch bass: they were caught with hooks, with seine nets, with larger tidal nets, or speared. A Native fisherman baited the hooks used to catch bass with a piece of lobster meat, which the women would have collected, or with mackerel (Wood 1977: 113; James 1963: 87). Individuals caught this way were over two feet long (James 1963: 9). people used seine nets for smaller individuals one foot to one and one half feet long (James 1963: 9). This was often done from sandbars at the mouths of rivers (Josselyn 1988:14). They used larger tidal nets, probably for striped bass, across the mouths of small creeks. English reports were that people could catch 500 to 700 at a time (James 1963: 9). The final technique used by Native people, spearing "…at the mouths of barred rivers (the Natives) being in their canoes, striking them with a fishgig." (Josselyn 1988: 100). Roger William's accounts support Josselyn' report. Williams stated that they would use Ashop (nets) "Which they will set in some little river or cove wherein they kill Bass (at the fall of the water) with their arrows, or sharp sticks, especially if headed with iron." (Williams 1971:31).

After people caught them, they smoke dried the fish just as they did the lobsters and scup (Wood 1977: 114). They were also used to make …"a dainty dish of Uppanquontup or heads of fish; and well they may, the brains and fat of it being very much and sweet as marrow." (Williams 1971:31).

Period sources state that bass were most plentiful in May, June, July and August (James 1963: 9). William Wood reported that there were different places from which to catch the bass. When the herring and alewives passed up the rivers, they could be caught there, in the early summer when the Natives would gather lobsters they could be caught around the rocks, and in the fall around Michelmas (September 29) they could be caught in the seas (Wood 1977: 55). This pattern reflects the seasonal migrations of both the black bass and the striped bass and could refer to either species.

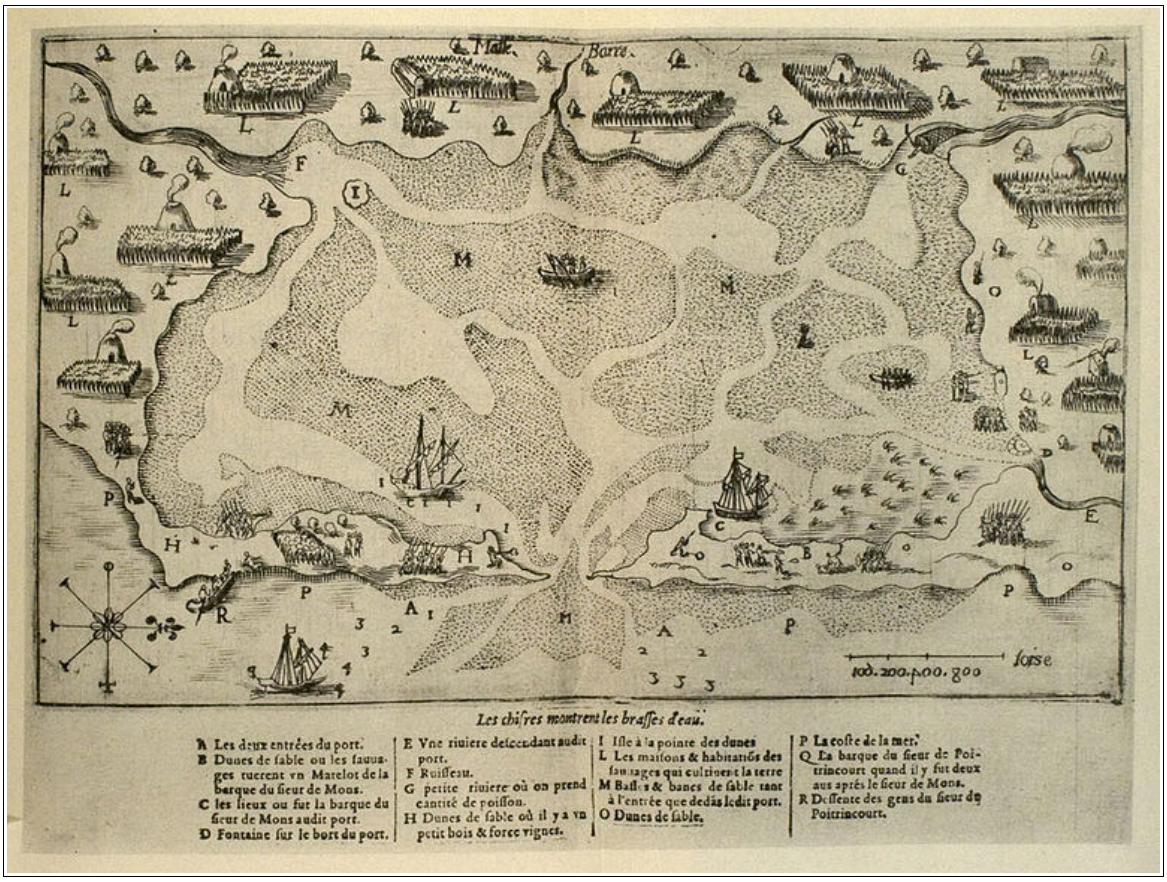

Figure 1. Champlain's map of Nauset Harbor. The tidal net is visible in the upper right corner of the map.

Excavations recovered 37 Striped Bass *(Morone saxatilis*) bones with most being found in three anomalies in L6H: N104 E241.6, N104.85 E235.6, and N109.3 E230.4 and from L6S anomaly N113.15 E250.8. Testing recovered one pharyngeal tooth fragment from L4S anomaly N148.2 E139.6. These fish were probably caught in the river in the spring.

Small Sized Mammals

Testing recovered small mammal remains from seven locations (Table 5). The woodchuck

Table 5. Small mammal bone recoveries

Species	L2H	L4H	L4S	L5H	L6H	L7SN	L8H
Small mammal		1	4	1	8		1
Beaver			5		2	3	
Woodchuck	1						
Mole	1						
Gray Squirrel			1				
Totals	**2**	**1**	**10**	**1**	**10**	**3**	**1**

remains from L2H was found in the plowzone and appears recent and is not considered in the discussion. Analysis concluded that the mole was a commensal species, one that lives with people, and is not one that is usually considered a consumable. Analysis found the mole bone calcined, which may indicate that it was deliberately deposited in the fire. No ethnohistoric sources mention moles or the Natives views on them. Archaeologists consider this bone an anomalous or stray inclusion.

In only two locations did the small mammal remains number more than one to three pieces, indicating a very low reliance on small mammals during the occupation at the site. Analysis found all fragments except for one beaver and two small mammal pieces, calcined or burned. Excavation recovered 10 fragments from anomalies at the L2H, L4H, L4S, L6H, and L7SN locations.

Beaver

Beaver (*Castor canadensis*) reach an adult size of 35.5 to 46 inches and a weight of 45 to 60 pounds. Their habitats are rivers, streams, marshes, lakes and ponds where they construct elaborate dam and lodges and feed on aquatic plants and vegetation. The Native name for the beaver is 'Tummunk' meaning 'the hitter', for the beaver's habit of striking the water with its tail as an alarm. Native people considered beaver an important food and raw material sources as well as being culturally significant. The cultural importance of beaver is seen in Roger Williams' reporting of separate designations for male (Sumhup) and female (Noosup) beavers (Williams 1971: 93). Ethnohistoric sources emphasize the importance of beaver furs, fat, and tails in Native culture (Josselyn 1972: 18; Josselyn 1988: 66; Morton 1972:77; Wood 1977:47). One important notation first stated by Morton (1634) and reinforced by Josselyn (1672, 1674) was that the tail was often roasted and eaten, being reserved for the sachems and reported to have aphrodisiac properties (Morton 1972: 77; Josselyn 1972:18; Josselyn 1988:66).

Beaver bones were found only in locations L4S and L7SN where archaeologists recovered them from four separate anomalies. Beaver fragments consisted almost completely of phalanges, with only one tooth enamel fragment being recovered from L7SN. When occurring in anomalies, beaver bones were found associated with alewife (three instances), deer (two instances), turtle (two instances), and turtle (one instance) (Table 6). Only one beaver bone was found in isolation with none of these other

Table 6. Beaver and small mammal bone recoveries from anomalies

Location	Anomaly	Small Mammal Species	Other Species
L2H	N268.1 E214.25	Mole	Alewife
L4H	N142.7 E147.3	Gray Squirrel	
L4H	N148.35 E131.55	Small Mammal	Deer
L4S	N144.4 E149.1	Beaver	
L4S	N145.75 E146.4	Small Mammal	
L4S	N148.3 E141.25	Beaver	Deer, Turtle, Alewife
L6H	N103.7 E237	Small Mammal	Deer, Bear
L7SN	N71 E252	Beaver	Alewife
L7SN	N74.5 E257.5	Beaver	Deer, Medium Bird, Turkey, Turtle, Alewife

species. The co-occurrence with other species, especially alewife and turtle, indicates that the beaver bones entered the archaeological record during the spring time. Bones identified generically as small mammal occurred alone in anomalies and with deer and bear.

Gray Squirrel

Gray squirrels (*Sciurus carolinensis)* range in size from 16 7/8 to 19 ¾ inches and 14 to 25 ounces in weight. They inhabit hardwood or mixed forests with nut trees especially oak-hickory forests where they feed on hickory and beech nuts, walnuts, acorns, corn, and plant buds. Native people called them 'Mishanneke', or 'the great scratcher' (possibly for their scratching of the ground to bury and recover nuts) and young boys hunted them with women the sewing the skins into robes (Williams 1971: 57). Josselyn, Morton and Wood all note that they will steal corn and destroy crops if not controlled (Josselyn 1988: 61; Morton 1972: 81; Wood 1977: 44). Excavations recovered one calcined femur in isolation from L2H.

Small mammals made up a minor part of the faunal assemblage across the site. Intensive survey and site examination testing yielded one gray squirrel bone from Lot 7 and one fox bone from Lot 6. Overall small mammal made up 24% of the intensive survey and site examination faunal assemblage and only .24% of the data recovery assemblage. Small mammals at the Agawam site made up 5.6% of the faunal assemblage This is likely the result of seasonality, as it would be expected that small mammals, especially fur bearing ones, would be caught and consumed in the fall and winter more often than the spring to summer.

Medium-Sized Mammal

Deer

White-tail deer (O*docoileus* virginianus) can reach a maximum length of 206 centimeters long and a weigh up to 135 kilograms (Whitaker 1988: 654). They prefer farmlands and brushy wooded areas. Native people frequently hunted deer and as a result their bones are fairly ubiquitous at Native-occupied sites.

The deer provided the Natives with many raw materials for producing a vast array of their material culture. Native people ate the meat, used the marrow to eat and for grease, tanned the hide with the hair on or off for clothing, the antlers and bone as a raw material for tools such as arrow heads and fishhooks, the sinews for sewing, the hooves for glue, and the bladders as a vessel to contain oil. Seventeenth century sources are replete with references to deer. This probably has to do with the fact that they were present in England so the Europeans knew of them, but they had never seen them in such great numbers as they did here.

Natives hunted them either by single hunters or by bands. When hunting singly, the hunter stalked the deer much as hunters do today. By observing their habits throughout the year, the hunters would know what locations the deer favored (Williams 1971:224). He would then either hunt the deer with his bow or would set snares and return to check them every day or two. The second way that people caught deer was communally. This could be done either by stalking or by setting snares as well. These would be large parties who went out to do this. Williams stated that 20 to 300 men might go out to pursue the deer on foot. During the trap hunting the men would bring their wives and children if they did not need to travel far and build a small impermanent house which was their hunting lodge. They would then

stake out their bounds for their family that might be 2-4 miles and would set 30-50 traps and check these every few days (Williams 1971:224).

The importance of the deer to the people is seen in the number of names that they used to describe them. The general name for deer was 'ahtuk' but the people further differentiated between ages and sexes. A 'paucottauwat' was a buck while a 'Wawunnes' was a young buck. A 'qunneke' was a doe and a 'moosqin' was a fawn (Williams 1971:224). Native people made the distinctions for a number of reasons. One may have had to do with different qualities of the meat of the deer. Josselyn stated that people, with no distinction being made whether they were English or Native, considered the flesh of the fawns the best (Josselyn 1972:99). It also may have had to do with the spiritual connection that the people felt they shared with the deer. Unfortunately this was not explicitly stated by any of the seventeenth century authors, merely hinted at. For example, Williams wrote that the Natives were "… very tender of their traps and where they lie, and what comes at them; for they say, the deer (whom they conceive has a divine power in them) will soon smell and be gone." (Williams 1971:224). Deer skins were also used as tribute to the sachems of the communities. The sachems had the right to the skin of any deer that either a hunter or wolves killed in water (Williams 1971:224).

Josselyn gives a good description of the hunting done by the Natives to the north of Boston. These people often hunted moose in this area, but the description of their hunting practices. He stated that

"They go 30-40 miles up into the country and run down a moose. When he has tired, they cut his throat and skin him, the women take out the heart, cut off the left rear foot and draw the sinews out, and cut out his tongue and as much venison as will deserve to satiate them. At the same time the men pitch camp near a spring and scrape the snow to the bare earth. In the middle they make a fire near a tree and hang their kettle from one of the branches of the tree and boil the venison...They do not trouble themselves with the horns of the moose or the deer because they are weighty and cumbersome. They leave the carcass out there for the wolverines." (Josselyn 1972:99).

This was probably much the same way that the Natives in southeastern Massachusetts hunted deer during the large drives in the fall. They would slay a large number of deer, take the meat and other parts they wanted and leave the rest.

Skeletal elements identified consisted chiefly of teeth and teeth fragments (N=83), vertebra fragments (N=69) and phalange fragments (N=35), followed by metapodial (metacarpal, metatarsal and generic metapodium) fragments (N=27). Other elements were present in much lower percentages (Table 7).

Table 7. Deer element recoveries

Element	**Count**	**Locations**
Antler	2	L5H
Cranial	2	L6H
Maxilla	1	L6S
Mandible	4	L6H, L4S
Teeth	83	L6H, L4S, L6S

Table 7. (Cont.)

Element	Count	Locations
Axis Vertebra	10	L6H, L6S
Cervical Vertebrae	13	L6H
Thorasic Vertebrae	2	L4S
Lumbar Vertebrae	9	L4S, L6H
Scapula	13	L6H
Humerus	7	L4S, L5H, L6H
Ulna	4	L4S
Carpal	2	L4S
Metacarpal	10	L6H, L7SN
Ribs	3	L6H
Pelvis	2	L4S
Tibia	7	L6H
Astragelous	2	L6H
Metatarsal	14	L6H
Metapodium	3	L6H
Vertebra Fragment	35	L6H, L6S
Sesamoid	6	L1H, L4H, L5H, L6H
Phalange	35	L7S, L5H, L6H, L7SN
Total Fragments	**269**	

Vertebrae, ribs, and phalanges are among the most numerous but least meat-bearing elements in a skeleton and thus the abundance of vertebra and phalange fragments are not surprising and indicate that complete or mostly complete carcases were at least occasionally butchered at the site. The paucity of ribs may indicate that these were either not brought back to the site that people processed or consumed them in such a way that fragments did not often enter the archaeological record. They may also be represented among the numerous unidentified medium mammal flatbone fragments recovered. Teeth and metapodial are very durable elements and as a result are often over represented in assemblages. The relative ease of identification of these elements, even as small fragments, versus others also accounts for their common identification in archaeological assemblages.

Another reason for the higher occurrences of metapodials and phalanges is that the thickness, durability and low meat yield on these elements may have resulted in them being processed in such a way that they were more likely calcined and thus preserved. It is possible that Native people crushed the vertebrae, phalanges and metapodials and then boiled to extract every last bit of grease. The Native processors may have tossed the resulting small waste bone fragments into the fire to dispose of them or to act as a source of fuel while they reduced the grease. Their fragmentation was most probably the result of the crushing of the bones to extract marrow. This was commonly done by the Natives in the northeast. For example, among the Micmac of Canada, Deny's noted that when Natives killed a moose

"they collected all the bones of the moose, pounded them with rocks upon another of larger size, reduced them to a powder; then they placed them in their kettle, and made them boil well. This brought out a grease which rose to the top of the water, and they collected it with a wooden spoon. They kept the bones boiling until they yielded nothing more, and with such success that from the bones of one moose, without counting the marrow, they obtained 5-6 pounds of grease as white as snow, and firm as wax. It was this they used as their entire provision for living when they went hunting. We call it Moose butter..." (Denys 1672:118).

The bone fragments were then disposed of in the midden. The Native people may have placed the fractured bones in a pot of boiling water as well and the grease added to soup for immediate consumption.

Few anomalies yielded large amounts of deer bone (Table 8), with their occurrence being limited

Table 8. Deer remains from anomalies

Location	Anomaly	Anomaly Type	Element
L4S	N141.5 E146.2	N	Humerus
L4S	N144.5 E145.5	LDP	Mandible
L4S	N147.2 E142.5	FCR	Ulna, Lumbar Vertebrae
L4S	N147.55 E140.4	MMP	Thorasic Vertebrae, Carpal
L4S	N148 E146.1	MMP	Phalange
L4S	N148.3 E141.25	MMP	Pelvis
L4S	N148.8 E145.4	MMP	Ulna, Carpal
L4S	N149.1 E144.7	MMP	Tooth
L4S	N151.8 E143	FCR	Ulna
L4H	N148.35 E131.55	MMP	Sesamoid
L5H	N129 E181.7	MMP	Phalange
L5H	N135 E186.5	LDP	Antler, Phalange
L6H	N100.6 E244	LDP	Humerus, Scapula, Molar
L6H	N103.6 E238.75	MMP	Axis Vertebra, Cranial, Teeth,Cervical Vertebrae, Metacarpal, Rib, Lumbar Vertebrae, Tibia, Astragelous, Phalange
L6H	N103.7 E237	MMP	Molar
L6H	N103.8 E244	LDP	Metacarpal, Lumbar Vertebrae, Sesamoid, Phalange
L6H	N104.5 E243	LDP	Phalange, Sesamoid
L6H	N104.85 E235.6	MSB	Mandible
L6H	N108.8 E235.7	LDP	Metapodium
L6S	N113.75 E250.8	MMP	Maxilla,Axis Vertebra
L6S	N114.3 E248.2	MMP	Molar
L7SN	N72.3 E255.5	MMP	Phalange
L7SN	N74.5 E257.5	MMP	Metacarpal

mostly to L2, L4S, L5H, and L6H. Skeletal element identification from L4S front limb (humerus, ulna), anterior axial (thoracic vertebra), and posterior axial/ pelvic (lumbar vertebrae, pelvis) with one mandible, molar and tooth root also being recovered. This distribution of elements likely represents preferential choice of certain parts to the camp from a distant kill site.

Identified skeletal elements from L6H represented fewer meaty elements with a humerus fragment being the only identifiable longbone fragment. Element presence was more biased towards cranial, dentary, vertebral, axial and lower limb elements. This may represent the return of a complete deer to the site with only the less meaty elements being consumed. Analysis found he general trends of higher flatbone element counts in L6H and higher longbone counts in L4S mirrored in the distribution of medium mammal longbone versus flatbone within anomalies, occurrences (Table 9). While L6H had a high longbone fragment count, L4S

Table 9. Distribution of deer longbone versus flatbone fragments

Location	Flatbone	Longbone
L1HN	1	5
L2H	1	42
L4H	13	2
L4S	11	280
L5H	66	24
L6H	180	248
L6S	1	5
L7H	0	4
L7SN	0	11
L8HN	0	1
L8S	1	0
Totals	**274**	**622**

had more longbone fragments and the ratio of flatbone to longbone showed a greater degree of disproportion in L4S (1:25.5) than in L6H (1:1.4). This support the possibility of more intense processing of longbones in Lot 4 than in Lot 6. If the known longhouse in Lot 4H and the suspected longer house in Lot 4S represent the homes of sachems, then the disproportionate occurrence of longbones, generally higher meat bearing elements, may represent gifts, tribute or “sachem shares” of deer. Deer skins were used as tribute to the sachems of the communities. This may have possibly extended to haunches of meat as well.

The distribution of deer fragments in the anomalies at the site also showed a clear pattern (Table 8). Native inhabitants disposed of deer elements in large size deep pits (interpreted as storage pits) (N=6-26%), in medium size medium depth pits (interpreted as pot cache pits) (N=13- 56.5%), in fire-cracked rock dump (or possibly hearth) (N=2-8.7%) locations, and in one case each in a natural anomaly that the inhabitants used for refuse disposal and in a medium size basin. The anomalies where archaeologists recovered the deer remains (N=25) often contained the remains of turtles (2.5%),

alewife (20%) or turtles and alewife (36%) and just deer itself (36%) (Table 10), at least in L4S, L6H, and L6S.

Table 10. Deer, Alewife and Turtle co-distribution*

Location	D	D and T	D and A	D, T and A	T	T and A	A	Totals
L2H					3		5	**8**
L4H	1				1	1	2	**5**
L4S	3	1	3	3	4	4	11	**29**
L5H	1			1	2	2	4	**10**
L6H	4	1		3	3	4	5	**20**
L6S			2				1	**3**
L7H						1	4	**5**
L7HN							1	**1**
L7SN				2		3	3	**8**
L8S							1	**1**
Totals	**9**	**2**	**5**	**9**	**13**	**15**	**37**	**90**

*D- Deer T- Turtle A-Alewife

This indicates that Natives hunted and consumed deer in the spring when the turtles emerged from hibernation and the alewife were running up the Nemasket River. Spring hunting of deer is supported by Speiss findings in Maine (Speiss 1983).

Deer remains were abundant at the Agawam and Sandy's Point sites as well. At the Agawam site Chartier identified 10 pieces as white-tailed deer (Chartier 2007). Most of these came from two features, Feature 8 and Feature 9, which also yielded abundant turtle and herring/ alewife remains, supporting the hunting of deer in the spring during the anadromous fish runs. Analysis found elements limited to tooth, cranium and metatarsal fragments. At the Sandy's Point site in Yarmouth two features, Feature 29 and 1, yielded deer remains (Chartier 2000). The deer remains from Feature 29 consisted of seven fragments representing one rib, one femur, one metatarsal, and one dew claw. All of these fragments are from one right rear leg and part of the rib cage of an adult deer. This also seems is the case for the deer remains from Feature 1. Deer remains in this feature are one humerus fragment, one femur fragment, one tibia fragment, and one complete astragelous. These parts are from the left front upper leg and the entire left rear leg an adult deer. The lack of any teeth or other skeletal elements also supports the notion that the deer arrived at the site in two pieces. Luedtke documents the presence of only deer leg elements on an island site from Calf Island in Boston Harbor (Luedtke 1980:61).

Black Bear

The black bear (*Ursus americanus*) is a vegetarian bear that reaches a mature size of 4.5 to 6.25 feet and with males ranging from 130 to 600 pounds and females from 100 to 400 pounds. They feed on twigs, buds, leaves, nuts, roots, corn, berries, bark, grubs, beetles, crickets, ants, and fish, hibernating in mid-November to December and emerging early March to mid-April. Black bears mate between mid-June and mid-July, giving birth in January to February. Females home range is nine to ten miles while a

males is up to 120 miles. Thomas Morton, William Wood and John Josselyn all stated that Natives esteemed bear meat more than venison and that they used the furs as robes and blankets (Morton 1972: 80; Wood 1977: 42; Josselyn 1972:13). Wood stated that they were fiercest in the spring at strawberry time when they defend their cubs (Wood 1977: 42). Morton related that they were very afraid of people and that the Natives would chase them back to their homesites and then kill them so that they would not have to carry the meat back (Morton 1972: 80). Native people called black bears 'mosq", meaning 'the scratcher' (which is root for the word mosquito), by Native people and they called the constellation Ursus mosq as well (Williams 1971: 224).

Excavations recovered 15 black bear fragments from three anomalies at L6H, two medium-size medium depth pits (N103.7 E237 and N103.6 E238.75) and one large-size deep depth (storage) pit (N100.6 E244), possibly establishing contemporaneity between the three pits. Analysis found elements limited to a mandible, molar, tibia, ulna and phalanges, possibly indicating that Native people brought only part of the bear back to the site, possibly the skin with the head and paws, and one forelimb, or that the individuals who created these anomalies only had access to a portion of a complete bear that someone elsewhere. Archaeologists recovered a bear headed effigy pestle from L4H, possibly indicating a connection between the occupations between the two areas.

Archaeologists reported the remains of black bears from Massachusetts archaeological sites but they are more common in northern and western Massachusetts than southeastern. Ritchie recovered two black bear bones from the Pratt Site on Martha's Vineyard (Ritchie 1969: 79). Black bear are not native to the islands and Native people must have transported to the island from the mainland. Unfortunately Ritchie did not report the elements recovered, so it is unknown if these remains arrived as a meat source or as an attachment to a skin robe or blanket (in which case one would only expect terminal phalanges "claws" present). Ritchie recovered the remains from Stratum 2 from which he also recovered numerous Early Woodland Lagoon, Rossville and Vinette I pottery. Other vertebrate species recovered from Stratum 2 included muskrat, raccoon, domestic dog, red fox, gray squirrel, turkey, striped bass, turtle, and Atlantic sturgeon (Ritchie 1969: 81). The species present indicate the seasonality of the occupation was from late spring to fall. Black bear remains were also recovered from the Flagg Swamp Rockshelter in Marlboro, Massachusetts associated with the Late Archaic occupation of the site (Huntington 1982: 81). Other vertebrate species associated with the bear remains were white-tailed deer, beaver, muskrat, woodchuck, rabbit, raccoon, domestic dog, fox, lynx, skunk, all, notably, fur-bearing species (Huntington 1982:81). Archaeologists found the black bear represented by a skull and mandible which had been extensively modified by cutting and chopping (Huntington 1982:84). Archaeologists aged the individual at five to six years old, and possibly a male. They determined seasonality as November to March for the Late Archaic assemblage (Huntington 1982:86).

Birds

Excavations recovered 92 fragmentary bird remains during the data recovery excavations with 67 of these pieces (72.8%) being recovered from anomalies and accounting for .8% of the total faunal assemblage. Edward Winslow of the Plymouth Colony stated that the best time for fowling was from October to March as the fishing tapered off (Young 1974: 294). Roger Williams noted that there were two ways that Native people caught birds: they shot them with arrows or they netted them. He stated that they would lay nets "…on shore and catch many fowle upon the plains, and feeding under okes upon acorns as Geese, Turkeys, Cranes and others." (Williams 1971:172).

Archaeologists recovered avian remains from a number of lots, L4S and L6H had the highest number of fragments (Table 11). Location L4S and L5H had the highest variety of identified species.

Table 11. Recovered avian remains

Location	Bird	Medium Bird	Passenger Pigeon	Duck	Canada Goose	Turkey	Cormorant	Totals
L1H	1							**1**
L2H	1							**1**
L4H		8						**8**
L4S	1	26	6			1	3	**37**
L5H	1			1	2			**4**
L6H	5	18						**23**
L7HN	1							**1**
L7SN		12						**12**
L8S	1							**1**
Totals	**11**	**64**	**6**	**1**	**2**	**1**	**3**	**88**

Locations L4S and L6H consistently had the highest occurrence and the most comparable of all classes of faunal remains. Analysis identified five species, two land based and three aquatic. The two largest species identified were the turkey and the Canada Goose. Wild Turkeys (*Meleagris gallopavo)* reach a mature length of 36 to 49 inches and a weight of 18 to 24 pounds for males and 10 pounds for females. They generally live in open land- fields, barrens, burn outs, and savannas where chicks feed on herbage and insects. In the winter they withdraw deep into the forest to mast producing stands and conifers where they can perch. Turkeys are generally vegetarian, feeding on buds, leaves, stems, roots, and tubers; seeds, grains, acorns and beechnuts, wild fruits and berries. They will also eat insects, spiders, snails and small amphibians. Ethnohistorically, writers documented that New England turkeys traveled in large rafters of 40 to 100 individuals, that they travel to the shore in the winter to feed on fish, shrimp and crabs, and that a hunter could kill ten or a dozen in half a day (Wood 1977: 50; Morton 1972:69). Individuals killed and consumed by the English weighed 30 to 60 pounds (Morton 1972: 69; Josselyn 1972: 8). Excavation recovered one turkey bone from the bottom of a medium-size medium depth pit in Lot 4 septic impact area.

Canada geese *(Branta canadensis)* frequent this area of Massachusetts from late September to late May. They average 30 to 43 inches in length and weigh seven to 14 pounds on average. They are generally herbivorous but will also feed on insects and fish. In the period, the English noted that geese were very numerous. Thomas Morton noted that in 1623 saw1000 geese before the barrel of his gun (Morton 1972: 67). He also noted that the flesh of the New World geese was better than that in England. Josselyn noted that there was a medicinal use for the goose which was to drink the fat drippings which will cure the "bloody flux" (Josselyn 1972:9). Ducks are available from Mid August to Early May in this area. Writers did not record much information regarding New England ducks except that they are better than those in England and that the dogs would get the giblets unless the colonists boiled them to make a broth (Morton 1972: 68).

Excavations recovered Canada geese bones from L5H, where the only identified duck remains were also found. The singularity of both species occurrence in this lot may indicate a more summer to fall occupation for this lot than in the others.

Cormorants (*Phalacrocorax auritus)* are aquatic birds that are commonly found on the coast but which may travel up river to following seasonally spawning anadromous fish species such as alewife. The average 28 to 35 inches in length and weigh 42 to 88 ounces. They nest in colonies which can number several hundred. Both William Wood (1634) and John Josselyn (1672) noted that cormorants were not palatable to the English, being too rank and fishy in taste, but that the Natives often ate them flayed, catching them by boat at night by means of their bare hands (Wood 1977: 51; Josselyn 1972: 73). Archaeologists recovered the cormorant bones from anomaly N148.8 E145.4 in L4S where alewife were also abundant, supporting the theory that the cormorants were feeding on the alewife.

The Passenger Pigeon (*Ectopistes migratorius*) was once the most numerous bird species on the planet with migratory flocks reported to have been up to one mile wide and 300 miles long. The vast flocks may have increased following the European discovery of the New World and the depopulation of the Native inhabitants whose hunting had controlled the size of pre-contact pigeon population (Mann 2005:315). The Passenger Pigeon was slightly larger than the Mourning Dove, which averages one foot long and weighs four to six ounces. Seventeenth century sources support the reports of great flocks of these birds and report that they arrive in early spring and depart at Michelmas (September 29) (Wood 1977: 50; Josselyn 1988: 71). Wood reported that they nested to the north of Boston and that the Natives traveled to their nesting areas and collected large numbers of them at one time (Wood 1977: 50). Excavations recovered Passenger Pigeon remains from anomaly N145.15 E146 in L4S. Their presence supports an early spring occupation for this portion of the project area.

A general paucity of avian remains is a common occurrence at sites occupied during the spring to early fall. At the Agawam site, archaeologists identified only four fragments of medium-sized bird longbone. This represents only 2% of the total faunal assemblage. Archaeologists failed to recover any bird remains identifiable to species at the Sandy's Point site. All of the fragments found (N=6) came from a medium to large species. Analysis found three of these fragments burned black, indicating as they did with the fish species that Natives either roasted them or disposed of the bones on a cooling fire.

Turtles

Chelonian species (turtles), due to their winter hibernation patterns, are good seasonality indicators for sites and anomalies. While turtle shells were sometimes curated and used as rattles, ornaments and drinking vessels, the presence of turtle bones, when cross-referenced with other lines of seasonality evidence, can provide a more detailed understanding of when activities conducted at a site. European colonists wrote little regarding turtles and their relationship with Native people. Williams reported that Native people called them 'Toonuppa', translated as 'the slimey one' (Williams 1971: 32).

Excavations recovered three species of turtle and a number of unidentified turtle carapace fragments at the Muttock-Pauwating site (Table 12). All species are active from April to October with Painted

Table 12. Distribution of turtle remains identified to species level

Location	Box Turtle April-October	Painted Turtle Late April to October	Snapping Turtle April to October	Turtle sp.	Total
L2H				5	**5**
L4H		2		2	**4**
L4S	20			2	**22**
L5H	2	26		5	**33**
L6H	1	10		6	**17**
L7H		1			**1**
L7SN	1	2		2	**5**
L8H			1		**1**
Totals	**24**	**41**	**1**	**22**	**88**

emerging later in April than the others. Painted turtles (*Chrysemys picta*) live in virtually any permanent body of water that has suitable basking sites (logs, banks, or rocks). They prefer muddy bottoms such as those found in rivers, lakes and ponds, making the Nemasket River an ideal place to find them. Painted turtles reach an average adult size of 5 to 8" and would provide approximately ½ pound of meat. Box turtles (*Terrapene carolina*) are a small to medium-sized turtle and are the only land turtle in New England. They reach an average length of eight inches and they inhabit a variety of ecological setting from woods to open fields. Box turtles are extremely long-lived, but spend their lives within a territory of only 200 meters where they consume just about anything from insects to frogs to plants. Snapping turtles (*Chelydra serpentina)* range in size from eight to 18.5 inches and in weight from 10 to 35 pounds. They are the largest New England turtle species. They live in fresh to brackish water especially those with muddy bottoms with females leaving the water in June to lay eggs on land. Their diet includes anything they can get in their mouths including carrion, fish, birds, amphibians, small mammals, vegetation and even other snapping turtles which they kill by decapitation.

Due to the fact that they live on land and thus are not limited by water temperature to keep heat in their bodies, box turtles emerge before any of the other species. Their presence at L4S, L5H, L6H, and L7SN may indicate an occupation at those locations that began earlier than others. This may be especially true to L4S where it was the only species identified. Painted turtles dominated the assemblage at L5H and L6H, possibly indicating a later spring occupation. Analysis identified snapping turtle from L8H. Excavation recovered 25 of the 88 turtle fragments recovered (25%) were found in the plowzone with the remaining 75% being recovered from anomaly contexts. A total of 28 anomalies from seven locations contained turtle remains (Table 13). The majority of the anomalies with turtle remains were

Table 13. Turtle remains recovered from anomalies

Location	Anomaly	Type	Turtle sp.	Box Turtle	Painted Turtle	Total
L2H	N267.8 E214.8	HD	3			3
L2H	N271.9 E214.8	MMP	1			1

Table 13. (Cont.)

Location	Anomaly	Type	Turtle sp.	Box Turtle	Painted Turtle	Total
L2H	N274.4 E210.3	MMP	1			1
L4H	N146.3 E126.55	MMP	1			1
L4H	N155.65 E130.15	LDP	1			1
L4S	N144.5 E145.5	LDP		1		1
L4S	N145 E149		1			1
L4S	N148 E146.1	MMP	1	1		2
L4S	N148.2 E139.6	MMP			1	1
L4S	N148.3 E141.25	MMP	1			1
L4S	N148.6 E143	N		13		13
L4S	N149.1 E144.7	MMP			1	1
L4S	N149.4 E145.1	MMP		1		1
L5H	N131 E181	MMP			6	6
L5H	N132.5 E194				1	1
L5H	N135 E186.5	LDP	1		1	2
L5H	N135.5 E174.9	MSB	3		1	4
L6H	N100.6 E237.2			1		1
L6H	N100.6 E244	LDP			1	1
L6H	N103.6 E238.75	MMP			1	1
L6H	N103.8 E244	LDP			7	7
L6H	N104 E241.6	LDP	1			1
L6H	N104.5 E243	LDP	3		2	5
L6H	N104.85 E235.6	MSB	1			1
L7H	N68.9 E262.8	LMP			1	1
L7SN	N72.3 E255.5	MMP	1		2	3
L7SN	N74.5 E257.5	MMP	2			2
L7SN	N75.6 E256	LMP		1		1
Totals			**15**	**18**	**25**	**65**

from L4S, L5H, L6H, and L7SN. Twelve of the anomalies were medium-size medium depth (cache) pits and seven were large-size deep (storage) pits. This supports the idea that the cache pits were for the storage of items such as pots and the storage pits were for storing food stuffs, and that people closed these pits in the fall and then opened and filled with refuse in the spring when they reoccupied the site. The occurrence of turtle remains from these pits indicates that they were all filled during the same time of the year.

Turtle remains are common at archaeological sites. Anders Rhodin summarized chelonian remains from the Concord shell heap and from the Cedar Swamp site in Westborough, Massachusetts (Rhodin 1992, 1995). At the Concord shell heap they accounted for an unknown proportion of the entire faunal assemblage, but it is known that there were a total of 599 fragments which were identifiable to eight species (Rhodin 1995:71). At the Cedar swamp site they accounted for 23% of the total faunal assemblage (Rhodin 1992: 21). Chartier identified fragments of painted turtles in two features representing 9% of the total faunal assemblage at the Agawam site (Chartier 2007). Analysis of the intensive survey and site examination faunal assemblages identified turtle remains from lots 4 and 6. Turtles do not appear to have ever represented a majority of the assemblage, but their presence does provide information on seasonality.

Vertebrate Faunal Summary

Overall, the distribution of butchery waste in the locations indicates three things. First, that people were obviously occupying the site for a significant period of time, long enough that they did not want to have butchery waste remaining on the surface producing noxious smells (in the case of the unburned bone) near their dwellings and attract flies and scavengers. Secondly that people were purposefully filling these anomalies after they were opened and did not plan on reusing the same pits again. Finally, that people opened these anomalies and filled them with refuse in the spring to early summer months.

Invertebrate/ Shellfish Remains

Excavations recovered 204 fragments of shellfish from Data Recovery excavations (Table 14).

Table 14. Shellfish species distribution

Location	Surf Clam	Quahog	Blue Mussel	Oyster	Soft-Shell Clam	Unidentified	Whelk	Crustacean	Total
L1S	1								**1**
L2H	47								**47**
L4H	3			1					**4**
L4S	19			3		1		1	**24**
L5H	21			1		6			**28**
L6H	18					32	1		**51**
L6S	13		6		5	2			**26**
L7H						2			**2**
L7HN						2			**2**
L7SN						8			**8**
L8H	8	2							**10**
L8HN	1								**1**
Totals	**131**	**2**	**6**	**5**	**5**	**53**	**1**	**1**	**204**

Excavations recovered 185 of these fragments from anomaly contexts and one fragment from the subsoil. Testing recovered the remainder of the assemblage from the plowzone. Species recovered from anomalies included surf clam, soft-shell clam, oyster, conch, and blue mussel. Eleven of the 19

anomalies that yielded shellfish remains were medium-size medium depth pits while the remainder were large deep (storage) pits (N=2) and one each of a natural anomaly with cultural material dumped into it, an FCR concentration, a small-size medium depth pit, a medium-size shallow basin, a large-size medium depth (cache?) pit, and a concentration of surf clam shells without any associated anomaly staining at the junction between the plowzone and subsoil (Table 15).

Table 15. Shellfish distribution within anomalies

Location	Anomaly	Type	Species
L2H	N272.7 E216	Shell Dump	Surf Clam
L2H	N274.4 E210.3	MMP	Surf Clam
L4H	N150.25 E125.85	MMP	Surf Clam
L4H	N156.25 E128.1	N	Surf Clam
L4S	N147.2 E142.5	FCR	Surf Clam
L4S	N148.2 E139.6	MMP	Surf Clam
L4S	N148.3 E146.25	MMP	Surf Clam
L4S	N148.8 E145.4	MMP	Surf Clam
L4S	N149.1 E144.7	MMP	Surf Clam
L4S	N149.4 E145.1	MMP	Oyster
L5H	N135 E186.5	LDP	Surf Clam, Unidentified
L6H	N103.6 E238.75	MDP	Surf Clam, Unidentified
L6H	N103.8 E244	LDP	Unidentified, Whelk
L6H	N104.85 E235.6	MSB	Unidentified
L6H	N109.3 E230.4	SMP	Unidentified
L6H	N114.3 E248.2	MMP	Surf Clam, Blue Mussel
L6S	N113.75 E250.8	MMP	Soft Shell Clam, Surf Clam, Unidentified
L7H	N68.9 E262.8	LMP	Unidentified
L7SN	N74.5 E257.5	MMP	Unidentified

The project area is located fifteen miles to the west of the Atlantic Ocean, where all of the shellfish species originated. The English reported in the seventeenth century that the Natives living at Nemasket would travel to Plymouth each spring “On the way we found some ten or twelve men, women, and children, which had pestered us till we were weary of them, perceiving that (as the manner of them all is) where victual is easiest to be got, there they live, especially in the summer: by reason whereof, our bay affording many lobsters, they resort every spring-tide thither; and now returned with us to Nemasket.” (Heath 1963: 62). Winslow met these Native in June of 1621 when he and some others were traveling to Pokanoket to visit Massasoit, indicating the Native traveled back to Nemasket in June, possibly after planting had occurred. The shellfish species, especially the surf clam, very common on Plymouth Beach, offer tantalizing evidence of these springtime forays to the east shore.

Unfortunately, the English wrote little about the Natives practices of shellfishing. Most authors simply stated that the Natives ate shellfish or that they collected it. Rarely did they state at what time of the year or in what manner they did so. Roger Williams stated that for clams at least, Natives harvested them winter and summer, although he probably was implying that people used year round (Williams 1971:184). John Josselyn stated that in the spring, the first "fish" which was harvested were clams (Josselyn 1988:100). William Wood stated that Native women "…to the flats dance many a winter jig, to dive for cockles and to dig for clams." (Wood 1977: 54). Ethnohistorically, people used shellfish throughout the year, especially in the winter and spring. This was done to supplement the diet in winter for variety reasons or in times of scarcity and may have occurred in the spring after the hunting had ended and after the move to the summer planting grounds.

Archaeologically, it has been found that people collected shellfishing in the Late Woodland during fall, winter and spring (Barber 1983:117; Bernstein 1992:143; Ritchie 1969: 82, 115, 156, 191, 201; McMannamon 1984:391). Hancock noted that for sites on Cape Cod, there appears to have been a gradual shift from the Late Archaic to the Late Woodland of shellfish harvesting from summer to winter/ spring (McMannamon 1984:391). It appears that the ethnohistorical records support what has been found archaeologically.

The only two species for which it was specifically stated how people gathered them were quahogs and clams. Concerning these shellfish, Roger Williams noted that the Natives waded deep and dove for them (Williams 1971:184). This correlates well with what the information which Speck collected among the Wampanoag in the 1940s. Speck's informants told him that quahogs were trod out in shallow water, presumably with bare feet (Speck 1948:258). Williams stated that the clams were dug out of the mud at low water (Williams 1971:184). As stated previously, Wood also noted that the women would dive for cockles (quahogs) and dig for clams.

A little more is known how people processed the species. Williams stated that for clams "…this fish and the natural liquor of it, they boile, and it makes their broth and their Nasaump (which is a kind of thickened broth) and their bread seasonable and savory in stead of Salt…"(Williams 1971:184). Whereas oysters were commonly roasted, as the Native name for them was "apwonnah" which comes from the root "apwonat" which means to roast, so oysters are the shellfish that people roasted (Trumbull 1903:14). Which of course is not to say that other species were not roasted, only that these were the most common ones roasted.

A number of sites have yielded information concerning the processing of various shellfish species. Barber cited an archaeological example of a feature that he believed people used to process bivalves. He described small fire pits in which were found burnt periwinkle shells and the charred reproductive sacs from rockweed (Barber 1983:21). Barber identified these features as clam roasting pits. Feature 1 at the Sandy's Point site is believed to represent a larger shellfish roasting pit (Chartier 2000). The shape of the feature is similar to two found by Bullen at the Clark Pond site which contained much charcoal and shell (Bullen 1949:112).

After people liberated the meat from the shells, it would be smoke dried over an open fire. William Wood described this process :

" In the summer these Indian women, when lobsters be in their plenty and prime, they dry them to keep them for winter, erecting scaffolds in the hot sunshine, making fires likewise underneath them (by whose smoke the flies are expelled) till the substance remain hard and dry. In this manner they dry bass and other fishes without salt, cutting them very thin to dry suddenly before the flies spoil them or the rain moist them, having a special care to hang them in their smoky houses in the night and dankish weather." (Wood 1977: 104).

Although Wood stated that people did this for lobster, Edward Winslow noted that on their way to Massasoit's house in the spring of 1621, he and Stephen Hopkins had ",…a small string of dried shell-fish, as big as oysters" (Young 1974:67).

Barber found evidence of what he believed was a shellfish drying complex at the Wheeler site. What he found was a 90 centimeter wide shallow pit with a number of 12cm wide post holes around it (Barber 1983:22). This fits well with Wood's description of the smoking complex he saw in use.

Gastropods

Excavation recovered one species of whelk, the channeled whelk (*Busycon caniculatum*). This species is commonly found from Cape Cod to Georgia and occurs from the shore to 15 meters and it feeds primarily on quahogs (Amos 1986: 139). It is commonly found on the same sandy or muddy substrates as quahogs, and is often collected attached to quahogs or are accidentally found when searching for quahogs. The channeled whelk can grow up to 19.1 centimeters and is abundant in shallow bays (Amos 1986:372).

A well-known use for the whelk was the production of "wampum" beads. Native people made these beads from the central columnellae of the whelks which were ground round, cut to a length of approximately 1 centimeter and drilled with traded European awl blades (Ceci 1989). Roger Williams noted that "Meteauhock: the periwinckle. Of which they make their Wampum or white money of half the value of their suckawhock" (Williams 1971: 212). The "suckawhock" being the dark-colored shell beads (see quahog below) while the wampum, which means white or light-colored, were the white beads. The white beads being the ones which John Josselyn, a colonial traveler noted were good to staunch the blood (Josselyn 1988: 36). The name for whelk, as it does not appear that they differentiated between the two species, 'meteauhock' comes from the root 'mehtauog' which means ear, so the whelk was an 'ear shaped shell' (Trumbull 1903:56).

Speck's work among the Wampanoag of Gay Head, Mashpee and Herring Pond cited that "Marine gastropods or snails also played a leading part in the economy of the Wampanoag." (Speck and Dexter 1948: 261). Whelks had three purposes to the 1940s Wampanoag; people cooked, ground up into a paste, and put them on bread; people used them as bait; and used the larger shells as trumpets (Speck and Dexter 1948:261). The use of the shells as "trumpets" probably is a more recent use as there is no documentation for this in any of the historical records or archaeological collections. But the use of the whelks as bait and there use as food must be considered as having probably occurred in the past.

Testing recovered the whelk from Lot 6 House anomaly N103.8 E244. This anomaly was a large size deep (storage) pit where archaeologists recovered various botanical remains (acorn, maize, bean),

lithics (quartz, quartzite, rhyolite, Saugus Jasper), projectile points (Small stemmed, Wayland Notched), and both grit and shell-tempered pottery fragments.

Bivalves

The Northern Quahog (*Mercenaria mercenaria*) is one of the most common shellfish remains from archaeological sites. Quahogs are found within sheltered bays and estuaries with a salinity of at least 10 parts per thousand, preferring to live in a sandy firm bottom that can provide attachment points for its young (Chesapeake 1988: 86). This large bivalve has a dark purple "eye" one inner edge of each shell, and as the quahogs grows and the shell thickens, so too does the eye. Quahogs can attain a maximum length of 10.9 centimeters long (Amos 1986:402).

There are many references to these shellfish in the seventeenth century records. Edward Winslow of Plymouth, noted that they could be found on Cape Cod at the Native village of Manomet, present day Bournedale, along with oysters, mussels, clams and razor clams (Young 1974:306). Roger Williams noted that the "Sequnnock, Poquauhock" or horsefish were what the "English call hens, a little thick shellfish which the Indians wade deep and dive for, and after they have eaten the meat there (in those which are good) they break out the shell, about one half of an inch of the black part of it, of which they make their Suckauhock, or black money, which is to them pretious." (Williams 1971: 182).

As stated by Williams, one of the values of the quahog was the purple or black part with which they make purple or dark-colored "wampum" beads. There does not appear to have been any bead production at the Sandy's Point site. The name quahog is a corruption of the original native name 'Poquauhock' which comes from the root 'pohkeni' which means 'closed' and 'hogki' which means 'shell' (Trumbull 1903: 131). The other name give by Williams 'Sequnnock' refers to the dark color of either the shell or the "eye". "Sequn" reefers to dark and again "hogki" reefers to shell. Speck noted that people obtained quahogs by treading in shallow water and were the commonest clam consumed in the area in the 1940s (Speck and Dexter 1948:258).

Archaeologists did not recover any of the quahog shell fragments from an anomaly. The two fragments recovered were found in the Lot 8 House impact area in the plowzone, making their association with Native occupation tenuous at best.

Oyster

The Eastern Oyster (*Crassostrea virginica*) is a species with fairly demanding requirements for growth and reproduction. Oysters need a salinity of at least 5 parts per thousand and as a result are found at estuary mouths and even several miles up rivers where there is considerable mixing with seawater (Cake 1983: 37). Along with their salinity requirement, oysters are one of only two bivalves from the site that require firm substrate, preferably one with a minimum of 50 percent clutch to anchor onto. The clutch is in the form of rocks, shells, gravel, shell hash, or old oyster beds (Chesapeake 1988: 86). They can grow up to 20.5 centimeters long, or longer if you believe the seventeenth century reports, and occur in water intertidally to 12.2 meters deep (Amos 1986 406). Oysters are preyed upon by oyster drills and whelks (Chesepeake 1988: 86).

Oysters were one of the mains shellfish consumed by the English in England and they appear to have been carefully watching for them when they came to New England. As early as 1605 explorers were

noting the presence of oysters on Cape Cod (Parker 1968: 149). Edward Winslow reports dining on oysters with some Natives on Cape Cod in 1621 and bemoans the fact that there are no oysters around Plymouth, although he does say that they buy them from the Natives when possible (Young 1974: 208, 233). John Pory gave a detailed account of the oysters of New England when he visited in 1622. He stated that

"Oysters, there are none, but at Massachusetts, some 20 miles to the north of this place, there are such huge ones, by savages report, as I am loth to report. For ordinary ones, of which there may be many, they make to as broad as a bushel, but one among the rest they compared to the great cabin of the Discovery, and being sober and well-advised persons, grew very angry when they were laughed at or not believed! I would have had Captain Jones to have tried out the truth of this report. And what was the reason? If, said I, the oysters be so great and have any pearls in them, then must the pearls be answerable in greatness to the oysters, and proving round and orient also, would far exceed all other jewels in the world!" (James 1963: 06).

William Wood stated that he had seen oysters up to 30.8 centimeters long (Wood 1977:56). John Josselyn, in the late seventeenth century, supported Wood's estimation by stating that he had "…found some 9" from joint to toe, containing an oyster that had to be cut in 3 pieces to fit in the mouth, sweet and fat." (Josselyn 1988: 79). While Thomas Morton stated that there were great stores of them at the entrance to every river and that he had seen an oyster bank 1 mile long (Morton 1972: 90). Josselyn also stated that the Natives would dry the oysters as they did lobsters and lampreys (Josselyn 1988:79).

The Native name for the oyster was 'apwonnah' which comes from the root 'apwonat' which means 'to roast', so oysters are the shellfish that people roasted (Trumbull 1903:14). Speck merely noted that the Natives favored the oysters in his study area (Speck and Dexter 1948:258).

Archaeologists recovered oyster fragments from the Lot 4 and 5 House impact areas and the Lot 4 septic impact area anomaly N149.4 E145.1 which also yielded lithics, grit and shell-tempered pottery fragments, and box turtle shell fragments.

Soft Shell Clam/ Surf Clam

Soft-shelled clams (*Mya arenaria*) and Surf clams (*Spisula* solidissima) represent the most common bivalve recovered from the site. Because these species were not differentiated in the seventeenth century, the ethnohistoric documents that refer to "clams" applies to either species. Both species live in sandy, sandy-mud or sandy clay substrates of bays and inlets intertidally to depths of up to 9.1 meters, generally preferring stiff sands and mud (Abbott 1986:256, Abraham 1986:18). Soft-shell clams average from 7-150 millimeters long with most of them being under 100 millimeters and adults can number from six to eight per square foot, burrowing up to 30 centimeters into the sand (Abraham 1986: 18). Surf clams grow up to 20 cm long and prefer coarse to fine sand substrates. Predators for both include the moon snail, the oyster drill and the blue crab (Abraham 1986:18).

Colonists and natives preferred this shellfish, along with the quahog and the oyster, more than any other. As a result, they were widely commented on by explorers and colonists alike. Edward Winslow noted their abundance in Manamet along with other shellfish species and mentioned that in March of 1623 the colonists ate clams as well as mussels (Young 1974: 306, 329). John Pory, an early visitor to

the colony, noted in 1622 that they had clams and mussels in that place all the year long (James 1963:09). Thomas Morton, during his stay at Merrymount (present day Quincy), took note that every shore was full of clams and that the Natives took great delight in them (Morton 1972: 90). William Wood noted, in somewhat derisive terms, that raccoons and "Indian women" feed upon clams at the sea shore, that they were not much unlike a quahog (cockle) and occurred in great plenty (Wood 1977:44, 56). Once again Roger Williams provides us with our most detailed commentary upon the Native use of clams

"Sickissuog Clams

> This is a sweet kind of shellfish, which all Indians generally over the country, winter and summer delight in; and at low water the women dig for them: this fish, and the natural liquor of it, they boil, and it makes their broth and their Nasaump (which is kind of thickened broth) and their bread seasonable and savory instead of salt: and for that the English swine dig and root these clams at low water wheresoever they come, and watch the low water." (Williams 1971: 182)

Finally, John Josselyn noted that clams were one of the first marine resources gathered in the spring (Josselyn 1988: 100). Regarding the entomology of the name of the clam 'sickissuog' it comes from 'sohkissu' which means 'he spits or squirts' (Trumbull 1903:149). This comes from their habit of expelling water from their burrows when the ground above them is trod upon. Speck notes only that the soft-shell clam was not as important on Cape Cod as it was to the north due to the presence of quahogs here (Speck and Dexter 1948:260). He does note that people used them in much the same way as the quahog except that the belly was the only part eaten. They were also used for bait (Speck and Dexter 1948:260).

Excavations recovered five soft shell clam shell fragments from the Lot 6 Septic impact area anomaly N113.75 E250.8, a medium-sized medium depth (cache) pit. This anomaly also contained alewife and deer remains, shell-tempered pottery, fire-cracked rock and a chert Levanna projectile point.

Surf clam remains were widely distributed across the project area being found in 13 of the 19 anomalies that yielded shellfish remains with an overall total of 131 fragments being recovered (Table 16). Anomalies containing surf clam fragments from L2H also contained limited

Table 16. Distribution of Surf Clam fragments from anomalies

Location	**Anomaly**	**Type**	**Species**
L2H	N272.7 E216	Shell Dump	Surf Clam
L2H	N274.4 E210.3	MMP	Surf Clam
L4H	N150.25 E125.85	MMP	Surf Clam
L4H	N156.25 E128.1	N	Surf Clam
L4S	N147.2 E142.5	FCR	Surf Clam
L4S	N148.2 E139.6	MMP	Surf Clam
L4S	N148.3 E146.25	MMP	Surf Clam
L4S	N148.8 E145.4	MMP	Surf Clam

Table 16. (Cont.)

Location	Anomaly	Type	Species
L4S	N149.1 E144.7	MMP	Surf Clam
L5H	N135 E186.5	LDP	Surf Clam, Unidentified
L6H	N103.6 E238.75	MDP	Surf Clam, Unidentified
L6H	N114.3 E248.2	MMP	Surf Clam, Blue Mussel
L6S	N113.75 E250.8	MMP	Soft Shell Clam, Surf Clam, Unidentified

amounts of lithics and FCR. Anomalies in L4H also contained rhyolite bifaces, debitage and grit-pottery. Anomalies in L4S also contained alewife bones, grit and shell-tempered pottery, FCR and debitage. The anomaly in L5H also contained debitage, maize, grit-tempered pottery, and FCR. Anomalies from L6H also contained alewife and deer and bear remains, shell-tempered pottery, fire-cracked rock, Saugus jasper and a chert Levanna projectile point. Anomalies from L6S also contained bone, alewife remains, shell-tempered pottery, FCR, maize and Levanna points.

Blue Mussel

Testing recovered one species of mussel from the excavations. The Atlantic Blue Mussel (*Mytilus edulis*), commonly makes it home embedded in muddy sand flats at the low water mark in salt marshes and bays (Abbott 1986:198). It prefers brackish water and can attain a length of 12.8 centimeters (Amos 1986:408). Edward Winslow noted their abundance in Manamet along with other shellfish species and mentioned that in March of 1623 the colonists ate clams as well as mussels (Young 1974: 306, 329). John Pory, an early visitor to the colony, noted in 1622 that they had clams and mussels in that place all the year long (James 1963: 09). Speck stated that the Wampanoag obtained these shellfish by digging them out at low tide (Speck and Dexter 1948:260).

Archaeologists recovered six fragments of blue mussel from Lot 6Septic impact area anomaly N114.3 E248.2. Also recovered from this anomaly were surf clam fragments, bone fragments, a possible Levanna point, and shell-tempered pottery.

One fragment of possible calcined crustacean shell was also recovered form Lot 4 from the plowzone. Because this can not be attributed to any particular occupation-prehistoric or historic- the importance of it can not be reliably examined.

Floral Analysis

Historical and Theoretical Background

"...they have a tradition, that the Crow brought them at first, an Indian Graine of Corne in one Eare, and an Indian or French Beane in another, from the Great God Kautantouwits field in the Southwest from whence they hold came all their Corne and Beanes." (Williams 1971: 114)

Corn, beans and squash, none of which were originally native to the area, are the traditional staples of pre-Contact Late Woodland Northeastern Native horticulture. Archaeologists recovered early to mid-late Holocene cucurbit (pumpkin, squash, gourd) rind from the Sharrow site in Maine (6,700-6,300 cal.

BP) and from the Memorial Park site (5404 +/- 552 BP) in north central Pennsylvania (Hart and Sidell 1997: 523). The earliest indisputable dates for maize are 2,000 BP (Riley et al. 1994) and the earliest date for beans is 1000 BP (Riley et al. 1990). Recent analysis of cooking residues on pottery from Iroquoia have identified opal phytoliths from maize and the residues themselves have been AMS dated to 1900 BP (Thompson et al. 2004:25). Residue dating and opal phytolith analysis offer tantalizing potential for further examination of maize introduction in the Eastern Woodlands. Archaeologists curated samples of unwashed sherds from the Muttock-Pauwating data recovery excavations without further processing to provide a resource for future investigators. Based on radiocarbon dates from across North America, these three crops spread north and eastward from a Mexican homeland, reaching Massachusetts at least by the Late Woodland period, and possibly much earlier. The earliest Massachusetts for Maize is 1160 A. D. +/_ 80 years from Martha's Vineyard (Ritchie 1969). No radiocarbon dates exist for cucurbits or beans from Massachusetts. The earliest ethnohistorical account of New England horticulture was by th first known European explorer to visit the area, Verrazanno (1524) who noted planted fields in coastal Rhode Island. It would appear that in Rhode island at least, maize horticulture existed to a possibly moderately significant degree before contact with Europeans.

Archaeologists have recovered few macrobotanical maize remains from the states east of New York State. Excavations recovered the largest sample to date from the Burnham-Shepard site where archaeologists found 1500 complete and partial maize kernels (Bendremer 1999: 136) Chilton has proposed a one-to-one correlation between the amount of maize recovered and the intensity of maize horticulture at a site, making the Burnham-Shapard site an place of intense cultivation (Chilton 1999:160). Little provided calibrated radiocarbon dates taken directly from prehistoric maize kernels in New England. She found that there was a temporally clustered but spatially widespread cluster of dates between A.D. 1250 and 1450 that suggest a sudden increase in maize use at this time that occurred at the same time as an increase visibility of beans in the archaeological record (Little 2002: 109). Little found only 47 sites in New England where archaeologists recovered maize in the past 50 years with only three of these sites being in mainland Massachusetts and being from farther west than Amherst, except for one sample from Cape Cod (Little 2002: 109). Archaeologists recovered most of this maize after the use of fine-mesh screens and flotation became standard archaeological procedures. It has been generally perceived by archaeologists in New England, that maize was not a significant part of the diet of Native people until the very Late Woodland to Contact period.

Lynn Ceci investigated the apparent contradiction between the paucity of maize in the archaeological record and the seventeenth century accounts of extensive fields and intensive use by positing that increased sedentism, village formation and maize cultivation were a response to historic economic activities such as wampum manufacture and European trade (Ceci 1990: 147). While her research focused only on Long Island, the potential of her hypothesis was far reaching. Unfortunately for Ceci, most researchers have not found evidence to substantiate her hypothesis (Little 2002). It is possible that on Long Island, there was an increase in sedentism, village formation and maize cultivation on the island after and as a response to European contact, but the findings do not appear applicable elsewhere. It is possible that on the coast maize horticulture emerged later than along inland river floodplains due to the greater reliance and use by coastal people of the bounty of the sea. The inclusion of maize horticulture in inland regions may relate to the presence of rich planting lands and a desire to incorporate maize and other domesticates as a part of a subsistence base that was more diverse than their coastal neighbors (Bendremer 1999: 144). McBride and DeWar examined the changes in site

distribution, function, and economic base in the lower Connecticut River valley from 4200 BP to 250 BP, noting a gradual transformation of the settlement systems towards village aggregation and occupation of villages for longer periods of time (McBride and DeWarr 1987: 305). Archaeologists view the inclusion of maize horticulture as a "non event" in the area that was merely an addition to a more sedentary lifestyle. At least that was the case until approximately 450 BP when substantial changes in the settlement system occurred, which they interpreted as the result of adoption of large scale reliance on horticulture (McBride and DeWarr 1987:305). The greater emphasis on the cultivation of corn following the arrival of the English has support in a statement by William Bradford "For the Indians used then to have none so much corn as they have since the English have stored them with their hoes, and seen their industry in breaking up new grounds therewith." (Bradford 1989: 87). This change is believed to be evident not just in the increase in occurrence of maize remains at sites, but also in the presence of thin-walled ceramic vessels. Braun argued that these vessels represented a technological response to changing, more maize based, diet (Braun 1980).

The introduction and incorporation of horticulture into Native subsistence presumably represented significant change in Native lifeways and cultural practices. It is possible that due to an increase in population numbers in the Late Archaic period, reliance on shellfish, wild plants and anadromous fish increased. Researchers have recognized that fundamental changes in residency patterns and mobility began in the Archaic period, prior to the earliest known domesticates in the Northeast (Odell 1998:554). Mulholland noted a 12.6% increase in the settlement in coastal versus inland settings from the fourth to the second millennium (Mulholland 1988: 154). He posits that this is related to cooler climate at the time which may have resulted in a decline of mast-related species in the interior, thus a need to shift subsistence focus to the newly emerging, and very productive, estuaries (Mulholland 1988: 155). The greater reliance on these resources to feed a larger population which inhabited smaller territories, may have led to the adoption of pottery to process foods such as nuts to obtain oil and to greater sedentism for longer periods to exploit seasonal fish runs. All these changes, and others such as the possible experimentation with domestication or encouragement of native wild plant species (most debatably *Chenopodium sp.*), in the Late Archaic set the stage for horticulture adoption in the Middle to Late Woodland Period. The use of seed-bearing plants, the "floodplain weed theory", posits that exploitation of these species (*Chenopodium* and *Amaranthus*), created a "re-adaptation" to the subsequent cultivation of formal horticultural crops (corn, beans and squash) (Benison 1997: 7). Subsequently, the adoption and later intensification of maize cultivation correlates with an increasing number of larger sites, possibly indicating that an increased production of field crops led to population increase which in turn led to a greater reliance on field crops (Benison 1997: 9). This may have led to intensified competition for planting grounds, and right to anadromous fish runs, leading to increased social stress and a need to lay claim to limited and restricted resources (Hodder 1979).

Horticultural adoption created changes in culture that may have paralleled those created by the exploitation of anadromous fish runs (see the discussion of alewife remains above in the report), creating greater sedentism and the reliance on a resource that has an energy yield greater to that expended to grow/ collect it. Greater sedentism would have led to a greater degree of territoriality related to the control of resources such as planting grounds on river terraces narrow areas along rivers where community weirs would likely be located. Cultivation of crops, with enough seed, cleared productive land, and hands to do the work, people produced enough food to immediately feed themselves, to store for the winter and the following spring, and to trade. Incorporation and acceptance

of foreign domesticates probably started slowly, but due to positive feedback eventually was widely accepted (Odell 1998: 554).

Going hand in hand with a greater reliance on anadromous fish and horticulture, went the development of rituals to seek aid from the spiritual powers that controlled the sun, rain, rivers and earth to ensure that the fish will return each year and the success of their crops as well as ceremonies of thanks following the harvests. Native people maintained long-term stability of fish and plant resources through the appeasement of the spirit world due to the fact that plants and animals seen as living beings, relatives in some cases, which had their own special needs. Native people viewed the relationship between plants and animals and people reciprocal where the species used deserved respect otherwise they would be offended and leave (Cowan 1985: 224). people maintained the interrelationships between plants and animals and people through ritual observances and acts. Such acts took two forms: small-scale one on one reciprocal acts of thanks between an individual and a harvested resource and those between the larger community and the creative forces that govern the plant and animal communities (Cowan 1985:224). Community-wide rituals included "first-fruits" ceremonies (such as the green corn festival) with which the interaction between people was transcended to interactions between a community and the supernatural forces that govern life itself. People did this to thank those powers for the abundant harvest and to insure future harvests (Cowan 1985: 224). Rituals such as these play an important cultural role of being a culturally perceived mechanism for reducing risk (Cowan 1985: 224).

Some researchers also see the Late Woodland as a period of "decline" which saw increased territoriality, decreased social contact between peoples living in adjacent areas and a reduction in the scale of regional exchange, reflecting the overall localization of social interaction (Benison 1997:4). This increased territoriality may also be reflected in the establishment of larger, centralized, formal burial grounds and mortuary features. Large burial grounds such as the one identified by the Pilgrims in Nauset territory on Cape Cod would have served as visible and permanent concrete claims to an area by a people

"Anon we found a great burying place, one part whereof was encompassed with a large palisade, like a churchyard, with young spires for or five yards long, set as close one by another as they could, two or three feet in the ground. Within it was full of graves, some bigger and some less; some were also paled about, and others had like an Indian house made over them, but not matted. Those graves were more sumptuous than those at Cornhill, yet we digged none of them up, but only viewed them, and went our way. Without the palisade were graves also, but not so costly." (Young 1974: 47). A Native burial ground is rumored to have been located to the east of the Muttock-Pauwating project area on Nemasket Cemetery hill.

An increased reliance on horticulture would have also changed the dynamic of the roles of the sexes in society. Whereas previously, men provided a significant portion of the diet through hunting and fishing, an increased reliance on horticulture, which was the domain of women, led to more of the yearly diet resulting from the labors of women. This may have elevated the position of women in society, possibly even shifting the balance of power within community and family dynamics. Unfortunately, the dynamic relationship between horticulture's expansion and changes in labor organization and land use patterns has not been well researched and thus not established (Benison 1997: 2). Increasing sedentism also led

to changes in the lithic portion of the material cultural assemblage of communities. People's increasing use of expedient tools increased as sedentism increased while formal bifaces tend to characterize more mobile populations with more mobile people possessing more standardized tool kits and more versatile, long-lasting, renewable and portable tools (Odell 1998:555). A greater occurrence of chopping tools, used for forest clearance, and the introduction of stone hoes into the artifact assemblage appears to have occurred as well (Odell 1998:556).

Europeans called maize or corn (*Zea mays*) "Indian corn", "Indian wheat", and "Turkey wheat" but Native people called it 'weatchimin', meaning 'the grain that is eaten', by the Native people in southeastern Massachusetts and Rhode Island. Archaeologists believe that the maize grown in New England was of several varieties including "northern flint corn". Flint corn characteristically has eight rows of kernels with approximately 30-40 kernels per row, thus for the investment of one kernel to plant in the spring, a Native woman could expect to get a minimum of 240 to 320 kernels in return per ear. The stalks of this maize usually grown five to six feet tall and have two ears per stalk, thus producing a maximum yield of 480 to 640 kernels for one kernel planted. Another type of corn called flour or soft corn was grown in the Northeast, making it easier to grind into flour. Winthrop recorded a third variety called "Mowhackes Corne" (Winthrop 1937: 127). This variety had a shorter stalk with ears closer to the bottom of it. When planted in June, this maize ripened in season and may be the same as the blue corn mentioned by Josselyn which he stated ripened before the other by a month (Josselyn 1972: 57). Maize generally was "party-colored" being most commonly yellow or white but also being red, blue, olive, and striped kernels (Winthrop 1937: 125).

Europeans called native beans (*Phaseolus vulgaris*) French, Turkey or Brazilian beans. The species included varieties such as kidney, navy, pea, and pinto beans all of which were found in a multitude of colors and people ate them green or dried. Native people called beans 'tuppuhquam', meaning 'the ones that turn or roll'. Europeans called squashes (*Cucurbita pepo*) vine apples and "pompions" and 'askutasq', meaning 'the round thing that can be eaten raw', by the Natives. There were two varieties: summer and winter squash. Summer squash included the modern varieties of yellow crook-neck squash (maturing by mid-summer) while winter included pumpkins, hubbard, acorn and possibly others. The latter types were often dried for winter storage. (Josselyn 1972: 57). Other crops grown by the Natives included watermelons, which may have arrived during the Contact Period, and which Josselyn noted by in the 1670s (Josselyn 1972: 57). Champlain noted Jerusalem artichoke (*Helianthus tuberosus*), which is in the sunflower family but which produces a starchy tuber versus edible seeds, as having been cultivated (Champlain 1971: 51).

European observers noted that women were in charge of the garden, doing all the planting, cultivating and harvesting while men hunted, fished (both leisure activities in England) and generally were lazy gourmands (Gookin 1972: 9; Wood 1977:113: Young 1974: 363). Roger Williams did note that while women generally were commanders of the garden, men sometimes, out of love for their wives and children or because they were old, will help the women in the garden, although they were not expected to (Williams 1971: 123). Mary Jemison,an English woman captured and adopted into Senaca society in the eighteenth century, reported that "In the summer season, we planted, tended and harvested our corn, and generally had all our children with us...we could work as leisurely as we pleased. We had no ploughs...but performed the whole process of planting and hoeing with a small tool that resembled...a hoe with a very short handle." (Axtell 1981: 138-139).

People located their planting fields on fertile, fairly level bottom lands with sandy loam soil that could be cultivated with stone, wood, shell, or bone tools. These fertile lands were often on level land adjacent to rivers, ponds and coastal areas. Champlain's 1605 map of Plymouth Harbor shows extensive small fields associated with individual homes all around the harbor **(Figure 2).** The Pilgrims

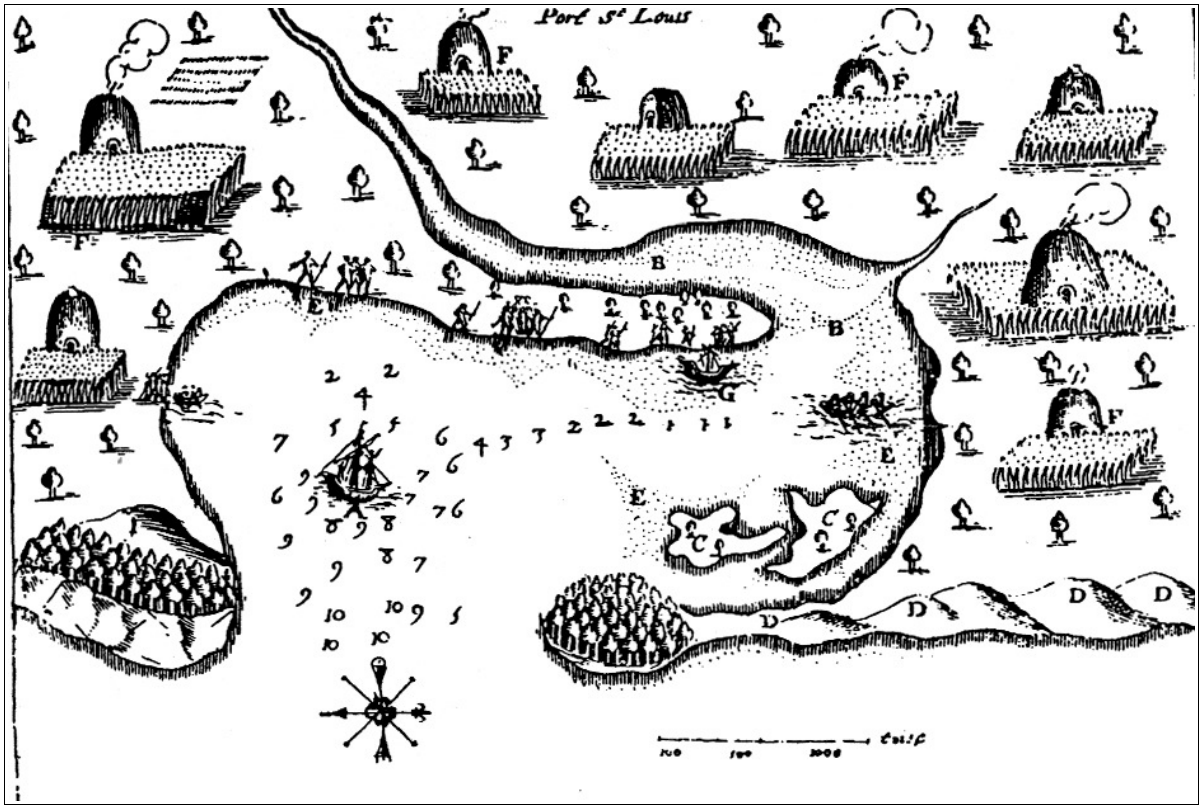

Figure 2. Champlain's map of Plymouth Harbor

saw extensive areas of abandoned field along the Taunton River when they journeyed to Pokanoket (Young 1974: 42-43). Each family would be allotted land by the sachem, with each receiving enough fertile land for their needs (Young 1974: 361; Champlain 1971: 341, 350, 413). The average size of the field plot is unknown but it would be expected to have varied due to the size of the family household. Archaeologists estimated that the field associated with the Native house at the Sandy's Point site in Yarmouth was approximately 1/3 of an acre in size. One English observer in the seventeenth century noted that fields up to an acre in size were possible for each family (Quinn and Quinn 1983: 223). If they were planting and "English acre" (roughly 660 x 66 feet) the average combined yield is predicted to have been 200 bushels of corn, beans, pumpkins, squash, sunflower, and chenopodium (Hunt 1996: 31). Smaller family plots (110 by 200 feet) would have produced a combined yield of approximately 100 bushels.

When people needed new fields, due to soil exhaustion or a need to cultivate a larger area, they selected a new area and a fire built around the base of each tree in the new field. The burning continued until it burned through the bark and the tree killed. The field was then planted using 'anaskhomwautowwin', a hoe, with the trees standing and then burned the wood as they fell the next spring (Aupaumet 1987: 28).

If the field was old, people sometimes used fish placed within each corn hill as fertilizer. Edward Winslow recorded this practice "We set last Spring some 20 acres of Indian Corne...and according to the manner of the Indians, we manured our ground with Herings or rather Shads..." (Young 1974: 60). Bradford also recorded this practice "Afterwards they ...began to plant ther corne, in which servise Squanto stood them in great stead, showing them both ye maner how to set it, and after how to dress and tend it. Also he told them excepte they gott fish and set with it (in these old grounds) it would come to nothing..." (Bradford 1989: 121). Finally, a source independent of Plymouth confirmed that this was a Native practice and not one shown to Squanto while he resided at Cupids colony in Newfoundland, as proposed by Ceci (Ceci 1975). John Winthrop Jr. , first governor of Connecticut, noted in hist study on Native horticulture that "Where the Ground is not very good, or hath beene long planted and worne out, the Indians used to put two or three of those fore-mentioned Fishes under each place upon which they planted their Corne, or if they had not time before planting, then they would put them afterwards into the Earth by the sides of those Corne hills, and by these meanes had far better Crops then that ground would otherwise produce, the English have learned this good husbandry of the Indians..." (Winthrop 1937:128). William Wood noted that the Natives would plant in the same spot for eight to ten years and then move, negating the need to fertilize with fish (Wood 1977:35). The use of a fertilizer versus moving a field may have been the result of shrunken community territory size or increased maize production in the Late Woodland to Contact periods. It appears that the Natives were more in the habit of moving a field versus fertilizing, except where previous planting had worn out the ground.

Planting occurred when certain seasonal clues told the Natives that the last frost had passed. These clues included the leaves of the dogwood or shadbush, which were the size of a squirrel's ear, before the ground was warm enough to plant (Tantaquidgeon 1977: 81). Essentially about the same time as when the alewives spawned- middle April to middle May (Winthrop 1937: 126).

The phases of the moon may have also been important as Tantaquidgeon recorded that it should be planted before the full moon, which would allow the full moon to pull the maize from the seed (Tantaquidgeon 1977: 81, 85). People planted the corn in hills spaced approximately six feet apart center to center. Women planted beans at the base of the corn sprouts when they were about the height of a finger. The beans, being a pole bean, climbed the corn stalk. People planted squashes and pumpkins between the corn hills. The fields were then weeded at regular intervals: when the maize was a hand high (late May early June), about a month after that (early June to early July) at which time women mounded up the earth around the base of the hills (Winthrop 1937:127). The field was then left alone except for regular inspections for cut worms, birds, woodchucks, and other pests.

The first plants that would be ready for harvest in midsummer around late July to early August were the green beans and summer squash (Butler 1948: 10). William Wood noted that summer squash were an important crop because by midsummer people would have used up the previous year's corn (Wood 1977: 86-87). Women harvested some corn in a green (also called unripe or milk) state in late August to early September. People harvested green corn and ate it fresh, roasted, or boiled, then dried and stored in bags or baskets for the future use either at ordinary meals or at festivals (Winthrop 1937:131). Green corn time would have been an occasion for a thanksgiving festival which would include prayers, dancing, feasting, and large congregations of people. Women dried the remainder of the corn, beans, and squash left in the field would for winter storage. This would have taken place in late September to early October.

Vegetable foods were placed on mats on the ground in the sun to dry. Corn was probably the most common vegetable food dried for storage. Roger Williams recorded the process for drying corn in 164:

"they doe carefully upon heaps and mats many dayes, before they barn it up, covering it up with mats at night, and opening when the sun is hot. The woman of the family will commonly raise two three heaps of twelve, fifteen, or twentie bushels a heap, which they dry in round broad heaps; and if she have the help of her children or friends, much more." (Williams 1971: 171).

The corn was simply piled up in heaps and allowed to dry during the day. people may have left it on the cob to dry this way, or they may have taken it off. People turned the heaps over each morning, so that the whole dried evenly.

People harvested certain wild plant species during the fall as well. Prominent among these are various types of nuts, such as hazel, hickory, beech, butternut, chestnuts and white oak acorns. Some years, more nuts would be harvested than in other years, depending on how well the corn crop had done that year (Williams 1971: 168). People harvested the final berries of the season, cranberries and grapes, at this time and at them fresh or dried them.

Nuts and berries were probably dried in a similar way. Specifically for the Native people in southeastern New England, we know through the historical records that they used cherries, strawberries, cranberries, barberries, grapes, blackberries, blueberries, and hurtleberries (Williams 1971:169). Archaeologically, raspberries, and hackberry can be added (Wheeler, Greenwich Cove). Among the Iroquois, huckleberries, thimble berries, high bush cranberries, nannyberries, mulberries, elderberries, gooseberries, dewberries, wintergreen, and June berries were also used (Parker 1968: 95). People did not dry all of these for the winter. The Iroquois dried cherries, blackberries, black raspberries, huckleberries, blueberries, strawberries and elderberries (Parker 1968: 97). It is known that in southern New England, people dried currants (Attitaash), and it the same berries that the Iroquois dried, the Wampanoag also dried.

Most of these berries could be easily dried by placing the whole berry on bark slabs or pieces of slate (Parker 1968: 97). Another Iroquois method for drying, specifically for blackberries, was to dry them on the stalk which was merely broken and allowed to hang on the bush (Parker 1968: 97). Parker also notes that people dried smaller "pulpy" berries such as blueberries in shallow basket trays. Strawberries and red raspberries were ground into mush and "with as much juice as the mass would hold placed on basswood leaves on slabs of slate or other flat rocks." (Parker 1968: 98). Again, we have not direct reference to the Wampanoag doing this, but it is likely.

Archaeologists have recovered other wild plants as macrobotanical remains at sites in New England including the following from Connecticut: Beadruby, Deerberry, Bunchberry, False Solomonseal, Goosefoot, Grape, Greenbrier, Hackberry, Hawthorn, Jerseytea, Pigwee Pokeberry and Smartweed (Powell 1981: 77). Botanicals recovered from Rhode Island sites include Sumac, Chenopods, Bulrush,

Solomonseal, Smartweed, Wild Rice, Bedstraws, Raspberry, Partridgeberry, and Cherry (Bernstein1992: 5). Bernstein presents the hypothesis that Natives placed a great deal of emphasis on the collection, processing, storage of nuts, especially hickory. At the RI670 site, archaeologists identified 17 features that yielded macrobotanical remains with eight of the features being large deep storage pits dated to ca. 2000 BP within which were found acorns, hazelnuts, and hickory nuts (Bernstein 1992: 6). Archaeologists interpreted other pits at the site that were dated to between 4610 and 280 BP, as roasting pits associated with the processing of hickory nuts. It is not detailed how the excavators believed people used these pits for processing hickory nuts, but they believed that the site showed the importance of hickory nuts in Native subsistence during the Middle Woodland Period. Bernstein's study also shows a slight increase in carbonized macrobotanical remain occurrence over time, possibly indicative of increased use of these resources. Archaeologists found this pattern paralleled by an increase in faunal species utilized (Bernstein 1992: 9). Nine genera of plants were dateable to Late Archaic to Early Woodland occupations while archaeologists recovered 13 from the Middle to late Woodland contexts (Bernstein 1992: 9).

Native processing of nuts involved the shelling and drying out of the meat for storage. The nuts most commonly used were Acorns, Beechnuts, Black Walnuts, which were not too common in our area, Butternuts, Chestnuts and Hickory. People would have removed the shell using a nutting stone. This is a flat stone with a shallow depression in it to hold the nut in place while it was split. Once the people removed the meat, they crushed it in a wooden bowl and threw it into boiling water, skimming off the oil and the drying the meats (Parker 1968: 101).

The Wampanoag used oils and greases for a variety of purposes. Greases could be used on the body to prevent sunburn, repel mosquitoes, retain heat, and when mixed with charcoal, to darken the hair. people collected oils and greases from a various substances such as fish, mammals such as bears, deer, and raccoons, birds, such as eagles and geese, nuts such as acorns, hickories and walnuts, and sunflower seeds.

Acorns need special boiling in lye to remove the oils (Williams 1971:168). The production of acorn oil involved a specific process to boil it out. John Josselyn described this process as follows:

“Maple- the ashes of this tree the Indians make a lye, with which they force out oyl from oak acorns that is highly esteemed. The natives draw an oyl, taking the rottenest maple wood, which they burnt to ashes, they make a strong lye therewith, wherein they boil their white oak acorns until the oil swim on the top in great quantity, this they fleet off, and put into bladders to anoint their naked limbs; they eat it likewise with their meat, it is an excellant clear oil .”(Josselyn 1972: 47-49).

People parched the acorns on the hot coals of a fire following the removal of the oil and then either stored or ground in a mortar and used the parched acorns (Parker 1968: 101: De Bry 1588:19). people placed acorns that they had parched in baskets and stored in storage pits, to be used in the winter. This is what the colonists discovered on Cape Cod in 1620 (Young 1974: 145). People boiled chestnuts and the meats dried, this is probably what Roger Williams meant when he stated that "The Indians have an

art of drying their chestnuts, and so to preserve them in their barnes for a daintie all yeare." (Williams 1971: 168).

Chilton summarizes the position of maize horticulture in southeastern Massachusetts (Chilton 1999:171) It appears that before the Contact era, maize was only part of a larger, more diverse subsistence-settlement system. Chilton saw evidence for this coming from from the lack of evidence for year round "villages", stable isotope analysis of human remains and osteological analysis indicating a significant change in diet and living conditions associated with intensive use of maize horticulture (Chilton 1999:171). The ethnohistoric descriptions of the seasonal mobility of southeastern Massachusetts populations show that permanent to semi-permanent Iroquoian-like villages did not exist in southeastern Massachusetts.. Native people in this region practiced seasonal transhumance, traveling from a winter base camp to summer planting cabins and then back to the winter base camp following the harvest. Stable carbon isotope analysis from Nantucket which shows a continued high reliance on seafood versus maize in the Late Woodland period, although a high dependence on seafood is what would be expected for a people living on an island. Current sensitivities and long-awaited for respect for current native communities beliefs and opinions on the disturbance, excavation and scientific study of burials may limit osteological and further isotope analysis, making the study of osteological changes associated with more intense horticultural reliance harder to evaluate.

Recovered Floral Remains

Archaeologists recovered charred floral remains, other than charcoal, in the field or more often during the scanning of flotation samples, from most of the impact areas (Table 17). Floral remains were not

Table 17. Recovered floral remains

Floral Remains	Location
Acorn	L2H, L4H, L4S, L5H, L6H, L7SN
Hazel nut	L4S
Hickory Nut	L1F2, L2H, L4S, L5H, L6H, L7H, L7SN
Bean	L6H
Maize	L1H, L1F2, L2H, L4S, L5H, L6H, L6S, L7SN, L8S
Grape	L2H, L6H
Seeds	L1F2, L1H, L1HN, L2H, L4H, L4S, L5H, L6H, L7HE1/2, L7HN, L7SN, L8S

recovered from L2S, L5S, L7S, L8H, and L8HN. Floral remains took the form of charred nut hulls, beans, maize, grape seed, and unidentified other seeds. The floral analysis was carried out by Blaine Borden at the University of Massachusetts Boston's Fiske Center (Appendix D). Analysis identified nut hulls from across the project area, possibly indicating occupation that extended through the planting season and into the fall, although, because people stored nuts for later use, they could have entered the archaeological record virtually in any season. Archaeologists recovered beans associated with maize from L6H in the large size deep depth pits that archaeologists interpreted interpreted as storage pits.

Excavation recovered grape seeds from L2H and from L6H. Testing recovered additional seeds from across the project area.

Maize Analysis

Ceci recorded the attributes used to identify Northern Flint corn maize kernels recovered from Coastal New York (Ceci 1990:152). The kernels tend to be crescent-shaped and have a greater width than depth, lacking the embryo/ endosperm area (Ceci 1990:152). Kernel size was found to vary significantly between the sites she analyzed (Table 18). The Bowman's Brook site kernels had the

Table 18. Size of Maize Kernels from Archaeological Sites in coastal New York (Ceci 1990:154) (measurements in cm)

Site	Max. Width	Max. Depth	Min. Width	Min. Depth	Average Width	Average Depth
Pleasant Hill	0.9	0.5	0.65	0.4	0.74	0.47
Sebonac	0.9	0.7	0.7	0.6	0.81	0.65
Bowman's Brook	1.2	0.7	0.8	0.6	1.01	0.72

largest kernels (6-12 mm) being comparative to Owasco and Iroquois sites (Ceci 1990:154) (Table 18). Kernels from the Pleasant Hill site were very small (4-8 mm). Ceci interpreted the difference in sizes between the sites as representing the difference between full-sized and mature (Bowman's Brook) and immature or "green" kernels or the result of poor growing conditions (Pleasant Hill) (Ceci 1990:152). One complete cob was also recovered. Overall the Bowman's Brook cob was 10.2 cm long bearing eight rows for a total of approximately 154 kernels (Ceci 1990:152). Cobs recovered from the Blain site in Ohio and ears described historically by John Winthrop Jr. in Connecticut, measure up to 15-20 cm in length and bear 200-400 kernels (Ceci-1990:152). By calculating the average kernel volume for the Bowman's Brook cob (381 cm 3), Ceci estimated a highest productivity per acre estimate for planting at the site at 20.9 bushels/ acre (Table 19) (Ceci 1990:155). Ceci found that this

Table 19. Productivity estimates for Northern Flint from Bowmans Brook (Ceci 1990: 155)

Variables	Planthills/ Acre	Ears/ acre	Bu/ a	lbs/ a	kg/ ha
3' spacing	4, 480				
2 plants-4 ears		19, 360	20.9	1, 172	1, 313.6
1 plant-2 ears		9, 680	10.5	586	656.9
4' spacing	2,722.5				
2 plants-4 ears		10, 890	11.8	659.3	739.1
1 plant-2 ears		5, 445	5.9	329.6	369.4
6' spacing					
2 plants-4 ears		4, 480	4.8	271.2	303.9
1 plant-2 ears		2, 240	2.6	146.5	164.2

corresponded well to a 15-20 bushel/ acre and 18 bushel/ acre estimated by Kroeber (1939:146) and Rutman (1967:9). Flannery estimated an estimate of 200-250 kg of maize per acre as a practical limit for reliance on maize as a staple food (Flannery 1972: 5). Unfortunately it is not known how many people lived at the Bowmans Brook site, what other resources they consumed or how many acres they planted by each family.

Archaeologists recovered 1220 maize kernel and cob fragments during field screening and flotation of soil samples from the Ja-Mar excavations. Maize kernels or kernel fragments that were complete enough to yield accurate width, thickness or depth (height/ length) measurements numbered 105 (Table 20) with not every fragment yielding all three measurements. Kernels

Table 20. Maize kernel measurements

Measurement	**Count**	**Range**	**Average**
Width	**97**	**.5-1 cm**	**.68 cm**
.5 cm	16		
.6 cm	23		
.7 cm	35		
.8 cm	15		
.9 cm	2		
1 cm	6		
Thickness	**104**	**.2-.7 cm**	**.45 cm**
.2 cm	3		
.3 cm	5		
.4 cm	42		
.45 cm	2		
.5 cm	44		
.55 cm	1		
.6 cm	5		
.7 cm	2		
Depth (Height/ Length)	**54**	**.2-.9 cm**	**.52 cm**
0.2	1		
0.3	1		
0.4	3		
0.45	1		
0.5	31		
0.6	13		
0.7	3		
0.9	1		

ranged in depth from .2 to .9 cm with the average being .52 cm. They averaged in width from .5 to 1 cm with the average being .68 cm and they averaged in thickness from .2 to .7 cm, average .45 cm. These measurements correspond closest with Ceci's data from Pleasant Hill but are slightly smaller. Maize measurement were consistent across the project area as well (Table 21). The consistency across the project area probably indicates

Table 21. Comparison of maize measurements across the project area

Location	**Depth**	**Width**	**Thickness**	**N**
1H	.5-.6	.8-.9	.4-.5	2
2H		0.6	.2-.4	2
4S	0.5	0.6	0.5	2
5H		0.6	0.5	1
6H	.2-.9/ .5 av	.5-1/ .7 av	.2-.7/ .4 av	86
6S	.5-.6/ .5 av	.7-1/ .8 av	.3-.7/ .5 av	10
7H		.7	.2	1
7SN	.5	.7	.5	1

that all the occupations occurred either concurrently or consecutively within a relatively short period of time, perhaps a generation at most during which time maize kernel size had not significantly changed.

Seasonality

Based on the faunal remains recovered from excavations, people occupied the site from spring to fall. Researchers reached this conclusion based on the presence of faunal (alewife, striped bass, turtle, goose and duck) and floral (nuts, maize, beans, grapes). Archaeologists believe that Late Woodland occupations at the site related to the planting, tending and harvesting of produce from Native gardens.

The economy and lives of both Native and Colonial people in the seventeenth century was closely tied to nature and the seasonal cycles. Because both groups relied on nature to furnish the people's needs, they had to know when specific foods and materials were available to them. The Wampanoag did not divide their year into the same segments that we do today, although, since both the Natives and Colonists based their calenders on the lunar year and natural changes, they are similar. Native people divided their year into thirteen "months" "according to the severall Moones; and they give to each of them significant names.." (Williams 1971:145). The months were names for important natural or cultural occurrences which happen during that lunar cycle, such as the Spring Month (Sequanakeeswush) or the Harvest Month (Taquontikeeswush). On a broader scale, they divided the year into the spring (Sequan) or Seed Time (Aukeeteamitch), the Summer (Neepun or Quaqusquan), the Fall (Taquonck), and the Winter (Papone) (Williams 1971: 144). This is at least how Roger Williams, who was very close to the Narragansett, understood the division of the year. They are very natural divisions, so they are true to what the people believed. In the sections which follow, research discusses the divisions of the year, beginning with the present day Wampanoag's traditional New Year in Spring, with regards to how the seasonality affected the foodways of the Wampanoag.

SEQUAN and AUKEETEAMITCH (March to May)
Spring was a time of relative plenty as far as what was available to the Native people. It is fairly safe to assume that corn was still present in the spring, probably until early summer, around June or July, but not in the same quantities as in the Fall and Winter. Beans may also have been left over from the winter, but because there was never as much beans grown as corn, we might not even want to use them in the spring. The people would have used up the pumpkin dried from the previous year by this time as well.

Spring greens are probably one of the most important food source used by the Natives at this time of the year. These supplemented the dwindling supplies of corn and provide vitamins lacking during the winter. Roots and tubers of plants such as Bulrush, Cattail, Jerusalem Artichoke and Groundnuts are available year round, but people added them to soups in the spring. Other plants and plant parts such as Cattail shoots, Fiddlehead Ferns, Milkweed and Poke shoots, are only available in the spring, as some of these plants become poisonous later in their growth cycle.

The Iroquois used the sprouts from other plants like sumac and raspberry, and may have also been prepared by the Wampanoag (Parker 1968: 93). Wild onions and garlic would be used in the late spring into summer. Berries would be used in May, towards the middle to the end of the month. Raspberries and Strawberries begin to fruit and be dried or used fresh.

Ducks and geese are present in the spring "..to the end of March, sometimes in May and June" (Young 1974: 294). The great flocks of Passenger Pigeons arrived in the beginning of spring and were present for much of the year to the northeast of Boston (Wood 1977: :50). Smaller birds such as Bobwhites (a native species of quail), woodcocks, ruffed grouse, and heath hens (also extinct), and turkeys were available year round and people may have hunted them in spring. Another less important food from birds was eggs and immature individuals taken from nests and eaten.

One of the most important seasonal occurrences was the spawning runs of fish into the fresh water rivers and eventually into ponds. John Pory and the Dutchman Isaac De Rasiers both note that in April and the beginning of May, herring and alewives traveled up Town Brook to spawn (James 1963: 07, 75). Eels would also be another fish available in rivers until the middle of April. Tisquantum was trodding the eels out of Town Brook and catching them with his hands in March of 1621 (Young 1974: 196). Shads, smelts and possibly a little salmon also begin to travel upriver in late April and into May. Native people smoke-dried many of these fish for use throughout the rest of the year. It appears that the ocean fishing did not figure prominently into the people's diets until possibly May and on into summer. The only ocean fish caught in the early spring was the winter flounder, easily caught on the beach in relatively shallow water. As the spring progressed though, fishing became more a part of the diet. John Josselyn, in 1674, stated that "Their fishing follows spring, summer, and fall of the leaf first for lobsters, clams, flouke, lumps or plaise, and alewives, afterwards for bass, cod, rock, bluefish, salmon, lampreys and such." (Josselyn 1988:100). The later part of spring (May) would see men venturing out into the ocean in the mishoons to begin fishing for Bass (Rock and Sea), Cod, Cunner, Cusk, Goosefish, Haddock, Hake, Lamprey, Mackeral, Sea Robin (which was probably caught accidentally when fishing for other fish), Sturgeon, Tautog, Weakfish and Wolffish.

Women shellfished throughout the year, with soft shell clams, surf clams, blue mussels, quahogs, and moon snails collected at low tide or in shallow water in the spring. Lobsters and crabs also placed an important social as well as food role for the people in the spring. Thomas Morton stated in 1637 that "savages will meet 500 to 1000 at a place where they come in with the tide to eat and have dried a store, abiding in the place for 4-6 weeks feasting and sporting together." (Morton 1637: 90). Lobsters and the other shellfish were smoke dried to keep them for the winter.

Men and boys hunted mammals such as deer, rabbit and woodchuck year round, and used them in the spring. They probably were not hunted in the spring to the extent that they were in the fall into winter, as they are very lean without much fat on them at this time.

The last food source available in the spring were the turtles, which come out of hibernation generally in April. Species begin to lay eggs at this time, providing the Native people with a perfect opportunity to catch them. Of the eight species of turtles available in our area, the snapping and the painted turtles were the most common ones eaten, as their bones are found at archaeological site more commonly than the other species.

NEEPUN or QUASQUSQUAN (June to August)
Summer was a time of plenty with regards to the wild natural bounty harvested by the people. Ocean fishing continued for the species fished in Spring, except for cod, hake and lamprey, species that are only winter residents of the area. Added to these fish were those that appear in our area only when the water temperature is warm enough, such as dogfish, several species of shark, skates and scup. Shellfishing continued throughout the summer, with many of them smoke-dried for the winter.

It does not appear that men hunted fowl during the summer. As Winslow stated in 1621 "As fowl decreases in March, so the fish increases" (Young 1974: 294). Turkeys and smaller birds would still be hunted, but most of the water fowl, such as many species of ducks and geese, would not be present at this time. Cranes and loons were the only other recorded water fowl hunted in the summer and late summer respectively (Wood 1977: 52-53). People continued to hunt turtles in the summer.

Corn, which Winslow noted was "..very deare to them.." in July, was probably used up around this time, the beans and squash which may have been present in early spring were definitely gone by summer. Women collected green beans and summer squash in July and August. Green corn (also known as corn in the milk) is available in August, which, Parker recorded, the Iroquois considered a time of celebration. It is not known if the Wampanoag celebrated the ripening of the corn with Green Corn Festivals the way the Iroquois did, or if they only celebrated the harvest later in the year.

Bulrush and cattail roots and bulrush shoots can still be collected during the summer, and people harvested bulrush seeds then dried and ground them into flour in August and September. Women collected cattail pollen in late July and ate this raw, cooked in soup, or roasted with the seeds being ground into flour. People used onions and garlic, the onion especially with fish. Purslane and goosefoot (Chenopodium) can also be put into soups or more correctly boiled separately and eaten throughout the summer. Beach plums and blueberries ripen in July and people harvested and dried them at this time, while choke cherries ripen in August and can also be dried.

Men hunted mammals to only a limited extent in the summer. Deer, bear, otters, and beavers are present in the area year round, and certainly they could be hunted in the summer, but fall and winter apparently was the primary time to hunt them. Rabbits and woodchucks would be trapped and hunted, especially if people caught them in the fields.

TAQUONCK (September to November)
In the Fall, subsistence focused on products from the garden and the fall deer hunt. The horticulture which had been practice in southeastern Massachusetts from at least 1100 A.D (900 years ago) provided the people with much of their food in the fall and especially the winter. Corn, which women harvested in its milk stage in August, matured in late September and harvested in October after the plants had died. The corn was thoroughly dried, and they placed some of it in underground storage pits for the winter. Beans were also dried on the vine and stored for the winter, and they may have sliced squash into rings or spiral slices and dried them in the sun to use in winter. People also harvested small dark green watermelons and ate them as they became ripe. Finally women harvested sunflowers, grown on the edges of the gardens, now and boiled the seeds to remove their oil, which they saved to use later.

Women harvested certain wild plant species during the fall as well. Prominent among these are various types of nuts, such as hazel, hickory, beech, butternut, chestnuts and white oak acorns. Some years, more nuts would be harvested than in other years, depending on how well the corn crop had done that year (Williams 1971: 168). People also harvested the last berries of the season, cranberries and grapes at this time and eaten fresh or dried.

One of the most important activities of the fall, is the annual deer hunt. Roger Williams stated that "about Harvest, they goe ten or twentie togeher,and sometimes more, and sets his traps and waits and once every 2 days he checks them." (Williams 1971:224). The deer hunt would allow hunters to acquire large amounts of skins and meat for the community in a relatively short amount of time. Men also began hunting other animals in earnest in this season. Josselyn states that bear could be hunted year round but the best time to do so is in acorn time and winter "when he is fat his meat is best" (Josselyn 1988: 65). The same is true for beaver and muskrats. Fall was a time to hunt fat animals to get an extra layer of fat on oneself for warmth and starvation protection. Ducks and geese return around October and as the ocean fishing dwindles with the approach of winter, the hunting of water fowl increased. Fishing continued in the fresh water where men sought fish such as trout, sunfish, carp, catfish and perch.

PAPONE (December to February)
Winter subsistence continued in much the same way that the fall did. Hunting and fresh water fishing provided meat for the family, while their vegetable needs were the crops which women dried and stored from the earlier year's planting season. During the late winter into very early spring, a community may face with dwindling food supplies. This would be especially if it was a particularly hard and long winter Corn, beans and squash crops were probably initially cultivated in this area as a way of supplementing the winter food supplies with a reliable and predictable food source. With the approach of spring, families would again begin to look for the spring greens and returning fish as welcome changes from the winter diet, and the cycle begins anew.

Archaeologists believe that the occupation at the Muttock-Pauwating site, as represented by the faunal and floral remains, represents a spring to fall occupation of the site. People caught alewives and striped bass in the spring when they ran up the adjacent Nemasket River to spawn. They harvested turtles from the spring to fall, ducks and geese were probably hunted either in the spring or fall and people hunted deer and bears in both the spring and fall. The main Late Woodland to early Contact Period activity focus at the site was probably horticultural production. Testing recovered extensive evidence from across the project area for maize and bean horticulture. This evidence took the form of macrobotanical remains, recovered stone hoes, and anomalies used to store horticultural products over the winter when inhabitants had left the site for winter quarters.