PREHISTORIC AGRICULTURAL SYSTEMS IN THE WEST BRANCH OF THE SUSQUEHANNA RIVER BASIN, A.D. 800 TO A.D. 1350

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Early Late Prehistoric (A.D. 800 - A.D. 1350) agricultural systems in the Eastern Woodlands of North America are best documented in the riverine interior. Other areas, particularly in the north, east of the Allegheny Front, are relatively poorly understood. Recent excavations at the Memorial Park Site, located at the Allegheny Front in the valley of the West Branch of the Susquehanna River in Pennsylvania, produced information that adds to our understanding of early Late Prehistoric agricultural systems in one portion of this generally poorly understood region. The evidence indicates that agricultural systems at some sites included not only the maize, bean, squash triad, but also two varieties of domesticated chenopod, sunflower, and cultivated little barley. Management systems included the use of stone hoes and large storage pits. The Memorial Park Site evidence indicates the importance of agricultural production prior to the appearance around A.D. 1350 of shell-tempered pottery and large, planned villages in the West Branch Basin. Combined with information from contemporaneous West Branch sites, the Memorial Park Site increases our knowledge of the mosaic of early Late Prehistoric agricultural systems in the Eastern Woodlands.

INTRODUCTION

Beginning around A.D. 800 throughout much of the Eastern Woodlands, maize became an increasingly important component of agricultural systems that included the use of a number of indigenous starchy and oily seed bearing crops. The increased use of maize was often associated with technological innovations in field management, food preparation and storage, including the use of large, well-made chert hoes, limestone- or shell-tempered pottery, and larger subterranean storage facilities, respectively (Smith 1986, 1992). By A.D. 1100, maize dominated agricultural systems in many areas of the Eastern Woodlands (Fritz 1990; Smith 1989, 1992), and, according to Smith (1992:111), there was "a developmental mosaic across the East, with different regions exhibiting variations in the types of maize

being grown and its dietary importance relative to indigenous crop and wild animal resources." As is evident in recent reviews (e.g., Fritz 1990; Scarry 1993; Smith 1989, 1992), these trends are best documented in the mid-latitude riverine interior of the Eastern Woodlands. Prehistoric agricultural systems in other portions of the Eastern Woodlands, particularly in the north, east of the Allegheny Front, are less well documented.

In this article, we review evidence for early Late Prehistoric (A.D. 800 to A.D. 1350) agricultural systems in one portion of the generally poorly documented Northeast, the West Branch of the Susquehanna River basin in north-central Pennsylvania. The data we present come primarily from recent investigations at the Memorial Park Site in the West Branch Valley at the Allegheny Front (Figure 1). Investigations at Memorial Park yielded important evidence for early Late Prehistoric agricultural systems in the West Branch Basin indicating that more complex systems were used than previously thought. At least some agricultural systems included not only maize, beans, and squash (Hay, et al. 1987; Stewart 1990), but also sunflower, two varieties of domesticated chenopod, and cultivated little barley, as well as tobacco. At least some agricultural management systems included the use of stone hoes and large storage pits. The plants cultivated and the use of hoes and large storage pits suggest the importance of agriculture in subsistence systems before the appearance of large, fortified villages in the region after A.D. 1350. This information adds to our understanding of the mosaic of early Late Prehistoric agricultural systems in the Eastern Woodlands.

REGIONAL SETTLEMENT AND SUBSISTENCE PATTERNS

In the West Branch Basin, the primary culture-historic taxon during the period ca. A.D. 750 to A.D. 1250 is the Clemson (or Clemson's) Island complex (for recent reviews see Hay, et al. 1987 and Stewart 1990). The Clemson Island Complex is defined primarily on the basis of chert- or other crushed-rock-tempered pottery with cord-marked or fabric-impressed exterior surfaces, and on many vessels, one or more bands of opposing punctates and bosses below the lip. The subsequent Stewart Phase, dating from ca. A.D. 1250 to A.D. 1350, is typified by crushed-rock tempered pottery with low-collared rims and incised decorations, as well as the appearance of longhouses (Graybill 1989), although there are subrectangular, small longhouses on some sites with Clemson Island pottery (Stewart 1990). While small amounts of shell-tempered pottery have been recovered from some Clemson Island sites (Stewart 1990), it does not become an important technology in the region until after ca. A.D. 1350 with the McFate-Quiggle horizon (Graybill 1989).

A large number of early Late Prehistoric sites have been reported in the West Branch Basin (Hay, et al. 1987; Turnbaugh 1977), only a few of which have been extensively excavated (e.g., Custer, et al. 1994; GAI Consultants, Inc. 1995; Hatch 1980; Hay and Hamilton 1984; Stewart 1988; Turnbaugh 1977). However, a number of regional settlement pattern models have been offered for this time period that encompass the West Branch Basin (e.g., Custer 1986; Custer, et al. 1994; Hay, et al. 1987; Hatch 1980; Stewart 1990, 1993). These models are in general agreement as to the kinds of settlements present in the region during this period of time.

The primary settlement types between ca. A.D. 750 and A.D. 1250 were single household farmsteads, multi-household hamlets, and fortified, multi-household hamlets (Custer, et al. 1994:18-23); small, planned villages apparently occur only after ca. A.D. 1250 (Custer, et al. 1994; Stewart 1990; cf. Garrahan 1990; Hay, et al. 1987). The basic unit of these settlements was the household cluster, composed of a house and various pit features (Custer, et al. 1994:19; Hatch 1980). Sites were scattered throughout the drainage basin in large and small stream valleys (Hatch 1980), and they are associated with fertile flood plain soils (Hay, et al. 1987; Turnbaugh 1977).

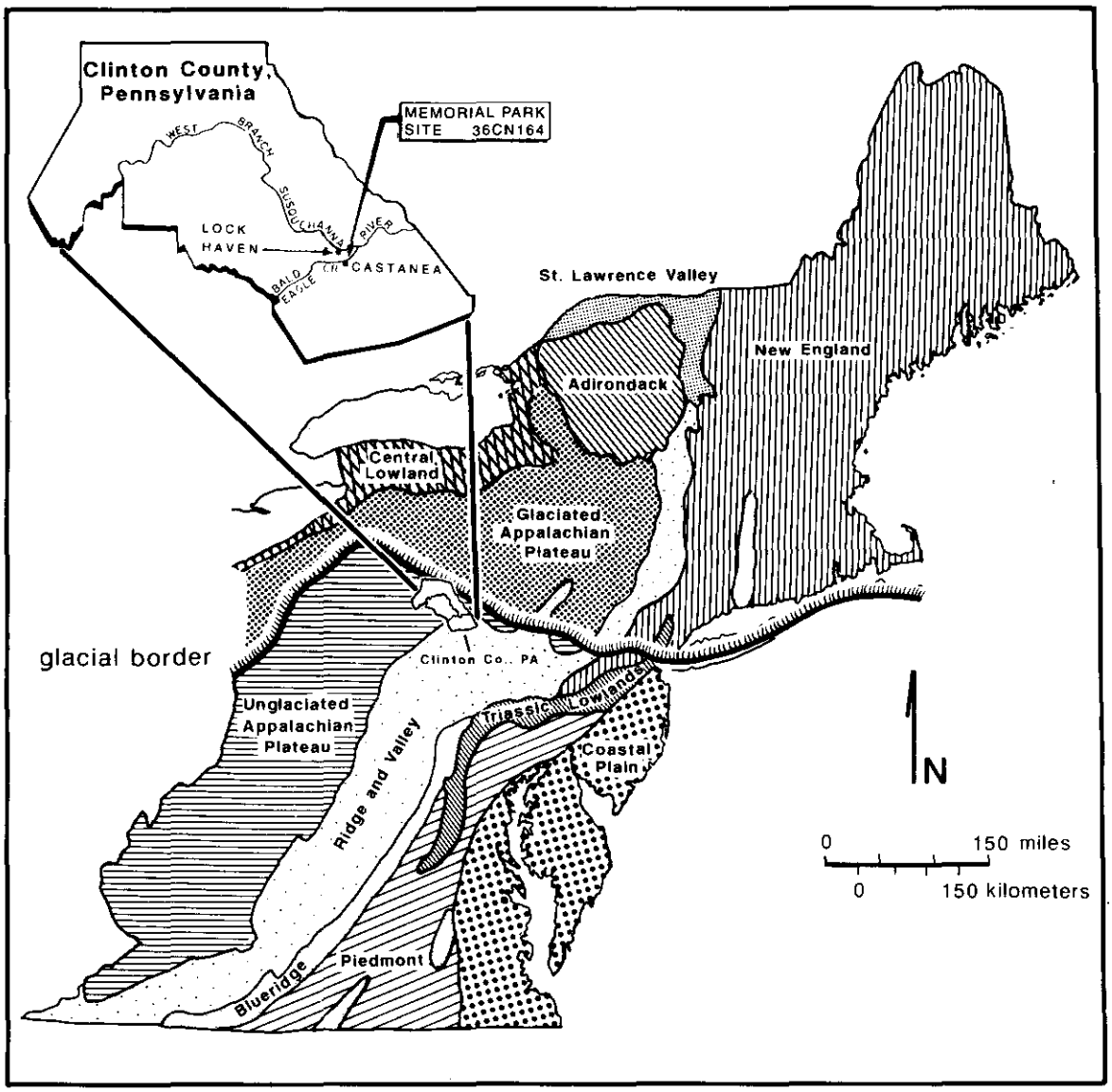

Figure 1. Location of the Memorial Park Site. Base map adapted from Ciolkosz, et al. (1989).

Some hamlets are spatially associated with burial mounds, though the functional and temporal relationships between mounds and hamlets is unclear; the mounds were generally destroyed during the nineteenth and early twentieth century, with little or no documentation (Hay, et al. 1987; Stewart 1990). The mounds were apparently accretional, and they contained adults and subadults of both sexes with few grave offerings (Stewart 1990:95-96). Custer (1986) and Stewart (1990) suggest that mounds and associated ceremonialism served as integrating mechanisms for dispersed communities of farmsteads and hamlets (also see Hay, et al. 1987). The mounds may also have served as territorial markers for these communities (Stewart 1990). Hamlets apparently persist after the appearance of small fortified villages around A.D. 1250, and they may have served as agricultural outposts for the villages (Hatch 1980).

Stewart Phase sites include small, fortified villages such as the Bull Run Site in the West Branch Basin (Bressler 1980) and, as evidenced below, farmsteads and hamlets (also see Bressler 1993; Hatch 1980). Large fortified villages appear after A.D. 1350 with the McFate-Quiggle horizon (Graybill 1989; Smith 1976). Burial mounds are not associated with post-Clemson Island sites.

The Clemson Island Complex is generally viewed as having had the first agriculturally oriented subsistence systems in the West Branch Basin (Custer 1986; Stewart 1990, 1993). Hay, et al. (1987) and Turnbaugh (1977) suggest that after ca. A.D. 800, sites are more likely to be located on tillable flood plain soils than are earlier sites, which they consider an indication of reliance on agricultural production. Maize is recovered at many sites from this time period; features containing maize have been dated to the eighth and ninth centuries A.D. (uncalibrated) at several sites (Hatch 1980; Stewart 1993). In addition to maize, beans and squash have been recovered from Clemson Island sites (e.g., Hatch 1980; Hay and Hamilton 1984; King 1982; Stewart 1988). Finds of starchy seeds, including *Chenopodium* and *Polygonum,* at a number of sites have been attributed to wild stand harvests (Custer, et al. 1994; Hay and Hamilton 1984; Hatch 1980; Stewart 1990). Little barley (*Hordeum pusillum*), a cultivated grass that bears starchy seeds, was identified at one Clemson Island site in the North Branch of the Susquehanna River Valley (King 1992).

Early Late Prehistoric agricultural production in the West Branch Basin was a component of mixed economies that exploited a wide range of wild resources including mast, fruits, berries, fish, and various large and small mammals (Stewart 1990). Evidence from the Stewart Phase is not as abundant, but maize, a variety of nuts, and seeds were recovered from Bull Run (Bressler 1980), and maize, beans, squash, and possible sunflower were recovered from a Stewart Phase feature at the Fisher Farm Site (Hatch 1980). This information suggests that Stewart Phase economies were similar to those of the Clemson Island complex.

THE MEMORIAL PARK SITE

The Memorial Park Site is located at the Allegheny Front, at the junction of the gently folded Appalachian Plateau Province to the north and west and the more complexly folded Ridge and Valley Province to the south (Figure 1). The site is situated on the south bank of the West Branch of the Susquehanna River on the eastern edge of the City of Lock Haven, Clinton County, Pennsylvania. It is on a low floodplain terrace at the point where the West Branch splits into two channels forming Great Island east of Memorial Park. The confluence of the major tributary, Bald Eagle Creek, with the southern channel of the West Branch is approximately 1.3 km southeast of Memorial Park. Bald Eagle Mountain, a homoclinal ridge on the northwest edge of the Ridge and Valley Province, is located to the south of Bald Eagle Creek and the West Branch. Bald Eagle Creek flows through the valley between Bald Eagle Mountain and the Allegheny Front; the West Branch enters this valley at Lock Haven. The combined width of the two streams' flood plains at Memorial Park is approximately 1.6 km.

The Memorial Park Site falls in Braun's (1950:233-242) oak-chestnut forest region, where broad valleys, like that of the West Branch, were dominated by white oak, tuliptree, red oak, black oak, and white pine. The combined early Late Prehistoric wood charcoal assemblage from Memorial Park contains 33% oak, 33% hickory, 17% walnut/butternut, 6% pine, 2% elm, 7% sugar maple, 2% black cherry, and less than 1% each maple, chestnut, beech, and ash. This combination indicates that a rich, well-drained mesic forest was present in the valley at Memorial Park. The wood charcoal assemblage closely resembles the forest that Braun describes as following the margin of the Allegheny Plateau in Pennsylvania, with some features of the mixed mesophytic type, some of the oak-chestnut type, and some of the northern hardwoods type. This is consistent with the site's location at the Allegheny Front.

ARCHAEOLOGICAL INVESTIGATIONS

The stratified Memorial Park Site was subject to extensive excavations to mitigate adverse affects from the construction of a flood wall/levee around the City of Lock Haven by the U.S. Army Corps of Engineers (GAI Consultants, Inc. 1995). As a result of these excavations, at least 15 components, ranging in age from ca. 5900 B.C. to A.D. 1334, were identified in stratified deposits extending to at least three meters below ground surface within a 50 meter by 200 meter (one hectare) study area. This study area was covered by fill material over two historic plow zones. The combined thickness of the fill and plow zones ranged between 40 cm and 125 cm, with the shallowest deposits toward the center of the study area and the deepest deposits to the northeast and southwest. The fill and plow zones were removed from the study area with heavy machinery to expose Late Prehistoric features. Soil investigations revealed that the project area consisted of a ridge and swale topography below the fill (Cremeens 1995). A point bar/levee extended diagonally, northwest to southeast, across the stripped area, while swales occurred to the northeast and southwest.

Mechanical stripping was performed to the point of feature recognition (Graybill 1995). Because of the poor contrast between features and the surrounding soils, this procedure and subsequent shovel scraping, resulted in an exposed surface generally, but in some areas more than, 10 to 40 cm below the plow zone-B horizon contact. Eighty three pit features and 511 postmolds, most dating to the early Late Prehistoric occupation of the site, were identified on the stripped surface. The pit features included six post pits, 38 storage pits, and 36 fire-related pits. Eight structure patterns were discerned from the postmolds. The features and postmolds were distributed across the point bar/levee (Figure 2). Some earlier period features were also exposed on this surface (Hart and Sidell 1996).

Thirteen radiocarbon assays were obtained from Late Prehistoric features that ranged in age from A.D. 760±40 to A.D. 1385±40 (A.D. 881 to A.D. 1404 calibrated). Two accelerator mass spectrometry (AMS) dates were also obtained to clarify the temporal assignment of two pit features (Table 1). Combined with artifactual evidence, these dates represent at least four components designated early Clemson Island, middle Clemson Island, late Clemson Island, and Stewart Phase. Features not assigned to particular components contained neither diagnostic bifaces nor large or distinctive pottery assemblages; most unassigned features were small, fire-related pits. S ome of the unassigned features may be associated with earlier Woodland components.

COMPONENT DEFINITIONS

Early Clemson Island

Four radiocarbon assays predate A.D. 900, and range in age from A.D. 760±40 to A.D. 830±60; calibrated ages (Stuiver and Reimer 1993) range from A.D. 881 to A.D. 906 (Table 1). Ward and Wilson's (1978) Chi-square test, as implemented in the CALIB rev. 3.03 program (Stuiver and Reimer 1993:227), indicates that the dates are not significantly different at the 95% level of confidence. The resulting pooled calibrated age of A.D. 888±27 indicates a late ninth century occupation for this first early Late Prehistoric component. Pottery attributes associated with this component include heavy, oblique cord impressions or cord-wrapped paddle impressions on flat-to-bevelled lips, cord-marked interior rim surfaces, cord-marked or fabric-impressed exterior surfaces, and interior punctations/exterior bosses below the lip. Diagnostic bifaces include Jack's Reef Side Notched, Jack's Reef Pentagonal, and Levanna.

Thirteen features were assigned to the early Clemson Island component based on pottery attributes associated with the early Clemson Island radiocarbon dates at Memorial Park (Figure 3). These features were distributed across the point bar/levee, though seven fell on the eastern third of the landform. There are two possible clusters of features, one on the eastern portion of the study area and one less convincing

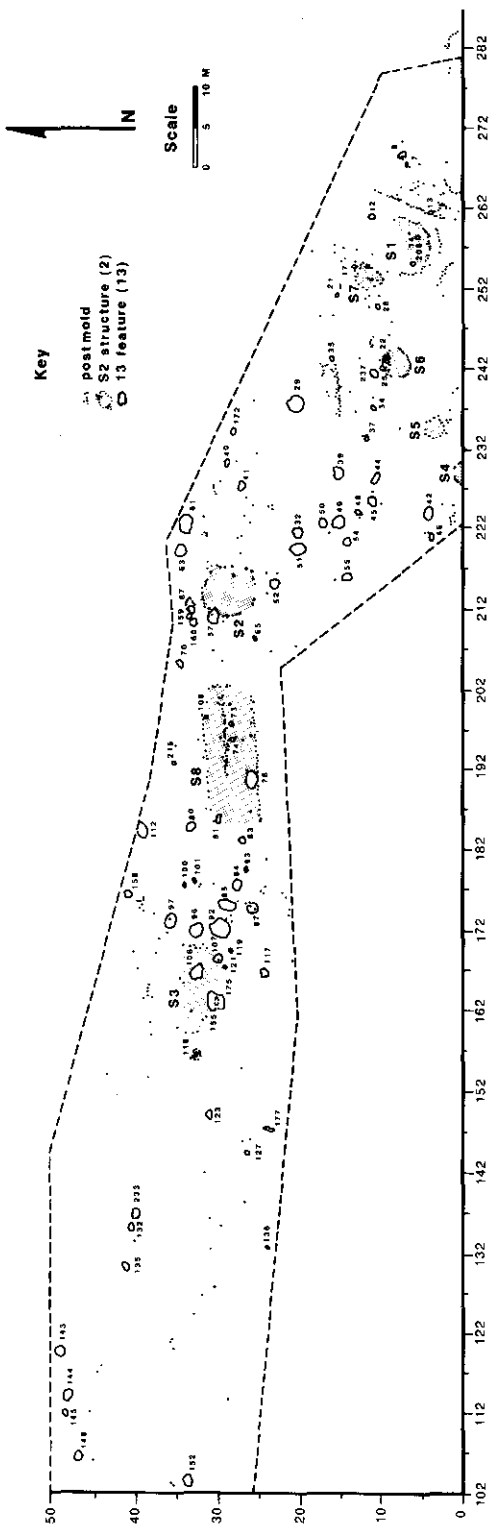

Figure 2. Distribution of Late Prehistoric features at Memorial Park.

Table 1. Memorial Park Radiocarbon Dates[1].

Lab Number	Radiocarbon Age (B.P.)	Radiocarbon Age (A.D.)	Calibrated One Sigma Range (A.D.)
		Early Clemson Island	
PITT-1073	1190±40	760	785 (881) 891
PITT-1075	1160±60	790	789 (888) 973
BETA-46542	1140±60	810	871 (893) 984
BETA-46545	1120±60	830	883 (898, 906, 961) 998
Pooled	1161±27	789	881 (888) 954
		Middle Clemson Island	
BETA-46543	1030±60	920	978 (1014) 1032
BETA-46548	1020±50	930	989 (1017) 1032
Pooled	1024±39	926	994 (1015) 1027
AA-19127[2]	985±45	965	1009 - 1039
		Late Clemson Island	
BETA-46541	900±60	1050	1036 (1165) 1222
BETA-46546	900±50	1050	1041 (1165) 1218
BETA-46544	870±50	1080	1063 (1195) 1230
BETA-46547	860±60	1090	1064 (1214) 1255
Pooled	883±28	1067	1161 (1170) 1217
		Stewart Phase	
BETA-46540	660±60	1290	1288 (1302) 1396
PITT-1078	600±45	1350	1306 (1328, 1333, 1395) 1407
PITT-1124	565±40	1385	1324 (1404) 1419
Pooled	616±27	1334	1312 (1329, 1331, 1396) 1403
AA-19126[3]	420±40	1530	1430 - 1476

[1]All BETA and PITT samples were wood charcoal.

[2]AMS date on maize cupule from Feature 143. Calibration by NSF-Arizona AMS Facility. δ13C -10.1‰ See text for explanation..

[3]AMS date on maize cupule from Feature 32.

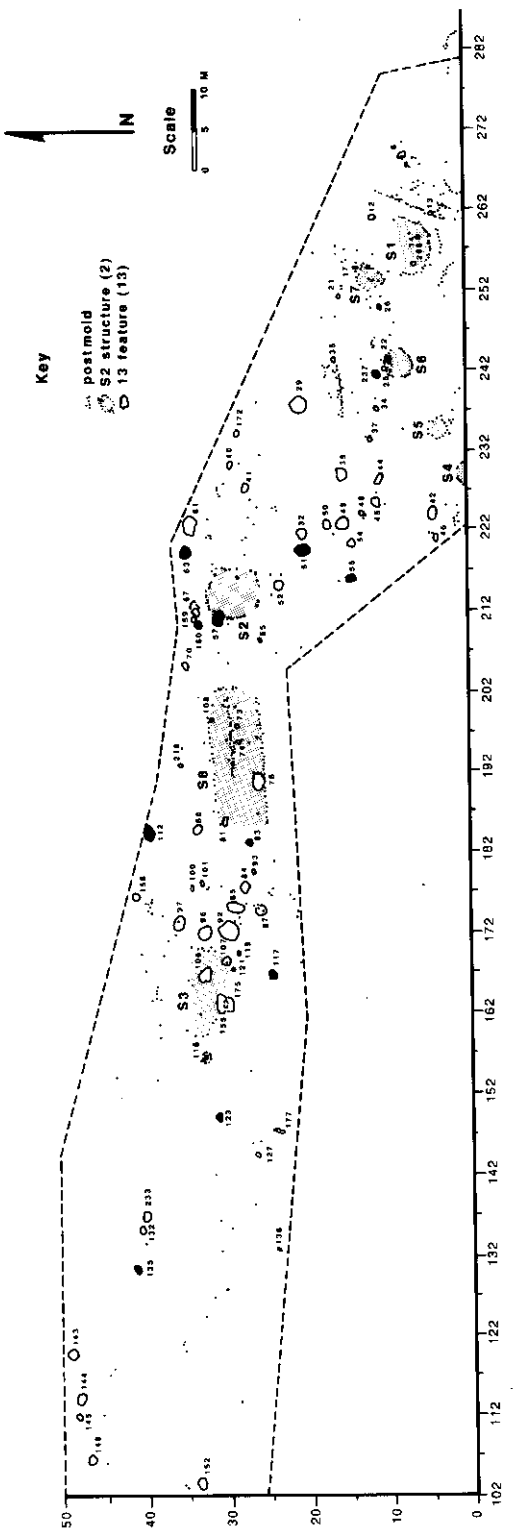

Figure 3. Distribution of Early Clemson Island features (shaded).

cluster on the central portion of the study area. Pottery sherd refits between features would be expected in these clusters if they were contemporaneous and reflected long-term occupations (Nass 1989). Only one cross-feature pottery refit occurred between early Clemson Island features. Given that the early Clemson Island features are so widely scattered, and that there were no other cross-feature pottery refits, the features apparently do not represent a long-term occupation. This is further suggested by the fact that pottery contained in most features appears to represent a small number of vessels, perhaps pots that were used during single occupations. Microwear analysis of chipped stone tools indicated that a wide range of domestic behaviors took place at the site during the early Clemson Island occupations, but no activity clusters were evident (Nass 1995). These data, along with the evidence for agricultural systems reviewed below, indicate that the early Clemson Island component represents a series of individual farmsteads and/or hamlets.

Middle Clemson Island

Two wood-charcoal-based radiocarbon assays from middle Clemson Island features provided dates of A.D. 920±60 and 930±50 (A.D. 1014 and A.D. 1017 calibrated) [Table 1]. These assays are not significantly different at the 95% level of confidence, and they yield a calibrated pooled age of A.D. 1015±39. As indicated in Table 1 there is some overlap in the one and two sigma ranges for the dates assigned to the early and middle Clemson Island components, and the dates from these components are not significantly different at the 95% level of confidence. However, the limited spatial distribution of the features assigned to the middle Clemson Island component, and the distinctive pottery style attributes of this component, as described below, indicate that they are two temporally distinct components. An accelerator mass spectrometry (AMS) assay was obtained for this component on a maize cupule recovered from a pit that yielded a wood-charcoal-based radiocarbon assay of A.D. 150 (A.D. 239 calibrated). The AMS assay yielded a date of A.D. 965±45 with a calibrated one sigma range of A.D. 1009 to A.D. 1039, indicating a middle Clemson Island origin for the maize (Table 1). The pottery from the pit also indicates a middle Clemson Island origin for the pit as described below; the wood charcoal on which the early date was obtained was probably intrusive.

Pottery style attributes associated with the middle Clemson Island component include heavy cord-marked or fabric-impressed exterior surfaces, broadly expanded rims with cord-marked lips and interior rim surfaces. Diagnostic bifaces belong to the Jack's Reef pentagonal and Levanna types. The Jack's Reef types are generally dated between A.D. 500 and A.D. 1000 in the Midwestern, mid-Atlantic, and northeastern United States (Justice 1987:215); they are rarely reported at Clemson Island complex sites (e.g., Hatch 1980). Justice suggests a terminal date for Jack's Reef types in the early tenth century based on a radiocarbon assay of A.D. 905±250 (uncalibrated) reported by Crane (1965). Lantz (1989:33) suggests a date range of A.D. 500 to A.D. 950 for the related Raccoon Notched type in western Pennsylvania and New York. Two Jack's Reef bifaces were recovered from each of the two middle Clemson Island component features with wood-charcoal-based radiocarbon assays. The uncalibrated early tenth century dates are consistent with the end of the temporal distribution of the Jack's Reef types.

Eight pit features were assigned to the middle Clemson Island component on the basis of radiocarbon assays and associated pottery attributes (Figure 4). Seven of these features fall within a 30 meter wide area toward the center of the study area. It is possible that these features are associated with Structure 2, which is the nearest pattern that does not overlap with any of the middle Clemson Island features. It is more probable that a structure was present in the vicinity of two fire related pits around which most of these features form an arc. One other storage pit occurred to the west of this cluster. Two pottery sherds refit between this pit and a feature in the cluster, suggesting that the features are contemporaneous.

Because the range of stylistic variation within the middle Clemson Island pottery assemblage is limited, and all the features assigned to this component fall within a small area, it apparently represents at most a few occupations, perhaps related to a several agricultural seasons. Microwear analysis of middle

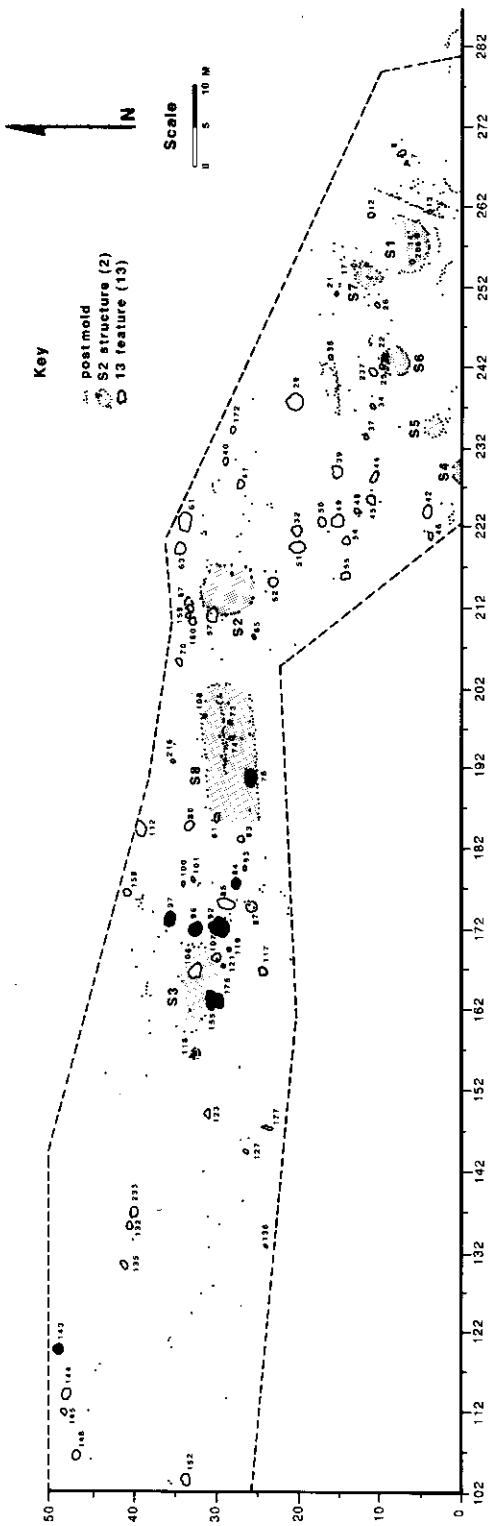

Figure 4. Distribution of Middle Clemson Island features (shaded).

Clemson Island chipped stone tools indicates a full range of domestic activities but no obvious activity clusters (Nass 1995). The possibility that human bone recovered from two middle Clemson Island features was interred during the winter months (Frankenberg 1995) suggests that at least in some years the middle Clemson Island occupations extended through the entire year. These data, and the evidence for agricultural systems reviewed below, indicate that the middle Clemson Island component also represents individual farmsteads and/or hamlets.

Late Clemson Island

Four radiocarbon assays obtained from late Clemson Island features range in age between A.D. 1050±50 and 1090±60; calibrated ages range between A.D. 1165 and A.D. 1214 (Table 1). The dates are not significantly different at the 95% level of confidence and yield a calibrated pooled radiocarbon age of A.D. 1170±28. Pottery style attributes associated with the late Clemson Island component include smoothed interior rim surfaces with or without vertical cord-wrapped dowel impressions, cord-marked or fine fabric-impressed exterior surfaces, and interior punctate/exterior bosses on the rims. In general, the execution of these attributes is finer than those on the early and middle Clemson Island pottery. Diagnostic biface types include Levanna and Madison triangles.

Eight pit features, scattered across the study area, were assigned to this component based on pottery style attributes associated with the late Clemson Island radiocarbon dates at Memorial Park (Figure 5). Possible feature clusters were present in the central portion of the study area, where four features occur and on the eastern portion where two features occur. As with the previous two components, the apparent feature clusters may represent individual households. The lack of pottery refits between the features suggests that the features do not represent a long-term occupation. The restricted range in radiocarbon dates suggests a limited time span for the component. Microwear analysis of the chipped stone assemblage indicates a full range of domestic activities, but again, no obvious activity clusters (Nass 1995). Like the early and Middle Clemson Island components, the late Clemson Island component represents farmsteads or hamlets.

Stewart Phase

Three wood charcoal-based radiocarbon assays ranging between A.D. 1290±60 and A.D. 1385±40 are associated with the Stewart Phase component. Calibrated dates range between A.D. 1302 and A.D. 1404 (Table 1). The dates are not significantly different at the 95% level of confidence, and yield a calibrated pooled radiocarbon age of A.D. 1331±27. An AMS date on a maize cupule recovered from a pit that contained a rhyolite Fox Creek-like biface, yielded a date of A.D. 1530 with a calibrated one sigma range of A.D. 1430 to A.D. 1476 (Table 1), which post-dates the Stewart Phase. Although it is possible that this date reflects a later occupation of the site, the calibrated range is close to those for the Stewart Phase component and no artifactual evidence was recovered from the site indicating a post Stewart Phase occupation. Therefore, this pit was assigned to the Stewart Phase occupation.

Pottery attributes associated with the Stewart Phase component include incised, collared rims with smooth, flat lips, smooth rim interiors, fine cord-marked exterior surfaces, and fine grit or quartz temper. A single Madison triangle was the only diagnostic biface recovered from this component.

Fourteen pit features were assigned to this component, three on the western third of the project area, and the rest on the eastern half (Figure 6). No obvious feature clusters are present. An apparent longhouse pattern toward the center of the point bar/levee, and possible incomplete longhouse patterns to the east, indicate that larger household units were occupying the site at this time. The assignment of long house pattern(s) to the Stewart Phase component was made on the basis of the recovery of Stewart Phase pottery from small pits located inside the more complete pattern and the similarity of this pattern to that reported by Bressler (1993) at Canfield Island, downstream from Memorial Park. The trends established

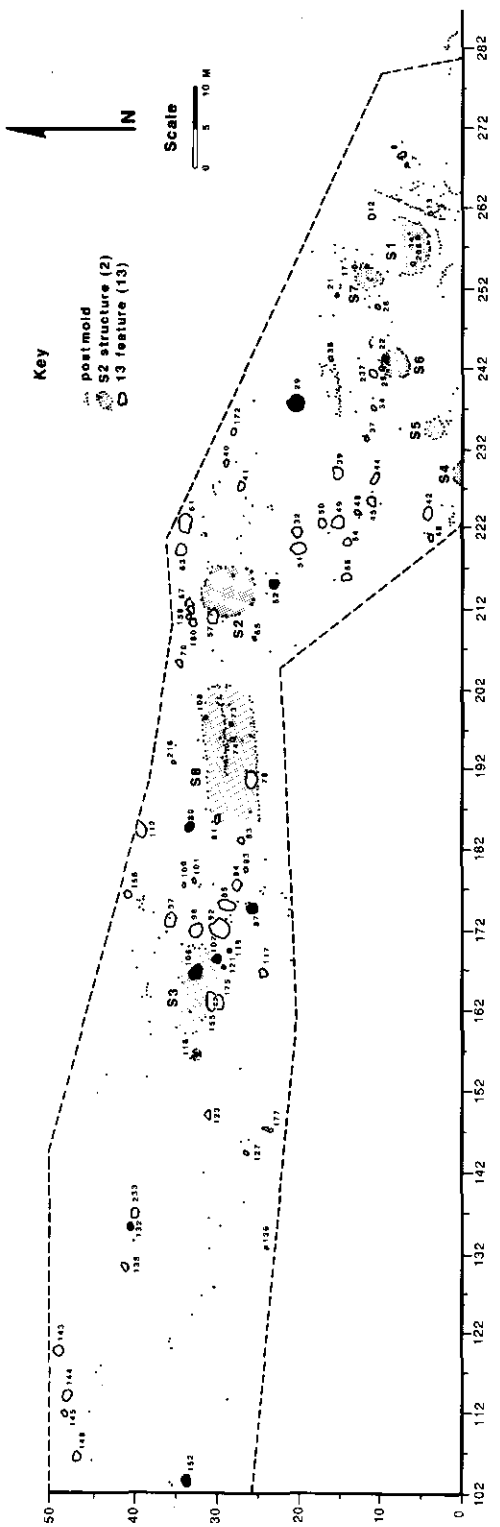

Figure 5. Distribution of Late Clemson Island features (shaded).

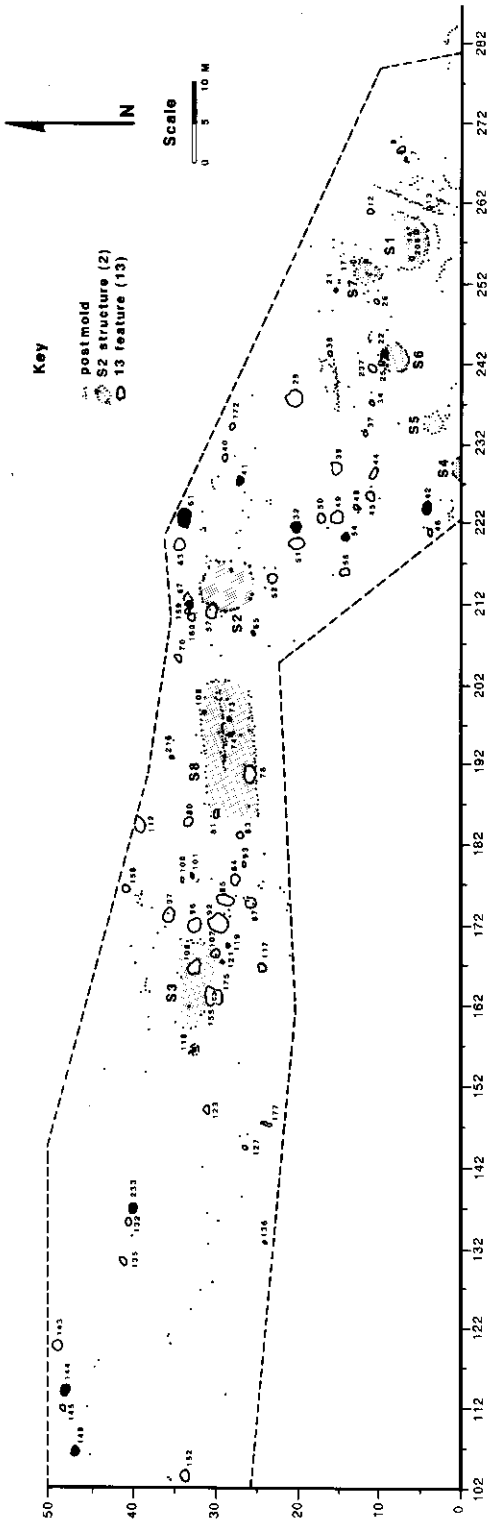

Figure 6. Distribution of Stewart Phase features (shaded).

during the earlier components continue, but microwear analysis of Stewart Phase chipped stone tools identified only one retouched flake with polish (Nass 1995), and the pottery assemblage was small compared to the Clemson Island assemblages. These factors suggest that despite the presence of one or more longhouses, the site was not occupied for long periods of time. It is likely that the Stewart Phase component continued to represent isolated farmsteads and/or hamlets.

Structure Patterns

Eight structures were identified on the basis of postmold patterns, all on the eastern half of the point bar/levee (Figure 2). Structures 1 and 2 were circular, and they encompassed 35 and 30 square meters, respectively. Structure 3 was defined from a roughly elliptical postmold pattern encompassing approximately 64 square meters. Structures 4, 5, 6, and 7 were small, circular patterns encompassing between four and nine square meters. Structure 8 was an apparent longhouse encompassing at least 108 square meters. Several other lines of postmolds on the eastern third of the point bar/levee may represent partial longhouse patterns.

It is unclear which structure patterns at Memorial Park are associated with which components, with the exception of the apparent longhouse pattern's association with the Stewart Phase component. Custer, et al. (1994:104) suggest that there was a general trend for larger houses through time during the early Late Prehistoric period, eventually leading to the longhouse. If this is true, then the smaller house patterns would be associated with the earliest Clemson Island occupations.

Postmolds of Structure 2 overlap one early Clemson Island feature suggesting that it is associated with the middle or late Clemson Island components. The nearest Clemson Island features to Structure 2 belong to the late Clemson Island component, so it is possible that this structure is associated with that component. Structure 3 overlaps a middle Clemson Island feature, and late Clemson Island features are located within and nearby the structure, suggesting that this structure is also associated with the late Clemson Island component. If these large structures are associated with the late Clemson Island component, following the trend noted by Custer, et al., Structure 1, given its large size, may also be associated with this component. Under this interpretation, the four small structures located on the eastern end of the project area would be associated with the early Clemson Island component. The presence of several early Clemson Island features near Structure 6 may support this interpretation. However, the very small size of these structures, encompassing an average of only 6.5 square meters, suggests that they were not dwellings. Finally, it is likely that a structure associated with the middle Clemson Island component occurred in the vicinity of the feature cluster in the center of the site, perhaps centered around two small fire-related pits/hearths inside the arc of features.

Summary

In summary, data from the four early Late Prehistoric components suggest that the site functioned as individual farmsteads and/or hamlets. The apparent lack of long-term intensive occupations of the site is supported by the virtual lack of overlapping pit features and cross-feature refits of pottery sherds.

SUBSISTENCE DATA

Macrobotanical Remains

Flotation samples, generally measuring two to four liters in size, were collected from all Late Prehistoric features at Memorial Park. Charred plant remains from both the light and heavy fractions of these samples were identified by Asch Sidell using procedures established at the Center for American Archeology (Asch and Asch Sidell 1992). Carbonized plant remains are itemized in Table 2.

Table 2. Carbonized Plant Remains by Component.

	Early CI	Middle CI	Late CI	Stewart	Unassign	Totals
Soil Processed (liters)	38	24	10	24	96.7	192.7
Sample Weight (g)						
>2mm	54.8	7.0	15.4	26.8	97.2	201.2
0.5 - 2mm	43.9	5.8	12.3	25.4	82.3	169.7
Total	98.7	12.8	28.8	52.2	179.5	372.0
Sample Composition (>2mm)						
Wood	4034	648	957	2761	7389	15789
Bark	418	102	126	150	559	1355
Twig	0	0	0	0	1	1
Pitch	10	12	71	60	112	265
Nutshell	554	29	165	84	770	1602
Grass stem	1	1	1	2	57	62
Herbaceous stem	1	0	0	0	0	1
Rhizome	4	0	2	8	5	19
Unkown	33	10	5	13	87	147
Zia mays, maize						
Cupule	57	19	2	17	34	129
Glume	12	7	0	13	8	40
Kernel	48	3	12	13	32	108
Embryo	0	0	1	0	0	1
Seeds (< 2mm in parens)	4 (205)	(108)	1 (74)	4 (77)	4 (94)	13 (559)
Totals	***5176***	***831***	***1343***	***3125***	***9058***	
Seed Identification (count)						
Amaranthus spp., amaranth	9	0	0	0	1	10
Amaranthus/Chenopodium	0	0	0	0	1	1
Chenopodium spp., goosefoot	19	0	2	0	0	21
Echinochloa spp., barnyard grass	3	0	0	0	0	3
Fabaceae, bean family	0	0	0	0	2	2
Galium spp., bedstraw	0	0	0	1	2	3
Helianthus annuus, sunflower	1	0	0	0	0	1
Hordeum pusillum, little barley	119	101	70	20	26	336
Nicotiana rustica, tobacco	0	0	0	0	1	1
Panicum spp., panic grass	1	0	0	0	0	1
Poaceae, grass family	7	0	0	3	2	12
Polygonum spp., smartweed	2	1	0	1	3	7
Prunus pensylvanica, pin cherry	0	0	0	0	1	1
Rhus spp., sumac	5	0	0	6	1	12
Rubus spp., bramble	1	1	0	0	4	6

Table 2. Continued

	Early CI	Middle CI	Late CI	Stewart	Unassign	Totals
Seed Identification (count)						
Solanum americanum, nightshade	20	0	0	1	3	24
Vaccinium spp., blueberry	0	0	0	0	1	1
Verbena spp., vervian	1	0	0	0	0	1
Vitis spp., grape	0	0	1	1	0	2
Zizania aquatica, wild rice	0	0	0	0	1	1
Type 50	5	0	1	27	0	33
Type 53	5	1	0	20	26	52
Type 54	1	0	0	0	1	2
Unknown or unidentifiable	10	4	1	1	12	28
Totals	***209***	***108***	***75***	***81***	***99***	***572***
Nutshell identification (count)						
Carya sp., hickory	216	17	135	59	652	1079
C. cordiformis, butternut	6	0	0	0	21	27
Castanea dentata, chestnut	47	0	0	0	0	47
Juglandaceae, walnut family	40	9	1	5	22	77
Juglans spp., butternut/walnut	0	2	0	0	1	3
J. cinerea, butternut	5	0	0	2	0	7
J. nigra, black walnut	5	0	11	12	12	40
Quercus spp., acorn	233	1	18	6	62	320
Totals	***554***	***29***	***165***	***84***	***770***	***1602***
Wood identification (count)						
Acer spp., maple	0	0	1	0	2	3
A. saccharum, sugar maple	2	1	2	1	33	39
Carya spp., hickory	66	29	6	22	56	179
Castanea dentata, chestnut	2	0	1	0	0	3
Fagus grandifolia, beech	3	0	0	0	2	5
Fraxinus spp., ash	3	1	0	0	0	4
Juglans spp., walnut, butternut	3	23	0	5	59	90
Pinus spp., pine	6	0	2	10	13	31
Populu spp., poplar	0	5	0	0	0	5
Quercus spp., oak	62	10	23	30	52	177
Red oak group (subtotals)	(32)	(6)	(10)	(10)	(18)	(76)
White oak group (subtotals)	(20)	(1)	(1)	(6)	(18)	(46)
Ulmus spp., elm	0	4	1	2	2	9
Ring porus	1	0	1	1	4	7
Diffuse porus	0	2	0	2	13	17
Unidentified	0	0	2	0	0	2
Totals	***150***	***75***	***40***	***80***	***235***	***540***

Maize. Maize *(Zea mays)* was recovered from 62% of the early Late Prehistoric features at Memorial Park (Table 3). It was present in all of the features assigned to the early and late Clemson Island components, 38% of the middle Clemson Island component features, 80% of the Stewart Phase component features, and 50% of the features not assigned to a component. A total of 278 maize fragments were recovered from the site, representing 1.4% of all charred plant remains larger than two mm. The maize fragments included cupules, glumes, kernels, and an embryo. As indicated in Table 4, for all Late Prehistoric features, 14.4 fragments of maize were recovered per 10 liters of flotation processed soil. The ratio varied between components, from a high of 30.8 fragments for the early Clemson Island component to a low of 12.1 fragments for the middle Clemson Island component. Kernels and cupules were recovered from all components, while glumes were recovered from all but the late Clemson Island component. The recovery of cob fragments suggests that maize was cultivated near the site.

Table 3. Ubiquity[a] of Cultigens by Component at the Memorial Park Site.

	Early CI	Middle CI	Late CI	Stewart	Unassigned	Total
Maize	100	38	100	80	50	62
Chenopod	31	0	25	0	0	6
Little Barley	46	25	50	30	17	25
No. Features	13	8	4	10	52	87

[a]Percentage of features that contained cultigen.

Seeds. Twenty one carbonized *Chenopodium* seeds were recovered from four early Clemson Island features and one late Clemson Island feature (Table 1). Mature, relatively well preserved seeds included two domesticated types. The first type has a very thin testa and truncate margin, as opposed to the thick seed testa and acute margin of seeds from nondomesticated plants. This thin-testa, eastern North American type, which resembles the modern chia of Mexico, has been named *Chenopodium berlandieri* spp. *jonesianum* (Smith and Funk 1985). The second type recovered from Memorial Park resembles the Mexican cultigen huauzontle in which the outer epiderm is entirely absent, leaving a thin inner epiderm, resulting in a pale colored seed. Of course, color cannot be determined in carbonized specimens, but we will refer to these as the pale seeded type of *Chenopodium berlandieri*. The early Clemson Island samples from Memorial Park yielded one definite thin testa type and six pale seeded type. The one measurable late Clemson Island seed was of the pale seeded type.

Little barley (*Hordeum pusillum*) is by far the most abundant seed type recovered from Memorial Park (Table 1), constituting 67.5% of the identifiable seeds. Little barley seeds were identified in 53% of the 49 flotation samples containing seeds, and 25% of the features. It was recovered from 46% of the early Clemson Island features, 25% of the Middle Clemson Island features, 50% of the late Clemson Island features, 30% of the Stewart Phase features, and 17% of the features not assigned to a component (Table 3). Little barley is very uncommon in Pennsylvania today (King 1992; Rhoads and Klein 1993), and it has been identified as a prehistoric cultivated crop in the Midwest (Asch and Asch 1985). Its frequency and association with domesticated *Chenopodium* at Memorial Park suggest that little barley was a cultivated crop at this site.

One sunflower (*Helianthus annuus*) kernel was found in an early Clemson Island feature. The kernel measured 3.9 mm x 1.7 mm. Correcting for the missing seed coat and for shrinkage due to carbonization using Yarnell's (1978) method, the estimated achene size is 5.1 mm x 2.5 mm, which is within the size

Table 4. Memorial Park Economic Seeds and Maize by Component.

	Early CI	Middle CI	Late CI	Stewart	Unassigned	Total
Percentage of Identified Seeds						
Starchy cultivated (chenopod, little barley)	69.3	97.1	97.3	25.0	41.4	67.5
Oily cultivated (sunflower)	0.5	0.0	0.0	0.0	0.0	0.2
Tobacco	0.0	0.0	0.0	0.0	1.1	0.2
Starchy noncultivated (wild rice)	0.0	0.0	0.0	0.0	1.1	0.2
Sweet/sour fruits & berries (pin cherry, sumac, raspberry/blackberry, black nightshade, blueberry, grape)	13.1	1.0	1.4	10.0	11.5	8.4
Weed seeds (amaranth, barnyard grass, bedstraw, panic grass, smartweed, vervian)	8.0	1.0	0.0	2.5	9.2	5.0
Other (bean family, grass family, unknown types)	9.0	1.0	1.4	62.5	35.6	18.5
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of identified seeds	199	104	74	80	87	544
Total seeds per 10 liters	55	43	76	33	10	28
Maize (*No. of Fragments >2mm*)						
Cupule	57	19	2	17	34	129
Glume	12	7	0	13	8	40
Kernel	48	3	12	13	32	108
Embryo	0	0	1	0	0	1
Total	117	29	15	43	74	278
Fragments per 10 liters	30.8	12.1	15.0	18.0	7.7	14.4

range of a wild or ruderal sunflower. However, given the size variation of kernels on domesticated sunflower heads and the fact that this plant is not native to the area, it is most likely from a domesticated plant (Bodner 1996).

Tobacco seeds are rarely found at archaeological sites because of their very small size (Wagner 1991). At the Memorial Park Site, one tobacco seed, probably *Nicotiana rustica*, was found in an unassigned Late Prehistoric feature.

About 8.4% of all seeds recovered from Late Prehistoric features at Memorial Park were of fleshy fruits and berries as well as *Rhus* spp. (sumac) [Table 4], a nonfleshy fruit with acidic hairs used for making beverages and medicines. The fruits and berries included *Solanum americanuum* (black nightshade), *Prunus pensylvanica* (pin cherry), *Rubus* spp. (raspberry, blackberry, dewberry), *Sambucus* spp. (elderberry), *Vaccinium* spp. (blueberry) and *Vitis* spp. (grape). These fruits were available from late summer through late fall, and could be dried and stored for winter use.

Black nightshade comprised 52% of the fruit and berry seeds, with 24 seeds occurring in seven samples (Table 1). In west-central Illinois and the American Bottom, the occurrence of black nightshade is associated with a period of intensive agriculture (Asch and Asch 1985:388). Today, black nightshade is widely distributed in open and disturbed habitats. Since it has not been recorded in Archaic sites, it is presumed that disturbances associated with prehistoric agriculture permitted an increase in the plant's abundance. The unripe berries contain a toxic glucoside, but the cooked, ripe berries are generally considered edible.

Pin cherry ripens in July and can be found in recent clearings, abandoned fields, and burned areas. Raspberries, blackberries, dewberries and elderberries likewise grow in abandoned fields. Blueberries tend to grow in dry woods, clearings, and thickets; they ripen from late July through September. At least four species of grape grow in bottomlands in central Pennsylvania (Wherry, et al. 1979:248-249); the riverbank grape (*Vitis ripara*) ripens in August and September, and the other bottomland and two upland species ripen in September and October. Sumac generally grows in dry soil and ripens in June and July. The edible elderberry prefers damp rich soil and ripens in June and July.

Five percent of the seeds can be considered possible weed seeds (Table 4), although some of them were occasionally used as food or medicine by some Native American groups. The seeds included in this category are *Amaranthus* spp. (amaranth), *Echinochloa* spp. (barnyard grass), *Galium* spp. (bedstraw), *Panicum* spp. (panic grass), *Polygonum* spp. (smartweed), and *Verbena* spp. (vervain). The weed seeds are most likely a byproduct of agricultural activities.

One grain of wild rice (*Zizania aquatica*) was recovered from an unassigned feature. Wild rice is a tall grass of marshes, stream borders and shallow water. It will grow in water from one to twelve feet deep, but it is most productive in water four to five feet deep. In Minnesota, it ripens over a period of 10 to 14 days, from August 18 to September 12 (Vennum 1988: 17).

As indicated in Table 4, for all Late Prehistoric features, 28 seeds were recovered per 10 liters of flotation processed feature fill. This ratio varied from a high of 76 seeds per 10 liters for the late Clemson Island component to a low of 33 seeds per 10 liters for the Stewart Phase component. Starchy cultivated seeds (chenopod and little barley) account for 67.5% of all identified Late Prehistoric seeds, ranging from a low of 25% for the Stewart Phase component to a high of around 97% for the middle and late Clemson Island components.

Mast. The largest and most diverse nutshell assemblage was recovered from early Clemson Island features (Table 2), which also produced the largest botanical assemblage. The early Clemson Island assemblage included hickory (*Carya* sp.), bitternut (*C. cordiformis*), chestnut (*Castanea dentata*), hazelnut (*Corylus* spp.), butternut (*Juglans cinerea*), black walnut (*Juglans nigra*), and acorn (*Quercus* spp.). Hickory and acorn constituted the largest percentage of the assemblage, 39.0% and 42.1%, respectively. Chestnut, hazelnut, and butternut were not present in the much smaller middle and late Clemson Island assemblages, and chestnut and hazelnut were not present in the Stewart Phase assemblage. The early and late Clemson Island samples had the highest density of nutshell, 146 and 165 fragmentsper 10 liters of flotation processed soil, respectively.

Pollen

Pollen was extracted from the fill of eight Late Prehistoric features, including three early Clemson Island features, three middle Clemson Island features, one late Clemson Island feature, and one Stewart

Phase feature (Brush 1995). Chenopodiaceae (goosefoot family) pollen was recovered from one early Clemson Island feature and one Middle Clemson Island feature that also contained *Helianthus* (sunflower) pollen. Pollen from these plants in a middle Clemson Island feature suggests their use in times other than those indicated by the macrobotanical remains.

Faunal Remains

The soil at Memorial Park was acidic with pH values mostly below 6.0. This resulted in poor bone preservation. Bone was recovered from only 22 of the early Late Prehistoric features. One early and two late Clemson Island features contained 84% of the of bone recovered by count, making interpretation of the assemblage difficult. For the early Late Prehistoric period as a whole, 5,541 pieces of bone were recovered weighing 981.1 g (Holt 1995). As indicated in Table 5, mammals identified in the assemblage included deer, opossum, rabbit, raccoon, and squirrel; birds included bobwhite and pigeon; fish included catfish, perch, sucker, and sunfish. Turtle and frog were also recovered.

Table 5. Memorial Park Early Late Prehistoric Faunal Remains.

Taxon	Count	Weight (g)
Mammals		
Deer (*Odocoileus virginianus*)	93	263.8
Oppossum (*Didelphis virginiana*)	1	4.2
Rabbit (*Lepus* spp.)	9	11.3
Raccoon (*Procyon lotor*)	1	3.1
Squirrel (*Sciurus* spp.)	7	4.5
Unidentified large mammal	5	11.3
Unidentified medium mammal	1	1.3
Unidentified small mammal	1	0.7
Undetermined mammal	2959	474.1
Fish		
Catfish (*Ictaluridae* spp.)	167	15.2
Perch (*Percidae* spp.)	85	4.3
Sucker (*Catastomidae* spp.)	1009	67.9
Sunfish (*Centrarchidae* spp.)	6	0.7
Undetermined fish	1074	61.7
Bird		
Bobwhite (*Colinus virginianus*)	5	4.4
Pigeon (*Columbidae* spp.)	4	3.1
Undetermined fish	65	15.8
Amphibian		
Frog (*Salientia* spp.)	2	0.3
Reptile		
Turtle (Terrapene spp.)	9	17.1
Mollusk		
Landsnail	2	0.3
Undetermined mollusk	36	16.0
Total	5541	981.1

Summary

The subsistence remains from early Late Prehistoric components of the Memorial Park Site indicate that maize crops were supplemented through the cultivation of oily and starchy seeds, including sunflower, two varieties of domesticated chenopod, and little barley. Sunflower and chenopod were harvested at about the same time as mature maize during the late summer and early fall, but little barley was harvested in late spring or early summer at a time when other crops were not available. Use of little barley extended the availability of cultivated crops back to the late spring months, indicating the importance of agricultural production to the early Late Prehistoric occupants of the site. Temporal differences in the use of these resources cannot be addressed because of small sample size. However, the recovery of little barley from Stewart Phase features indicates that the agricultural complex used during the Clemson Island occupations remained in use at this later date. A variety of wild seeds, fruits, and berries supplemented agricultural production. Their availability was increased by the presence of agricultural fields, since some of the taxa are associated with fallow fields and field edges. Most would have been harvested during the late summer and early fall, as was wild rice. A variety of nuts were exploited that would also have been harvested during the late summer and early fall. Faunal resources indicate the exploitation of riverine and terrestrial resources, most of which would have been procured during the growing season. Fish may have been exploited throughout the year, although it is feasible that much of the harvest would have occurred during the spring spawning season.

STONE HOES

Three hafted stone implements resembling hoes were recovered from Late Prehistoric features that probably reflect agricultural management at the site. The first implement, recovered from an early Clemson Island feature, is a teardrop shaped sandstone cobble or slab, whose edges have been modified through unifacial and bifacial flaking (Figure 7a). The distal end of the implement has been modified through unifacial flaking. Two opposing notches were formed on the lateral edges through bifacial flaking above the midpoint of the tool, presumably for hafting. The lateral edges above the notches have been modified throughbifacial flaking, presumably to facilitate hafting. This implement is 19 cm long, ranges in width from 2.15 to 10.6 cm, and weighs 647.1 g.

The second implement is a longitudinally split sandstone cobble recovered from a late Clemson Island feature (Figure 7b). All edges of this piece were modified through flaking of the dorsal side. Flaking of the lateral edges resulted in two opposing notches above the midpoint, apparently for hafting. The distal end of the implement is bevelled through unifacial flaking on the dorsal side. The proximal end of the piece was also modified through flaking, presumably to facilitate hafting. The implement is 20 cm long, ranges in width from 2.5 to 8.4 cm., and weighs 538.6 g.

The third implement, recovered from a Stewart Phase feature, consists of a sandstone slab, whose edges have been modified through a combination of bifacial flaking and battering (Figure 7c). This is the largest of the three implements, measuring 22.7 cm long and 10.5 cm wide, and weighing 1352.5 g. The distal end of the piece was originally shaped through bifacial flaking, and was subsequently modified through use to almost a rounded state. The proximal end was shaped through bifacial flaking. One lateral edge was modified through bifacial flaking, while the second edge maintains the flat surface of the original slab. Opposing bifacially flaked notches, presumably for hafting, exhibit considerable wear. The planar surfaces of the implement are not modified.

STORAGE FACILITIES

Thirty-eight Late Prehistoric storage pits were identified on the stripped surface. These features generally had straight walls and flat bases, and three had charred grass linings. They are similar to what

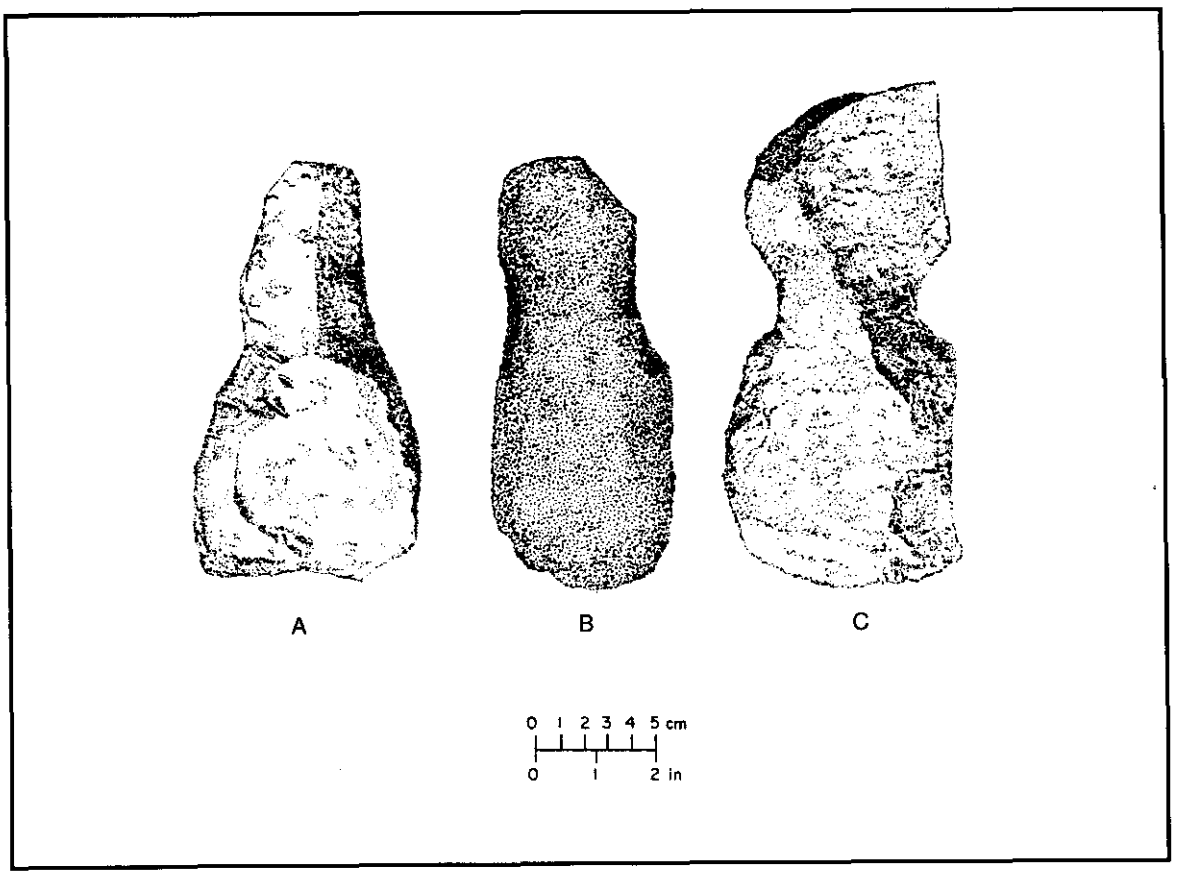

Figure 7. Stone hoe-like implements recovered from [A] Early Clemson Island, [B] Late Clemson Island, and [C] Stewart Phase features.

Stewart (1988) designated silos at the St. Anthony Site. The storage pits at the Memorial Park Site averaged 134.0 cm in length, 115.6 cm in width. The average pit depth, when corrected for estimated truncation below the Ap-B horizon interface, is 65.3 cm. Eleven of the pits were associated with the early Clemson Island component, seven with the middle Clemson Island component, eight with the late Clemson Island component, and six with the Stewart Phase component. Three of the storage pits lacked large artifact assemblages and could not be assigned to a component and three features were not investigated.

The size of the pits by component is presented in Table 6. With the estimated correction for truncation, and assuming a cylindrical shape, the average pit contained approximately 973 liters. By component, the average early Clemson Island pit contained 993 liters, the average middle Clemson Island feature 1287 liters, the average late Clemson Island pit 412 liters, and the average Stewart Phase pit 741 liters. Using numbers provided by McConaughy (1991:122-125), the average-sized pits would have held substantial quantities of shelled maize (Table 6). These pits probably indicate that agricultural production and wild resource harvests produced more than was necessary for immediate consumption, allowing for

Table 6. Storage Pit Capacity by Component.

Component	N	Mean Size (liters)[a]	Size Range (liters)	Mean shelled maize capacity (kg)[b]	Shelled maize capacity range (kg)[b]
Early Clemson Island	11	993	310 - 2610	728.2	227.3 - 1,914.0
Middle Clemson Island	7	1287	511 - 3269	943.8	374.7 - 2,397.2
Late Clemson Island	8	412	114 - 1790	302.1	83.6 - 1,312.6
Stewart Phase	6	741	350 - 1488	547.8	256.7 - 1,091.1
All	32	976	114 - 3269	715.6	83.6 - 2,397.2

[a]Assumes cylindrical shape.
[b]Based on numbers in McConaughy (1991:122-125).

the use of resources beyond their period of harvest. They also may indicate concealment of produce from competing populations during periodic site abandonment (DeBoer 1988).

SUMMARY OF MEMORIAL PARK EVIDENCE

The distribution of features and structures indicates that Memorial Park functioned as isolated farmsteads and/or hamlets throughout the early Late Prehistoric period. Relatively short-term occupations are evidenced by the paucity of cross-feature pottery refits and overlapping features. If the site had been subjected to lengthy, intensive settlement, more cross-feature refits would have been found (Nass 1989). If the site was intensively occupied over the course of the early Late Prehistoric period, overlapping pits would have been more common. It is likely that most of the occupations of the site occurred primarily during the growing season and early fall, with subsequent abandonment from late fall through early spring, although the possible winter burials suggest at least one middle Clemson Island component winter occupation.

The Memorial Park Site yielded a number of classes of data that shed new light on early Late Prehistoric agricultural systems in the West Branch Basin. Macrobotanical remains indicate the use of maize, chenopod and little barley. The recovery of a single small sunflower kernel and sunflower pollen indicate that this taxon was also part of the agricultural system. The presence of maize cob fragments and the seeds from a number of weedy plants associated with fallow agricultural fields indicate that agricultural fields were located near the site. Few seeds from wild plants were present in Late Archaic assemblages at this site, but they are relatively abundant during the Late Prehistoric period, probably reflecting expanded habitats in the form of agricultural fields and field edges. The recovery of stone hoes, one of which exhibits considerable use, suggests that these fields were subject to intensive management. The Clemson Island occupations exhibited the first large-scale use of large storage pits at Memorial Park. The use of subterranean storage facilities has several implications. First, they suggest the existence of

surplus. Second, subterranean facilities are generally used under conditions where settlements are abandoned periodically each year (DeBoer 1988). Agricultural surplus and other valuables would have been hidden in the subterranean facilities during site abandonment to prevent discovery by competing populations. Floral and faunal data suggest that agriculture was a component of a mixed economy that made use of wild aquatic and terrestrial resources.

Subsistence remains suggest that early Late Prehistoric occupations at Memorial Park occurred from at least late spring/early summer through autumn, although the middle Clemson Island component may have extended through winter. Little barley is harvested during late spring/early summer. The cultivation of little barley indicates the planned use of the site during this time, because it germinates during the early spring or winter. This crop may have been sown prior to abandonment in the autumn for a planned harvest in the late spring when other cultigens and most wild plant resources would not be available for use except in stored contexts. Maize was sown during the spring and harvested in ripe form during late summer through autumn; green ears may have been consumed earlier. *Chenopodium* would have been harvested during the late summer through early autumn. Mast and wild rice would also have been harvested from late summer through early autumn. Faunal remains suggest primarily spring through summer procurement (Holt 1995).

REGIONAL IMPLICATIONS

The Memorial Park Site yielded important information on early Late Prehistoric agricultural systems in the West Branch Basin. Some of this information is consistent with that obtained from other sites in the basin, while other information is new. The implications of the information from Memorial Park Site are reviewed below.

Like Memorial Park, most early Late Prehistoric farmsteads and hamlets subjected to extensive excavations in the West Branch Basin have contained large subterranean storage facilities, or silos (Stewart 1990). These pits are the first widespread evidence for food storage in the basin, which most likely included agricultural produce. The pits at Memorial Park fall within the size range exhibited by other early Late Prehistoric sites in the West Branch Basin, indicating the importance of storage during the early Late Prehistoric period. The recovery of stone hoes at Memorial Park Site is among the first direct evidence for early Late Prehistoric field management practices in the West Branch Basin. Bressler (1980:47) provides an illustration of a similar implement recovered from the Stewart Phase Bull Run site downstream from Memorial Park.

The most important information came from the botanical remains. While other sites have yielded maize, beans, and squash, the Memorial Park is the first site in the West Branch Basin with reported domesticated chenopod and cultivated little barley. The sunflower kernel and pollen at Memorial Park is only the second reported early Late Prehistoric occurrences of this probable domesticate in the West Branch. In other ways, however, the macrobotanical remains are consistent with those identified at other early Late Prehistoric West Branch sites. The presence of various taxa in the macrobotanical assemblages from Memorial Park and four contemporary West Branch sites, Bald Eagle (Hay and Hamilton 1984), Fisher Farm (Hatch 1980), St. Anthony (Stewart 1988), and West Water Street (Custer, et al. 1994), is listed in Table 7. The assemblage from the Catawissa Bridge site, a contemporary site on the North Branch of the Susquehanna (King 1992), is included for comparative purposes.

The maize, beans, squash triad was a regular component of early Late Prehistoric agricultural systems in the West Branch. The Memorial Park investigations confirm that maize was used in the West Branch Basin by at least the ninth century A.D. Maize recovered from a pit at Fisher Farm with a radiocarbon assay of A.D. 705±70 (A.D. 781 calibrated), suggests that it may have been used as early as the eighth century A.D. Maize is consistently found at West Branch Basin sites after the ninth century.

Beans were not recovered from Memorial Park Site, but they have been found at other West Branch sites. Beans were present in features assigned to the earliest component at Bald Eagle, which begins

Table 7. List of Taxa Present at Early Late Prehistoric Sites in the West Branch Basin.

Taxon	Memorial Park	Bald Eagle	West Water Street	Fisher Farm	St. Anthony	Catawissa
Domesticates/Cultigens						
Maize (*Zea mays*)	X	X	X	X	X	X
Bean (*Phaseolus vulgaris*)		X	X	X		X
Squash (*Cucurbita pepo*)		X		X		X
Sunflower (*Helianthus annuus*)	X			X		
Chenopod (*Chenopodium berlandieri*)	X					
Little barley (*Hordeum pusillum*)	X					X
Tobacco (*Nicotiana rustica*)	X					
Starchy unclutivated seeds						
Goosefoot (*Chenopodium* spp.,)			X	X		X
Zizania aquatica, wild rice	X					X
Weed seeds						
Amaranth (*Amaranthus* spp.,)	X		X[a]			
Barnyard grass (*Echinochloa* spp.)	X					
Bedstraw (*Galium* spp.)	X					X
Knotgrass (*Paspalum distichum*)			X			
Panic grass (*Panicum* spp.)	X			X		
Pokeweed (*Phytolacca americana*)				X	X	
Ragweed (*Ambrosia artemisiifolia*)				X		
Smartweed (*Polygonum* spp.)	X	X		X	X	X
Vervian (*Verbena* spp.)	X					
Sweet/sour fruits and berries						
Black nightshade (*Solanum americanum*)	X					
Blackberry/raspberry (*Rubus* spp.)	X	X	X	X	X	X
Blueberry (*Vaccinium* spp.)	X		X[a]		X	X
Cherry (*Prunus* spp.)					X	X
Elderberry (*Sambucus canadensis*)			X[a]			X
Grape (*Vitis* spp.)	X		X		X	X
Pin cherry (*Prumus pensylvanica*)	X					
Plum (*Prunus americana*)						X
Strawberry (*Fragaria* sp.)						X
Sumac (*Rhus* spp.)	X		X		X	
Viburnum (*Viburnum spp.*)						X
Mast						
Acorn (*Quercus* spp.)	X	X		X	X	X
Bitternut (*Carya cordiformis*)	X					
Butternut (*Juglans cinerea*)	X				X	X
Black walnut (*Juglans nigra*)	X				X	X
Chestnut (*Castanea dentata*)	X					
Hazelnut (*Corylus* spp.)	X					X
Hickory (*Carya* spp.)	X	X		X	X	X
Walnut family (Juglandaceae)	X	X		X		
Others						
Bean family (Fabaceae)	X					
Grass family (Poaceae)	X					
Wild onion bulbs (*Allium* spp.)						X
Sedge (Cyperaceae)						X
Waterlily (*Nymphaea* sp.)						X
Bulrush (*Scirpus* sp.)						X
Miscellaneous	X	X	X	X	X	X

around A.D. 850; beans were recovered from a feature assigned to this component that yielded a radiocarbon assay of A.D. 910±85 [A.D. 1162 calibrated] (Hay and Hamilton 1984). Beans were also found at the West Water Street site, which is thought by Custer, et al. (1994:153) to date the later part of the period A.D. 1000 to A.D. 1200. At Fisher Farm, beans were recovered from a feature that yielded a radiocarbon assay of A.D. 1350 ±150 (A.D. 1328, 1333, 1395 calibrated). These contexts suggest that this domesticate was probably present in the West Branch Basin by the eleventh or twelfth century A.D., and that it was used throughout the remainder of the early Late Prehistoric period. The absence of beans at Memorial Park may be the result of preservation, differential use of this domesticate, and/or because some of the Memorial Park components pre-date the adoption of beans in the West Branch Basin.

Squash and/or pepo gourd is less frequently identified at West Branch early Late Prehistoric sites than either maize or beans, possibly the result of preservation. *Cucurbita pepo* was not recovered from early Late Prehistoric contexts at Memorial Park, although it was recovered from Early Woodland and Late Archaic contexts (Hart and Sidell 1996). At Bald Eagle, squash was recovered from features associated with the earliest component beginning around A.D. 850 [uncalibrated] (Hay and Hamilton 1984), including the feature dated to A.D. 910±85. Squash rind fragment was recovered at Fisher Farm in the same feature containing bean (Hatch 1980). Given its presence in Early Woodland contexts at Memorial Park and in early Late Prehistoric contexts at other West Branch sites, it is likely that squash was used in the West Branch Basin throughout the early Late Prehistoric period.

The sunflower recovered at Memorial Park is only the second report of this taxon in the West Branch Basin. The evidence from Memorial Park, a single, small kernel from a feature dated to A.D. 810 (A.D. 892, 925, 936 calibrated), and pollen recovered from a feature dated to A.D. 930 (A.D. 999 calibrated), demonstrate this plant's use by at least the end of the ninth century A.D. A single, possible sunflower seed was recovered at Fisher Farm from the same fourteenth century feature that contained beans. These occurrences indicate that sunflower was used in the basin during the entire early Late Prehistoric period.

Starchy seed domesticates and cultigens were used in the West Branch Basin throughout the early Late Prehistoric period. Two types of domesticated *Chenopodium* and cultivated little barley are both associated with the earliest Late Prehistoric component at Memorial Park, indicating their presence in the West Branch Basin by at least the ninth century A.D. *Chenopodium* seeds were recovered from early and late Clemson Island features, Chenopodiaceae pollen was recovered from early and middle Clemson Island features, and little barley was recovered from all of the early Late Prehistoric Memorial Park components. Given that little barley was also identified at Catawissa in the North Branch (King 1992) as well as in the Upper Susquehanna River basin in New York (Wurst and Versaggi 1993), it was probably more widely used than is indicated by macrobotanical assemblages at other West Branch sites. Wild *Chenopodium* and *Polygonum* seeds have been identified at a number of sites, suggesting that starchy seeds contributed to early Late Prehistoric diets even when domesticated plants were not sown. The single tobacco seed recovered from an unassigned feature at Memorial Park is the only reported occurrence of this domesticate in the West Branch Basin.

Seeds from weedy plants and fruits and berries are consistently recovered from early Late Prehistoric sites in the West Branch Basin. Their use supplemented agricultural produce, and at least some of their presence is indicative of agricultural fields near the sites. A number of the taxa, such as the black nightshade recovered from Memorial Park, grow in disturbed habitats like the edges of agricultural fields and fallow plots. While the specific taxa recovered from the sites vary, their consistent presence at an early date is probably a reflection of agricultural activities.

Agricultural produce was also supplemented by the exploitation of terrestrial mast and aquatic resources. Acorn, hickory nut, and walnut are consistently identified at early Late Prehistoric sites in the West Branch Basin. In addition to these, bitternut, butternut, chestnut, and hazelnut were identified at Memorial Park; butternut and hazelnut were identified at Catawissa (King 1992); and butternut was identified at St. Anthony (Stewart 1988). This mix of taxa suggests that mast was exploited over the

course of several months each year. Exploitation of aquatic plants is indicated by the recovery of wild rice at Memorial Park and Catawissa (King 1992).

CONCLUSIONS

A number of trends in early Late Prehistoric agricultural systems have been documented in the Eastern Woodlands. The often sudden appearance of maize at sites beginning around A.D. 800 was accompanied by the use of larger storage facilities, large, well-made chert hoes, and shell- or limestone-tempered pottery. The use of indigenous starchy and oily seed-bearing domesticates and cultigens continued in many areas after the widespread appearance of maize. The extent of the use of maize and the occurrence of the accompanying technological traits varied throughout the Eastern Woodlands reflecting a mosaic of agricultural systems (Smith 1992). These trends are best documented in the mid-latitude riverine interior; much less is known about early Late Prehistoric agricultural systems in the northern Eastern Woodlands east of the Allegheny Front. Evidence from the Memorial Park Site and other early Late Prehistoric sites in the West Branch Basin of north-central Pennsylvania, east of the Allegheny Front, increases our knowledge of the range of variation present in the Eastern Woodlands during this time. Evidence from the West Branch Basin reviewed above indicates:

1. Populations generally occupied small habitation sites during the growing season. These sites were distributed across the West Branch Basin in both the main valley of the river and in the valleys of its tributaries.

2. The occupants of these sites had access to a number of cultigens including maize, sunflower, two types of chenopod, and little barley by at least the ninth century A.D., while beans entered the basin several centuries later. Squash and gourd were present in the West Branch Basin considerably earlier (Hart and Sidell 1996) and were also used during the early Late Prehistoric period.

3. Agricultural production was an important component of subsistence economies well before the appearance of small villages after ca. A.D. 1250 and of large, planned villages and shell-tempered pottery after ca. A.D. 1350. This is evidenced by the regular occurrence of large storage facilities, the apparent regular association of early Late Prehistoric sites with fertile flood plain soils, and the use of stone hoes. Also reflecting the importance of early Late Prehistoric agriculture in the West Branch basin was the use of little barley. While most of the cultivated plants were harvested during late summer and autumn, little barley was harvested in late May or June, when few wild fruits and grains were available.

4. Agricultural produce was supplemented by the exploitation of wild seeds, fruits, and berries. The exploitation of these plants was facilitated by their growth on agricultural field edges and in fallow fields. A variety of nuts and aquatic plants were also exploited.

In summary, while shell-tempered pottery does not become a major technology in this area until around A.D. 1350, evidence from Memorial Park and other sites in the West Branch Basin indicate that a number of trends first identified in the riverine interior also occurred in the northern Eastern Woodlands east of the Allegheny Front after A.D. 800. These include the sudden widespread appearance of maize, and the use of starchy and oily seed-bearing domesticates and cultigens, larger storage facilities, and stone hoes. The extent to which agricultural production contributed to early Late Prehistoric diets in the West Branch Basin, and the level of effort expended on its production, probably varied spatially and temporally depending on local conditions (Hart 1990, 1993; Hart and Nass 1994). Continued investigations of the West Branch Basin and other portions of the larger Susquehanna River basin should provide additional information on small and large scale variation in early Late Prehistoric agricultural systems in the Eastern Woodlands.

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