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THE ARCHAEOLOGY OF LITTLE WOOD CREEK: NEW CHRONOMETRIC EVIDENCE

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This study reports on the establishment of viable dates for several major cultural components at the Little Wood Creek site on the upper Hudson in Fort Edward, New York. The original excavation in the mid-1980s (Grossman et al. 1990) resulted in the identification of two major periods of occupation, a deeply buried Transitional period sequence of living floors, and closer to the surface, and separated by circa five feet of sterile alluvium, a series of Late Woodland period pits and features. Both are overlain by the discovery of the southern bastion of Revolutionary War-era Fort Edward. Ambiguities in the original bulk radiocarbon dating of the site left it in chronological limbo with widely divergent determinations for both prehistoric occupation periods. New AMS dates from 10 samples, four Transitional period and six Late Woodland period assays, both refined the absolute chronology of the site complex and clarified several major issues in the cultural and environmental history of the region. Together, these two sets of dates, combined with recent high resolution environmental sequences, provide sufficient resolution to correlate the newly defined periods of occupation with major events in the pollen and climate record of eastern New York State.

INTRODUCTION (LOGISTICAL CONTEXT)

The federally mandated rescue excavation at the Washington County Sewer District II plant site of Little Wood Creek (NYSM #:5852) in Fort Edward, New York, documented a 30-century record of well preserved buried occupations dating from the fifteenth century B.C. through to the eighteenth century A.D. The 1986 ”discovery under construction” had to be undertaken because the site and its many components and periods was belatedly encountered under the footprint of a much needed sewer treatment plant being built with US EPA funding by the Washington County Sewer District II. Fifty field and laboratory personnel, and a core analysis team of 29 archaeologists and conservators, under the direction of the senior author, worked for 125 days to uncover and document the archaeological remains. The site complex was exposed on the east bank of the Hudson River, opposite Rogers Island, at the confluence of the Champlain Canal and the Hudson River (Figures 1 and 2). The series of discoveries gained added significance because they were well separated stratigraphically and unmixed by later disturbances. The site was excavated by natural stratigraphic levels to produce a quantified three-dimensional data base of the material and environmental record. All features were measured with a computer transit to a tenth of an inch (0.25 cm). In addition to a high resolution archaeological record, this technology permitted the development of rapid mapping and reporting capabilities to local, state, Native American and federal officials as the prehistoric site became defined relative to ongoing construction activities. All excavated materials were computer inventoried, conserved, documented and reported (see Grossman et al. 1990).

The project results provided important new lines of information on the cultural history of the Transitional (ca. 1100 -1500 cal B.C.) and Late Woodland periods (ca.700/1000 - 1620 cal A.D.) of the Upper Hudson region. Three major periods of occupation were documented. Closest to the modern surface, the team exposed the triangular bastion of historic eighteenth-century Fort Edward. At and below the level of the Fort bastion, at an average depth of ca 18 inches (ca 46 cm) below modern grade, the excavation revealed and recorded more than 400, generally truncated, Late Woodland period pits and features. The identified pits and

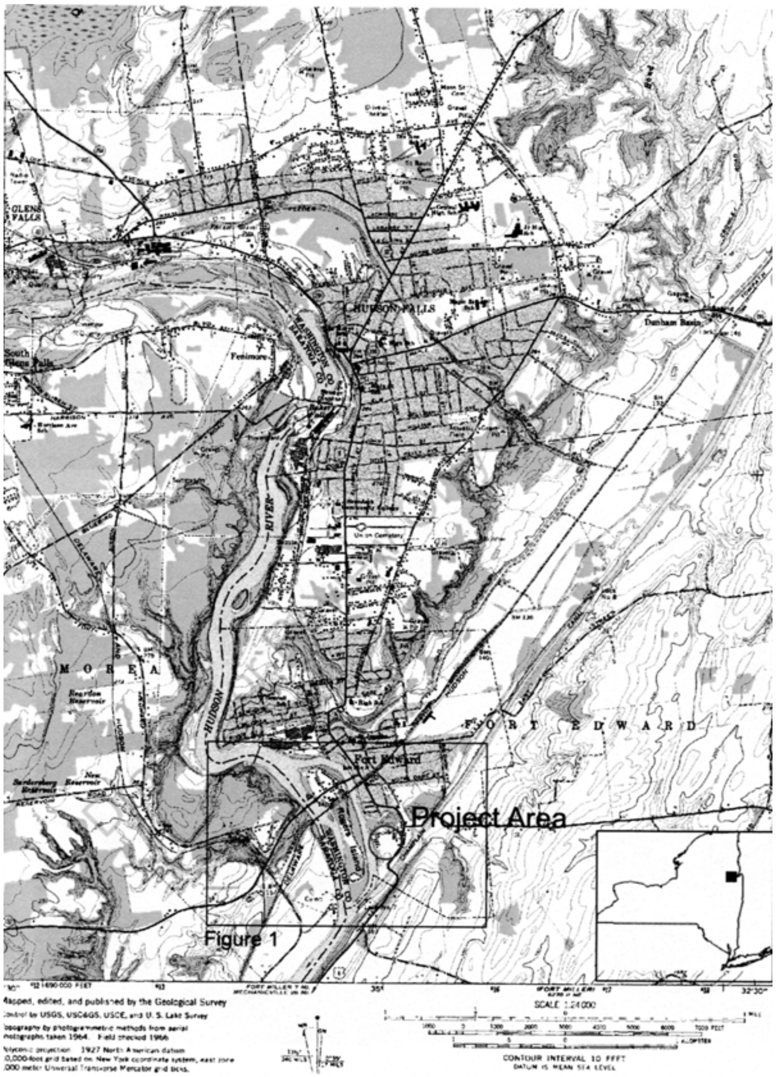

Figure 1. Project location map, the Little Wood Creek site complex, Fort Edward, Washington County, New York.

post molds were found by stripping (manually and with a grade-all) the surface plowzone and construction-disturbed soils (160,000 sq. ft.) down to the beginning of the undisturbed sub-plowzone interface at ca 18 inches (Figure 3). The archaeological team identified, evaluated and mapped 914 features and stains. Of these a total of 447 were documented as belonging to the Late Woodland period. These included six Late Woodland period human burials, one of which dated to between 1265 and 1412 cal A.D. (Beta 16862 - Cx. 904 - 1987; See Table 2). Finally, from the earliest and deepest deposits, and separated by four to five feet of recent Holocene alluvium, the excavation identified the buried remains of a series of Transitional period living floors and hearths (Figures 4 and 5). This report focuses only on the time frames and chronology of two major prehistoric occupations: the Late Woodland period pits and burials, and the deeply buried Transitional period living surfaces.

A recent Hudson River Foundation grant allowed the investigators to cull the surviving archeological botanical collection for appropriate non-seed samples and to submit 10 charcoal samples for high resolution AMS (Accelerator Mass Spectrometry) radiocarbon dating. The goal was to establish accurate time frames for both the early Transitional period levels and the Late Woodland period features, specifically those distinguished by the presence of maize. With the exception of a single burial pit, all of the dated Late Woodland radiocarbon samples represented the results of intensive flotation to recover seeds. A total of 39 pits were floated; recovered macrobotanicals were fully analyzed and identified to the genus level. Of these, 19 contained both diagnostic pottery, maize and other identifiable food plants (see Table 2). The botanical analysis of the flotation results were performed at the Laboratory of Archaeology, Boston University, under the direction of Dr. Julie Hansen and seven investigators (Hansen et al. 1988). The actual flotation was done by Roger Moeller of Archaeological Services, Bethlehem, Connecticut.

The original radiocarbon dates were problematic and confusing based on widely disparate age determinations from different laboratories using traditional radiocarbon dating. The earliest 1980s era buried Transitional period determinations (See Table 1) were widely divergent and, therefore, of limited utility. Likewise, the original (of the 1980s) Late Woodland period dates were deceptively "early" relative to the new AMS determinations (See Table 2). All of the Little Wood Creek samples, both Transitional and Late Woodland periods, were recalibrated to match the IntCal13.14 data set and correction curve. Thus, the cal-

Figure 2. Air photos of Little Wood Creek site at Fort Edward, New York; a) general view, b) detailed view.

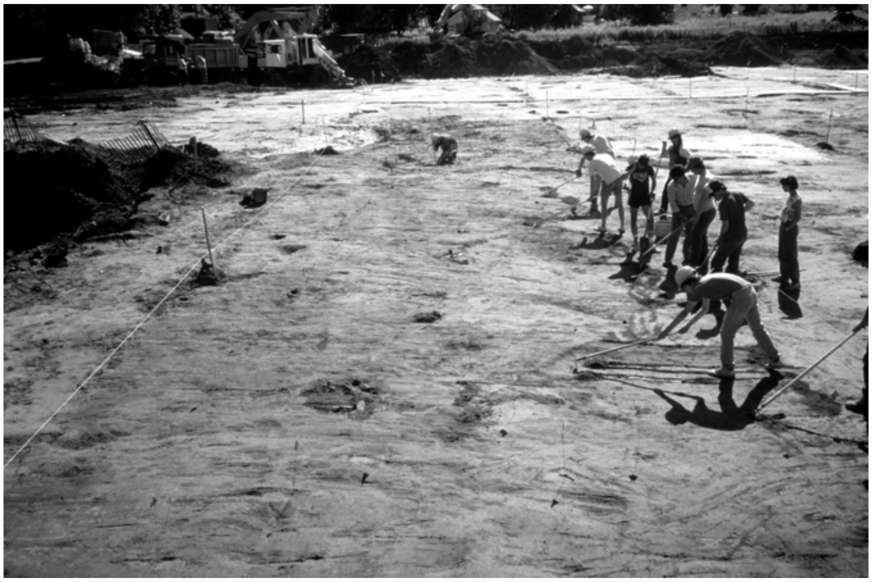

Figure 3. Wide area exposure of Late Woodland Period surface at Little Wood Creek.

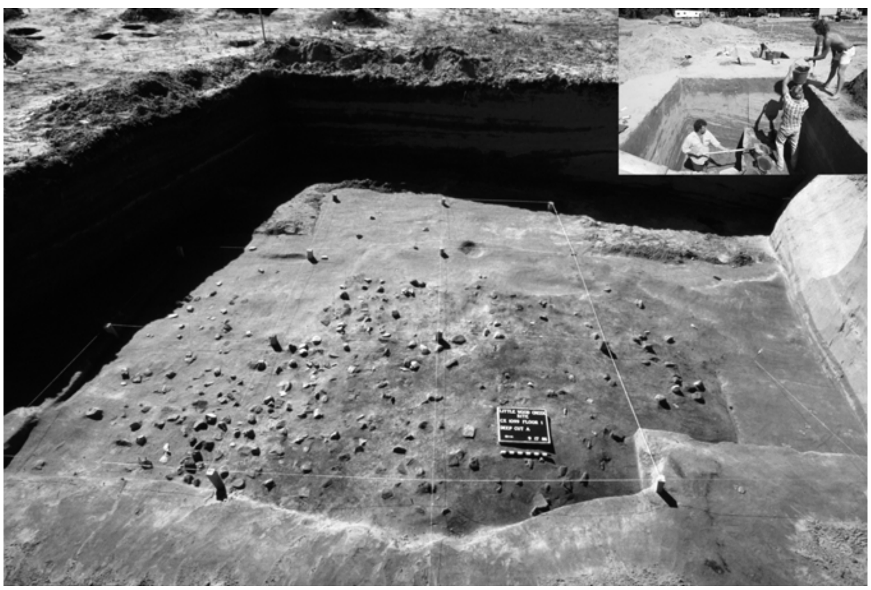

Figure 4. Deep wide-area test unit used to expose the first of five hearths resting on the buried living floor of the Transitional Period deposits. Inset: Deep strata test unit cutting down to and through the Transitional Period living floors.

ibrated dates are not presented as a single determination, but instead as a set of projected high and low readings (see Tables 1 and 2 below). As is becoming standard in reporting, the calibrated age determinations are presented as two sigma ranges; a protocol that assumes a 95% probability that the date falls within the reported two sigma range.

The AMS dates both refine the absolute chronology of the site complex and clarify several major issues in the cultural and environmental history of the region. Instead of spanning over 35 centuries as the initial radiocarbon assays suggest, the new AMS determinations resolve the Transitional period time frame down to four centuries between cal B.C. 1058 and 1501. The Late Woodland AMS determinations are of equal importance in clarifying the chronology of later occupations at the site. Instead of spanning over six hundred years with the implication of early dates for maize in this region, the new AMS age ranges for the Late Woodland period indicate that the site was occupied late and for a relatively short period of time. Individual AMS age ranges were limited to ca 110 to 120 years per assay and a short cumulative time frame of ca 193 years. The new AMS dates also serve to disprove the previously identified presence of early corn cultivation in the eighth century and instead document that maize was not visible in the site record until after cal 1247 A.D..

Together, these two sets of dates, combined with recent high resolution environmental sequences described below, provide sufficient resolution to correlate the newly defined periods of occupation with major events in the pollen and climate record of eastern New York State. Specifically, the age ranges suggest that the Broadspear associated Transitional period site may have been occupied following a period of drought in the region and with the advent of the Oak-Chestnut forest at about 1600 B.C. The Transitional period pollen record also documents the presence of fireweed (*Epilobium* sp.) and ragweed (*Ambrosia* sp.) and suggests the local environment may have been disturbed by human activity in general and by fire in particular (Segovia in Grossman et al. 1990:206-212).

The Late Woodland chronology likewise suggests the possibility that the onset of the later period of occupation may have correlated with the advent of the Medieval Warm period (MWP) and may have ceased as a maize reliant settlement with the onset of the Little Ice Age (LIA) in the Northeast. Finally, the prehistoric archaeological evidence suggests that the indigenous inhabitants continued to be present until the mid-fifteenth century.

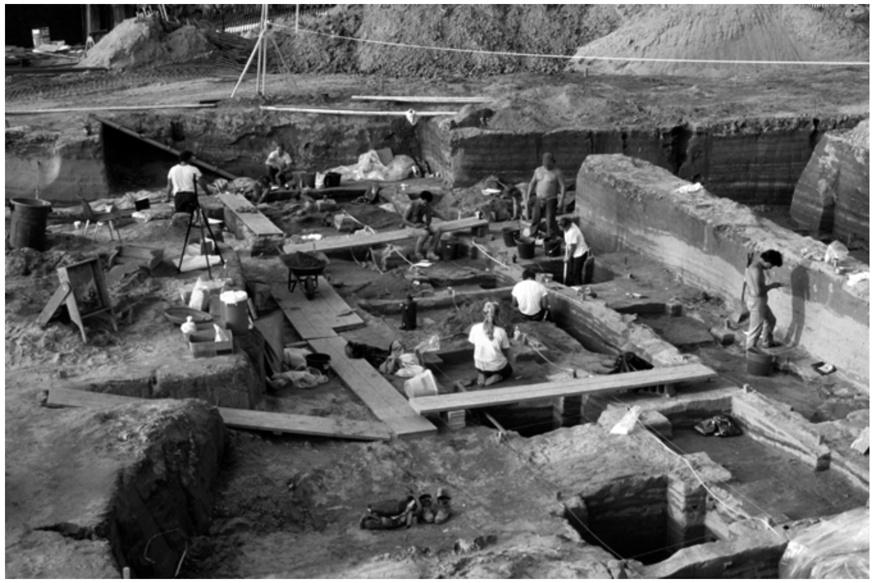

Figure 5. View looking north of Deep Cut A excavation of buried Transitional Period surface.

PALEOCLIMATE AND PALEOECOLOGY: TEMPORAL AND REGIONAL CONTEXTS

This environmental section addresses the need to bring the paleoenvironmental background treatment, attempted in the 1980s with no local comparative material, up to include the most current findings of regional pollen and sedimentary studies of the twenty-first century. The previous treatment (Grossman et al. 1990:31-37) was nearly 30 years out of date (1986-1990). Several questions are currently posed and addressed. What was the timing of prehistoric droughts relative to the two time periods defined at the site? What were the conditions during and immediately before the advent of the of the Transitional period occupations around three thousand years ago? For the Late Woodland period occupations, one question concerns the impact from, or response to, the environmental and climatic shifts referred to as first the MWP and then the LIA?

We place the refined chronological record at Little Wood Creek within the most current pollen and sediment records for the Late Holocene in the Hudson drainage. The following is a chronological treatment of contemporary prehistoric climate and habitat changes, droughts and the emergence of new species and forest composition for the two archaeologically defined periods of ca 1058 - 1501 cal B.C. and 1247 - 1440 cal A.D. Although there is a lack of data for the Upper Hudson, the geographic scope of this effort covers the Hudson drainage and environmentally connected regions of bordering states.

The regional pollen stratigraphy for the past 3,00 years was first defined by Deevey (1939) in southern Connecticut who described the oak-chestnut zone (Zone C-3) including a rise in hemlock around 3000 years ago and concurrent increases in chestnut, with a climatic interpretation of cooling and increased moisture. At Sutherland and Spruce Ponds in the Hudson Highlands (41ºN) (Maenza-Gmelch 1997), late Holocene cooling is suggested by an increase in spruce as oak declines. Closer to Fort Edward, palynological analysis at Balsam Lake (42º30 N) in the Catskills, Newe York, records the increase in spruce as well as chestnut (Ibe l985). At Ballston Lake near Saratoga (43ºN) just south of Fort Edward, the late Holocene regional cooling is indicated by increases in spruce and hemlock, similar to the more northern New England regional records

(Toney et al. 2003). At 44 ºN in the south-central Adirondacks, the late Holocene cooling is even more apparent with marked increases in fir and spruce (Overpeck 1985). No indications of drought in these lake records are noted in the late Holocene, and sedimentation rates and dating resolution in lakes are so low that intervals such as the Medieval Warm period (MWP) are not addressed. However, in some sites such as the Adirondacks, fluctuations in hemlock and beech pollen around the turn of the millennium are apparent, suggesting shifts in moisture.

Much higher depositional sites such as Piermont Marsh, New York, at 41º N (Pederson et al. 2005) indicate a strong MWP signal dated with AMS chronology between 800 A.D. and 1300 A.D., visible in both the pollen record as a shift from oak to pine-hickory and in the large amount of charcoal signifying fire from regional drought. Upriver, the Tivoli Bays marsh (42º N) record (Sritrairat et al. 2012) echoes this drought signal with increases in charcoal and declines in oak. Across the Hudson Valley at Davis Pond (Newby et al. 2011) in Massachusetts (42 ºN), the sedimentary stratigraphic record indicates a low stand roughly between 350 - 1350 cal A.D., one of many Holocene droughts. Recent sedimentological, palynological, and macrofossil investigation of a site in the drought-sensitive Sky Lakes region (Menking et al. 2012), Lake Mohonk (42 ºN) reveals replacement of organic gyttja (lacustrine mud) with a sand layer in the lake close to the last millennium, suggesting a marked drought at this time, with at least three other major droughts visible in the record throughout the Holocene. In this Mohonk record, the chestnut expansion is related to shade intolerance with the demise of hemlock (Menking et al. 2012). In sum, the low resolution lake paleorecords in the Fort Edward region coupled with higher resolution marsh peats further south in the Hudson Valley indicate that further detailed chronology is needed to link the Ft. Edward occupation to regional moisture shifts, but the trend toward cooling in the region is well-established.

The Transitional Period Conditions (cal 1058 to 1501 B.C.)

The Transitional period around 3500 B.P. (ca 1500 cal. B.C.) is marked in palynological regional history by a shift towards cooler, wetter conditions compared to previous millennia, defined by increases in spruce (Maenza-Gmelch 1997), fir (Overpeck l985; Ibe l985), and sometimes hemlock (Maenza-Gmelch l997). Chestnut migrated into the region by about 4700 to 3700 cal yr B.P. (Maenza-Gmelch l997; Menking et al. 2012) and remains dominant over hemlock at some sites such as Lake Mohonk (Menking et al. 2012) until its demise in the twentieth century. Specifically, the Transitional period age ranges suggest that the Broadspear component of the site may have been occupied following a period of drought in the region and with the advent of the Oak-Chestnut forest at about 3700 B.P.(ca 1700 cal B.C).

The Late Woodland Period Conditions (cal 1247-1440 A.D.)

Regional pollen records indicate the sustained increases in spruce and hemlock in the last few millennia, indicative of a wetter, cooler, climate. However, most lake records in the northeastern US lack high-resolution chronology and stratigraphy that can address fluctuations in moisture in recent centuries. However, two regional lake records suggest drought – the Davis Pond record in Massachusetts (Newby et al. 2011) which records a stratigraphic sedimentary shift between 400 and 1400 cal A.D., as well as the Lake Mohonk sand layer (Menking et al. 2012) around 1000 cal A.D. Comparing these records with those of much higher resolution further south in the Hudson Valley (Pederson et al. 2005) suggest that they reflect the same MWP drought 850-1350 cal A.D. that was responsible for increased pine and charcoal due to fires. The Late Woodland period occupation at Little Wood Creek thus marks either the end of this drought interval or the beginning of the LIA which followed.

THE 2012 TRANSITIONAL PERIOD AMS RESULTS

Beneath the Late Woodland period surface, at a depth of seven to nine feet below the modern grade (Figure 6), the team discovered a buried island or point bar formation adjacent to a former oxbow, covered with thousands of chipped flakes, fire cracked rocks from cooking hearths and distinctive chipped stone "Broadspear" projectile points or knives (Figure 7). The buried Transitional period living floor was discovered by Bill Barse, Field Supervisor for the Grossman and Associates team. This living floor, marked by a series of contiguous platform hearths, or roasting platforms, was discovered during the course of deep bucket augering conducted as part of the geomorphological testing of the site area. Augering identified a dense pavement of fire-cracked rock and charcoal about a foot below the base of the initial test units excavated across the site area. This living floor was sampled by placement of additional large test units (Figure 4) that provided a guide for the excavation of a large block (Deep Cut A) placed to expose this deeply buried living surface (Figures 5 and 6). This levee or point-bar formation was located at the elbow of Little Wood Creek close to its confluence with the Hudson River.

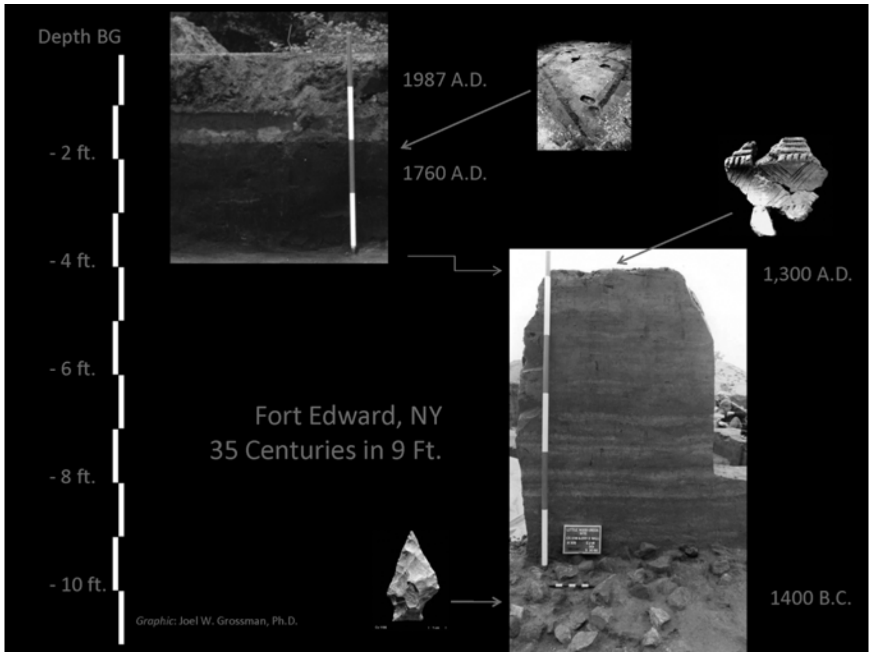

Figure 6. Composite view of vertically stratified sequence of superimposed cultural deposits of Deep Cut A at Little Wood Creek, Fort Edward, New York. A deeply buried Transitional Period hearth or roasting platform is visible at the lower right.

The deep excavation units or wide area exposure blocks (Figures 4 and 5), revealed an overlapping series of discontinuous cultural deposits over a completely undisturbed living floor located along the crest of a low, 70 foot long buried landform, or sand bar, at the elbow of the curving Little Wood Creek stream channel. This primary occupation surface, designated Component C, contained over 40,000 *in situ* artifacts found in association with five contemporary hearths or roasting platforms, arranged in a "T" shaped configuration across and down the crest of this buried ridge. In addition to the well preserved stone hearths and roasting platforms, the deeply buried living floors revealed undisturbed distinct tool making areas, different food processing stations and activity areas (Figure 9, page 9)[1] distinguished by a range of chipped stone artifacts, steatite bowl fragments (Figure 10) and clumps of brightly colored ochre pigment, presumably for decoration or ceremonial use. Flotation of a sample of the Hearth 1 ash revealed a small but significant range of plants. In addition to three varieties of nuts [*Juglans cinerea* (butternut) *Carya* sp. (hickory nut) and *Ostrya virginiana*

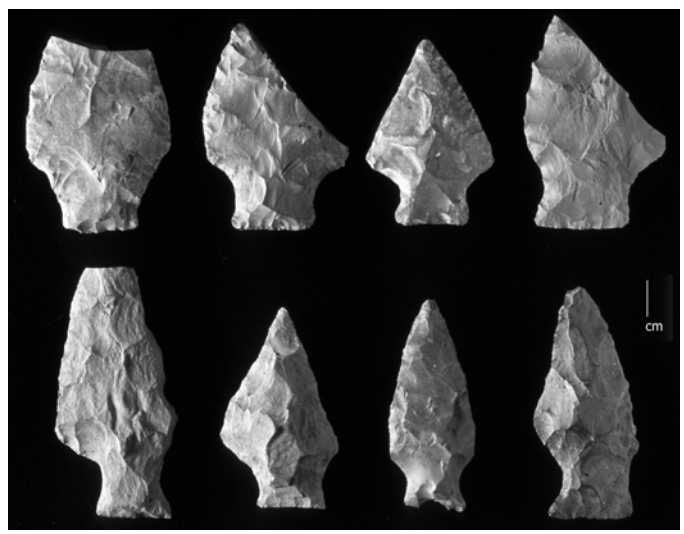

Figure 7. Sample of Susquehanna Broadspear and "Fishtail" points from the Transitional Period components.

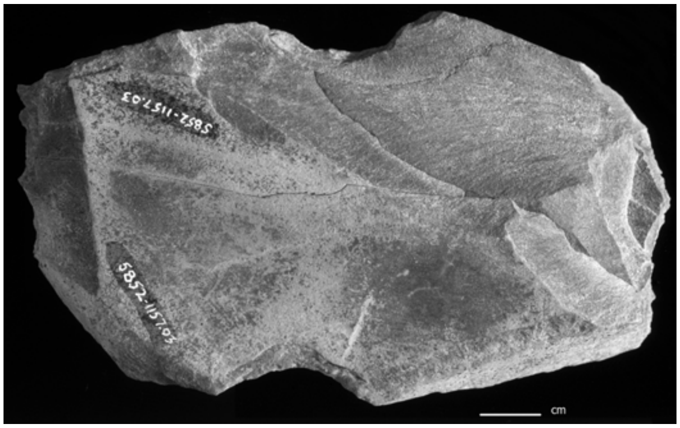

Figure 8. "Net-sinker" chipped stone weight from the Deep Cut A Component C living floor.

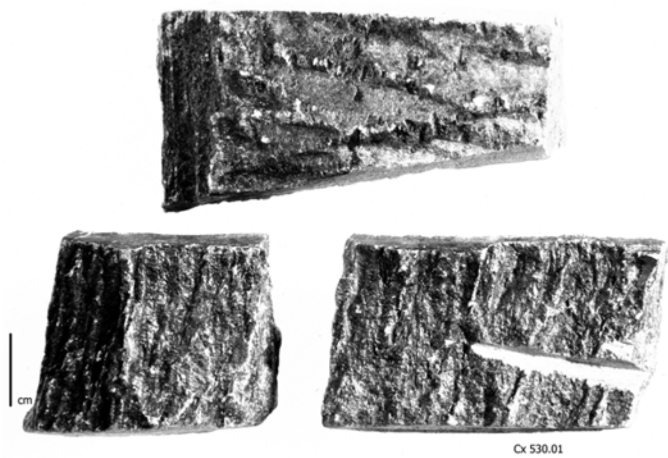

Figure 10. Steatite (soapstone) sherds from the Transitional Period deposits at Little Wood Creek.

(hophornbeam)], this hearth or roasting platform yielded four seeds of *Iva* sp. (marshelder) from two areas (contexts) of the hearth.

The 23 diagnostic chipped stone points and other biface (n = 16) tools (Figure 7) as well as chipped stone netsinkers (Figure 8), and fragments of steatite stone bowls (Figure 10), together with the radiocarbon determinations, indicate that these people were affiliated with the Susquehanna Broadspear tradition in general (Witthoft 1953), and with the Frost Island Phase of the Transitional period in particular (Ritchie 1980). This is an undisturbed Frost Island Phase site without materials mixed from other periods (Figure 6). While this was the first undisturbed deeply-stratified such occupation to be found in the Hudson-Mohawk confluence area, research subsequent to the 1986 excavations has documented the presence of the Frost Island Phase in the southern Hudson drainage, the upper reaches of the Hudson and the Susquehanna drainage of the south central portion of New York.

Chronometric Evidence (Table 1, page 10)

The four 2012 Transitional period AMS assays returned calibrated age determinations that refine the time span of the buried occupations to a range spanning less than four centuries. The four AMS dates (Samples 1-4; Beta Nos. 317204-317207) were run from a single Transitional period feature (Hearth 1), but from different context units and areas within it (Table 1). This feature, Hearth 1 (Contexts 1099, 1187 and 1221, 1221A), yielded four AMS dates that were internally consistent with one another, consistent with the stratigraphic sequence of dated logs from below the hearths, and consistent with published dates for other contemporary Frost Island sites in New York (Funk 1998).

The wide variability in the 1987 non-AMS dates (Grossman et al. 1990:Table 3.9) returned from the Transitional period occupation made re-dating particularly important for this period. The non-AMS dates together defined a thousand year range from cal B.C. 800 to 1800. Three of the original non-AMS dates for the Transitional period dated between 4000 and 4700 B.P., much too old for the identified Broadspear occupation. The dated buried logs predated the occupation, but some of the Component C dates returned 4000 B.P. readings that predated the logs they covered. Split samples returned widely different ranges. In addition, samples from the same hearth returned age ranges that were different by almost 3,000 years (Table 1). When compared to the conventional radiocarbon dates from the 1980's, the new AMS dates both clarify and correct the inconsistencies of the original radiocarbon data set. The four Transitional period samples returned conventional age determinations between 2970 ± 30 and 3160 ± 30 B.P., with short individual time spans of ca 177 to 261 years per determination.

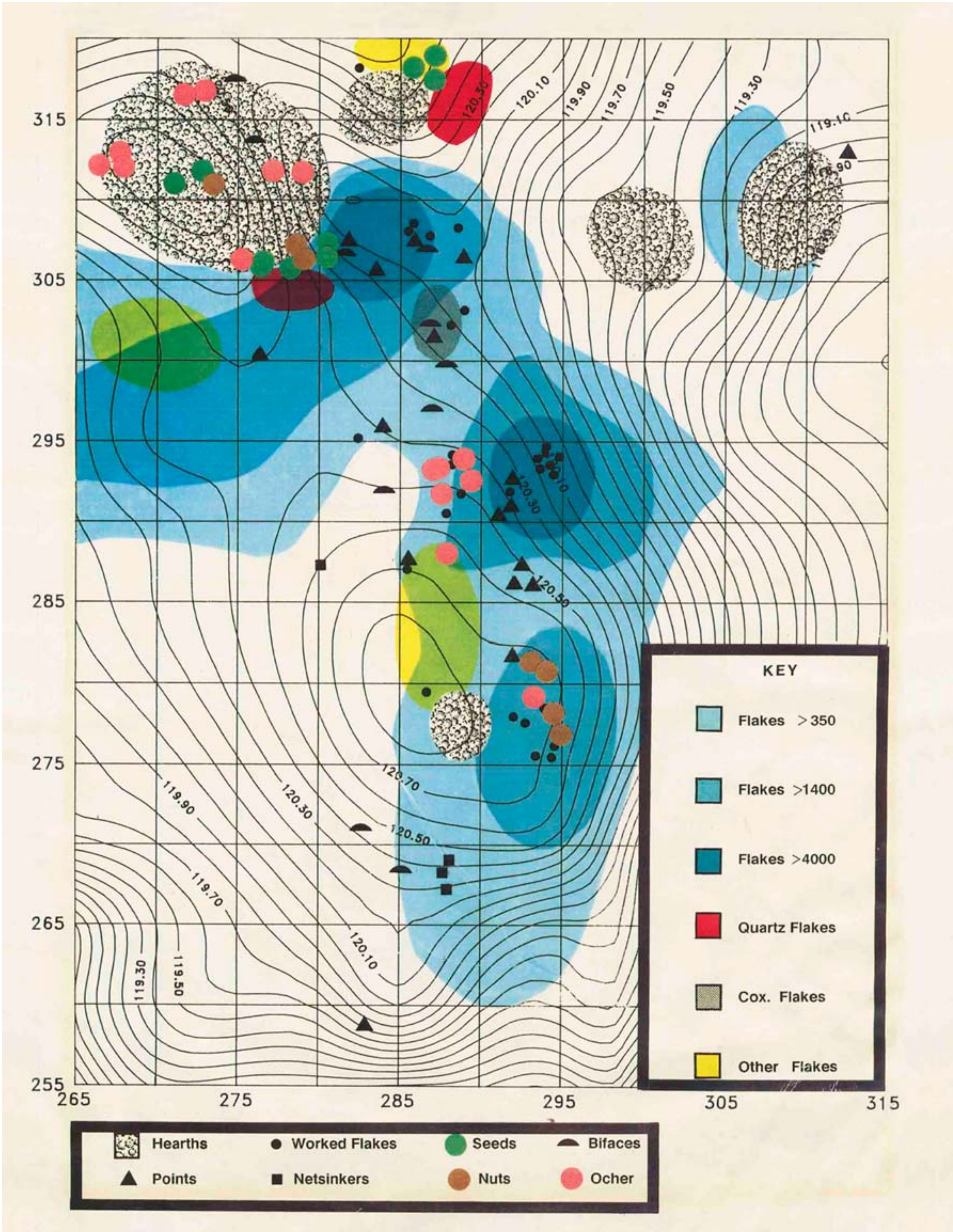

Figure 9. Summary map of multiple 3D density plots showing relative distribution of different artifact categories by class and material across the buried Component C Transitional Period living floors (After Figure 3.56, Grossman et al. 1990).

Table 1. Little Wood Creek site radiocarbon dates.

Component Group	Context No.*	Sample No.	C14 Age BP**	SD	Cal 2 Sigma	Feature Description
1987 RADIOCARBON DETERMINATIONS						
Component C	1099.00	GX-13252	2455	130	cal BC 837-209	C: Hearth 1
	1137.00	GX-13253	3115	85	cal BC 1606-1127	C: Hearth 3
	1138.00	GX-13254	2840	110	cal BC 87-cal AD 214	C: Hearth 4
	1173.02	GX-13256	4320	185	cal BC 3510-2469	C
	1167.04	GX-13257	4320	90	cal BC 3334-2670	C
	1221.00	GX-13825	4045	110	cal BC 2886-2296	C: Hearth 1
	1188.00	GX-13758	3275	75	cal BC 1741-1411	C
Component B	1163.02	GX-13757	3280	95	cal BC 1870-1306	B
Component A/B	1181.01	GX-13255	2380	130	cal BC 785-211	A/B
Component D	941.00	Beta-17530	2620	100	cal BC 87-cal AD 214	D
	768.00(a)	Beta-17465	4710	100	cal BC 3701-3116	D: Hearth 6
	768.00(b)	Beta-17438	3270	100	cal BC 1869-1297	D: Hearth 6
Deep Cut A Log	1153.22	GX-13792	3795	95	cal BC 2475-1960	Buried Log - Deep Cut A
Deep Cut B	1339.00	GX-13809	3170	90	cal BC 1657-1213	Hearth (Deep Cut B)
Cut B Log	1322.19(a)	GX-13258	3380	90	cal BC 1899-1455	Buried Log(Deep Cut B)
Cut B Log	1322.19(b)	GX-13760	3230	70	cal BC 1683-1317	Buried Log (Deep Cut B)
Transitional (Levee)	530.01	GX-13251	3185	150	cal BC 1873-1045	Levee Hearth
2012 AMS DETERMINATIONS						
Component C	1221A	**Beta-317204-AMS**	3160	30	1501-1324	Hearth 1
	1099.00	**Beta-317205-AMS**	3070	30	1414-1235	Hearth 1
	1221.00	**Beta-317206-AMS**	2970	30	1280-1058	Hearth 1
	1187.00	**Beta-317207-AMS**	2980	30	1372-1111	Hearth 1

Calibrated with Calib 7.01 using Intcal13.14c.
KEY: GX, Krueger Enterprises, Inc., Beta, Beta-Analytic, Inc.
* All Dated material: charcoal
** Uncorrected (B.P. determined-1950)

When calibrated, these four AMS samples defined two age ranges of between cal B.C. 1280 to 1058 and cal B.C. 1501 to 1324. Three of the Transitional period AMS dates, for Hearth 1, were close to one another with age determinations of 3070 ± 30 B.P. (Context 1099, Beta-317205), 2970 ± 30 B.P. (Context 1221,Beta-317206) and 2980 ± 30 B.P. (Context 1187, Beta-317207) (Table 1). As a group, these three determinations translated to between cal B.C. 1414 to 1058 (Table 1), or from the eleventh to the fifteenth century B.C. Note that two of these dates, that from Context 1221 and that from 1187 are virtually identical (Table 1). The fourth determination, Cx. 1221A (Beta 317204), with a B.P. determination of 3160 ± 30, yielded a slightly older date than the first three of cal B.C. 1324-1501.

Regional and Temporal Context

There is little to compare the Little Wood Creek find to in the immediate region of the Upper Hudson (Lindner 2011). Despite the paucity of other stratified Frost Island sites in northeastern New York State, there have been numerous surface finds of Susquehaqnna Broad or Broadspear points within the eastern United

States in general and in New York in particular. It is now apparent that this point type was widely dispersed throughout the eastern seaboard and the Midwest. Surveying the literature, Justice identified the Susquehanna Broadspear and related forms in the Ohio Valley, Massachusetts, Delaware, New York, New Jersey, Pennsylvania, Michigan, West Virginia, Indiana and as far north as Vermont (Justice 2009). Steatite vessels have been documented from Florida to Maine (Turnbaugh 1975; Truncer 2004; Sassaman 2006). Likewise, in Pennsylvania, Patricia Miller surveyed known Transitional period sites listed in the state's Cultural Resources GIS inventory and identified 194 sites which were distinguished by the presence of Susquehanna Broadspears, steatite and specific to that region, the almost exclusive use of rhyolite for the production of points and knives for that period (Witthoft 1953; Miller 2008:2; 2009).

Within New York, regional surveys of surface finds and excavation reports have demonstrated that the Susquehanna Broadspear tradition is more prevalent than previously depicted. A computer inventory of Transitional period materials at the New York State Museum identified nearly 500 steatite sherds in the southern and western part of the state, but few in the northeast portions of the Hudson River drainage near Fort Edward (Truncer 2004:493, Figure 4) In a parallel study, the Iroquois pipeline survey across much of both New York and Connecticut identified a total of 616 points, of which 62 were of the "Susquehanna Tradition" from the Hudson drainage (Cassedy 1999:131). In a prior survey of Susquehanna points within the Hudson river drainage, Funk identified 155 Susquehanna points in eight survey areas up and down the Hudson river (Funk 1976:Fig. 21, 195). Of these, 49, or 31.6%, were identified in the upper reaches (Funk's Geographic Area II) of the Hudson in the vicinity of Fort Edward (Funk 1976:195). What distinguishes the Little Wood Creek site is that it represented an unmixed and stratigraphically isolated buried single component series of living floors and hearths of this cultural complex.

The new "Transitional period" AMS dates are consistent with the determinations in the literature for comparable Frost Island sites in the New York region in general and for the well-documented Susquehanna drainage in particular (Funk 1998:309). In addition to the O'Neil site (on the Seneca River in Cayuga County, New York) which Ritchie radiocarbon dated to 1,200 B.C. ± 100 (uncalibrated) and which he used to define the Frost Island Phase as the New York manifestation of the Susquehanna Broadspear tradition (Ritchie 1980:156-157), four dates from the Susquehanna drainage overlap in time with the Little Wood Creek dates. Funk cited dates of between 1475 B.C. and 1250 B.C. for Frost Island sites in New York (Funk 1998:309). These apparently uncalibrated dates ranged from the ca 1475 B.C. from the Camelot No. 1 site, to 1330 B.C. from the Fortin site, to 1300 B.C. from the Enck No. 1 site and finally to 1290 B.C. from the Camelot No. 2 site (Funk 1993:197; Funk 1998:309). Funk also noted the significantly earlier occurrence of three 16th century B.C. dates from the Kuhr No. 1 site (Funk 1998, 308). As Funk pointed out, these three dates from Susquehanna Broadspear levels at the Kuhr No. 1 site were early relative to those from other Frost Island period sites with determinations of ca. 1535, 1550 and 1595 B.C. (Funk 1998:308). This time span is close to the earliest 2012 AMS date from Little Wood Creek that returned a determination (Beta-317204) of cal B.C. 1501 to 1354 (Table 1). In other words, this assay of Hearth 1 at Little Wood Creek, yielded a series of calibrated AMS dates that are close to, within a century, the three early determinations from the Kuhr No. 1 site and overlapped with the 1475 B.C. date reported for the Camelot No. 1 site (Funk 1998:309).

THE 2012 LATE WOODLAND PERIOD AMS RESULTS: CHRONOMETRIC EVIDENCE

The 2012 AMS results defined the time span of the early Late Woodland period at the site both precisely and with results that contradicted most of the original non-AMS radiocarbon assays. All six determinations post-dated cal 1247 A.D., and two determinations associated with maize and other seeds(Cx. 138 & 1015.01) post-dated cal 1330 A.D. (Table 2). Of the six Late Woodland AMS samples (all with maize and other food plants), two pits (Cx 1063.01 & Cx 751) returned almost identical high resolution dates between cal A.D. 1262 to 1386 and 1266 to1387, respectively. Two pits (Cx 138 & 1015.01) with maize and other food plants returned identical AMS age range of cal A.D. 1330 to 1440. One sample, (Beta-3378438-AMS) from pit

	Flotation Contexts*	Iva sp.	Zea mays	Vitis sp.	Phaseolus sp.	Chenopodium sp	Polygonum sp.	Polygonatum sp.	Cucurbitaceae (Family)	C14-Lab No.	C14 (BP)	Calibrated 2 sigma ranges (cal AD)**	Diag. Ceram. Associations***
1	112.01								1				No data
2	138.01		7	10	1	2 m	1	14		Beta-322876-AMS	530 +/-30	1330-1440	*Castle Creek/Bainbridge (Box D)*
3	398.03		7										*Late Woodland (Box H)*
4	417.00		2	1				2		Beta-3378438-AMS	600 +/-30	1247-1440	*Late Woodland (Box H)*
5	418.00		11			1 m				Beta-337440-AMS	570 +/-30	1304-1423	*Late Woodland (Box H)*
6	646.02	1	4	5			1 m			GX-13249	809 +/-75	1037-1294	*Castle Creek (Box F)*
7	751.00	2	7	16	2	10 m				Beta-322877-AMS	690 +/-30	1266-1387	*Castle Creek (Box E)*
8	921.01			1	3			3					*Late Woodland (no Samp)*
9	984.00		1										*Late Woodland (no Samp)*
10	1014.01		6							GX-13755	710 +/-65	1194-1403	*Castle Creek/Bainbridge (Box D)*
11	1015.01		2			2 m				Beta-337439-AMS	530 +/-30	1330-1440	*Castle Creek (Box E)*
12	1039.01		7										*Bainbridge Coll Lin. (Box B)*
13	1040.00		2										*Owasco Corded Collar (Box A)*
15	1042.01					1		2					*Bainbridge Coll Lin. (Box B)*
16	1042.02					1 m		1					*Bainbridge Coll Lin. (Box B)*
17	1050.02		2	8						GX-13246	805 +/-75	1036-1297	*Castle Creek (Box F)*
18	1063.01-AMS	1	6	1						Beta 317208-AMS	700 +/-30	1262-1386	*Owasco Plaited (Box I)*
19	1064.01	1	18							GX-13826	815 +/-75	1037-1289	*Owasco Plaited (Box I)*
	Total	**5**	**82**	**42**	**6**	**17**	**2**	**22**	**1**				
	*** - Seed Counts per Floated Context**			**** - Calibrated with Calib 7.01 and Intcal13 (Stuiver and Reimer 1993)**						***** - Seed Sample box # and label**			**m="modern"?**
	Other Radiocarbon assays:												
	1063.01 (1987)									GX-13756	**1075 +/- 80**	**770-1154**	**Non-AMS Dererminiation**
	Cx 974									GX-13250	**975 +/- 150**	**713-1288**	**Pit - Castle Creek Neck Incised - Not Floated**
	Cx 904.02									GX 13245	**780 +/- 105**	**1029-1395**	**burial pit fill**
	Cx 904 (1987)									Beta 16862	**650 +/- 60**	**1265-1412**	**Burial Pit fill (1987)**

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Table 2. Early Late Woodland flotation seeds from Little Wood Creek: contexts, age, associations and count. (Botanical identifications: Hansen et al. 1988).

417 yielded an AMS date range of cal A.D. 1247-1440. Taken together, the six Late Woodland determinations with maize and other plants dated to between cal 1247 and 1440 A.D.

In addition to being *late*, the thirteenth to fifteenth century range is relatively *short* compared to the other earlier determinations from New York. Together, the six AMS determinations defined a time span of just 193 calibrated years. Individually, the AMS determinations covered even shorter time spans of 110 and 120 years each (Table 2). The original non-AMS Late Woodland determinations defined a significantly longer time span of 665 years, or nearly seven centuries. The contrast in age ranges between the non-AMS and AMS determination translates to more than a threefold increase in resolution. The AMS age ranges also strongly suggest that the earlier non-AMS age determinations were, with one or possibly two exceptions, returning ranges that were, at a minimum, two to four centuries too early. They thus also cast doubt on the validity of many "early" non-AMS determinations in the Northeast in general and for New York in particular.

Finally, one of the Late Woodland period charcoal samples (Context 1063.01) was tested twice, first in the 1980s as a traditional non-AMS radiocarbon sample found in association with maize (Figure 15), and then again in 2012 as an AMS sample (Table 2). This bell-shaped pit was an important analytical unit. These original conventional 1987 radiocarbon dates were early and led to the impression that the Fort Edward maize was potentially early in New York State. It contained both multiple plant varieties (maize (n=6), one *Iva* and one grape) as well a single rim sherd identified as *Owasco Plaited*. This sherd cross-mended (and thus was contemporary) with sherds from pit 840 and pit 1064.01. This second context, or pit, (1064.01) yielded the highest number of corn specimens (n=18) and a deceptively early non-AMS 1987 determination of cal A.D. 1037-1289 - GX-13826) (Grossman et al. 1990:Plate 24, Figures B, D and F). Likewise, the original 1987 determination by Geochron for Context 1063.01 (GX-13756) returned an equally deceptive early radiocarbon determination of 1075 ± 80 B.P. with a calibrated age of cal A.D. 770-1154 (IntCal 13.14). However, the new 2012 AMS date from Context 1063.01 (Beta-137208) contradicted these original radiocarbon determinations and established instead, that the all three pits had been filled at Fort Edward around 700 ± 30 B.P. with a calibrated age of between cal A.D. 1262-1386.

Prehistoric Regional Context

Before describing the Late Woodland remains recovered at Little Wood Creek it is important to put these finds in regional and temporal context. What were the ages of other occurrences of maize in the Northeast in general and the upper Hudson drainage in particular? When did maize first appear the regional archaeological record? Was it early or late in the chronological sequence? When did beans and squash appear? What other food plants were represented? And in general, how does the Fort Edward data compare to what is known from other cases in the region?

Traditionally, the “three sisters,” corn, beans and squash were thought to have travelled together across the continent. However, AMS dating and other innovations in archaeology serve to segment these assumed botanical associations. It is now clear that "squashes were present in the Northeast by the end of the third millennium B.P., while gourds were in use at least two millennia earlier" (Hart 2008:89). Phytoliths of both squash and maize have been found together in residues dating as early as 1525 ± 35 B.P. (cal at two sigma 1518-1345 B.P.) (Hart 2008:90). When calibrated according to the IntCal13.14 data set and correction curve, this determination translated to a corrected range of cal A.D. 428 - 604. The earliest evidence for presumably edible squash in New York is 2905±35 (cal 2-sigma 1213-1001 B.C.) based on phytolith evidence from the Scaccia site in the Genesee River basin. (Hart et al. 2007).

In addition, almost a decade before the early phytolith dates for corn were established, AMS dating served to document the fact that the age of common beans in the archaeological record was significantly more recent than had been previously assumed and significantly later than both maize and squash (Hart and Scarry 1999; Hart 2008:90). Beans did not become archaeologically visible before 1300 cal A.D. As a result there is, given the antiquity of maize "no convincing evidence for the co-occurrence of maize, beans and squash before that time" (Hart and Scarry 1999:657; Hart and Brumbach 2003:746; Hart 2011). "Maize-beans-squash agriculture was not established in the Northeast until the late thirteenth to early fourteenth centuries

A.D." (Hart and Scary 1999:656-657). As summarized by Hart …."each of the crops have separate histories, only merging together after cal 700 B.P.." (2008:90). Or stated alternatively, ..."maize and squash were in use up to two millennia prior to and beans a few hundred years after the traditional A.D. 1000 boundary....". (Hart 2011:102) between the Middle and Late Woodland periods.

The antiquity of corn in the archaeological record of the Northeast varies greatly by region. Early macro-botanical evidence for corn in the northeastern United States has been documented by direct accelerator dates in Tennessee and Ohio around the second century A.D. (Cassedy and Webb 1999:91). However, the earliest macrobotanical corn east of the Mississippi River comes from Middle Woodland components at the Holding site in Illinois which date to between cal 170 B.C. and A.D. 60 at one standard deviation. (Riley et al. 1994:490). The direct dating of maize from specimens in this region suggest that corn was present …."before 1000 B.P. in southern New England and New York and around 1200 B.P. in north-central Pennsylvania." (Hart 1999:5). But these generalized time frames may reflect only the limited number of samples evaluated to date. "The potential for earlier maize in the Northeast is suggested by AMS dates in southern Ontario as early as 1500 B.P.." (Hart 1999:5). "Maize was introduced into Pennsylvania by at least A.D. 750, possibly much earlier considering it presence in Ohio sites by 425" (King 1999:21). The earliest evidence for maize in eastern Pennsylvania came from a pit found to contain corn which was dated to A.D. 705 ± 70 or ca 1245 B.P. (King 1999:19). In other words, maize has been documented in Pennsylvania by the early eighth century A.D., approximately a century before it has been documented in New York State. On this point, McConaughy concluded that "….maize may have been present in small quantities prior to A.D. 900, but was not a constituent of the local diet until after that date"(2008:22).

For New York State proper,…."multiple radiocarbon dates from excavations in the Susquehanna and Hudson Valleys of central and eastern New York since 1990 strongly suggest that maize was cultivated in the region starting by the 9th century A.D. "(Cassedy and Webb 1999:85). Until recently, the earliest radiocarbon dates in New York for corn have come about as a result of research conducted as part of the cultural resource survey for the Iroquois Pipeline project through eastern New York and Connecticut (Cassedy and Webb 1999). These dates came from a site designated 211-1-1 on the Roeliff Jansen Kill in southeastern Columbia County, ca 150 kilometers to the south of the Little Wood Creek excavations in Washington County. From this site, …."two early dates of A.D. 850 ± 70 (Feature 44) and A.D. 900 ± 60 (Feature 32) were obtained …on charcoal associated with maize in the feature" (Cassedy and Webb 1999:87). Neither of these initial determinations was tested with AMS procedures. Several years later, both associated charcoal and a maize kernel from Feature 32 were tested again with AMS dating. Both yielded AMS dates of 1050 B.P. (cal to two sigma at 1166-833 B.P., or a mean date of cal 900 A.D.) (Cassedy and Webb 1999:87-89). Subsequently, a reevaluation of the associations led Petersen and Cowie (2002:271) to ascribe a date of A.D. 1140 A.D. ± 50 for the occurrence of maize at the Roeliff Jansen Kill site. In New York State, until recently, the ..."earliest directly dated AMS-dated maize was no earlier than cal A.D. 985" (Cassedy and Webb 1991; see also Hart and Lovis 2013:Table 1). Subsequently, a 2009 study from the upper Delaware valley reported an early direct date on corn of "ca cal A.D. 814" (Hart and Lovis 2013:186, Table 1). Finally, Hart et al. identified maize phytoliths dating to 650 A.D. from the Kipp Island site in Seneca County, New York (Hart et al. 2003).

Although early for New York, these dates are not the earliest for the Northeast. The New York determinations were in turn preceded in time by a cluster of five dates from the Great Lakes region which indicate that introduction of corn into southern Ontario had occurred by the fifth century A.D. (Crawford et. al. 1997:117). The earliest dated maize in the Northeast ..."comes from Ohio (cal A.D. 275) and southern Ontario (cal A.D. 460)" (Hart and Means 2002:350). It was later in the east. These determinations led Crawford et al. to conclude that: …."The conservative interpretation is that corn diffused from regions to the south and/or west over a period spanning six centuries; once it was present in southern Ohio and Tennessee, it took only two or three centuries to move to Ontario" (1997).

Compared to these early dates for maize in New York State, the Fort Edward AMS dates for maize are relatively "late." Against these examples, it is now clear that the Fort Edward Late Woodland determinations *postdate* by hundreds of years the earliest occurrences of maize in the region. Thus, the six AMS determinations from the Little Wood Creek site suggest that corn in the Upper Hudson region was relatively *late* compared to both southern and western New York, but relatively early relative to, or roughly contemporary with, New England. However, this relationship may be tempered by the fact that with the exception of the Roeliff Jansen Kill site, there has been little or no comparative data available for establishing the antiquity of maize agriculture for the immediate region of the Upper Hudson (Brumbach and Bender 2002:230).

Despite the "early" time frame for the initial or earliest maize dates for New York, most of the reported dates for maize for New England fall within the later period of ca. A.D. 1300-1600 (Little 2002:114; Chilton 2010:170). Direct dates in southern New England fall around cal 1200 A.D. for the northern Connecticut River Valley, and at A.D. 1350 in Maine (Hart and Means 2002:350). The earliest direct date *east* of New York State is from the Ingalls site in New Hampshire which yielded a calibrated age determination of cal A.D. 1019-1159 (Chilton 2010:170). Further to the northeast in Maine maize has been dated to A.D. 1020-1235 (Petersen and Cowie 2002:274). These determinations suggest that corn appears in New England some three to four centuries after it becomes visible as macro-botanical remains in the Great Lakes region and at least a century or two after it becomes visible as macro-botanical remains in New York.

Other lines of evidence now suggest that maize was present hundreds of years before it became visible as macrofossils in the archaeological record. Microfossils in the form of phytoliths and maize starch grains recovered from Michigan and the Finger Lakes region of New York now indicate the presence of maize between the second and fourth centuries B.C. (Hart and Lovis 2013:190). The identification of maize phytoliths and species-specific starch grains from the interior residue on pottery and steatite vessels has indicated the presence of early corn in the northeast, long before it becomes visible as macro-botanical specimens (Hart et al. 2007).

Most recently, this line of evidence has been expanded back in time based on an increasing early series of phytolith dates from an initial projection of the seventh century A.D. (Hart et al. 2003), to ca 1900 B.P. dates (Thompson et al. 2004) to 2270 ± 35 B.P.(cal B.C. 399-208), or ca the fourth century B.C. (Hart et al. 2007:564; Hart et al. 2008). This age determination in turn led Hart et al. to suggest that corn was "certainly continuously used by 1500 B.P. [450 A.D.] in this region" (Hart et al. 2008:89). It also led Hart et al. to conclude that …."maize was present in central New York up to eight centuries before the earliest macrobotanical evidence for this crop in southern Ontario …and five to six centuries before the earliest macrobotanical remains in Ohio" (2007:577). Likewise, Chilton observed that…"The presence of maize and squash phytoliths in pottery residues suggests the use of maize by native peoples in New York State more than 2,000 years ago, far before the oldest macrobotanical evidence would indicate" (Chilton 2008:56).

The early phytolith dates by Hart et al. (2007) for corn significantly impact traditional theoretical treatments of subsistence and settlement systems in the region. As laid out by Chilton "the timing of the adaptation of maize….has important implications for understanding the relationships between sedentism, farming and social complexity…"(2008:57). The discovery of corn with other edible plants also led Chilton to hypothesize that the early maize growing peoples maintained "seasonably mobile subsistence patterns" (Chilton 2006, 2008; also see Hart and Lovis 2013). The range of dated plants found in addition to maize suggests that the Little Wood Creek people likewise practiced a diversified mobile economy of periodically dispersed and seasonally varied settlement patterns.

Little Wood Creek Ceramic Associations

The excavation of the Late Woodland pits yielded 3,059 sherds of pottery. When conserved and "cross-mended" to unite fragments from the same vessel from different pits (to produce a larger network of contemporary and associated group of pits or units of analysis), this total translated to a minimum of 34 distinct pottery vessels and four distinct pipes (Grossman et al. 1990).

The Late Woodland period ceramic assemblage was dominated by four distinct ceramic "types" or stylistic units: Castle Creek Incised Neck (Figure 11), Bainbridge Collared Incised (Figure 12) Owasco

Figure 11. Late Woodland Period “Castle Creek Incised Neck" sherds (Cx 984).

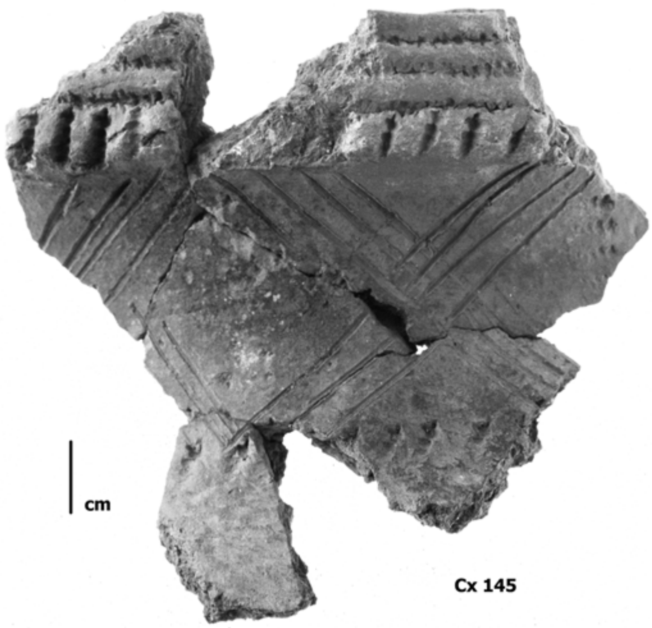
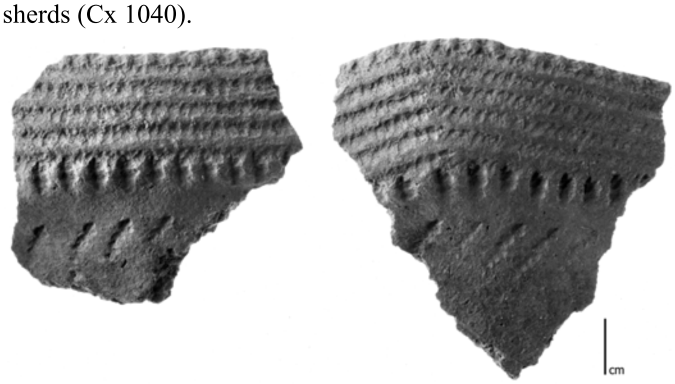


Figure 12. Late Woodland Period “Bainbridge Collared Incised” sherd.

Figure 13. Late Woodland Period “Owasco Corded Collar” sherds (Cx 1040).



Corded Collar (Figure 13), with Owasco Plaited as a distant fourth (Table 3). In addition there were small numbers of sherds typed as Kelso Corded Collar, Oak Hill Collared, Chance Incised, Ostungo Notched and Bainbridge Notched Lip (Grossman et al. 1990). With the exception of Middle Woodland period sherds (Pseudo Scallop Shell) found as isolated surface remains, the identified ceramic types belonged to the Owasco Series classified by archaeologists as belonging to the Castle Creek and Oak Hill phases of the early Late Woodland period (Ritchie and MacNeish 1949:Lenig 1965; Ritchie 1980). All but two of the Woodland period stone projectile points were characteristic Levanna style triangular forms (Figure 14) that are consistent with regional patterns for Late Woodland period types.

The ceramic analysis (by Regan Vercruysee of the Grossman and Associates team) divided the diagnostic sherds into two major groups: collared vessels versus uncollared vessels (Grossman et al. 1990:122-144), each of which had specific types associated with it (Table 3). "The sherds that were identified as uncollared vessel fragments did not occur in the same pit with the sherds that were clearly from collared specimens" (Vercruysee, R. in Grossman et al. 1990:179). In other words, each major group had mutually exclusive types.

There were six types associated with the collared group and eight types associated with the uncollared group (Table 3). Three of the listed types represent more recent, or "higher" groupings by Lenig of types originally defined by Ritchie and MacNeish, as shown; all other listed types were originally defined by Ritchie and MacNeish (1949) and are not subsumed below the Lenig (1965) designations. Within the collared vessel group, Lenig's Kelso Corded is made up of two types (Bainbridge Collared Incised and Owasco Corded Collar) defined by Ritchie and MacNeish in 1949. Within the Uncollared group two of Lenig's (1965) types (Sackett Corded and Ostungo Notched) were also made up of several earlier types by Ritchie and MacNeish (1949).

Typology issues aside, these major groupings of collared versus uncollared vessels do

Table 3. Late Woodland collared versus uncollared ceramic types (cal A.D. 1247-1440). N = minimum vessel count.

UNCOLLARED GROUP 33 pits	COLLARED GROUP 9 pits
Castle Creek Incised Neck (9)	Kelso Corded Collar (Lenig 1965)
Sackett Corded (2) (Lenig 1965)	-Bainbridge Collared Incised (5)
-Owasco Horizontal (2)	-Owasco Corded Collar (3)
-Owasco Platted (1) (Cx 1063+1064+840)	Oak Hill Collared (1)
Otstungo Notched (Lenig 1965)	Chance Incised (1)
-Bainbridge Notched Lip	Oak Hill Corded (1)
Pseudo Scallop Shell (1)	
Unidentified Types	

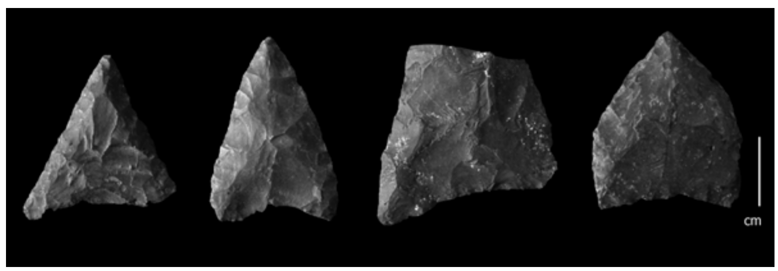


Figure 14. Late Woodland Period triangular Levanna points.

not suggest a chronological seriation (Table 3). The presence of a single sherd of Chance Incised (Cx. 1091.00) and Oak Hill types in the collared group suggests that the site may have been occupied through the Chance phase of early Iroquois culture (Ritchie 1980:312-313). "Two radiocarbon dates place the Chance Phase within the fourteenth century." at 1325 ± 75 (M-1185) and 1398 ± 150 years (Ritchie 1980:314). The presence of Middle Woodland period "Pseudo Scallop Shell" sherds (Cx. 251) suggests that some types in the Uncollared vessel group may be earlier (Table 3). Likewise the wide presence of types with incisions on the lip was indicative of the Castle Creek and Oak Hill Phases in Ritchie's typology (Ritchie 1980:147).

However, even together, the original 1987 determinations, Ritchie's dates and the new AMS dates, do not provide sufficient resolution to assign chronological significance to either of these groupings. There may be, however, a spatial distinction between the two groups of sherd types. The collared group clustered along the shoreline of the Hudson River; the uncollared group was more evenly distributed throughout the site (Grossman and Agelarakis in Grossman et al.1990:184). This spatial variation suggests that there may be a temporal element to the mutually exclusive distribution of ceramic types.

Avoiding the dispute over the validity of Owasco as an analytical or chronological unit in Northeastern Late Woodland chronology (See Hart 2011; Hart and Brumbach 2003; Hart and Schulenburg 2002), the new dates clearly document that the identified Owasco types, whatever their ultimate typological designations, can now be dated to between1247 and 1440 cal A.D. Whereas it was initially thought, based on the original non-AMS 1987 dates, that the recovered "Owasco" pottery dated as far back as ca. 1000 A.D. (Grossman et al. 1990:v), the new AMS determinations document that the identified Owasco types, and their associated ethnobotanical remains, do not appear at the site of Little Wood Creek until after cal A.D. 1247, or the mid-thirteenth century.

These new AMS determinations are close to and in fact overlap with earlier projections for the age of the Ritchie's temporal definition of his pre-Iroquoian Castle Creek Phase of the Owasco tradition or "culture"

(1980:Figure 1) which he published in 1980 (and which he footnoted as being current back to 1968). He dated the Castle Creek Phase based on one date of A.D. 1310 ± 95 (uncalibrated) (1980:Figure 1). The subsequent Oak Hill phase (which Ritchie defined as representing "early Iroquois culture") was dated based on two determinations of 1337 ± 150 and 1450 A.D. ± 80 (uncalibrated) (Ritchie 1980:xxvi). Both of his determinations had very large standard deviations that made precise dating impossible. He apparently chose to ignore the earlier 1337A.D. date in assigning the temporal range or age to his Oak Hill phase (see Ritchie 1980:Figure 1). However, given the long time spans and statistical uncertainly of the large errors associated with each date, Richie's evidence allowed in fact for only the low resolution projection that both phases dated to between the thirteenth and fifteenth centuries A.D. Clearly the early dates did not have enough resolution to differentiate between the age or antiquity of Ritchie's Oak Hill and Castle Creek phases (Ritchie 1980). Still, in the preface to his 1980 publication, Ritchie relied on this limited dating evidence to chronologically distinguish the two phases (Ritchie 1980:Fig 1; xxvi). The new AMS dates do nevertheless corroborate the general accuracy of Ritchie's earlier determinations and chronological projections for the Castle Creek phase in particular. The principle identified Castle Creek Phase sherd types date to between cal A.D. 1247 and 1440 at Little Wood Creek.

Furthermore, the ceramic analysis provided a series of new insights into the identity and regional correlations between the Late Woodland period at Fort Edward and other parts of New York. The diversity of identified ceramic types suggests that the people of Fort Edward had a cultural affiliation with early Iroquois peoples in central New York, and that a ceramic complex, the Owasco style, thought to be focused in west-central New York (Ritchie 1980), was clearly present in the region of the Upper Hudson in east-central New York State between the thirteenth and fifteenth centuries A.D. Whether these ceramic parallels represent the by-products of actual travel by the people, or long distance trade cannot be determined based on available information.

In addition to these ceramic parallels, the collection was distinguished by the recovery of five shells of an ocean bivalve, *Mercenaria mercenaria* (northern quahog or hard-shell clam) of which two were worked with chipped edges. Their presence provided concrete evidence that the Late Woodland inhabitants of Little Wood Creek had direct or indirect access to marine shell resources along the Atlantic coast. Hard shell clams are widespread along the Atlantic coast, but do not occur in inland fresh water environments, therefore they indicate importation or long distance travel. They indicate that not only did the Late Woodland period inhabitants of Little Wood Creek have contacts to the west, as indicated by the pottery, but also to the south.

Paleoethnobotany

The 2012 AMS results provide critical new information on the antiquity of maize, beans and other edibles at the Late Woodland period Fort Edward site. The early Late Woodland period pits yielded (through flotation and wet screening) large numbers of charred seed and plant remains, with a total of 1,463 from a restricted sample of 39 of the pits. A sample of 19 of the pits was selected for discussion because of the presence of both identified botanical specimens and diagnostic pottery (see Table 2). "The predominant species represented are butternut (*Juglans cinerea*), hickory nut (*Carya* sp.) corn and grape with an additional 23 species occurring in very small quantities." (Hansen et. al. 1988:12).

Figure 15. Detail of Late Woodland corn kernels from Context 1063.01. Charcoal from this pit dated to cal A.D. 1262-1386.

Maize was well represented with a total of 66 kernels and 50 cupules, recovered from both wet screening and flotation (Figure 15). Maize is late relative to earlier dates in the region, but beans at the site are consistent in age with multiple direct AMS radiometric assays that indicate that beans became visible in the archaeological record of the Northeast only after the mid-thirteenth century A.D. (Hart and Means 2002:352). The six AMS-dated Late Woodland period pits yielded corn kernels and other edible plants that fell as a group from between cal 1247 and 1440 A.D. (For dates on charcoal within each pit, see Table 2). However, given that these are the only dates for maize, beans, and other plants from a Late Woodland period site in the Upper Hudson (beside the Roeliff Jansen Kill with early ca 1100 A.D. corn); people may have arrived with maize that they had been using for a while.

Six specimens of *Phaseolus* sp., or bean, were recovered through flotation and wet screening from three contexts: Cx. 138, Cx 751 and context 921 (not dated) (see Table 2). Of these three pits with both corn and beans, two were dated with AMS testing. Context 138 dated to 530 ± 30 B.P. with a calibrated age range of cal A.D. 1330-1440. Context 751 dated to 600 ± 30 B.P. with a calibrated range of cal A.D. 1266-1387. Thus together, the two pits with dated beans and corn at Little Wood Creek fell within cal A.D. 1266-1440, a time span of 174 years. Maize is late relative to earlier dates in the region, but beans at the site are consistent in age with multiple direct AMS radiometric assays that indicate that beans became visible in the archaeological record of the Northeast only after the mid- thirteenth century A.D. (Hart and Means 2002:352).

Among the very small quantities of preserved seeds were maize (n=82 in 14 contexts), squash/ gourd (significant for its low visibility in the archaeological record)), *Iva* sp.(n=5 in 4 contexts), *Chenopodium* sp. (n=17 in 6 contexts)[2], *Polygonum* sp. (knotgrass/bistort), *Polygonatum* sp. (Solomon's seal) and *Phaseolus* sp. (bean, n=6 in 3 contexts)(see Table 2). *Polygonum* sp. and *Polygonatum* sp. warrant brief discussion as food plants. Knotgrass was nutritious as a food resource in both prehistoric and historic contexts in the Northeast. Its starchy root was eaten in eastern and northern Europe "in times of scarcity as a substitute for bread" (Hedrick 1977:499). It was also recovered, along with *Chenopodium* sp., from prehistoric storage pits outside both of their natural habitats, with knotweed constituting upward of 30 percent of the *small seed assemblage* in some excavated prehistoric sites (Delcourt and Delcourt 2004:42,106; see Grossman 2011:95, 97,107-108). *Polygonatum* sp. (Solomon's seal) was also a nutritious root (Hedrick 1919:448). It, like *Polygonum*, was eaten in Europe in times of scarcity; its shoots were eaten in Turkey like asparagus and it was known for its medicinal qualities as a diuretic (Ripley and Dana 1876:158). In addition, one plant family, *Curcurbitaceae* (squash/gourd) was undated in this study; none were found with any of the AMS samples (see Table 2). However, despite the lack of chronometric evidence for the squash/gourd family, like corn and beans, it spanned the mid-thirteenth to the mid-fifteenth centuries at this site.

This pantheon of diverse edible plants corresponds with seeds from plants that comprise what scholars call in the Midwest the Eastern Agricultural Complex (EAC), or the pre-maize complex of indigenous plants that were harvested or collected for food (see Hart and Lovis 2013:197; Smith 1992; 2006; see Asch Sidell 2008:45 for parallel evidence in Pennsylvania). The fact that EAC-related plants were numerous and diversified in almost all of the floated pits at Little Wood Creek, and were associated with maize, supports the argument that traditional economies and food sources were not replaced with the advent of corn (e.g., see Cowan 1998; see Hunt and Lovis 2013:197-200). These other plants had long histories (note *Iva* in the Transitional period occupation) before the appearance of corn and beans in the archaeological record and continued to be used subsequent to their appearance.

CONCLUSIONS

Transitional Period

The Transitional period results indicate two major findings. First, the four new AMS dates refine the buried Transitional period occupations down to a ca 450 year time span. One of the determinations gave AMS dates of between cal B.C. 1058 and 1280, a difference of 222 years. A second determination gave a date of cal B.C. 1111- 1372, a differential of 261 years. A third date came out at cal B.C. 1235-1414, a shorter differential of 179 years. Finally, the fourth sample gave an earlier date of cal B.C. 1324-1501, a difference of only 177 years. Together, the four new 2012 AMS determinations document that the Broadspear occupations ranged between cal 1058 and 1501 B.C. with short, plus or minus 30 year errors or standard deviations.

Second, the revised chronology for the Transitional period at Little Wood Creek suggests an ecological correlation with the development of the Oak-Chestnut forest. Work by palynologists now suggests that the American Chestnut (*Castanea dentata*) expanded in the Hudson Highlands around ca 4750 yr cal B.P. (ca 2800 cal B.C.)(Menking et al. 2012). Near the Sky Lakes region of New York (42 N), Menking et al. suggest that chestnut may have increased in response to the drought which was responsible for the hemlock decline, as chestnut is shade intolerant but quite drought-tolerant. This spread in turn is prior to the earliest ca cal B.C. 1500 date for Broadspear occupation at the site. As such, it is *possible* that the onset of Broadspear culture in New York State followed the expansion of the American Chestnut as an important high canopy element of the pervasive Oak-Chestnut forest in this region prior to the Chestnut blight. Similar pollen work at a variety of New York and New England sites suggests that the emergence of the Broadspear culture in northeastern New York State may have also correlated with the advent of cooler conditions and prior to a period of Late Holocene drought which ended close to 1000 B.P.(ca 1000 cal A.D.)(Menking et al. 2012; Newby et al. 2011).

Late Woodland Period

The 2012 AMS results defined the time span of the early Late Woodland period at the site both precisely and with results that contradicted most of the original non-AMS radiocarbon assays. The new AMS age determinations indicate that the identified ceramics, and non-ceramic cultural items, date to between the middle of the thirteenth century and the middle of the fifteenth century A.D. (See Table 2). All six determinations post-dated 1247 A.D. and two determinations associated with maize and other seeds (Cx. 138 & 1015.01) post-dated cal 1330 A.D. (See Table 2). These six assays suggest strongly that corn (maize) was not exploited at this site in the Fort Edward area until after the mid-thirteenth century. Together, the six determinations cluster within a range of cal 1247 and 1440 A.D.

As a group, these six assays suggest that the Little Wood Creek occupation may have been both late and short within the chronology of the early Late Woodland period. This limited time span implies that the diversity of Owasco pottery types may not reflect chronological differences, but instead stylistic or regional ones in a single period. The decline of radiocarbon AMS dates after cal 1440 A.D. may also reflect a possible correlation with the end of the MWP or the beginning of the LIA, or both.

The apparent demise of corn and Late Woodland dates at Little Wood Creek after the mid-fifteenth century A. D. may be a site-specific event, rather than reflecting a regional response to the advent of the Little Ice Age (King 1999:21; Chilton 2010:173). This hypothesis will be tested as additional readiocarbon dates are generated from other Late Woodland sites in the immediate region. Abandonment of the site fits with the suggestion that there was little evidence for Late Woodalnd occupation after ca. the mid-1400s. No artifacts were identified that suggested sixteenth or seventeenth-century contacts.

Finally, multiple lines of archaeological evidence from Little Wood Creek suggest access to items from foreign sources. Marine shells suggest trade or travel to the south along the Atlantic coast. The diversity of Late Woodland period lithic materials suggests multiple and some long distance sources (Ludwig in Grossman et al.1990:148) The late mid-thirteenth century dates for corn suggest cultural parallels with people in New England, versus to the south in New York State and Pennsylvania. The decorated Woodland period pottery suggests links to western New York. Taken together these threads imply that the early Late Woodland period people of Little Wood Creek were not isolated or provincial, but instead enjoyed access to exotic ideas, material goods, and cultural influences from a broad network of external sources.

ENDNOTES

[1] The 1988 computer-generated map (Figure 9) documents three categories of data: 1) a 3D topographic contour map of the buried Transitional period living surface, 2) the XY location of key diagnostic artifacts (including points, bifaces, seeds, nuts, worked flakes, netsinkers, hearths and ocher) and, 3) a color-coded series of plots showing the distribution of different flake categories by count and material. The density plots (blue) first defined a ca 50 foot long “L-shaped” scatter, or 15 foot wide band, of flakes immediately to the south and west of the largest hearth. The density plots also defined at least four distinct areas, or peaks, of high flake concentrations, three in association with hearths and one not. The plotting of different flake types by material defined six additional activity areas. The plot of “other” flakes (yellow) identified three localized concentrations, two of which bordered hearths. The plotting of “quartz” flakes (red) displayed two distinct clusters and one locus of “Coxsackie” flakes (gray) was evident. When piece-plotted “diagnostic” artifacts are factored in, at least two additional clusters were found in association with high concentrations of flakes. Taken together, these multiple lines of quantified geospatial data defined, in addition to the five roasting platforms, a total of at least twelve distinct, and not necessarily contemporary, activity areas and chipping stations (Grossman in Grossman et al. 1990, Figure 3.4.16).

[2] For all but one context (1042.01) all of the *Chenopodium* sp. seeds were classed as "modern" ("m") by Julie Hansen and her team (1988 in Grossman et al. 1990, Table 5.4), based on the premise that as un-charred organic survivals, they could not have been ancient 1) because the needed bog-like anaerobic conditions were not apparent with the Late Woodland period pits 2, simply because of the assumption that *Chenopodium* is indicitative of disturbed environments and is by definition "modern," or 3) they simply looked modern, or organic vs. charred. The authors of this report disagree. Only *Chenopods*, and one seed of *Polygonum* were marked as modern. No other seeds in the same contexts were similarly classed. The assumption of this report is that all floated units were unmixed with later time periods and that all recovered plant materials are indigenous to the Late Woodland period, and undisturbed by later intrusion or mixing (see Table 2).

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Initial Comments on Grossman et al. 2015

- *"Hi Joel,*
  I just read the article. Congratulations on an important contribution to the literature. I will definitely be citing it in future articles."
  John Hart (08-29-2015)
  New York State Museum

- *"I sent you a note last night and after that, around 4 AM, got up and read most of it. Again, really glad this got published! It is an outstanding contribution to NE archaeology. I, at least, am humbly proud that I was able to work at this site with you!"*
  Bill Barse (8-29-2015)
  Smithsonian

- *"Hi Joel:*
  I really like this paper and I'm happy to be mentioned in the acknowledgments. Thanks. The paper makes a major contribution to the study of the spread of maize and beans into the region. I hope that others focus on that problem and do as good a job as you have in acquiring and analyzing the relevant data."
  Dean Snow
  Penn State Univ.

- *"Joel,*
  Great article. Very informative-and excellent dating. Nice to see a CRM site make it into the literature.
  Joe"
  Joseph Diamond
  SUNY-New Paltz

- *What an article! I admire your intellectual curiosity, not to mention integrity, to seize the newest technology and go back to challenge your previous work. And isn't it wonderful that the way archeological work was done then that it allows you to reinterpret it now?*
  Joseph Cutshall-King
  Fort Edward, New York

- [Upon computer transfer of digital archive of artifact scans and fieldwork at Little Wood Creek]
  .....Everything went perfectly! Thank you. And what a treasure trove! Oh my God! It is wonderful! .....I've successfully copied everything on the 6.56 gig drive. Can you believe that—a 6.56 gig drive? I'm flabbergasted by the science now, Joel.
  Joseph Cutshall-King
  Fort Edward, New York