Oberly Island: Trend and Tradition in the Lower Lehigh Valley

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ABSTRACT

A Phase III archeological data recovery was conducted by John Milner Associates, Inc. (JMA) at the Oberly Island (36NM140) site, located in Northampton County, Pennsylvania. Occupations at the site include Early/Middle Archaic, Late and Terminal Archaic, and early Late Woodland, with the Late Archaic and late Woodland being the most substantial. The Late Archaic Lackawaxen Phase occupation involved the use of large platform-type hearths similar to those found in the adjacent Delaware valley. The Late Woodland presence is marked by over 1,000 sherds of Overpeck Incised, indicating cultural affiliation with the Overpeck Complex in the middle Delaware. Chipped-stone debitage revealed a consistent bifacial industry throughout the occupations of the site, despite shifts in raw material use. The relative percentages of raw materials represented in the projectile point assemblage are approximately reverse of the debitage, by soil horizon. These discrepancies are interpreted to reflect tool-production strategies in conjunction with hunter-gatherer mobility patterns. Overall shifts in raw material selection through time may relate to emergent exchange networks by the Late Archaic period.

PROJECT HISTORY AND BACKGROUND

In 1995 and 1996 John Milner Associates, Inc. (JMA) conducted a Phase III data recovery at the Oberly Island site (36NM140) in conjunction with the proposed construction of a bridge to span the Lehigh River (Siegel et al. 1999). This work was conducted for URS Greiner Woodward Clyde on behalf of the Pennsylvania Department of Transportation, Engineering District 5-0. The site is located along the levee of the lower Lehigh River in Northampton County, Pennsylvania (Figures 1-3). It is situated on an artificial island along the north bank of the lower Lehigh River. The island was created in the 1820s when the Lehigh Canal was constructed (Rivinus 1989:6).

The Oberly Island site (36NM140) was discovered during a Phase I archeological survey performed by Cultural Heritage Research Services (CHRS) in connection with one of the S.R. 33 right-of-way alternatives (Lewis et al. 1989). CHRS subsequently performed a Phase II archeological evaluation at the site (Basalik and Lewis 1989). The results of the CHRS investigations suggested the presence of at least two prehistoric occupations. A Late Woodland occupation was evident in the upper levels of the site, in the buried plowzone and immediately below. Artifacts and features from a lower stratum may were thought to reflect an earlier occupation, possibly dating to the Late Archaic period. Basalik and Lewis (1989:35) suggested that occupational intensity of the Oberly Island site was high during the Archaic period, perhaps indicating a base camp. By the Late Woodland period the range and kinds of activities performed in the area appear to have diminished considerably. Given the integrity of the archeological deposits at the Oberly Island site and the range of activities possibly conducted, the excavators recommended that a Phase III archeological data recovery be conducted (Basalik and Lewis 1989:36). JMA's proposal for Phase III archeological data recovery (John Milner Associates 1990) was accepted by the Department of Transportation, and fieldwork was conducted during July to November 1995 and May to October 1996.

GEOLOGICAL CONTEXT

Oberly Island is situated in the lower Lehigh River valley within the Great Valley section of the Ridge and Valley physiographic province. The Great Valley is broad and moderately dissected with a gently undulating surface (Berg et al. 1989). The northeastern portion of the Great Valley is drained by the Lehigh River. Underlying rock types in the vicinity of the Oberly Island site are included in the Leithsville, Allentown, and Hardyston formations. The Leithsville formation includes limestone and dolomite formed during the early and middle Cambrian age (500-570 million years ago) (MacLachlan 1976; Richards 1956:34-345; Socolow 1982). The Allentown formation consists primarily of dolomite or dolomitic limestone (Swanson et al. 1981:20), though the presence of black chert is described as well developed at various locations in Northampton County (Miller et al. 1939:231). The name "Allentown chert" is applied to locally occurring black to dark-gray chert, commonly found as a raw material in local archeological lithic assemblages. The Hardyston formation typically crops out as narrow bands of strata situated on relatively steep slopes of gneiss hills (Buckwalter 1959; Miller 1941:165). The uppermost exposed member of the Hardyston formation consists of jasper, which is

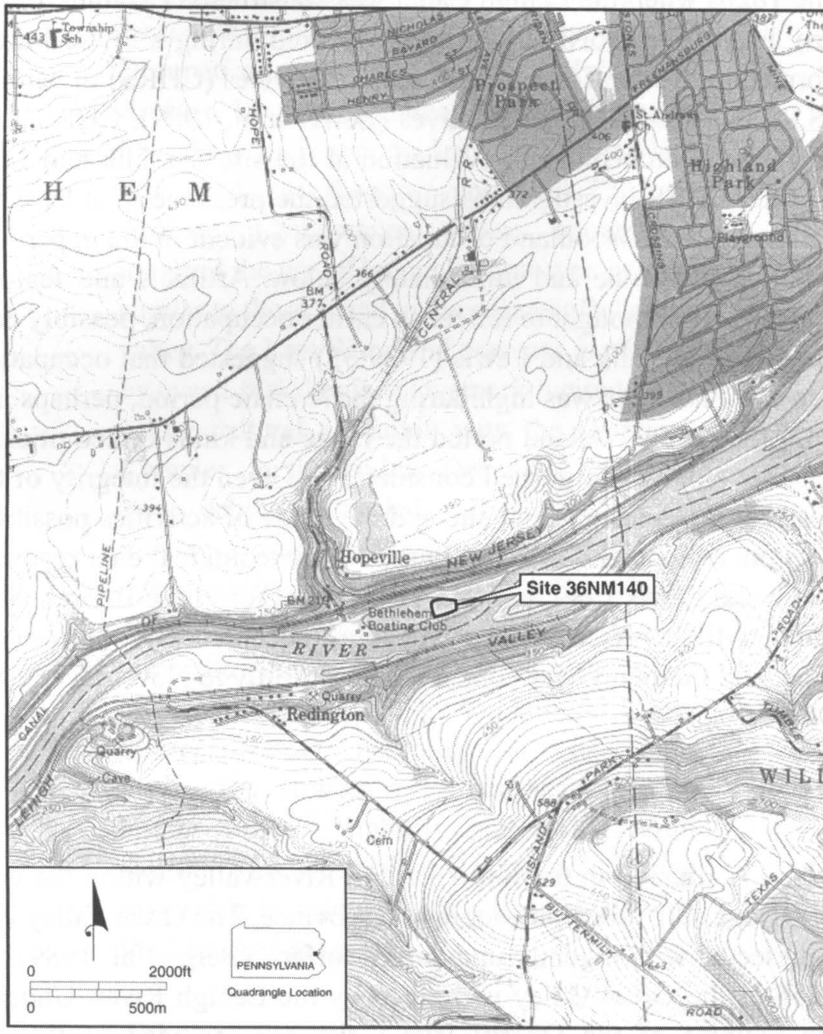


Figure 1: Location of the Oberly Island Site, 36 NM 140 (Nazareth, PA,USGS 7.5 Minute, 1964, Revised 1992)

Figure 2: Oberly Island Block Excavation, View East, Lehigh River at Right

characterized by "light brown to reddish brown, dense, with marked conchoidal fracture, and occasionally exhibits a very fine-grained structure apparently inherited from the Hardyston sandstone" (Buckwalter 1959). The Hardyston formation is best known archeologically for its jasper deposits, commonly referred to as "Pennsylvania jasper," which were quarried extensively in prehistory for stone tool production (Anthony and Roberts 1988; Hatch 1993; Hatch and Miller 1985; Miller 1954).

TOPOGRAPHY, GEOMORPHOLOGY, AND PEDOLOGY

The Oberly Island site is located within a first terrace (T-1) of the Lehigh River, along the north side of the stream. A thick sequence of vertical-accretion (overbank) alluvial deposits composes the terrace, accumulated since the late Pleistocene to early Holocene epochs. Historically deposited sediments, including a 1- to 1.5-m-thick coal sand layer and the upper of two plowzone (Ap) horizons, cap the prehistorically derived fine-sandy and silty alluvium. Point-bar (lateral accretion) and channel sediments, over glaciofluvial (outwash) deposits, underlie the alluvium. A majority of the outwash was deposited during the Wisconsinan glaciation as torrents of meltwater flowed down the river from the edge of the receding ice sheet; some remnant Illinoian outwash may have survived intact below the Wisconsinan sediments.

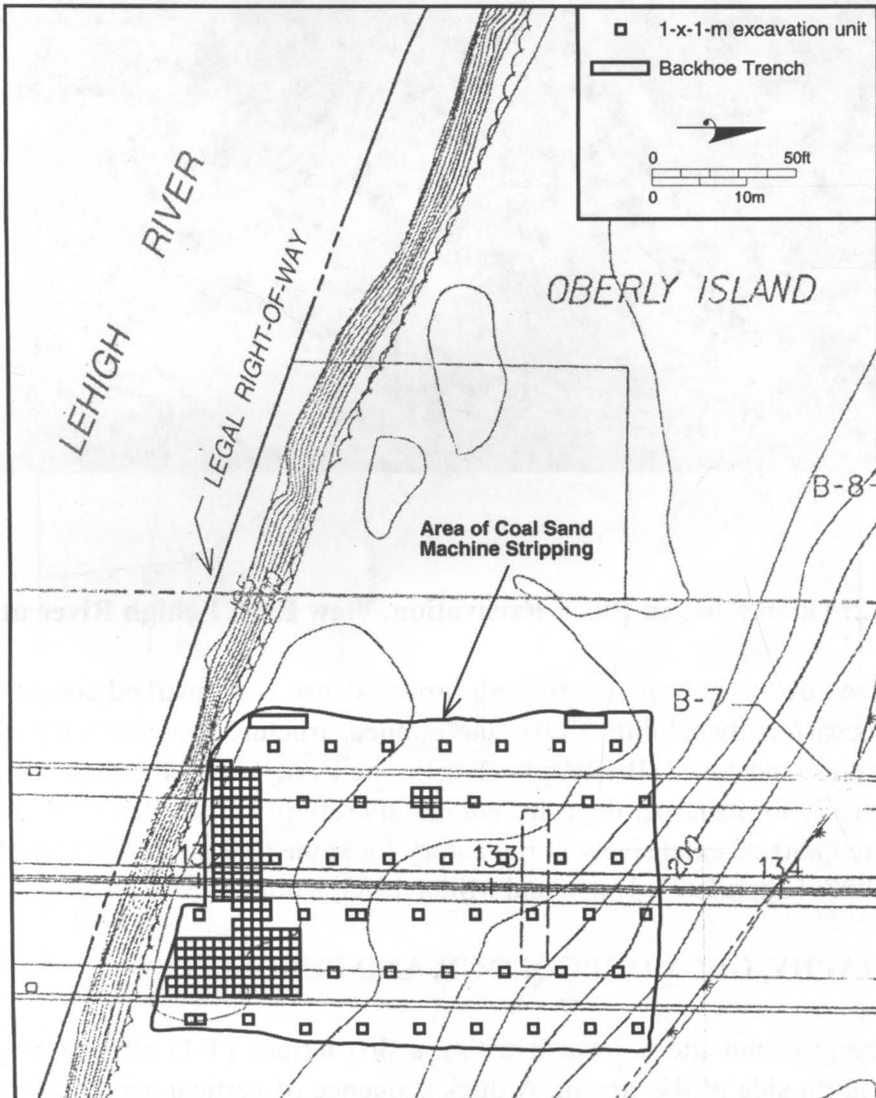


Figure 3: Site Map Showing Areas of Mechanical Stripping and Excavation Unit Locations

Pedological and geomorphological investigations conducted within the lower Lehigh Valley have documented both vertical-accretion and lateral-accretion deposits in alluvial environments, in which weak to strong soil development has occurred (Vento n.d.; Wagner 1989, 1993, 1999). Both argillic and cambic B-horizons were identified, indicative of at least minimal to extended landscape stability and of late Pleistocene/early Holocene to late Holocene terrace ages. A thick deposit of coalwash capping the prehistoric and early historical surface is common throughout a majority of the main-stem valley, derived from mine runoff that flowed into the river. The coal particles were incorporated into the suspended load of the stream, and were deposited as overbank alluvium during flood events. The construction of numerous dams along the river during the nineteenth century served to elevate the pool level of the river, thus increasing flood frequency and facilitating alluviation. However, the frequency of overbanking has decreased within the past several decades, as the terrace surfaces have aggraded to sufficient heights above the pool level to preclude lower-energy floodwaters from overtopping the banks. Strongly developed soil profiles are present across most of the upland landforms in the region, the result of a weathering history extending back to the Pleistocene epoch.

The intra-site stratigraphy included four major stratigraphic units: plowzone (Ap-horizon), E/BE-horizon, upper Bt-horizon, and lower Bt-horizon (e.g. Figure 4). These stratigraphic units generally correspond to the Late/Middle Woodland (Ap and E/BE), Late Archaic (upper Bt), and Early/Middle Archaic lower Bt) periods. The distincitive stratigraphy served to structure the analysis of spatial and vertical patterning in artifact and feature distributions.

RESULTS

Radiocarbon Dates

Table 1 presents the seven radiocarbon dates obtained from Oberly Island. All dates are based on single pieces or discrete clusters of charcoal. Charcoal samples were taken from both feature and non-feature contexts. Artifactual associations vary from excellent to absent. While the lack of some artifact associations is bothersome, it is gratifying that all seven dates correspond perfectly to their vertical stratigraphic provenience.

Features

All told, 26 features were identified at the Oberly Island site (Table 2). These consist of hearths (n=8), scattered hearths (n=8), rock pavements (n=3), postmolds or small pits (n=2), lithic workshop (n=1), unidentified soil anomalies (n=3), and an historic horse or mule burial (n=1).

Hearths (n=8) Hearths are represented by well-defined, relatively small, dense concentrations of fire-cracked rocks and unmodified cobbles. In profile they range

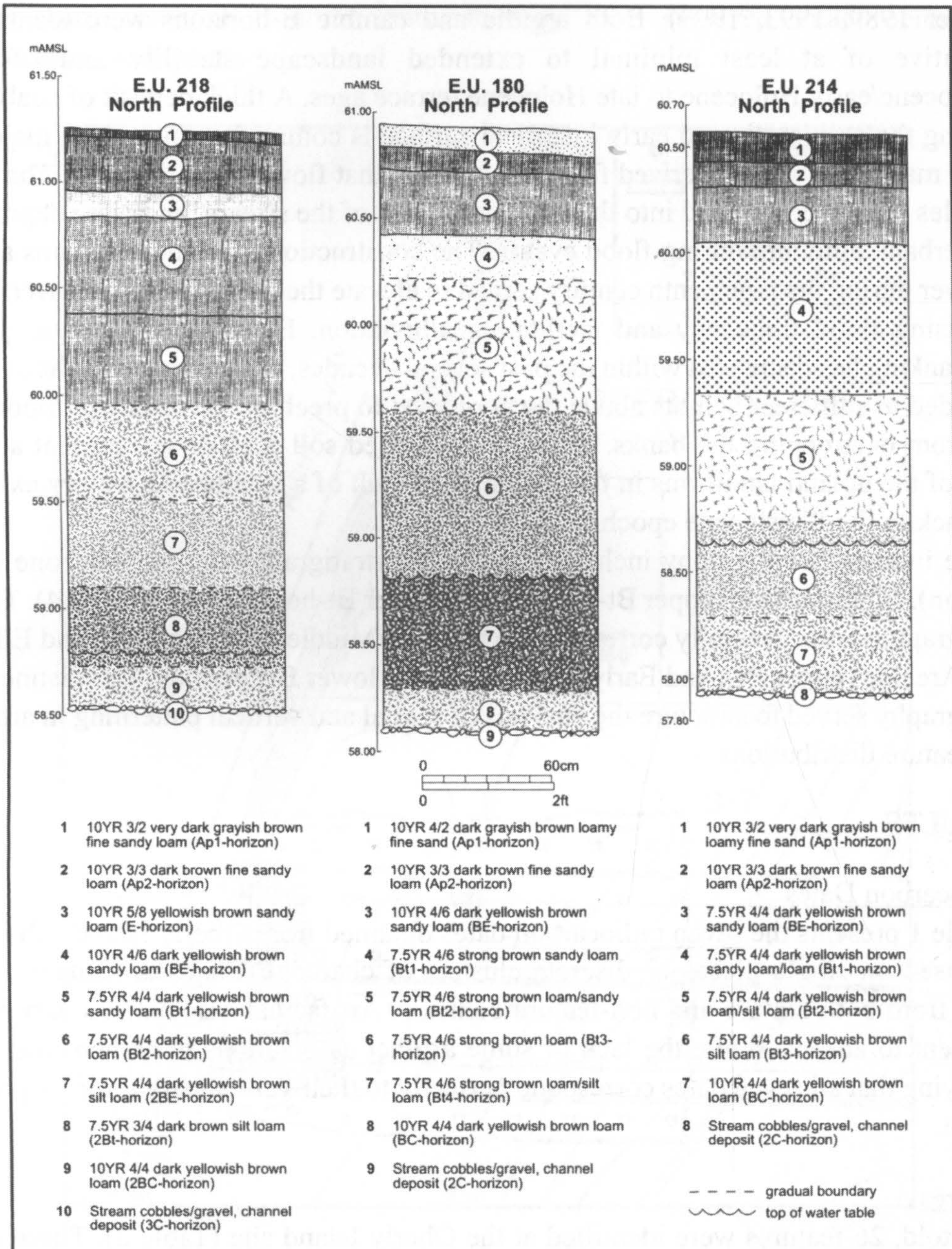


Figure 4: Typical Soil Profiles

Lab Sample No.	Context	Conventional Radiocarbon Age (BP)	Calibrated Results (2 sigmas)
Beta-105799	Feature 22, small stain with pebbles and cobbles (60.65-60.44 m AMSL)	1680±70	AD 225-550
Beta-105331	Feature 24,cobble concentration (60.31-60.28 m AMSL)	2010±70	180 BC-AD 135
Beta-105803	EU 217 (60.39 m AMSL)	4460±60	3350-2915 BC
Beta-105802	EU 171 (60.05 m AMSL)	6340±70	5425-5095 BC
Beta-105328	EU 131 (60.72 m AMSL)	900±60	AD 1015-1265
Beta-105330	EU 188 (60.64 m AMSL)	1920±100	150 BC-AD 350
Beta-108183	Feature 20, pavement of fire-cracked rocks (60.68 m AMSL)	2950±100	1295-1000 BC

Note. All radiocarbon dates are based on charcoal samples.

Table 1. Radiocarbon Dates Obtained from the Oberly Island Site.

from surface layers of rocks to shallow basin-shaped pits. Hearth fill occasionally includes fragments of charcoal and reddened soil. Similar small stone hearth features have been documented for numerous sites in the Delaware Valley. Cavallo (1987:183-201) interprets many of these features as "stone-boiling container dumps" or "stone caches", rather than hearths, based on physical attributes of the rocks and lack of obvious in situ burning. Kinsey (1972g:323, Fig. 101; 1972e:292, Fig. 93) documented two small rock-filled hearth surrounded by six and nine postmolds at two separate sites, and suggests that these features may have functioned as food-drying racks or small sweat lodges. All interpretations of these features center around heat-producing facilities in general and, except for the sweat-lodge hypothesis, cooking activities specifically.

Scattered Hearths (n=8) Scattered diffuse hearths are defined as moderate concentrations of fire-cracked rocks and cobbles. In plan view the boundaries of these features are not as clear as hearths. Generally, scattered diffuse hearths are larger than hearths, although a certain amount of overlap is evident. Cavallo (1987:170) suggests that similar features identified in the Area B site "represent the culling and discarding of smaller stone fragments after their use within the rock ovens."

Rock Pavements (n=3) These are large, moderately dense to dense concentrations of fire-cracked rocks and cobbles. Two of these features were identified in the BE-

Feature Number/ Soil horizon	Length (m)	Area (m^2)	Feature Type
31/Ap	-	-	horse/mule burial
13/BE	3.25	2.75	Pavement
21/BE	5.2	4.5	Pavement
17/BE	.63	.53	Hearth
18/BE	1.75	1.25	Hearth
24/BE	1.5	1.42	Hearth
12/BE	1.5	1.0	scattered hearth
12A/BE	-	-	scattered hearth
25/BE	2.6	1.5	scattered hearth
27/BE	1.1	.55	scattered hearth
28/BE	1.1	.8	scattered hearth
15/BE	.43	.40	postmold/small pit
23/BE	.4	.35	postmold/small pit
19/BE	.3	.3	unidentified soil anomaly
22/BE	.83	.73	unidentified soil anomaly
11/Upper Bt	.5	.46	hearth
14/Upper Bt	-	-	hearth
34/Upper Bt	.48	.33	hearth
26/Upper Bt	1.0	.95	scattered hearth
29/Upper Bt	-	-	scattered hearth
30/Upper Bt	3.3	2.3	scattered hearth
20/Upper Bt	6.0	3.0	pavement
10/Lower Bt	.8	.65	hearth
32/Lower Bt	1.4	.85	hearth
33/Lower Bt	.625	.59	lithic workshop
16/Lower Bt	.25	.25	unidentified soil anomaly

Table 2. Dimensions of Features Identified in the Oberly Island Site.

horizon (Features 13, 21). Feature 13 extended into portions of seven excavation units, while Feature 21 was present in portions of 15 excavation units. Feature 20 (Figure 5) was discovered in the upper Bt-horizon, and was a large pavement of densely packed fire-cracked rocks and unmodified cobbles, similar to those identified in the overlying BE-horizon. The portion of excavated feature is approximately 6 x 3 m in area. The feature extends into the south wall, and the estimated area of Feature 20 is approximately 24 m2. A conventional radiocarbon date for this feature is 2950±100 BP (1295-1000 BC cal, 2 sigmas). The 2-sigma calibrated date range falls within the Late/Terminal Archaic period. In outline, this feature is similar to the "giant hearth" associated with the Early to Middle Woodland component of the Harry's Farm Site (Kraft 1975:50-51, Figs. 29 and 31). At approximately 110 m2, however, the Harry's Farm feature dwarfs Feature 20 from Oberly Island. While artifacts were recovered from within all pavement features, most artifacts in these levels were distributed around the peripheries of the features, suggesting that general activities were conducted in relation to the heating facilities.

These features generally have been interpreted to be platform heating facilities for the cooking and drying of the large numbers of fish, especially anadromous varieties, that undoubtedly were a major resource collected during the spring and summer spawning seasons (e.g. Kraft 1970, 1972). Seventy-five species of native fish are known for the Delaware River (Cooper 1983; Schmidt 1986).

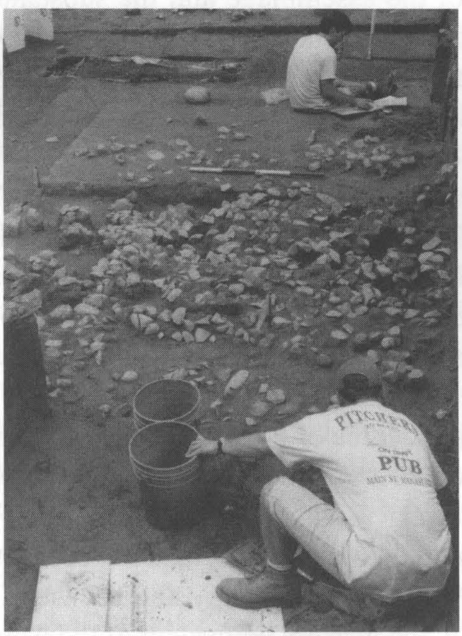


Figure 5: Platform Hearth Feature 20, View Northeast

Postmolds or Small Pits (n=2) Postmolds or small pits are defined as small circular stains in plan view and shallow basins in profile. As the name implies, the precise function of these features remains problematic.

Lithic Workshop (n=1) Feature 33 consisted of a small concentration of jasper flakes and blocky fragments, biface fragments, and cores. No soil stain or pit outline was discernible. The feature may be a product of a small number of tool-chipping episodes. The feature is positioned within a low-artifact-density section of the large block excavation area. It is notable that this jasper work locus is situated within the lower Bt-horizon, the layer that produced the least amount of jasper from the site.

Unidentified Soil Anomalies (n=3) As indicated, these three amorphous soil stains are of unidentified function.

Historic Horse or Mule Burial (n=1) Feature 31 was the only feature identified in the Ap-horizon. The feature is a deep historic pit that contained the skeleton of a horse or mule; the pit intruded into the prehistoric deposits. The horse or mule may have been used in the operation of the nearby Lehigh Canal.

Lithic Assemblage

Due to the sheer size of the assemblage and the substantial level of analysis conducted on it, the results of the entire detailed analysis of the Oberly Island lithic assemblage are not presented here. Rather, the following discussion will highlight some of the more interesting and salient findings of the analysis. The comprehensive lithic analysis can be found in Siegel et al. (1999).

Lithic Raw Materials. The major raw materials represented in the lithic assemblage include chert, jasper, quartzite, and chalcedony. Other materials that occur in trace amounts include quartz, argillite, and rhyolite. The locally derived jasper is associated with the Hardyston formation. This formation is distributed within an east-northeast band extending through the Reading Prong and New Jersey Highlands, and it has a high degree of bedrock exposure. Hardyston jasper occurs in a variety of colors and mottled combinations of yellow, brown, and red (Lavin and Prothero 1987; Miller 1982).

Cherts of the Allentown and Tomstown formations occur in both bedded and nodular forms and are largely black in color. Gray and brownish gray cherts are recorded for the Richland formation, the western equivalent of the Allentown formation. Oberly Island is positioned close to both the Allentown and Hardyston formations. Cherts associated with the Beekmantown dolomites and limestones are somewhat more variable in color, ranging from black to gray to white. In addition to potential sources near those of the Allentown and Tomstown formations, good exposures have been noted in central Berks County at the border of the Reading Prong and the Great Valley (Snethkamp et al. 1982:7.13).

Quarrying and extensive reduction of quartzite have also been associated with the Hardyston formation. The Hardyston formation becomes increasingly thicker oward the southwest and reaches its greatest thickness, approximately 700 feet, on South Mountain (Aaron 1979:29; Buckwalter 1973). Locally derived quartzites are generally pastel in color, with whites and tans dominating over pink and light gray varieties.

Argillite is contained within the Lockatong formation, a Late Triassic lithofacies belonging to the Newark Group in central New Jersey and Pennsylvania. Narrow bands of this bedrock type occur south of Oberly Island in Bucks County, crossing the Delaware valley (Kingsley et al. 1991).

Projectile Points The Phase III excavations produced 75 projectile points. In general, the stratigraphic positioning of the point types corresponds to the appropriate chronological units (Figure 6). Ten points each of the Madison and Levanna types (Late Woodland) were collected from the plowzone. The remaining eight plowzone point types include Orient Fishtail (n=2), Dry Brook Fishtail (n=1), Lackawaxen (n=2), Brewerton Side-notched (n=1), and unidentified (n=2). The Orient and Dry Brook Fishtails and the Lackawaxen points date to the Late/Terminal Archaic Period. The Brewerton point is Middle to Late Archaic in age. Mean size measurements (length, width, thickness) for the points indicate that the Levannas are somewhat larger than the Madisons, although there is considerable overlap in the size ranges (Table 3).

The E/BE-horizon produced one Levanna and two Madison points (Table 4; Figure 7), and also generated 15 Terminal Archaic points, the latter divided among Orient Fishtail (n=6), Dry Brook Fishtail (n=1), Lehigh (n=1), Koens-Crispin (n=1), and Lackawaxen (n=7). In addition, one Brewerton Corner-notched and seven unidentified points were collected from the E/BE-horizon (Table 4; Figure 7).

Thirteen Terminal Archaic points were collected from the upper Bt-horizon, including Orient Fishtails (n=2), Susquehanna Broadspears (n=2), one Perkiomen Broadspear, and Lackawaxens (n=7) (Table 5; Figure 8). One Palmer Corner-notched point was recovered. The finding of three triangular points deeply buried in the site (lower portion of the upper Bt-horizon) adds to a growing recognition of the Archaic Triangle point type (e.g., Cavallo 1981; Custer 1996:135-138; Stewart 1998a; Stewart nd Cavallo 1991:23). Custer (1996:137-138) and Stewart and Cavallo (1991:23) sug-

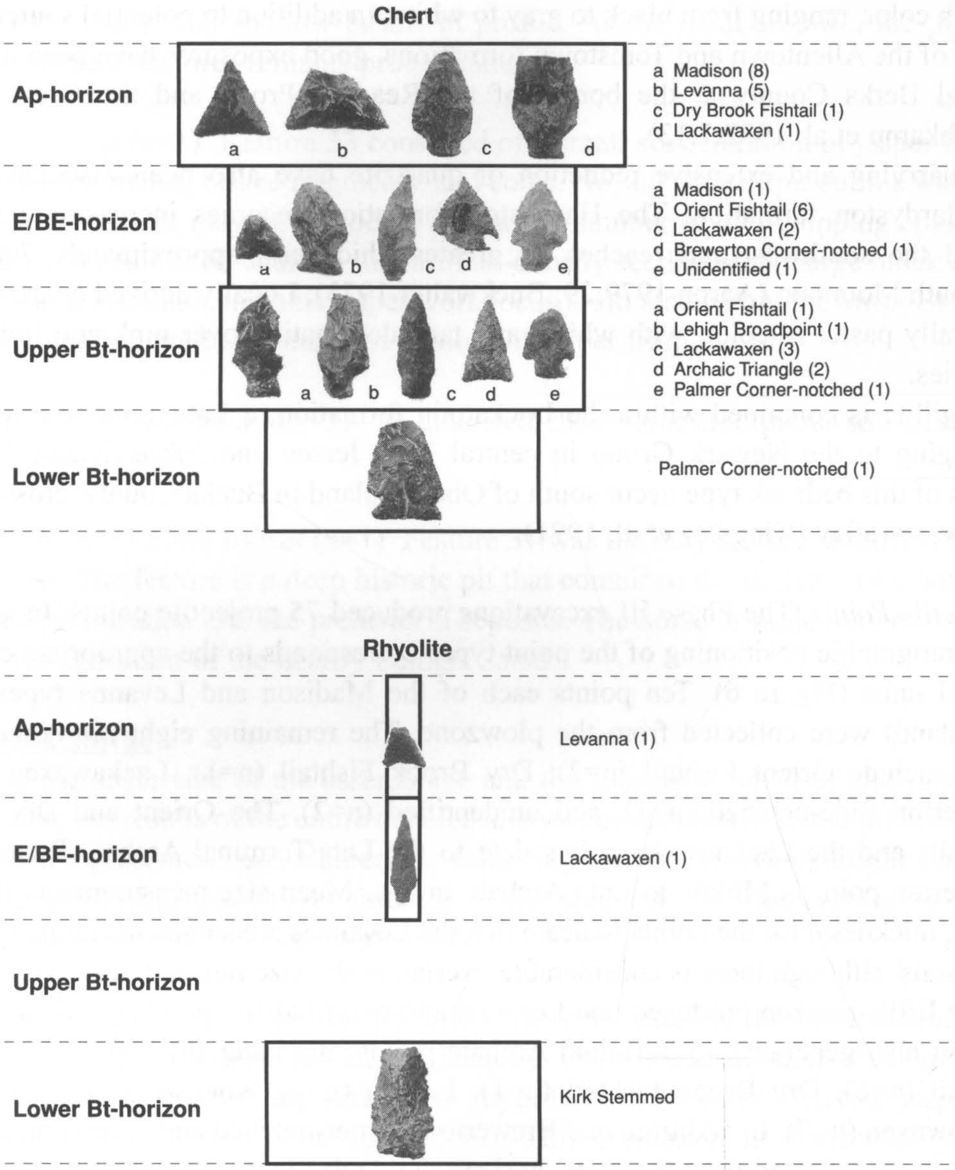
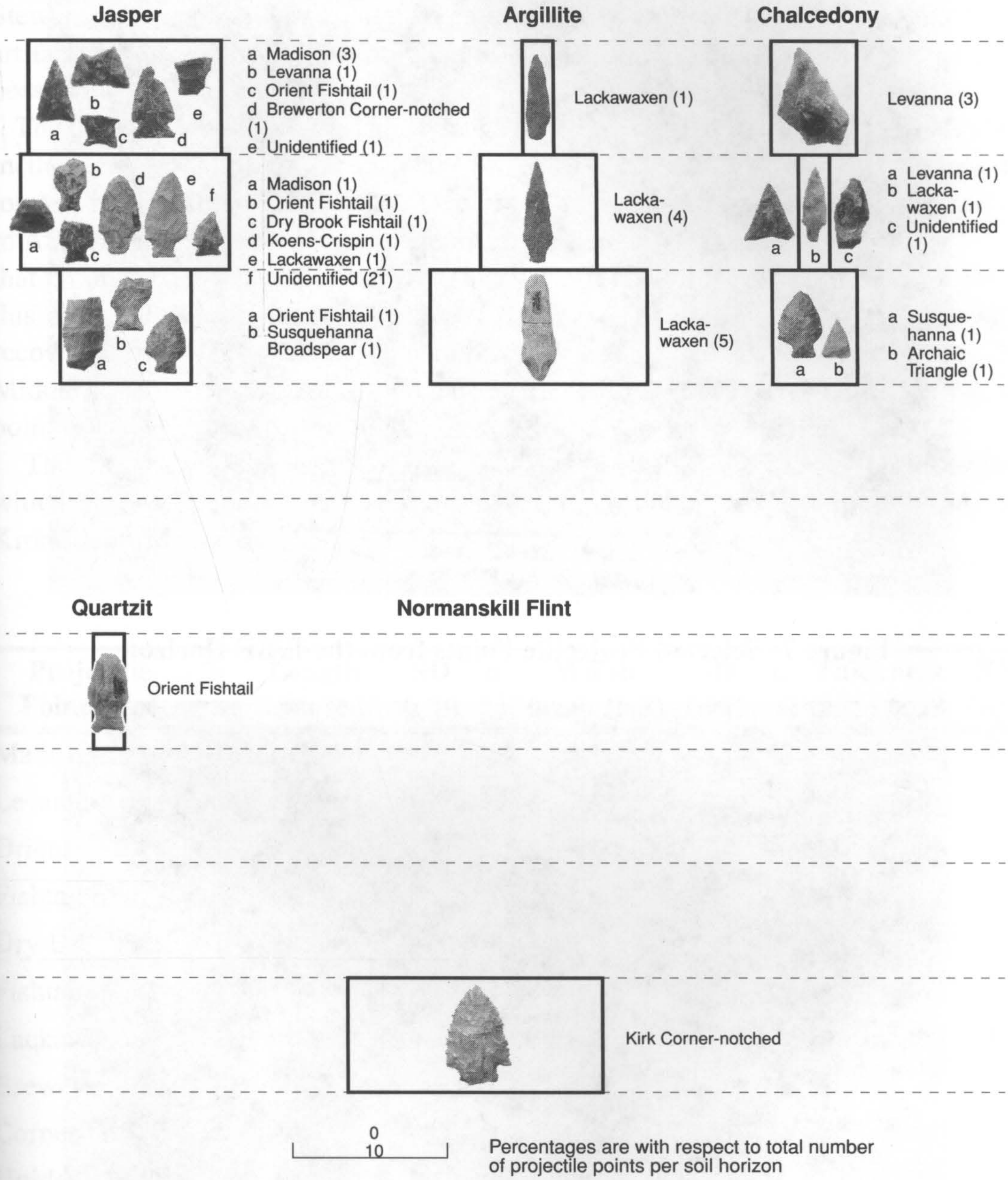


Figure 6: Projectile Point Types and Distribution


Jasper
a Madison (3)
b Levanna (1)
c Orient Fishtail (1)
d Brewerton Corner-notched (1)
e Unidentified (1)
a Madison (1)
b Orient Fishtail (1)
c Dry Brook Fishtail (1)
d Koens-Crispin (1)
e Lackawaxen (1)
f Unidentified (21)
a Orient Fishtail (1)
b Susquehanna Broadspear (1)
Argillite
Lackawaxen (1)
Lacka-waxen (4)
Lacka-waxen (5)
Chalcedony
Levanna (3)
a Levanna (1)
b Lacka-waxen (1)
c Unidentified (1)
a Susque-hanna (1)
b Archaic Triangle (1)
Quartzit
Orient Fishtail
Normanskill Flint
Kirk Corner-notched
0
10
Percentages are with respect to total number of projectile points per soil horizon

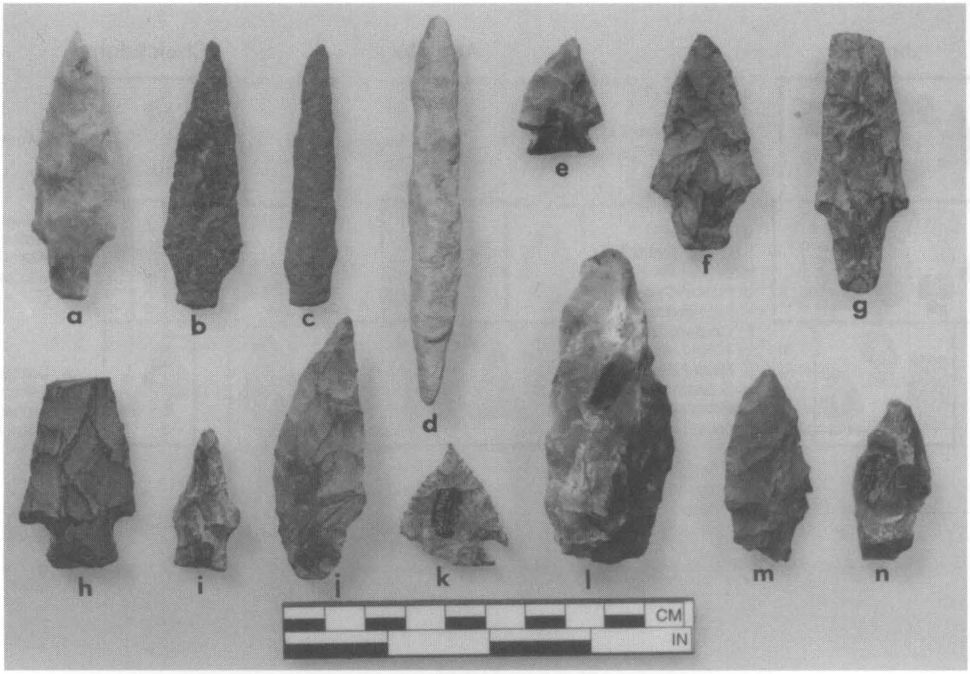


Figure 7: Selected Projectile Points from the E/BE Horizon

Figure 8: Selected Projectile Points from the Upper Bt Horizon

gested a Middle Archaic chronological association for these points, although recently Stewart indicates that they should be assigned more generally to the Archaic: "These artifacts pre-date 2100 BC and are used over a period extending to 4000/4500 BC, and possibly as early as 6000/6500 BC" (Stewart 1998a:1).

The three Oberly Island Archaic Triangles were recovered from a 24-cm band within the upper Bt-horizon (60.33-60.09 m AMSL). Horizontally the three points are located within 10 m of each other. One of the points, collected from EU 151 at 60.13 m AMSL, was positioned within one meter horizontally of a charcoal sample that produced a date of 6340±70 BP (Beta-105802) (EU 171, 60.07 m AMSL). Using this date and the relative positioning of the projectile points, the Archaic Triangles recovered from Oberly Island were likely to have been manufactured during the Middle Archaic period. This does not negate Stewart's (1998a) observation that the point type was produced at other times during the Archaic as well.

The deepest culture-bearing stratigraphic unit in the site is the lower Bt-horizon, which produced three Early/Middle Archaic points: one Kirk Corner-notched, one Kirk Stemmed, and one Palmer Corner-notched points (Table 6).

Projectile Point Type	**n**	**Length mean (cm)**	**SD (cm)**	**n**	**Width mean (cm)**	**SD (cm)**	**n**	**Thickness mean (cm)**	**SD (cm)**
Madison	10	2.09	.29	11	1.96	.27	11	.42	.07
Levanna	6	2.48	.68	10	2.81	.41	10	.54	.08
Orient Fishtail	1	4.26	-	2	2.06	.31	2	.81	.35
Dry Brook Fishtail	1	4.33	-	1	2.44	-	1	.68	-
Lackawaxen	2	4.78	.74	2	2.07	.79	2	.84	.04
Brewerton Corner-notched	1	3.76	-	1	2.25	-	1	.64	-
Unidentified	0	-	-	1	2.12	-	1	.49	-

Table 3
Summary Size Data for the Projectile Points Recovered from the Ap-Horizon of the Oberly Island Site.

Projectile Point Type	n	Length mean (cm)	SD (cm)	n	Width mean (cm)	SD (cm)	n	Thickness mean (cm)	SD (cm)
Madison	2	1.72	.08	2	2.07	.16	2	.54	.03
Levanna	1	2.85	-	1	2.57	-	1	.40	-
Orient Fishtail	7	4.42	1.17	7	1.92	.11	7	.66	.05
Dry Brook Fishtail	0	-	-	1	2.01	-	1	.56	-
Koens-Crispin	1	6.01	-	1	3.18	-	1	.86	-
Lackawaxen	9	6.89	1.48	9	2.24	.67	9	.85	.18
Brewerton Corner-notched	1	3.15	-	1	2.70	-	1	.42	-
Unidentified	4	4.07	.9	4	2.31	.37	4	.74	.15

Table 4
Summary Size Data for the Projectile Points Recovered from the E/BE-Horizon of the Oberly Island Site

Projectile Point Type	n	Length mean (cm)	SD (cm)	n	Width mean (cm)	SD (cm)	n	Thickness mean (cm)	SD (cm)
Orient Fishtail	1	5.2	-	2	2.43	.11	2	.68	.09
Susquehanna Broadspear	0	-	-	1	2.38	-	1	.84	-
Perkiomen	1	5.04	-	1	3.29	-	1	.68	-
Lehigh Broadpoint	0	-	-	1	2.51	-	1	.77	-
Lackawaxen	8	6.49	1.70	8	2.01	.44	8	.85	.23
Archaic Triangle	3	2.54	.69	3	1.85	.07	3	.45	.01
Palmer Corner-notched	1	3.96	-	1	2.94	-	1	.55	-

Table 5
Summary Size Data for the Projectile Points Recovered from the Upper Bt-Horizon of the Oberly Island Site.

Projectile Point Type	n	Length mean (cm)	SD (cm)	n	Width mean (cm)	SD (cm)	n	Thickness mean (cm)	SD (cm)
Kirk	2	4.85	.43	2	2.96	.53	2	.79	.12
Palmer Corner-notched	1	5.16	-	1	3.99	-	1	.78	-

Table 6
Summary Size Data for the Projectile PointsRecovered from the Lower Bt-Horizon of the Oberly Island Site.

Chipped-Stone Lithic Assemblage The excavation resulted in a large lithic assemblage (47,238 artifacts, including fire-cracked rocks). In total, 33,645 chipped-stone artifacts were collected, represented by the following classes of artifacts.

- Cores/core fragments (n=73, .21% of chipped-stone)
- Decortication flakes (n=5,598, 16.63%)
- Non-decortication flakes (n=25,427, 75.57%)
- Blocky fragments (n=2,208, 6.56%)
- Retouched flakes (n=24, .07%)
- Bifaces/biface fragments (n= 202, .60%)
- Knife (n=1, .003%)
- Scrapers/unifaces (n=21, .06%)
- Drills/spokeshaves (n=10, .03%)
- Projectile points (n=75, .22%)

The predominant raw material represented in the chipped-stone assemblage is jasper (19,191 artifacts [57.06%]), followed by chert (n=12,485 [37.12%]), quartzite (n=919 [2.73%]), chalcedony (n=851 [2.53%]), quartz (n=160 [.47]), and argillite (n=27 [.08]) (Table 7; Figure 9). Finally, 13,017 (1,715.28 kg) fire-cracked rocks and 417 (143.65 kg) unmodified cobbles were collected from the site.

Based on analysis reported in detail elsewhere (Siegel et al. 1999), a sequence may be pieced together regarding stone-tool production at Oberly Island. Core reduction was performed on-site, evidenced by the distribution of decortication flakes. More than 70 cores and 5,000 decortication flakes were recovered from the site. Various debitage distribution plots, except for decortication flakes, reveal an emphasis on bifacial-reduction trajectories and some resharpening of tools. The decortication flake plot suggests that core-reduction activities were conducted as well. Core

Raw Material	Plowzone	E/BE-Horizon	Upper Bt-Horizon	Lower Bt-Horizon
Chert	44	35	42	62
Jasper	48	45	30	23
Chalcedony	5	10	5	4
Quartz	1	1	5	4
Argillite	1	5	12	-
Rhyolite	1	1	-	4
Quartzite	1	1	2	-
Normanskill Flint	-	-	-	4

Note. Cores and core fragments are not included with these figures; they are included with debitage raw material distributions.

Table 7
Raw-Material Percentage Distributions of Morphologically Identifiable Chipped-Stone Artifacts by Soil Horizon at the Oberly Island Site.

reduction and biface production are not mutually exclusive activities. In the Oberly context they likely represent distinct stages in tool production. In other words, cores are reduced producing flakes that are subsequently used to manufacture bifacial implements. There is remarkable consistency in these patterns throughout the occupations of the site. In terms of chipped-stone production, all occupants of Oberly Island collected and reduced raw materials similarly.

The predominant raw materials used in the production of stone tools by the Oberly Island occupants were jasper and chert (Table 7). The earliest occupations (Early/Middle Archaic), represented by the lower Bt-horizon assemblage, relied primarily on chert, followed by jasper and quartzite. Chipped-stone artifacts recovered from the upper Bt-horizon (Late Archaic) were almost evenly divided between chert and jasper, followed by quartzite. The E/BE- and Ap-horizons (Late/Terminal Archaic, Late Woodland) were dominated by jasper, followed by chert and quartzite.

Shifts in raw-material selection in the Delaware Valley have been noted by others as well (e.g., Bergman et al. 1992, 1994; Robertson and Kingsley 1994; Stewart 1994).

At the Padula and Sandts Eddy sites, Bergman and his colleagues have documented a significant increase in the use of jasper by the Terminal Archaic period, compared to earlier periods. Robertson and Kingsley (1994) observed a shift from a predominant use of argillite in the Late/Terminal Archaic occupations to chert and jasper in the Early through Late Woodland occupations of the Lower Black's Eddy site. In that case, the shift is from the use of argillite to fine-grained cryptocrystalline silicates (chert and jasper). In the Oberly case, fine-grained cryptocrystalline silicates predominate throughout the occupations; variability occurs within this group (jasper vs. chert). Emphasis on chert and jasper at Oberly Island is explained by close proximity to the Hardyston and Allentown formations.

Chronological shifts documented for specific raw materials may relate to settlement, mobility, and intergroup exchange patterns. Models of regional

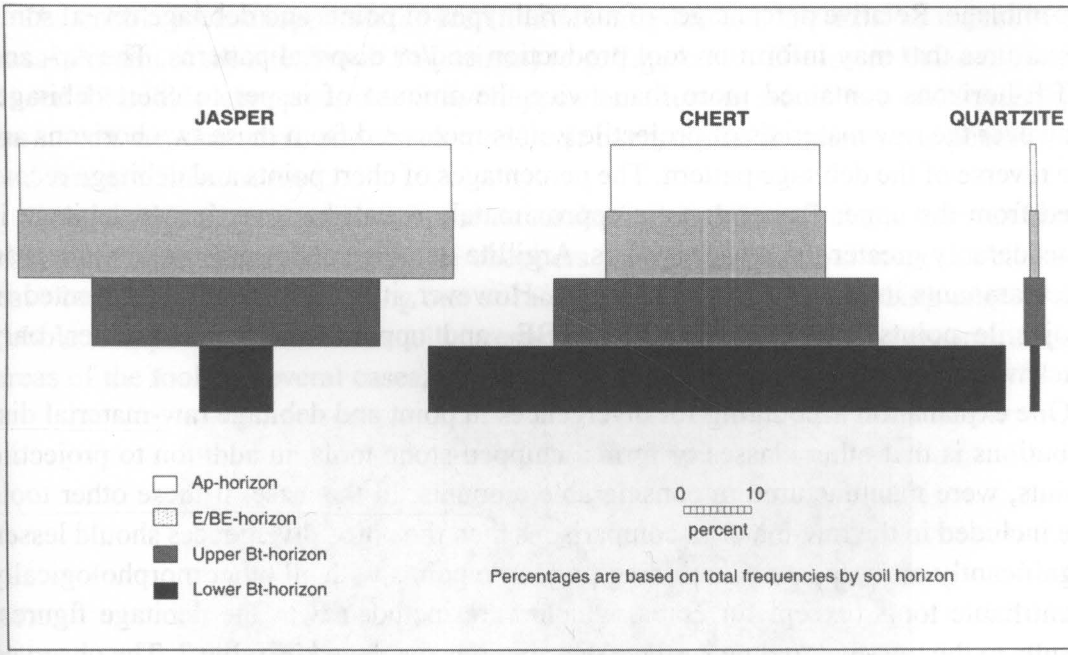


Figure 9: Chipped Stone Raw Material by Soil Horizon

settlement patterns depict wide-ranging territorial distributions for Paleo-Indian and Early Archaic cultures, which relate to demographic and early post-Pleistocene environmental factors. Low population densities combined with a patchy environment selected for highly mobile groups of hunters and gatherers (Custer 1996:105-107). As intrinsic rates of reproduction resulted in larger group sizes in the context of a gradually ameliorating environment, groups settled in to local environments and territorial ranges decreased in size (Caldwell 1958). Custer (1996:165-166) has argued that lifeways during the Late Archaic, Early Woodland, and Middle Woodland periods were similar, and included larger groups that participated in far-flung exchange networks. The elevated quantities of jasper in the upper Bt- and E/BE-horizons of Oberly Island may be related to emerging exchange networks in the Middle Atlantic region and perhaps farther. If jasper was becoming a more widely sought material as formal exchange networks were being established, then the procurement and processing of this material should become increasingly more evident beginning with the Late Archaic period.

The majority of points recovered from the site were manufactured from chert or jasper, which correspond to the major raw materials represented in the overall lithic assemblage. Relative percentages of material types of points and debitage reveal some departures that may inform on tool production and/or disposal patterns. The Ap- and E/BE-horizons contained more than twice the amount of jasper to chert debitage. However the raw materials of projectile points recovered from these two horizons are the reverse of the debitage pattern. The percentages of chert points and debitage recovered from the upper Bt-horizon are approximately equal; however jasper debitage is considerably greater than jasper points. Argillite debitage is not present in more than trace amounts in any of the soil horizons. However, it is prominently represented in projectile points recovered from the E/BE- and upper Bt-horizons. Further, only Lackawaxen points are manufactured from argillite.

One explanation accounting for divergences in point and debitage raw-material distributions is that other classes of formal chipped-stone tools, in addition to projectile points, were manufactured in considerable amounts. In this case, if these other tools are included in the raw-material comparisons then the noted divergences should lessen significantly or disappear. Combining projectile points with all other morphologically identifiable tools (except for cores, which were included with the debitage figures) results in the raw-material percentage distributions displayed in Table 7. The observed divergences decrease somewhat but not appreciably, thus not accounting for the differences.

Alternatively, not all tools that were manufactured/repaired on site are present. Tool production, use, maintenance, and disposal frequently occur in different locations within a settlement and subsistence round, especially in the context of mobile hunters and gatherers (e.g., Binford 1978, 1979, 1980; Gramly 1984). Archaic and Woodland survival strategies in the Mid-Atlantic and Northeast regions are characterized by groups of highly mobile hunters, gatherers, and foragers. Territorial sizes are likely to have contracted and expanded depending on a specific mix of factors such as ecological/environmental perturbations, demographic fluctuations, resource availability/predictability, and social boundaries and interactions. The rates of movement and degrees of mobility may have varied through the Oberly occupations, although all groups spent one or more seasons elsewhere. This scenario is the most likely explanation accounting for the formal tool-debitage differences in raw-material distributions documented in each of the soil horizons.

Ground and Rough Stone Distributions Ground and rough stone artifacts include tested cobbles or pebbles (n=9), cobble or pebble tools/choppers (n=37), axes (n=4), celts (n=2), polishing stones/abraders (n=3), nutting stones (n=4), mano/metate/pestle (n=3), netsinkers (n=18), hammerstones (n=61), anvils (n=3), bannerstones (n=3), and fragments of steatite (n=101).

The cobble tools/choppers/axes are an interesting lot, and are most abundant in the basal stratum of the site (lower Bt-horizon) (e.g. Figure 10). The lower Bt-horizon produced 19 cobble choppers, one core/chopper, one nutting stone, two netsinkers, one hammerstone, one anvil, one abrader, one celt/bannerstone fragment, one pebble tool, and one groundstone disc.

Considerable diversity exists in the technological and formal characteristics of the chopping implements. Many of the choppers are fabricated from river cobbles that have been carefully flaked along one or more sides to produce a working edge. Other cobble choppers were more casually prepared with impromptu flaking on one or more areas of the tool. In several cases, cobble chopping edges were unprepared,

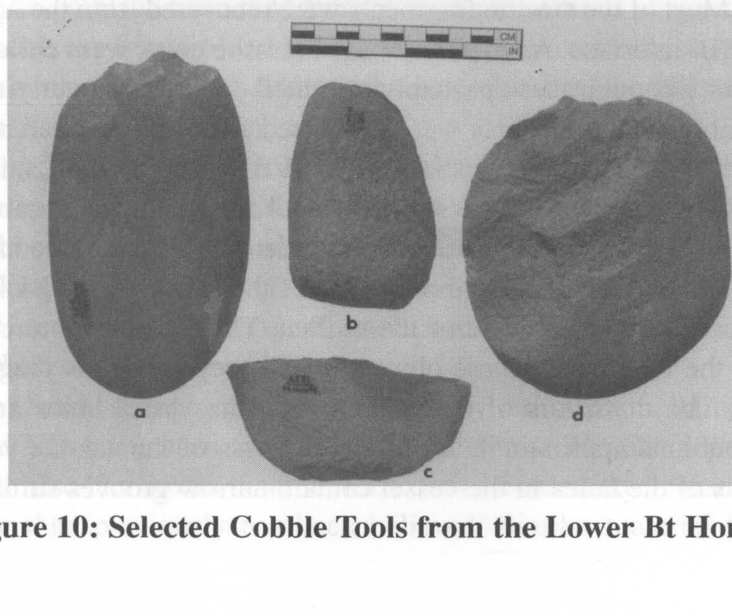


Figure 10: Selected Cobble Tools from the Lower Bt Horizon

and use-derived flaking was present. Sometimes it is difficult to distinguish purposeful-expedient from use-derived flaking. One chopper displayed a combination of careful regular and impromptu expedient flaking.

Cobble and pebble tools are common elements of Delaware Valley assemblages (e.g., Kinsey 1972c:245, 1975:57-58; Kinsey and McNett 1972:214; Kraft 1970:84-96, 1975:95-118; McNett 1985:98, 109; Wall et al. 1996:45-46; Werner 1972:80). In his investigations of the Tocks Island area, Kraft (1975:95) observed that, in general, the cobble and pebble industry was emphasized during the Late Woodland period, though he recovered five teshoa choppers, a cobble chopper, and several netsinkers from the Early Archaic horizon of the Harry's Farm Site (Kraft 1975:11, Fig. 8). He notes that teshoas, as expedient chopping and scraping implements, were used initially during the Early Archaic period but increased considerably in frequency during the Late Woodland period (Kraft 1975:102).

The frequency of chopping tools documented at Oberly Island is considerably higher in the lower Bt-horizon than in other strata. The upper Bt-horizon also produced a relatively greater number of chopping tools. The Oberly Island distribution indicates that chopping activities were emphasized in the earlier occupations of the site (Early to Middle Archaic). The edges of the cobble choppers reveal considerable crushing and microflaking, suggesting their use in woodwork. In contrast to choppers, netsinkers were not present in great amounts in the lower Bt-horizon. The upper Bt-, E/BE-, and Ap-horizons each yielded approximately equal numbers of netsinkers, suggesting greater emphasis on net fishing beginning with the Middle Archaic Period.

Steatite artifacts are represented to some extent in all of the soil horizons. In total, 101 steatite items were tabulated from the site, 89 percent of which are small fragments or chips. Most of the steatite fragments were recovered from the Ap-horizon and the E/BE-upper Bt interface. A small amount of steatite chips were collected from the lower Bt-horizon, although these probably migrated down from overlying deposits.

Three enigmatic steatite artifacts were recovered from the site, referred to here as "nubbins" (Figure 11). They were located at the E/BE-upper Bt-horizon interface, the same stratigraphic context for most steatite vessel fragments. The nubbins range in diameter from .75 to .88 cm and .80 to 1.12 cm in length. Two to three narrow grooves encircle the barrels of each of the nubbins. One of the specimens is broken obliquely, resulting in a tooth-like appearance of the artifact. The other two are complete. One explanation for the function of these objects is that they served as plugs for holes in steatite vessels. The diameters of the nubbins and the vessel holes aresimilar. The lengths of the nubbins approximate the wall thickness of the steatite vessel. Finally, the interior walls of the holes in the vessel contain narrow grooves similar to those

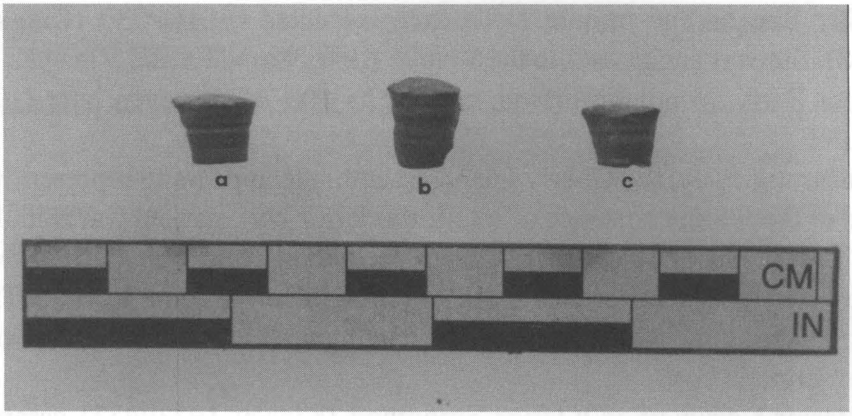


Figure 11: Steatite Nubbins

identified on the nubbins. Alternatively, the nubbins might be byproducts of drilling holes in a steatite vessel. That is, if a hollow reed drill is used together with sand as an abrasive, it is conceivable that when the hole is completed a steatite nubbin or plug will result. However, a reed drill technique was not used to drill the holes in the recovered steatite sherds. Those holes are biconical in shape, wider at the interior and exterior surfaces of the vessel.

A partially completed steatite bannerstone was recovered from the E/BE-upper Bt-horizon interface in EU 152. The bannerstone is complete except for the hole drilled through the centrum.

<u>Ceramic Analysis</u>

The ceramic assemblage from the Oberly Island site consists of approximately 1,455 sherds. Rimsherds are few (n=18; 1.3%); body sherds are many (n=1,437; 98.7%). Six ceramic types and/or classes are distinguishable within the Oberly Island assemblage, and are summarized in Table 8 and below.

Typologically, the Interior/Exterior Cordmarked ceramics at the Oberly Island site bear strong resemblance to the Early Woodland Vinette I type (Ritchie 1965). Several sites in the Abbott Farm locality near Trenton have produced ceramics referred to as Ware Va and VIa, which Stewart (1998b:55-56, 60-61) regards as the local equivalent of Vinette I. Ware Ia is similar but employs shell temper (Stewart 1998b:33-34), which is absent at Oberly.

None of the Oberly sherds were directly dated by radiocarbon, though Vinette I and Wares Va and VIa have been well-dated to the Early Woodland period. However, recent research also has shown that interior/exterior-cordmarked ceramics persist considerably later than previously has been believed. Similar material from the Lower

Blacks Eddy Site on the middle Delaware was dated to AD 330 (Kingsley et al. 1991:97-98). Stewart suggests that the Vinette I-like Wares Va and VIa span the early-through-later Early Woodland period, ca. 1200 - 100 BC, or even later (1998b:165-167).

Based on stratigraphy, the Oberly Island assemblage appears to represent yet another example of the later persistence of interior/exterior-cordmarked wares in the greater Delaware Valley. All of these sherds were recovered from either the plowzone or, mostly, the underlying BE-horizon; none were found below about Level 5. They occur in the same levels as various other later types dating well into the AD era, strongly suggesting contemporaneity.

The Exterior Cordmarked/Interior Smoothed (Kinsey 1972i:453) ceramics from Oberly Island appear to be contemporaneous with the Interior/Exterior Cordmarked, as well as other types. The co-occurrence of these ceramics has been noted at many sites in the greater Delaware Valley, including the Abbott Farm (e.g., Stewart 1985:16; 1998b:167, 175) and Lower Blacks Eddy (Kingsley et al. 1991). Vertically, these sherds occur predominantly in the BE-horizon, with lesser frequencies in the Ap- and upper Bt-horizons.

The Oberly Island ceramic assemblage is dominated by the Overpeck Incised type (Kinsey 1972i:471-472). Over 1,000 sherds of the type were recovered, accounting for 76.5 percent of the pottery (Figures 12-14). The Oberly Overpeck Incised assemblage bears very close resemblance to ceramics from the Overpeck type site on the Delaware in Bucks County (Forks of the Delaware Chapter 14 1980:22-25). Decorative motifs are nearly identical and include rectilinear plats (see especially Forks of the Delaware Chapter 14 1980:Fig. 17d), triangles, and ladders, sometimes accompanied with bordering rectilinear punctations. Vessel rim forms, so far as can be reconstructed from the Oberly sample, also appear identical, consisting of a slightly constricted neck. Most body sherds at the Overpeck site were cordmarked, which contrasts with the predominantly smoothed-exterior Oberly assemblage. The Oberly Overpeck Incised is also very similar to pottery from several sites in the Abbott Farm locality, specifically Wares XIIIa, XIIIb, XVa, XVb (Stewart 1998b:106-108, 119-122). Finally, the Overpeck sherds display a goodly number of repair holes, at least four.

Regarding the atypical "Overpeck Punctate," the closest parallels found to the Oberly specimens derive from the Abbott Farm locality, Wares XIIIa, XIIIb, XVa (Stewart 1998b:106-108, 119-122). Similarities are close but nonetheless remain "generic"; the Abbott Farm pottery tends toward oval punctates, while the Oberlyindicates, this type is decorated with parallel horizontal or oblique cord-wrapped paddle-edge impressions on the rim and upper body. Also, appliqué collars are characteristic. The Overpeck report suggests that this type is Owasco-related and

Type	Number of Rim Sherds	Number of Body Sherds	Total Number of Sherds	Temper	Remarks
Interior/Exterior Cordmarked	0	92	92	Chert, quartz	Interior cordmarked horizontal, exterior cordmarked vertical
Exterior Cordmarked/ Interior Smoothed	0	95	95	Quartz, granitic rock	Cordmarking symmetrical to sloppy
Overpeck Incised	18	1047	1065	Quartz, gneiss	Includes cordmarked and smoothed sherds
Overpeck Punctate	0	15	15	Quartz, gneiss	Unusual hemiconical punctuates
Linear Corded	0	23	23	Quartz, granitic rock	Resembles Sackett Corded
Untyped/ Unclassified/ Crumbs	0	159	159	Grit	
Total	18	1431	1449		

Typological Assignments of the Prehistoric Pottery Recovered from the Oberly Island Site

probably dates later than Overpeck Incised (Forks of the Delaware Chapter 14 1980:27), which seems reasonable. In any case, no sherds remotely resembling Overpeck Paddle-Edge Stamped were found at Oberly Island, and the absence of this type might support the inference of its later temporal placement.

A radiocarbon date of AD 1050 (uncalibrated) was obtained on charcoal from the floor of EU 131, Level 3 (41 cmbd). This level produced an Overpeck Incised rimsherd with platted decoration, which consists of five sizable sherds that refit (Figure 14). This date is altogether appropriate for the Overpeck type (e.g. Stewart 1985:28-29, 1998b:106-108, 119-122), indicating a temporal position toward the early end of the Overpeck time span (ca. AD 700/800-1600). The charcoal from which the date was derived was not found in a recognized feature, but rather in the floor of the unit in a discrete concentration. Significantly, three of the five refitting sherds were found in direct, secure association with the charcoal.

Feature 22 yielded one Overpeck cordmarked body sherd and produced a date of AD 270 (uncalibrated). This date is considerably too early for Overpeck ceramics, and the calibrated date range of AD 225-550 is too early as well. It is likely that the single small sherd is intrusive from levels above, somehow working its way down into the feature.

Stratigraphically, the overwhelming majority of Overpeck Incised sherds derived from the Ap-horizon (n=875; 82.1%). The underlying BE-horizon yielded 168 sherds (15.7%), with the upper and lower Bt-horizons producing 11 and three sherds, respectively. The 15 Overpeck Punctate sherds all derive from the plowzone.

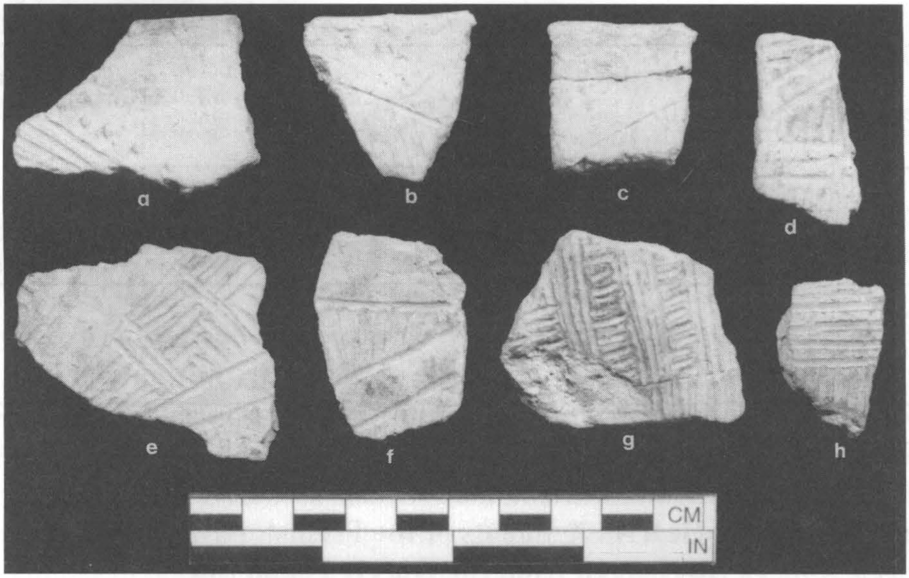


Figure 12: Selected Overpeck Incised Sherds

The small amount of linear cord-impressed pottery indicates minimal late-prehistoric presence at the site, and/or little Owasco-related presence or influence. The closest typological similarity appears to be the Sackett Corded type (e.g., Kinsey 1972i:462), which has also been recognized elsewhere in the Delaware valley (e.g. Kinsey 1972a; Kraft 1975; Struthers and Roberts 1982). These sherds occur almost exclusively in the Ap-horizon; one was found in the BE-horizon.

Finally, the untyped/unclassified/crumbs ceramics contribute little to the interpretation of the Oberly Island site. For the record, these sherds occur in all levels but predominate in the BE- and Ap-horizons, in that order.

SUMMARY AND CONCLUSIONS

Oberly Island was capped by 1-1.5 m of historical alluvial coalwash, of which approximately 1,660 m2 were mechanically stripped. Cultural deposits underlying the coalwash were stratified within approximately 1.5 m of undisturbed sediments. The four major soil horizons documented in the site were employed as analytical units in dividing up the assemblage. From top to bottom these include the Ap-, E/BE-, upper Bt-, and lower Bt-horizons. The Oberly Island site was discontinuously occupied from the Early Archaic to the Late Woodland periods.

The earliest occupations of the site were small, and activities centered around the use of chopping tools, locally available Allentown chert, and some Hardyston jasper. One Palmer and two Kirk points, two small hearths, and a jasper workshop were recovered from a relatively circumscribed area of the lower Bt-horizon.

The lower portion of the upper Bt-horizon yielded three Archaic Triangle projectile points. One of the points was associated with a sample of charcoal that produced a C-14 date of 6340±70 BP, placing a Middle Archaic association for this portion of the deposit. Chopping implements were still present in abundance in the upper Bt-horizon, but to a lesser extent than in the underlying horizon. Increased reliance on locally available jasper in the chipped-stone industry is evident in the upper Bt-horizon, resulting in approximately equal use of Allentown chert and Hardyston jasper at this time. Occupational intensity increased in the upper Bt-horizon, reflected by a larger and more diverse set of features compared to the lower Bt-horizon.

The upper portion of the upper Bt-horizon and the lower portion of the E/BE-horizon are associated predominantly with Late/Terminal Archaic occupations, represented by an abundance of Lackawaxen, Orient Fishtail, Dry Brook, Susquehanna, Lehigh Broadpoint, Koens-Crispin, and Perkiomen projectile points, and fragments of steatite vessels. The E/BE-horizon yielded a number of hearth features and two large pavements of fire-cracked rocks. The chipped-stone industry emphasized the use of jasper, followed by chert at this time. A sizable sample of Overpeck Incised pottery was recovered from the E/BE- and Ap-horizons. In addition, numerous Levanna and Madison projectile points were collected from the Ap-horizon.

Analysis of the chipped-stone debitage revealed a consistent bifacial industry throughout the occupations of the site, despite shifts in raw material use. Based on vertical distributions of chipped-stone debitage raw materials, Allentown chert was favored during the Early Archaic and Middle Archaic periods, with a gradual shift to

Hardyston jasper during the Late Archaic and the following periods. Both materials are fine-grained cryptocrystalline silicates and are available in the local area. The relative percentages of raw materials represented in the projectile point assemblage are approximately reverse of the debitage, by soil horizon. In addition, argillite, present only in trace amounts in the debitage, is well represented in Lackawaxen projectile points. Mobile hunters and gatherers are likely to have produced tools in locations other than where they ultimately become part of the archeological record. Differences in selection between the Hardyston jasper and Allentown chert cannot be explained by relative fracture properties; they are both fine-grained silicates. Documented shifts in raw material use through time are probably related to emergent exchange networks by the Late Archaic period.

OBERLY ISLAND IN CONTEXT
SITE DISTRIBUTION IN THE LOWER LEHIGH VALLEY

Oberly Island is a lowland site, positioned on the levee adjacent to the lower Lehigh River. The context and contents of the site represent some of the variability in prehistoric lifeways and adaptations in east-central Pennsylvania.

In order to place Oberly Island into the context of Lehigh Valley prehistory, all documented sites in the area were examined for chronology and topographic setting. Figure 15 depicts an idealized cross-section of the Lehigh Valley, showing the landforms monitored for the site settings. The Pennsylvania Archaeological Site Survey (PASS) files were systematically searched for all sites in the lower Lehigh Valley, from the Lehigh Gap downstream. The assumption underpinning this exercise is that good-sized stream valleys may have corresponded to distinctive cultural or territorial units in prehistory (Snow 1980).

Two hundred seventy prehistoric sites have been recorded within the Lehigh River drainage basin below Lehigh Gap. One hundred seventy-eight of the sites are located in Lehigh County, 77 are located in Northampton County, 13 are located in Berks County, and two are located in Carbon County, at or near the ridge line of Blue Mountain.

The majority of the identified sites (n=137; 50.7%) are located on upland, making this setting the most common landform type on which sites occur within the lower Lehigh watershed. The second most prevalent landform type is upland adjoined by stream terrace or floodplain, into which the site may or may not extend (n=42; 15.6%). Assuming that none of these sites actually extends into terrace or floodplain landforms, the upland-site total rises to 173 (64.1%). According to the respective county soil surveys (Carey and Yaworski 1963; Staley 1974; Ackerman 1970), all but one of

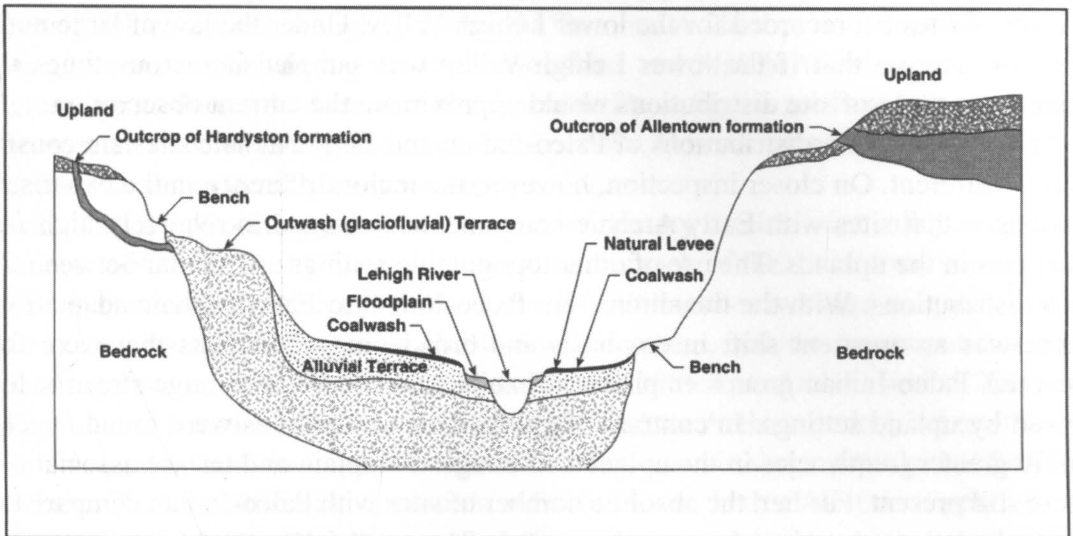


Figure 13: Idealized Cross-Section of the Lower Lehigh River Valley Depicting Landforms

the 42 sites located in both upland and possibly terrace/floodplain settings contain soils derived from nonalluvial parent material (e.g., residuum, colluvium, till), indicating that the sites may be exclusively upland. The one exception, Site 36LH116, contains both Washington and Lindside silt loams; the latter soil series is composed of alluvium. Terrace sites are the third most common landform type, composing 33 of the total (12.2%). The remaining groupings include floodplain/terrace (n=21; 7.8%), floodplain/terrace/upland (n=13; 4.8%), terrace/upland (n=11; 4.1%), outwash terrace (n=4; 1.5%), upland with possible outwash terrace (n=4; 1.5%), outwash terrace with possible alluvial terrace (n=2; .7%), alluvial terrace with possible upland (n=1; .4%), floodplain/terrace/outwash terrace (n=1; .4%), and upland/outwash terrace (n=1; .4%).

The PASS-file data are not a random sample of the population of archeological sites. Site discovery and reporting techniques range from systematic surveys and excavations conducted by professional archeologists to brief observations made by local residents. Thus, from a strict statistical sampling perspective it may not be appropriate to generalize from this dataset. There may be some basis for generalizations, however, derived from the law of large numbers (Papoulis 1965:69-71, 263-266): "The law of large numbers could be considered as a 'link' between theory and application. Since the event ... has probability close to 1 if n is sufficiently large, we conclude that, in a single trial of the experiment ... 'with a high degree of certainty' that this event will occur" (Papoulis 1965:71). In the present discussion, the "event" would be defined as the set of sites (n) recorded for the lower Lehigh Valley. Under the law of large numbers we assume that if the lower Lehigh Valley was sampled numerous times the resulting pattern of site distributions would approximate the current observation.

At first glance, the distributions of Paleo-Indian and Early Archaic sites are considerably different. On closer inspection, however, the major difference in the two distributions is that sites with Early Archaic components are found in relatively high frequencies in the uplands. The use of other topographic settings are similar between the two distributions. With the transition from Paleo-Indian to Early Archaic adaptations there was an apparent shift in emphasis and broadening of habitats that were frequented. Paleo-Indian groups emphasized habitats associated with large streams, followed by upland settings. In contrast, Early Archaic occupations were found in relatively greater frequencies in the uplands, although floodplain and terrace associations were still present. Further, the absolute number of sites with Paleo-Indian compared to Early Archaic occupations increased from 9 to 21, respectively.

A significant decline in cultural occupations is documented for the Middle Archaic period, with an emphasis on upland settings continuing from the previous period. If the Archaic Triangle projectile point type is valid, and if it is associated predominantly with the Middle Archaic period, there may be mis-assignments of Middle Archaic sites for Late Woodland sites, especially for surface-collected assemblages. This dilemma will not be resolved until refinements are made to the relevant point types (see Stewart 1998a).

The Late Archaic period was witness to an explosion of site numbers and occupied habitats compared to previous periods. In particular, sites located on uplands, upland and alluvial landforms, and stream terraces were emphasized during the Late Archaic period. This dramatic spike in the frequency of sites and broad range of site settings corresponds to what Caldwell (1958:17) referred to as a trend "toward increasing complexity and specialization" by the "later Archaic" in eastern North America. The Terminal Archaic period represents a continuation of the Late Archaic pattern.

The Early Woodland pattern is similar to the Late/Terminal Archaic distributions, although with considerably fewer sites and a somewhat more narrow range of habitats. This trend in decreasing site numbers and fewer occupied habitats continues into the Middle Woodland period, producing a distribution similar to the Middle Archaic pattern. Finally, the Late Woodland period displays a distribution remarkably similar in site count and habitat range to the Late Archaic pattern.

Site frequency will serve as a proxy for population density in this discussion. Examining absolute numbers of sites for each of the major time periods reveals relatively low population numbers in the lower valley during the Paleo-Indian, Early Archaic, and Middle Archaic periods. A dramatic spike in the population occurs during the Late Archaic, which decreases slightly during the Terminal Archaic period. Population levels decrease considerably during the Early Woodland and Middle Woodland periods, and increase again during the Late Woodland period. These figures are based on numbers of documented sites for each of the major time periods. However, the number of years represented vary considerably between time periods.

Another view of occupational, or demographic, history for the lower valley is based on numbers of sites per 1,000 years of occupation for each of the major time periods. The shape of the standardized demographic curve is similar to the raw data curve, with important exceptions. Again, a bimodal distribution is apparent, with the first population peak occurring now during the Terminal Archaic, instead of the Late Archaic period. The trend in population increase clearly is observable by the Late Archaic period, but contrary to the nonstandardized data, population values continue to surge during the Terminal Archaic. The standardized and nonstandardized datasets both exhibit demographic collapses by the Middle Woodland period. Both datasets show a rebound in the Late Woodland population of the lower Lehigh Valley. In the standardized data, the rebound surpasses the population peak of the Terminal Archaic.

Finally, the number of habitats occupied per time period displays a curve broadly similar to the nonstandardized demographic curve, with peaks occurring in the Late Archaic and Late Woodland periods. In toto, the PASS-file data reveal suggestive patterns in the use of the lower Lehigh Valley throughout the prehistoric occupations. Except for the Paleo-Indian period, upland habitats are emphasized on the basis of site frequencies. Absent from this analysis is a discussion of site types. The site-file data are too uneven to develop diachronic settlement typologies for the area.

The Oberly Island site is a microcosm for the larger demographic patterns in the lower Lehigh Valley. Early Archaic and Middle Archaic occupations are present to a limited degree. The Late Archaic and Terminal Archaic periods are well represented with large and diverse assemblages. The Early Woodland and Middle Woodland periods are poorly represented. Finally, Oberly contains a large Late Woodland occupation.

INTERPRETATIONS AND REGIONAL COMPARISONS

The patterning explicated above in the lower Lehigh Valley generally tends to mirror that seen in the nearby Middle Delaware. Pre-Late Archaic sites are everywhere infrequent, and Late/Terminal Archaic population and site increases have been well-documented throughout the Delaware Valley (e.g., Stewart 1985; Kingsley et al. 1991; Robertson and Kingsley 1994).

Based on the Oberly Island data, Late and Terminal Archaic adaptations in the Lower

Lehigh appear similar to those in the Delaware Valley, e.g. use of platform hearths; fishing using netsinkers; use of lanceolate, broadspear, and fishtail points; and intense exploitation of local lithic raw materials. In many respects, the Lackawaxen/Piedmont Archaic and Terminal Archaic components at Oberly may be likened to that at the Lower Blacks Eddy site (Schuldenrein et al. 1991; Kingsley et al. 1991; Robertson and Kingsley 1994) downstream on the Middle Delaware, albeit writ much smaller. Procurement and reduction of locally available lithic materials were conducted at both sites, as well as seasonal fishing and fish processing through the use of platform hearths and/or stone boiling. In short, the residents of the Lower Lehigh appear to be doing largely the same kinds of things as people on the Delaware; indeed, they may have been the same people, and certainly were of the same society. The Oberly Island excavations have demonstrated that the Lackawaxen phase/Piedmont Archaic and Terminal Archaic settlement system extended at least three miles up the lower Lehigh Valley. How much further upstream it may have extended is unclear; though the PASS data include numerous references to Lackawaxen, broadspear, and Orient points recovered from many sites in the valley, references to platform hearths or otherwise large-scale processing facilities is lacking.

The Lehigh River is the second-largest tributary of the Delaware, the Schuylkill River being the largest. The Schuylkill lies south of the Lehigh and joins the Delaware at Philadelphia, just beyond the fall line. A synthetic analysis of prehistoric adaptations and cultural dynamics in the Lower Schuylkill Valley has been conducted by Kingsley et al. (1990; also Kingsley 1991). These researchers amassed information from the PASS files on 184 sites, including all temporal periods, and employed data from several excavated sites as well.

The Schuylkill data also indicated a dramatic increase in sites and, presumably, population throughout the Late and Terminal Archaic periods. Again, Lackawaxen phase point types and broadspears predominate in artifact assemblages; Orient points are relatively uncommon. Here is where any similarity to the Lehigh or Delaware ends, however, as Late/Terminal Archaic adaptations in the Schuylkill appear very different. Sites comparable to Oberly Island, Lower Blacks Eddy, or any of the Late/Terminal Archaic sites in the Abbott Farm locality are absent. No sites approximate anything that could be called a base camp. Evidence for fishing is nearly absent, as netsinkers are reported at only a single site in the entire lower Schuylkill. Platform hearths and/or hot rock boiling facilities have not been found in excavated sites. Rather than being used in like manner to the Delaware and Oberly Island, the lower Schuylkill Valley appears to have been used as a specialized resource procurement area, presumably for hunting, by populations residentially based in the Lower Delaware. Though the Schuylkill is the largest tributary of the Delaware, Late/Terminal Archaic populations used the area as if it was a low-order drainage, and/or an "upland-like," logistical resource base (Kingsley et al. 1990:167-177; Kingsley 1991). The precise reason(s) for this mode of use remains elusive.

The Early to Middle Woodland periods in the lower Lehigh generally mirror the Middle Delaware, at least in terms of overall population/site demographics. A pronounced drop in numbers of identified sites is observed in the Middle and Upper Delaware Valley, beginning in the Early Woodland and continuing through the Middle (e.g., Custer 1996:255-259). By contrast, Middle Woodland sites abound in the Abbott Farm locality in the Lower Delaware (e.g., Cross 1956; Stewart 1985, 1994, 1998b), and a vigorous adaptation is in evidence here. Custer (1996:255) has recently extended the range of the Abbott complex to include the Middle and Upper Delaware Valley, but explains that his doing so is merely the result of a lack of good Middle Woodland data from the upper reaches of the valley, rather than on observed similarities between the areas. A dramatic population/site drop is observed in the Lower Schuylkill Valley as well. Indeed, Kingsley et al. (1990:184-185) posit a possible occupational hiatus during the Middle Woodland period ca. AD 200-800.

It is not altogether clear whether this phenomenon reflects a real population drop or an inability by archeologists to recognize Middle Woodland components; however, given the goodly amount of archeological work that has been conducted in these three river valleys, the latter seems unlikely. In any case, the sparse Middle Woodland materials at the Oberly Island site, in concert with an apparent dearth of sites throughout the lower Lehigh Valley, suggests that whatever processes were affecting populations in the Delaware obtained in the Lehigh too. It probably goes without saying that the cause of this apparent regional population decline is not known.

For the Late Woodland period, most site identifications in the Lower Lehigh are based on the presence of triangular points, not pottery; indeed, of the 270 lower Lehigh Valley sites recorded in the PASS files, only seven (not including Oberly Island) reportedly yielded pottery, none of it identified beyond "cordmarked, grit-tempered". For the record, one ceramic site is located on the Lehigh floodplain upstream near Palmerton in a setting identical to Oberly Island, two occur on tributary creeks, and four occupy upland locations (one is a rockshelter). Overall, the diverse environmental settings of Late Woodland sites, ceramic and aceramic, reflect the settlement diversity seen throughout the Delaware Valley during this time (e.g., Stewart et al. 1986:72-73; Custer 1996:290).

In the Lower Schuylkill, a spike in Late Woodland site frequency is also apparent. As with the Late Archaic, however, the nature of the adaptation to the valley appears very different. Large and even small villages or hamlets are absent, most temporal identifications are based on triangular points, ceramics are rare, and a settlement pattern similar to that of the Late Archaic is in evidence. A high degree of environmental redundancy between site locations is apparent between the Late Archaic and Late Woodland, though the Late Archaic population was much larger (Kingsley et al. 1990:185-188). Kingsley et al. (1990:187-188; Kingsley 1991) conclude that the Schuylkill had no resident Late Woodland population, and may have constituted "open territory" used by many groups for hunting and transportation, but by no one for permanent settlement. Further, the greater Schuylkill Valley may have functioned as a societal buffer zone between Overpeck systems to the north and east, Shenks Ferry to the north and west, and Minguannan to the south.

The Late Woodland occupation at Oberly Island is dominated by Overpeck Incised ceramics; the occupation is securely radiocarbon dated to AD 1050 (calibrated AD 1015-1265). It may be observed that Oberly represents a fairly "pure" Overpeck occupation, with little Owasco-related or other material to obfuscate patterning. The inference is made herein that the makers of Overpeck Incised and related ceramics constitute a distinct socio-cultural system, different from contemporary systems elsewhere (e.g., Owasco, Minguannan). As a general observation, based largely on negative evidence, the Overpeck occupation at Oberly Island resembles Overpeck and other Late Woodland manifestations elsewhere in the Delaware Valley, e.g. large villages are not present, apparently agriculture was not practiced, defensive works are not known, no house structures are present, and no huge, Upper Delaware-type "silo" storage pits have been found (e.g., Custer 1996:289-294). Overpeck is only poorly represented in the Upper Delaware (Kinsey 1972i:471-472). Whatever the precise nature of the Overpeck settlement system was, it included the Lower Lehigh to some extent. To what extent is not known, but the paucity of ceramic-bearing sites (7 of 270, none with Overpeck) within the Lower Lehigh drainage strongly suggests that it did not extend very far upstream. On the other hand, perhaps the numerous aceramic Late Woodland sites suggest use of the valley but not actual occupation, much like the situation in the lower Schuylkill Valley.

Stewart (1998b:221) has recently remarked that "It is possible that the Lower/Middle Delaware Valley is the hearth of the Overpeck tradition." The Oberly Island data tend to support this inference, if not that the region was the "hearth" per se, then at least that Overpeck presence is demonstrable in the Lower Lehigh as well as in the adjacent Delaware. The geographical range of Overpeck is thus expanded, if only a rather short three miles. Nonetheless, Overpeck still remains rather ephemeral and not well known. Custer (1996:289-294) has summarized the Overpeck complex, and notes that the best known manifestations are located in the Abbott Farm locality in the Lower Delaware. Overpeck in the Middle Delaware is far less well-known and, moreover, some of the data presented by Custer seem questionable. In particular, of eight Middle Delaware sites cited by Custer (1996:289-294) as having Overpeck components, three may be described as modest at best: Lower Blacks Eddy yielded only seven minimal Overpeck vessels (Kingsley et al. 1991:92), the Lambertville site produced a total of three sherds (Struthers and Roberts 1982:Table 5), and the authors could find no reference whatsoever to Overpeck ceramics in Kinsey's (1975:68) report on the Byram site beyond mention that small amounts of incised sherds were present. The point to be made is that the Overpeck complex in the Middle Delaware Valley may be less well-known than even Custer acknowledges.

The foregoing brings up one final point regarding the Overpeck complex. It has become clear to the authors that tighter ceramic typological control is strongly needed if archeologists are to further investigate the Overpeck complex (or any, for that matter) with any degree of satisfaction. That is, future research into isolating just what ceramic types are and are not included in the Overpeck complex is requisite to further definition and understanding of the complex. Archeologists have lamented the bewildering plethora of type names and descriptions in the Delaware Valley for years, and the present complaint is far from new. However, it bears repeating, and emphasis. Stewart's (1998b) recent synthesis of the ceramics from the Abbott Farm sites is extremely useful and goes a long way toward rectifying this problem. Still, Delaware Valley archeologists do not know the cultural relationships represented by, for example, Overpeck Incised, Overpeck Paddle-Edge Stamped (if this type really is Owasco-related, then it does not belong in the Overpeck complex assemblage), Bowmans Brook Incised, Townsend wares, and many other contemporaneous types. Sweeping statements like "Bowmans Brook Incised, Overpeck Incised, and Townsend Ware are related pottery types" (Kinsey 1972i:472) and that they occur from "Coastal New York to the Delmarva Peninsula" (ibid.) do little to help break out the discrete socio-cultural and settlement systems represented by these ceramic wares. In short, greater emphasis on isolating ceramic types and wares as material representatives of discrete socio-cultural systems is advocated for future archeological research in the Delaware Valley.

In sum, variability in adaptations and cultural dynamics are in evidence for the Lower/Middle/Upper Delaware River valley and its two largest tributaries, the Lehigh and Schuylkill rivers. Further explication and explanation of these phenomena are required. Trends observable in the Oberly Island site and the Lower Lehigh Valley demonstrably reflect larger cultural historical patterns, and combinations of local and pan-regional factors underpin the patterns observed in the archeological record of the site. It is hoped that the discussions presented in this report will provide structure and impetus for future investigations in the region.

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