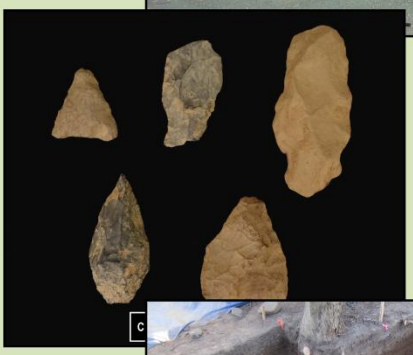

Data Recovery Archaeological Investigation Reeders Creek West Site (28Me360)

I-95 Scudder Falls Bridge Improvement Project Ewing Township Mercer County, New Jersey

Volume I

Prepared For

Delaware River Joint Toll Bridge Commission
Executive Offices
2492 River Road
New Hope, Pennsylvania 18938-9519

Prepared By

AECOM Transportation
516 East State Street
Trenton, New Jersey 08609

April 2012

Delaware River Joint Toll Bridge Commission

AECOM

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July 2012

ABSTRACT

AECOM was contracted by the Delaware River Joint Toll Bridge Commission (DRJTBC) to perform the archaeological Phase I/II/III survey work for the Scudder Falls Bridge Improvement Project. This report presents the results of the Phase III archaeological data recovery investigation of the Reeders Creek West (RCW) Site (28Me360), a multi-component prehistoric site in Ewing Township, Mercer County, New Jersey (Figure 1-1). This work was performed in order to mitigate the adverse effects on this significant prehistoric cultural resource related to the proposed improvement of the Scudder Falls/I-95 Bridge over the Delaware River. AECOM of Trenton, New Jersey, conducted Phase III field investigations between October of 2010 and February of 2011 for the Delaware River Joint Toll Bridge Commission (DRJTBC).

The RCW Site was initially identified in the Reeders Creek Center (RCC) and RCW test areas of the Route 29/I-95 Interchange Area of Potential Effect (APE) (A.D. Marble 2006). The site was situated on a high, Pleistocene outwash terrace overlooking the Delaware River. Phase I/II level investigations performed by AECOM in 2009 determined that the portion of the RCW Site within the RCW test area was an eligible prehistoric archaeological resource (Lore and Lawrence 2010). Avoidance of the site was not possible and a data recovery program for the site was required. The data recovery consisted of the excavation of 104, 1 meter square (m^2) test units (TUs). Nineteen prehistoric features were identified during Phase III excavations and included primarily hearth remnants and activity areas where lithic reduction occurred. A total of 15,898 prehistoric artifacts were recovered during the Phase III data recovery program. The Phase III investigation determined that the primary occupations of the RCW Site were during the Late Woodland and latter half of the Late Archaic periods, along with smaller Early/Middle Woodland and early Late Archaic period occupations.

The Phase III work determined that the RCW Site most likely served as a resource procurement and processing station occupied on an intermittent/seasonal basis. The RCW Site most likely served macro-band camps and other larger sites along the Delaware River. The analysis of Late Archaic through Late Woodland settlement patterns within a broad region surrounding the Reeders Creek Site reveals that both types of site, macroband and microband, would have been established by the Lenape on the broad Delaware River terrace as part of a generalized economy that included both hunting and gathering of wild resources.

With completion of the Data Recovery investigation report and submission of all curation items (artifacts, field notes, catalogs and photographs), the Delaware River Joint Toll Bridge Commission has fulfilled its obligations under the Programmatic Agreement to mitigate the adverse impacts of the Scudder Falls Bridge Improvement Project to the RCW Site (28Me360).

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1.0 INTRODUCTION

AECOM was contracted by the Delaware River Joint Toll Bridge Commission (DRJTBC) to perform the archaeological Phase I/II/III survey work for the Scudder Falls Bridge Improvement Project. The following report presents the results of Phase III Data Recovery Archaeological Investigations conducted for the proposed improvement of the Scudder Falls Bridge, which carries I-95 from Bucks County, Pennsylvania over the Delaware River to Mercer County, New Jersey (Figure 1-1). The Project is being undertaken by the Delaware River Joint Toll Bridge Commission (DRJTBC) and requires replacing the existing bridge with a new bridge that meets current design standards and constructing approach improvements on both the New Jersey and Pennsylvania sides of the Delaware River. Archaeological investigations were performed to mitigate the adverse effects of the proposed undertaking on the Reeders Creek West Site (RCW) (28Me360), a National Register of Historic Places-eligible archaeological site, within the project's APE.

A.D. Marble and Company conducted the initial Phase I Archaeological Survey for the proposed bridge improvement in 2005. The Phase I Archaeological Survey included both the New Jersey and Pennsylvania sides of the project area. Testing was completed at the 1509 River Road, Woodside Road and Taylorsville Road locations in Pennsylvania and the Reeders Creek North and Route 29 Interchange locations in New Jersey. The RCW Site (28Me360) was identified for cultural resources within the Route 29 Interchange test area in New Jersey, and the 1509 River Road Site (36Bu379) was identified for cultural resources within the River Road test area in Pennsylvania. Both sites were recommended as eligible for listing in the National Register of Historic Places and data recovery excavations were recommended for both sites (A.D. Marble 2006). This report only covers the Data Recovery conducted at the RCW Site and a separate report was produced for excavations at the 1509 River Road Site (36Bu379) (Lawrence and Albright 2012).

After reviewing the A.D. Marble and Company's *Draft Archaeology Phase I Report*, AECOM archaeologists arrived at the conclusion that while both 36Bu379 and 28Me360 sites were NR eligible, there was insufficient field data on which to construct a Data Recovery work plan. As a result AECOM performed additional Phase I/II survey investigations on both the 1509 River Road and RCW sites. The additional testing determined the horizontal and vertical extent of artifact deposits at both sites, the material cultural present, and the temporal components they represent. AECOM then produced separate *Phase I/II Addendum Report*s for the 1509 River Road Site in Pennsylvania and the RCW Site in New Jersey that included the results of the additional excavations along with a synthesis of A.D. Marble's 2006 testing. The addendum report for testing on the New Jersey side presented a Data Recovery work plan for the RCW Site for review and approval by the New Jersey Department of Transportation (NJDOT) and the New Jersey Historic Preservation Office (NJ HPO) (Lore and Lawrence 2010). AECOM was given approval of their RCW Site data recovery work plan in September 3, 2010. Field preparation and excavations of the site then began in October of 2010 and extended through the winter to February of 2011.

The investigation was conducted in accordance with the information contained within the *New Jersey Historic Preservation Office Guidelines for Phase I Archaeological Investigations: Identification of Archaeological Resources* (New Jersey Historic Preservation Office 1994, 2003). In addition, all cultural resource evaluations were conducted in accordance with

Section 106 of *The National Historic Preservation Act* of 1966, as amended; the *Procedures for the Protection of Historic and Cultural Properties* set forth in 36CFR 800, as amended; 23 CFR 771, as amended; guidance published by the Advisory Council on Historic Preservation; Sections 1(3) and 2(b) of *Executive Order* 11593; and the *National Environmental Policy Act* of 1966.

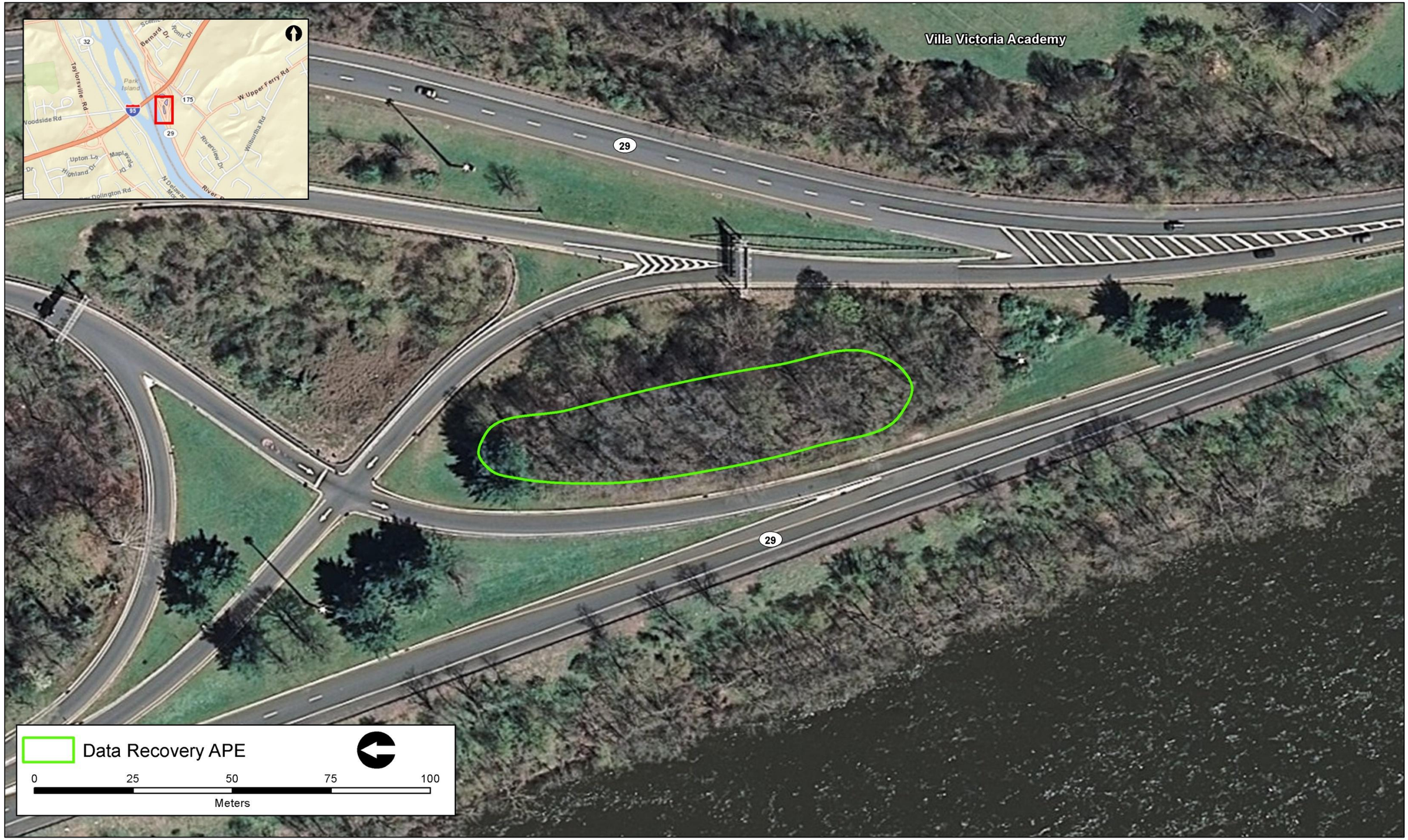


Figure 1-1. Project Location.

2.0 PROJECT DESCRIPTION

The Scudder Falls Bridge Improvement Project proposes a number of improvements to the existing river crossing, approaches, and interchanges with intersecting roadways. These include:

- Lane Additions – The new I-95/Scudder Falls Bridge will consist of 5 lanes northbound/4 lanes southbound
- New Bridge on Upstream Alignment; Existing Bridge to be demolished and replaced
- Pennsylvania Mainline Inside Widening
- Reconstructed Taylorsville Road Interchange
- Reconstructed NJ Route 29 Interchange
- New Pedestrian/bicycle facility

Each of these elements is briefly described below. The bridge improvement work and NJ Route 29 Interchange modification have the potential to adversely impact the archaeological resources described in this report. Earlier plans to impact Park Island with bridge pier construction have been modified and the island will no longer be adversely affected.

Standard Lane Additions: Existing I-95 includes two travel lanes in each direction west of NJ Route 29, and three travel lanes in each direction east of NJ Route 29. The area immediately east of the I-95/Scudder Falls Bridge, which is two lanes in each direction, is a transition area from two lanes to three lanes in each direction.

Under the proposed action with standard lane additions, one travel lane in each direction will be added on the I-95/Scudder Falls Bridge. The project will also add two auxiliary lanes northbound between Taylorsville Road and NJ Route 29 and one auxiliary lane southbound, providing safer merges at these closely spaced interchanges, for a total of five lanes northbound and four lanes southbound on the I-95/Scudder Falls Bridge and approaches. One northbound auxiliary lane will be dropped at the NJ Route 29 Interchange, and the second auxiliary lane will be extended east to the Bear Tavern Road Interchange. Full width inside and outside shoulders will be provided in both directions of I-95. The inside shoulder of I-95 throughout the project area will be 14 feet (ft) wide to accommodate future planned Route 1 Bus Rapid Transit service during congested conditions.

New Bridge on Upstream Alignment: A new, wider bridge will be constructed upstream of, or north of, the existing I-95/Scudder Falls Bridge over the Delaware River, with the new bridge extending north from the southern edge of the existing bridge. This bridge will incorporate a single bridge structure.

Pennsylvania Mainline Inside Widening: Along the Pennsylvania mainline of I-95, one travel lane in each direction will be added within the existing median, i.e. on the left side of the existing travel lanes (See Figures III-13 and III-14 for a typical cross-section). West of Taylorsville Road, with the proposed improvements, I-95 will consist of three travel lanes in each direction, with full-width inside and outside shoulders. With the inside widening, the grassed median will be replaced by the additional pavement for the travel lanes and shoulders, a paved median and concrete median barrier.

Taylorsville Road Interchange: The eastern southbound off-ramp will be eliminated at the Taylorsville Road Interchange and combined with the western southbound off-ramp. The two northbound on-ramps at the interchange, the single northbound off-ramp, and single southbound on-ramp will be retained. Taylorsville Road will be widened to provide two travel lanes plus intersection turning lanes within the interchange. Woodside Road will be widened on the approaches and exit legs to its intersection with Taylorsville Road.

NJ Route 29 Interchange: The design for the NJ Route 29 Interchange will incorporate a folded diamond interchange with two roundabout intersections at the I-95 ramp termini. This design is preferred by the FHWA and viewed as the best option from safety and traffic operations perspectives (Figure 2-1). This design will retain the bypasses for NJ Route 29 northbound and southbound through traffic and will allow free-flow traffic through the interchange, as the preferred design does not include any traffic signals or stop sign-controlled intersections. The width of the NJ Route 29 northbound bypass will be reduced to one travel lane plus shoulders to reduce existing proximity effects on the Delaware and Raritan Canal. The I-95 northbound on-ramp from NJ Route 175 (Upper River Road) will also be closed for public use and only available for emergency use by State Police.

Pedestrian/Bicycle Facility: The proposed action will include a pedestrian/bicycle facility that will provide a connection across the Delaware River to the adjoining towpaths within the canal systems in Pennsylvania and New Jersey.

The NJ Route 29 Interchange improvements will be the principal disturbance to archaeological deposits at 28Me360. The proposed improvements include abandonment of the existing access and exit ramps and reconfiguration of the ramp and roadway network, including a roundabout directly within Reeders Creek West (RCW). The proposed construction activity follows the T2 Terrace and will impact the entire portion of 28Me360 identified within RCW.

2.1 Environmental Context

The Scudder Falls/I-95 Bridge straddles the upper limits of the Fall Zone, that area between the Falls at Trenton and Scudder Falls. It also falls in to the Gettysburg-Newark Lowland Section of the Piedmont Physiographic region, just north of the northern limit of the Lowland and Intermediate Section of the Atlantic Coastal Plain Physiographic Province. The Atlantic Coastal Plain is characterized by a flat upper terrace surface with low local relief and is cut by numerous short streams. The coastal plain terrace consists of Quaternary-age unconsolidated to poorly consolidated sand and gravel and is designated the Trenton Gravel Formation (DCNR 2011a). The formation contains gray or pale-reddish-brown, very gravelly sand interstratified with cross bedded sand and clay-silt beds. The Quaternary deposits have been found to contain quartz, quartzite, sandstone, argillite and shale gravels (Owens & Minard 1975), while also containing small amounts of cobble cherts and jaspers (Stewart 1981). Holocene alluvium and swamp deposits also characterize the formation; the Trenton-Hamilton Marsh and Tinicum Marsh being prime examples (USGS 2011a).

The Upland Section of the Piedmont is barely expressed in the vicinity of Scudder Falls, but it generally forms the northwest boundary to the Atlantic Coastal Plain (Figure 2-1). Along the

Delaware River, the Gettysburg-Newark Lowland Section of the Piedmont forms the contact with the Coastal Plain. The contact between the two provinces can be sharply defined topographically, as the Piedmont consists of broad, gently rolling hills dissected by shallow open

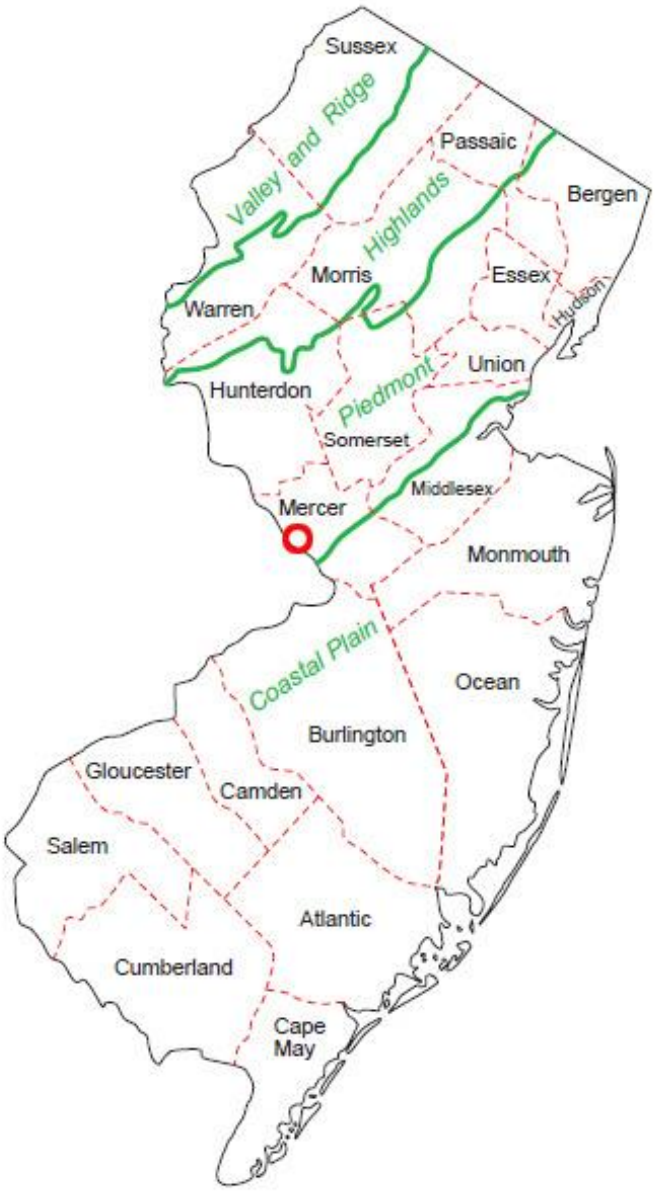


Figure 2-1. Physiographic Provinces of New Jersey**.**

valleys which become narrow and rugged in the vicinity of the project area (Benner 1932:8; Thornbury 1965: 90; DCNR 2011). In resource terms, the basement geology of the Piedmont offered several useful lithic materials. The Stockton Formation is mapped less than 0.5 kilometers (km) south of the RCW site and contains beds of argillecious siltstone among the larger strata of medium- to coarse-grained sandstone and silty mudstone (USGS 2011b).

The RCW site is located within the Lockatong Formation. The dark gray to black, thick-bedded argillite contained within the formation was a significant source of lithic raw materials during prehistoric times and extensive argillite deposits run in two broad bands across Mercer County, with extensive exposure along creeks and streams (USGS 2011a; Didier 1975:98). Deposits of Newark hornfels (metamorphosed argillite) are found in the vicinity of diabase sheets intrusive to Lockatong Formation argillite (Didier 1975:93,95). The intrusive diabase is found in discordant basin-shaped sheets approximately 8 km northwest of RCW.

The Project's location along the Fall Line Zone represents a transition from the rolling hills of the Piedmont Uplands to the flatter Coastal Plain. This juncture marks the boundary of two rich ecotonal settings and makes it ideal location for access to a variety of resources. The boundary between these two areas has long been recognized for geologic, soil and climatic differences. The area is unique because many species of northern affinity reach the southernmost limit of their range on the Coastal Plains and likewise, southern species are reaching their northern most range at the Piedmont. Even as early as 1910, Dr. Witmer Stone wrote that the boundary "marks a great change in plant life." This distinction is evident in his identification of 475 species of plants growing in the Inner and Outer Coastal Plain that were rarely found in the Piedmont region (Robichaud & Buell 1973).

2.1.1 Site Specific Environmental Context

The archaeologically-sensitive portion of the APE is defined by the presence of riparian terraces bordering the Delaware River. These landforms have been extensively impacted by the construction of various historic "improvements" (Insert 1):

- Delaware and Raritan Canal (1834)
- Trenton Water Power Canal (1834)
- I-95 bridge (late 1950s)
- Lattice work of ramps that connect NJ Route 29 with I-95 (late 1950s)

The RCW Site is located on the T-2 terrace located along the eastern bank of the Delaware River. The T-1 terrace and floodplain of the Delaware River were extensively if not completely disrupted by construction of the Trenton Water Power Canal, constructed between 1831 and 1834 (State of New Jersey Official Website). The T-2 or higher T-3 terrace were extensively reworked for construction of I-95 and the NJ Route 29 interchange. The T2 and T3 terraces will also be impacted during the currently proposed I-95/Route 29 Interchange project (Figure 2-2).

Figure 2-2. Project Design, Route 29 Interchange. Interchange.

3.0 SUMMARY OF PREVIOUS WORK COMPLETED AT THE REEDERS CREEK WEST SITE

The Reeders Creek West (RCW) Site (28Me360) was identified during Phase I excavations within the Route 29 Interchange with I-95 in 2005 by A.D. Marble. The site was identified within the Reeders Creek Center (RCC) and RCW portions of the APE. AECOM conducted additional Phase I/II excavations in 2009 in order to better define the vertical and horizontal limits of the site. The portion of the RCW Site located within RCC was found to be disturbed and data recovery efforts were directed at the portion of the site within RCW. The section below summarizes the previous work performed by A.D. Marble and Company (A.D. Marble) and AECOM within the RCC and RCW test areas in the 2005 and 2009 field seasons. The following section analyzes the Phase I/II results and places them within the context of the data recovery.

3.1 A.D. Marble Phase I (2005)

A.D. Marble conducted a Phase I Survey within the Route 29 Interchange with I-95 in 2005. Two, one meter square test units (TUs) were excavated within the RCC and RCW test areas (Figure 4-1). Test Unit NJ-26 was excavated within the southern portion of RCC, and NJ-25 was excavated within the southeastern portion of RCW. Geomorphological investigations conducted during the Phase I survey indicated that soil profiles within the two test areas differed below the plowzone (Ap) stratum. RCC appeared to contain a Bw-horizon below the plowzone while RCW contained stacked C-horizons.

The initial A.D. Marble Phase I assessment of the RCW soil profile was revised during AECOM's Phase II/III excavations when larger and deeper wall exposures were examined by the project geomorphologist. Larger profile exposures enabled subtle strata breaks to be observed immediately below the plowzone that had not been identified previously. These new strata included the AE and E horizons below the plowzone that transitioned to a Bw-horizon. The stacked C-horizons identified during the Phase I geomorphological assessment of RCW were re-classified as Bw-horizons; indicating that soil stratigraphy at the RCC and RCW were more alike than previously thought (Tables 3-1 and 3-2).

Phase I testing identified portions of the RCW Site (28Me360) within the RCC and RCW test areas. A total of 202 prehistoric artifacts were recovered from the site; primarily lithic debitage. A mix of modern and nineteenth century historic artifacts were also recovered and attributed to a mix of modern roadway debris and historic field scatter associated with the former Perry House Farm located north of the I-95 Interchange (Marble 2006). Artifacts were relatively high in the soil profile with few artifacts recovered below 46 cm bgs in RCC (n=1) and below 60 cm bgs in RCW (n=2) (Tables 3-1 and 3-2).

Analysis of the lithic debitage recovered from the test areas indicated that chert was the predominant material type making up 81.6-percent of the Phase I debitage recovered from RCC, and 92 percent of the debitage from RCW. Four prehistoric ceramics were recovered from RCW, and although they lacked any specific temporal attributes, a Late Woodland association was suggested (Marble 2006). No diagnostic prehistoric artifacts were recovered during testing of the RCC and RCW test areas. The only tool recovered from either test area was a chert early stage biface found in RCW.

Table 3-1. Results of TU NJ-26, Reeders Creek Center (28Me360).

Phase I Horizon	Equivalent Phase. II/III Horizon	Prehistoric Counts	Historic Counts	Phase III Component
A	Am/Ap1	5	*present	Modern Historic; Late Woodland
Ap2	Ap2	19	*present	Nineteenth Century Historic; Late Woodland
Bw	AE	12	1	Historic; Late Woodland
BwC	Bw1	2	0	Late Archaic
C1	Bw2	0	0	-
Total		***38***	***>1***	

*Source: A.D. Marble (2006: Tables VII-5 and VII-6). *Specific historic artifact counts are not available in A.D. Marble's Phase I report, only the word "present".*

Table 3-2. Results of TU NJ-25, Reeders Creek West (28Me360).

Phase I Horizon	Equivalent Phase II/III Horizon	Prehistoric Counts	Historic Counts	Phase III Component
A	Ap1	11	1	Modern Historic; Late Woodland
Ap	Ap2	130	*present	Nineteenth Century Historic; Late Woodland
C1	AE/E/Bw1	21	1	Late Archaic through Late Woodland
C2	Bw2	0	0	-
2BC	C/B	2 (FCR)	0	Late Archaic
2C	C	0	0	-
Total	**-**	***164***	***>1***	

*Source: A.D. Marble (2006: Tables VII-3 and VII-4) *Specific historic artifact counts are not available in A.D. Marble's Phase I report, only the word "present".*

The limited Phase I excavation recovered prehistoric artifacts within stratified deposits on the T2 terrace. The only prehistoric diagnostic artifacts recovered were determined to be a few Late Woodland ceramics. No speculation on earlier components was made as no evidence was recovered during testing. Only four artifacts were found below the AE-horizon, this is likely because the Phase I TU was excavated within a portion of the site where the earlier Late Archaic component was absent. The AE and E horizons within RCW were also inadvertently mixed with the Bw1-horizon effectively mixing the Early/Middle Woodland and Late Archaic temporal components. Additional excavations were recommended by A.D. Marble to determine the RCW site's vertical and horizontal extent (A.D. Marble 2006).

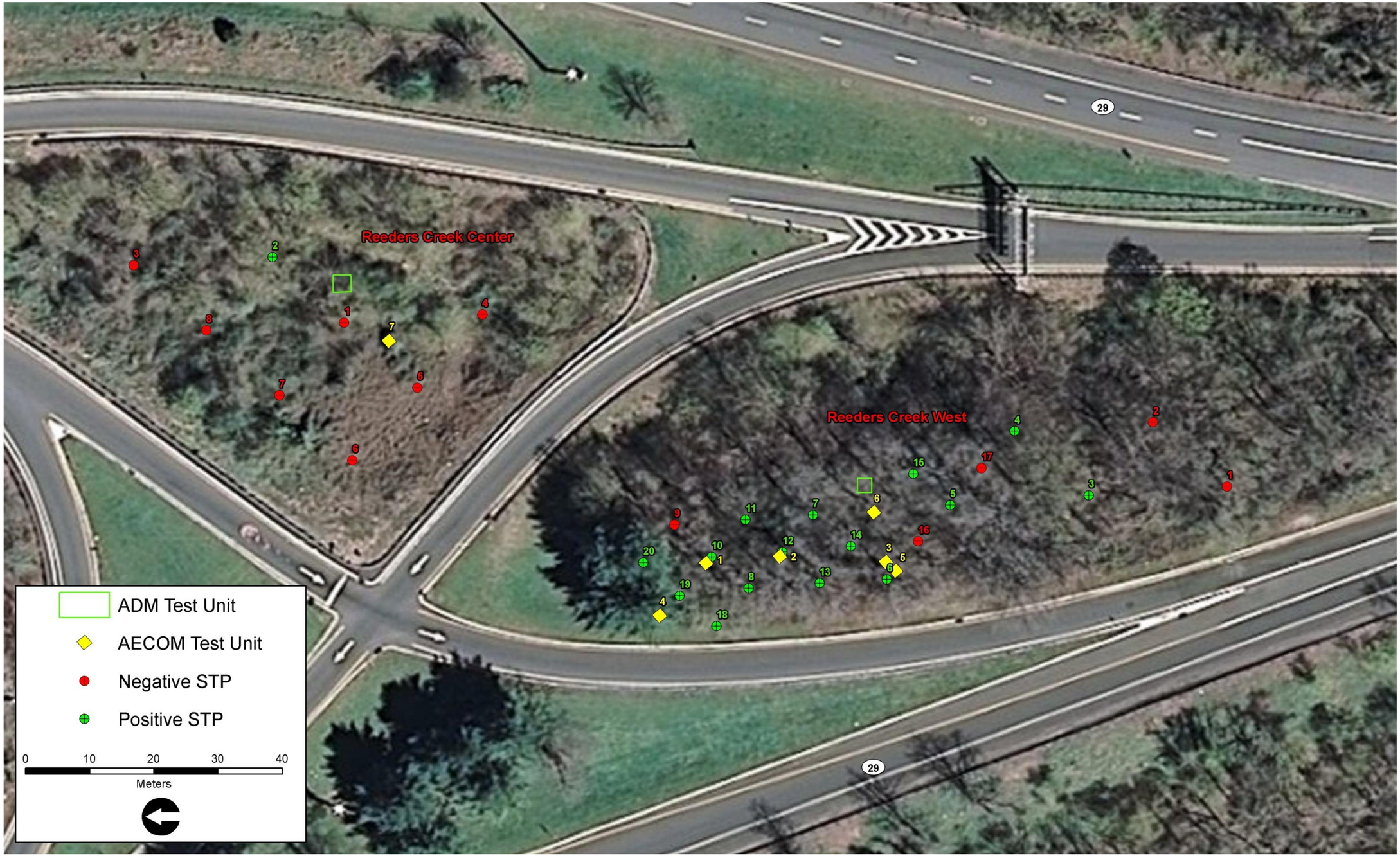


Figure 3-1. Phase I/II Archaeological Testing.

3.2 AECOM Phase I/II (2009)

AECOM conducted additional Phase I/II excavations at the RCC and RCW locations in 2009 (Figure 3-1). Testing within RCC consisted of eight STPs, a one meter square TU, and a 1 x 0.5 m TU; while testing within RCW consisted of 20 STPs and six, 1 m² TUs. No prehistoric cultural features were identified during the survey. Geomorphologist data on TU 1 within RCW and TU 7 within RCC excavated during the Phase II survey are located within Appendix C at the end of this report.

3.2.1 Reeders Creek Center

Subsurface testing in the RCC area indicated that substantial ground disturbance related to road and bridge construction had occurred in proximity to where A.D. Marble recovered prehistoric artifacts during their 2005 Phase I survey. All of the prehistoric artifacts (n=109) recovered from TU excavations during AECOM's Phase I/II survey were from fill and plow zone horizons and were mixed with historic-period artifacts (Table 3-3). These artifacts were found in direct association with a large, partially burnt log or fence post. Only a single STP (STP 2) contained prehistoric artifacts. The results of archaeological testing within RCC confirmed that the test area lacked intact undisturbed deposits and therefore did not contribute to the significance of the RCW Site (Lore and Lawrence 2010). No additional archaeological survey was recommended at RCC.

Table 3-3. Results of AECOM Phase I/II Testing, Reeders Creek Center.

Soil Horizon	Prehistoric Counts	Historic Counts	Temporal Component
Ap1	26	7	Modern, Late Woodland
Ap2	75	11	Nineteenth to Twentieth Century Historic, Late Woodland
Ap2/Bw1	4	1	Late Woodland
Feature 7.1	4	0	Modern Historic Feature, Unknown Prehistoric
Total	***109***	***19***	

Source: AECOM (2009:Tables 4-2 through 4-4 and Phase II Report Appendix C).

3.2.2 Reeders Creek West

Phase I/II testing within RCW recovered a total of 265 prehistoric artifacts and 105 historic artifacts (Table 3-4). Artifacts were recovered from three temporal components later identified during the data recovery. These components included the Late Woodland, the Early/Middle Woodland, and the Late Archaic I. Late Woodland diagnostics recovered during excavations included a Levanna projectile point and Overpeck and Bowmans Brook ceramics. A Poplar Island projectile point, a Middle Archaic to Middle Woodland diagnostic, was recovered within the Late Woodland context.

Table 3-4. Results of AECOM Phase I/II Testing, Reeders Creek West.

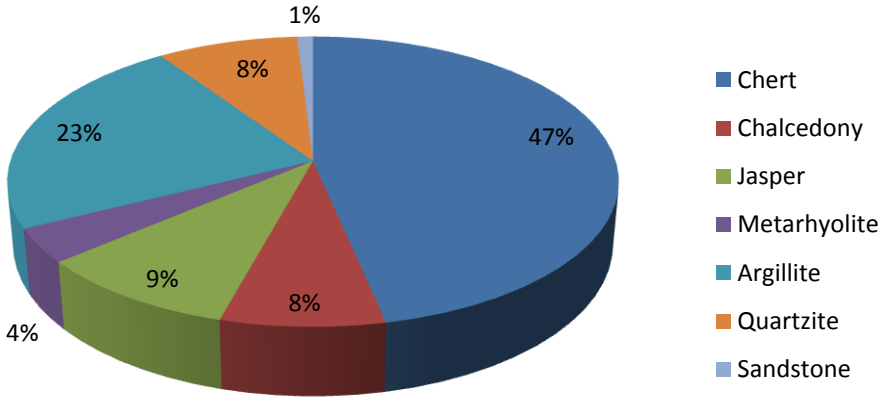
Soil Horizon	Prehistoric Counts	Historic Counts	Temporal Component
Fill/Mixed Contexts	1	17	-
Ap1	5	33	Nineteenth Century to Modern Historic/ Late Woodland
Ap2	77	30	
Ap3	4	13	
AE	45	7	
E	50	1	Early/Middle Woodland
Bw1	51	4	Late Archaic
Bw2	32	0	
Total	***265***	***105***	

Source: AECOM (2009:Tables 4-5 through 4-12 and Phase II Report Appendix C).

3.2.2.1 Late Woodland Component

Fifty percent of the prehistoric artifacts recovered during the Phase I/II survey were from the upper Late Woodland Component (n=131), which consisted of the Ap1, Ap2, Ap3, and AE-horizons (Figure 4-4). The predominant lithic debitage materials within this component were chert (n=47 percent), argillite (n=23 percent), and jasper (n=9 percent) (Figure 3-2). Smaller amounts of chalcedony, metarhyolite, argillite, quartzite, and sandstone debitage were also recovered within the component during the survey.

Figure 3-2. Late Woodland Component Lithic Debitage Material by Stratum.



A jasper Levanna biface and an argillite Poplar Island biface were recovered from the Ap2-horizon (plow zone) within the Late Woodland Component. While the triangular Levanna biface is indicative of the Late Woodland Period, the Poplar Island biface can range from the Middle Archaic to Middle Woodland periods (Custer 2001). The Poplar Island biface is relatively small in size and therefore likely dates to post 0 A.D. (ibid). There is a high likelihood that the older Poplar Island biface was re-deposited within the upper Late Woodland Component from the

underlying Early/Middle Woodland during historic plowing. An almost even distribution of primary, secondary, and tertiary reduction flakes was recovered within the Late Woodland Component (Table 3-5).

Eight ceramic body-sherds, partially cord-marked and incised, were recovered within the upper component. Although the ceramic fragments were rather small, their characteristics appear indicative of Overpeck and Bowmans Brook Series ceramics common during the Late Woodland Period in the Middle Delaware Valley (Custer 1996).

Table 3-5. Phase I/II Late Woodland Component Artifact Types by Lithic Material*.

Artifact Type	Chert	Chalcedony	Jasper	Metarhyolite	Argillite	Quartzite	Sandstone	Igneous	*Total*
Primary Flakes	6	1	2	0	11	5	0	0	***25***
Secondary Flakes	18	3	3	2	5	1	0	0	***32***
Tertiary Flakes	20	4	5	1	1	2	0	0	***33***
Flake Fragments	4	0	0	0	0	0	0	0	***4***
Angular Shatter	1	0	0	1	7	1	1	0	***11***
Core	1	0	0	0	0	0	0	0	***1***
Cobble Flake	0	0	0	0	0	2	0	0	***2***
FCR	0	0	0	0	0	8	3	1	***12***
Levanna Biface	1	0	0	0	0	0	0	0	***1***
Poplar Island Biface	1	0	0	0	0	0	0	0	***1***
Manuport	0	0	0	0	0	1	0	0	***1***
Total	***52***	***8***	***10***	***4***	***24***	***20***	***4***	***1***	***123***

**Color coded to Figure 3-2.*

3.2.2.2 Early/Middle Woodland Component

The Early/Middle Woodland Component, within the E-horizon, consisted of 19 percent (n=50) of the artifacts recovered during the Phase I/II survey (Table 3-4). The primary material of lithic debitage within the component is quartzite (n=30 percent), followed by argillite (n=27 percent) and jasper (n=17 percent) (Figure 3-3). Four prehistoric ceramics were recovered within the component but were too small and weathered for identification. No temporally diagnostic artifacts were recovered from the Early/Middle Woodland Component during AECOM's Phase I/II survey. Primary and secondary reduction flakes were the principal types of debitage recovered within the Early/Middle Woodland Component (Table 3-6).

Figure 3-3. Early/Middle Woodland Component Lithic Debitage Material by Stratum.

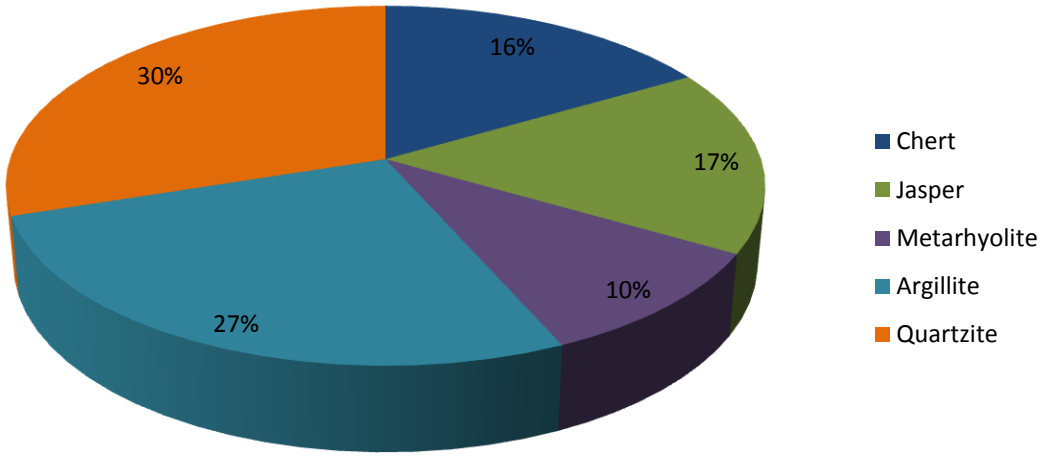


Table 3-6. Phase I/II Early/Middle Woodland Component Artifact Types by Lithic Material*.

Artifact Type	Chert	Jasper	Metarhyolite	Argillite	Quartzite	*Total*
Primary Flakes	0	0	0	1	6	***7***
Secondary Flakes	4	4	3	4	1	***16***
Tertiary Flakes	1	1	0	1	0	***3***
Angular Shatter	0	0	0	2	2	***4***
Core	0	0	0	0	1	***1***
FCR	0	0	0	0	11	***11***
Manuport	1	0	0	0	3	***4***
Total	***6***	***5***	***3***	***8***	***24***	***46***

**Color coded to Figure 3-3.*

3.2.2.3 Late Archaic I Component

The Late Archaic I component, within the Bw1 and Bw2 horizons, produced 31-percent (n=83) of the artifacts recovered during the Phase I/II survey (Figure 3-4). The primary material of lithic debitage within the component consisted of quartzite (n=43 percent), argillite (n=33 percent), and chert (n=17 percent) (Table 3-7). No prehistoric ceramics or temporally diagnostic artifacts were recovered within the Bw1 and Bw2 horizons. A severely weathered argillite biface was recovered from the Bw2-horizon and could not be attributed to any particular point type. As with the Early/Middle Woodland Component above the principal debitage types recovered consisted of primary and secondary reduction flakes (Table 3-7).

Figure 3-4. Late Archaic I Component Lithic Debitage Material by Stratum.

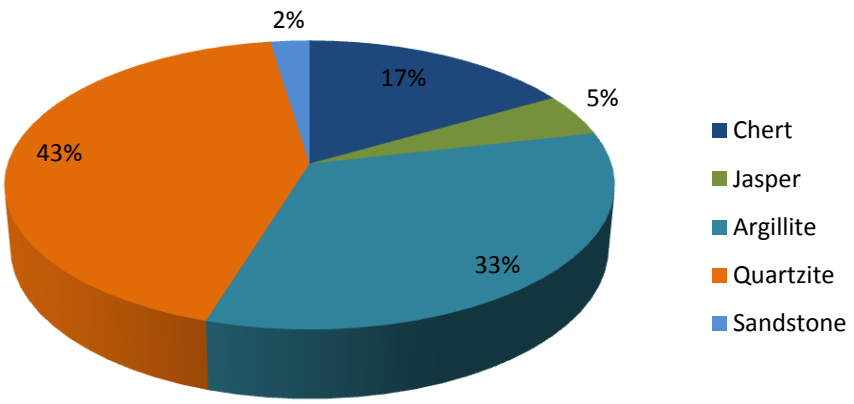


Table 3-7. Phase I/II Late Archaic I Component Artifact Types by Lithic Material*.

Artifact Type	Chert	Jasper	Argillite	Quartzite	Sandstone	*Total*
Primary Flakes	1	0	9	13	0	***23***
Secondary Flakes	5	1	3	0	0	***9***
Tertiary Flakes	1	0	0	0	0	***1***
Flake Fragments	0	1	0	1	0	***2***
Angular Shatter	0	0	2	4	1	***7***
Core	1	0	1	2	0	***4***
FCR	0	0	0	32	4	***35***
Unidentifiable Biface	0	0	1	0	0	***1***
Manuport	0	0	0	1	0	***1***
Total	***8***	***2***	***16***	***53***	***5***	***83***

**Color coded to Figure 4-4.*

3.2.3 AECOM Phase I/II Survey Assessment of Reeders Creek West

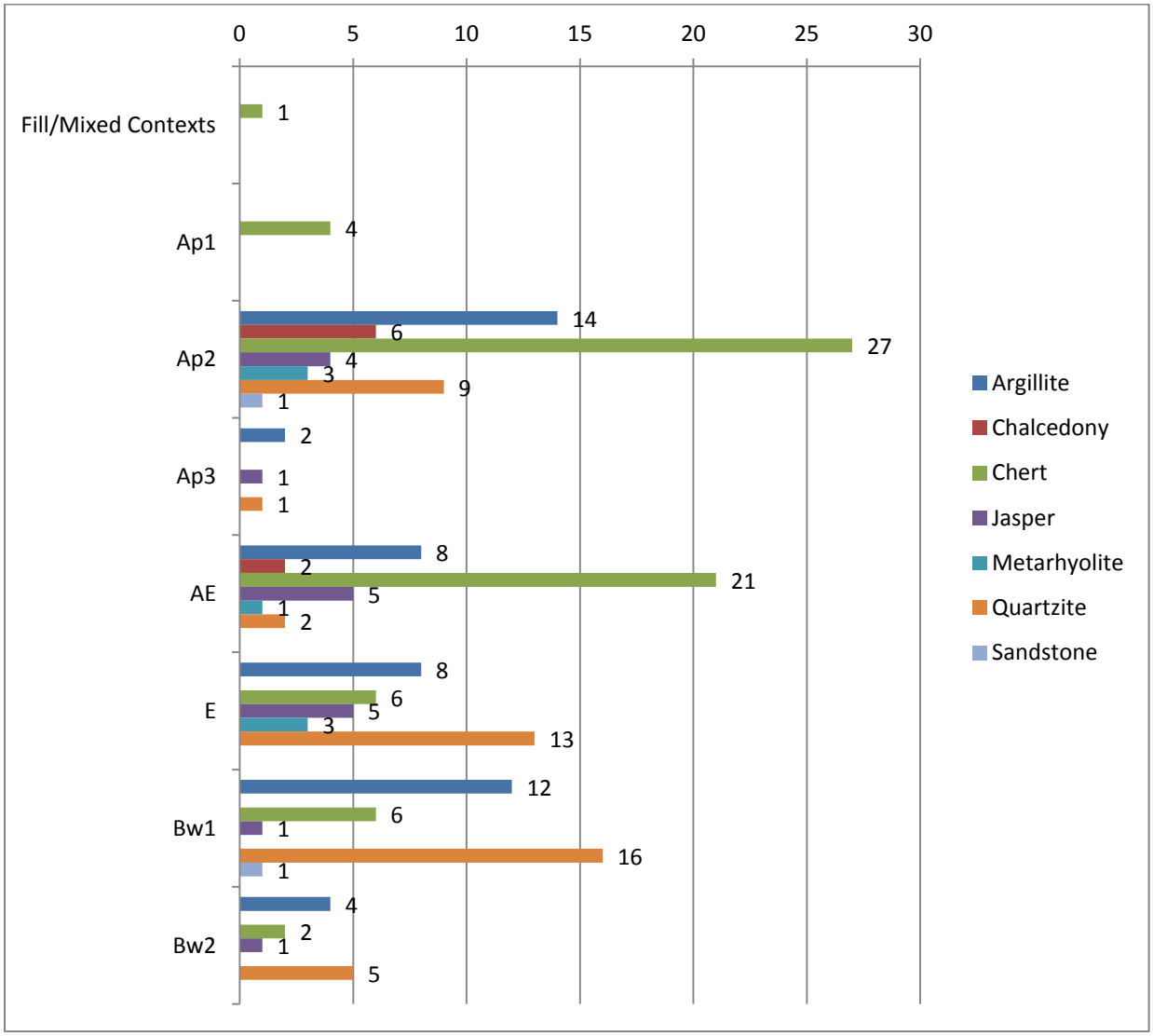
The Phase I/II report noted that a strong Late Woodland Component was present at the RCW Site (Lore and Lawrence 2010). No earlier diagnostics were recovered below the Ap1, Ap2, and AE-horizons (Late Woodland Component) during the Phase I/II Survey. There were indications of a possible earlier component with the recovery of a Poplar Island biface in the Ap2-horizon and a weathered argillite contracting stemmed biface within the Bw2-horizon. No prehistoric cultural features were identified within Reeders Creek West however the recovery of FCR within all three of the temporal components indicated the likelihood of hearth features.

Analyzing the type of lithic material utilized within each component in the Phase I/II foreshadows the distributions present in the Phase III. The predominant materials within the upper Late Woodland Component consisted of chert, argillite, and jasper; the main materials in

the Early/Middle Woodland Component consisted of quartzite, argillite, and jasper; and the main materials present within the Late Archaic I Component consisted of quartzite, argillite, and chert.

Higher proportions of cryptocrystalline materials were utilized within the Woodland periods, while meta-sedimentary materials were more predominant within the Late Archaic period. Locally available argillite was utilized during all temporal periods. Distributions of debitage types (primary, secondary, tertiary) within the components also reflect similar activities taking place at RCW throughout all periods. The Late Woodland Component displayed an even distribution of all the flake types, while the Early/Middle Woodland and Late Archaic contained primarily primary and secondary flakes. Primary flakes and secondary flakes are typically associated with the initial stages of lithic reduction, while tertiary flakes are associated with retouching and bifacial reduction activities.

Figure 3-5. AECOM Phase I/II Lithic Debitage Material by Stratum.



The results of AECOM's subsurface testing at RCW verified that the APE contained significant cultural resources associated with the RCW Site. The site was located on an intact remnant of the T2 Terrace, and archaeological data from the Phase I/II investigation complimented observations by A.D. Marble that the site contained a strong Woodland component, with the clearest cultural expressions attributed to the Late Woodland (Lore and Lawrence 2010). Additional archaeological investigations and a geomorphological examination of a larger surface area were recommended at the RCW Site to clarify the understanding of the site's development and occupation periods. A Data Recovery plan for the RCW Site was also included with AECOM's Phase I/II report which provided the baseline for testing methodologies employed during the excavation discussed in this report.

4.0 RESEARCH DESIGN AND METHODOLOGIES

4.1 Research Issues and Design

Based upon the Phase I/II testing of the Reeders Creek West (RCW) Site, AECOM concluded that the site had the potential to address numerous research questions pertinent to the area. The original formulation of the Data Recovery investigation for the site included the following topics and research questions:

- Site Formation Processes and Stratigraphy
  1. Does the site contain a distinct Late Woodland period occupation, or is there evidence for an earlier occupation?
  2. What role did post-occupation taphonomic effects have on the archaeological deposits, and how have these processes potentially affected the deposits?
- Site Chronology
  3. Do pottery types recovered at the Reeder's Creek Site compare favorably to Late Woodland period types typically associated with the Middle Delaware Valley such as Overpeck/Bowmans Brook varieties?
  4. If ceramic types are different, do they more closely resemble types found in the Upper or Lower Delaware River Valley?
- Site Function
  5. What was the primary activity at the Reeder's Creek Site and how does this compare to other Late Woodland period sites from the Middle Delaware Valley?
  6. Does the site contain a single component, or is there evidence for multiple Late Woodland period occupations? If so, what does this say about continuity in resource procurement at the site?
- Settlement Patterns/Mobility
  7. How does the site fit into the settlement models generated from the Trenton Complex? Does the material culture suggest that the Reeder's Creek Site was a small procurement site with ties to larger base camps near the Trenton Complex series of sites?
  8. Does the lithic assemblage reflect an expedient technology focusing on local raw material, or a strategy oriented toward staged bifacial reduction indicative of mobile groups of hunters and gatherers?
- Subsistence and Seasonality
  9. What was the primary subsistence base of the site's inhabitants? Does the material culture of the site reflect a specialized subsistence strategy, or a generalized adaptation to the riverine environment?
  10. Does the site contain evidence that the inhabitants had access to horticultural based subsistence?

During the course of the data recovery investigation, and particularly during a field visit to the Project on November 18, 2010 with representatives of NJDOT and NJHPO, some of the research design questions were refined and modified to better reflect the data these sites were yielding (Appendix B). The revised research design is presented below.

4.1.1 Research Design Revisions

The initial excavations during the data recovery at the RCW Site yielded data that indicated earlier temporal components not identified during the Phase I/II work. While earlier components were assumed to be present at the site, no diagnostic materials were recovered during A.D. Marble's Phase I Survey or AECOM's Phase I/II Survey to confirm their presence. Research questions formulated exclusively for the Late Woodland Period regarding site chronology and function needed to be revised and expanded to address a site with multiple temporal components. Below are listed the research questions that were revised and expanded:

<u>Original Research Question #3</u>

- Do pottery types recovered at the RCW Site compare favorably to Late Woodland period types typically associated with the Middle Delaware Valley such as Overpeck/Bowmans Brook varieties?

<u>Revised Research Question #3</u>

Since another Early to Middle Woodland component was identified during Phase III excavations the research question needed to be revised to:

- Do pottery types recovered at the RCW Site compare favorably to Early to Late Woodland period types typically associated with the Middle Delaware Valley such as Marcey Creek (Early Woodland), Mockley Ware (Middle Woodland), Overpeck/Bowmans Brook (Late Woodland) varieties?

<u>Original Research Question #5</u>

- What was the primary activity at the RCW Site and how does this compare to other Late Woodland period sites from the Middle Delaware Valley?

<u>Revised Research Question #5</u>

- The Reeders Creek West Site was found to contain multiple components ranging from the Late Archaic to Late Woodland so the question was revised to state:
- What was the primary activity at the RCW Site during each temporal component identified and how does this compare to other multiple-component sites from the Middle Delaware Valley?

<u>Original Research Question #6</u>

- Does the RCW Site contain a single component, or is there evidence for multiple Late Woodland period occupations? If so, what does this say about continuity in resource procurement at the site?

<u>Revised Research Question #6</u>

The question needs to be expanded to address the site and all of the temporal components present at the site:

- Does the RCW Site contain a single component, or is there evidence for multiple prehistoric period occupations? If so, what does this say about continuity in resource procurement at the site?

4.2 Data Recovery Methodologies

The Phase III excavation methodology for the Scudder Falls Bridge project ultimately differed from the work plan proposed within the Phase I/II report in two ways. The original work plan called for the excavation and screening of the Ap2-horizon from approximately 10 percent of the TUs to determine if the site contained stratified archaeological deposits, and to obtain a greater artifact sample from this horizon. Early on during Phase III excavations, it was determined that the Ap2-horizon contained a high potential for prehistoric features at the transition of the Ap2 and AE horizons and also contained the majority of the Late Woodland component artifacts. Due to this observation, the Ap2-horizon was completely sampled. Based on the vertical distribution of artifacts from the Phase I/II survey, it was anticipated that TU excavation would typically terminate at 1 m bgs. Instead, excavations reached an average depth of 1.5 m bgs with some of the TUs reaching near 2 m bgs.

4.2.1 Field Work and Sampling Methodology

A series of 2 m x 2 m excavation blocks (EB) were set-up around those areas that contained high artifact concentrations during Phase I/II excavations. All Phase III Test Units (TU) were mapped onto the site grid and assigned grid coordinates. All of the excavation blocks were mapped using a total station. AECOM excavated a total of 104 m^2 test units (161.28 m^3) as part of the data recovery plan. This constituted a 13.4 percent sample of the RCW Site.

The results of the Phase I/II survey and the geomorphological investigation verified that the RCW Site contained a recently developed Ap1-horizon (originally labeled an Am-horizon) that had no potential to contain significant cultural resources. As a result, this soil was removed from all TUs with a flat blade shovel and not screened. Once the Ap2-horizon was reached, all soil was excavated in 10 cm levels and screened through 0.25 in wire mesh to recover artifacts. The original work plan called for a 10 percent sample of the Ap2-horizon to be taken from across the site, however sampling of the strata identified large amounts of prehistoric artifacts and features near the base of the horizon, and as a result, the Ap2-horizon was completely sampled during Phase III excavations.

One of the goals of the excavation was to identify cultural features at the interface of the Ap2/AE-horizons and significant artifact deposits that could be the locations of leached out features. After earlier components were identified deeper in the soil profile, the goal expanded to identifying the vertical and horizontal limits of these earlier occupations. Archaeologists continued to excavate the subsoil in 10 cm levels until they reached culturally sterile soil horizons or low artifact densities. Based on the vertical distribution of artifacts from the Phase I/II survey, it was anticipated that TU excavation would terminate at 1 m bgs, however, earlier prehistoric components not identified in previous phases, reached an average depth of 1.5 m bgs with some of the TUs reaching nearly 2 m bgs. Consultation with the project geomorphologist indicated a revision of soil horizon classification given during the Phase I/II excavations (Appendix C).

Prehistoric features were exposed, photographed, and a plan view map was generated by using a Total Station. Features were bisected along their longest axis and excavated by natural stratigraphy. If the feature contained evidence of internal stratification, field archaeologists excavated the feature matrix in 10 cm arbitrary levels. The feature matrix was

screened through 1/8-inch wire mesh to recover smaller artifacts such as calcined bone, micro-debitage, and charred floral remains. The unexcavated portion of the feature was retained for flotation. The soil sample was processed by water flotation using 0.64 cm wire mesh to recover light and heavy fractions of floral, faunal, micro-debitage, and carbon samples for further analysis. Charcoal samples recovered from intact features were retained for submittal to Beta Analytic, Inc. for AMS or conventional radiometric radiocarbon dating. Floral remains recovered during flotation of feature fill were retained for submittal to Dr. William Hilgartner for floral analysis.

4.2.2 Laboratory Methodology

All prehistoric artifacts recovered during the Phase III archaeological data recovery were washed, cataloged, and analyzed at AECOM's Yardley, Pennsylvania laboratory. Stone tools and prehistoric ceramic were collected in the field using sterile plastic bags for possible specialized analyses. These artifacts were not washed or removed from the bags until the analysis was performed. Soil samples were also collected with each tool and ceramic for use as control samples in specialized analysis. The principal investigator examined the artifact's context and determined if they should be submitted for starch grain, blood residue, edge wear, or residue analysis. Any artifacts not submitted for specialized analyses remained in their bags when curated to enable researchers to use them during future analyses. The laboratory director oversaw artifact preparation for curation at the New Jersey State Museum. The artifact assemblage contained numerous pieces of fire cracked rock (FCR). These artifacts were cataloged and examined, but only a 19 percent sample was retained for curation. Diagnostic historic-period artifacts were brought back to the lab and examined by the laboratory manager and principal investigator to determine their temporal range, and to document the extent of recent disturbance at the site. After consultation with the New Jersey State Museum, the artifacts were noted in the catalog, but not retained for extensive analysis or curation.

Prehistoric ceramics were cataloged based on their temper, surface treatment, and decoration. Stewart (1998b) provides an overview of general trends in ceramic typology; however, there are still gaps in the archaeological record, and information on temper, paste, and decoration can provide insight into diagnostic attributes of the Woodland period.

Soil samples retained for analysis were water-screened in a filtered flotation system. The flotation process separated light materials that floated in 1/14-in fine mesh from heavier materials that sunk and were caught in coarser 1/48-in mesh. All samples dried for several days before laboratory personnel separated out cultural material including micro-debitage, ceramic, floral, and faunal remains.

4.2.3 Artifact Analyses

All lithic material was sorted into basic categories such as debitage, tools, and FCR. The raw material of all artifacts was identified and stone tools were assigned specific designations such as biface, flaked tool, and scraper. All debitage was analyzed using a variation of criteria established by other researchers (Andrefsky 2005; Sullivan and Rosen 1985; Verrey 1986). This included classifying the debitage as: 1) Whole flakes—those flakes that have a platform and a clear termination, 2) Angular shatter—pieces of lithic debris resulting from the reduction of small cobble cores or other materials, 3) Flake fragments—those flakes that appear to have

broken or snapped. Additional analysis included categorizing all debitage on a size gradient based on fitting flakes through a series of circles with metric dimensions (Patterson 1990). In this method, the flakes are placed through a series of circles whose diameters increase by 5 mm. The flake size is then used to make quantitative comparisons with other sites where a similar methodology was utilized. In addition, the flakes were also assigned traditional lithic designations of primary, secondary, and tertiary to allow for qualitative comparisons as well.

4.2.3.1 Lithics

Prehistoric artifact analysis was designed to document the basic temporal and functional parameters of the assemblage. Beyond the categories described, all lithic artifacts were identified according to raw material type.

Debitage

Debitage was identified according to lithic reduction stage. Primary flakes were those whose dorsal surfaces are entirely covered with cortex; secondary flakes have at least a trace of cortex on the dorsal surface; and tertiary (interior) flakes lack cortex, having originated entirely from the interior of the core. Primary flakes and secondary flakes are usually associated with the initial stages of lithic reduction, while tertiary flakes are more likely to be associated with retouching and bifacial reduction activities (Andrefsky 2005).

Bifaces

Bifaces are lithic objects that have been flaked on both the dorsal and ventral surfaces. Bifaces have recognizable morphological characteristics, including bilateral symmetry and a lenticular cross-section. Bifaces can be either hafted or unhafted and are used for a variety of purposes. These uses include projectile points, drills, or knives. Bifaces can also be utilized as cores from which utilizable flakes can be generated.

Biface reduction/production has been carefully researched. Callahan (1979) proposed a staged approach for the classification of biface production. These stages have been applied here in a simplified form. Early stage bifaces are crude, bifacially worked flakes or cores, often with a large percentage of cortex. This stage of biface production has a relatively low length-to-thickness ratio. Middle stage bifaces are thinner than the previous stage and may still show areas of cortex. The lenticular cross-section is also more apparent in this stage of production. Late stage bifaces are in essence finished forms. They are symmetrical and have a high length-to-thickness ratio.

Projectile points are late stage bifaces with recognizable morphology. These items possess a hafting element or hafting wear. Points were frequently affixed to spear, arrow, or dart shafts and used as projectiles. Often impact produced damage to the tips and shoulders of projectile points. Points may also have been used as knives or other tools. Drills are heavily reduced late stage bifaces with a width-to-thickness ratio in the 1.5 range (Lowery and Custer 1990:86). These tools are used to drill or perforate a variety of hard and soft materials. Unidentified biface fragments are also included in the assemblage. These are biface fragments that cannot be ascribed to a specific biface production stage. Biface fragments can be created by both production and use.

Flaked Tools

This class includes a wide variety of artifacts, both formally prepared and expediently utilized. Unmodified tools include utilized flakes, teshoas, utilized shatter, and utilized cores. These four unifacial expedient tools are used in an unmodified state for cutting and scraping activities and show no purposeful retouch or re-sharpening.

Formally prepared flaked tools include scrapers, spokeshaves, denticulates, gravers, wedges, and multipurpose tools. Scrapers are unifacial flaked tools with fairly steep working edge angles. This category includes end scrapers and side scrapers. End scrapers are defined as unifacial flake tools retouched along either the distal or the proximal end. Side scrapers are similar tools but are retouched along the lateral margins. Spokeshaves, also known as concave scrapers, also display lateral retouching. These tools may have shallow or deeply concaved working surfaces. Scrapers may be either hafted or held freehand during use.

Denticulates are unifacial or bifacial flake tools with serrated edges. These tools may be used for cutting, sawing, or shredding. Gravers are unifacial tools with one or more protuberances used for cutting grooves into wood, bone, or antler. Wedges are unifacially or bifacially worked flakes with a flat distal end. Battering damage is present on the distal end. These tools are often associated with bone and antler tool production (Lowery and Custer 1990:93). Multipurpose flake tools may be any combination of the above tool types. These tools may be unifacial or bifacial, and have two or more working surfaces, displaying two or more different functions.

4.2.3.2 Other Lithic Artifacts

Fire Cracked Rock (FCR)

FCR possesses sharp angles and often displays reddening caused by direct contact with flame. This randomly broken, thermally altered stone (TAS) is taken as direct evidence for campfires or hearths for cooking and heating. Three types of FCR are typically recognized and include (Benson 2008):

- Water fractured FCR have rough and jagged undulating fracture surfaces. This type of FCR is interpreted as reflecting food processing or preparation and result from stone boiling; where stones are heated and placed in a water filled container.
- Heat spalled FCR typically resemble lithic debitage in appearance and have concave and convex dorsal surfaces. The stones often fracture due to one surface of the rock being heated more than the other, resulting in fragments of the stone exfoliating from the rock's surface. This type of FCR is often interpreted as resulting from stone roasting features and sweat lodges.
- Bedding fractured FCR have fracture surfaces that follow bedding planes or pre-existing faults or fractures on the rock.

Manuport

Manuports are unmodified rocks/cobbles that have been transported from their original contexts to another area by human action. An example would include a rounded, quartzite river cobble transported from the bed of a stream for future lithic reduction or cooking activities.

4.2.3.4 Pottery

This artifact class consists of clay that has been formed into a vessel, dried, and heated. Prior to vessel formation, a tempering agent is added to the clay. Temper in prehistoric pottery can consist of a wide variety of materials including crushed rock, sand, grit, shell, and reused pottery. Intense heating transforms the clay and temper mixture into ceramic. Native American pottery vessels in the Mid-Atlantic were usually formed via two methods: slab construction and coil construction. The former represents early pottery technology. Coil construction represents a far superior technology and was the most commonly employed potting technique used during the Woodland period. Native American pottery of the Mid-Atlantic displays a wide range of decorative surface treatments as well including smoothing, incising, net and cord impression, punctation, and castellation. Collectively, pottery temper, vessel shape, and decorative treatments have been shown to be strong temporal and cultural markers (Stewart 1998). Ceramic technology was also employed in the formation of ceremonial objects, including smoking pipes and animal effigies.

4.2.4 Analytical Methods

After using a standard methodological approach to catalog the artifact assemblage, the principal investigator examined the assemblage to determine what artifacts should be subjected to specialized analyses. The following analytical approaches were used to obtain the most significant information from the artifact assemblage.

4.2.4.1 Flaked Tool Analysis

All flaked tools recovered during the investigation were subjected to macroscopic and microscopic analysis by Mr. Jack Cresson. The presence or absence of use-wear was conducted using both naked eye observations and a microscope. Use-wear was defined as random flake scarring/tool damage caused on the working surface of a tool during usage. Retouching and/or re-sharpening was not considered use-wear unless the tool contained accompanying scarring caused by actual use. When use-wear was observed, the type of resultant scarring was recorded for each working surface. Previous research has established that specific uses create distinctive scarring and wear patterns (Dockall 1997, Odell 2001, Sivert 2005, in Lore and Bini 2005; Yerkes and Kardulias 1993).

4.2.4.2 Prehistoric Pottery Analysis

In addition to cataloging the assemblage for general typological information and descriptions, sherds associated with prehistoric cultural features were selected for residue analysis. Residue present on ceramics can provide dietary information of individuals living during the Woodland period.

4.2.4.3 Geomorphological Analysis

Soil exposures in TUs are described in detail and were sampled for laboratory determinations of soil particle size distributions. Such field and laboratory analyses together with available archaeological data can serve to define site chronostratigraphies and develop site formation models (Appendix D).

4.2.5 Ecofact Analyses

Ecofacts include seeds or other plant materials, calcined faunal remains, and blood protein residue recovered from stone tools. The following specialized analyses were conducted to provide sufficient information to resolve the stated research questions.

4.2.5.1 Fourier Transform Infrared Analysis

Fourier Transform Infrared Spectroscopy, or FTIR Analysis, is a failure analysis technique that provides information about the chemical bonding or molecular structure of materials, whether organic or inorganic. It is used in failure analysis to identify unknown materials present in a specimen. Seventeen ceramics recovered from the site were analyzed by Dr. Linda Scott Cummings of Paleo Research, Inc., Golden, Colorado (PRI) for remnant animal proteins and flora remains associated with the ceramic's use (Section 6.4.2.1; Appendix F).

The technique is based on the observation that bonds and groups of bonds vibrate at characteristic frequencies. A molecule that is exposed to infrared rays absorbs infrared energy at frequencies which are characteristic of that molecule. During FTIR analysis, a spot on the specimen is subjected to a modulated IR beam. The specimen's transmittance and reflectance of the infrared rays at different frequencies is translated into an IR absorption plot consisting of reverse peaks. The resulting FTIR spectral pattern is then analyzed and matched with known signatures of identified materials in the FTIR library.

4.2.5.2 Floral Analyses

Seeds or other plant materials recovered from soil flotation of feature matrixes were analyzed for represented plant species. For each sample isolated, identified seeds were stored in plastic vials and the remaining sediment in plastic bags. Identifiable seeds are listed by species and provenience, and the seed production time for each species is also provided. This information is invaluable for reconstructing food procurement practices and season(s) of site occupation. Floral materials related to prehistoric cultural features were submitted to Dr. William Hilgartner for analysis (Section 6.4.2.2; Appendix E).

4.2.5.3 Faunal Analyses

Paleofaunal information was gathered through the identification of blood protein residue recovered in association with prehistoric tools from the RCW Site. Seven lithic tools recovered from the site were analyzed by PRI for remnant animal proteins associated with the tools (Section 6.4.2.4; Appendix F).

Artifacts submitted for protein residue analysis were tested using an immunologically based technique referred to as cross over immunoelectrophoresis (CIEP or COE). The method for CIEP is based on forensic work by Culliford (1964; 1971) with changes made by Newman (Newman and Julig 1989) following the procedure used by the Royal Canadian Mounted Police Serology Laboratory in Toronto, Canada. Further changes were made at Paleo Research Institute following the advice of Dr. Richard Marlar at the Thrombosis Research Laboratory in the Denver V.A. Medical Center and the University of Colorado Health Sciences Center.

Artifacts were washed using 1 to 2 ml of a 0.02 M Tris hydrochloride, 0.5 M sodium chloride, and 0.5 percent Triton X-100 solution. Artifacts were placed in an ultrasonic bath for 30 minutes, on a rotating mixer for 30 minutes, then again in the ultrasonic bath for an additional 30 minutes. Because soils contain compounds such as bacteria and animal feces that can cause false positive results for artifacts buried in the soil, control samples were also tested. One gram of soil was added to 1 ml of the Tris/NaCl/Triton solution, then refrigerated for several days prior to testing.

The residues extracted from the artifacts and the soil controls were first tested against pre-immune goat serum (serum from a non-immunized animal) to detect non-specific binding of proteins. Samples testing negative against pre-immune serum were then tested against prepared animal antisera obtained from ICN Pharmaceuticals, Inc. and Sigma Chemical Company, and against antisera raised under the direction of Robert Sargeant in Lompoc, California, and Dr. Richard Marlar. Appropriate positive and negative controls were run for each antiserum. A positive control consists of the blood of an animal for which the antiserum is known to test positively, and a negative control consists of the serum/blood of the animal in which the antiserum was raised, either rabbit or goat.

CIEP was performed using agarose gel as the medium. Two holes were punched in the gel about 5 mm apart. The protein extract from the artifact was placed in the cathodic well and the antiserum was placed in the anodic well. The sample was electrophoresed in barbital buffer (pH 8.6) for 45 minutes at a voltage of 130v to drive the antigens and antibodies toward each other. Positive reactions appeared as a line of precipitation between the two wells. Gels were stained with coomassie blue to make the precipitate line easier to see. Positive reactions were re-tested with dilute antisera to determine between true and false positives. Antisera were diluted to increase specificity of reactions, usually 1:10 or 1:20.

4.2.5.4 Pollen Analyses

Several continuous soil column samples were collected during the data recovery excavations at the RCW Site. These samples were placed in sterile plastic bags using sterilized equipment during the sampling procedure. Four soil samples from the site were then analyzed by PRI to identify the type and amount of floral pollen present (Section 6.4.2.3; Appendix F).

A chemical extraction technique based on flotation is the standard preparation technique used in this laboratory for removing pollen from the large volume of sand, silt, and clay with which it is mixed. Hydrochloric acid (10 percent) was used to remove calcium carbonates present in the soil, after which the samples were screened through 250-micron mesh. The samples were rinsed until neutral by adding water, letting the samples stand for 2 hours, then pouring off the supernatant. A small quantity of sodium hexametaphosphate was added to each sample once it reached neutrality, then the samples were allowed to settle according to Stoke's Law in settling columns. This process was repeated with ethylenediaminetetraacetic acid (EDTA). These steps remove clay prior to heavy liquid separation.

The samples then were freeze dried. Sodium polytungstate (SPT), with a density 1.8, was used for the flotation process. The samples were mixed with SPT and centrifuged at 1500 rpm for 10 minutes to separate organic from inorganic remains. The supernatant containing pollen and organic remains was decanted. SPT again was added to the inorganic fraction to repeat the

separation process. The supernatant was decanted into the same tube as the supernatant from the first separation. This supernatant was then centrifuged at 1500 rpm for 10 minutes to allow any remaining silica to be separated from the organics. Following this, the supernatant was decanted into a 50-ml conical tube and diluted with distilled water. These samples were centrifuged at 3000 rpm to concentrate the organic fraction in the bottom of the tube. This pollen-rich organic fraction was rinsed, then all samples received a short (20–30 minute) treatment in hot hydrofluoric acid to remove any remaining inorganic particles. The samples then were acetylated for 3–5 minutes to remove any extraneous organic matter.

A light microscope was used to count pollen at a magnification of 500x. Pollen preservation in these samples varied from good to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University and the University of Colorado Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

4.2.7 Artifact Curation

All materials recovered during this project were curated according to standards outlined in the *New Jersey State Museum Curation Guidelines* dated August 30, 2005. All artifacts were washed and placed in resealable 4-mil polyurethane bags with labels. These bags were then logically ordered in acid-free Hollinger boxes for permanent storage. The artifact collection will be delivered to the New Jersey State Museum for final curation.

5.0 SITE FORMATION

The Reeders Creek West (RCW) Site is located on a stream terrace approximately 6 m (19.7 ft) above the Delaware River (Plates 1 and 2). Although the setting is similar to that of the River Road Site (36Bu379) located to the west across the river, the RCW Site is a higher landform by 2 to 3 m. The greater height of the RCW terrace likely indicates a Pleistocene landform of glacial outwash origins. The earliest soil deposits within the site may date as early as the Late Pleistocene as opposed to the River Road Site which did not begin terrace building until after the Early Holocene (Wagner 2011; Appendix D).

In terms of terrace development this would make the T2 terrace on the New Jersey side (where the RCW Site is located) older than the T2 terrace on the Pennsylvania side (where the River Road Site is located). Radiocarbon dates from carbon recovered from both cultural features and a deep 4Ab-horizon at the site help to illustrate this assumption (Table 5-1). The combined geomorphological data indicates that the RCW terrace landform has been relatively stable within the Late Holocene. Little to no historic sedimentation was observed on the terrace, which is uncommon among such landforms. The majority of the terrain surrounding the RCW Site is mantled by modern fill deposits resulting from construction of the Route 29 Interchange and I-95/Scudder Falls Bridge. Soil stratigraphy was relatively consistent within the RCW Site however, a few variations within the soil profile did occur within the terrace landform (Figures 5-1 and 5-2; Plates 3 and 4). A detailed geomorphologic report is located within Appendix D at the end of this report.

Geomorphologic studies indicated the presence of two historic plowzone horizons designated Ap1 and Ap2 (Table 5-2). The Ap1 appeared to have been stripped from the northwestern portion of the site during interchange construction. Below these initial plowzone horizons was the AE-horizon. The AE stratum is a precursor to an E-horizon and is identified as an area of mottling at the base of an A-horizon which has suffered leaching resulting in a lighter color than the organic horizons above.

Not represented within Table 5-2, due to variation in the site's soil stratigraphy, is the aforementioned E-horizon, located throughout the site, except for small areas within the northern and central portions of the test area (Figure 5-1). An E-horizon is typically only present within forested areas, and like the AE-horizon, is a lighter, leached out, stratum present under an A-horizon. The reason for the absence of the E-horizon within certain portions of the RCW is not known but may be attributable to differing rates of leaching occurring at the site. A transitional BE-horizon, located below the E-horizon, was localized within the southern/central portion of the site and marked the transition of the E-horizon into the underlying Bw horizons.

The underlying Bw1, Bw2 and Bw3 subsoil horizons are both classified as weakly formed cambic strata. The Bw1 and Bw2 strata were located throughout the RCW Site, while the Bw3-horizon was localized within the northern/central portion of the site (Figures 5-1 and 5-2). Typically, thick lamellae characterized the Bw2 and underlying C/Bb horizons. The C/Bb-horizon sits atop a C-horizon that contained fine sands that transition to a loamy sand 2Bwb1 and sandy loam 2Bwb2 strata. Phase III excavations reached a maximum depth of 2 m bgs while geomorph auguring extended to basal Pleistocene gravel at a depth of 4.5 m.

A possible buried A-horizon, identified as the 4Ab-horizon, was observed in auguring of Block B at a depth of almost 3 m bgs. Radiocarbon dating of a soil sample recovered from the 4Ab-horizon dated to the Middle Archaic Period B.C 5290 to B.C. 5040 (6,200±40 BP) (Beta 288329; Table 5-1; Appendix G). Due to the depth of the 4Ab-horizon no systematic testing to identify potential cultural resources could occur within the stratum. Current construction plans will not directly impact the 4Ab-horizon.

Plate 5-1. Reeders Creek West Site Beginning of Excavations. View South.

Plate 5-2. Reeders Creek West Site Close of Excavations. View Northeast.

Plate 5-3. Typical Soil Profile EB C, Reeders Creek West. View North.

Plate 5-4.Typical Soil Profile EB G, Reeders Creek West. View North.

Table 5-1. Radiocarbon Sample Results, Reeders Creek West Site, 28Me360.

Beta Sample #	Feature	Associated Soil Horizon	Radiocarbon Dates BP	2 Sigma Calibration	Temporal Period
295379	67	Ap2	890±30	A.D. 1040 to A.D. 1220	Late Woodland
300627	70	AE	540±30	A.D. 1390 to A.D. 1430	Late Woodland
295380	73	AE	3610±40	B.C. 2120 to B.C. 2090	Late Archaic
288328	27	E	1500±40	A.D. 520 to 640 A.D.	Middle Woodland
300629	44	E	2250±30	B.C. 320 to 210 B.C	Early Woodland
300630	45	Bw1	3450±30	B.C. 1880 to 1690 B.C.	Late Archaic
295378	64	Bw1	2990±40	B.C. 1330 to 1120 B.C.	Late Archaic
295381	Free Carbon Block G	B/C	3870±40	B.C. 2470 to 2200 B.C.	Late Archaic
300628	76	C/B	4450±30	B.C. 3180 to 3150 B.C.	Late Archaic
300626	75	2Bwb1	4130±30	B.C. 2870 to 2580 B.C.	Late Archaic
288329	-	4Ab	6200±40	B.C. 5290 to 5040 B.C.	Middle Archaic

Table 5-2. Typical Soil Stratigraphy of the RCW Site, Block B*.

Soil Horizon	Depth (cm below ground surface)	Soil Description
Ap1	0-17	7.5YR3/1 to 7.5YR 3/2 sandy loam
Ap2	17-30	7.5YR 3/2 sandy loam
AE	30-44	7.5YR 3/2 and 3/3 with 10YR4/3 sandy loam
Bw1	44-65	7.5YR 3/4 sandy loam
Bw2	65-85	7.5YR 4/4 loam
Bw3	85-104	7.5YR 4/4 and 4/3 sandy loam
C/Bb	104-122	10YR3/4 sand with three wavy lamellae 7.5YR3/4 and 5YR3/4 sandy loam
C	122-132	10YR3/4 sand
2Bwb1	132-146	7.5YR4/4 and 3/4 loamy sand
2Bwb2	146-180	7.5YR3/4 sandy loam
2C1	180-193	10YR 3/4 fine sand
2C2	193-206	7.5YR 3/4 fine sand
3Bwb	206-241	10YR 3/4 very fine sandy loam
3C/Bb	241-284	10YR 3/4 fine sand; two thin lamellae, 7.5YR 3/4 very fine sandy loam
3C	284-298	10YR 3/4 fine sand
4Ab	298-316	7.5YR 3/4 to 5YR 3/4 fine sandy loam
4Bwb1	316-333	7.5YR 4/3 loam with medium distinct mottles of brown 7.5YR 5/3
4Bwb2	333-365	7.5YR 4/3 and 7.5YR 3/4 loam; many, medium distinct mottles of 7.5YR 5/3 and 5/2
4Bwb3	365-394	7.5YR 4/4-4/3 loam to very fine sandy loam; common, coarse distinct mottles of brown 7.5YR 5/3
5BAb	394-414	5YR 4/3 to 5YR 3/3 silt loam; common, medium distinct mottles of 7.5YR 5/2
5Bwb	414-440	10YR 4/4 and 4/6 loam to silt loam; common, coarse distinct mottles of 7.5YR 5/2
6BCb	440-456	10YR 3/6 fine sandy loam; common, medium distinct mottles of 2.5Y 5/1 and 10YR 4/6

*Soil Information from geomorphologic report Appendix C.

Figure 5-1. Reeders Creek West Site Plan with Soil Horizon Limits.

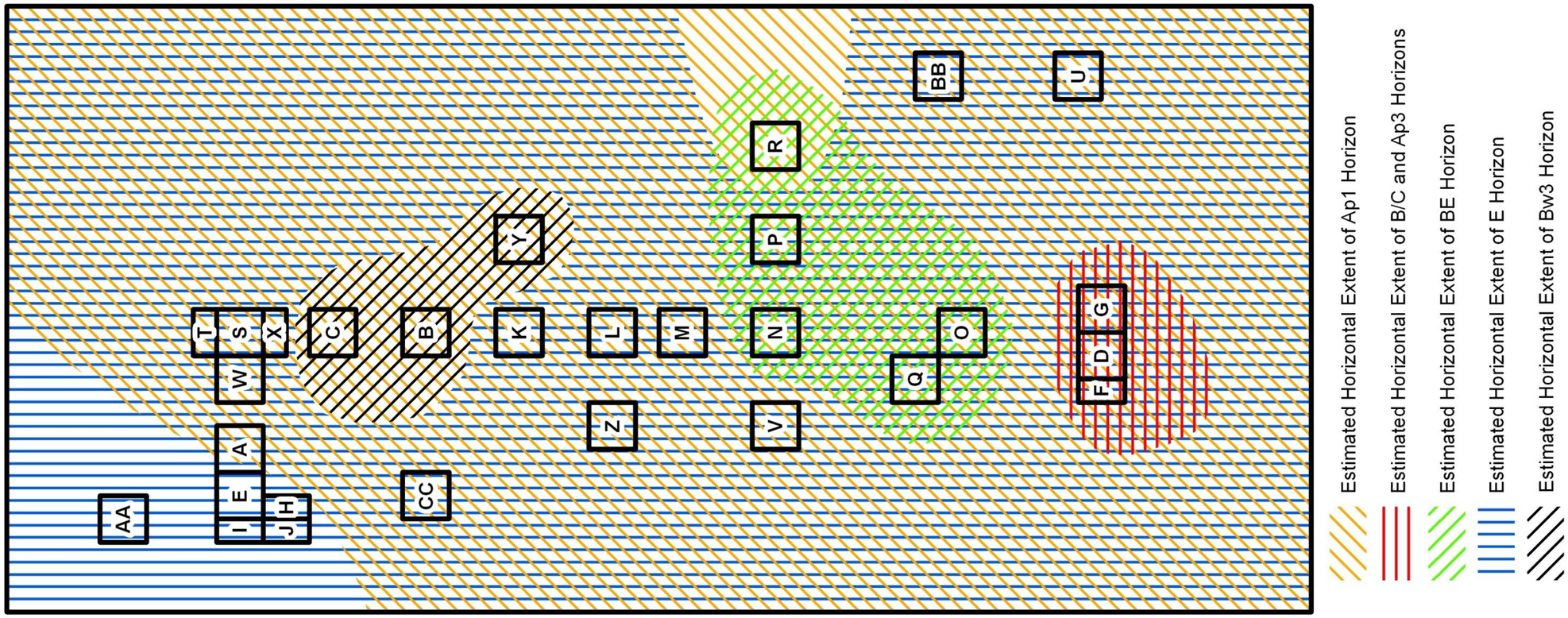
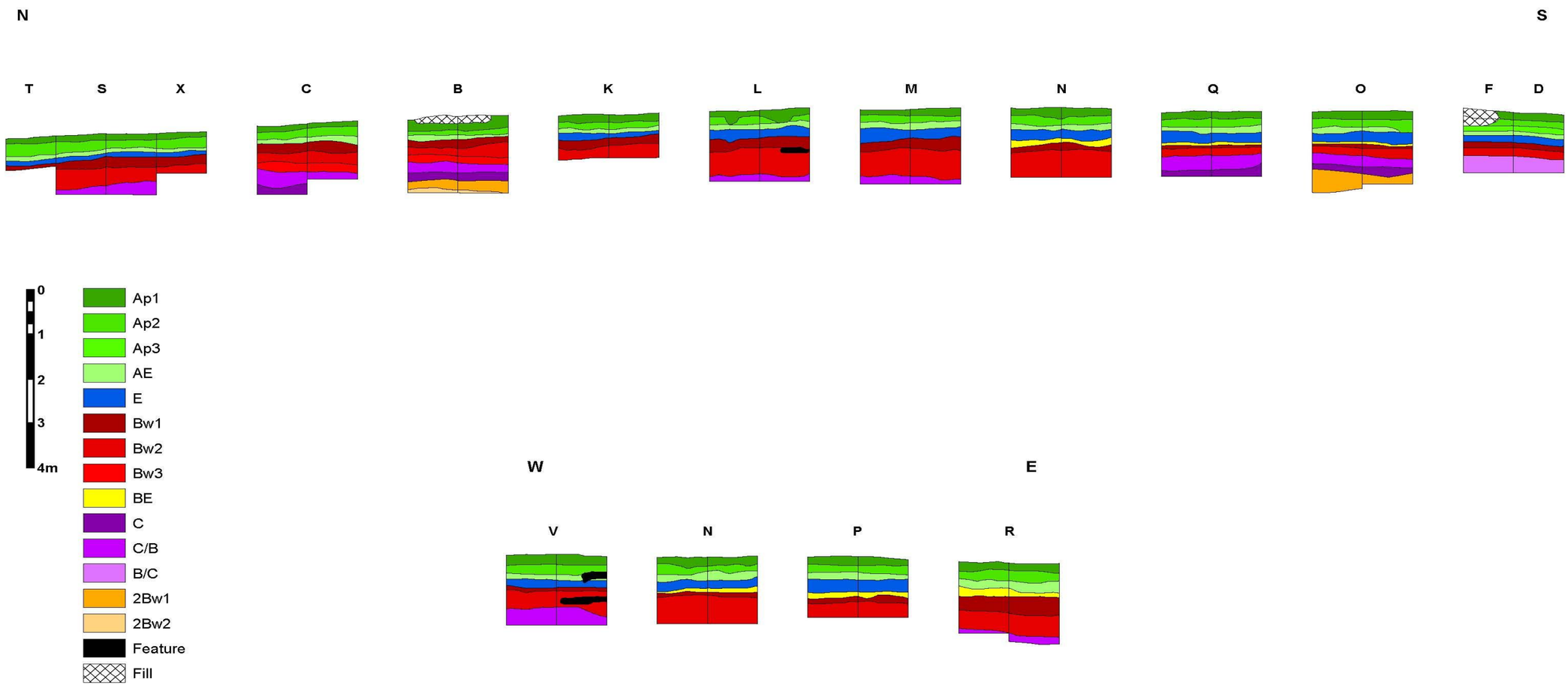


Figure 5-2. Reeders Creek West Site Soil Profile Cross-Sections.



6.0 ARCHAEOLOGICAL RESULTS

The following section details the Phase III excavation results of the Reeders Creek West (RCW) Site (28Me360). Phase III excavations at the RCW Site occurred between October 2010 and February 2011. The RCW Site was located within the Route 29 Interchange connecting the I-95/Scudder Falls Bridge to Route 29. The site was located on a T2 terrace within a clover leaf on the east bank of the Delaware River.

6.1 Phase III Excavation Results

One hundred and four, 1 m² TUs were excavated within 29, 2 m x 2 m excavation blocks during the Phase III excavation within the RCW Site (Figure 6.1; Appendix D). The portion of the RCW Site located within the RCW APE measured approximately 1,203.6 m^3. The combined Phase I/II unit totals constituted a 10.4 m^3or 1 percent sample of the site within the APE. Phase III excavations constituted another 161.28 m^3or 13.4 percent sample of the site. Therefore, the combined Phase I/II and Phase III unit totals constituted a 14.4 percent sample of the RCW Site located within the Scudder Falls Bridge APE. A total of 15,898 prehistoric artifacts and 128 historic artifacts were recovered during the Phase III excavations at the RCW Site (Appendix H). Cultural bearing deposits extended down the soil profile to almost 2 m in some portions of the site.

Excavations identified Late Woodland, Early/Middle Woodland, and Late Archaic I and II components within the RCW Site. The Late Archaic I and II components represent the different Late Archaic occupations present within the RCW Site and do not refer to any overarching periods or complexes defined by other researchers. A Late Woodland Component was identified within the plow zone (Ap1, Ap2, and Ap3) and AE-horizons. The Early/Middle Woodland Component was identified within the E and BE horizons. The Late Archaic I Component was identified within the Bw1, Bw2, and Bw3 horizons. Another Late Archaic Component, identified as the Late Archaic II Component, was identified within the B/C, C/B, C, 2Bwb1, and 2Bwb2 horizons. The Late Archaic I component contained radiocarbon dates of between B.C. 1,880 to 1,120 B.C. (Beta-300628 and 295378; Appendix G) dating to the later part of the Late Archaic period, while the Late Archaic II component contained an earlier Later Archaic occupation dating between B.C. 3,150 to 2,200 B.C. (Beta-295381, 300628, and 300626; Appendix G) The radiocarbon dates from the components appear to indicate at least a 320 year separation between the Late Archaic I and II occupations at the RCW Site.

A total of 19 prehistoric features were identified during Phase III excavations (Table 6-1). These features included hearth remnants, activity areas, and a remnant of a prehistoric post mold. The temporal components with the highest feature density were the Late Archaic I component (n=6), followed by the Early/Middle Woodland component (n=5). Four prehistoric features were also identified within the Late Woodland Component. The Late Woodland component was undoubtedly affected by historic plowing activities which would have destroyed any intact cultural features located within surficial levels. An additional four features were also identified within the Late Archaic II component, the earliest and deepest component identified at the RCW Site.

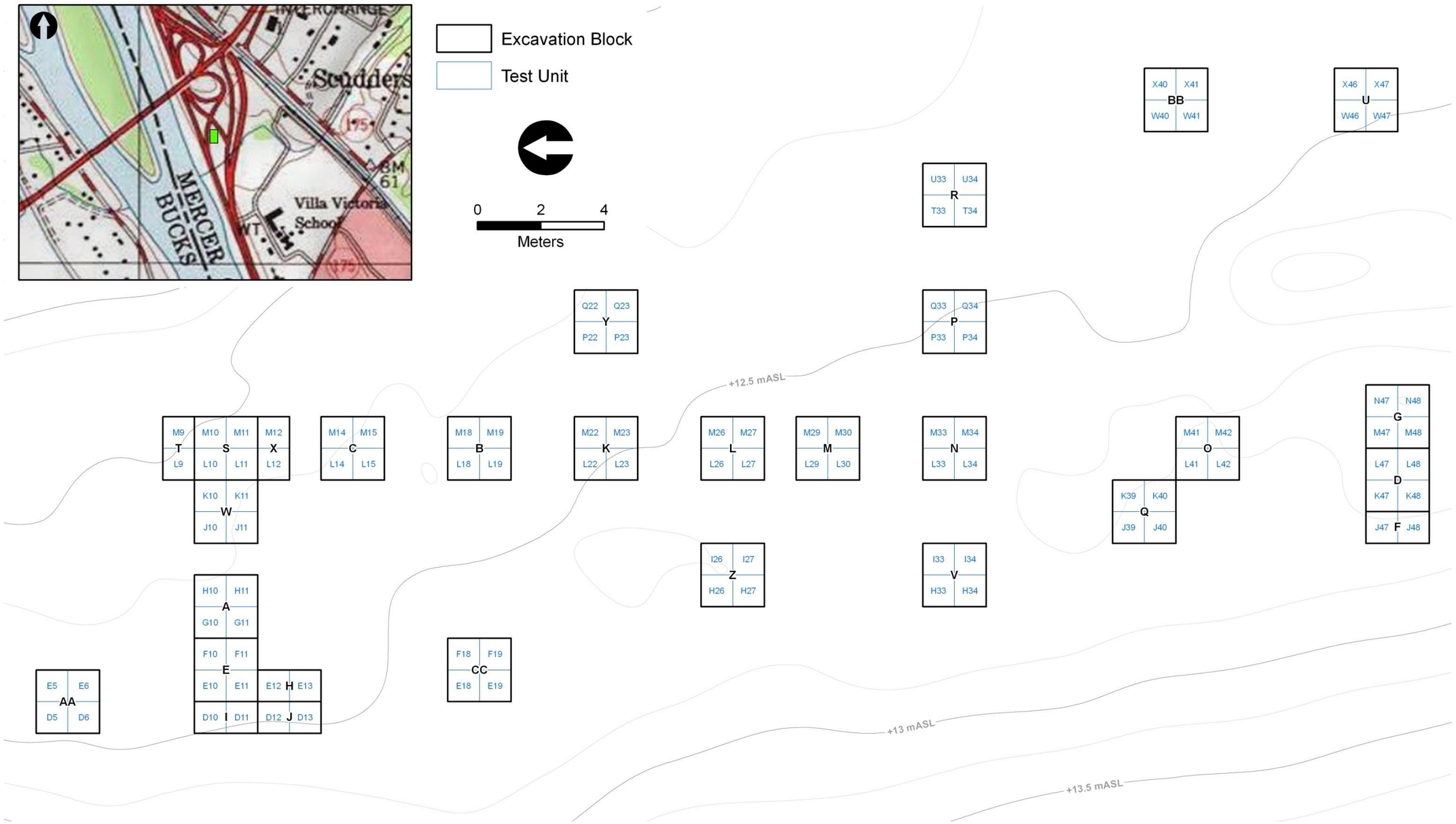
Archaeological features at the RCW Site have been characterized as having been identified within either a primary or secondary context. A primary archaeological deposit is an archaeological layer or deposit that is undisturbed and thus contains well-associated artifacts. A secondary archaeological context consists of archaeological material that has moved from where it was first deposited as a result of subsequent human activity or natural phenomena. Secondary contexts may well include residual material from a number of primary contexts.

Table 6-1. Total Artifact Counts by Soil Horizon and Temporal Component.

Stratum	Prehistoric Artifacts	Historic Artifacts	Prehistoric Features	Component	Temporal Period
Fill	16	4	-	Mixed Contexts	
Wall Scrape	18	1	-		
Total	***34***	***5***	**-**		
Ap1	487	24	-	**1**	Late Woodland
Ap1/Ap2	44	1	-		
Ap2	2,447	48	1		
Ap3	59	3	-		
AE	1,841	15	2		
Feat.33	6	-	-		
Feat.67	388	1	-		
Feat.70	71	-	-		
Feat.73	15	-	-		
Total	***5,358***	***92***	***3***		
E	1,339	9	5	**2**	Early to Middle Woodland
BE	196	3	-		
Feat.27	665	16	-		
Feat.40	12	-	-		
Feat.44	46	-	-		
Feat.50	52	-	-		
Feat.77	93	-	-		
Total	***2,403***	***28***	***5***		
Bw1	1,673	-	4*	**3**	Late Archaic I
Bw2	2,281	-	3		
Bw3	52	-	-		
Feat.26	18	-	-		
Feat.42	434	-	-		
Feat.43	13	-	-		
Feat.45	126	-	-		
Feat.64	2,342	-	-		
Feat.65	7	-	-		
Total	***6,946***	**-**	***7***		
B/C	168	-	-	**4**	Late Archaic II
C/B	637	3	2		
C	127	-	1		
2Bwb1	164	-	1		
2Bwb2	4	-	-		
Feat.39	32				
Feat.62	15				
Feat.75	3				
Feat.76	7	-	-		
Total	***1,157***	***3***	***4***		
TOTALS	***15,898***	***128***	***19***		

*****Feature 33, the base of a Late Woodland post mold feature was identified within the Bw1-horizon.

Figure 6-1. Phase III Archaeological Testing, Reeders Creek West Site.



6.1.1 Late Woodland Component (1040 A.D. to 1430 A.D)

The Late Woodland Period was represented within the top most stratigraphic layers of the RCW Site that included the plow zone horizons (Ap1, Ap2, and Ap3) and the AE-horizon. Typically the component measured no deeper than the first 70 cm of the soil profile. The Late Woodland Component was the most disturbed of the temporal periods represented at the site due to historic plowing activities and disturbances caused by prior interchange construction. The Late Woodland Component represents the latest artifact bearing period within the RCW Site, accounting for 34 percent of the total Phase III artifact assemblage and 21 percent of cultural features identified during excavations.

Intra-site spatial patterning of artifacts indicates that the central and southern portions of the RCW Site were most heavily used during the Late Woodland period (see Section 6.2.1). Chert and Jasper were the primary lithic materials utilized for bifacial tools while argillite and quartzite appeared to be utilized primarily for expedient tools. All of the lithic materials identified during excavation of the Late Woodland Component were local materials reduced from a combination of river cobbles and transported cores (Section 6.4.1).

While plowing has led to the mixing of artifact bearing horizons and destruction of most cultural features, one feature (Feature 67) was identified at the base of the Ap2-horizon. Features 70 and 73 were identified within the underlying AE-horizon, which was the only intact horizon within the component. Feature 33, the base of a post mold, was identified within the deeper Bw1-horizon. There has unquestionably been limited mixing of the Late and Early/Middle Woodland Components resulting from bioturbation and historic plowing.

A total of 5,358 prehistoric artifacts were recovered from the Late Woodland Component; primarily from the Ap2 (n=2,447) and AE (n=1,841) horizons. These artifacts included cores (n=19), debitage (n=3,842), flaked tools (n=74), cobble/groundstone tools (n=11), ceramics (n=755), smoking pipe fragments (n=2), FCR (n=670), manuports (n=10), and flaked cobbles (n=8) (Table 6-1; Appendix H). Diagnostic biface types recovered included Levanna (n=5), Rossville (n=2), and Meadowood (n=1) varieties (Plate 6-1). The Rossville and Meadowood bifaces which date to the Early/Middle Woodland period were likely re-deposited from the underlying Early/Middle Woodland Component due to bioturbational and historic plowing activities. The majority of ceramics recovered within the Late Woodland Component were grit/mineral tempered, small and heavily weathered but could be attributed to the Middle to Late Woodland series of ceramics. A total of 16 sherds were identified as part of the Bowmans Brook/Overpeck Series, Late Woodland ceramics common in the Middle Delaware Valley (Custer 1996:267). Two ceramic pipe fragments were also recovered from the component during excavation representing recreational/ritual smoking activities at the site during this period.

Radiocarbon dates were obtained from all three of the features identified within the Late Woodland Component during Phase III excavations. Carbon from a hearth remnant identified as Feature 67, 1040 A.D. to 1220 A.D. (890±30 BP), and a food processing activity area identified as Feature 70 1390 A.D. to 1430 A.D. (540±30 BP), both dated from the middle to latter half of the Late Woodland period (Beta-295379 and 300629; Appendix G). The radiocarbon date associated with Feature 73, a lithic reduction and food processing activity area, came back with a date from the later part of the Late Archaic 2120 B.C. to 2090 B.C. (3610±40 BP) (Beta-295380;

Appendix G). The radiocarbon date associated with Feature 73, a lithic reduction and food processing activity area, came back with a date from the later part of the Late Archaic B.C. 2120 to B.C. 2090 (3610±40 BP) (Beta-295380; Appendix G). Bowmans Brook/Overpeck Series ceramics, typically associated with the Late Woodland, were recovered from Feature 73 and contrast starkly with the earlier radiocarbon date received from Beta Analytic. Two possible scenarios could explain the earlier Late Archaic date recovered from Feature 73. One is that free carbon worked its way up through the soil profile from the earlier Late Archaic deposits through bioturbation; or some type of contamination took place during carbon retrieval or testing.

Regardless of the anomalous radiocarbon date from Feature 73, strong evidence exists that a Late Woodland Component is present within the initial strata (Ap1, Ap2, Ap3, and AE) of the site. This evidence includes diagnostic ceramics and bifaces along with radiocarbon dates from two features. Some mixing of the underlying Early/Middle Woodland Component's artifacts should be expected as bioturbation and historic plowing has impacted the Late Woodland Component significantly. Floral remains recovered from Features 67 and 70 indicate that Native Americans present at the site during the Late Woodland period were gathering and/or consuming pignut hickory nuts, blackberries, wild grape, knotweed, and pokeweed (Table 6-2; Section 6.4.2.2; Appendix E). One ceramic fragment tested positive for raw acorn, indicating that acorns were also available at/or near the site for consumption. The RCW Late Woodland Component appears to represent a short to medium term seasonal campsite that was used repeatedly over the Late Woodland period to gather floral and faunal resources from the surrounding Delaware River and Reeders Creek watersheds.

Plate. 6-1. Diagnostic Projectile Points, Late Woodland Component, Reeders Creek West.

Table 6-2. Late Woodland Component Feature Summary.

Feature No.	Soil Horizon(s)	Type of Feature	Associated Radiocarbon Date	Associated Floral Materials	Ceramic Residues Identified
33	Bw1	Post Mold	-	-	-
67	Ap2, AE	Hearth	890±30 BP	Blackberry, Mustard, Wild Grape, Pokeweed, Pignut Hickory	-
70	AE, Bw1, Bw2	Activity Area; Food Processing	540±30 BP	Blackberry, Mustard, Wild Grape	-
73	AE	Activity Area; Food Processing	3610±40 BP	-	Raw Acorn

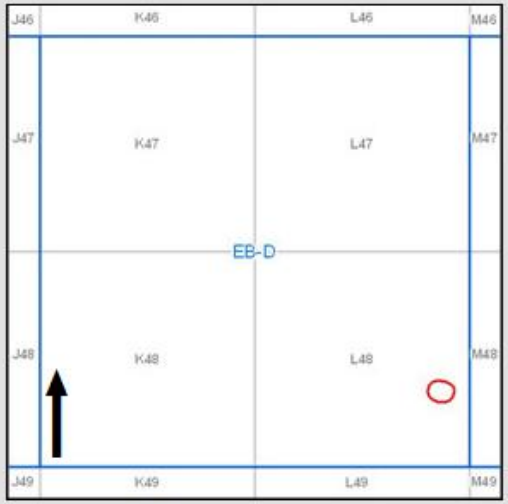
6.1.1.1 Feature 33

Feature 33 was identified during excavation of TU L48, level 8, EB D at 86 cm bgs (11.633 m ASL) within the top of the Bw1-horizon (Figure 6-2). Feature 33 appeared as a faint, round dark yellowish brown (10YR 4/6) stain approximately 0.11 m in diameter surrounded by a matrix of dark yellowish brown (10YR 4/4) sandy loam. Bisection of the stain revealed a tapered profile that terminated at approximately 101 cm bgs (11.483 m ASL) with a terminal width of 4.5 cm. Based on the formal characteristics of Feature 33, it has been interpreted as the base of a prehistoric post mold.

Very few artifacts were recovered during excavation and flotation of Feature 33. Argillite tertiary flakes (n=3), a metarhyolite secondary flake (n=1), a quartzite FCR (n=1), and a jasper Levanna biface (n=1) were recovered from Feature 33 during excavation (Appendix H). No artifacts or floral materials were recovered during flotation of the feature fill samples.

Feature 33 was identified within the Bw1-horizon a soil horizon associated with the Late Archaic I Component. No evidence was observed that the post mold was present within the upper Late Woodland or Early/Middle Woodland components. This may be due to the fact that the feature's soil color (10YR3/1) was very similar to the soil horizons present within the plow zones above and, as such, the feature was not discernible. Of course historic plowing would have obliterated the top portions of this feature leaving only the bottom portion extant within the subsoil. Nevertheless, a Levanna biface, a solid Late Woodland diagnostic artifact, was recovered from Feature 33. Feature 33 was the only post mold identified during Phase III excavations at the RCW Site and its function at the site during the Late Woodland is unknown.

Figure 6-2. Feature 33



Feature 33 (red) Plan View.

Feature 33 Plan View of Postmold.

Feature 33 Contents of Postmold Matrix.

6.1.1.2 Feature 67

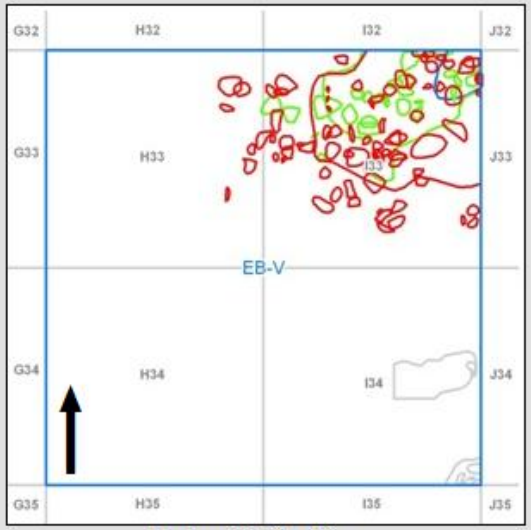
Feature 67 was identified within EB G, TUs H33 and I33, levels 4 through 6 (Figure 6-3). The feature was located within the Ap2-horizon at approximately 39 cm bgs (12.242 m ASL) and intruded into the AE-horizon to a depth of approximately 61 cm bgs (12.005 m ASL). The matrix was a brown (10YR 3/4) sandy loam mottled with a yellowish brown (10YR 3/2) sandy loam. Heavy charcoal flecking was found within the feature during excavation. One piece of historic bird shot was found at the top of the feature within the Ap2-horizon, likely deposited by modern/historic hunting activities. The feature consisted of a concentration of FCR and is likely a remnant of a Late Woodland hearth in a primary context that was partially scattered by historic plowing.

A total of 388 artifacts were recovered from Feature 67 (Table 6-3; Appendix H). This included primarily jasper debitage (n=46) and quartzite FCR (n=251). FCR fracture morphology clearly indicates the spontaneous cleavage of smooth quartzite and chert river cobbles by means of heat spalling, generating numerous flake-like FCR fragments with sharp regular fracture lines and pseudo flake scars with smooth sharp fracture planes. Carbon was also recovered during excavation, which produced a Late Woodland date of 1040 A.D. to 1220 A.D. (890±30 BP) (Beta-295379, Appendix G). Processing of soil samples taken from the feature identified chert (n=3), jasper (n=22), and argillite (n=10) micro-flakes, floral remains, and small fragments of calcined bone. The floral remains recovered from Feature 67 indicated the presence of blackberries, mustard, wild grapes, pokeweed, and pignut hickory; all likely utilized as food sources (Section 6.4.2.2; Appendix E). Feature 67 appears to have been a hearth used to process floral and faunal resources and a location for lithic tool re-sharpening activities as indicated by the amount of micro-debitage present.

Table 6-3. Feature 67 Artifact Types by Lithic Material.

Artifact Type	Chert	Jasper	Metarhyolite	Argillite	Quartzite	Quartz	*Total*
Primary Flakes	0	1	2	1	1	0	***5***
Secondary Flakes	1	0	2	1	0	0	***4***
Tertiary Flakes	0	5	0	1	0	0	***6***
Micro-Flakes	3	22	0	10	0	0	***35***
Angular Shatter	1	17	1	11	1	0	***31***
Core	0	0	0	1	0	0	***1***
FCR	3	0	0	43	251	3	***300***
Bifacial Tool	0	1	0	0	0	0	***1***
Retouched Flake	0	0	0	1	0	0	***1***
Hammerstone	0	0	0	0	1	0	***1***
Manuport	0	0	0	0	3	0	***3***
Total	***8***	***46***	***5***	***69***	***257***	***3***	***388***

Figure 6-3. Feature 67



Feature 67 Plan View.
Level 1 (red) and Level 2 (green).
Nearby Features (gray).

Feature 67 Plan View Looking North.

Heat Spalled Quartzite FCR from Feature 67.

6.1.1.3 Feature 70

Feature 70 was found within EB Z, TU H27, levels 4 and 5 (Figure 6-4). The feature was located within the AE-horizon at approximately 40 cm bgs (12.329 m ASL) and extended to a depth of 60 cm bgs (12.188 m ASL). Excavations revealed a brown (7.5YR 4/4) sandy loam feature matrix. The feature consisted of a concentration of FCR and prehistoric ceramics and is likely a remnant of a Late Woodland food processing activity area in a primary context.

Seventy-one prehistoric artifacts were recovered from Feature 70 (Appendix H). This included prehistoric ceramic (42),a quartzite manuport (n=1), and argillite micro-debitage (n=28), along with bone and seeds. Carbon recovered from Feature 70 dated to 1390 A.D. and 1430 A.D. (540±30 BP), the later part of the Late Woodland period (Beta-300627; Appendix G).

Ceramics recovered from Feature 70 were grit tempered body sherds belonging to the Late Woodland Bowmans Brook/Overpeck Series. Floral remains recovered from Feature 70 indicate the possible processing of blackberries, mustard, and wild grapes (Section 6.4.2.2; Appendix E). The feature likely represents an activity area where food processing was taking place as evidenced by both the amount of ceramics and types of seeds present. Argillite tool re-sharpening was also taking place as indicated by the relatively large amount of argillite micro-flakes recovered during flotation.

6.1.1.4 Feature 73

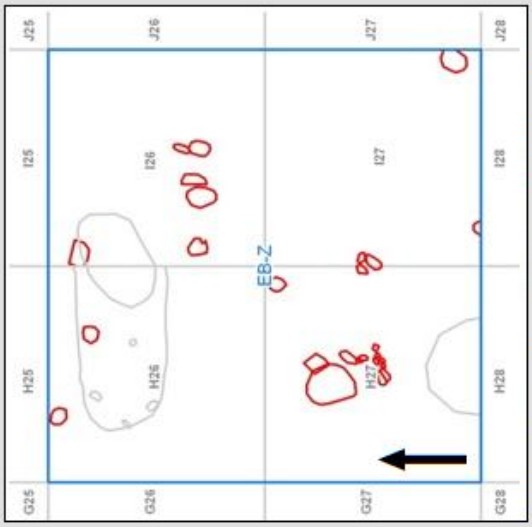
Feature 73 was located within EB Z, TUs H-26 and I-26, level 4 (Figure 6-5). The feature was initially identified within the AE-horizon at 50 cm bgs (12.205 m ASL) and extended into the underlying E, Bw1 and Bw2 horizons to a depth of 121 cmbgs (12.084 m ASL). The feature matrix consisted of a 7.5YR 4/4 to 3/3 loamy silt. Feature 73 is likely a remnant of a Late Woodland food processing activity area in a primary context.

Fifteen prehistoric artifacts were recovered during excavation of the feature, including prehistoric ceramic (n=11), quartzite teshoas (n=2), a quartzite primary flake (n=1), and quartzite FCR (n=1) (Appendix H). The predominant artifact type recovered within the feature was grit and crushed mineral tempered ceramic body sherds. While most of the ceramics were unable to be identified, two of the ceramic fragments belonged to the Bowmans Brook/Overpeck Series (Cat#s 1076.7 and 8), typically attributed to the Late Woodland Period. Three of the ceramics (Cat#s 1076.1, 7, 8) were sent to PaleoResearch for ceramic residue analysis and one sample indicated raw acorn residue (Appendix F). Feature 73 was the likely scene of an acorn/nut processing area that utilized quartzite teshoas to break the raw nuts.

The carbon recovered during flotation was sent to Beta Analytic and returned with a date of 2120 B.C. to 2090 B.C. (3610±40 BP) (Beta-295380, Appendix G). This date would appear to place the feature into the later part of the Late Archaic; however Late Woodland ceramics recovered within the feature indicate that the carbon was re-deposited from below or there was contamination within the carbon sample itself. Diagnostic artifacts recovered in the vicinity of Feature 73 (within the AE-horizon), as well as those recovered within the feature confirm a Late Woodland context.

Figure 6-4. Feature 70

Feature 70 Plan View Looking North.

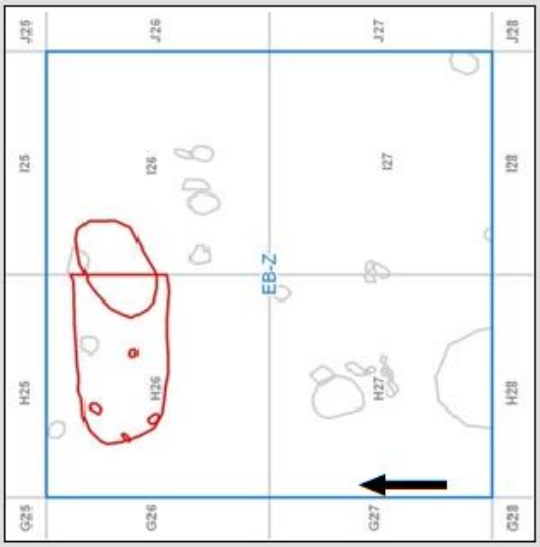


Feature 70 (red) Plan View. Nearby features (gray).

Water Spalled Quartzite FCR from Feature 70.

Figure 6-5. Feature 73

Feature 73 Plan View Looking North.



Feature 73 (red) Plan View. Nearby features in (gray).

Quartzite Teshoas and Ceramics from Feature 73.

6.1.2 Early to Middle Woodland Component (320 B.C. to 640 A.D.)

The Early/Middle Woodland Period was present within the E and BE soil horizons. Some mixing with the above Late Woodland component has likely occurred within the component due to plowing and bioturbational activities, however, radiocarbon dates and diagnostic artifacts indicate that the majority of the Early to Middle Woodland component is intact. No clear vertical separation in terms of soil characteristics or artifact differences were observed between the Early and Middle Woodland artifact-bearing zones within the E and BE-horizons. So, for purposes of the remaining analysis section of this report, the E and BE-horizons were interpreted as combined Early/Middle Woodland deposits. The lack of Early Woodland components in good stratigraphic context is not unprecedented in the Middle Atlantic as scholars have previously noted a scarcity of these types of sites in the region and have lumped the periods together as the Early/Middle Woodland period lasting from 3000 B.P. to A.D. 1000 (Hummer 1994:149). Five prehistoric features (Features 27, 40, 44, 50, and 77) were identified within the component and include hearths and activity areas (Table 6-4). The Early/Middle Woodland Component accounted for 15 percent of the total Phase III artifact assemblage and 26 percent of cultural features identified during excavations.

Intra-site spatial patterning of artifacts indicates that the central and southern portions of the RCW Site were most heavily used during the Early/Middle Woodland period (see Section 6.2.2). Chert and jasper were the primary lithic materials utilized for bifacial tools while argillite and quartzite appeared to be utilized primarily for expedient tools. All of the lithic materials identified during excavation of the Late Woodland Component were local materials reduced from a combination of river cobbles and transported cores (see Section 6.4.1).

A total of 2,403 prehistoric artifacts were recovered from the Early/Middle Woodland Component; primarily from the E (n=1,339) and BE (n=196) horizons along with Feature 27 (n=665). These artifacts included cores (n=3), debitage (n=1,068), flaked tools (n=24), cobble/groundstone tools (n=4), ceramic (n=112), FCR (n=1,174), manuports (n=14), and flaked cobbles (n=4) (Appendix H). Diagnostic biface types recovered included Levanna (n=1), Fishtail (n=2), Fox Creek (n=1), and Jack's Reef Pentagonal (n=1) varieties (Plate 6-2). The Fox Creek and Jack's Reef Pentagonal bifaces date to the Early/Middle Woodland period. The Fishtail bifaces date to the latter part of the Late Archaic (Custer 1996). A Late Woodland Levanna biface was likely re-deposited from the above Late Woodland Component as a result of plowing and/or bioturbation. Ceramics recovered from the component were typically small fragments that were heavily weathered and, as such, no temporally diagnostic ceramic types were identified within the Early/Middle Woodland Component.

Radiocarbon dates were obtained from two of the five features identified within the Early/Middle Woodland Component during Phase III excavations (Appendix G). Carbon from a hearth remnant identified as Feature 27, (520 A.D. to 640 A.D. [1500±40 BP]) dated to the Middle Woodland, and another hearth remnant identified as Feature 44 (320 B.C. to 210 B.C. [2250±30 BP]) dated to the Early Woodland period (Beta-288328 and 300629)(Appendix G).

Floral remains recovered from Features 27 and 44 indicate that Native Americans present at the site during the Late Woodland were gathering and/or consuming pignut hickory nuts, elderberries, blackberries, wild grape, knotweed, and pokeweed (Table 6-2; Section

6.4.2.2; Appendix E). One ceramic fragment from Feature 44 tested positive for raw acorn, yarrow stem, cattail root, sunflower seed shell, and hickory nut shell indicating the ceramic was used for a multiplicity of tasks and contained many types of products (Section 6.4.2.1; Appendix F). Testing on the same sherd indicated that duck was also cooked within the ceramic vessel. The RCW Site appears to have functioned during the Early Middle Woodland much like it did during the Late Woodland period; as a seasonal, short-term campsite used to process locally available food and game.

Table 6-4. Early to Middle Woodland Component Feature Summary.

Feature #	Soil Horizon(s)	Type of Feature	Associated Radiocarbon Dates	Associated Floral Materials	Ceramic Residues Identified
27	E	Hearth	1500±40 BP	Blackberry, Elderberry, Mustard, Pokeweed, Knotweed	-
40	E	Activity Area; Lithic Reduction	-	-	-
44	E	Hearth	2250±30 BP	Blackberry, Mustard, Wild Grape, Pokeweed, Pignut Hickory	Duck skin, Yarrow stem (raw), hickory nut shell (raw), sunflower shell (raw), cattail root (raw)
50	E	Activity Area; Lithic Reduction	-	-	-
77	E	Hearth/ Activity Area; Lithic Reduction	-	Blackberry, Mustard	-

Plate. 6-2. Diagnostic Projectile Points, Early/Middle Woodland Component, Reeders Creek West.

6.1.2.1 Feature 27

Feature 27 was initially identified in the southwest corner of EB E, TU E11, levels 3 through 5 (Figure 6-6). Prior to excavation of the feature EB H, I and J were opened to define the full extent of Feature 27. The upper margin of Feature 27 was identified at the surface of the E-horizon at 33 cm bgs and extended to a depth of 45 cm bgs (12.196 to 12.241 m ASL). Feature 27 was located in close proximity to the berm for the Route 29 interchange; as a result a large amount of modern trash was deposited above the feature. The feature appears to be a remnant of a Middle Woodland hearth in a primary context.

The feature consisted of a medium sized, discrete rounded cluster of quartzite (n=630) and quartz (n=3) FCR and a quartzite cobble manuport (n=1) measuring 0.62 m^2 in extent, arranged in a single shallow layer 8 to 12 cm thick (Appendix H). The calculated average distance between FCR components in Feature 27 measured approximately 0.06 m. Upon bisection, the soil matrix within Feature 27 clearly was distinct from that of surrounding soils and consisted of a very dark grayish brown (10YR 3/2) sandy loam. One jasper tertiary flake was recovered during excavation of feature fill.

The uniform material of the FCR and cobbles, along with their discrete clustered distribution in association with notable charred material, suggest this feature was found in a primary context. A sample of the charred material recovered from Feature 27 returned a firm Middle Woodland date of (520 A.D. to 640 A.D. [1500±40 BP]) (Beta-288328, Appendix G). FCR fracture morphology clearly indicates the spontaneous cleavage of smooth quartzite river cobbles by means of heat spalling, generating numerous flake-like FCR fragments with sharp regular fracture lines and pseudo flake scars with smooth sharp fracture planes.

Chert (n=18) and jasper (n=11) micro-flakes, an argillite tertiary flake (n=1), and seeds were recovered during excavation of Feature 27. The micro-debitage may represent tool re-sharpening activities taking place near the hearth. The floral remains recovered from Feature 27 indicate the likely processing of blackberries, elderberry, mustard, pokeweed, and knotweed (Section 6.4.2.2; Appendix E). Sixteen small historic bottle glass fragments were also recovered during flotation likely deposited from above by bioturbation processes. Feature 27 appears to be a Middle Woodland hearth where resource processing and tool re-sharpening activities were occurring at the RCW Site.

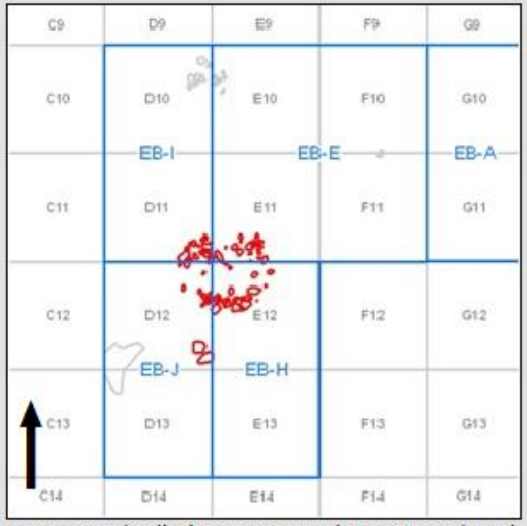
Table 6-5. Feature 27 Artifact Types by Lithic Material.

Artifact Type	Chert	Jasper	Argillite	Quartzite	Quartz	*Total*
Tertiary Flakes	-	1	1	-	-	***2***
Micro-Flakes	18	11	-	-	-	***29***
FCR	-	-	-	630	3	***633***
Manuport	-	-	-	1	-	***1***
Total	***18***	***12***	***1***	***631***	***3***	***665***

6.1.2.2 Feature 40

Feature 40 consists of a very large unmodified quartzite cobble associated with an unmodified argillite cobble manuport surrounded by a loose scatter of quartzite FCR (n=9) measuring approximately 0.46 m^2 in extent. A chert microflake (n=1) was also recovered from Feature 40 during excavation (Appendix H). Feature 40 was initially identified in excavation level 6 (52-62 cm bgs), TU M27, EB L and ranged in elevation from 12.094 m ASL on the south down to 11.894 m ASL on the north (Figure 6-7). The feature was in a matrix of strong brown (7.5YR 5/6) sandy loam within the E-horizon and contained no associated soil staining or charcoal flecking. Feature 40 appears to be a quartzite lithic reduction activity area. Given their size and close proximity, the two large unmodified cobbles may comprise a cache of unutilized lithic raw material in a primary context surrounded by incidental, functionally unassociated discarded materials.

Figure 6-6. Feature 27

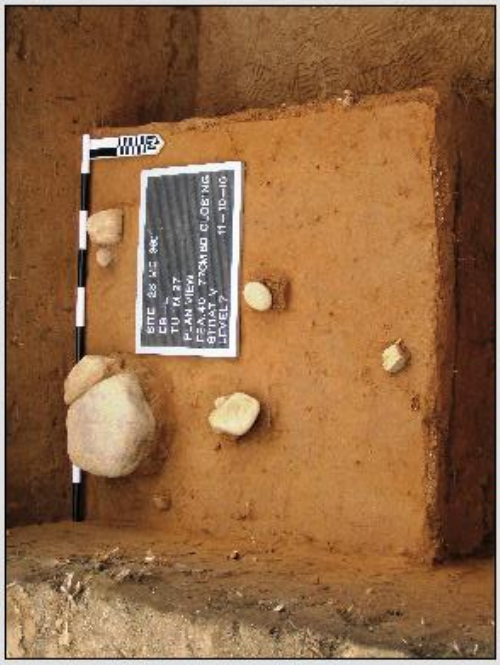


Feature 27 (red) Plan View. Nearby Features (gray).

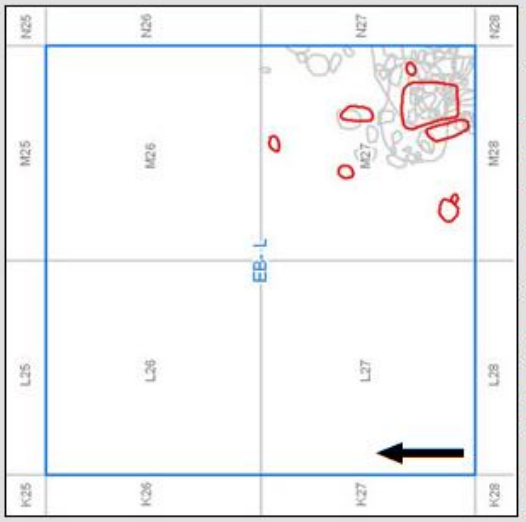
Heat Spalled Quartzite FCR From Feature 27.

Feature 27 Plan View Looking West.

Figure 6-7. Feature 40



Feature 40 Plan View Looking South.



Feature 40 (red) Plan View. Nearby Features (gray).

Water Spalled Quartzite FCR from Feature 40.

6.1.2.3 Feature 44

Feature 44 was initially identified in EB N, TU L34, level 7 at 60 cm bgs, and ranged in elevation from 11.940 to 11.813 m ASL and measuring 0.62 m^2 in area (Figure 6-8). No soil staining was identified in association with Feature 44 but diffuse charcoal flecking was noted at the base of the feature in level 8 at 70 cm bgs (11.950 m ASL). The feature lay in a matrix of mottled pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) sandy loam. Feature 44 appears to be an Early Woodland hearth in a primary context.

Feature 44 consisted of a loose, discrete scatter of blocky, angular quartzite FCR (n=22), quartzite manuports (n=4), a jasper secondary flake (n=1), a jasper tertiary flake (n=1), a chert secondary flake (n=1), chert tertiary flakes (n=4), chert micro-flake (n=1), angular chalcedony shatter (n=1), an argillite secondary flake (n=1), quartzite micro-flakes (n=4), a quartzite angular shatter (n=1), prehistoric ceramic (n=5), a prehistoric ceramic rim sherd (n=1), along with seed and nut shells (Appendix H). FCR fracture morphology suggests the breakage of the quartzite cobbles by means of water fracture resulting in blocky FCR fragments with multiple rough fracture planes and jagged fracture lines. One prehistoric ceramic body fragment consisted of a cross-cord malleated exterior with smoothed interior and was Mockley-like (Early to Middle Woodland) in appearance. Two other ceramic fragments had a cross-corded exterior with a smoothed interior and likely fit into the Middle to Late Woodland Series of ceramics. All of the other prehistoric ceramics recovered from the feature were too small and worn to identify any diagnostic traits.

Given the components (e.g. FCR; jasper, chert and chalcedony debitage; ceramic) Feature 44 likely represents a remnant of a hearth feature where lithic reduction activities took place. Carbon recovered during excavation was sent to Beta Analytic and indicated an Early Woodland date; 320 B.C. to 210 B.C. (2250±30) (Beta-300629, Appendix G).The floral remains recovered from Feature 44 indicate the possible processing/consumption of blackberry, mustard, wild grape, pokeweed, and pignut hickory nuts (Section 6.4.2.2; Appendix E).

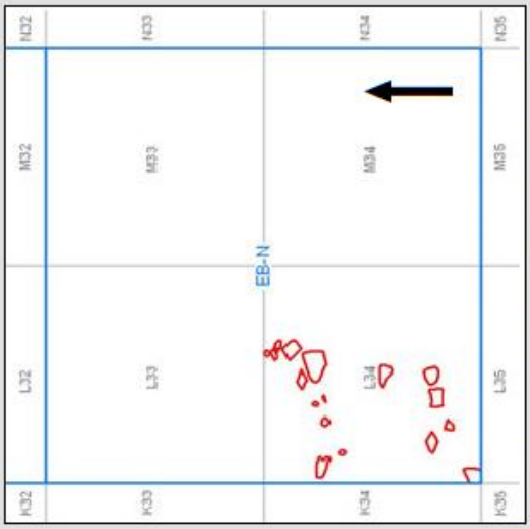
Two prehistoric ceramics (Cat#s 611.22 and 611.23) recovered from Feature 44 were sent to PRI for FTIR analysis. The results indicated that Cat# 611.22 tested positive for duck skin, and had contact with raw yarrow stem, hickory nut shell, sunflower seed shell, and cattail root (Section 6.4.1.5.1; Appendix F). Cat# 611.23 had contact with raw hickory nut shell. It is clear that sherd Cat#611.22 was part of a vessel used to cook water fowl. The multiple floral residues identified on the sherds were all identified as “raw”. This could be attributable to background environmental signatures, or could indicate that the vessel was used for storage of those items at some point in the past. Nevertheless, the raw residues indicate that plant resources such as yarrow, cattail, sunflower, and hickory were present at/or near the site during the Early/Middle Woodland period, and were no doubt being utilized by Native American occupants.

Table 6-6. Feature 44 Artifact Types by Lithic Material.

Artifact Type	Chert	Chalcedony	Jasper	Argillite	Quartzite	*Total*
Secondary Flakes	1	-	1	1	-	***3***
Tertiary Flakes	4	-	1	-	-	***5***
Angular Shatter	-	1	-	-	1	***2***
Micro-Flakes	1	-	-	-	4	***5***
FCR	-	-	-	-	22	***22***
Manuport	-	-	-	-	4	***4***
Total	***6***	***1***	***2***	***1***	***31***	***41***

Figure 6-8. Feature 44

Feature 44 Plan View Looking West.



Feature 44 (red) Plan View. Nearby Features (gray).

Water Spalled Quartzite FCR from Feature 44.

6.1.2.4 Feature 50

Feature 50 was identified within the E-horizon in EB O, TU L42, level 6 48 cm bgs ranging in elevation between 12.061 and 12.004 meters ASL (Figure 6-9). The feature was relatively shallow and terminated at approximately 55 cm bgs. Feature 50 lay in a matrix of dark yellowish brown (10YR 4/6) to brown (10YR 4/3) sandy loam with no associated soil staining. The feature consisted of a discrete cluster of lithic debitage measuring approximately 0.20 m^2 in extant. Feature 50 likely represents an argillite lithic reduction activity area in a primary context.

The primary lithic materials recovered from Feature 50 included argillite primary flakes (n=8), argillite secondary flakes (n=10), and argillite angular shatter (n=11) (Appendix H; Table 6-7). Artifacts recovered from TU L42, level 6 surrounding the feature matrix included: a chert primary flake, chert secondary flakes (n=2), chert tertiary flakes (n=13); and jasper secondary flakes (n=2).

The close association between many of Feature 50s component artifacts, the presence of at least one primary flake refit associated with the argillite core, and the presence of two hammerstones, point to this feature as an argillite reduction station in a primary context mixed with debitage associated with both early and late stage chert and jasper tool manufacture/reduction. The quartzite FCR recovered is in a secondary context likely transported to the area for use as hammerstones in lithic reduction activities.

Table 6-7. Feature 50 Artifact Types by Lithic Material.

Artifact Type	Chert	Jasper	Argillite	Quartzite	*Total*
Primary Flakes	1	-	8	-	***9***
Secondary Flakes	2	2	10	-	***14***
Tertiary Flakes	13	-	-	-	***13***
Angular Shatter	-	-	11	-	***11***
Core	-	-	1	-	***1***
FCR	-	-	-	2	***2***
Hammerstone	-	-	-	2	***2***
Total	***16***	***2***	***30***	***4***	***52***

6.1.2.5 Feature 77

Feature 77 was located within the E-horizon in EB CC, TU E-19 levels 5 and 6 at 50 cm bgs and extended to a depth of 60 cm bgs (12.18 to 12.08 m ASL) (Figure 6-10). Feature 77 consisted of a discrete cluster of FCR and lithic debitage measuring approximately 0.60 m^2 in extent. The feature matrix was a dark yellowish brown (10YR4/6) mottled with a brown (7.5YR4/4) sandy silt. Feature 77 appears to be the remnant of a hearth and lithic reduction activity area in a primary context.

A total of 93 lithic artifacts were recovered during excavation and included primarily chert tertiary flakes (n=22), chert shatter (n=1), jasper tertiary flakes (n=14), quartzite FCR (n=46), and seeds (Table 6-8; Appendix H). FCR fracture morphology suggests the breakage of quartzite cobbles by means of heat fracture resulting in concave and convex dorsal surfaces that resemble lithic debitage in appearance. One expedient tool, a retouched chert flake, was recovered during excavation. The floral remains were identified as blackberry and mustard seeds, which may indicate the processing/consumption of these plant resources at/or near Feature 77 (Section 6.4.2.2; Appendix E). Feature 77 appears to be a hearth where resource processing and late stage chert and jasper reduction was occurring at the RCW Site.

Table 6-8. Feature 77 Artifact Types by Lithic Material.

Artifact Type	Chert	Jasper	Argillite	Quartzite	*Total*
Primary Flakes	-	-	-	1	***1***
Secondary Flake	1	-	2	1	***4***
Tertiary Flakes	22	14	2	-	***38***
Angular Shatter	2	-	-	1	***3***
FCR	-	-	-	46	***46***
Retouched Flake	1	-	-	-	***1***
Total	***26***	***14***	***4***	***49***	***93***

Figure 6-9. Feature 50

Feature 50 Plan View Looking South.

Feature 50 (red) Plan View. Nearby features (gray).

Argillite Flakes from Feature 50.

Argillite Core from Feature 50.

Figure 6-10. Feature 77

Feature 77 Plan View Looking South.

Feature 77 (red) Plan View.

Water Spalled Quartzite FCR from Feature 77.

6.1.3 Late Archaic I Component (1880 B.C. to 1120 B.C.)

The later portion of the Late Archaic period (1880 B.C. to 1120 B.C.) was present within the Bw1, Bw2, and Bw3 soil horizons. The Late Archaic I Component represents the largest artifact bearing period within the RCW Site, accounting for 44 percent of the total Phase III artifact assemblage and 32 percent of cultural features identified during excavations. Six prehistoric features (Features 26, 42, 43, 45, 64, and 65) were identified within the component and are exclusively hearth remnants (Table 6-9). Feature 64, a platform hearth, was the largest feature identified during archaeological testing at the RCW Site.

Intra-site spatial patterning of artifacts indicates that the entire RCW Site was heavily utilized during the Late Archaic I occupation (see Section 6.2.1). Argillite and quartzite were the primary lithic materials utilized for all tool types (ie. bifacial, expedient, and formal tools). All of the lithic materials identified during excavation of the Late Archaic I Component appear to be local materials reduced from a combination of river cobbles and transported cores and indicate very little long distance acquisition of lithic materials (see Section 6.4.1).

A total of 6,946 prehistoric artifacts were recovered from the Late Archaic I Component; primarily from the Bw1 (n=1,673) and Bw2 (n=2,281) horizons along with Feature 64 (n=2,342). These artifacts included cores (n=11), debitage (n=1,804), flaked tools (n=56), cobble/groundstone tools (n=6), ceramic (n=92), a ceramic smoking pipe fragment (n=1), FCR (n=4,942), manuports (n=17), and flaked cobbles (n=17). Diagnostic biface types recovered included Levanna (n=2), Fishtail (n=1), Rossville (n=1), Lackawaxen (n=6), and Meadowood (n=2) varieties (Plate 6-3). Levanna bifaces date to the Late Woodland, while the Rossville and Meadowood bifaces date to the Early Woodland period. The Fishtail and Lackawaxen bifaces date to the Late Archaic. The Late Woodland Levanna bifaces likely worked their way down through the soil profile to the Late Archaic I Component through bioturbation activities. Since the Late Archaic Component I dated to the later part of the Late Archaic period it is not surprising to find bifaces associated with the Early Woodland period together with Late Archaic diagnostics.

Over 75 percent (n=69) of the ceramics recovered within the Late Archaic I Component were recovered near the transition between the Bw1 and E/BE horizons. The majority of the ceramics recovered were not identifiable, but a proportion of them (n=15) appear to have Middle to Late Woodland Series characteristics. As the Bw1-horizon (Late Archaic I Component) is located directly under the E/BE horizons (Early/Middle Woodland Component) it is understandable that some ceramics would have worked their way down through the soil profile to the surface of the Bw1.

Radiocarbon dates were obtained from two of the six features identified within the Late Archaic I Component during Phase III excavations. Carbon from a hearth remnant identified as Feature 45 dated to the later portion of the Late Archaic, 1880 B.C. to 1690 B.C. (3450±30 BP) (Beta-300630). A large platform hearth identified as Feature 64 also dated to the later portion of the Late Archaic period, 1330 B.C. to 1120 B.C. (2990±40 BP) (Beta-295378) (Appendix G).

Diagnostic bifaces along with radiocarbon dates from Features 45 and 64 indicate that the Late Archaic I period occupation(s) was present at the RCW Site between 3,450 and 2,990 B.P.

Some artifacts within the component, like the Levanna biface and ceramics, have likely filtered down from the above Woodland components but evidence suggests this happened on only a limited scale within the Late Archaic I Component and represents less than 1 percent of the components artifact assemblage.

Floral remains recovered from Features 45 and 64 indicate that Native Americans present at the site during the later part of the Late Archaic were gathering and/or consuming pignut hickory nuts, blackberries, wild grape, pokeweed and mustard (Table 6-9; Section 6.4.2.2; Appendix E). Residue testing of a ceramic fragment (Cat# 865.1) recovered within the Late Archaic I Component just above Feature 64 revealed that the vessel was used to cook cattail root (Section 6.4.2.1; Appendix F). The RCW Site appears to have served the same function during the latter half of the Late Archaic as it had during the Woodland periods; as a seasonal, short-term campsite used to process locally available food and game.

Table 6-9. Late Archaic I Component Feature Summary.

Feature #	Soil Horizon(s)	Type of Feature	Associated Radiocarbon Dates	Associated Floral Materials	Protein Residues Identified
26	Bw2	Hearth	-	-	-
42	Bw2	Hearth	-	-	-
43	Bw2/C/B	Hearth	-	-	-
45	Bw1	Hearth	3450±30 BP	Blackberry, Mustard, Wild Grape, Pokeweed, Pignut Hickory	-
64	Bw1/Bw2	Large Platform Hearth	2990±40 BP	Blackberry, Mustard, Wild Grape, Pokeweed, Pignut Hickory	-
65	Bw1	Hearth	-	-	-

Plate 6-3. Diagnostic Projectile Points, Late Archaic I Component, Reeders Creek West.

6.1.3.1 Feature 26

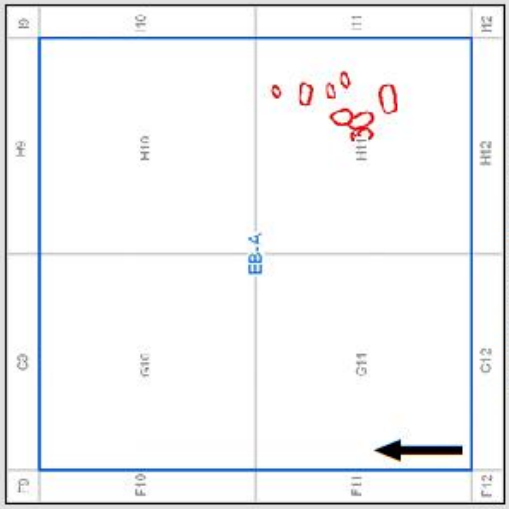
Feature 26 was identified within EB A, TU H11, excavation level 11 and ranged in depth between 94 and 104 cm bgs (11.508 – 11.421 m ASL) (Figure 6-11). The feature was identified within the Bw2-horizon in a matrix of mottled yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) sandy loam marked by distinct lamellae banding. No soil staining or carbon was observed in association with Feature 26 during excavation. Feature 26 appears to be the remnant of a hearth in a primary context.

The feature consisted of a small, discrete cluster of blocky sub-angular quartzite FCR (n=14) and a quartzite manuport (n=1) arranged in a single shallow layer less than 10 cm thick and measuring approximately 0.13 m^2 in extent (Appendix H). Argillite micro-flakes (n=3) were recovered during the excavation of the feature. The calculated average distance between FCR components in Feature 26 measured approximately 0.09 meters. Flotation of feature fill recovered unidentified seeds (n=13) and carbonized hickory nut shells (n=30).

Analysis of the feature FCR indicates blocky FCR fragments with multiple rough fracture planes and jagged fracture lines, typically associated with water fracturing. The type of FCR fracturing often occurs during stone boiling activities. The presence of a relatively large amount of carbonized hickory nut shells within Feature 26 indicates that hickory nuts were being processed within the hearth. Limited argillite tool re-sharpening also appears to have taken place at Feature 26.

Figure 6-11. Feature 26

Feature 26 Plan View Looking East.



Feature 26 (red) Plan View.

Water Spalled Quartzite FCR From Feature 26.

6.1.3.2 Feature 42

Feature 42 was located during excavation of EB L, TU M-27, level 10, within the Bw2-horizon at 96 cm bgs (11.684 m ASL) (Figure 6-12). Feature 42 appeared as a dark grayish brown (10YR 3/1) sand within the southeast corner of the test unit. The stain measured approximately 0.13 m^2 in size and contained visible FCR and charcoal. Bisection of the feature revealed a basin shaped profile extending to a depth of 116 cm bgs (11.482 m ASL). Feature 42 has been interpreted as a hearth located within a primary context.

A total of 434 artifacts were recovered during excavation of Feature 42 and included quartzite FCR (n=369), an argillite tertiary flake (n=1), an argillite scraper (n=1), a chert manuport (n=1), chert micro-flakes (n=3), and argillite micro-flakes (n=59) (Appendix H). Fracture morphology indicates heat spalling of FCR in Feature 42 and typically results from roasting activities. Analysis of the debitage recovered from Feature 42 indicates the reduction of late stage reduction argillite material near the hearth feature, with limited utilization of chert. The presence of a relatively large amount of argillite and chert micro-flakes likely indicates tool re-sharpening activities as well.

Small fragments of unidentifiable, calcined bone along with a few seeds and nutshell fragments were also recovered during flotation. While the seeds were not able to be identified, the nut shells were recognized as pignut hickory. Feature 42 appears to be a hearth where plant and animal resources were being processed at the RCW Site. Late stage reduction and tool re-sharpening of lithic materials, primarily argillite, was also occurring at Feature 44.

6.1.3.3 Feature 43

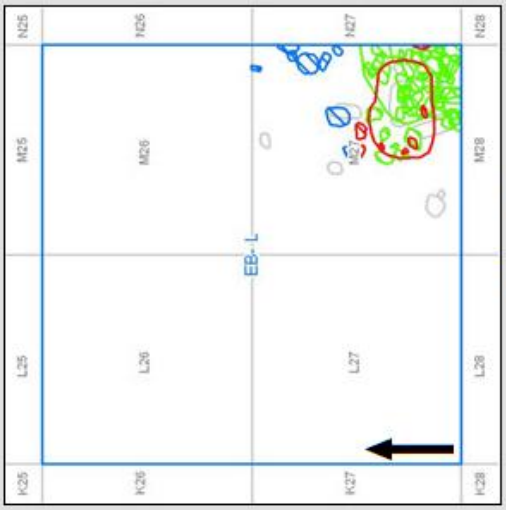
Feature 43 consists of a 5 cm thick accumulation of charcoal flecked, very dark grayish brown (10YR 3/2) sandy loam measuring less than 0.01 m^2 in areal extant found immediately beneath a large flaked quartzite cobble. Feature 43 was first identified in EB E, TUs F10 and F11, excavation level 10 at a depth of 82 cm bgs (11.441 m ASL) (Figure 6-13). Feature 43 began at the base of the Bw2-horizon and penetrated 8 cm into the underlying C/B-horizon. Feature 43 is interpreted as the remnant of a hearth located in a primary context.

Excavation of Feature 43 recovered a total of 11 artifacts including quartzite FCR (n=6), argillite secondary flakes (n=3), a quartzite flaked cobble (n=1), and chert shatter (n=1) (Appendix H). Bisection of the feature revealed no internal stratification and the entire feature matrix was collected for water screening and flotation analysis. Flotation recovered an argillite tertiary flake (n=1) and a piece of argillite shatter (n=1). Pignut hickory nut shells (n=18) were also recovered during soil flotation.

Based on the paucity of artifacts recovered within Feature 43, it appears likely that the hearth represents either a small campfire or a remnant of a larger hearth that was scavenged after use. The charcoal flecking present within the feature matrix along with the large number of carbonized pignut hickory nut shells recovered indicates that the hearth was minimally used to process plant resources at the site. The presence of argillite, chert, and quartzite debitage indicates limited early stage lithic reduction activities taking place near Feature 43.

Figure 6-12. Feature 42

Feature 42 Plan View Looking East.



Feature 42 Plan View.
Level 1 (red), Level 2 (green), and Level 3 (blue).
Nearby Features (gray).

Heat Spalled Quartzite FCR from Feature 42.

Figure 6-13. Feature 43

Feature 43 Plan View Looking North.

Feature 43 (red) Plan View. Nearby Features (gray).

Water Spalled Quartzite FCR from Feature 43.

6.1.3.4 Feature 45

Feature 45 consisted of a discrete scatter of blocky angular and sub-angular quartzite FCR (n= 94) within the Bw1-horizon (Figure 6-14). Feature 45 was initially identified as two separate features: Feature 45 in EB M, L-29, excavation level 7; and Feature 49 in L-30, excavation level 8. However, it was determined in the field that both features represented a single continuous artifact concentration measuring approximately 1.21 m^2 in extant and the initial Feature 45 designation was retained. Feature 45 was identified at 38 cm bgs (12.109 m ASL) and terminated at 55 cm bgs (11.944 m ASL) and lay within a matrix of brown (7.5YR 5/4) sandy loam. Feature 45 was interpreted as the remnant of a hearth identified within a primary context.

No soil staining was identified in association with Feature 45. A total of 126 artifacts were recovered during the excavation of the feature and included quartzite FCR (n=116), argillite micro-flakes (n=7), chert micro-flakes (n=2), and a piece of angular chert shatter (n=1) (Appendix H). FCR fracture morphology suggests the breakage of quartzite river cobbles by means of water fracture which is typically associated with stone boiling. The small amount of argillite and chert micro-debitage present indicates lithic tool re-sharpening activities taking place near the hearth.

Carbon and floral remains were recovered during flotation of soil samples taken from Feature 45. The carbon was sent to Beta Analytic for radiocarbon dating and returned with a Late Archaic date of B.C. 1880 to 1690 B.C. (3450±30 BP) (Appendix G). Floral remains recovered include blackberry, mustard, wild grape, and pokeweed seeds along with pignut hickory shells (Section 6.4.2.2; Appendix E). Two of the recovered seeds were carbonized, but were not identifiable since they were charred. Several very small fragments of calcined bone were also recovered during flotation. The carbonized seeds and calcined bone indicate the processing of plant and animal resources within Feature 45.

6.1.3.5 Feature 64

Feature 64 was located within EBs S, T, W, and X, and was present within 11 TUs (J11, K10 through K11, L9 through L12, and M9 through M12) (Figure 6-15). The feature was identified near the surface of the Bw1-horizon at 77 cm bgs (11.657 m ASL) and sloped slightly downward to the west into the top portion of the Bw2-horizon to a depth of 110 cm bgs (11.347 m ASL). Feature 64 consisted of a concentration of quartzite FCR two courses thick and measured approximately 20 cm in width. No soil staining was identified in association with Feature 64. The exposed feature measured 7.3 m^2 in areal extent and was the largest cultural feature encountered at the RCW Site. Large trees prevented the identification of the southern limits of the feature, however the full limits are extrapolated to measure approximately 10.5 m^2 (assuming a roughly circular shape for the remainder of the feature to the south and southwest). Feature 64 was interpreted as a large platform hearth identified within a primary context.

A total of 2,106 artifacts were recovered from the excavation of Feature 64 and included primarily quartzite FCR (n=2,071) (Table 6-10; Appendix H). A 25 percent sample of the FCR was taken during excavation and the remaining portion was counted, weighed and discarded in the field. Relatively small amounts of argillite (n=25), quartzite (n=6), and chert debitage (n=2) were recovered within the feature. Flotation of feature soil recovered quartzite FCR (n=234), a

quartzite secondary flake (n=1), and a chert micro-flake (n=1). The FCR from the feature appeared to be a mix of heat and water fractured material. Heat spalled FCR are typical within stone roasting features, while water fractured FCR are typically indicator of stone boiling activities.

The debitage indicates a mix of early and later stage lithic reduction activities occurring with local argillite material. Chert debitage is represented at very low amounts and appear to represent later stage reduction. A chert manuport recovered within the feature may represent lithic raw material that was stockpiled near the hearth to be utilized at a later period of time. A quartzite flaked cobble and debitage indicates that river cobbles were also being used during lithic reduction activities. Only one tool, a quartz utilized flake, was recovered during excavation of Feature 64.

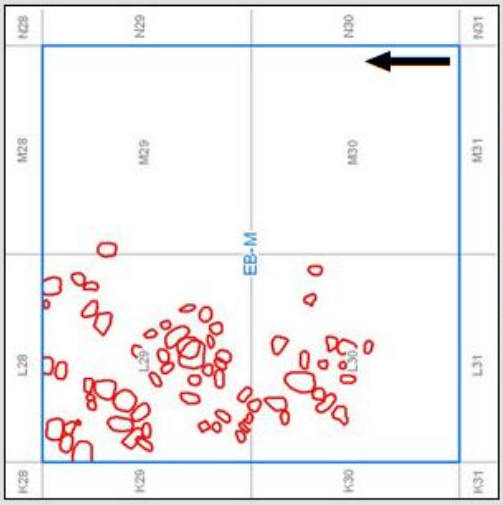
Flotation recovered a large amount of carbon and floral remains. A sample of the carbon recovered during excavation of Feature 64 was sent to Beta Analytic for radiocarbon dating and returned with a Late Archaic date of B.C. 1330 to 1120 B.C. (2990±40 BP) (Appendix G). The floral remains recovered within the feature included blackberry, mustard, wild grape, and pokeweed seeds along with pignut hickory shells (Section 6.4.2.2; Appendix E). A portion of the pignut hickory shells were carbonized indicating that they were processed within Feature 64. Feature 64 appears to be a hearth where plant and animal resources were processed at the RCW Site during the Late Archaic. While the large platform hearths found within the Abbot Farm area downstream were associated with fish processing activities, Feature 64 displayed no direct evidence of this activity (Cavallo 1983, 1987). Some early stage reduction of argillite was also occurring within Feature 64, perhaps for expedient tool manufacture.

Table 6-10. Feature 64 Artifact Types by Lithic Material.

Artifact Type	Chert	Argillite	Quartzite	Quartz	*Total*
Primary Flakes	-	7	-	-	***7***
Secondary Flakes	-	16	3	-	***19***
Tertiary Flakes	1	2	1	-	***4***
Micro-Flakes	1	-	-	-	***1***
Angular Shatter	-	-	2	-	***2***
FCR	-	2	2,299	4	***2,305***
Utilized Flake	-	-	-	1	***1***
Flaked Cobble	-	-	1	-	***1***
Manuport	1	-	1	-	***2***
Total	***3***	***27***	***2,307***	***5***	***2,342***

Figure 6-14. Feature 45

Feature 45 Plan View Looking West.

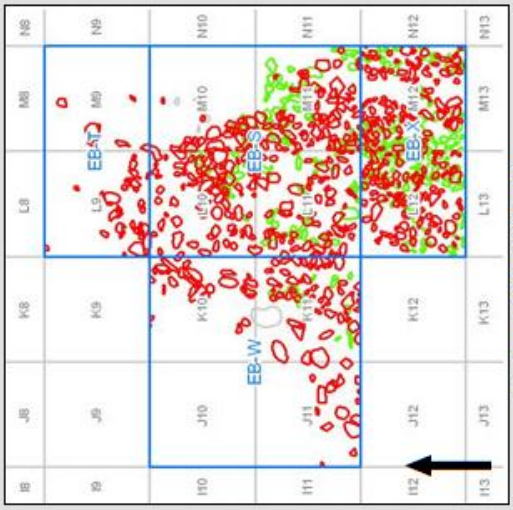


Feature 45 (red) Plan View.

Water Fractured Quartzite FCR from Feature 45.

Figure 6-15. Feature 64

Feature 64 Plan View Looking East.



Feature 64 (red) Plan View.
Level 1 (red) and Level 2 (green).
Nearby Features (gray).

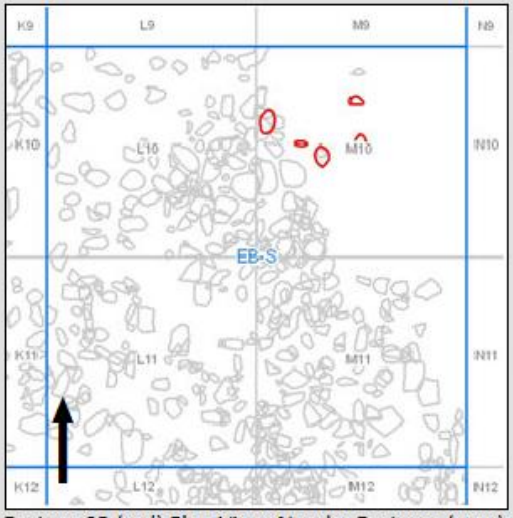
Water Fractured Quartzite FCR From Feature 64.

6.1.3.6 Feature 65

Feature 65 was identified at in EB S, TU M10 level 7 at 59 cm bgs and terminated at 79 cm bgs (11.630 to 10.887 m ASL) (Figure 6-16). No soil staining or charcoal flecking was observed in association with Feature 65. Measuring approximately 0.13 m^2 in extent, the feature consisted of a small cluster of blocky angular and sub-angular FCR (n=6) and one possible quartzite cobble tool. The feature was located within the Bw1-horizon. The surrounding soil matrix consisted of a brown (10YR 5/3) silt loam. Feature 65 was identified as the remnant of a hearth located within a secondary context and may be a disarticulated portion of Feature 64 which is located directly below Feature 65.

Artifacts recovered during excavation included quartzite FCR (n=6), and a flaked quartzite cobble (n=1) (Appendix H). FCR fracture morphology suggests the spontaneous breakage of quartzite river cobbles by means of water fracture resulting in blocky FCR fragments with multiple rough fracture planes and jagged fracture lines. Although relatively continuous in its distribution and of uniform material, the absence of refits and smaller FCR fragments suggest that Feature 65 likely represents prehistoric materials in a secondary context, likely part of Feature 64 that is located directly beneath it. Flotation of feature soil samples recovered no additional artifacts and two unidentifiable seeds.

Figure 6-16. Feature 65



Feature 65 (red) Plan View. Nearby Features (gray).

Feature 65 Plan View Looking North.

Water Fractured Quartzite FCR from Feature 65.

6.1.4 Late Archaic II Component (3180 B.C. to 2580 B.C.)

The Late Archaic II period was present within the B/C, C/B, C, 2Bwb1, and 2Bwb2 soil horizons. Four prehistoric features (Features 39, 62, 75, and 76) were identified within the component and include hearths and activity areas (Table 6-11). The Late Archaic II Component (3180 B.C. to 2580 B.C.) represents the earliest artifact bearing period within the RCW Site, accounting for 7 percent of the total Phase III artifact assemblage and 21 percent of the cultural features identified during excavations.

Intra-site spatial patterning of artifacts indicates that the entire RCW Site was heavily utilized during the Late Archaic II occupation (see Section 6.2.1). Argillite and quartzite were the primary lithic materials utilized for bifacial and expedient tools. All of the lithic artifacts identified during excavation of the Late Archaic II Component were produced from local materials reduced from either river cobbles or transported cores (see Section 6.4.1).

A total of 1,157 prehistoric artifacts were recovered from the Late Archaic II Component; primarily from the B/C (n=168), C/B (n=637), and 2Bwb1 (n=164) horizons (Appendix H). These artifacts included cores (n=5), debitage (n=623), flaked tools (n=19), cobble/groundstone tool (n=3), ceramics (n=13), FCR (n=470), manuports (n=16), and flaked cobbles (n=8). Diagnostic biface types recovered included Fishtail (n=2), and Lackawaxen (n=3) varieties. Fishtail and Lackawaxen bifaces date to the Late Archaic period (Plate 6-4).

Thirteen ceramic fragments were recovered from the B/C-horizon within the Late Archaic II Component. All of these ceramics were recovered within the southeastern corner of the site (EBs J and D). While five of the fragments were unidentifiable, eight appear be Early Woodland Marcey Creek ceramics. The average size of the recovered ceramic sherds was 28 mm in size (or just over 1 in) likely indicating that they were re-deposited from the above Early/Middle Woodland Component through bioturbation.

Radiocarbon dates were obtained from two of the four features identified within the Late Archaic II Component during Phase III excavations (Appendix G). Carbon from an activity area identified as Feature 75, dated to the Late Archaic, 2870 B.C to 2580 B.C. (4130±30 BP). Feature 76, identified as a hearth remnant, dated to the Late Archaic, 3180 B.C. to 3150 B.C. (4450±30 BP). Both features date to the earlier portion of the Late Archaic, very close to the end of the Middle Archaic period (Appendix G).

Diagnostic bifaces along with radiocarbon dates from Features 75 and 76 indicate that a Late Archaic period occupation(s) was present at the RCW Site between 4,450 and 4,130 B.P. The ceramics recovered within the B/C-horizon have likely filtered down from the above Early/Middle Woodland Component. Evidence suggests this happened on only a limited scale within the Late Archaic II Component and represents only 1 percent of the component's artifact assemblage.

Floral remains recovered from Feature 76 indicate that Native Americans present at the site during the later part of the Late Archaic were gathering and/or consuming pignut hickory nuts (Table 7-11; Section 6.4.2.2; Appendix E). Residue testing of an argillite biface (Cat# 704.1) recovered within the Late Archaic II Component tested positive for black bear and deer

antiserum indicating that Native Americans were hunting and consuming locally abundant animal resources at the site (Section 6.4.2.4; Appendix F). The RCW Site continued to serve as a seasonal, short-term campsite used to process locally available food and game during the early part of the Late Archaic period.

Plate. 6-4. Diagnostic Artifacts, Late Archaic II Component, Reeders Creek West.

Table 6-11. Late Archaic II Component Feature Summary.

Feature #	Soil Horizon(s)	Type of Feature	Associated C14 Dates	Associated Floral Materials	Residues Identified
39	C/B	Hearth	-	-	-
62	C	Activity Area; Lithic Reduction	-	-	-
75	2Bwb1	Activity Area; Lithic Reduction	4130±30 BP	-	-
76	C/B	Hearth	4450±30 BP	Pignut Hickory	-

6.1.4.1 Feature 39

Feature 39 was initially identified within EB E, TU E10, level 10 at approximately 90 cm bgs (11.697 m ASL) (Figure 6-17). The feature extended to the west into EB I, TU D10, level 10 to a depth of 100 cm bgs. Feature 39 was identified within the C/B-horizon and consisted of a small, discrete cluster of quartzite FCR measuring approximately 0.12 m^2 in areal extent, arranged in a single layer approximately 10 cm thick. The soil matrix in which Feature 39 was found consisted of a dark yellowish brown (10YR 4/6) sandy loam. Although no distinct soil staining was observed in association with Feature 39, some diffuse charcoal flecking was noted throughout the feature matrix. Feature 39 is interpreted as a hearth remnant located in a primary context.

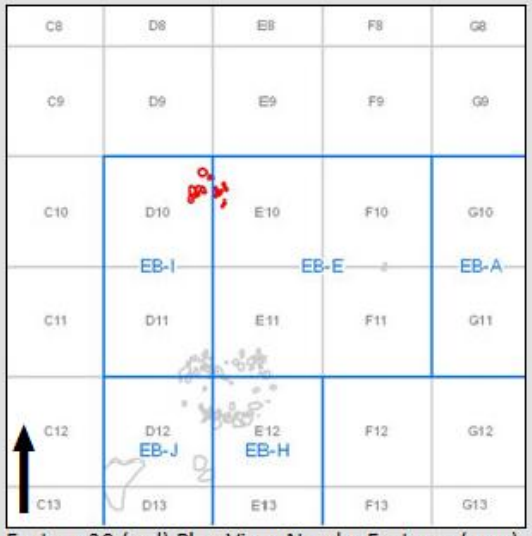
Quartzite FCR (n=32) was the only artifact type recovered from Feature 39 during excavation (Appendix H). FCR fracture morphology suggests the breakage of quartzite river cobbles by means of water fracture which is typically associated with stone boiling activities. The uniform material of the FCR and cobbles and their discrete clustered distribution in association with notable charcoal flecking indicate this feature was likely found in a primary context. No floral remains such as nut shells or seeds were recovered during flotation. The hearth was likely utilized in the processing of plant and animal resources at the RCW Site.

6.1.4.2 Feature 62

Feature 62 was identified in EB Q, TU K39, level 16 at 145 cm bgs (11.174 m ASL) and extended to a depth of 150 cm bgs (11.101 m ASL) (Figure 6-18). Feature 62 was located within the C-horizon and contained no visible soil staining or associated charcoal flecking. Measuring approximately 0.39 m^2 in extent, the feature consisted primarily of four unmodified quartzite manuports (n=4). Three of these manuports display possible thermal reddening. Debitage recovered within the feature consisted of quartzite primary flakes (n=4) and chert micro-debitage (n=7) (Appendix H).

Given the close association between the quartzite primary flakes, the more generalized spread of the quartzite manuports and the absence of flaked cobbles, Feature 62 might best be characterized as an early stage quartzite lithic reduction activity area in a primary context utilizing local quartzite river cobbles. Chert micro-flakes also indicate that chert tool re-sharpening was also likely occurring within Feature 62.

Figure 6-17. Feature 39



Feature 39 (red) Plan View. Nearby Features (gray).

Feature 39 Plan View Looking West.

Water Fractured Quartzite FCR From Feature 39.

Figure 6-18. Feature 62

Feature 62 Plan View Looking North.

Quartzite Manuports from Feature 62.

Feature 62 (red) Plan View.

Quartzite Flakes from Feature 62.

6.1.4.3 Feature 75

Feature 75 was located during excavation of EB O, TU M41, level 14, within the 2Bwb1-horizon at a depth of 133 cm bgs (11.196 m ASL) and extended to a depth of 138 cm bgs (11.086 m ASL) (Figure 6-19). Feature 75 appeared as a concentration of quartzite material within the southeast corner of the test unit. The feature measured approximately 0.36 m^2 in areal extent and contained no visible staining or charcoal flecking. Feature 75 has been interpreted as an early stage lithic reduction activity area located within a primary context.

Three artifacts were recovered during excavation of Feature 75 and included a quartzite teshoa-like utilized flake (n=1), a quartzite hammerstone (n=1), and a quartzite manuport (n=1) (Appendix H). A sample of the carbon recovered during excavation of Feature 75 was sent to Beta Analytic for radiocarbon dating and returned with a Late Archaic date of 2870 B.C. to 2580 B.C. (4130±30 BP) (Appendix G). The quartzite manuport along with the hammerstone and flake tool likely represent a single event where quartzite river cobbles were reduced into expedient tools.

6.1.4.4 Feature 76

Feature 76 was identified at in EB V, TU I34, level 12 at 113 cm bgs and terminated at level 14 at a depth of 148 cm bgs (11.488 and 11.154 m ASL) (Figure 6-20). The feature matrix consisted of a light yellowish brown (10YR 6/4) sandy loam mottled with black (10YR 2/1), and very dark grayish brown (10YR 3/2) sandy loam. Measuring approximately 0.03 m^2 in extent, the feature consisted of a small, bowl-like stain with carbon and carbonized nutshells. The feature was located within the C/B-horizon. Feature 76 was identified as the remnant of a hearth located within a primary context.

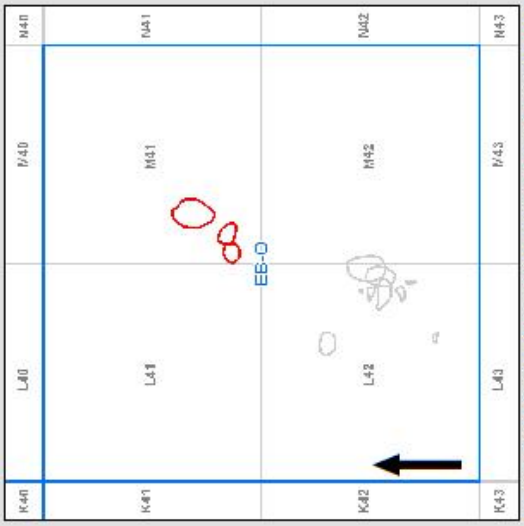
Artifacts recovered during excavation included quartzite FCR (n=4), argillite angular shatter (n=1), and argillite secondary flakes (n=2) (Appendix H). FCR fracture morphology suggests the spontaneous breakage of quartzite river cobbles by means of water fracture indicative of stone boiling activities. Flotation of soil samples taken from feature fill recovered carbonized seed and hickory nut shells.

A sample of the carbon recovered during excavation of Feature 76 was sent to Beta Analytic for radiocarbon dating and returned with a Late Archaic date of 3180 B.C. to 3150 B.C. (4450±30 BP) (Appendix G). Floral remains consisted of carbonized pignut hickory nut shells (Section 6.4.2.2; Appendix E). Feature 76 was likely the remnant of a small hearth where late stage lithic reduction of argillite was occurring either for expedient or formal tool manufacture. What is clear is that Feature 76 was the location where the processing of pignut hickory nuts was taking place during the early part of the Late Archaic.

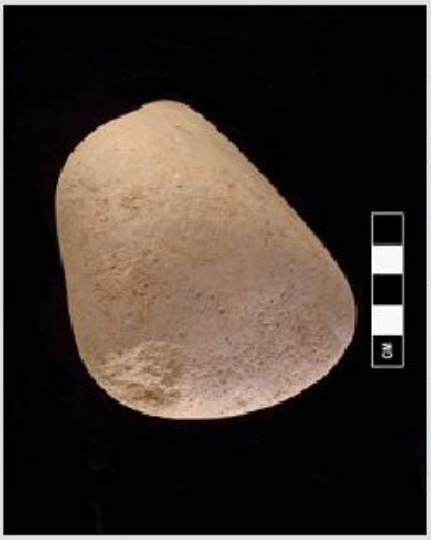
Figure 6-19. Feature 75

Feature 75 Plan View Looking South.

Quartzite Utilized Flake From Feature 75.

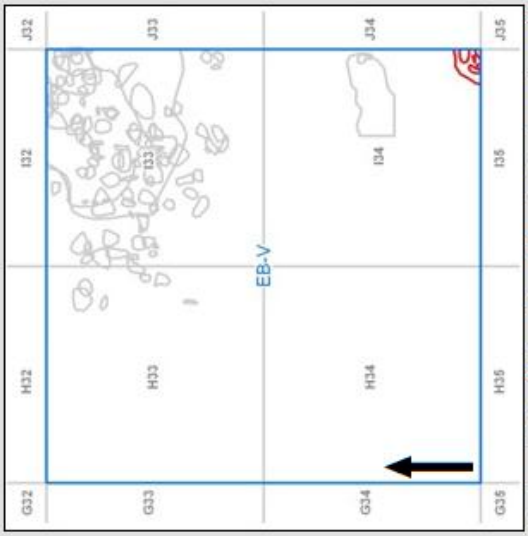


Feature 75 (red) Plan View. Nearby Features (gray).

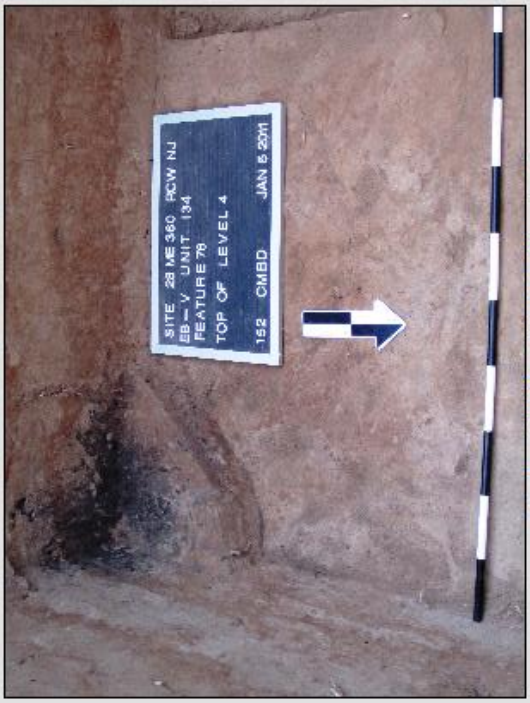


Quartzite Hammerstone From Feature 75.

Figure 6-20. Feature 76



Feature 76 (red) Plan View. Nearby Features (gray).



Feature 76 Plan View Looking South.

Water Fractured Quartzite FCR from Feature 76.

6.2 Intra-Site Spatial Patterning

Several journal articles have figured prominently in the following analysis and interpretation of spatial patterning at the RCW Site. This analysis draws on work by Petraglia (2002) concerning the analysis of latent and evident thermally altered stone (TAS) or FCR features in the archaeological record. While the authors are concerned primarily with the analysis of FCR, their conceptualization of latent vs. evident features is particularly useful in the analysis of less distinct artifact concentrations composed of various materials including stone tools, lithic debitage, ceramic sherds, and, as originally implied, FCR. Likewise Timmon's (2002) criteria for assessing the integrity of FCR features were used as an aid in evaluating the degree of post-depositional modification of latent feature forms. Additionally, interdisciplinary works such as that produced by Graham (1993), Seymour (2009), Kelly et al. (2005) and those collected in Kroll and Price's *The Interpretation of Archaeological Spatial Patterning* (1991) figure prominently in the analysis and particularly those by Susan Kent and Stevenson.

Petraglia (2002) developed a set of functional-descriptive criteria for TAS applicable to both discrete TAS features and more diffuse concentrations of TAS. Petraglia's system integrates an understanding of cultural and natural post-depositional processes. Petraglia, following Leroi-Gourhan (1972), divides TAS stone patterns in the archaeological record into evident and latent features. Evident features are morphologically distinct and readily identifiable during excavation while latent distributions are likely to be identified during post excavation analysis (2002: 243-244).

Petraglia's latent features are evident features that have undergone such a degree of modification by natural and cultural processes as to render their original function and morphology relatively difficult to establish. Processes that might transform evident features into latent features include the effects of gravity, water, root action, burrowing animals and plowing as well as the length of site occupation, the frequency of reoccupation, the occurrence of feature reuse (2002: 247) as well as intentional and unintentional cultural activities like scavenging, floor clearing and trampling (Stevenson 1991). The term concentration used below is employed and conceptualized synonymously with Petraglia's *latent feature* or *latent pattern* (2002). In all cases these concentrations are best interpreted as "deposits that are overlapping accumulations of site activities" (2002: 247).

Timmons (2001) developed criteria for assessing the relative integrity of TAS features. While these criteria were developed for assessing eroding TAS features several are useful for addressing the integrity of TAS features whether disarticulated by natural (e.g. erosion, bioturbation, etc.) or cultural processes (e.g. reuse, trampling, etc.). They include:

- Density of TAS/m^2
- Range of fragment size
- Presence of TAS supported by other TAS
- Presence of TAS refits or in place fractures

Timmons proposed that TAS densities of less than 15/m^2 indicate post depositional scattering of the feature. Timmons associates a narrow range of fragment sizes with natural or cultural sorting

of TAS materials. And the presence of stacked TAS, TAS refits and in-place fractures all are proposed as useful indicators as to the degree of feature articulation/integrity (Timmons 2001: 10-11; MTSHPO 2002: 22). While Timmons is focused primarily on the degree of integration of TAS features, density and range of fragment size are employed in this analysis to interpret the function of and post-depositional effects on a range of latent features or concentrations.

In response to what she perceived as tautological ecological explanations of site structure variability, Kent (1991) working with data collected from San and Bantu camps in Botswana used bivariate statistical analysis to identify factors most influential on six characteristics of site structure. The structural characteristics included:

1. Area per person in square meters
2. Site size
3. Presence or absence of formal storage facilities
4. Frequency of activity-restricted or monofunctional activity areas
5. Hut diameter
6. Number of huts (ibid: 37-42)

Kent's results indicated that *anticipated mobility* or the "length of time people expect to occupy a site" (ibid: 35) was best able to explain variation in four of the six structural characteristics (1, 2, 3 and 5). Conversely, the variation in monofunctional activity areas was best explained by "subsistence orientation"[1] (ibid: 39-41) and variation in the number of huts was best explained by the number of site occupants (ibid: 41-42). Most of the structural characteristics identified above can be difficult to measure archaeologically particularly without 100 percent excavation or require a comparative set of sites for analysis (1, 2, 5 and 6). However, characteristics 3 and 4 are relatively well suited for archaeological identification and analysis at the RCW Site. In Kent's study, formal storage areas were only found at sites with an anticipated medium (3 – 5.9 month) or long (> 6.0 month) occupation. Additionally, Kent noted that although subsistence strategy best explains the variance in frequency of monofunctional activity areas, anticipated length of occupation was still a statistically strong predictor of the presence or absence of monofunctional activity areas. Her results suggest: 1) that anticipated extended occupation results in investment in formal storage facilities; and 2) while subsistence orientation best explains the variation seen in the establishment of monofunctional activity areas, anticipated length of occupation is a strong predictor of their presence. These results are generally consistent with assertions by Seymour (2009) that those "expecting to stay in one place for an extended period"… "build their environment to suit their needs, even formalizing spaces in consistent ways" (255) as well as findings by Kelly et al. (2005) that feature diversity and duration of occupation are related (410).

Based on the work of the above authors, several axia were developed to aid in the interpretation of latent features at the RCW Site during its four identified occupations:

1. High density concentrations of a particular artifact class (e.g. argillite debitage, ceramic sherds, finished tools, etc.) are the accumulated result of activities carried out at that

[1] **Kent's classes include hunting-gathering, farming, paid labor employment and mixed strategies (1991: 38).**

location; higher densities represent a greater number of refuse producing events at that location;

2. Spatially coincident high density artifact concentrations of multiple types can be interpreted as being produced by related activities occurring in monofunctional activity areas (e.g. the coincidence of ceramic sherds and FCR at locations where foods were cooked in ceramic vessels), or the result of disparate activities carried out in the same multifunctional activity area (e.g. utilized tools and lithic debitage);

3. With regard to fragile materials, specifically ceramics, low modal fragment length is associated with post-depositional trampling and/or clearing activities; conversely low modal fragment length is associated with scavenging and/or clearing activities with regard to more durable materials (e.g. debitage, FCR, etc.);

4. High artifact density concentrations of a particular type spatially isolated from other high artifact density concentrations represent monofunctional activity areas;

5. The variety of formal tool types located in areas of dense tool concentration are directly related to the variety of activities carried out in that location;

6. The absence or low incidence of monofunctional activity areas implies routine short term occupation;

7. And, low density concentrations of FCR and ceramics with high modal fragment size results from limited effects of trampling or scavenging or their intentional discard at locations peripheral to most camp activities.

6.2.1 Late Woodland Component

6.2.1.1 Ceramic Concentrations

During the Late Woodland Period, substantial ceramic concentrations were generally limited to the south half of the RCW site. Ceramic artifact densities within test units range from 0 to 211 artifacts/m^2 with an average of 7.2/m^2 (s = 25.5). The greatest concentrations occur in EB Z, with lesser concentrations in the west half of EB L, EB R, EB Q, EB O and EB G (Table 6-12; Figure 6-21). Ceramics recovered within EB Z account for 43 percent of the total ceramics recovered in the Late Woodland Component.

Table 6-12. Late Woodland Ceramic Concentrations.

EB	Ceramic Density	Temper Materials	Range in Maximum Length/Modal Length
Z	107.5/m^2	grit, grog, sand, crushed mineral	10 – 90 mm (0.4 – 3.5 in)/10 – 15 mm (0.4 – 0.6 in)
L (west half)	18.0/m^2	argillite, grit	10 – 55 mm (0.4 – 2.2 in)/25 – 30 mm (1.0 – 1.2 in)
R	7.3/m^2	grit, gravel, sand, crushed mineral	10 – 30 (0.4 – 1.2 in)/25 – 30 mm (1.0 – 1.2 in)
Q	11.0/m^2	argillite, grit, sand, crushed mineral	10 – 75 mm (0.4 – 3.0 in)/20 – 25 mm (0.8 – 1.0 in)
O	9.8/m^2	grit, crushed mineral	10 – 50 mm (0.4 – 2.0 in)/10 – 15 mm (0.4 – 0.6 in)
G	11.5/m^2	grit, crushed mineral	10 – 60 mm (0.4 – 2.4 in)/20 - 25 mm (0.8 – 1.0 in)

The ceramic concentration in EB Z is notable for its exceedingly high density of sherds, the wide variation in sherd size and temper and the predominance of small length (10-15 mm) sherds. These characteristics point to the intensive use of this area for activities resulting in numerous ceramic breakage events and subsequent trampling. The relatively large maximum sherd length (90 mm) may indicate relative little clearing of this activity area during its use.

The lower concentrations of ceramics in EBs L, R, Q and G seem to indicate less intensive use of these areas. While temper and sherd size remain variable, modal sherd size is relatively high indicating the relative infrequency of clearing and trampling activities at these locations. The ceramic concentration in EB O is similar in density to those identified in L, R, Q and G but modal sherd length is lower (10-15 mm) perhaps indicating the effects of relatively more trampling behavior at this location. Since 44 percent (n=329) of the Late Woodland Component prehistoric ceramics were recovered within plow zone horizons (Ap1, Ap2, Ap3) historic plowing activities no doubt played a role in sherd length and density.

The central portion of the RCW Site within EB Z produced the most ceramic sherds during testing of the Late Woodland Component. Features 70 and 73 both interpreted to be a food processing activity areas were located within EB Z. Clearly this portion of the RCW Site played an important role in food processing during the Late Woodland period.

6.2.1.2 FCR Concentrations

Substantial FCR concentrations associated with the Late Woodland Component are found across the site. FCR densities within the test units range from 0 to 69 artifacts/m^2 with an average of 3.5/m^2 (s=7.8). The greatest concentrations occur in EBs Z, V, Q and the west half of O with lesser concentrations found in EBs L and N (Table 6-13; Figure 6-22).

With the exception of Q and V, small FCR fragments (10-15 mm) predominate. Size ranges across the blocks are also comparable with maximum lengths ranging between 90 and 135 mm

(3.5 and 5.3 in). EB V is outstanding in three respects. EB V's comparatively high density of FCR, its generally greater range in FCR size, and its bimodal size distribution set it apart. EB V appears to be the central focus of relatively intense FCR related activities, possibly hot rock cookery of some fashion. The concentrations identified in EBs Z, Q, O, L and N may represent the outer margins of this activity area where trampling and discard result in lower FCR densities and recycling of larger rocks results in lower modal lengths.

The greatest concentrations of FCR at the RCW Site appear to be within the central and southern half of the site along the site's western margins. Feature 67 interpreted as a hearth feature was located within EB G, outside of the main FCR concentration located around EBs Z, V, Q, and O. The FCR concentrations appear to indicate that the main activity areas within the RCW Site during the Late Woodland were located within the central and southern portions of the site along the western edge of the project APE.

Table 6-13. Late Woodland FCR Concentrations.

EB	FCR Density	Range in Maximum Length/Modal Length
Z	11.75/m^2	10 – 135 mm (0.4 – 5.3 in)/10 - 15 mm (0.4 – 0.6 in)
V	26.75/m^2	10 – 135 mm (0.4 – 5.3 in)/10 - 15 mm (0.4 – 0.6 in) and 25 – 30 mm (1.0 – 1.2 in)
Q	6.50/m^2	10 – 95 mm (0.4 – 3.7 in)/55 - 60 mm (2.2 – 2.4 in)
O (west half)	15.50/m^2	10 – 90 mm (0.4 – 3.5 in)/10 – 15 mm (0.4 – 0.6 in)
L	4.25/m^2	10 – 95 mm (0.4 – 3.7 in)/ 10 – 15 mm (0.4 – 0.6 in)
N	5.25/m^2	10 – 120 mm (0.4 – 4.7 in)/ 10 – 15 mm (0.4 – 0.6 in)

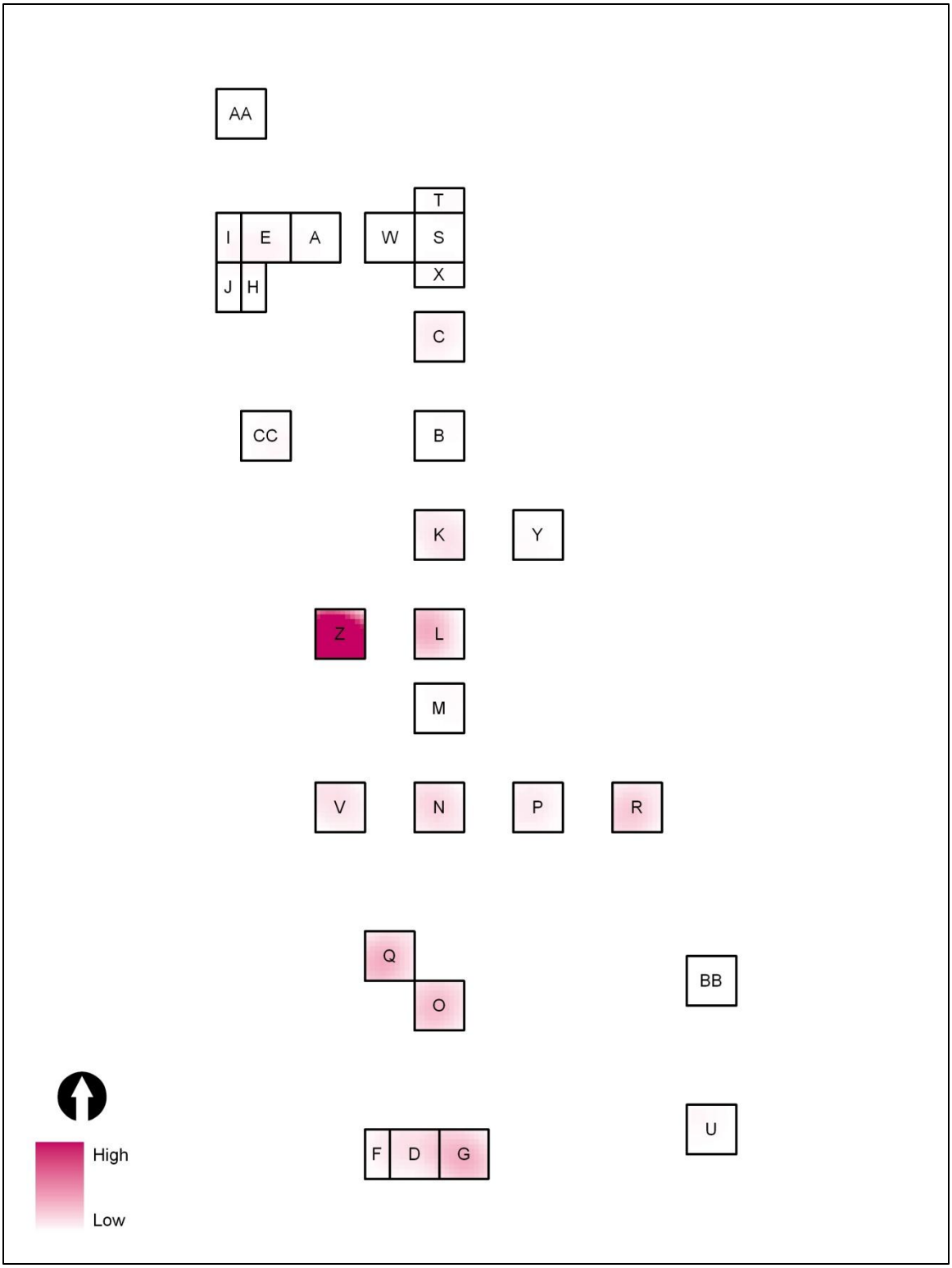


Figure 6-21. Late Woodland Ceramic Concentrations (1:250).

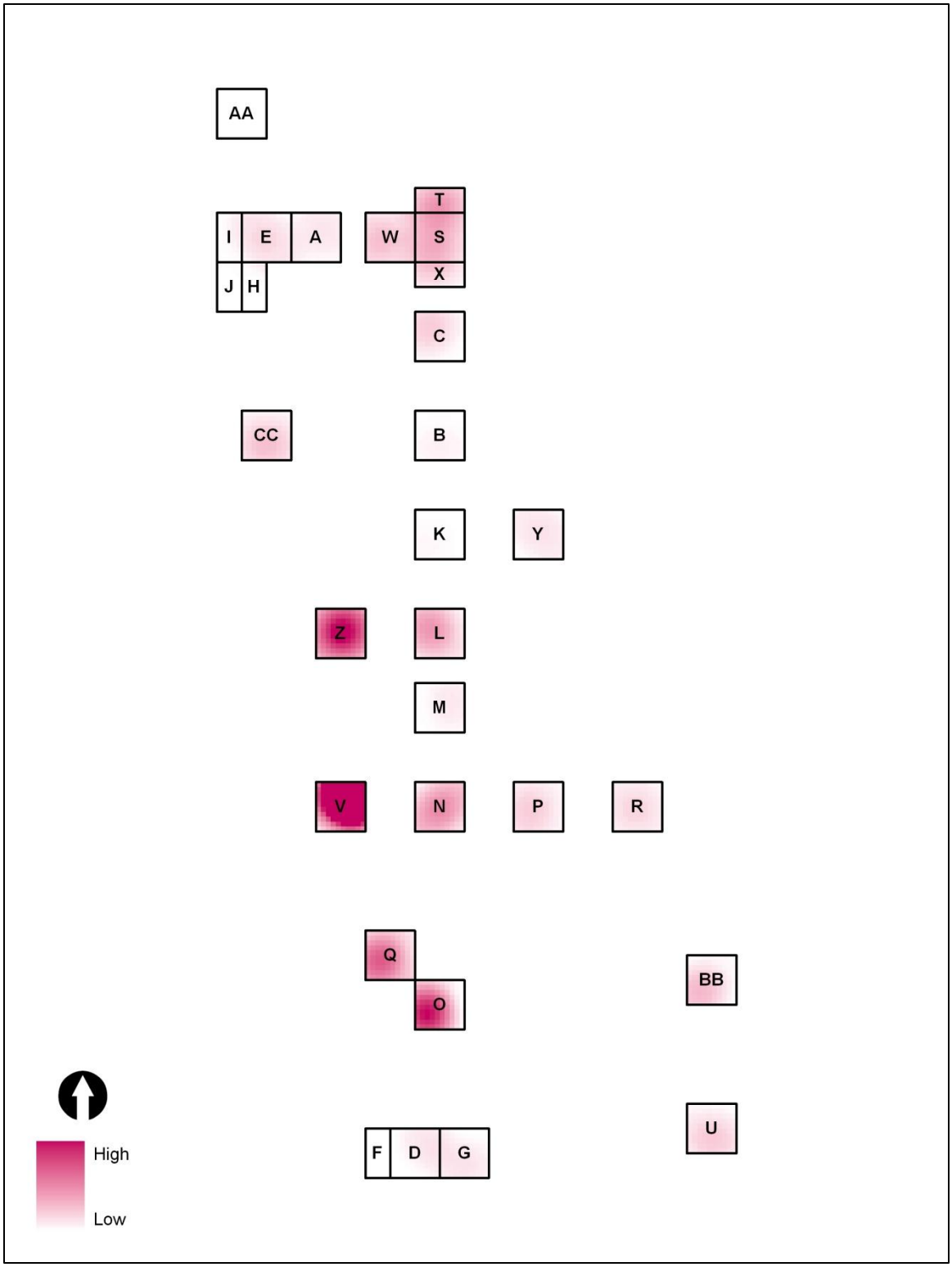


Figure 6-22. Late Woodland FCR Concentrations (1:250).

6.2.1.3 Tool Concentrations

Tools are found across the site during the Late Woodland Period. They include utilized flakes, unifacially and bifacially retouched flakes, ground stone artifacts, hammerstones, nutting stones, pestles, projectile points/knives, scrapers, bifaces and utilized cores. Within excavation units, densities range from 0 to 6 artifacts/m^2 with an average of 0.8/m^2 (s=1.1). The greatest concentrations of tools are found in EBs K, L, M, N, D and G within the central and southern portions of the RCW Site (Table 6-14; Figure 6-23).

Use wear analysis of tools found within EBs K, M, N, and D indicate that cutting, scraping, and reaming/perforating of both soft and hard materials was the primary activity within the central portion of the site (Table 6-15). Soft materials can include animal/fish flesh, plant leaves/stems, and hide while hard materials would include items like bone, shell, nuts, and wood. Heavy edge polish on all of the tools indicated heavy usage of expedient tools and the likely curation of bifacial tools within the site. The specialized tool types found within the tool concentration may be associated with a variety of tasks including but not limited to food preparation (e.g. hide preparation, woodworking, etc.).

Table 6-14. Late Woodland Tool Concentrations.

EB	Density	Tools
K	2.00/m^2	• utilized argillite flake (1) • utilized chert flakes (1) • utilized chert flake (1) (Reamer/Perforator Tool; Edge Polish) • utilized chert flake (1) (Scraping Tool; Edge Polish) • proximal fragment of a chert Levanna point (1) • distal fragment of a chert Rossville point (1) (Cutting Tool; Edge Polish) • unifacially retouched jasper flake (1) • quartzite hammerstone (1)
L	1.75/m^2	• argillite Rossville point (1) • unifacially retouched argillite flakes (2) • utilized chert flake (1) • chert end scraper (1) • distal fragment of a chert biface (1) • quartzite nutting stone (1)
M	1.25/m^2	• bifacially retouched argillite flake (1) (Cutting Tool) • chert biface fragment (1) • utilized chert flake (1) (Scraping Tool; Edge Polish) • jasper Levanna point fragment (1) • unifacially retouched jasper flake (1) (Scraping Tool; Edge Polish)
N	3.25/m^2	• argillite biface fragment (1) • chert biface, medial fragment (1) • utilized chert flake (1) (Reamer/Perforator Tool; Edge Polish) • utilized chert flakes (2) (Cutting Tools; Edge Polish) • unifacially retouched chert flake (1) (Cutting/ Scraping Tool) • chert projectile point, distal fragment (1) • chert biface (1) (Cutting Tool; Edge Polish) • utilized chert core (1) • jasper scraper (1) • quartzite teshoa (1) • quartzite ground stone tool (1) • unifacially retouched quartzite flake (1)
D	1.50/m^2	• utilized argillite flake (1) (Cutting/Scraping Tool; Edge Polish) • utilized quartzite flakes (2) • utilized quartzite flake (1) (Cutting Tool; Edge Polish) • quartzite nutting stone (1) • quartzite hammerstone (1)
G	1.00/m^2	• heat-altered utilized chalcedony flake (1) • utilized jasper flake (1) • utilized quartzite flakes (2)

Table 6-15. Late Woodland Tool Concentrations and Related Use Wear Patterns.

Tool Concentration	Tool Action	Material Acted Upon	Number of Tools
Central	Cutting	Hard	1
	Cutting	Soft	3
	Cutting	Mixed	2
	Cutting/Scrape	Hard	2
	Scrape	Hard	1
	Scrape	Soft	1
	Scrape	Mixed	1
	Reaming/Perforating	Mixed	2
		Total	***13***

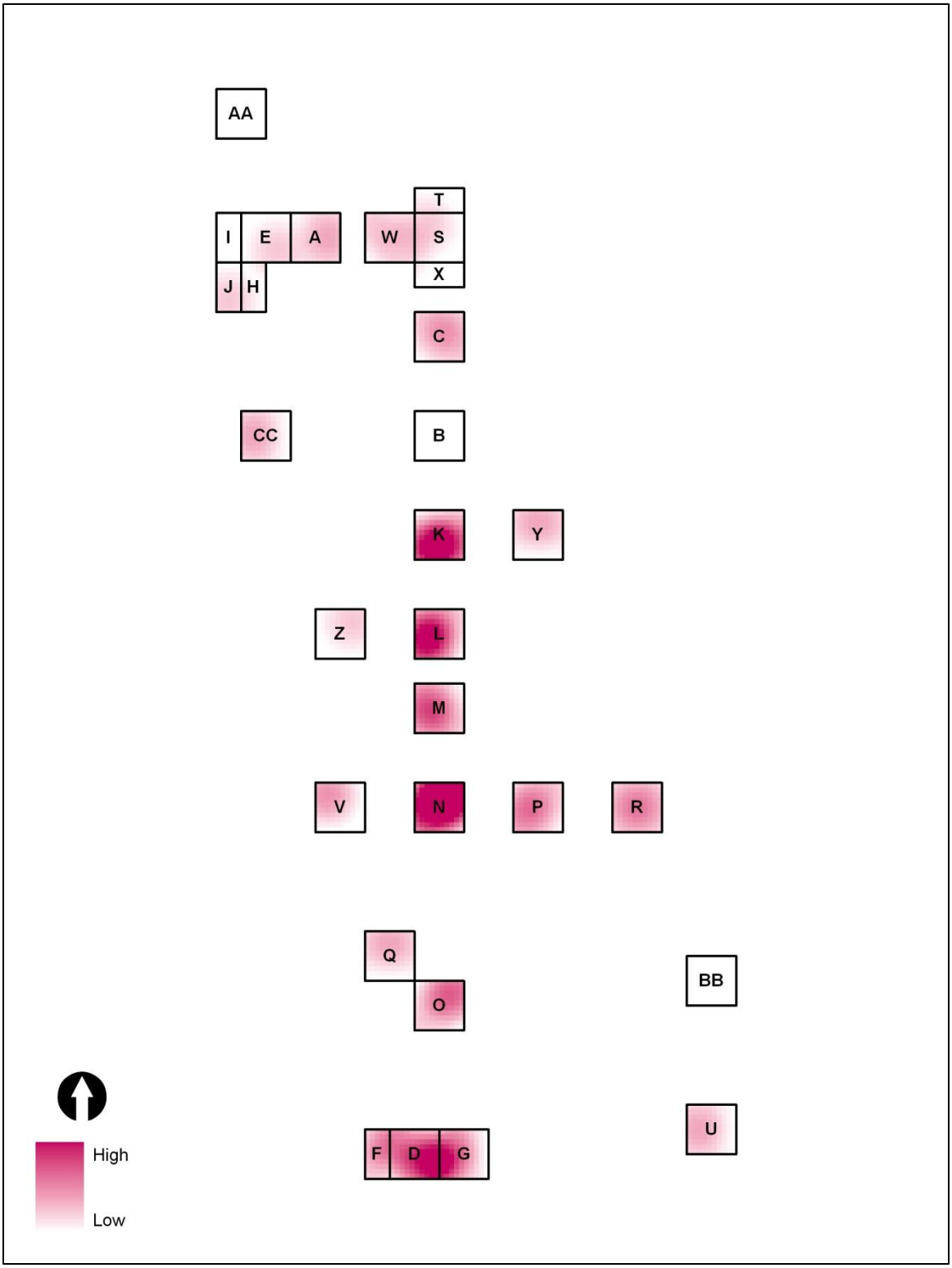


Figure 6-23. Late Woodland Tool Concentrations (1:250).

The tool assemblages associated with the concentrations especially in EBs K, L, M and N indicate a variety of activities taking place in this central portion of the site including cutting, chopping, scraping and, reaming/perforating activities (Table 6-38; Section 6.4.1.4). FTIR residue analysis of a ceramic sherd from nearby EB M (Cat#565.1) contained residue of "raw" acorn nut meat and shell possibly indicating the processing of acorns within this portion of the site (Table 6-41; Section 6.4.2.2). More generalized less intensive use of these areas is indicated by the relatively low artifact densities and the variety of tool forms represented. Tool concentrations in nearby EB Z and EB V were lower than average ($0.3/m^2$ and $0.5/m^2$, respectively); tools associated with the dense ceramic concentration in EB Z included only the distal fragment of a jasper Levanna point (n=1); tools associated with the dense FCR concentration in EB V included a utilized argillite flake (n=1) and a utilized jasper flake (n=1).

6.2.1.4 Debitage Density

Debitage densities across the site during the Late Woodland are highly variable depending on the raw material utilized (Table 6-16; Figures 6-24 through 6-28). Across the site, average quartz and metarhyolite densities during this time period are so low as to warrant exclusion from analysis ($0.1/m^2$ and $0.8/m^2$, respectively).

Examination of the density of localized debitage concentrations and the ratio of primary to secondary to tertiary flakes in each concentration suggests several patterns of lithic production. Argillite concentrations are of relatively low density and generally have a low proportion of tertiary flakes as compared to primary and secondary flakes. This pattern suggests a generalized use of the site area as a whole for infrequent perhaps expedient argillite core reduction activities and commensurably infrequent production or maintenance of finished argillite tools. In general, the production of argillite tools appears directed towards projectile points and expedient impromptu tools of possibly limited use life. The Late Woodland argillite tools recovered during excavation consisted in the majority (63 percent of the total number of argillite tools) of utilized and retouched flakes with the remainder made up of projectile points (27 percent) and bifaces (9 percent) (Figure 6-24).

Quartzite debitage seems to follow a similar pattern with relatively low density concentrations and relatively low amounts of tertiary debitage in comparison to primary and secondary flakes (Figure 6-28). Likewise tool counts point toward the utilization of quartzite for expedient tool production (0.50 of the total of quartzite tools) with the remainder dominated by ground stone or relatively unmodified quartzite tools like hammerstones and pestles (42 percent) as well as formal scrapers and bifaces (8 percent).

Chalcedony, chert and jasper lithic production follow a different pattern (Figures 6-25 and 6-26). Chalcedony and chert lithic reduction activities and tool production/maintenance activities appear to be much more intensive than argillite and quartzite lithic production and appear to be focused in the southeastern portions of the site. High artifact densities, and high proportions of tertiary flakes as compared to primary and secondary debitage point toward intensive use of this area for all stages of lithic reduction and tool manufacture/maintenance. Jasper follows a similar pattern but the focus of jasper lithic production appears to be located in the southwestern portion of the site (Figure 6-27).

With respect to chert and jasper, tool counts appear to support the preferential use of these materials to produce formal tools. Late Woodland chert tools still have a high proportion utilized and retouched flakes (45 percent), however, the remainder of the assemblage consists of high numbers of finished formal tools: projectile points (24 percent); bifaces (20 percent); and end scrapers (7 percent). Late Woodland jasper tools follow a similar pattern consisting in the majority of utilized and retouched flakes (66 percent) with smaller numbers of projectile points (17 percent), scrapers (8 percent) and bifaces (8 percent).

Chalcedony is relatively underrepresented by formal tools in the assemblage however. The majority of the Late Woodland chalcedony tools consist of utilized and retouched flakes (85 percent) with very few formal tools (14 percent) despite clear debitage evidence of tool manufacture especially in EB O and EB P where the proportions of tertiary flakes were very high.

Table 6-16. Late Woodland Debitage Concentrations.

Lithic Material	EB	Density	Debitage Ratios (Primary: Secondary: Tertiary)
Argillite	N	6.75/m^2	1:4:3
	O	5.00/m^2	0:10:9
	Z (south half)	5.5/m^2	1:7:3
	W (northwest quarter)	8.00/m^2	0:1:7
	L (east half)	5.00/m^2	1:2:0
Chalcedony	N	11.25/m^2	0:1:2
	O	15.00/m^2	1:15:40
	P	11.50/m^2	1:6:37
	R	17.00/m^2	1:3:9
Chert	Z	48.50/m^2	1:3:18
	M	32.50/m^2	1:7:6
	N	57.00/m^2	1:11:14
	O	55.50/m^2	1:7:29
	P	95.5/m^2	1:19:53
	R	111.00/m^2	1:26:116
Jasper	CC	7.50/m^2	0:1:14
	Z	11.25/m^2	1:3:10
	V	22.50/m^2	1:6:30
	N	12.00/m^2	1:7:13
	Q	9.00/m^2	0:1:2
	O	9.00/m^2	1:6:21
Quartzite	C	4.50/m^2	1:1:1
	Z (south half)	3.50/m^2	1:2:3
	Q (southwest quarter)	6.00/m^2	1:5:0
	F & D (south halves)	3.33/m^2	4:5:0

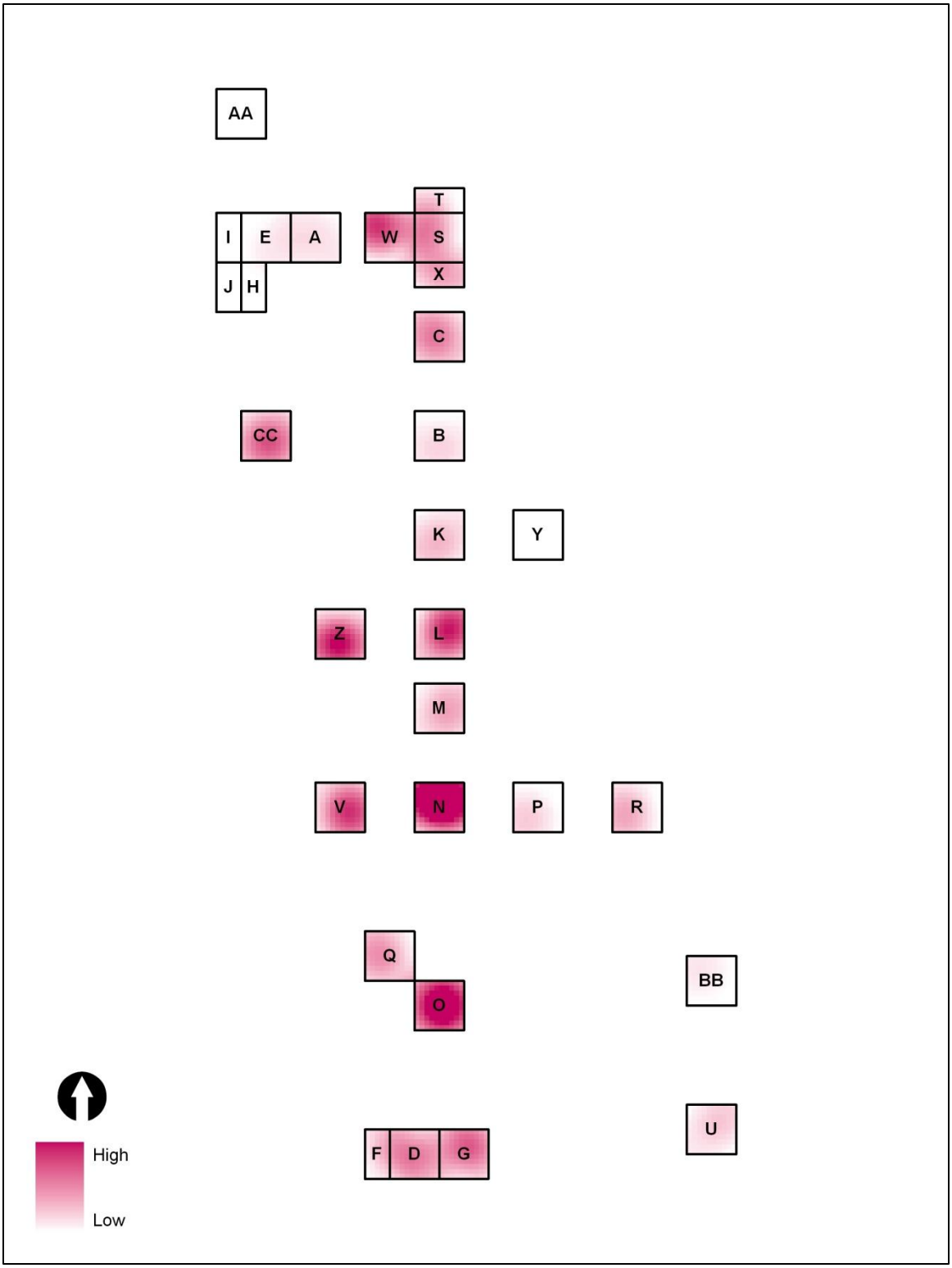


Figure 6-24. Late Woodland Argillite Debitage Concentrations (1:250).

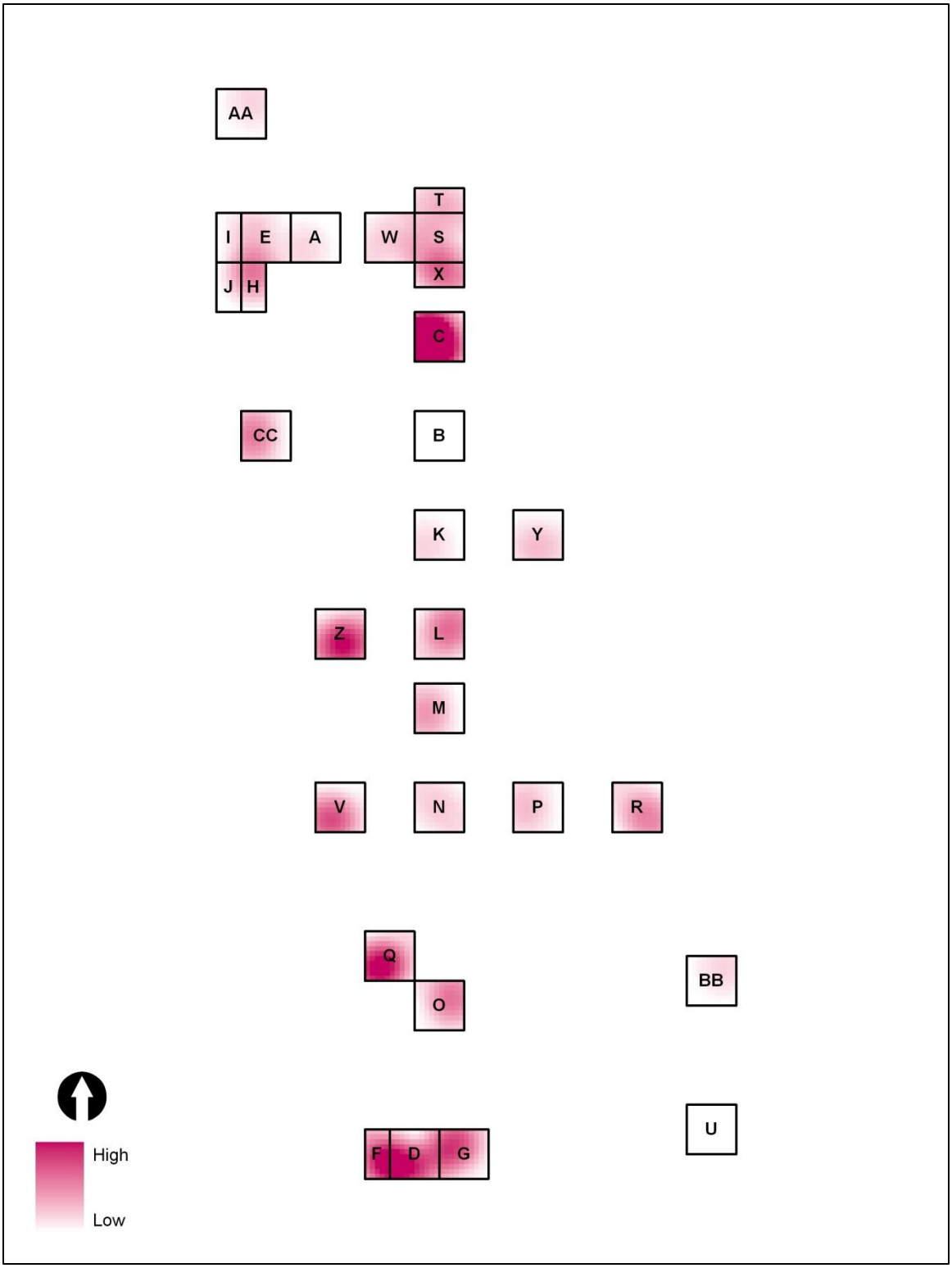


Figure 6-25. Late Woodland Quartzite Debitage Concentrations (1:250).

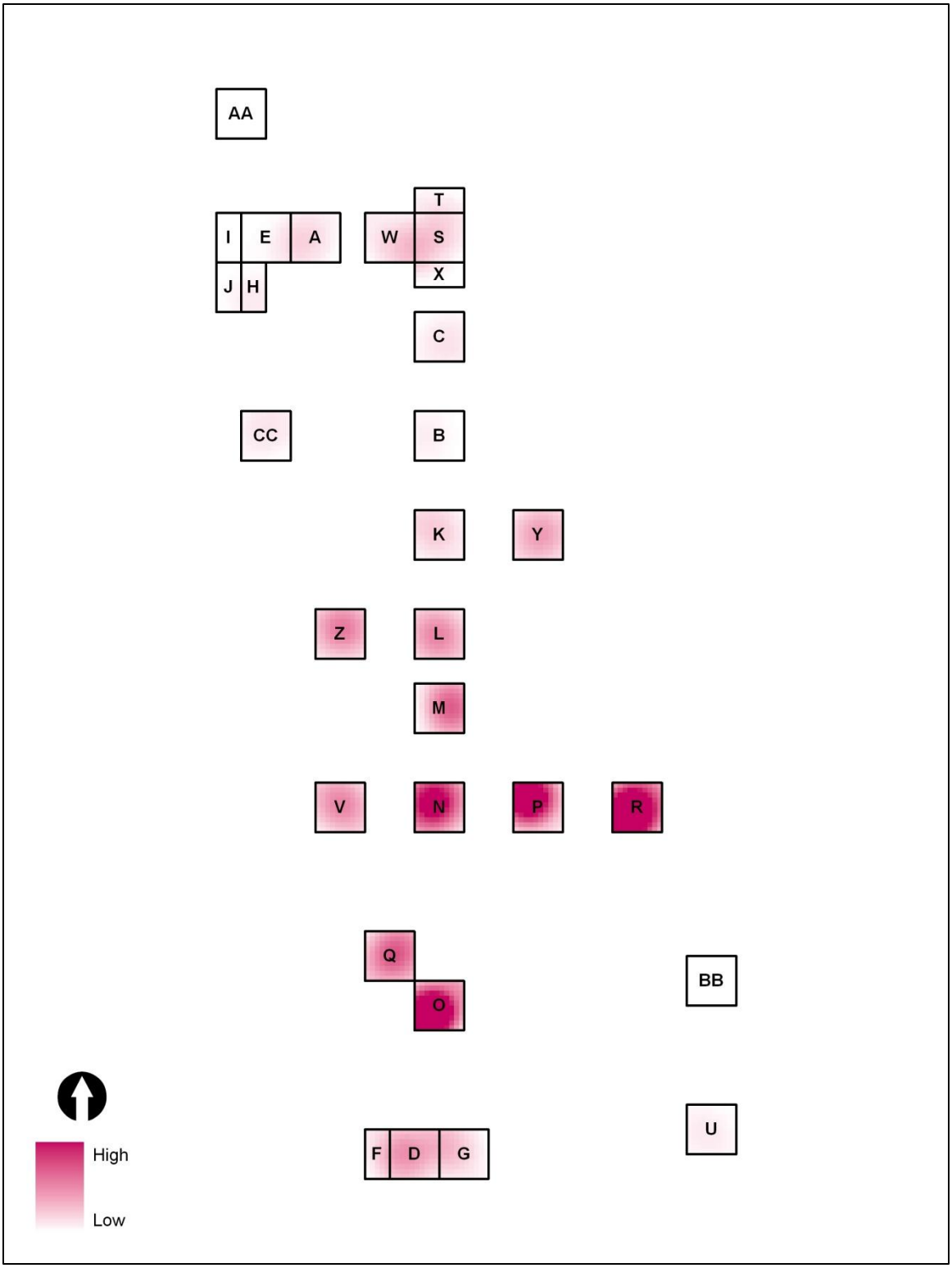


Figure 6-26. Late Woodland Chalcedony Debitage Concentrations (1:250).

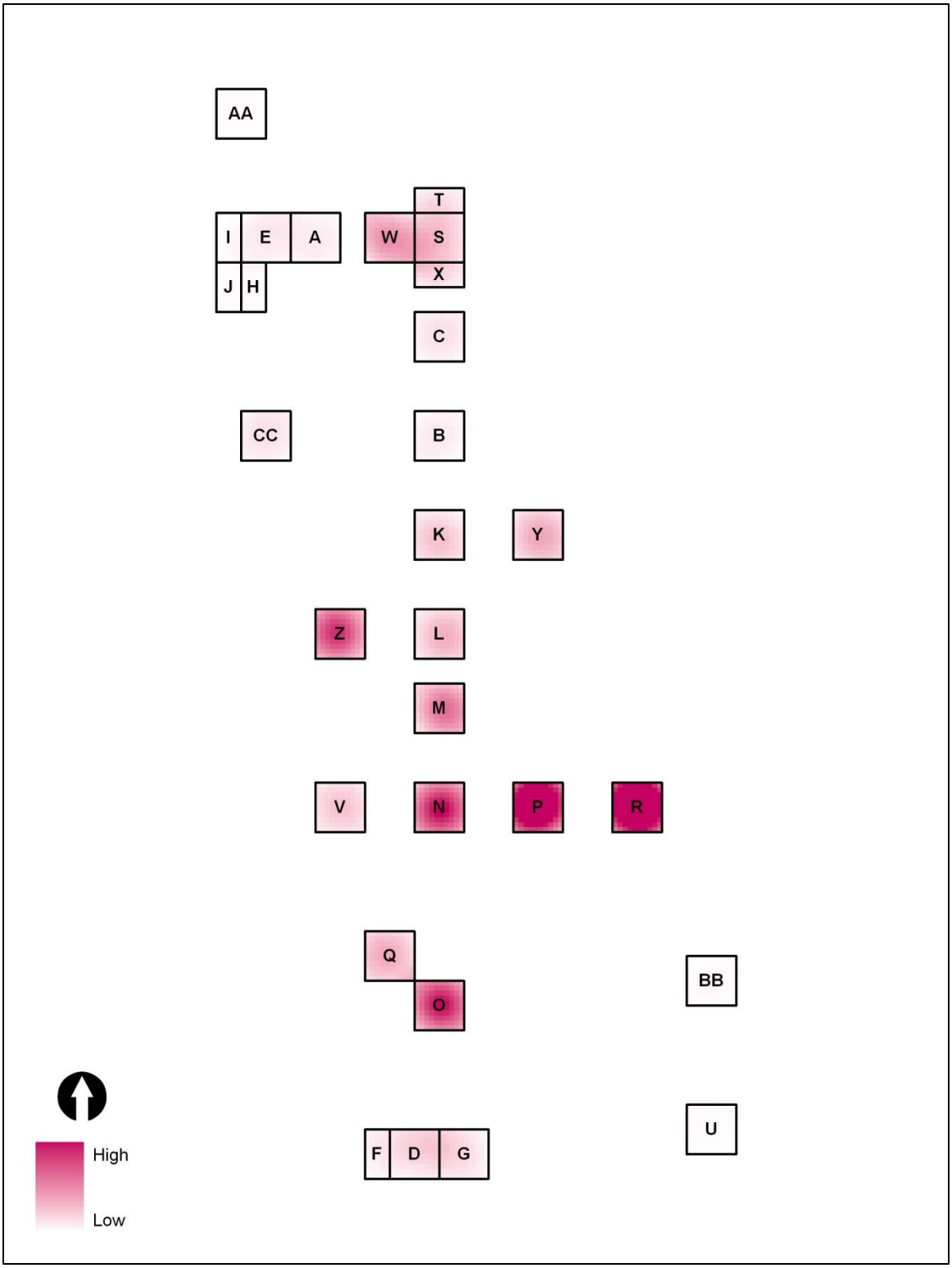


Figure 6-27. Late Woodland Chert Debitage Concentrations (1:250).

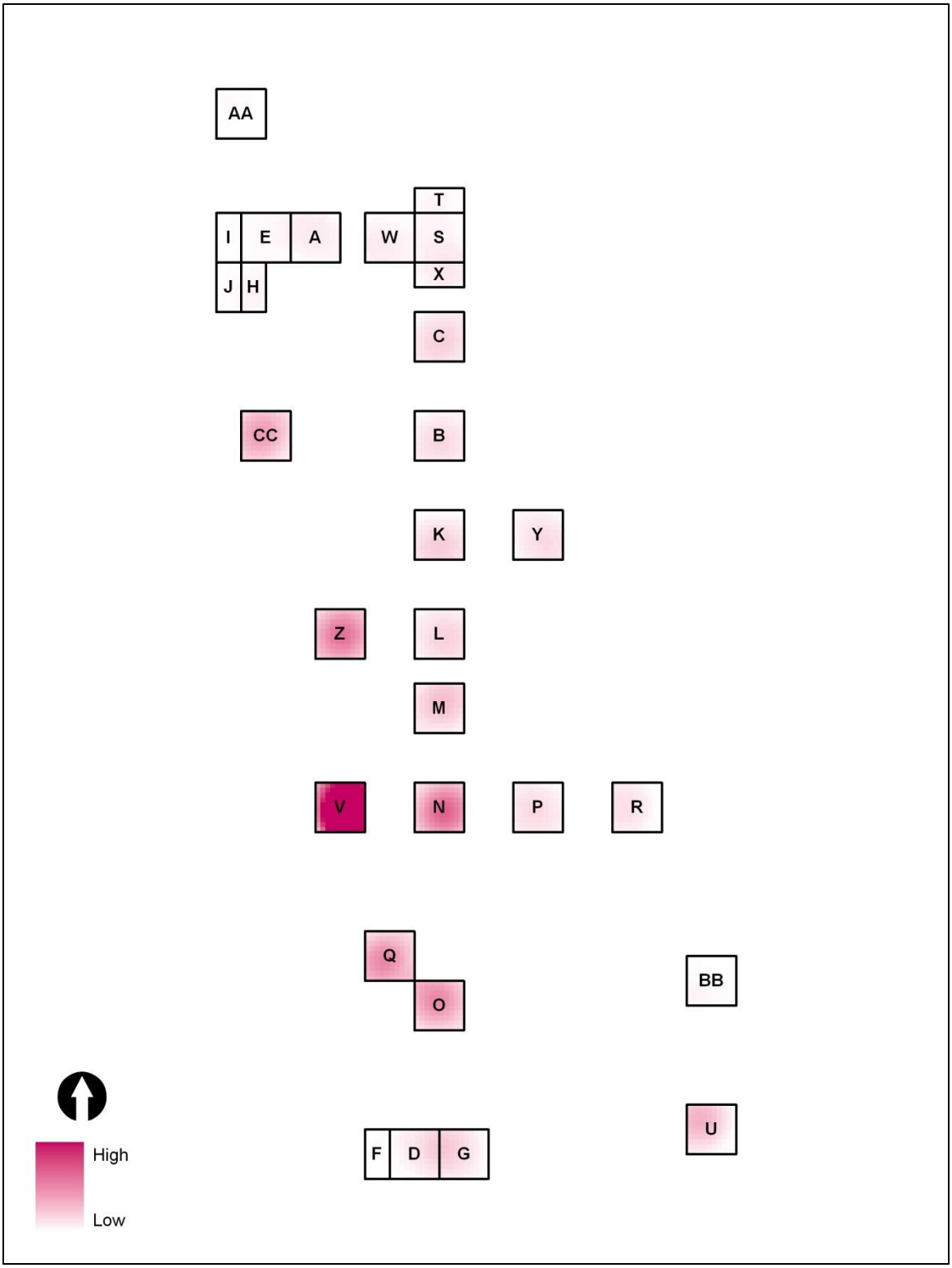


Figure 6-28. Late Woodland Jasper Debitage Concentrations (1:250).

6.2.1.5 Late Woodland Component Analysis and Conclusions

Spatial and statistical analysis of artifact frequency across the RCW Site during the Late Woodland occupation identified a number of latent patterns (Figure 6-29). The pattern of ceramic distribution points toward the intensive use of the area around EB Z for activities in which ceramic vessels play a major role such as food processing, preparation, storage or consumption. Its association with relatively dense accumulations of FCR nearby (EB V) and relatively low frequency of associated processing tools points toward cooking of already prepared (e.g. ground, gutted, skinned, etc.) foods at this location. Ceramic concentrations identified in EBs Q and O may represent similar but less intensive use of these areas for food preparation activities. The concentrations identified in EBs R and G, not clearly associated with any appreciable accumulations of FCR, may represent sporadic breakage events of ceramic vessels during food consumption or storage.

Tool distributions suggest that a variety of activities were carried out in the relatively intensely utilized central portion of the site. Tool forms associated with cutting, scraping, and reaming/perforating are all found in relatively dense concentrations in the central and southern portions of the site. A smaller concentration of cutting, scraping and reaming/perforating tools was also identified within the northern section of the site. These specialized tool types may be associated with a variety of tasks including but not limited to food preparation (e.g. hide preparation, woodworking, etc.).

Finally debitage distribution indicates the intensive production or maintenance of chert and chalcedony tools (projectile points, bifaces and scrapers) in the southeastern portions of the site and intensive jasper tool production or maintenance located in the southwestern portions of the site. In comparison, argillite and quartzite tool production appears to have been much less intensive and carried out sporadically across the entire site focusing on the *ad hoc* production of expedient flake tools as well as argillite projectile points.

The Late Woodland occupation of the RCW Site appears to consist primarily of a centrally located and intensively utilized hearth within EB V (Feature 67) and food production area within EB Z (near Feature 73) surrounded by less intensely utilized activity areas. These peripheral areas include: 1) general use areas characterized by relatively high density concentrations of cutting, chopping, scraping and grinding tools, low density ceramic concentrations and low density FCR concentrations; as well as 2) more intensely utilized lithic production areas characterized by high density debitage concentrations with high proportions of tertiary flakes. Jasper tool production or maintenance seems to be centered around the Feature 67 hearth area in EB V while the center of chert and chalcedony tool production seems to be located within the center of the site in EBs N, P, and R.

The apparently well-defined spatially segregated activity areas identified during the Late Woodland occupation suggest an anticipated medium to long term occupation of this area resulting in a consistent patterning of activity areas, high artifact densities and some consistent spatial separation of monofunctional activity areas (e.g. food preparation from cooking from lithic production from general use areas). The absence of food storage features may indicate a tendency toward medium length as opposed to long term occupation but the effects of sampling bias and or the physical structure of the food storage facilities employed during the Late

Woodland may have rendered such features unexcavated or archaeologically unrecognizable. It should be noted that Features 70 and 73 consist of shallow (15-30 cm) pits filled with stained soil and a variety of artifactual materials including carbon, floral materials, unmodified cobbles, FCR, debitage, flake tools and finished tools. These appear to be pit features subsequently infilled with a random selection of materials; the relatively small amounts of carbon identified within them argue against their being hearth features. Features 70 and 73 may have been used as food storage features, however there is no direct evidence of this, and they have been interpreted as areas where food processing took place at the site.

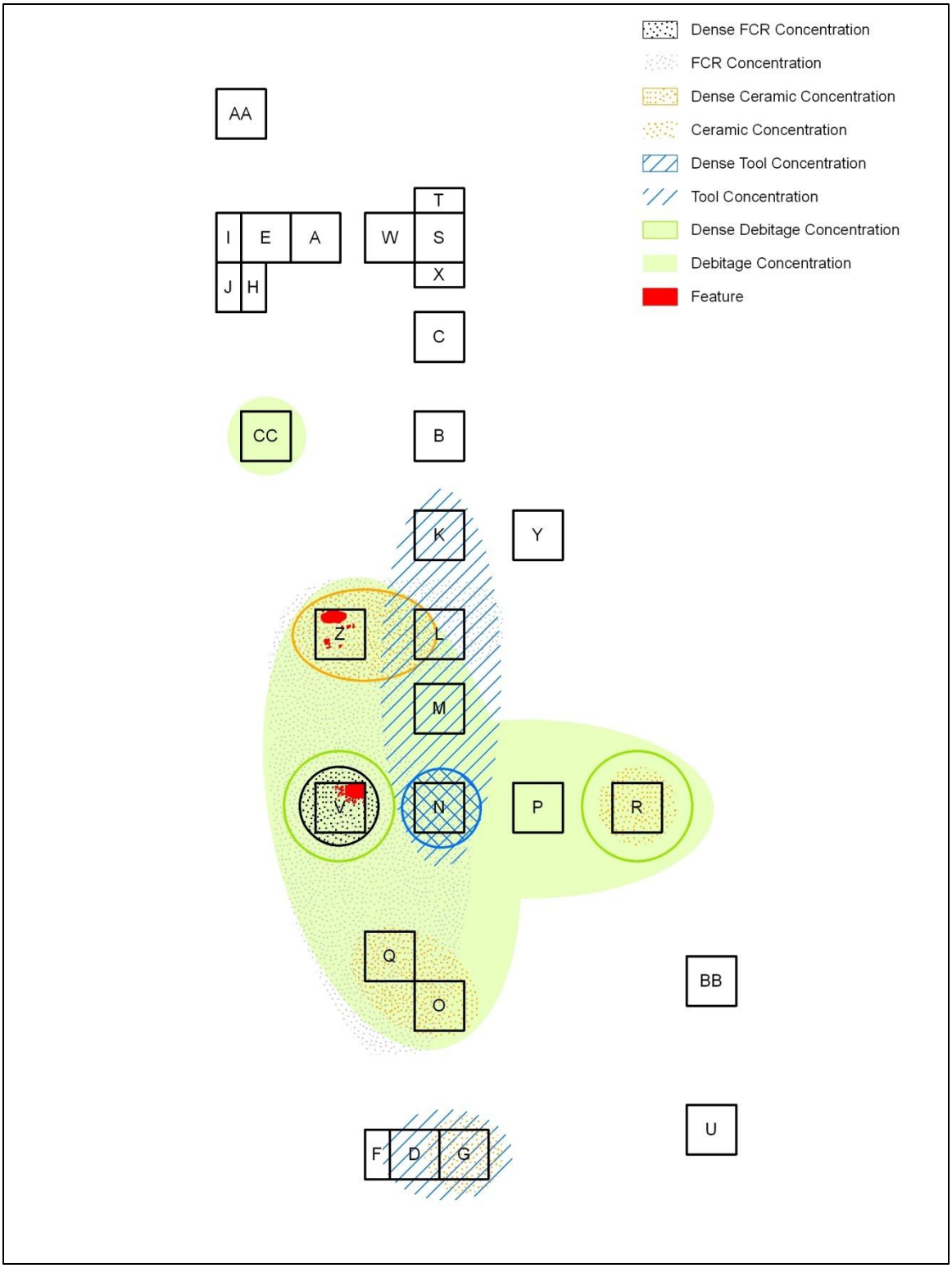


Figure 6-29. Late Woodland Artifact Densities (1:250).

6.2.2 Early/Middle Woodland Component

6.2.2.1 Ceramic Concentrations

During the Early/Middle Woodland Period, substantial ceramic concentrations are generally limited to the south half of the site. Ceramic artifact densities within test units range from 0 to 35 artifacts/m^2 with an average of 1.2/m^2 (s = 4.0). The greatest concentrations occur in EB U (northeast corner) and EB N (southwest corner), with lesser concentrations locate in EB-Z (north half), EB Q (southwest quarter) and EBs D and G (northeast and southwest quarters, respectively) (Table 6-17; Figure 6-30).

Table 6-17. Early/Middle Woodland Ceramic Concentrations.

EB	Ceramic Density	Temper Materials	Range in Maximum Length/Modal Length
U (northeast corner)	35.00/m^2	crushed mineral	10 – 40 mm (0.4 – 1.6 in)/ 10 – 15 mm (0.4 – 0.6 in)
N (southwest corner)	16.00/m^2	mixed argillite and sand, crushed mineral, grit	10 – 60 mm (0.4 – 2.4 in)/ 10 – 15 mm (0.4 – 0.6 in)
Z (north half)	5.50/m^2	Not Available	10 – 35 mm (0.4 – 1.4 in)/ 10 – 15 mm (0.4 – 0.6 in)
Q (southwest quarter)	7.00/m^2	crushed mineral	10 – 30 mm (0.4 – 1.2 in)/ 25 – 30 mm (1.0 – 1.2 in)
D (northeast quarter) and G (southwest quarter)	6.50/m^2	grit temper	10 – 30 mm (0.4 – 1.2 in)/ 25 – 30 mm (1.0 – 1.2 in)

Low modal sherd length points to the effects of post depositional processes such as trampling or clearing in EBs U, N and Z, whereas the relatively large modal sherd lengths seen in EBs Q, D and G may indicate little post depositional modification. Additionally, the uniformity of temper seen in EBs U, Q, D and G may indicate the breakage of a relatively small number of vessels at these locations or a larger number of vessels fractured over a relatively brief period of time.

An additional distinction between these concentrations is their variable association with significant FCR concentrations. While the ceramic concentrations in EBs N and Q are associated with moderate to high density FCR accumulations (see below), those in Z, U, D and G are associated with minimal accumulations of FCR at these locations perhaps indicating the discard of broken vessels or the breakage of vessels used for food storage/consumption rather than preparation at these locations.

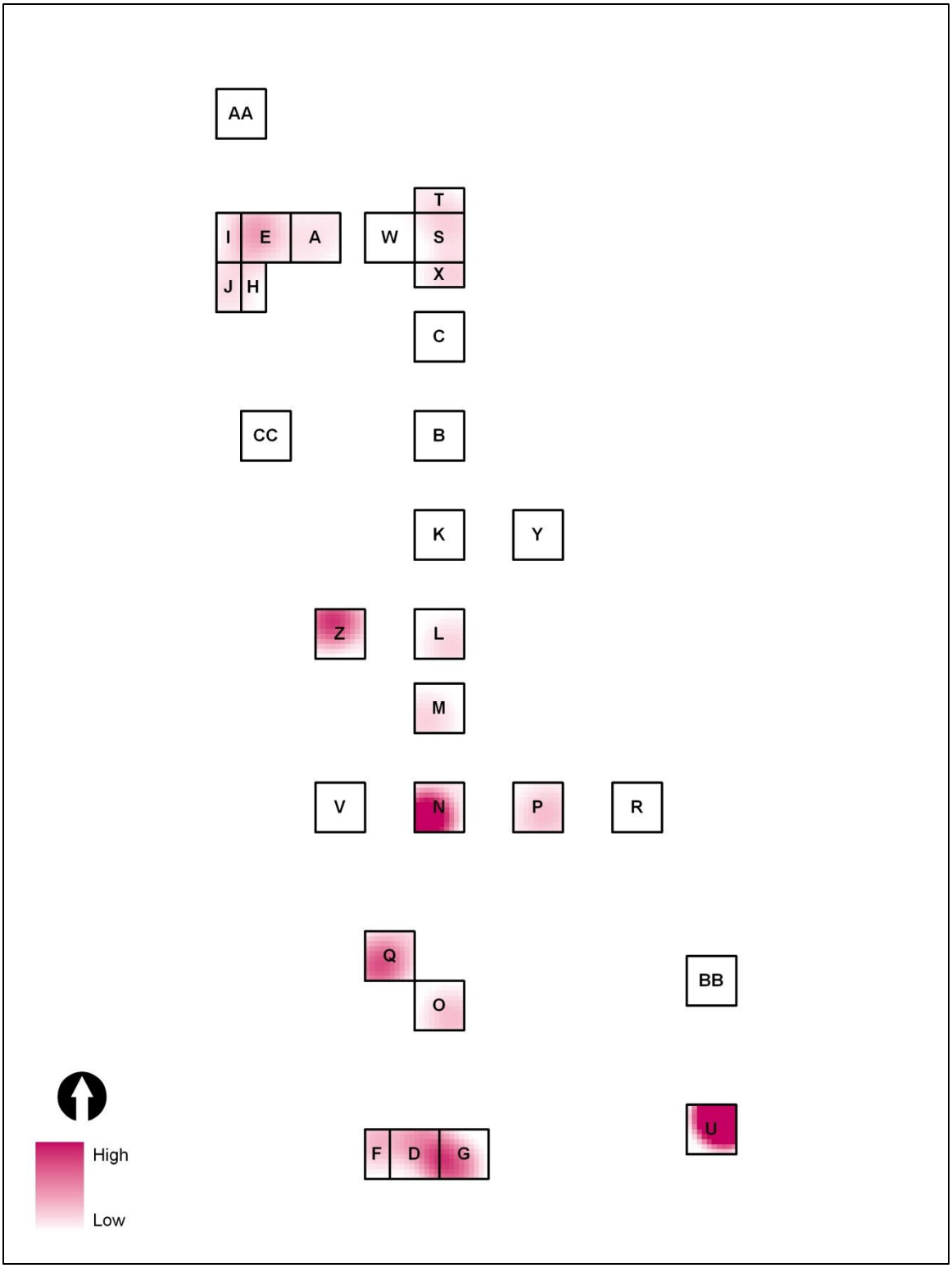


Figure 6-30. Early/Middle Woodland Ceramic Concentrations (1:250).

6.2.2.2 FCR Concentrations

Substantial FCR concentrations are found across the site within the soil strata associated with the Early/Middle Woodland Component. FCR densities within the test units range from 0 to 82 artifacts/m^2 with an average of 4.4/m^2 (s = 10.2). The greatest concentrations occur in EBs W, S and T; EB V (north half); and EBs N, P, Q and O (Table 6-18; Figure 6-31). The Early/Middle Woodland Component contained four hearth features. These included Feature 27, located in EBs H, J, and E; Feature 40, located in EB L; Feature 44, located in EB N; and Feature 77, in EB CC.

Table 6-18. Early/Middle Woodland FCR Concentrations.

EB	FCR Density	Range in Maximum Length/Modal Length
W, S and T	16.60/m^2	10 – 110 mm (0.4 – 4.3 in)/20 – 25 mm (0.8 – 1.0 in)
V (north half)	12.00/m^2	10 – 105 mm (0.4 – 4.1 in)/ 10 – 15 mm (0.4 – 0.6 in)
N	24.50/m^2	10 – 120 mm (0.4 – 4.7 in)/ 10 – 15 mm (0.4 – 0.6 in)
P	7.25/m^2	10 – 75 mm (0.4 – 3.0 in)/ 10 – 15 mm (0.4 – 0.6 in)
Q	6.50/m^2	10 – 90 mm (0.4 – 3.5 in)/ 20 – 40 mm (0.8 – 1.6 in)
O	5.25/m^2	10 – 95 mm (0.4 – 3.7 in)/ 35 – 40 mm (1.4 – 1.6 in)

In all cases FCR concentrations contained a relatively wide range of fragment sizes. However, modal fragment size was relatively higher in EBs W, S and T as well as Q and O. This may indicate association with relatively fewer heating events, as repeated heating is likely to result in repeated fracture and overall smaller fragment size. It is noteworthy that generally those concentrations with the highest densities (V, N and P) are associated with the lowest modal fragment lengths (10-15 mm). Also, the association of the high density FCR concentration (EB N) with the highest maximum fragment length (120 mm) is also associated with a high density concentration of mixed temper ceramics, perhaps indicating the repeated intensive use of the area around EB N for food preparation activities. In contrast, the dense FCR concentration in EBs W, S and T is associated with much lower density ceramic accumulations and a larger modal fragment size (20-25 mm) perhaps indicating less frequent use of this location for food preparation activities or the infrequent preparation of food items by methods not requiring ceramic vessels.

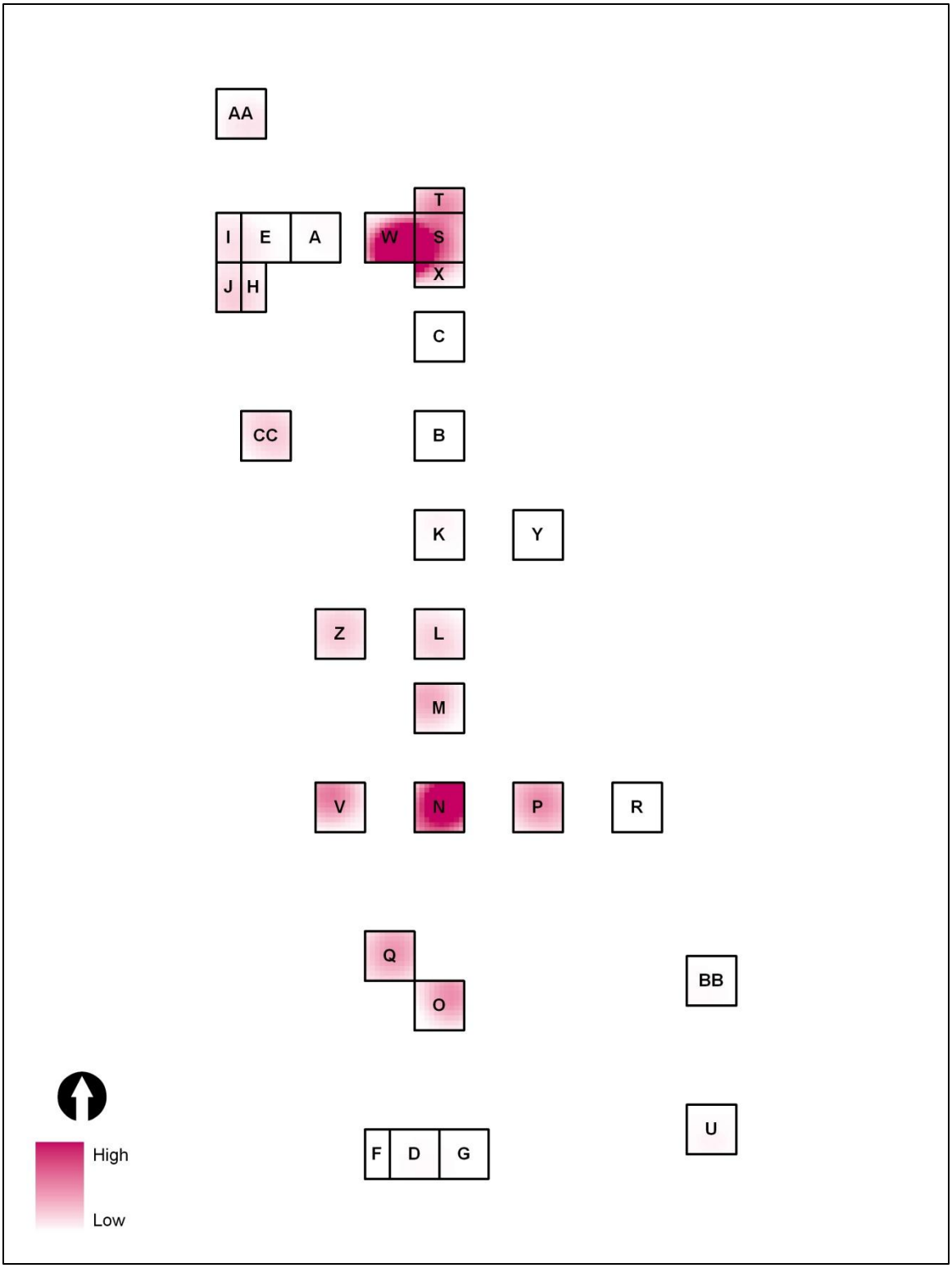


Figure 6-31. Early/Middle Woodland FCR Concentrations (1:250).

6.2.2.3 Tools

Tools are found in the northwest and southeast portions of the site during the Early/Middle Woodland occupation. They include utilized flakes, unifacially retouched flakes, hammerstones, projectile points/knives, bifaces, and scrapers. Within excavation units, densities range from 0 to 3 artifacts/m^2 with an average of 0.2/m^2 (s = 0.6). The greatest concentrations of tools are found in EBs N and P (Table 6-19; Figure 6-32). Argillite projectile points comprise the majority of the component's tool assemblage (67 percent) along with a unifacially retouched flake tool (33 percent).

Table 6-19. Early/Middle Woodland Tool Concentrations.

EB	Density	Tools
N	1.00/m^2	• utilized jasper flake (1) (Cutting Tool; Edge Polish) • utilized chert flake (1) (Cutting Tool, Edge Polish) • utilized chert flake (1) (Cutting Tool; Edge Polish) • distal fragment of a chert Fishtail point (1) (Cutting; Edge Polish)
P	0.75/m^2	• utilized jasper flake (1) (Scraping Tool; Edge Polish) • Jack's Reef Pentagonal point (1) (Cutting Tool; Edge Polish) • chert side scraper (1) (Scraping Tool; Edge Polish) • jasper bifacial tool (1) (Cutting Tool; Edge Polish)

Use wear analysis of the tool concentrations identified in EBs N and P are associated with a limited range of activities specifically cutting and scraping (Table 6-38; Section 6.4.1.4). Their close association with the dense ceramic and FCR concentrations identified in EB N suggest their use in food processing/preparation activities such as the preparation of plant resources and the skinning and gutting of fish or game animals. This assumption was confirmed during FTIR analysis of two ceramic fragments (Cat#s 611.22 and 611.23) found within EB N. The sherds contained residues that indicated processing of duck skin along with several "raw" residues that included yarrow, hickory nut, acorn nuts, and cattail (Section 6.4.2.1; Appendix F).

Use wear analysis of tools found within EBs N and P indicate that cutting of both soft and hard materials was the primary activity taking place within the central portion of the site (Table 6-20). Soft materials can include animal/fish flesh, plant leaves/stems, and hide while hard materials would include items like bone, shell, nuts, and wood. Heavy edge polish on all of the tools indicated heavy usage of expedient tools and the likely curation of bifacial tools within the site.

Table 6-20. Early/Middle Woodland Tool Concentrations and Related Use Wear Patterns.

Excavation Block	Tool Action	Material Acted Upon	Number of Tools
N	Cutting	Hard	2
	Cutting	Soft	1
	Cutting	Mixed	1
		Total	***4***
P	Cutting	Soft	2
	Scraping	Hard	2
		Total	***4***

6.2.2.4 Debitage Density

Depending on raw material, debitage densities across the site during the Early/Middle Woodland are highly variable (Table 6-21). Across the site, average chalcedony, quartz, quartzite and metarhyolite densities during this time period are so low as to warrant exclusion from analysis ($0.3/m^2$, $0.1/m^2$, $0.3/m^2$ and $0.3/m^2$, respectively).

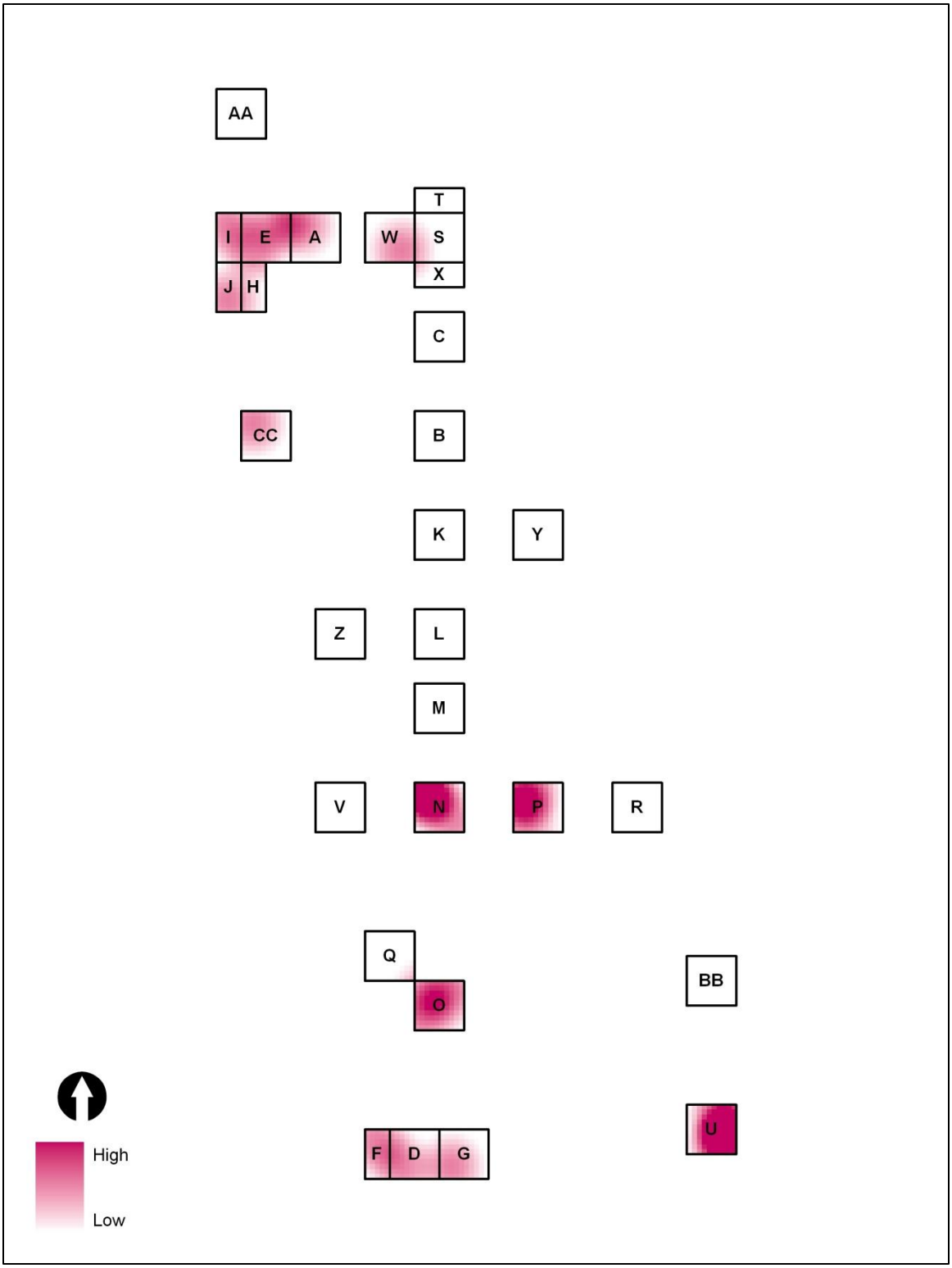
The generally low density of the argillite concentrations identified and the relatively low proportion of tertiary flakes to primary and secondary flakes at this location appear to represent a pattern similar to that seen with argillite during the Late Woodland occupation of the site (Figure 6-33). This pattern suggests a generalized use of the site area as a whole for infrequent perhaps expedient argillite core reduction activities and commensurably infrequent production or maintenance of formal argillite tools aside from projectile points. The production of argillite tools appears directed toward expedient task oriented flake tools of possibly limited use life.

With respect to the chert concentrations, artifact densities and debitage ratios seem to point to intensive use of the areas around EBs W, N, P and O for formal chert tool manufacture and maintenance (Figure 6-34). Outside of these areas, lower density debitage concentrations and higher proportions of primary and secondary debitage may indicate more generalized lithic production activities including core reduction, cobble testing and initial stages of tool manufacture. While expedient flake tools are most common in the assemblage (63 percent), the remainder consists of projectile points/knives (27 percent) and scrapers (9 percent). Concentrations also indicate two distinct areas of intensive chert tool manufacture: one located around EB W at the northern end of the site and another focused on EBs N, P and O in the southern half of the site.

Areas utilized for relatively intensive jasper tool production appear to be focused around EBs N and O (Figure 6-35). Less intensive tool manufacture appears to have occurred around EBs U, V and Z, whereas more generalized lithic reduction activities appear to have been carried out in the northern half of the site. Expedient flake tools comprise the most common tool types in the assemblage (60 percent), projectile points (20 percent) and scrapers (20 percent) comprise the remainder.

Table 6-21. Early/Middle Woodland Debitage Concentrations.

Lithic Material	EB	Density	Debitage Ratios (Primary: Secondary: Tertiary)
Argillite	I, E, J, H	6.20/m^2	1:7:4
	CC (north half)	2.50/m^2	0:1:3
	K (north half)	4.50/m^2	0:2:1
	Z	2.50/m^2	0:1:9
	M	2.50/m^2	1:4:5
	V	3.75/m^2	0:2:3
	N	3.00/m^2	1:6:5
	O (southeast quarter)	19.00/m^2	1:6:3
	U	8.25/m^2	1:3:4
Chert	E	6.5/m^2	1:2: 4
	J & H (south half)	4.5/m^2	0:7:1
	W	21.75/m^2	0:1:4
	CC	5.25/m^2	0:1:2
	M	5.75/m^2	1:14:7
	N	12.50/m^2	1:8:13
	P	15.25/m^2	1:5:24
	O	27.25/m^2	1:2:5
Jasper	I, E, J	2.90/m^2	1:5:1
	K (north half)	5.00/m^2	0:2:1
	Z (south half)	3.00/m^2	0:0:1
	V	3.50/m^2	0:1:2
	N	5.75/m^2	1:3:15
	O	12.50/m^2	1:10:31
	U	3.25/m^2	1:1:8



6-32. Early/Middle Woodland Tool Concentrations (1:250).

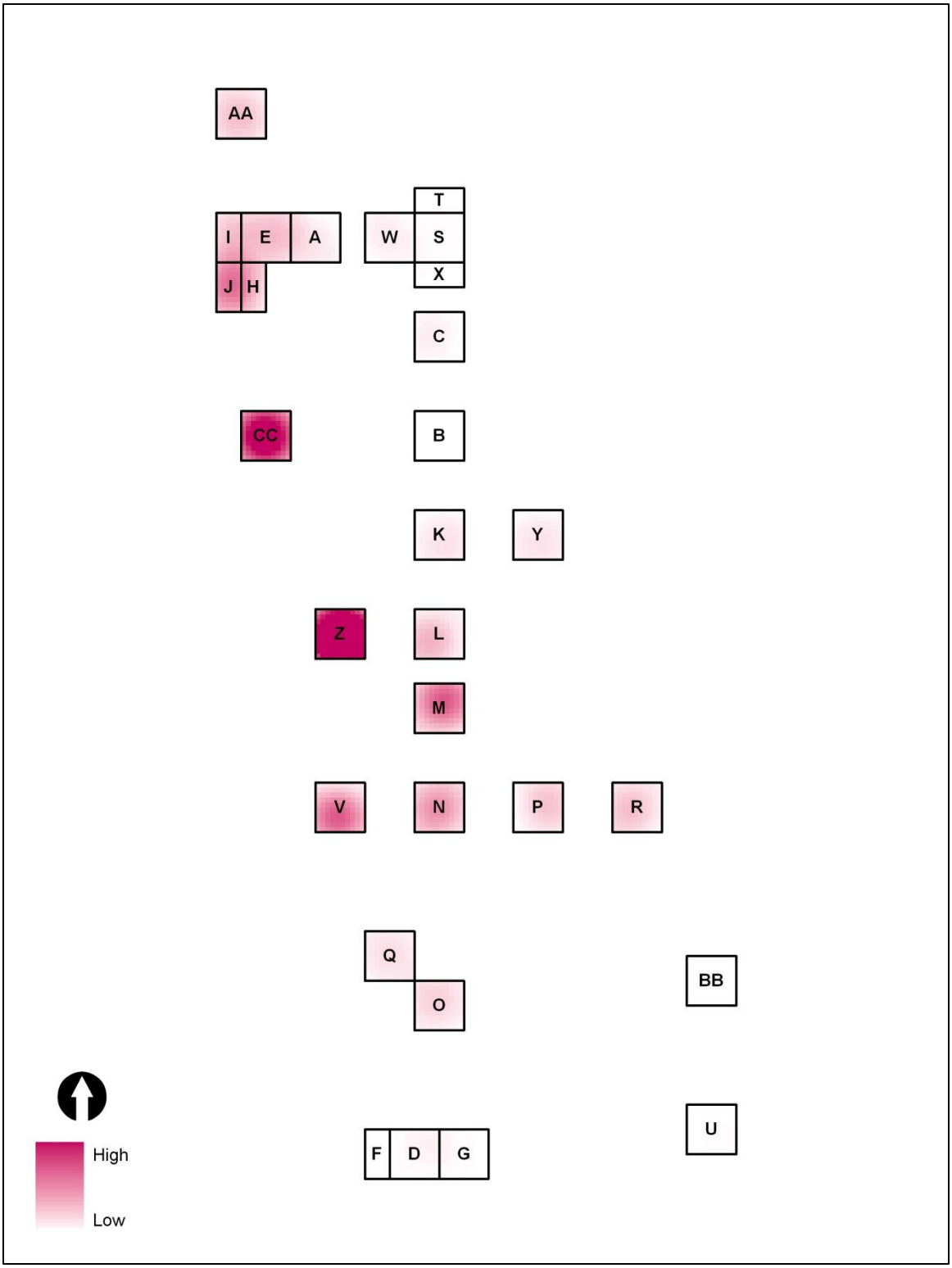


Figure 6-33. Early/Middle Woodland Argillite Debitage Concentrations (1:250).

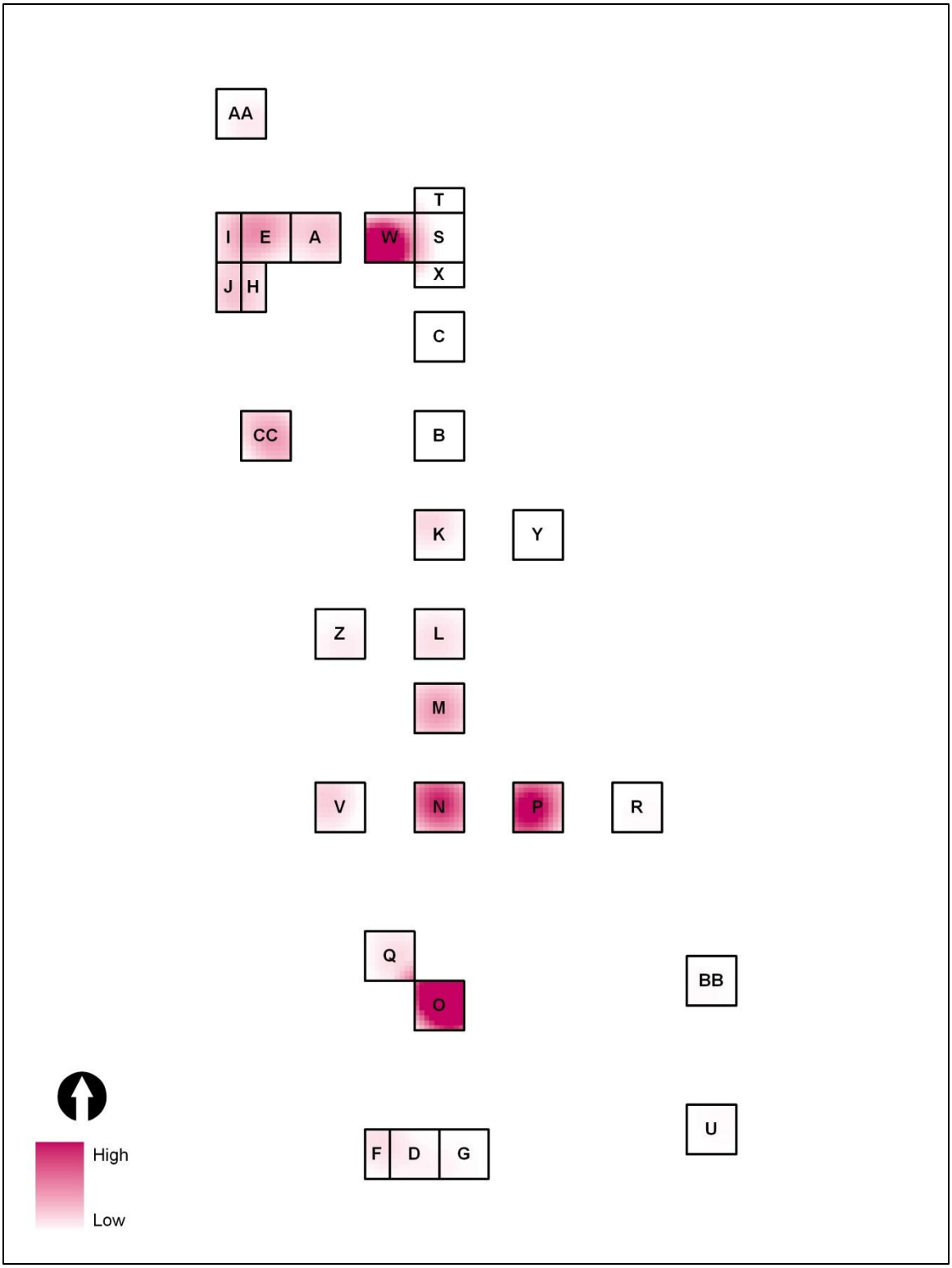


Figure 6-34. Early/Middle Woodland Chert Debitage Concentrations (1:250).

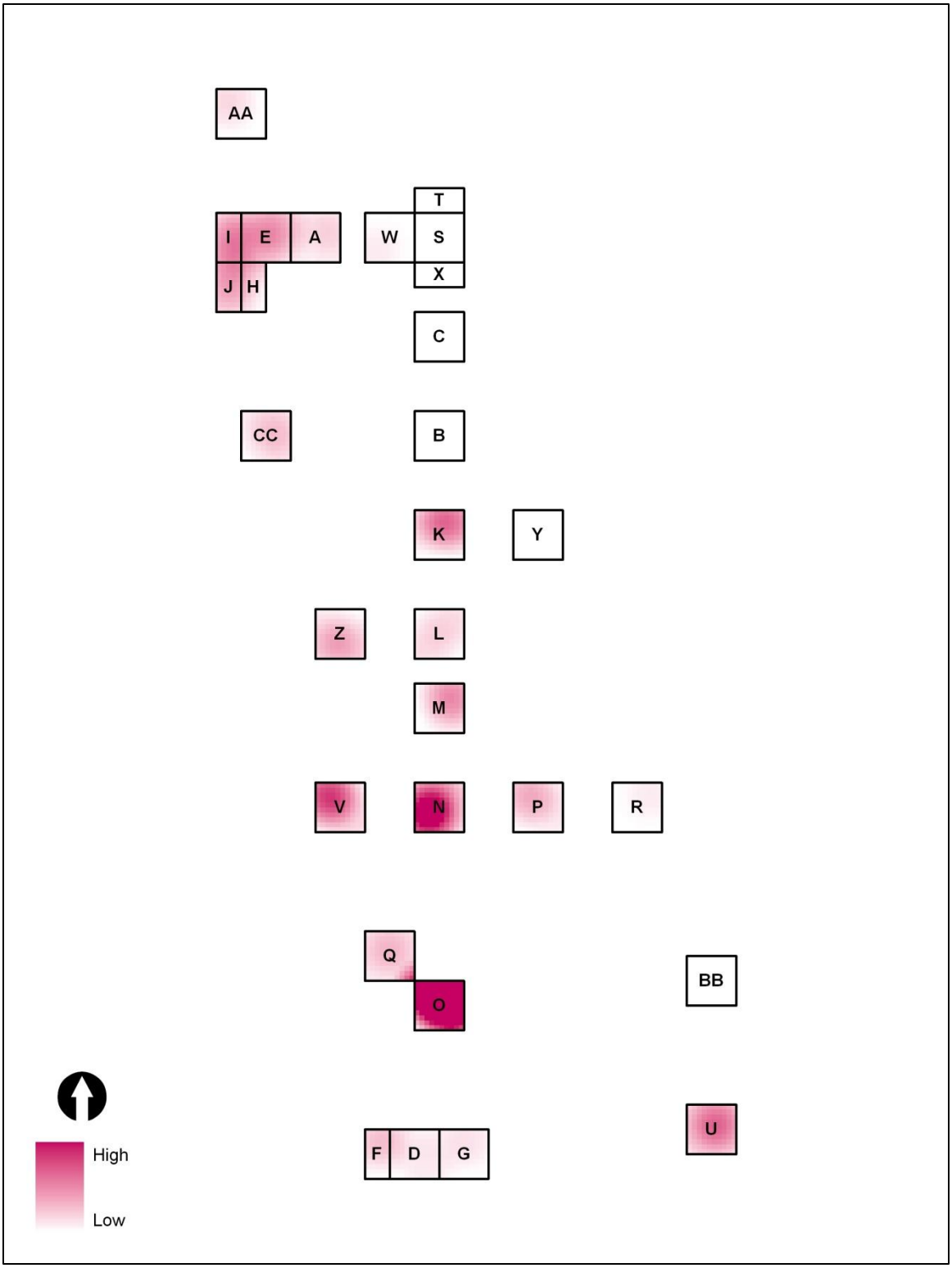


Figure 6-35. Early/Middle Woodland Jasper Debitage Concentrations (1:250).

6.2.2.5 Early/Middle Woodland Component Analysis and Conclusions

Ceramic distributions point toward the intensive use of the area around EBs N and Q for activities in which ceramic vessels play a major role such as food processing, preparation, storage or consumption. Their association with relatively dense accumulations of FCR nearby and, in the case of EB N, expedient chert and jasper cutting tools points toward preparation and cooking of foods at these locations. The concentrations identified in EBs U, Z, G and D are not clearly associated with appreciable accumulations of FCR and may represent sporadic breakage events of ceramic vessels during food consumption or storage (Figure 6-36).

The tool concentrations identified in EBs N and P are associated with a limited range of activities; specifically, cutting. Their close association with the dense ceramic and FCR concentrations identified in EB N suggest their use in food processing/preparation activities such as skinning and gutting of fish or game animals. In contrast, many types of ground stone tools typically associated with the processing of plant resources that were recovered from the Late Woodland component of the site appear absent during the Early/Middle Woodland component, including nutting stones and pestles.

Finally, debitage distribution indicates the intensive production of chert and jasper scrapers, bifaces and projectile points in the southern portions of the site with earlier stages of their production being carried out in a more generalized area. In comparison, argillite tool production appears to have been much less intensive and carried out sporadically across the site focusing on the expedient production of simple cutting tools and argillite projectile points.

During the Early/Middle Woodland occupation, activities appear to remain focused around two hearth areas, one located in the north around EBs W, S and T and one located in the south around Feature 44 (EB N) and EB V. Cooking, general use and lithic production areas appear more centralized as exemplified by the areas around EB N while artifact densities remain high and activity areas well defined. In contrast to the Late Woodland occupation this pattern may represent regular, frequent, relatively short term occupation of this location during the Early/Middle Woodland. Frequent routine reoccupation of specific areas within the RCW Site could result in well defined high artifact density multifunctional activity areas while the transient nature of the occupation might impede the establishment of clearly segregated monofunctional activity areas.

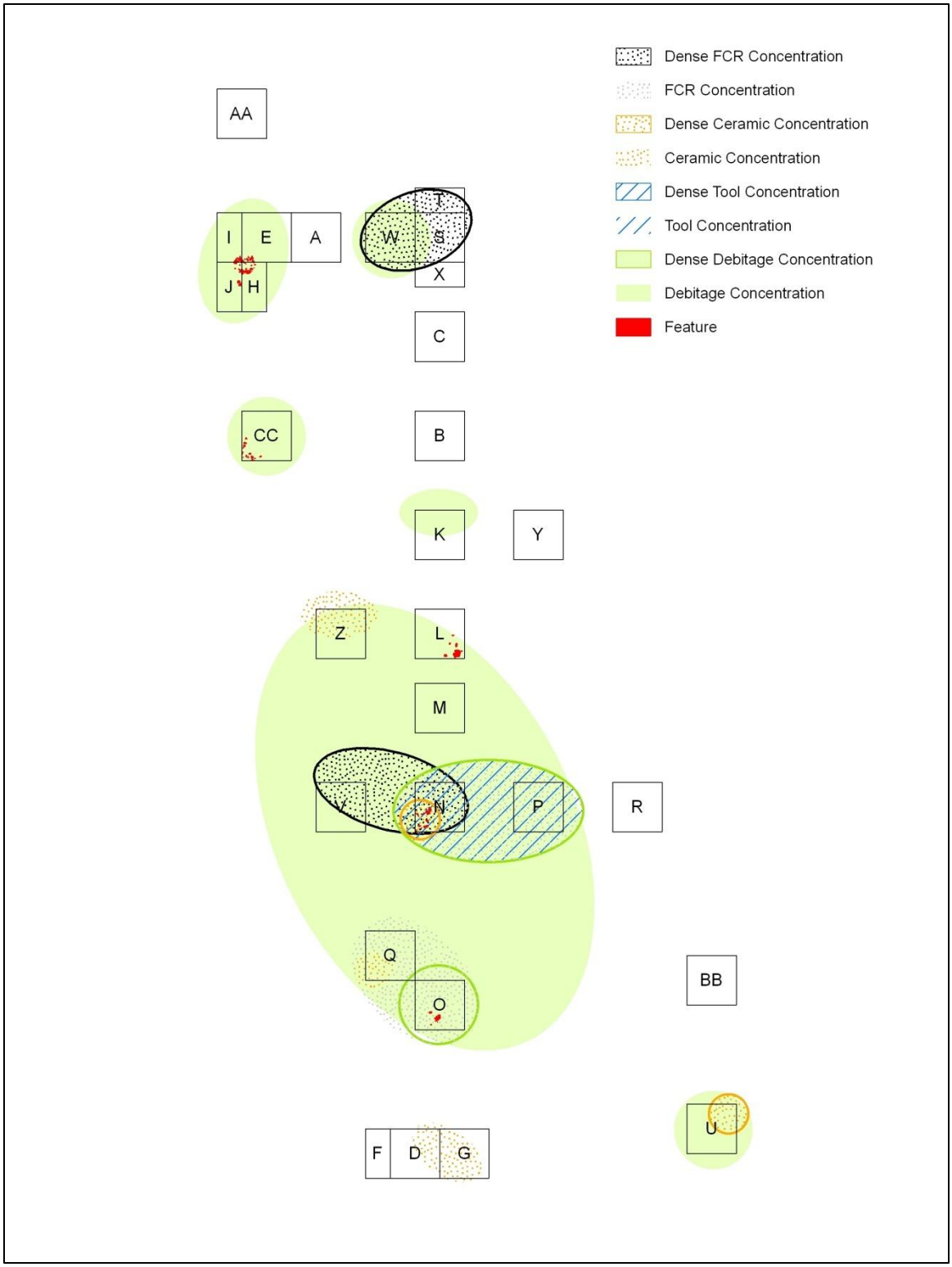


Figure 6-36. Early/Middle Woodland Artifact Densities (1:250).

6.2.3 Late Archaic I Component

6.2.3.1 FCR Concentrations

Very dense FCR concentrations are found across the northern two-thirds of the site during the Late Archaic I occupation (Figure 6-37). Within test units, FCR densities range between 0 and 104 artifacts/m^2 with an average of 20.3/m^2 (s=24.0). The greatest concentrations are found in EBs CC, Z, M, N and R as well as W and S (Table 6-22). Six hearth features were identified within the Late Archaic I Component. These features include Feature 26, in EB A; Feature 42 in EB L; Feature 43 in EB E; Feature 45 in EB M; Feature 64 in EBs S, T, W, and X; and Feature 65 in EB S. As the FCR recovered from EBs S, T, W, and X are Feature 64, and constitute a large platform hearth, FCR from these locations will be excluded from this analysis of latent patterns so as not to skew the data. All FCR concentrations are relatively dense and exhibit a wide range of fragment size. However, modal fragment size was relatively high (35-40 mm) in EB M. This may indicate association with relatively fewer heating events, as repeated heating is likely to result in repeated fracture and smaller fragment size overall.

Table 6-22. Late Archaic I FCR Concentrations.

EB	FCR Density	Range in Maximum Length/Modal Length
CC	80.25	10 – 115 mm (0.4 – 4.5 in)/10 – 15 mm (0.4 – 0.6 in)
Z	77.25	10 – 90 mm (0.4 – 3.5 in) /10 – 15 mm (0.4 – 0.6 in)
M	36.75	10 – 80 mm (0.4 – 3.1 in)/ 35 – 40 mm (1.4 – 1.6 in)
N	34.5	10 – 90 mm (0.4 – 3.5 in)/10 – 15 mm (0.4 – 0.6 in)
R	30.25	10 – 90 mm (0.4 – 3.5 in)/10 – 15 mm (0.4 – 0.6 in)

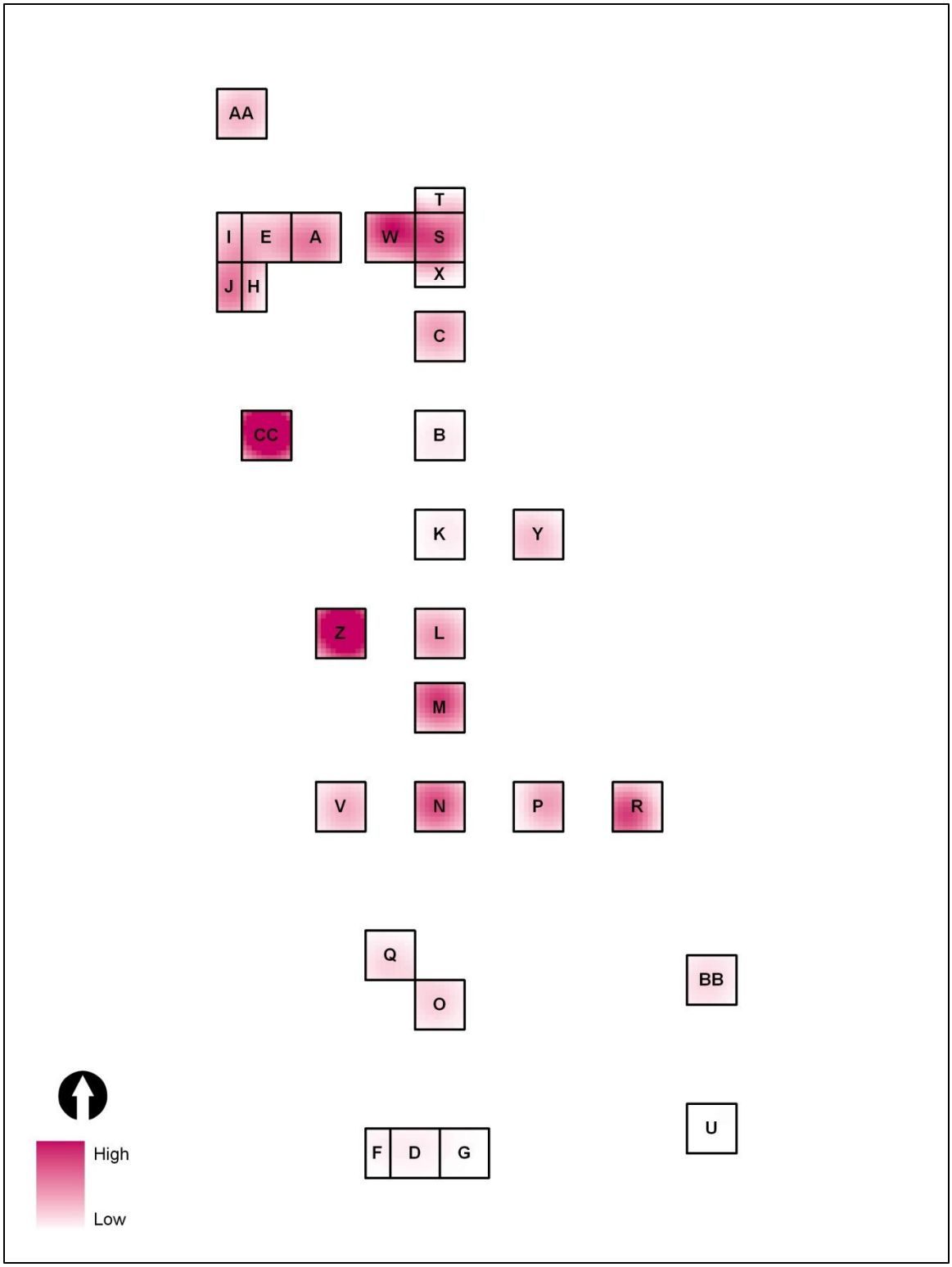


Figure 6-37. Late Archaic I FCR Concentrations.

6.2.3.2 Tool Concentrations

Tools are found across the site during the Late Archaic I occupation. They include retouched and utilized flakes, hammerstones, nutting stones, pestles, preforms, projectile points/knives, scrapers and bifaces. Within excavation units, densities range from 0 to 5 artifacts/m^2 with an average of 0.6/m^2 (s = 1.0). The greatest concentrations of tools are found in EBs CC, Z, Y (north half), N and R as well as F and D (south halves) (Table 6-23; Figure 6-38).

Table 6-23. Late Archaic I Tool Concentrations.

EB	Density	Tools
CC	1.25/m^2	• argillite preform (1) • argillite projectile point (1) • argillite Lackawaxen point (1) • argillite bifaces (2)
Z	2.00/m^2	• retouched argillite flake (1) • argillite preform (1) • argillite Lackawaxen point (1) • argillite bifaces (4) • argillite biface (1) (Cutting Tool)
Y (north half)	2.00/m^2	• argillite Lackawaxen projectile point (1) (Reamer/Perforator) • chert biface (1) • jasper biface (1) • quartzite cobble tool (1)
N	2.25/m^2	• argillite preform (1) • argillite Lackawaxen projectile points (2) • argillite Lackawaxen projectile point (1) (Reamer/Perforator Tool) • argillite Meadowood point (1) • argillite Rossville point (1) • argillite biface (1) • quartzite pestle (1) • unifacially retouched metarhyolite flake (1)
R	1.50/m^2	• bifacially retouched argillite flakes (2) • utilized argillite flakes (2) • argillite Lackawaxen point (1) • quartzite ground stone tool (1)
F (south half) and D (south half)	2.00/m^2	• jasper Levanna point (1) (Reamer/ Perforator Tool; Edge Polish) • jasper scraper (1) • bifacially retouched jasper flake (1) • argillite Fishtail point (1) • argillite scraper (1)

Use wear analysis of tools within the tool concentrations identified appear to be associated primarily with cutting, scraping, and reaming/perforating activities (Table 6-38, Section 6.4.1.4). Unlike concentrations identified for the Late Woodland and Early/Middle Woodland occupations, formal tools appear to dominate the assemblages with notable lower representation of expedient flake tools: formal tools represent 100 percent of the total in EB-CC, 88 percent in EB-Z, 75 percent in EB Y, 89 percent in EB N, 33 percent in EB R and 80 percent in EBs F & D. Additionally, during the Late Archaic I occupation, formal argillite tools other than projectile points are common and include argillite bifaces and scrapers.

Use wear analysis of tools found within EBs Y, Z, and CC indicate that cutting and reaming/perforating of soft and hard materials was the primary activity within the northern portion of the site. Soft materials can include animal/fish flesh, plant leaves/stems, and hide while hard materials would include items like bone, shell, nuts, and wood. Very few of the tools present within the northern concentration of tools showed use wear or polish. The majority of the artifacts present within the concentration are made of argillite (n=76 percent) which weathers relatively easy when compared to cryptocrystalline materials.

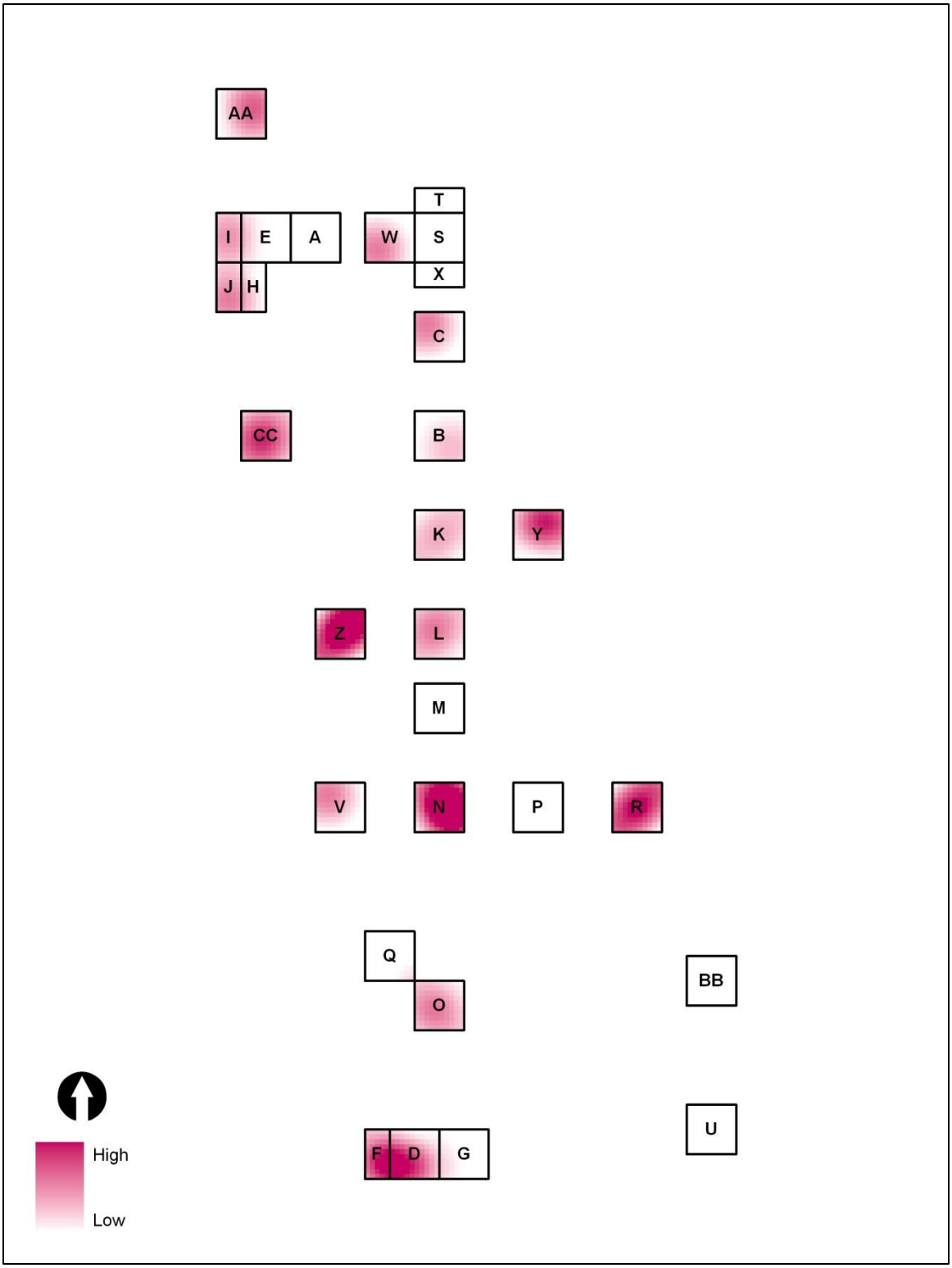


Figure 6-38. Late Archaic I Tool Concentrations.

6.2.3.3 Debitage Density

Depending on raw material, debitage densities across the site during the Late Archaic 1 occupation are highly variable (Table 6-24). Across the site, average chalcedony and quartz densities during this time period are so low as to warrant exclusion from analysis. High density argillite debitage concentrations can be found in the central and northwestern portions of the site (Figure 6-39). While most concentrations appear to represent intensive manufacture of argillite tools, those identified in EB N and EBs I, E, J and H seem to indicate the less intensive use of these locations for later stage core reduction activities based on the ratio of secondary to tertiary debitage calculated.

Overall chert and jasper concentrations are of lower density than argillite (Figures 6-40 and 6-41). Debitage ratios for chert suggest intensive tool manufacture located in EB CC with less intensive use of EBs K, N and O for all stages of core reduction and tool manufacture. Jasper exhibits a similar pattern to that of chert with an apparent central focus of tool manufacture in EB F and G and several other areas associated with less intensive core reduction and tool manufacture activities.

All stages of quartzite lithic reduction appear to be carried out across the site. However, based on increased densities and debitage ratios EBs A, C and N appear to be centers of intensive reduction of quartzite cobbles (Figure 6-42). Thermal reddening of numerous quartzite flakes from EB C indicates site inhabitants were likely scavenging useable cobbles from Feature 64 located approximately 2 m north.

Notable metarhyolite debitage concentrations are located primarily in the central portion of the site specifically EBs CC, Z, M, V, N and O (Figure 6-43). All stages of metarhyolite lithic reduction appear to be carried out across the site with the most intense utilization occurring in EB M.

Table 6-24. Late Archaic I Debitage Concentrations.

Lithic Material	EB	Density	Debitage Ratios (Primary: Secondary: Tertiary)
Argillite	I, E, J, H	12.30/m^2	1:20:3
	CC	42.50/m^2	1:9:23
	Z	77.25/m^2	1:33:121
	M	20.00	1:5:10
	V	18.75	1:23:51
	N	14.00	1:13:4
Chert	CC	13.00	1:8:32
	K (south half)	8.00	0:1:1
	N	8.75	0:1:2
	O	6.75	1:2:3
Jasper	K (south half)	8.50	0:2:1
	N (west half)	10.50	1:1:1
	O	5.75	1:12:9
	F (south half) and D (southwest quarter)	24.00	1:10:14
Quartzite	A	2.00	5:1:0
	J & E (southwest quarter)	2.33	1:2:2
	C	9.25	6:6:1
	Z	2.25	1:3:1
	N	2.75	2:8:1
Metarhyolite	CC	2.75	2:3:6
	Z	7.00	1:13:14
	M	11.00	0:34:10
	V	3.50	0:8:6
	N	3.50	1:7:5
	O (west half)	3.00	1:4:1

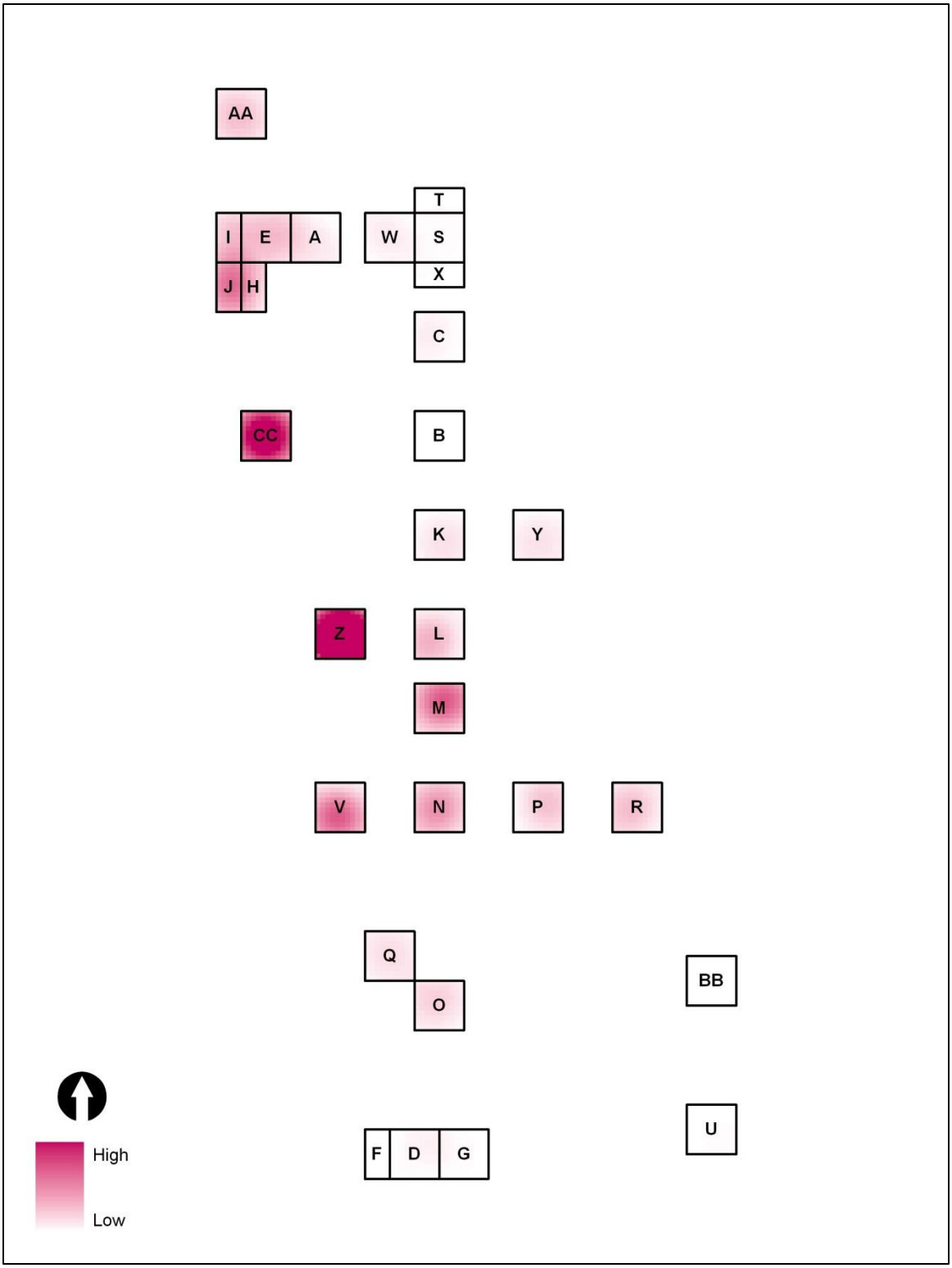


Figure 6-39. Late Archaic I Argillite Debitage Concentrations.

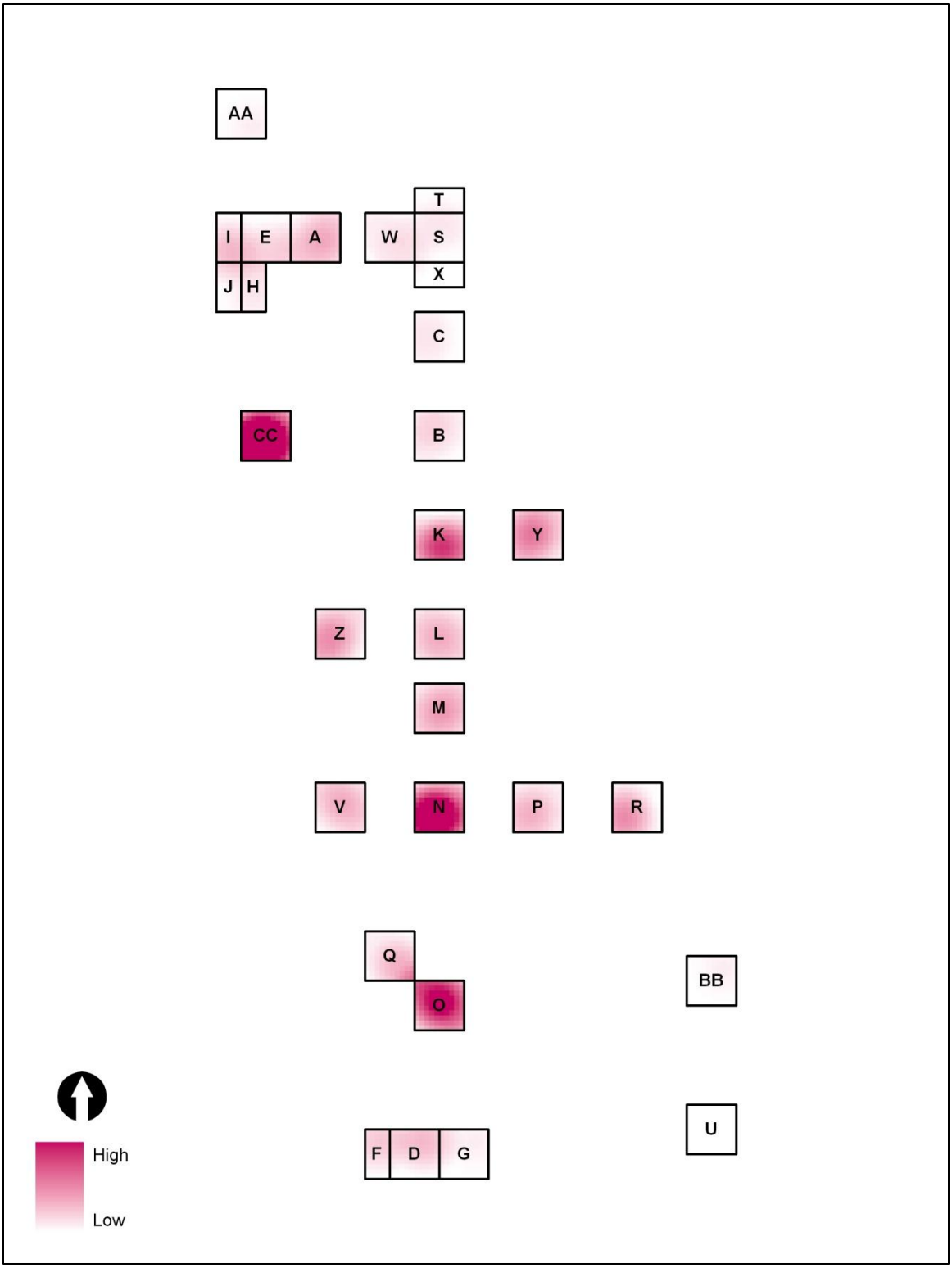


Figure 6-40. Late Archaic I Chert Debitage Concentrations.

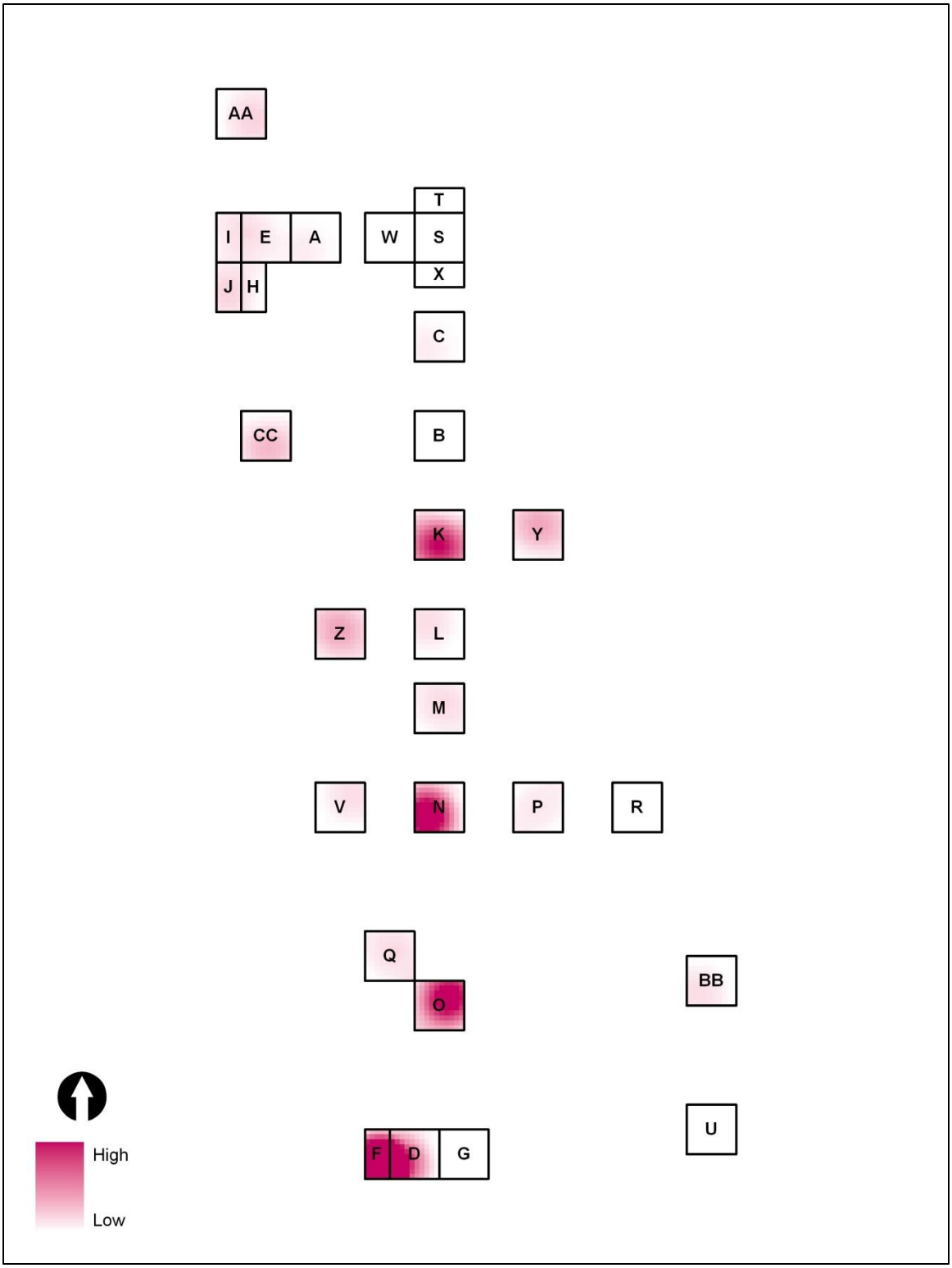


Figure 6-41. Late Archaic 1 Jasper Debitage Concentrations.

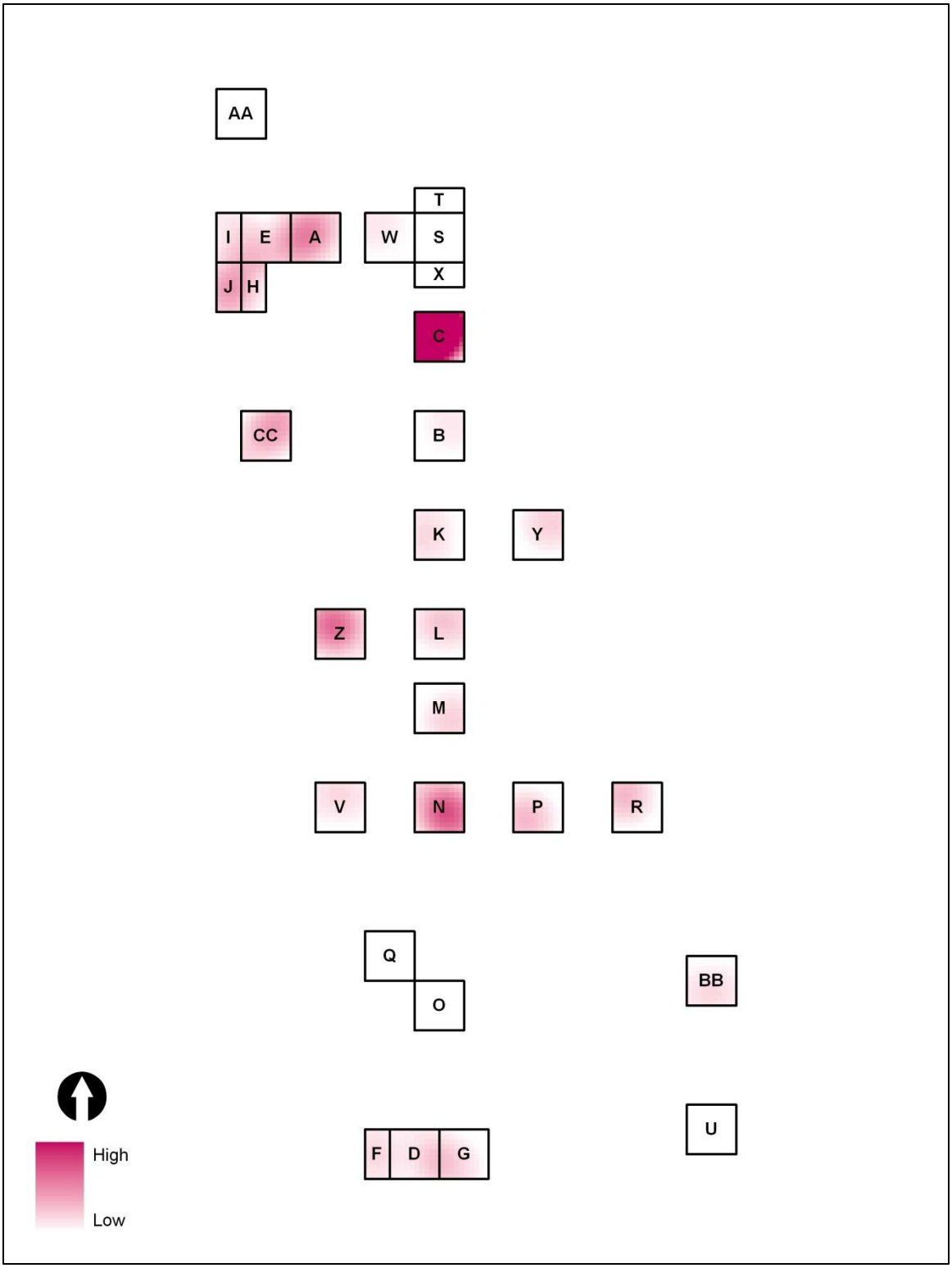


Figure 6-42. Late Archaic I Quartzite Debitage Concentrations.

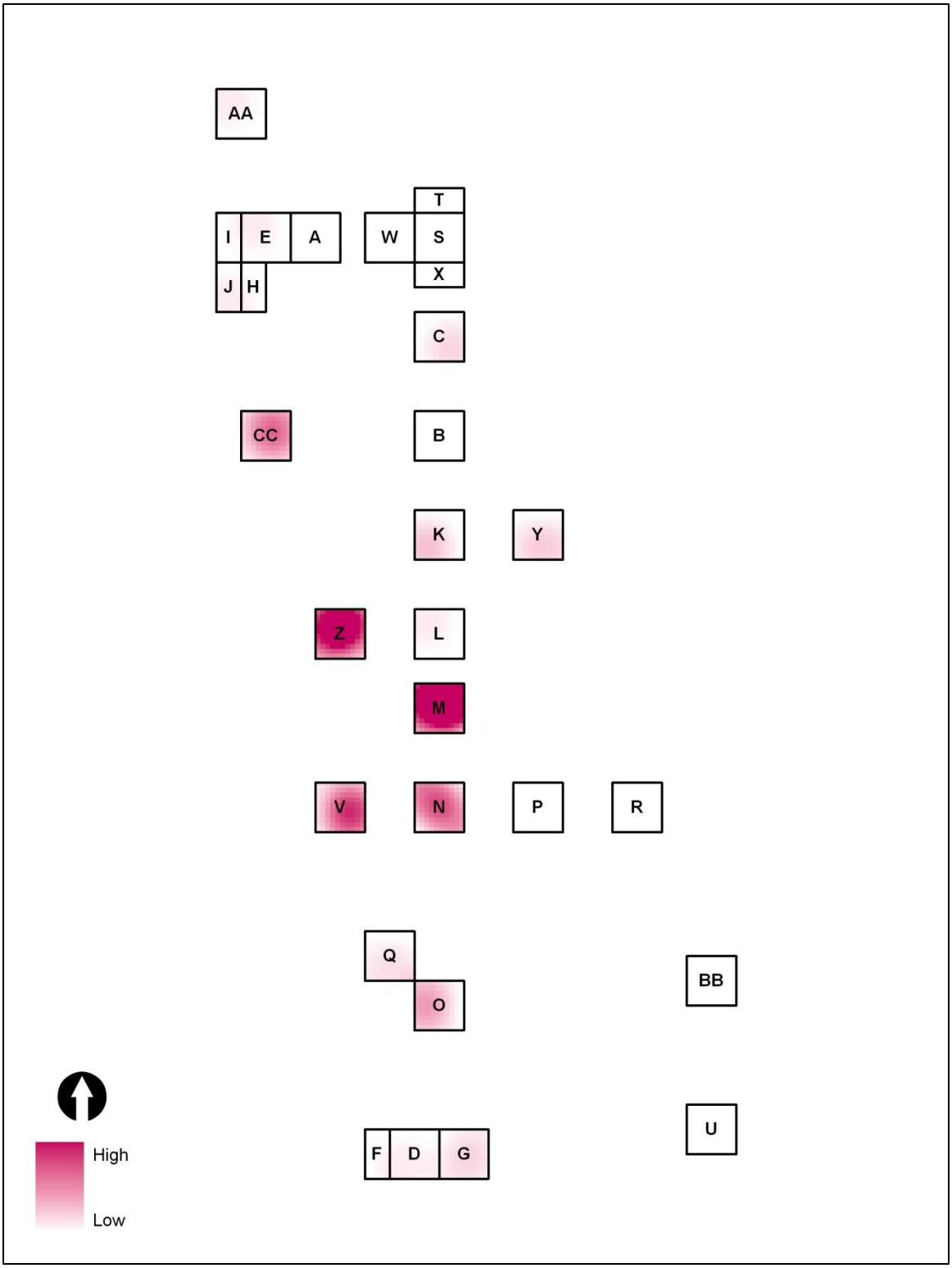


Figure 6-43. Late Archaic I Metarhyolite Debitage Concentrations.

6.2.3.4 Late Archaic I Component Analysis and Conclusions

Ceramic distributions and small sherd size point toward the ceramics having been re-deposited from the Woodland components above. FCR concentrations are of substantially greater density and seemingly less centralized within the site than those seen during the Late Woodland and Early/Middle Woodland occupations (Figure 6-44). Six hearth features identified within the Late Archaic II Component were all located within different portions of the site proving that activity areas were less centralized during this period. Features 26 and 43 were located within the northern portion of the site, Features 42 and 45 were located within the central portion of the site, and Features 64 and 65 were located within the southern portion of the site.

Tool concentrations were widespread across the site and consisted primarily of argillite flake tools (n=4), bifaces (n=8), projectile points (n=10) and preforms (n=3) with formal (non-flake) tools dominating the assemblage. Groundstone tools (ie. nutting stones and pestles) which are typically associated with the processing of plant resources were also recovered from the Late Archaic I Component of the site. Use wear on the tool concentration indicated the cutting and reaming/perforating of soft and hard materials. The Late Archaic I and Late Woodland components were the only components of the site to produce groundstone tools.

Finally debitage concentrations are dominated by argillite and to a lesser extent jasper materials. Based on debitage ratios all stages of lithic reduction appear to be carried out across the site. A specialized lithic production area appears to exist in EB C consisting of relatively high density scatter of thermally altered quartzite debitage dominated by primary and secondary flakes. Given their proximity and uniformity of material, it would appear that useable quartzite cobbles may have been scavenged from Feature 64 in EBs W, S, T and X for the manufacture of expedient flake tools.

In contrast to the Woodland Period occupations, the distribution of latent features during the Late Archaic 1 occupation appears significantly more complicated. Clear segregation and nucleation of activity areas is not as apparent as during the Late and Early/Middle Woodland occupations at the site. This may be the result of sampling bias with respect to the location of excavated blocks relative to the actual location of artifactual deposits and features. Alternately, the lack of clear spatial segregation and nucleation may be reflective of the actual use of space at the RCW Site during the Late Archaic I occupation. If the patterning, or the perceived lack thereof, is reflective of the actual use of space during the Late Archaic I occupation, it may reflect the cumulative effects of relatively sporadic short term occupation of this location for perhaps a relatively limited set of activities.

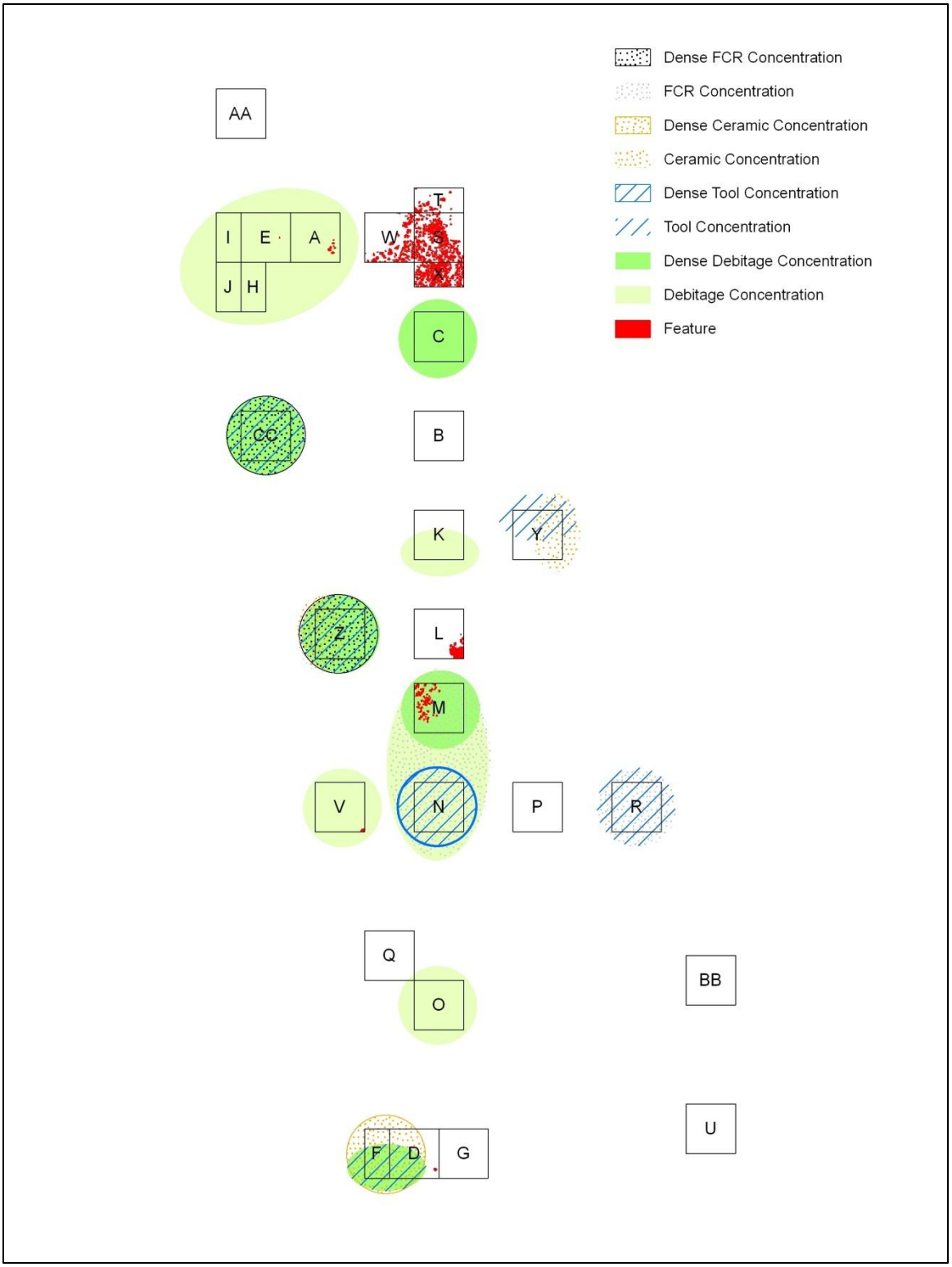


Figure 6-44. Late Archaic I Artifact Densities (1:250).

6.2.4 Late Archaic II Component

6.2.4.1 FCR Concentrations

Very dense FCR concentrations are found in the northwest and southwest portions of the site during the Late Archaic II occupation. Within TUs, FCR densities range between 0 and 40 artifacts/m^2 with an average of 4.1/m^2 (s=7.9). The greatest concentrations are found in EBs AA (south half); I, E, J and H; B and O (Table 6-25; Figure 6-45). Two hearth features were identified within the Late Archaic II Component. These features included Feature 39 in EBs E and I; and Feature 76 in EB V.

Table 6-25. Late Archaic II FCR Concentrations.

EB	FCR Density	Range in Maximum Length/Modal Length
AA	9.00	10 – 70 mm (0.4 – 2.8 in)/ 10 – 15 mm (0.4 – 0.6 in)
I, E, J, H	15.30	10 – 35 mm (0.4 – 1.4 in)/ 10 – 15 mm (0.4 – 0.6 in)
B	21.75	10 – 75 mm (0.4 – 3.0 in) / 10 – 15 mm (0.4 – 0.6 in)
O	22.75	10 – 90 mm (0.4 – 3.5 in) / 10 – 15 mm (0.4 – 0.6 in)

FCR Concentrations identified in EBs AA, B and O are all relatively dense with a wide variation fragment size and low modal length values (10-15 mm). The concentration identified in EBs I, E, J and H while relatively dense, displays a smaller range of fragment size perhaps indicating the effects of more heating events or post use scavenging of suitable FCR from this location.

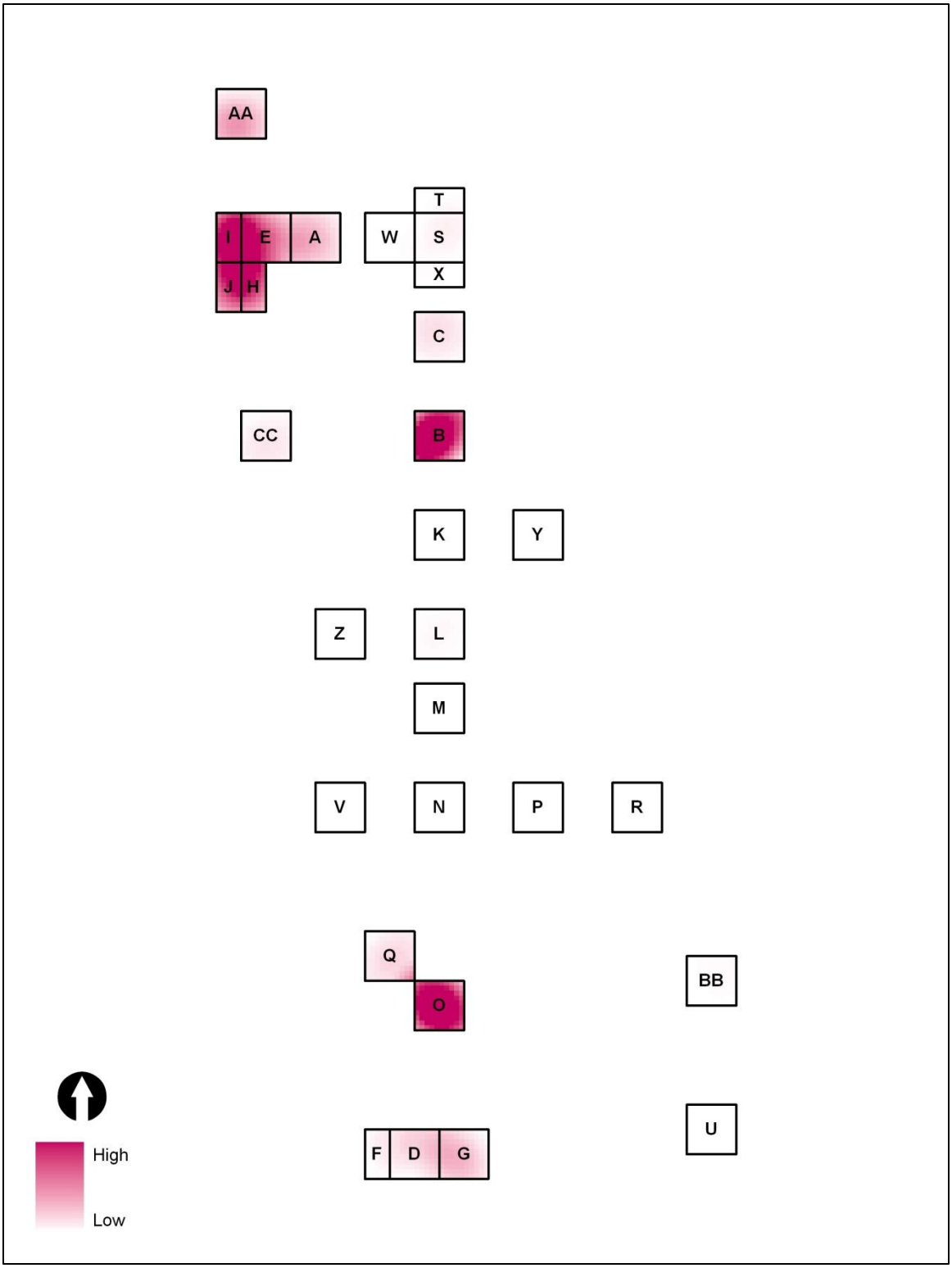


Figure 6-45. Late Archaic II FCR Concentrations.

6.2.4.2 Tool Concentrations

Tools are found across the site during the Late Archaic II occupation. They include retouched and utilized flakes, hammerstones, net weights, tool preforms, projectile points and bifaces. Within excavation units, densities range from 0 to 4 artifacts/m^2 with an average of 0.2/m^2 (s=0.7). The greatest concentrations of tools are found in EBs I, B, O and G (Table 6-26; Figure 6-46). The tool concentrations identified appear associated primarily with cutting and reaming/perforating activities; however, it is important to note that the Late Archaic II tool assemblage displayed only two tools with obvious use wear (Table 6-38, Section 6.4.1.4). Evidence for the use of Late Archaic II tools processing game consisted of an argillite biface (Cat#704.1) found within EB O. Protein residue analysis indicated that the biface was used to process black bear and deer (Section 6.4.2.4; Appendix F). Like concentrations identified for the Late Archaic I occupation, formal tools appear to dominate the assemblages with notable lower representation of expedient flake tools: formal tools represent 100 percent of the total tools in the Late Archaic II Component in EB I, 67 percent in EB B, 86 percent in EB O, and 25 percent in EB G.

Table 6-26. Late Archaic II Tool Concentrations.

EB	Density	Tools
I (south half)	3.00	• argillite preforms (3)
B (southwest quarter)	3.00	• bifacially retouched argillite flakes (2) • utilized argillite flake (1)
O (east half)	3.50	• unifacially retouched jasper flake (1) • argillite perform (1) • argillite perform (1) (Cutting Tool) • argillite Fishtail point (1) • argillite Fishtail point (1) (Reamer/Perforator Tool) • argillite Lackawaxen point (1) • argillite biface (1)
G	1.00	• utilized argillite flake (1) • argillite preform (1) • utilized quartzite flake (1) • quartzite hammerstone (1)

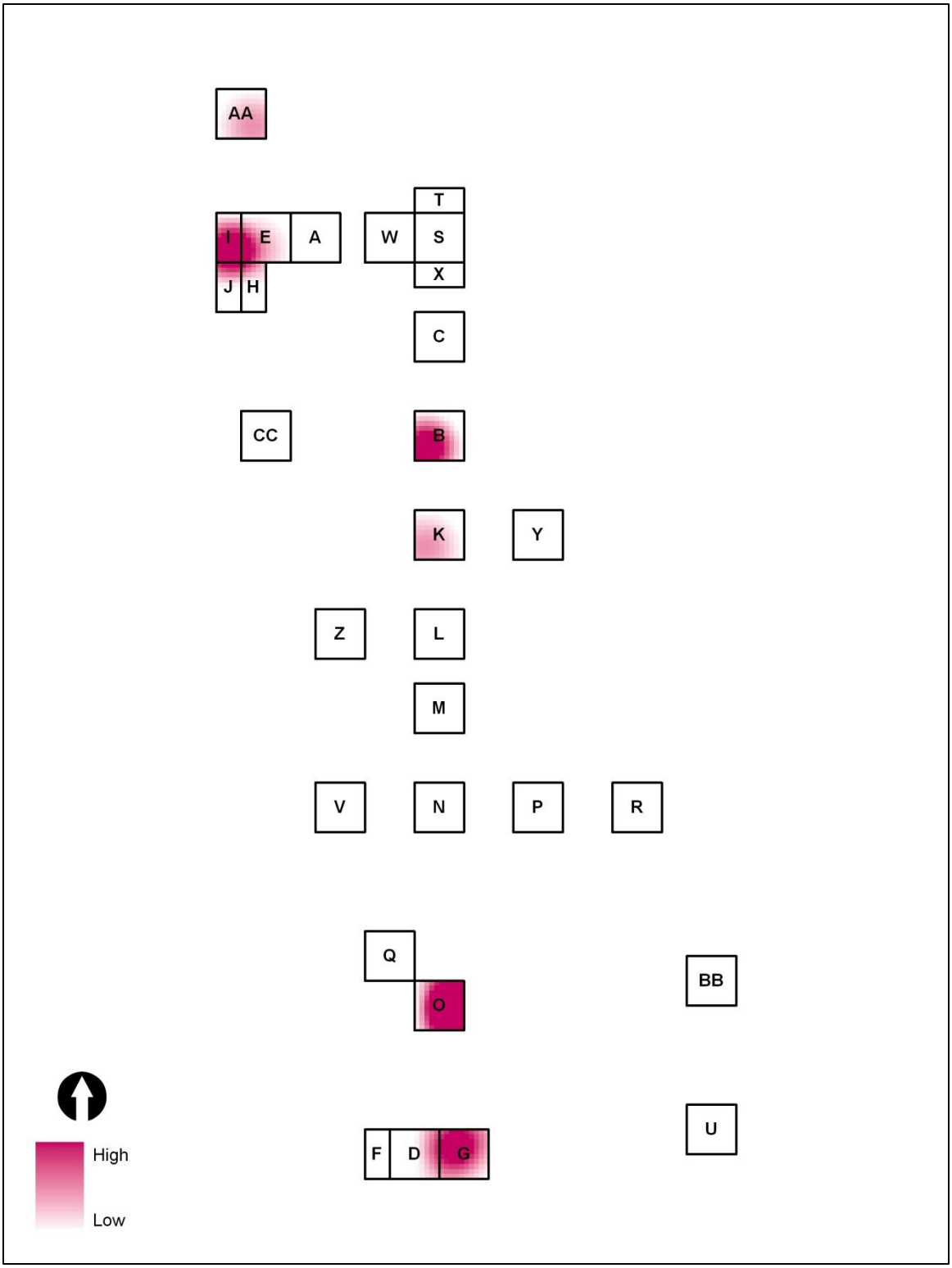


Figure 6-46. Late Archaic II Tool Concentrations.

6.2.4.3 Debitage Density

Depending on raw material, debitage densities across the site during the Late Archaic II occupation are highly variable (Table 6-27). Average chalcedony, jasper and quartz densities across the site during this time period are so low as to warrant exclusion from analysis. Argillite debitage is found in the highest concentrations during the Late Archaic II occupation with lesser concentrations of chert, quartzite and metarhyolite debitage. The highest concentrations of argillite debitage are found in EBs O and G at the southern edge of the site (Figure 6-47). The high ratio of secondary to primary and tertiary debitage at these locations at EBs I, E, J and H as well as B, and the high incidence of argillite preforms (0.38 of all argillite tools recovered from the Late Archaic II deposits) likely indicates relative intensive late stage core reduction and early stage biface manufacture at these locations as well as some late stage tool manufacture (EB AA).

Debitage associated with chert tool production is generally low with the majority of the material present in the form of angular and subangular shatter (Figure 6-48). Similarly, quartzite debitage ratios point toward little formal tool manufacture with angular shatter and primary flakes comprising the majority of the debitage recovered (Figure 6-49). In both cases formal tools are absent from the assemblage. Metarhyolite debitage ratios point to some tool manufacture centered around EB O, however, metarhyolite tools are absent from the assemblage (Figure 6-50).

Table 6-27. Late Archaic II Debitage Concentrations.

Lithic Material	EB	Density	Debitage Ratios (Primary: Secondary: Tertiary)
Argillite	AA	7.75	1:1:13
	I, E, J, H	14.30	1:7:2
	B	6.75	1:14:11
	O	27.50	1:13:7
	G	26.75	1:7:1
Chert	H, I (south half)	6.50	1:0:0
	G	5.00	0:1:3
Quartzite	H	3.50	1:0:0
	O	2.50	2:1:2
	G (east half)	2.00	1:0:0
Metarhyolite	O	5.50	0:1:2

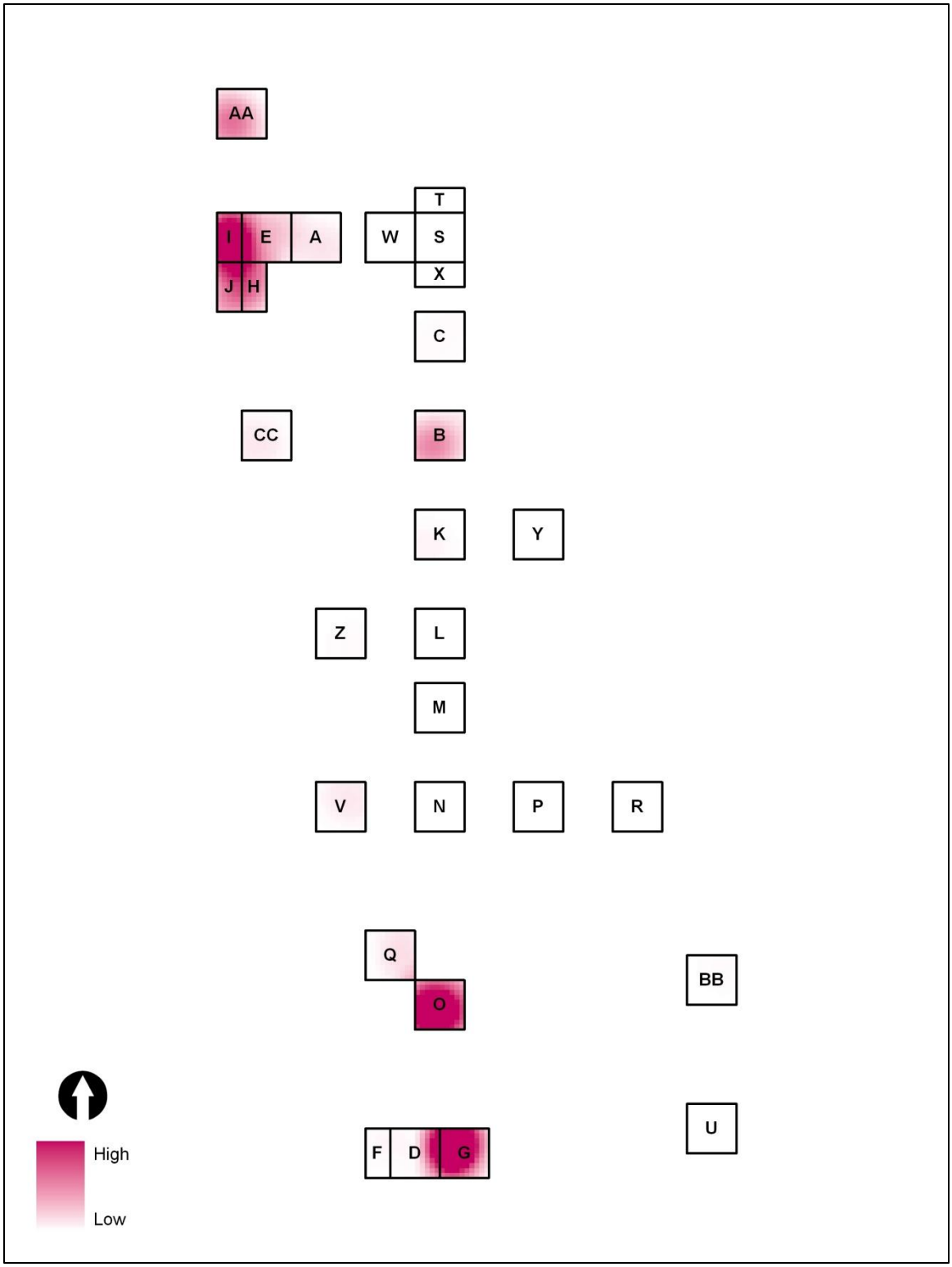


Figure 6-47. Late Archaic II Argillite Debitage Concentrations.

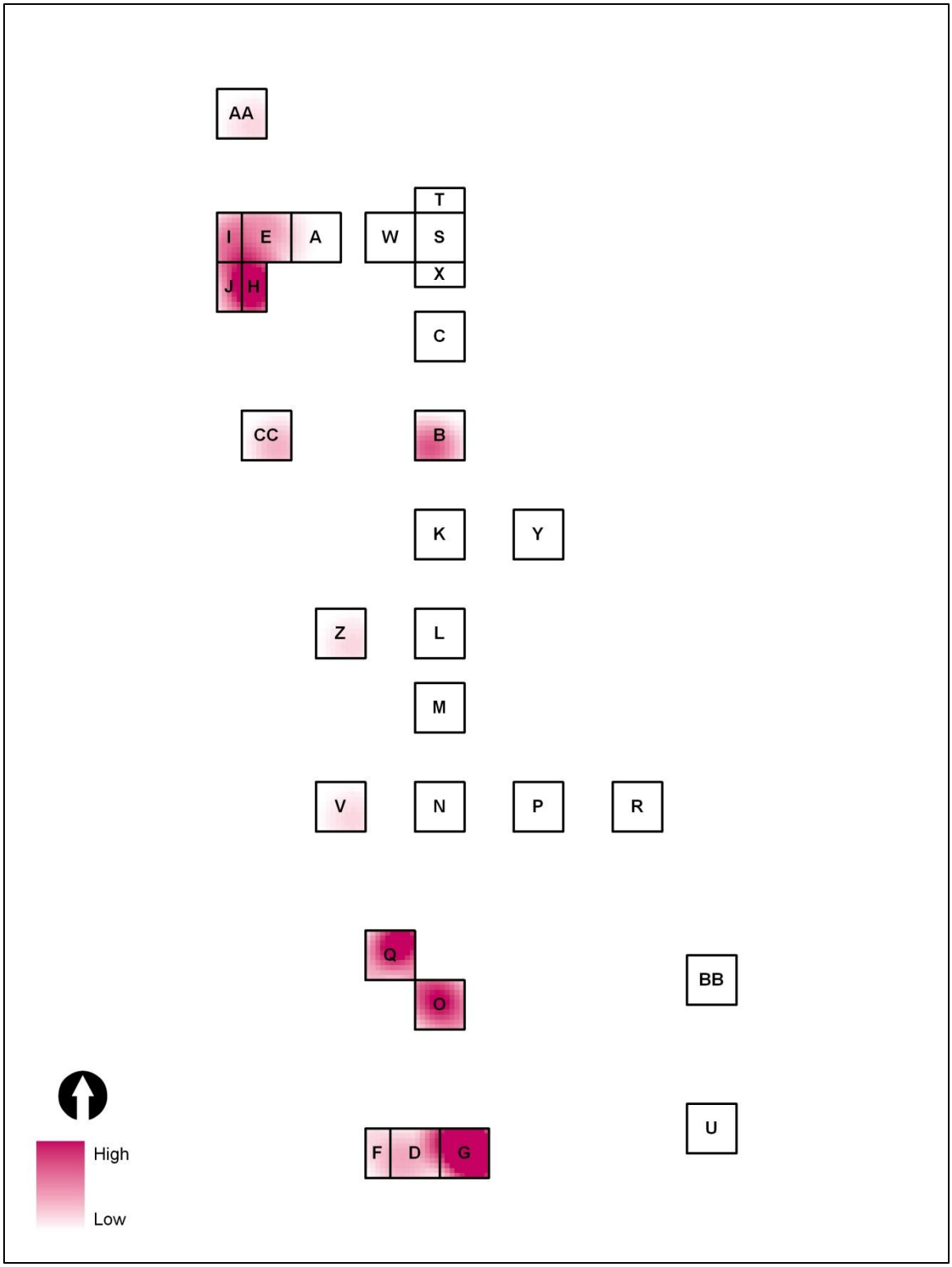


Figure 6-48. Late Archaic II Chert Debitage Concentrations.

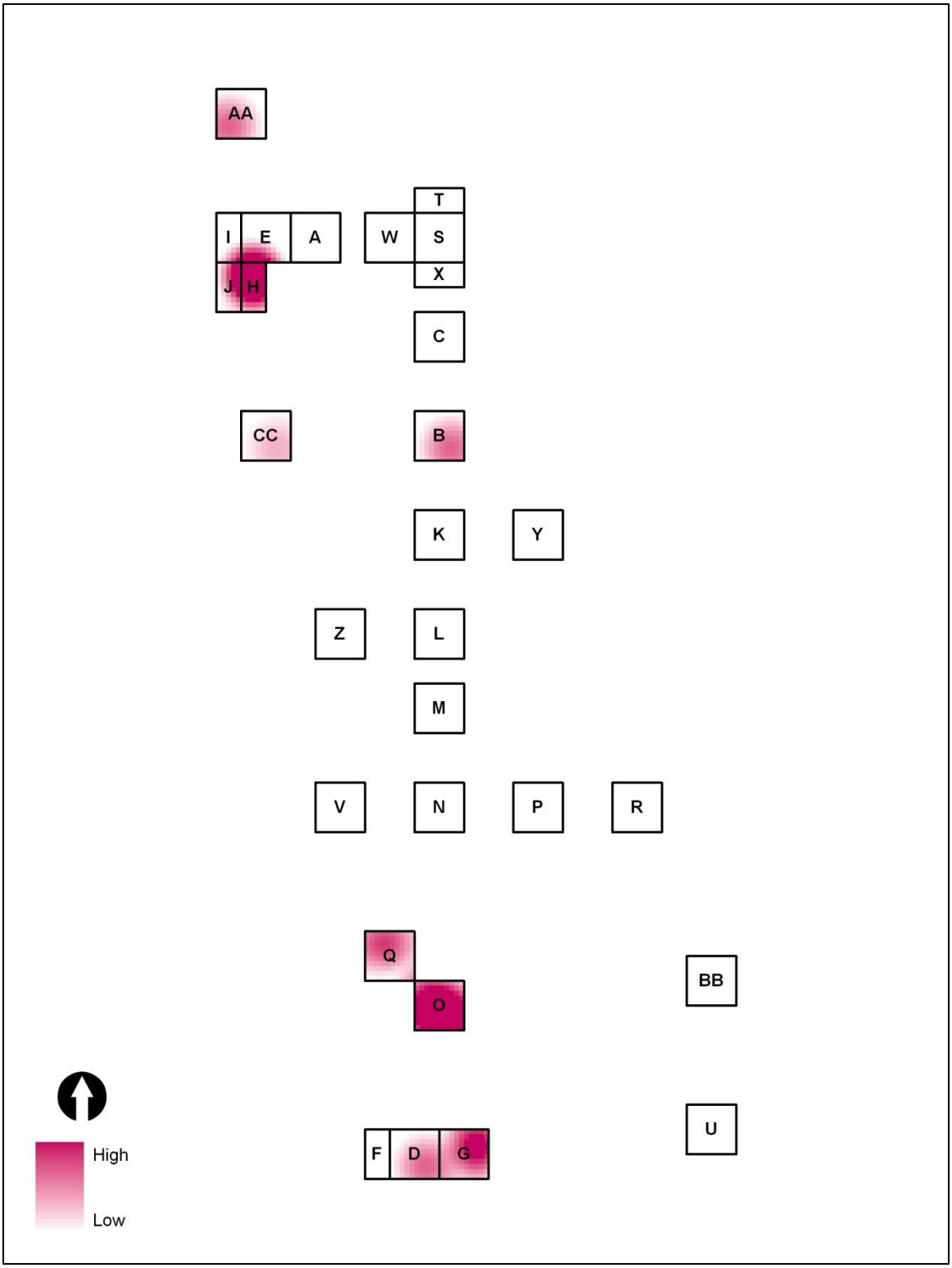


Figure 6-49. Late Archaic II Quartzite Debitage Concentrations.

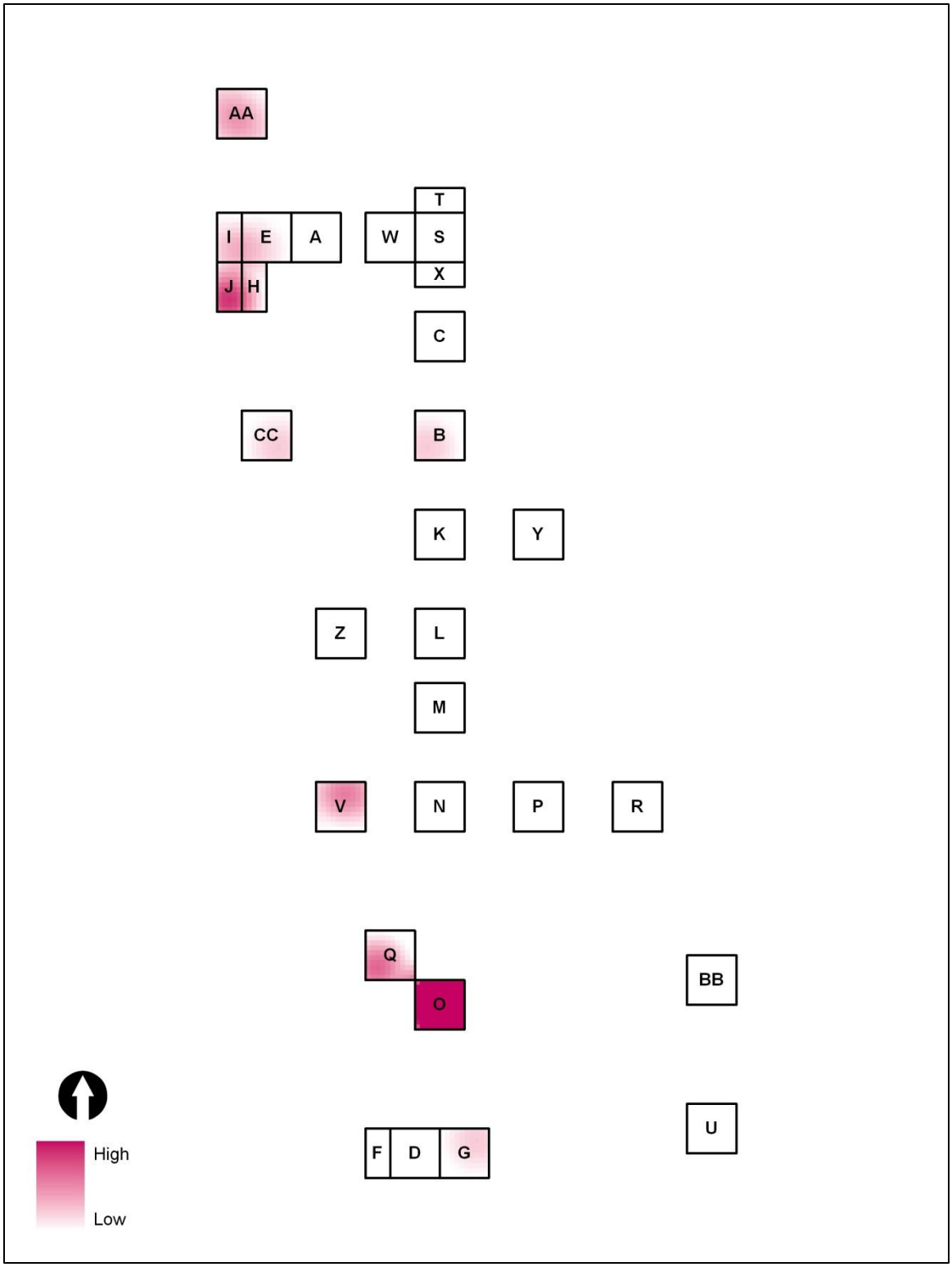


Figure 6-50. Late Archaic II Metarhyolite Debitage Concentrations.

6.2.4.4 Late Archaic II Component Analysis and Conclusions

Similar to the Late Archaic I Component, ceramic distributions and small sherd size point toward the ceramics having been re-deposited from the Woodland components above. Dense FCR concentrations closely associated with ceramic concentrations are absent during the Late Archaic II occupation. The absence of relatively widespread low densities of FCR material points to some degree of persistence of formal hearth locations (Figure 6-51).

Tools consist primarily of utilized argillite flakes, preforms and projectile points. Tool concentrations are closely associated with dense concentrations of FCR, the exception being in EB G. Similar to the Early/Middle Woodland Component, many types of ground stone tools typically associated with the processing of plant resources that were recovered from the Late Woodland and Late Archaic I components of the site appear absent during the Late Archaic II occupation including nutting stones and pestles.

Finally, debitage concentrations are dominated by argillite and to a lesser extent chert and metarhyolite materials. Based on debitage ratios all stages of lithic reduction appear to be carried out across the site. Given the high number of argillite preforms (n=6) present within the identified tool concentrations and the dense concentrations of argillite debitage, initial stages of argillite biface manufacture may have been carried out at the site with the final stages of tool production carried out off site.

As in the Late Woodland and Early/Middle Woodland periods activity areas appear to be generally focused around hearth locations, specifically Feature 39 in EB E and Feature 76 in EB-V. Discrete peripheral specialized activity areas such as for lithic manufacture seem relatively uncommon during the Late Archaic II occupation but are extant. Lithic reduction features were identified within EB Q (Features 62 and 75). This pattern of activity nucleation without the establishment of clearly-bounded specialized activity areas may represent the effects of regular short-term occupation of the site where centers of occupation are frequently reused but formal activity areas are not established.

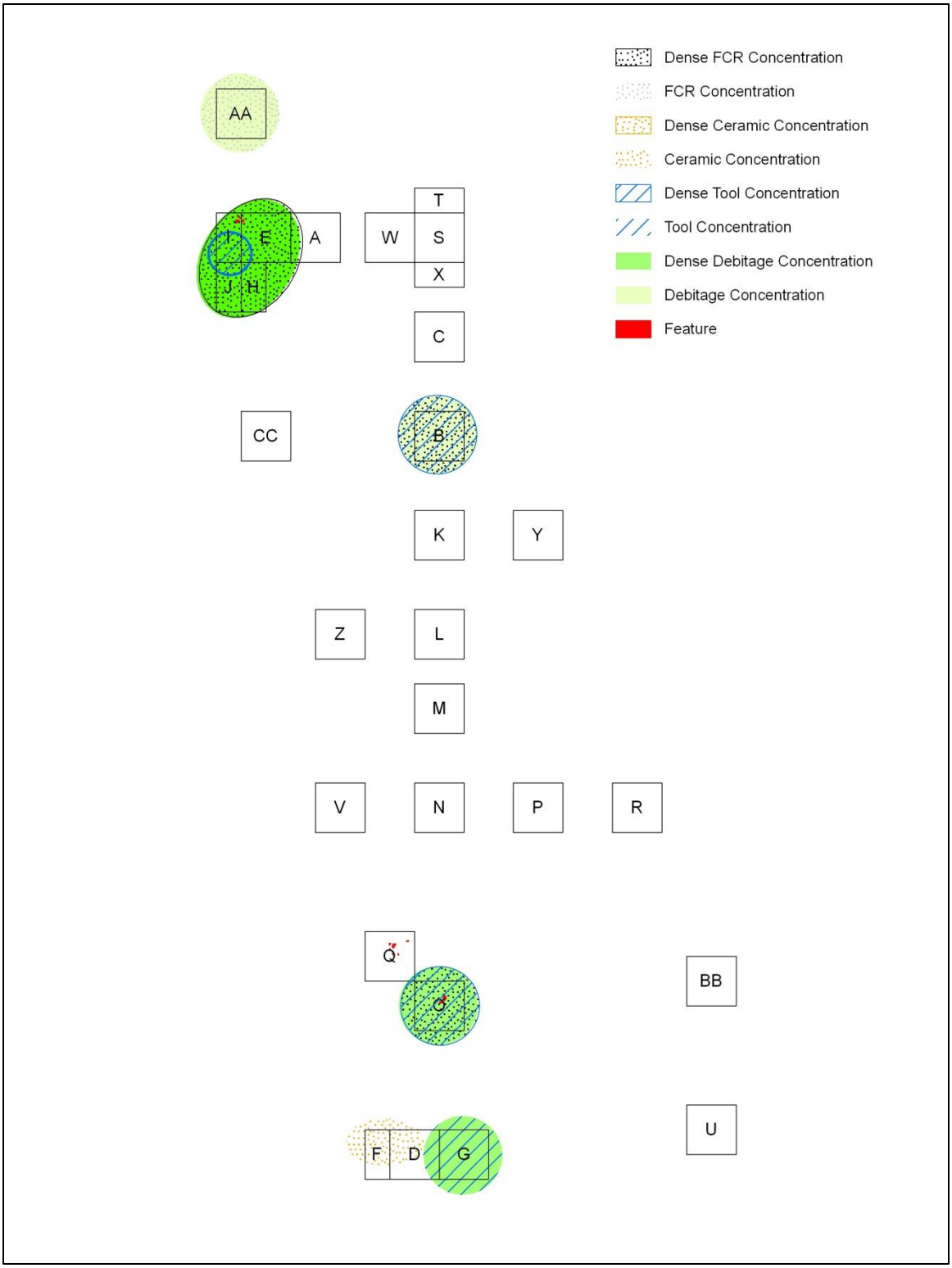


Figure 6-51. Late Archaic II Artifact Densities (1:250).

6.3 Reeders Creek West Site Chronology

Archaeological work at the RCW Site has conclusively demonstrated four periods during which prehistoric Native American groups visited the site. The most recent occupation was a Late Woodland occupation indicated by Levanna projectile points, Bowmans Brook/Overpeck Series pottery sherds, and Late Woodland radiocarbon dates from Features 67 and 70. The 2-Sigma calibrated range for Feature 67 is A.D. 1040 to A.D. 1220 (Beta-295379) and Feature 70 is A.D. 1390 to A.D. 1430 (Beta-300627) (Appendix G). Late Woodland diagnostic artifacts were recovered from the Ap1, Ap2, Ap3, and AE-horizons. For the purposes of this report, artifacts from these horizons, and from Features 33, 67, 70, and 73 are considered to represent the Late Woodland Component of the site.

The RCW Site also yielded strong evidence for earlier Woodland occupations. No clear vertical separation in terms of soil characteristics or artifact differences were observed between the Early and Middle Woodland artifact-bearing zones within the E and BE-horizons. So, for purposes of the remaining analysis section of this report, the E and BE-horizons will be interpreted as combined Early/Middle Woodland deposits. Conclusive evidence for an Early Woodland occupation came in the form of a radiocarbon date from a hearth remnant labeled Feature 44. The 2-Sigma calibrated range for Feature 44 is B.C. 320 to B.C. 210 (Beta-300629) (Appendix G). Evidence for a Middle Woodland occupation was identified within another hearth remnant labeled Feature 27, with a 2-Sigma calibrated range of A.D. 520 to A.D. 640 (Beta-288328) (Appendix G). Fishtail, Fox Creek, and Jack's Reef Pentagonal projectile points along with Early to Middle Series ceramics were recovered at the RCW Site. A sherd of Marcey Creek ceramic was identified within the lower Late Archaic II Component, but none were found within the Early/Middle Woodland Component. For the purposes of this report, artifacts from the E and BE-horizons, and from Features 27, 40, 44, 50, and 77 are considered to represent the Early/Middle Woodland Component of the site.

Evidence for Late Archaic occupations at the RCW Site is also quite strong. In fact, radiocarbon dates indicated two temporally separate Late Archaic occupations at the site identified as the Late Archaic I and Late Archaic II components. The Late Archaic I Component was located within the Bw1, Bw2, and Bw3 horizons and appeared to date to the latter half of the Late Archaic period. This assumption was based on radiocarbon dates recovered from two hearth features identified as Features 45 and 67. The 2-Sigma calibrated range for Feature 45 is B.C. 1880 to B.C. 1690 (Beta-300630), while the range for Feature 64 is B.C. 1330 to B.C. 1120 (Beta-295378) (Appendix G). Diagnostic artifacts included Fishtail and Lackawaxen projectile points, along with Early Woodland Rossville and Meadowood varieties. For the purposes of this report, artifacts from Bw1, Bw2, and Bw3-horizons, and from Features 26, 42, 43, 45, 64, and 65 are considered to represent the Late Archaic I Component of the site.

The Late Archaic II Component dates to the early part of the Late Archaic period and represents the earliest temporal period present at the RCW Site. The Late Archaic II Component was located within the B/C, C/B, C, 2Bwb1, and 2Bwb2-horizons. Carbon dates from an activity area labeled Feature 75 indicated a 2-Sigma calibrated range of B.C. 2870 to B.C. 2580 (Beta-300626) and a hearth feature labeled Feature 76 indicated a 2-Sigma calibrated range of B.C. 3180 to B.C. 3150 (Beta-300628) (Appendix G). Free carbon associated with an argillite core recovered within the B/C-horizon indicated a 2-Sigma calibrated range of B.C. 2470 to B.C.

3150 (Beta-300628) (Appendix G). Diagnostic artifacts included Fishtail and Lackawaxen projectile points. For the purposes of this report, artifacts from the B/C, C/B, C, 2Bwb1, and 2Bwb2-horizons, and from Features 39, 62, 75, and 76 are considered to represent the Late Archaic II Component of the site.

6.4 Reeders Creek West Site Material Culture Analysis

6.4.1 Reeders Creek West Site Artifact Analysis

The Phase III excavations at the RCW Site yielded a total of 16,026 artifacts. This included 128 historic and modern-era artifacts, recovered largely from two plow-disturbed horizons: Ap1 and Ap2 (Table 6-28). All historic artifacts recovered below the E-horizon were very small and were concluded to have been re-deposited through bioturbation. A full inventory of historic/modern artifacts is provided in Appendix H. The modern/historic artifacts within the Ap1 and Ap2 represent the remains of a combination of historic field scatter distributed through plowing in the nineteenth and twentieth century and roadside debris deposited during the twentieth century. The historic artifacts found at the RCW Site are likely a mix of roadside debris and historic artifacts related to the Perry House Farm located approximately 900 ft north of the RCW Site under I-95. The refuse from the Perry Farm would have been distributed through the surrounding fields by plowing. Based on the artifact types, the artifacts date to the late nineteenth and early twentieth century. The historic component was not considered a significant component of the RCW Site; therefore historic/modern artifacts will not be discussed further in this report.

Table 6-28. Historic Artifacts, Phase III.

Stratum	Architectural				Kitchen										Other					Total
	Window glass	Nail, unidentified type	Fastener, other	Brick	Plastic	Vessel glass	Creamware	Pearlware	Whiteware	Ironstone	Porcelain	Stoneware	Redware	Styrofoam	Misc. metal	Birdshot	Coal/charcoal/slag	Brass Button	Chain Link	
Fill/Mixed Contexts	-	-	-	-	-	1	-	-	3	-	-	-	1	-	-	-	-	-	-	***5***
Ap1	-	5	-	-	-	2	1	1	1	3	4	5	-	-	1	-	-	1	-	***24***
Ap1/Ap2	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	***1***
Ap2	2	15	-	2	-	2	1	-	13	1	6	2	2	-	-	-	2	-	-	***48***
Ap3	-	1	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	***3***
AE	-	4	-	-	-	1	-	-	4	-	1	-	5	-	-	-	-	-	-	***15***
E	1	3	-	-	-	3	-	-	1	-	-	-	-	-	-	-	-	-	1	***9***
BE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	***3***
C/B	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	***3***
Feat. 27	-	-	-	-	-	16	-	-	-	-	-	-	-	-	-	-	-	-	-	***16***
Feat. 67	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	***1***
TOTAL																				***128***

A total of 15,898 prehistoric artifacts were recovered from the RCW Site during the Phase III study (Appendix H). Prehistoric artifact counts from the Phase III assemblage are listed by horizon and level in Table 6-29. The prehistoric artifacts were recovered from a variety of contexts, including plow zones (Ap1, Ap2, and Ap3), intact alluvial strata (e.g., AE, E, BE, Bw1, Bw2, Bw3, B/C, C/B, C, 2Bwb1, and 2Bwb2), and 19 features. Flaked stone artifacts (e.g., flakes, flake tools, bifaces) and FCR represented the vast majority (47 and 46 percent) of the total prehistoric artifacts recovered during Phase III excavations, with 46 percent of the flaked stone sample being debitage. Prehistoric pottery accounted for 6 percent of the artifact assemblage and was recovered during all of the excavation phases. Groundstone/cobble tools made up less than 1 percent of the total Phase III prehistoric artifact assemblage.

In total, the combined AECOM field investigations at the RCW Site produced 16,116 prehistoric artifacts. Prehistoric artifacts for the combined field Phases I through III are listed by period in Table 6-30. Similar proportions of artifact types are observed within the combined artifact assemblage (AECOM's Phase I, II, and III) as those witnessed in just the Phase III assemblage. Flaked stone artifacts (e.g., flakes, flake tools, bifaces) and FCR represented the vast majority (48 and 43 percent) of the combined prehistoric artifacts recovered from the RCW Site, with 47 percent being debitage. Prehistoric pottery accounted for 9 percent of the artifact assemblage and was recovered during all of the excavation phases. Groundstone/cobble tools made up less than 1 percent of the total combined prehistoric artifact assemblage.

Table 6-29. Prehistoric Artifact Counts by Stratum, Phase III.

Soil Horizon	Debitage						Flaked Tools														Cobble/Groundstone Tools						Other Lithics			Ceramic		Total Prehistoric Artifacts
	Core, nodular	Shatter	Primary	Secondary	Tertiary	Micro-Flakes	Utilized flake	Retouched flake	Scraper	End scraper	Untyped Point	Levanna Triangle	Rossville	Fishtail Variant	Fox Creek	Jacks Reef Pentagonal	Lackawaxen	Meadowood	Preform	Biface fragment	Netsinker	Hammerstone	Nutting Stone	Anvil	Pestle	Groundstone Tool	FCR	Flaked Cobble	Manuport	Smoking Pipe	Ceramics	
Mixed Contexts	1	2	2	6	12	-	-	-	-	1	-	1	-	-	-	-	-	-	2	1	-	-	-	-	-	-	2	2	1	-	1	34
Ap1	3	18	16	145	256	-	4	1	-	-	1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	15	-	-	-	26	487
Ap1/ Ap2	-	5	2	10	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	44
Ap2	7	136	63	525	1,145	91	17	5	2	-	3	2	-	-	-	-	-	1	-	2	-	3	1	1	1	1	152	5	1	-	283	2,447
Ap3	-	3	4	19	11	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	20	59
AE	8	117	60	372	679	-	10	7	-	2	2	1	3	-	-	-	-	-	-	4	-	1	-	-	-	1	192	2	5	2	373	1,841
Feat.33	-	-	-	1	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	6
Feat.67	1	31	5	4	6	35	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	300	-	3	-		388
Feat.70	-	-	-	-	-	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	42	71
Feat.73	-	-	1	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-		-	11	15
E	2	87	57	287	385	2	13	1	1	-	-	1	-	2	1	1	-	-	-	1	-	2	-	-	-	-	382	4	8	-	102	1,339
BE	-	4	8	35	63	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80	-	-	-	4	196
Feat.27	-	-	-	-	2	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	633	-	1	-	-	665
Feat.40	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	2	-	-	12
Feat.44	-	2	-	3	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	22	-	3	-	6	46
Feat.50	1	11	9	14	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	2	-	-	-	-	52
Feat.77	-	3	1	4	38	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	46	-	-	-	-	93
Bw1	8	62	41	234	362	4	4	4	1	-	1	1	1	-	-	-	3	1	3	6	-	1	1	-	1	-	855	4	6	1	68	1,673
Bw2	3	88	62	404	426	-	6	4	2	-	-	-	-	1	-	-	3	1	2	8	-	1	1	-	-	1	1,227	10	7	-	24	2,281
Bw3	-	1	1	3	1	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	44	-	-	-	-	52
Feat.26	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	1	-	-	18
Feat.42	-	-	-	-	1	62	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	369	-	1	-	-	434
Feat.43	-	2	-	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-	-	-	13
Feat.45	-	1	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	116	-	-	-	-	126
Feat.64	-	2	7	19	4	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,305	1	2	-	-	2,342
Feat.65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	1	-	-	-	7
B/C	-	10	15	80	14	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	28	1	3	-	13	168
C/B	3	44	28	180	104	-	-	-	-	-	-	-	-	-	-	-	1	-	3	1	1	-	-	-	-	-	262	4	6	-	-	637
C	-	6	8	16	14	-	1	2	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	78	1	1	-	-	127
2Bwb1	2	9	8	32	37	-	-	1	-	-	-	-	-	2	-	-	1	-	2	1	-	-	-	-	-	-	66	2	1	-	-	164
2Bwb2	-	1	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	4
Feat.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	32	-	-	-	-	32
Feat.62	-	-	4	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	15
Feat.75	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1	-	-	3
Feat.76	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	7
TOTAL	***39***	***646***	***402***	***2401***	***3,600***	***277***	***62***	***29***	***8***	***3***	***7***	***8***	***4***	***5***	***1***	***1***	***8***	***3***	***13***	***26***	***1***	***13***	***4***	***1***	***2***	***3***	***7,258***	***39***	***58***	***3***	***973***	***15,898***

Table 6-30. Artifact Assemblage Counts by Temporal Period, AECOM All Phases Combined.

Temporal Component	Artifact Type																					
	Core	Flaked Cobble	Shatter	Primary Flake	Secondary Flake	Tertiary Flake	Micro-Flake	Cobble Flake	Retouched Flake	Utilized Flake	Multi-purpose Flake Tool	Scraper	Biface	Nutting Stone	Hammerstone	GST	Netsinker	Anvil	Smoking Pipe	Ceramics	Manuport	FCR	*Total Prehistoric Artifacts*
Late Woodland	20	8	321	175	1,108	2,156	158	2	14	32	9	4	18	2	5	3	-	1	2	755	11	682	5,486
Early/Middle Woodland	4	4	111	82	359	509	37	-	3	13	1	2	5	-	4	-	-	-	-	112	18	1,179	2,444
Late Archaic I	15	17	163	134	672	796	81	-	9	12	11	4	22	2	2	2	-	-	1	92	18	4,977	7,028
Late Archaic II	5	8	72	63	313	170	7	-	3	4	2	-	10	-	2	-	1	-	-	468	16	13	1,158
Total	44	37	667	454	2,452	3,627	283	2	29	61	23	10	55	4	13	5	1	1	3	1,427	63	6,851	16,116

In terms of the temporal distribution of artifacts, the Late Woodland and Late Archaic I components eclipsed the Early/Middle Woodland and Late Archaic II components by a factor of nearly 2 to 1 and 6 to 1 respectively (Table 6-31). This clearly demonstrates that the site was used more intensively during the Late Woodland and the latter half of the Late Archaic.

6.4.1.1 Lithic Artifact Analysis

Lithic artifacts account for a total of 14,922 items, or 94 percent of the RCW Site Phase III artifact assemblage (Table 6-31). In total, 15,174 lithic artifacts were recovered from the RCW Site during all three AECOM fieldwork phases. Debitage accounted for the majority (98 percent) of the flaked stone artifacts from the entire site assemblage.

As Table 6-29 indicates, debitage remained the most common flaked stone artifact type throughout the RCW Site cultural sequence. Flaked tools, including bifaces and points, made up the remaining 2 percent of the flaked lithic artifact assemblage (Table 6-29). Of the flaked lithic tools, formal tools were by far most common, accounting for 75 percent of the flaked tool assemblage, with informal utilized flakes representing the remaining 25 percent (Table 6-32). Of the formally flaked tools, bifacially worked items made up the majority of the formal tools (57 percent). Formal, non-bifacial tools (e.g., scrapers) accounted for only 10 percent of the total flaked stone tools. A breakdown of the total lithic artifact assemblage by lithic material and cultural period is presented below in Table 6-33.

Table 6-31. Lithic Artifacts by Raw Material Type, Phase III.

Lithic Artifact Type	Lithic Material									Total
	Chert	Chalcedony	Jasper	Metarhyolite	Argillite	Quartz	Quartzite	Igneous	Sandstone	
Core	8	1	1	6	16	1	6	-	-	***39***
Debitage	3,235	469	953	291	2,051	24	303	-	-	***7,326***
Utilized flake	20	3	6	2	15	2	14	-	-	***62***
Multipurpose Tool	4	1	8	-	14	-	2	-	-	***29***
Scraper	4	-	3	-	3	-	1	-	-	***11***
Biface/Biface Fragment	13	-	3	-	16	-	1	-	-	***33***
Preform	-	-	-	-	13	-	-	-	-	***13***
Levanna point	2	-	4	-	2	-	-	-	-	***8***
Rossville point	1	-	-	-	2	1	-	-	-	***4***
Fishtail variant point	1	-	-	-	4	-	-	-	-	***5***
Fox Creek point	1	-	-	-	-	-	-	-	-	***1***
Jacks Reef Pentagonal point	-	-	1	-	-	-	-	-	-	***1***
Lackawaxen point	-	-	-	-	8	-	-	-	-	***8***
Meadowood point	1	-	-	-	2	-	-	-	-	***3***
Hammerstone	-	-	-	-	-	-	13	-	-	***13***
Nutting stone	-	-	-	-	-	-	4	-	-	***4***
Netsinker	-	-	-	-	-	-	1	-	-	***1***
Anvil	-	-	-	-	-	-	1	-	-	***1***
GST	-	-	-	-	-	-	5	-	-	***5***
Manuport	7	-	-	3	3	-	45	-	-	***58***
Flaked cobble	17	-	-	-	10	-	12	-	-	***39***
FCR	20	1	-	-	137	68	7,028	3	1	***7,258***
Total	***3,335***	***475***	***979***	***302***	***2,301***	***96***	***7,436***	***3***	***1***	***14,922***

Table 6-32. Lithic Artifact Assemblage by Temporal Period, Phase III.

Temporal Component	Core	Debitage	Utilized Flake	Multi-purpose Flake Tool	Scraper	Levanna point	Rossville point	Fishtail variant point	Fox Creek point	Jacks Reef Pentagonal point	Lackawaxen point	Meadowood point	Biface	Hammerstone	Nutting stone	Netsinker	Anvil	GST	Manuport	FCR
Late Woodland	0.4%	83.3%	0.7%	0.2%	0.1%	0.1%	0.1%	-	-	-	-	<0.1%	0.2%	0.1%	<0.1%	-	<0.1%	0.1%	0.2%	14.4%
Early/Middle Woodland	0.2%	47.2%	0.6%	<0.1%	0.1%	<0.1%	-	0.1%	<0.1%	<0.1%	-	-	-	0.2%	-	-	-	-	0.8%	50.7%
Late Archaic I	0.2%	27%	0.2%	0.2%	0.1%	<0.1%	<0.1%	<0.1%	-	-	0.1%	<0.1%	0.3%	<0.1%	<0.1%	-	-	<0.1%	0.3%	71.6%
Late Archaic II	0.4%	55.6%	0.3%	0.2%	-	-	-	0.2%	-	-	0.3%	-	0.4%	0.2%	-	0.1%	-	-	1.4%	40.9%
Total	***0.3%***	***49.8%***	***0.4%***	***0.2%***	***0.1%***	***0.1%***	***<0.1%***	***<0.1%***	***<0.1%***	***<0.1%***	***0.1%***	***<0.1%***	***0.2%***	***0.1%***	***<0.1%***	***<0.1%***	***<0.1%***	***<0.1%***	***0.4%***	***48.2%***

Table 6-33. Lithic Artifact Types by Material and Component, Phase III.

Temporal Period	Artifact Type	Lithic Material									*Total*
		Chert	Chalcedony	Jasper	Metarhyolite	Argillite	Quartz	Quartzite	Igneous	Sandstone	
Late Woodland	Core	4	1	-	3	6	1	4	-	-	**19**
	Debitage	2,399	420	572	81	220	11	106	-	-	**3,809**
	Utilized Flake	13	3	3	-	3	-	11	-	-	**33**
	Formal tool, non-bifacial	2	1	5	-	4	-	2	-	-	**14**
	Biface/Biface Fragment	14	-	3	-	4	1	1	-	-	**23**
	Preform	-	-	-	-	-	-	-	-	-	**-**
	GST/Cobble Tool	-	-	-	-	-	-	11	-	-	**11**
	Flaked Cobble	2	-	-	-	3	3	-	-	-	**8**
	Manuport	1	-	-	1	1	-	7	-	-	**10**
	FCR	4	1	-	-	91	12	562	-	-	**670**
Early / Middle Woodland	Core	1	-	-	-	2	-	-	-	-	**3**
	Debitage	515	31	210	34	234	7	37	-	-	**1,068**
	Utilized Flake	6	-	3	1	1	1	1	-	-	**13**
	Formal tool, non-bifacial	2	-	-	-	1	-	-	-	-	**3**
	Biface/Biface Fragment	3	-	-	-	2	-	1	-	-	**6**
	Preform	-	-	-	-	-	-	-	-	-	**-**
	GST/Cobble Tool	-	-	-	-	-	-	4	-	-	**4**
	Flaked Cobble	3	-	-	-	1	-	-	-	-	**4**
	Manuport	-	-	-	1	1	-	12		-	**14**
	FCR	-	-	-	-	17	10	1,147	-	-	**1,174**
Late Archaic I	Core	3	-	1	2	4	-	1	-	-	**11**
	Debitage	228	14	161	136	1,138	3	124	-	-	**1,804**
	Utilized Flake	1	-	-	1	9	1	-	-	-	**12**
	Formal tool, non-bifacial	-	-	2	-	7	-	-	-	-	**9**
	Biface/Biface Fragment	1	-	3	-	22	-	-	-	-	**26**
	Preform	-	-	-	-	5	-	-	-	-	**5**
	GST/Cobble Tool	-	-	-	-	-	-	6	-	-	**6**
	Flaked Cobble	6	-	-	-	5	-	6	-	-	**17**
	Manuport	4	-	-	-	-	-	13	-	-	**17**
	FCR	12	-	-	-	17	35	4,875	3	-	**4,942**
Late Archaic II	Core	-	-	-	1	3	-	1	-	-	**5**
	Debitage	74	3	10	40	458	3	35	-	-	**623**
	Utilized Flake	-	-	-	-	2	-	2	-	-	**4**
	Formal tool, non-bifacial	-	-	1	-	2	-	-	-	-	**3**
	Biface/Biface Fragment	-	-	-	-	6	-	-	-	-	**6**
	Preform	-	-	-	-	6	-	-	-	-	**6**
	GST/Cobble Tool	-	-	-	-	-	-	3	-	-	**3**
	Flaked Cobble	4	-	-	-	2	-	2	-	-	**8**
	Manuport	2	-	-	1	1	-	12	-	-	**16**
	FCR	4	-	-	-	11	11	443	-	1	**470**

6.4.1.2 Lithic Procurement and Usage

Among the flaked lithic artifacts from the RCW Site, chert dominated the Phase III assemblage (Table 6-34). Among the total assemblage, chert accounted for 44 percent of the flaked lithic artifacts, with argillite, accounting for an additional 28 percent (Figure 6-52, Table 6-35). Jasper and chalcedony materials were also utilized at the site, with jasper accounting for 13 percent and chalcedony 6 percent. Metamorphic materials quartzite (5 percent), metarhyolite (4 percent), and quartz (less than 1 percent) are represented at the RCW Site as well. Trace quantities of sandstone were also present at the site and accounted for less than 1 percent of the lithic assemblage.

Figure 6-52. RCW Phase III Lithic Material by Percentage.

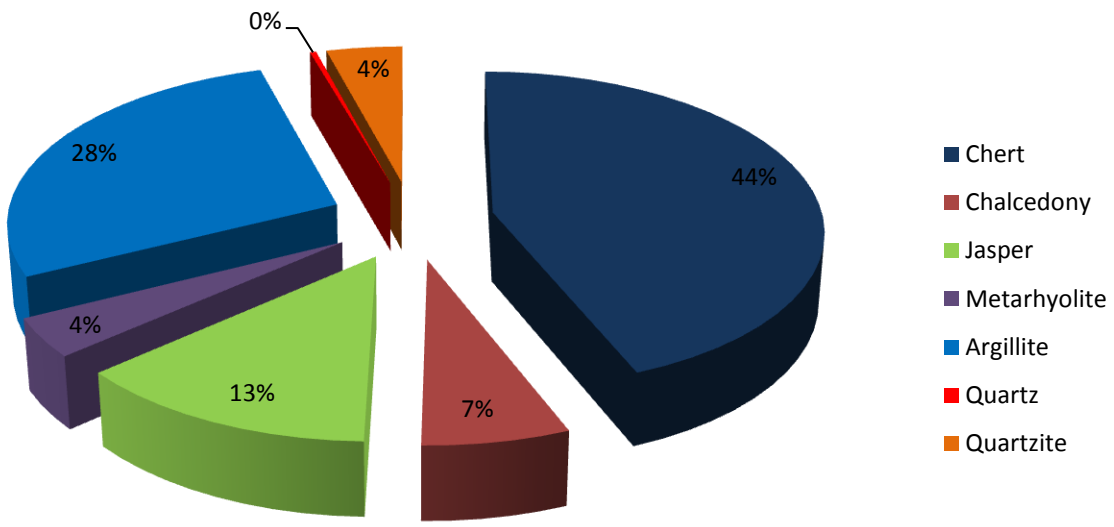


Table 6-34. Lithic Debitage Material Counts and Percentages by Stratum, Phase III.

Soil Horizon	Temporal Component	Lithic Material Type													
		Chert		Chalcedony		Jasper		Metarhyolite		Argillite		Quartz		Quartzite	
Ap1	Late Woodland	347	80%	48	11%	21	5%	2	<1%	9	2%	1	<1%	7	2%
Ap1/Ap2		25	71%	2	6%	3	9%	2	6%	1	3%	1	3%	1	3%
Ap2		1313	66%	217	11%	317	16%	28	1%	80	4%	6	<1%	40	2%
Ap3		17	46%	7	19%	4	11%	-	-	6	16%	1	3%	2	5%
AE		688	56%	146	12%	209	17%	46	4%	84	7%	2	<1%	53	4%
Feat.33		-	-	-	-	-	-	1	25%	3	75%	-	-	-	-
Feat.67		5	6%	-	-	45	56%	5	6%	24	30%	-	-	2	2%
Feat.70		-	-	-	-	-	-	-	-	28	100%	-	-	-	-
Feat.73		-	-	-	-	-	-	-	-	-	-	-	-	1	100%
E	Early/Middle Woodland	385	47%	26	3%	153	19%	25	3%	193	24%	7	1%	29	4%
BE		64	58%	4	4%	27	25%	8	7%	7	6%	-	-	-	-
Feat.27		18	58%	-	-	12	39%	-	-	1	3%	-	-	-	-
Feat.40		1	100%	-	-	-	-	-	-	-	-	-	-	-	-
Feat.44		6	40%	1	7%	2	13%	-	-	1	7%	-	-	5	33%
Feat.50		16	34%	-	-	2	4%	-	-	29	62%	-	-	-	-
Feat.77		25	54%	-	-	14	30%	-	-	4	9%	-	-	3	7%
Bw1	Late Archaic I	96	14%	11	2%	89	13%	43	6%	416	59%	-	-	48	7%
Bw2		119	12%	3	<1%	72	7%	89	9%	625	64%	3	<1%	69	7%
Bw3		2	33%	-	-	-	-	2	33%	1	17%	-	-	1	17%
Feat.26		-	-	-	-	-	-	-	-	3	100%	-	-	-	-
Feat.42		3	5%	-	-	-	-	-	-	60	95%	-	-	-	-
Feat.43		1	17%	-	-	-	-	-	-	5	83%	-	-	-	-
Feat.45		3	30%	-	-	-	-	-	-	7	70%	-	-	-	-
Feat.64		2	6%	-	-	-	-	-	-	25	76%	-	-	6	18%
Feat.65		**No Debitage Recovered**													
B/C	Late Archaic II	14	12%	1	1%	-	-	1	1%	100	84%	1	1%	2	2%
C/B		39	11%	1	<1%	5	1%	20	6%	275	77%	1	<1%	15	4%
C		4	9%	-	-	1	2%	3	7%	29	66%	1	2%	6	14%
2Bwb1		9	10%	1	1%	4	5%	17	20%	46	53%	1	1%	8	9%
2Bwb2		1	25%	-	-	-	-	-	-	3	75%	-	-	-	-
Feat.39		**No Debitage Recovered**													
Feat.62		7	64%	-	-	-	-	-	-	-	-	-	-	4	36%
Feat.75		**No Debitage Recovered**													
Feat.76		-	-	-	-	-	-	-	-	3	100%	-	-		

Based on analysis of lithic material recovered during all phases of the RCW Site excavation, variation in lithic material use is apparent within each temporal component (Table 6-35). The main materials utilized within the Late Woodland period were chert (n=62 percent) and jasper (n=15 percent). Chert and argillite were the primary materials utilized within the Early/Middle Woodland Component, accounting for 47 percent and 22 percent respectively. Jasper continued to be an important lithic material during the Early/Middle Woodland period accounting for 20 percent of the Early/Middle Woodland Component's lithic assemblage. There is a dramatic shift in material types used during the Late Archaic period. While chert continued to be utilized during the Late Archaic I Component (n=13 percent), argillite (n=63 percent) became the primary material used during the period. This trend continues in the Late Archaic II Component with chert accounting for 11 percent and argillite accounting for 74 percent of the component's artifact assemblage.

Table 6-35. Total Material Counts and Percentages by Period,Flaked Artifact Assemblage*.

Temporal Component	Chert		Chalcedony		Jasper		Metarhyolite		Argillite		Quartz		Quartzite		Sandstone	
Late Woodland	2,478	62%	432	11%	595	15%	86	2%	261	6%	12	<1%	144	4%	1	<1%
Early/Middle Woodland	530	47%	31	3%	225	20%	38	3%	248	22%	8	1%	52	5%	-	-
Late Archaic I	248	13%	14	1%	173	9%	136	7%	1,208	63%	4	<1%	146	8%	1	<1%
Late Archaic II	74	11%	3	<1%	11	2%	41	6%	483	74%	4	1%	40	6%	-	-
Total	*3,330*	*43%*	*480*	*6%*	*1,004*	*13%*	*301*	*4%*	*2,200*	*28%*	*28*	*<1%*	*382*	*5%*	*2*	*<1%*

*All Phases Combined.

Local river or stream gravel deposits likely contained many of the lithic materials present within the RCW Site, however it is likely that some of the materials were procured closer to bedrock sources. Bedrock sources would have included metarhyolite, quartzite, jasper, and chert all of which are available within 40 mi of the RCW Site. Bedrock sources of chert and jasper can be found in the area of Durham, Riegelsville, and Carpentersville near bedrock argillite sources (Anthony et al. 1988; Stose and Jonas 1973). Well known argillite quarries are present north of the site within the Point Pleasant/Byram area located in Sussex County, New Jersey (Mercer

1897, Didier 1975; Stewart 1992). Stewart has noted an isolated source of jasper was once present within the Langhorne Pennsylvania area (1993; 1999:450). Jasper from the Hardyston Formation of the Reading Prong located to the south and west of Allentown, Pennsylvania was likely utilized at the site as well. The Hardyston Formation was a major source of raw materials during prehistoric times and Custer notes it was the preferred material during the Late Woodland while it was most intensively used during the latter portion of the Late Archaic (1996:13). Therefore, the most that can be said about lithic materials recovered at the RCW Site is that lithic procurement activities may have extended over an area of approximately 40 mi.

In terms of the temporal trends in lithic material acquisition at the RCW Site, chert was the dominant material for both the Late Woodland and Early/Middle Woodland components followed by jasper and chalcedony (Table 6-33). Chert continued to be utilized within the Late Archaic period but at a much more reduced rate than during the Woodland. Heavy use of chert and jasper during the Early through Late Woodland periods has been documented in the Middle Delaware Valley (Custer 1996). John Milner's excavation of the Lambertville Site (28Me468) north of the RCW Site and Hunter Research and Gannett Fleming's Route 29 excavations have also indicated that chert and jasper were important lithic materials in Early through Late Woodland artifact assemblages (Milner 1982; Hunter 2002). Although chert was still an important material in the Late Archaic I and II component assemblages, other lithic materials, such as argillite and quartzite, accounted for higher relative percentages of the lithic assemblage than among the Early through Late Woodland assemblages. These patterns correspond with Native American lithic acquisition trends observed in the Mid-Atlantic during the period of the Middle-Late Archaic through Late Woodland (Custer 1996:191-2; Katz et al. 2003). These trends show a broadening of the use of different lithic materials, particularly crystalline, sedimentary, and metamorphic materials (e.g., quartz, quartzite, metarhyolite, siltstone, and argillite) beginning in the Middle Archaic and accelerating during the Late Archaic. This shift away from high quality cryptocrystalline silicates (e.g., chert and jasper) has been attributed to a number of factors:

1. A broadening of subsistence patterns that relied less on hunting (re: Custer 1996).
2. An increased population resulting in decreased band territory (Kent 1970).
3. The development of trade and exchange networks (Stewart 1989).

Metarhyolite, found in all of the site's temporal components, is commonly associated with Archaic occupations, particularly Late/Transitional, in the Mid-Atlantic region. A relatively small quantity of metarhyolite artifacts was found in the Late Archaic I (n=136) and Late Archaic II (n=41) deposits at the RCW Site (Table 6-35). This constitutes 7 percent of the total Late Archaic I and 6 percent of the total Late Archaic II flaked artifact assemblages. The metarhyolite in the upper components (Late Woodland and Early/Middle Woodland) is particular interesting. A total of 86 pieces of metarhyolite were recovered from the Late Woodland component (2 percent of total assemblage) and 38 in the Early/Middle Woodland component (3 percent of total assemblage) during the Phase III investigation. Interestingly, only two tools made from metarhyolite were recovered from the RCW Site consisting of utilized flakes from the Early/Middle Woodland (n=1) and Late Archaic I (n=1) components. The majority of metarhyolite artifacts recovered within all of the components consisted of debitage (n=291) and cores (n=6), indicating that the material may have been more prized by the site inhabitants and utilized less for expedient expendable tools and more for bifacial tools.

Metarhyolite was not the prime lithic material used by Late Woodland people in the Piedmont; chert dominated lithic assemblages during that time (Custer 1996). However, metarhyolite from the upper deposits of the RCW Site demonstrates the continued, albeit limited, use of this material during the Early through Late Woodland periods. According to Michael Stewart, metarhyolite continued to be used by Late Woodland groups in the Piedmont and Ridge and Valley provinces (Stewart 1994).

As stated above, cryptocrystalline silicates made up the greatest percentage of lithic material for both the Late Woodland and Early/Middle Woodland components. When combined, these materials account for 88 percent of the Late Woodland lithics and 70 percent of the Early/Middle Woodland lithics (Table 6-35). A steep decline in the use of cryptocrystalline silicates is apparent within the Late Archaic I (13 percent of the lithic assemblage) and Late Archaic II (11 percent of the lithic assemblage) components. A visual analysis of the region's lithic material varieties among the data recovery assemblage showed that the site occupants used chert most commonly during the later occupations and locally available argillite during the earlier occupations. Not surprisingly, argillite is represented at relatively high levels within all of the temporal components. Argillite is available within outcrops located all along the Middle Delaware Valley and is the most abundantly available lithic resource near the RCW Site.

Argillite was represented within all of the components and rose steadily from 6 percent in the Late Woodland to 22 percent in the Early/Middle Woodland to 63 percent in the Late Archaic I and then to 74 percent of the Late Archaic II. Quartzite use within the RCW Site remained relatively constant through all the represented temporal periods with a small rise in use during the earlier Late Archaic I and II periods. The overwhelming use of metamorphic materials at the site during the Late Archaic period likely indicates that inhabitants were utilizing readily available materials located within the Delaware River Valley, including abundant argillite outcrops and quartzite river cobbles.

In looking at how different lithic raw materials were used during the first two main temporal occupations of the RCW Site, several interesting patterns are evident between the Late Woodland and Early/Middle Woodland components. First, for both the Late and Early/Middle Woodland periods, flaked lithic tools were predominately made from chert and quartzite. Some differences within the Late and Early/Middle Woodland components regarding lithic material usage for expedient and formal/bifacial tools is discernible, however (Table 6-36). As Table 6-36 shows, 28 percent of the Late Woodland and 46 percent of the Early/Middle Woodland expedient tools were manufactured from chert. Quartzite makes up 51 percent of expedient tools during the Late Woodland and 8 percent within the Early/Middle Woodland. This trend continues when analyzing formal, non-bifacial tools at the site, 15 percent of the Late Woodland and 50 percent of the Early/Middle Woodland formal, non-bifacial tools were made from chert. Quartzite makes up 42 percent of the Late Woodland non-bifacial tool assemblage and 40 percent of the Early/Middle Woodland component. While the Early/Middle Woodland's expedient tools are dominated by chert, it appears that during the Late Woodland quartzite was the preferred lithic material accounting for 51 percent of expedient and 42 percent of formal tool assemblages. Argillite was the dominate material utilized within the Late Archaic I period accounting for 66 percent of the expedient tool assemblage, while quartzite accounted for only

14 percent of the tools. The Late Archaic II period shows a near equal use of argillite (40 percent) and quartzite (50 percent) materials for expedient tools.

In essence, materials such as chert, jasper, quartzite, argillite, and metarhyolite, were utilized for both expedient and non-bifacial tools. When examining expedient and non-bifacial tools chert and quartzite are the dominant materials used during the Woodland periods at the site. Chert and quartzite account for 50 percent (chert=28 percent and quartzite=22 percent) of the Late Woodland and 70 percent (chert=48 percent and quartzite=22 percent) of the Early/Middle Woodland expedient and non-bifacial tool assemblage. These same tools types are predominantly made from argillite and quartzite during the Late Archaic period. Argillite and quartzite account for 80 percent of expedient and non-bifacial tools during the Late Archaic I (argillite=66 percent and quartzite=14 percent) and 90 percent during the Late Archaic II (argillite=40 percent and quartzite=50 percent).

When examining bifacial tools in the Late Woodland assemblage, chert accounts for 58 percent (n=14) of the bifacial tools. In the Early/Middle Woodland period chert, jasper, and argillite together accounted equally for 100 percent (n=6) of the bifacial tools (two of each material type were recovered). During the Late Archaic I and II periods argillite becomes the primary bifacially worked material, accounting for 86 percent (n=31) of the Late Archaic I assemblage and 100 percent (n=13) of the Late Archaic II assemblage.

Several interesting conclusions can be drawn when examining the tool types present at the RCW Site. While quartzite was a primary material used for expedient and non-bifacial tools at the RCW Site, it was not used to create bifacial tools. Only one bifacially worked quartzite artifact was recovered from the Late Woodland Component during excavation. The same observation can be made about metarhyolite which was also only used for expedient and non-bifacial tools at the site. A visible shift in material utilization can be seen from cryptocrystalline materials (chert) in the Woodland period to metamorphic materials (argillite) in the Late Archaic period. The fact that quartzite is represented in the expedient and non-bifacial tools at such a high proportion throughout all the components likely speaks to the readily available amounts of quartzite river/stream cobbles along the Delaware River and Reeders Creek drainages. These cobbles could be easily gathered and quickly worked into expedient tools.

Table 6-36. Percentages of Lithic Artifact Types by Material and Component, Phase III.

Temporal Component	Artifact Type	Lithic Material Type								
		Chert	Chalcedony	Jasper	Metarhyolite	Argillite	Quartz	Quartzite	Igneous	Sandstone
Late Woodland	Core	25%	5%	-	15%	30%	5%	20%	-	-
	Debitage	62%	11%	15%	2%	6%	<1%	3%	-	<1%
	Utilized Flake	28%	7%	7%	-	7%	-	51%	-	-
	Formal tool, non-bifacial	15%	4%	23%	-	15%	-	42%	-	-
	Biface/Bifacial Tool	64%	-	12%	-	16%	4%	4%	-	-
	GST	-	-	-	-	-	-	100%	-	-
	Manuport	9%	-	-	9%	9%	-	73%	-	-
	FCR	1%	<1%	-	-	13%	2%	84%	<1%	<1%
Early / Middle Woodland	Core	25%	-	-	-	50%	-	25%	-	-
	Debitage	47%	3%	20%	3%	22%	1%	4%	-	-
	Utilized Flake	46%	-	23%	8%	8%	8%	8%	-	-
	Formal tool, non-bifacial	50%	-	10%	-	10%	-	40%	-	-
	Biface/Bifacial Tool	33%	-	33%	-	33%	-	-	-	-
	GST	-	-	-	-	-	-	-	-	-
	Manuport	6%	-	-	6%	6%	-	83%	-	-
	FCR	-	-	-	-	1%	1%	98%	-	-
Late Archaic I	Core	27%	-	7%	13%	33%	-	20%	-	-
	Debitage	13%	1%	9%	7%	62%	<1%	8%	-	<1%
	Utilized Flake	8%	-	-	8%	75%	8%	-	-	-
	Formal tool, non-bifacial	-	-	18%	-	59%	-	24%	-	-
	Biface/Bifacial Tool	3%	-	13%	-	84%	-	-	-	-
	GST/Cobble Tool	-	-	-	-	-	-	100%	-	-
	Manuport	22%	-	-	-	-	-	78%	-	-
	FCR	<1%	-	-	-	<1%	1%	99%	<1%	<1%
Late Archaic II	Core	-	-	-	20%	60%	-	20%	-	
	Debitage	12%	<1%	2%	6%	74%	1%	6%	-	
	Utilized Flake	-	-	-	-	50%	-	50%	-	
	Formal tool, non-bifacial	-	-	17%	-	33%	-	50%	-	
	Biface/Bifacial Tool	-	-	-	-	100%	-	-	-	
	GST/Cobble Tool	-	-	-	-	-	-	-	-	
	Manuport	13%	-	-	6%	6%	-	75%	-	
	FCR	1%	-	-	-	2%	2%	94%	-	<1%

6.4.1.3 Lithic Reduction

A total of 7,304 pieces of lithic debitage and 39 core fragments were recovered from the RCW Site during Phase III excavations (Table 6-29). Detailed analyses of the attributes of the Phase III debitage assemblages provided a good characterization of the overall collection. The results of these analyses, discussed herein, show many striking similarities between the Woodland and the Late Archaic debitage assemblages. As Table 6-37 shows, the assemblages from both the

Woodland and Late Archaic components have very similar proportions of flake types. Both secondary and tertiary reduction flakes dominate all temporal period assemblages (Table 6-37). Early or primary stage reduction was not practiced regularly at the site, as only 402 flakes from the primary category were identified in the Phase III assemblage. Other indicators of earlier-stage lithic reduction, (shatter n=646 and core fragments n=39) were also present in relatively low quantities. So, with secondary and tertiary flakes representing 82 percent of the total Phase III debitage assemblage, it is clear that secondary and tertiary reduction was by far the most common lithic reduction preformed at the site during all four temporal occupations. Flake sizes were concentrated in the 10 to 20 mm range (Table 6-38), generally intimating that lithic reduction was performed on smaller items and/or was skewed to the latter end of the reduction sequence. The amount of flaked (or tested) cobbles (n=39) and manuports (n=58) recovered during excavations, help to support the theory that most primary lithic reduction at the site likely resulted from the reduction of river/stream cobbles recovered from the nearby Delaware River and Reeders Creek.

Table 6-37. Lithic Reduction Counts and Percentages by Temporal Component, Phase III.

Temporal Component	Debitage Type					
	Core, fragment	Shatter	Primary	Secondary	Tertiary	Micro-flakes
Late Woodland	19	310	151	1076	2118	154
Early/Middle Woodland	3	107	75	343	506	37
Late Archaic I	11	156	111	663	795	79
Late Archaic II	5	71	63	313	169	7
Late Woodland	<1%	8%	4%	28%	55%	4%
Early/Middle Woodland	<1%	10%	7%	32%	47%	3%
Late Archaic I	1%	9%	6%	37%	44%	4%
Late Archaic II	1%	11%	10%	50%	27%	1%

Table 6-38. Size Class Analyses by Temporal Component, Phase III Debitage.

Temporal Period	Size Class					
	1 (<5mm)	2 (5-10mm)	3 (10-20mm)	4 (20-30mm)	5 (30-40mm)	6 (>40mm)
Late Woodland	<1%	<1%	61%	33%	3%	3%
Early/Middle Woodland	3%	-	53%	32%	6%	6%
Late Archaic I	<1%	-	46%	34%	10%	10%
Late Archaic II	1%	-	34%	37%	17%	11%

In summary, the overall picture of lithic reduction at the RCW Site during both the Woodland and Late Archaic temporal periods is likely as follows. During the Late through Early Woodland periods locally available cobbles were reduced to make expedient tools. Bifacial reduction was occurring during these periods but to a lesser degree than during the Late Archaic I and II periods. Quartzite appears to be the preferred material for expedient tools at the site as it is represented in high proportions within all of the components. Following regional trends, argillite replaced chert during the Late Archaic as the dominant material for chipped lithic tools. Argillite an abundant material within the Middle Delaware Valley was present at relatively high proportions within all of the temporal components at the site. Lithic reduction at the RCW Site appears to be a mix of early and late stage reduction, with later stage reduction more heavily represented in the assemblage than earlier stage reduction. Tertiary flakes dominate all of the components except for the Late Archaic II period where secondary flakes account for 50 percent of the lithic debitage. Micro-debitage at the site may indicate tool re-sharpening activities at the site.

6.4.1.4 Analysis of the RCW Site Lithic Tool Assemblage

A total of 202 stone tools were recovered during the Phase III excavation at the RCW Site (Table 6-29). The majority of these were chipped stone tools, as ground-stone and cobble tools accounted for only 12 percent (n=24) of the total tool assemblage. Ground-stone/cobble tools included an anvil, two pestles, four nutting stones, a netsinker, 13 hammerstones, and three groundstone tools of unknown function (Table 6-39). Forty-six percent of the ground stone/cobble tool assemblage was recovered within the Late Woodland Component and 17 percent from the Early/Middle Woodland Component. A total of six ground stone/cobble tools were found within the Late Archaic I Component (25 percent) and three from the Late Archaic II Component (13 percent). Hammerstones and nutting stones were the primary cobble tool recovered at the RCW Site. The presence of nutting stones within the Late Woodland and Late Archaic I components indicate that the processing of nuts was an important activity at the site. Ceramic residue analysis of several ceramics from the Late Woodland period produced archeo-botanical evidence for nut oil and raw nut shells along with cooked meat (see Section 6.4.2.3 for more details). The relative lack of net sinkers (only one was recovered within the Late Archaic II Component during excavations) within all of the temporal components represented at the RCW Site indicates that fishing was not a primary activity performed at the site.

Table 6-39. Groundstone/Cobble Tools, Phase III.

Temporal Component	GST/Cobble Tool Type						*Total*
	Hammerstone	Pestle	Nutting Stone	Net sinker	Unknown Groundstone	Anvil	
Late Woodland	5	1	2	-	2	1	***11***
Early/Middle Woodland	4	-	-	-	-	-	***4***
Late Archaic I	2	1	2		1	-	***6***
Late Archaic II	2	-	-	1	-	-	***3***
Total	***13***	***2***	***4***	***1***	***3***	***1***	***24***

The majority of the stone tools recovered at the RCW Site were chipped stone items. All four of the components represented at the RCW Site contained extremely high debitage to tool ratios. The Late Woodland Component had a debitage to tool ratio of 46.5:1. A total of 24 chipped stone tools were found among the Early/Middle Woodland deposits, with a debitage to tool ratio of 36:1. The Late Archaic I had a total of 56 chipped stone tools with a debitage to tool ratio of 28:1. A total of 19 chipped stone tools were recovered within the Late Archaic II with a debitage to tool ratio of 27.5:1. These ratios further illustrate the point that the portion of the site investigated for the Scudder Falls Bridge Project was a location where great amounts of lithic reduction occurred, and served as a work area where expedient tools were created and used for a variety of tasks and then discarded. This is true for all four of the temporal components represented at the RCW Site.

Differences among the chipped stone tools assemblages of the four temporal components are evident. First, expedient unmodified flakes that were utilized as tools are the primary tools utilized in the Late and Early/Middle Woodland periods (n=51). Among the Late Woodland and Early/Middle Woodland chipped stone tools account for 69 percent and 79 percent of the tool assemblage. Expedient flake tools were somewhat less common among the Late Archaic I and II period's chipped tool assemblages, representing only 45 percent and 43 percent of chipped tools. Also, five scrapers were found in the Late Woodland Component, two in the Early/Middle Woodland Component, and four in the Late Archaic I Component. All components yielded bifaces/biface fragments and projectile points. In total, the Late Woodland component produced Levanna (n=5), Rossville (n=3), and Meadowood (n=1) points along with several untyped biface/biface fragments (n=14) (Table 6-29). The Early/Middle Woodland Component produced five projectile points, including Levanna (n=1), Fishtail (n=2), Fox Creek (n=1), and Jacks Reef Pentagonal (n=1) points, and a biface fragment (n=1) (Table 6-29). The Late Archaic I Component produced Levanna (n=2), Rossville (n=1), Fishtail (n=1), Lackawaxen (n=6), and Meadowood (n=2) points along with several untyped biface/biface fragments (n=15) (Table 6-29). Finally, the Late Archaic II Component produced Fishtail (n=2), Lackawaxen (n=3), and a few untyped narrow points (n=2) (Table 6-29). As mentioned above, one of the argillite bifaces recovered in the Late Archaic II Component had black bear and deer antiserum on it (Cat# 704.1). These tools may have been used as part of hunting spears, but more likely were used in skinning activities and in the preparation of animals for cooking.

The lithic use wear analysis was conducted by Mr. John (Jack) Cresson, a recognized authority on prehistoric stone tool manufacture and use. Overall, the analysis of chipped lithic tools with visible use wear patterns shows similar trends for all of the components. However, when compared to the Woodland components, there is a steady decrease in the quantity of tools with use wear recovered within the Late Archaic I and II components (Table 6-40). This decrease may be attributed to the fact that most lithic tools recovered within the Late Archaic I and II were made from argillite material which weathers more easily than the cryptocrystalline materials which made-up the majority of the Late and Early/Middle Woodland tool assemblage. Tools used for cutting, scraping and reaming/perforating were recovered from all four contexts. Tools used exclusively for cutting were common among both the Late and Early/Middle Woodland assemblages, though this was more evident among the Late Woodland assemblage. According to the wear patterns, flaked tools were used in a variety of ways to cut and scrape both soft (e.g., flesh, hide, fibers) and hard (e.g., wood, bone) materials (Table 6-40). Some tools were

used to work both soft and hard materials. This may be evidence of the butchering process, where bifaces were employed as knives to cut soft tissue, as well as bone.

Edge polish was observed on large percentages of the tools recovered from the Late Woodland, Early/Middle Woodland, and Late Archaic I components. Overall, 77 percent of the flaked lithic tools recovered during Phase III excavations (bifacial, formal, and expedient) displayed use wear polish. Among bifacial tools, edge polish was observed on 100 percent of the Late Woodland, 50 percent of the Early/Middle Woodland, and 75 percent of the Late Archaic I tools. This may indicate that the Late Woodland and Late Archaic I bifaces were used for heavier work or possibly were curated for a longer period. Among the expedient flake tools, use on only one type of material (either hard or soft, but not both) was more common. This may reflect the expedient, perhaps even single use, of these items. Interestingly, expedient flake tools from the Late Woodland (68 percent), Early/Middle Woodland (100 percent), and Late Archaic I (83 percent) components showed very high proportions of edge polish. In this case, these items were not likely curated, so the polish probably indicates hard and prolonged use.

Table 6-40. Summary of Wear Analysis, Flaked Lithic Tool Assemblage.

Component	Tool Type	Action				Material		
		Cutting	Scraping	Cutting & Scraping	Reaming/ Perforating	Soft	Hard	Soft/Hard
Late Woodland	Biface	2	-	-	3	4	-	1
	Formal Tools	-	3	-	-	-	1	2
	Expedient Flake Tools	14	4	3	1	7	13	2
	Total	***16***	***7***	***3***	***4***	***12***	***14***	***5***
Early/Middle Woodland	Biface	3	-	-	1	3	1	-
	Formal Tools	-	-	-	-	-	-	-
	Expedient Flake Tools	8	3	-	-	4	6	1
	Total	***11***	***3***	***-***	***1***	***7***	***7***	***1***
Late Archaic I	Biface	1	-	-	2	1	-	2
	Formal Tools	-	1	-	-	-	1	-
	Expedient Flake Tools	1	-	3	2	1	4	1
	Total	***2***	***1***	***3***	***4***	***2***	***5***	***3***
Late Archaic II	Biface	1	-	-	1	1	-	1
	Formal Tools	-	-	-	-	-	-	-
	Expedient Flake Tools	-	-	-	-	-	-	-
	Total	***1***	***-***	***-***	***1***	***1***	***-***	***1***

***Note**: Bifaces include projectile points. Only tools with visible use wear.

In summation, the lithic tool types and tool use wear patterns for the Late and Early/Middle Woodland and the Late Archaic I and II components indicate that a variety of general subsistence activities most likely oriented around butchering and processing of game and aquatic resources, were undertaken at the site. Abundant evidence for the processing of nuts was also identified within all four of the components, suggesting an occupation during the fall.

6.4.1.5 Prehistoric Pottery Analysis

A total of 973 ceramics were recovered during Phase III excavations of the RCW Site with the majority recovered from the Late Woodland (n=755) and Early Middle Woodland (n=112) components. Additional ceramics were recovered from the Late Archaic I (n=92) and Late Archaic II (n=13) components. Seventy-eight percent of the prehistoric ceramic recovered during the Phase III excavation was from the Late Woodland Component. Smoking pipe fragments were also identified within the Late Woodland (n=2) and Late Archaic I (n=1) components.

Seventy-four percent (n=68) of the ceramics recovered within the Late Archaic I Component were recovered within the top few centimeters of the Bw1-horizon, located directly under the Early/Middle Woodland Component. Ceramics likely filtered down through the soil profile into the lower Late Archaic components due to bioturbation. The majority of ceramics recovered during the RCW Phase III were too small or worn to ascribe to any particular types. However, the bulk of the ceramic remains appear to fall into the Middle to Late Series of durable container use. A very large proportion of the typeable forms fall into the broad Middle Woodland temporal range, dominated by corded and cross corded surface treatments with a narrow mix of tempering agents. Given the proximity to the well known Middle Woodland ceramic sequences at the Abbott Farm it is unique and telling that these assemblages lack dentate and zone decorated and net marked wares. Also, the lack of steatite, gneiss, granite or porphyry is notable and helps bolster the variation in ceramic technologies that erupted during the inferred time period.

6.4.2 Ecofact Analyses

6.4.2.1 Ceramic FTIR Analyses

FTIR Analysis of 17 ceramics from the RCW Site identified plant residues on six sherds (Table 6-41; Appendix F). The majority of the residues identified on the ceramic samples were labeled “raw”. Ceramics (Cat#s 565.1 and 1076.7) found within the Late Woodland Component tested positive for raw acorn shell (Feature 73) and acorn nut meat (AE-horizon). A ceramic (Cat# 611.22) found within Feature 44 of the Early/Middle Woodland Component tested positive for raw yarrow stem, hickory shell, sunflower seed shell, acorn shell, and cattail root residues. Another ceramic sherd (Cat# 764.7) from the E-horizon in the Early/Middle Woodland Component identified raw hickory nut shell, sunflower seed shell, and acorn shell residues.

The only plant residue not identified as “raw” was identified on a ceramic (Cat# 865.1) from the Late Archaic I Component likely displaced from the above Woodland components by bioturbation. This ceramic tested positive for cattail root residue indicating that the ceramic was part of a vessel that cooked cattail root (Plate 6-5). Another ceramic fragment (Cat# 611.2) from the Early/Middle Woodland Component analyzed using FTIR identified duck protein and aromatic ester peaks, indicating that Native Americans at the site were cooking water fowl at the site (Table 6-41; Plate 6-6).

Table 6-41. Summary of Ceramic FTIR Analysis, Floral and Faunal.

Catalog #	Artifact	Description	Associated Soil Horizon	FTIR Residue Results
554.12-13	Ceramic, grit temper	Smoothed over cord mark exterior, smoothed interior, body sherds	E	Negative
565.1	Ceramic, crushed mineral temper	Cross-cord malleated exterior, smoothed interior, body sherd	AE	Acorn nut meat (raw), acorn shell (raw)
611.22	Ceramic, crushed mineral temper	Cross-cord exterior, smoothed interior, body sherds	Feature 44	Duck skin, Yarrow stem (raw), hickory nut shell (raw), sunflower shell (raw), acorn nut shell (raw), cattail root (raw)
611.23	Ceramic, crushed mineral temper	Cross-cord exterior, smoothed interior, body sherds	Feature 44	Hickory nut shell (raw)
764.7	Ceramic, crushed mineral temper	Body sherds	E	Hickory nut shell (raw), sunflower seed shell (raw), acorn nut shell (raw)
764.8	Ceramic, crushed mineral temper	Body sherds	E	Negative
865.1	Ceramic, crushed mineral temper	Body sherd	Bw2	Cattail Root
919.28	Ceramic, crushed mineral temper	Body sherd	AE	Negative
1076.1	Ceramic, crushed mineral temper	Body sherd	Feature 73	Negative
1076.7	Ceramic, crushed mineral temper	Bowman's Brook/Overpeck body sherds	Feature 73	Acorn Nut Shell (Raw)
1076.8	Ceramic, crushed mineral temper	Bowman's Brook/Overpeck body sherds	Feature 73	Negative
1085.14-16	Ceramic, crushed mineral temper	Body sherds	AE	Negative
1085.17	Ceramic, crushed mineral temper	Body sherd	AE	Negative
1113.1	Ceramic, grit temper	Smoothed over cord-marks, Body sherd	AE	Negative

*PaleoResearch Result Reports are located within Appendix F.

Plate 6-5. Ceramic Fragment with Cattail Residue (Cat# 865.1), Reeders Creek West.

Plate 6-6. Ceramic Fragment with Duck Skin Residue (Cat# 611.2), Reeders Creek West.

6.4.2.2 Floral Analyses

Flotation of soil samples taken from eight prehistoric features identified as hearth remnants (Features 67, 27, 44, 77, 45, 64, and 76) and an activity area (Feature 70) recovered a total of 444 seed and nut materials. These floral materials were then analyzed by Dr. William Hilgartner for the identification of the represented plant species. His analysis of the RCW floral material is located within Appendix E of this report. Dr. Hilgartner identified 11 distinct plant species along with several carbonized and unknown seed/nut types (Table 6-42). The most abundant seed/nut types recovered included blackberry, mustard, wild grape, pokeweed, lambs quarters, and pignut hickory. A small amount of elderberry, knotweed, sedge, tulip tree, and black locust seeds were also identified during the examination. Evidence of the use of berries, hickory nuts, knotweed, and pokeweed by Native Americans was also identified within the Chain Shop and Lexington Street areas of the Douglas Gut Archaeological Complex (28Me273) located south of Trenton (Hunter 2002:3-158).

When analyzing the floral results it is clear that the blackberry played an important role as a food source within three of the four temporal components present at the RCW Site (Table 6-42). The blackberry accounted for 50 percent of the floral materials recovered from Features 67, 70, 27, 44, 77, 45, 64, and 76 (Table 6-42). The fruit is present at a higher proportion within the Early/Middle Woodland features than in the Late Woodland or Late Archaic I features; accounting for 58 percent of the floral materials in the Early/Middle Woodland versus 46 percent in the Late Woodland and 16 percent in the Late Archaic I. Blackberry seeds recovered from Feature 27 alone within the Early/Middle Woodland Component accounted for 53 percent of the total blackberry seeds identified during analysis. No blackberry seeds were recovered from the Late Archaic II Feature 76. This lack of blackberry seeds in the Late Archaic II Component, which likely dates to the early part of the Late Archaic period, could result from of a lack of seed preservation. With that being said it should be noted that very few floral remains at all were recovered from Late Archaic II features during flotation. Nevertheless, blackberries appear to have been an important food source for inhabitants during the majority of the occupations represented at the RCW Site.

Pignut hickory nut shells were also identified within all of the temporal components at the RCW Site. While they only represent 4 percent of the floral remains identified during analysis hickory nut shells were identified within 63 percent (n=5) of the eight features analyzed. Charred hickory shells (n=6) were identified within Feature 76 of the Late Archaic II Component. Ceramics from Feature 44, a hearth feature, within the Early/Middle Woodland Component were identified with residue of raw hickory nut shells (Table 7-42; Appendix F). The kernel of hickory seeds is exceptionally high in crude fat, measuring 70 to 80 percent in some species, essential for individuals gathering food for use in the lean fall and winter months (USFS accessed 2012).

Kraft (2001: 210) surmises that the Delaware Valley Native Americans, like other Native American groups in eastern North America, created a “kind of nut milk” from hickory nuts, walnut, and butternuts. Making this milk involved mashing the nuts and boiling them. This mixture was then strained several times to extract the oily part of the liquid. This milk would have been an important supplement to Native American diets during the winter months. Kraft also notes that nut meat from such nuts as hickory were also dried and stored for use in

leaner months (ibid). This winter storage of nuts may account for the raw hickory shell residue identified on ceramic from Feature 44 (Table 6-42). While it is not clear how or why the nuts were being processed at the RCW Site, whether for nut meat, oil, or both, it is clear that the nuts were an important food source.

Seeds identified as belonging to the mustard family accounted for 19 percent of the floral materials present within the Early/Middle Woodland Component (Table 6-42). While the exact genus of the species is not known, the seed could belong to the turnip or field mustard plant, both of which have edible roots and foliage. Feature 27 within this component contained the highest quantity of mustard seeds (n=49; or 72 percent of the total assemblage) out of all eight features. A lesser quantity of mustard seeds were identified within the Late Woodland (n=8) and Late Archaic I (n=2) components. No mustard seeds were recovered from Feature 76, a hearth feature within the Late Archaic II Component. Like with the blackberry seeds the Late Archaic II Component could suffer from a lack of floral material preservation due to the deposits age. What is clear is that mustard appears to be used predominantly in the Early/Middle Woodland occupation of the RCW Site.

Wild grape seeds, identified as belonging to either the Summer or Fox Grape varieties, were present within all of the temporal components at the site, but were most abundant in the Late Archaic I Component accounting for 74 percent (n=26) of the wild grape seeds identified in the analysis. These seeds (n=25) came predominantly from Feature 64, a hearth feature within the Late Archaic I Component (Table 6-42). Wild grapes were eaten in their natural state and also dried for later consumption (Kraft 2001: 210).

Pokeweed seeds accounted for 4 percent (n=18) of the seeds recovered from the eight features analyzed (Table 6-42). They are spread equally throughout the temporal periods but are present within 63 percent (n=5) of the eight features. The leaves and shoots can be consumed but must be blanched first to remove harmful toxins (Lewis and Smith 1979). Pokeweed also produces dark purple berries that are edible when ripe and toxic when green. As they are considered a major pest species by famers today, they were also undoubtedly abundant throughout prehistoric times.

Lambs Quarters (Chenopodium*)* seeds were found within Features 67, 27, and 44 in the Late and Early/Middle Woodland components (Table 6-42). These seeds were identified by Dr. Hilgartner as markers indicating a post-1700 non-native species. Dr. Hilgartner gives two possible explanations for the presence of this non-native species in Late and Early/Middle Woodland features. First, the seeds may be present due to bioturbation/contamination from surface layers. The upper portion of Feature 67 was located within a plow zone, and Features 27 and 44 were both located immediately under a plow zone so bioturbation may have re-deposited the seeds within the features. The second explanation, mentions that the science and taxonomy surrounding Chenopodium in North America has been somewhat confused by the persistence of several varieties which might be separate interacting crop and weed populations in which the crop species produce larger, thinner seeds, and possibly extinct cultivated varieties (DeFant 1997; Gremillion 1993; Smith 1989). Regardless, the seeds are present within three of the eight features at the RCW Site and it is currently unknown whether they were utilized by prehistoric peoples.

Small amounts of elderberry, knotweed, sedge, tulip tree, and black locust seeds were also identified during the examination of macro-floral remains from the RCW Site (Table 6-42). The tulip and black locust seeds make-up a portion of the flora that is present at the modern day location of the RCW Site. Elderberry (n=2) was identified within Feature 27 in the Early/Middle Woodland Component. Uses for the fruit include medicinal products, food, and dye (Table 6-43). As a medicine the elderberry acts as a laxative or astringent, and the berries make a purple to lavender dye (NT 2012). Knotweed or Smartweed as it is commonly called was found in Feature 67 within the Late Woodland Component and Feature 27 within the Early/Middle Woodland Component (Table 6-42). Kraft noted that knotweed was gathered and eaten by Native Americans (Kraft 2001:111). The plant can also be used as a tea to help treat heart ailments, stomachaches, inflammation, sore throat, and as a diuretic (Medicinal Plants of the NE 2012).

Table 6-42. Summary of RCW Site Floral Analysis.

Temporal Component	Feature	Species															*Total*
		Blackberry	Elderberry	Wild Grape	Pokeweed	Knotweed	Mustard	Sedge	Pignut Hickory	Carbonized Pignut Hickory	Lambs Quarters	Carbonized Chenopodium	Tulip Tree	Black Locust	Unknown Seed	Carbonized Unknown Seed	
Late Woodland	67	29	-	5	6	1	7	-	5	-	4	-	-	-	2	2	***61***
	70	3	-	1	-	-	2	-	-	-	-	-	-	-	1	1	***8***
Early/Middle Woodland	27	118	2	-	4	1	49	-	-	-	28	8	-	1	-	-	***211***
	44	50	-	3	1	-	5	-	2	-	7	-	7	-	2	-	***77***
	77	6	-	-	-	-	3	-	-	-	-	-	-	-	2	-	***11***
Late Archaic I	45	4	-	1	2	-	-	1	5	-	-	-	1	-	1	1	***16***
	64	11	-	25	5	-	2	-	6	-	-	-	1	-	3	1	***54***
Late Archaic II	76	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	***6***
	Total	***221***	***2***	***35***	***18***	***2***	***68***	***1***	***18***	***6***	***39***	***8***	***9***	***1***	***11***	***5***	***444***

Table 6-42 was created from results located in Appendix E.

Table 6-43. Species Analysis of Common Floral Materials Recovered at the RCW Site*.

Species Recovered	Common Name	Fruit/Seed Abundance	Active Growth Period	Fruit/Seed Period Begin	Fruit/Seed Period End	Possible Use(s)
Rubus allegheniensis	Allegheny Blackberry	High	Spring and Summer	Summer	Summer	Food
Brassica rapa	Mustard	High	Spring, Summer, Fall	Summer	Summer	Food
Phytolacca americana	American Pokeweed	High	Spring and Summer	Summer	Fall	Medicine/ Food
Persicaria pennsylvanica	Pennsylvania Smartweed	Medium	Summer	Spring	Fall	Medicine
Vitis aestivalis/labrusca	Summer Grape/Fox Grape	Medium	Spring and Summer	Summer	Fall	Food
Sambucus Canadensis	American Black Elderberry	High	Spring and Summer	Spring	Summer	Medicine/ Food/Dye
Carya glabra	Pignut Hickory	Medium	Spring and Summer	Summer	Fall	Food

**Source: USDA Plants Database 2012.*

In summary it is clear that plant resources such as blackberries, mustard, wild grape, and pignut hickory nuts were utilized by those occupying the RCW Site and that these resources were within close availability to the site. Table 6-43 also clearly illustrates that the spring and summer periods are the active growth periods for all the plant species found within the features analyzed. The plants also fruit within the summer and fall periods likely indicating that the site was occupied during these seasons. Similar evidence of plant resource utilization has been identified within other sites located within the Delaware Valley and include Gropp's Lake (28ME100G), Shady Brook (28ME20 and 28ME99), Sturgeon Pond (28ME114), Lister (28ME1-A), Carney Rose (28ME106), Bordentown Waterworks (28ME37), 1509 River Road Site (36Bu379), and the Douglas Gut Archaeological Complex (28Me273). These sites were interpreted as transient camps and produced wild food remains including wild grape, blackberry along with nuts and seeds of hickory and butternut (Stewart 1986; Wall and Stewart 1996; Foss 1996; Stewart 1996b; Dumont and McLearen 1996; Hunter 2002; Lawrence and Albright 2012).

6.4.2.3 Pollen Analyses

Pollen analysis of the four sediment samples from EB M at the RCW Site yielded a record suggesting a mosaic of vegetation communities that included trees that may have grown individually or in clusters within wooded areas on the landscape (Table 6-44; Appendix F). Interspersed with the trees would have been more open areas that supported a variety of shrubs, herbaceous plants, and grasses. The local growth of hickory, walnut, oak, and chestnut trees indicates that nut crops would have been available for use by local residents. Various other plants in the Cheno-am group, mustard family, and grasses produce edible seeds that may also have contributed to the local subsistence economy.

What is interesting is that pollen samples from the Late Archaic I and II components failed to return any positive pollen results. Only algal and fungal spores were identified within samples from the Bw2-horizon (Late Archaic I) and C/B-horizon (Late Archaic II). This lack of identifiable pollen may have to do with the age of the Late Archaic components and the inability of the Bw2 and C/B horizons to preserve pollen. Several of the plant species identified within the Late and Early/Middle Woodland components during the pollen analysis were also identified within the floral analysis (Section 6.4.2.1; Appendix E). Pollen and flora remains from the hickory/pecan, sunflower family, mustard/cabbage family, chenopodium (goosefoot), tulip tree, and knotweed were identified within the Late Woodland. Hickory/Pecan, sunflower family, and mustard/cabbage family pollen and floral remains were identified within the Early/ Middle Woodland. The presence of these species pollen combined with their seed/nut remains confirms that they were available within close proximity to the RCW Site and were likely exploited by the inhabitants throughout the Woodland period.

The pollen analysis also identified three new edible nut and seed producing plant species that were not identified during the floral analysis (Table 6-44). Chestnut was identified within the Late Woodland and walnut, goosefoot, and ephedra were identified within the Early/ Middle Woodland. The presence of chestnut pollen is not surprising as the species was one of the most common during the Late Woodland period and represents an important food source (Cochran 1990:130). Pollen from the walnut family identified within the Early/Middle Woodland likely belongs to the Black Walnut a native of North America and an important food source. Ephedra also identified within the Early/Middle Woodland was sometimes brewed in a tea, later labeled "Mormon Tea" by Euro-Americans, and used as a stimulant and a thermogenic[2] by Native Americans. Goosefoot, a plant within the Chenopodium genus, produces greens and seeds that can provide an important food source (Johnson et al. 1995; Miles 1978). Goosefoot seeds were identified during excavations of the Chain Shop within Pit Context 93 during Hunter and Gannett Fleming's excavations of the Douglas Gut Archaeological Complex (26Me273) (Hunter 2002). These additional sources of food and medicine combined with those identified through the floral study confirm that the RCW Site was located within an area abundant with plant resources.

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[2] **Thermogenic means tending to produce heat and is commonly applied to drugs which increase heat through metabolic stimulation (Clapham and Arch 2007).**

Table 6-44. Summary of Pollen Analysis, Block M.

Temporal Component	Stratum	Species Identified in Soil Samples	Species Identified During Floral Analysis
Late Woodland	AE	Hickory/Pecan	X
		Chestnut	
		Oak	
		Elm	
		Cashew/Sumac	
		Sunflower Family	X
		Mustard/Cabbage Family	X
		Knotweed	X
		Wild Buckwheat	
		Willow Tree	
		Pine	
		Tulip Tree	X
		Geranium	
		Grasses	
Early/Middle Woodland	E	Walnut Family	
		Hickory/Pecan	X
		Pine	
		Oak	
		Daisy	
		Sunflower Family	X
		Mustard/Cabbage Family	X
		Goosefoot	
		Ephedra	
		Grasses	

6.4.2.4 Faunal Analyses

Seventeen macro-faunal remains were found during the excavation of the prehistoric deposits at the RCW Site. Soil flotation recovered an additional 20 micro-faunal remains. All of the faunal remains were recovered from the upper Late Woodland component in plow zone contexts. The majority of these remains were too small to identify, but did include recent deer bone and historic oyster shell. Micro-faunal remains were found within prehistoric Features 27, 42, 45, 67, 70, and 73 but were all calcined and too small to identify.

However, PRI conducted protein residue testing on seven stone tools from the site (Table 6-45). Samples from each of the four temporal components were selected in an attempt to understand the types of fauna utilized by Native Americans during each period. Unfortunately, all but one lithic tool tested negative for protein residue. An argillite contracting stemmed biface recovered from the Late Archaic II component (2Bwb1-horizon) tested positive for black bear and deer antiserum (Plate 6-7). One ceramic fragment from the Early/Middle Woodland Component

analyzed using FTIR identified duck protein and aromatic ester peaks, indicating that Native Americans at the site were consuming water fowl (Table 6-45). It should come as no surprise that Native American during the Late Archaic were hunting and consuming bear, duck, and deer as they would have been plentiful within the Delaware Valley from the Late Archaic through the Late Woodland periods. These animals would have also been consuming the same plant resources (i.e. hickory nuts, blackberries, and wild grapes) as the inhabitants of the RCW Site making those areas where plant resources were plentiful prime hunting grounds.

Table 6-45. Summary of Protein/FTIR Analysis, Faunal.

Catalog #	Artifact	Material	Associated Soil Horizon	Protein Residue Results
245.6	Fishtail Variant	Argillite	Bw2	Negative
267.5	Levanna	Jasper	Bw1	Negative
341.9	Scraper	Jasper	Bw2	Negative
704.1	Contracting Stem Biface	Argillite	2Bwb1	Black Bear, Deer
611	Prehistoric Ceramic	Ceramic	E	Duck
720.1	Tool, Bifacial	Jasper	E	Negative
817.1	Lackawaxen	Argillite	Bw2	Negative
1032.1	Rossville	Quartz	AE	Negative

*PaleoResearch Result Reports are located within Appendix F.

Plate 6-7. Biface Positive for Black Bear and Deer Antiserum, Reeders Creek West.

7.0 REGIONAL ANALYSIS RESULTS

In order to more fully interpret the adaptive strategies represented by the temporal components uncovered at the Reeders Creek West (RCW) Site, the site was examined within a regional context. Analysis focused on the geophysical distribution of Late Archaic, Early/Middle Woodland and Late Woodland sites within the study area relative to the occurrence of natural resources. The purpose of which was to elucidate the properties of the settlement system that produced the observed distribution of sites, and the place of the RCW Site within that system.

The environmental modeling for the study area is based on an approach utilized by Marcopul (2007) in the study of the Greater Crosswicks Creek Watershed and Bailey and Lawrence (2006) for the Shannon Site, a Late Woodland period upland site in northern Bucks County, Pennsylvania. However, because of limited accessibility to the original data as well as substantially different topological characteristics, some deviation from those original models was necessary during its development application and interpretation. The study region measures approximately 4,196 km^2 (1,620 mi^2) and spans Hunterdon and Mercer Counties in New Jersey and portions of Berks, Bucks, Montgomery, Northampton and Lehigh Counties, Pennsylvania (Figure 7-1).

In New Jersey the study region encompasses portions of the Upper Delaware, North and South Branch Raritan, Central Delaware, Millstone and Assiscunk-Crosswicks-Doctors water management areas (WMAs) (NJDEP 2006) (Table 7-1).

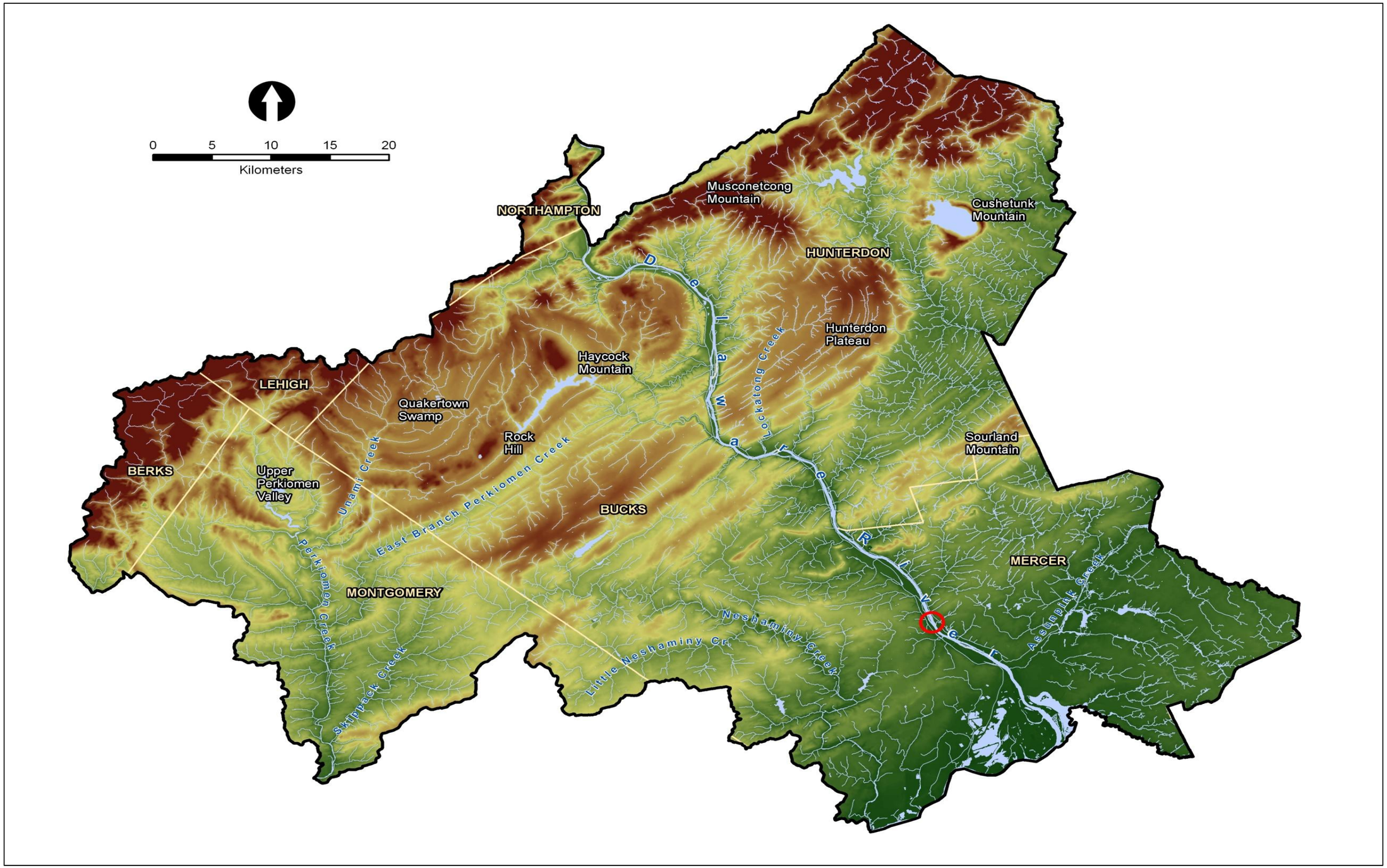

Figure 7-1. Study Region indicated by red circle(1:800,000).

Table 7-1. Watersheds in the Study Region.

Central Delaware River Subbasin 2D (PA)	Central Delaware River Subbasin 2E (PA)	Lower Delaware River Subbasin 3E (PA)
Delaware River	Delaware River	Butter Creek
Beaver Creek	Aquetong Creek	Deep Creek
Beaver Run	Brock Creek	Deer Run
Cabin Run	Buck Creek	Doe Run
Cooks Creek	Dark Hollow Run	East Branch Perkiomen Creek
Deep Run	Dyers Creek	Goshenhoppen Creek
Dimple Creek	Houghs Creek	Hazelbach Creek
Frya Run	Jericho Creek	Hosensack Creek
Gallows Run	Martins Creek	Indian Creek
Geddes Run	Mill Creek	Ironstone Creek
Haycock Creek	Paunnacussing Creek	Licking Creek
Hickory Creek	Pidcock Creek	Lodal Creek
Mink Run	Queen Anne Creek	Macoby Creek
Morgan Creek	Rabbit Run	Middle Creek
Rapp Creek	Rock Run	Mill Creek
Threemile Run		Mine Run
Tinicum Creek	**Central Delaware River Subbasin 2F (PA)**	Minister Creek
Tohickon Creek	Cooks Run	Molasses Creek
	Core Creek	Morris Run
Upper Delaware WMA (NJ)	Ironworks Creek	Perkiomen Creek
Delaware River	Lahasca Creek	Pleasant Spring Creek
Lopatcong Creek	Little Neshaminy Creek	Ridge Valley Creek
Muscetong River	Mill Creek	Schlegel Run
	Neshaminy Creek	Schmoutz Creek
Millstone WMA (NJ)	Newton Creek	Schoolhouse Run
Bear Brook	North Branch Neshaminy Creek	Scioto Creek
Beden Brook	Park Creek	Skippack Creek
Devils Brook	Pine Run	Stony Run
Duck Pond Run	Robin Run	Swamp Creek
Millstone River	Watson Creek	Towamencin Creek
Rock Brook	West Branch Neshaminy Creek	Unami Creek
Stony Brook		Vaughn Run
	Assiscunk-Crosswicks-Doctors WMA (NJ)	West Branch Perkiomen Creek
North and South Branch Raritan WMA (NJ)	Back Creek	West Branch Skippack Creek
Back Brook	Crosswicks Creek	Wolf Run
Beaver Brook	Delaware River	Zacharias Creek
Cakepoulin Creek	Doctors Creek	
Chambers Brook	Duck Creek	**Central Delaware WMA (NJ)**
Cold Brook		Assunpink Creek
Holland Brook		Delaware River
Lamington River		Fiddler Creek
Mulhockaway Creek		Hakihokake Creek
Neshanick River (1st, 2ns and 3rd)		Harihokake Creek
Pleasant Run		Jacobs Creek
Prescott Brook		Lockatong Creek
Rariton River		Little Shabakunk Creek
Rockaway Creek		Miry Run
Spruce Run		Moore Creek
		Nishisakawick Creek
		Plum Creek
		Pond Run
		Shabakunk Creek
		Shipetaukin Creek
		Swan Creek
		Wichecheoke Creek

7.1 Model Introduction

Sites for which temporal provenience was unclear or absent were omitted from analysis. Likewise several sites at the extreme margins of the study area had to be omitted due to insufficient coverage by the created data layers. Some discussion of data quality is necessary. The archaeological sites analyzed in the study area were identified and reported by both professional and avocational archaeologists based on surface survey, informal collection, excavation and interviews. The quality of the attribute data (e.g. site size, location, presence or absence of features, etc.) is highly variable ranging from good to poor to totally absent. Additionally in most cases identified sites have been subject to limited formal excavation and analysis. This having been said, the proposed settlement model presented below is based on admittedly flawed data that can likely only be remedied by additional field and documentary research compiled from other sites excavated within the region.

Given the large size of the study area, approximately 90 km x 60 km (55 mi x 37 mi), and the seeming inappropriateness of treating sites more than 30 mi apart as part of a functionally interrelated system of settlements, multivariate statistical analysis was employed using the PAST software package (Hammer et al. 2011) to divide the population of sites into discrete clusters based on the relative distance between sites. The goal of this division was to avoid comparison of sites unlikely to have been inhabited by the same populations because of the large distances between them. Multivariate cluster analysis based on the N and E coordinates (UTM Zone 17N, NAD83) of each site was performed using Euclidian Distance as a measure of similarity. Both a paired group clustering algorithm and Ward's Method were used to assign each site to a cluster and the results were compared. Visual comparison of the resulting trees indicated that the population could be divided into seven discrete clusters. An additional eighth cluster was added to minimize the possible inclusion of outlier sites into unrelated clusters. K-means clustering was then employed to assign each site to one of the eight clusters (Figure 7-2). Hypothetically, each of the resulting clusters represents a network of related sites within a defined territory.

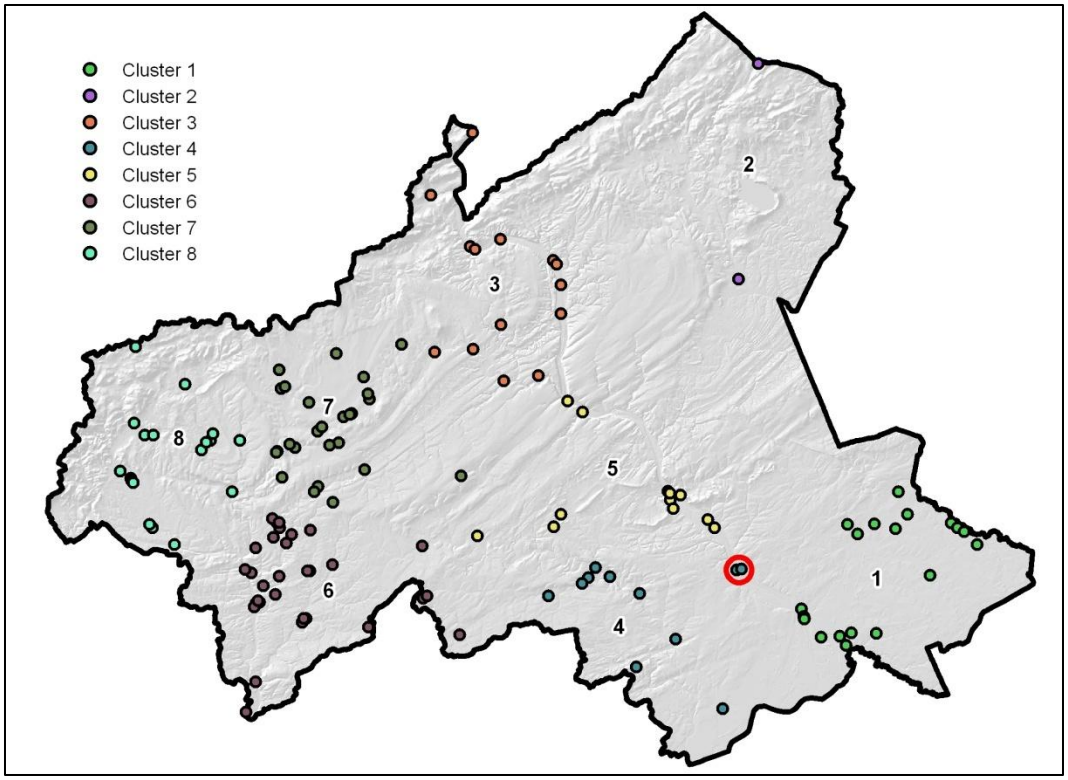

Figure 7-2. Distribution of Clusters. APE indicated by red circle (1:800,000).

7.1.1 Modeling Plant Resources

In order to model the natural environment during the Late Archaic, Early/Middle Woodland, and Late Woodland occupations of the study region, digital soils, elevation, land use, wetlands and hydrologic information as well as aerial photography were acquired from a number of sources (NRCS 2010, 2009, 2008 a-e; NCGC n.d.; SARS 2011 a,b; USFWS 2009; NJDEP 2010; ERRI 1998a; NJDEP 2010; ESRI 2011). Additionally a number of derived dataset such as topographic setting, soil drainage class, slope and aspect were generated (For examples see Figure 7-3 and Figure 7-4). Using ESRI's ArcMap-ArcInfo Desktop (ver. 9.3.1) and Spatial Analysis Extension a series of raster datasets were developed to identify areas of preferred habitat for 52 economically important plant resources (Table 7-2) identified in the original model. Because of their documented identical seasonal availability, distribution and use, soft stem bulrush and cattail were combined into a single dataset.

For each raster dataset, areas of preferred habitat were assigned a value of one based on the coincidence of all preferred variables (e.g. well drained soils, upland setting, southeast exposure, etc.). Areas lacking one or more of the preferred variables were assigned a value of zero. Areas of water other than wetlands, urban lands and soils characterized in the STATSGO soil databases (NRCS 2010, 2009 and 2008 a-e) as udorthents[3] were omitted from subsequent analysis by assigning them a value of <NoData>. These datasets model the species-specific presence or absence of preferred habitat at particular locations across the entire study region (For examples see Figure 7-5 and Figure 7-6).

[3] **Anthropogenic soils created by cutting and filling activities.**

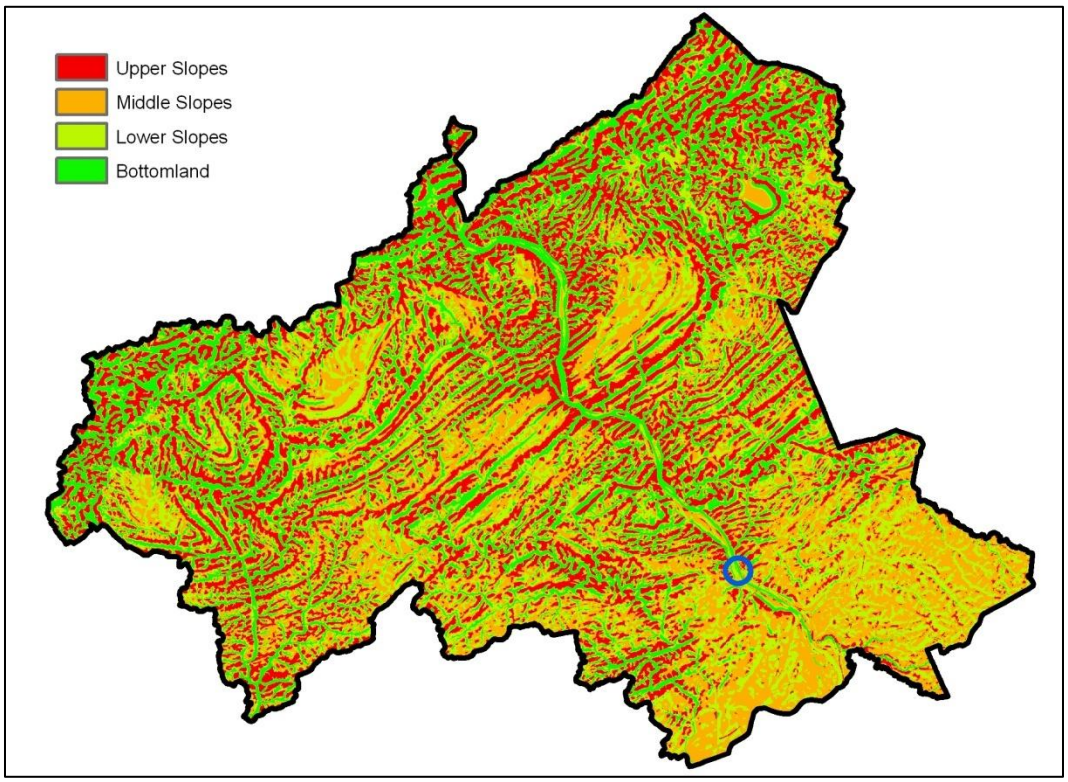

Figure 7-3. Modeled Topography. APE indicated by blue circle (1:800,000).

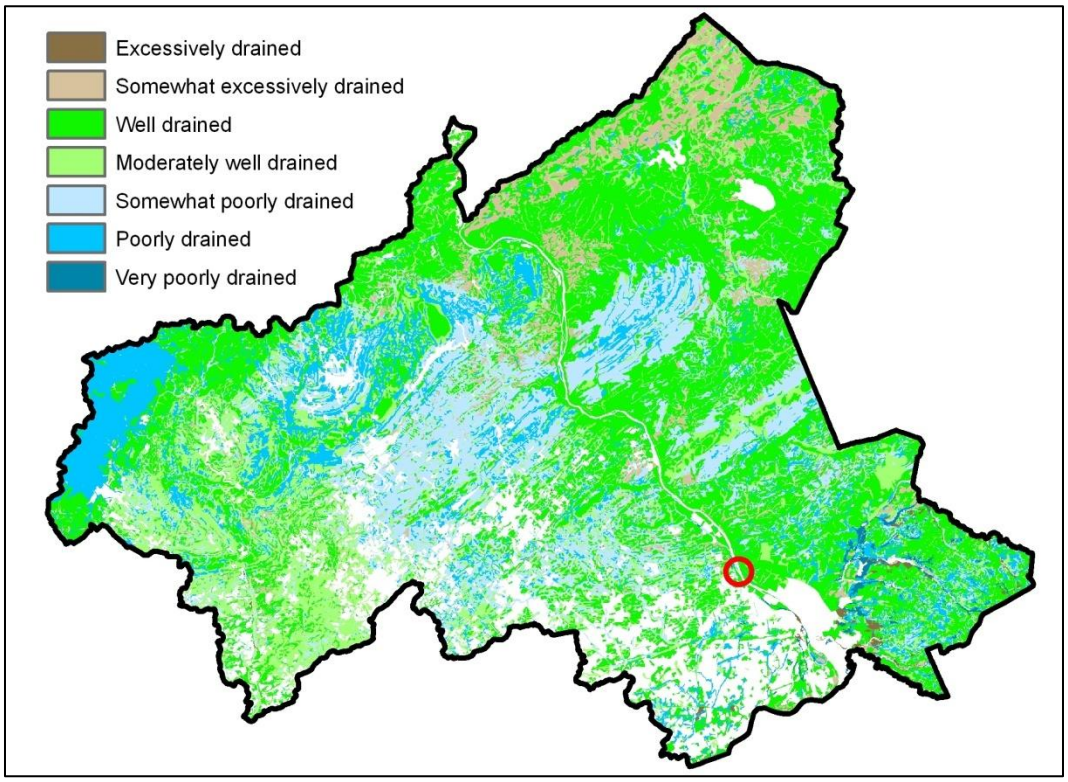

Figure 7-4. Soil Drainage APE indicated by red circle (1:800,000).

Table 7-2. Seasonal Availability of Modeled Flora.

Scientific Name	Common Name	Winter	Spring	Summer	Fall
Acer rubrum	red maple	x	x		
Acer saccharum	sugar maple	x	x		
Allium candense	wild onion	x	x	x	x
Amelanchier arborea	smooth serviceberry			x	
Amphicarpaea bracteata	American hog peanut	x	x		x
Apios americana	groundnut	x	x	x	x
Carya cordiformis	bitternut hickory				x
Carya glabra	pignut hickory				x
Carya ovate	shagbark hickory				x
Carya tomentosa	mockernut hickory				x
Castanea dentata	American chestnut				x
Claytonia viginica	spring beauty		x		
Corylus americana	American hazelnut			x	x
Corylus cornuta	beaked hazelnut			x	x
Fagus grandifolia	American beech				x
Fragaria vesca	woodland strawberry			x	
Fragaria virginiana	wild strawberry			x	
Gaylussacia baccata	black huckleberry			x	
Juglans cinerea	butternut				x
Juglans nigra	black walnut				x
Matteuccia struthiopteris	ostrich fern		x		
Morus rubra	red mulberry		x	x	
Nuphar lutea	cow lily (yellow pond-lily)	x	x	x	x
Onoclea sensibilis	sensitive fern		x		
Pinus strobus	eastern white pine		x		
Podophyllum peltatum	may apple			x	
Polygonatum biflorum	Solomon's seal	x	x	x	x
Prunus serotina	black cherry			x	x
Prunus virginiana	choke cherry			x	x
Quercus alba	white oak				x
Quercus prinus	chestnut oak				x
Quercus rubra	red oak				x
Quercus velutina	black oak				x
Ribes rotundifolium	wild gooseberry			x	
Rubus canadensis	smooth blackberry		x	x	
Rubus hispidus	swamp dewberry		x	x	
Rubus occidentalis	black raspberry		x	x	
Rubus pensilvanicus	blackberry		x	x	

Scientific Name	Common Name	Winter	Spring	Summer	Fall
Rubus pubescens	dwarf blackberry		x	x	
Sambucus canadensis	common elderberry			x	
Schoenoplectus tibernaemontani, Typha latifolia	softstem bulrush and cattail	x	x	x	x
Smilax Rotundifolia	common greenbrier	x	x	x	x
Tsuga candensis	eastern hemlock	x	x	x	x
Ulmus rubra	red elm		x		
Vaccinium angustifolium	low sweet blueberry			x	
Vaccinium corymbosum	high bush blueberry			x	
Vaccinium pallidum	low bush blueberry			x	
Vaccinium stamineum	deer berry			x	
Viburnum lentago	sheep berry	x		x	x
Viburnum trilobum	high bush cranberry			x	x
Vitis aestivalis	summer grape			x	x
Vitis labrusca	fox grape			x	x

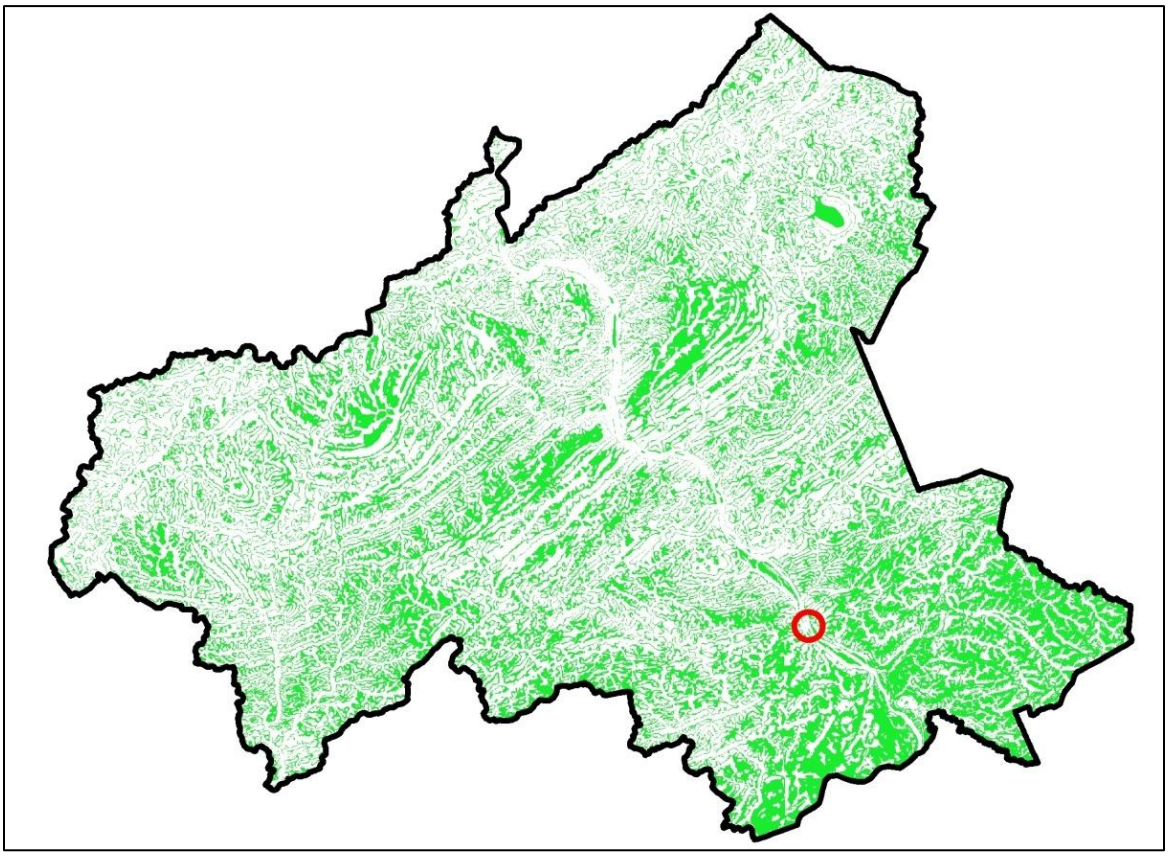

Figure 7-5. Modeled Summer Grape (*Vitis aestivalis*) Preferred Habitat (green). APE indicated by red circle (1:800,000).

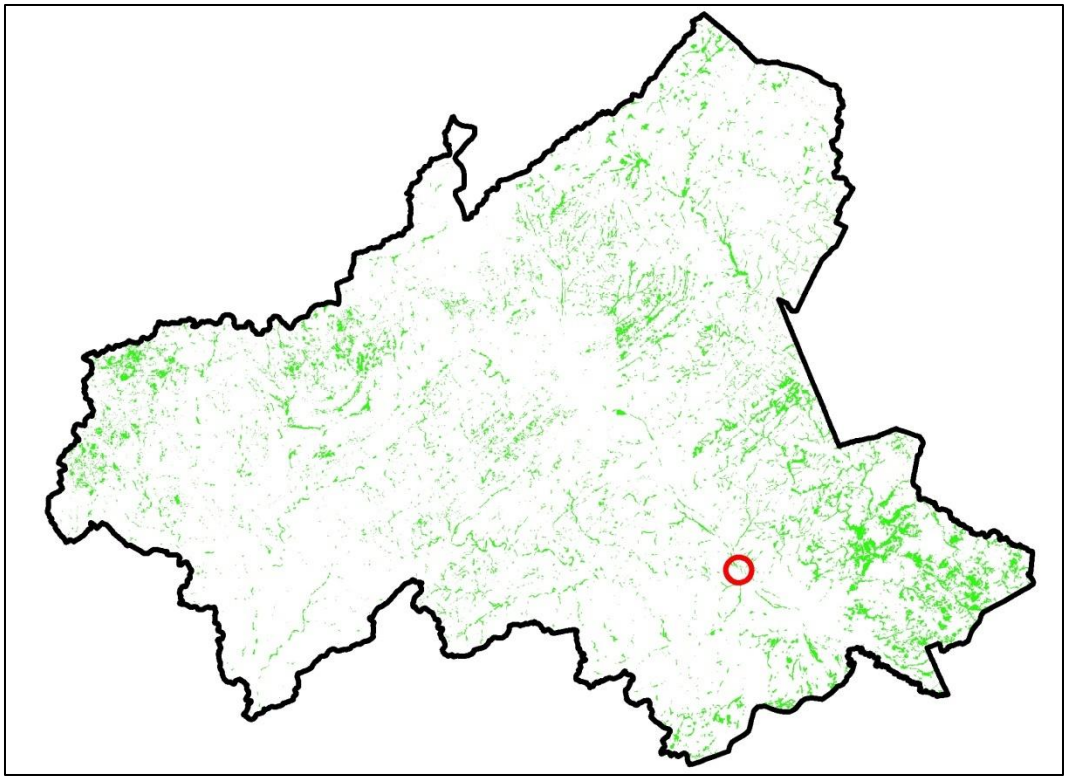

Figure 7-6. Modeled Cow Lily (*Nuphar lutea*) Preferred Habitat (green).
APE indicated by red circle (1:800,000).

After the datasets describing the preferred habitats of the 52 plant species were generated, four seasonal composite resource availability datasets (summer, fall, winter and spring) were generated by calculating the raster sum of each seasonally available resource. These datasets represent a measure of the number of modeled resources available at a given location during a particular season or Mean Resource Density (MRD); they measure both expected resource diversity and density at a given location during a particular season by measuring the degree of coincidence of preferred habitats (Table 7-3; Figures 7-7 through 7-10).

Table 7-3. Average Number of Coincident Preferred Habitats by Location by Season.

Raster Dataset	Minimum Diversity/Density	Maximum Diversity/Density	MRD (± 1.0 σ)
Winter Resources	0	10	0.95 (± 1.48)
Spring Resources	0	17	1.86 (± 2.68)
Summer Resources	0	17	3.75 (± 2.74)
Fall Resources	0	14	2.33 (± 1.99)

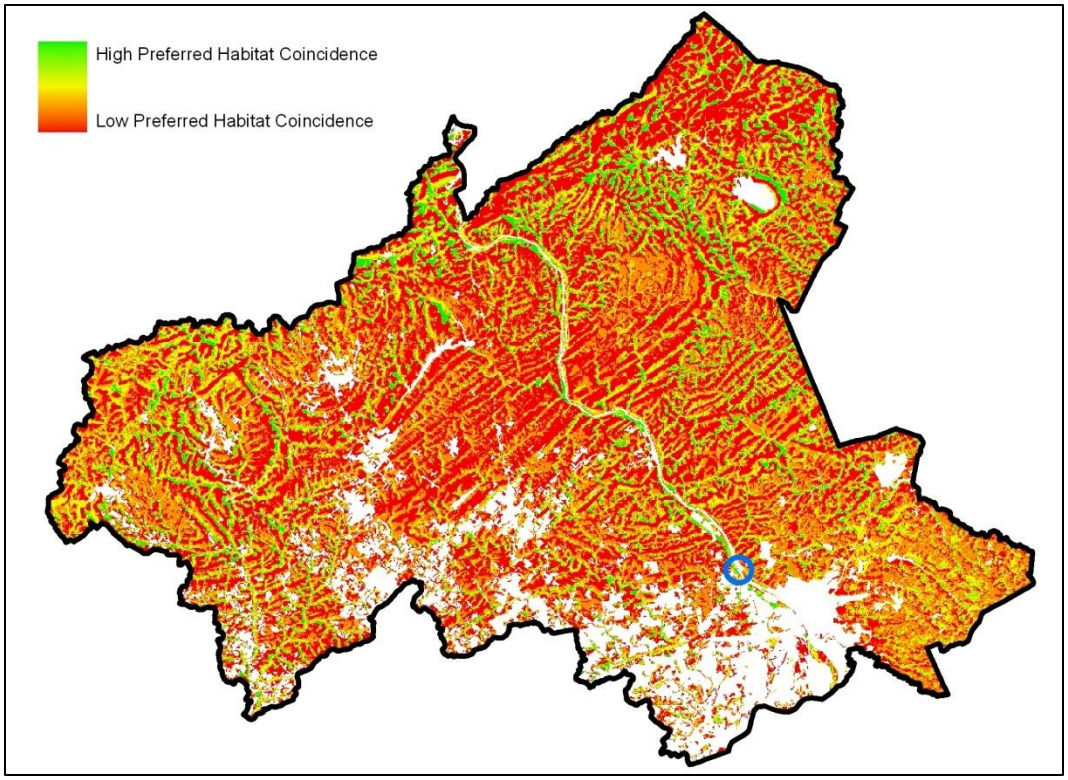

Figure 7-7. Modeled Winter MRD. APE indicated by blue circle (1:800,000).

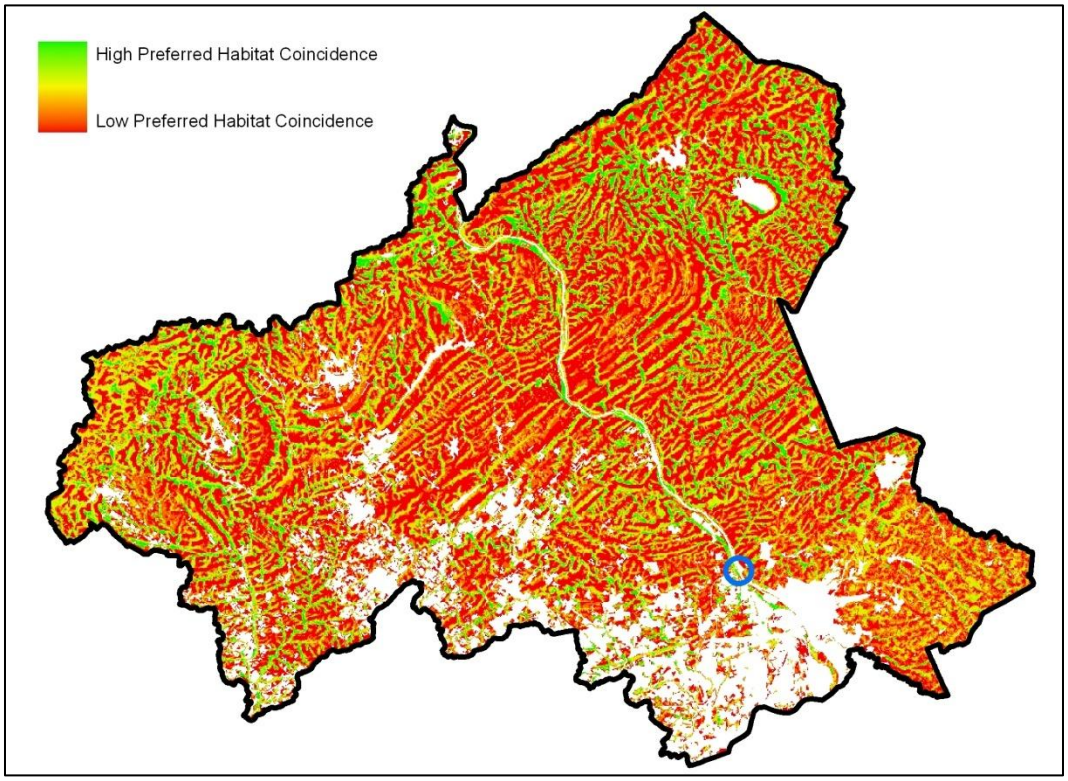

Figure 7-8. Modeled Spring MRD. APE indicated by blue circle (1:800,000).

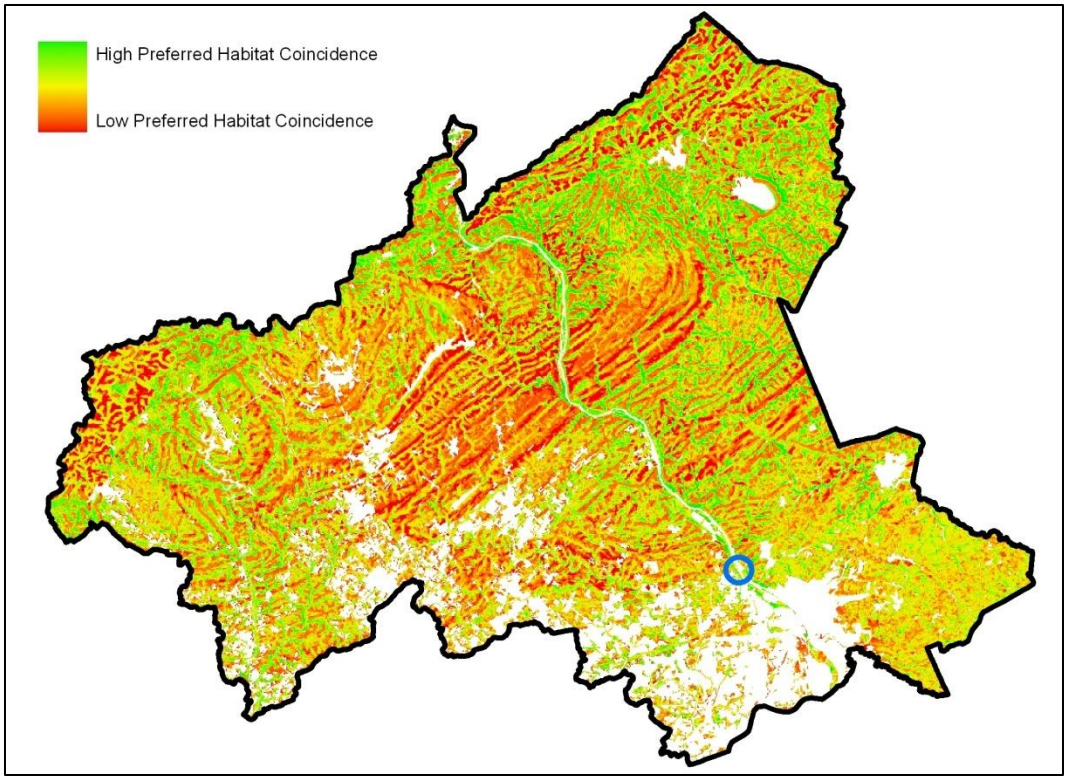

Figure 7-9. Modeled Summer MRD. APE indicated by blue circle (1:800,000).

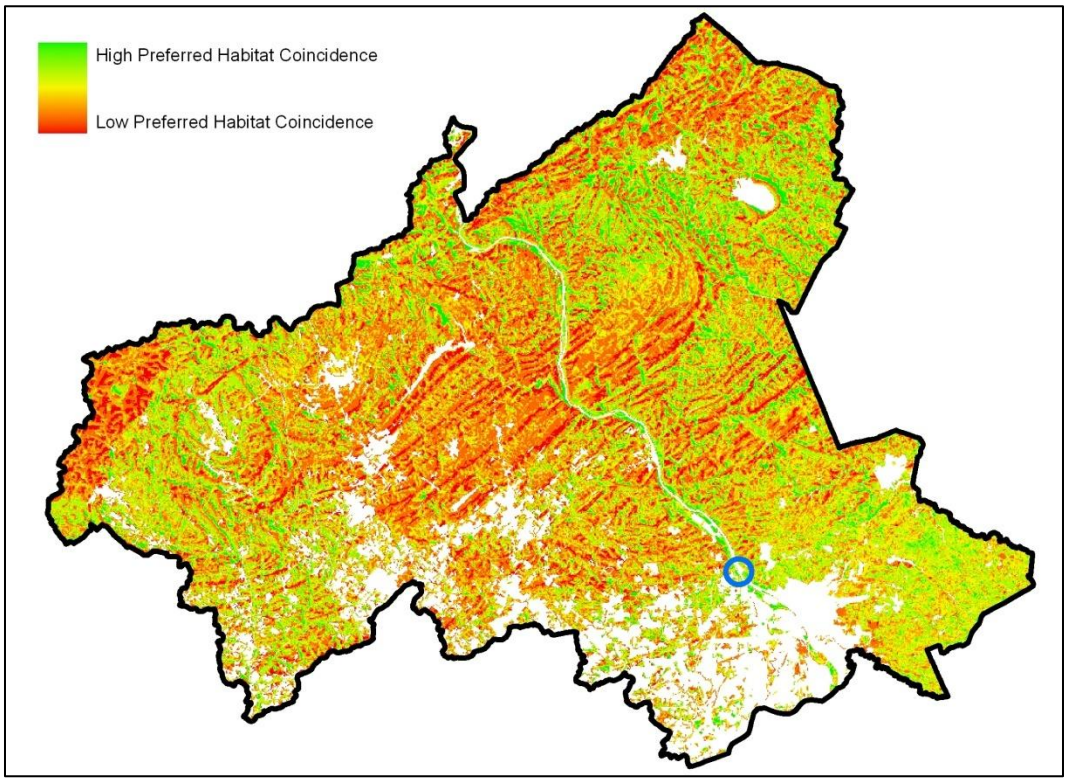

Figure 7-10. Modeled Fall MRD. APE indicated by blue circle (1:800,000).

In order to characterize *areas* of resource diversity/density, four additional datasets were generated. These datasets were created using Spatial Analyst's Neighborhood Statistics Tool. The tool was used to calculate by season the average local mean resource density (LMRD) within 1 km (0.6 mi) of each grid location in the study region. The resulting seasonal datasets measure the average amount of preferred habitat coincidence within 1 km of each location on the map (Table 7-4; Figures 7-11 through 7-14); it is a measure of both locally available resource diversity and resource density.

Table 7-4. Mean Resource Density within 1 km of each Map Location by Season.

Raster Dataset	Minimum Diversity/Density	Maximum Diversity/Density	LMRD (± 1.0 σ)
MeanWin1k	0	7.5	1.08 (± 0.40)
MeanSpr1k	0	11	2.01 (± 0.71)
MeanSum1k	0	13.5	3.97 (± 0.99)
MeanFal1k	0	11.5	2.55 (± 0.70)

Having modeled the distribution of preferred plant habitats (presence/absence), the degree of coincidence of those habitats (diversity/productivity) and measured the MRD and LMRD, five additional resource models were created: three modeling preferred black bear habitat during the summer, fall and winter; and two modeling preferred white tailed deer habitat during the fall and winter-spring seasons.

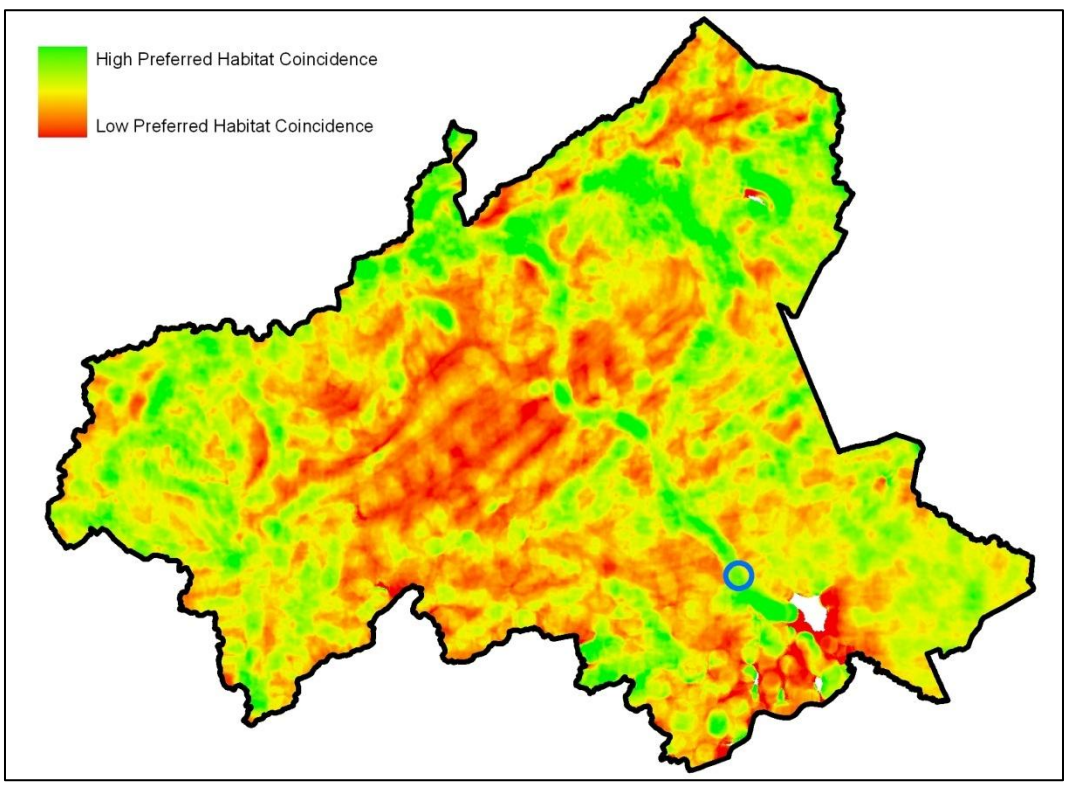

Figure 7-11. Winter LMRD. APE indicated by blue circle (1:800,000).

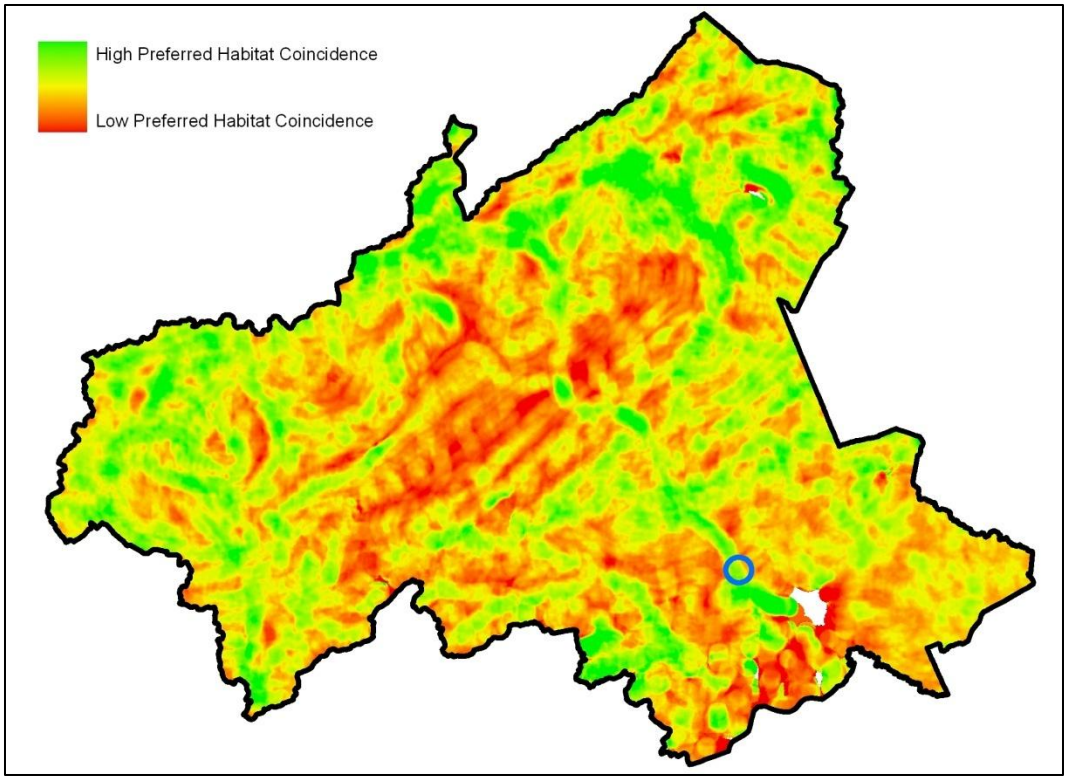

Figure 7-12. Spring LMRD. APE indicated by blue circle (1:800,000).

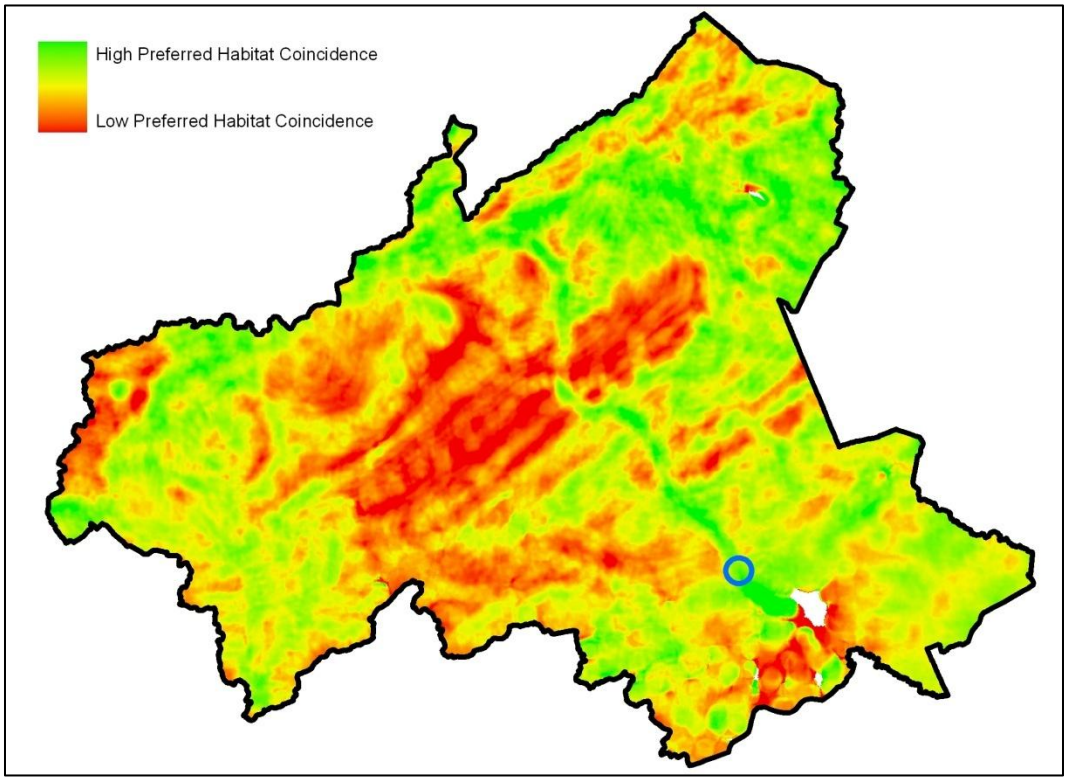

Figure 7-13. Summer LMRD. APE indicated by blue circle (1:800,000).

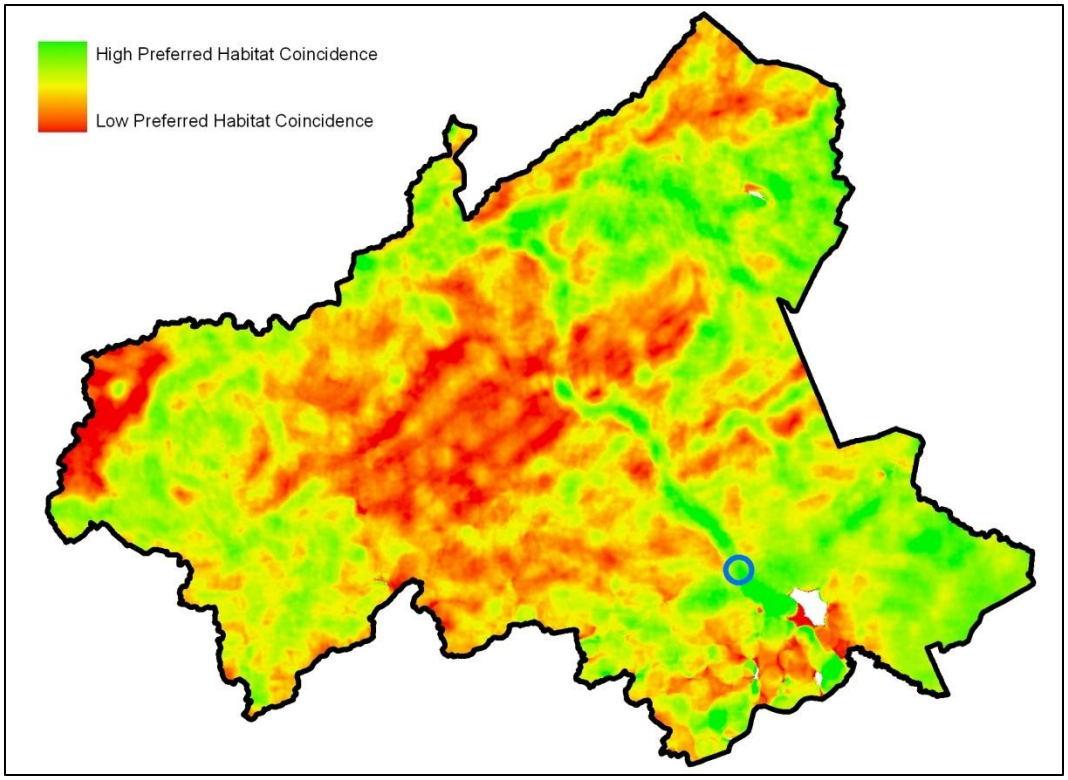

Figure 7-14. Fall LMRD. APE indicated by blue circle (1:800,000).

7.1.2 Modeling Faunal Resources

Preferred Black bear (*Ursus americanus*) habitat is predominantly influenced by seasonal feeding and denning habits. During the summer their diet consists primarily of soft mast such as strawberries, blackberries, huckleberries, wild grapes and raspberries as well as insects. During the fall they focus on hard mast like nuts and acorns. During winter their preferred denning locations are in hollow trees or under fallen logs. During the spring, low food availability and depleted fat stores force them to range over large areas feeding on emergent grasses and shoots; during this season their preferred habitat is generally unpredictable (Ulev 2007). In order to model the seasonally preferred habitats of the black bear during the summer and fall, the coincidence of soft mast habitats and hard mast habitats respectively were analyzed to identify those areas of maximum preferred mast diversity. With regard to the winter denning season, preferred denning areas were modeled based on the distribution of hardwood trees with a maximum mature height greater than 15.24 m (50 ft) that might contain hollows large enough to accommodate denning bears (VADOF 2011) (Figure 7-15).

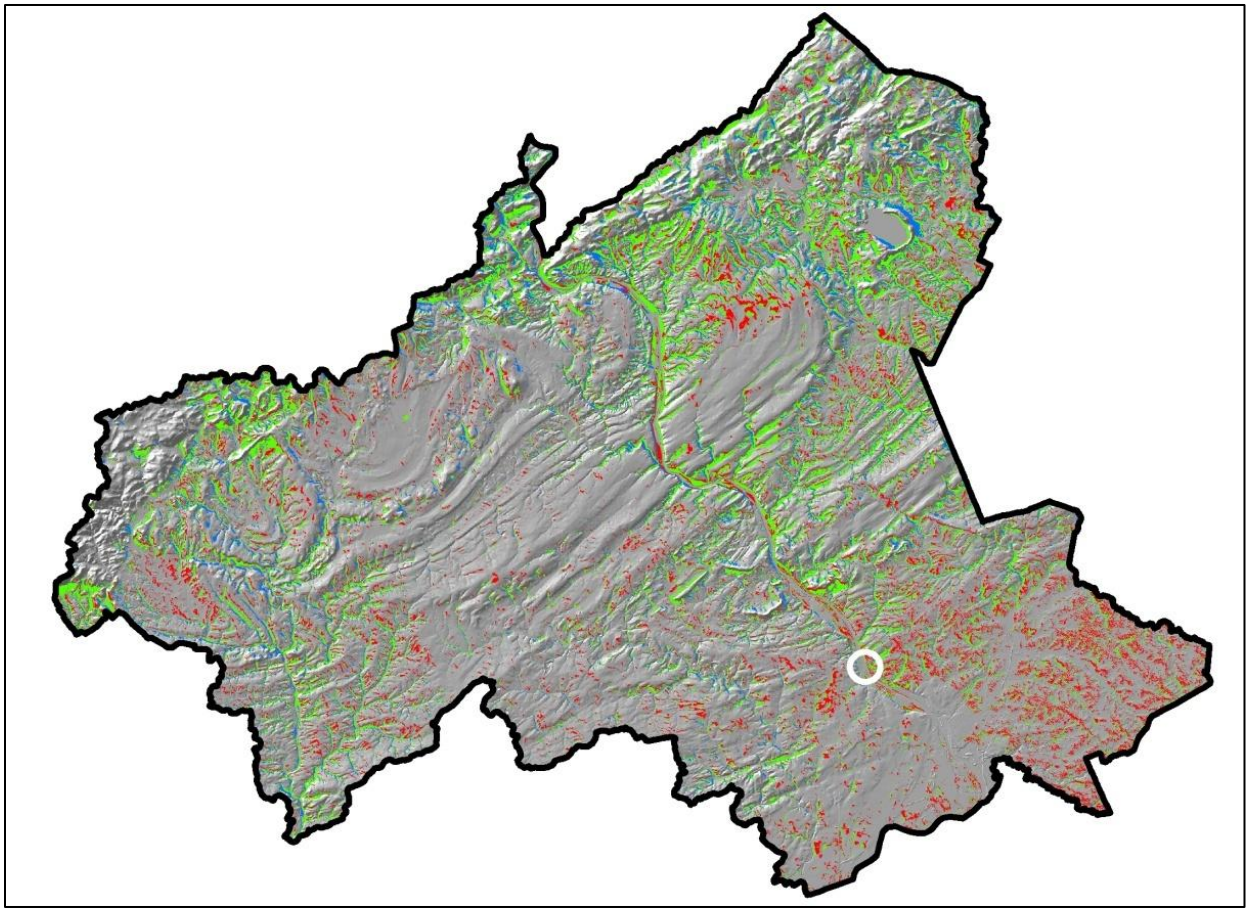

Figure 7-15. Preferred Black Bear Habitat: Summer (green), Fall (red), Winter (blue). APE indicated by white circle (1:800,000).

White-tailed deer (*Odocoileus virginianus*) during the autumn also focus on hard mast plants and the model generated for black bear is used to identify their preferred fall habitat as well. In the winter and early spring, deer engage in denning behavior congregating in riparian areas with a southern exposure between midwinter and April or May (Snyder 1991) (Figure 7-16).

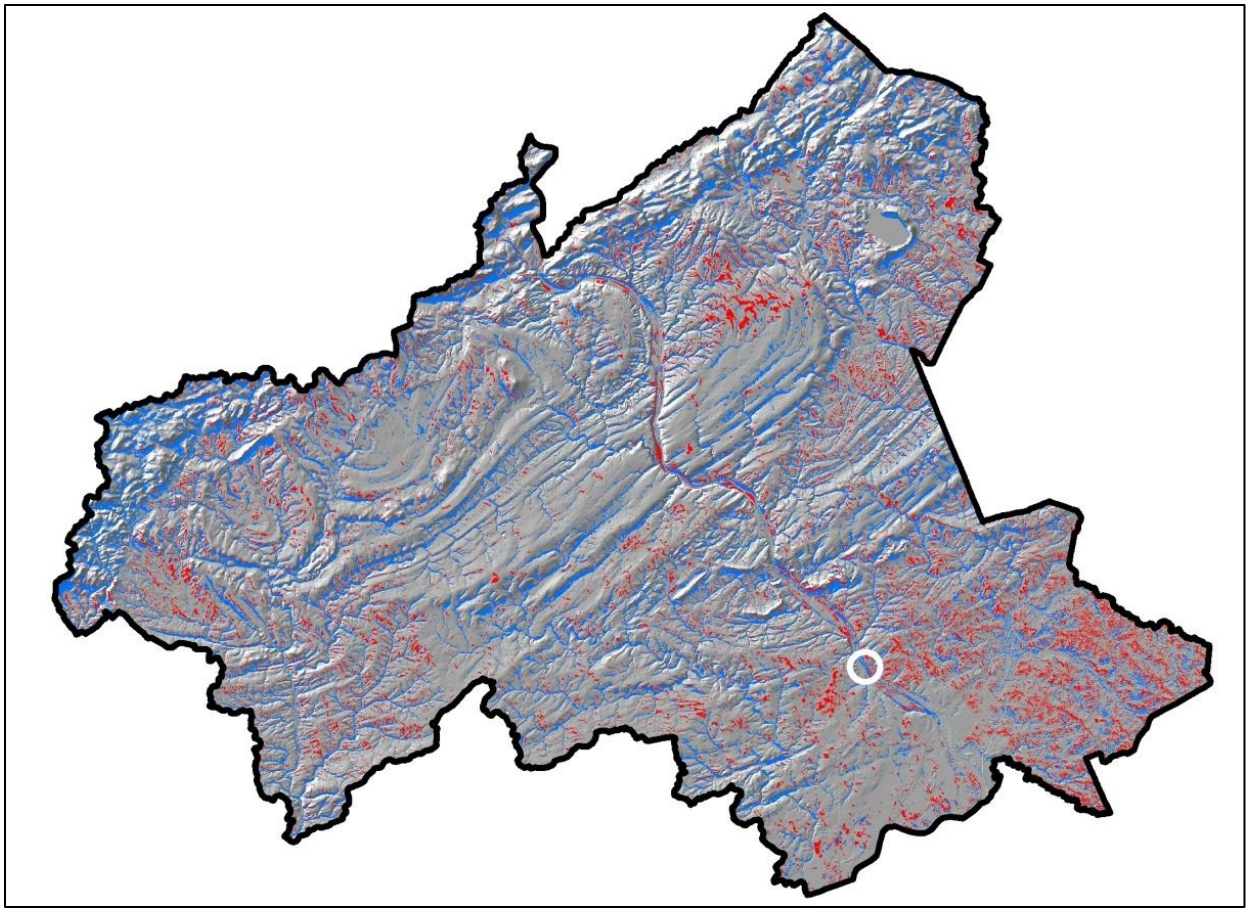

Figure 7-16. Preferred White-tailed Deer Habitat: Fall (red), Winter/Spring (blue). APE indicated by white circle (1:800,000).

7.1.3 Analysis of Site Locations

Late Woodland Period

A total of 135 Late Woodland archaeological sites were analyzed in the study region (Figure 7-17). Based on the premise that sedentary/semi-sedentary macroband base camps would be intentionally located in areas where economically valued plant resources were both dense and diverse throughout much of the year, the Late Woodland sites within each cluster were divided into two groups: potential macroband base camps; and potential microband base camps/resource procurement sites. When compared to other sites within the cluster, those sites occupying areas with greater than average LMRD during three or more seasons of the year were identified as potential macroband base camps. Those occupying areas with greater than average LMRD during two or fewer seasons of the year were identified as potential procurement sites or microband base camps.

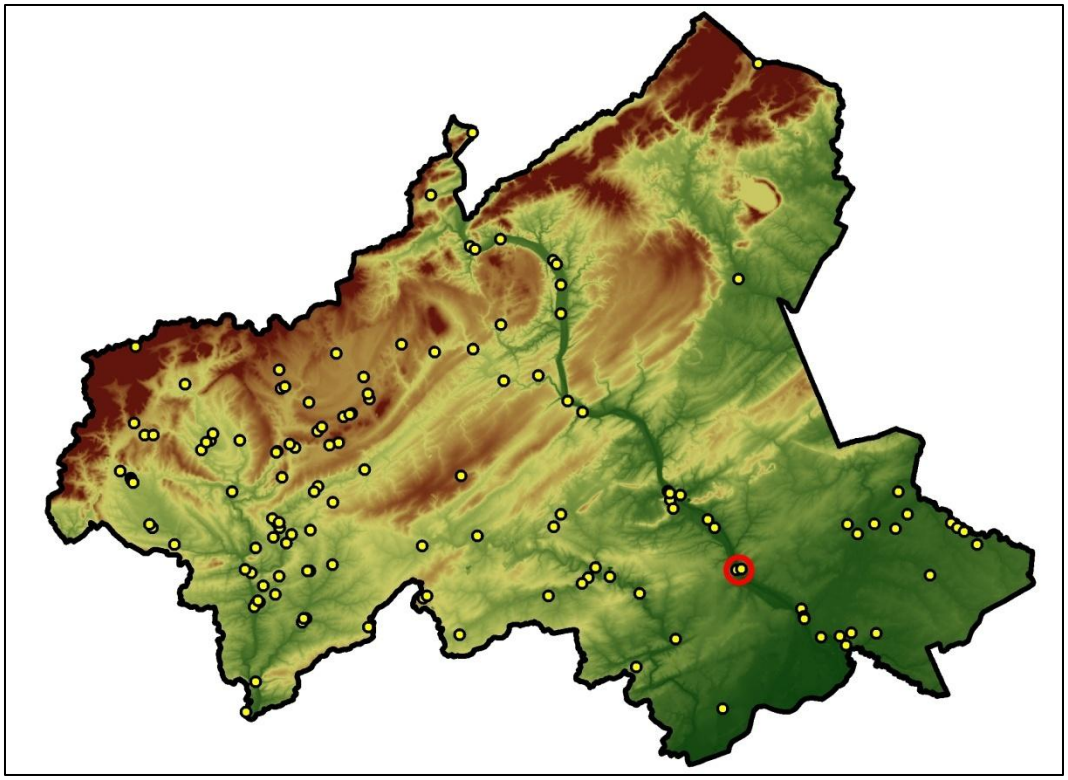

Figure 7-17. Distribution of Late Woodland Sites (yellow).
APE indicated by red circle (1:800,000).

Out of the 135 Late Woodland Sites analyzed 59 were identified as potential macroband base camps and 76 as microband camps/procurement sites based on the seasonal availability of resources. In order to test the validity of the concept that the previously defined spatial clusters represent related networks of sites within defined territories, Thiessen Polygons were constructed using the ESRI Create Thiessen Polygons analysis tool around each macroband base camp site under the assumption that base camps would represent central locations within a group's home range. The borders of adjacent polygons derived from macroband base camps in the same cluster were dissolved to create composite territories (Figure 7-18; Table 7-5). In most cases the clusters defined using all the sites (N=135) correspond well to the hypothetical territories built around the macroband base camps. The association between clusters and modeled territories seems particularly robust in the western portion of the study region but is less clear in the east specifically with regard to Clusters 1 and 4.

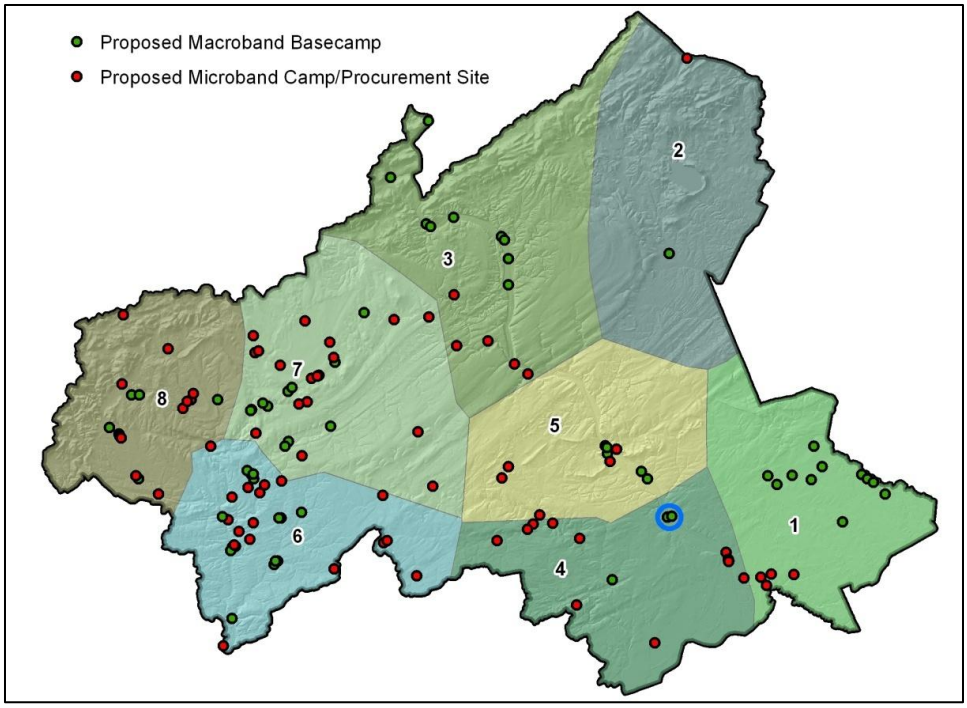

Figure 7-18. Distribution of Clusters with Respect to Modeled Territories. APE indicated by blue circle (1:800,000).

Table 7-5. Summary of Modeled Territories**.**

Cluster	Macroband Base Camp Sites	Microband Base Camp/ Procurement Sites	Estimated Late Woodland Population[4]	Late Woodland Deer Population[5]	Late Woodland Bear Population[6]	Modeled Territory Size
1	11	4	177	3672	4	459 km^2
2	1	1	242	5016	5	627 km^2
3	9	5	262	5448	5	681 km^2
4	3	12	185	3840	4	480 km^2
5	5	4	180	3736	4	467 km^2
6	14	19	167	3456	3	432 km^2
7	11	18	242	5016	5	627 km^2
8	5	12	162	3360	3	420 km^2

The distribution of modeled site types in Cluster 1 (Figure 7-18) appears problematic. As can be seen in Clusters 3, 4 and 5, within each cluster those sites located on the Delaware River typically are among the most resource dense/diverse throughout the year. The contradiction of this pattern seen in cluster 1 likely has arisen from substantial data gaps in the resource models at the location of the city of Trenton (Figures 7-7 through 7-14). This distortion likely affects the extent of the proposed territories for Clusters 4 and 5 as well. An alternate territory model is presented in Figure 7-19 in which the Delaware River sites in Cluster 1 are characterized as macroband camps and cluster 1 inland sites as microband camps or resource procurement sites.

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[4] **Based on Kraft and Mounier (1982: 139) and Kraft (1986: 156).**
[5] **Based on Whitmer and DeCalesta (1991: 131).**
[6] **Based on Ohio Division of Wildlife Publication 378 (R905) (n.d.: 2).**

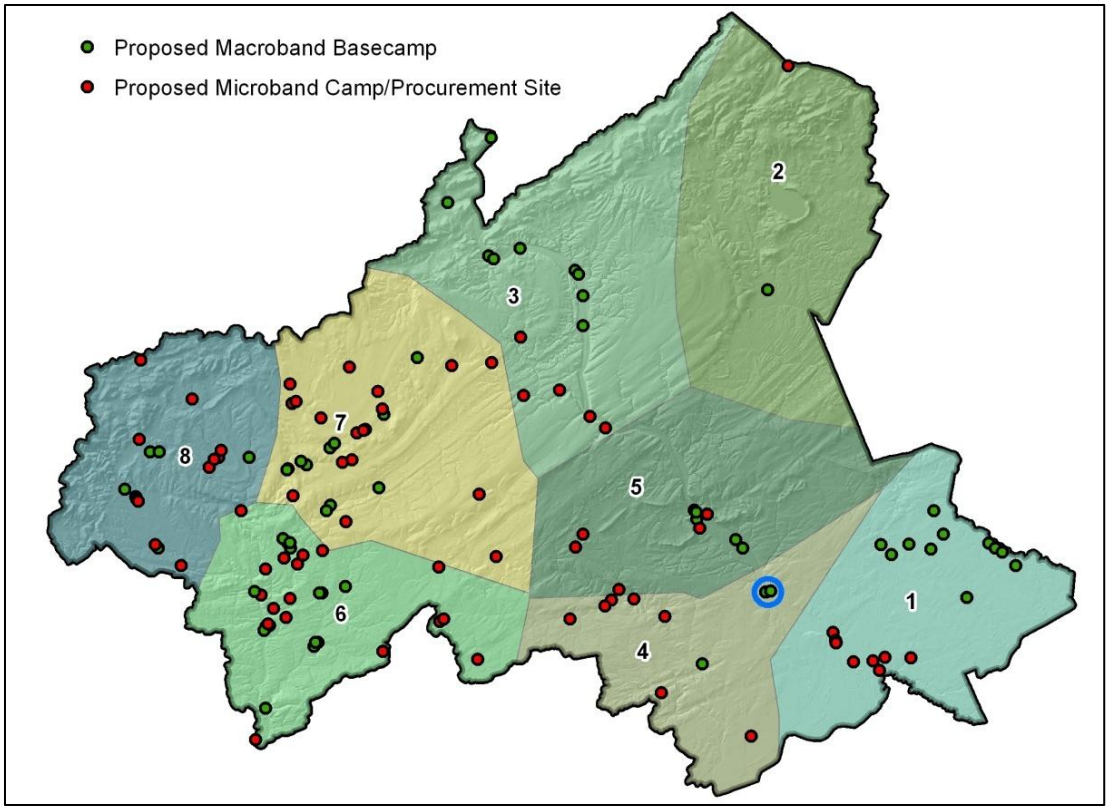

Figure 7-19. Distribution of Clusters with Respect to Alternate Modeled Territories. APE indicated by blue circle (1:800,000).

In the alternate territory model the size and configuration of Clusters 3, 6, 7 and 8 remain unchanged; however the territory assigned to the Cluster 4 sites takes on a dubious shape. Additionally the territory associated with the Cluster 5 sites expands while that associated with the Cluster 4 sites is significantly reduced (Table 7-6). It also appears likely that many of the sites assigned to Cluster 4 share territorial associations with sites in Cluster 5 or Cluster 1. In any case, for the purposes of this analysis the Cluster 4 sites and territory will be maintained as a discrete area of analysis. Because of the previously stated issues regarding Cluster 1, the Cluster 1 sites and territory will be excluded from further analysis. Likewise, the Cluster 2 sites and associated territory will be omitted from further analysis because of the low number of Late Woodland sites identified (n=2).

Table 7-6. Revised Modeled Territories.

Cluster	Macroband Base Camp Sites	Microband Base Camp/ Procurement Sites	Estimated Late Woodland Population	Late Woodland Deer Population	Late Woodland Bear Population	Modeled Territory Size
4	3	7	151	3136	3	392 km^2
5	5	5	204	4232	4	529 km^2

In Clusters 3-8, 47 sites were assigned to the semi-sedentary macroband base camp category (Table 7-7) based on their location in areas of higher than average MRD for three or more seasons of the year. As can be seen below (Table 7-7) assignment based on resource availability

appears to encompass too large a variety of sites when archaeological data are considered when assigning sites to functional types.

Table 7-7. Characteristics of Late Woodland Semisedentary Macroband Basecamps based on LMRD.

ID	Name (Description)	Ceramics	Tools	Debitage	Features	High Winter LMRD	High Spring LMRD	High Summer LMRD	High Fall LMRD
28-HU-14	Milford/Kerr					+	+	+	+
28-HU-15	Williamson	+	+	+	+	+	+	+	+
36BK0677	Swamp Creek		+	+		+	+	+	+
36BK0681	Niantic #1-3		+	+		+	+	+	+
36BU0001	Diehl Site	+	+	+		+	+	+	+
36BU0005	Overpeck	+	+	+	+	+	+	+	+
36BU0008	Kings Orchard Rockshelter	+	+	+		+	+	+	+
36BU0015	Perkiomen Creek		+			+	+	+	-
36BU0016	Washington Crossing		+	+		+	+	+	-
36BU0036	Butter Creek Rockshelter	+	+	+		+	+	+	+
36BU0038	Twin Lows Rockshelter	+	+	+		+	+	+	+
36BU0040	Spring Run Rockshelter		+			+	+	+	+
36BU0062	Roudensbush Site		+	+		+	+	+	+
36BU0071	Camp Rockhill Rockshelter	+	+	+		+	+	+	+
36BU0118	<no name>	+	+	+	+	+	+	+	+
36BU0149	Gruber #5 (Quarry)					+	-	+	+
36BU0154	Gruber #4 (Quarry)	+	+	+	+	+	+	+	+
36BU0161	Margo	+	+	+		+	+	+	+
36BU0187	Project Area B		+	+	+	+	+	+	+
36BU0201	Core Creek (Lithic Reduction)			+		+	+	+	+
36BU0262	Uhlerstown #3		+		+	+	+	+	+
36BU0407	Maintenance Facility		+	+	+	+	+	+	+
36BU379	1509 River Road	+	+	+	+	+	+	+	+
36MG0006	Arcola Road		+	+		+	-	+	+
36MG0019	Unami Creek Rockshelter	+	+	+		+	+	+	+
36MG0076	Camp Hart Rockshelter	+	+	+	+	+	+	+	+
36MG0090	Barndt Site	[7]	+	+		+	+	+	+
36MG0095	Skippack #1		+	+		+	+	+	+
36MG0098	Sheck #1					+	+	+	+
36MG0117	Rising Sun		+	+		+	+	+	+
36MG0125	Vernfield Bridge		+	+		+	+	+	+
36MG0126	Berghys Bridge		+	+		+	+	+	+
36MG0127	Thompson Road		+	+		+	+	+	+

[7] **Steatite bowl fragments.**

ID	Name (Description)	Ceramics	Tools	Debitage	Features	High Winter LMRD	High Spring LMRD	High Summer LMRD	High Fall LMRD
36MG0132	Pennypacker Mills		+	+		+	+	+	+
36MG0149	Locus 15		+	+		+	+	+	+
36MG0161	Locus 14	+		+		+	+	+	+
36MG0212	Heckler #1		+	+		+	+	-	+
36MG0213	Heckler #2		+	+		+	+	+	+
36MG0220	Graterford Prison #2					-	+	+	+
36MG0227	<no name>		+	+		+	+	+	+
36MG0253	Niantic #4-5		+	+		+	+	+	+
36MG0352	Stoney Run		+	+		+	+	+	+
36MG0424	Tom Moyer		+			+	+	+	+
36MG0432	Wambold		+			+	+	+	+
36NM0080	Bachman		+	+		+	+	+	+
36NM0138	Koch		+	+		+	+	+	+
28ME0360	Reeders Creek West	+	+	+	+	+	+	+	+

Although 47 sites initially were assigned to the macroband base camp category, archaeological site attributes identified in New Jersey State Museum records, PASS forms and a cursory literature search (Custer 1986; Kraft 1986) indicate that only nine can likely be ascribed that function:

1. Williamson Site (28HU0015)
2. Diehl Site (36BU0001)
3. Overpeck Site (36BU0005)
4. 36BU0118
5. Gruber #4 (36BU0154)
6. Margo (36BU0161)
7. 1509 River Road (36BU0379)
8. Locus 14 (36MG0161)
9. **Reeders Creek West (28ME0360)**

Of those sites assigned to the microband camp/procurement site category, those not specifically described as quarries or rockshelters are summarized below (Table 7-8). Despite their location in apparently marginal settings with respect to seasonal mean resource density, two additional sites can be identified as potential macroband base camps:

10. Sweet Water (36BU0057)
11. Price (36MG0085)

Table 7-8. Characteristics of Microband Camps/Procurement Sites based on LMRD.

ID	Name	Ceramics	Tools	Debitage	Features	Winter	Spring	Summer	Fall
36BK0728	Bally		+			-	+	-	-
36BU0009	Keller Road		+			-	-	-	-
36BU0012	Featherbed Hill		+	+		-	-	-	-
36BU0020	Vermuhlen	+	+	+		-	-	-	-
36BU0023	Lower Black Eddy		+	+	+				
36BU0052	Chain Bridge Site 1	+	+	+		-	+	-	-
36BU0054	School House Bend		+	+		-	-	-	-
36BU0057	Sweet Water (Sweetwater)	+	+	+	+	-	-	-	-
36BU0061	BCCC Site		+	+		+	+	-	-
36BU0079	Snyder Farm	+	+	+		-	-	-	-
36BU0082	Wentz Farm		+			-	-	-	-
36BU0088	Pasquale Farm		+	+		-	-	-	-
36BU0089	Idle Hour Dairy		+	+		-	-	-	-
36BU0091	Schaffer Farm		+			-	-	-	-
36BU0131	Pipersville (Randt's Mill)		+	+		-	-	-	-
36BU0180	Haines Open Air	+	+	+		-	+	-	-
36BU0193	Farmers Daughter		+	+		-	-	-	-
36BU0208	Ripley Whistle Stop		+	+	+	-	-	-	-
36BU0258	Hafler		+	+		+	+	-	-
36BU0269	Jericho East			+		-	+	-	-
36BU0281	Stadler		+			-	-	-	-
36BU0287	River Road #2	+		+		+	+	-	-
36BU0346	Bristol Twp. Complex		+	+		-	-	+	+
36BU0385	Buckingham Forest Locus F		+	+		-	-	-	-
36MG0003	<no name>				+	-	-	-	-
36MG0049	Perkiomen Heights I		+			-	+	-	-

ID	Name	Ceramics	Tools	Debitage	Features	Winter	Spring	Summer	Fall
36MG0051	Pennsburg II	+	+			-	-	-	-
36MG0053	Pennsburg IV	[8]	+			-	-	-	-
36MG0085	Price	+	+	+	+	-	-	-	-
36MG0094	Clemmers Mill		+	+		+	-	-	-
36MG0099	Sheck 2					-	-	+	+
36MG0122	XK1		+	+		-	-	+	+
36MG0123	Garges		+	+		-	-	-	-
36MG0124	Goods Field		+	+		-	-	-	-
36MG0129	Pennypacker Mills			+		-	-	+	-
36MG0221	Graterford Prison #3		+	+		-	-	+	+
36MG0223	Graterford Prison #4		+			-	-	+	-
36MG0224	A		+	+		-	-	-	-
36MG0228	<no name>		+	+		-	-	+	+
36MG0248	Fagleysville Road		+	+		+	+	-	-
36MG0249	Schlengle Road #1		+	+		-	-	-	+
36MG0250	Schlengle Road #2		+	+		-	-	-	+
36MG0251	Schlengle Road #3		+	+		-	-	-	+
36MG0254	Hughes		+	+		-	-	-	-
36MG0295	Prehistoric Site 13		+			-	+	-	-
36MG0297	Prehistoric Site 15		+	+		+	+	-	-
36MG0330	Wentz 2					-	-	+	+
36MG0390	Lederach Golf Course Area D		+	+		-	-	-	-
36MG0398	Warren Long		+			-	-	-	-
36MG0420	Witacher		+	+		-	-	-	-
36MG0447	Graterford Prison #9		+	+		-	-	-	-

[8] **Steatite bowl fragments.**

The eight Delaware River macroband camps lie within the river's wide floodplain on well- to moderately well-drained middle slopes, lower slopes and bottomlands (Figure 7-19). Each is located within 500 m of tributary perennial and seasonal streams draining the adjacent uplands. All are located adjacent to attractive winter-fall season deer yarding areas. Based on proximity to substantial areas of preferred habitat, as a whole these camps had immediate (within 1 km) access to a variety of economically useful plant species throughout the year (Table 7-9). Additionally, during the spring the middle Delaware River would have provided access to spawning American shad (*Alosa sapidissima*), hickory shad (*Alosa mediocris*), striped bass (*Morone saxatilis*) and migratory sea lampreys (*Petromyzon marinus*) while the nearby perennial streams could be fished for migratory eels (*Anguilla rostrata*) and spawning brook trout (*Salvelinus fontinalis*) during the fall. Additionally, local waterways would have provided year-round access to a number of non-migratory fishes including catfish (Ictaluridae), suckers (Catostomidae), pikes (Esocidae), perches (Percidae), temperate basses (Moronidae), sunfishes (Centrarchidae) and large minnows (Cyprinidae) like the river chub (*Nocomis micropogon*) and golden shiner (*Notemigonus crysoleucus*) which can grow up to 9 in (length) (PAFBC 2012).

Table 7-9. Locally (within 1 km) Available Plant Resources.

Scientific Name	Common Name	Delaware River Base Camps	Skippack and Indian Creeks Base Camps	Neshaminy Creek Base Camp
Acer rubrum	red maple	x	x	x
Acer saccharum	sugar maple	x	x	x
Allium candense	wild onion	x	x	x
Amelanchier arborea	smooth serviceberry	x	x	x
Amphicarpaea bracteata	American hog peanut	x	x	x
Apios americana	groundnut			
Carya cordiformis	bitternut hickory	x	x	x
Carya glabra	pignut hickory		x	
Carya ovata	shagbark hickory			
Carya tomentosa	mockernut hickory	x	x	
Castanea dentata	American chestnut	x	x	
Claytonia viginica	spring beauty	x	x	x
Corylus americana	American hazelnut			
Corylus cornuta	beaked hazelnut			
Fagus grandifolia	American beech			
Fragaria vesca	woodland strawberry		x	x
Fragaria virginiana	wild strawberry		x	
Gaylussacia baccata	black huckleberry	x	x	x
Juglans cinerea	butternut			
Juglans nigra	black walnut	x	x	x
Matteuccia struthiopteris	ostrich fern		x	
Morus rubra	red mulberry			

Scientific Name (con't)	Common Name	Delaware River Base Camps	Skippack and Indian Creeks Base Camps	Neshaminy Creek Base Camp
Nuphar lutea	cow lily (yellow pond-lily)		x	
Onoclea sensibilis	sensitive fern		x	
Pinus strobus	eastern white pine	x	x	x
Podophyllum peltatum	May apple			
Polygonatum biflorum	Solomon's seal			
Prunus serotina	black cherry	x	x	
Prunus virginiana	choke cherry			
Quercus alba	white oak	x	x	
Quercus prinus	chestnut oak			
Quercus rubra	red oak	x	x	
Quercus velutina	black oak	x	x	x
Ribes rotundifolium	wild gooseberry			
Rubus canadensis	smooth blackberry	x	x	x
Rubus hispidus	swamp dewberry		x	
Rubus occidentalis	black raspberry			
Rubus pensilvanicus	blackberry		x	
Rubus pubescens	dwarf blackberry	x	x	x
Sambucus canadensis	common elderberry		x	x
Schoenoplectus tibernaemontani, Typha latifolia	softstem bulrush and cattail		x	
Smilax Rotundifolia	common greenbrier	x	x	x
Tsuga candensis	eastern hemlock	x	x	x
Ulmus rubra	red (slippery) elm	x	x	x
Vaccinium angustifolium	low sweet blueberry	x	x	x
Vaccinium corymbosum	high bush blueberry	x		x
Vaccinium pallidum	low bush blueberry		x	
Vaccinium stamineum	deer berry		x	
Viburnum lentago	sheep berry	x	x	
Viburnum trilobum	high bush cranberry	x	x	x
Vitis aestivalis	summer grape	x	x	x
Vitis labrusca	fox grape		x	

Based on archaeological data, seven sites were identified as microband camps (Figure 7-19). Sites were identified based on the recorded presence of ceramics, debitage and chipped stone tools without the identification of associated features likely indicative of relatively short term or seasonal occupation. All are located in moderately-well to poorly drained lower slopes and bottomlands. Five sites are located north of Rock Hill and the East Branch of Perkiomen Creek and are associated with riparian settings and substantial areas of freshwater wetland along Tohickon and Perkiomen Creeks. The two microband camps identified south of Rock Hill and the East Branch of Perkiomen Creek lack clear associations with freshwater wetlands however both are located in riparian settings. On the Delaware River, 36BU287 is located on a moderately well drained bottomland at the confluence of Paunnacussing Creek and the Delaware River northeast of Plumstead Hill and opposite Bulls (Pannacussing) Island. The locally steep terrain and narrow Delaware River floodplain limits the development of wetland habitats at this location. On Neshaminy Creek, 36BU0052 is located on a moderately well drained bottomland at the confluence of Neshaminy Creek and an unnamed tributary with somewhat limited immediate access to wetland resources. Three of the sites (36BU0052, 36BU0180 and 36BU0287) seem particularly well suited to winter-spring occupation based on the relative abundance of seasonally available plant resources at these locations including American hog peanut, eastern hemlock, eastern white pine, common greenbrier, red maple, red elm, sheep berry, dwarf blackberry, spring beauty and wild onion. All are also located adjacent to attractive winter-fall season deer yarding areas although deer remains have not been reported at these sites.

Sixty-seven sites have been identified as resource procurement sites based on the reported presence of stone tools and debitage at these locations and the absence of either ceramics or associated features. Forty-nine were identified as general resource procurement sites with little evidence for seasonality, eight were identified as summer-fall procurement sites due to relatively abundant warm weather plant resources at these locations and 10 were identified as winter-spring procurement sites due to relatively abundant cold weather plant resources at these locations. Procurement sites are almost universally located in bottomland and lower slope settings and soil drainage can vary considerably ranging from well to poorly drained. All are found in or near to riparian settings at stream headwaters, trunks and confluences. North of Rock Hill and the East Branch of Perkiomen Creek, many procurement sites are associated with extensive areas of freshwater wetlands. Many appear to cluster near identified macroband base camps especially in the southern portion of the Delaware River valley and around the Indian and Skippack Creek macroband camps. Not surprisingly these sites are not associated with a consistent range of available plant resources, physiographic settings or faunal habitats.

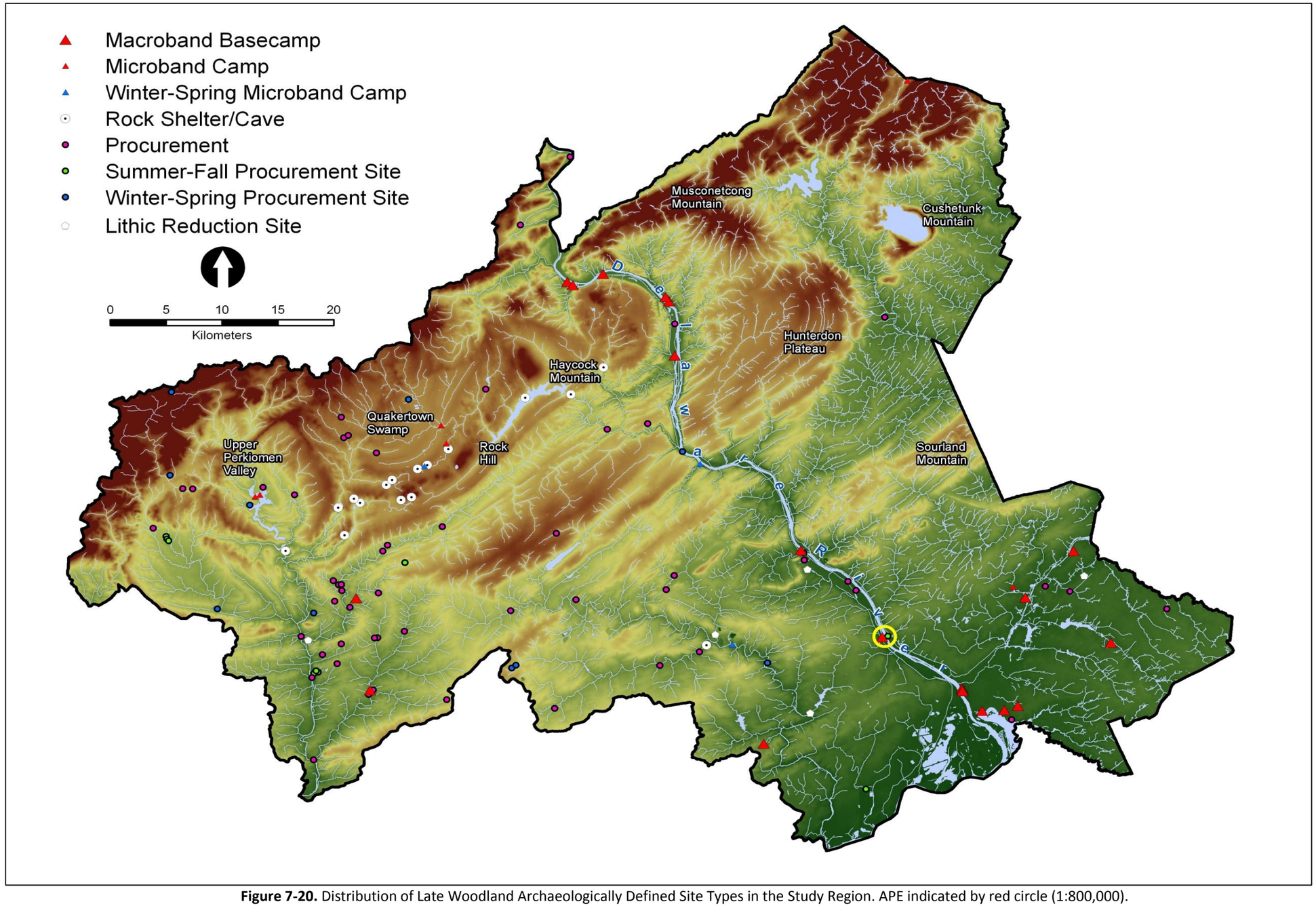

Figure 7-20. Distribution of Late Woodland Archaeologically Defined Site Types in the Study Region. APE indicated by red circle (1:800,000).

7.2 Proposed Settlement Systems

7.2.1 Late Woodland Period

Two distinct Late Woodland settlement-subsistence systems are proposed for sites focused on the Middle Delaware River floodplain and those located on interior river systems (Figure 7-20). Because of the scarcity of sites identified in the southeastern portion of the study region as well as the previously identified data quality issues it is unclear whether the Neshaminy Creek macroband base camp operated under a subsistence settlement system similar to sites focused on the Middle Delaware River floodplain or rather those focused on smaller interior drainages. Additionally, the scarcity of firmly dateable interior sites in relatively undeveloped areas of New Jersey leave the applicability of the suggested models in doubt with respect to settlement dynamics east of the Delaware River floodplain.

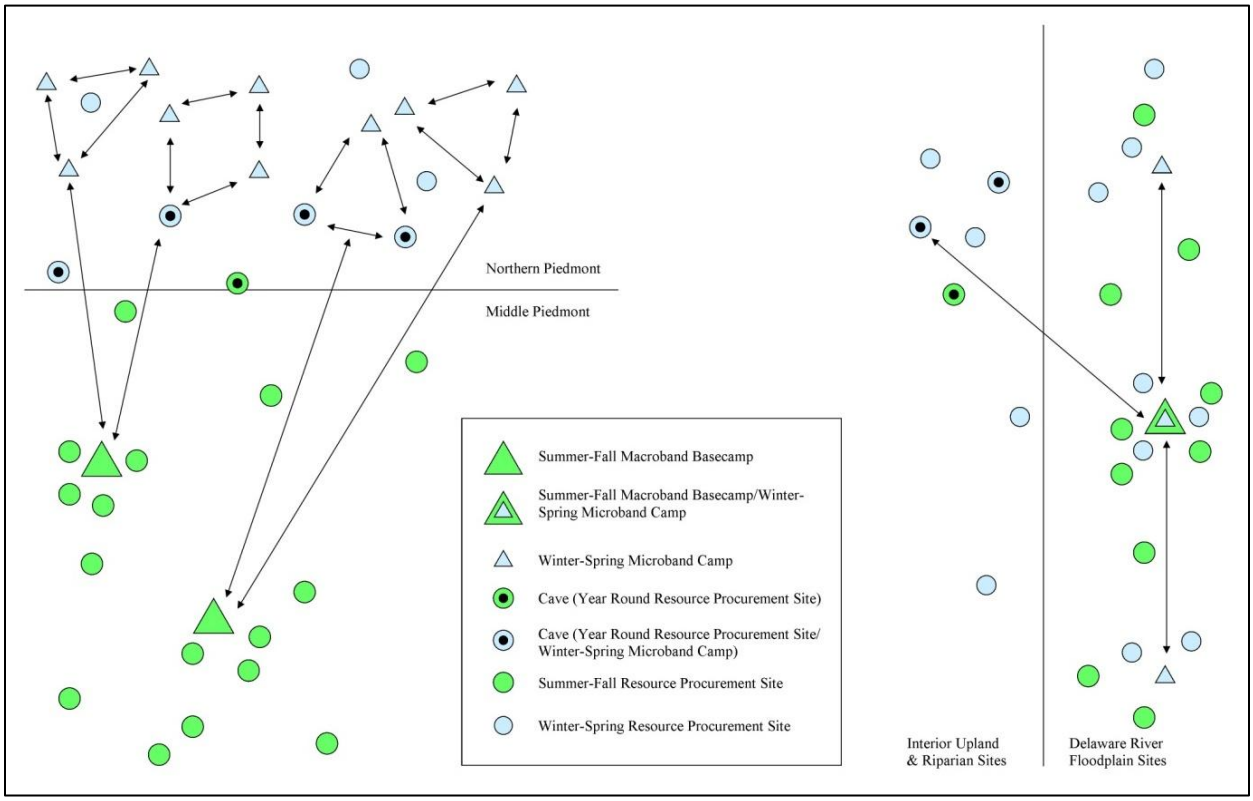

Figure 7-21. Proposed Settlement Models for the Skippack Creek/Indian Creek Macroband Base Camps (l) and the Delaware River Base Camps (r).

During the summer subsistence efforts likely focused on seasonally abundant concentrations of summer grape (*Vitis aestivalis*) and berries (*Viburnum*, *Vaccinium* and *Rubus* spp.) supplemented by non-migratory fish, small game and the infrequent black bear encountered foraging for soft mast species. During the fall, subsistence would have shifted to the abundant anadromous (brook trout) and catadromous (eel) fish species spawning in nearby perennial streams as well as locally available nut and acorn producing species, particularly pignut, bitternut and mockernut hickory (*Carya* spp.); red, black and white oak (*Quercus* spp.); black walnut (*Juglans nigra*) and American chestnut (*Castanea dentata*) supplemented by small game and infrequent deer and bear encountered foraging for hard mast. During summer and fall the area surrounding the

macroband camp was extensively exploited by means of short distance (<8.0 km) short duration trips made to diverse upstream and downstream procurement sites as well as sites in adjacent watersheds to acquire immediately unavailable or temporarily depleted but otherwise locally available resources such as berries, nuts, and large game animals. During the winter, foraging expeditions to resource procurement sites likely targeted seasonally available and relatively abundant species like common greenbrier, eastern hemlock, American hog peanut and red maple as well as cow lily and great bulrush/cattail. As scarce winter resources became depleted locally microband camps likely moved relatively frequently. Progressing into spring, a diet based on dwindling winter-season plant resources and increasingly wary and dispersed deer herds would have been supplemented with the emergent shoots and buds of various species (*Matteuccia struthiopteris*, *Onoclea sensibilis*, *Claytonia virginica*, *Rubus* spp., *Allium canadense*) and bark (*Tsuga canadensis*, *Ulmus rubra*, *Pinus strobus*). By mid-spring, populations would have then returned to the macroband base camps in the middle piedmont to prepare for the appearance of spawning hickory shad (*Alosa mediocris*).

With regard to settlements on the Middle Delaware River floodplain the settlement-subsistence strategy appears to have been concentrated primarily on intensive exploitation of the river's broad, rich floodplain. During the summer and fall sedentary macroband base camps were located on moderately well- to well-drained lower slopes and bottomlands in the Delaware River floodplain. There access to a diversity of riparian habitats was assured by close proximity to seasonal drainages, perennial streams and the Delaware River. Unlike the interior macroband base camps, access to palustrine resources was highly variable with some macroband base camps enjoying immediate access to freshwater wetlands along the Delaware River (28HU0015) while others lay more than 2 km from even modestly sized wetland areas (36BU0001and 36BU0118).

During the summer, subsistence activities likely concentrated on short distance (< 8.0 km) short duration foraging trips carried out within the Delaware River floodplain targeting locally abundant plant species such as wild grape (*Vitis* spp.) and berries (*Fragaria*, *Viburnum*, *Vaccinium*, *Morus* and *Rubus* spp.), black cherry (*Prunus serotina*) and may apple (*Podophyllum peltatum*). These plant foods were supplemented with non-migratory fish species, small game and the infrequent black bear encountered foraging for soft mast. Deer, widely dispersed over the landscape during the summer would likely have played a very infrequent subsistence role during the summer months. During the fall, subsistence would have shifted its focus to migratory fish species including brook trout and eel spawning in nearby perennial streams and to the exploitation of a broad variety of locally abundant nut and acorn producing tree species particularly pignut, bitternut, mockernut and shagbark hickory (*Carya* spp.); red, white and black oak (*Quercus* spp.); butternut and black walnut (*Juglans* spp.); American beech (*Fagus grandifolia*), American hazelnut (*Corlyus americana*) and American chestnut (*Castanea dentata*). This fall diet would have been supplemented with small game and occasionally deer and bear encountered foraging for hard mast.

During the winter some degree of group fragmentation seems to have been the response to seasonal reductions in food availability. While seasonal transhumance was employed as an adaptive strategy by the Late Woodland inhabitants of the Indian and Skippack Creek macroband camps, the winter-fall open-air microband camps established by Delaware River populations apparently remained within the river's wide floodplain. Immediately accessible plant resources

included sheepberry, eastern hemlock, common greenbrier, Solomon seal, groundnut, American hog peanut, red maple, sugar maple and wild onion; short duration forays into the uplands and perennial drainages would have added soft stem bulrush/cattail and cow lily to the winter diet. Given the broad range of winter-season plant resources immediately available to microband camps in the Middle Delaware River floodplain and the apparent absence of open-air microband camps in the adjacent uplands (cave/rockshelter sites excepting) it seems possible that group fission and migration to microband camps may have dispersed populations to sufficiently low densities that the rich floodplain environment supported semi-sedentary winter-spring microband base camps reproducing the structure and function of the summer-fall macroband basecamps on a smaller more dispersed scale. With the arrival of spring dwindling supplies of winter plant foods would have been supplemented with the emergent shoots and buds of various species (*Claytonia virginica*, *Rubus* spp., *Allium canadense*, etc.) and bark (*Tsuga Canadensis* and *Pinus strobus*). White-tailed deer were likely hunted during the winter and early spring in their yarding areas along perennial streams. As discussed previously, individual cave/rockshelter sites overlooking these yarding areas may have been utilized as resource procurement areas year round or solely as winter-fall microband camps. By mid-spring populations would have congregated once again at the Middle Delaware River floodplain macroband sites to harvest the numerous anadromous fish species spawning in the Delaware River including the American shad (*Alosa sapidissima*), the hickory shad (*Alosa merdiocris*) and the striped bass (*Morone saxatilis*).

How do we interpret the RCW Site in these proposed systems? As discussed above, modeling of site location relative to resource abundance and diversity suggests that it functioned as macroband base camp (Table 7-7). However, there is an abundance of evidence from RCW that the site was occupied at other times, and for other purposes not consistent with the seasonality or activities associated with macroband camps. Does this fact invalidate the model? No, it merely reminds us that it is a model – an abstraction of reality – and that it needs to be regarded and used as such.

The settlement system proposed for the Middle Delaware River predicts both macro and micro band camps within the river's floodplain but it does not assign exclusivity for any one location for either site type. The archaeological evidence from RCW and model predictions are in fact in agreement that this location was occupied at different times during the Late Archaic through Late Woodland periods by different elements of the settlement system. This informs us that the model cannot be used *a prioi* to determine what type of site may be found at a given locality within a given physiographic setting and with given resource base. It should be used to predict what type(s) of site(s) may be found in that setting, but 'ground truthing' through archaeological sampling is required to confirm how that physical location was utilized over time, even within a single temporal period. This fact speaks to the flexibility of a settlement system that permits the use of space by human groups of variable size and composition at different times for different extractive (and undoubtedly other social) purposes.

7.2.2 Early/Middle Woodland Period

In general, the subsistence-settlement patterns for the Early and Middle Woodland periods appear qualitatively very similar to those seen during the Late Woodland Period although the total number of sites identified is much lower for these time periods (Figures 7-21 and 7-22). Two distinct settlement systems are apparent, one focused on the Middle Delaware River

floodplain during the Early and Middle Woodland and another associated with a macroband base camp (36MG0085) on Indian Creek during the Middle Woodland and a macroband base camp (36MG0220-Graterford Prision#2) located on Perkiomen Creek during the Early Woodland.

As during the Late Woodland, microband camps appear restricted to the northern piedmont area around Quakertown Swamp, the exception being two microband camps (36BU0164 and 36BU0368) identified in the southern portion of the study region during the Middle Woodland on Newtown Creek and Neshaminy Creek respectively. These two microband camps may be associated with a less intense winter-spring utilization of the Delaware River floodplain before the Late Woodland or perhaps are associated with the ill-defined system of settlements on Neshaminy Creek identified for the Late Woodland period. In contrast to both the Middle and Late Woodland Periods, during the Early Woodland, there is less evidence for the intensive winter season exploitation of the large freshwater marshes of the northern piedmont.

During the Early and Middle Woodland periods, the subsistence-settlement systems employed appear nearly identical to those of the Late Woodland. Those groups with territories centered on relatively smaller drainages like Indian and Perkiomen Creeks likely lived in semi-sedentary macroband base camps during the summer-fall season making regular short distance trips to upstream and downstream procurement sites as well as adjacent drainages to exploit a variety of resource habitats. During the winter-spring season group fission and relocation served as a response to seasonally reduced resource availability. Although evidence is scanty for the Early Woodland Period, by the Middle Woodland winter-spring exploitation of the extensive freshwater swamps of the northern piedmont is clearly established. Cave sites likely played a similar role as in later time periods some acting as temporary year-round resource procurement sites and others as winter-spring microband camps.

For those settlements focused on the Delaware River the arguments for formal continuity of settlement throughout the Woodland Period are more tenuous due to a substantial reduction in the number of identified sites in the floodplain during the Early and Middle Woodland periods, specifically sites identified as microband camps. Nonetheless the distribution of macroband camps and procurement sites during the Early and Middle Woodland Periods is identical to their Late Woodland distribution. The Delaware River floodplain appears to have remained the focus of both settlement and subsistence throughout the Woodland Period with only limited utilization/occupation of interior upland and riparian habitats.

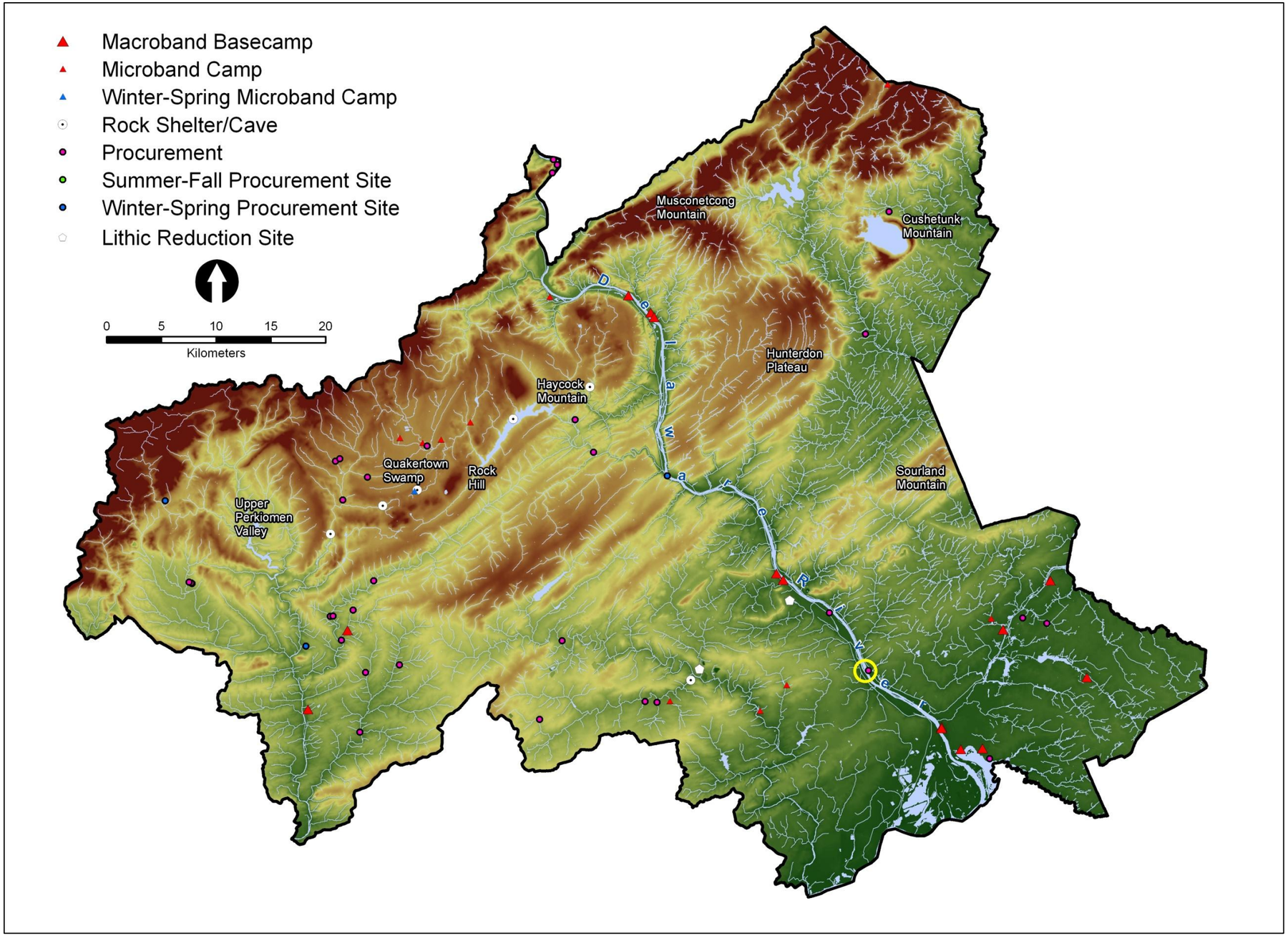

Figure 7-22. Distribution of Middle Woodland Archaeologically Defined Site Types in the Study Region. APE indicated by yellow circle.

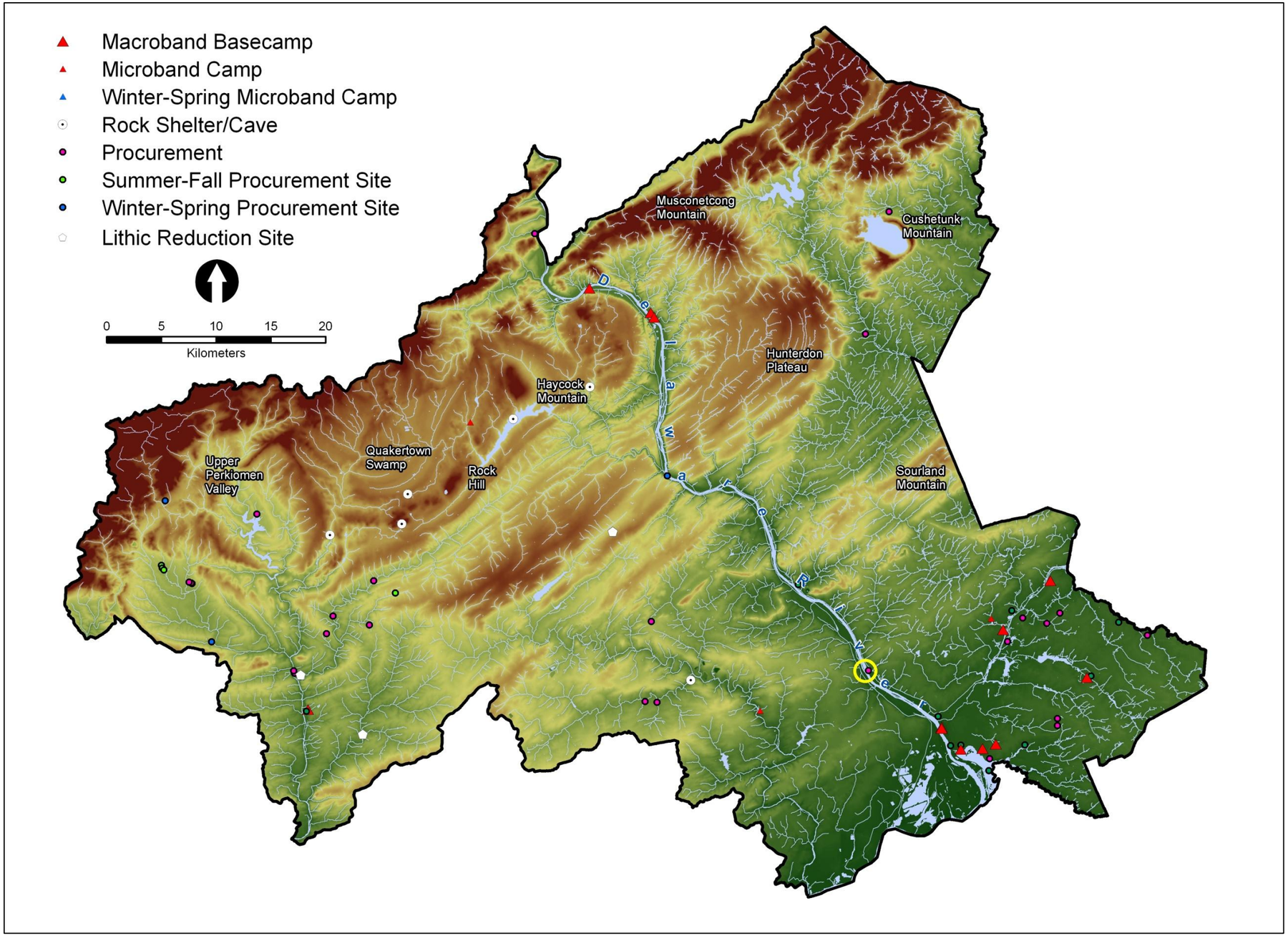

Figure 7-23. Distribution of Early Woodland Archaeologically Defined Site Types in the Study Region. APE indicated by yellow circle.

7.2.3 Late Archaic Period

While Woodland Period sites were divided into several type categories based on the presence or absence of features, ceramics, debitage and stone tools, the generally more numerous Late Archaic sites were divided into four categories based on slightly different criteria (Table 7-10).

Table 7-10. Late Archaic Site Types.

Late Archaic Site Type	Characteristics
Camp	Lithic debitage, chipped stone tools and/or FCR as well as one or more of the following: • ground stone tools • bannerstones • non-FCR features • gorgets • pestles • steatite vessels/fragments • grooved axes
Procurement Site	Lithic debitage, chipped stone tools and/or FCR
Lithic Reduction Site	Hammerstones and/or lithic debitage
Rock Shelter/Cave	NA

The most notable characteristic of the Late Archaic period is the marked increase in the total number of sites and a relatively high degree of exploitation of upland interfluves in the middle piedmont (Figure 7-23). In contrast to the Woodland period, the distribution of sites does not seem to support intensive exploitation of the Middle Delaware River floodplain during the Late Archaic. Rather most sites identified as camps are located along interior drainages like Perkiomen and Neshaminy Creeks in the middle piedmont and Unami and Tohickon Creeks in the northern piedmont area. Overall the pattern suggests a greater degree of mobility than is associated with the Woodland period perhaps indicative of a less generalized subsistence strategy during the Late Archaic period in which frequent population movement was necessary to target a more limited range of "acceptable" subsistence resources. Increased exploitation of the relatively unproductive middle piedmont uplands to the south and southeast of Rock Hill may indicate a greater degree of year-round reliance on large game animals particularly white-tailed deer during the Late Archaic. A strategy of year-round encounter and intercept hunting (Binford 1978) of white-tailed deer during the Late Archaic may have been replaced by intensive winter-fall intercept hunting of deer in known yarding areas during the Woodland period.

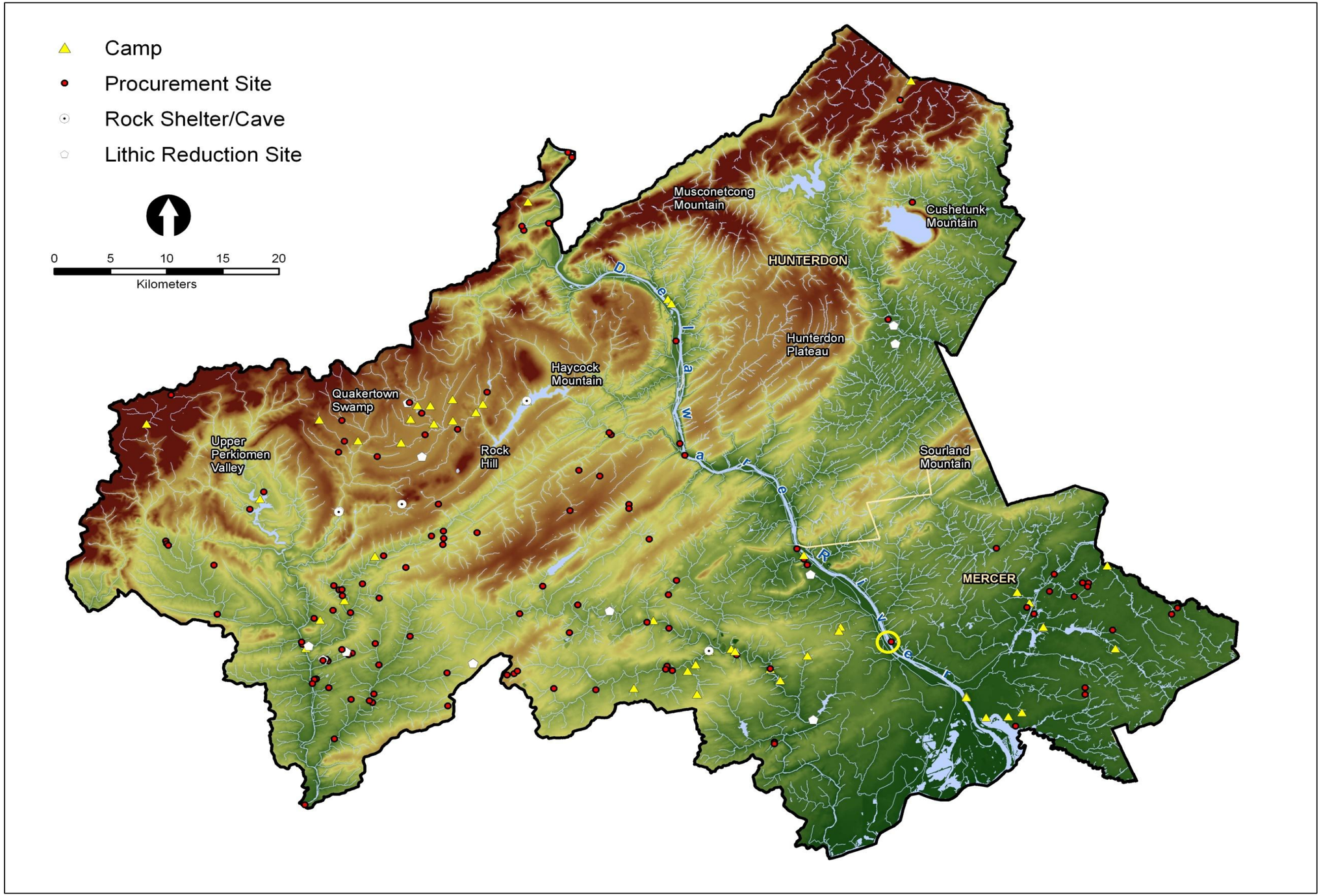

Figure 24. Distribution of Late Archaic Archaeologically Defined Site Types in the Project Area. APE indicated in by yellow circle.

7.3 Discussion

In summary, it appears that the Reeders Creek West Site (RCW) location was used at discrete periods of time and possibly for different purposes from the early Late Archaic through to the Late Woodland periods. What constituted that value and how it may have been integrated into a larger pattern of settlement and subsistence requires examination. A number of settlement pattern models have been presented for the Mid-Atlantic region that are pertinent to the present study (Custer 1984, 1989; Mounier 1985a, 1985b, 1991; Stewart 1986). Custer's (1996) most recent synthesis of southeastern Pennsylvania prehistory does not contain an explicit settlement pattern model for the Woodland Period. In earlier publications, he (Custer 1984, 1989:131, 278) presented a model for the Archaic and Woodland Periods, which is presented as generally applicable to the Mid-Atlantic region. Custer envisioned a three-tier settlement system comprised of 1) macro-band base camps, 2) micro-band base camps, and 3) procurement sites. Custer's (1984a:67) tripartite division of sites was based on criteria of site size, location, and quantity/density of artifacts and features. However, no explicit archaeological criteria for each site type was presented, and the definition of these site types rested heavily on the investigator's interpretation of site function. Custer principally used elements of a settlement system (e.g., social unit size, composition) to describe site types within his settlement pattern model. Macro-band base camps were interpreted as having been occupied by multiple family units and are located in areas of "maximum habitat overlap" (ibid.). Micro-band base camps were defined as sites occupied by a small number of individual family units. They are located in areas similar to macro-band sites, but with a reduced carrying capacity. Micro-base camps were also characterized as containing smaller quantities of artifacts in comparison to macro-band base camps (ibid.). Procurement camps were believed to be limited to a small set of activities focused on resource extraction (ibid.).

In a later article, Custer (1988:43-45) stressed the important place of large riverine base camps and multitudinous small, upland "procurement sites" in the settlement of the central Mid-Atlantic region. In Custer's (1988:45) view, small, single occupation upland sites were the result of direct forays from riverine base camps. Custer (ibid.) saw limited evidence for "staged foray" sites and "minor base camps." These site types were not adequately discussed, but it may be inferred that they functioned as intermediate types of sites between base camps and procurement sites, perhaps functioning as staging areas for procurement forays. Custer's conception of a functioning Late Archaic settlement system is directly analogous to Binford's (1980) hypothesized collector strategy for hunters/gatherers. Collectors practice a greater degree of functional specialization, where specialized task groups collect goods and materials which are brought back to central base camps for use or consumption. A collector strategy is organized in such a way that resources are moved to human settlements rather than humans moving to seasonally available resources. Foraging groups are organized by group movement from food source to food source in an annual round of movement within a given territory. A foraging strategy is marked by a higher degree of mobility where population units move to the location of resources that are to be exploited.

Other investigators employ a similar terminology that appears, superficially, to be coterminous with Custer's, but which in fact is not the same. R. Alan Mounier, working in the Inner Coastal Plain along the eastern margin of the Delaware River, has also written extensively on the subject of regional settlement patterns. In earlier reports, Mounier (1985a, b) presented a settlement

model similar to Custer's. Mounier defined "macro-band base camps" located at the confluence of major drainages of the Inner Coastal Plain with the Delaware River, "micro-band base camps" located at riverine headwaters, and "transient supply camps" located on well-drained high ground adjacent to smaller streams. This model appears to match in general terms that presented by Custer.

In more recent writings, Mounier (1991) has changed and elaborated his model, while employing many of the same terms as before. Mounier's settlement pattern model remains tripartite, with important modifications from previous models. There are "larger, more densely populated settlements" (i.e., macro-band base camps) located near reliable resource concentrations or areas of marked ecological diversity (Mounier 1991:VI-7). As in earlier models, this definition seems to imply floodplain environments along the Delaware River and its larger tributaries, but is now defined to include locations at the head of tidewater (Mounier 1991:VI-27), significantly upstream from the confluence of major river systems. A significant difference in site typologies is also introduced by the next category, "micro-band (or transient) settlements" (Mounier 1991: VI 28). These sites are found "in zones of relative ecological homogeneity" near "headwater situations and along the divides which separate river systems" (Mounier 1991: VI-27, 28). The smallest sites in the new typology are "remote, interior sites," small material manifestations left by individuals or small groups which were, at the time of occupation, oriented towards wetlands (Mounier 1991:VI-28).

The most significant change between the above model and earlier models is the conflation of the terms "micro-band" and "transient" camps, terms that had been previously used to differentiate two different site types. Micro-band or transient settlements appear to play a stronger role in Mounier's more recent model and may be found in a variety of ecological settings: tidal area, mouths of streams, and "along the divides which separate river systems" (ibid.). Apparently, areas at the head of tide could be occupied by both macro-band and micro-band camps. According to Mounier's proposed settlement system, it is assumed that micro-band/transient sites were occupied for several months during the annual subsistence round. The "transient procurement site" of previous models is now almost non-existent and now appears to play a less significant role as "remote, interior sites."

Although the settlement pattern presented by Mounier is tripartite, his proposed settlement system is comprised of two forms of band social organization. The settlement system presented by Mounier is essentially two-tiered. It includes macro-bands which were "affiliated with and comprised" of local bands and were "organized in territories that followed major river drainages" (Mounier 1991:VI-24). The composition of "micro-bands" is not well defined, and their territories were also "coextensive with major river basins, except for occasional lateral moves into neighboring drainages" (Mounier 1991:VI-23). Micro-bands apparently moved as a group, occupying areas near the mouths of streams in early spring, the head of tide and riverine headwaters during the later spring, summer, and early fall and occupying "winter base camps" [possibly macro-band camps] in the late fall (Mounier 1991:VI-24).

Although superficially similar, Custer's and Mounier's interpretation of prehistoric settlement patterns is significantly different. Focusing specifically at the lower end of site typology used by each of these investigators, the implication of Watson and Custer's model is that transient camps

were occupied for relatively short periods of time by a small number of individuals to execute a limited number of goals. This conceptualization of the transient camp contrasts sharply with that held by Mounier. Mounier visualizes micro-bands as semi-autonomous social units of one or more extended family groups with bounded territorial limits. Congregation of micro-bands into a macro-band base camp was in Mounier's model for social/ceremonial reasons as much as for purposes of subsistence (Mounier 1991:VI-23). The organization and occupation of micro-band camps was not, therefore, directed by the needs and performed by the personnel of the macro-band base. Mounier's definition of a micro-band/transient camp also implies occupation by family groups engaged in a variety of activities necessary for daily life, and by inference, it might be assumed that archaeological assemblages from sites of this type would exhibit greater variability than transient camps as defined by Custer. It may not be going too far to say that whereas Custer envisions hunter/gatherers in the Mid-Atlantic region was utilizing a collector strategy (in Binford's terms), Mounier sees them operating within the context of a foraging strategy. Again, in a foraging strategy, groups move to the location of different resources according to the logic of group size, composition, seasonality of resource availability, etc. Mounier's view of the settlement system along the Coastal Plain is more in keeping with Binford's description of a foraging economy rather than a collector economy. If Binford's characterization of hunter/gatherer subsistence and settlement strategies is correct, these are two diametrically opposed adaptive systems. From this, it follows that two principal archaeologists working in the region are interpreting the archaeological record in very different ways.

The RCW Site exhibits characteristics of being a transient camp utilized for the procurement of plant and animal resources. For this interpretation to be correct, the principal question that remains open is: where is the rest of the macroband base camp? There is no satisfying answer to this question, but several possibilities do exist. The T2 terrace closer to the river, and impacted by Route 29 Interchange construction, may have hosted the principal residential area of the site, or it may have been located slightly downstream, in the area now occupied by the existing Route 29 roadway. The archaeological evidence for transient camps seems unequivocal. Archaeological deposits identified within all four temporal components at the RCW Site conform in size, intensity and artifact assemblage to the definition of these camps as encampments of limited duration by relatively small groups of people and for limited purposes. These components at the site also fit into Mounier's (1991) view of micro-band/transient camps as having been used by small social groups engaged in a variety of activities necessary for daily life.

8.0 DATA SYNTHESIS AND INTERPRETATIONS

8.1 Site Formation Processes and Stratigraphy

The Reeders Creek West (RCW) Site was formed on a Pleistocene glacial outwash terrace on the eastern shore of the Delaware River. By the time the first Native American occupants arrived at the site during the early part of the Late Archaic period, this terrace was already a relatively high and habitable landform. Alluviation occurred at the site throughout the Late Holocene, though at a much lower rate than at the initially lower-lying western shore in Pennsylvania where the 1509 River Road Site (36Bu359) is located.

The Late Woodland occupation is present in what became the Ap2-horizon and was significantly affected by historic plowing. The Early/Middle Woodland occupation is present within the E-horizon. The E-horizon appears to have served as a surface for the inhabitants of the site during both the Early and Middle Woodland periods as no discernible division between the two periods was evident within the horizon. The low sedimentation rate noted within the geomorphological study failed to create a sufficient, culturally sterile buffer between the Early and Middle Woodland deposits (Appendix C). This rendered any potential distinctions between the two occupations that may have existed unclear. The differing radiocarbon dates recovered from two features within the component along with the mixing of temporally diagnostic artifacts from the Early and Middle Woodland periods clearly illustrated this problem. Analysis of a range of artifact variables (e.g., percentages of lithic material and debitage types) failed to detect any meaningful and distinctive differences between the various levels of the E-horizon. Remains of the later Late Archaic I occupation were originally deposited in what became Bw2-horizon. The earlier Late Archaic II occupation formed in the C/B-horizon.

8.2 Site Chronology

Archaeological work at the RCW Site has conclusively demonstrated four periods during which prehistoric Native American groups visited the site. The most recent occupation was a Late Woodland occupation indicated by Levanna projectile points, Overpeck/Brooks pottery sherds, and Late Woodland radiocarbon dates from Features 67 and 70. The 2-Sigma calibrated range for Feature 67 is A.D. 1040 to A.D. 1220 (Beta-295379) and Feature 70 is A.D. 1390 to A.D. 1430 (Beta-300627) (Appendix G).

Next, the RCW Site yielded strong evidence for earlier Woodland occupations. Conclusive evidence for an Early Woodland occupation came in the form of a radiocarbon date from a hearth remnant labeled Feature 44. The 2-Sigma calibrated range for Feature 44 is B.C. 320 to B.C. 210 (Beta-300629) (Appendix G). Evidence for a Middle Woodland occupation was identified within another hearth remnant labeled Feature 27, with a 2-Sigma calibrated range of A.D. 520 to A.D. 640 (Beta-288328) (Appendix G). Fishtail, Fox Creek, and Jack's Reef Pentagonal projectile points along with Early to Middle Series ceramics were recovered at the RCW Site. A sherd of Marcey Creek ceramic was identified within the lower Late Archaic II Component, but none were found within the Early/Middle Woodland Component.

Evidence for Late Archaic occupations at the RCW Site is also quite strong. In fact, radiocarbon dates indicated two temporally separate Late Archaic occupations at the site identified as the Late Archaic I and Late Archaic II components. The Late Archaic I Component was located

within the Bw1, Bw2, and Bw3 horizons and appears to date to the latter portion of the Late Archaic period. This assumption was based on radiocarbon dates recovered from two hearth features identified as Features 45 and 67. The 2-Sigma calibrated range for Feature 45 is B.C. 1880 to B.C. 1690 (Beta-300630), while the range for Feature 64 is B.C. 1330 to B.C. 1120 (Beta-295378) (Appendix H). Diagnostic artifacts included Fishtail and Lackawaxen projectile points, along with Early Woodland Rossville and Meadowood varieties.

The Late Archaic II Component dates to the early part of the Late Archaic period and represents the earliest temporal period present at the RCW Site. The Late Archaic II Component was located within the B/C, C/B, C, 2Bwb1, and 2Bwb2-horizons. Carbon dates from an activity area labeled Feature 75 indicated a 2-Sigma calibrated range of B.C. 2870 to B.C. 2580 (Beta-300626) and a hearth feature labeled Feature 76 indicated a 2-Sigma calibrated range of B.C. 3180 to B.C. 3150 (Beta-300628) (Appendix G). Free carbon associated with an argillite core recovered within the B/C-horizon indicated a 2-Sigma calibrated range of B.C. 2470 to B.C. 3150 (Beta-300628) (Appendix G). Diagnostic artifacts included Fishtail and Lackawaxen projectile points.

8.3 Site Function

Overall, the portion of the RCW Site excavated during the Scudder Falls project appears to reflect a series of short-term, seasonal occupations. Native Americans came to the site during the Late Archaic, Early/Middle Woodland, and Late Woodland periods for apparently specific purposes, chief among them being resource procurement and processing. During these periods, Native American groups likely also hunted and processed game at the site, as suggested by several projectile points and butchering tools recovered during the excavation. It is possible that a more substantial habitation site was located close to, but outside of, the APE, perhaps even under the existing Route 29 interchange.

The lack of evidence for fishing activities at the RCW Site is interesting considering the proximity of the Delaware River. Anadromous fish, such as Shad moving upstream would have provided a bountiful food source in the late spring/early summer period. Floral remains within the RCW Site suggest that the area was occupied during the summer and fall, well after the conclusion of fish runs up the Delaware River. Currently, the stream is shallower on the Pennsylvania side of the Scudder Falls Bridge near the 1509 River Road Site (36Bu379). If this was the case during the Late Archaic through Late Woodland periods, anadromous fish moving upstream to spawn would have been easier to gather via fish weirs or nets on the shallower side of the stream. The 1509 River Road Site (36Bu379) did display significant evidence for fishing during the Late Woodland period, including tools and ceramics that tested positive for shad and trout antiserum (Lawrence and Albright 2012).

Evidence from the stone tool assemblage suggests that during the Late Archaic period, Native American were hunting game at or near the site and processing it there. Game species would have been attracted to the Delaware River, Reeders Creek, and the adjacent wetlands for water and for food. Based on residue and floral analysis, Native American groups were also likely collecting pignut hickory nuts and acorns at the site which suggests activity at the site during the fall months. Blackberry, wild grape, mustard, and pokeweed seeds found within all of the components at the site also suggest activity at the site during the summer months. The greater

quantities of FCR and other artifacts during the Late Woodland and Late Archaic I occupations suggests a somewhat more intensive occupation than during the Early/Middle Woodland and Late Archaic II periods. In summary, during the Late Woodland, Early/Middle Woodland and Late Archaic I and II periods, the RCW Site served as a short-term procurement and processing station, undoubtedly providing resources to much larger base camps and/or village sites in the area. Several large prehistoric sites have been recorded along the Delaware River downstream from the RCW Site, including the Abbot Farm Complex in Trenton.

8.4 Settlement Patterns/Mobility

The material culture present within the Reeder's Creek Site indicates that the site was most likely a small procurement/processing site with ties to larger base camps. Floral remains recovered from Late Woodland through Late Archaic features at the site indicate a series of short-term summer and early fall occupations. Predictive models of the Delaware Valley region suggest that the RCW Site would have been in close proximity to plant resources abundant in the summer and fall months likely making the site a satellite camp for the procurement of nuts, berries, and other edible plants. Large animal populations would also be present near these plant resources creating prime hunting grounds. The number of hearths present at the site along with the large amount of ceramics recovered within the Woodland and Late Archaic periods, and lack of structural evidence, helps to support the conclusion that the RCW Site served as a seasonally occupied short-term campsite. While short-term camping did occur at the site it appears that the site's main purpose was for the gathering and processing of nearby plant and animal resources.

When analyzing the lithic assemblage of the different temporal components it is clear that the assemblage represents a mix of both expedient tool technology and staged bifacial reduction. Expedient technology is more prevalent in the Late and Early/Middle Woodland components, while bifacial reduction and expedient tool creation appear to have been equally important in the Late Archaic I and II components. Practically all of the tools at the RCW Site were created from chert, jasper, argillite, and quartzite materials likely procured from local river cobbles or from lithic bedrock sources within a 40 mi radius. Metarhyolite represented less than 1 percent of the Phase III lithic assemblage and was almost never used for expedient tools. Clearly expedient tools made of local material were important during all of the temporal occupations at the site reflecting a need to produce quick tools with available materials for resource processing. Non-local materials such as metarhyolite were much more prized and used for the creation of bifacial tools.

8.5 Subsistence and Seasonality

Evidence suggests that both plant and animal resources were processed and consumed at the RCW Site. However the evidence dealing with how much animal processing was taking place is limited and less definitive than that of plant processing at the site (Sections 6.4.2.2 and 6.4.2.4). Only one lithic tool, an argillite contracting stemmed biface recovered from the Late Archaic II component, tested positive for black bear and deer antiserum. One ceramic fragment analyzed using FTIR from the Early/Middle Woodland Component identified duck protein and aromatic ester peaks, indicating that Native Americans at the site were cooking and consuming water fowl. Several lithic tools show use wear indicative of heavy use on hard and soft surfaces usually indicative of cutting flesh and bone with the same tool. Excavation of Features 42 and 45, both hearths within the Late Archaic I Component, recovered small fragments of calcined bone which are likely remnants of animals cooked at the hearths. Even though evidence for

animal processing at the site is limited it can be safely assumed that animals such as deer, black bear, water fowl, along with other species native to the Delaware Valley were being hunted and utilized at the RCW Site.

Much better evidence exists for the processing and/or consumption of plant resources at the RCW Site (Section 6.4.2.2). Eleven distinct plant species along with several carbonized and unknown seed/nut types were identified during analyses of eight features at the RCW Site. These features represented all the temporal periods present at the site which included the Late Woodland, Early/Middle Woodland, Late Archaic I, and Late Archaic II components. The most abundant seed/nut types recovered included blackberry, mustard, wild grape, pokeweed, and pignut hickory. Blackberry, wild grape, mustard, and pokeweed seeds were identified within all but the Late Archaic II Component and appear to have been major staples for inhabitants at the RCW Site. Few seed/nut remains were recovered from the Late Archaic II Component which was the earliest occupation documented at the site. Radiocarbon dates place the Late Archaic II Component within the early part of the Late Archaic period very near the end of the Middle Archaic and a there may be a lack of preservation of floral remains due to the deposits age. Pignut hickory nut shells were identified within all of the components at the site. Carbonized hickory shells were identified within hearth Features 42, 45, and 64 in the Late Archaic I and in Feature 76 in the Late Archaic II.

FTIR analysis of ceramic sherds from the RCW Site also helps to shed light on subsistence at the RCW Site. A ceramic sherd, likely re-deposited by bioturbation from the above Woodland components, identified that cattail root was cooked at the site. The majority of the residues identified on the ceramic samples were labeled “raw” and attributed to natural background levels in the soil. These raw residues can help to determine what resources were available at the site even if they were not conclusively processed within a particular vessel. The raw residue may also indicate that the vessel was used to store dried plant resources. Ceramics found within the Late Woodland Component tested positive for raw acorn shell and acorn nut meat. A ceramic found within the Early/Middle Woodland Component tested positive for raw yarrow stem, hickory shell, sunflower seed shell, acorn shell, and cattail root residues. Another ceramic sherd from the Early/Middle Woodland Component identified raw hickory nut shell, sunflower seed shell, and acorn shell residues.

The subsistence pattern at the RCW Site reflects a generalized adaptation to the riverine environment of the Middle Delaware Valley. Evidence of hunting and gathering at the site is strong and it is clear that Native Americans exploited both the Reeders Creek and Delaware River watersheds. The site appears to have been a prime location for plant and animal resource exploitation during the summer to early fall months. Conclusive evidence of this includes the 4,300 year span of occupation of the site, which likely functioned as a seasonal procurement/processing camp during all of the temporal periods represented.

9.0 CONCLUSIONS

The prehistoric Reeders Creek West (RCW) Site (28Me360) was initially encountered and reported during the course of a cultural resources survey conducted as part of the Section 106 review process for the proposed federal undertaking to replace the I-95 Scudder Falls Bridge over the Delaware River. The site was recommended eligible for inclusion on the National Register of Historic Places and a Programmatic Agreement entered upon between the Federal Highways Administration (FHWA), Pennsylvania Historical and Museum Commission (PHMC), and New Jersey Historic Preservation Office (NJHPO) to assure the implementation of a Data Recovery investigation of that portion of the site that would be adversely impacted by project development (Appendix B).

The Data Recovery investigation was duly performed, implementing a work plan that was submitted and approved by both the DRJTBC and the NJHPO. The work plan called for the hand excavation of a 13 percent sample of the site extending to approximately 1.5m bgs.

Unlike the previous Phase I and II investigations at the site which identified only a Late Woodland occupation, the Data Recovery investigation identified an Early/Middle Woodland and two Late Archaic occupations. A total of 19 prehistoric features including hearths, lithic tool production areas, food processing areas, and a post mold were identified within the site. Radiocarbon dates and diagnostic artifacts from these features indicated that the RCW Site was occupied from the Late Archaic through to the Late Woodland period. Floral and faunal evidence suggests that the camp was occupied primarily in the summer and fall months and that the consumption/processing of hickory nuts and blackberries was an important activity during all of the temporal periods represented at the site.

AECOM speculates that the remainder of the base camp was established on the edge of the T2 terrace bordering the Delaware River. This portion of the campsite was either capped or destroyed during the construction of the current Route 29 Interchange.

To contextualize our interpretation of the RCW Site within a broad region of the Middle Delaware River, AECOM performed a regional settlement pattern analysis, examining all other known prehistoric sites containing Late Archaic, Early/Middle Woodland and Late Woodland period sites within a 4196 km^2-size area, in relation to those faunal and floral resources known to have played a significant role in Native American diet. That exercise suggests that the Lenape engaged in two separate settlement systems, one focused on the interior drainages of the Piedmont and another focused primarily (but not exclusively) on the broad Delaware River terraces for use by both macro and micro bands on a semi-sedentary but seasonal basis. As predicted by the settlement system model, the RCW site produced evidence for use as a macroband camp. However – and also predicted by the model – it appears to have been used repeatedly by smaller social groups.

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