The Use of Dover-Like Tool Stone by Pre-Mississippian Peoples in the Black Bottom of Southern Illinois

Ryan M. Parish and Brian M. Butler

The presence of Dover chert artifacts at the Mississippian Kincaid site was established in the 1930s and recent work has shown that Dover, or something very much like it, was being brought into the Black Bottom as early as the late Middle Archaic. There has been a growing concern that some of what has been traditionally identified as Dover chert in the Kincaid area is actually a variety of Fort Payne chert. Samples of Dover-like chert from Archaic and late Early-to-Middle Woodland (Baumer) components at Kincaid have been tested for geological provenance, and the results suggest that a preference for local Fort Payne chert existed during both occupations.

This paper examines the patterns of chert procurement of early inhabitants of the Black Bottom of the Ohio River with special reference to raw materials visually identified as "Dover chert." The recently discovered abundance of this brown, mottled chert in the Archaic and Baumer assemblages at Kincaid raises questions about the extent of mobility and exchange networks extending southward into the Cumberland River valley of Tennessee. The provenance of the "Dover-like" artifact materials from these occupations are analytically evaluated using reflectance spectroscopy. The extent to which Archaic and Baumer occupants of the Black Bottom were acquiring tool-stone resources from far beyond their immediate vicinity is evaluated.

The provenance information from chert artifacts is an important dataset allowing researchers to investigate a number of aspects of prehistoric human behavior. Chert provenance data potentially sheds light on group mobility (Burke 2004; Evans et al. 2007; Meltzer 1984), social ties via exchange and trade (Cobb 1989; Koldehof and Brennan 2010), and technological organization (Andrefsky 1994; Bradbury and Carr 2009). However, the existence of variable chert types and deposit characteristics over

Ryan M. Parish, Department of Earth Sciences, The University of Memphis, 125 Johnson Hall, Memphis, TN 38152, rmparish@memphis.edu
Brian M. Butler, 3110 Chautauqua Road, Carbondale, Il 62901, bbutler@siu.edu

large geographic areas often prevents clear source identification. The great variability of chert manifests itself in macroscopic characteristics such as color, texture, luster, tractability, and microscopic and geochemical attributes. The ranges of variation both at the outcrop and formation scales create an overlapping array of possible sources and source locations.

The Problem of "Dover Chert" in the Lower Ohio River Valley

What has traditionally been called "Dover chert" was procured primarily from quarries near the Cumberland River in Stewart County, Tennessee. The material is best known for its extensive use for large bifaces during the Mississippian period (Cobb 2000; Gramly 1992; Lewis and Kneberg 1958; Smith and Moore 1999). These bifaces, which included hoes, axes, adzes, large knives, as well as various ceremonial artifact forms, were widely distributed and were the principal forms of these tools in large portions of the Tennessee and Cumberland valleys. They were also imported into the lower Ohio Valley in significant numbers, where they competed against the same artifact forms made from Mill Creek chert from southern Illinois (Cobb 2000; Philips 1900).

The primary source area of the "Dover chert" utilized by Mississippians has long been known, but its correct geological assignment has been the subject of some confusion through the years (Gramly 1992; Nance 2000). Parish (2009) has argued that Marcher's (1962) assignment of the chert to the lower portion of the St Louis limestone is accurate and the chert should be identified as Lower St Louis (variety Dover).

It is well established that true Dover chert artifacts are abundantly represented in the Mississippian occupation at Kincaid Mounds. Their presence was recognized during the 1930s when Robert Bell (1943) documented significant numbers of them in the University of Chicago collections. What is less clear is the origin and identity of Dover-like chert artifacts found in much earlier occupations in the same area.

It has been evident for some time that visually similar cherts exist in the lower Tennessee and Cumberland valleys, particularly from the Fort Payne limestone (Conaty 1987; Gatus 1978, 1983). Parish and Durham (2015) demonstrated that the visual sorting of these two materials is unreliable. Analytical provenance tests using reflectance spectroscopy on the Dover "swords" from multiple sites, including the Link Farm site in the western Tennessee Valley (Brehm 1981), indicate that many of them are made from a local Fort Payne source (Parish 2013).

Geological Context

The Black Bottom is a large, crescent-shaped alluvial bottomland of the Ohio River strategically located between the confluences of the Cumberland and Tennessee rivers with the Ohio (Butler and Crow 2013). The well-known Kincaid site is on the north bank of Avery Lake, one of several long, narrow sloughs or lakes in the Bottom, remnants of back-channels abandoned by the southward migrating Ohio River (Alexander and Prior 1971; Butler and Crow 2013) (Figure 1). The ecological diversity of the bottom provided ample floral and faunal resources as well as fertile soils for prehistoric peoples, but no tool stone. The most immediately available lithic materials were fluvial deposits of Mounds Gravels, previously referred to as LaFayette (Ross 1964) and currently included in the Upland Complex Gravels (Saucier 1994). The chert gravel deposits occur as accumulations on point bars and hillslopes adjacent to the Ohio River, mostly downstream from the Black Bottom. The wide distribution of these Pliocene/Pleistocene chert gravels throughout much of the lower Ohio and Mississippi valleys provided an ample supply of tool stone with highly variable qualities (often poor) and small to medium sizes.

Previous surveys of tool-stone material in the regions surrounding the Black Bottom provide the context needed to examine whether in fact Archaic and Baumer occupants at Kincaid had ties to resources/people of the lower Cumberland River (Conaty 1987; Gatus 1979, 1983; Meyers 1970; Koldehoff 1985, 2002; Lopinot and Butler 1981). The tool-stone surveys have identified deposits of Fort Payne chert in primary contexts within the Shawnee Hills and directly across the Ohio River adjacent to the Black Bottom, and within the peninsula of land encompassed by the lower Tennessee and Cumberland rivers. The variety of Fort Payne most commonly found in these regions is a brown to dark greyish brown mottled chert of medium to fine grain. Nance (2000) mistakenly assigns this variety of Fort Payne to the Lower St. Louis Formation although the Little Cypress geologic quadrangle clearly maps the McCormick Creek deposits within the Fort Payne Formation nearly 40 km to the southeast of the Black Bottom (Figure 2). There are two small source areas for Fort Payne chert in southern Illinois, one near the village of Elco in Alexander County (Lopinot and Butler 1981) and one on the flanks of the Hicks Dome structure in Hardin County (Baxter and Desborough 1965). For reasons explained later, neither of these two areas is thought to be represented in artifacts from the Black Bottom.

Additional tool-stone materials available to the Kincaid inhabitants include Ste. Genevieve (Fredonia), Upper St. Louis (Cobden, Dongola), and Lower St. Louis (Salem) nodular chert; fossiliferous Warsaw chert; and Degonia, Kinkaid, and Tuscaloosa gravels. Alluvial gravels, the uplifted region of the Shawnee Hills to the west, and the highly faulted region between the Tennessee and Cumberland rivers to the east provided a diverse selection of chert materials both adjacent to the bottom lands and up to 100 km from it. Both the geologic and geographic distribution of tool stone highlights the potential range of procurement options available to the inhabitants of the Black Bottom. The presence of extralocal material types such as Dover, from approximately 100 km up the Cumberland River, would indicate either an unusually mobile population with access to more-distant resources or a group with large, established social networks.

The Archaeological Contexts and Samples

The archaeological centerpiece of the Black Bottom is the massive Kincaid site, a large mound center and town of the Mississippian period (AD 1100–1400) extending

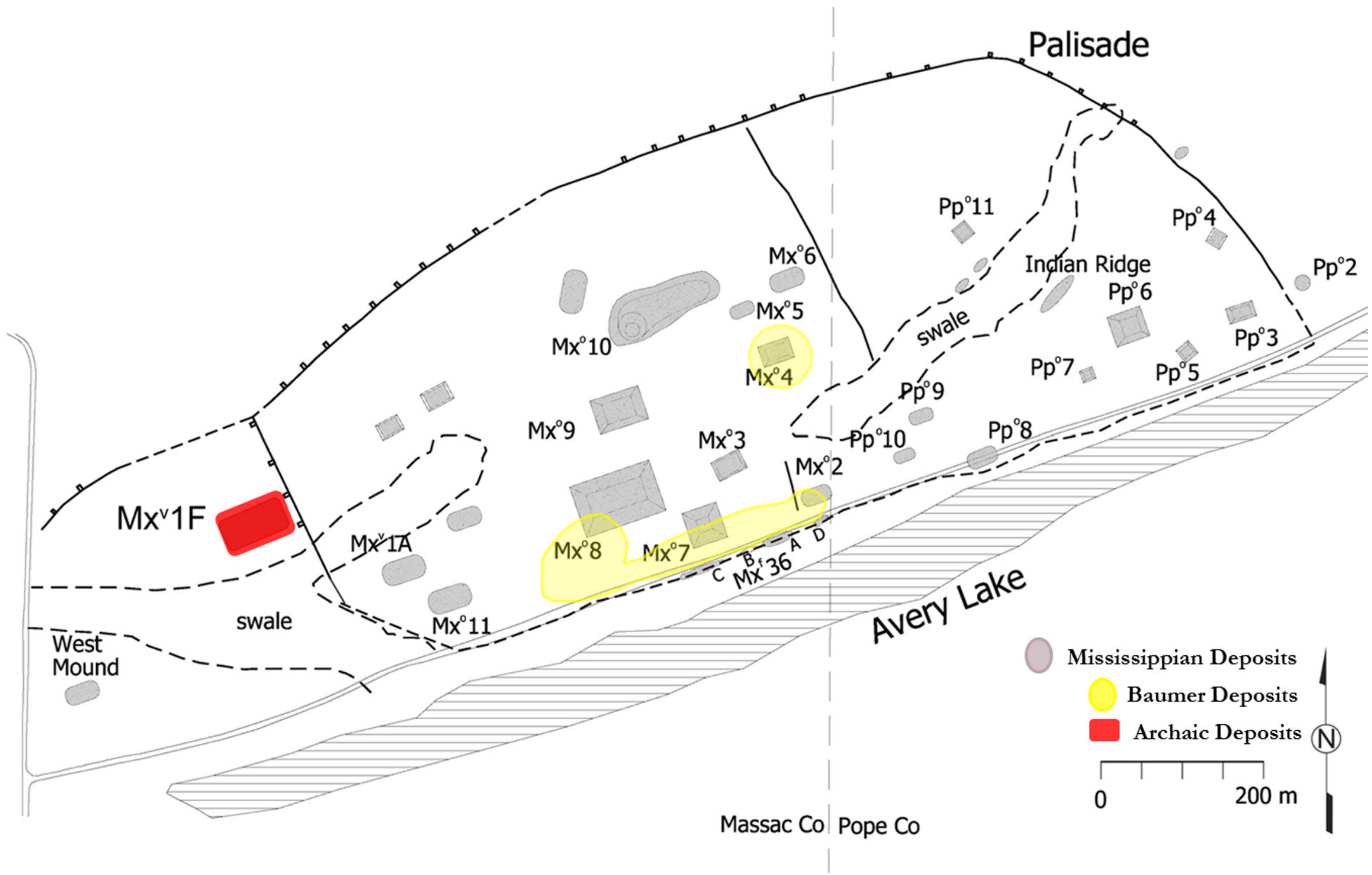

Figure 1. Planview map of the Kincaid site situated in the Black Bottom. The late Middle Archaic, Baumer, and Mississippian components delineated. Adapted from Butler et al. (2011).

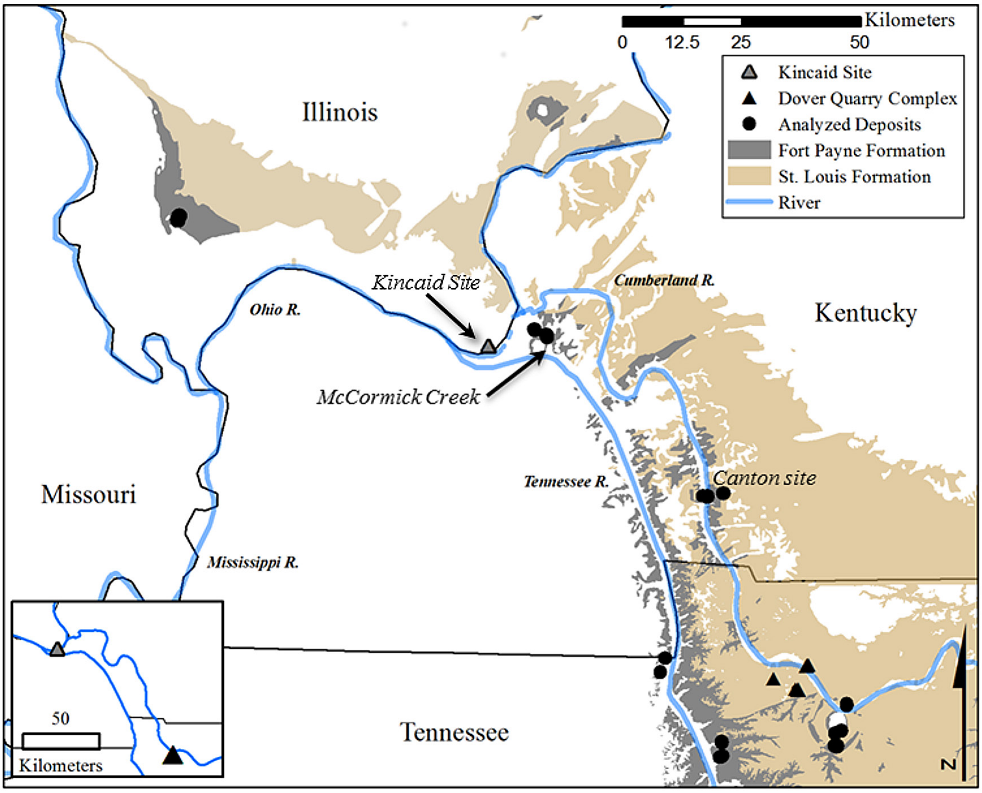

Figure 2. Planview map depicting the Black Bottom with surrounding bedrock geology. Inset map showing the proximity of the Kincaid site to the Dover Quarry complex.

for about 1,700 m along the north shore of Avery Lake. Early investigations by the University of Chicago (1934–1944) documented the cultural sequence both at Kincaid and in the surrounding area (Cole et al. 1951). In 2003, Southern Illinois University at Carbondale initiated a new program of research at the site (Butler et al. 2011). Although focused on the Mississippian occupation, the work has identified earlier occupations within the confines of the mound center. In 2011, excavations were carried out on a ridge point in the western part of the site to ground truth some unusual magnetic signatures. The locus was given the site designation Mx1F after the University of Chicago System. Test units encountered a Middle to Late Archaic midden deposit (Figure 1). Two radiocarbon dates on charred walnut shell place the basal layers of the deposits between 3950 and 3710 cal B.C. (Butler and Crow 2013).

The UC investigations at Kincaid had previously established the presence of a substantial Early and Middle Woodland (Baumer) occupation extending for over 300 m along the north bank of the lake as well as under some of the larger mounds (Butler 2007; Butler and Welch 2006; Cole et al. 1951:184, 84). In 2003 and 2006, excavations for the footprint of a new interpretive platform near the lake front (designated Mx2 by UC archaeologists) encountered 22 Baumer pit features, many of them large storage pits containing substantial amounts of refuse. Radiocarbon dates from these features ranging from cal 250 B.C. to A.D. 200 were obtained (Butler 2006a, 2007).

Both the Archaic and Baumer lithic assemblages contained Dover-like chert. In the Archaic assemblage of roughly 3,350 specimens, Dover-like chert comprised about 9.6 percent by count (Butler and Crow 2013). Dover-like chert was much more prominent in the Baumer sample of 1,300 pieces, comprising 41 percent (Butler 2007). The lithic data in their entirety for these assemblages are important and will be revisited at the end of the study; however, a look at the Dover-like materials is warranted as their presence is a potential indicator of longer-distance resource acquisition. As noted above, the presence of Fort Payne chert visually similar to Dover in proximity to the Black Bottom complicates macroscopic identification (see Parish and Durham 2015). Therefore, an analytical technique is needed to characterize variation between the two material types and potentially provide a match to the chert artifacts in question.

Methodology

Reflectance spectroscopy has a relatively long history of use in archaeological material-analysis studies. Research by Beck et al. in the 1960s used reflectance spectra on amber artifacts found throughout Europe to compositionally link them to Baltic sources (Beck et al. 1964; Beck et al. 1965; Beck 1986). Currently, reflectance spectroscopy is used upon various archaeological materials including, ceramics, nephrite, soil, soapstone, paint, flint clay, masonry, residues, and chert. Recent research has demonstrated the potential of reflectance spectroscopy in chert-source studies (Parish 2011, 2013; Parish et al. 2013).

The principle behind the application of reflectance spectroscopy in chert-provenance studies is that electromagnetic radiation interacts with the atomic and molecular composition of any given sample at particular wavelength locations. Some portions of the electromagnetic signal are reflected, transmitted, and absorbed by particular atoms or dipole bonded molecules causing them to be bumped up into a higher energy level (Mackin et al. 2014). Graphically, the interactions are portrayed as reflectance peaks (Figure 3). Particular impurities within chert, possibly a product of the unique paleodepositional environment and subsequent diagenesis of the deposit, alter both the intensity and wavelength location of the spectral interactions (spectral features). Additionally, slight slope changes within larger spectral features, such as in quartz reststrahlen bands, are indicative of subtle micromineralogy characteristics. The sum differences in spectral variation potentially then can be used to differentiate one chert type from another and one deposit from another. Spectra recorded on chert artifacts of unknown provenance can be compared within a spectral database of known samples to provide source determinations.

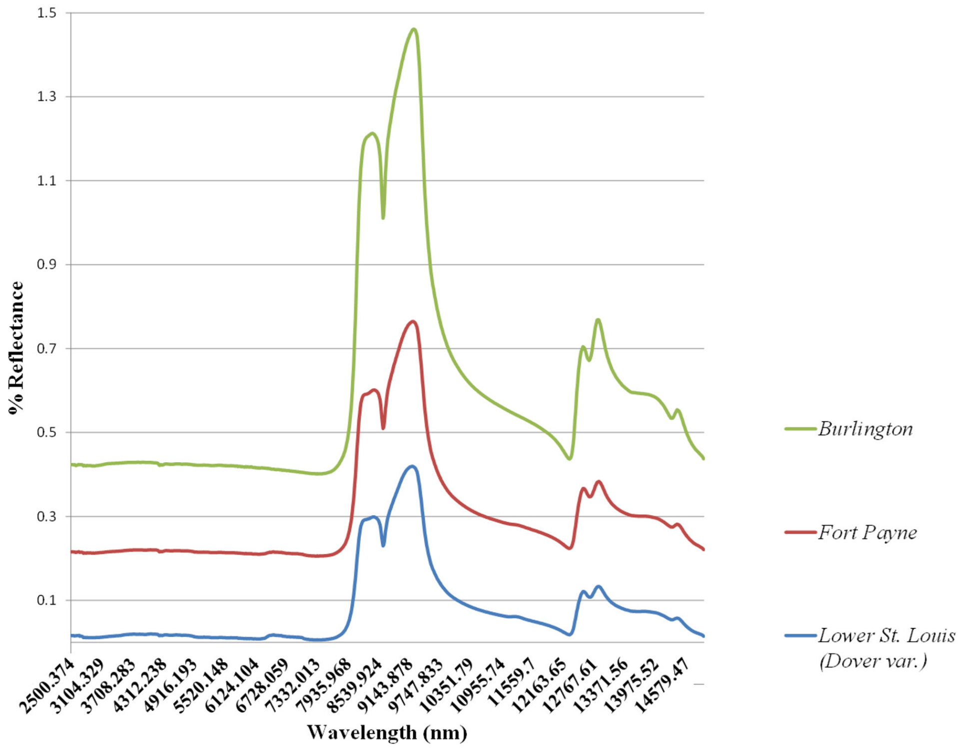

Figure 3. Typical middle-infrared reflectance spectra of Burlington, Lower St. Louis (Dover var.), and Fort Payne chert. A few of the more visible diagnostic regions are highlighted. Spectra vertically offset for display.

Geologic Samples

Ongoing field work by the lead author is assembling a large chert-sample collection for the Southeast and Midwest. The collection currently is composed of over 4,700 samples from 160 deposits representing 13 formation types. The current study isolates chert samples of Lower St. Louis (Dover var.) and Fort Payne for spectral comparison to the artifact assemblages. Thirty samples of Lower St. Louis (Dover var.) chert were taken from each of the four recorded Dover Quarry sites in Stewart County, Tennessee and two additional prehistoric quarry sites in Trigg County, Kentucky along the Cumberland River, thus providing 180 specimens from six deposits within the Lower St. Louis Limestone Formation (Figure 4). Correspondingly, thirty samples from each of 44 deposits of Fort Payne chert were collected, giving 1,320 specimens from the Fort Payne Limestone Formation. A total of 30 Burlington chert samples were also incorporated into the sample collection as a visually distinct control group. The Fort Payne deposits were widely spatially distributed; they were obtained from the Shawnee Hills of southern Illinois, western and central Kentucky, Tennessee and northeastern

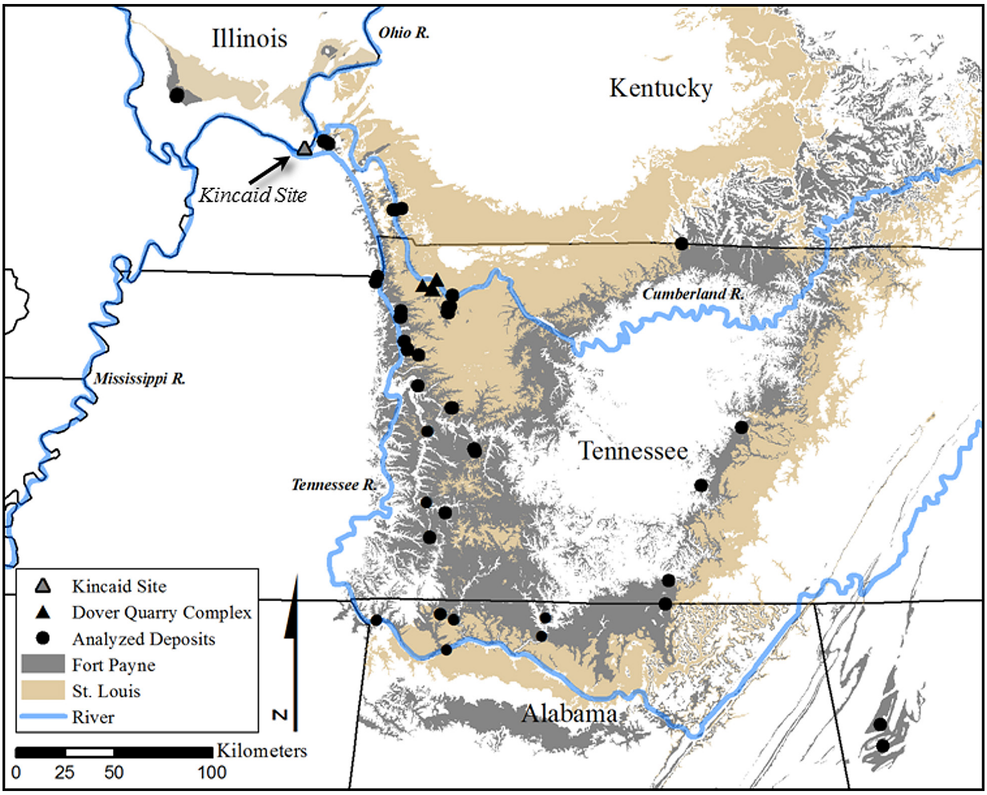

Figure 4. General map of all chert deposits sampled and included in the study.

Mississippi, northern Alabama, and northwestern Georgia (Figure 4). Deposits of Fort Payne chert located near the Black Bottom represented in the sample collection are those found in southern Illinois ("Elco") and also those located along Dry Branch and McCormick Creek in Kentucky. The total number of chert samples used to characterize the Burlington, Lower St. Louis (Dover var.), and Fort Payne cherts in the current study is 1,530 specimens. The Burlington and Dover sample populations were weighted in the statistical analysis to prevent bias to the larger Fort Payne population.

Geologic chert samples were obtained primarily from prehistoric procurement sites but also from modern exposures and fluvial deposits. The geologic provenience of each deposit was assigned by careful inspection of both the mapped geologic quadrangle for the region and empirical observations made in the field. Secondary deposits were only included if the geologic parent source could be identified with a reasonable degree of certainty. Thirty samples of chert were quasi-randomly selected spanning the entire vertical and lateral extent of the deposit.

Artifact Sample

Artifact samples consisted of visually typed "Dover" chert debitage, tools, and tool fragments from the Archaic and Baumer cultural components at the Kincaid site. A total of 77 out of 304 (25 percent) of the lithic artifacts typed as Dover from the Archaic midden deposits were included in the study. Only 69 of these were analyzed due to analyst-imposed size restrictions. The majority of the Archaic lithics are typed as complete and fragmented flakes (n=64) with four projectile points and one core fragment. Baumer lithics in the study included 69 out of 547 (13 percent) of the total Dover lithic assemblage. Baumer lithics are typed as 63 complete or fragmented flakes, three projectile points, two utilized flakes, and one core. The lithics were recovered from pit features.

Analysis

The prehistoric lithics and reference samples were analyzed with a BioRad FTS 40 spectrometer or Fourier Transform Infrared (FTIR) spectrometer that collects reflectance spectra in the middle infrared region of the electromagnetic spectrum (2,500–25,000 nm). The specific detector limitations on the BioRad allows for recorded analysis up to 16,500 nm. Nondestructive analysis is performed on each specimen by placing it on an adjustable platform, focusing on a small spot approximately 20 microns in diameter with the instrument's optics, and recording a reflected infrared signal off of the sample's surface/near surface. The spectrometer records a reflectance measurement at 12-nm intervals. Each spectrum is a composite of 64 total scans on the single spot. A series of three spots at varying locations on the sample were analyzed and later averaged. Multiple spectra recorded upon a chert sample provide a mechanism to quantify intrasample spectral variability. The resulting averaged spectrum per sample is represented by a total of 1,160 reflectance values each potentially diagnostic for chert type (parent formation). The incredible amount of spectral data prohibits simple pattern recognition via comparing and contrasting line graphs of plotted spectra. Indeed the spectrum for chert is relatively homogenous when viewed as Gaussian and Lorentzian lines (Figure 3). Therefore, multivariate statistics are required to quantify the range of variation within sample groups, potentially differentiate chert types, and match unknown artifacts to the sample populations.

A necessity prior to statistical comparison of spectral data is the processing of the data in order to standardize measurements, reduce noise, and highlight subtle differences. First, a background measurement collected upon a gold standard prior to each analysis session was subtracted from each spectrum allowing for the removal of most atmospheric influences. Second, the reflectance spectra were converted to absorption spectra to maximize subtle interactions caused by sample composition. Next, the spectra were normalized or baseline corrected so that slight differences in sample geometry and sample surface-to-detector angular relationships were minimized. Baseline correction

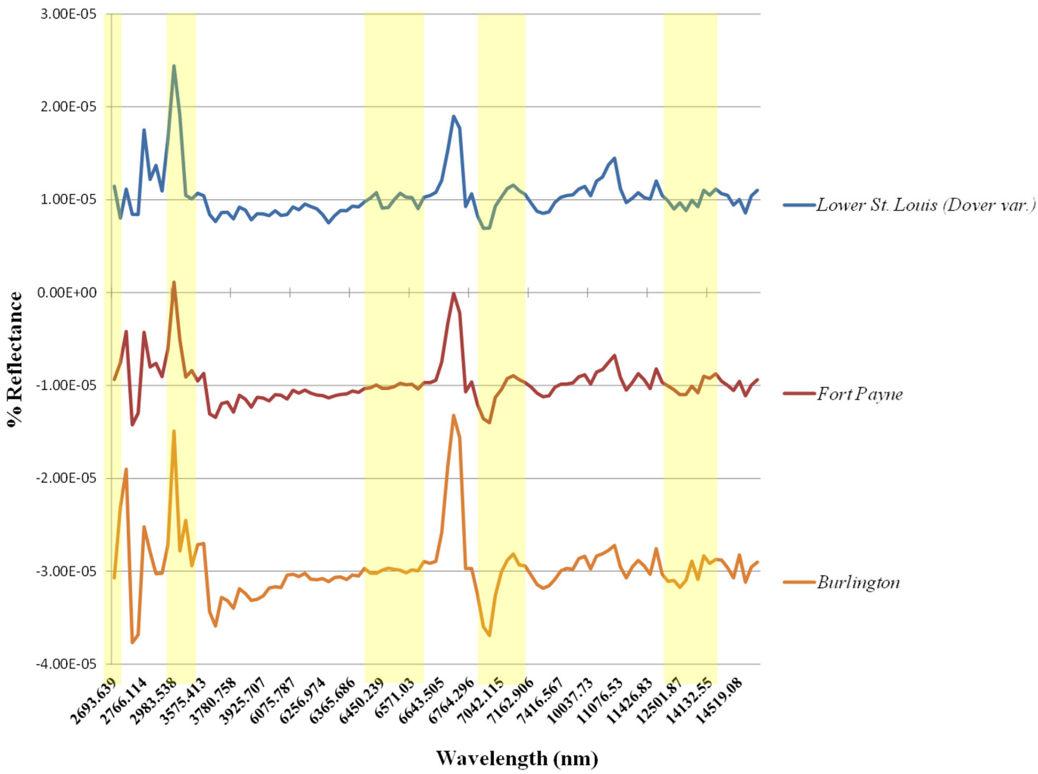

Figure 5. Diagnostic spectral differences highlighted on the processed spectra of Burlington, Lower St. Louis (Dover var.), and Fort Payne chert. Spectra are vertically offset for display.

allows for better comparison between analyses taken upon different samples with slightly different angles of the sample surface to the probe. Finally, the spectra were converted to a first derivative transform, a common technique in spectral analysis that highlights small differences in slope changes and absorption features. As seen in Figures 3 and 5, small differences related to minute mineral composition are the diagnostic attributes for particular chert types and deposits. The processed spectra were imported into the Statistical Package for the Social Sciences (SPSS) software where multivariate analysis functions could be applied.

A stepwise canonical discriminant function analysis was used to quantify variation, differentiate sample populations, and assign unknown artifacts. Most of the middle-infrared diagnostic variables used in the study were selected from the 2,600 to 7,500 nm region; however, additional portions of the middle-infrared signal were also identified as diagnostic regions (Figure 5) (Table 1). The discriminant function analysis evaluates each wavelength variable and enters or removes it from the model. Additionally, the Lower

Table 1. Some Diagnostic Spectral Regions and Corresponding Mineralogy Identified by the Stepwise Discriminant Function Analysis.

Spectral Feature	Reflectance Peak Locations (nm)	Diagnostic Minerals Detected
AL-OH bonds	2,700–2,770	Kaolinite
K-AL-SI-OH bonds	2,800, 10,100	Illite
Na-Ca-Al-Si-O-OH bonds	2,880–2,980	Montmorillonite
CH3 bonds	3,500–4,080	Organic compounds
Carbonate asymmetric stretch	6,050–7,200	Dolomite and Calcite
Carbonate asymmetric stretch	5,460–5,500, 6,570, 6,860–6,940, 13,750	Dolomite
Carbonate asymmetric stretch	6,680, 11,300–11,340, 14,070	Calcite
Na-Ca-Al-Si-O-OH bonds	10,730	Smectite
TI-0 bonds	10,030–10,100, 14,130–14,190	Rutile
Fe-O-OH bonds	11,010–11,080, 12,600	Goethite
Fe-O-OH . nH2O bonds	11,430	Limonite
Fe-K hydroxide bonds	12,320	Glauconite
Fe-S2 bonds	14,370–14,400	Pyrite
Mn-O hydroxide bonds	14,460	Manganite
Mg oxide bonds	14,500–14,550	Brucite
Fe oxide bonds	14,900–14,940, 17,540	Hematite

St. Louis (Dover var.) group was weighted to account for differences in group size. All unknown artifact samples were assigned to either the Lower St. Louis (Dover var.) or Fort Payne groups by calculating their Mahanolobis distances to the group centroid. Probabilities of group membership are also reported (Table 2). Visual identification of 'diagnostic' spectral features by stacking spectra proved an inadequate methodology as spectral variability prohibited direct presence vs. absence comparisons. Multivariate statistical analysis is necessary in order to characterize patterns and bracket variation.

Results

The discriminant function model assigned each of the chert samples in the sample collection to one of three chert groups (i.e., Burlington, Dover, Fort Payne). A total of 33 out of the 1,530 geologic samples were misclassified by the model for an internal accuracy of 98 percent. Two samples of Burlington chert was misclassified as Fort Payne, 17 samples of Dover chert were misclassified as Fort Payne, and 14 samples of Fort Payne chert were classified as Dover. The misclassifications are possibly a result of multiple factors including low spectral reflectance, atmospheric interference, and noise. More detailed discussions may be found in Parish (2011, 2013). The ability of

Table 2. Group Statistics for the Discriminant Function Model and Probabilities of Group Membership for All of the 138 Artifacts Analyzed.

Mxv1F Archaic			Mxv1D Baumer		
Artifact	Probability	Chert Type	Artifact	Probability	Chert Type
MXvIF.001	1.00	Fort Payne	MXvID.001	0.86	Dover
MXvIF.002	0.78	Dover	MXvID.002	1.00	Dover
MXvIF.003	1.00	Fort Payne	MXvID.003	0.64	Dover
MXvIF.004	0.72	Fort Payne	MXvID.004	0.91	Dover
MXvIF.005	0.94	Fort Payne	MXvID.005	0.98	Fort Payne
MXvIF.006	1.00	Fort Payne	MXvID.006	1.00	Fort Payne
MXvIF.007	0.97	Fort Payne	MXvID.007	0.94	Dover
MXvIF.008	0.98	Dover	MXvID.008	0.94	Dover
MXvIF.009	1.00	Fort Payne	MXvID.009	0.59	Dover
MXvIF.010	1.00	Fort Payne	MXvID.010	1.00	Fort Payne
MXvIF.011	0.99	Dover	MXvID.011	1.00	Fort Payne
MXvIF.012	0.94	Dover	MXvID.012	0.99	Fort Payne
MXvIF.013	1.00	Dover	MXvID.013	0.99	Fort Payne
MXvIF.014	1.00	Fort Payne	MXvID.014	1.00	Fort Payne
MXvIF.015	1.00	Dover	MXvID.015	0.57	Fort Payne
MXvIF.016	0.76	Fort Payne	MXvID.016	1.00	Fort Payne
MXvIF.017	0.60	Fort Payne	MXvID.017	1.00	Fort Payne
MXvIF.018	0.90	Dover	MXvID.018	0.95	Dover
MXvIF.019	1.00	Fort Payne	MXvID.019	1.00	Fort Payne
MXvIF.020	0.96	Fort Payne	MXvID.020	1.00	Dover
MXvIF.021	1.00	Fort Payne	MXvID.021	1.00	Dover
MXvIF.022	0.81	Burlington	MXvID.022	1.00	Dover
MXvIF.023	1.00	Dover	MXvID.023	1.00	Dover
MXvIF.024	0.74	Fort Payne	MXvID.024	1.00	Fort Payne
MXvIF.025	0.97	Fort Payne	MXvID.025	0.99	Fort Payne
MXvIF.026	0.80	Fort Payne	MXvID.026	0.99	Fort Payne
MXvIF.027	1.00	Dover	MXvID.027	1.00	Fort Payne
MXvIF.028	1.00	Dover	MXvID.028	1.00	Fort Payne
MXvIF.029	1.00	Fort Payne	MXvID.029	0.79	Fort Payne
MXvIF.030	1.00	Fort Payne	MXvID.030	0.90	Fort Payne
MXvIF.031	1.00	Fort Payne	MXvID.031	1.00	Fort Payne
MXvIF.032	1.00	Dover	MXvID.032	1.00	Fort Payne
MXvIF.033	1.00	Fort Payne	MXvID.033	1.00	Fort Payne
MXvIF.034	1.00	Fort Payne	MXvID.034	1.00	Fort Payne
MXvIF.035	1.00	Fort Payne	MXvID.035	1.00	Fort Payne
MXvIF.036	1.00	Dover	MXvID.036	1.00	Fort Payne

Table 2. Continued.

Mxv1F Archaic			Mxv1D Baumer		
Artifact	Probability	Chert Type	Artifact	Probability	Chert Type
MXvIF.037	0.98	Fort Payne	MXvID.037	1.00	Fort Payne
MXvIF.038	1.00	Dover	MXvID.038	1.00	Fort Payne
MXvIF.039	1.00	Fort Payne	MXvID.039	1.00	Fort Payne
MXvIF.040	1.00	Fort Payne	MXvID.040	0.56	Dover
MXvIF.041	1.00	Dover	MXvID.041	1.00	Fort Payne
MXvIF.042	1.00	Fort Payne	MXvID.042	0.97	Fort Payne
MXvIF.043	0.84	Fort Payne	MXvID.043	0.95	Dover
MXvIF.044	1.00	Fort Payne	MXvID.044	0.91	Dover
MXvIF.045	1.00	Dover	MXvID.045	0.91	Fort Payne
MXvIF.046	1.00	Dover	MXvID.046	0.67	Fort Payne
MXvIF.047	1.00	Dover	MXvID.047	0.86	Dover
MXvIF.048	1.00	Dover	MXvID.048	0.65	Dover
MXvIF.049	0.99	Fort Payne	MXvID.049	1.00	Dover
MXvIF.050	1.00	Fort Payne	MXvID.050	0.99	Dover
MXvIF.051	1.00	Fort Payne	MXvID.051	1.00	Dover
MXvIF.052	1.00	Dover	MXvID.052	0.70	Dover
MXvIF.053	1.00	Fort Payne	MXvID.053	1.00	Dover
MXvIF.054	1.00	Dover	MXvID.054	0.99	Fort Payne
MXvIF.055	0.93	Dover	MXvID.055	0.99	Dover
MXvIF.056	0.93	Fort Payne	MXvID.056	1.00	Dover
MXvIF.057	1.00	Dover	MXvID.057	1.00	Dover
MXvIF.058	0.96	Dover	MXvID.058	0.99	Fort Payne
MXvIF.059	0.96	Dover	MXvID.059	1.00	Dover
MXvIF.060	0.97	Fort Payne	MXvID.060	0.99	Dover
MXvIF.061	0.97	Fort Payne	MXvID.061	1.00	Fort Payne
MXvIF.062	1.00	Dover	MXvID.062	1.00	Dover
MXvIF.063	1.00	Fort Payne	MXvID.063	1.00	Dover
MXvIF.064	1.00	Fort Payne	MXvID.064	0.98	Fort Payne
MXvIF.065	1.00	Fort Payne	MXvID.065	0.91	Fort Payne
MXvIF.066	1.00	Dover	MXvID.066	1.00	Dover
MXvIF.067	1.00	Fort Payne	MXvID.067	1.00	Fort Payne
MXvIF.068	1.00	Dover	MXvID.068	0.63	Fort Payne
MXvIF.069	1.00	Fort Payne	MXvID.069	1.00	Fort Payne
Model statistics					
Wilk's Lambda	0.073	Chi Square	4016.93	$df = 200$	$p < 0.000$
	0.396		1,423.685	99	$p < 0.000$

the discriminant function analysis to identify enough spectral variation between material types is illustrated by the high accuracy of the base model. Previous studies have validated the accuracy noted here through subsequent trial runs treating 10 percent, 20 percent and 30 percent of the geologic samples as having unknown provenience and re-running the discriminant function model (Parish 2013).

The 69 lithics from the Archaic component were statistically assigned to both the Lower St. Louis (Dover var.) and Fort Payne deposits (Figure 6). A total of 27 lithics or 39 percent by count had their best match with Dover chert. Forty-one lithics identified as Fort Payne chert comprised 59 percent of the Archaic assemblage analyzed. One lithic was characterized as incorrectly belonging to the Burlington chert source group (Table 2). Three of the four Archaic projectile points were identified as matching Fort Payne deposits. The single core fragment also was matched to the Fort Payne sample group.

Lithics analyzed from the Baumer component were similarly matched to both Dover and Fort Payne deposits. A total of 30 artifacts of the 69 analyzed had their best match within the Dover sample group (43 percent) (Figure 6). The remainder of the Baumer lithics, 39 (57 percent by count), were assigned to the Fort Payne source group by the discriminant function model (Table 2). All three of the projectile points and the core fragment in the Baumer lithic assemblage were assigned to the Fort Payne chert sample group. During both occupation phases, the inhabitants relied primarily on Fort Payne chert, however the significant use of Dover chert is notable and somewhat unexpected.

Conclusions

The results of the chert-source analysis in both the Archaic and Baumer assemblages are similar and can therefore be discussed together. The use of 'Dover-like' Fort Payne chert by these early Kincaid inhabitants allows for a more accurate explanation regarding lithic-material acquisition and consumption. Previous visual identifications for this portion of the lithic assemblages typed the material as Dover chert from the lower reaches of the Cumberland River valley approximately 100 km overland or 150 km distant by boat. However, the analytical sourcing of the lithics demonstrates that the majority of the Dover look-alike material is in fact Fort Payne chert, thus simplifying the patterns of chert acquisition.

Although there are two Fort Payne sources in southern Illinois, the material found in the Black Bottom is probably coming from the lower Cumberland drainage. Archaeological work in southern Illinois has shown that the Fort Payne chert from the Elco locality was used only very locally and only rarely after the Archaic period. Once prehistoric populations identified the abundant and high quality Cobden and Kaolin cherts in the same area, the Elco source area was largely ignored (Lopinot and Butler 1981:28, 79). The Fort Payne Formation is also exposed in a band surrounding the Hicks Dome structure in Hardin County in the Eastern Shawnee Hills, but the subsequent erosion of the dome has heavily weathered and degraded the deposits there (Baxter

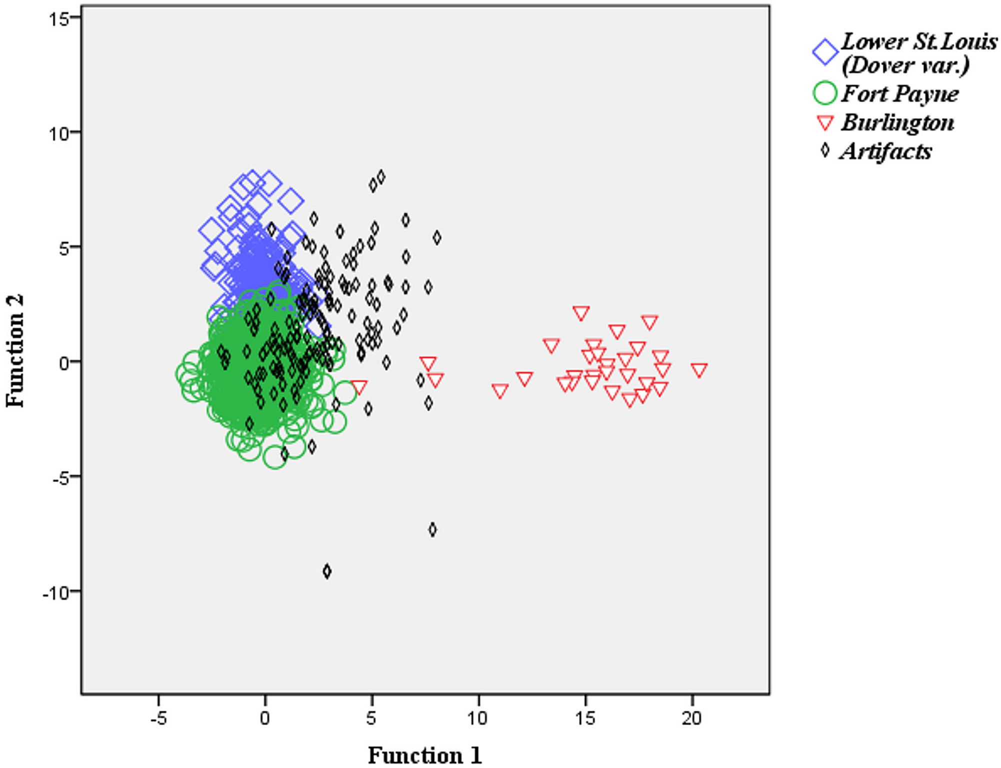

Figure 6. Discriminant function scatter plot depicting the characterization of the Kincaid artifacts to both Lower St. Louis (Dover var.) and Fort Payne chert sample groups.

and Desborough 1965:7). Chert surveys of this locality have yet to locate any chert of sufficient quality for tool making.

The relatively close proximity of chert-bearing outcrops of the Fort Payne Formation in the lower Cumberland River, 10 km to the east, provided a potential source of high-quality chert materials to early inhabitants of the Black Bottom. The results of the study show that these deposits were almost certainly known and exploited as early as 6,000 years ago by inhabitants of the region (Bell 1943). The use of Fort Payne chert at the Morrisroe site just east of the Black Bottom extends the use of these local deposits back by a few more millennia (Nance 2000). Also noteworthy is the presence of Lower St. Louis (Dover var.) chert as it ties the Archaic and Baumer inhabitants to resources and possibly people farther to the south, though possibly not as distant as the Dover Quarry Complex in Stewart County, Tennessee. Recent investigations of the Canton Site (15Tr1) report extensive use of the Lower St. Louis (Dover var.) materials located adjacent to the site by Early and Middle Archaic inhabitants (Hanvey et al. 2015). The findings indicate that Dover chert was available to inhabitants of the Black Bottom 55 linear kilometers to the southeast (Figure 2).

The majority of the Archaic lithic materials recovered during the Southern Illinois University excavations was comprised of informal reduction debris from locally occurring Mound Gravels. The bulk of the lithic assemblage is indicative of procurement of locally available tool stone (Butler and Crow 2013), although the presence of Dover chert as debitage and the preference for Upper St. Louis chert in the bifaces suggest that Black Bottom residents were not content to use only the low-quality gravel chert that was most readily available. They would travel to or exploit social connections to access better-quality sources that were somewhat further distant. The nearby outcrops of visually similar Upper St. Louis and Ste. Genevieve chert across the Ohio River to the east among the faulted Tennessee and Cumberland drainages should not be discounted as potential sources utilized by the Archaic inhabitants. Further testing is needed to analytically source the Upper St. Louis portion of the assemblage. The results may confirm the hypothesis that the fine-grained, blue grey Upper St. Louis chert is being acquired just to the east and south. The lithic source data currently indicate a restricted territorial range heavily reliant upon local stone resources during the late Middle Archaic.

As noted by previous investigators, the Baumer lithic material showcases a greater diversity of material types and possible greater complexity in resource acquisition and exchange networks (Butler 2007). For example, the sample included small quantities of (banded) Cobden (2.3 percent), Mill Creek (3.7 percent), and Kaolin (0.5 percent) chert from the western Shawnee Hills (Butler 2006b). The majority of the lithic assemblage is comprised of the Dover-like chert with a greater portion of the Upper St. Louis nodular and tabular varieties present than exists in the Archaic component (Butler 2007). The source data generated in the current study refines the lithic data by identifying Fort Payne chert as the majority component of the Dover-like materials. Additionally, the tabular and nodular varieties of the Upper St. Louis chert exploited by the Baumer inhabitants may also be obtained in close proximity to the site both upstream and across the Ohio River.

The identification of significant portions of potentially local available Fort Payne chert in both the Archaic and Baumer components suggest a localized resource acquisition strategy that had a degree of continuity throughout subsequent occupations in the Black Bottom. The presence of lithic material sourced to deposits of Lower St. Louis (Dover var.) chert along the lower Cumberland River to the south is evidence suggesting either a north-south mobility within the river valleys or long-established exchange relationships with groups to the south. The identification of angular cores in both the Archaic and Baumer components as Fort Payne chert supports the explanation that local acquisition of tool stone was the primary strategy in the Black Bottom during both occupations.

Chert-provenance data influences our explanations of human behavior and stands as a useful component in our anthropological models. However, caution must be exercised to contextualize tool-stone consumption to geologic availability, presence of overlapping variability, and methodological limitations. Namely, a holistic view of the 'lithic landscape' is needed to identify any and all potential sources. A provenance methodology must be able to adequately characterize and differentiate between all potential sources prior to assigning sources to artifacts of unknown provenance. The present study utilized source data generated by reflectance spectroscopy to examine the use of Dover-like chert found within the Archaic and Baumer components at the Kincaid site. The results support the idea that the occupants relied less on chert materials acquired from outside regions and more upon local stone-tool resources. The conclusions found here support previous findings in the adjacent Lower Tennessee and Cumberland river valleys that postulate an embedded procurement strategy reliant upon locally available chert resources (Nance 1984, 2000).

Acknowledgments

The authors would like to thank Michael Conner and two anonymous reviewers for corrections and suggestions on a previous draft of the article. Paul Welch and those at the Illinois Historic Preservation Agency are acknowledged for allowing a temporary loan of the Kincaid materials for nondestructive analysis. We also thank the Maury's and other property owners who granted permission to sample chert deposits. Finally, the continued collaboration of Haluk Cetin and the hyperspectral lab at Murray State University is appreciated.

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