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TWENTY-FIRST CENTURY WOODLAND ARCHAEOLOGY IN THE LOWER ILLINOIS RIVER VALLEY: A REGIONAL MODEL

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by

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DISSERTATION

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ABSTRACT

The Lower Illinois River Valley (LIV) has been the subject of over a century of focused archaeological inquiry, resulting in robust body of data with which to investigate the lifeways of ancient indigenous peoples of midcontinental North America. Among the most visible components of this record are the Middle Woodland (50 cal BC-cal AD 400) and Late Woodland (cal 400-1000) assemblages that document an extended period of significant social and demographic transformation of the valley, marked by highly visible monumental architecture, e.g. mounds, and often complex mortuary practices culminating in the disposal of the dead with these monuments. Research reported in this dissertation addresses several outstanding questions concerning Woodland period settlement, moundbuilding and monumentality, mortuary practices, kinship, and ideology during the LIV Woodland period.

First, radiometric data from habitation and mound sites are used to test models of LIV settlement between ca. 50 cal BC and cal AD 400. Analyses show the conventional model of north-to-south LIV settlement is generally supported by mortuary radiocarbon dates, but it is not wholly supported by dates from associated habitation sites. Existing data do not readily support intrasite chronologies at selection mound sites as well. Results indicate that LIV settlement was more complex than suggested by existing models and demonstrate the need for more robust models and datasets.

Second, moundbuilding and monumentality are investigated using a geophysical approach. Results from several geophysical surveys of LIV Middle Woodland mounds using multiple instruments demonstrate the utility of this approach in the non-invasive investigation of internal mound structure. The geophysical work reported here is the first application to LIV mounds, and it points to new directions for the anthropological study of LIV mounds through non-invasive methods.

Finally, a bioarchaeological/biological distance approach is employed to investigate Woodland period mortuary practices, kinship, and ideology between ca 50 cal BC and cal AD 1000. Two studies are reported, one regional and one intrasite, that document interrelationships between community membership, post-marital residency, kinship, and ideology. Results demonstrate Woodland period mortuary practices were an important process through which kin groups/lineages established and legitimized existing social relations within communities.

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Introduction

The Illinois River Valley and its extensive record of human occupation, particularly its record of ancient monumental tumuli, has been the subject of antiquarian and archaeological interest since the nineteenth century (Baker et al. 1941; Buikstra 1988; Farnsworth 2004a, 2004b; Fowke 1905; Henderson 1884; McAdams 1881; Snyder 1895, 1898, 1909; Thomas 1894). It is a history too complex and storied to do justice in a few introductory paragraphs even by just listing milestones relevant to the work reported here. Illinois Valley tumuli were among the data Cyrus Thomas (1894) used to demonstrate the ancestors of Native Americans were the authors of the ancient mounds of eastern North America. P.F. Titterington's (1935) article "Certain Bluff Mounds of Western Jersey County, Illinois" was the first article in the first number of *American Antiquity*. Illinois Valley data informed Thorne Deuel's (1935) conception of "Woodland Basic Culture" in his *American Anthropologist* article, "Basic Cultures of the Mississippi Valley," which was based on the W.C. McKern's (1939) Midwestern Taxonomic Method (MTM). This approach would be explicitly applied to Illinois River Valley contexts in Fay-Cooper Cole and Thorne Deuel's (1937) influential *Rediscovering Illinois: Archaeological Explorations in and around Fulton County*. Illinois River Valley archaeology would continue to figure prominently through the mid-twentieth century in James Griffin's substantial

body of work. These efforts interpreted the local archaeological record or attempted to organize the culture history of eastern North American (Baker et al. 1941; Griffin 1941, 1946, 1952d, 1952e, 1955, 1958, 1967, 1978; Griffin et al. 1970). The culmination of this work was, of course, Griffin's (1952a) *Archeology of Eastern United States*, which included chapters reporting or using Illinois Valley data (Deuel 1952; Griffin 1952b, 1952c; Neumann 1952; Wray 1952). Crane and Griffin's early, and extensive, database of radiocarbon dates included a considerable number of Illinois Valley samples, contributing to the still ongoing correlation of the material record to time (Crane 1956; Crane and Griffin 1958a, 1958b, 1959, 1962, 1963, 1964, 1965, 1966, 1968a, 1968b, 1970, 1972a, 1972b). Mounds, including the human remains and artifacts within them, were an important part of the Illinois archaeological datasets that informed this scholarship.

The latter half of the twentieth century witnessed important transformations of both Americanist and Illinois Valley archaeology. Stuart Struever's (1960, 1964, 1965, 1968a, 1968b; Struever and Houart 1972) work in the Lower Illinois Valley coincided with the emergence of the New Archeology (Binford 1962, 1971). During this time, Gregory Perino (1968, 1973a, 1973b, 2006) conducted his influential and extensive excavations of Lower Illinois Valley mounds and created a corpus of data that continues to inform archaeological and bioarchaeological investigations of past people (Cook 2006). Perino's innovation of complete excavation of mound sites, rather than simply excavating artifact-rich central tombs, provided the representative evidential baseline for

Jane Buikstra's (1972) *Hopewell in the Lower Illinois Valley: A Regional Study of Human Biological Variability and Prehistoric Mortuary Behavior*." This widely influential work, and those that grew from it, would be foundational in the emergency of bioarchaeology as an active and robust subdiscipline of archaeology (Buikstra and Beck 2006). The latter half of the twentieth century would also see the founding and growth of the Center for American Archeology in Kampsville, IL—first known as Archeological Research, Inc., then the Foundation for Illinois Archeology—which would become the interdisciplinary institutional platform from which numerous advances in archaeological theory, method, and knowledge would launch. It is within this long history and context of archaeological research that the work reported here emerges. There are outstanding problems in Illinois Valley archaeology because there has been outstanding research in the Illinois Valley that has provided the necessary body of scholarship and data to address the questions in the articles that follow. The contributions reported here would not be possible, or conceivable, without the considerable amount of work that precedes it.

In the following chapters I report new research that advances knowledge in several important areas of Lower Illinois Valley (LIV) archaeology with broader implications for Americanist Midwestern archaeology. The central problem that unites the work presented here is the manner in which communities and the social relations they embodied were established, reproduced, and transformed during the period between ca. 50 cal BC and cal AD 1000, a span of time corresponding to the archaeologically-defined Middle Woodland (50 cal BC – cal

AD 400) and Late Woodland (cal AD 400-1000) periods. The issues addressed concern the chronology of migration and settlement, moundbuilding and monumentalism, mortuary practices, kinship, and ideology in the LIV between approximately 2000 and 1000 years before present.

The first article, "Time and Archaeological Traditions in the Lower Illinois Valley," (Chapter 2[1]) uses radiometric data from mound and habitation sites to test hypotheses about Middle Woodland period settlement of the LIV and intra-site chronologies of moundbuilding. Several new radiocarbon dates from LIV mound sites are introduced before the entire Middle Woodland radiometric database is used to evaluate intra-site chronologies at select mound sites and to investigate the temporality of LIV settlement. Habitation and mound data are tested in order to detect potential differing temporal signatures. Theses analyses differ from previous work by testing explicit regional temporal models of settlement and moundbuilding, as opposed to site-specific or general discussions of chronology based uncritical use of radiocarbon data, e.g. University of Michigan dates, and uncalibrated dates. Our results generally support a north-to-south settlement trajectory, particularly when viewed from mound dates; however, unexpected early radiocarbon dates from Kampsville Hollow and Macoupin Creek indicate the process of settlement was more complex than typically appreciated and an emphasize the need for increased radiometric sampling and alternative models. Importantly, the results presented

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[1] Jason L. King, Jane E. Buikstra and Douglas K. Charles. "Time and Archaeological Traditions in the Lower Illinois Valley." American Antiquity 76(3):500-528 (2011)

here provide the basis for building new models of the temporality of community establishment, interaction, and change.

The second article, "The Role of Geophysics in Evaluating Structural Variation in Middle Woodland Mounds in the Lower Illinois Valley" (Chapter 3[2]) addresses current problems concerning the investigation of ancient tumuli and the manner in which geophysical prospection is employed to address them. In this article, my coauthors and I present our recent groundbreaking work using geophysical prospection to investigate the structure of MW mounds within the context of mound excavations and regional surveys of external morphology. Geophysics is presented as an important non-invasive approach for relatively rapidly collecting data on internal structure and evaluating the conservation status of tumuli. Emphasis is placed on the empirical challenges of geophysical mound data, particularly concerning detecting and differentiating between geophysical signatures of mound soils and mound structures. The second concern of this article is the manner in which archaeologists can move from empirical interpretation of geophysical results to using geophysical data to address anthropological questions about past communities.

"Creating Ancestors: Kinship, Mortuary Practices, and Ideology in the Middle and Late Woodland Periods of the Lower Illinois," (Chapter 4) is a bioarchaeological investigation of regional Middle Woodland and Late Woodland

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[2] Jason L. King, Duncan McKinnon, Jason T. Herrmann, Jane E. Buikstra, and Taylor H. Thornton. "The Role of Geophysics in Evaluating Structural Variation in Middle Woodland Mounds in the Lower Illinois Valley" In Archaeological Remote Sensing: Applications in North America, Duncan McKinnon and Bryan Haley, eds. University of Alabama Press (in press).

mortuary practices. In that chapter, I present a new model for understanding changing mortuary practices and their connections to kinship, community membership, and ideology. This model posits that limited-access mortuary treatments (processing) during the Middle and Late Woodland periods were employed by influential lineages within communities to ritually construct their dead kin as ancestors to the exclusion of others in the community, e.g. post-marital migrants, new recruits, and junior lineages. I argue this exclusionary social action deliberately reproduced and legitimized specific forms of Woodland period social relations within communities, rather than merely represented individualized status differences. Results indicate continuity in community structure and its relationships to kinship, locality, and mortuary treatments between ca. 50 cal BC – cal AD 1000, across the presumed cultural disjuncture inferred from material culture. This work improves upon previous analyses that either focus solely on the MW assemblages or overly emphasize differences between archaeologically-defined time periods to promote unsupported interpretations of social collapse and/or social organization from inferred individual-centric representations of the dead.

The final article, “The Temporality of Community Dynamics: Mortuary and Biological Variability at the Pete Klunk (11C4) and Gibson (11C5) Sites, Calhoun County, Illinois,” (Chapter 4) uses the approach reported in “Creating Ancestors” in an intra-site analysis of two Middle Woodland sites overlooking Kampsville Hollow. New radiocarbon dates are reported for both sites. Prior to this dissertation only a single radiocarbon date existed for the MW component of the

Pete Klunk site—a site that has been integral for understanding MW mortuary practices. Thus, the new radiocarbon data places the Pete Klunk and Gibson sites in their proper temporal context for the first time and show simultaneous use of mounds at both sites. Radiometric data are used to partition the Pete Klunk and Gibson mortuary and biological distance datasets into sub-samples to investigate the ancestor-generative model presented in Article 3/Chapter 4 at the intra-site level. The new temporal data provide increased resolution of social processes in the Kampsville Hollow community and provide insight into previously unknown community dynamics. Results document previously undetected changes in mortuary practices, post-marital residency practices, and mortuary practices at the Kampsville mounds, and provide insight into manner in which relatively stable forms of mortuary practices (processing) were employed to legitimize the social relationships with communities.

Finally, Chapter 6 summarizes results presented in Chapters 2-5 and suggests future research directions in LIV archaeology. These articles contribute to advancing a methodologically, analytically, and theoretically-informed perspective on Woodland archaeology. Article 1 (Chapter 2) and Article 4 (Chapter 5) provide the beginning of refined regional and intra-site chronologies to more firmly anchor subsequent studies while demonstrating the need for more date. Article 2 (Chapter 3) illustrates initial non-invasive strategies for inventory and investigation of Woodland funerary monuments through non-invasive geophysical prospection. Articles 3 and 4 (Chapters 4 and 5) explore Woodland period transformations of social relations and funerary practice at the

regional (Chapter 4) and community levels (Chapter 5), respectively, anchoring Middle and Late Woodland social process in kinship.

Chapter 2

Time And Archaeological Traditions In The Lower Illinois Valley

The mortuary monuments lining the lower Illinois valley (Figure 1, Table 1) have stimulated well over a century of archaeological inquiry (Henderson 1884; Thomas 1894). Among these, none are more highly visible than those tumuli belonging to the Middle Woodland period, typically associated with crypt-ramp complexes and finely crafted "Hopewell" artifacts, frequently of non-local raw materials (Braun 1979; Brown 1968, 1979; Buikstra 1976, 1988; Buikstra et al. 1998; Charles et al. 2004; Farnsworth 2004; Perino 1968, 2006; Struever 1968; Struever and Houart 1972). Despite intense scholarly interest and early applications of radiometric techniques (e.g., Crane and Griffin 1958a, 1958b, 1959, 1962, 1963, 1964, 1965, 1966, 1968, 1970, 1972a, 1972b), fundamental chronological issues remain unresolved. These include (1) intra-site mound chronologies of bluff top mound groups; (2) the timing and pattern of valley settlement; and (3) the emergence of regional symbolic communities (Ruby et al. 2005) in relationship to settlement of the valley. Regional chronological problems are exacerbated by the indeterminacy of early radiocarbon assays in the regional database with broad error ranges (Crane 1956; Crane and Griffin 1958a, 1958b, 1959, 1962, 1963, 1964, 1965, 1966, 1968, 1970, 1972a, 1972b).

Figure 1. Lower Illinois valley mound and habitation sites, and mound survey transects.

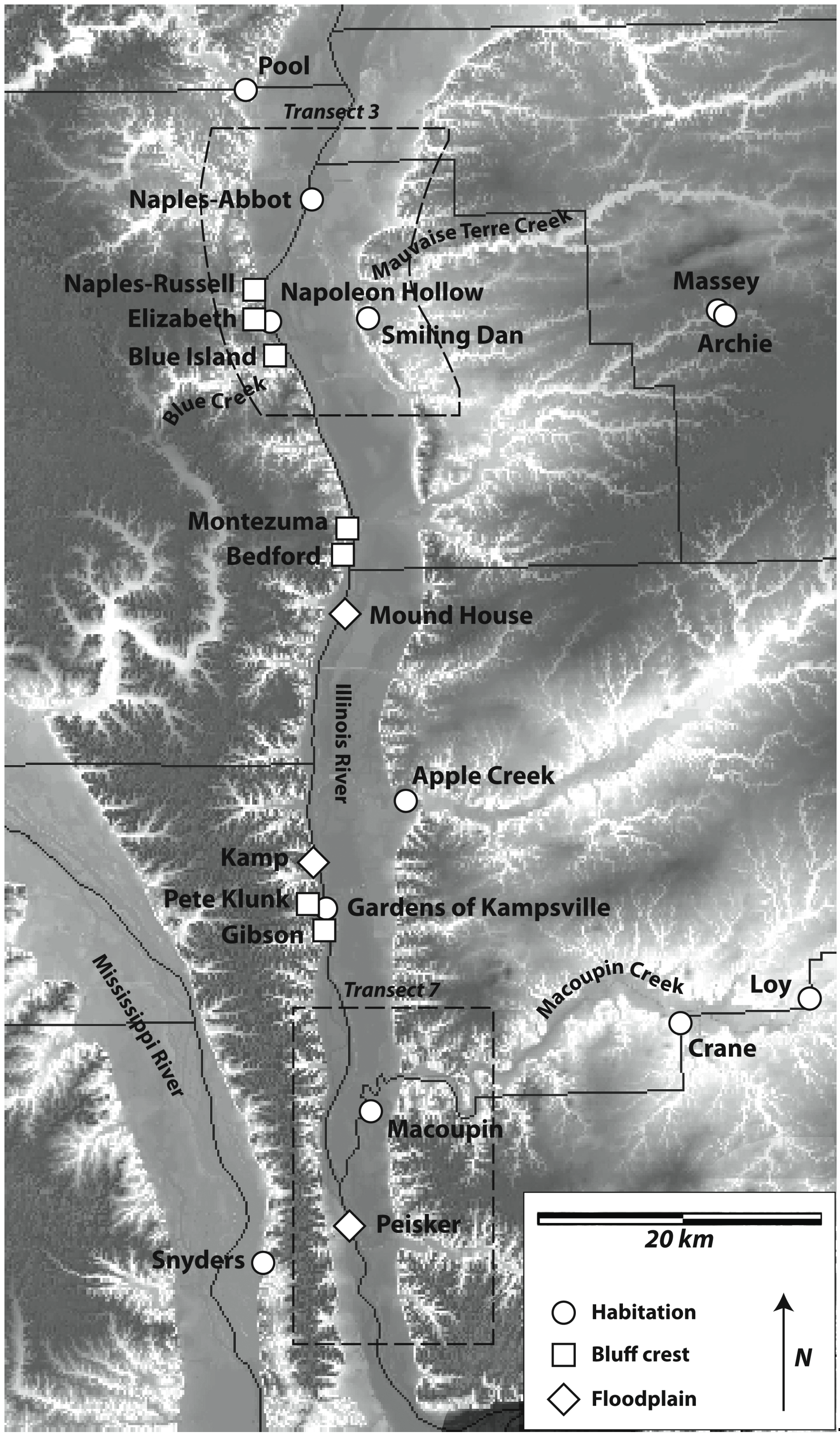


Table 1. Lower Illinois Valley site names and IAS/STS designations.

Site Name	IAS/STS Designation
Apple Creek	11GE2
Archie	11MG17
Bedford	11PK7
Blue Island	11PK1384
Crane	-
Elizabeth	11PK512
Gibson	11C5
Irving	11PK2
Kamp	11C12
Loy	-
Macoupin	11JY70
Massey	11MG15
Montezuma	11PK1245
Mound House	11GE7
Naples-Abbot	11ST1
Naples-Russell	11PK513
Napoleon Hollow	11PK500
Peisker	11C135
Pete Klunk	11C4
Pool	11PK1
Smilling Dan	11ST123
Snyders	11C8
The Buried Gardens of Kampsville	11C373

Such chronological questions are significant, because they relate to the proposition that this phenomenon archaeologists term Hopewell—long distance movement of rare materials, elaborate mortuary and other ceremonial manifestations, and widespread iconographic and design elements—is a materialization of “increased intensity of social, political and economic relations among individuals, residential groups and wider communities” in a context of demographic and geographic transformation (Charles et al. 2004:49; see also Charles and Buikstra 2002; Van Gilder and Charles 2003). To address these issues, we present hypotheses amenable to testing with radiometric data. Our tests are based upon fourteen new, high-precision radiocarbon assays from

Middle Woodland mound sites (Table 2), supplemented with published mound (Table 3) and habitation site dates (Table 4).

Table 2. New calibrated radiocarbon dates.

Sample[a]	Lab #	$\delta^{13}C$	^{14}C Age±E (BP)	Cal Range (2σ)	Median
Blue Island 6 Burial 1 Skeleton 2	QL-4902	-20.0	2058±14	160 – 3 B.C.	74 B.C.
Elizabeth 4 Burial 2	QL-4893	-21.5	2010±15	46 B.C. –A.D. 47	-12 B.C.
Gibson 1 Burial 16	QL-4897	-21.6	2000±15	43 B.C. – A.D. 51	0
Elizabeth 1 Burial 3 Skeleton 1	QL-4891	-21.0	1990±15	39 B.C. – A.D. 54	A.D. 12
Elizabeth 7 Burial 9 Skeleton 2	QL-4895	-21.4	1940±16	A.D. 21 – 122	A.D. 62
Naples-Russell 8 Burial 1 Skeleton 1	QL-4904	-20.7	1913±16	A.D. 58 – 127	A.D. 91
Elizabeth 6 Burial 4 Skeleton 5	QL-4894	-20.0	1908±15	A.D. 64 – 128	A.D. 97
Elizabeth 3 Burial 2 Skeleton 1	QL-4892	-20.6	1881±16	A.D. 72 – 211	A.D. 111
Kamp 9 Burial 4	QL-4903	-20.3	1849±14	A.D. 93 – 230	A.D. 170
Gibson 3 Burial 17	QL-4899	-21.2	1799±16	A.D. 136 – 314	A.D. 221
Gibson 5 Burial 30	QL-4901	-20.3	1756±16	A.D. 237 – 336	A.D. 293
Gibson 2 Burial 2	QL-4898	-21.1	1745±16	A.D. 240 – 345	A.D. 295
Gibson 4 Burial 2	QL-4900	-21.3	1705±16	A.D. 258 – 398	A.D. 346
Elizabeth 10 Burial 14	QL-4896	-21.1	1312±21	A.D. 658 – 769	A.D. 687

[a]Skeleton numbers are provided for burials that included more than one individual. Those lacking skeleton designations are single inhumations.

Table 3. Published calibrated radiocarbon dates from Lower Illinois Valley mound sites.

Sample[a]	Lab #	^{14}C Age (BP)	Calibrated Range (2σ)	median	Source
Montezuma 9 Central Feature	M-1485	2110±130	407 B.C. – A.D. 210	146 B.C.	(Crane and Griffin 1968)
Elizabeth 6 Feature 1, Prepared Surface	ISGS-844	2070±75	356 B.C. – A.D. 78	96 B.C.	(Charles, Leigh and Buikstra 1988)
Kamp 9, Pike Vessel 3	ISGS-1780	2060±70	352 B.C. – A.D. 80	83 B.C.	(Asch 1990)
Mound House 1 Feature 260-08-1	ISGS-2974	2040±70	347 B.C. – A.D. 123	57 B.C.	(Buikstra et al. 1998)
Elizabeth 7 Sq 143-14A, Feature 1	ISGS-1316	2030±70	339 B.C. – A.D. 126	44 BC	(Charles, Leigh and Buikstra 1988)
Kamp 9, Sub-Mound Pit 2	ISGS-1774	2020±70	202 B.C. – A.D. 129	32 B.C.	(Asch 1990)
Mound House 1 Feature 259-02A	ISGS-2973	2010±70	199 B.C. – A.D. 131	20 BC	(Buikstra et al. 1998)
Peisker 2, Sub-Mound Feature L	ISGS-1109	1980±80	179 B.C. – A.D. 220	A.D. 13	(Farnsworth and Asch 1986)
Elizabeth 6 Sq 85, Feature 1, Central tomb	ISGS-1140	1980±70	172 B.C. – A.D. 210	A.D. 14	(Charles, Leigh and Buikstra 1988)
Kamp 9, Sub-Mound Pit	M-1040	1980±75	173 B.C. – A.D. 213	A.D. 14	(Crane and Griffin 1962)
Mound House 1 Feature 227-04	ISGS-2970	1960±70	158 B.C. – A.D. 221	A.D. 38	(Buikstra et al. 1998)
Peisker 3, Sub-Mound Feature 1038a	WIS-942	1955±60	94 B.C. – A.D. 216	A.D. 44	(Bender et al. 1979)
Bedford 10-11, Basin	M-444	1940±125	349 B.C. – A.D. 385	A.D. 59	(Crane and Griffin 1958a)
Elizabeth 7 Sq 110, Central crypt	ISGS-1317	1940±70	105 B.C. – A.D. 238	A.D. 62	(Charles, Leigh and Buikstra 1988)
Kamp 9, Pike Vessel 2	M-1039	1940±75	154 B.C. – A.D. 241	A.D. 62	(Crane and Griffin 1962)
Kamp 9, Pike Vessel 3	ISGS-1652	1940±70	105 B.C. – A.D. 238	A.D. 62	(Asch 1990)
Mound House 1 Feature 230	ISGS-2948	1940±70	105 B.C. – A.D. 238	A.D. 62	(Buikstra et al. 1998)
Mound House 1 Feature 262-03	ISGS-2969	1940±70	105 B.C. – A.D. 238	A.D. 62	(Buikstra et al. 1998)
Bedford 10-11, Basin	M-443	1930±125	346 B.C. – A.D. 390	A.D. 72	(Crane and Griffin 1958a)
Mound House 1 Feature 252-02	ISGS-2972	1910±70	84 B.C. – A.D. 316	A.D. 98	(Buikstra et al. 1998)
Mound House 1 Feature 258-05-1	ISGS-2971	1900±70	48 B.C. – A.D. 318	A.D. 110	(Buikstra et al. 1998)
Kamp 9, Central Feature Log	ISGS-1778	1890±70	44 B.C. – A.D. 321	A.D. 121	(Asch 1990)
Peisker 3, Sub-Mound Feature 2	M-1570	1880±120	165 B.C. – A.D. 410	A.D. 134	(Crane and Griffin 1968)
Peisker 3, Sub-Mound Feature 5	M-2223	1860±140	193 B.C. – A.D. 531	A.D. 157	(Crane and Griffin 1972a)
Mound House 1 Feature 232-1, 4-6	ISGS-2976	1850±80	A.D. 0 – 381	A.D. 169	(Buikstra et al. 1998)
Peisker 2, Sub-Mound Feature W	O-2269	1850±105	87 B.C. – A.D. 419	A.D. 170	(Struever 1968)
Peisker 3, Sub-Mound Feature 1094a	WIS-947	1835±70	A.D. 26 – 380	A.D. 183	(Bender et al. 1979)
Mound House 1 SQ-78-08/09b	ISGS-2549	1820±70	A.D. 57 – 383	A.D. 198	(Buikstra et al. 1998)
Peisker 2, Sub-Mound Feature V		1820±160	-174 B.C. – A.D. 562	A.D. 200	(Struever 1968)
Kamp 9, Central Feature Log	M-1041	1810±75	A.D. 56 – 396	A.D. 211	(Crane and Griffin 1962)

Mound House 1 Feature 258-05-2	ISGS-2975	1800±70	A.D. 72 – 392	A.D. 222	
Pete Klunk 1, Primary A	M-1161	1775±75	A.D. 80 – 414	A.D. 253	
Peisker 2, Sub-Mound Feature 7	M-1405	1770±130	38 B.C. – A.D. 549	A.D. 259	
Elizabeth 3 Burial 7 Skeleton 1	GX-18529-AMS	1767±51	A.D. 132 – 388	A.D. 268	
Kamp 9, Pike Vessel 1	M-1038	1760±100	A.D. 57 – 533	A.D. 271	
Peisker 3, Sub-Mound Feature 10302	WIS-950	1755±60	A.D. 130 – 410	A.D. 282	
Bedford 4 Burial 19	M-445	1720+125	A.D. 53 – 594	A.D. 313	
Peisker 3, Sub-Mound Feature 1	M-1569	1700±120	A.D. 77 – 592	A.D. 336	
Bedford 9, Central crypt	M-446	1550±125	A.D. 215 – 765	A.D. 489	
Elizabeth 10 Burial 14	ISGS-1527b	1260±70	A.D. 649 – 944	A.D. 764	(Charles, Leigh and Buikstra 1988)
Elizabeth 10 Burial 14	ISGS-1527a	900±100	A.D. 903 – 1284	A.D. 1127	(Charles, Leigh and Buikstra 1988)

[a]Skeleton numbers are provided for burials that included more than one individual. Those lacking skeleton designations are single inhumations.

Table 4. Published calibrated radiocarbon dates from Lower Illinois Valley habitation sites.

Sample	Lab #	^{14}C Age + E BP	2σ Cal Range	Cal Median	Source
Naples-Abbott, Smith Area	ISGS-1645	2100±130	403 B.C. – A.D. 210	135 B.C.	(Asch 1987)
Gardens of Kampsville	ISGS-1818	2100±70	359 B.C. – A.D. 49	130 BC	(Studenmund and Farnsworth 2000)
Loy, carbonized nutshell	ISGS-1078	2040±70	347 B.C. – A.D. 123	57 B.C.	(Farnsworth and Asch 1986)
Macoupin Sample 6[a]	M-2225	2020±200	702 B.C. – A.D. 502	42 B.C.	(Crane and Griffin 1972b)
Smiling Dan SQ39-17B-19B, dispersed nutshell and wood	ISGS-854	2020±75	347 B.C. – A.D. 113	33 B.C.	(Stafford and Sant 1985)
Loy, pit feature, charcoal mass	ISGS-181	2010±85	347 B.C. – A.D. 214	24 B.C.	(Coleman and Liu 1975)
Napoleon Hollow, Block IV, Feature 45-01,01P, 02,03,03BP	ISGS-916	2000±70	199 B.C. – A.D. 201	9 B.C.	(Wiant and McGimsey 1986)
Loy	ISGS-1105	1970±80	171 B.C. – A.D. 224	A.D. 25	(Farnsworth and Asch 1986)
Loy	ISGS-251	1970±80	171 B.C. – A.D. 224	A.D. 25	(Liu et al. 1986)
Loy, pit hearth	ISGS-171	1970±75	165 B.C. – A.D. 214	A.D. 26	(Coleman and Liu 1975)
Napoleon Hollow, Block I, SQ73-08A,09A, midden	ISGS-935	1970±70	164 B.C. – A.D. 213	A.D. 26	(Wiant and McGimsey 1986)
Gardens of Kampsville	ISGS-1813	1960±70	158 B.C. – A.D. 221	A.D. 38	(Studenmund and Farnsworth 2000)
Macoupin, Feature 127, charcoal	M-2229	1950±200	397 B.C. – A.D. 533	A.D. 42	(Crane and Griffin 1972b)
Massey, Feature11-02-3-4	ISGS-963	1930±70	93 B.C. – A.D. 243	A.D. 74	(Farnsworth and Koski 1985)
Gardens of Kampsville	ISGS-1808	1920±70	91 B.C. – A.D. 253	A.D. 86	(Studenmund and Farnsworth 2000)
Smiling Dan, midden	ISGS-1094	1910±40	A.D. 5 – 216	A.D. 95	(Stafford and Sant 1985)
Macoupin, Feature 173	M-2243	1900±140	350 B.C. – A.D. 429	A.D. 108	(Crane and Griffin 1972b)
Archie, Feature 4 Zone 2	ISGS-966	1900±70	48 B.C. – A.D. 318	A.D. 110	(Farnsworth and Koski 1985)
Snyders, Feature 8c	M-1154	1890±75	47 B.C. – A.D. 326	A.D. 122	(Crane and Griffin 1963)
Napoleon Hollow, Block IV, SQ237-05	ISGS-931	1880±70	39 B.C. – A.D. 323	A.D. 133	(Wiant and McGimsey 1986)
Crane	ISGS-1107	1870±70	37 B.C. – A.D. 331	A.D. 146	(Conrad et al. 1984)
Snyders, Pit 18 Feature C	M-1487	1850±120	160 B.C. – A.D. 430	A.D. 170	(Crane and Griffin 1965)
Napoleon Hollow, Block IV - SQ237-02,03A,03B	ISGS-834	1840±75	A.D. 20 – 381	A.D. 179	(Wiant and McGimsey 1986)
Smiling Dan, Post mold Unit IIb	Beta-4534	1830±50	A.D. 71 – 328	A.D. 184	(Stafford and Sant 1985)
Napoleon Hollow, Block IV - F41-01,02	ISGS-929	1810±70	A.D. 66 – 388	A.D. 210	(Wiant and McGimsey 1986)
Naples-Abbott, Smith Area	ISGS-1650	1810±70	A.D. 66 – 388	A.D. 210	(Asch 1987)
Gardens of Kampsville	ISGS-1814	1810±70	A.D. 66 – 388	A.D. 210	(Studenmund and Farnsworth 2000)
Smiling Dan, Unit III	Beta-4980	1805±95	A.D. 1 – 427	A.D. 219	(Stafford and Sant 1985)

Archie, Feature 5 Zone 1-2	ISGS-964	1800±70	A.D. 72 – 392	A.D. 222	(Farnsworth and Koski 1985)
Crane, Carbonized Nut shell[b]	ISGS-1200	1800±70	A.D. 72 – 392	A.D. 222	(Farnsworth and Asch 1986)
Napoleon Hollow, Block I, SQ73-03-06	ISGS-904	1800±70	A.D. 72 – 392	A.D. 222	(Wiant and McGimsey 1986)
Gardens of Kampsville	ISGS-1102	1790±70	A.D. 79 – 397	A.D. 235	(Farnsworth and Asch 1986)
Smiling Dan, Feature 231	ISGS-1027	1790±80	A.D. 63 – 416	A.D. 235	(Stafford and Sant 1985)
Smiling Dan, Trench F profile wall	ISGS-841	1780±75	A.D. 78 – 412	A.D. 247	(Stafford and Sant 1985)
Crane	ISGS-951	1750±70	A.D. 87 – 428	A.D. 285	(Conrad et al. 1984)
Massey, Feature 1-01-02	ISGS-965	1750±70	A.D. 87 – 428	A.D. 285	(Farnsworth and Koski 1985)
Pool	M-183	1740±125	A.D. 22 – 571	A.D. 292	(Crane 1956)
Macoupin, Sample 101	M-2245	1730±130	A.D. 25 – 591	A.D. 302	(Crane and Griffin 1972b)
Snyders, Feature 8d	M-1155	1720±75	A.D. 129 – 532	A.D. 316	(Crane and Griffin 1963)
Apple Creek	ISGS-1204	1710±70	A.D. 134 – 532	A.D. 328	(Farnsworth and Asch 1986)
Crane	ISGS-1081	1710±70	A.D. 134 – 532	A.D. 328	(Conrad et al. 1984)
Smiling Dan, Feature 61	ISGS-958	1700±70	A.D. 139 – 534	A.D. 339	(Stafford and Sant 1985)
Smiling Dan,	Beta-4981	1630±80	A.D. 242 – 595	A.D. 424	(Stafford and Sant 1985)
Macoupin, F 44b	M-2244	1500±130	A.D. 240 – 798	A.D. 536	(Crane and Griffin 1972b)
Apple Creek, Feature 367b	M-1721	1490±130	A.D. 245 – 805	A.D. 546	(Crane and Griffin 1966)

[a]Not included in analysis. Crane and Griffin (1972) called this assay “a bad run” without elaboration.
[b]An earlier assay of the same material (ISGS-1078) returned a date of 2040±70 B.P.

Models

Intra-Site Chronology

Charles (1985, 1992) developed a model of mound group formation that correlates external mound shape and mound position with time. External structure of unexcavated mounds was found to differentiate among and between Middle (4 types) and Late Woodland (2 types) mounds. Spatially, the earliest mounds in a mound group occur on the most prominent, distal bluff ridges, which provided the greatest viewscapes of the valley. In complementary fashion, these loci are highly visible from the valley floor. Later mounds occupied increasingly less prominent spaces. These six mound types were then used to establish the migration model (see below).

Seriation of genetic variation between groups of human remains recovered from individual mounds at the Gibson and Pete Klunk sites tentatively supported Charles' structural/spatial model. Konigsberg (1987) measured biological distances between cemetery samples within mounds as a proxy for time to test hypothesized intra-site chronologies, assuming greater biological distances would correlate with temporal distance between individual mounds. However, lack of a robust suite of absolute dates for either site left his chronologies unanchored and in need of further testing.

Middle Woodland mound size and structural complexity have also been hypothesized as time-sensitive variables, based on excavation at the Elizabeth site (Bullington 1988; Charles, Leigh and Buikstra 1988). Structural complexity

was measured as the addition of novel components to mounds (e.g., central feature, burial ring, ramp extensions). Both size and complexity appeared to align with existing expectations of tumulus location relative to the distal end of the bluff's ridge (Bullington 1988:220). Thus, earlier mounds were small, simple structures located on distal bluff ridges while later mounds were large, complex and occupied less prominent locations.

Recently, Martin (2002, 2005) has presented a (re)construction of Illinois Middle Woodland burial practices that differs from that developed by Buikstra and Charles (Buikstra 1976, 1988; Buikstra and Charles 1999; Charles 1985, 1992, 1995; Charles and Buikstra 2002; Charles et al. 2004). Applying concepts developed by the philosopher of science Bruno Latour, Martin's analysis involved identifying "Latourian controversies," which he defined as ideological disputes involving the representation of social order. Martin recognized controversies as the superimposition of mound types defined by his analysis (e.g., the ramp/crypt complex constructed on top of the subfloor processing pits and associated graves in Gibson mounds 2 and 5 described below). Martin's typology, and thus pattern, had not been identified by Bullington (1988) or by Buikstra and Charles (e.g. 1999). While the structural configuration Martin identifies appears to have some validity, the assertion that these components represent the work of factions with competing ideologies within Middle Woodland populations is made in the absence of any definition of "group" or "community," or indications what these factions might be in standard anthropological terminology. Though purportedly based on agency theory,

Martin's analysis is inherently and synchronically structuralist, and there is no discussion of this Hopewellian practice within a larger framework of Eastern Woodlands prehistory. Charles' model recognizes both diachronic and synchronic relationships among variables and embeds Middle Woodland practice within the prehistory of the region (Buikstra and Charles 1999; Charles 1992, 1995; Charles and Buikstra 2002; Charles et al. 2004; see also Bullington 1988). A full consideration of the theoretical and methodological issues invoked by Martin's work is beyond the scope of this article. Martin's (2002) dissertation, the basis for his 2005 article, does provide an extended analysis amenable to examination via the ^{14}C dates now available. We compare his expected intra-site chronologies with those predicted by the aforementioned mound group formation model.

Implicit in all interpretations, with the exception of Martin's model, is the assumption that individual mounds within sites were used serially, with mound use lasting perhaps a single generation. Temporal overlap between mounds, if it occurs at all, is expected only at initiation and closure of sequential structures. The possibility of concurrent use of structures within sites has received less attention; thus, contemporaneity of mounds is a potentially complicating factor for most site/mound group formation models.

Migration

Evidence from habitation and mortuary sites suggests the lower Illinois valley was largely vacant between the end of the Early Woodland period, ca. 200 B.C., until the early Middle Woodland Period, ca. 50 B.C. (Buikstra and Charles 1999; Charles 1985, 1992, 1995; Farnsworth 1986; Farnsworth and Asch 1986). In their analysis of ceramics and then-extant radiocarbon dates, Farnsworth and Asch (1986) estimated an 150-year hiatus between late Early Woodland Black Sand (Cypress Phase) and initial Middle Woodland Havana (Mound House Phase) occupations in the lower Illinois valley, indicated by both a gap in uncalibrated radiocarbon ages (B.P.) and the absence of transitional Cypress to Havana cultural residues (i.e., ceramics). Population densities estimated from cemetery distribution data also indicate small or nonexistent populations within the lower Valley during the Early Woodland period (Charles et al. 1986). Both Terminal Archaic and Early Woodland cemeteries are infrequent compared to Archaic and Middle Woodland cemeteries, suggesting depopulation of the region.

By ca. 50 B.C., the appearance of prominent bluff crest tumuli—community cemeteries—along the valley margins and habitation sites—residential communities—signaled the presence of new groups and the beginning of the Middle Woodland period. Migrants into the lower Illinois valley may have originated in the central Illinois valley (Buikstra and Charles 1999; Charles 1985, 1992, 1995; Farnsworth and Asch 1986) and occupied “territory that was already vacated” (Farnsworth and Asch 1986:446). Analyses of material

culture (e.g., ceramics) (Farnsworth and Asch 1986) and mound structure (Bullington 1988) support a significant central valley contribution to lower valley dynamics; however, neither the genetic nor the demographic structure of migration and settlement of the lower valley has been extensively modeled due to an absence of temporal control.

Based on structural and spatial analysis of Middle Woodland bluff crest mounds from the two transects indicated in Figure 1, Charles (1985, 1992, 1995) hypothesized that initial settlement occurred at the northern end of the lower valley, along its western edge near Blue Creek (Figure 1). Subsequent expansion was hypothesized both northward toward Mauvaise Terre Creek and southward toward the confluence of the Illinois and Mississippi Rivers. The spatial-temporal distribution of residential sites should correlate with the mound data, reflecting this demographic transformation of the lower valley. However, in their assessment of Middle Woodland habitation site dates, Studenmund and Farnsworth (2000) found the radiometric data did not fit a southward migration model though they suggest a trend of movement from north to south (but see Discussion and Conclusion section below).

Expectations for a north-to-south migration model are directly testable. The earliest bluff crest mound and habitation dates should cluster on the western side of the main valley near Blue Creek. Later sites should be found both north and south of the initial occupation. More recent settlements and cemeteries are expected in the southern portion of the valley.

Regional Symbolic Communities

Ruby et al. (2005) have outlined a model of Middle Woodland community interactions for regional Hopewell expressions, including the lower Illinois valley. They suggest three types or forms of community for Middle Woodland/Hopewell groups—residential, sustainable and symbolic—and they anchor the emergence of Illinois Hopewell in the formation and maintenance of large symbolic communities that integrated residential communities into larger, more inclusive groups (Ruby et al. 2005:123-4). While sustainable communities may incorporate multiple residential communities (or parts of communities), symbolic communities may be coterminous with either, or cross-cut them, and there may be multiple symbolic communities at the same or different scales. These definitions of community reflect organizing principles, not cross-cultural entities. Residential communities are defined by geographic proximity, sustainable communities refer to long-term viable biological and social populations, and symbolic communities are reflective of cultural practice. Development of symbolic communities can be traced via their expression in Middle Woodland/Hopewellian monumentalism where moundbuilding is embedded in ceremonial contexts broader than solely funerary ritual (Buikstra and Charles 1999; Buikstra et al. 1998; Charles 1985). In the lower Illinois valley, different community scales are materially manifested as different types and locations of sites. Bluff crest tumuli, in general, served to integrate floodplain *residential* hamlets into small and inclusive local *symbolic* communities. Floodplain mound sites incorporated a broader range of civic and ceremonial functions, integrating

local symbolic communities, or segments of those communities, into larger regional groups, creating and maintaining *regional symbolic* communities (Buikstra et al. 1998; Charles et al. 2004; Ruby et al. 2005; Struever and Houart 1972). We expand the framework of Ruby and coworkers (2005), to differentiate between local symbolic communities, in which different groups of hamlets (perhaps representing extended lineages) unite in funerary rituals conducted at each groups' own blufftop mound site, and regional symbolic communities, where larger numbers of people periodically gather at floodplain mound sites, potentially constructing and maintaining sustainable communities. Whereas the distribution of bluff top mound sites are presumed to correlate with the distribution of clusters of hamlets (Charles 1985, 1992; Charles and Buikstra 1983; Goldstein 1980, 1981; Saxe 1970), the composition of the sustainable communities represented by the floodplain mound sites may be based around cross-cutting social networks that do not have clear geographic correlates and their membership may not be geographically or temporally stable (Ruby et al. 2005).

As a corollary to the previous hypothesis, we predict the emergence of multi-community sites should follow the north-south trajectory of people migrating into the valley. Floodplain mound groups would have developed as settlers spread southward. The appearance of floodplain ceremonial sites may have occurred later than initiation of residential community cemeteries, reflecting development of broader inter-group interactions as populations

increased in size and became geographically stable (Braun 1977, 1981; Buikstra and Charles 1999; Charles 1985; Ruby et al. 2005).

Large, complex bluff crest mounds (e.g., Naples-Russell 8, Elizabeth 6 & 7) associated with hypothesized early residential settlements may have been prototypes for the immense, complex tumuli found in the floodplain, such as Mound House, Kamp and Peisker. The large Naples-Russell-Elizabeth (Figure 1) mounds should predate subsequent moundbuilding within the floodplain to the south. Alternatively, they may have been built on the bluffs because of the restricted breadth of floodplain adjacent to the sites. Since the Naples-Russell-Elizabeth mounds are similar to both bluff crest and floodplain mounds, analyses were conducted both including and excluding these three tumuli in order to detect any effects on significance statistics.

Materials and Methods

To test Middle Woodland chronologic hypotheses, we present 14 new radiocarbon dates from five lower Illinois valley mound sites (Figure 1, Table 2). Preliminary interpretation (Kut and Buikstra 1998) generally considered regional chronology and supported Charles' (1985, 1992) model for migration and repopulation of the lower Illinois valley. We expand upon that analysis, considering these "new" radiocarbon dates along with those previously reported to address the issues defined above.

Radiometric dates were measured by the Quaternary Isotope Laboratory (QL) using extended count-time analysis of human collagen samples, resulting in high precision estimates of time of death of sampled individuals. These assays allow us to establish temporal relationships within and between cemeteries by estimating the time of emplacement of the dead within tumuli. Samples were obtained from skeletons from five Middle Woodland/Hopewell mound sites (Table 2). Four sites (Blue Island, Elizabeth, Gibson and Naples-Russell) contain residential community cemeteries and are located on the bluff crests (Charles, Leigh and Buikstra 1988; Farnsworth and Atwell 2001; Perino 2006). Kamp 9, in contrast, is part of a large, multi-community (regional symbolic community) site situated in the floodplain adjacent the Illinois River (Baker et al. 1941; Struever 1960). As noted above, some mounds at the Naples Russell and Elizabeth sites may fall into either category.

We have supplemented our data with additional radiocarbon assays from Middle Woodland mound (Table 3) and habitation sites (Table 4). These samples were collected during the last half century of Illinois archaeology and analyzed by Beta Analytic (Beta), Geochron Laboratories (GX), Illinois State Geological Survey (ISGS), Humble Oil and Refinery (O), University of Michigan (M), and Wisconsin (WIS) radiocarbon laboratories as indicated by their lab specific codes. Dates are organized by the median of the calibrated probability curve, which is a more robust temporal estimator than the intercept(s) (Telford et al. 2004). While the calibrated median does not adequately describe the full range of probable calendar dates, it provides a guide that allows us to maximize the

interpretative potential of older radiocarbon determinations while remaining sensitive to the indeterminacy of estimates with overly broad counting errors.

Calibrated dates were generated using Calib 5.01 (Reimer et al. 2004; Stuiver and Reimer 1993). Statistical comparisons of uncalibrated radiocarbon ages (B.P.) were performed before calibration using *T´* as outlined in Ward and Wilson's Case II scenario, with additional variance ($f^2=50^2$) added to counting errors (Clark 1975; Ward and Wilson 1978). Reported calibrated ranges do not include added variance, however.

Using calibrated medians, temporal differences between spatial groups (see Results) were tested using PROC GLM (*G*eneralized *L*inear *M*odel) in SAS 9.1.3. This test is equivalent to an unbalanced ANOVA model and assumes equal variances between groups. Levene's test of homogeneity of variances indicates that group variances are not significantly different. Group distributions are approximately normal, either when all mounds are considered together or by spatial subset, though subset group sizes are small. Differences between groups were evaluated by inspecting contrasts. Contrasts are comparisons of linear combinations of factors, (e.g., spatial groups of sites) that include pairwise mean comparisons as well as more complex combinations such as a single group's mean versus the average of several factors (Christensen 1998:117-119, 132-136). Contrast significance was evaluated using Scheffé's method, which is best suited for unbalanced data and post hoc multiple comparisons suggested by the data (Christensen 1998:159-160; Scheffé 1959). Testing in this manner assumes calibrated medians are a reasonable estimate of the true calendar

date, but it does not account for the entire calibrated range. Therefore, statistical significance should be interpreted conservatively.

Results

We present the context and results for new radiocarbon samples below. Other dates are discussed only where relevant to the new samples. References for those previously presented in the literature are provided in Tables 3 and 4. Following our discussion of sample results, analytical results are considered.

Samples

Blue Island (BLM). The Blue Island group is an impressive series of coalesced bluff crest tumuli on the west side of the Illinois valley overlooking Blue Creek (Figure 1). Sample QL-4902 is from Blue Island 6 Burial 1 Skeleton 2 (BLM°6-1-2), a bundle burial at the feet of an extended skeleton associated with multiple Hopewell items. The burial feature was a large grave excavated into the bluff, which was probably covered by a single capping episode (Kenneth Farnsworth, personal communication 2006). It is not clear whether Burial 1 was an initiating or closing event at mound 6, though there was no indication of additional corpse processing within the burial feature (e.g., isolated small bones or bone fragments). Evidence of further burials was not noted in the disturbed remnants of mound 6; however, most of the group remains unexcavated. BLM°6-1-2 dates 160 - 3 cal B.C., and is earlier than any other collagen-based assay reported here.

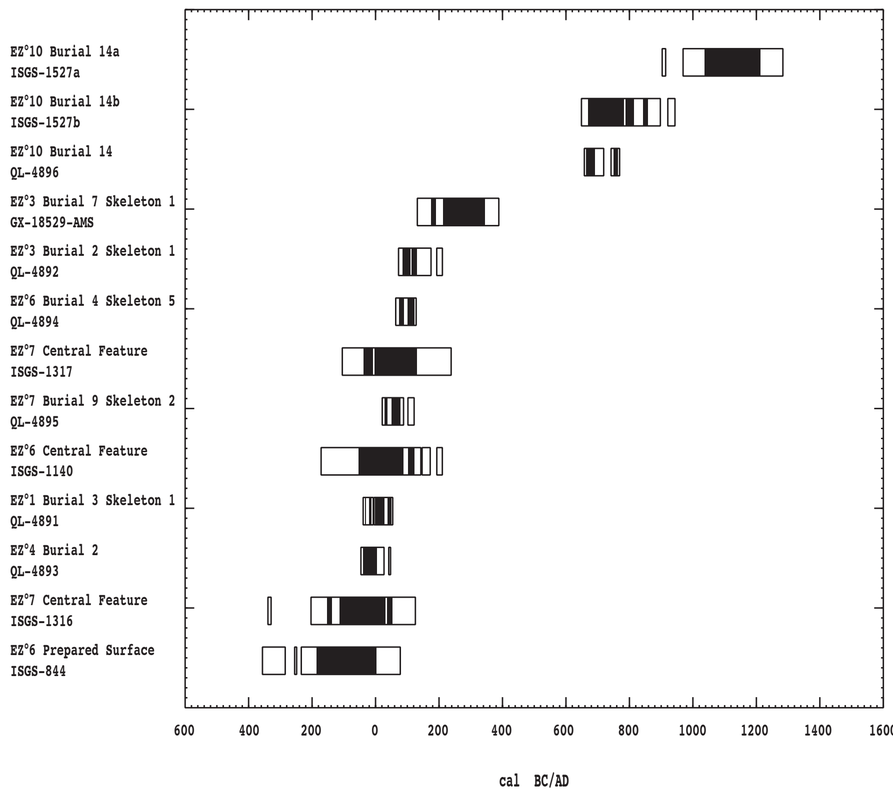
Naples-Russell (NRM). The Naples-Russell site is a group of eight mounds in the north end of the valley on the bluffs north of Napoleon Hollow. Mound 8 (NRM°8) was constructed atop an earthen platform supporting two ramped log tombs[1]—presumably used for processing the dead—that had been capped by an earthen “saddle” (Kenneth Farnsworth, personal communication 2006). NRM°8 Burial 1 Skeleton 1 (QL-4904) was interred on the upper west side of the tumulus, and was likely one of the last burials in the mound. QL-4904 thus estimates end-use of the structure (Farnsworth and Atwell 2001). NRM°8-1-1 was interred between cal A.D. 58 - 127.

Elizabeth (EZ). The Elizabeth site was a multi-component bluff crest group located immediately above Napoleon Hollow (Charles, Leigh and Buikstra 1988). Fourteen mounds and three knolls—including Archaic, Middle Woodland, and Late Woodland cemeteries—comprised the site. Of these, mounds 1, 3, 4, 6 and 7 were Middle Woodland structures. The remainder were probably constructed by Late Woodland peoples. Dates are available from all Middle Woodland mounds and mound 10 (Figure 2).

Elizabeth 1 included a ring of burial features capped by mounded earth and was the least structurally complex mound at the site (Leigh et al. 1988:41-45, 228). Unlike “typical” Middle Woodland tumuli, it lacked ramps, a central feature, or processing pits (Brown 1979; Buikstra 1976; Charles et al. 2004; Perino 1968). At the time of archaeological excavation, parties unknown had pitted the mound’s center, though archaeologists noted no evidence of a disturbed central feature. Mound 1 Burial 3 Skeleton 1 (EZ°1-3-1), which was

located at the northwestern edge of the mound beneath the primary capping layer, was chosen for dating (QL-4891). This burial dates 39 cal B.C. – cal A.D. 54, placing it near the beginning of the Middle Woodland period.

Figure 2. Elizabeth (EZ) calibrated date ranges sorted by calibrated median



Like mound 1, EZ°3 was a relatively simple structure, though it included a central facility surrounded by peripheral burials (Leigh et al. 1988:45-50). Two individuals (Burial 2, Skeletons 1 and 2) had been interred in the central crypt. Burial 2 Skeleton 1 (QL-4892) dates between cal A.D. 72 – 211 and estimates last use of the central tomb prior to capping.

An intrusive burial (Burial 7, Skeleton 1), an achondroplastic dwarf, provided a second radiocarbon date (GX-18529-AMS) for mound 3. This is therefore an upper temporal boundary for capping of Mound 3 between cal A.D. 132 - 388. Radiocarbon ages of EZ°3-2-1 and EZ°3-7-1 are not significantly different ($T' = 1.6541$; $df = 1$; $p = .1984$); however, one sigma ranges do not overlap and EZ°3-2-1 clearly precedes EZ°3-7-1 stratigraphically. Thus, both the stratigraphic detail and, more weakly, the radiocarbon evidence support a temporal sequence for the interments.

Structural details of EZ°4 include features typical of the generalized model for lower Illinois valley Middle Woodland mounds (Bullington 1988; Charles et al. 2004; Leigh et al. 1988). Despite evidence of central feature processing, the mound lacked associated peripheral burials (Leigh et al. 1988). QL-4893 dates Burial 2, a single skeleton interred immediately below the central tomb. Stratigraphically, EZ°4-2's pit antedates the central tomb and primary ramp, though it may have been accessible throughout the tomb's use via a log roof in the central feature's floor. Continual accessibility to the pit complicates interpretation of Burial 2; interment of Burial 2 may have occurred before tomb construction, anytime during tomb use, or as the last activity before closing the central tomb.

The calibrated 2σ range places EZ°4-2 early in the Elizabeth sequence, between 46 cal B.C. and cal A.D. 47. Regardless of Burial 2's ultimate place within mound 4's activity sequence, the tumulus dates within the earliest part of Middle Woodland period. If Burial 2 was a closing event in EZ°4's use,

processing within the central feature suggests that the ramp/crypt complex appeared very early within both the Elizabeth site and regional Middle Woodland sequence. BLM°6-1-2 and EZ°4-2 radiocarbon ages are not significantly different ($T' = .4250$; $df = 1$; $p = .5144$), suggesting that early activity at Elizabeth may have been contemporaneous with some portion of moundbuilding at Blue Island.

Our new date from Elizabeth 6 (EZ°6-4-5; QL-4894) is complimented by two assays obtained from charcoal samples collected during excavation (Leigh et al. 1988:220). ISGS-844 dates a stump at the edge of mound 6 burned during creation of the prepared surface. This date may be problematic since it was drawn from the root structure of the stump (Leigh et al. 1988:59). The second date (ISGS-1140) is from burned logs lining the central feature. Error ranges for both dates are large, and the difference between them is statistically insignificant ($T' =.5217$; $df = 1$; $p = .4701$). The more secure date from the central feature (ISGS-1140, 172 cal B.C. – cal A.D. 210) has a broad range that encompasses most of the Middle Woodland period.

Burial 4 was located on the southeastern perimeter of the mound's primary ramp, below the eastern extension, and included six individuals: two adults (Skeletons 5 and 6) within a roofed tomb and four individuals (Skeletons 1-4) placed on top of the log roof. Skeleton 5 (QL-4894) dates cal A.D. 64 – 128, a range falling entirely within that of the central feature date (ISGS-1140). The two dates are not significantly different ($T' =.5120$; $df = 1$; $p = .4743$) indicating that interment of Skeleton 5 was either contemporaneous with or subsequent to

construction of the central feature. The absence of evidence for processing among Burial 4 skeletons is suggestive, though not definitive, evidence that the peripheral burial program at EZ°6 was coterminous with use of the central feature.

There are also three dates available from EZ°7. Again, two are charcoal samples collected during excavation. Both are from the log walls or roof of the central feature (ISGS-1316, 339 cal B.C. – cal A.D. 126; ISGS-1317, 105 cal B.C. – cal A.D. 238) and provide estimates of time of cutting of trees and construction of the central tomb (Leigh et al. 1988). The radiocarbon ages are not significantly different ($T' = .5473$; $df = 1$; $p = .4595$). The new assay (QL-4895, cal A.D. 21 – 122) dates Burial 9 Skeleton 2, an individual interred in the ramp extension on the southern side of the mound. Burial pits were unobservable during excavation, suggesting bodies were interred on ephemeral extension surfaces or incorporated into the sediment during deposition (Leigh et al. 1988:71). The EZ°9-2 date is identical to ISGS-1317: the two differ only in their error ranges, with the 2σ range of EZ°7-9-2 falling entirely within the 1σ range of ISGS-1317 (Figure 2). As at EZ°6, the data suggest non-processed interments were contemporaneous with central tomb processing.

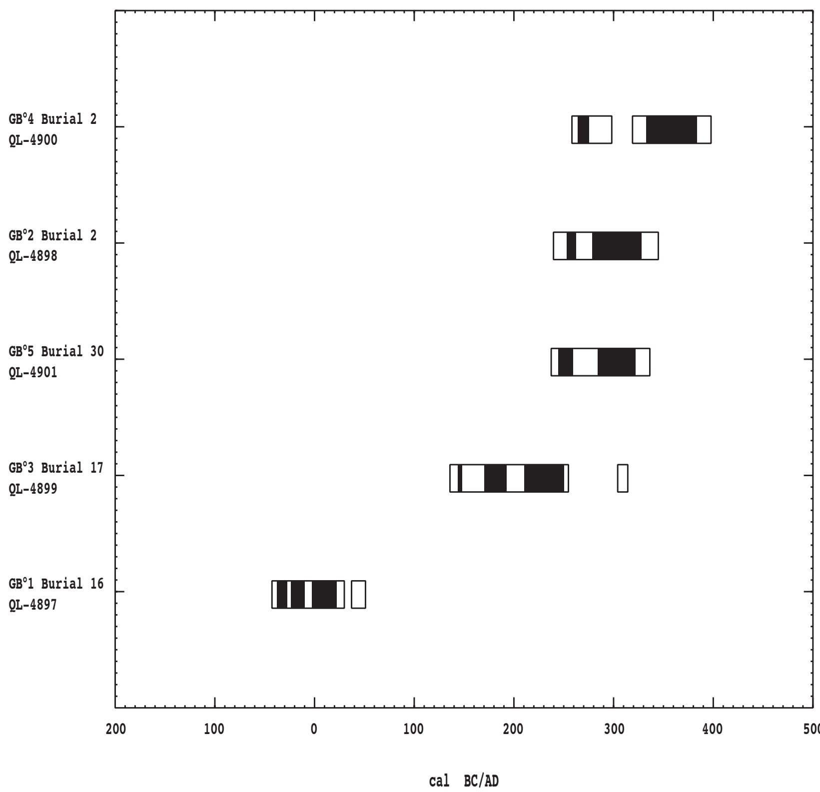
The final new Elizabeth date (QL-4896) is from EZ°10 Burial 14, which was identified as a Late Woodland tumulus during excavation (Charles, Leigh and Albertson 1988:95-6). Mound 10 is structurally distinct from the Elizabeth Middle Woodland mounds. There is no patterning to the disposal of skeletons and no evidence of internal structures characteristic of the Middle Woodland

mounds (Charles, Leigh and Albertson 1988). Burial 14 dates within the Late Woodland period, cal A.D. 687 – 769. Charles et al. (1988) report two additional dates based on rib samples from Burial 14. ISGS-1572a (900±100 B.P.) dates the apatite fraction, while ISGS-1527b (1260±70 B.P.) dates the collagen fraction (Figure 2, Table 3). Since all three samples date the same individual, i.e. we know the real date for all three samples is the same, comparison was made using Ward and Wilson's (1978) Case I equation. The three dates are significantly different (T =16.48; df = 2; p = .0003). It is obvious that the bone apatite date is the outlier in this case (Figure 2). The collagen dates are not significantly different (T' =.2615; df = 1; p = .6091). Burial 14 (QL-4896; ISGS-1527b) affirms the Late Woodland designation for EZ°10. QL-4896 is significantly different from the next most recent Elizabeth site date (EZ°3-7-1; GX-18529-AMS; T' = 25.743; df = 1; p < .0001) supporting the inference of a different mortuary program at Elizabeth by at least cal A.D. 600.

Gibson (GB). The Gibson Mounds were located on the southern bluffs overlooking Kampsville Hollow, above the present-day village of Kampsville. Mortuary structures included seven mounds and three knolls. Mounds 1 – 6 and Knoll C were Middle Woodland/Hopewell structures (Buikstra 1976; Perino 2006). The Gibson site—along with the Pete Klunk mounds on the northern bluffs above Kampsville—have profoundly shaped conceptions of Illinois prehistory, serving as the definitive Middle Woodland/Hopewell mortuary sites in the lower valley (Braun 1979; Brown 1979, 1981; Buikstra 1976, 1977; Charles 1985, 1992; Perino 1968, 2006; Tainter 1975, 1977, 1978). Temporal placement

of these tumuli is crucial for understanding the Middle Woodland period and subsequent cultural change. We have obtained five new dates from the Gibson site. With the exception of GB°1-16, all fall within the middle to late Middle Woodland period (Figure 3).

Figure 3. Gibson (GB) calibrated date ranges sorted by calibrated median.



The earliest date is from Gibson 1 (GB°1-16; QL-4897). Unknown excavators damaged a portion of the mound, including its central feature. Burial 16 was located in a small, secondary tomb adjacent the disturbed central feature (Perino 2006). It dates between 43 cal B.C. and cal A.D. 51. This result is

noteworthy because it places mid-valley mortuary activity approximately coeval to some of the earliest activity in the region (e.g., Elizabeth). A similar early date (Table 4; ISGS-1818) characterizes a Middle Woodland context from the Gardens of Kampsville habitation site located in Kampsville Hollow. The dated sample was from dispersed charcoal in association with Middle Woodland ceramics (Kenneth B. Farnsworth, personal communication, 2007). It is not significantly different from GB°1-16 ($T' = .9877$; $df = 1$; $p = .3203$). Furthermore, GB°1-16 is significantly earlier than any other Gibson date. Simultaneous testing indicates the five Gibson dates are significantly different ($T' = 19.7597$; $df = 4$; $p = .0006$). When QL-4897 (GB°1-16) is removed, remaining Gibson dates are statistically indistinguishable ($T' = 1.6259$; $df = 3$; $p = .6535$).

While the Gardens of Kampsville charcoal and GB°1-16 dates suggest an early Middle Woodland presence in Kampsville Hollow, historic or prehistoric activity may have compromised the context of GB°1-16. Unknown excavators piled GB°1-16 in the corner of the tomb, presumably after removing the skull and possibly any associated artifacts (Perino 2006:409). Nothing in Perino's notes suggests GB°1-16 did not belong in the secondary crypt where it was found; however, it is conceivable that the skeleton was redeposited by historic excavators. Alternatively, Perino apparently did not find any of the skeletal elements articulated or in situ, leaving open the possibility the remains reflect reburial of an ancestor transported to the site as a founding event of the cemetery by Middle Woodland peoples. Leigh et al. (1988:46-48) reported a

similar possible ancestor burial at EZ°3, where six skulls were interred together in a trench (Feature 1).

Gibson 3 Burial 17 (QL-4899) was one of three skeletons emplaced in the central log tomb of the mound. Associated remains were those of a child (Burial 18) and a headless roseate spoonbill (Perino 2006:421). Construction of the central feature and associated ramps initiated moundbuilding at Gibson 3. Burials 17, 18 and the spoonbill appear to have been the only interments in the central crypt as there is no reported evidence of earlier processing within or around the tomb. Burial 17 dates between cal A.D. 136 – 314. It is the next most recent Gibson date after GB°1-16. Radiocarbon ages of GB°1-16 and GB°3-17 are significantly different ($T' = 7.3711$; $df = 1$; $p = .0066$) and emphasize the potential temporal discontinuity between GB°1 and all other Gibson tumuli.

Sample QL-4901 dates Gibson 5 Burial 30, the final interment in one of two processing pits excavated into the knoll surface (Perino 2006:437). Initial activity at mound 5 involved the excavation of two sub-surface pits into the knoll for processing the dead; both antedate ramp and tomb construction stratigraphically. Following decomposition, individuals were interred in a ring peripheral to the processing pits. Processing pits and peripheral burials were subsequently mounded over with earth, followed by a log tomb and ramp constructed over the top of both pits and burials. Additional peripheral burials were associated with this later structure. Burial 30 dates cal A.D. 237 – 336 and predates the log tomb and ramp structure.

Gibson 2 was structurally similar to Gibson 5, as stressed by Perino (2006:413). Initial mortuary activity occurred in sub-surface processing pits and associated peripheral burials. Secondary structures included mounding, a log tomb, and additional burials. QL-4898 dates Gibson 2 Burial 2, a ground surface, primary interment associated with the sub-mound processing pits. The burial dates cal A.D. 240 – 345. GB°5-30 and GB°2-2 dates are not significantly different ($T' = .0220$; $df = 1$; $p = .8822$), indicating pit processing may have occurred either simultaneously or in short succession at both loci.

The final Gibson date is from GB°4 Burial 2 (QL-4900). Unlike the other Gibson tumuli, Gibson 4 contained few burials. In this respect, it is similar to floodplain mounds and large bluff crest structures such as NRM°8 and EZ°6 and EZ°7. The earliest activity at mound 4 was the construction of a sub-surface pit and low ramp upon which an earthen platform of loaded sediment was constructed (Perino 2006:426). A tomb and ramp structure was constructed upon the loaded platform. The initial sub-surface pit appears to have been unused for mortuary purposes, while highly mixed sediment associated with the second tomb suggests reuse of sediment for processing of remains. A final capping layer covered the mound. Only five burials were found in Gibson 4. Burial 2 dates cal A.D. 258 – 398 and was located on the eastern edge of the mound, outside the platform, but under the mound's capping layer and probably post-dates central tomb processing.

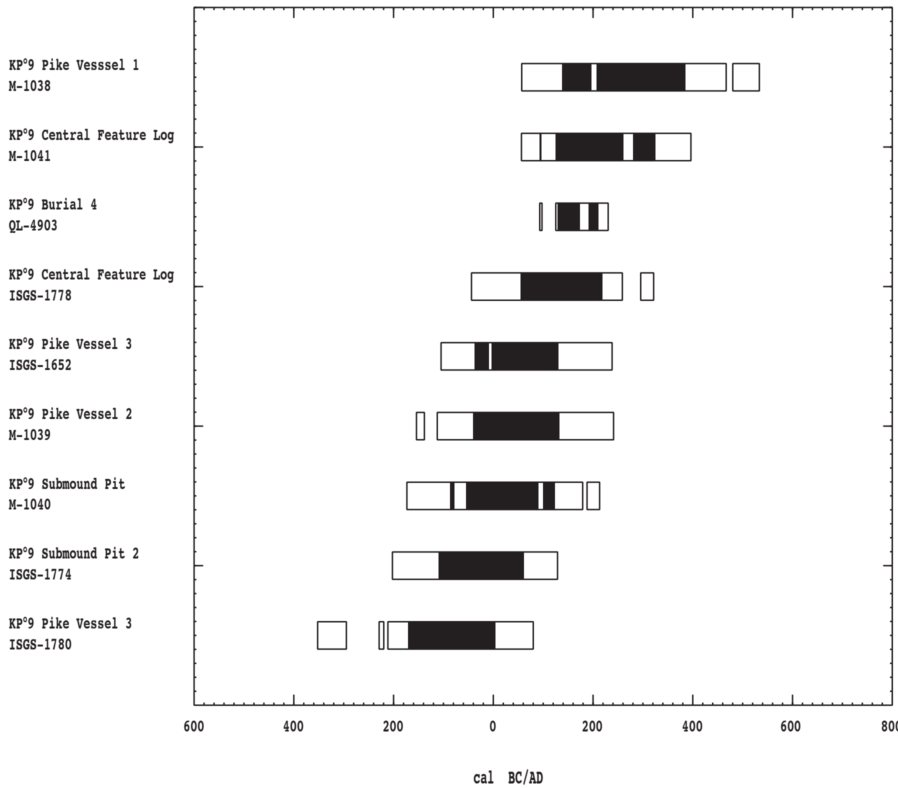
Kamp (KP). Kamp 9 was one of ten tumuli organized around a central open space or plaza located north of Kampsville, IL (Baker et al. 1941; Struever

1960). Situated on the floodplain, Kamp is thought to be a multi-community ceremonial (i.e. regional symbolic) site similar to the Mound House and Peisker sites (Buikstra and Charles 1999; Buikstra et al. 1998; Staab 1984). Extensive excavation has occurred in all mounds except KP°1 and KP°8 (Baker et al. 1941:35-39; Struever 1960). QL-4903 (KP°9-4) dates one of the final interments in the central processing feature before capping, ca. cal A.D. 93 - 230.

Eight additional dates are available from Kamp 9 (Table 3, Figure 4), all of which are stratigraphically earlier than Burial 4. Two dates (M-1040, ISGS-1774) are from sub-mound pits and provide a temporal baseline for initial construction and use between 173 cal B.C. – cal A.D. 213 (median cal A.D. 14) and 202 cal B.C. – cal A.D. 129 (median 32 cal B.C.), respectively. These dates are not significantly different ($T' = .1031$; $df = 1$; $p = .7482$). The remaining dates are from central tomb log fragments (M-1041, ISGS-1778) or charcoal from three vessels within the central tomb (M-1038, M-1039, ISGS-1780, ISGS 1652). Construction of the central tomb occurred cal A.D. 56 – 396 (M-1041). Vessel dates are cal A.D. 57 – 533 (M-1038) and 154 cal B.C. – cal A.D. 241 (M-1039). The broad errors for the vessel dates overlap considerably; their radiocarbon ages are not significantly different ($T' = 1.5709$; $df = 1$; $p = .2101$), but evidence of repeated firing within them indicates the widely spaced dates are not particularly problematic. Rather, they most likely reflect long-term use of the mound's central feature. Vessel and central tomb construction dates are also not significantly different ($T' = 1.838$; $df = 2$; $p = .3988$). As a group, the Kamp 9

dates are not significantly different from each other (*T′ = 3.6630*; *df = 4*; *p* = .4535). Figure 4 displays Kamp 9 calibrated ranges in chronological order.

Figure 4. Kamp 9 (KP°9) calibrated date ranges sorted by calibrated median.

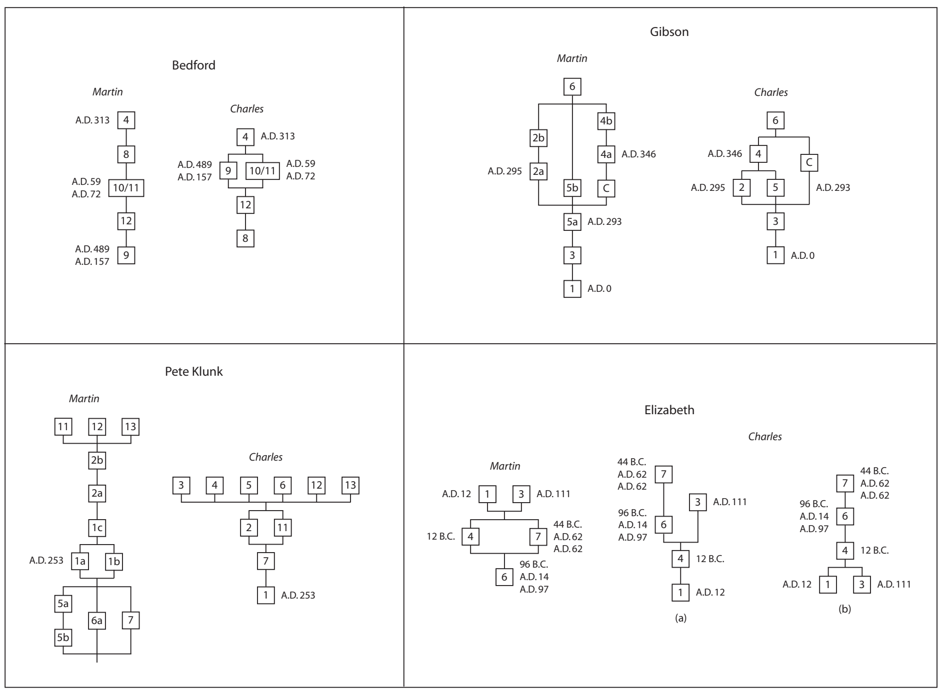


Intra-site Chronology

Figure 5 illustrates mound sequences of four sites predicted by Martin (2002, 2005) and Charles (1985, 1992). Median calibrated dates (Tables 2 and 3) are indicated where available. Evaluation of intra-site chronology requires sites with an adequate number of radiocarbon dates for temporal reconstruction. At present, only Elizabeth and Gibson sites have sufficient dates for comparison of

alternate models. Pete Klunk and Bedford sequences are provided as illustrations of explicit, though unresolved, differences between expected sequences.

Figure 5 Intra-site temporal models for Bedford, Gibson, Klunk, and Elizabeth sites predicted by Martin (2002, 2005) and Charles (1985, 1992) represented by Harris matrices. Individual boxes and numbers represent mounds or mound components. Where available, median date of the calibrated probability curve is adjacent to individual mounds.



None of the proposed Bedford mound sequences correspond well with the ^{14}C data; however, broad radiocarbon error ranges makes interpretation difficult (Table 3). The two mound 10-11 dates (M-443 and M-444) are not significantly different from each other ($T' = .0028$; $df = 1$; $p = .9581$). David Asch (1990) resampled the log crypt from BD°9 previously dated by Crane and Griffin (1959:176). Crane and Griffin's sample (M-446) returned a relatively recent

radiocarbon age (1550±125 BP; cal A.D. 215 – 765); Asch's sample (ISGS-1848) is older and dates cal A.D. 77 – 234. The two dates are significantly different based on Ward and Wilson's Case I test (T = 4.68; df = 1; p = .0305). Given the fact that Asch found evidence of systematic errors with the Michigan dates, the Illinois State Geological Survey results is more likely to include the true date (Asch 1990). Neither of the BD°9 dates are significantly different from the BD°10-11 dates whether the questionable Michigan date is included (T' = 5.66; df = 3; p = .1290) or excluded (T' = .34; df = 2; p = .8417) from the analysis. BD°4-19 (M-445) is also not significantly different from the two BD°10-11 dates (T' = 1.7030; df = 2; p = .4268) or the ISGS BD°9 central feature date (T' = .77; df = 1; p = .3809). If calibrated medians are reasonable temporal estimates, Bedford 4 and 9 are later than conjoined Bedford 10-11. Bedford 4 may indicate persistence of "Hopewellian" mortuary practices well beyond the Middle Woodland-Late Woodland interface, though Asch's (1990) detection of potential systematic errors in the Michigan samples requires cautious interpretation. It is clear that neither intra-site sequence fits the existing dates, though Charles' model provides a more adequate approximation. Additional sampling is necessary to generate the chronological resolution for proper analysis.

Charles and Martin posit different sequential models for the Pete Klunk site as well. Unfortunately, only one Middle Woodland date is available (M-1161). M-1161 was obtained from a charred stump at the original surface below primary mound A of Pete Klunk 1—cal A.D. 80 – 414. Two additional dates from Late Woodland tumuli at the Pete Klunk site, Pete Klunk 8 (M-1355) and Pete

Klunk 10 (M-1356) provide an approximate upper boundary for Middle Woodland moundbuilding at the site, ca. cal A.D. 434-948 and cal A.D. 645-1151, respectively. Given the paucity of data, neither sequence can be adequately evaluated.

The proposed Gibson sequences are not significantly different; ^{14}C dates are consistent with both models. Of particular interest are the almost identical new dates for Gibson 2 and 5 (Table 2, Figure 3). The prevailing assumption in modeling Middle Woodland cemetery use has been that mounds were constructed sequentially within a site except for a short period of possible contemporaneity between the end of use of one mound and the construction and initial use of the next. Models involving multiple active mounds have not been seriously considered. Thus, we would have assumed Gibson 2 and 5 were sequential, even though they cannot be sequenced from a topographic perspective. Martin's model, however, predicts simultaneous mounds in certain instances. He argues for significant overlap in the duration of use of Gibson 2 and 5, mounds Perino reported as structurally identical (Perino 2006:413).

Konigsberg (1987) tested possible temporal mound sequences using genetic data from the Gibson and Pete Klunk sites. His analysis of Pete Klunk data indicated genetic variation within and between mounds was most consistent with the topographic chronology defined by Charles versus other possible orderings (Figure 5). Unfortunately, the radiometric data necessary for evaluating Konigsberg's and Charles' sequence are not available at this time.

Lacking an archaeological basis for ordering Gibson mounds, Konigsberg (1987) grouped GB°1, °2 and °3 together and considered them, along with GB°5, with the Pete Klunk mounds. The hypothetical ordering of the Pete Klunk site served as the basis for the Gibson model. His analysis suggested Gibson was earlier than Pete Klunk, though sufficient assays are not available to test this temporal relationship. His resultant Gibson sequence, however, does not align with the radiocarbon data. Gibson 5 is earlier than Pete Klunk 1 and Gibson 1-3 are placed after Pete Klunk 1. Our new data indicate that Gibson 1 likely predates Pete Klunk 1 and may predate all other Gibson mounds. In addition, a considerable temporal discontinuity may exist between use of Gibson 1 and all other Gibson mounds. The mis-ordering of Gibson tumuli via biodistance measures is probably the effect of grouping the three Gibson mounds (1-3); however, Konigsberg's apparent (mis)placement of Gibson 5 earlier than Pete Klunk 1 suggests that genetic distances between mounds may be a problematic temporal measure in the absence of corroborating lines of evidence.

Finally, Charles' and Martin's Elizabeth chronologies are also significantly different. Elizabeth is the only site presented here that was surveyed before excavation. The pre-excavation sequence (Figure 5, Charles 'a') was generated based on the typological seriation defined by Charles (1985, 1992). Unmounded Late Woodland cemeteries (EZ°8-14 and knolls A, B, and E), except for the small amount of fill added to EZ°10, were not discovered until the site was excavated. In the original study (Charles 1985), mounds 1 and 4 were Type 1 (earliest) and

mound 3 was Type 2 (later). EZ°1 was placed before EZ°4 based on its distal ridge location. Mounds 6 and 7 (along with eight other mounds out of 296 total mounds) were excluded from the analysis as outliers. Based on their location on the ridge, they would have been later than mounds 1 and 4. EZ°7 appears to have been built on ground significantly disturbed by the construction of mound 6. Thus, construction of EZ°7 followed initiation of EZ°6 (Leigh et al. 1988). Figure 5, Charles 'b' represents a later revision of the sequence based on a reinterpretation of EZ°3. A deposit of skulls in mound 3 was interpreted as ancestors brought from elsewhere, suggesting that mound 3 might be the founding mound of the new cemetery.

The early dates for EZ°6 and °7 are based upon charcoal from structural components of the crypts or, in one case, from an in situ tree presumably burned as part of the site preparation before mound construction. Structural or pre-mound dates should antedate those from burials. The ^{14}C data, particularly if only the skeletal dates are used, are most consistent with the original topographic model (Figure 5, Charles 'a'), though EZ°1 and °4 may be inverted. Martin's Elizabeth sequence is not consistent with the radiocarbon data (Figure 5).

Migration

Bluff top mounds follow a north-south trajectory consistent with our model of in-migration. Figure 6 displays side-by-side boxplots of calibrated median bluff crest mound dates by spatial clusters in the valley (Figure 7). A

noticeable visual trend toward later dates as one moves south is evident between groups.

Figure 6. Side-by-side boxplots of mound site median dates of the calibrated probability curve by spatial cluster: (Group 1) Blue Island, Elizabeth, Naples-Russell; (Group 2) Bedford, Montezuma; (Group 3) Gibson, Pete Klunk.

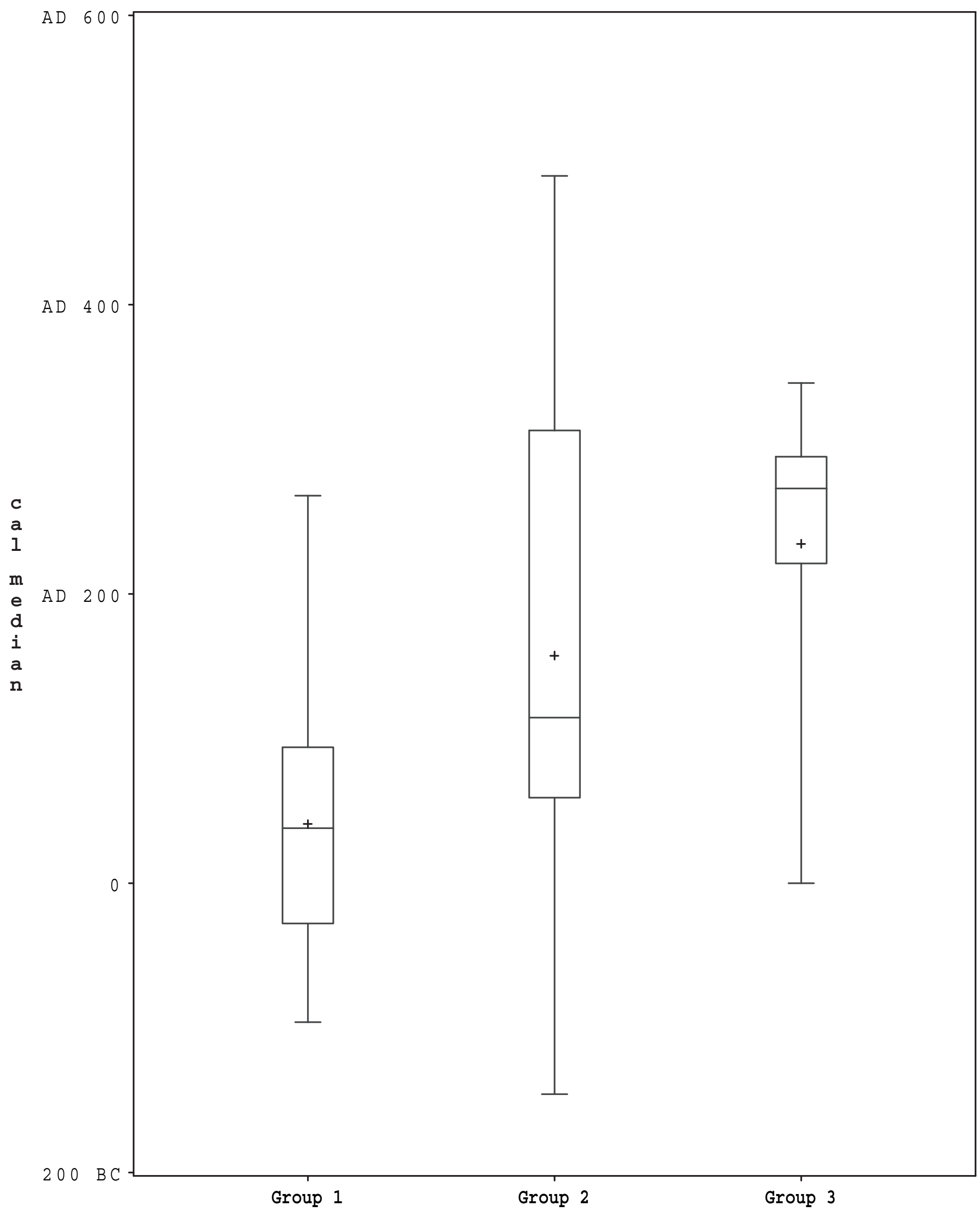
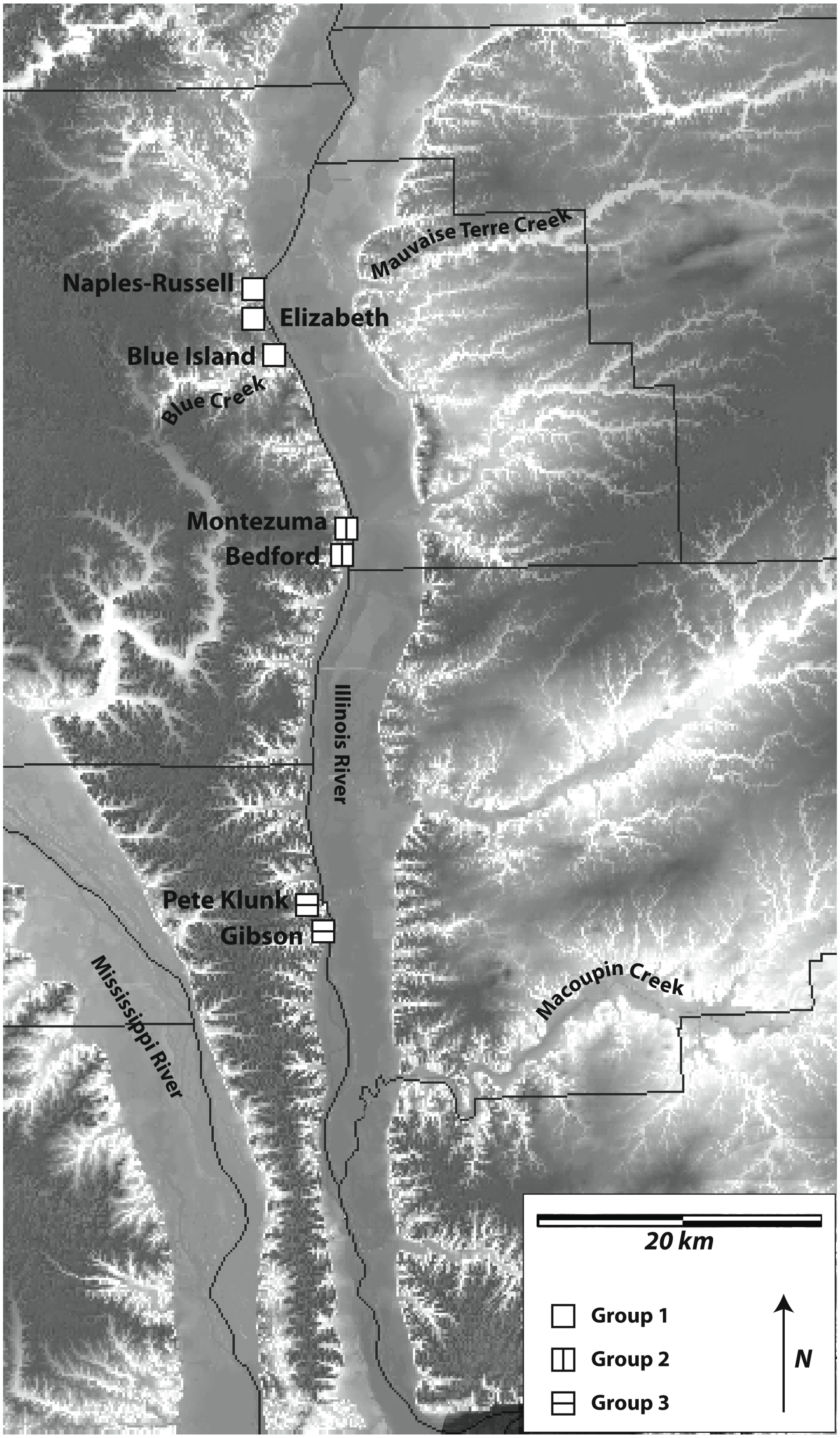


Figure 7. Bluff crest mound sites differentiated by spatial group.



Spatial group means are significantly different (*F* = 4.01; *df* = 2, 21; *p* = .0355). Pairwise comparison reveals significant differences between Groups 1 and 3 (*F* = 3.71; *df* = 2, 21; *p* = .0417) and Group 1 and 2+3 (*F* = 3.56; *df* = 2, 21; *p* = .0465) at the .05 level. No other comparisons are statistically significant. These results generally support the general model of a north-south temporal pattern for Middle Woodland moundbuilding, with the earliest tumuli occurring in the northern end of the valley.

Since Naples-Russell 8 and Elizabeth 6 and 7 may be more similar to floodplain mound sites than bluff crest cemeteries, dates from these structures were removed and the analysis was rerun. Removal results in no significant differences between bluff crest groups (*F* = 1.48; *df* = 2, 14; *p* = .2615). If only the potentially problematic burned stump sample (ISGS-844) from submound EZ°6 is removed, the full bluff crest model is still significant—including contrasts—but only at the .10 level (*F* = 3.33; *df* = 2, 20; *p* = .0564).

The earliest bluff crest dates are associated with the Blue Island, Elizabeth and Naples-Russell sites (Group 1); BLM 6-1-2 dates earlier than any other bone date, consistent with Charles' (1985) mound survey conclusions. The Naples-Russell sample (NRM°8-1-1) is slightly later than most of the other Group 1 dates, potentially reflecting northward migration subsequent to initial colonization near Blue Creek.

Bedford and Montezuma (Group 2) dates are problematic. While it is possible these sites are earlier than or contemporaneous with Blue Island or Elizabeth mounds, their extremely broad errors make them difficult to interpret

and probably warrant resampling. Given the fact that Asch (1990) found evidence of systematic errors with the Michigan dates, the Illinois State Geological Survey result is more likely to include the true date. If M-446 is removed from the analysis, the full model is still significant (F = 5.16; df = 2, 20; p = .0156). The Group 1 and 3 (F = 5.13; df = 2, 20; p = .0159), and Group 1 and 2+3 (F = 2.90; df = 2, 20; p = .0783) contrasts are significantly different, as is the Group 1+2 versus Group 3 contrast (F = 4.09; df = 2, 20; p = .0323). This additional significant contrast does not affect our interpretation as it emphasizes the temporal difference between the northernmost and southernmost bluff crest sites in the data set.

The Gibson 1 Burial 16 (QL-4897) date suggests an early mid-valley occupation (Group 3), though transportation and reburial of an ancestor skeleton as a founding event cannot be ruled out. Removing GB°1-16 from the bluff crest full model does not affect significance of aforementioned contrasts, though the Group 1+2 versus Group 3 contrast becomes statistically significant (F = 3.54; df = 2, 20; p = .0484). Gibson 1 is probably later than Blue Island, but may be contemporaneous with Elizabeth and other early sites. The BLM°6-1-2 and GB°1-16 radiocarbon date difference is insignificant (T' = .6205; df = 1; p =.4308), but calibrated ranges only partially overlap (Table 2). Removal of the questionable Bedford date (M-446) results in the additional significance difference between Groups 2 and 3 (F = 3.81; df = 2, 19; p = .0407).

Existing habitation site dates (Table 4, Figures 8 and 9) do not readily support a north-south migration model. Unfortunately, no dates are available

from the southernmost segment of the valley. Comparison of calibrated medians from the northern and upper- and lower-middle segments of the valley indicates no significant differences between group medians (F = .50; df = 2, 41; p = .6111). Analysis of contrasts reveals pairwise and group differences are not significantly different. Under a north-to-south migration model, northern habitation dates (Group 1) should be earlier than Group 2 and Group 3 dates; however, none are significantly different (F = .43; df = 2, 41; p = .6102).

Figure 8. Side-by-side boxplots of habitation site median dates of the calibrated probability curve by spatial cluster: (Group 1) Archie, Massey, Napoleon Hollow, Smiling Dan, Pool, Naples-Abbott; (Group 2) Apple Creek, Gardens of Kampsville; (Group 3) Crane, Loy, Macoupin, Snyders.

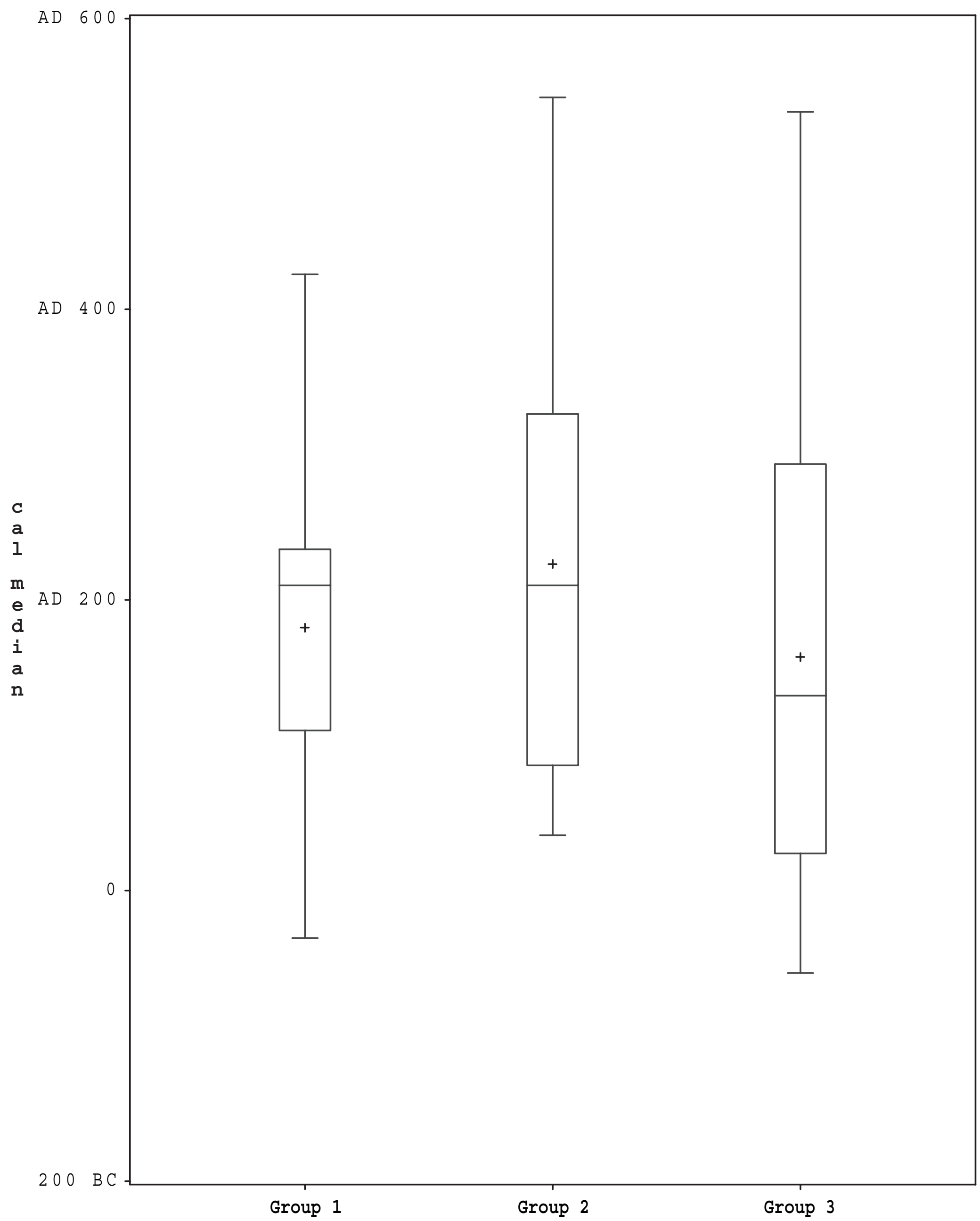
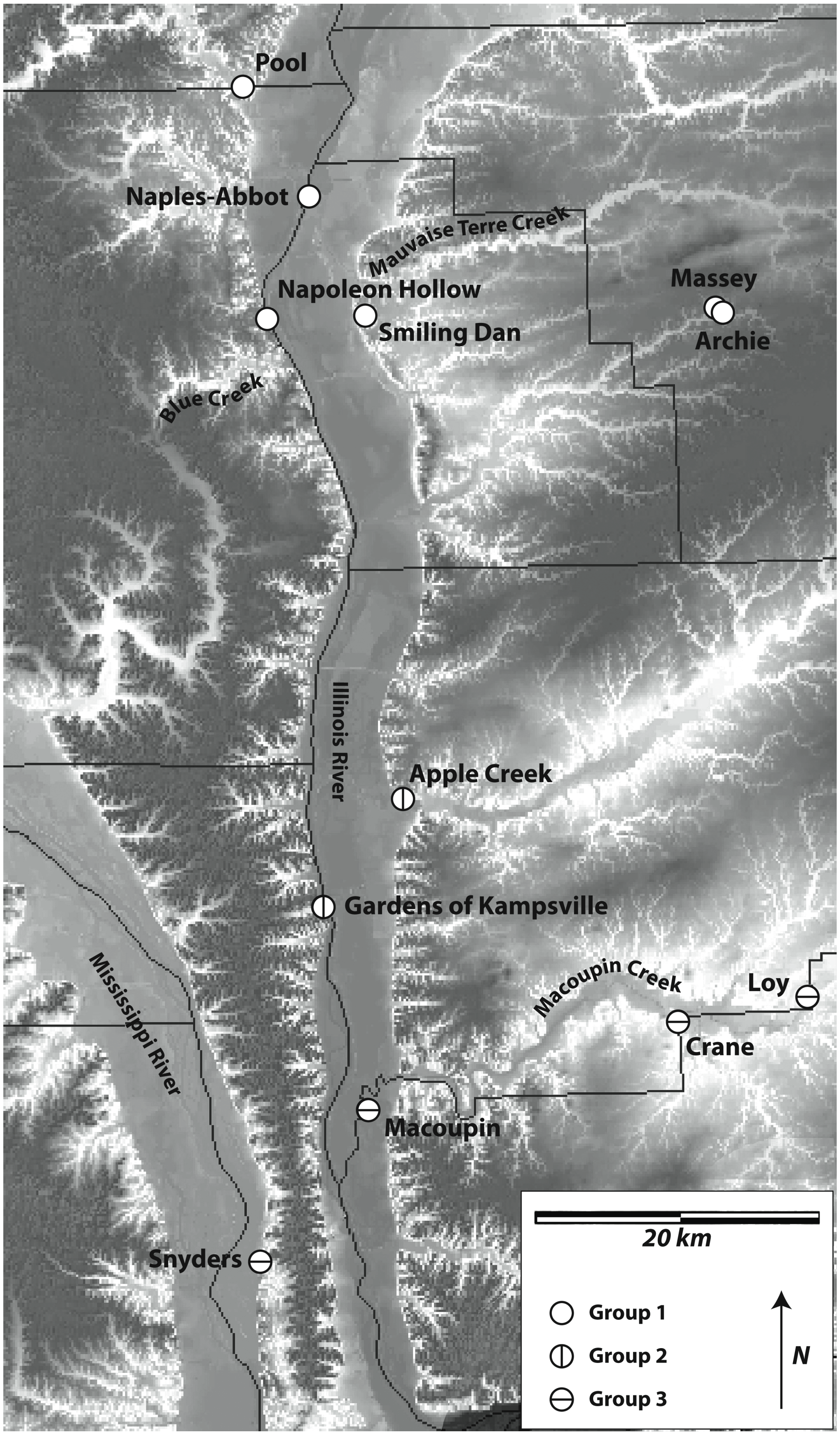


Figure 9. Habitation sites differentiated by spatial group.



Data indicate earlier than expected occupations near mid-valley at the Gardens of Kampsville site (ISGS-1818) and within the Macoupin Creek valley at the Loy site (ISGS-1078) (Figure 1, Table 4). There is no statistically significant difference between the earliest habitation site dates from Naples-Abbott, Gardens of Kampsville or Loy (T' =.2822; p = .8684). The early Gardens of Kampsville and Loy dates are also not significantly different from Blue Island 6-1-2 (QL-4902) and Elizabeth 4-2 (QL-4893) dates (T' = .9223, df = 3; p = .8199), suggesting contemporaneous occupations in the northern and central portions of the lower Illinois valley. Under a model of north-to-south migration, we would expect no middle or southern valley occupations contemporaneous with northern valley occupations or mounds. Coupled with the unexpected early date from Gibson 1—with the caveat that GB°1-16 may be an ancestor reburial—these data suggest a settlement pattern different from that predicted by Charles' model: specifically, early occupation in the lower middle segment of the lower Illinois valley. Pike-Baehr sherds are present in these early habitation and mound sites (e.g., Loy, Crane, Kamp), but are "all but unknown from the central Valley" (Farnsworth and Asch 1986:446). Such occupations may reflect pulses into the valley from areas other than the central Illinois valley if the distribution of ceramic styles monitors population differences and movements during the early portion of the Middle Woodland period. However, the trajectory indicated by establishment of community cemeteries does largely support the north-south migration model.

Regional Symbolic Communities

Floodplain mound sites (e.g. Mound House, Kamp, Peisker) served as ceremonial and civic gathering sites for multiple communities. Large bluff crest mounds such as Elizabeth 6 and 7, and Naples-Russell 8 may have fulfilled a similar function. This scale of community interaction—which might be termed a regional symbolic community, extending the framework of Ruby et al. (2005)—served to integrate smaller local symbolic communities for various purposes. According to Ruby and co-authors (2005: 123-4), local symbolic communities are "bounded geographically, either practically or by a common goal of owning, maintaining, or using a territory." Regional symbolic communities in the Illinois valley potentially served to facilitate sustainable communities, and as such, or in any case, may have been unbounded and not geographically circumscribed.

Multi-community floodplain sites appear to follow the general north-south trend established by in-migration and reflected in the temporal order of bluff crest mound sites (see above). Figure 10 illustrates boxplots of calibrated median dates for floodplain mound sites (Figure 11). Included in both the general model and boxplots are NRM°8, EZ°6 and EZ°7 dates, since these sites have been suggested to serve similar functions to floodplain mound sites (Charles 1985, 1992; Ruby et al. 2005). Inspection of calibrated ranges reveals a north-south pattern similar to the one seen in Figure 6. Linear modeling of calibrated medians indicates that group means are significantly different (F = 3.55; df = 3, 32 p = .0252). Pairwise comparison shows significant differences in group means of calibrated medians between the Elizabeth/Naples-Russell

complex (Figures 10 and 11; Group 1) and Peisker (Figures 10 and 11; Group 4) (*F* = 3.32; *df* = 3, 32; *p* = .0322), and all floodplain groups versus Peisker (*F* = 3.06; *df* = 3, 32; *p* = .0421). Removal of the NRM°8, EZ°6 and EZ°7 dates from the model results in significant differences at the .10 level (*F* = 2.52; *df* = 2, 26; *p* = .1003). The only significant contrast compares calibrated medians between Mound House and Kamp versus those from Peisker (*F* = 2.32; *df* = 2, 26; *p* = .1005). Removal of ISGS-844 has no effect on the model (*F* = 2.84, *df* = 3, 31; *p* = .0541), though the only significant between group difference between the Elizabeth/Naples-Russell complex and Peisker (*F* = 2.32; *df* = 2, 31; *p* = .0943).

Figure 10. Side-by-side boxplots of regional symbolic community mound site median dates of the calibrated probability curve by spatial cluster: (Group 1) Elizabeth-Naples Russell Complex; (Group 2) Mound House; (Group 3) Kamp 9; (Group 4) Peisker.

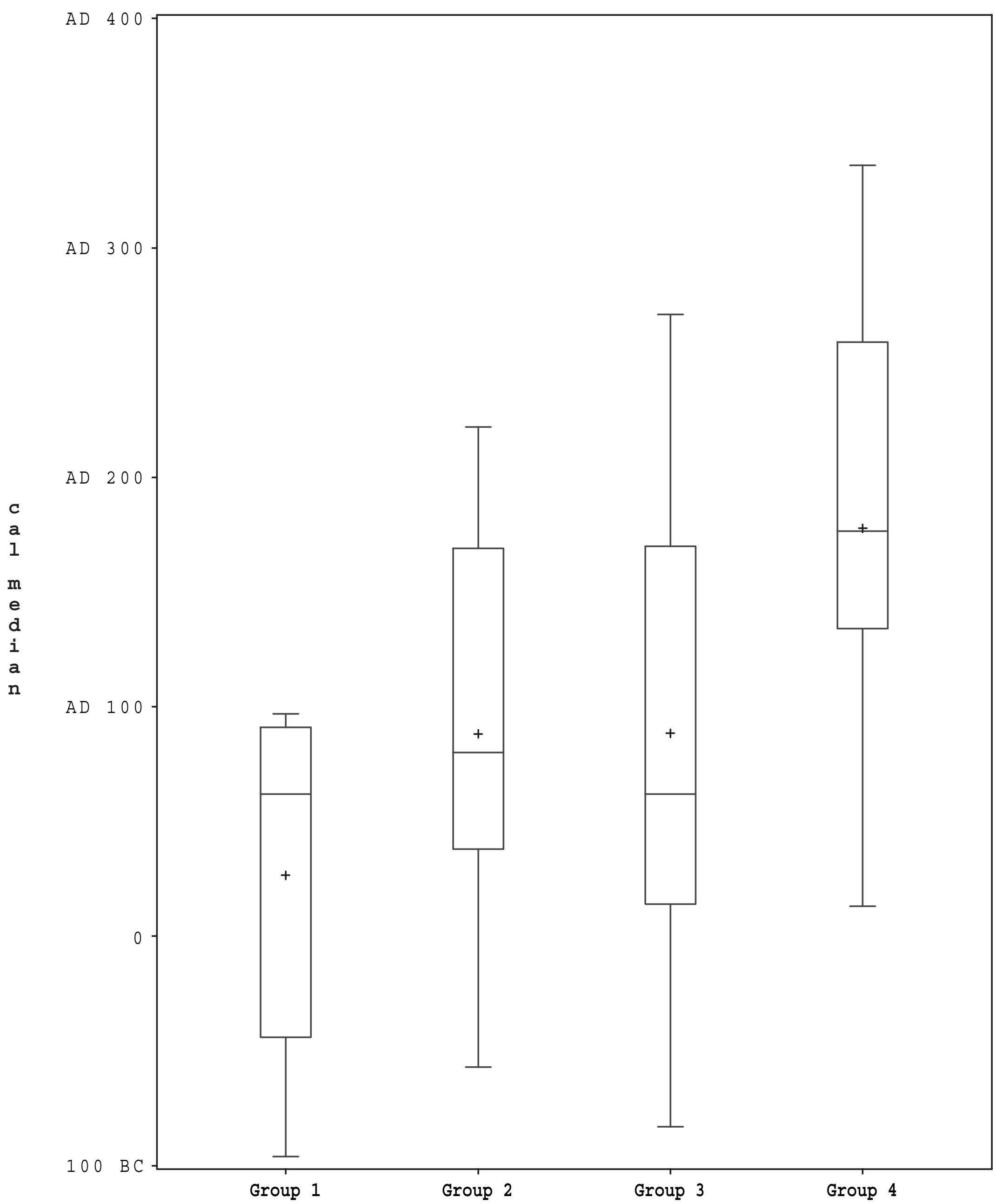
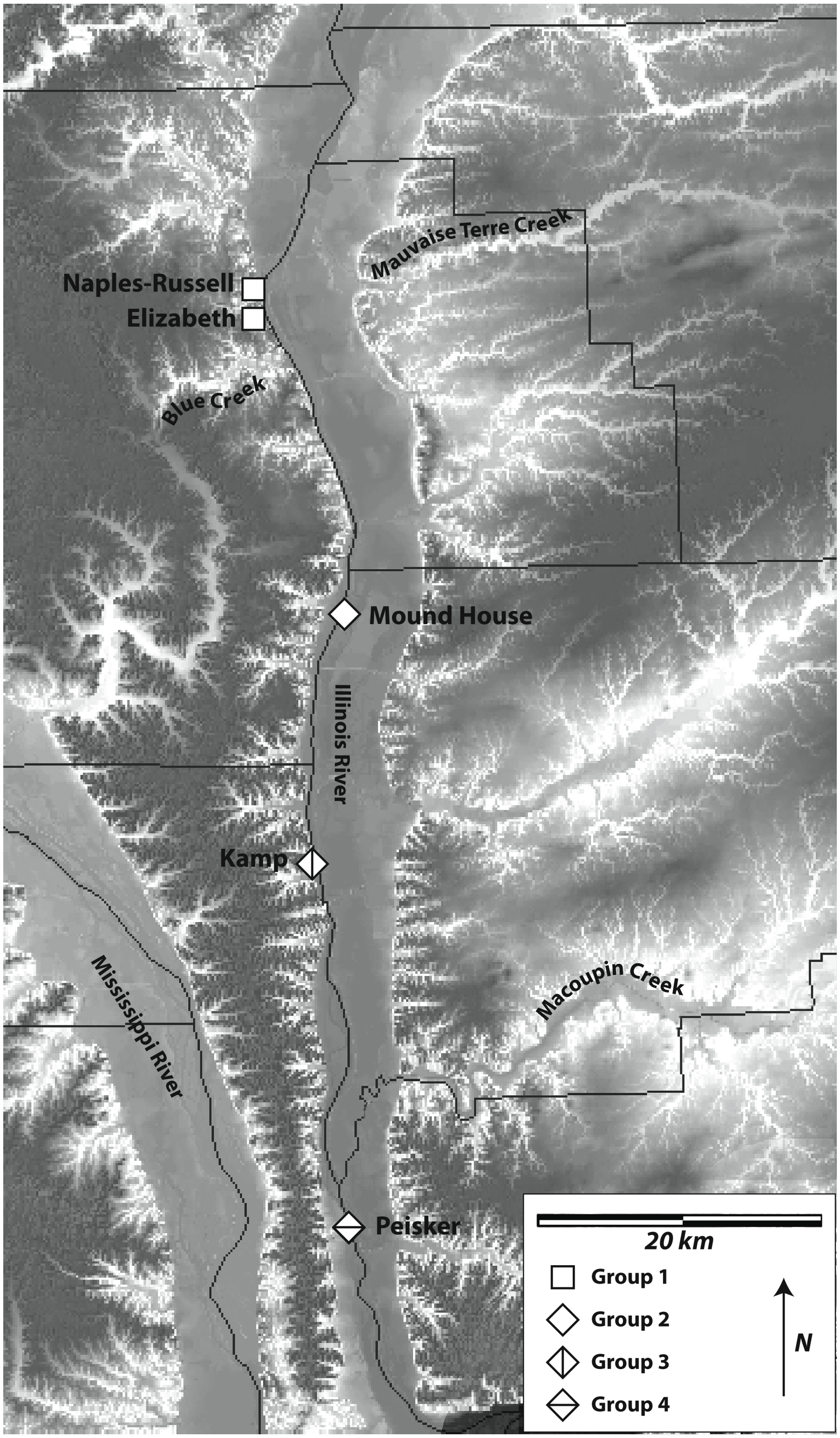


Figure 11. Floodplain mound sites differentiated by spatial group.



Initial multi-community floodplain moundbuilding at the north end of the lower valley may have been followed by rapid subsequent moundbuilding further south. It should be noted that these floodplain sites include multiple mounds that have not been completely excavated or dated. Thus, duration of site use remains unknown; and, undated and untested structures may have been built earlier or later than those sampled. Additional dates with narrower ranges from floodplain sites are necessary to fully test this hypothesis.

The emergence of multi-community floodplain centers appears to post-date initial local community moundbuilding on the bluff crests. As noted above, local residential cemetery moundbuilding occurs earliest at Blue Island, Elizabeth, and possibly Gibson. Furthermore, Blue Island predates the earliest moundbuilding at Elizabeth, where simple, local mortuary structures predate large complex tumuli (i.e. EZ°6 and °7).

Significant pre-mound activity at floodplain sites may have been contemporaneous with early bluff crest moundbuilding. Blue Island 6-1-2 (QL 4902) and the earliest pre-mound date from Mound House (ISGS 2974) are not significantly different ($T' = .0321$; $df = 1$; $p = .8578$); however, BLM°6-1-2 is one the latest interments in BLM°6. Earlier moundbuilding and mortuary activity there likely predated the initial activity at Mound House. The oldest Mound House intra-mound radiocarbon date (ISGS-2948) is also not significantly different from BLM°6-1-2 ($T' = 1.3792$; $df = 1$; $p = .2402$), though the 140-year error range of the Mound House date makes meaningful comparison difficult.

BLM°6-1-2 and ISGS-2948 have calibrated medians of 74 cal B.C. and cal A.D. 62 suggesting a later occurrence for moundbuilding at Mound House 1.

The Kamp 9 submound date (M-1040) is not significantly different from either BLM°6-1-2 ($T' = .5607$; $df = 1$; $p = .4540$) or the earliest submound Mound House date ($T' = .2319$; $df = 1$; $p = .6301$). As noted above, the Kamp 9 dates are not significantly different from each other. This result may be the consequence of large error ranges rather than contemporaneous moundbuilding. However, contemporaneity cannot be ruled out without additional data.

Dates from Peisker (Group 4) all reflect pre-mound activity and not mound use. Use dates for Peisker should be later than those available, though additional sampling is necessary to establish the temporal place of Peisker burial activity and moundbuilding. Extant dates, however, indicate construction of Peisker occurred later than at sites further north.

Finally, it is not immediately clear whether structural variation within and between regional symbolic community mound sites tracks time. Excavation quality at floodplain sites has varied greatly and fine structural details have only recently emerged as a regional research focus (Buikstra et al. 1998; Charles et al. 2004; King and Buikstra 2005, 2006; Van Nest 2006; Van Nest et al. 2001). The basic structure (see Charles et al. 2004:Figure 3.3) appears to be common across mounds, though recent data from the Mound House—mounds 1 and 2—suggest considerable flexibility may have been available within the Middle Woodland liturgic sequence (King and Buikstra 2005; 2006).

Discussion and Conclusion

The new radiometric dates, coupled with existing data, allow us to test specific hypotheses about Middle Woodland occupations in the lower Illinois valley. They also highlight problems that are yet to be resolved. Perhaps the most important of these problems is the inadequacy of the extant radiometric database for answering fine-scaled chronological questions. While the lower Illinois valley enjoyed early attention from those applying the then new radiometric approaches, the error ranges of these old assays are too broad for firm chronological conclusions at the scale of the questions we are asking.

Charles' (1985, 1992) intra-cemetery model is generally confirmed for those sites where radiometric data are fine-scaled and sufficient site-wide sampling has occurred (i.e. Gibson and Elizabeth). Martin's (2002, 2005) intra-cemetery chronologies do not fit the data, although the early settlement foci in the north and in the vicinity of, and upstream along, Macoupin Creek raise the possibility that the conflicting ritual forms he suggests may have existed. Again, our results highlight the need for additional sampling to achieve the resolution necessary for further fine-grained hypothesis-testing. Particularly problematic is the lack of dates from important sites (e.g. Pete Klunk) that have been used to characterize regional and inter-regional prehistory (e.g. Illinois Hopewell). Nevertheless, the confirmation of the intra-site sequences supports the mound seriation (Charles 1985, 1992) that was the basis for the north to south migration model.

Our analyses indicate that Middle Woodland mound sites on the bluff crests generally follow a north-south temporal trajectory as modeled by Charles (1985, 1992). Initial moundbuilding does appear to occur near Blue Creek early in the Middle Woodland period with subsequent northward and southward expansion from that locus. Habitation data, however, present a somewhat different picture: contemporaneous occupations are present in both the northern and lower middle sections of the valley, including apparent early settlement along Macoupin Creek to the east. These results complicate a simple, one-way model of in-migration from the central Illinois valley. The differing mound and habitation patterns are intriguing and suggest reoccupation of the lower valley occurred as a complex set of interactions not yet fully explicated, with the Macoupin valley playing an important role. While additional mound surveys were conducted in several transects in the region between those used by Charles (1985, 1992; see Figure 1), it was not possible to standardize data from those transects for incorporation in his study.[2] Consequently, the patterns involving the area around Macoupin Creek that are now emerging were not apparent in the earlier mound study. It should also be noted that at present it is difficult to distinguish from the existing habitation site data instances of early seasonal utilization of locales as opposed to later permanent occupation entailing the presence of cemeteries. Alternatively, mound construction may be tracking a population density threshold rather than initial occupation. In either case, ^{14}C dates derived from contexts of subsistence related use of the landscape would predate dates derived from burial mounds. In this light, the seemingly

anomalous date from GB°1 might represent an early pulse in the migration process.

Ruby et al.'s (2005) community model provides a framework for further investigation of the Middle Woodland period settlement of the lower Illinois valley. Martin (2002, 2005) suggests possible migration from the west, though additional data are needed to test this hypothesis. To date, no work has been undertaken to explicitly model and test migration into the valley. A multiregional, temporally sensitive bioarchaeological approach focused on population genetics, demography and archaeological residues of community settlement is warranted.

Data indicate that the establishment of sites serving regional symbolic communities follows the north-south pattern of community cemeteries, as predicted in our third (corollary) hypothesis. The early bluff crest sub-mound dates suggest local cemeteries probably antedate premound floodplain ceremonialism as well as later moundbuilding. Elaboration of floodplain sites may have occurred rapidly as infilling of the southern portion of the valley occurred. Additional bioarchaeological modeling and better quality dates should help clarify this issue as well.

Our analysis of new and previously available radiocarbon dates provides general support for our working model of Middle Woodland north to south migratory infilling of the lower Illinois valley, an area apparently largely abandoned by the end of the Early Woodland period. It is also apparent that the situation was much more complex, and not as straightforward, as Charles'

(1985, 1992) model based on burial mound survey data suggested. Additional work is necessary to resolve these key issues of lower Illinois valley prehistory. Further assays and robust, temporally sensitive analyses are needed to help explicate the complex web of transformations we conveniently gloss as the Early and Late Woodland periods.

Chapter 3

The Role of Remote Sensing in Evaluating Structural Variation in Middle Woodland Mounds in the Lower Illinois River Valley

The Illinois River Valley remains one of the most impressive and best-preserved records of Middle Woodland (2000-1550 BP) moundbuilding in the North American Midcontinent, a fact affirmed by the significant number of avocational and professional excavations conducted over last century and a half and their impact on Americanist archaeology (Baker et al. 1941, Buikstra 1976, 1988, Buikstra et al. 1998, Charles 1992, 1995, Cole and Deuel 1937, Farnsworth 2004a, 2004b, Ford and Willey 1942, Griffin 1952, Henderson 1844, McAdams 1881, 1884, 1887, Perino 1968, 1973a, 1973b, 1973c, 2006, Snyder 1895, 1909, Struever 1960, 1964, Squier and Davis 1848, Thomas 1894). Though numerous Illinois Valley mounds have been excavated since the nineteenth century, the overall range of structural variation in Middle Woodland mounds remains only partially understood. We do not yet have a well-distributed spatial and temporal sampling of prehistoric structures at the resolution necessary to make comprehensive statements about the nature of moundbuilding, monumentalism, and the meanings encoded therein. Recent changes in archaeological ethics and laws regulating the disturbance of human graves and items of cultural patrimony, such as the Native American Graves and Repatriation Act (1990) and the Illinois Human Skeletal Remains Protection Act (1989), have limited mound archaeology in Illinois and elsewhere in North

America. Thus, direct inspection of mound interiors is rarely possible, necessitating new strategies for investigating structure and variability. Geophysical prospection is one non-invasive method for ethically investigating and monitoring sensitive cultural resources that would otherwise be inaccessible (Henry et al. 2014; Monaghan and Peebles 2010; Kassabaum et al. 2014; Thompson et al. 2014; see also Chapters 13 and 14, this volume).

In this chapter, we review select geophysical surveys conducted at mound sites in the Lower Illinois Valley (LIV). In order to contextualize our geophysical results, we begin with an overview of LIV Middle Woodland monumentalism, focusing on internal mound structure informed by archaeological investigation. We then turn to a comparative representation of proposed structural features in our geophysical datasets. Finally, we consider some issues involved in moving from methodological and empirical questions concerning the mapping of archaeological phenomena toward a research perspective focused on using geophysical data to address anthropological questions about past peoples and the landscapes they created and imbued with meaning.

Mound Archaeology in the Illinois Valley

Mound archaeology in the Illinois Valley has its roots in the westward expansion of Euro-American settlers and their recognition that the landscapes they observed included earthworks and other built phenomena (Buikstra et al.

1998; Farnsworth 2004b; Silverberg 1968; Van Gilder and Charles 2003). Avocational explorers such as William McAdams, John Francis Snyder, and John G. Henderson provided the first documented explorations of prehistoric tumuli in the region (Farnsworth 2004b and citations therein). The central question concerning mounds during the nineteenth century was that of authorship. Illinois Valley mounds were among those sampled to resolve this issue through Cyrus Thomas' Bureau of Ethnology explorations (Thomas 1887, 1894). While some observers noted structural details of mounds, a primary goal of these pre-disciplinary excavations often focused upon the recovery of aesthetically pleasing objects, frequently found within the large tombs at the center of mounds.

In the early 20th century the emerging profession of archaeology likewise focused on excavating and documenting mounds, and like their avocation predecessors they were often concerned with artifact recovery. Warren K. Moorehead's Illinois Valley Mounds Survey (1927-1928) was the first systematic archaeological survey of ancient monuments within the river valley. The University of Chicago Central Illinois Valley projects focused upon establishing cultural units and stratigraphic sequences within Illinois and connecting them the broader schema embodied in the Midwestern Taxonomic Method (Cole and Deuel 1937; Deuel 1935; McKern 1939).

Gregory Perino's extensive LIV fieldwork (1950-1975) constitutes the earliest efforts to systematically excavate entire prehistoric mounds and mound groups (Perino 1968, 2006). By today's standards, Perino's documentation of

mound structure is limited; however, Perino recognized what are generally considered quintessential structural features of Middle Woodland mounds, such as ramp/tomb complexes and contrastive central/peripheral burial configurations. Importantly, Perino reported “loaded” mound fill composed of distinctive sediments and soils.

In 1958, the Center for American Archeology (CAA) began systematic investigation of Lower Illinois Valley mounds when Stuart Struever initiated fieldwork at the Kamp Mound Group (Struever 1960; McKinnon et al. 2014). This initial effort in mound archaeology, coupled with Perino’s work, led to an institutional focus on documenting Woodland mounds that continues today. This work was supplemented by intensive surveys of mound sites conducted in the 1970s to document the distribution of these sites along substantial transects of the valley (Buikstra 1981; Charles 1985; DeRousseau 1973; Holliday 1977; Palkovich 1975). Our current LIV work builds upon this archaeological history and is part of a project designed to understand the manner in which monumental architecture constructed social relations within and between prehistoric communities. Of particular interest is the intersection of cosmology, ideology, ceremonialism, and monumentalism in the construction and maintenance of community at varying moments and scales of social interactions.

As an integrated component of this project, we have conducted geophysical surveys at a number of LIV Middle Woodland mound sites in order to build a comparative corpus of geophysical signatures of mound structures

(Herrmann et al. 2014; McKinnon et al. 2014). The overarching goals of these surveys include: (1) addressing the *empirical* question of whether mound structures can be detected at sufficient resolution to identify mound architecture and build a body of data to evaluate regional structural variation, (2) using these data to address *anthropological* questions about the nature of Middle Woodland moundbuilding and its relation to community and cosmos, and (3) evaluating the degree to which structures remain intact and should therefore be the target of conservation efforts.

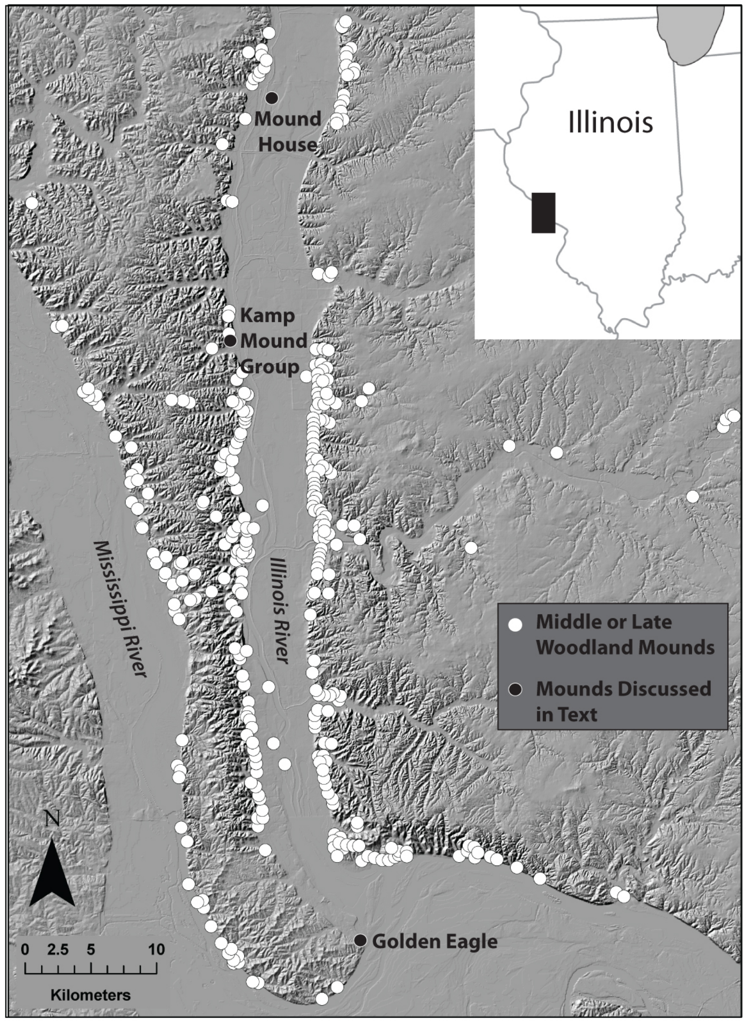
Woodland Period Moundbuilding in the LIV

The LIV comprises the final 120 km (75 miles) of the Illinois River, its floodplain, bluffs, and associated upland features (Figure 12). Prehistoric peoples undoubtedly ranged broadly across this landscape; however, their most visible signatures are hundreds of mounds built on the bluff crests and on raised geomorphic features within the valley, defined by archaeologists as bluff crest mounds and floodplain mounds, respectively (Struever 1964; Buikstra and Charles 1999; Charles and Buikstra 2002; Charles et al. 2004, 2014 King et al. 2011; Ruby et al. 2005). This spatial difference is thought to reflect functional and scalar dichotomies of Middle Woodland period social practices and community interactions. Bluff crest mound sites are generally considered to be residential community cemeteries. Floodplain mound groups, in contrast, have traditionally been conceptualized as supra-residential gathering spaces

anchored, in part, by mounds and moundbuilding in which funerary activity is only a portion of the activities reflected there. Presumably, events, funerary or otherwise, at floodplain mound groups were regularly attended and/or participated in by multiple residential units. These tumuli are frequently considered cemeteries, but despite their funerary components, neither type should be considered strictly cemeteries, but rather “as platforms or stages for ceremonial performances into which some burial crypts are incorporated” (Charles et al. 2004:53).

Differences in the scale of activities, and presumably audience, at bluff crest and floodplain mounds appear related to the overall size and complexity of the structures. Bluff crest mounds are usually smaller than those in the floodplain, though Naples-Russell Mound 8 and Elizabeth Mounds 6 and 7 are exceptions (Buikstra and Charles 1999; Bullington 1988; Charles and Buikstra 2002; Ruby et al. 2005; King et al. 2011). Although typically smaller, bluff crest mounds generally include greater numbers of interments that are demographically representative of the communities building them (Buikstra 1976). Despite differences in use and scale, both mound types share structural similarities thought to encode commonly held meaning(s) and functions (see Hall 1979, 1997; Ruby et al. 2005; Struever and Houart 1972).

Figure 12. Location of sites discussed in the text situated within the Lower Illinois River Valley.



The "Standard Model" of Middle Woodland Mounds

Archaeologists in the LIV have developed a working model of Middle Woodland mound structure anchored in Perino's observations (Perino 1968, 2006; Buikstra and Charles 1999; Buikstra et al. 1998; Bullington 2004; Charles et al. 2004; Van Nest 2006; Van Nest et al. 2001). This basic format includes a cleared and/or prepared surface, central tomb and ramp complex, and final

capping layer(s) that effectively seals the earthen monument. The initiating event is often the creation of a cleared surface by removing of all or most of the organic A-Horizon soil in what will be the footprint of the earliest phase of the built structure. Next, a layer, or layers of light-colored sediment are deposited on this cleared surface, comprising the prepared surface upon which the initial ramp and tomb complex will be built. We introduce this distinction between cleared and prepared surfaces to differentiate between removal of surficial soil and deposition new soil before ramp and tomb construction.

Nearly all bluff crest and some floodplain Middle Woodland mortuary rituals are centered on the ramp and tomb complex. Some burials are processed through the central crypt and later interred elsewhere within the complex; some are left in the central tomb, while others are emplaced in pits at the periphery of the ramp. Eventually, the entire structure is buried beneath a capping layer or layers.

While the features that comprise the standard model are common, variation exists (Bullington 1988; Charles et al. 2004). For example, the primary structures of Brangenberg Mounds 1, 2, and 3 were covered with limestone pavement (Baker et al. 1941; Taylor 1928). Excavation at the Elizabeth Mounds documented several additions and modifications to the basic format, which include burning and abandonment of the central tomb prior to closing the mound with an extensive capping layer (Charles et al. 1988). Additionally, instances of multiple ramp and tomb structures are not uncommon. These may be superimposed, such as those interpreted in the Kamp Mound 7 geophysical

data (see below) or those observed archaeological at Pete Klunk Mound 1. They may also be horizontally related within conjoined mounds, such as examples from the Bedford, Pete Klunk, and Kamp Mound Group (Perino 1968, 2006; Struever 1960; McKinnon et al. 2014).

It is important to also distinguish between the structural and compositional properties of mounds. *Structural* elements refer to discrete building units of a mound, e.g. prepared surfaces, ramp/crypts, ramp extension(s), successive capping layers, etc. and are basic architectural elements of mounds. *Compositional* elements, in contrast, refer to construction materials used to build structures. Julieann Van Nest and colleagues have developed a classificatory schema for Illinois Valley mound fills based on constituent materials: loaded, massive, and stratiform (Van Nest et al. 2001:634-5).

Loaded mound fills are composed of discrete depositional units with distinct boundaries, either as compositional loads or sod blocks. Compositional loading is characterized by soils from multiple sources, contrasting soil colors and textures readily distinguishing the units, even across millennia. Sod blocks, in contrast, are discrete turf units. While their boundaries are distinct, variation observed as in situ moundfills is the result of each block crosscutting A and sub A-Horizon soils. Both have a variegated appearance, but the soil color/texture variation occurs within distinct blocks of sod and across distinct compositional loads. Finally sod blocks tend to be from a singular source. Both are generally

used to build the ramps of the ramp/tomb complex (or primary mound) or structural additions.

Massive fills, in contrast, are homogenous with indistinct boundaries. They are typically sediments emplaced over the primary mound as a cap or other secondary structural units.

Stratiform fills are either geogenic or anthropogenic laminated or bedded fills, such as waterlaid flood deposits or prepared sand surfaces. All three fills may be found within a single mound, though major types appear to be strongly correlated with specific structural elements. These construction units have compositional properties that may (or may not) create specific signatures with regard to various geophysical instruments. Detection is further complicated by the constituent soil properties of construction units, e.g. sand versus clayey soils versus the many observable textural properties of soil.

Geophysical Prospection and the Standard Model

Since 2010, we have conducted geophysical surveys at a number of Middle Woodland mound sites (Herrmann et al. 2014; McKinnon et al. 2014). We focus here on results from Mound House Mound 1 (MD 1), Golden Eagle Mound 1 (GE 1) and Mound 2 (GE 2), and the Kamp Mound Group Mounds 1, 6, 7 and 10 (KP 1-10) to illustrate structural and compositional aspects as monitored by different geophysical instruments (see Figure 12). Results from MD 1 and GE 1 are electrical resistance tomography (ERT) pseudosections. GE 2 was mapped

using ground-penetrating radar (GPR) and magnetic gradiometry. KP 1, 6, 7, and 10 were also mapped with magnetic gradiometry. MD 1 results are informed by direct observation of archaeological soils recorded during earlier excavations at the site (Buikstra et al. 1998). The MD 1 results allow for a comparative archaeological data set when examining ERT survey on GE 1. Previous coring at KP also permits retrospective “ground-truthing” of our geophysical results (Van Nest and Asch 2001). We organize our discussion by focusing on what we interpret as detectable structural units in stratigraphic sequence beginning with initial stages of mound building.

Cleared and/or Prepared Surfaces

ERT results from MD 1 (Figure 13) include a low resistance anomaly we interpret as a large depression related to a cleared surface at the interface of the high-resistance natural sand ridge that underlies the mound and the constructed mound ramp/tomb complex (Herrmann et al. 2014:171-2:Figure 4D). The depression is approximately 12 m wide and is centered below the archaeologically identified sod ramp (Buikstra et al. 1997; Van Nest et al. 2001). A second, smaller submound depression is present at the south end of the MD 1 ERT profile that correlates to an anthropogenic sand surface emplaced on the natural sand ridge (Herrmann et al. 2014:Figure 4A; Buikstra et al. 1998). There is no archaeological evidence of a prepared surface below the ramp and tomb at MD 1. A thin A-Horizon is reported below the excavated portion of the ramp, though it is not apparent if is intact (Buikstra et al. 1998). The sand surfaces

reported at the south end of the mound are clearly anthropogenically prepared though no ramp/tomb complex has been documented there. In contrast, the GE 1 ERT profile lacks such a depression (Figure 14). As Herrmann and colleagues (2014) note, there was no expectation of detecting the 10-20 cm thick archaeologically-observed sand layers below the southern half of MD 1, particularly when juxtaposed to the sand ridge soils upon which the site was built. Similarly, we have no basis for interpreting such a structure below GE 1, though at present there is also no geophysical evidence to rule out the presence of a prepared stratiform surface either. For example, apparent submound depressions in the ERT data could represent differential water drainage patterns, a confounding factor that would directly impact resistance measurements.

Ground-penetrating radar results from GE 2 also suggest of a prepared surface. Amplitude slices of from GE 2 results (Figure 15) show high amplitude reflections (27ns; 1.8 m bs) that surround a less reflective area upon which the mound is centered (Herrmann et al. 2014:Figure 6). These reflections are interpreted as the original ground surface (OGS) upon which GE 2 was built (Herrmann et al. 2014:Figure 6). The less reflective region near the center of the mound is interpreted as an approximately 15 m (~50 ft) area of the OGS. This area appears to be too large for a central tomb, but it is the expected location for a cleared surface.

Figure 13. Detail of electrical resistance profile of Mound House Mound 1 with location of prepared surface and loaded fills indicated.

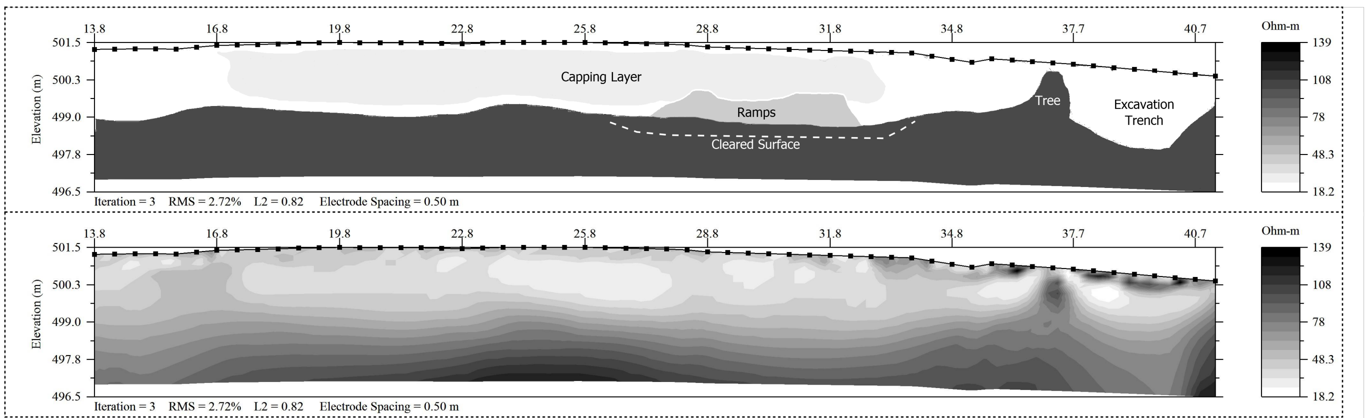
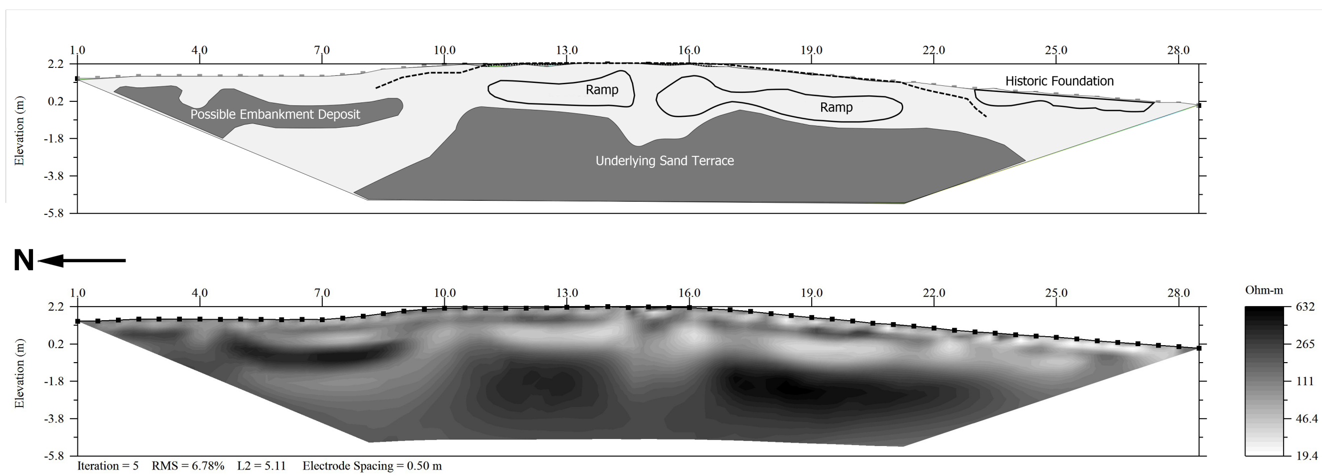


Figure 14. Electrical resistance profile of Golden Eagle Mound 1.



Ramp and Tomb Complexes

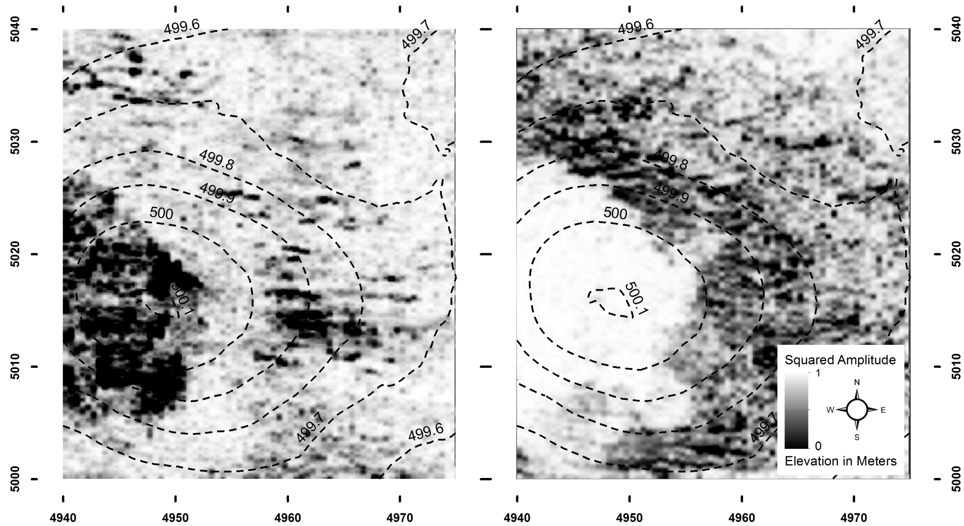
Ramp and tomb complexes are the central organizing feature of Middle Woodland tumuli. As noted above, they are often constructed of distinctive soils that contrast with the underlying natural substrate and prepared stratiform surface(s). Above these complexes are the often massive, homogeneous fills that closed the tombs and form the contours of the present-day mounds. Because of contrasts between the ramps and both underlying and overlying soils, ramp and tomb structures seem to be the most easily detected and interpretable units visible in geophysical datasets. MD 1 ERT results document a feature that is consistent with a ramp and tomb complex, which is less resistant than soil below it and more resistant than the overlying massive fills (see Figure 13; Herrmann et al. 2014:Figure 4). The archaeological and geophysical data suggest the MD 1 central tomb around which the ramps were organized was not intrusive into the original ground surface. These results are important because they can be directly correlated with archaeologically observed mound structure and constituent soils. For example, the geophysical feature aligns with the sod ramp observed in Sq 81 at MD 1 (Buikstra et al. 1997).

In contrast, ERT results from GE 1 suggest a centrally placed, large, rectangular and roughly straight-walled low resistance depression suggestive of a central tomb that *is* intrusive into the original ground surface (Herrmann et al. 2014:Figure 5). The proposed large tomb is approximately 3m N-S and flanked by two low resistance areas that are interpreted as ramps. Three plausible

interpretations emerge from these data: (1) the ramp surrounds a large crypt that is several meters deep as measured from the top of the ramp to the base of the crypt; (2) there is a large crypt excavated into the original ground surface with a smaller, ramped crypt superimposed upon it; or (3) there is a large crypt with a looters' pit truncating it.

At GE 2, GPR high-amplitude returns (9-13ns; 0.4 m bs) indicate the top and base of a buried structure suggestive of a primary mound (Figure 15; Herrmann et al. 2014:Figure 6). The topographic shape of GE 2 is roughly circular; however, its subsurface amplitude geometry is strongly rectangular, which is generally unexpected for Middle Woodland structures (Herrmann et al. 2014:Figure 7). Additionally, we observe an angled, reflective interface that descends and widens in the radargram to connect the two highly reflective features in the time slices, suggesting a basic ramp form (Hermann et al. 2014:Figure 6).

Figure 15. Time slices from ground-penetrating radar survey of Golden Eagle Mound 2. Left: Capping layer as seen in data from 9.9 – 13 ns (estimated 90cmbs) from sensor. Right: Surface preparation as seen in data from 22.7-23.9 ns (estimated 170cmbs) from sensor.



Turning to the Kamp Mounds Group (Figure 16), magnetic gradiometry results from KP 1, 6, and 7 delineate apparent ramp and tomb complexes and reveal high-contrast differences between the ovoid ramp shape and the central tomb features within these mounds (McKinnon et al. 2014). Magnetic gradiometry results from KP 7 suggest the presence of a ramp and tomb complex (7A) superimposed upon another (7B), although the relationship of 7A and 7B is not yet fully understood (McKinnon et al. 2014: Figure 5). Areas of high contrast could represent compositional differences, although it is possible that burning on some of these structures (see Charles et al. 1988) could have enhanced the magnetic intensity of these features (Kvamme 2006a:214; Aspinall, Gaffney, and Schmidt 2008:21).

Figure 16. Geomagnetic results from the Kamp Mound Group. (a) Results from Mound 6 and 7 (b) Results from Mound 1.

Sod Ramps. As noted above, sod blocks are single-source materials, whereas compositional loading is multisource. Thus, it is reasonable to hypothesize that the two have distinct geophysical signatures. This hypothesis has yet to be fully tested, but we have two geophysical datasets that can be supplemented by archaeological evidence. At MD 1 and KP 1, 6, and 7, mound excavations and geoarchaeological sampling have identified the presence of sod ramps (Buikstra et al. 1998; Van Nest and Asch 2001; Van Nest et al. 2001). In all four mounds, high contrast resistance and geomagnetic signatures appear to differentiate sod ramps from surrounding structures, suggesting it may be

possible to differentiate sod block ramps from other compositional-structural combinations with geophysical prospection. There are no direct observations of moundfills at other surveyed mounds; however, the GE 1 ERT data indicates that the hypothesized ramps are relatively low resistance compared to the overlying fill, the sediment within the tomb, and the submound surface - a pattern observed in both the MD1 ERT and excavation results. The strong resistivity contrasts suggest distinct compositional differences between structures, and may be indicative of sod ramps at GE 1.

Capping Layers

Our remarks concerning capping layers are limited to 3D data collected using GPR and ERT methods. Geomagnetic data provides little insight into the uppermost caps, largely owing to the inability of magnetic gradiometry to distinguish between thermoremanant and induced magnetism (see Kvamme 2006). Capping layers are indicated primarily in their contrast to the buried architecture of the ramp and tomb complex. As Van Nest and colleagues (2001) note, capping layers and other additions to the mounds are often massive fills. That is, the soils are not (geo)archaeologically detected as loads and were not deposited as cohesive units, but rather as basket loads broadcasted over the ramp and tomb complex. In all cases, these layers are also relatively homogenous across the structure in the geophysical data. Variation observed within them appears to be primarily the result of post-construction disturbances, particularly historic ones as in the case of the resistance pseudosections (see

Figure 13), or relatively non-reflective layers of soil whose profiles are dominated by historic plowing, e.g. GE 2.

Geophysical Testing in the LIV: A Successful Beginning

The first stage of our geophysical testing program, detecting interpretable geophysical representations of buried prehistoric phenomenon for Middle Woodland LIV sites, has been a success. Components of Middle Woodland monumental architecture are detectable via multiple sensors, and results thus far suggest that they are reasonably uniform across multiple sites. In particular, geophysical prospection at Golden Eagle and Kamp Mound Group has allowed us to investigate internal structures we would otherwise not be able to observe. Additionally, results from these sites illustrate that significant structural remains are intact despite over a century of plowing and, in the case of Kamp (KP 1), earlier excavations (McKinnon et al. 2014:Figure 6). The ability to monitor the impact of historical modification of sites is important for cultural resource management and stewardship initiatives. Importantly, these results provide an empirical baseline for comparing LIV mounds to those in other parts of the Illinois Valley, e.g. the Central Illinois Valley. Additional multi-sensor surveys of each mound discussed here along with additional Middle Woodland sites will only increase our resolution and understanding of structural and regional variation throughout the Illinois River Valley.

It is clear geophysical prospection can detect buried prehistoric architecture within Middle Woodland mounds and determine, within limits, what those structures likely represent. At this level of resolution, MD 1, GE 1, and KP 1, 6, and 7 share structural details consistent with the “standard model” of Middle Woodland moundbuilding. This general uniformity suggests a shared moundbuilding repertoire amongst LIV Middle Woodland communities at floodplain sites that we have elsewhere referred to as “liturgical sequences” (Buikstra et al. 1998; King and Buikstra 2005; 2010). These repeated structures, which are the result of specific architectural and compositional choices made by Middle Woodland peoples, have been implicated in world renewal rituals anchored in representations of the Middle Woodland cosmos in the vertical configuration of mounds and re-creations of the Earth Diver’s creation of land in this-world through the use of sods (Buikstra et al. 1998; Buikstra and Charles 1999; Charles et al. 2004; Van Nest 2006; Van Nest et al. 2001).

That we can detect such architecture or their absence within mounds indicates that geophysical surveys of additional unexcavated mound sites will be productive and thus allow us to more firmly establish the range variation in mound configuration. With this in mind, our results thus far are encouraging. The location, frequency, and distribution of cosmologically symbolic structures and ceremonial stages is crucial for understanding the manner in which the cosmos and creation were mobilized to unite and/or differentiate various dimensions of community practically and ideologically, particularly as imagined communities that might crosscut archaeologically defined residential groups suggested by

habitation sites (Ruby et al. 2005; Canuto and Yaeger 2000; Bernbeck and McGuire 2011). The ability to use geophysical data as primary datasets in the future Illinois Valley research to address these questions will ensure that archaeological geophysics remains problem-oriented and anthropological rather than wholly descriptive, and that the past remains peopled.

Chapter 4

Creating Ancestors: Kinship, Mortuary Practices, And Ideology In The Middle And Late Woodland Periods Of The Lower Illinois Valley

Kinship has become increasingly visible in bioarchaeology as researchers seek to make social inferences about past peoples through investigation of biological indicators of relatedness and their relationship(s) to archaeological variables connecting investigatory practice(s) and results to modern conceptions of kinship (Johnson and Paul 2015, and citations therein; Stojanowski and Schillaci 2006). Biological distance (biodistance) has long been a common, even if not the most prominent, bioarchaeological approach though biodistance studies were often less directed at addressing broadly anthropological concerns about kinship than they were focused on biological or sociological issues, e.g. regional biological or genetic variation, hetereogeneity, admixture, post-marital residency (Buikstra and Beck 2006; Konigsberg 2006). Biodistance studies are useful for more than simply measuring or accounting for the apportionment of phenotypic and/or genetic variation within a cemetery or a region; the distribution of these data tell us little of interest on their own. To be certain, the apportionment of biological markers across space is informative from a (micro-)evolutionary perspective; however, evolutionary principles are only the proximate cause. Social relations are the ultimate determinate, a premise foundational to this study.

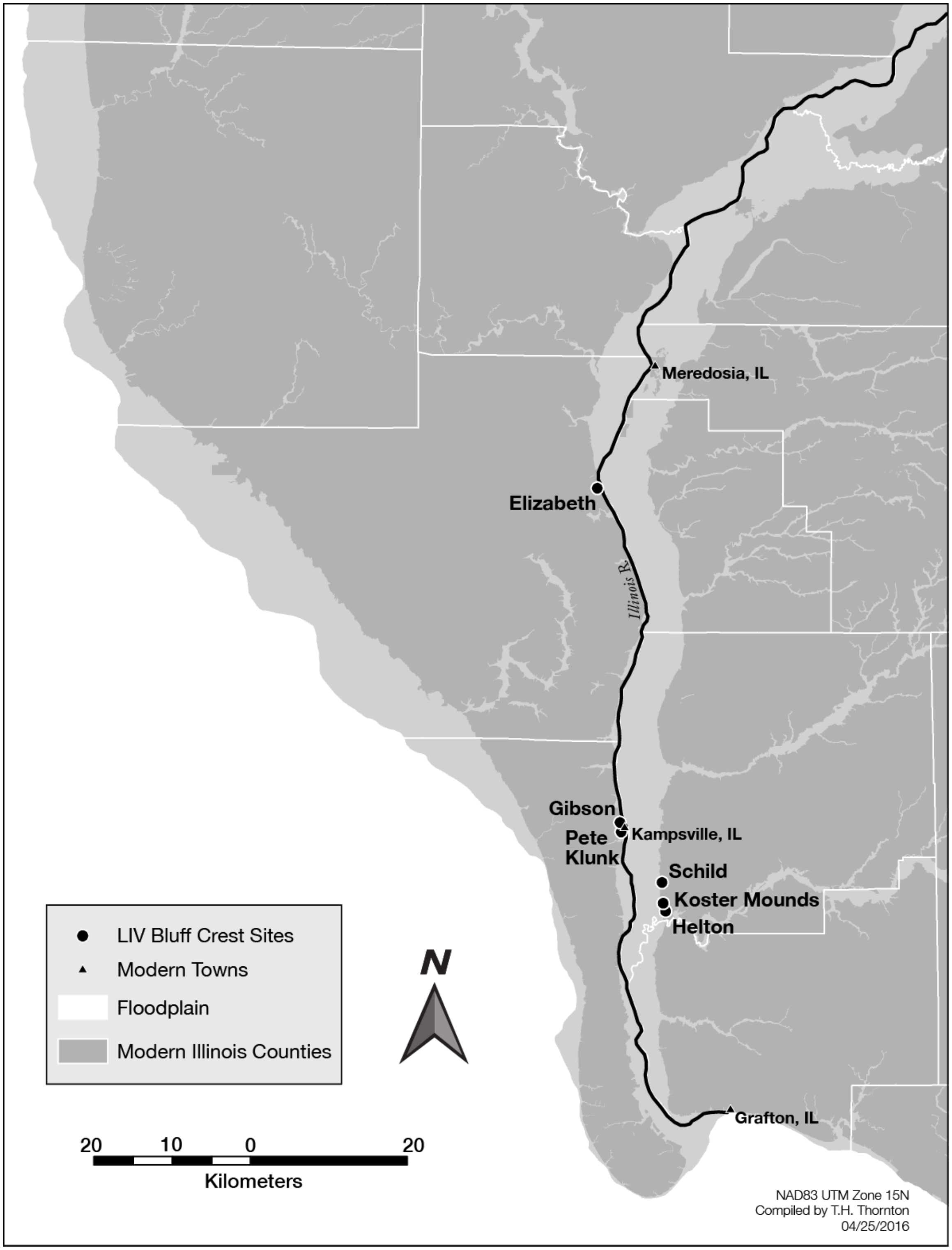
Kinship, or perhaps more generally relatedness, provides some of the most basic ties of social life (Sahlins 2013). These relations are not merely connections of shared genetic material, but they are also culturally constituted and continually reproduced in the production of social life. Such complex relationships can be realized in multiple ways, one of which may be mortuary practices that are limited to specific segments of a community. As such, relatedness, and the practices reifying and reproducing it become ideological as they recreate specific sets of social relationships at the expense of others.

In this article, I report investigations of the interrelationship of kinship, ancestorhood, mortuary treatment, and ideology in the context of Middle (ca. 2000-1550 B.P.) and Late Woodland (ca 1550-950 B.P.) social life in the Lower Illinois Valley (LIV). I begin by reviewing earlier work on Middle Woodland (MW) and Late Woodland (LW) mortuary practices, particularly those related to mortuary (bio)archaeological and biodistance that provide the empirical basis for the model presented here. I then present a model of MW and LW mortuary practices embedded in social relationships determined by relatedness wherein these relations are reproduced and legitimized via mortuary treatment. Expectations of this model are then tested using a biodistance approach to mortuary analysis.

Lower Illinois Valley

The Lower Illinois Valley (LIV) includes the final ~75 mi (120 km) of the Illinois River, as well as its floodplain, bluffs, and associated uplands (Figure 17). This region and its approximately 10,000 year record of human occupation, particularly its earthen tumuli and remains interred within them, have been the focus of intensive archeological investigation since the mid-twentieth century, with earlier excavations extending back to the late nineteenth century (Farnsworth 2004; Perino 1968, 1973a, 1973b, 1973c, 1973d, 2006; Struever 1960) Between approximately 2000 and 950 B.P., LIV people built complex, earthen mounds for the burial of the dead on the bluff's crests, the most prominent of these associated with the Middle Woodland period and Hopewell phenomenon (Buikstra 1976; Buikstra and Charles 1999; Charles et al. 2004; Struever 1968). Middle Woodland monuments were not simple cemeteries; decades of archaeological investigation have documented complicated structures modified over time for the duration of their use (Buikstra 1988; Buikstra et al. 1998). Concomitant with this structural dynamism was a suite of mortuary practices that frequently involved the manipulation of the some of the dead after initial disposition (Buikstra 1976; Buikstra and Charles 1999; Kerber 1986; Perino 1968, 1973b, 1973c, 1973d, 2006).

Figure 17. Lower Illinois Valley and sites discussed in this study.



The LIV MW period began after a period either abandonment or low-density, ephemeral occupation of the main valley (Charles et al. 1986; Farnsworth and Asch 1986; King et al. 2011). Resettlement of the valley is observed archaeologically in the presence of mounds on the bluffs or on raised features, e.g. sand ridges, terraces, in the valley's floodplain as well as by the presence of long-term residential sites at the valley's margins. MW bluff crest tumuli are community cemeteries for nearby residential units, typically found at the bluffs' base, while those in the floodplain are thought to anchor seasonal, or at least intermittently occupied, ceremonial spaces at which several residential communities gathered for social, economic, and ceremonial purposes (Buikstra 1976; Buikstra and Charles 1999; Ruby et al. 2005; Struever and Houart 1972). The terminus of MW occupations is typically demarcated archaeologically as the disappearance of Havana-Hopewell and Pike-Baehr series pottery and various Hopewell items, e.g. highly decorated Hopewell pottery, blade core lithic technology, extralocal cherts, copper items, cut mica figures, and associated moundbuilding (Braun 1977, 1979; Buikstra and Charles 1999; Struever 1968; Tainter 1977). In contrast, the Late Woodland (LW) period has traditionally been characterized by the subsequent absence of MW/Hopewell items and mounds, frequently referred to as a 'decline" or 'collapse' (Griffin 1967; Hall 1981; Tainter 1977, 1980). LW peoples continued to bury their dead in mounds on the bluffs, but these structures lack the distinctive ramp-and-tomb structure and complexity that characterizes MW mounds (Buikstra and Charles 1999; Charles 1992, 1995; Kerber 1986). In addition to changes in mortuary treatments,

monumentalism, and artifact assemblages, the LIV MW and LW periods encompass transformations: increased population density, reduction in village size, reduction in catchment size, improvement and/or introduction of new technologies (e.g, bow and arrow), and the introduction of maize agriculture (Braun 1977; Buikstra 1988; Charles 1992, 1995; McElrath et al. 2000; O'Brien 1987; Styles 1981).

Mortuary Practices and Social Inferences

LIV (bio)archaeologists have frequently used mortuary contexts to make social inferences anchored in processualist theory influenced by Arthur Saxe's (1970), Lewis Binford's (1971), and James Brown's (1971) foundational essays concerning cemeteries and social inference. In essence, these approaches were concerned with how one could approach mortuary variability to discern dimensions of social structure and/or individual status. This approach was less concerned with theorizing the nature of social organization, individualizing funerary treatments, and their expression(s) in mortuary practice than they were with generalizing regularities at differing scales to develop methodologies for the detection sociological organization in archaeological contexts where past principles were unknown. The arguments for and against such approaches consumed archaeological debate for several decades and are well-worn (Hegmon 2003, 2005; Hodder and Hutson 2003; McGuire 1992; Moss 2005; Parker Pearson 1999; Trigger 1989). They will not be reproduced here except to

note that the processualist concerns with status and social organization are central to early LIV MW and LW mortuary archaeology interpretations, though more recent analyses have incorporated approaches informed by different theoretical perspectives (Buikstra and Charles 1999; Buikstra et al. 1998; Charles 1995, 2010; Charles and Buikstra 2002; Martin 2005)

Jane Buikstra's (1976) analysis of MW mortuary practices identified two distinct tracks in the MW mortuary program: a limited-access track focused on extended postmortem processing of the dead associated with the ramp-and-tomb complex and a second associated with direct inhumation of the dead in relatively simple graves at the peripheries of the mounds. She found that adults males were associated the central tomb/ramp burial track, and adult females were more commonly associated with peripheral burials, suggesting status differentiation represented by mortuary treatment. When adult female and juveniles remains were included in the less accessible track, their remains were always accompanied by those of an adult male, indicating that inclusion was predicated upon a relationship to males. Most MW people were interred in bluff crest mounds, though a small subset was interred in floodplain tumuli. Floodplain burial practices were similar to those occurring at the bluff crest, however activity there was primarily focused on central crypts and more restrictive than the bluff crest track. Buikstra (1976:44) concluded that status in MW society was ascribed and therefore MW societies best fit Morton Fried's (1960) ranked model rather than his egalitarian one.

Joseph Tainter's (1975, 1977, 1978, 1980) analysis for LIV mortuary practices was concerned both with social organization and status, as well as the manner in which these might have been different during the MW and LW periods. The end of Hopewell was of primary concern to Tainter. Arguing from systems theory, Tainter posited that energy expenditure was the primary indicator of vertical differentiation in the mortuary domain. In short, those upon whom the most energy was expended were the highest rank, and those of lesser social standing had the least amount of energy expended upon them at death. Tainter employed a clustering algorithm to derive groups of burials he argued represented different expenditures of energy on the part of the living for the dead (Tainter 1975). From these he devised measures of organization derived from systems and information theory. He found that Middle Woodland/ Hopewell society was comprised of six rank levels while Late Woodland society was comprised of five, and "in all cases….the paramount rank levels seems to have been hereditary, ascribed status" (1977:82). He therefore argued that the LW record was a reflection of a social "collapse," manifested archaeologically as the absence of Hopewell items. Later LW LIV, though, experienced another shift toward a "higher amount and degree of organization, and to a higher degree of rank differentiation" (1977:85). This approach and interpretation were heavily criticized by David Braun (1977, 1979, 1981; see also Brown 1995). Braun's (1979) reanalysis of the Gibson and Pete Klunk data found no evidence of the kind of ranking complexity or inherited status detected by Tainter. Instead, Braun found burial types and grave accouterments did not crosscut

demographic categories, though adolescents were excluded from limited access treatments. Rather, differentiation was primarily conditioned on sex and personal ability; in short, he found no evidence of hereditary ranking and instead individual prestige. Rather than collapse, Braun (1977, 1985, 1986, 1987; Braun and Plog 1982) has argued for increased integration of communities and intensified subsistence strategy in a widespread process of “tribalization” during MW and LW periods. Arguing from ceramic data, Braun posited increased regional homogeneity reflected an increase in cooperation among local communities (Braun 1977; Braun and Plog 1982:516-517).

Brown (1979, 1981; see also Charles 1992) has argued the two-track burial program in MW mounds was a manifestation of lineage hierarchy associated with settlement of the valley. Early settlers, presumably kin-groups, were founder families who occupied a privileged social space relative to junior lineages composed of later-arriving families. Charles (1992) argues that LW demographic saturation of the LIV resulted in the formation of more stable mate-exchange networks and kin-alliances, thus reducing the need of Hopewell items and associated ritual for mediating inter-group relations (1992, 1995; Charles et al. 2004). This transformation decreased the power dominant lineages elites within communities: “[t]he power base of the traditional MW elites—their ability to mediate intragroup status and intergroup exchange—would have been negated by the development of kinship ties among the non-elite members of the various communities” (Charles 1992:192). Charles et al. (2004) argue that at the

community level the Hopewell phenomenon mediated local social relations within and/or between residential units.

More recent considerations of MW monumentalism have emphasized connections between emplacement of ancestors in highly visible spaces and moundbuilding ritual connected to world renewal symbolism (Buikstra and Charles 1999; Charles and Buikstra 2002; Charles et al. 2004; Van Nest 2006). Drawing on Lynne Goldstein's (Goldstein 1976, 1980) reformulation and Ian Morris' (1991) critique of Saxe's (1980) Hypothesis 8, Buikstra and Charles (1999) theorized that differences in funerary treatment observed in LIV cemeteries—MW as well as others—reflect differences in practices intended as rituals for the dead and practices oriented toward ancestors. During the MW period, this difference in practice and intention correlates to two-track mortuary program: direct inhumation relating to mortuary ritual, and extended processing relating to ancestor veneration, the latter being drawn from senior lineages within communities (Brown 1979, 1981; Buikstra and Charles 1999; Charles 1992, 1995).

Andrew Martin's (2002; 2005) analysis of LIV MW/Hopewell mortuary practices takes a much different approach from those discussed above. Drawing on philosopher Bruno Latour's work, particularly the notion of "controversies," Martin proposes a vastly different kind of MW society in which competing subsets of society establish and re-establish cemeteries, often directly upon those of rivals, as a means of presenting competing ideologies concerning the nature and organization of society. He proposes four distinct

cemetery forms, presumably associated with an equal number of competing groups and ideologies. Who these subsets are, how they are composed, and what is meant by ideology is not explained. Martin's argument relies upon his proposed intra-site chronologies, which King et al. (2011:505, 513-516) have shown to depart from radiocarbon-based sequences.

Biological Distance in the LIV

LIV biodistance studies provide useful insights into MW and LW social dynamics and their relation to mortuary contexts. In her 1976 study, Buikstra employed discrete cranial traits to measure biological distance between mounds groups, individual mounds, and mortuary tracks using Mean Measure of Divergence. She found no significant distance difference between mounds or mortuary tracks. Buikstra's (1977, 1981) analyses of discrete cranial traits demonstrated genetic continuity between MW and LW populations, which indicates that differences in mortuary practices, mound structure, and material assemblages cannot be explained in terms of population replacement. Subsequent research on the regional biological structure during the MW and LW periods has shown that cultural boundaries may have existed that limited gene flow between groups (Konigsberg and Buikstra 1995). Particularly, they detected a boundary between the Ray site, located in the central IL valley, and other sites included in the study. A similar boundary isolated the Elizabeth mound group

near the juncture of the central and lower valley from those located further south.

Biodistance analysis of MW and LW post-marital residency practices suggest virilocality during both periods (Droessler 1981; Konigsberg 1987, 1988). Konigsberg's (1988) employed discrete cranial traits from MW, LW, Emergent Mississippian, and Mississippian cemeteries to investigate sexual migration. He calculated the determinant of the covariance matrix of traits of male and female samples within sites to produce a ratio for measuring relative variability. The non-migrant sex was expected to be less variable than the migrant sex. Determinant ratios less than 1.0 indicated males were less variable than females within sites and thus virilocality; ratios less than one suggested the converse and uxorilocality. His results suggested that most communities practiced virilocality, some form of post-maritial residency predicated on male relationships. Exceptions were the Pete Klunk MW sample and Mississippian Schild Knolls (Konigsberg 1988:479). The importance of adult male relationships is, perhaps, not surprising given the apparent emphasis on males and male relationships documented in MW mounds as discussed above.

Recently Bolnick and Smith (2007) performed a mitochondrial DNA (mtDNA) analysis of the Pete Klunk site. They tested for evidence of sex-biased post-martial residency and genetic associations with mortuary treatments within the site. Regarding the latter, they tested genetic associations with mortuary programs proposed by Buikstra (1976), Brown (1981) and Charles (1992), Tainter (1997) and Martin (2005). They found no differences between mtDNA

haplogroup frequencies when comparing sexes, tumuli, or mortuary tracks, with the exception of “the two burial tracks defined by Brown (1981) and Charles (1992)” (Bolnick and Smith 2007:634). Their comparison was statistically significantly (*p* = .02); however, they caution that Bonferroni correction of the p-values produces an insignificant result: “this result should be considered suggestive but not conclusive” (Bolnick and Smith 2006:634). In contrast to Konigsberg they found evidence of matrilocality at the Pete Klunk site. Measurement of haplogroup and nucleotide diversity showed males were more diverse than females, though statistical testing suggested that two were not different. Bolnick and Smith’s samples are small due to recovery rates, and most of their data comes from Pete Klunk Mounds 5 and 6.

Ancestor-Generative Model

To date, several important generalizations may be offered regarding MW and LW society, mortuary practices, and biological relationships. First, it is clear that the LIV valley underwent a substantial demographic transformation that began with the arrival of early MW migrants and continued through the LW period (Charles 1992, 1995). As noted above, migration was likely kin-structured, and founder lineages likely exerted some degree of social prominence relative to junior lineages composed of later migrants into the valley and/or community fusions. Importantly, LW communities were descendants of MW founders, and not a replacement population.

Second, MW and LW people appear to have practiced some form of virilocal post-marital residency (Bolnick and Smith 2007; Droessler 1981; Konigsberg 1988). At minimum, MW and LW mortuary practices resulted in interments predicated on adult male relationships. In either case, adult males were buried amongst kin in their natal communities, and adult females were interred in cemeteries that were not adjacent to their natal communities.

Third, variation existed in the MW and LW mortuary program that was tied to adult male relationships (Braun 1979; Buikstra 1976; Kerber 1986; Tainter 1977). The MW program was comprised of two tracks, one of which involved extended handling of the dead (processing), and the other did not. The LW mortuary program is somewhat more complicated, though Kerber (1986) notes the continuance of this processed/unprocessed dichotomy with middle-aged adult males' bodies most likely to receive extended curation. Considered together, these factors indicate a strong connection between ties to one's natal community, in this case male's natal communities, and mortuary practices anchored in kinship.

Kinship is social (Salhins 2013 and sources cited therein), but it exists at the interface of social and biological interrelationships of personal and generational interconnections engaged in the reproduction of communal society (Bender 1985; Bender 1990; Gilman 1984; Godelier 1975; Gregory 1984; Hindess and Hirst 1975; Leacock 1972; Lee 1990; Marx 2007[1964]; Marx and Engels 1998[1845]; McGuire 1992; Patterson 2003; Saitta 1988, 2005; Spriggs 1984; Wolf 1982). In kin-ordered or communal societies like those of the LIV MW

and LW periods, kin relations are both dialectical productive and ideological relationships (Godelier 1975; Gregory 1984; Hindess and Hirst 1975; McGuire 1992; Wolf 1982). Communal societies stand in contradistinction to class societies, and are characterized by common ownership of the means of production, absence of class relations, and collective production and appropriation. Marx and Engels (Marx and Engels 1998[1845]) viewed these societies as "extensions of the family." As such, kin relations are social relations of production and dialectical. Kin and non-kin are dialectical in that they are mutually constructive and antagonistic relations of production (Ollman 2003). Despite the theorized absence of institutionalized difference, differences may existence between kin groups, either within or between communities, both in their interests and in production. These conflicting factors may take on dialectally contradictory relations when viewed from the appropriate scale, such as the intersection of kin group membership and birth community residency. These relationships are productive not only in the ongoing practical reproduction of social life, but also in procreation. Procreation need not be limited strictly to biological reproduction and the social relations that condition it. Rather, it should conceptually include those processes that increase population size in general by incorporating new people into the social relations of production, such as adoption, fictive kinships, and community fusions where relevant.

Ideology is inherent within human society, arising from social relations (Bernbeck and McGuire 2011; Eagleton 1991; Giddens 1979; Hodder and Hutson 2003; Larrain 1979; Marx and Engels 1998[1845]; Shanks and Tilley

1982). It is defined here as those statements and actions asserting how the social order *is* and *ought to be* organized. It operates to universalize group interests, to deny contradictions and to reify the present (Bernbeck and McGuire 2011; Giddens 1979; Hodder and Hutson 2003; Larrain 1979). Ideologies may also assert the present as both its own past and future, obscuring social relations, their histories and the potential for alternatives to the status quo. Though resistant ideologies may exist, they can be masked when one segment of society has greater access to forums of speech and action. Kinship and ancestorhood become ideological when they make claims about proper relations and social order. Choices of who is and is not kin, or who is or is not a community member become ideological as these decisions reflect and reproduce the existing social order, particularly as they relate to social power, community membership and opportunities for social action (Godelier 1975; McGuire 1992; Wolf 1982).

Because kinship necessarily presupposes a generational relationship, it extends to ancestorhood as well (Buikstra and Charles 1999; Morris 1991). Ancestorhood is not simply death-mediated relatedness, but also the culmination of processes establishing and reifying relatedness among the living and between the living and dead. Both kinship and ancestorhood may be limited to subsets of a community, and rituals such as funerals may make these relations concrete. As argued by Meyer Fortes (1965), death and genealogy are not always sufficient to establish ancestorhood. Rather, ancestorhood can be

understood as the culmination of processes reifying relatedness among and between the living and the dead.

To emphasize differential access to ancestorhood, the following distinction is employed: *progenitors* are all individuals contributing to the gene pool of a community, and *ancestors* are those culturally designated as such regardless of their genetic contribution. Ritually designated relatedness reproduces and legitimizes limited sets of dialectical social relationships, and in doing so, processes and interrelations given meaning become ideological as they reinforce sectional interests. Decisions about who is or is not kin, and who is or is not naturally ‘of a community,’ can be understood as both generating and reproducing the existing social order and its conditions, thus having economic and ideological dimensions.

In sum, the kin and community structure implied by residence patterning suggests mobility and locality may have provided a substrate for extrapolating kinship and ancestorhood, limiting non-natal community members as progenitors. This social difference is hypothesized to be partially reflected in sex-associated funerary treatments ultimately anchored in lineage membership. Non-mobile members of communities likely constituted a core socio-political unit and engaged in rituals creating their dead kin as ancestors, excluding more recent non-natal members as non-ancestors. This perspective differs from previous LIV conceptions of MW and LW mortuary practices in that directs attention away from burials as reflections of individual status and toward the mortuary record as the outcome of a body of actions undertaken by the living, in

part, to (re)produce the social order in a specific manner. Unlike Martin (2005), I hypothesize a single ideology in LIV MW and LW society within which some kin-groups, or lineages, expressed their social importance.

Based on the discussion above three expectations are posited:

1. Males are expected to be less variable than females within cemeteries if MW/LW societies were virilocal
2. Processed burials are expected to be associated with the non-migrant sex, i.e. adult males, and unprocessed burials are expected to be associated with the migrant sex, i.e. adult females
3. Processed burial groups are expected to be less biologically variable than unprocessed burial groups within cemeteries.

Materials and Methods

To investigate connections between kinship, mortuary practices, and ideology, mortuary and biological distance data from eight samples from six Middle and Late Woodland mound sites were used (Figure 1, Table 1). Burials were coded as either unprocessed (UN) or processed (PR), the former corresponding to primary inhumations with no evidence of manipulation subsequent to burial and the latter including all burials manipulated sometime after inhumation. Skeletons described as disturbed by excavators were excluded. Burial descriptions were drawn from field notes where available or published reports.

Table 5. Sites and associated radiocarbon dates discussed in text.

Site / Period	Context	Lab Sample[1,2,3]	^{14}C Age±E	95.4% Distribution		Median
Elizabeth MW	EZ 6 Feature 1 Prep Surface	ISGS-844	2070±75	-356	77	-97
	EZ 7 Feature	ISGS-1316	2030±70	-339	126	-46
	EZ 4-2	QL-4893	2010±15	-47	47	-13
	EZ 1-3-1	QL-4891	1990±15	-40	55	13
	EZ 6 Feature 1- Central Tomb	ISGS-1140	1980±70	-173	210	14
	EZ 7-9-2	QL-4895	1940±16	21	122	63
	EZ 7 Central Tomb	ISGS-1317	1940±70	-111	240	62
	EZ 6-4-5	QL-4894	1908±15	63	129	97
	EZ 3-2-1	QL-4892	1881±16	72	210	111
	EZ 3-7-1	GX-18529-AMS	1767±51	133	384	269
Elizabeth LW	EZ 10-14	QL-4896	1312±21	659	766	687
	EZ 10-14b	ISGS-1527b	1260±70	648	947	761
	EZ 10-14a	ISGS-1527a	900±100	904	1284	1126
Gibson MW	GB 1-16	QL-4897	2000±15	-43	51	1
	GB 1-16	OS-71824*	1999±40	-94	118	10
	GB C-4	OS-71825*	1840±30	86	242	175
	GB 5-27	OS-71823*	1830±25	92	246	182
	GB 1-7	AA-76995*	1824±46	80	327	191
	GB 3-17	QL-4899	1799±16	135	318	224
	GB 5-30	QL-4901	1756±16	239	334	292
	GB 2-2	QL-4898	1745±16	241	344	293
	GB 4-2	QL-4900	1705±16	257	394	350
Pete Klunk MW	PK 2-11	AA-77007*	1994±45	-149	122	5
	PK 7-29	AA-77008*	1946±45	-50	208	54
	PK 1-24	AA-77006*	1942±45	-48	209	59
	PK 5-28	AA-77012*	1922±45	-37	214	82
	PK 6-20	AA-77014*	1825±45	80	326	189
	PK 13-2	AA-76993*	1802±46	87	341	218
	PK 11-58A	AA-77013*	1789±44	126	379	237
	PK 1A Submound	M-1161	1775±75	80	406	253
Pete Klunk LW	PK 8 Crematory B	M-1355	1350±110	429	946	688
	PK 10 Crematory A	M-1356	1170±120	643	1150	854
	PK 8-8	AA-76998*	1015±42	900	1154	1017
Helton LW	HN 22-33	OS-77119*	1160±30	773	968	870
	HN 22	ISGS-258	1125±75	694	1028	901
	HN 20-36-1	OS-76862*	1050±30	900	1027	994
	HN 47-25	UCR-1412	1030±85	777	1186	1004
	HN 22	ISGS-257	1020±75	779	1208	1017
	HN 20-36-6	OS-77401*	995±30	986	1153	1032

	HN 47-63	UCR-1409	860±85	1021	1281	1162
	HN 47S2-15	UCR-1410	780±85	1038	1389	1227
	HN 47-70	UCR-1413	750±80	1049	1399	1253
	HN 47S2-3	UCR-1411	730±80	1057	1408	1271
Schild LW	SC 4-2	UCR-1402	1560±125	146	685	479
	SC 9-7	UCLA-1919B	1255±35	671	872	740
	SC 9-5	UCLA-1919A	1155±50	723	991	875
	SC 3-34	UCLA-1919C	1130±50	773	1011	909
	SC 2-11	UCR-1400	1080±90	718	1157	943
	SC KnB-275	M-1393	1020±110	769	1244	1013
	SC 1-34	UCR-1399	980±80	892	1220	1070
	SC 2-32	UCR-1401	900±70	1020	1258	1129
	SC KnA-122	M-1394A	750±110	1040	1407	1246
Koster LW	KO 5A-18	UCLA-1919E	1340±70	574	870	690
	KO 1-9	UCR-1405	1310±90	563	949	727
	KO 5A-17	UCLA-1919D	1310±50	639	864	709
	KO 2-2	M-1357	1300±120	474	995	743
	KO 2-11	UCR-1395	1300±90	577	953	737
	KO 6-4	UCR-1398	1190±90	665	995	834
	KO 1-14	UCR-1394	1090±100	693	1155	931
	KO 4-15	UCR-1397	1050±70	778	1155	982
	KO 6-14	UCR-1407	750±120	1033	1410	1244
	KO 4-8	UCR-1396	700±100	1051	1433	1293

[1] Cal BC dates are given as negative values.
[2] Laboratories performing radiocarbon analyses: NSF-Arizona AMS Laboratory (AA), Geochron (GX), Illinois State Geological Survey (ISGS), University of Michigan (M), National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution (OS), University of California, Riverside (UCR) and Quaternary Isotope Laboratory (QL).
[3] Samples indicated by a " * " are previously unpublished.

Age, sex, and twenty-two non-metric cranial traits were used for each individual from an existing database of LIV dichotomized nonmetric traits (see Konigsberg 1987). Only MW and LW adult samples were included. Demographically correlated and intercorrelated traits were excluded from the analysis using logistic regression and tetrachoric correlation, respectively, resulting in five traits used to measure biological variability: asterionic bone present, supraorbital foramen present, mylohyoid arch present, divided hypoglossal canal present, obelionic foramen present.

Mortuary associations with sex were measured using chi-square. Biological variability was measuring using covariance matrix determinants, which were then used to construct determinant ratios to compare variability between unprocessed and processed burial groups within cemeteries. These measures were chosen primarily for consistency with previous regional biodistance studies using discrete traits. Konigsberg (1988) previously used this method in his analysis of post-marital residency. This analysis of PR and UN group variation follows his logic and method except that ratios were constructed as $|C_{PR}|/|C_{UN}|$ rather than $|C_M|/|C_F|$. Trait correlations and chi-square analyses were performed in SAS 9.3. Determinant ratio analysis and all other statistical tests were performed in R 3.2.4 (R Core Team 2016). Calibration and significance testing of radiocarbon dates (Table 17) were performed in OxCal 4.2 with IntCal13 (Bronk Ramsey 2009; Reimer et al. 2013).

Results

Regional Analysis

Residency. Table 6 shows determinant ratios of M/F covariant matrices by site and time period and associated p-values. Males are less variable than females in all samples except Pete Klunk MW, Gibson+Pete Klunk MW, and Helton LW. All p-values are larger than .05. Results are generally consistent with those found by Konigsberg with some exceptions (Konigsberg 1988:479). His results indicated virilocality for all samples excepting Gibson MW and the

Mississippian Schild Knolls. Konigsberg's analysis included Mississippian samples, i.e. Hacker South and Schild Knolls, which resulted in different trait selections. Differences in results, therefore, are undoubtedly related to the inclusion/exclusion of the Mississippian sites. It is not immediately clear why determinant ratios would be reversed for Gibson MW and Pete Klunk MW in Konigsberg's analysis and the one presented here. Bolnick and Smith's (2006) mtDNA analysis of Pete Klunk MW suggested matrilocality, as noted above, and these results are consistent with those.

Gibson MW and Pete Klunk MW are at least partially contemporaneous (Table 5). When the two samples are pooled, the resultant determinant ratio is larger than one, suggesting uxorilocality. If, as the limited radiometric data suggests, mortuary activity at Gibson MW is slightly later than that at Pete Klunk MW, the separate analyses suggest a change in residency rules *during* the MW period. Additional radiometric assays may establish a more complicated temporal relationship between the two sites.

Table 6. Male/Female covariance ratio analysis results.

Sample	N♂	N♀	|C♂|/|C♀|	p-value
Elizabeth MW	21	25	.3864	.7290
Gibson MW	31	39	.5590	.8820
Pete Klunk MW	68	80	1.5625	.3200
Gibson+Pete Klunk MW	99	119	1.5779	.9000
Elizabeth LW	15	20	.5799	.4470
Schild LW	20	29	.1650	.3510
Koster LW	39	36	.7930	.3840
Helton LW	41	27	1.2759	.4720

Mortuary Associations. Mortuary treatment was not associated with sex at most sites. Only Gibson MW, EZ MW, and Schild LW treatments by sex were significantly different (Table 7). Where treatment differences were significant, processing was associated with males. As with the post-marital residency analysis, Pete Klunk MW is the single MW exception. These results are generally consistent with previous analyses that suggest extended mortuary treatment during the MW period is more commonly associated with adult males. Processing during the LW period does not appear to be associated with adult males. Kerber (1986) found reburial to be inclusive of several demographic groups and curation to be primarily associated with middle-aged adults, though

it is difficult to understand why these two categories should be different. This analysis did not separate them.

Table 7. χ^2 analysis of adult sex associations with processing by sample.

Sample	PR♂	UN♂	PR♀	UN♀	χ^2	p-value
Elizabeth MW	10	14	2	23	7.5052	.0083
Gibson MW	12	21	7	35	3.7904	.0645
Pete Klunk MW	18	57	20	69	.0534	.8541
Gibson+Pete Klunk MW	30	78	27	104	1.6743	.0527
Elizabeth LW	6	14	4	16	.5333	.7164
Schild LW	22	37	18	44	.9311	.4396
Koster LW	25	35	17	37	1.2671	.3315
Helton LW	10	32	12	22	1.2049	.3157

Processing and Variability. Processed burial groups are less variable than unprocessed groups at all sites, suggesting that those receiving extended mortuary treatment were more closely related to each other than unprocessed individuals were to one another (Table 8). Middle Woodland ratios tend to be smaller than Late Woodland ratios. Schild LW and Koster LW processed burial groups contained few individuals, and the determinant of the processed covariance matrix resolved to zero in each case. The ratio for these two samples has bee reported as simply *"< 1.0"* to avoid a zero in the ratio's numerator. Combining the Gibson and Pete Klunk MW samples has little effect on the

determinant ratio. Randomized probability values are greater than .05 for all comparisons.

Table 8. Processed treatment determinant ratio analysis results.

Sample	**PR**	**UN**	$\|C_{PR}\| / \|C_{UN}\|$	**p-value**
Elizabeth MW	11	38	.0089	.3590
Gibson MW	15	51	.2352	.3706
Pete Klunk MW	22	103	.3757	.3450
Gibson+Pete Klunk MW	37	154	.5448	.3090
Elizabeth LW	7	30	*<1.0*	-
Schild LW	11	44	.6770	.9160
Koster LW	7	48	*<1.0*	-
Helton LW	15	45	*.7282*	.7040

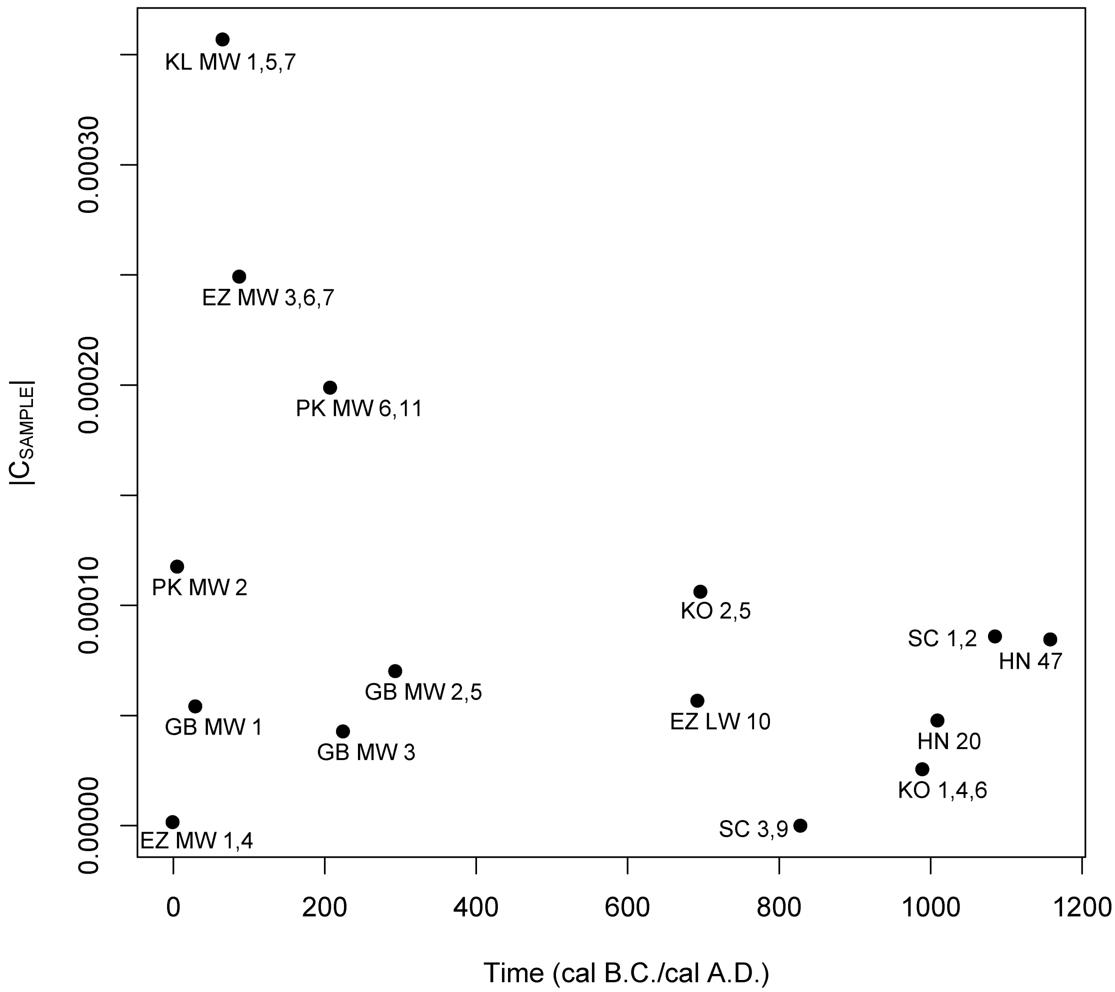
Sub-sample Analyses

Regional Variation. Site samples were decomposed into sub-samples based on time for all mounds with at least one radiocarbon date in order to analyze variability at a finer resolution (Table 9). Figure 18 illustrates determinants of sub-sample covariance matrices over time as measured by median of the calibrated probability curve (Table 9).

Table 9. Covariance Matrix Determinants |C| of sub-samples organized by median of the calibrated probability distribution.

Sample	Period	Time	|C|	PR	UN	$\|C_{PR}\|$	$\|C_{UN}\|$	♂	♀	$\|C_{♂}\|$	$\|C_{♀}\|$
EZ 1,4	MW	1 cal BC	0.0000016019	5	8	0.0000651042	0.0000000000	7	8	0.0000000000	0.0000000000
GB 1	MW	cal AD 29	0.0000541565	1	12	0.0000000000	0.0000673046	4	10	0.0000000000	0.0000548488
KL 2	MW	cal AD 5	0.0001175893	2	14	0.0000000000	0.0000971508	9	9	0.0000239620	0.0000000000
KL 1,5,7	MW	cal AD 65	0.0003568992	9	60	0.0001524706	0.0003761884	42	45	0.0004030458	0.0000731799
EZ 3,6,7	MW	cal AD 87	0.0002492418	6	30	0.0000000000	0.0002654290	15	22	0.0000699294	0.0002472031
KL 6,11	MW	cal AD 207	0.0001988238	14	38	0.0000727201	0.0001832409	23	37	0.0000776953	0.0002864282
GB 3	MW	cal AD 224	0.0000427849	2	15	0.0000000000	0.0000507000	7	11	0.0000182246	0.0000000000
GB 2,5	MW	cal AD 293	0.0000701447	12	25	0.0000186000	0.0000394961	21	18	0.0000000000	0.0000837331
EZ 10	LW	cal AD 692	0.0000567143	2	9	0.0000000000	0.0000614000	6	5	0.0000000000	0.0000000000
KO 2,5	LW	cal AD 696	0.0001061962	1	18	0.0000000000	0.0001099176	10	15	0.0000000000	0.0000566675
SC 3,9	LW	cal AD 828	0.0000000000	7	24	0.0000000000	0.0000000000	15	24	0.0000000000	0.0000000000
KO 1,4,6	LW	cal AD 989	0.0000256142	4	21	0.0000000000	0.0000357225	12	23	0.0000000000	0.0000155080
HN 20	LW	cal AD 1009	0.0000477514	6	18	0.0000000000	0.0000708000	20	14	0.0000000000	0.0001006711
SC 1,2	LW	cal AD 1085	0.0000859219	11	30	0.0000042976	0.0000347192	19	34	0.0000276150	0.0001195161
HN 47	LW	cal AD 1158	0.0000845468	8	14	0.0000029772	0.0000382923	12	11	0.0000064374	0.0000000000

Figure 18. Sub-sample covariance matrix determinants over time,



Visual assessment suggests the MW period samples as a whole are more variable than the LW period samples. Levene's test for equality of variances results (Table 10) suggest the spread of MW and LW variances are not equal ($F = 5.19$; $df = 1, 14$; $p = .0387$). That is, MW populations are generally more variable than LW populations. The Pete Klunk MW and Elizabeth MW samples appear to be particularly variable compared to the other MW samples. The MW outliers ($|C_{site}| > .0002$) account for the difference in results. These sites appear to cluster between approximately cal A.D. 65 and cal A.D. 210, however, temporal estimates are arranged by the median of the calibrated probability curve that do not take into account the duration of mortuary facility use or the full spread of the radiocarbon dates. It is tempting to suggest that the middle of the MW period saw an increase in variability, though this is not easily demonstrated at this point. What the results do show is that there is considerably more variation among those in these mounds than in similar MW samples. Variability is not, however, correlated with time (Table 11).

Table 10. Levene's Test of Equality of Variances results.

Comparison	F	df	p-value
$\|C_{MW}\| \sim \|C_{LW}\|$	8.50	1,13	.0120
$\|C_{MW♂}\| \sim \|C_{LW♂}\|$	3.74	1,13	.0753
$\|C_{MW♀}\| \sim \|C_{LW♀}\|$	2.94	1,13	.1103
$\|C_{MWPR}\| \sim \|C_{LWPR}\|$	12.14	1,12	.0045
$\|C_{MWUN}\| \sim \|C_{LWUN}\|$	9.36	1, 13	.0091
$\|C_{MWPR}\| \sim \|C_{MWUN}\|$	5.91	1,14	.0291
$\|C_{LWPR}\| \sim \|C_{LWUN}\|$	10.28	1,13	.0069
Proportion ♂ ~ Time	7.01	1, 13	.0201
Proportion ♀ ~ Time	<.01	1,13	.9919
Proportion Juvenile ~ Time	.28	1,13	.6075

Table 11. Spearman Rank Correlation Test results.

Comparison	S	r_s	p-value
$\|C_{sample}\| \sim$ Time	672.00	-.2000	.4738
$\|C_{♂}\| \sim$ Time	678.23	-.2111	.4501
$\|C_{♀}\| \sim$ Time	515.59	-.0783	.7788
$\|C_{PR}\| \sim$ Time	525.88	-.1558	.5949
$\|C_{UN}\| \sim$ Time	762.18	-.3610	.1861
Proportion ♂ ~ Time	376.93	.1483	.5979
Proportion ♀ ~ Time	282.00	.4965	.0623
Proportion Juvenile ~ Time	254.00	.5464	.0377
Proportion Juvenile ~ Proportion ♂	317.78	.4325	.1073
Proportion Juvenile ~ Proportion ♀	58	.8964	< .0001
Proportion ♂ ~ Proportion ♀	313	.4397	.1010

Male and Female Variation. MW and LW male determinant ratios are significantly different at the .10 level ($F = 3.74$, $df = 1, 13$; $p = .0753$) (Table 9). The difference in spread between the two archaeologically defined time periods

is obviously the effect of Pete Klunk Mounds 1, 5, and 7 (Figure 19). Several determinant ratios were calculated as zero, suggesting the absence of variance within the samples though inspection of traits indicates very low variability in traits will resolve to a determinant equal to zero. Small samples do not appear to be the cause of zero values. For example, Gibson 1 includes more than twice as many individuals and returned a positive determinant value (Table 9), leading to the conclusion that those samples where $|C| = 0$ are simply not particularly variable. This result is to be expected is males, on average, were not relocating following marriage, i.e. practicing virilocality. The detected difference between MW and LW groups reflects the aforementioned regional decrease in overall variability. Results are similar when MW and LW female are compared ($F = 2.94$; $df = 1, 13$; $p = .1103$) (Table 10). Highly variable female samples are Elizabeth 3,6,7, and Pete Klunk 6,11 (Figure 20). Sample-specific extremely low variability ($|C| = 0$) were detected in the analysis of females as well, though less frequently than among the male samples. Neither the male nor female sub-sample variances were correlated with time (Table 11).

Figure 19. Male sub-sample covariance matrix determinants over time

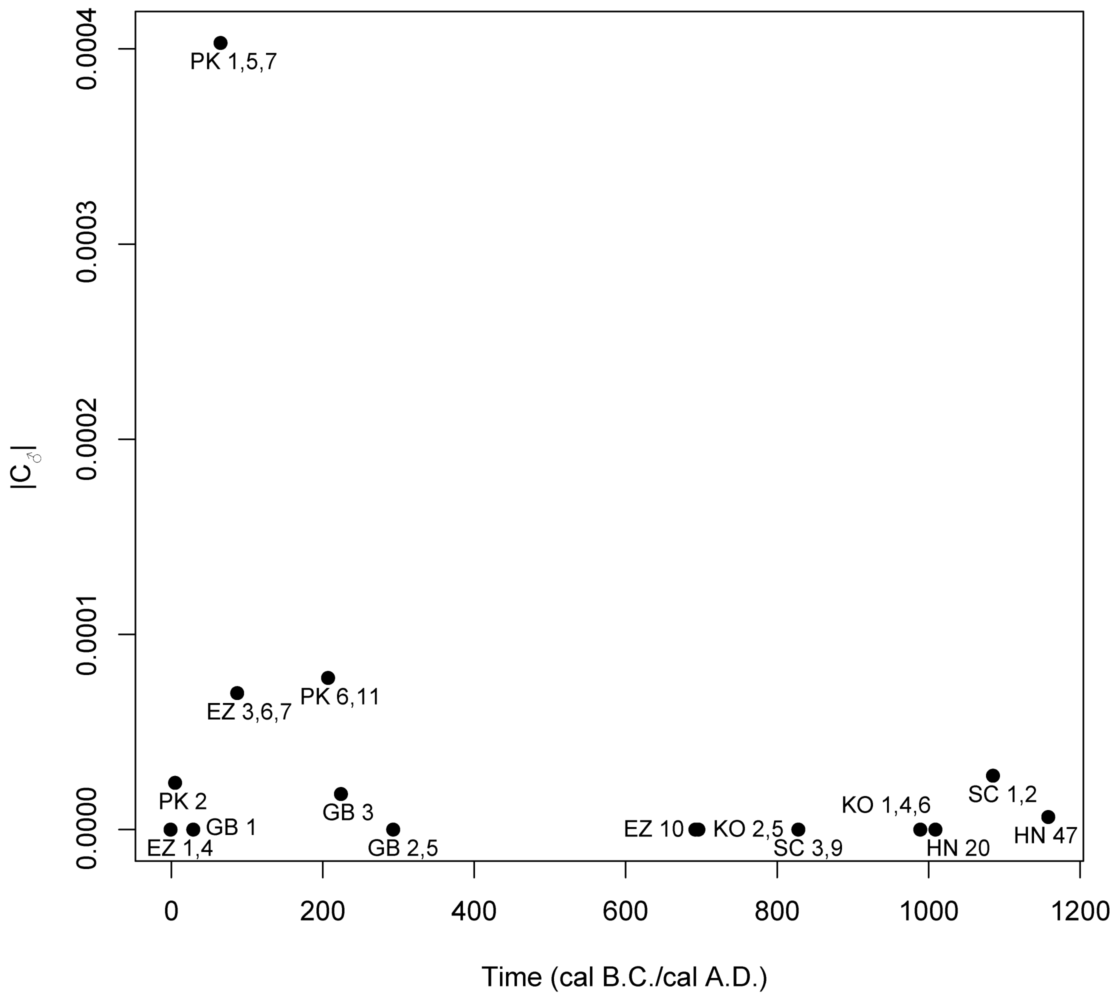
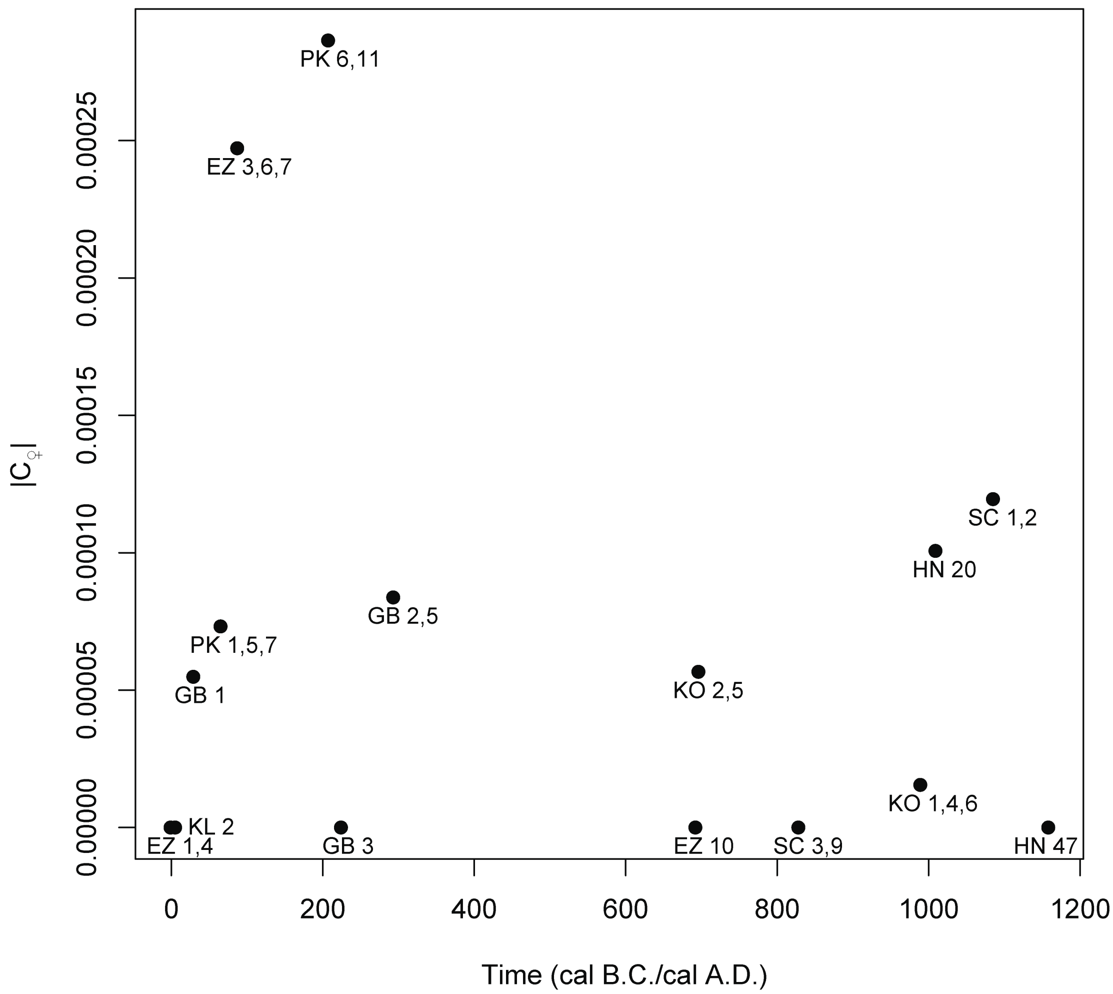


Figure 20. Female sub-sample covariance matrix determinants over time.



Processing Variation. Comparison of processed and unprocessed groups demonstrates decreased variation over time (Table 9, Figures 21, 22). There appears to be a wider range of variation at MW sites than at LW sites when either processed burial groups (F = 12.14, df = 1,12; p = .0045) or unprocessed burial groups (F = 9.36; df = 1, 3; p = .0091) by time period, further supporting reduced variability over time (Table 10). As with those tests, Pete Klunk and

Elizabeth samples near the middle MW are the most variable. Time and variation are not correlated (Table 11).

Figure 21. Processed burials covariance matrix determinants over time.

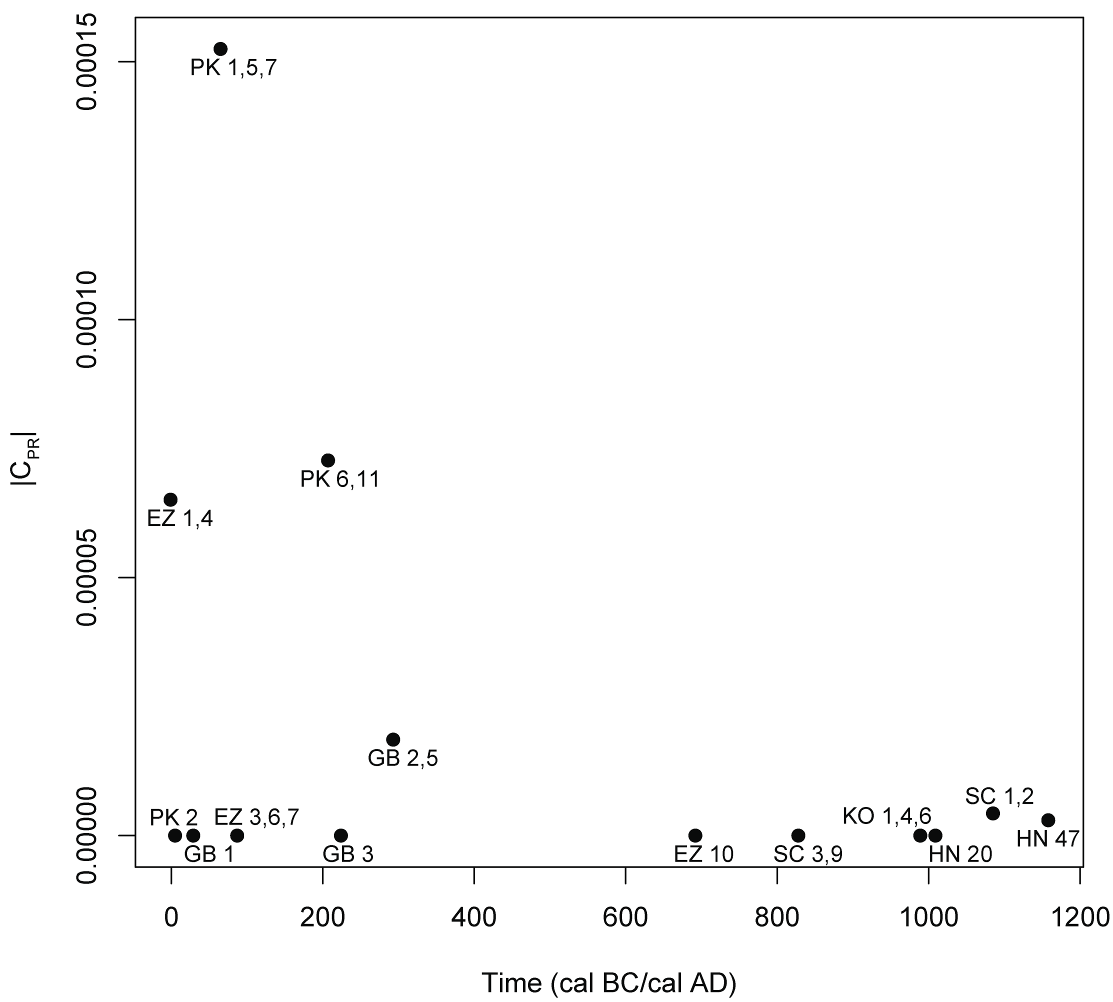
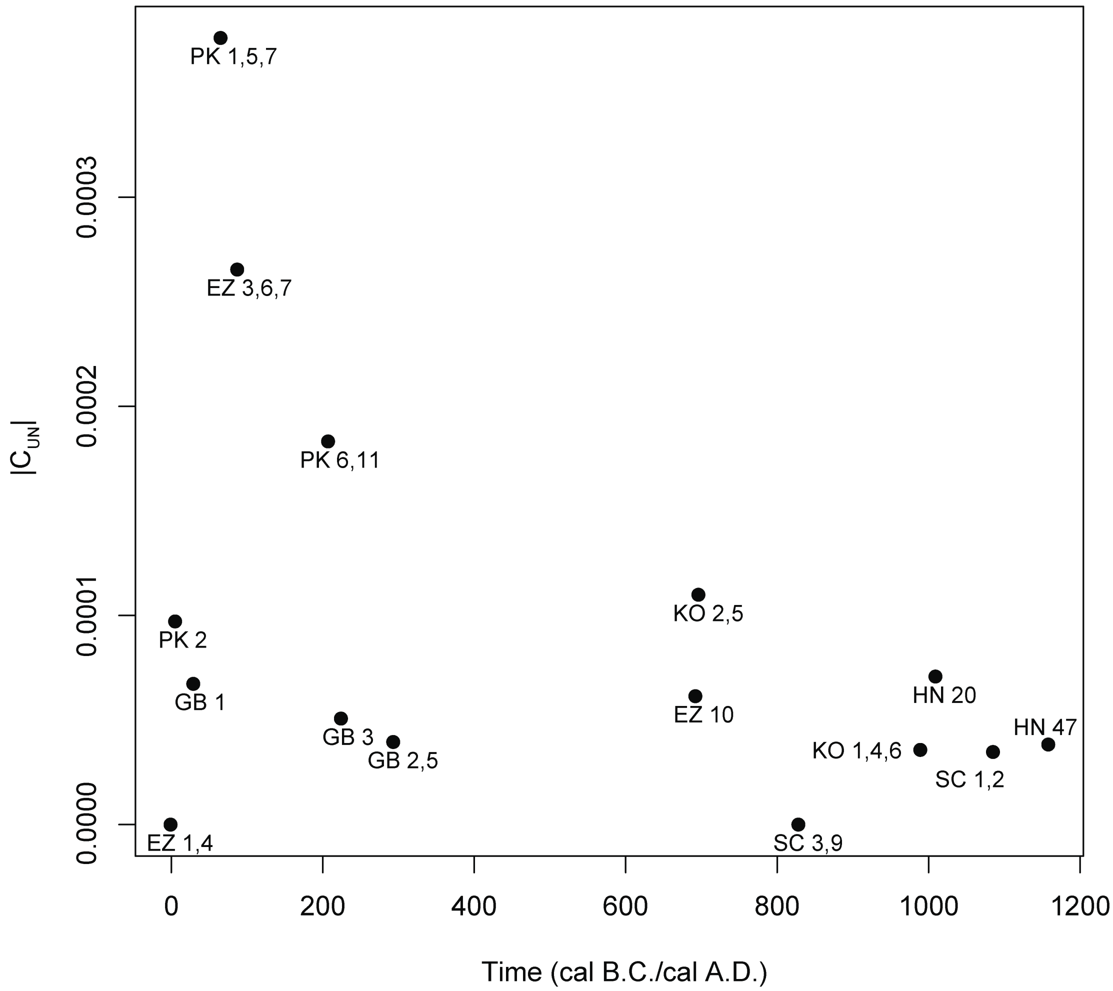


Figure 22. Unprocessed burials covariance matrix determinants over time.



Finally, both MW and LW processed burial groups are less variable than unprocessed burial groups, respectively (Table 10). MW_{PR} samples are less variable than MW_{UN} (F = 5.91; df = 1, 14; p = .029), as are LW_{PR} compared to LW_{UN} (F = 10.28; df = 1, 13; p =.0069). These results support the determinant ratio analysis reported above, in which processed groups were consistently less variable than unprocessed groups within sites. As noted in the M/F

comparisons, several covariance matrix determinants resolved to zero, suggesting little variation exists among these individuals; however, several of the processed burial groups have extremely low sample sizes. Small sample sizes are to be expected in this restricted track of the MW and LW mortuary programs, particularly once site samples are decomposed into smaller sub-samples.

Proportional Analyses

Proportions. The analyses reported above concern the adult funerary treatments and biological relationships. I chose to focus on adults based upon the assumption "adults" get married and juveniles generally reside (and die) in the communities their parents live in. The Chi-squared tests (above) suggest a shift away from sex-specific (presumably gender-specific) treatments *with regard to processing*. The Chi-squared results may therefore mean that either fewer males or more female are being included into the processed mortuary track. This change may include juveniles as well.

Figures 23-25 show the proportion of processed adult males, adult females, and juveniles compared to all members of their class of the sub-samples over time, respectively. Proportion of categories is simple measure of inclusiveness.

Figure 23. Proportions of male processed burials over time

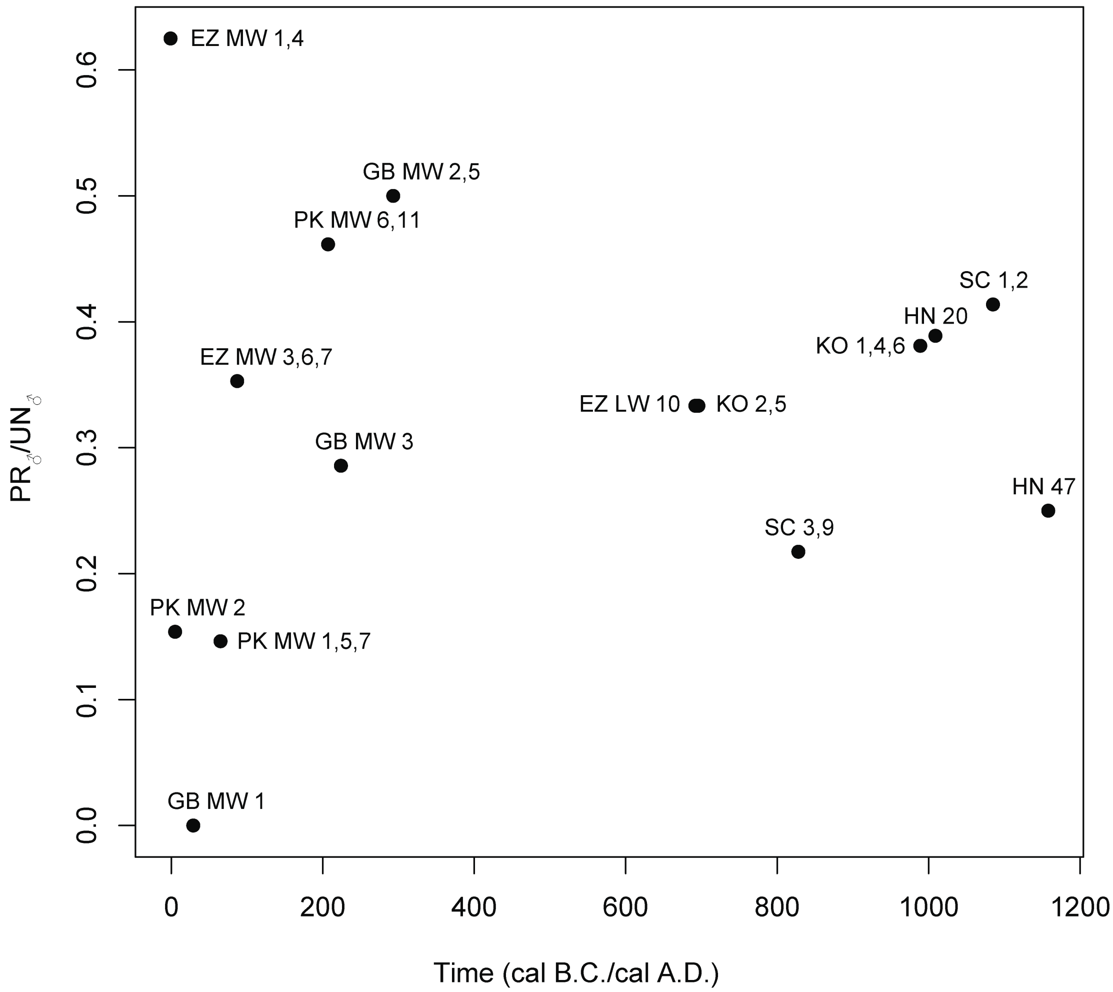
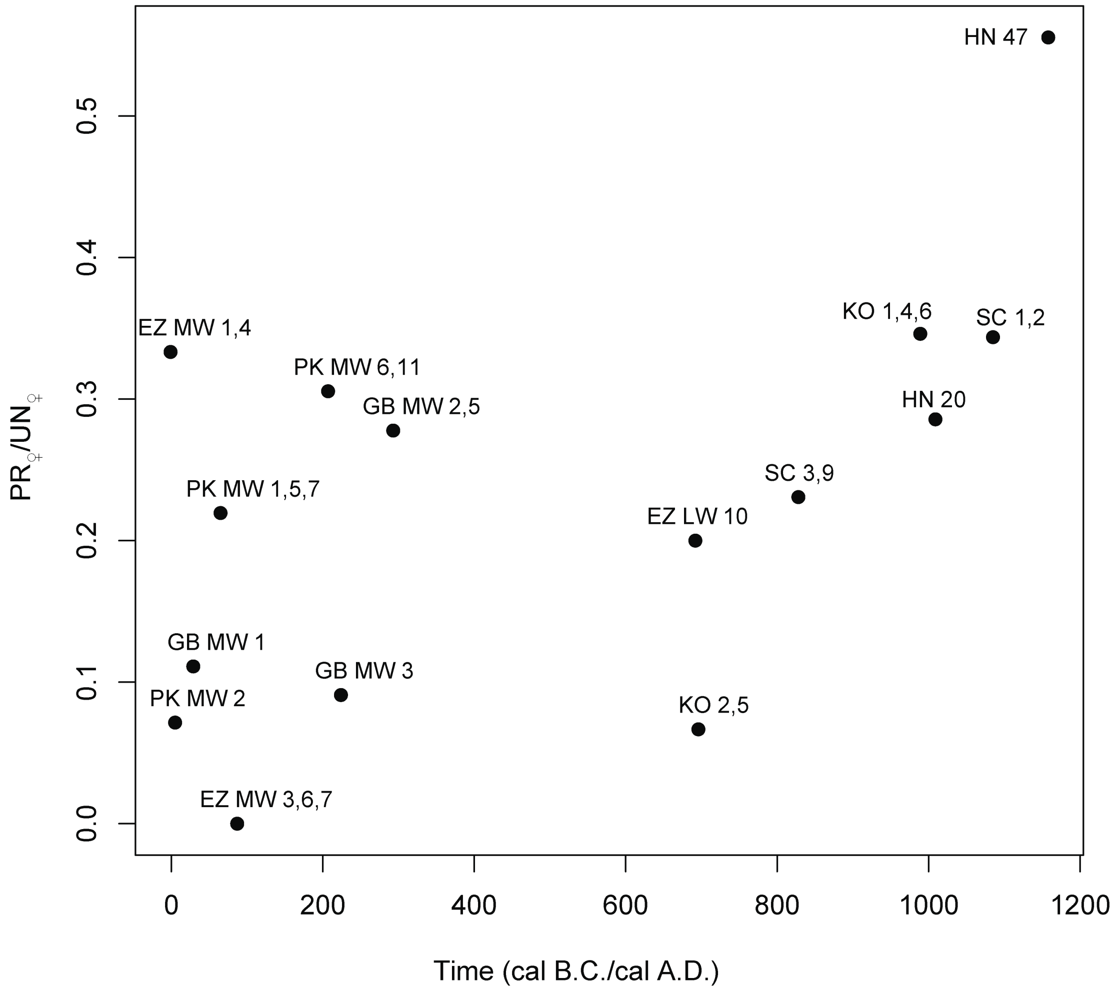


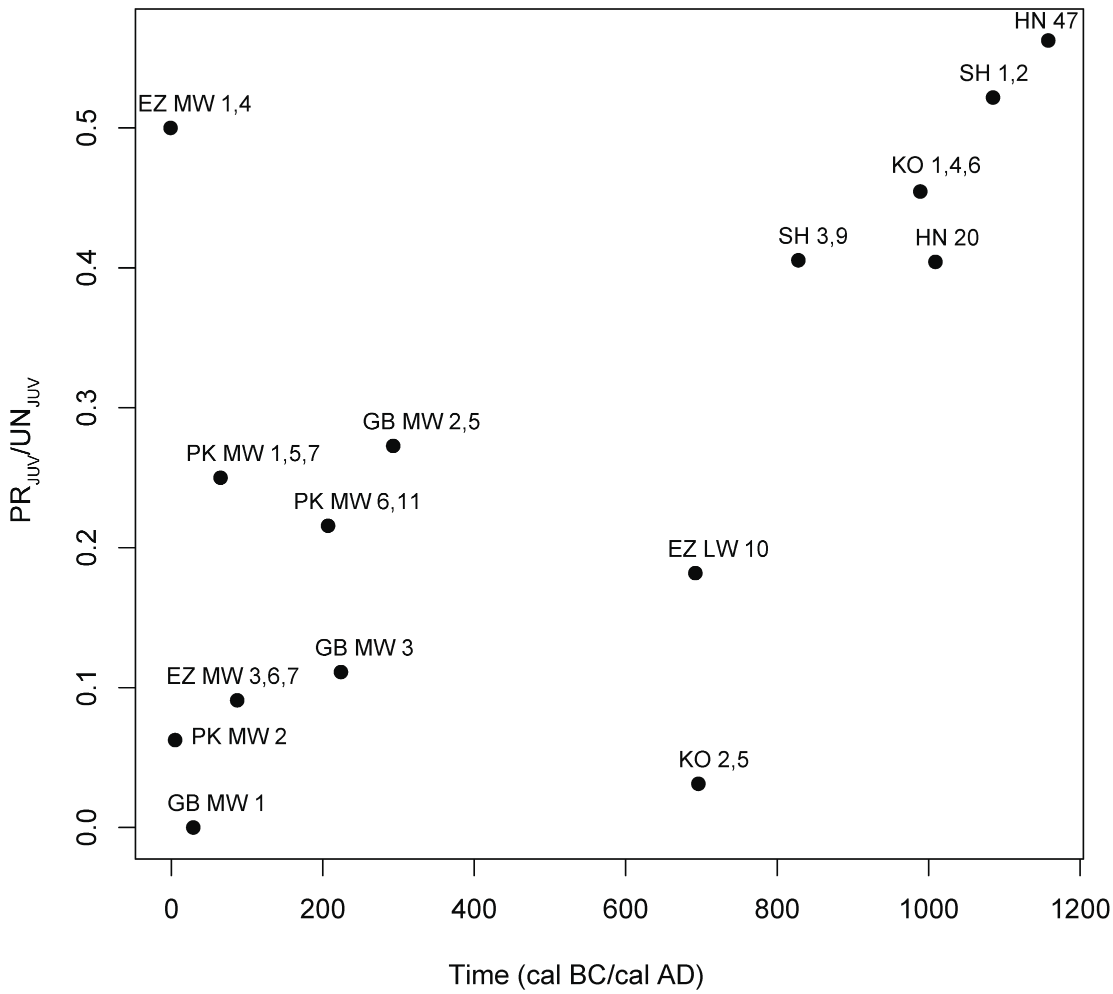
Figure 24 Proportions of female processed burials over time



Frequency of adult male inclusion in processing is not correlated with time (S = 476.93; r_s = .1483; p = .5978), however there is a visible difference in male inclusion during the MW and LW periods (Figure 23) suggesting greater variability during the MW than the LW period (F = 7.01; df =1, 13, p = .0201) (Tables 10 and 11). In contrast, the proportion of adult females included in the processed mortuary track is weakly correlated with time (S = 282, r_s = .4965, p =

.0623), though both the spread of proportions in MW and LW are not significantly different ($F = 0.00$; $df = 1, 13$; $p = .9919$). These results support the earlier analysis, which indicate increased inclusion of adult females into formerly male-dominated mortuary tracks.

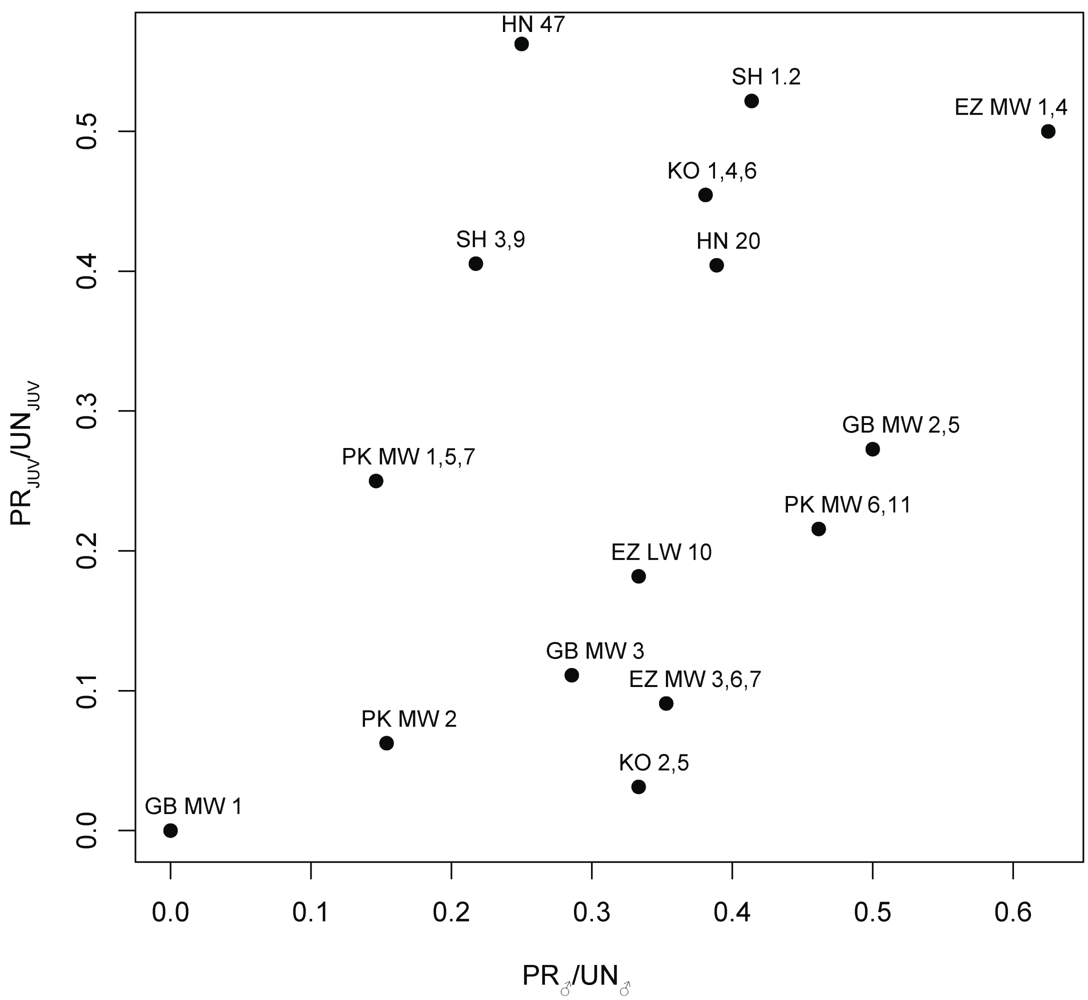
Figure 25. Proportions of juvenile processed burials over time.



Though not included in the biodistance analyses, the proportion of juvenile remains experiencing processing were also calculated and plotted over

time (Figure 25). Juvenile inclusion was positively correlated with time (S = 254; r_s =.5464; p = .0377), though variability was not significant different (F = .28; df = 1, 3; p = .6075) (Tables 10 and 11). This pattern is similar to that of adult females.

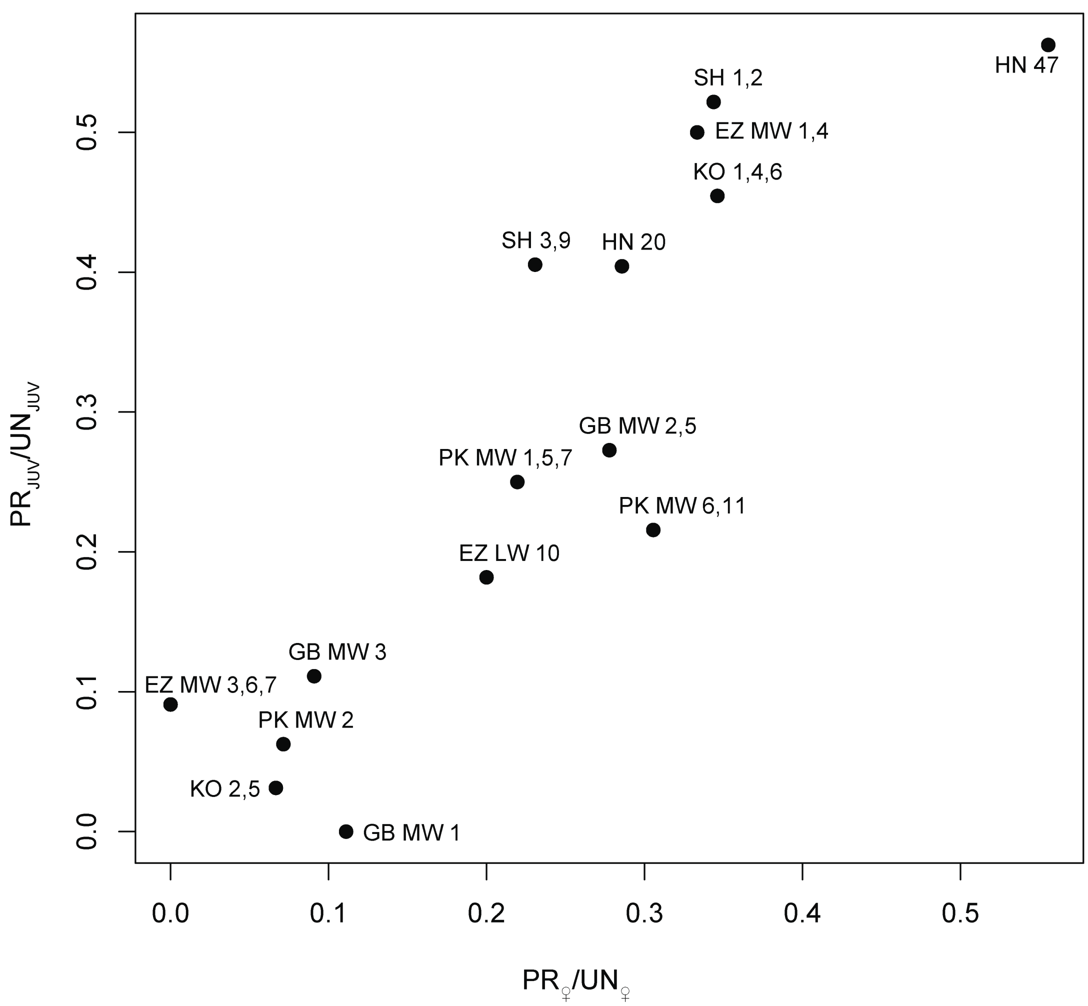
Figure 26. Proportion of processed juvenile burials over proportion of adult male burials.



No obvious pattern emerges when proportions of processed juveniles are plotted against the proportion of processed adult males (Figure 26), though the

two are perhaps weakly correlated (Table 10). However, when proportion of processed juveniles is plotted against proportion of adult females an obvious pattern *does* emerge; adult female and juvenile inclusion in processing mortuary tracks is strongly positively correlated (S = 58; r_s = .8964; p < .0001) (Figure 27, Table 11).

Figure 27. Proportion of processed juvenile burials over proportion of adult female burials.



The aforementioned positive correlation of time with both adult female and juvenile processing suggests that more female and juveniles were including in limited-access track burials during the LW. Additionally, inspection of Figure 27 shows that some MW samples show moderately highly inclusion rates, a well. Curiously, these are the same MW sites that were outliers in the biodistance analyses above: Pete Klunk MW 1,5,7, Pete Klunk MW 6,11, and Gibson MW 2,5. These results demonstrate that when *females* are more likely to be processed, juveniles are as well.

Discussion

These results generally align with both the presented model and regional models of change, despite the occasional lack of statistical significance. Measures of biological variation suggest males are generally less variable within sites than females excepting Pete Klunk MW and Helton LW. The Pete Klunk MW case is conspicuous among MW samples; however, this difference may be related to relative demographic instability of the region during in-migration. In contrast, Helton LW is relatively late in the LW sequence and may indicate an early shift toward uxorilocality associated with the Mississippian period.

MW Males are more likely to receive extended treatments; however, treatment differences are not significant in later Late Woodland sites indicating increased inclusion of females into the hypothesized progenitor mortuary track.

Pete Klunk Middle Woodland is conspicuous among MW sites for having a male/female ratio greater than one and lacking sex-based treatment association.

Hypothesized progenitor groups are less variable than unprocessed groups at all sites, suggesting relatedness played a role in processed burial track choices across the Middle and Late Woodland periods. This pattern appears to be reasonably stable over time. Hypothesized ancestor-generative mortuary practices, however, did change. At MW sites, males tended to receive ancestor funerary treatments. During the LW period, and possibly earlier at cemeteries like Pete Klunk, processing was no longer associated with sex and more frequently included females.

Increased inclusion of females into ancestor-generative mortuary tracks does not appear to be directly associated with residency practices. Certainly, at Pete Klunk MW and Helton LW post-marital residency and female inclusion in the processing mortuary track coincide with apparent uxorilocality, though that is not the case for all other sites.

Temporal analysis of mortuary and biological data supports the aggregate site results. During the study period, there was a trend toward increased female inclusion in processed mortuary tracks concomitant. In addition, juvenile funerary treatment appears to have changed along a trajectory similar to that of adult females. At the same time, the range of biological variance decreased, which was likely the result of both less frequent migration into the lower valley and stabilization of regional marriage networks within it, consistent with expectations a process of demographic stabilization and

increased community integration (Braun 1977, 1985, 1986, 1987; Braun and Plog 1982; Charles 1992, 1995).

It was previously noted that the Middle Woodland component of the Pete Klunk mound group was dissimilar to other Middle Woodland cemeteries, both in terms of male-to-female biological variation and inclusion of females in extended mortuary processing. Pete Klunk was also an outlier in the temporal analyses presented here, and it contributed disproportionately to the broad range of Middle Woodland variances. This pattern may be the result of social processes tied to migration into the valley during the Middle Woodland period. Both Pete Klunk and Gibson overlook Kampsville Hollow and probably represent a single community's cemetery usage over time. Radiocarbon dates suggest activity first occurred primarily at Pete Klunk. The earliest Pete Klunk MW mound (Mound 2) is considerably more complex than the earliest Gibson tumulus (Mound 1), and a significant hiatus appears to have occurred at Gibson between mound 1 and the next more recent mound (King et al. 2011; Perino 1968, 2006). The subsequent Gibson pattern more closely reflects the expected Middle Woodland burial program. Considered together, these two groups likely mirror processes occurring at other communities and cemeteries within the region during settlement of the valley: variability in biological relatedness and mortuary treatment during the initial settlement, and subsequent decrease in variation as social relations and the forums for negotiating them become less flexible. This pattern emphasizes the ideological character of mortuary activity

and its relationship to social life. Pete Klunk MW's status as an outlier may also suggest that MW social practices were simply not uniform across the valley.

Processed mortuary treatments served as ancestor-generative mortuary rituals, enacted by non-mobile, politically influential lineages within Woodland communities to materialize their dead as ancestors. Despite changes in access to specific mortuary treatments over time, the amount of biological variation within ancestor-generative mortuary tracks remained relatively low. These results indicate that relatedness was an important factor defining who was ritually created as an ancestor, as well as relative stability in the rules determining access to ancestorhood over time. Females included in the ancestor mortuary track may have been buried among their natal kin, suggesting that some adult females did not depart their communities upon marriage. If so, this would reflect the ability of influential lineages to engage in differential residency practices than others in the community. Thus, displays of lineage power and influence may have shifted from MW 'Hopewellian' ostentation toward lineages exerting themselves via marriage networks. As ideological statements, these rituals allowed the living a forum reaffirming their centrality to community life, while minimizing the place of others. It should be noted, however, that ideology can both emphasize and mask. Therefore, lineage aggrandizement may have been highly visible in mortuary rituals but with little impact on daily life.

Relatedness and residency in one's natal kin-community were apparently important components of ancestorhood. Lineages likely employed multiple

meaningful social acts that reaffirmed their central place within the social order. Statements and actions asserting and reifying their centrality to community life, such a funerary rites, constituted ideological acts legitimatizing social difference. These statements visibly materialized ancestorhood in contrast to those that received less protracted burial treatments.

Not all Middle or Late Woodland individuals were constructed as ancestors upon death. In a genetic sense, individuals within communities were all related over time in that they contribute to subsequent generations. Neither genetic contributions to the next generation nor living within a community, however, necessarily provided non-natal individuals kin-status or a path to ancestorhood. Ancestor-generative rites reified some segments as the proper socio-political core of communities and limited the potential for social action for others. As such, relatedness and ritual were engaged ideologically in socially reproductive processes.

Understanding the production of ideology is essential to explaining the development of social inequality. The contexts through which ideology emerges in relatively non-stratified societies is not well understood. Relatedness between the living and dead, materialized as ancestorhood, can be a potent symbol for universalizing and legitimizing sectional interests and the status quo within communities as essential, natural and timeless. This process of materialization should not be understood as a simple reflection of the social order, but rather as both statements of what that order should be and its active production as such.

This study builds upon previous analyses and interpretation in several ways. These results reaffirm the importance of the two-track MW mortuary program and its relationship to kin groups, or lineages, within MW communities (Brown 1979, 1981; Buikstra 1976; Charles 1992, 1995). Importantly, the model and analysis identify kin relations as important social relations during the LW period, demonstrating continuity despite differences in material records. In contrast to previous work (Tainter 1975, 1977, 1978), this model repositions group membership at the center of past social organization and mortuary practices rather than individual status. Individualizing treatment(s) may certainly exist and be detected archaeologically; however, there the uncritical emphasis on individual status is likely unwarranted for communal societies and may be more reflective modern individualist ideologies than those of the past (Brown 1995:5).

The biodistance results support earlier investigations of post-marital residency (Droessler 1981; Konigsberg 1988) and analysis of regional variation (Conner 1984, 1990). Most MW and LW communities practiced some form of virilocality, with exceptions. These exceptions, as noted above, suggest spatial and temporal variation that requires further exploration.

This study also supports a view of MW to LW change that posits continuity (Braun 1977, 1985; Braun and Plog 1982, Buikstra 1981; Buikstra and Charles 1999; Charles 1992, 1995, Charles et al. 2004; Kerber 1986) rather than collapse (Tainter 1975, 1977, 1978). MW variation, both biological and mortuary, is anchored in community migration and settlement of the valley and the

establishment of inter-group relations in a new landscape (Buikstra and Charles 1999, Charles 1995). Decreasing biological variation over time and continuity in ancestor-generative treatments and ideology suggest increasing stability and integration of LIV communities through both periods as marriage networks stabilize and social practices indicated by "Hopewellian" artifacts become less efficacious. The fact that ancestor-generative mortuary treatments continue across the MW and LW periods suggest processing and burial of the dead in the LIV were not so much "Hopewellian" as they were LIV Woodland. These practices continue while the form of cemeteries and material inclusions change (Buikstra and Charles 1999, Kerber 1986).

Finally, the importance of ancestor-generative mortuary practices builds upon Buikstra and Charles' (1999, Buikstra and Charles 1983, Charles and Buikstra 2002) work that places MW mounds in a deep-history of ancestor-centric monumentalism in the lower valley. Their work and the work presented reflect two complimentary scales of Woodland social relations and practice. The built landscape of MW and LW peoples placed their ancestors in prominent spaces visible to anyone in a form of inter-community ancestor-ideological practice; it was primarily organized away from individual communities toward others. Within-site ancestor-generative mortuary practices, like those analyzed and reported here, are directed toward those living in the community, differentiating living members through example via the dead. Thus, ancestor-generative practices take different forms depending on the intended audience.

More research is needed to confirm the ideas presented here. The temporal organization of MW and LW sites is still poorly understood. In addition, the nature of intra-community organization in MW and LW sites is unknown, as is the effect(s) of community size. It is clear that not all MW and LW villages were uniform in size, which may have had an effect upon the forms of mortuary practices and relationship(s) to other communities, including trade and marriage networks. Do MW and LW habitation sites have evidence for internal lineage structure? Does ceramic variation correlate to kin-structured MW and LW societies; and if so, how? These remain unanswered questions, but should be investigated. Understanding the degree to which MW and LW mortuary practices truly obscured or enhanced dialectical social relations requires further investigation of contexts that may be less ideologically encumbered than the grave.

The model and interpretation presented here are not intended to assert that kin-based social relations and ideology are the *only* dimensions of social relations manifesting in MW and LW mortuary practices. Gender, social age, health status, and a host of other factors were undoubtedly intertwined in MW and LW social relations. The totality of Woodland period society was as complex as any other, and these factors deserve attention, too. It is my view, however, that kinship was the determinant dialectical social relation through which other relations were conditioned. This can be seen in the continuity of ancestor-generative mortuary practices for individuals living in their natal communities despite temporal and regional differences in post-marital residency. Locality,

natality, and kin-status comprised a kind of relation within the community that could only manifest in dialectical contradiction to non-local, non-natal, and non-kin. It is therefore important to understand other factors with regard to kinship and the interactions, antagonistic or otherwise, that might exist.

Chapter 5

The Temporality of Community Dynamics: Mortuary and Biological Variability at the Pete Klunk (11C4) and Gibson (11C5) Sites, Calhoun County, Illinois

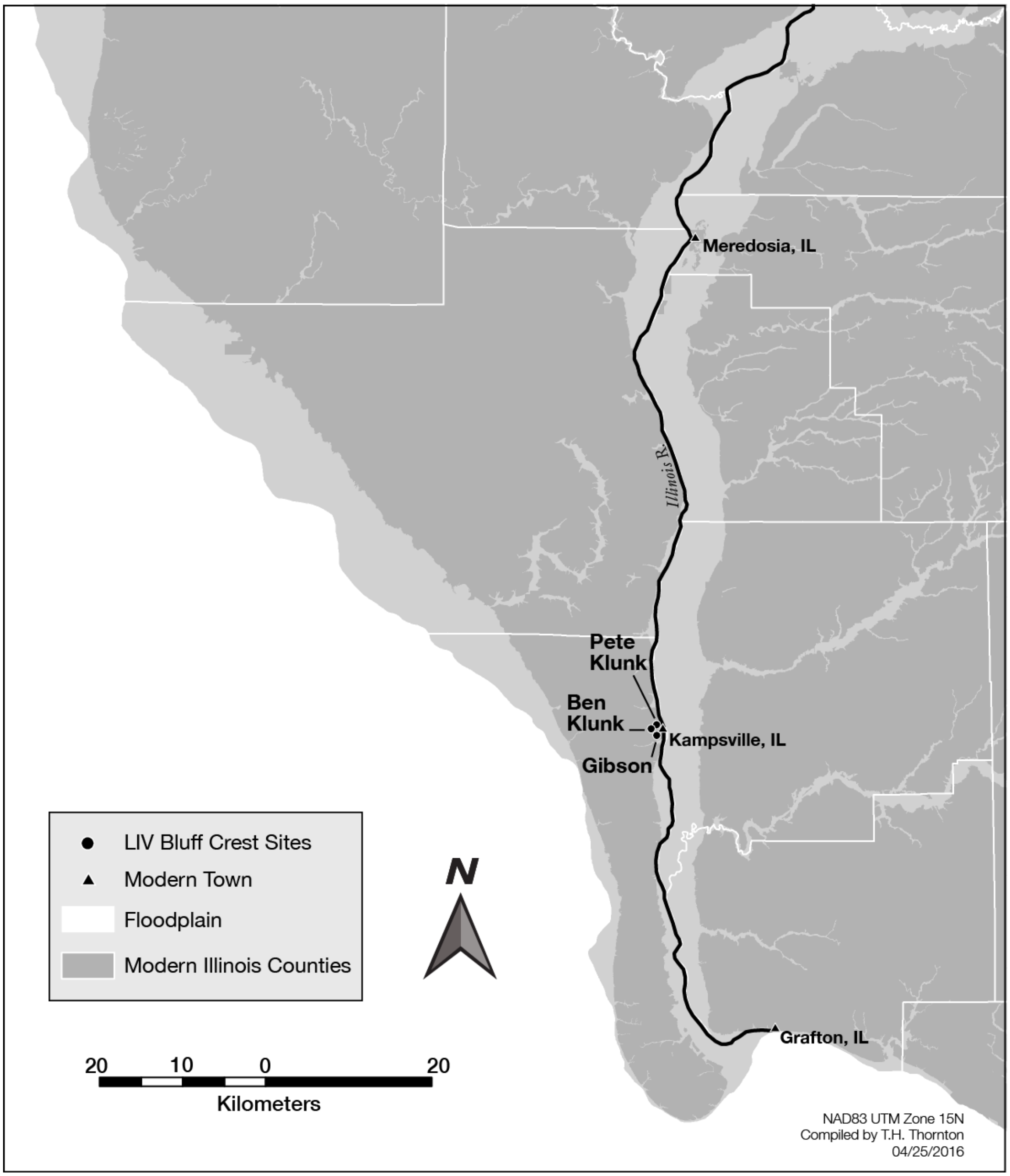
The Pete Klunk (11C4), Gibson (11C5), and Ben Klunk (11C43) mound sites comprise the Kampsville Mound Group (Figure 1). The sites are located on the bluffs above Kampsville Hollow and the Village of Kampsville, Calhoun County, IL. Pete Klunk, largest of the three groups, includes 14 mounds. Gibson includes seven tumuli and three knolls used for disposal of the dead. Both sites include Archaic, Middle Woodland, and Late Woodland components, though the Middle Woodland/Havana-Hopewell component dominates both and has garnered the most scholarly attention (Braun 1979, 1981; Brown 1979, 1981; Buikstra 1976, 1977, 1981, 1988; Cook 2006; Kerber 1986; Perino 1968; Gregory H. Perino 2006; Tainter 1975a, 1975b, 1977, 1978, 1980, 1981). The five mounds of the Ben Klunk site remain unexplored.

Despite the sites' importance in Illinois and Middle Woodland/Hopewell archaeology, temporal control beyond coarse-resolution placement into general archaeologically-defined time periods has not been achieved. Until recently, the only absolute dates from the sites were three assays generated during the initial phase of the radiometric era of American archaeology (Crane and Griffin 1963, 1964, 1966; King et al. 2011). In the absence of absolute dates, temporal assignment of site components has otherwise relied on associated artifact

assemblages. The lack of temporal information about the sites, particularly their internal chronology, creates difficulties for detecting change within sites and the region. Without information to order site components, archaeologists are left to generate inter-mound comparisons that may not be meaningful or that obscure evidence for change. For example, recent analysis of five radiocarbon dates from the Gibson site raised important questions about the temporal structure of settlement of the valley during the Middle Woodland period and the internal sequence of the site (King et al. 2011). At the time of that article's publication, only a single date from Pete Klunk existed, leaving its relationship to Gibson unknown. Also unknown is the temporal trajectory of mortuary practices at two sites that have played a singular role in archaeological interpretations and debates concerning Middle Woodland society.

In this article, I report new radiocarbon dates from Pete Klunk and Gibson sites. These dates are used in a Bayesian analysis of Pete Klunk and Gibson internal chronology that results in a working temporal model for the sites. This chronology is then used to inform a recent analysis of mortuary practices and kinship at the sties in order to detect changes in the nature of funerary practices, biological relationships, and social change. The results of the analyses presented here indicate an important change in population structure occurred in the community responsible for building the two sites.

Figure 28. Lower Illinois Valley and Kampsville Mounds.



The Kampsville Mounds

Gregory Perino excavated the Pete Klunk (1960-1961) and Gibson (1969) mound groups. His field efforts were responsible for many of the mound sites excavated in the Lower Illinois Valley (Gregory Perino 2006; Perino 1968, 1973). Though Perino's field methods and record-keeping were lacked certain desirable details, he made several contributions regarding the structure and organization of Middle and Late Woodland mounds that continue to inform archaeologists' understanding of ancient tumuli (Buikstra and Charles 1999; Charles et al. 2004; Herrmann et al. 2014; McKinnon et al. 2016; see also Chapter 3) Among his important contributions was his recognition of the ramp-and-tomb complex that is an important structural feature of MW mounds, including those at Pete Klunk and Gibson (Perino 1968:13-16). Briefly, Perino recognized that centrally placed, often log-lined and roofed, crypts anchored mounds. Soil was mounded around these central crypts, or central features, to form ramps. In addition to recognizing this central structuring complex, Perino observed the organization of peripheral burials around the ramp-and-tomb complex and evidence of processing in central features at these mounds. In addition, Perino's fieldwork at MW and LW mounds differed from earlier investigations by attempting complete excavation of sites rather than just the large, artifact-rich tombs at mounds' centers. This approach resulted in large,

representative skeletal collections that would form the evidential basis for Illinois Valley bioarchaeological and mortuary studies beginning in the 1970s.

Since excavation, the Pete Klunk and Gibson sites have received considerable scholarly attention, and together they comprise a primary dataset that informs modern understandings of many dimensions Middle Woodland society in the Lower Illinois Valley. The full breadth of research engaging the Pete Klunk and Gibson datasets cannot be recounted here. Della Collins Cook (2006) has compiled a useful bibliography of biological and mortuary studies using these data, among others excavated by Perino, that includes research prior to the volume's publication. Studies noted include the full breadth of analyses now common in bioarchaeology and mortuary studies. I focus on research most relevant the analyses reported here: mortuary treatment and biological distance.

Jane Buikstra's (1976) influential analysis set the foundation for bioarchaeological investigation of prehistoric cemeteries in Illinois and abroad. Her study investigated demography, biological relationships, mortuary practices, and social organization at the site. Important for the analyses presented here, she recognized a two-track mortuary program in the MW component of the site. In one track, bodies were interred in a process that involved temporary emplacement and decomposition of the dead within processing facilities followed by reburial elsewhere in the mound's structure; this track was associated with the mounds' central feature. A second track involved direct inhumation of the dead at the mounds' peripheries. She found the more

complicated track was primarily associated with adult males. Adult females were more commonly interred in primary, peripheral burials. When adult females or juveniles were included in the extended treatment track, they were accompanied by adult males. Thus, the limited-access mortuary track appeared to based on male-centric relationships. James Brown (1979, 1981) and Douglas Charles (1992, 1995) have suggested that this dual track mortuary program involved differential treatment of senior and junior lineages within MW communities. In this model, migration and settlement of the Lower Illinois Valley by kin-groups resulted in some degree of social difference between early settlers and subsequent community members that manifested in differential mortuary treatments.

Joseph Tainter (1975a, 1977, 1978, 1980) included Pete Klunk and Gibson in his analysis of MW and LW society organization, arguing that mortuary practices, grave inclusions, and cemetery structure of these sites reflected a six-tiered social structure during the Middle Woodland period in contrast to a five-tier social structure during the subsequent Late Woodland period. Braun's (Braun 1977, 1979, 1981) critique of Tainter's interpretation would similarly hinge on the Pete Klunk and Gibson datasets. More recently, Andrew Martin (2005) provided an alternative interpretation of MW mortuary practices and moundbuilding that posited competing communities, or sub-sets of communities, constructed Pete Klunk and Gibson (and other sites) as ideological representations meant to resolve what he terms "Latourian controversies."

Pete Klunk and Gibson date has also been used to investigate the biological structure of MW peoples. Buikstra (1981) analyzed a dataset that included Pete Klunk and Gibson to demonstrate genetic continuity from the MW to LW periods. Lyle Konigsberg (1988) investigated adult male and female biological variability to detect post-marital residency practices, finding evidence of both virilocality and uxorilocality at the Pete Klunk and Gibson respectively. These sites were also included in Konigsberg and Buikstra's (1995) analysis of regional variation to detect boundaries to gene flow. Recently, Bolnick and Smith (2007) performed mitochondrial DNA analysis of Pete Klunk skeletons and detected marginal support uxorilocality and Brown's (19179, 1981) and Charles' (1992) lineage model of mortuary treatments.

More recently, I proposed a model of Woodland period mortuary practices that built upon the work of Buikstra (1976), Brown (1979, 1981), Charles (1992, 1995), and Konigsberg (1988) and argued that socially important kin groups (lineages) in MW and LW communities used extended processing to create their dead kin as ancestors (Chapter 4). This ancestor-generative mortuary practice was limited to those who were natal community members, excluded non-kin community members, and produced both the living social relations and the ideological justifications for it. Those receiving extended processing were expected to be more closely related to one another than those receiving primary inhumation. To test this model, a measure of biological variability was used to detect differences between burial groups. At Gibson, males were found to be less variable than females and more likely to receive

ancestor-generative treatments. At Pete Klunk, males were more variable than females and no associations were found between adult sex and mortuary treatment. Results from both sites indicated those receiving processed burials were closely related than those receiving primary inhumations. Results generally supported the model I presented, but like previous studies, my analyses relied on aggregate samples within sites by archaeologically-defined time periods. The analyses presented here investigate the relationships between mortuary practices and kinship based on new radiometric data.

Methods

Radiocarbon

Twenty radiocarbon assays from the Pete Klunk and Gibson sites were calibrated in OxCal 4.2 IntCal13 (Bronk Ramsey 2009; Reimer et al. 2013). OxCal employs a Bayesian approach to the calibration of radiometric data and chronologic modeling in which “calendar date information is expressed as the likelihood and the relative date information as the prior” (Bronk Ramsey 2009). Unlike other calibration and analysis programs, OxCal allows for the construction of models based on groupings of data to account for both calendar data and relative information on time from archaeological contexts in the form of likelihoods and priors, respectively, to calculate posterior probabilities for modeled events (Bronk Ramsey 1995; 2009). Modeling can be accomplished through the use of sequences and phases. Sequences structure order of

elements and phases include elements where fixed relationships are not assumed (Bronk Ramsey 2005:426). This use of phase should not be confused with phase as it is employed in other archaeological systems, such as the Midwestern Taxonomic Method or subsequent modifications.

Model consistency is evaluated using agreement indices (Bronk Ramsey 2005, 2009). OxCal generates agreement indices as measures of overall fit for models and data. The model agreement index, A_{model}, informs on a model's consisitency. Individual agreement indices (*A*) are used to identify samples that do not fit the model. By default, OxCal reports models or samples as poor fits if relevant indices are less than 60%.

Finally, OxCal allows combinations of dates either before or after calibration, i.e. combination of radiocarbon ages before calibration (R_Combine) and combination of calibration probability distributions (Combine). Both functions provide test statistics for Ward and Wilson's (1978) test and comparable agreement indices. For this analysis, assays from the same source were combined using R_Combine. Dates from difference samples were combined using Combine.

Mortuary Data

Burial descriptions were drawn from Perino's published reports, and in the case of Gibson, burial forms on file at the Center for American Archeology, Kampsville, IL. Burials were coded for the presence or absence of bundle reburial and extended processing. Bundle reburials are those remains that

showed evidence of wrapping and reburial of skeletonized remains subsequent to decomposition at another location. Typical bundle burials are found as clusters of disarticulated remains. Bundle reburial is a form of extended processing; the latter is more inclusive and includes any individuals who display evidence of intentional postmortem handing, including cremations. Processed burials burial within processing facilities, e.g. central tombs, processing pits. Individuals with no evidence of postmortem handling were coded as primary burials. Disturbed burials were excluded from the analysis. Associations were tested using chi-square. Fisher's Exact Method was used to generate p-values, as necessary. All mortuary statistical analyzes were performed in SAS 9.2. Significance was evaluated at the .10 level.

Biological Distance

Biological data were drawn from a database of LIV burials. Biological variability was measured using five non-metric cranial traits: asterionic bone present, supraorbital foramen present, mylohyoid bridge present, divided hypoglossal canal present, obelionic foramen present. Trait selections were made after removing all demographically correlated and intercorrelated traits (see King 2016, Konigberg 1988). Group variability was calculated as the determinant ratio of the group's covariance matrix |C|, which is a generalized variance (Green 1976). Relative variability between groups is shown using ratios of determinants. P-values were calculated using a randomization procedure of 1000 runs. Variability measures were calculated for adult males (M), adult

females (F), processed burials (PR), and unprocessed burials (UN). Group variances are compared in the form of a ratio. For example, $|C_M|/|C_F|$ measures relative M to F variances. Ratios greater than one indicate females are less variable than males. Values smaller than one indicate the converse. In some cases, small sample sizes resulted in a $|C| = 0$. In those cases, ratios are reported as either >1.0 or <1.0.

Results

There are 20 radiocarbon dates from the Kampsville Mounds, twelve of which are previously unreported (Table 12, Figure 29). All radiocarbon assays were performed on human bone except the three University of Michigan (M) dates, which were obtained from wood charcoal (Crane and Griffin 1963, 1964, 1966). Dates were calibrated in OxCal 4.2 IntCal13 (Bronk Ramsey 2013, Riemer 2013). Table 1 reports radiocarbon ages and unmodelled calendar dates. Both the 68.2% and 95.4% probability ranges are presented for each sample, as well as the median of the calibrated probability curve for each. The 68.2% and 95.4% probability distributions are comparable to the 1-sigma and 2-sigma ranges generated by the intercept method in Calib. The median of the calibrated probability distribution is a measure of central tendency that performs somewhat better than intercepts; however, it is not a wholly adequate substitute for probability distribution (Telford et al 2004). End dates of probability distributions may differ slightly from those presented in King et al. (2011: Tables

2,3) because this study uses newer calibration data (IntCal13). For the sake of clarity, published dates will only be discussed in terms of IntCal13 calibrated ranges. Unless otherwise specified, all ranges discussed below are 95.4% probability ranges.

Figure 29. Unmodelled calibrated Pete Klunk and Gibson radiocarbon dates.

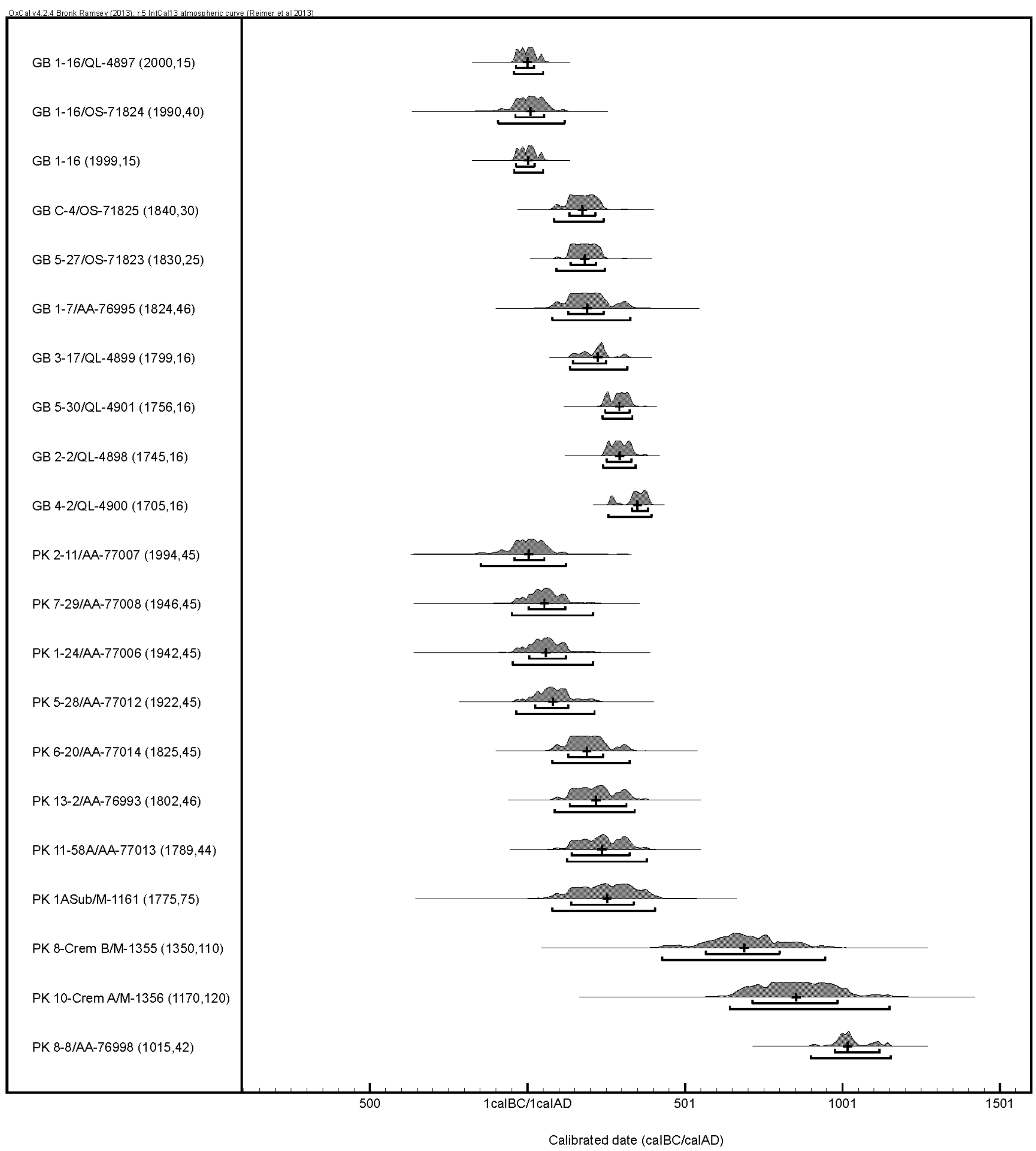


Table 12. Gibson and Pete Klunk radiocarbon data organized by radiocarbon age and site/component.

Site / Time Period	Sample[1]	Lab Sample[2]	Material	^{14}C Age±E	(Unmodelled cal BC/cal AD)[3] 68.2%		95.4%		Median	Source
Gibson MW	GB 1-16	QL-4897	bone	2000±15	-37	22	-43	51	1	(King et al. 2011)
	GB 1-16	OS-71824	bone	1990±40	-39	54	-94	118	10	
	GB 1-16 Combined			*1999±15*	*-37*	*23*	*-43*	*51*	*2*	
	GB C-4	OS-71825	bone	1840±30	133	216	86	242	175	
	GB 5-27	OS-71823	bone	1830±25	138	218	92	246	182	
	GB 1-7	AA-76995	bone	1824±46	130	242	80	327	191	
	GB 3-17	QL-4899	bone	1799±16	145	251	135	318	224	(King et al. 2011)
	GB 5-30	QL-4901	bone	1756±16	247	325	239	334	292	(King et al. 2011)
	GB 2-2	QL-4898	bone	1745±16	253	331	241	344	293	(King et al. 2011)
	GB 4-2	QL-4900	bone	1705±16	333	384	257	394	350	(King et al. 2011)
Pete Klunk MW	PK 2-11	AA-77007	bone	1994±45	-42	54	-149	122	5	
	PK 7-29	AA-77008	bone	1946±45	5	121	-50	208	54	
	PK 1-24	AA-77006	bone	1942±45	7	123	-48	209	59	
	PK 5-28	AA-77012	bone	1922±45	25	130	-37	214	82	
	PK 6-20	AA-77014	bone	1825±45	130	240	80	326	189	
	PK 13-2	AA-76993	bone	1802±46	135	315	87	341	218	
	PK 11-58A	AA-77013	bone	1789±44	141	325	126	379	237	
	PK 1A-Sub-mound	M-1161	wood charcoal	1775±75	140	338	80	406	253	(Crane and Griffin 1963)
Pete Klunk LW	PK 8-Crematory B	M-1355	wood charcoal	1350±110	566	801	429	946	688	(Crane and Griffin 1964)
	PK 10-Crematory A	M-1356	wood charcoal	1170±120	715	985	643	1150	854	(Crane and Griffin 1966)
	PK 8-8	AA-76998	bone	1015±42	977	1118	900	1154	1017	

[1] Samples are reported as *Site Mound-Burial*
[2] Laboratories performing radiocarbon analyses: NSF-Arizona AMS Laboratory (AA), University of Michigan (M), National Ocean Sciences AMS Facility, Woods Hole Oceanographic Institution (OS), and Quaternary Isotope Laboratory (QL).
[2] Cal B.C. dates are given as negative values.

Gibson Middle Woodland Dates

The calibrated Gibson dates do not differ appreciably from results presented by King et al. (2011: Table 2), and the reader is referred to that publication for description of those dates. I focus here on the four unreported Gibson radiocarbon assays.

GB 1-16. King et al. (2011:611-612) reported five dates from Gibson. All fell within the traditional boundaries of the Middle Woodland period, though GB 1-16 (QL-4897) was earlier than expected given the site's mid-lower valley location and the generally north-to-south settlement model of the Lower Illinois Valley during the MW period (Charles 1985, 1992; Farnsworth and Asch 1986; King et al. 2011). The early GB 1-16 date indicated mortuary activity at that mound was contemporaneous with activity at the Elizabeth site (11PK512). A contemporaneous date (ISGS-1818) was also reported for the Gardens of Kampsville site located in Kampsville Hollow. Following publication of that study, a second sample from GB 1-16 was dated, returning a similar radiocarbon age (OS-71824, 1990±40 BP, 94 cal BC-cal AD 118). OS-71824 is not significantly different from QL-4897 (T = 0.1; df = 1; p = .7518), reaffirming our earlier results. The averaged date of the two is 1999±15 BP, which calibrates to 43 cal BC-cal AD 41. All discussion of GB 1-16 will refer to the combined date.

GB 1-7. Gibson 1 Burial 7 was sampled as a comparison to the early GB 1-16 dates. While GB 1-16 was an individual interred in the secondary tomb of GB 2, Burial 17 was located at the periphery of the mound on the original ground surface with Baehr jar (Perino 2006:409). The GB 1-7 (AA-76995) radiocarbon assay was considerably younger than the GB 1-16 assays: 1824±46 BP, cal AD 80-327. Neither radiocarbon ages nor calibrated probability distributions suggest contemporaneity, and the two are statistically significantly different (T = 10.21; df = 1; p = .0014; n = 2, A_{comb} = 2.2%; A_n = 50.0%). The 95.4% difference probability between the two burials is 57-326 years. GB 1-7 is buried at the north end of the mound near Burials 3-6, 8 and 12. It is possible that all of these burials were added to the mound at a later date. Long intervals between burials in specific mounds may complicate analyses and interpretations that assume individuals interred in mounds were approximately contemporaneous or at minimum representative relatively uninterrupted use of mortuary facilities. GB 1-7, however, maybe indicate that communities revisited seemingly "completed" mounds to renew activity.

GB C-4. Perino (2006:445-450) reports three "knolls" at the Gibson site that appeared to be human modified and contained burials. Knoll C was located between GB 3 and GB 4, and contained eight burials arranged in a circle. Perino and excavators found no evidence of a central feature. Burial 4 was an extended, adult male buried in a subfloor gave (Perino 2006:450). GB C-4 (OS-71825) dates to cal AD 86-242 (1840±30 BP).

GB 5-27. Perino (2006:436) reported two graves (GB 5-27, GB 5-30) that were used as processing pits below Gibson 5. Both pits were excavated into the natural knoll before moundbuilding occurred and were associated with additional burials excavated into the original surface. The soil in and around GB 5-27 and GB 5-30 was loose, mixed and contained small bones, presumably from bodies processed in the pits. GB 5-27 and GB 5-30 were placed in the two pits and left in place, marking the end of the pits' use as processing facilities. GB 5-27 was a partially articulated, "rearranged skeleton of an adult" (Perino 2006:443-444;Figure 11.41). GB 5-30 was an adult male buried with galena, mica, portions of a turtle carapace, *Anculosa* shell beads, and elk teeth. GB 5-30 (QL-4901) dated 1756±16 BP, cal AD 239-334 (King et al. 2011). GB 5-27 (OS-71823) returned the date 1830±25 BP, cal AD 92-246. As can be seen in Figure 2, the unmodelled probability distributions suggest a small probability of contemporaneity. The two dates are statistically significantly different (T = 4.78; df = 1; p = .0287; n = 2; A_{comb} = 34.5%; A_n = 50.0%). The 95.4% difference probability for the two dates is 14-195 years.

Pete Klunk Middle Woodland Dates

PK 2-11. The earliest PK date is from PK 2 Burial 11 (AA-77007). Mound 2 was a "classic" Middle Woodland mound; it included two ramp-and-tomb complexes and peripheral burials. Tomb B was built first and encircled by burials in the ramp and at the ramp's peripheries. Tomb A was later built on top of the capped Tomb B. Peripheral burials were also associated with Tomb A.

Burial 11 was a disarticulated adult male in the Tomb B along with a disarticulated young adult; worked turtle carapace and two cubes of galena were also found in the tomb (Perino 1968:42). PK 2-11 should antedate Tomb A and its associated burials and postdate burials peripheral to Tomb B. PK 2-11 dates 1994±45 BP, 149 cal BC-cal AD 122. This result supports the early dates from GB 1-16. The PK 2-11 and GB 1-16 samples are not statistically significantly different ($T = 0$; $df = 1$; $p = 1$; $A_{comb} = 121.5\%$; $A_n = 50\%$).

PK 7-29. Mound 7 was a MW tumulus built over a Late Archaic cemetery (Perino 1968:67-84). Perino (2006:67-84) also reports a LW component to the mound. MW graves intruded into the underlying Late Archaic cemetery. Burial 29 was an adult female buried in the side of the mound and associated with bone awls, a shell spoon, lamellar blades, a plain limestone-tempered bowl, and a bird-motif Hopewell vessel (Perino 1968:87). The radiocarbon age for PK 7-29 is 1946±45 BP, 50 cal BC-cal AD 208. It is not significantly different than PK 2-11 ($T = .53$; $df = 1$; $p = .4649$; $n=2$, $A_{comb} = 112.5\%$; $A_n = 50.0\%$).

PK 1B-24. Pete Klunk 1 was the largest and most complex mound at the site. The tumulus was composed of three distinct ramp-and-tomb complexes (Perino 1968:18; Figure 5). Mounds A and B each included ramp-and-tomb structures and peripheral burials. Perino (1968:36-37) reports that after PK 1A and PK 1B were complete, MW peoples excavated into the two mounds and built an earthen platform that joined the two. A third tomb (PK 1C) was built on this platform. PK 1B-24 is one of three skeletons interred in Tomb B; an extended, adult female dated 1942±45 BP, 48 cal BC-cal AD 209. The

difference between PK 1B-24 and PK 7-29's radiocarbon ages is four years, and the calibrated ranges for the two samples are almost identical (Table 12). Clearly, funerary activity was occurring at both mounds simultaneously.

The PK 1A-Sub-mound is date derived from charcoal beneath PK 1 Primary Mound A. Crane and Griffin (1963:233) describe the sample as charred wood from a stump on the original ground surface below the primary mound. Presumably the tree, or stump, was burned during preparations for moundbuilding. As Crane and Griffin (1963:233) state, "[t]he date should be earlier than thee construction of the mound." The sample was analyzed at the University of Michigan Laboratory. As David Asch has shown, there appear to be systematic errors associated with the Michigan dates (Asch 1990; King et al. 2011). PK1A-Sub-mound (M-1161) dates 1775±75 BP, cal AD 80-406. Despite its relatively large error, M-1161 is in poor agreement with PK 1B-24 (T = 3.45, df = 1; p = .0630; n = 2; A_{comb} = 52.6%; A_n = 50.0%). It is possible that PK 1A-Sub-mound and PK 1A are substantially later than PK 1B, however the poor resolution and known problems with the date suggest cautious interpretation.

PK 5-28. Mound 5 was another MW ramp-and-tomb structure with peripheral burials and intrusive LW interments. Burial 28 was one of three females (Burials 29, 30) in a log-covered grave (Perino 1968:57). Perino reports "[t]he bodies seem to have been dumped into the grave and not arranged in an orderly fashion" (1968:57). One of the skeletons was placed face-down, though it's not clear from his description or figures which of the three it was. PK 5-28 dates 1922±45, 37 cal BC-cal AD 214. PK 7-29, PK 1-24, and PK 5-28 are not

significantly different (T = .17; df = 2; p = .9162; n=3; A_{comb} = 143.5%; A_n = 40.8%).

PK 6-20. Pete Klunk 6 included two large tombs, like several other PK mounds. Burial 20 was an adult peripheral burial in the original ground surface near a cluster of of burials on the north side of the mound. It dated 1825±35 BP, cal AD 80-326.

PK 13-2. Mound 13 was a relatively small mound with MW and LW components. The mound consisted of a large tomb that included two individuals: an adult male and an adult female. The individuals were interred with a substantial amount of artifacts. Burial 2 (adult female) wore limestone-tempered clay earspools. The adult male wore two pairs of large bear canines and conch-shell disc beads, a copper panpipe with over 200 shell beads, pearls and beads around his ankles, and copper earspool in each hand (Perino 1968:112). After the tomb was covered with logs, "black sand and grave…obtained from the village site at the foot of the bluff" was used deposited over it. The soil contained MW pottery sherds. A final MW capping layer of soil was built over the tomb, followed by a LW addition over it. The radiocarbon age for Burial 2 is 1802±46 BP, cal AD 87-341.

PK 11-58A. Mound 11 a multi-tomb structure (Tombs A and B) that included over 100 interments (Perino 1968:94-95; Figure 43). Burial 56A was an adult male located in Tomb B, the second tomb in the mound. Burial 58A is the latest MW date from the site: 1775±75 BP, cal AD 126-378.

Models

The new dates discussed above are consistent with the findings presented by King and colleagues (2011). The date from PK 2 confirms early Lower Illinois River valley (LIV) occupation at Kampsville Hollow, or at least mortuary activity at the bluffs above it. Unlike the Gibson case, there does not appear to be an obvious hiatus in moundbuilding and burials at Pete Klunk. Similarly, funerary activity appears to have occurred at several mounds simultaneously at both Pete Klunk and Gibson (King et al. 2011). Importantly, the dates suggest simultaneous use of both sites. To further explore this possibility, dates from both sites were modeled together.

Modeling all Pete Klunk and Gibson MW and LW dates as a single phase returns $A_{model} = 99.1$, which is above the $A_{model} = 60$ threshold. Individual dates appear to fit well. None of the agreement (*A)* values for individual dates are below 85.9 and convergent values (*C)* are larger than 95. Separating the MW and LW dates into two phases does not appreciably change the model ($A_{model} = 98.6$). Finally, a two-phase model that separates Gibson and Pete Klunk performs very poorly. OxCal did not compute agreement indices, and several individual sample agreement values are less 1.0, indicating a poor fit. It is clear from the results presented here and results presented in King et al. (2011) that there are detectable differences between dates. For example, the early dates at GB 1 and PK 2, or the LW dates associated with PK 8 and 10 are nonconvergent. These differences were used to partition the data into subsamples. The Michigan date from PK 1A was excluded from the analysis in

order to avoid the date having undue influence on the model based on more recent assays. Given the few dates available from the LW component of PK and the fact that neither range crosses outside of the accepted LW boundaries, they will be included in this analysis solely to avoid having LW represented by a single date. The problems associated with these dates will have no effect on the subsequent biodistance and mortuary analyses since the LW samples are not subdivided into finer temporal units.

The three-phase model separates the samples into approximately early MW (Phase A), MW (Phase B), and LW (Phase C) phases (Figure 30, Table 13). Agreement indices suggest a marginally better fit than the single-phase model (A_{model} = 104). Individual sample agreement indices (*A*) are all relative large except PK 4-2, where *A* = 73.7. Though *A* is above the cutoff, this low value suggests the date does not fit as well as others. Convergence *(C)* values are all larger than 99.

The five-phase model further separates the data (Figure 31, Table 14). In this model, Both Phases A and B are separated into two small units: Phases A1, A2, B1, B2. This model appears to be a considerable improvement over the previous models (A_{model} = 125.3). Unfortunately, partitioning the data in this manner results in phases that have few radiocarbon dates; Phases A1, A2, B2, and C all have three dates. The five-phase model makes intuitive sense, though it is best to consider both models hypotheses to be tested with additional dates rather than a final result. Both the three-phase and five-phase model will be used for the biodistance analyses below.

Figure 30. Kampsville Mounds three-phase model.

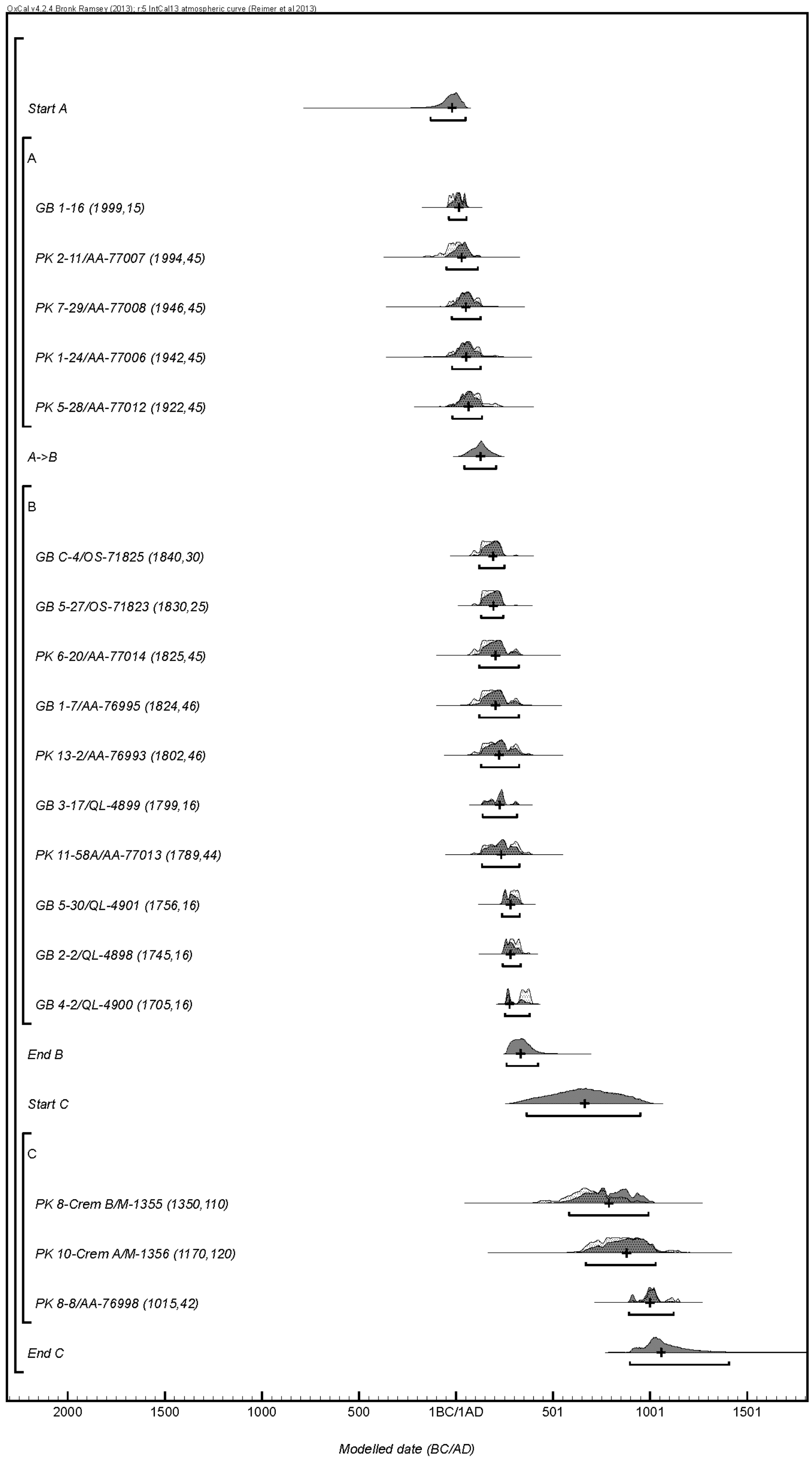


Table 13. Kampsville Mounds three-phase model.

Model Indices A_{model} 104.4 / $A_{overall}$ 105.4		**Unmodelled (BC/AD)**			**Modelled (BC/AD)**			**Indices**	
		95.4%		**median**	**95.4%**		**median**	**A**	**C**
	Start A				-132	51	-21		97
Phase A	GB 1-16	-43	51	2	-37	55	15	91.3	99.6
	PK 2-11	-149	122	5	-50	113	30	109.2	99.7
	PK 7-29	-50	208	54	-22	127	51	113.5	99.8
	PK 1-24	-48	209	59	-21	128	53	113.3	99.8
	PK 5-28	-37	214	82	-19	135	65	110.7	99.8
	A/B Transition				44	207	126		99.7
Phase B	GB C-4	86	242	175	120	250	191	104.1	99.8
	GB 5-27	92	246	182	130	244	193	101.7	99.8
	PK 6-20	80	326	189	120	324	204	106.8	99.7
	GB 1-7	80	327	191	120	325	205	107	99.8
	PK 13-2	87	341	218	130	326	222	107.2	99.6
	GB 3-17	135	318	224	138	315	225	105.6	99.8
	PK 11-58A	126	379	237	135	328	234	106.4	99.8
	GB 5-30	239	334	292	237	329	280	97.9	99.6
	GB 2-2	241	344	293	242	334	280	101.4	99.7
	GB 4-2	257	394	350	254	380	277	73.7	99.8
	End B				261	423	333		99
	Start C				364	950	663		98.5
Phase C	PK 8-Crematory B	429	946	688	583	992	789	82.4	99.2
	PK 10-Crematory A	643	1150	854	669	1029	880	106.8	99.5
	PK 8-8	900	1154	1017	891	1122	999	93.9	99.5
	End C				897	1407	1057		95

Figure 31. Kampsville Mounds five-phase model.

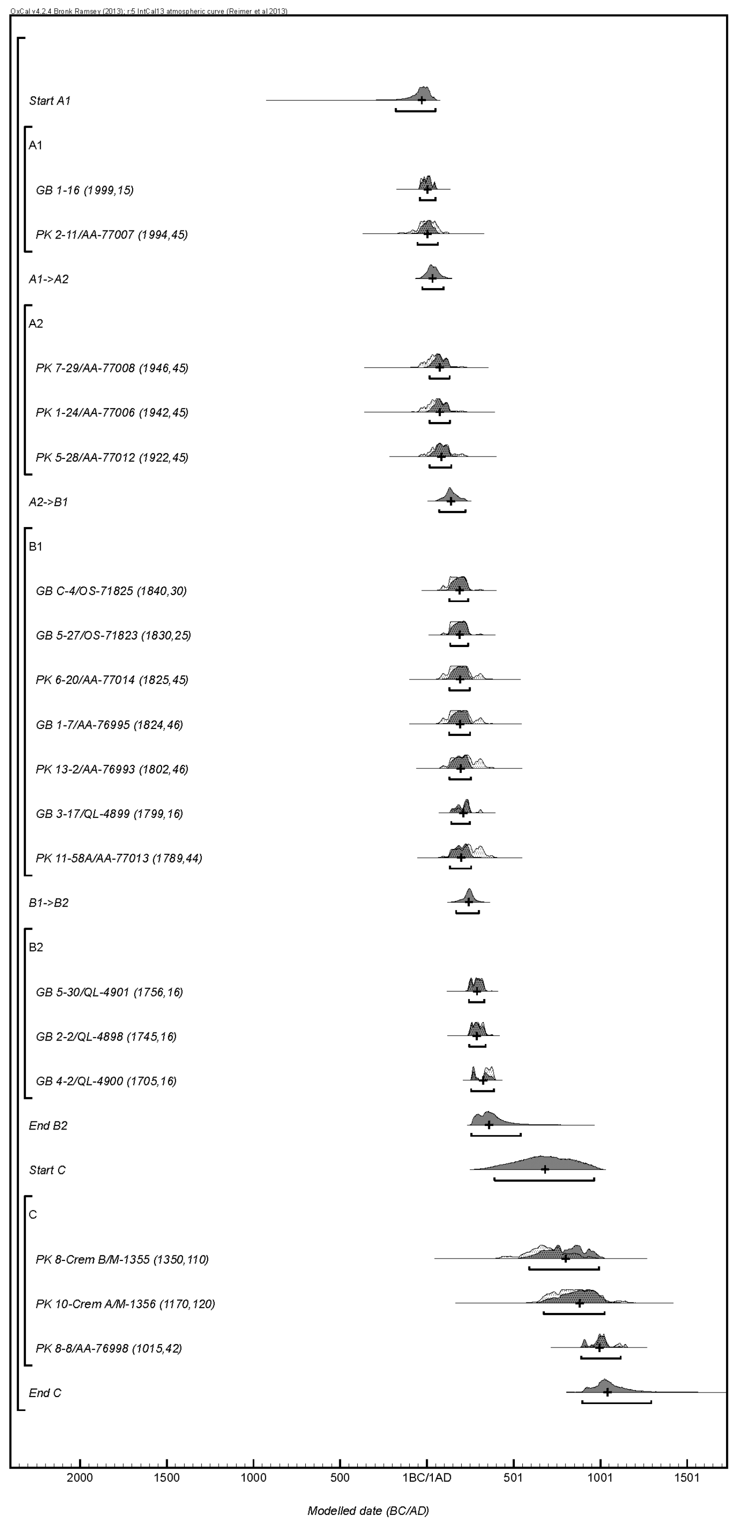


Table 14. Kampsville Mounds five-phase model.

Model Indices A_{model} 125.3 / $A_{overall}$ 125.3		**Unmodelled (BC/AD)**			**Modelled (BC/AD)**			**Indices**	
		95%		**median**	**95%**		**median**	**A**	**C**
Start A1					-180	51	-30		95.9
Phase A1	GB 1-16	-43	51	2	-41	50	5	101	99.6
	PK 2-11	-149	122	5	-55	64	5	120.4	99.7
A1/A2 Transition					-27	97	33		99.8
Phase A2	PK 7-29	-50	208	54	16	132	74	111.8	99.9
	PK 1-24	-48	209	59	15	133	75	114.1	99.9
	PK 5-28	-37	214	82	17	141	84	121.8	99.8
A2/B1 Transition					72	222	139		99.7
Phase B1	GB C-4	86	242	175	130	239	189	108.5	99.9
	GB 5-27	92	246	182	135	238	190	105.2	99.8
	PK 6-20	80	326	189	129	248	192	121	99.8
	GB 1-7	80	327	191	129	249	192	121.6	99.9
	PK 13-2	87	341	218	131	254	195	118	99.8
	GB 3-17	135	318	224	141	248	210	99.4	99.8
	PK 11-58A	126	379	237	133	255	199	106.3	99.8
B1/B2 Transition					169	300	243		99.7
Phase B2	GB 5-30	239	334	292	243	332	289	99.7	99.8
	GB 2-2	241	344	293	245	339	288	102.5	99.8
	GB 4-2	257	394	350	255	388	325	82.3	99.7
End B2					257	541	360		99
Start C					391	965	682		98.8
Phase C	PK 8-Crem B	429	946	688	591	994	801	80	99.3
	PK 10-Crem A	643	1150	854	675	1025	882	107.7	99.6
	PK 8-8	900	1154	1017	890	1118	996	90.7	99.5
End C					896	1294	1042		95.8

Mortuary Analysis

Chi-square analysis of adult sex associations with mortuary treatments are shown in Table 15. Several low p-values suggest significant differences, though the number of significant tests is reduced when considering p-values for Fisher's exact test. Most results are as expected for existing models of MW mortuary treatment: males are more likely to receive extended treatment.

However, A2's results are somewhat different. The sex by bundle burial analysis is significant at the .10 level, though sample sizes are small. Fisher's exact test shows no difference; the Fisher's exact right-side p-value (p = .0925) indicates females *are* represented more often than expected.

Table 15. Kampsville Mounds mortuary treatment comparisons.

Phase	Comparison	χ^2	p-value	Fisher's p-value	♂+	♀+	♂-	♀-
A	Sex ~ Bundle Burial	1.8211	0.1772	0.2043	3	7	57	72
A	Sex ~ Processed Burial	0.0351	0.8514	1.0000	12	11	48	48
B	Sex ~ Bundle Burial	4.0755	0.0435	0.0852	5	1	57	80
B	Sex ~ Processed Burial	11.3198	0.0008	0.0009	26	11	35	58
C	Sex ~ Bundle Burial	1.5625	0.2113	0.3123	3	2	6	14
C	Sex ~ Processed Burial	3.5858	0.0583	0.0870	5	3	4	13
A1	Sex ~ Bundle Burial	0.0500	0.8230	1.0000	1	1	13	18
A1	Sex ~ Processed Burial	1.2810	0.2577	0.3791	4	2	12	17
A2	Sex ~ Bundle Burial	2.8775	0.0898	0.1378	2	6	44	34
A2	Sex ~ Processed Burial	0.2420	0.6227	0.7866	8	9	36	31
B1	Sex ~ Bundle Burial	2.1460	0.1429	0.2990	3	1	40	64
B1	Sex ~ Processed Burial	8.0775	0.0045	0.0054	17	8	25	46
B2	Sex ~ Bundle Burial	1.7863	0.1814	0.4891	2	0	17	16
B2	Sex ~ Processed Burial	2.7493	0.0973	0.1518	9	3	19	12

Biological Variation

Covariance matrix determinants were calculated for each temporal phase based on the discrete cranial traits previously discussed (Table 16). Figure 32 shows |C| values over time, where time is given as the median of the probability curve for each phase. It should be noted that radiocarbon dates, calibrated or not, are ranges and not point estimates. The median is used here simply to facilitate visualization. Individuals were assigned to the phase suggested by radiocarbon dates for the mound in which they were interred. In cases where

radiocarbon dates for a single mound fell into two phases, e.g. Gibson 1, individuals were apportioned based on details in burial reports and notes.

The variance for Phase A is larger than the others in the three-stage model, suggesting significantly greater biological variability during the earliest phase of Gibson and Pete Klunk's use. In the five-phase model, Phase A1 and Phase A2 variances are also larger than subsequent phases. These results suggest the early phases of the MW occupation were more biological variable than subsequent phases, which is to be expected during a period of in-migration and settlement as new groups formed communities.

The male and female determinants are informative here. Male variances are larger than female variances during Phases A, A1, and A2 (Table 16). Male variance is especially large during Phase A2. Considering the ratios of male to female variances, the results suggest that males during Phase A (A1+A2) were the more mobile sex and thus uxorilocality was practiced during this period. This situation *changes* during Phase B and the remaining phases demonstrate low male variation as one would expect from existing models of LIV post-marital residency, i.e. virilocality (Chapter 4, Konigsberg 1988). Based on these results, it appears there was a major influx of new males into the community at Kampsville Hollow during Phase A2. This change in the community's biological structure antedated an apparent shift in post-marital residency patterns that occurred during the subsequent phases. Despite this change in sex-based variability and mobility, mortuary practices appear to have been relatively stable with regard to the ancestor-generative model posited above: those receiving

extended treatment were more closely related to one another despite changing demographics.

Figure 32. Phase covariance matrix determinants over time.

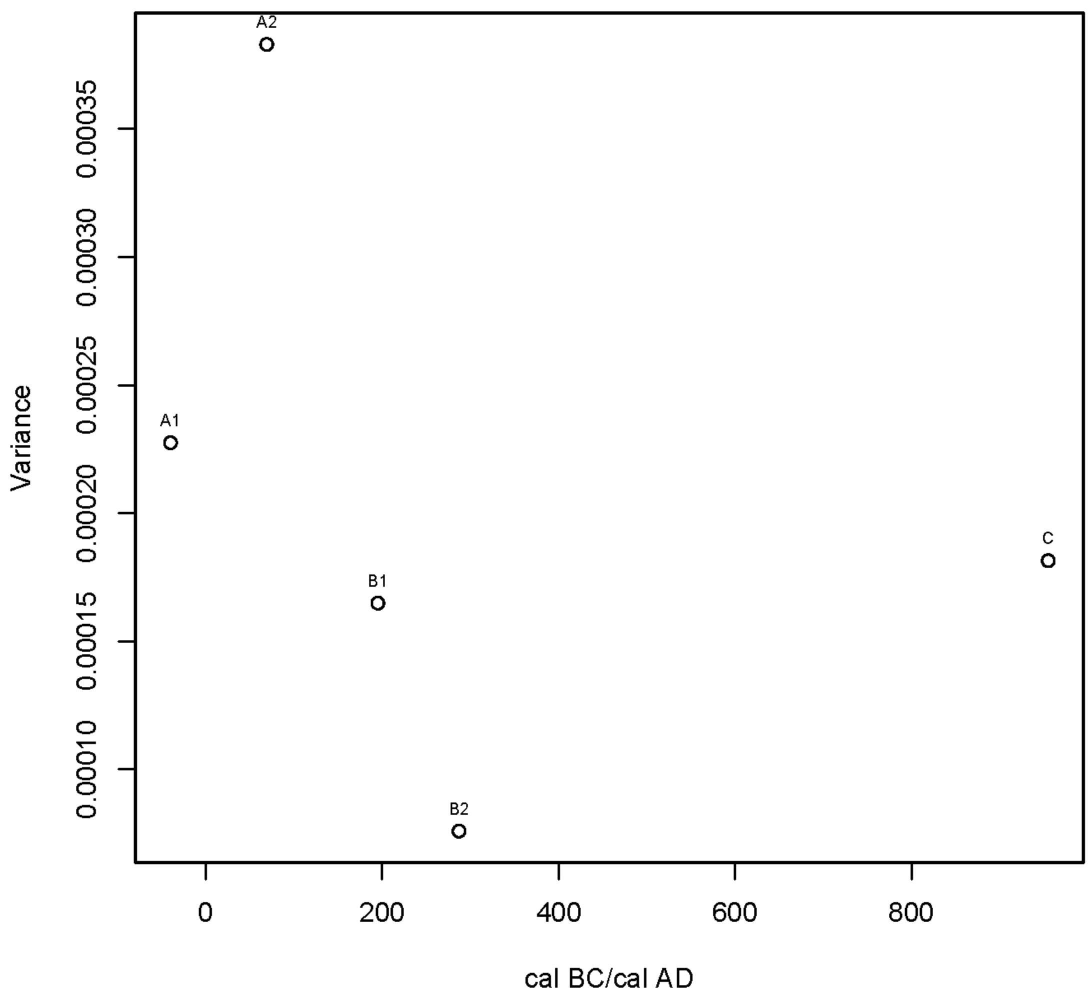


Table 16. Biological variance measures of Pete Klunk and Gibson phases.

Phase	median	N	|C|	N_{PR}	N_{UN}	$\|C_{PR}\|$	$\|C_{UN}\|$	$\|C_{PR}\|/\|C_{UN}\|$	*p*	$N_{♂}$	$N_{♀}$	$\|C_{♂}\|$	$\|C_{♀}\|$	$\|C_{♂}\|/\|C_{♀}\|$	*p*
A	30	88	.000364613	11	77	.000105919	.000351271	.3015	.7280	46	42	.000306261	.000090378	3.3887	.987
B	300	108	.000174694	25	73	.000120919	.000182222	.6636	.5580	44	64	.000091812	.000165238	.5556	.256
C	963	17	.000181450	3	14	.000000000	.000123619	<1.0	-	4	13	.000000000	.000156724	<1.0	-
A1	-40	23	.000227494	4	19	.000000000	.000171077	<1.0	-	11	12	.000013939	.000000000	>1.0	-
A2	69	65	.000383012	7	55	.000081869	.000377241	.2170	.9390	35	30	.000420959	.000138763	3.0336	.937
B1	195	77	.000164909	16	52	.000051353	.000190166	.2700	.4550	26	51	.000105328	.000138829	.7587	.599
B2	287	31	.000075888	9	21	.000000000	.000047672	<1.0	-	18	13	.000000000	.000137372	<1.0	-
C	955	17	.000181450	3	14	.000000000	.000123619	<1.0	-	4	13	.000000000	.000156724	<1.0	-

Discussion

An intriguing pattern of Middle Woodland period mortuary practices and social dynamics emerges in the Kampsville Mounds data. During the initial MW period contemporaneous with the establishment of the residential community in Kampsville Hollow (Phase A1), the processed, or ancestor, mortuary track was open to both males and females. During Phase A2, an important shift appears to have occurred in the community as signaled by the increase in male biological variation and female-centric mortuary treatments. The A2 sample size is ~2.8 times larger than that of A1, suggesting an increase in community population size. The increase in male variability indicates that inclusion of new males into the community either through post-marital migration or community fusion. The apparent shift toward male-centric extended mortuary treatment and virilocal residency suggests the latter and that this fusion resulted in a rearrangement of community organization. These results would explain the unexpected Pete Klunk findings I previously reported for the aggregate analyses (Chapter 4). In that analyses, Pete Klunk diverged from the expected male-centric residency and mortuary pattern observed in other MW sites. The aggregate analyses obviously obscured local social processes related to the history of the Middle Woodland community resident in Kampsville Hollow.

Regardless of changing social dynamics, the processed and unprocessed variance ratios indicate that extended mortuary treatments were

kin-based, indicating the construction of ancestorhood for a limited subset of the community. The stability in this practice despite community dynamics clearly reinforces the importance of funerary practices as means of asserting the ideological primacy of specific sets of social relations and as means of reproducing them within the living community. This stability can be seen the structure of PK 1 and 2. PK 2 exhibits the “classic” MW/Hopewell mound configuration (ramp-and-tomb complex, peripheral burials) before the detected change in community structure in the Kampsville Hollow community, indicating persistence in mortuary practices and the structuring of space *despite* change within the community (contra Martin 2005). The complex cemetery configuration of PK 2 may point toward community-building. As noted above, PK 1 is consists of two mounds (PK 1A, PK 1B) united by the addition of a third ramp-and-tomb complex (PK 1C). Tomb C included the two burials (PK 1-71, PK 1-72) that Perino describes as the “disarticulated bones of several individuals [that] were used for final interment to reconstruct two extended skeletons” (Perino 1968:36). It is difficult to see the intentional conjoining of two distinct tumuli with another ramp-and-tomb and the construction and interment of two “individuals” from skeletal elements of several as a competitive display of competing ideologies as argued by Martin (2005). Rather, PK 1 suggests commonality of practice in the production of ancestors and ancestor ideology. Unfortunately there are insufficient dates from PK 1 to refine the temporality of events; it is clear PK 1C postdates PK 1A and PK 1B, and one of the last individuals in PK1 B died during Phase A2. The constructed individuals in PK 1C may have been

intended as an act to literally unite the newly diverse Kampsville Hollow community as in through ties to common ancestors. Regardless, these results thus support Charles and colleagues' (2004; Buikstra and Charles 1999, Charles 1995) position that MW mortuary practices were enmeshed in the negotiation of changing social relationships during the demographic transformation of the Lower Illinois Valley.

It is not clear how often this process occurred throughout the MW period. One would expect that early MW communities experienced a number of changing circumstances during the initial settlement of valley. Rates of migration and when migration ended are unknown and unexplored. The apparent stability in post-marital residency practices and mortuary treatments, as well as indicators of interregional stabilization and integration, suggest this process was confined to early part of the Middle Woodland period when new migrants and community formation may have been more frequent (Braun and Plog 1982; Charles 1995). At some point new additions to communities must have occurred primary through marriage networks and natural increase rather than community fusion and migrant settlement. It is possible that Late Woodland community dynamics and population infilling of the valley may more closely reflect community fissions. Such questions may be addressed by more radiocarbon dates.

These models improve upon existing conceptions of MW dynamics at Pete Klunk and Gibson by incorporating measures of time. Certainly these models are incomplete and based on a limited amount of radiometric data; more

dates are needed to better characterize intra- and inter-community social and biological dynamics. Thus, the results presented here should be taken as models to be tested and undoubtedly improved upon by greater temporal resolution. Though the radiometric data are limited, they have enabled intra-site analyses that help clarify bluff crest funerary record of Woodland groups. Mortuary ritual in Middle and Late Woodland communities materialized ideology emphasizing natal communities, non-mobility, and lineage membership as central social relations (Chapter 4). Though who was included changed over time, the centrality of relatedness apparently did not. However, finer resolution is necessary to more completely investigate the complex mortuary and moundbuilding activities we observe archaeologically and to document processes of change that might otherwise elude us.

Chapter 6. Conclusion

The research reported in the preceding articles provides new insights into Woodland period communities of the Lower Illinois Valley. I summarize the key points here, and then turn to some new directions suggested by them.

In "Time and Archaeological Traditions in the Lower Illinois Valley" (Article 1/Chapter 2) I, with Jane Buikstra and Douglas Charles, investigated chronology of Middle Woodland period settlement and moundbuilding. Our results support a north-to-south settlement trajectory in the Lower Illinois, but point toward a more complex process than has traditionally been conceived for the lower valley. While data generally align with the north-to-south model, early dates at Kampsville Hollow and at sites in Macoupin Creek suggest initial contemporaneous settlement in a variety of locales. Relationships between these early settlements are not yet understood. Our results suggest that multi-community sites ("regional symbolic centers") emerged slightly later than habitation sites and community cemeteries, though may have developed quickly across the region once established. If such aggregation sites were important forums for inter-community relationships, it would be useful to know the relationship between community sizes, regional population density, floodplain moundbuilding, and time. These questions can only be addressed with additional radiometric data and careful analysis of habitation and floodplain mound site data together. Such analyses would facilitate the detection of early

Middle Woodland period settlements from possible sources other than the Central Illinois Valley, as tentatively suggested by material culture.

The geophysical discussion presented in “ The Role of Remote Sensing in Evaluating Structural Variation in Middle Woodland Mounds in the Lower Illinois River Valle” (Article 2/Chapter 3) builds upon the first phase of geophysical prospection of LIV mounds. Geophysical prospection allows us to investigate mound structure where traditional excavation is not possible. With my colleagues I raise important issues concerning variability in MW moundbuilding and the interpretation of geophysical data from such sites. Two important, related empirical problems exist. The first concerns the nature of structural variation with mounds. The second concerns the manner in which we discern such variation from geophysical data. The existing model of mound structure is based on excavations that unevenly sample space and time in the LIV. Geophysics allows us to rapidly expand our database of mound structure variation, but only if we are able to adequately detect and differentiate structural details from sediment variation. As we report in that article (and elsewhere), general structures are detectible via geophysics, but it is necessary to differentiate between building materials and built structures in order for geophysical data to be primary data. Equally important is the need to move from solely empirical issues of geophysical data to the use of such data to address anthropological questions. This report, and ongoing prospection projects shows that this is possible.

As discussed in “Creating Ancestors” (Article 3/Chapter 4) mortuary practices have been important for understanding MW and LW society. My work approach differs from previous work by refocusing analysis away from individualizing status and toward practices intended both to reproduce and to legitimize social relations among the living. This transformation is accomplished by theorizing kinship at the center MW and LW communities and social life, and by positing mortuary practices as both productive and ideological rather than simply representations. By adopting a biodistance approach to kinship and mortuary practices, I show continuity in MW and LW mortuary practices with regard to processing of the dead despite regional and temporal variation. Regional biological variation is show to decrease over time. These results support the interpretation that mortuary practices played an important role in (re)production of the social order as LIV communities became increasingly enmeshed and integrated into intercommunity social networks through the MW and LW periods.

Finally, my analysis of the Pete Klunk and Gibson sites expands upon the model presented in “Creating Ancestors.” New radiocarbon dates provide important new insight into the temporal structure of MW moundbuilding. As discussed in “Time and Archaeological Traditions” (Article 4/Chapter 5), a general working assumption of archaeologists is that mounds were used sequentially. The new Pete Klunk and Gibson results reveal a more complex scenario. Using these new dates, I was able to detect biological and social dynamics within the community at Kampsville Hollow that were previously

known. Post-marital residency, mortuary practices, and the biological structure of the Kampsville Hollow community changed during the MW period in unexpected ways. The apparent introduction of new males into the community at Kampsville Hollow affected residency and mortuary practices; however, it did not affect the ancestor-centric nature of body processing. The earliest dates from Pete Klunk and Gibson place occupation and mortuary activity there near the beginning of the LIV MW period. It is not clear how representative the Kampsville Hollow community is of LIV MW communities in general. This issue will be addressed in subsequent research.

The results reported in the preceding articles advance our knowledge of LIV history during the Middle and Late Woodland periods. While clearly not the last word on this subject, they are intended as new insights into outstanding problems in Illinois archaeology to be used as models for subsequent research and identify several new questions. Central is the need for more radiocarbon dates from all contexts. Increased temporal control will allow for finer resolution and will undoubtedly continue to reveal unexpected signatures of social dynamics. A comprehensive, representative, regional dating strategy would transform our understanding of temporality from one primarily dominated by broad typological categories to one centered on the complex variation of social dynamics.

In addition, the research presented here illustrates the significance of focusing archaeological investigations on community and kinship in exploring both intra-community and regional dynamics. Migration and settlement of the

LIV was undoubtedly kin structured; however the biological and demographic of migration and settlement remains undefined. Variations in the structure of migration should result in (bio) archaeologically-detectable differences, which may have had profound effects upon the nature community interactions. An unstated assumption of many analyses—including some presented here—is that past communities dating to the same archaeologically-defined time period are largely equivalent. It is clear from cursory inspection of these data that communities differed in size and perhaps scale of moundbuilding. Population differences between settlements undoubtedly affected intra-community interactions such as trading and marriage networks. As mentioned above, the timing of settlement and community differences affected the timing and structure of multi-community spaces. The ubiquitous, well-documented but poorly understood ceramic assemblages of MW sites may be comprehensible from a community- and kinship-informed anthropological perspective rather than artifact-centric one.

The Illinois Valley, particularly the final ~75 miles of it, is home to an immensely fascinating and important archaeological record even when considering the limited timeframe discussed here. Over a century of excavation and analysis has generated considerable knowledge about past peoples who left no written record. This research adds additional insights into MW and LW societies that will establish a pathway for future discoveries.

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