ARCHAEOLOGICAL AND PALEOECOLOGICAL INVESTIGATIONS AT THE RICHARD BEENE SITE, SOUTH-CENTRAL TEXAS

edited by

Alston V. Thoms and Rolfe D. Mandel

Volume II: Archaeological Studies, Synthesis, and Appendixes

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Reports of Investigations 8
Center for Ecological Archaeology
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Cover photo: View of the south wall of the spillway trench at the Richard Beene site (41BX831); excavation underway at the early Early Archaic components ca. 10 m below surface.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

10

LITHIC ASSEMBLAGES: TRANSITIONS OF HOLOCENE TECHNOLOGICAL ORGANIZATION

John Dockall and Charlotte D. Pevny

This chapter details the results of technological and functional analyses of flaked, ground, and battered stone assemblages recovered from the deeply stratified Richard Beene site (Appendix C). The research orientation for the lithic analysis follows the research design for the overall Applewhite Reservoir project (Carlson et al. 1990). Research topics included patterns of raw material procurement and use, settlement patterns, technology, and cultural change. Component terminology and assemblage nomenclature used herein is derived from Chapter 9.

The Assemblages

Lithic assemblages (Table 10.1) recovered from the Richard Beene site provide a significant window into the occupation strategies and behaviors during the Holocene epoch. The earliest Holocene components are represented primarily by Blocks H and T (early Archaic) and date to ca. 8700 B.P. The assemblages recovered from these contexts may represent the largest collection of in situ cultural materials associated with Angostura projectile points in Texas, if not North America (Thoms et al. 1996:8). Block G represents an extensive late, Early Archaic component and assemblage and dates to ca. 7000 B.P. Excavations in this area yielded numerous small cooking features and artifact-concentrations (Chapter 13) in direct association with stemmed/indented-based projectile points, a plethora of other flake tool types, faunal remains, and FCR. Deposits in Block A and U represent a Middle Archaic occupation that dated to ca. 4100–4500 B.P. These Middle Archaic components re represented by comparatively few artifacts; including Bell and Desmuke points, and features; including small hearths. A Late Archaic component in the lower portion of Block B (ca. 3100 B.P.) yielded a large feature that resembled an earth oven and a high density of broad-bladed projectile points and thin bifaces. The Late Pre–Columbian component in the upper portion of Block B, dated typographically to ca. 1200–400 B.P. yielded arrow point fragments, ceramic sherds, and a high density of FCR.

The largest artifact category recovered from 41BX831 is debitage (Table 10.2). In terms of total numbers and percentages, the upper Perez component/paleosol (Blocks H, T, and N), lower Medina (Block G), upper Medina (Block U and upper Block A), and upper Leon Creek (lower Block B) have substantial sub-assemblages of debitage. These components correspond to early and late Early Archaic, Middle Archaic, and Late Archaic occupations, respectively, and they provide the best insight into lithic technology. Excavations also yielded small sub-assemblages from components dated to the middle, Early Archaic.

The most obvious correlation between debitage and tools in these sub-assemblages is that larger numbers of one corresponds to larger numbers of

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Table 10.1. Lithic assemblages by component and period of occupation.

Payaya: Late Pre-Columbian, Block upper B		
Category	*Total*	*Percent of Classes*
Cores	1	12.50
Projectile points	2	25.00
Bifaces	1	12.50
Edge modified flakes	1	12.50
Nonflaked	3	37.50
Total	8	100
Upper Leon Creek: early, Late Archaic, Block lower B		
Category	*Total*	*Percent of Classes*
Cores	24	16.78
Projectile points	10	6.99
Bifaces	47	32.88
Edge modified flakes	54	37.76
Nonflaked	8	5.59
Total	143	100
Lower Leon Creek: Middle Archaic, Block upper A		
Category	*Total*	*Percent of Classes*
Cores	-	-
Projectile points	1	50.00
Bifaces	1	50.00
Edge modified flakes	-	-
Nonflaked	-	-
Total	2	100
Upper Medina: Middle Archaic, Blocks lower A, U and other exposures		
Category	*Total*	*Percent of Classes*
Cores	3	16.67
Projectile points	7	38.89
Bifaces	1	5.55
Edge modified flakes	6	33.33
Nonflaked	1	5.55
Total	18	100
Lower Medina: late, Early Archaic, Block G		
Category	*Total*	*Percent of Classes*
Cores	19	19.79
Projectile points	11	11.45
Bifaces	23	23.98
Edge modified flakes	41	42.70
Nonflaked	2	2.08
Total	96	100

continued

Table 10.1. Continued.

Elm Creek: middle, Early Archaic, Blocks I and K		
Category	*Total*	*Percent of Classes*
Cores	5	45.46
Projectile points	-	-
Bifaces	2	18.18
Edge modified flakes	4	27.27
Nonflaked	1	9.09
Total	12	100

Upper Perez: early, Early Archaic, Blocks H, N, T, and other Perez exposures		
Category	*Total*	*Percent of Classes*
Cores	140	30.43
Projectile points	15	3.26
Bifaces	53	11.52
Edge modified flakes	246	53.48
Nonflaked	6	1.30
Total	460	100

the other category. Another interesting trend is the average weight of an individual flake from each paleosol or component (Table 10.2). Generally, this measure is consistent among the sub-assemblages ranging from 1.1 to 3.45 g; the exception is the upper Perez component with an average flake weight of 0.8 g. The technological and behavioral significance of this trend is explored more fully in the discussions that follow. What the overall trend suggests, however, is an increase in core reduction from the early Holocene to late Holocene components. In comparison to other components, the lithic assemblage recovered from the upper Perez component were characterized by tool maintenance and repair as a significant activity with less core reduction.

Raw material selection for stone tool manufacture was characterized by almost exclusive use of local Edwards chert cobbles in the Medina River gravel bars (Table 10.3). Selection for this material represented more than 90 percent of the analyzed subsample for every major component. Other minor raw materials that were common within the assemblages included unidentified cherts, quartzites, and several unidentified or undetermined raw materials.

Table 10.2. Debitage by total count/percent, total weight, and average flake weight for each assemblage recovered from the major components identified at the Richard Beene site.

Paleosol/Component	**Debitage Total/Percent**	**Total Weight (gms)**	**Average Flake Weight (cms)**
upper Perez	7868/28.305	9913.11	0.79
Elm Creek	303/1.0898	234.15	2.25?
lower Medina	9917/35.676	4459.49	2.22
upper Medina	1643/5.91	475.41	3.45
lower Leon Creek	106/0.381	44.99	2.35
upper Leon Creek	7338/26.398	5360.85	1.36
Payaya	622/2.237	297.78	2.08

Table 10.3. Raw material type for analyzed subsamples from each component (values in cells are total counts/percentages).

Raw Material (Code)	UP*	EC*	LM*	UM*	LLC*	ULC*	Payaya
Chert (1)	1/0.05	-	-	82/5.90	3/5.00	-	-
Quartzite (2)	36/1.63	-	6/0.19	17/1.22	2/3.33	68/7.02	-
Sandstone (4)	1/0.05	-	1/0.05	1/0.08	1/1.66	3/0.30	-
Limestone (5)	-	-	-	-	-	1/0.10	-
Mudstone (8)	-	-	-	-	-	1/0.10	-
Chalcedony (9)	-	1/8.99	-	-	-	-	-
Quartz (10)	-	-	-	1/0.08	-	-	-
Conglomerate (12)	-	-	-	-	-	1/0.10	-
Edwards chert (local cobbles) (14)	2163/ 98.22	81/91.0 1	3045/98.79	1279/92.08	54/90.00	887/91.63	12/100.0
Georgetown chert (17)	-	-	-	-	-	1/0.10	-
Other (20)	-	-	-	-	-	3/0.30	-
Undetermined (99)	1/0.05	-	30/0.97	9/0.64	-	3/0.30	-
Totals	2202	89	3082	1389	60	968	12

* UP: upper Perez component; EC: Elm Creek component; LM: lower Medina component; UM: upper Medina component; LLC: lower Leon Creek component; ULC: upper Leon Creek component.

Size-Grade Analysis

All types of chert (i.e., “chert”, “Edwards”, and “Georgetown”) are included as a single analytical unit in the size-grade analysis. Size grade data are broadly indicative of both core reduction strategies and various techniques of flaking (Table 10.4). Larger size grades typically indicate the presence of early stages of core reduction and are frequently associated with greater abundances of cortex. Size grade data must also be considered in relation to the initial size range of raw materials such as cobbles or pebbles.

Cortex Variability

Cortex variability (Table 10.5) by size grade likely demonstrates behavioral trends related to technological differences and variability in raw material nodule size. Based on overall proportions (percentage) of cortex represented in each size grade, there is an obvious and predictable relationship between flake size and cortex abundance. The smaller the flake, the less cortex is present. Among the upper Perez, lower Medina, upper Medina, and lower and upper Leon Creek flake assemblages, the complete reduction sequence is well represented. Technological differences among these assemblages represent different types of reduction sequences including generalized core reduction (simple flake tool manufacture), tool finishing or maintenance, and manufacture of retouched flake tools from small primary and secondary cortex flakes.

Upper Perez flake size and cortex patterns are consistent with generalized core reduction and behaviors that result in a rather high proportion of smaller flake sizes with and without cortex. Such behaviors include the manufacture of tools from small cortical flakes and maintenance or manufacture of bifacial and unifacial tools. Tool-type frequencies in the components bear this out rather clearly.

Lower and upper Medina size grade and cortex patterns follow the upper Perez trends rather closely, as do those of lower and upper Leon Creek. Little can be said about behavioral patterning represented by the Elm Creek or Payaya debitage assemblages due to small sample size. For components with adequate assemblage sizes, the data strongly suggest

Table 10.4. Size grade flake counts for each component.

Size Grade	UP*	EC*	LM*	UM*	LLC*	ULC*	Payaya
1-50mm	1	-	-	-	-	6	-
2-25mm	51	1	34	2	-	55	1
3-19mm	276	3	62	19	-	146	12
4-12.5mm	951	25	353	96	6	507	25
5-9.5mm	1013	22	500	115	9	692	48
6-6.3mm	1878	63	1684	288	23	2036	111
7-2.8mm	3460	179	5988	1018	56	3636	349
8-2.8mm	238	10	1296	105	12	260	76
Totals	7868	238	9917	1643	106	7338	922

* UP: upper Perez component; EC: Elm Creek component; LM: lower Medina component; UM: upper Medina component; LLC: Leon Creek component; ULC: upper Leon Creek component.

a flake assemblage that is the result of a mix of technological behaviors that included reduction, various stages of tool manufacture, and maintenance. Patterning also suggests that there was a degree of technological stability through time, given the similarities in the debitage assemblages.

Block Comparisons of Flake Size

Block comparisons of general size grade variability can be used to address technological differences between areas and components. These data can also answer questions about post-depositional processes including sheet erosion and flooding, which might remove smaller size grades. Due to sample size variability, only certain blocks for particular time periods or components can be used to develop inferences in this comparison (Tables 10.6–10.10).

Blocks (early, Early Archaic) associated with the Perez component present a similar pattern of flake variability (Table 10.6). Without exception, “Block” L, all blocks exhibit between 67.5 and 76.8 percent debitage in size grades 6 and 7. Block L, which represents a grab-sample from mechanical exposures of the Perez paleosol, has only 15 percent of debitage in size grades 6 and 7 and 67.4 percent of all debitage in grades 3 and 4. Because Block was not excavated/screened, its grab sample is not comparable to excavated blocks (H, N, and T). Interestingly, Block H assemblages, which appear to represent lag deposited artifacts, seem to represent a technologically intact debitage assemblage similar to other upper Perez debitage assemblages. This supports that Block H material was not transported very far from its primary contexts.

Lower and upper Elm Creek components (middle, Early Archaic) present a similar trend in debitage proportions to that of the upper Perez Table 10.7). Lower Elm Creek, Block K, has 80.0 percent of debitage in grades 6 and 7 compared with 84.6 percent for Block I. These patterns are similar, but both values are probably inflated due to smaller sample sizes compared with those from the upper Perez. Nevertheless, tool repair or late-stage finishing is suggested by the pattern.

Data from lower and upper Medina components, late, Early Archaic and Middle Archaic respectively, continue the trends noted for the upper Perez and Elm Creek components (Table 10.8). Proportions of grades 6 and 7 debitage range from 70.9 percent (lower Medina Block Gc) to 89.5 percent (upper Medina Block U). Sample sizes for these blocks are sufficiently large and lend credibility to these patterns. Lower and upper Leon Creek debitage assemblages (Table 10.9), Middle and Late Archaic respectively, also mimic these patterns. Size grades 6 and 7 range from 74.5 percent (lower Leon Creek) to 79.1 percent (upper Leon Creek). Sample sizes, again, are not a problem and do not seem to influence this pattern. Payaya (Late Pre-Columbian) is a bit lower, but similar at 68.5 percent, suggesting that small tool retouch or tool maintenance was a common behavior (Table 10.10).

Table 10.5. Cortex and size grade variability by Paleosol/Component.

Size Grade	UP* (n=2126) Cortex Type			LEC* (n=81) Cortex Type			LM* (n=3042) Cortex Type			UM* (n=1275) Cortex Type			LLC* (n=54) Cortex Type			ULC* (n=884) Cortex Type			Payaya (n=11) Cortex Type		
(in mm)	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
1(50)	-	100	-	-	-	-	-	-	100	-	-	-	-	-	-	-	-	-	-	-	-
2(25)	16.7	66.6	16.7	-	-	-	14.2	42.9	42.9	-	-	-	-	-	-	-	50.0	50.0	-	-	-
3(19)	16.9	55.9	27.2	-	-	-	10.5	31.5	58.0	-	18.1	81.9	-	-	-	28.5	28.5	43.0	-	-	-
4(12.5)	6.2	38.6	55.2	-	100	-	4.8	24.2	71.0	7.4	27.7	64.9	-	20.0	80.0	23.6	21.0	55.4	-	-	100
5(9.5)	5.2	27.2	67.7	-	-	-	4.3	2037	75.0	1.1	18.6	80.3	-	25.0	75.0	15.6	29.6	54.8	-	25.0	75.0
6(6.3)	4.5	20.8	74.7	7.1	42.8	50.1	24.1	11.4	64.5	2.5	16.5	81.0	12.5	12.5	75.0	14.3	15.8	69.9	-	-	100
7(2.8)	1.8	10.9	87.3	1.5	9.2	89.3	0.8	7.7	91.5	0.7	7.8	91.5	16.6	8.3	75.1	5.2	5.9	88.9	-	-	-
8(2.8)	-	-	-	-	-	-	-	-	-	-	11.1	88.9	-	-	100	-	-	100	-	-	-

* UP: upper Perez component; LEC: lower Elm Creek component; UEC: upper Elm Creek; LM: lower Medina component; UM: upper Medina component; LLC: lower Leon Creek component; ULC: upper Leon Creek component.

Table 10.6. Selected block comparisons of debitage size grade proportions for the upper Perez component.

Size Grade (mm)	Ha	Hb	Hc	L	N	T	T2
1(50)	-	.03	-	0.0	-	-	-
2(25)	0.6	0.8	0.4	1.1	-	0.7	-
3(19)	3.5	3.5	5.5	23.2	1.7	1.0	1.7
4(12.5)	12.9	12.1	14.7	44.2	8.2	7.7	6.7
5(9.5)	12.5	14.2	16.7	16.5	13.5	7.7	9.2
6(6.3)	22.2	26.9	24.9	13.9	24.7	18.8	20.6
7(2.8)	45.7	40.6	36.9	1.1	47.1	58.0	52.7
8(<2.8)	2.6	1.8	0.9	-	4.8	6.1	9.1
Totals	2434	3222	510	86	170	674	694

Table 10.7. Selected block comparisons of debitage size grade proportions for the Elm Creek component.

Size Grade (mm)	K (lower Elm Creek)	I (upper Elm Creek)
1(50)	-	-
2(25)	0.4	-
3(19)	0.8	1.5
4(12.5)	8.0	3.1
5(9.5)	8.4	3.1
6(6.3)	21.7	15.4
7(2.8)	58.4	69.2
8(<2.8)	2.3	7.7
Totals	226	605

Flake Types and Reduction Techniques

A notable trend in the debitage flake types for all components prior to the Late Pre–Columbian is the dominance of soft hammer flakes (i.e., bending initiation) over hard hammer flakes (i.e., conchoidal initiation). The Payaya differs in being roughly equivalent in both flake types, albeit having a small sample size. Correlated with a predominance of soft hammer or bending type flakes are an abundance of broken flakes and shatter.

Early Holocene components—Perez, Elm Creek, lower Medina—generally reflect a similar array of identified flake types (Table 10.11). Technologically, a bending initiation technique appears to have been typical for tool manufacture in lieu of

Table 10.8. Selected block comparisons of debitage size grade proportions for the lower and upper Medina components.

Size Grade (mm)	Ga (lower Medina)	Gb (lower Medina)	Gc (lower Medina)	A (upper Medina)	U (upper Medina)
1(50)	-	-	-	-	-
2(25)	0.2	0.4	1.4	0.1	-
3(19)	0.7	0.5	3.3	1.1	0.7
4(12.5)	2.6	3.5	7.7	6.1	3.5
5(9.5)	4.7	4.9	6.3	7.5	4.7
6(6.3)	16.2	17.1	13.7	17.4	18.6
7(2.8)	64.0	60.3	57.2	60.5	70.9
8(<2.8)	11.8	13.3	10.3	7.3	1.6
Totals	615	9009	271	1375	258

Table 10.9. Selected block comparisons of debitage size grade proportions for the lower and upper Leon Creek components.

Size Grade (mm)	A (lower Leon Cr.)	B (upper Leon Cr.)	D (upper Leon Cr.)
1(50)	-	0.08	-
2(25)	-	0.7	-
3(19)	-	2.0	5.2
4(12.5)	5.7	6.9	10.5
5(9.5)	8.5	9.5	5.2
6(6.3)	21.7	27.8	21.1
7(2.8)	52.8	49.5	58.0
8(<2.8)	11.3	3.5	-
Totals	106	7300	38

Table 10.10. Debitage size grade proportions for the Payaya component.

Size Grade (mm)	B (Payaya)
1(50)	-
2(25)	0.1
3(19)	1.9
4(12.5)	4.0
5(9.5)	7.7
6(6.3)	17.8
7(2.8)	56.1
8(<2.8)	12.4
Totals	622

a conchoidal initiation technique. This is unexpected given the predominance of the use of local chert gravels. Although it is only "negative evidence," a dearth of hammerstones in the lithic assemblage may be correlated with the use of softer billets of perishable material such as bone or wood as a technological preference. It is also possible that hammerstones were among the highly curated tool such that they may not have been discarded regularly at the site.

There may be a technological link between bending flakes and the presence of some discoid bifacial cores. A difference in the proportions of bending initiation flakes among the Early Archaic components may indicate behavioral or organizational differences associated with differences in site function or activities. Perhaps the use of a bending initiation technique is related to a systematic core reduction strategy in which greater control over flake dimensions was desired, especially if flakes were to be selected for tools or for manufacture into other retouched expedient tool types.

The relatively few lipped and pressure type flakes document occasional retouch or repair of edged flake tools or bifaces and perhaps tool resharpening and finishing of these and other tools. Blades and blade cores are present but rarely so, in Early Archaic assemblages. The upper Perez component includes tools made on blades and a blade core. Blades are also present in both the Elm Creek and the lower Medina components. To the extent

Table 10.11. Flake type proportions by component.

Flake Type	UP*	EC*	LM*	UM*	LLC*	ULC*	Payaya
Bending initiation	28.47	84.48	28.11	16.26	14.81	21.30	41.66
Conchoidal initiation	1.71	-	0.36	0.54	-	4.17	58.34
Flake with platform missing	56.49	13.58	58.09	74.04	35.58	36.30	-
Shatter	11.65	3.70	11.46	6.09	46.29	30.32	-
Pot lids	0.32	-	0.39	0.46	-	1.01	-
Lipped (or biface thinning)	0.60	-	0.82	0.15	1.86	3.83	-
Blade	-	1.24	0.32	0.39	-	3.83	-
Pressure	0.69	-	-	1.84	1.86	2.85	-
Unknown	0.07	-	0.39	0.23	-	0.11	-

* UP: upper Perez component; EC: Elm Creek component; LM: lower Medina component; UM: upper Medina component; LLC: lower Leon Creek component; ULC: upper Leon Creek component.

that blade blanks and blade tools were at all common, they must have been part of the curated tool assemblage.

The Middle Archaic upper Medina component mirrors the technological character of the Early Archaic. Blades, lipped flakes, and pressure flakes are present in small proportions. Late Archaic debitage samples illustrating continuation of technological trends observed for earlier time periods.

The temporal redundancy of these technological patterns suggests several interpretations. First, the technological organization of a river-cobble lithic technology was established by the early, Early Archaic period and remained stable into the Late Archaic period. Accordingly, the technological needs associated with habitation probably remained relatively consistent. Certainly the compositions of the tool assemblages from Early to Late Archaic suggest similar activities and patterns of site use. It could also indicate this technology was adaptable and flexible enough to meet a variety of needs that changed through time. Small sample size makes the Late Pre–Columbian Payaya component difficult to interpret.

Table 10.12 provides a broad representation of core reduction intensity via the flake/core ratio. This ratio is based on the assumption that there is a technological relationship between cores and flakes in each assemblage. The upper Perez and lower Elm Creek assemblages present flake/core ratios that are suggestive of technological connections between the cores and most of the debitage. Accepting the limitations of sample size for some assemblages, other assemblages present decidedly different ratios.

In these cases, an unknown proportion of the debitage is not related to the cores but was produced via other techniques or purposes such as tool repair, maintenance, recycling, or retooling. Alternatively, there may have been a greater degree of curation of cores or more intensive core reduction. There may certainly be a relationship between these ratios and the abundance of bending initiation flakes. Curation and/or more intensive tool or core reduction are the most plausible explanations of ratio differences and could account for the low density of cores within these sub-assemblages.

Table 10.12. Flake/core ratios for each component/ occupation period.

Component: Occupation	Flake/Core Ratio
upper Perez: early, Early Archaic	56.2
lower Elm Creek: middle, Early Archaic	47.6
upper Elm Creek: middle, Early Archaic	-
lower Medina: middle, Early Archaic	521.94
upper Medina: Middle Archaic	547.66
lower Leon Creek: Middle Archaic	-
upper Leon Creek: early, Late Archaic	305.75
Payaya: Late Pre-Columbian	622.00

Early, Early Holocene: Upper Perez Component

Blocks T, H, and N, along with mechanically exposed collection areas J and L (Figure 4.1), represents the upper Perez component of the early Holocene (ca. 8800–8600 B.P.) epoch. These excavation areas represent the earliest dated occupations at the Richard Beene site. Table 10.13 provides information on the lithic assemblages recovered from these blocks and other proveniences associated with early Holocene occupations.

As expected, debitage represents the majority of flaked stone artifacts from all early Holocene

Table 10.13. Early, Early Archaic (upper Perez) totals for flaked and non-flaked artifacts from all blocks (values in bottom row are total counts/percents).

Component	Block	Cores	Bifaces	Edgemodified	Non-flaked	Points	Debitage	Totals
H	H	3	9	-	-	-	-	12
H	Ha	36	7	50	3	4	2434	2534
H	Hb	53	16	197	-	3	3222	3491
H	Hc	11	6	25	-	1	510	553
N	N	2	-	-	-	-	170	172
T	T	5	3	19	3	2	1368	1400
J	J	2	1	5	-	1	20	29
L	L	10	3	8	-	1	86	108
-	BHT 1	-	-	-	-	1	-	1
-	EDM	16	2	23	-	2	-	43
-	Grab	-	2	10	-	-	-	12
Totals	-	138/1.8	49/0.5	337/4.0	6/0.07	15/0.2	7810/93.4	8355

contexts. Biface manufacture is not a significant component of the upper Perez lithic assemblage. Edge-modified implements dominate the tool assemblage. A comparison of cores and total debitage yields a flake/core ratio of 56.5, but this figure ignores variability in flake size. A more realistic ratio for indicating technological relationships is between flakes and tools, which is 19.4. This measurement assumes that there was a shared technological relationship between tools and debitage as opposed to an exclusive relationship between cores and debitage: debitage was the product of diverse activities such as tool manufacture, flake retouch, and occasional biface manufacture and tool maintenance.

In a study of amorphous core technology in the midsouth, Johnson (1986) employed the core/biface ratio as a measure of the relationship of lithic resource abundance and the type of core reduction. A core/biface ratio close to, or approaching zero, was characteristic of localities lacking ready access to suitable material. In these cases, a bifacial core reduction strategy was employed as a strategy of raw material conservation. In areas with abundance of lithic raw material, and especially at quarries, the ratio was higher, between 1.00 and 3.00.

For the upper Perez assemblages, the core/biface ratio is 2.81, which is consistent with an abundance of raw material from the Medina River and other nearby gravel sources. When the core/biface ratio for individual assemblages from the upper Perez is considered however, a different picture of reduction strategies emerges that may represent technological relationships to task specific activities.

It is known that there is ample raw material at the Richard Beene site, so raw material scarcity cannot be considered as an influencing factor. For example, the core/biface ratio for blocks varies from 1.83 to 5.14. Core/biface ratios between 1.83 and 2.00 may be indicative of a relative raw material shortage. Components of Block H with a greater abundance of bifaces or bifacial cores could suggest that there were specific functional requirements for flakes produced as tools. Increased mobility (small groups staying for very short periods) may also have contributed to observed differences. Hayden et al. (1996:22–24) argued that a bifacial strategy is most appropriate for groups in contexts of high mobility or task specific needs.

Blocks Ha, Hb, and Hc represent the bulk of the upper Perez assemblage. Block T was more intact in terms of being in primary context. Block N contributes to the overall character of upper Perez lithic technology and reinforces patterns based on larger sub-assemblages from Blocks H and T.

The combined upper Perez assemblage is represented by 545 flaked stone tools and cores and

7,810 pieces of debitage. It is a very significant assemblage from the early, Early Archaic period in south Texas that contains a variety of cores, bifaces, and edge-modified flake tools, projectile points, along with a few non-flaked tools.

Expedient hard-hammer cores with random flake removals from suitable platforms represent the most common core type at the Richard Beene site (Figure 10.1). Large pebbles and small cobbles of chert were selected for this reduction strategy. Usually, negative flake scars from previous flake removals served as platforms for subsequent flake removal, resulting in an angular or blocky core. Flakes produced by this method were thicker than flakes removed from discoid cores and had more dorsal cortex and fewer dorsal flake scars. Striking platforms were typically cortical or single-faceted, and flake cross-sections ranged from wedge-shaped to triangular and irregular. Lateral edges exhibited an assortment of edge angles from obtuse to acute and were used in a variety of tasks requiring a range of edge angles suitable for cutting/scraping and chopping/adzing.

Discoid cores are also common in the assemblage (Figure 10.1a-c). They have a prepared surface that served as a striking platform to remove flakes from the opposite side of the core, and frequently retained cortex on the prepared platform surface. This core reduction strategy was useful in producing expedient flake-tool blanks for a variety of cutting tasks requiring a thin cross-section and acute lateral edges.

Conical blade cores were recovered from the early, Early Archaic deposits (Figure 10.1d-e). Blades produce a more usable cutting edge per removal than either discoid or random flake production strategies. Such elongated flakes are useful for incising, piercing, drilling, and perforating.

A single example of a macroflake percussion core was recovered from surface exposures of the Perez paleosol. Other core fragments from Blocks T and U represented repair of broken cores or damaged platforms. Some may also represent recycling of exhausted or otherwise abandoned cores for expedient tools. Block H and its sub-blocks present the best picture of core reduction strategies during the early Holocene at the site. The abundance of cores indicates that flake production was an important activity.

Bifaces (Figure 10.2) represent the third largest group of flaked tools from upper Perez assemblages. Of bifaces, 61.5 percent are thick (>1 cm) and 38.6 percent are thin (<1 cm). The thick/thin dichotomy can represent a distinction between heavy-duty and light-duty implements. The majority of upper Perez bifaces were recovered from Block H (77.5 %).

Distally beveled bifaces represent one of the major types of bifacial artifacts in upper Perez assemblages. Eighteen distally beveled bifaces were recovered from various contexts within the upper Perez (Figure 10.3). Table 10.14 provides basic metric data for distally beveled bifaces from the upper Perez. In general, beveled bifaces were uniform in size.

Functionally and technologically these implements have been classified as heavy-duty scraping or adzing tools similar in form and function to Dalton adzes or Clear Fork bifaces and unifaces (Dial 1998; Gaertner 1992; Hofman 1977, 1978; Shiner 1975; Turner and Hester 1999:246, 252). Similar implements are common in lithic assemblages in the eastern United States beginning ca.10,000 B.P. (Anderson and Sassaman 1996). One fragmentary thick biface with heavy edge damage (Cat. 368) in the upper Perez assemblage could possibly represent a Guadalupe biface (Figure 10.4).

Adzing tools from Richard Beene were almost as frequent as knives and projectiles combined. Those in the upper Perez represented the entire tool-use life from unfinished/abandoned preforms to implements broken and discarded. It appears that there was on-site use and retooling of these tools (Thoms et al., 1996:18–20). These tools indicate the importance of woodworking tasks during the early, Early Archaic period.

The presence and importance of woodworking activities are also indicated in the variability of edge-modified flake tools. A number of the beveled bifaces retain evidence of impact fractures against

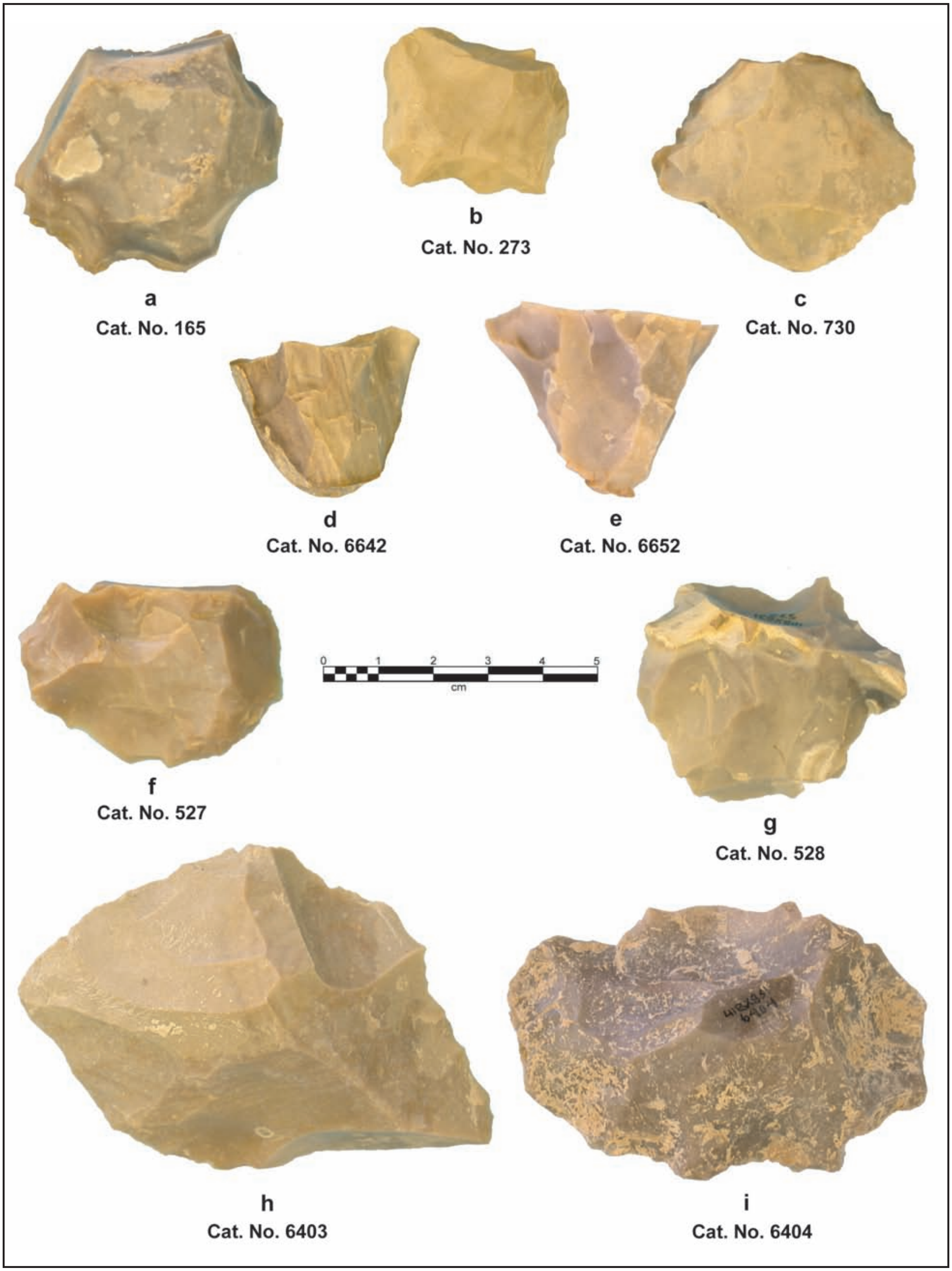

Figure 10.1. Selected cores (a–c) discoid; (d–e) conical; (f–g) amorphous; and (h–i) recovered from the upper Perez component, early, Early Archaic period (ca. 8800–8600 B.P.)

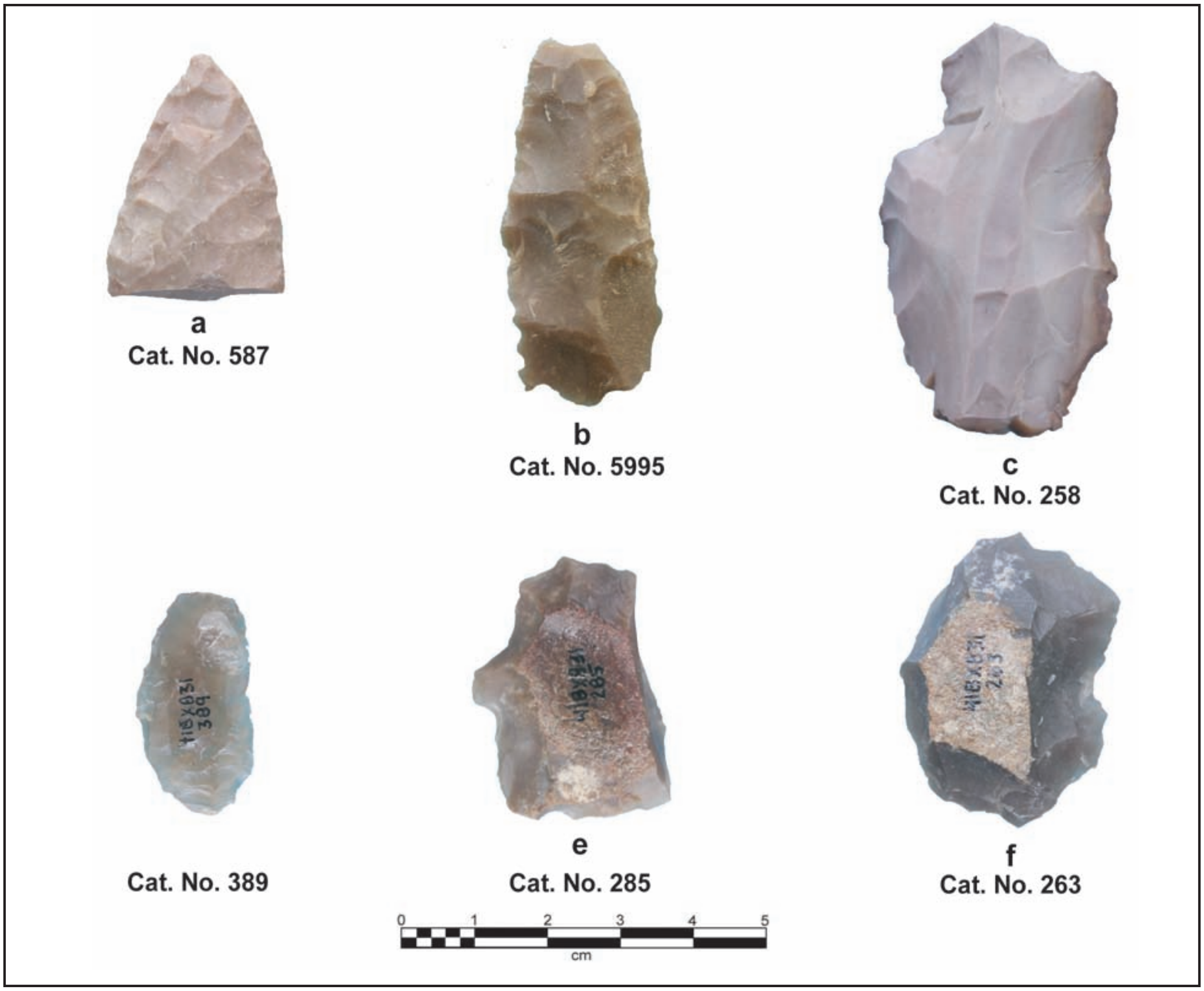

Figure 10.2. Selected bifaces (a–f) from the upper Perez component, early, Early Archaic period (ca. 8800–8600 B.P.).

a dense material and lateral edge preparation for hafting. A few small (size grade 3) percussion flakes in the upper Perez assemblage may represent resharpening flakes from beveled bifaces. The striking platforms and portions of the dorsal surface on these retain bright polish, step fractures, and a general battered appearance observed on some of the beveled bifaces. The distal ends of some of the bifaces exhibit remnants of small percussion-flake scars where flakes were removed during the last resharpening episode prior to discard.

Several thin bifaces in the upper Perez assemblage are technologically and stylistically similar to Lerma bifaces (Turner and Hester 1999:145). These bifaces co-occur with the Angostura points. Lerma bifaces are known to be a common technological trait of temporally equivalent lithic assemblages in south-central Texas (Kelly 1989). Thoms (1993) noted that the Lerma specimens recovered from upper Perez components technologically resemble Zella Angostura points described by Kelly (1983). Functional analysis of the upper Perez specimens (Figure 10.5a-c) indicated that these implements probably functioned as hafted knives (Thoms 1995). The presence of large knives that are technologically similar to projectile points has been documented as a common feature of early Holocene lithic assemblages in the southeastern United States (Anderson and Schuldenrein 1985; Collins 1979; Goodyear et al. 1989; Kimball 1996:163–164; MacDonald 1968; Morse 1973).

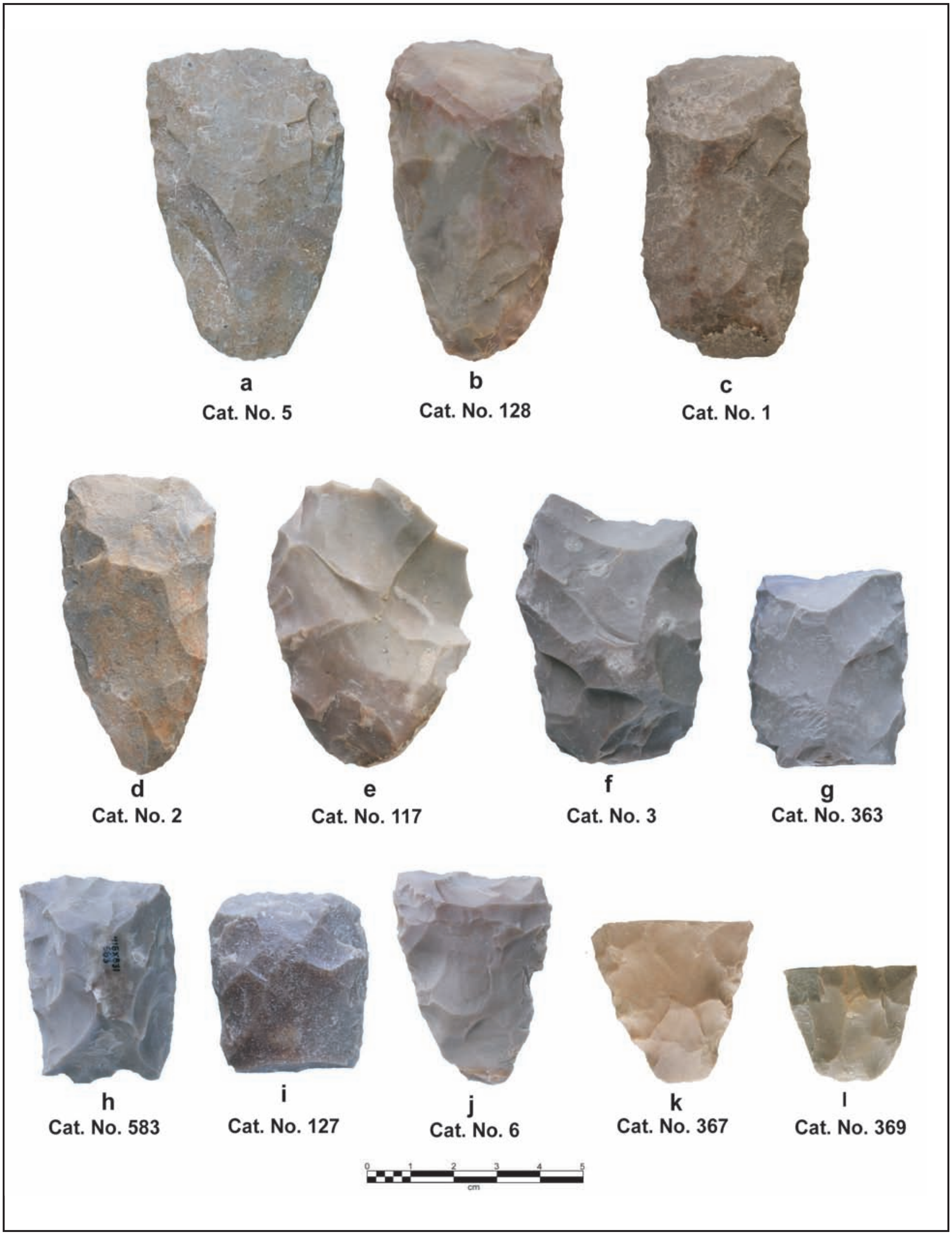

Figure 10.3. Distally beveled bifaces (a–l) from the upper Perez component, early, Early Archaic period (ca. 8800–8600 B.P.).

Table 10.14. Metric data for complete distally beveled bifaces from upper Perez components.

Block	Length	Width	Thickness	Weight
EDM	61.58	-	19.57	40.69
H	73.08	-	18.09	43.37
Hb	71.14	-	16.06	50.00
Hc	53.52	-	14.57	25.87
Hc	67.71	-	18.01	45.85
L	72.76	-	24.11	66.32

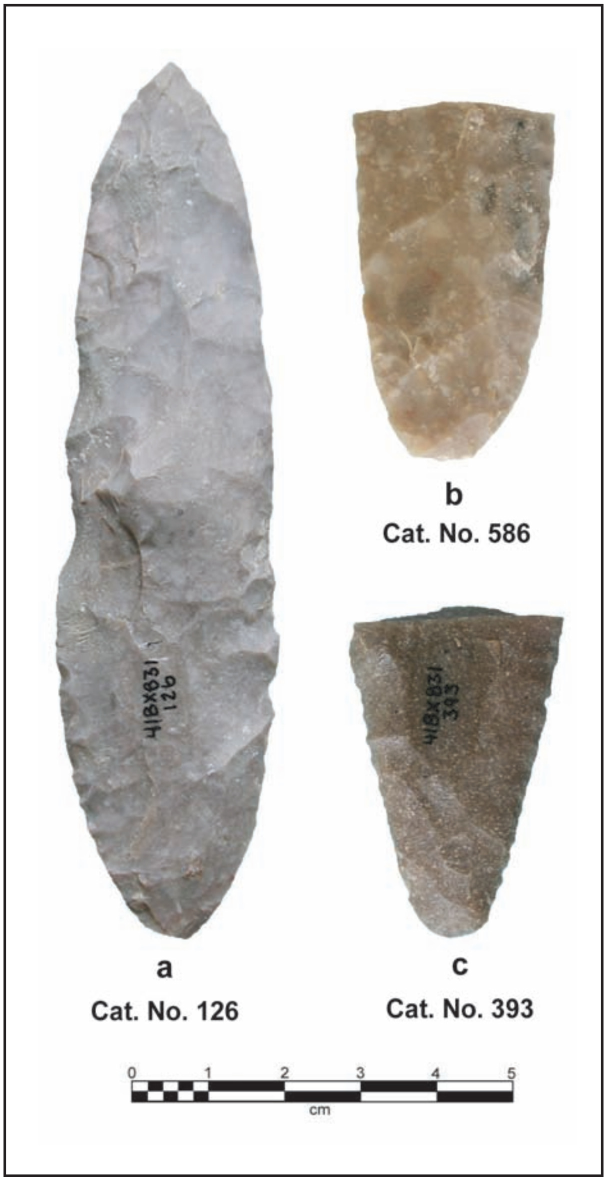

Figure 10.5. Lerma-like (a) biface and (b–c) basal fragments thereof from the upper Perez components, early, Early Archaic period (ca. 8800–8600 B.P.).

Figure 10.4. Guadalupe tool from the upper Perez component, early, Early Archaic period (ca. 8800–8600 B.P.).

A complete Lerma-like specimen (Figure 10.5a) was recovered from the upper Perez paleosol along with four basal fragments. The complete specimen is a large lanceolate, laurel-leaf shaped biface with some light step flaking and polish along the lateral edges. Functional determinations for this specimen are not clear. Two thin-biface distal fragments resemble the distal end of the complete specimen.

One proximal-medial fragment (Figure 10.5b) has pronounced edge grinding of the lateral edges of the base. A basal fragment (Figure 10.5c) has minor edge grinding and smoothing at the proximal portion of the haft element. Another biface fragment exhibited pronounced grinding of the haft element edges. The presence of only one complete specimen along with basal or distal fragments of Lerma-like bifaces suggests that broken implements were repaired or replaced with partially finished or finished bifaces. Fracture patterns and fragments suggest that Lerma bifaces functioned as hafted bifacial cutting tools primarily. Relatively complete preforms may have been part of individual toolkits.

Fourteen whole and fragmentary Angostura points and one Angostura-like fragment were recovered from the upper Perez component (Figure 10.6). Four specimens were complete or nearly complete, five were proximal fragments, seven were proxi-

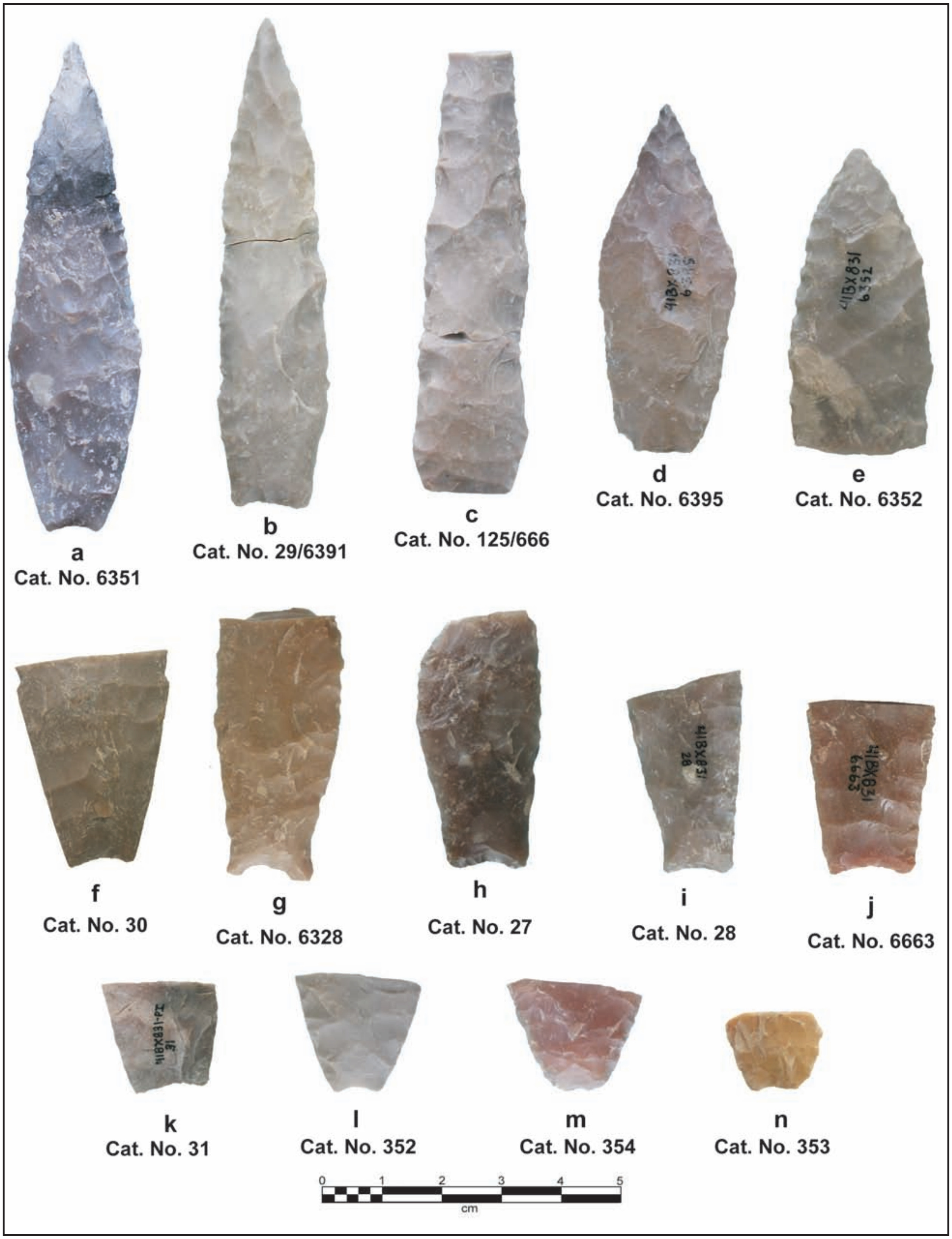

Figure 10.6. Angostura (a–e) points and (f–n) fragments thereof from the upper Perez components, early, Early Archaic period (ca. 8800–8600 B.P.).

mal-medial fragments, and one was a distal-medial fragment. This breakage pattern suggests hunting implements were being reconditioned and replaced rather than manufactured on site. Fragments of lanceolate points are similar in raw material and technology to those identified as Angostura.

One of the non-Angostura types is a basal fragment of a possible Plainview point (Figure 10.7a). This fragment has well-ground basal edges, a concave base, and parallel lateral basal edges. It may be within the range of variation of Texas Angostura points, however. Thoms (1993:16–27) briefly described the Angostura technology and assessed the relevance of this specimen in relation to the whole conundrum of the Angostura as a type concept.

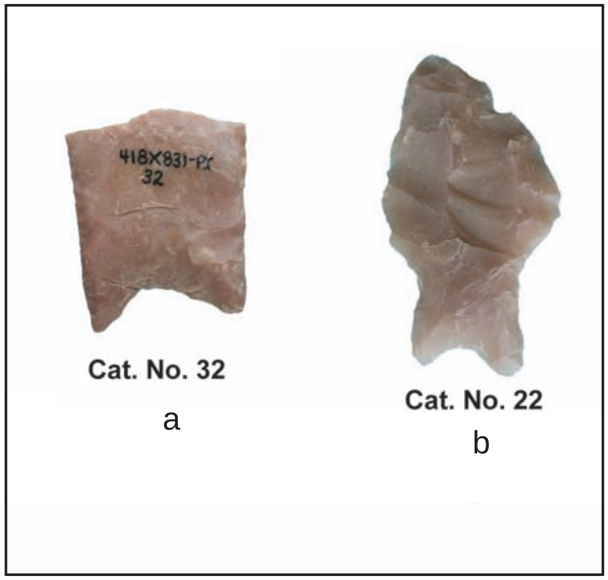

Figure 10.7. Other projectile points from the upper Perez components, early, Early Archaic period (ca. 8800–8600 B.P.): (a) Planwiew-like specimen; and (b) Hoxie-/Gower-/Jetta-like specimen.

The second ostensibly non-Angostura specimen (Figure 10.7b) is a stemmed/shouldered point that resembles the Hoxie–Gower–Jetta morphological scheme. This artifact exhibits a distal-impact scar and some reworking of the tip after impact. Lateral edges of the stem exhibit edge-grinding. The basal concavity is not as pronounced as on most Gower specimens. This specimen more closely resembles Hoxie in the depth of the basal cavity but the shoulders are reminiscent of the Gower point form. Identification is tentative as Hoxie or Gower. The presence of basal stem-edge grinding, however, is characteristic of Hoxie and not Gower or Jetta. This point differs from Angostura points in basal and stem/shoulder characteristics. It also differs from the stemmed/indented base point forms from 41BX831 in the presence of basal grinding and an apparent absence of barbs or pronounced shoulders, as are typical of the late, Early Archaic points from Block G (lower Medina component).

In the absence of preforms, there is no definitive evidence of a manufacturing sequence for Angostura points. Moderate to heavy lateral edge grinding is evident on stems of six specimens and slight grinding on the stem of one specimen. One complete Angostura point exhibits alternately right-beveled lateral blade edges and the second whole specimen exhibits alternately left-beveled blade edges.

Table 10.15 presents metric and completeness data for Angostura points. Thickness data show a bimodal distribution of the sample into two groups: >5.00 but <7.00 and >7.00 but <9.00. This bimodal distribution represents thickness differences at point midsection (>7.00 but <9.00) versus point thickness at the base (>5.00 but <7.00).

Two lanceolate point medial fragments are also present in the early, Early Archaic component (Figure 10.8). One exhibits two bending fractures and the other exhibits a single bending fracture on one end (Figure 10.8a) while the other represents a probable failed burin spall removal in which a previous bending fracture served as the striking platform (Figure 10.8b). This specimen exhibits a classic plunging fracture and the burin spall was supposed to have followed the lateral edge of the medial fragment, but plunged inward truncating the medial portion. It is unlikely that this removal was due to hunting impact.

The typology of all of these specimens from Richard Beene is probably best left at Angostura rather than to imbue it with some type of variant status, especially given the fragmentary and reworked nature of the sample. Broken and complete Angostura points from the site resemble those illustrated by Collins et al. (1998:224) from the Wil-

Table 10.15. Metric and grinding data for complete and fragmentary Angostura points from the upper Perez components.

Catalog	Length (mm)	Width (mm)	Thickness (mm)	Weight (gms)	Fragment	Haft-grinding
27	45.99	21.73	7.73	9.70	proximal-medial	yes
28	35.51	20.33	7.06	5.80	proximal-medial	no
29/ 6391	47.70	18.48	7.56	9.60	proximal-medial	no
30	37.36	26.51	8.86	9.26	proximal-medial	yes
31	20.52	19.90	5.45	2.3	proximal	no
352	20.71	21.26	5.73	2.9	proximal	no
353	13.80	17.03	5.84	1.4	proximal	no
354	17.91	22.7	7.53	3.2	proximal	no
666/ 125	78.68	19.61	6.75	12.22	distal-medial	yes
6328	48.70	21.77	7.89	9.84	proximal-medial	yes
6351	84.31	22.95	8.34	15.64	complete	yes
6352	52.48	24.36	8.15	11.69	distal-medial	undetermined
6395	59.33	22.74	7.69	10.62	complete	yes
6663	31.00	22.20	5.80	4.50	proximal	yes

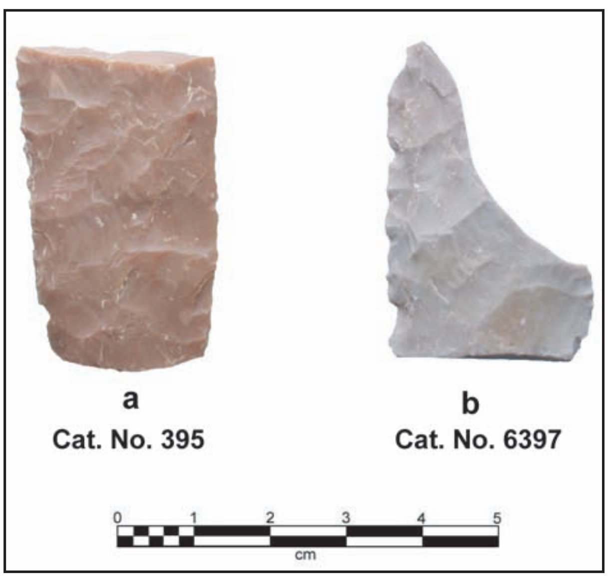

Figure 10.8. Lanceolate point medial fragments (a–b) from the upper Perez components, early, Early Archaic period (ca. 8800–8600 B.P.).

son–Leonard site. Angostura points from Wilson–Leonard were recovered in various contexts dated to the early portion of the Early Archaic period.

Aside from projectile points, edge-modified flake tools are perhaps most informative of early Holocene behaviors at the Richard Beene site. A thick/thin dichotomy suggests a functional distinction between tools that served heavy-duty versus light-duty functions. Based on the abundance of local raw materials represented, most edge-modified tools were probably manufactured, used, and discarded on the site.

Unifaces exhibit retouch that is more regularized along at least a portion of the edge, whereas edge-modified implements typically exhibit a greater degree of variability in edge shape and degree of retouch. Even so, there are essentially equal proportions of both thick and thin edge-modified implements. If this pattern is literally translated into functional inferences, then this tool group is indicative of roughly equal proportions of tools being employed in tasks requiring a variety of functional edge characteristics.

Edge-modified implements classified as thick or thin unifaces were scarce, represented by only 19 implements. Edge-modified flake tools included a variety of denticulate or carinated implements with toothed or scalloped edges, notched flakes, occasional small burin spall cores, burin spalls, graver-like tools, and battered pieces resembling *pieces esquillees* (Figure 10.9). The morphological variability reflected within this group of implements suggests a diverse array of tasks were undertaken at the site.

Smashed flakes were occasionally found among the debitage from the upper Perez and upper Leon Creek components (Figure 10.10). This flake type is a by-product of flintknapping (including flakes, flake fragments, or shatter) that exhibits features indicative of secondary reduction for expedient flake tool manufacture. Typical features may include multiple impact cones or ring cracks, radiating transverse breaks, and pronounced bulbs of percussion on the face of the transverse break that indicate the flake was placed on an anvil and subjected to forces similar to bipolar percussion. Often, this type of breakage produces multiple chisel-like edges that serve as very durable scraping implements. Flakes and broken bifaces can serve as raw material for such reduction trajectories. While photographs of smashed flakes (Figure 10.10) adequately illustrate striking platforms, percussion cones, bulbs of percussion, and smashed surfaces, the more subtle attributes of small ripple marks and radiating fractures are not readily visible.

Smashed or deliberately broken flakes have earlier been identified as a Folsom period technique at the Hanson site in Wyoming (Frison and Bradley 1980). At that site, percussion and biface thinning flakes were occasionally broken by direct percussion to produce fracture angles that were used in a variety of scraping tasks. The present author observed similarly deliberately broken flakes used secondarily as tools in lithic assemblages from the Santa Cruz Islands in the Pacific.

Smashed flakes represent an interesting technique to quickly or expediently produce usable tool edges and to extend the utility of good quality materials or broken tools. These expedient implements were made by employing a bipolar technique to the dorsal or ventral surface of a percussion flake. This results in a radiating fracture surface and splits the flake into several wedge-shaped fragments originating at the point of impact. On occasion the flake is also merely broken in two fragments but also exhibit a radial fracture pattern. These flakes appear to have been deliberately broken or shattered to produce small angular fragments with obtuse angled edges along the fractures. These angular pieces may represent an expedient use of on-hand debris to produce additional tools for small tasks. Seven specimens identified in the overall Richard Beene assemblage. Only three were recovered from excavation contexts, one from the upper Leon Creek and two from the upper Perez. The remaining four specimens were isolated finds from exposed areas in the spillway trench.

Diagnostic features on smashed flakes from the site were only identified during detailed microscopic use-wear analysis. This flake type, therefore, may be overlooked during standard technological analyses that focus on the macro attributes.

One of the smashed flakes from the Upper Perez is a thin edge-modified flake with light scraping and cutting wear (Figure 10.10f). It is a medial flake fragment with a transverse break at each end. One transverse break has a negative Herzian cone and radiating ripple marks and the percussion blow was delivered to the ventral surface. The second smashed flake from the upper Perez (Figure 10.10a) is a large percussion flake broken by direct percussion to the ventral surface that produced a radiating fracture pattern at the distal end of the flake. This fragment was then retouched into a notched denticulate tool.

A smashed flake was recovered from the upper Leon Creek paleosol (Figure 10.10b) and is a distal fragment of a larger percussion flake. The break

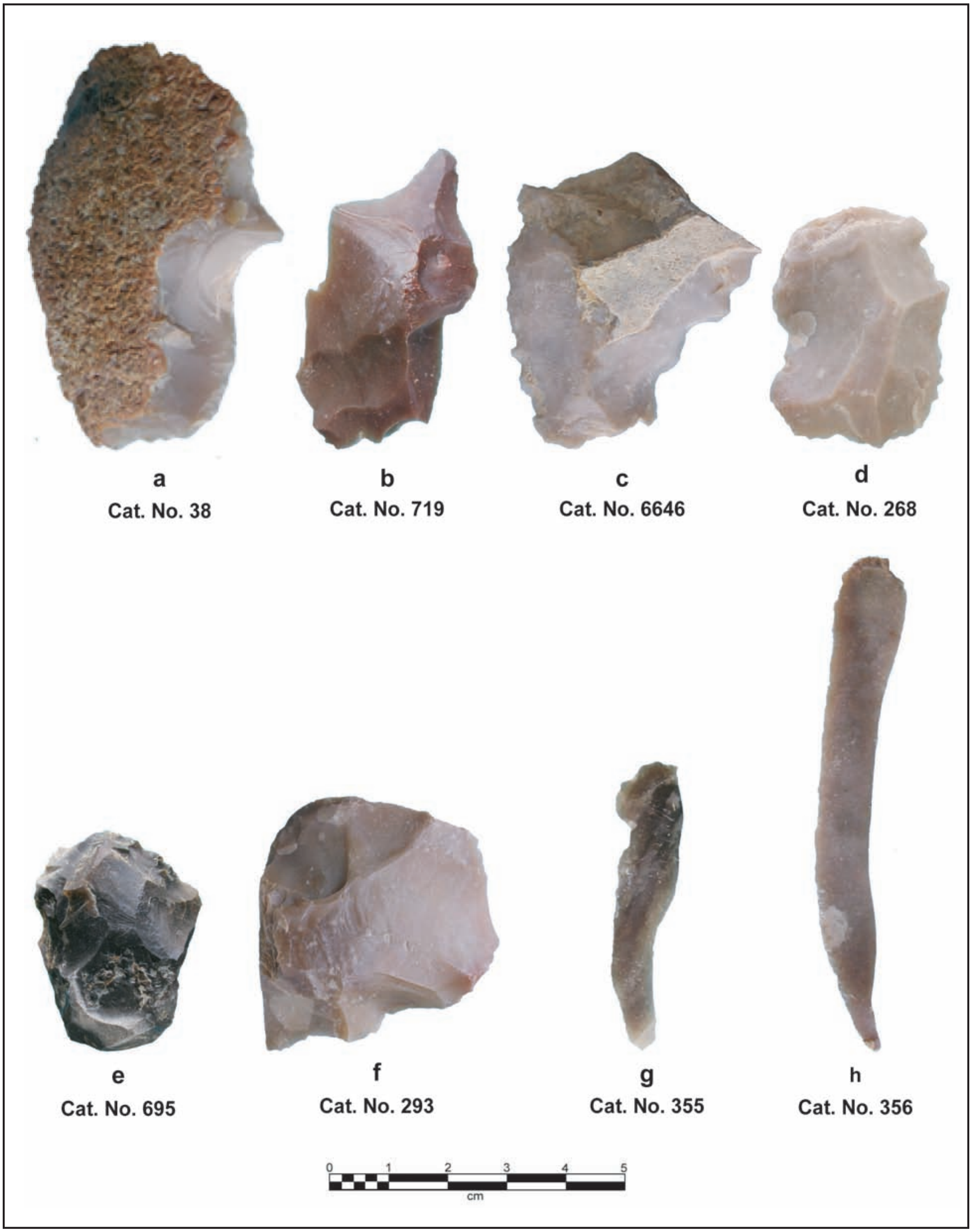

Figure 10.9. Edge-modified tools from the upper Perez components, early, Early Archaic period (ca. 8800–8600 B.P.): (a–b) gravers; (c–d) thick denticulates; (e–f) *pieces esquilles*; (g–h) burin spalls.

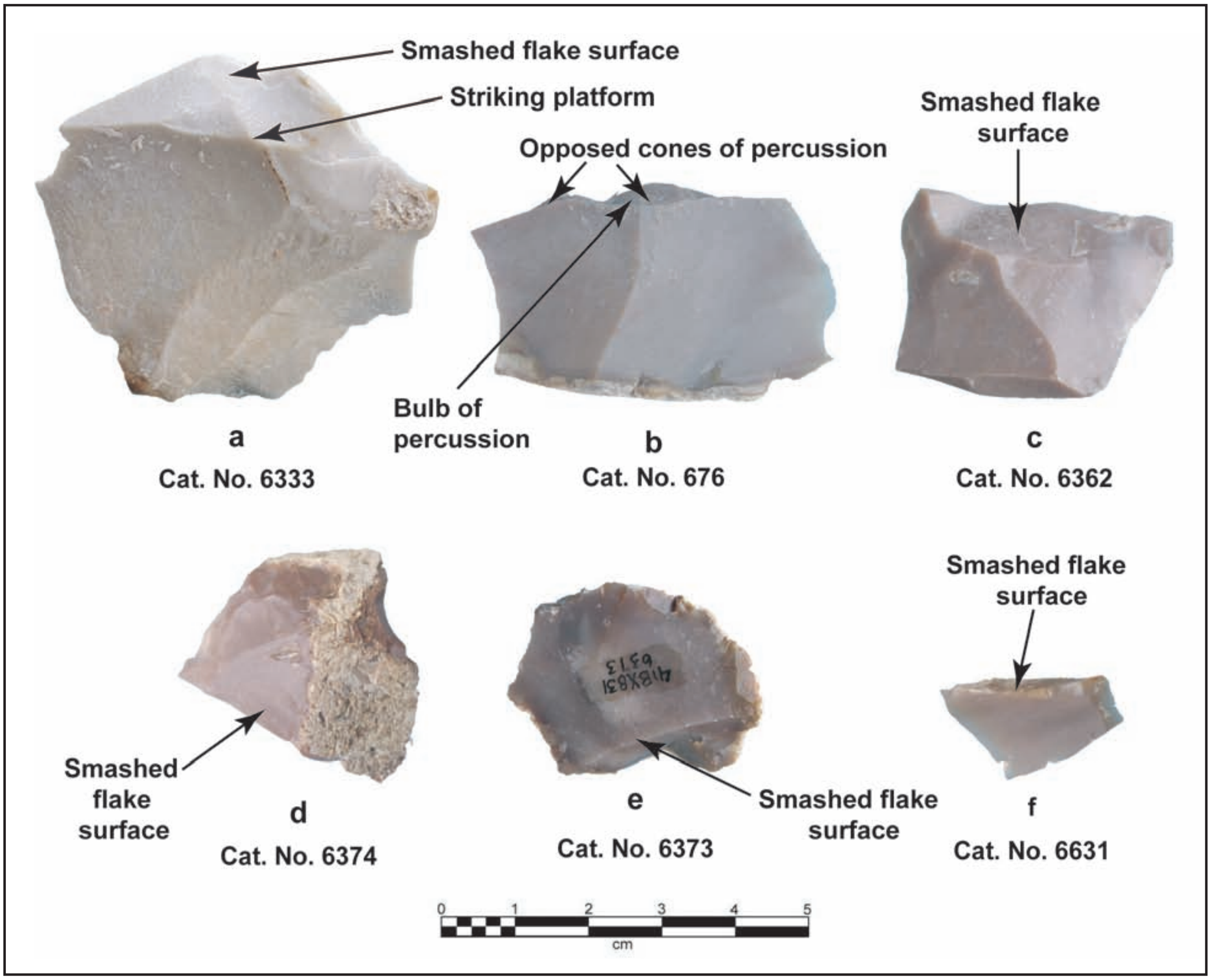

Figure 10.10. Smashed flakes from the upper Perez and other components at the Richard Beene site.

surface exhibits opposed percussion cones and radiating fractures at the midpoint of the transverse break. The lateral edge has microscopic edge wear suggestive of use as a cutting tool on a soft material. Features that were observed on other similar artifacts (Figure 10.10c–e) include small bulbs of percussion and ripple marks on transverse breaks with multiple cones of percussion on opposite surfaces suggestive of breakage on an anvil.

Non-flaked implements recovered from the upper Perez include three hammerstones (Figure 10.11), two of quartzite and one chert, and two pecked/ground chert artifacts. The dearth of hammerstones from early Holocene contexts suggests that these implements may have been curated and only discarded after they had either been damaged or were too small. As noted, however, it is also possible that soft hammers were used more often than hard hammers.

In summary, the upper Perez lithic assemblage represents one of the best examples of an in situ, well-dated Angostura assemblage in North America. Coupled with the abundance of Angostura points and the variety of bifacial and edge-modified implements, this assemblage provides a unique window into lithic technology associated with Angostura points. The non-biface portion of the lithic assemblage includes a variety of functional and morphological types, the majority of which appear to represent an assemblage distinctly oriented toward woodworking and toolkit maintenance and refurbishing.

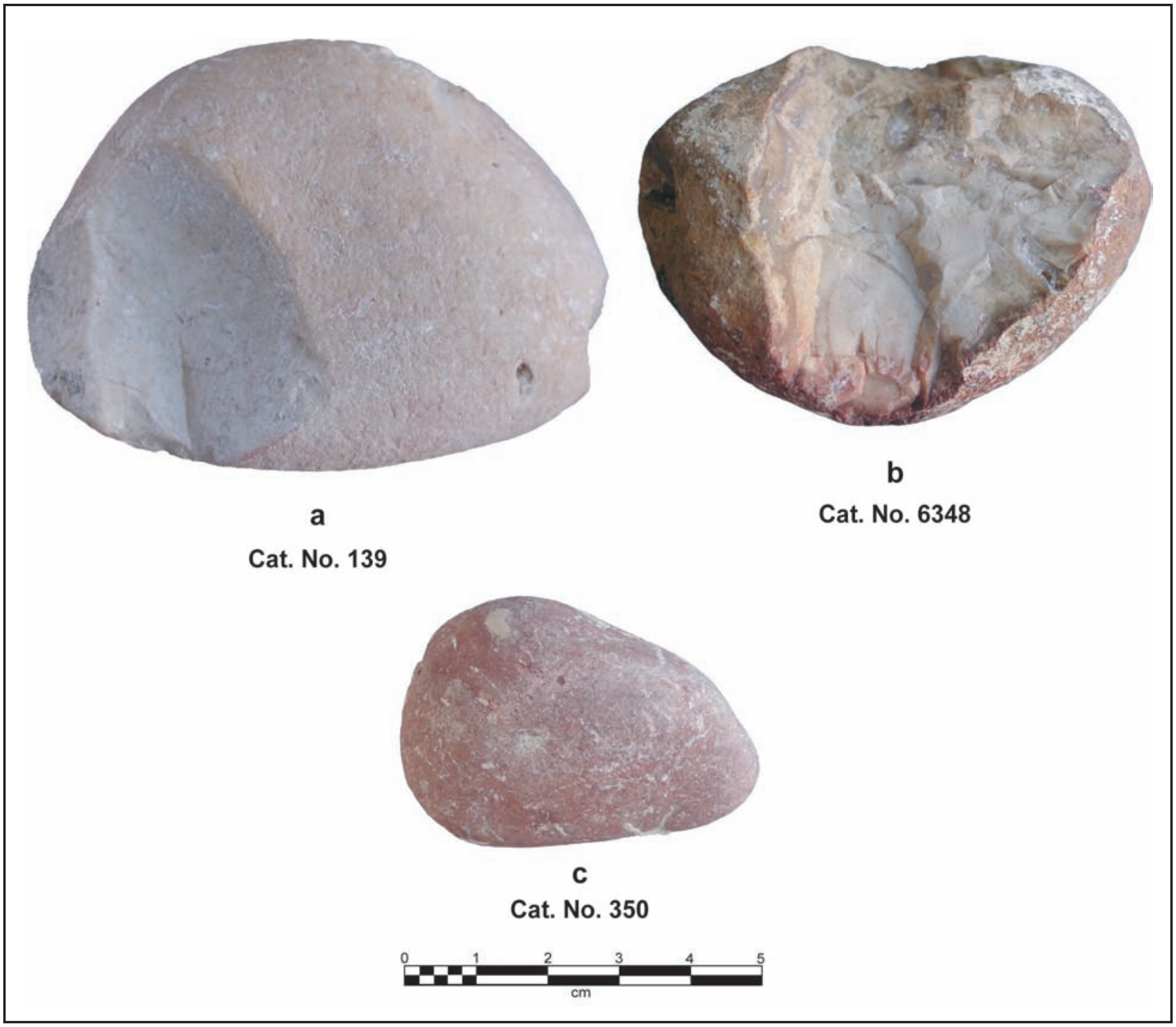

Figure 10.11. Hammerstones (a–c) from the upper Perez components, early, Early Archaic period (ca. 8800–8600 B.P.).

Middle, Early Holocene: Elm Creek Component

The Elm Creek components are dated to the middle, Early Archaic period (ca. 8500–7500 B.P.). They are composed of several small blocks (I, K, O, P, and M), most of which were excavated to salvage mechanically exposed features. Sample size from the Elm Creek paleosol is small (Table 10.16) and, accordingly, probably not "representative" as the Upper Perez assemblage. Projectile points are lacking and bifaces are few, as are other flaked and nonflaked tools. Characteristics of Elm Creek debitage discussed earlier indicate that bending initiation flakes dominate the debitage assemblage at 84.48 percent, the highest of all Holocene components.

The predominance of small flake sizes (grades 6 and 7) and the dearth of cores, bifaces, or other implements suggest that flake tool finishing or late-stage biface finishing were important activities. Sample size of tools and cores is too small to provide meaningful core/biface, flake/tool, or flake/core ratios. As discussed earlier however, the patterns for Elm Creek debitage follow closely those of the upper Perez, which suggests similar technological origins and perhaps similar range of behaviors.

Table 10.16. Middle, Early Archaic totals for flaked and non-flaked artifacts from several Blocks and proveniences (upper and lower Elm Creek) (values in bottom total row include total counts/percents).

Component	Block	Cores	Bifaces	Edge modified	Non-flaked	Points	Debitage	Totals
Elm Creek	K	4	2	2	-	-	226	234
Elm Creek	I	-	2	1	-	-	605	608
Elm Creek	O	2	-	-	1	-	-	3
Elm Creek	P	-	-	1	-	-	-	1
Totals	-	6/0.7	4/0.4	4/0.4	1/0.1	-	831/98.78	846

Edge-modified implements included two thick unifacial tools, one thin edge-modified tool, and one thick edge-modified tool (Figure 10.12a–e). Block I had two bifaces and Block K also had two bifaces (Figure 10.12g). Several cores were recovered from Blocks K and O. Two chipped stone axes (Figure 10.12h, i) were found on exposures of the Elm Creek paleosol in the spillway trench. One pecked/ground artifact, a possible bola stone, was recovered from Block O (Figure 10.12f). A grinding slab (Figure 10.12j) was recovered from the lower portion of the Elm Creek paleosol exposed in an exploratory backhoe trench (no. 61) dug near the south end of the spillway trench (Figure 4.2).

The Elm Creek lithic assemblage is similar to behavioral or technological organization of the upper Perez component, except for projectile points and the presence of two chipped stone areas. Given the absence of projectile points from any Elm Creek components, the bifacial counterpart of this assemblage can only be speculated. Non-bifacial flaked tools are broadly comparable to those of the upper Perez and overall the assemblage may represent a similar technological and behavioral adaptation to the earlier assemblage.

Late, Early and Middle Holocene: Medina Components

The lower Medina component is represented by Block G and dated to ca. 6900 B.P. The upper Medina component is represented by artifacts from lower Block A (ca. 4500 B.P.) and Block U (ca. 4600 B.P.) (Figure 4.1). Both core reduction and biface-related lithic activities are represented in Block G. Block U follows the same trend as the Elm Creek assemblages in being dominated by debitage (Table 10.16).

These patterns indicate basic technological differences between the late, Early and Middle Archaic that can most logically be explained as a result of different behaviors or activities. Technological ratios are useful only for the lower Medina component because of sample size limitations of the upper Medina components. The flake/core ratio for the lower Medina is 520.78, an unusually high value that indicates behaviors other than core reduction were responsible for the bulk of debitage production. The core/biface ratio for the lower Medina assemblages is 0.82. Values for individual lower Medina excavation blocks are similar and indicate that both core reduction and biface manufacture were characteristic behaviors. It is possible that by the middle Holocene, stylistic and technological changes in projectile point forms or changes in site function were influencing the lithic technology.

Projectile points from the late, Early Archaic assemblage (Block G) were predominately corner-notched and barbed, with parallel-sided to slightly expanding stems, usually with concave (i.e., indented) bases. These include Martindale-like and Bandy-like specimens (Figures 10.13a-b), Baker (Figures 10.13c-f), and Uvalde (Figures 10.13h) points. An unidentified lanceolate point (Figure 10.13g) and an unidentified stemmed indented base point (Figures 10.13i-j) are also represented. The Bandy/Martindale-like specimens have straighter bases than typically found on Bandy and Martindale points (Turner and Hester 1999). Only one of the stemmed/indented base points exhibited basal grinding. An interesting aspect of this projectile point

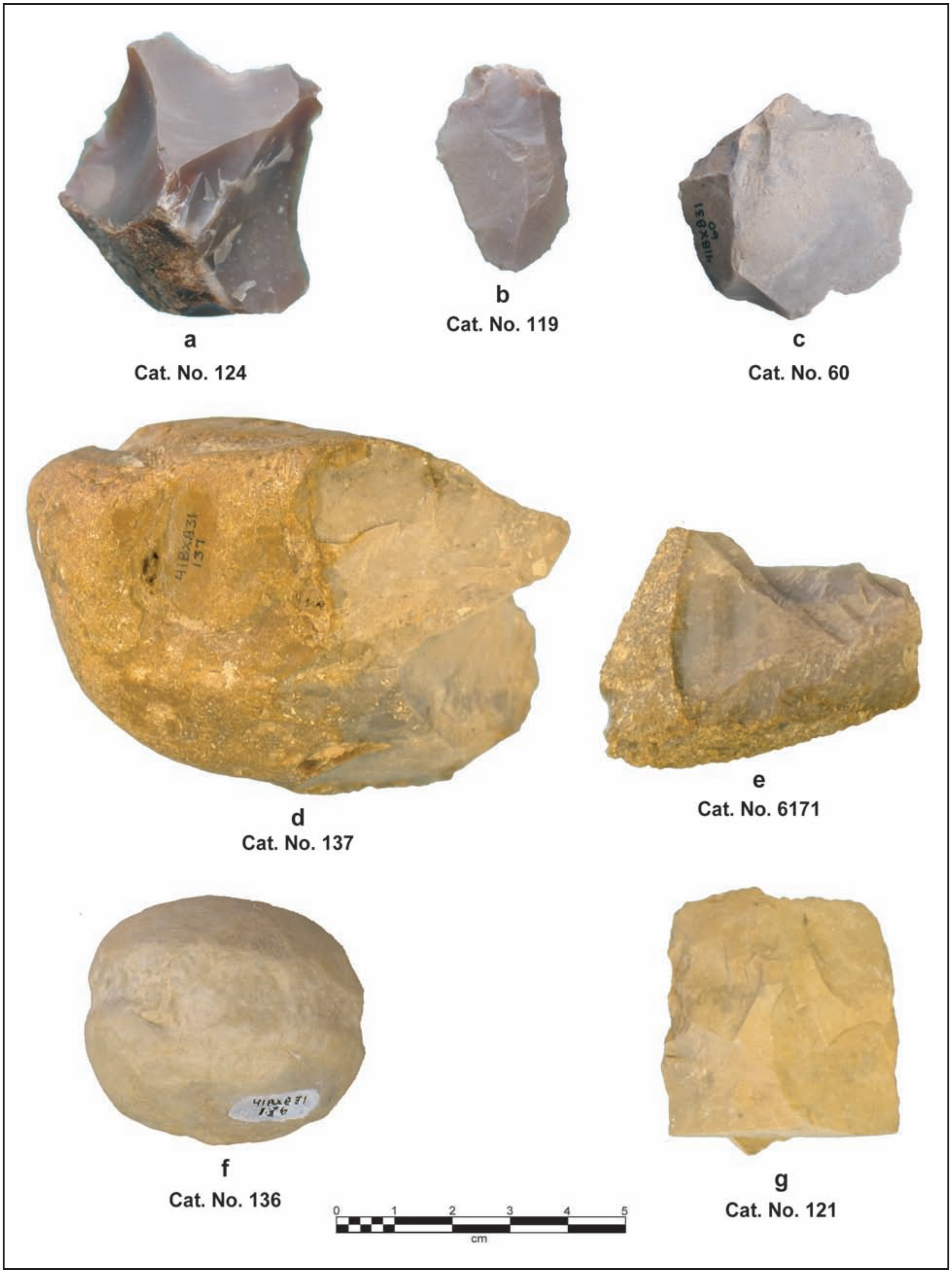

Figure 10.12. Selected artifacts from the Elm Creek component, middle Early Archaic period (ca. 7500–8500 B.P.): (a–c) edge modified tools; (d–e) cores; (f) possible bola stone; and (g) adze.

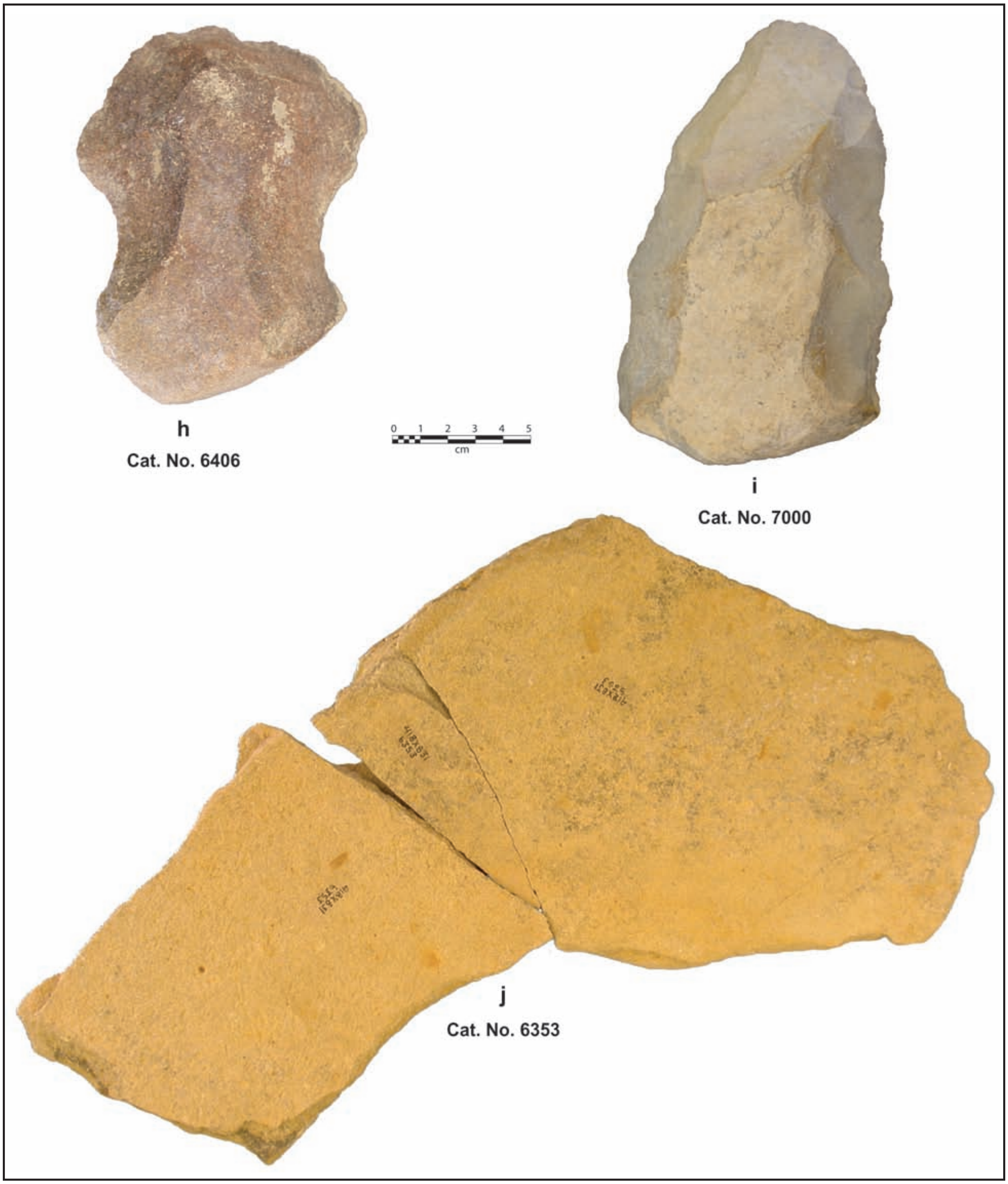

Figure 10.12(cont.).: (h–i) axes and (j) sandstone grinding slab.

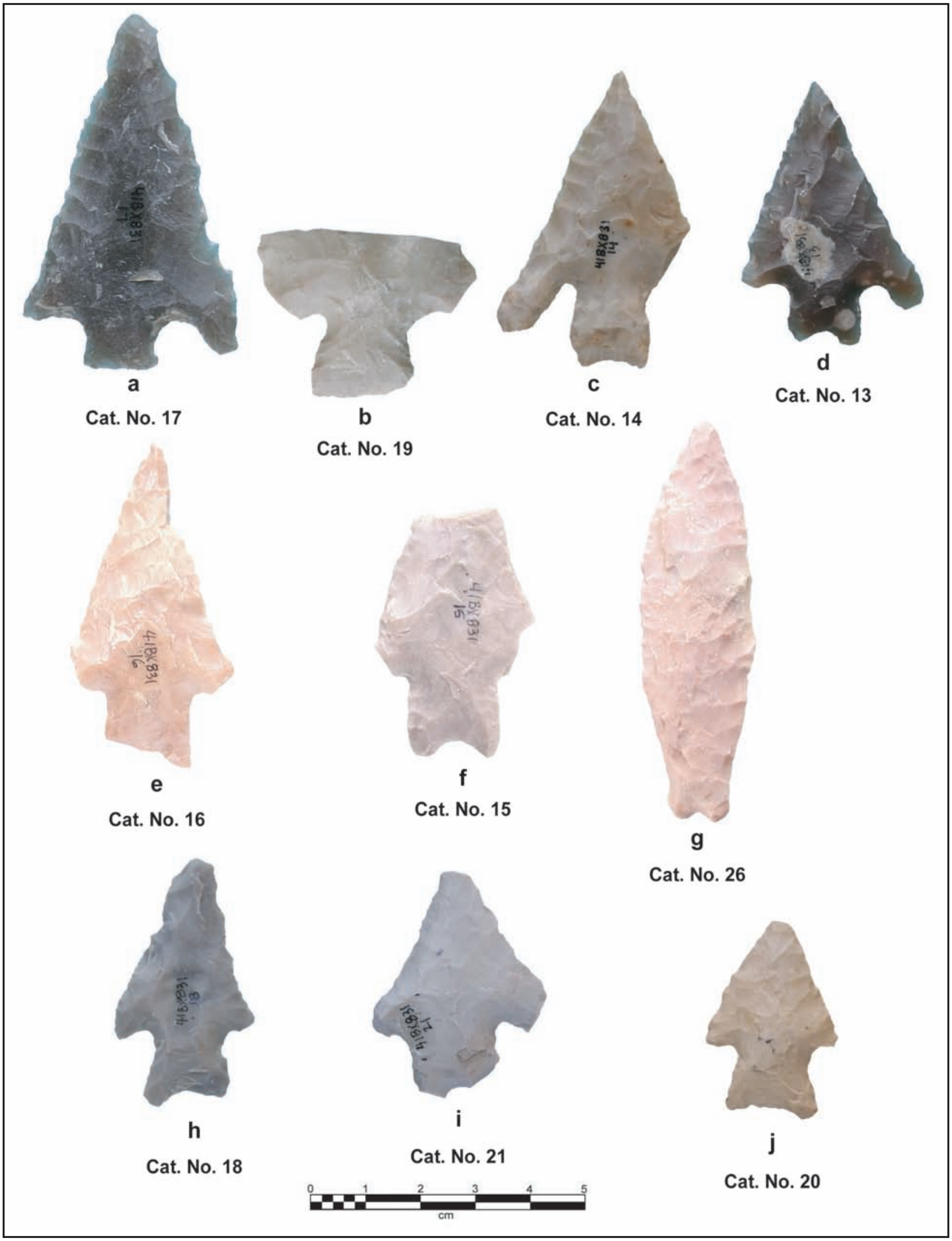

Figure 10.13. Projectile points from the lower Medina component, late, Early Archaic period (ca. 6900 B.P.): (a–b) Martindale/Bandy-like; (c–f) Baker; (g) unidentified lanceolate (Pandale-like?); (h) Uvalde; and (i–j) unidentified stemmed/indented base points.

assemblage is its resemblance to such types as the Kirk, Hardin, Jude, Decatur, and other stemmed/indented types that occurred in the southeastern United States at roughly the same time (Anderson and Sassaman 1996).

The unidentified lanceolate point (Figure 10.13g) superficially resembles an Angostura point but is technologically distinct. The lateral blade edges are considerably reworked and the barbs are missing. It appears that the lateral edges have been entirely reworked to give this point a lanceolate appearance. The cross-section is asymmetrical with slight bevels on the blade edges.

Possible identification for this specimen is as a Pandale type. Morphologically this point resembles Pandale in basal and blade characteristics. Argument against it being a reworked stemmed/indented point type is that none of the other projectile points with stemmed or indented bases are shoulderless. Further examination of this specimen is warranted.

A key characteristic of the lower Medina assemblage is that the lateral blade edges of projectile points are resharpened and beveled to varying amounts. The degree of reworking makes these points difficult to type. The degree of basal concavity is also variable. Early Archaic point types that could be represented within the variability of this group include Martindale, Uvalde, Baker, and perhaps Gower.

The Upper Medina component is represented by bifaces, unifaces, cobble tools, adzing tools, and cores (Figure 10.14). Two Desmuke points **(**Figure 10.15a**–**b), a Uvalde (Figure 10.15c), a Travis (Figure 10.15d), and an unidentified point are represented. Also in this assemblage are four Bell/ Andice fragments; the first is a complete barb/basal fragment with a portion of the blade (Figure 10.15e) and the second specimen is a barb (Figure 10.15f). Two smaller fragments of either Bell or Andice points were recovered from various upper Medina contexts near Block U (Figure 10.15g**–**h). Except for the Uvalde point, which is considered to be an Early Archaic type, these point styles are typical of the middle Holocene of central and south Texas (Turner and Hester 1999).

It should be noted that the Uvalde point (Figure 10.15c) was collected from a mechanical exposure of the upper Medina paleosol in the vicinity of Block U (Figure 4.1). This is the only specimen from the Middle Archaic assemblage that exhibits a distinctive patina that results from prolonged exposure to the sun. As such, it is possible that this early Holocene point was collected during the middle Holocene and eventually ended up encased in the upper Medina paleosol, which dates to about 4500 B.P. In any event, this particular Uvalde point is far more reminiscent of points from the lower Medina assemblage, dated to about 6900 B.P., than it is to other points in the Middle Archaic assemblage.

One Desmuke came from a surface exposure of the upper Medina paleosol (Figure 10.15a) and the second Desmuke (Figure 10.15b) was recovered from Block U within the upper Medina paleosol (4430±55 B.P. [GX–21746–AMS]). Both Desmuke points were heavily reworked and resharpened and represent points which were probably discarded during retooling and personal gear maintenance. The tip of one Desmuke point (Figure 10.15b) has been retouched into a dihedral burin by the removal of two small burin spalls along each lateral edge (Thoms et al. 1996:26). The technology of the distal tip is not characteristic of impact wear.

The tip of the Travis point (Figure 10.15d) exhibits an impact fracture that crushed the tip and then removed a burin-spall-like fracture along one lateral blade -edge. The Travis point was recovered from a surface exposure of the lower Leon Creek and upper Medina paleosols in the spillway trench (between ca. 4100 and 4500 B.P.) (Thoms et al. 1996:26).

Non-biface flaked tool types and bifacial implements from the Medina pedocomplex are similar to the upper Perez and include a variety of edge-modified implements that represent portions of a woodworking toolkit, inclusive of Clear Fork bifaces (Figure 10.16e**–**f; Table**s** 10.17 and 10.18). A common technological trait shared between lower Medina and upper Perez projectile points is the presence of lateral-edge beveling, suggesting that projectile points of both time periods served double duty as hunting and butchering tools. This phenomenon is not as

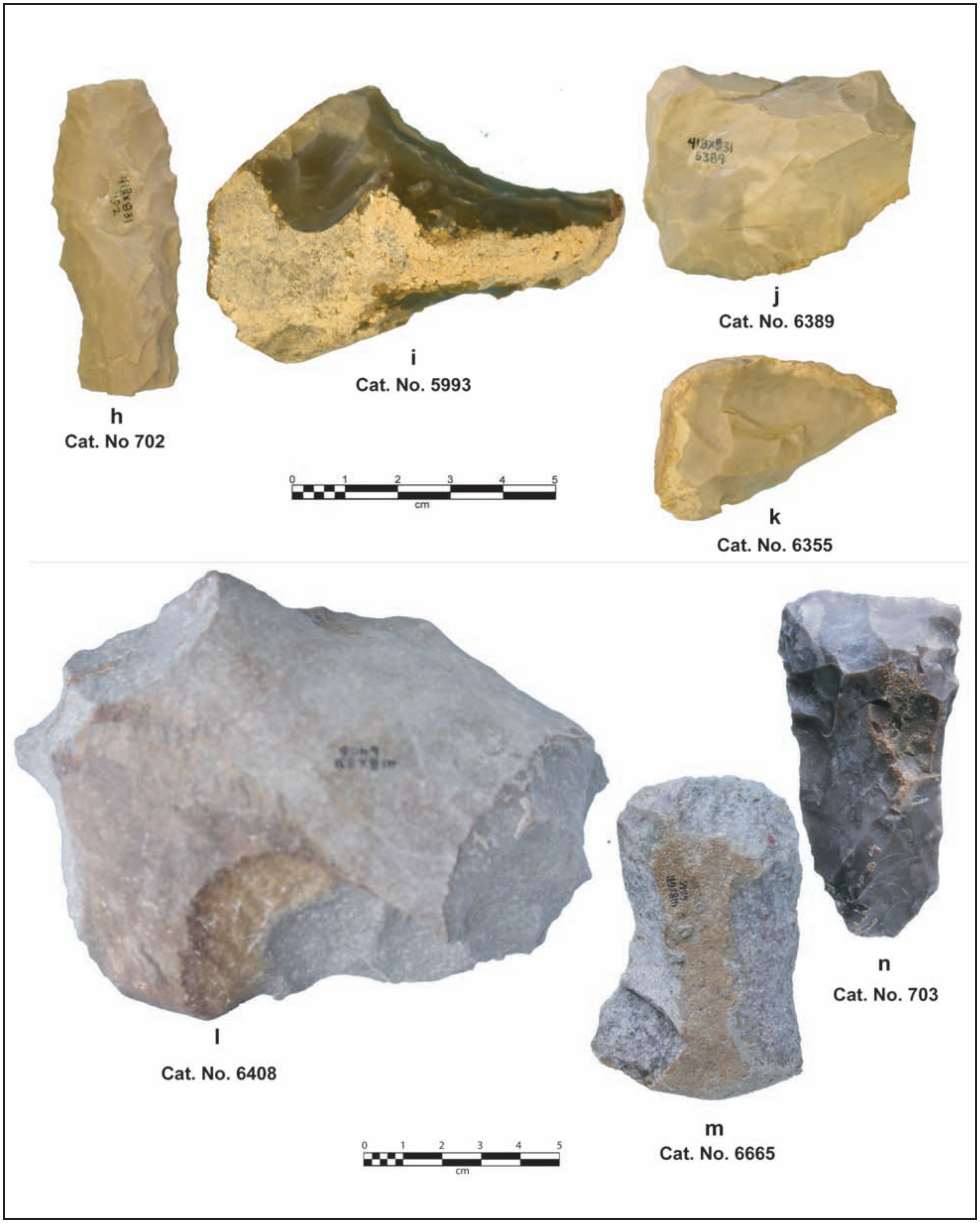

Figure 10.14. Selected artifacts from the upper Medina component, Middle Archaic period (ca. 4500 B.P.): (a) lenticular biface; (b) thick uniface; (c–d) cores; (e–f) hafted cobble tools (axes); and (g) adzing tools.

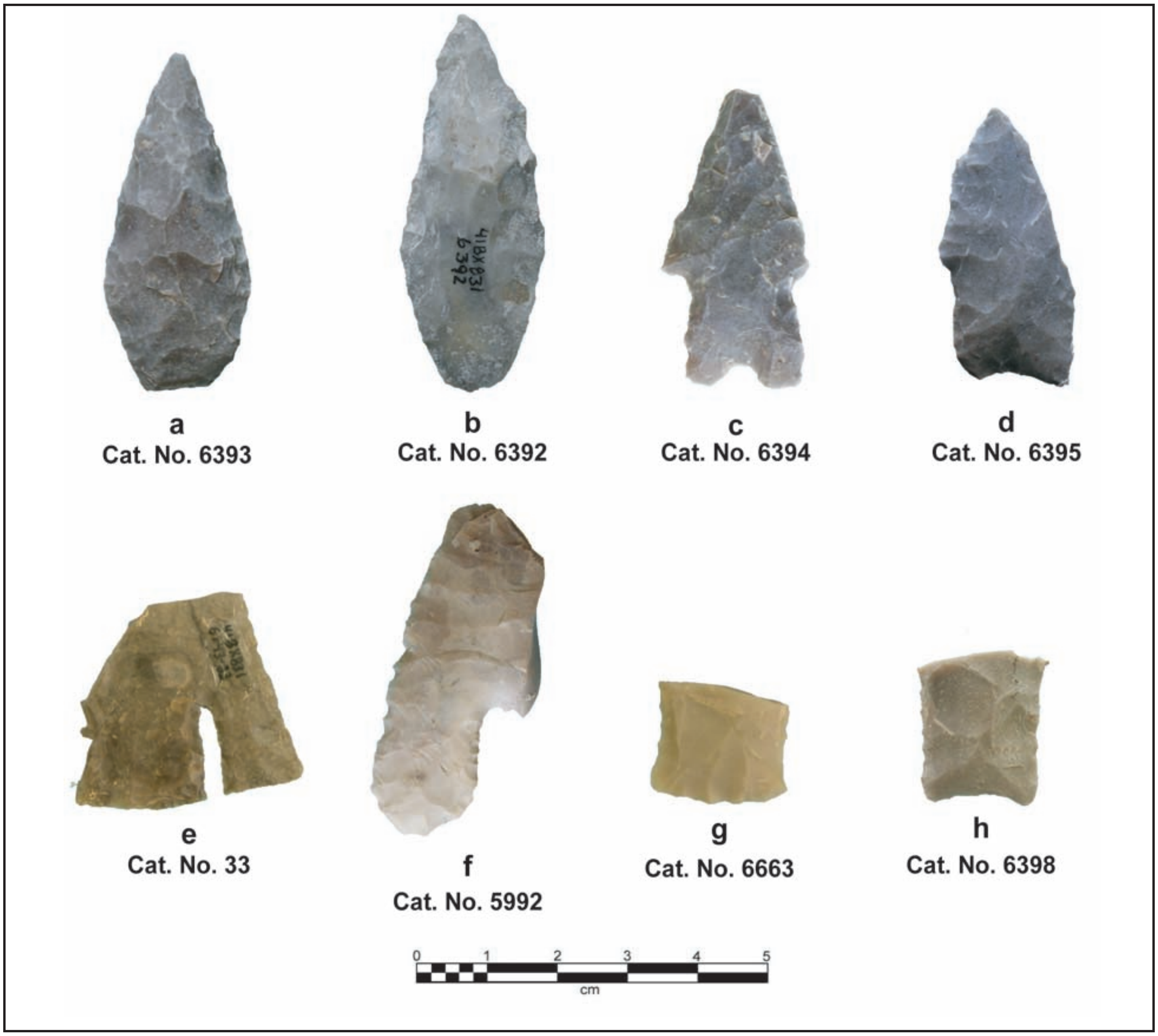

Figure 10.15. Projectile points from the upper Medina component, Middle Archaic period (ca. 4500 B.P.): (a–b) Desmuke; (c) Uvalde; (d) Travis; (e–f) Bell/Andice; and (g-h) possible Bell/Andice stems.

common on upper Medina and later period projectile points. Again, this is suggestive of a technological and behavioral change in hunting technology/behaviors during upper Medina times.

Early, Late Holocene: Leon Creek Components

The lower Leon Creek component (ca. 4100 B.P.) is represented by upper Block A. Lower Block B and Block D represent the upper Leon Creek (ca. 3500–2800 B.P.) (Figure 4.1). Block B represents the best assemblage from this component (Table 10.19). Late Holocene technological interpretations are based on the recovered Block B lithic assemblage. A flake/core ratio of 310.66 is again too high and suggests other behaviors influencing the composition of the lithic assemblage. A core/biface ratio is 0.52, indicative that both core reduction and biface manufacture characterized the assemblage to varying degrees.

Lower and upper Leon Creek components yielded a number of projectile points, 90 percent of them coming from lower Block B (Figure 10.17). Upper Block A yielded a proximal fragment of a

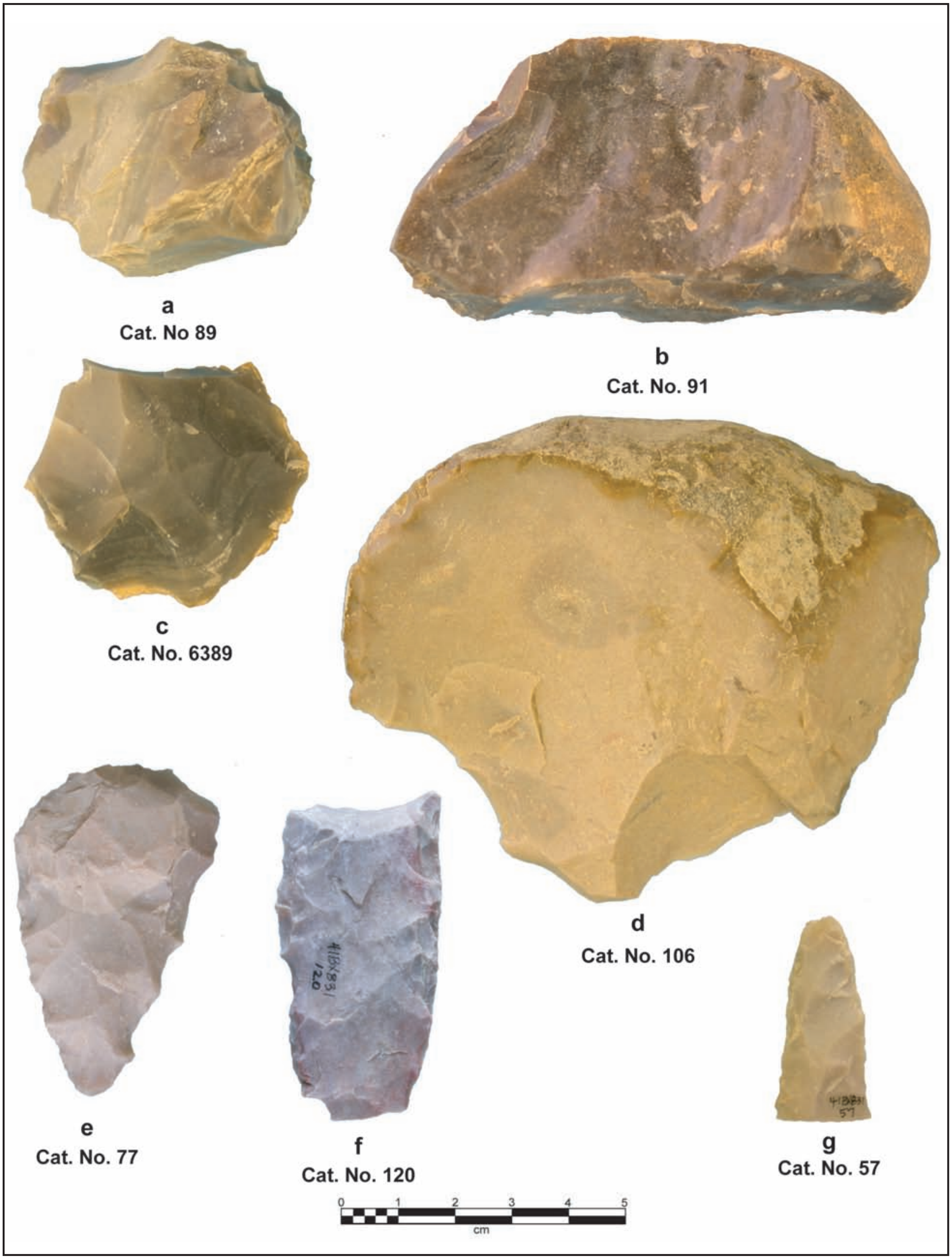

Figure 10.16. Selected artifacts from the lower Medina component, late, Early Archaic period (ca. 6900 B.P.): (a-c) cores; (d) thick uniface; (e–f) adzing tools; and (g) drill fragment.

Table 10.17. Late, Early Archaic totals for flaked and non-flaked artifacts from the lower Medina paleosol/ component (values in bottom total row include total counts/percents).

Component	Block	Cores	Bifaces	Edge modified	Non-flaked	Points	Debitage	Totals
lower Medina	Ga	5	4	3	1	3	615	631
lower Medina	Gb	11	16	37	-	5	9009	9078
lower Medina	Gc	2	3	1	1	2	271	280
lower Medina	Ge	1	-	-	-	-	-	1
lower Medina	EDM	-	-	-	-	1	-	1
Totals/ Percent	-	19/ 0.19	23/ 0.23	41/ 0.41	2/ 0.02	11/ 0.11	9895/ 99.03	9991

Table 10.18. Middle Archaic totals for flaked and non-flaked artifacts from upper Medina paleosol/component (values in bottom total row include total counts/percents).

Component	Block	Cores	Bifaces	Edge modified	Non-flaked	Points	Debitage	Totals
Lower Leon Cr.	Au	-	1	-	-	1	106	108
upper Medina	A	-	-	-	-	-	1375	1375
upper Medina	Al	-	-	1	-	-	-	1
upper Medina	U	1	-	3	-	-	258	262
upper Medina	EDM	-	-	-	-	4	-	4
Totals/ Percents	-	1/ 0.05	1/ 0.05	4/ 0.22	-	5/ 0.28	1739/ 99.37	1750

Table 10.19. Late Archaic totals for flaked and non-flaked artifacts from all Blocks and proveniences (upper and lower Leon Creek). Values in bottom total row include total counts/percents.

Component	Block	Cores	Bifaces	Edge modified	Non-flaked	Points	Debitage	Totals
B (upper Leon Creek)	Bl	24	45	50	9	10	7300	7438
D (upper Leon Creek)	D	-	-	-	-	-	38	38
Totals	-	24	45	50	9	10	7338	7476

projectile that is a projectile point barb. The upper Leon Creek (lower Block B) yielded Ensor (Figures 10.17a–c), Lange (Figure 10.17d), Marcos (Figures 10.17e–f), Marshall (Figure 10.17g), Pedernales (Figure 10.16h–i), and Langtry (Figure 10.17j) points. These point types are representative of the Middle and late-Transitional Archaic period in Texas (Turner and Hester 1999). There is one unidentified medio-distal blade fragment (Figure 10.18a) and a proximal or basal fragment (Figure 10.18b) that resembles a Pedernales base but remains untyped.

Edge-modified implements and bifaces occur in roughly equal proportions within lower Block B (upper Leon Creek), suggesting a relatively equal importance of both formal and informal implements and bifacial and core/flake technological strategies.

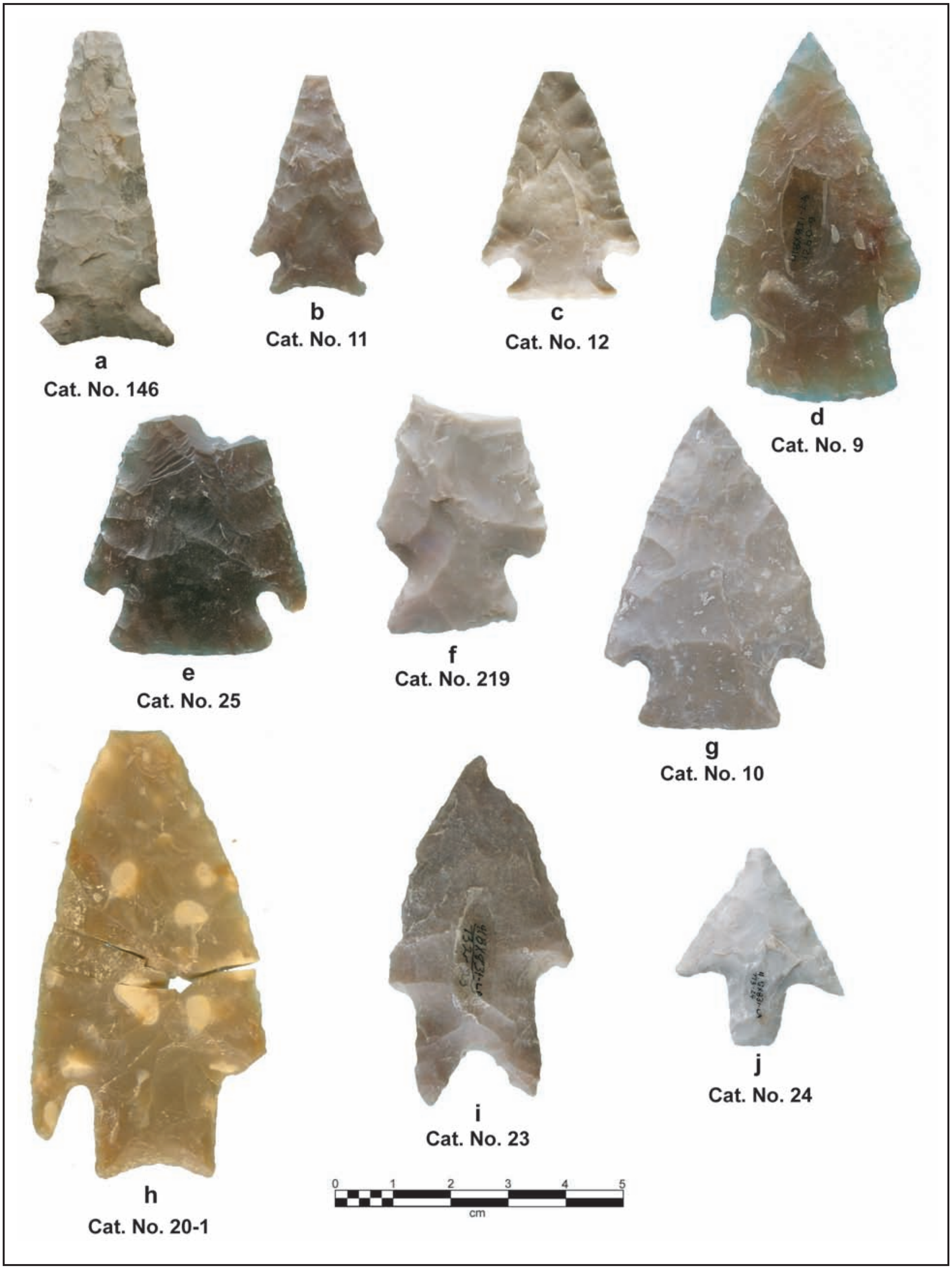

Figure 10.17. Projectile points from the upper Leon Creek component, early, Late Archaic period (ca. 3500–2388 B.P.): (a–c) Ensor; (d) Lange; (e–f) Marcos; (g) Marshall; (h–i) Pedernales; (j) Langtry .

Figure 10.18. Projectile point fragments from the upper Leon Creek component, early, Late Archaic period (ca. 3500–2388 B.P.): (a) unidentified medio-distal fragment; and (b) possible Pedernales base.

Edge-modified and bifacial artifacts are comparable to those recovered from earlier dated contexts (Figures 10.19 and 10.20, respectively).

Associated with the edge-modified tool component is a small number of non-flaked artifacts from lower Block B. Non-flaked implements include three hammerstones (Figure 10.21), a sandstone grinding slab (Figure 10.22), two hammerstones, and a piece of ochre. The presence of grinding slabs or fragments of these implements suggests the processing of vegetal food items. Such implements are not characteristic of other assemblages from the Richard Beene site, although one sandstone grinding slab was recovered from the Elm Creek paleosol.

Lower and upper Leon Creek lithic assemblage interpretations are based primarily on Block B artifacts. Debitage analysis indicates that both core reduction and biface manufacture were manufacturing strategies of these assemblages. In addition to an increasing variety of projectile point types such as Lange, Langtry, Marcos, Marshall, and Pedernales, a tip fragment of what appears to be a needle-sharp dart point was recovered from upper Block A. Again, non-biface edge-modified artifact types represent a continuation of forms from earlier components reflecting toolkit maintenance and woodworking. Local sandstone grinding slabs and fragments are also more abundant from Leon Creek contexts, although one fragment was recovered from an earlier Elm Creek component.

Late, Late Holocene: Payaya Component

The Payaya component represents the Late Pre-Columbian period (ca. 1200–400 B.P.) at the Richard Beene site. Behavioral interpretations of the Late Pre–Columbian Payaya component are limited because of sample composition and a predominance of debitage (Table 10.20). Meaningful technological ratios are not feasible. Debitage size grade data are ratios are not feasible. Debitage size grade data are broadly comparable with other assemblages from the Richard Beene site. The flaked artifact assemblage includes two finished but fragmentary arrow points: one Perdiz-like arrow point with a broken tip and a Scallorn or Perdiz-like fragment with the stem and tip missing. Other implements include one hammerstone, a core, an edge-modified flake tool, one biface, and one tool of unknown function (Figure 10.23).

Sample size is a distinctly limiting factor in terms of understanding Payaya lithic technology. Obviously, arrow points were in use based on the presence of two fragmentary specimens resembling Perdiz and Scallorn types. It is assumed that there were technological changes that were associated with the introduction of the bow and arrow.

Block and Paleosol Comparisons of Tool Function and Tool Discard

Comparisons of tool function and tool discard at the Richard Beene site provide information on temporal and probable spatial patterns of lithic behavior. Tool function was assessed by microscopic use-wear analysis of formal implements, minimally modified tools, and unmodified but utilized flakes. Use-wear analysis was not conducted to assess exact worked materials, but to provide broad interpre-

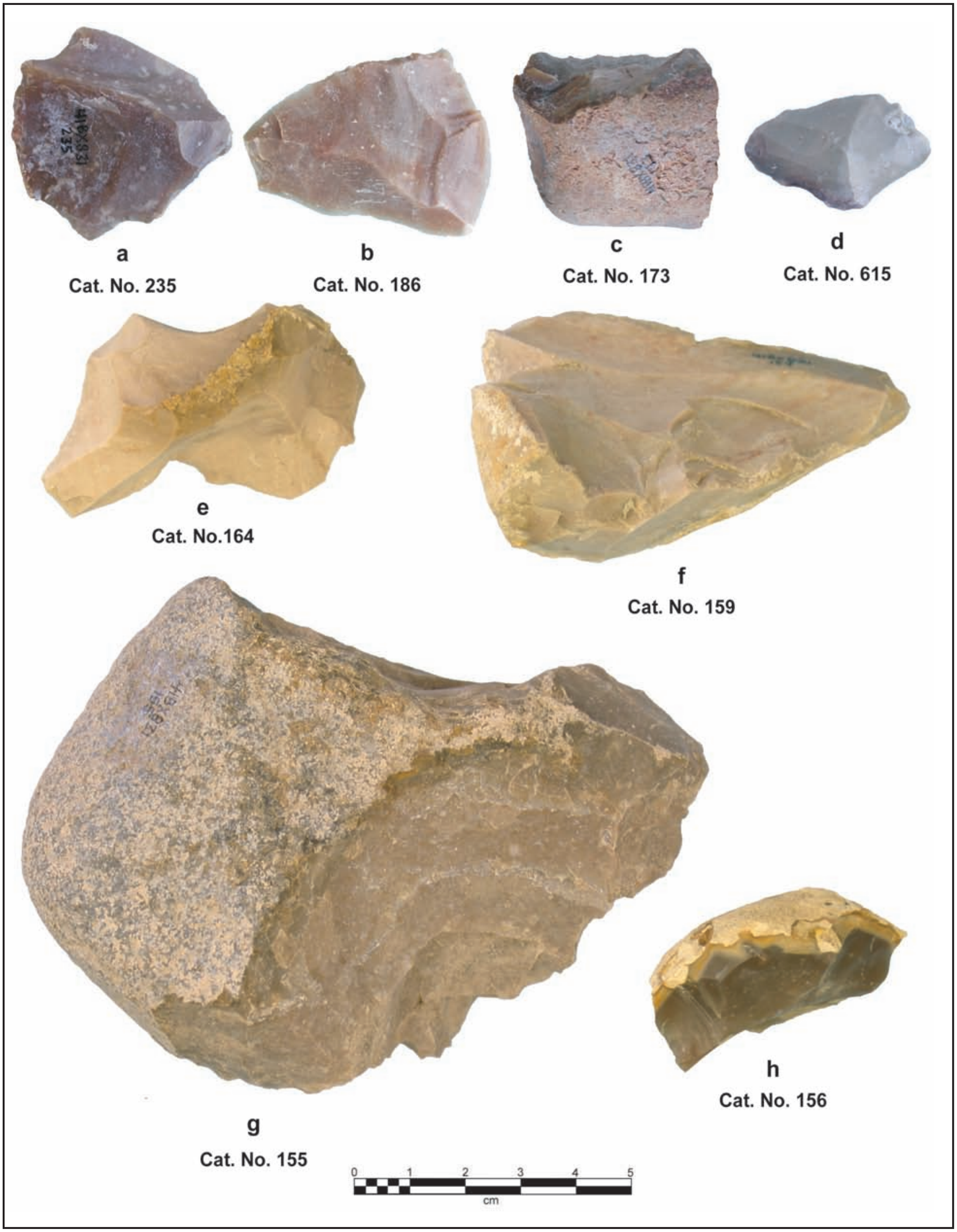

Figure 10.19 Selected artifacts from the upper Leon Creek component, early, Late Archaic period (ca. 3500–2800 B.P.): (a–d) edge-modified tools and (e–h) cores.

Figure 10.20). Bifacial tools from the upper Leon Creek component, early Late Archaic period (ca. 3500–2800 B.P.).

tations of tool motion and edge damage that could be used to develop behavioral inferences. All artifacts were initially scanned for use wear with a Nikon Stereomicroscope with a magnification range of 7–30X. Final functional interpretations and use-wear descriptions were performed using a WILD Heerbrugg Stereo-microscope with a magnification range of 6–100X. An Erinreich MKII fiber optic light source was used in conjunction with both microscopes. All tool margins and surfaces were examined for use wear. Functional assessments and descriptions were typically made between 40 and 100X.

Functional classification follows the classes employed by Ahler and Swenson (1985) in their analysis of lithic material from Big Hidatsa Village. The functional classifications, 66 in all, are morphological but also employ functional or traditionally typological terms such as drill, projectile point, knife, scraper, or spokeshave where deemed appropriate. The following section discusses tool functional inferences by block and component. The primary data for this section come from functional and morphological analyses of all edge-modified tools and bifaces.

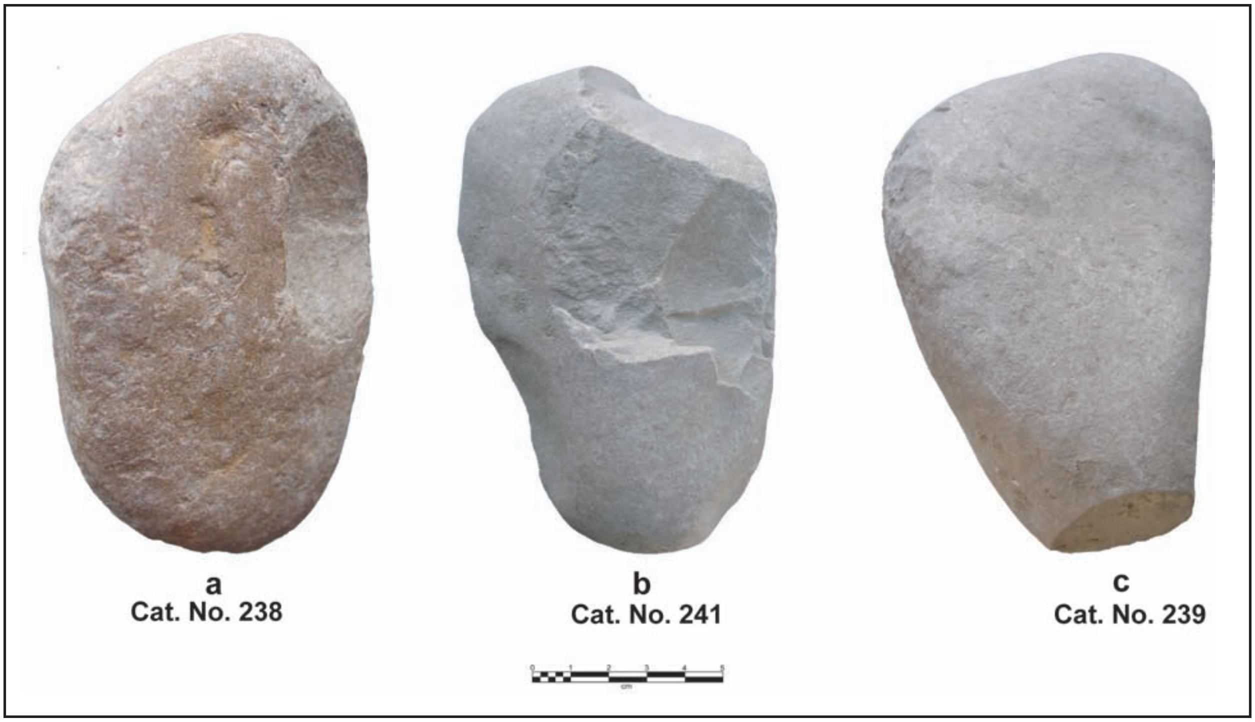

Figure 10.21. Selected hammerstones from the upper Leon Creek component, early, Late Archaic period (ca. 3500–2800 B.P.).

Tool Function in Upper Perez Component

Functional determinations and interpretations of chipped stone artifacts from the upper Perez components were compromised somewhat by effects of flood scouring that redeposited artifacts (Chapter 4). Flood scouring resulted in as yet undetermined edge damage to many specimens, although the amount of edge damage does not appear to have substantial. Nonetheless, results of the analysis presented in Tables 10.21 and 10.22 are useful from an overall site behavioral perspective. Due to size of the lithic assemblages, functional data are discussed in broad categories and not specifically in relation to particular tool types.

Bifaces present consistent results as having been employed in a variety of cutting, wedging, and adzing tasks, most probably related to wood-working tasks. These data speak of a fairly specific range of tool motions and perhaps functions for non-projectile point bifacial implements. Edge-modified flake tool functional data (Table 10.22) indicate a greater diversity of tasks or motions. By far, and not surprisingly, retouched or utilized flakes used on variable materials are most abundant in the assemblage. Wear patterns on these implements were variable, non-specific as to worked material, and exhibited varying combinations of abrasive and microfracture damage. Transverse scraping implements used on hard material and a variety of beaked flake tools represent the next most abundant implement types. These implements suggest that wood-working tasks were being conducted.

Whether the abundance of these tools can be equated to the rate at which these tasks were conducted or suggest that tools used in wood-working had a high attrition rate is not known presently. Other indications of wood-working include the presence of heavy-duty chopping tools, flake tools with denticulated edges, and flakes used to saw or slice hard material.

Most interesting in terms of general abundance, variety of tool types, and functional inferences are the biface and edge-modified implements from Blocks Ha and Hb. Lithic assemblages from both blocks suggest a similar array of tasks. To an extent, the Block Hc assemblage is comparable as well.

Figure 10.22. Selected non-flaked artifacts from the upper Leon Creek component, early, Late Archaic period (ca. 3500–2800 B.P.): (a) grinding slab fragment and (b) ochre fragment.

Table 10.20. Late Pre–Columbian totals for flaked and non-flaked artifacts from all Blocks and proveniences (Payaya component). Values in bottom total row include total counts/percents.

Component	Block	Cores	Bifaces	Edge modified	Non-flaked	Points	Debitage	Totals
B (Payaya)	B	1	1	1	1	2	622	628

Tool Function in Elm Creek Component

Two bifaces were recovered from the lower Elm Creek paleosol, in Block K. One is classified as a generalized, patterned bifacial cutting tool and the other as a beveled scraping/adzing implement or Clear Fork biface Figure 10.12g). There were only four edge-modified implements recovered from Elm Creek contexts; two retouched or utilized flakes used on variable material from Block K; a light-duty transverse scraper used on soft material from Block P.; and a beaked flake tool probably used as a slotting or grooving tool.

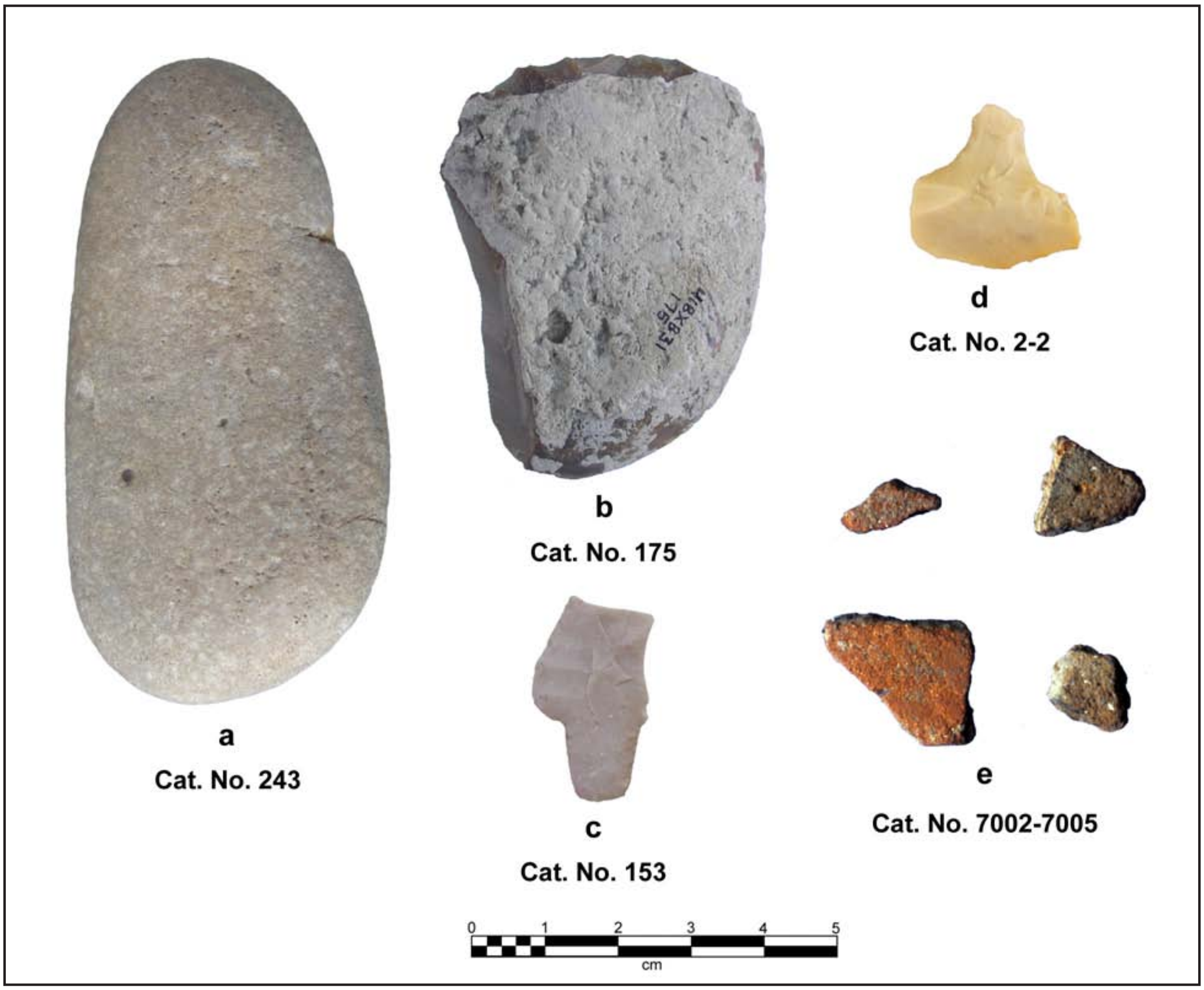

Figure 10.23. Selected artifacts from the Payaya Component, Late Pre–Columbian period (ca. 1250–400 B.P.): (a) non-flaked cobble tool; (b) thick edge-modified tool; (c) fragment of a Perdiz arrow point; (d) drill fragment; and (e) Indian ceramic sherds.

Table 10.21. Biface functional data for upper Perez components.

Block	Sub-block	Biface Functional Categories							
		Projectile	Perforator	Cut hard material	Generalized cutting	Punch/ wedge/ chisel	Scraping/ adzing	Generalized or unknown function	Undetermined
B	Bl	-	-	-	-	-	-	1	1
H	H	-	-	-	1	1	1	1	1
H	Ha	1	-	1	3	-	2	-	1
H	Hb	-	1	1	4	1	4	-	4
H	Hc	-	-	-	1	1	3	-	1
J	J	-	-	-	-	-	1	-	-
L	L	-	-	1	2	-	2	-	1
N	N	-	-	-	-	-	-	-	-
T	T	-	1	-	-	-	1	-	-
T	T2	-	-	-	-	-	-	-	-
-	BHT 1	-	-	-	-	-	-	-	-
-	EDM	-	-	-	1	-	1	-	-
-	Grab	-	-	-	1	-	-	-	-
Totals	-	1	2	3	13	3	15	2	9

Table 10.22. Edge-modified functional data for upper Perez components.

2. Perforator
5. Basal scraper/grinder
6. Light duty transverse scrapers used on soft materials
8. Expedient, general purpose cutting tool
13. Lateral scraper used on soft material
14. Heavy duty chopping, pounding tool
15. Generalized, patterned bifacial cutting tools
17. Transverse scrapers used on hard materials
18. Denticulated flake tool
19. Slotting, grooving tool (beak)
20. Generalized transverse scraping tool
22. Utilized flake used to saw or slice hard material
23. Retouched or utilized flake used on variable material
25. Core/punch/wedge/chisel
27. Steep-edged, heavy duty scraping/adzing tool
30. Graving, incising tool
45. Spokeshave
99. Undetermined

Block	Sub-block	Edge-Modified																	
Functional Category		**2**	**5**	**6**	**8**	**13**	**14**	**15**	**17**	**18**	**19**	**20**	**22**	**23**	**25**	**27**	**30**	**45**	**99**
B	Bl	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
H	H	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
H	Ha	-	1	1	-	-	-	-	2	4	2	1	6	29	-	-	-	-	-
H	Hb	-	-	6	1	-	2	-	8	-	6	1	7	52	-	-	-	-	6
H	Hc	-	-	-	-	1	-	1	-	1	2	-	-	19	-	-	-	-	1
J	J	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-
L	L	-	-	1	-	1	-	-	1	-	-	-	-	5	-	-	-	-	-
N	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
T	T	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-
T	T2	1	-	-	-	-	-	-	1	-	-	-	-	9	-	-	-	1	3
-	BHT 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	EDM	1	-	-	-	-	1	-	2	1	3	-	-	15	2	1	1	-	3
-	Grab	-	-	-	-	-	-	-	1	-	-	-	-	7	-	-	-	-	2
Totals	-	2	1	8	1	2	3	1	15	6	13	2	13	147	2	1	1	1	15

Tool Function in lower and upper Medina Components

Bifacial artifacts from the lower and upper Medina components represent the same general range of functions or tasks as those from the upper Perez paleosol (Table 10.23). The majority of bifaces were employed in a variety of functions and represent use on a variety of materials, although nothing specific. Small numbers make interpretations difficult. Edge-modified implements are dominated by retouched or utilized flakes used on a variety of materials (Figures 10.14 and 10.16).

Block Gb (late, Early Archaic) is representative of all Medina paleosol components and indicates functional continuity with early Holocene flaked tools. Functional data suggest a greater importance of wood-working tasks and a greater use of more specialized wood-working implements compared to assemblages from later Holocene contexts (Figure 10.15).

Tool Function in lower and upper Leon Creek Components

Functional data from lower and upper Leon Creek components (Table 10.24) indicate a similar range of tasks characterize these Holocene components. Bifacial artifacts (Figure 10.20) are associated with a rather narrow functional range and perhaps a limited set of associated tasks. The most common tasks or tool motions are generalized cutting and scraping/adzing, suggesting that bifaces may have been typically associated with wood-working and processing a variety of other materials.

Edge-modified flake tools from upper Leon Creek assemblage were most commonly associated with working variable materials. The most common tool type is retouched or utilized flakes used on a variety of materials, but the rest of the assemblage is strongly oriented toward wood-working tasks and appears to represent a wood-working toolkit (in general composition). Present are a single perforator, a heavy-duty chopping/pounding tool, a denticulated flake tool, three beaked implements (slotting or grooving), a unifacial beveled tool used in scraping or adzing, and a spokeshave or notched tool (Figure 10.19b). With the exception of certain blocks of the upper Perez, lower Block B exhibits the most clear-cut assemblage inferred to be associated with wood-working tasks.

Tool Function in Payaya Component

The Payaya assemblage (Late Pre–Columbian) is the smallest of all datasets from the Richard Beene site. A single retouched or utilized flake used on variable material was recovered from upper Block B (Figure 10.23). It is not possible to place it into any behavioral context.

Blank Types for Edge-Modified Flake Tools: A Block Comparison

Technological variability among different blank types used for modified and unmodified flake tools is instructive and relates to tasks associated with each assemblage. Nine different potential blank types were coded during the lithic analysis: (1) cobble; (2) cobble fragment; (3) cortex-free flake; (4) cortical flake; (5) macroflake; (6) blade; (7) burin spall; (8) core; and other/undetermined types. Edge-modified implements were selected for blank analysis because the majority of unfinished bifaces could not be identified as to blank type and most non-flaked implements were not appropriate for this type of analysis. Table 10.25 provides summary counts of particular blank types for components and excavation blocks.

Some particularly interesting trends were detected in this analysis. First, blank types such as burin spalls and blades are limited entirely to early Holocene components. Second, blades as a blank type for edge-modified tools are restricted to upper Perez components (Blocks Hb and Hc), and seem to co-occur with burin spalls. Cortical and non-cortical flakes are the most common blank types selected for edge-modified tool manufacture among all components. This suggests that the majority of the technology used to produce tool blanks was a generalized core reduction strategy and was characteristic of early, middle, and late Holocene occupations. Similarities can be observed among Blocks

Table 10.23. Bifacial and edge-modified tool functional data from the Medina components.

Block	Sub-block	Lower Medina (late, Early Archaic)							
		Projectile	Perforator	Cut, hard material	Generalized cutting	Punch/ wedge/ chisel	Scraping/ adzing	Generalized or unknown function	Undetermined
Biface Functional Categories									
G (LM*)	Ga	-	-	-	1	-	-	-	3
G (LM*)	Gb	2	-	-	4	-	2	6	2
G (LM*)	Gc	1	-	-	-	-	-	2	-
Edge-modified Tool Functional Categories									
		17	19	23	46	27	99	-	-
G (LM*)	Ga	-	-	3	-	-	-	-	-
G (LM*)	Gb	1	-	34	-	1	1	-	-
G (LM*)	Gc	-	-	-	-	-	1	-	-
Totals	-	22	19	60	52	28	103	8	5
Block	**Sub-block**	**Upper Medina/Lower Leon Creek (Middle Archaic)**							
Biface Functional Categories									
EDM (UM*)	-	-	-	-	-	-	1	-	-
Edge-modified Tool Functional Categories									
A (LLC*)	Au	1	-	-	-	-	-	-	-
A (UM*)	Al	-	1	-	-	-	-	-	-
U (UM*)	U	-	-	4	-	-	-	-	-
EDM (UM*)	-	-	-	-	1	-	-	-	-
Totals	-	1	1	4	1	-	1	-	-

* UM: upper Medina component; LM: lower Medina component; LLC: lower Leon Creek component.

Table 10.24. Bifacial and edge modified functional data from upper and lower Leon Creek components.

Block	Sub-block	Upper and Lower Leon Creek (Late and Middle Archaic)								
Functional Category		**Generalized cutting**		**Scraping/adzing**		**Generalized or unknown function**		**Undetermined**		**-**
Biface Functional Category										
B (ULC*)	Bl	25		2		2		17		-
Edge-modified Tool Functional Category										
		6	14	17	18	19	23	27	45	99
B	B	-	-	2	1	-	5	-	-	1
B (ULC*)	Bl	1	1	-	1	3	37	1	1	

* ULC: upper Leon Creek component.

Table 10.25. Blank types for edge-modified tools from 41BX831.

Component, Occupation, Block	Cobble	Cobble Fragment	Noncortex Flake	Cortex Flake	Macroflake	Blade	Burin Spall	Core	Other
upper Perez, early, Early Archaic, H	-	-	-	1	-	1	-	-	-
upper Perez, early, Early Archaic, Ha	-	3	24	20	1	-	2	-	-
upper Perez, early, Early Archaic, Hb	3	10	34	45	-	3	1	1	1
upper Perez, early, Early Archaic, Hc	-	1	9	10	-	1	1	-	1
upper Perez, early, Early Archaic, J	-	-	2	3	-	-	-	-	-
upper Perez, early, Early Archaic, L	1	-	2	5	-	-	-	-	-
upper Perez, early, Early Archaic, T	-	-	2	-	-	-	-	-	-
upper Perez, early, Early Archaic, T2	-	-	10	4	1	-	-	-	-
upper Perez, early, Early Archaic, Grab	-	1	4	4	-	-	1	-	-
upper Perez, early, Early Archaic, EDM	2	-	19	10	-	-	-	-	-
lower Elm Creek, middle, Early Archaic, K	-	-	1	1	-	-	-	-	1
upper Elm Creek, middle, Early Archaic, I	-	-	-	-	-	-	-	-	-1
lower Medina, late, Early Archaic, Ga	-	-	3	-	-	-	-	-	-
lower Medina, late, Early Archaic, Gb	-	1	20	11	-	-	3	-	1
lower Medina, late, Early Archaic, Gc	-	-	-	-	-	-	1	-	-
upper Medina, Middle Archaic, Al	-	-	-	1	-	-	-	-	-
upper Medina, Middle Archaic, U	-	-	4	-	-	-	-	-	-
upper Medina, Middle Archaic, EDM	1	-	-	-	-	-	-	-	-
upper Leon Creek, early, Late Archaic, B	-	-	4	3	1	-	-	-	-
upper Leon Creek, early, Late Archaic, Bl	1	1	26	11	-	2	-	-	2
Payaya, Late Pre-Columbian, Bu	-	-	-	1	-	-	-	-	-
Totals	8	17	164	130	3	7	9	1	7

Ha, Hb, Hc, and T of the upper Perez component, Block Gb of the lower Medina component, and lower Block B of the upper Leon Creek component.

Other technological, functional, and typological similarities have been demonstrated for these components indicating similar occupational intensity, site function, and technological organization at the site across time and space. The upper Perez component and associated assemblages, however, are distinctive in regard to the presence of blades and small burin spalls/cores that may be indicative of specialized activities which were not conducted in later time periods or were accomplished with a different toolkit.

Comparisons with Assemblages from Surveyed and Tested Sites

Technological changes among various diagnostic artifacts at the Richard Beene site closely follow those well documented for south Texas (Turner and Hester 1999). These have been described in some detail above but have not been placed within a regional context with the rest of the data generated during the archaeological survey of the proposed Applewhite Reservoir impoundment area. Analyses of the survey and testing data from the Applewhite project area documented a variety of diagnostics representing Early Archaic through Late Pre–Columbian/Protohistoric and Historic periods (Dockall and Pevny 2008).

Diagnostic projectile points and fragments indicate the broad time periods represented at sites in the Applewhite Reservoir project area. Several dozen sites located within a few km upstream of the Richard Beene site produced similar Early, Middle, and Late Archaic dart points and/or Late Pre–Columbian arrow points (Mandel et al. 2008; McCulloch et al. 2008). Late Pre-Columbian arrow points, however, comprised 57.5 percent of the all diagnostic points, far more than was the case for the Richard Beene site. These data suggest that survey and testing efforts during the Applewhite Reservoir archaeological project primarily sampled younger sites. While the some of the downstream sites were on high terraces where projectile points of all different time periods were exposed on the surface, most of the surveyed and tested sites were on the Applewhite terrace. Artifacts exposed on the Applewhite terrace tended to be only a thousand years old although it is likely that much older projectile points were buried in the terrace fill well beneath even the deepest test pits. Table 10.26 provides summary data on temporal diagnostics recovered during survey efforts.

The variability of projectile points and bifacial diagnostics recovered from surveyed and tested sites is much greater than the projectile point variability encountered at 41BX831. Virtually all projectile point types identified from any one of the surveyed and tested sites are represented by single specimens. The Late Pre–Columbian period at several sites was represented by multiple examples of a single type. The only other diagnostics recovered during the survey were a Guadalupe biface from 41BX526 and Clear Fork tools from 41BX526 and 41BX872.

A single Angostura point from 41BX793 represents early, Early Archaic occupation within the reservoir area, whereas more than a dozen specimens were recovered from 41BX831. Documented early, Early Archaic occupation elsewhere in the reservoir area is sparse attesting to the significance of the Richard Beene site assemblages from the upper Perez components.

Middle, Early Archaic evidence for occupation within the project area is more abundant. Representative point types include Abasolo (41BX872), Bulverde (41BX526, 41BX854), Thinned-Base Early Triangular (41BX526, 41BX539, 41BX670), La Jita (41BX849), and Uvalde (41BX532). A Uvalde point type was also recovered from 41BX831. Again, the data suggest that evidence for Early Archaic occupation, based on presence of diagnostic points, is rather sparse and widely scattered within the project area.

Middle Archaic evidence for occupation and settlement within the project area is more abundant and perhaps suggests some logistical and subsistence changes between the early and middle Holocene periods. Point styles representative of this period

Table 10.26. Summary data on recovered temporal diagnostic projectile points from the survey efforts.

Time Period	Types Represented (whole identifiable)	Count	Percent
early, Early Archaic	Angostura	1	1.25
late, Early Archaic	Abasolo, Bulverde, Thinned-Base Early Triangular, Uvalde, LaJita	8	10.00
Middle Archaic	Carrizo, Pedernales, Tortugas, Pandora, Ellis, Marshall	14	17.50
Late Archaic	Marcos, Montell, Frio	8	10.00
Transitional Archaic	Ensor	2	2.50
Late Pre-Columbian	Alba, Edwards, Scallorn, Perdiz	46	57.50
Historic/Protohistoric	Guerrero	1	1.25
Totals	-	80	100.00

include Carizzo (41BX528, 41BX544), Pedernales (isolated find, 41BX528, 41BX540, 41BX546, 41BX831), Tortugas (41BX534, 41BX669, 41BX793), Pandora (41BX552), Ellis (41BX554), and Marshall (41BX539).

Late Archaic types evidence an even greater diversity of point styles. Types found at sites in the project area include Marcos (41BX528, 41BX858), Montell (41BX526, 41BX528, 41BX872), and Frio (41BX528, 41BX872). Transitional Archaic point styles are represented by two Ensor points (41BX528, 41BX537).

Untyped dart point preforms were found at 41BX346 and 41BX534. Several finished but untyped dart points were also found. These were a small corner-notched specimen from 41BX537, a larger triangular corner-notched point from 41BX528, two stemmed points from 41BX526, and a shouldered point from 41BX834. Miscellaneous fragments were recovered from three sites: 41BX526, 41BX534, 41BX539.

Late Pre–Columbian evidence represents a minor difference in projectile points recovered from surveyed and tested sites. The first notable difference is that multiple examples of point types are found at single sites more commonly than single specimens of dart points. The second notable difference is that Late Pre–Columbian diagnostics are limited to only four types: Alba (41BX528, 41BX544), Edwards (41BX525, 41BX537, 41BX544), Perdiz (41BX374, 41BX528, 41BX534, 41BX537, 41BX544), and Scallorn. Other arrow points include a unifacial contracting stemmed point (41BX669), a unifacial side-notched example (41BX528), and a stemmed point made on a biface fragment (41BX863). Arrow point preforms were recovered as surface finds from 41BX528, 41BX534, and 41BX637.

A single Guerrero point was found at 41BX528 and represents the Historic period. Within the project area, Protohistoric and Historic occupation was identified at the Pampopa–Talon Crossing site (Thoms and Ahr 1995).

Summary and Conclusions

The Richard Beene site can be placed within a framework of a mobile group settlement pattern. The site's artifact assemblages are defined spatially and stratigraphically. In that sense, each assemblage represents a different occupation or at least spatially segregated sets of artifacts indicative of different tasks. The site probably served as a base camp, logistical and/or residential, within a mobile hunter–gatherer economic and subsistence system. Based on observed patterning within and between different artifact assemblages recovered from the site, it probably served alternately as both types of camps. Assemblage composition and size differences may, in part, document this phenomenon, which is related to time, season, and duration of occupation.

Site 41BX831 can be considered a lithic raw material source area, but only as incidental to utilizing the site for other resources. The local lithic material was not the primary reason for site location and occupation. Based on the presence of hearth features and a diversity of tool types, food procurement and processing were undoubtedly the principal focus of site occupation, with lithic material procurement and tool manufacture related to and supporting these activities.

Support for this inference is the relative scarcity of biface preforms and finished bifaces that were manufactured of local material. Debitage and artifacts that would document a biface manufacture strategy as part of the lithic technology are scarce as well. Preforms and other unfinished and finished bifaces seem to have been gear that was made or employed off site, perhaps within the logistical and foraging radius of 41BX831. Broken and otherwise worn out hunting gear was likely returned to the site for repair, replacement, and discard. Primarily very late-stage shaping or sharpening seems to have place on site during gear repair. Again, support for this inference is based on the dearth of projectile point preforms, manufacturing failures, and early-stage bifaces.

Local chert gravels were used to manufacture a range of heavy- and light-duty tools for resource procurement and processing. Wood-working implements are a significant component of the preserved and recovered technological assemblage. They represent an important aspect of the core reduction strategy at the Richard Beene site from the early to late Holocene.

For Pre–Columbian lithic assemblages in general it is typically difficult to address questions about functional diversity since the types are an organizational construct of the archaeologist. Moreover, the recovered tools represent only the discarded portion of the overall technology. Discarded tools such as broken projectile points may not have been used on site, but represent a different set of behaviors not directly associated with the main tasks at the site.

In the case of 41BX831, the best understanding of tasks that were conducted at the site is obtained from informal flake tools and non-projectile point bifaces. Projectile points represent hunting, a task that occurred within the logistical or foraging radius of the site but not on the site itself. Projectile point use on-site was almost entirely related to repair, replacement, and discard of broken gear. These were probably ancillary activities conducted in association with the main resource procurement and processing tasks that were being conducted. This is not to say that projectile point manufacture never occurred, but there is only limited evidence for it. An alternative could be that this task was spatially segregated elsewhere from those locations that were excavated.

High frequencies of expedient tools in the assemblages from this site could reflect the use and discard of tools manufactured of local material in partial effort to conserve personal gear and tools manufactured of non-local chert. The character of the lithic assemblage from the site suggests certain convincing similarities with what Binford (1978a) had termed a foraging campsite.

It is apparent from the composition of the lithic assemblages that local raw materials played a significant role in the technological organization. Binford (1977, 1978a, 1979, and 1989) stressed that variables of mobility, resource distribution, and tool/task relationships were integrated with tactical and planning depth (Binford 1989). Planning depth includes tool manufacture, transport, and maintenance. Tactical planning is used to assure that technological needs are met. In terms of the Richard Beene site, these variables undoubtedly formed a basis of decision making which structured the organization of the lithic technology.

Provisioning was a key logistical behavior at the Richard Beene site (cf. Kuhn 1990). Beginning in the early Holocene, lithic technology emphasized activity-level provisioning in which the majority of tools were manufactured, as items were needed, and then discarded soon after use. This pattern of tool manufacture and use is comparable to Binford's concept of expedient technology (Binford 1977, 1979). A predictable supply of suitable lithic material is necessary for this level of provisioning to occur.

Some of the technology at the site was organized around provisioning to equip individuals with toolkits and personal gear (Binford 1977). At the Richard Beene site this is reflected indirectly by the presence of items that may be considered to have formed components of personal gear. This would include projectile points, bifacial preforms and cutting implements, bifacial and unifacial adzing implements, hammerstones, and formal unifaces.

At present, it is not possible to estimate the proportion of each assemblage that represents personal gear. Components of personal gear are typically under heavier or more frequent use demands than expedient gear. This results in higher attrition, tool breakage, repair, and replacement rates than expedient tools. Virtually every projectile point recovered from the site exhibits evidence of either resharpening prior to discard or represents basal fragments that were carried back to the site for replacement. This similar pattern is also reflected in a majority of the beveled bifaces (i.e., Clear Fork and similar tools) and in unifaces. On the basis of lithic evidence, there is no direct indication that areas of the Richard Beene site were deliberately provisioned, either in terms of cached tools, tool blanks, or raw material. The geological occurrence of suitable chert materials in the vicinity of the site would indicate that these types of provisioning activities were not necessary.

The research questions (Carlson et al. 1990) that were generated for the Applewhite Reservoir archaeological project can be addressed to varying degrees with information derived from the present lithic analysis. It is not certain when inhabitants first arrived in the area, but it is known that the site environs were intermittently occupied into the Late Pre–Columbian period. Also, based on excavation data, it is certain that there are undisturbed or at least minimally disturbed deposits dating to the early to late Holocene periods.

Throughout the Holocene period subsistence patterns and associated technology remained sufficiently the same to argue that a broad-spectrum forager pattern of subsistence was practiced. Technological changes were primarily associated with formal tools such as bifaces and projectile points. Styles changing but the same basic functions remained.

Research questions concerning technology can be addressed in greater detail. The composition of the toolkit for much of the Holocene at the Richard Beene site remained quite stable. This suggests: (1) the site continued to fill the same role within the forager regimen; (2) subsistence and technological behaviors remained comparable across time; and (3) perhaps use became less intensive over time.

Toolkit composition included both a curated and formal aspect as well as an expedient component. The formal, curated implements included heavily retouched and hafted unifacial tools, hafted and unhafted bifacial knives and preforms, and projectile points. Evidence that these implements were curated is represented by the presence and abundance of basal point fragments, worn out retouched flake tools, heavily retouched and resharpened projectile points, and other bifaces. Expedient tools made with hard and/or soft hammers include thick and thin flakes with a variety of edge morphologies that may have been functionally relevant. The abundance of denticulated, serrated, notched/beaked flake tools coupled with varied wear patterns suggests the exploitation of a number of different environmental resources. Wear patterns of expedient flake tools and bifacial adzes indicate that wood procurement and modification was a common activity.

Comparative Studies

Some of the more appropriate studies to which the Richard Beene site can be compared are found in a recent volume by Anderson and Sassaman (1996), entitled *The Paleoindian and Early Archaic Southeast*. The comparison of 41BX831 with the greater Southeastern United States is legitimate on several grounds, one of the most logical being that of geography. Wissler (1917) described the environs that encompass the site as ecotonal between the Plains and Southeast culture areas. Thoms (Chapter 2) noted the geographic position of the site within the Post Oak Savannah on the southern edge of the Great Plains. The site lies within the inner portion of the

West Gulf Coastal Plain within 50 km of the Great Plains province. Floral and faunal characteristics indicate a broad similarity with the rest of the West Gulf Coastal Plain.

One of the more notable aspects of the early Holocene technology of the Richard Beene site is that it is predominantly expedient in character. Other researchers have documented a similar technological shift from curated to expedient lithic technological organization between 9800–9000 B.P. (Anderson and Sassaman 1996:27–28). This shift, they suggested, marked change to a foraging subsistence system based on residential mobility.

In his discussion of Early Archaic settlement patterns along the Savannah River floodplain of South Carolina, Daniel (1996:88–89) noted that a comparison of the abundance of formal versus expedient tools revealed differences between a collector settlement system and a forager settlement system. He noted in a comparison of seven Savannah River sites that expedient tools dominated lithic assemblages, hence a forager strategy. Other lines of data from the site suggest the Richard Beene site fits well with this pattern of a forager settlement system dominated by a generalized subsistence regimen. But Daniel also concluded that the differences in raw material use patterns along the Savannah River were influenced by local geological conditions, a conclusion that can likewise be readily applied to the Richard Beene site.

In terms of assemblage composition and site type, the Richard Beene site resembles the Haw River site (31CH29) in North Carolina (Cable 1996). This site lies within a Holocene alluvial terrace in the Haw River Valley and a number of block excavations produced lithic assemblages associated with discrete occupations spanning the early to middle Holocene contexts. Culturally, occupations spanned the period from the Late Paleoindian to the Middle Archaic periods. Here again, comparisons of expedient versus curated implements demonstrated a broad-spectrum forager model of subsistence and settlement. The complement of curated and expedient tool types from Haw River closely resembles those of 41BX831. There were eleven curated tool types and nine expedient tool types. Curated types from Haw River are projectile points and fragments, thick retouched unifaces, thin retouched unifaces, combination unifacial implements, bifacial tools and cores, flake blanks, chopping implements, and drills.

Expedient tools from the Haw River site include thick retouched unifaces, utilized flakes, flake cores, flakes with bifacial retouch, various forms of modified flake tools, and flake adzes. Allowing for analytical differences in artifact classification, these classes are in the range of variability of implements identified from various components at Richard Beene.

Cable (1996) concluded that some of the occupational floors at Haw River represented logistical field camps (cf. Binford 1978a) that were the focus of a variety of different activities, including implement repair and discard of curated and expedient tools, along with a limited amount of subsistence-related activity. Both Haw River and Richard Beene sites exhibit a fairly restricted range of expedient tool variability. Most of the flake tools from both sites are variations on a theme differing in edge shape and mode of retouch and size, but without extensive modification.

The difference between these sites is largely in the greater abundance of extensively modified flakes or unifaces at Haw River, suggesting to Cable (1996) that some of the occupations represented short-term logistical camps used for bulk processing of materials procured by hunting. Given the amount of burned rock and the absence of significant numbers of formal or extensively modified implements from any occupations at Richard Beene, hunting and processing of resources procured via hunting do not appear to have been common activities. Rather, the burned rock, hearths, grinding implements, and variety of expedient and limited formal tools that do appear seem to have been used to work a variety of materials, wood among them. These findings indicate that the Richard Beene site was the locus for procurement and processing of an array of perishable riverine or woodland resources, a different sort of bulk processing than that observed at Haw River by Cable (1996).

The Wilson–Leonard site lithic assemblage (Collins et al. 1998) provides an excellent comparative assemblage to that from the Richard Beene site. Numbers aside, the early, Early Archaic Wilson–Leonard and Richard Beene assemblages reflect some similarities. Both assemblages have lanceolate and stemmed/indented-base point types, distally beveled bifaces, a number of specialized flake tool types, burin/burin spalls, *pieces esquillee*, thick and thin unifaces, and spurred or beaked implements. Both sites also had implements that probably functioned in plant processing. Waco Sinkers and grooved stones are characteristic only of the Wilson–Leonard assemblage, although one grooved stone, possibly a bola stone, was recovered from sediments dating to about 7600 B.P. at the Richard Beene site.

Wilson–Leonard is characterized by a greater variety of stemmed/indented-base point types such as Hoxie, Gower, and Jetta. Late, Early Archaic forms from the site include Uvalde, Baker, Bandy, and Martindale. There is one specimen from the upper Perez paleosol at the Richard Beene site that may fit within the Hoxie–Gower–Jetta morphological scheme. This specimen (Figure 10.7b) has been reworked distally, but has lateral edge grinding on both sides of the stem. Lateral grinding is also a common technological feature of both lanceolate and stemmed points at Wilson–Leonard. Distal resharpening and alternate edge blade beveling characterize points from both sites.

Both sites have Clear Fork tools in association with Early Archaic lithic assemblages. At Wilson–Leonard, Clear Fork bifaces occur throughout the sequence but the unifacial form appears only in the later part of the Early Archaic timeframe. This technological transition is not seen at the Richard Beene site, as bifacial forms persist through time and unifacial forms are absent.

At the Wilson–Leonard site, unlike the Richard Beene site, there were a number of large tools and bifacial preforms in addition to a variety of burins, unifacial tools, and perforators (Collins et al. 1998:224). A small number of ground-stone implements such as manos and unpitted metates were recovered from the site in addition to Waco Sinkers and a grooved stone. The metate or grinding slab fragments recovered from various late, Early Archaic contexts at Richard Beene were also unpitted and slab-like but were much fewer in number and variability.

One of the more important analytical studies from the Wilson–Leonard site is the debitage and flake analysis conducted by Masson (2000). Her study was focused on the analysis and interpretation of the small flake component (flakes less than 2.5 cm in maximum dimension).

Results of Masson's study demonstrate that much of the lithic reduction at the Wilson–Leonard site was organized with an emphasis on later-stage bifacial thinning. There was a strong reliance on locally available, fine-grained cherts with only a minor increase in some coarse-grained varieties over time. Cortex types and patterning indicated that site occupants preferred nodular cobbles with a possible shift to some upland residual gravel sources later in time. The Richard Beene site evidence also indicates use of local nodules of chert procured from gravel deposits. There appears to have been no identifiable technological shift to upland residual gravel sources. The Wilson–Leonard data suggest a forager-type subsistence strategy, but the technology was directed largely toward biface manufacture. Richard Beene technology was organized toward expedient tool manufacture, tool use, and curated tool maintenance and resharpening.

A brief comparison with Plainview projectile points from the San Isidro site, Nuevo Leon, Mexico, with the Angostura points from 41BX831 is interesting. The majority of points from San Isidro argue for a repeated and intermittent occupation between the Late Paleoindian and Archaic periods. Key elements include a series of Plainview points and a number of Clear Fork tools. Excavations at San Isidro yielded 14 Plainview points (Epstein 1969:29–30), in marked contrast to the single specimen from Richard Beene. However, as with Angostura points from the Richard Beene site, San Isidro Plainview points are dominated by fragmentary bases and reworked points. Most appear to represent haft breaks.

Of the Clear Fork tools that were recovered at San Isidro, both unifacial and bifacial specimens are represented. Eight specimens were found: four which conformed to Ray's Gouge 1 type in being bifacial and four which are unifacial and conform to Ray's Gouge 2 type (Epstein 1969:39). The unifacial specimens were manufactured from thick percussion flakes of a tan limestone. Only one bifacial gouge was manufactured from chert. Six illustrated specimens in the San Isidro report (Epstein 1969:41: Figure 7) show a general consistency in maximum width with variability in planview shape from ovate to triangular, with bit contour varying from straight to slightly convex to concave. The majority of these implements were complete, in contrast to the specimens from the Richard Beene site. A similar range of shapes, however, is noted among Clear Fork tools from Richard Beene.

Ethnoarchaeology and Woodworking

The most pertinent ethnographic and ethno-archaeological study of stone tools associated with woodworking is that conducted by Hayden (1979) among the Australian Aborigines. Hayden focused his study on stone tool function, morphology, and context. General characteristics of the replicated and archaeological stone tools associated with wood-working included a mix of formal and expediently manufactured forms. These included chopping implements, adzes, a variety of hand-held modified and unmodified flake tools (scrapers, notches, denticulates, and burins), flake saws, impact flakes, and wood-grinding implements. Most of these general categories and forms of tools, the notable exception being burins, were present in most of the component assemblages at 41BX831. The similarities between toolkits described and discussed by Hayden and formal and flake tool variability observed at 41BX831 strongly suggest that portions of the site technology reflect an array of wood-working tasks and repair and replacement of wood-working components of portable lithic toolkits.

The 41BX831 lithic assemblages and those discussed by Hayden (1979) both evidence a mix of formal and generalized core reduction strategies (following Cobb and Webb 1994; Johnson 1986; Parry and Kelly 1985; Teltser 1991). A mix of core reduction strategies can be viewed as logistical flexibility within the technological system that allowed tool makers and users access to a variety of tools of multiple and specific functions. The lithic assemblages from 41BX831 also reflect a mix of tool repair, tool replacement, and specialized wood-working toolkits.

These types of activity sets are strong evidence to support an argument that the assemblages were associated with short-term repeated occupations of at least several days' duration. This setting is similar to that documented by Hayden during his research among the Australian Aborigines (Hayden 1979). One striking example of the lithic assemblage from Richard Beene is the general rarity of such heavy-duty wood-working implements such as handheld or hafted axes, heavy wedges, or other heavy chopping implements. Behaviorally, this suggests that heavy procurement tasks were rarely conducted at the Richard Beene site. A similar pattern was noted by Hayden (1979:15) for Western Desert and Tasmanian groups and it correlated with relatively small wooden artifact inventories (small in terms of numbers of wooden artifacts).

In terms wooden artifacts that might have been manufactured and utilized by the inhabitants of 41BX831, there are some basic comparisons that can be made with the Western Desert and Tasmanian groups. As with these groups and probably the majority of Paleolithic stone tool-using hunter–gatherer band level groups known, the most common implements were the digging stick, spears and components, traps, and some type of wooden throwing stick or club.

Examples of the types of wooden artifacts which may have been represented among the inhabitants of the Richard Beene site are reflected in the preserved wooden artifacts from the Trans Pecos and Lower Pecos areas of West Texas. Included are rabbit sticks, hearth sticks, spear shafts, digging sticks, arrow shafts, and bows, among a variety of other items (Hamilton 2001; Shafer 1986). Wood is not necessarily the only material that could be modified with these tools. Occasional artifacts manufactured from bone or soft stone could also have been modified with the same range of stone tools inferred to have been used to work wood. Seldom considered is the idea that this range of tools is also suitable for preparing materials for woven items such as sandals, baskets, trays, and matting and for components of snares, traps, and nets.

Hayden (1979) makes a further important distinction between the Western Desert and most Paleolithic stone tool inventories used for wood-working. That distinction is the presence of the hafted adze among the Western Desert groups. There are temporal differences at 41BX831 that suggest either a general reorganization of lithic toolkits oriented toward wood-working, logistical changes in toolkit structure toward more hunting dominated implements, or both. This is attested by the presence of hafted beveled bifaces and unifaces within the Early and Middle Archaic periods and their absence in Late Archaic and Late Pre–Columbian period assemblages.

11

LATE PLEISTOCENE THROUGH LATE HOLOCENE FAUNAL ASSEMBLAGE

Barry W. Baker and D. Gentry Steele

Over 10,000 vertebrate remains were recovered from more than 150 m^3 of sediment. Archaeological components and temporal designations used herein are defined and discussed in Chapter 9. The present analysis affords a broad examination and general description of the site's faunal assemblages (Appendix D).

Environmental Setting

The environmental setting of the project area is mixed and complex. Bordering the site to the north is the Balconian Biotic Province, which centers on the Edwards Plateau. To the south lies the Tamaulipan Biotic Province (Blair 1950:102–115). The junction of these provinces forms a rich and diverse biotic community consisting of post oak and brushy species, tall and short grasses, and bottomland flora including pecan, cottonwood, elm, and willow. The vertebrate fauna of the Balconian Province is itself a mixed assemblage consisting of Austroriparian, Tamaulipan, Chihuahuan, and Kansan species, as well as regional endemics (particularly plants, fish, and salamanders, some of which are cavernicolous) (Blair 1950:112). The Tamauli-pan Biotic Province immediately to the south contains most of these species, plus taxa more typical of Mexico. On a regional scale, the wide diversity of transitional bottomland and upland species between the two provinces would have provided a rich environment for prehistoric cultural exploitation.

Methods

The faunal remains discussed here were recovered by water screening sediments through 1/4- and 1/8-inch hardware cloth. For the present analysis, taxa counts were hand tabulated and recorded by time period (Table 11.1). Many of the skeletal elements were identified only to broad levels such as small-sized mammal, medium-sized mammal, etc.

The number of identified specimens (NISP) is used in Table 11.1 and Figure 11.1 to refer to specimens identified minimally to the level of class. The term "bone count" in Figure 11.1 is used broadly to include data on teeth and otoliths. Broken elements that could be fitted together were counted as one specimen. Mandibulary or maxillary portions containing teeth were also counted as one specimen. Mammal size categories listed in Table 11.1 are defined as follows: small mammal (up to cottontail rabbit sized); small rodent (mouse-sized); medium mammal (canid-, caprine-sized); large mammal (deer-, pronghorn-sized); very large mammal (bison-sized). A description of the identified taxa appears at the end of this chapter.

The Assemblages

The recovered assemblage consists of 10,682 specimens from discrete late Pleistocene (ca. 15,000–

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Table 11.1. Taxa by preliminary NISP[a] counts (Number of Identified Specimens).

Time Period	Late Pleistocene	early, Early Archaic	late, Early Archaic	Middle Archaic	early, Late Archaic	Late Pre-Columbian	Total
Taxon							
Osteichthyes (Fish)	-	1	4	-	-	-	5
Anura (Frogs &Toads)	2	-	-	-	2	1	5
Testudinata (Turtles)	106	-	29	-	1	-	136
Kinosternidae (Mud & musk turtles)	-	-	2	-	-	-	2
Chrysemys sensu lato (Water turtles)	3	-	-	-	-	-	3
cf[b] *Chrysemys sensu lato* (Water turtles)	9	-	-	-	1	-	10
Trionyx (Softshell turtles)	1	-	2	-	-	-	3
Serpentes (Snakes)	198	1	12	-	1	1	213
Aves (Birds)	16	-	-	-	-	-	16
Passeriformes (Perching birds)	1	-	-	-	-	-	1
S mammal[c]	120	5	64	3	5	-	197
S/M mammal	74	2	21	1	-	-	98
M mammal	43	1	9	2	-	-	55
M/L mammal	49	5	185	3	45	-	287
L mammal	17	-	34	3	5	1	60
VL mammal	6	-	-	-	-	-	6
Leporidae (Rabbits & hares)	50	2	142	-	6	-	200
Sylvilagus (Rabbit)	1	-	3	-	2	-	6
S rodent	4	2	9	1	1	-	17
Sciuridae (Squirrels)	2	-	1	-	-	-	3
Geomyidae (Gophers)	-	1	2	-	1	-	4
Castor canadensis (Beaver)	-	-	-	-	1	-	1
Sigmodon (Cotton rats)	8	-	8	-	-	-	16
Neotoma (Woodrats)	-	-	-	-	1	-	1
Erethizon dorsatum (Porcupines)	-	-	1	-	-	-	1
Carnivora (Carnivores)	8	-	1	-	-	-	9
Bassariscus astutus (Ringtail)	9	-	-	-	-	-	9
cf. *Bassariscus astutus*	1	-	-	-	-	-	1
Canis (Canids)	-	-	-	-	1	-	1
cf. *Canis* (Canids)	-	-	1	-	-	-	1
Atriodactyla (Artiodactyls)	5	2	3	1	32	-	43
Odocolieus (Deer)	1	-	14	-	5	-	20

continued

Table 11.1. Continued.

Time Period	Late Pleistocene	early, Early Archaic	late, Early Archaic	Middle Archaic	early, Late Archaic	Late Pre-Columbian	Total
Taxon							
Antilocapra/Odocoileus (Pronghorn/deer)	-	-	6	1	1	-	8
Antilocapra Americana (Pronghorn)	-	-	1	-	-	-	1
Period Total	734	22	554	15	111	3	1,439

[a]NISP counts include taxa identified minimally to Class (Fish, Amphibian, Reptile, Bird, Mammal).
Note: Taxa counts are not inclusive (e.g. Testudinata counts do not include identified turtles such as Kinosternidae, *Chrysemys*, *Trionyx*, etc.).
[b]cf.=compares favorably with.
[c]For taxa size descriptions: S=small; S/M=small to medium; M=medium; M/L=medium to large; L=large; VL=very large. See Methods section for definitions of animal size ranges.

12,500 B.P.), early, Early Archaic (ca. 8800–8600 B.P.), late, Early Archaic (ca. 6900 B.P.), Middle Archaic (ca. 4600–4100 B.P.), early, Late Archaic (ca. 3500–2800 B.P.), and Late Pre-Columbian (ca. 1200–400 B.P.) components (Table 11.2). While the faunal sample is relatively small compared to two of the largest Late Archaic/Late Prehistoric and Early Ceramic assemblages from southern (41LK201) and southeastern (41HR273) Texas (Table 11.2), the Richard Beene sample is particularly noteworthy for the large Late Pleistocene and late, Early Archaic components and the well stratified nature of the assemblage.

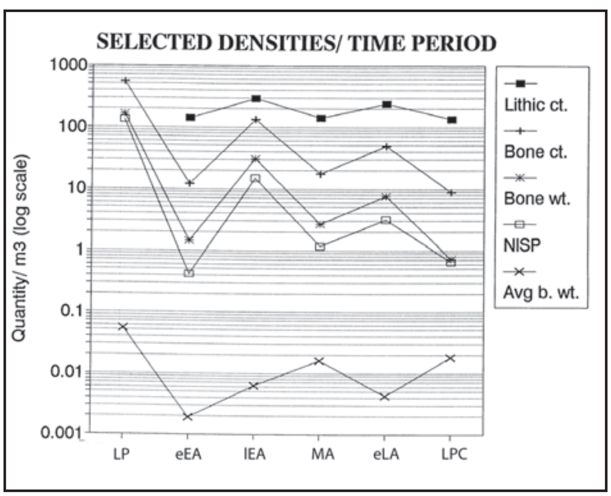

Figure 11.1. Selected material density by time period (abbreviations in legend: ct.=count; wt.=weight; INSP=number of identified specimens; b.=bone).

The state of preservation of the assemblage is variable. The late Pleistocene component has remarkably well-preserved bone with many complete elements. Some of the late Pleistocene fragments exhibit spiral fractures indicating that breakage occurred while the bone was still fresh. At least nine burned fragments were recovered from this component, though no unequivocal artifacts or cultural features were found in the Late Pleistocene deposits.

The taphonomic condition of the Archaic assemblages is more difficult to interpret. The average middle, Early through late, Late Archaic bone fragment is smaller than the average late Pleistocene fragment (Figure 11.1 and Table 11.2). For the most part, elements from the Archaic assemblage are more fragmented, with some specimens showing fine line cracking and abrasive wear on the edges. Interpretation of the nature of deposition that created these conditions awaits further analysis. Many of the bone fragments from the site's Archaic components are burned.

The early, Early Archaic and Late Pre-Columbian assemblages are relatively small and poorly preserved. These assemblages show the lowest densities of specimen weight and count (Figure 11.1 and Table 11.2).

Of the 10,682 vertebrate fragments, approximately 14% are identified to five taxonomic classes

Table 11.2. Comparative sample data for selected South-Central, Southern, and South-East Texas archaeological assemblages[a].

Site & Period	Mesh	N	Wt (g)	m^3	Wt/N	N/m^3	Wt/m^3
41BX831	1/4" & 1/8"						
Late Pleistocene		3,039	929.75	5.6271	0.3	540.1	165.2
early, Early Archaic		726	84.83	60.1679	0.1	12.1	1.4
late, Early Archaic		4,850	1,134.98	37.2205	0.2	130.3	30.5
Middle Archaic		229	34.40	12.7627	0.2	17.9	2.7
Late Archaic		1,798	275.41	36.1211	0.2	49.8	7.6
Late Pre-Columbian		40	3.30	4.6100	0.1	8.7	0.7
Total Sample		10,682	2,462.67	156.5093	0.2	68.3	15.7
41LK201 (Steel 1986b)	1/4" & 1/8"						
Late Archaic and Late Pre-Columbian		13,671	-	3.4	-	4,021	-
41HR273 (Baker et al. 1991)	1/4" & 1/16"						
Early-Late Ceramic		59,094	34,789	6.4	0.6	9,233	5,436

[a]Mesh=recovery screen size; N=sample size; Wt=weight in g; m^3=volume excavated in cubic m; Wt/N=average specimen weight in g; N/m^3=weight density (per cubic m).

(Table 11.1 and Figure 11.2). Minimally, 19 species are present in the site, with 11 of these identified to genus and/or species. The late Pleistocene deposits contain the largest faunal assemblages (N=3,039) and the best preserved remains (Figure 11.3). It includes skeletal elements of frog/toad, softshell turtle (Figure 11.4), water turtle (other than softshell), snake, perching bird, rabbit, squirrel, cotton rat, ringtail (aka ringtail cat), deer, and bison or other bison-sized (i.e., very large) mammals (see taxa descriptions and Table 11.1). The bison-sized fragments from the late Pleistocene represent the only very large taxon recovered during excavations.

The presence of ringtail (*Bassariscus astutus*) in Bexar County during the late Pleistocene is particularly noteworthy. To our knowledge, only one other Pleistocene record for this taxon has been reported from known archaeological *and* paleontological sites in the central and south-central Texas regions (Semken 1961:304). Dalquest et al. (1969:216–217) noted that ringtail was not recovered from Pleistocene deposits at Schulze Cave in nearby Edwards County, and implied the species may have colonized the region only within the late Holocene. Other North American Pleistocene (Late Wisconsinian) records of *Bassariscus astutus* have been reported from over a dozen localities in Arizona, California, Nevada, New Mexico, and western Texas (Graham 1987:62; Harris 1985:184; Kurten and Anderson 1980:177). The recovery of ringtail from late Pleistocene deposits dated to ca. 12,500 B.P. at the Richard Beene site supports Semken's assessment that the species has been endemic to the region since the Pleistocene.

This leaves unanswered the question of why *Bassariscus astutus* has not been found in the many other Pleistocene faunal assemblages from central Texas (see Graham 1987 for a review of Late Quaternary mammalian faunas and their associated distributions for this region). Since the material from the Richard Beene site was positively identified on the basis of several elements, the identification was confirmed (Ernest Lundelius, personal communication,1992), and the Pleistocene provenience of the remains is secure, either the taxon was relatively uncommon in the central Texas Hill Country or was largely confined to the Tamaulipan Biotic Province to the south and west. This issue remains to be resolved.

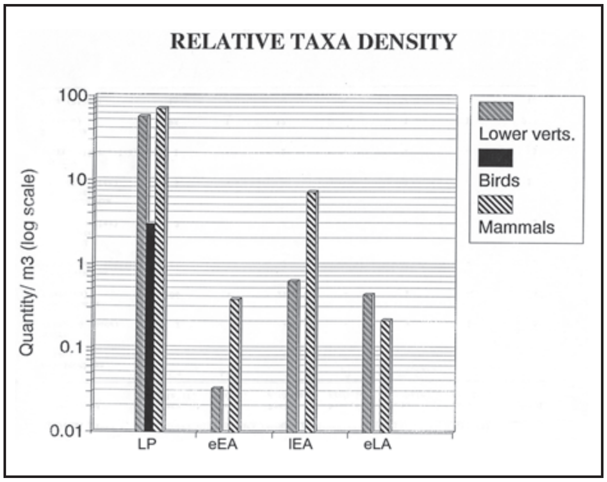

Figure 11.2. Comparison of density of faunal remains by time period.

Figure 11.3. Faunal remains from the late Pleistocene, miscellaneous bone, Block S, illustrating the relatively good condition of the recovered sample.

The sample size for the early, Early Archaic component (N=726) from Blocks H, T, and N, contained only 25 specimens identified to class (Figures 11.5 and 11.6). These faunal remains were recovered from strata that yielded a wide variety of cultural materials. Some of the bone is burned. Taxa include fish, snake, small mammal, rabbit, small rodent, gopher, woodrat, and unidentified artiodactyl (even-toed ungulates).

The late, Early Archaic deposits (Block G) yielded the largest culturally related faunal assemblage from the site (N=4,850). Mammals and lower vertebrates (fish, amphibians, and reptiles) dominate this assemblage, as well as the combined Archaic assemblage (Figures 11.2 and 11.7). Late, Early Archaic taxa include fish, mud/musk turtle, softshell turtle, snake, rabbit, small rodent, squirrel, gopher, cotton rat, woodrat, porcupine, carnivore, canid, unidentified artiodactyl, deer, pronghorn/deer, pronghorn, and unidentified small-, medium-, and large-sized mammals. The most abundant taxa (in terms of NISP) are medium/large mammals, rabbits, and small mammals. The rabbit assemblage is interesting in that more than 140 elements were recovered. Included are complete mandibular rami, representing several individuals. This high frequency of leporid remains is also seen in Late Archaic and Late Prehistoric sites from Tamaulipan assemblages to the south (e.g., Hellier et al. 1995:1280–1282; Steele 1986a:134–135, 1986b:237–239; Steele and Hunter 1986:485–491).

The only culturally modified bone from the site, a worked rabbit radius, is from the late, Early Archaic component (Figure 11.8).

Both charred (burned black) and calcined bones (burned white) were encountered in the late, Early Archaic assemblage, and weathering and degradation ranged from slight to marked. Spiral fractures are present on several medium/large mammal long-bone fragments. The late, Early Archaic fauna appears to have the greatest potential for addressing questions of cultural activity and subsistence at the site, making this an especially significant component.

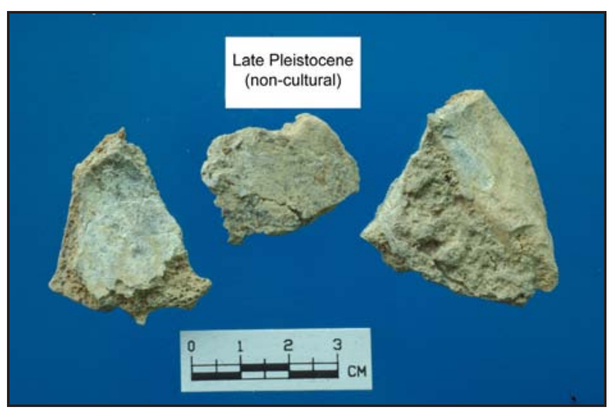

Figure 11.4. Faunal remains from the late Pleistocene, turtle carapace, Block S, illustrating the relatively good condition of the recovered sample.

Figure 11.5. Sample of faunal remains from the early, Early Archaic period, Block H, illustrating the relatively poor presentation condition.

Two well-worn human molars were also recovered from the late, Early Archaic component (Block G). Both specimens were from sheet midden deposits. These were the only human osteological remains from the entire site (Appendix E).

The Middle Archaic assemblage (Blocks A and U) (Figure 11.9 and Table 11.2) is relatively small (N=229), though these remains were recovered from a much smaller area than was excavated for the Early Archaic components. Only 15 specimens from the Middle Archaic components are identified to class, including small, medium, and large mammals, small rodent, artiodactyl, and pronghorn/deer. Charred, calcined, and spirally fractured bone is present. Specimen condition ranges from slightly to heavily weathered.

Figure 11.7. Faunal remains from the late, Early Archaic period, Block G, illustrating the overall presentation condition of the sample, which is the best of the cultural components.

Figure 11.6. Sample of faunal remains from the early, Early Archaic period, Block T, illustrating the relatively poor state of presentation.

The early, Late Archaic (lower Block B) vertebrate assemblage (N=1,798) includes frog/toad, water turtle, snake, rabbit, small rodent, gopher, beaver, woodrat, canid, artiodactyl, deer, pronghorn/deer, and unidentified small-, medium-, and large-sized mammals. Post-cranial elements of medium-to-large mammals and artiodactyl tooth fragments dominate the assemblage. Charred, calcined, and spirally fractured bone is present (Figure 11.10). Specimens range from slightly to heavily weathered.

Three bones are identified to class from the Late Pre-Columbian (N=40) component, which was the least extensively excavated (Table 11.2). Taxa from Pre-Columbian deposits include frog/toad, snake, and large mammal. Charred and calcined bone and specimens with slight and heavy weathering are present (Figure 11.11).

Figure 11.8. Worked rabbit radius from the late, Early Archaic period, Block G.

Figure 11.9. Faunal remains from the Middle Archaic period, upper Block A, illustrating the sample's relatively poor state of presentation.

Figure 11.10. Faunal remains from the early, Late Archaic period, lower Block B, illustrating the overall variation in the sample's preservation condition.

Taxa Descriptions

The recovered material is described with references to other southern Texas sites that have yielded the same or similar taxa. This comparison focuses on selected taxa from archaeological sites in the Tamaulipan Biotic Province, analyzed primarily by D. G. Steele (Steele 1986a, 1986b; Steele and Hunter 1986).

Class OSTEICHTHYES (Bony Fish)

Referred material. 1 otolith (early, Early Archaic); 1 vertebra, 3 otoliths (late, Early Archaic).
Discussion. A left sagitta otolith was recovered from early, Early Archaic deposits at the site. From the late, Early Archaic deposits, two right and one left sagitta otolith were identified. At least three fish, one from early, Early Archaic and two from late, Early Archaic deposits, are represented in the site assemblage. All four otoliths resemble those of the sunfish family (Centrarchidae, Order Perciformes) (McClure 1991:14).

Class AMPHIBIA (Amphibians)
Order ANURA (Frogs and Toads)

Referred material: 2 long bones (late Pleistocene); 2 long bones (Late Archaic); 1 long bone (late Pre-Columbian).

Class REPTILIA (Reptiles)
Order TESTUDINATA (Turtles and Tortoises)

Referred material. Unidentified turtle shell fragments from late Pleistocene, late, Early Archaic, and Late Archaic components.
Discussion. The majority of these specimens identified as Order Testudinata are hardshell turtles. Softshell turtles (family Trionychidae) are easily distinguished from other families by their characteristically dimpled shells. Most of the turtle bone is from late Pleistocene deposits and probably represents water turtle (*Chrysemys [sensu lato]*). At least three individual turtles are represented from the late Pleistocene: one is a softshell turtle, and remains of two other turtles of different sizes are also present. Turtle-shell fragments, in conjunction with snake vertebrae, account for the high density

Figure 11.11. Sample of faunal remains from the Late Pre-Columbian period, upper Block B, illustrating its relatively poor state of presentation.

of lower vertebrates represented in deposits from the late Pleistocene (Figures 11.3 and 11.4).

Family KINOSTERNIDAE (Mud and Musk Turtles)

Referred material. 2 shell fragments (late, Early Archaic).
Site records. This family has been reported from sites 41LK28 (Hellier et al. 1995:1269), 41LK201 (Steele 1986b:226–227), and 41MC296 (Steele and Hunter 1986:480) in Live Oak (LK) and McMullen (MC) counties, Texas, in the Tamaulipan Biotic Province.
Discussion. Kinosternidae is represented by two genera in Texas: *Kinosternon* (mud turtle) and *Sternotherus* (musk turtle) (Dixon 1987:79–81). Of the five species of Kinosternidae occurring in Texas, *K. flavescens*, *K. subrubrum*, and *S. odoratus* occur in Bexar County today (Dixon 1987:176–181). These species are highly aquatic and their presence at the site suggests nearby riparian environments.

Family EMYDIDAE (Box and Water Turtles)
Genus *Chrysemys (sensu lato)* (Water Turtles)

Referred material. 9 shell fragments (Late Pleistocene); 3 carapace fragments from late Pleistocene deposits; 1 shell fragment (Late Archaic).
Site records: This genus has been reported from sites 41LK28 (Hellier et al. 1995:1268), 41JW8 (Steele 1986a:129), 41LK201 (Steele 1986b:226), and 41MC222 and 41MC296 (Steele and Hunter 1986:479).
Discussion: The use here of the taxon *Chrysemys* (*sensu lato*) follows Weaver and Rose's (1967) inclusion of painted turtles, cooters, and sliders within a single genus. *Chrysemys* (*sensu stricto*) reflects the placement of the painted turtles within their own genus, with cooters placed in *Pseudemys*, and the sliders included within *Trachemys*. Controversy exists even today, however, concerning which classification system most accurately reflects the relationship of these turtles (Seidel and Smith 1986). Because of difficulty involved in identifying water turtle genera from carapace fragments (Sobolik and Steele ms.:12), Weaver and Rose's (1967) classification is followed here.

Family TRIONYCHIDAE (Softshell Turtles)
Genus *Trionyx* (Softshell Turtle)

Referred material. 1 shell fragment (Late Pleistocene); 2 shell fragments (Early Archaic).
Site records. This genus has been recovered from 41LK28 (Hellier et al. 1995:1270), 41LK201 (Steele 1986b:227–228), and 41MC296 (Steele and Hunter 1986:480).
Discussion. Two species of *Trionyx* occur in Texas. These are *T. muticus* (smooth softshell turtle) and *T. spiniferus* (spiny softshell turtle) (Dixon 1987:86–87). Only *T. spiniferus* is known from Bexar County today (Dixon 1987:195–196). Habitats include marshy creeks, ponds, lakes, and rivers. *T. muticus* rarely leaves the water, though *T. spiniferus* often basks along banks and logs exposed in the water (Ernst and Barbour 1972:258, 262). As noted earlier, softshell turtles are easily distinguished from other families by their characteristically dimpled shells. Consequently, they are typically over-represented in taxonomic frequency lists.

Order SQUAMATA (Lizards and Snakes)
Suborder SERPENTES (Snakes)

Referred material. 213 complete and fragmented vertebrae from all cultural periods at the site, exclusive of the Middle Archaic.
Discussion: Generic and species identification of snakes from skeletal elements is often difficult, despite work by authors such as Auffenberg (1969) and Holman (1979, 1981). While identification to the family level (Colubridae vs. Viperidae) has proven simpler based on ventral process morphology, none of the vertebrae retained complete ventral processes.

Class AVES (Birds)

Referred material. 16 post-cranial elements (late Pleistocene).
Discussion. Many of these elements are complete and additional taxa may be identified with further analysis. The majority are the size of large perching birds.

Order PASSERIFORMES (Perching Birds)
Referred material. 1 humerus (late Pleistocene).

Class MAMMALIA (Mammals)

Order LAGOMORPHA (Lagomorphs)
Family LEPORIDAE (Rabbits and Hares)

Referred material. 200 cranial and post-cranial elements (late Pleistocene, early, Early Archaic, late, Early Archaic, and Late Archaic deposits).
Discussion. Leporids are represented by two genera in Texas, *Sylvilagus* and *Lepus* (Schmidly 1983:104–115). Species that occur in Bexar County today include *S. floridanus* (eastern cottontail), *S. auduboni* (Audubon cottontail), *S. aquaticus* (swamp rabbit), and *L. californicus* (black-tailed jackrabbit) (Davis 1974:236–244). Morphological similarities and size overlap between *S. aquaticus* and *L. californicus*, along with degradation of the sample, make distinction between these taxa uncertain for most elements.

Genus *Sylvilagus* (Rabbits)

Referred material. 1 post-cranial element (late Pleistocene); 3 post-cranial elements (late, Early Archaic); 2 post-cranial elements (Late Archaic).
Site records. Rabbits have been reported from sites 41LK28 (Hellier et al. 1995:1281–1282), 41JW8 (Hester 1977; Steele 1986a:135), 41LK201 (Steele 1986b:237–239), 41MC222 and 41MC296 (Steele and Hunter 1986:486–491), and 41ZV14, 41ZV60, and 41ZV152 (Hester et al. 1975:227). Jim Wells (JW) and Zavala (ZV) counties, Texas, are located in the Tamaulipan Biotic Province, as are Live Oak and McMullen counties, mentioned previously.
Discussion. *Sylvilagus* is represented by three species in Bexar County: *S. floridanus* (eastern cottontail), *S. auduboni* (Audubon cottontail), and *S. aquaticus* (swamp rabbit) (Davis 1974:236–244; Schmidly 1983:104–111). Specimens were included in *Sylvilagus* based on their small size.

Order RODENTIA (Rodents)
Indeterminate Small-Sized Rodents

Referred material. From all time periods excluding Late Pre-Columbian.
Discussion. "Small rodent" is defined here as mouse-sized. The majority of these specimens are incisors and long-bone elements. Much of the material tentatively classed as small mammal probably is of the order Rodentia, as well.

Family SCIURIDAE (Squirrels)

Referred material. 3 teeth (late Pleistocene, late, Early Archaic).
Site records. The family Sciuridae has been identified at site 41LK28 (Hellier et al. 1995:1274–1275).
Discussion. Squirrels in the Bexar County area may be divided into ground squirrels (*Spermophilus mexicanus* [Mexican ground squirrel], *S. variegatus* [rock squirrel], and *Cynomys ludovicianus* [black-tailed prairie dog]) and tree squirrels (*Sciurus carolinensis* [eastern gray squirrel], and *S. niger* [fox squirrel]), with *S. niger* being the most common tree squirrel (Davis 1974:146–164).

Family GEOMYIDAE (Pocket Gophers)
Referred material. 1 tooth (early, Early Archaic); 2 teeth (late, Early Archaic); 1 post-cranial element (Late Pre-Columbian).
Site records. Gophers have been reported from sites 41LK28 (Hellier et al. 1995:1275–1276), 41JW8 (Hester 1977; Steele 1986a:136), and 41MC296 (Steele and Hunter 1986:491).
Discussion. Three gopher genera occur in Texas today, including *Thomomys*, *Geomys*, and *Pappogeomys* (Davis 1974:164–171). Without dental elements, morphological distinction of gopher genera from skeletal material is often difficult. The classification of Texas geomyids in general is complex (Jones and Jones 1992:60–62). Many of the currently recognized species of *Geomys*, for example, are identified principally from chromosomal and biochemical differences. Taxa which occur in and near Bexar County today include *G. personatus* (south Texas pocket gopher), *G. bursarius* (plains pocket gopher), and *G. attwateri* (Attwater's pocket gopher) (Davis 1974:169; Schmidly 1983:138). Despite the fact that gophers spend much of their time underground, there is sufficient evidence to indicate they were exploited by North American Indians, and therefore should not be ignored as a possible food source for the inhabitants of the site (Shaffer 1991:132–136, and references therein).

Family CASTORIDAE (Beavers)
Species *Castor canadensis* (Beaver)

Referred material. 1 tooth (Late Archaic).

Family CRICETIDAE (New World Rats and Mice)
Genus *Sigmodon* (Cotton Rat)

Referred material. 8 elements (late Pleistocene); 8 elements (Early Archaic).
Site records. This genus has been reported from sites 41LK28 (Hellier et al. 1995:1279), 41JW8 (Steele 1986a:136), 41LK201 (Steele 1986b:243), 41MC222 and 41MC296 (Steele and Hunter 1986:492–493).
Discussion. Of the three extant Texas *Sigmodon* species (Jones and Jones 1992:66), only *S. hispidus* (hispid cotton rat) occurs in the region today.

Genus *Neotoma* (Woodrat)

Referred material. 3 elements (early, Early Archaic); 5 elements (late, Early Archaic); 2 elements (Late Archaic).
Site records. The genus *Neotoma* has been reported from sites 41LK28 (Hellier et al. 1995:1277–1278), 41JW8 (Steele 1986a:135), 41LK201 (Steele 1986b:241), 41MC222 and 41MC296 (Steele and Hunter 1986:492).
Discussion. Three woodrat species occur today in or near Bexar County. These include *Neotoma albigula* (white-throated woodrat), *N. floridana* (eastern woodrat), and *N. micropus* (southern plains woodrat) (Jones and Jones 1992:66; Schmidly 1983:197–205). *N. floridana* prefers riparian habitats, while *N. micropus* and *N. albigula* are more common in semiarid or xeric environments (Davis 1974:221; Schmidly 1983:197, 202).

Family ERETHIZONTIDAE (Porcupines)
Species *Erethizon dorsatum* (Porcupine)

Referred material. Mandible portion with teeth (late, Early Archaic).
Discussion. The specimen is the distal portion of the right mandible retaining molars M_1–M_3. The animal was a subadult, showing no wear on the erupting right third molar. Jones and Jones (1992:67) noted that the eastward range of extant porcupines in Texas extends at least to Kerr County, though no specimens are known from Bexar County, located just to the southeast (Davis 1974:232).

Order CARNIVORA (Carnivores)

Referred material. 8 teeth (late Pleistocene); 1 tooth (late, Early Archaic).
Discussion. These are teeth of primarily medium-sized carnivores that have yet to be identified.

Family PROCYONIDAE (Procyonids)
Species *Bassariscus astutus* (Ringtail)

Referred material. 4 dental, 5 post-cranial elements (late Pleistocene).
Site records. Ringtail elements have been reported from nearby late Pleistocene deposits at Longhorn Cavern, Burnet County, Texas (Semken 1961:304). Toweill (1976) reviews ringtail ecology in the Edwards Plateau region of south-central Texas.

Family CANIDAE (Canids)
Genus *Canis* (Dogs and Relatives)

Referred material. 1 tooth fragment (late, Early Archaic); 1 anterior portion of a mandible (Late Archaic).
Site records. *Canis* has been reported from 41JW8 (Steele 1986a:133), 41K201 (Steele 1986b:234), 41MC222 and 41MC296 (Steele and Hunter 1986:484–485).
Discussion. Species of *Canis* whose ranges have included the project area include *C. latrans* (coyote), *C. lupus* (gray wolf), and *C. rufus* (red wolf) (Davis 1974:123–129; Jones and Jones 1992:68; Schmidly 1983:234–245). Further analysis should lead to a more specific identification of this taxon.

Order ARTIODACTYLA (Artiodactyls)

Referred material. Primarily tooth enamel fragments from all time periods exclusive of the Late Pre-Columbian.
Discussion. These are primarily small teeth fragments that exhibit artiodactyl morphology but could not be identified to family.

Family CERVIDAE (Cervids)
Genus *Odocoileus* (Deer)

Referred material. 1 tooth (late Pleistocene); 12 teeth/fragments, 2 post-cranial elements (late, Early Archaic); 5 teeth/fragments (Late Archaic).
Site records. Deer remains are common throughout archaeological sites in the region.
Discussion. Specimens were identified as deer based on Lawrence's (1951) criteria used in conjunction with comparative material. Morphological overlap between *Odocoileus virginianus* (white-tailed deer) and *Odocoileus hemionus* (mule deer) for most skeletal elements makes osteological differentiation between the two difficult. *O. virginianus* inhabits the region today (Schmidly 1983:295).

Genus *Antilocapra/Odocoileus*
Indeterminate (Pronghorn/Deer)

Referred material. Fragments from Early, Middle, and Late Archaic deposits.
Discussion. These are primarily long-bone fragments that cannot be classified as either deer or pronghorn.

Family ANTILOCAPRIDAE (Pronghorn)
Species *Antilocapra americana* (Pronghorn)

Referred material. 1 medial phalanx (late, Early Archaic).
Discussion. This toe bone was identified as pronghorn based on comparison with modern material and with Lawrence's (1951:25) criteria of proximal end morphology. Currently, pronghorn are restricted to the Panhandle and western portion of the state (Davis 1974:248). Formerly, pronghorn range extended from the western portion of Texas eastward to Robertson and McLennan counties and included Bexar County (Jones and Jones 1992:72).

Summary and Concluding Comments

Animal bone preservation at the Richard Beene site is variable. The late Pleistocene component is very well preserved and warrants further study. The early Holocene component (Block G) is comparatively well preserved, though natural preservation conditions resulted in highly weathered bone. In many cases, it was difficult to distinguish small, weathered bone fragments from calcium carbonate nodules.

Several general conclusions can be drawn from the faunal data concerning the local environment of the Richard Beene site. Among the identified fauna are fish, beaver, and at least three species of water turtles. These clearly document the proximity to water, arguably the nearby Medina River, and perhaps nearby springs. Ringtail, porcupine, woodrats, cotton rat, pronghorn, and white-tailed deer elements were recovered from the site. These are species common to the present-day local Tamaulipan and Balconian Biotic Provinces. Pronghorn and perhaps porcupine were extirpated historically from the immediate vicinity of the site. The fauna from the late, Early Archaic component (Block G) suggests that the biotic community was relatively stable within the region during the Holocene. The presence of ringtail suggests that at least one Tamaulipan species that is typical of the region today existed during the late Pleistocene epoch, as well.

In terms of human subsistence, recovered faunal remains resemble assemblages from other human habitation sites from southern and central Texas. Identified species in all time periods are consistent with what is known about Late Pre-Columbian and Late Archaic assemblages in the region. Deer, rabbits, cotton rat, woodrat, and turtles are common, suggesting the site's occupants followed a subsistence lifestyle apparently typical of hunters and gatherers of southern Texas. Based on size class, deer-sized animals were likely most important, though smaller game is well represented. The stratified nature of the assemblage and its primarily modern appearance in terms of species composition attest to the exploitation of a similar range of animal species through time.

12

PLANT REMAINS

J. Philip Dering and Vaughn M. Bryant, Jr.

Twenty-five sediment samples from the cultural levels and Late Quaternary deposits dated from ca. 3100 to 15,000 B.P. were collected and processed for pollen analysis. In addition, 22 flotation samples containing fragments of carbonized wood were examined and identified. Terminology and time pans for paleosols and pedocomplexes used herein are defined and discussed in Chapter 3. Terms and time spans for cultural components and periods are presented in Chapter 4.

Current Vegetation

Blair (1950) characterized the region south of San Antonio as arid subhumid or moist subarid, and placed it in the Tamaulipan Biotic Province. The subarid environment is created by megathermal temperatures with an evaporation rate that exceeds the area's precipitation (Bomar 1992). The study area is situated in the north-central part of the South Texas Plains vegetational zone, a few kilometers south of its junction with the Edwards Plateau to the north and the Blackland Prairie to the northeast (Hatch et al. 1990).

Five landform/sediment assemblages have been identified in the Medina River Valley at the Richard Beene site: (1) the modern floodplain; (2) scattered remnants of a low terrace (Miller terrace); (3) a broad, flat, paired terrace (Applewhite terrace); (4) a late Pleistocene terrace (Leona terrace); and (5) an old, high terrace (Walsh terrace) (see Chapter 3). The Walsh terrace is dominated by black-brush acacia (*Acacia rigidula*), huisache (*Acacia farnesiana*), mesquite (*Prosopis glandulosa*), various buckthorns (*Rhamnaceae*) and cacti (*Cactaceae*). The Leona and Applewhite terraces consist of abandoned cotton fields characterized by weedy mesquite/huisache scrubs. The scarp separating the Applewhite and Miller terraces and/or floodplain is dominated by a xeric assemblage including mesquite, acacias, retama (*Parkinsonia aculeata*), and prickly pear (*Opuntia* spp.) mixed with live oak (*Quercus virginiana*). The Miller terrace is dominated by mesquite, oak, and thorny scrub brushland, including genera of the buckthorn family (*Rhamnaceae*) and cacti. The active floodplain is characterized by riparian vegetation including dense stands of large pecan trees (*Carya illinoiensis*), cypress (*Taxodium distichum*), soapberry (*Sapindus saponaria*), hackberry (*Celtis* spp.), sycamore (*Platanus* spp.), and elm (*Ulmus* spp.).

Paleovegetation of South Texas: Previous Studies

The late Pleistocene and Holocene vegetation record for the region of the South Texas Plains is fragmentary. This region lacks peat bogs, dry caves, or other settings from which botanists might recover

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sufficient plant remains or fossil pollen to reconstruct vegetational chronologies. Several deeply stratified archaeological deposits have been studied in south Texas but have yielded only meager traces of badly degraded fossil pollen in quantities too small for analytical purposes, despite a large number of test samples processed by the present authors and others (Bryant and Holloway 1985). The near absence of fossil pollen may be attributed to high soil pH, low soil organic content and poorly drained soils (Bryant and Hall 1993).

The nearest well-studied archaeological sites within the South Texas Plains are located at Choke Canyon Reservoir, 120 km south of the Applewhite project area (Figure 8.3). Pollen preservation at and near Choke Canyon is poor. Alkaline soils and a high oxidation rate in the sediments of this region destroy pollen grains that are normally highly durable in many sediment samples (Hall 1981; Havinga 1964). As a result, paleobotanical research in south Texas has produced few significant records of Quaternary-age vegetation and has contributed little to the paleoenvironmental reconstruction of that area.

Studies of botanical remains from areas adjacent to the South Texas Plains have been more productive and helpful in establishing a probable paleovegetational context for the Applewhite Reservoir area. Peat bogs located just beyond the eastern periphery of the South Texas Plains, in Gonzales and Lee Counties, have revealed a rich late Pleistocene and Holocene vegetation record. In addition, studies of the dry cave sediments in the lower Pecos River and Devil's River regions of southwest Texas have established a long vegetational sequence for that area (Bryant and Holloway 1985). General environmental trends identified in the well-preserved plant sequence from the lower Pecos River region can be cautiously extrapolated to the Richard Beene site, because both areas are affected by the same general climatic conditions. That is, both are located in a region of a double rainfall peak that occurs in spring and fall, and both are subject to a drastic interannual variation in precipitation amounts that is typical of southern Texas and adjacent Mexico (Dering 1999).

Late Glacial Period: 14,000 to 10,000 B.P.

The Late Glacial pollen record in Texas reveals a transitional period characterized by a slow and gradual loss of woodland and parkland areas in various regions of the state. In west Texas the Late Glacial is characterized as a time when areas of conifers (juniper, pinyon, and western yellow pine) growing at low elevations were replaced by grasslands. Coniferous forests at higher elevations probably remained fairly stable, yet there may have been a reduction of certain species such as spruce (*Picea* spp.). In southwestern Texas, Late Glacial vegetation developed into a broad mosaic pattern characterized by scrub grasslands. This conversion occurred at the expense of the remaining pinyon-juniper woodland and parkland regions. In central Texas, the existing deciduous woodland regions began to change in composition and in some areas were replaced by grasslands and oak savannas (Bryant and Holloway 1985).

The apparent Late Glacial reduction of arboreal taxa is seen in the fossil pollen record of Hershop Bog, located in Gonzales County, Texas, 120 km east of the Applewhite reservoir project area (Larson et al. 1972). At Hershop Bog, peat deposits began to form near the end of the Late Glacial period. Pollen records from those peats indicate an overall decline in arboreal taxa and a loss of river birch (*Betula nigra*). Currently, river birch grows in areas of east Texas, where the mean annual rainfall ranges from 1,016 to 1,270 mm. The closest modern stands of birch are 415 km northeast of Hershop Bog. Based on the pollen record, the climate of south-central Texas probably was wetter and cooler during the Late Glacial than it is today.

In southwestern Texas, pre-Holocene pollen records recovered from Bonfire Shelter (Figure 8.3) are not dated. Nevertheless, probable Late Glacial deposits at that site reflect regional trends similar to those found in other areas of Texas (Bryant 1969). Decreasing percentages of pine pollen accompanied by rising concentrations of grass, composite, and mormon tea (*Ephedra* spp.) pollen, just prior to the onset of the post-glacial period at Bonfire Shelter, suggest that nearby areas of mixed pinyon and juniper woodlands were being reduced in size while savanna and scrubland areas were steadily spreading. The shift of the flora in the lower Pecos River area to a less mesic group during the Late Glacial may have been caused by a variety of factors, including a possible reduction in stream discharge and reduced availability of ground water caused by higher summer evaporation rates.

By extending the paleoenvironmental trends from these nearby sites, we can infer that the South Texas Plains probably experienced a gradual warming and drying trend around the end of the Late Glacial period transition. The lack of direct fossil evidence prevents us from making a more detailed statement about the potential vegetational changes prior to 10,000 B.P.

Holocene Period: 10,000 B.P. to Present

No post-Glacial fossil pollen records exist for the South Texas Plains. Archaeobotanical studies are available for the region and can be used to formulate a few generalized statements. Holloway (1986) examined a number of charcoal samples recovered from archaeological deposits spanning the past 6,000 years in the Choke Canyon region (Figure 8.3). In that study, Holloway found that the primary fuel sources used by aboriginal groups consisted of acacia and mesquite wood. To a lesser degree, these same aboriginal groups used firewood from riparian sources such as willow (*Salix* spp.), pecan (*Carya* spp.), and probably persimmon (*Diospyros* spp.). Based upon those findings, Holloway (1986) suggested that during the last 6,000 years of the Holocene, the Choke Canyon region contained vegetation very similar to the area's modern flora, and that no major vegetational changes had occurred during that time span.

Steele's (1986b; Steel and Hunter 1986) analysis of faunal remains recovered from some of the same Choke Canyon archaeological sites studied by Holloway (1986) indicates possible human utilization of a variety of mammal species during the past 6,000 years. Recovered faunal remains include taxa such as the common raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and common muskrat (*Ondatra zibethicus*). Each of these represents animals generally associated with wooded areas similar to some of the current south Texas riparian habitats. In addition, other prehistoric faunal remains in those same archaeological sites come from pronghorn (*Antilocapra americana*), American bison (*Bison bison*), collared peccary (*Tayassu tajacu*), and black-tailed jackrabbit (*Lepus californicus*). This last group of animals reflects a grassland and scrub habitat similar to the type common in many dry, upland areas of south Texas today.

In southwestern Texas the inferred Late Glacial mosaic vegetation of woodlands, parklands, and scrub grasslands gradually was replaced by larger areas of scrub grasslands between 10,000 and 7,000 years ago (Bryant 1966, 1969; Bryant and Larson 1968; McAndrews and Larson 1966). By 8500 B.P., agave (*Agave*), sotol (*Dasylirion*), yucca (*Yucca*), and prickly pear (*Opuntia*) were common elements of the lower Pecos River area flora, as they are today in the xeric Chihuahuan Desert environments of northern Mexico (Dering 1977, 1979).

Macrobotanical remains from the lower level of Hinds Cave, which date between 8000 and 8500 B.P., contain agave lecheguilla leaf fragments (Dering 1979). It appears, therefore, that elements of xeric-adapted flora were present in the area at least by that time period. Data indicate that for the next 3,000 years, xeric-adapted plants became more abundant in the lower Pecos River region. Combined records of pollen, macroplant remains, coprolites, and fauna from Hinds Cave indicate that by 6000 B.P. the foragers of the region were intensifying the use of both xeric plant resources and small game (Brown 1991; Dering 1999). It appears that the Chihuahuan Desert flora continued to expand into the lower Pecos River region for the next 3,000 years.

Fossil pollen records representing the last 4,000 years in southwestern Texas indicate a gradual and continual trend toward increased aridity. Only once, around 2,500 years ago, was this apparent trend interrupted, as evidenced by sharp increases in the percentages of both pine and grass pollen in deposits at Bonfire Shelter and at the Devil's Mouth (Figure 8.3) site. After this inferred short-lived increase in available moisture, the trend toward increased aridity was resumed and has continued in southwestern Texas until the present (Bryant and Holloway 1985).

In summary, interpretation of south Texas Holocene vegetational chronology rests upon very limited information. Although the climate of south Texas may have been generally stable during the Holocene, slight changes in temperature and rainfall patterns may have caused significant but temporary shifts in the areal extent of local and regional post-glacial vegetational communities. Studies of fossil pollen at the Cueva de la Zona de Derrumbes site, located in the state of Nuevo Leon, Mexico, suggest vegetational stability in that part of northern Mexico during the past 5,000 years (Bryant and Riskind 1980). According to Bryant and Riskind (1980), modern vegetation in both south Texas and northeastern Mexico is sensitive to environmental change and is controlled to a great extent by temperature, exposure, elevation, moisture availability, and edaphic conditions. Collectively, the data indicate that there was a mosaic vegetational pattern in the Tamaulipan Biotic Province (Blair 1950) throughout the Holocene. It is likely that wooded areas were dispersed within expansive grasslands and brushlands.

Gunn et al. (1982) have proposed an alternative model for climate change in south Texas. Utilizing current climatic records as their basis and projecting these trends into the past, they reported a series of alternating wet and dry periods during the Holocene. Most of their empirical evidence is based on phytolith data (Robinson 1979, 1982), which point to an abrupt episode of aridity during the mid-Holocene. Neither the radiocarbon dated pollen sequences from central Texas (Graham and Heinsch 1960) nor the plant macrofossil (Holloway 1986), nor the faunal evidence (Steele 1986a, 1986b, Stelle and Hunter 1986) from south Texas, support the presence of a distinct dry period within the region. Instead, current data indicate a gradual trend toward aridity for at least the past 6,000 years. The combined evidence of charcoal, fauna, and pollen records suggests that a reevaluation of Gunn et al.'s (1982) model is warranted.

Plant Remains

Botanical analyses form the data base for many types of interpretations, ranging from sequential changes in past environments to information about the lifestyles and diets of prehistoric human populations. In each of these studies, the interpretation of botanical data must account for composition of the original pollen rain, factors that may have altered the composition of the buried pollen assemblage, plus mechanisms for emplacement of macrofossils (e.g., differentiating between flood-transported materials, local treefall accumulated material, in-place roots, deliberately or inadvertently buried objects, etc.) and the post-depositional processes that may have altered or destroyed the carbonized plant assemblage.

Pollen

An examination of 25 sediment samples from the Applewhite Terrace fill at the Richard Beene site demonstrated that while moderate amounts of fossil pollen were recovered from the Leon Creek paleosol, pollen preservation below that level was very poor. Five soil samples from the Leon Creek paleosol were processed and analyzed by John Jones of the Texas A&M University Palynology Laboratory, and indicated reasonably good pollen preservation (Table 12.1). Jones also examined two samples from lower levels of the Applewhite Terrace and 18 other samples from the Applewhite Reservoir study area. These 20 samples yielded badly degraded pollen in concentrations below 500 grains/ml.

Samples from the upper levels, including the Leon Creek paleosol, indicate vegetation similar to that in the area today. Recovered pollen represents riparian arboreal taxa such as pecan and bald cypress (*Taxodium* spp.), and more widespread arboreal types such as oak and hackberry (*Celtis* spp.). The assemblage is dominated, however, by wind-pollinated types of composites, including dandelion-type (*Liguliflorae*) pollen representing weedy species that inhabit open and disturbed areas such as human habitation sites.

Table 12.1. Pollen samples were collected from the following contexts: Sample 1: 20-40 cm bs, modern soil, Bk1 horizon; Sample 2: 70-90 cm bs, upper Leon Creek paleosol, Bk3 (Ab1) horizon; Sample 3: 110-145 cm bs, mid Leon Creek paleosol, Bk4 horizon; Sample 4: 260 cm bs, upper Medina paleosol, Akb2 horizon; and Sample 5: modern surface.

Taxon	**Sample (%)**				
	1	**2**	**3**	**4**	**5**
Pinus	1.4	0.9	0.4	2.4	5.0
Ephedra	0.9	-	-	0.9	-
Taxodium	-	-	-	-	5.0
Quercus	1.4	2.7	1.2	3.8	14.3
Carya	0.9	2.7	-	0.5	-
Fraxinus	1.4	1.8	0.8	0.5	2.5
Ilex	0.5	-	-	-	-
Myrica	0.5	-	-	1.4	0.4
Cornus	-	-	0.4	-	-
Platanus	0.5	-	0.4	-	-
Ulmus	0.5	-	-	-	-
Celtis	0.5	5.4	3.2	2.4	4.2
Salix	-	0.4	0.4	-	0.8
Cylindropuntia	-	-	-	0.5	-
Liquidambar	-	1.3	0.4	-	0.4
Poaceae	3.5	9.4	25.4	8.9	8.8
L. S. Compositae	66.1	35.9	38.6	41.0	25.8
H. S. Compositae	6.2	5.4	6.0	3.7	3.3
Liguliflorae	4.0	5.9	1.2	1.2	4.2
Cheno-Am	0.9	4.5	6.6	16.7	-
Convolvulaceae	0.5	-	-	0.5	-
Cyperaceae	-	0.9	-	-	-
Euphorbiaceae	-	0.4	-	-	-
Fabaceae	0.5	0.9	0.4	0.5	-
Alnus	0.9	-	-	-	-
Apiaceae	-	-	-	0.5	-
Lamiaceae	-	-	-	-	0.4
Malvaceae	-	0.4	0.8	-	-
Mimosaceae	-	-	0.4	-	0.4
Nyctaginaceae	-	-	0.4	-	-
Liliaceae	-	-	0.8	0.5	-
Polygonaceae	-	0.4	-	0.4	1.5
Rosaceae	-	-	-	0.5	0.4
Scrophulariaceae	-	-	-	0.5	-
Onagraceae	-	-	-	0.5	-
Eriogonum	-	4.9	2.8	-	-
Artemisia	0.9	0.4	0.4	0.5	-
Eleaginaceae	-	-	-	0.5	-
Unknown	-	-	-	-	0.4
Total	100	100	100	100	100
Lycopodium Tracers Concentration	79	22	38	44	35
Value (grains/ml)	3,161	11,454	7,464	5,445	7,748

Below the Leon Creek paleosol, pollen preservation is so poor that no meaningful statements can be made regarding the nature of the prehistoric vegetation. Palynologists should have pollen concentration values exceeding 2,500 grains per milliliter (ml) of sediment before the record can be properly interpreted (Bryant and Hall 1993; Bryant and Jones 1989; Hall 1981).

Carbonized Plant Remains

Charred plant remains from archaeological sites can provide direct evidence of prehistoric plant utilization. The charred wood assemblage consisted of material collected from sediment samples for the purpose of obtaining radiocarbon ages. These samples were examined for identification prior to sending them to the radiocarbon laboratory. Thirteen sediment samples extracted from the features with the most carbon-stained sediments were subjected to flotation analysis. These samples yielded no identifiable carbonized remains.

Of the 22 charcoal samples analyzed, only five exhibited sufficient woody structure for identification. From these results, it is apparent that conditions for the preservation of carbonized plant remains are very poor in the Applewhite Terrace fill. Nevertheless, available plant identifications contributed to our knowledge of the paleovegetation at the site. Table 12.2 presents the results of the plant identification in both cultural and stratigraphic contexts. Three plant taxa were identified: mesquite/acacia (*Fabaceae*), oak (*Quercus*), and bois d'arc (*Maclura pomifera*).

Mesquite/acacia. Mesquite and acacia wood charcoal is very difficult to differentiate. Only excellent conditions of preservation have enabled separation of the two types. Mesquite and several species of acacia were common components of the prehistoric vegetation of southwestern Texas since the late Pleistocene/Holocene transition (Dering 1979). Fabaceae-type wood representing these two taxa was recovered from 6,000-year-old sediments in the Choke Canyon Reservoir. The material identified as mesquite/acacia at the Applewhite Reservoir was recovered from the middle, Early Archaic deposits (Elm Creek paleosol), providing evidence that these shrubs were present in the early Holocene vegetation assemblage of south Texas.

Both mesquite and certain species of acacia were commonly utilized by Native Americans (Yanovsky 1936). Mesquite provided excellent firewood and building material, and the seed pods were a major food source for many groups. Acacia pods and seeds also were used as food.

Oak. Oak is very durable and can be identified even in samples of diminutive size (<2mm). As a result, oak is often overrepresented in archaeological samples. Oak pollen is a common element in the late Pleistocene record of Hershop Bog to the east (Larson et al. 1972) and is present at Bonfire Shelter to the west (Bryant 1966) and in the Holocene record of the Choke Canyon area (Holloway 1986).

Bois d'arc. The third wood type identified, bois d'arc (*Maclura pomifera*), merits special consideration. The single identified specimen was recovered from the early, Early Archaic deposits (Perez paleosol) and dates to approximately 8800–8600 B.P. While records show that bois d'arc wood was utilized by Native Americans, such as the Osage people, as a favored source of bow wood (Vines 1960), it does not grow in the Applewhite project area today. In fact, it is not reported from natural stands in the area described as the South Texas Plains (Hatch et al. 1990). The possibility exists that bois d'arc may grow in some protected riverine microenvironments of the region and simply has not been reported. In addition, bois d'arc does grow on the nearby Edwards Plateau, including the upper Medina River watershed upstream from the project area. Bois d'arc wood could have been transported into the area by floods, thereby becoming accessible to inhabitants once the flood waters receded.

The human factor must also be considered when bois d'arc wood is found in an archaeological site. While plant macrofossils found in bogs, lakes, or pack rat middens may represent a relatively unbiased sample of the local vegetation (Watts 1973; Wells 1976), plant macrofossils in archaeological site deposits are generally the result of human selection and/or possible long-distance transport. Ethnographic studies of modern hunter-gatherer groups have

Table 12.2. Carbonized plant remains from the Richard Beene site.

Botanical Sample Number	**Block**	**Cultural Affiliation**	**Paleosol**	**Depth(m below surface of Applewhite Terrace)**	**Fea**	**Results**
BOT-1	GC	late, Early Archaic	Medina	6.38-6.54	73	No Structure
BOT-2	G	late, Early Archaic	Medina	6.42	76	No Structure
BOT-3	G	late, Early Archaic	Medina	6.56-6.70	44	No Structure
BOT-4	G	late, Early Archaic	Medina	6.47	30	No Structure
BOT-5	GC	late, Early Archaic	Medina	6.58-6.65	74	No Structure
BOT-6	G	late, Early Archaic	Medina	6.40-6.50	30	No Structure
BOT-7	GB	late, Early Archaic	Medina	6.52-6.58	43	No Structure
BOT-8	H	early, Early Archaic	Elm Creek (C horizon)	8.50	31	Oak (*Quercus* sp.)
BOT-9	HA	early, Early Archaic	Elm Creek (C horizon)	8.86-8.96	-	Bois D’arc
BOT-10	M	middle, Early Archaic	Elm Creek	11.75	80	Oak (*Quercus* sp.)
BOT-11	M	middle, Early Archaic	Elm Creek	11.67-11.80	80	Mesquite or Diffuse Porous Hardwood
BOT-12	O	middle, Early Archaic	Elm Creek	9.08	108	No Structure
BOT-13	T	early, Early Archaic	Perez	10.55-10.72	-	No Structure
BOT-14-	T	early, Early Archaic	Perez	10.45-10.55	-	No Structure
BOT-15	T	early, Early Archaic	Perez	10.35-10.45	-	No Structure
BOT-16	T	early, Early Archaic	Perez	10.44-10.54	-	No Structure
BOT-17	T	early, Early Archaic	Perez	10.55-10.72	-	No Structure
BOT-18	S	Non-Cultural (late Pleistocene)	Soil 7	15.94-16.04	-	No Structure
BOT-19	S	Non-Cultural (late Pleistocene)	Soil 8	16.02-16.12	-	No Structure
BOT-20	S	Non-Cultural (late Pleistocene)	Soil 7	15.74	95	Oak (*Quercus* sp.)
BOT-21	BHT 54	Non-Cultural (late Pleistocene)	Somerset	12.94-13.06	-	Oak (*Quercus* sp.)
BOT-22	BHT 54	Non-Cultural (late Pleistocene)	Somerset	12.94-13.06	-	No Structure

demonstrated that humans utilize only a small fraction of the available plant resources on a regular basis, and exercise considerable bias in species selection. These factors then create a bias in the diversity found at a site (Bicchieri 1972; Lee 1969).

Not only are hunter-gatherer groups selective, but they also tend to have conservative cultural traditions that are resistant to change over long periods. For instance, the Archaic cultural tradition of the lower Pecos River region probably changed very little over a period of nearly 5,000 years (Shafer 1975, 1986). This resistance to change is manifested in the plant macrofossil record of several archaeological sites in the lower Pecos River region where the cultural plant record remains remarkably stable despite concurrent pollen data indicating obvious alterations in the regional vegetation. The plant macrofossil study at Hinds Cave in the lower Pecos River region is an excellent example of cultural stability in the plant macrofossil record covering a period of 7,000 years (Dering 1979, 1999). Similar results have been noted at other Archaic sites. At Hogup Cave in central Utah, Harper and Alder (1970) were impressed by the stability of the plant macrofossil record over a period of thousands of years. As long as the flora did not change so drastically that technologically important plants disappeared or became too rare to exploit, certain prehistoric populations evidently would continue to select the traditionally favored plants. This selectivity tended to mask regional ecological changes in the plant macrofossil vegetation record.

Plant macrofossils at archaeological sites may represent “imports” carried in from distant localities by prehistoric peoples (Bicchieri 1972; Lee 1969). As a result, the plant macrofossils recovered from the Richard Beene site could represent prehistoric vegetation that grew well beyond the immediate area. This situation is very different from that encountered in studies of autochthonous plant remains, where the plant macrofossils represent vegetation adjacent to the site of preservation. Bois d’arc, commonly used in Native American technology (Swanton 1946), could have been transported or even traded across vegetation zones in the form of a tool or other curated utensil. Given these possibilities, further analysis is needed to interpret the exact significance of the bois d’arc macrofossil found at the Richard Beene site.

Preservation of Paleobotanical Remains

At the Richard Beene site, which is an open site, one would normally expect to find only charred plant remains and adequately preserved pollen and phytoliths. Unfortunately, the conditions for preservation were apparently very poor for *all* categories of plant remains. As noted in Table 12.2, only 5 out of 24 specimens of charcoal exhibited sufficient remaining cellular structure to be identified, and pollen was virtually nonexistent below the Leon Creek paleosol.

Chemical decomposition of plant materials has played an important role in the paleobotanical record at the Richard Beene site. In order of their increasing resistance to oxidation, the three main compounds found in the walls of plant cells are cellulose, lignin, and sporopollenin. Because most pollen taxa contain a high percentage of sporopollenin, pollen is generally one of the plant remains most resistant to decomposition. The amount, kind, and condition of fossil pollen is often a good guide to the overall level and potential for organic preservation (Bryant 1989).

Holloway (1981) showed that a number of specific chemical compounds can be classified as important plant decomposition agents. Interestingly, eight of the nine compounds tested were bases, and three of these contained carbonate. Sediment composing the Applewhite Terrace fill is very basic and rich in carbonates.

During the processing and examination of charcoal samples at Applewhite Reservoir, the condition of the specimens varied from exhibiting good structure to completely lacking any internal structure. The most poorly preserved samples were little more than a black powder imbedded in a sediment matrix. The most likely explanation for such degradation would be a combination of mechanical reduction and chemical processes involving the following: (1) high (basic) pH levels;

(2) percolation of carbonate-rich ground water; and (3) expansion and contraction due to continuous wetting and drying of the site's clay-rich sediments.

Summary

Analyses of pollen and carbonized plant remains were conducted on sediments from the Richard Beene site, a deeply stratified archaeological site in the Applewhite Terrace fill of the Medina River. Results of the analysis indicate that very poor preservation conditions prevailed at the site. Despite poor preservation at the site, 10,000 year–old specimens of bois d'arc charcoal were recovered.

Recovered plant remains indicate little change in the riparian vegetation of the Medina River valley during the Holocene epoch. The limited pollen record demonstrates that modern vegetation patterns were probably in place for at least the past 3,000 years. The presence of oak and mesquite pollen in deposits dating to 4600–4100 B.P. fails to demonstrate any significant differences in the late Holocene riparian vegetation relative to modern flora.

Poor plant preservation conditions probably relate to: (1) very high pH levels; (2) percolation of carbonate-rich ground water; and (3) expansion and contraction brought on by continual wetting and drying of the sediments, causing mechanical reduction.

The size of the fossil pollen and plant macrofossil assemblage must be considered when weighing the validity of any conclusions regarding Holocene vegetation change in the study area. These results from the botanical investigations at the Richard Beene site do not contradict the general trends indicated by other studies within or adjacent to the region.

13

FEATURE ASSEMBLAGE

Patricia A. Clabaugh and Alston V. Thoms

Archaeological features, especially well preserved examples, contribute substantially to understanding site structure and function (Binford 1983:145–146; Bower 1986:271–272; Butzer 1982:87, 1989:120; Schiffer 1987; Stewart 1977:150; Wolynec 1977). At the Richard Beene site, 74 features in varying states of preservation. Two broad classes of features were identified: (1) cooking-related features (n=56), including earth ovens and hearths; and (2) debris concentrations (n=23), including mussel shell dumps, sheet middens, and flood-lagged material. Cooking-related features are the focus of this chapter. The general nature of these features is consistent with the types of small cooking facilities described in or inferred from ethnohistoric accounts of multifamily encampments in south-central Texas and northeast Mexico (Chapter 8). Most of the site's features are rather small and probably represent remains of *family-sized* cooking facilities, as opposed to large, *communal* or *bulk-processing* facilities. The site's thin sheet middens are suggestive of short-duration camps occupied by a few families.

This chapter describes, compares, and interprets the site's cultural features. It begins with an overview of the general nature of the features at the Richard Beene site. Some of the established approaches used in feature and cook-stone research are then reviewed as are regional ethnohistoric accounts that pertain to aboriginal cooking practices. The next section discusses field, laboratory, and data processing methods used in the present study. A feature typology is introduced next to establish an analytical framework. It is followed by feature descriptions presented from most recent to oldest, and according to the deposit in which they occur. Stratigraphic and cultural component terminology follows that introduced in Chapters 3 and 9, respectively. The chapter ends with a summary of findings and concluding remarks.

General Nature of the Feature Assemblage

The most common and best preserved features at the site were remains of small (< 0.6 m diameter, n=37) and somewhat larger (ca.0.6–1.5 m diameter, n=19) cooking facilities. These features appear to be the remains of various types of open-air hearth and earth ovens. Some of them were in shallow basins and others appeared to have been built on/near the surface. Many (n=64) contained varying amounts and configurations of FCR (aka cookstone) (Chapter 8) but others were entirely rockless (n=15). Less common but widespread were mussel shell lenses (n=6) and sheet middens (n=8) of varying size with FCR, mussel shells, bone fragments, and chipped stone debitage. Eight midden-like deposits in Block H (early, Middle Archaic) that consisted of admixtures of different artifact types and stream-worn pebbles are classified as lag deposits that resulted from flood scouring; other such lag deposits were recognized but not designated as features (Chapter 4). One concentration of chipped stone debitage in a Middle Archaic component (lower Block A) was designated as a feature.

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Conspicuously absent from the Richard Beene site were substantial accumulations of FCR (i.e., more than two or three rocks thick) that are characteristic of burned rock middens in central Texas (Black and Creel 1997) and some parts of the Nueces River basin to the south (Thoms et al. 1981). Although mussel shell concentrations were documented at the Richard Beene site, they were never more than two or three shells thick. With the exception of one very large (ca. 2 m diameter) earth oven in the site's Late Archaic deposits (upper Block B, Feature 12), features large enough to have been used for bulk processing or other forms of communal cooking (cf. Binford 1983; Thoms 1989) were not observed.

Neither post holes nor storage pits were encountered at the site. These and other non-fire-related pit features are less likely to be discerned in the field, especially if they lack distinctive fill such as carbon-stained sediments and FCR typically found in fire-related features. However, storage pits and sizable post holes are not characteristic of hunter-gatherer sites elsewhere in the region, although they are common at remains of agricultural villages in the surrounding regions. At the Richard Beene site, pit features in general are rather shallow, which could be a reflection of the site's hard-to-dig clayey sediments.

Variation in the degree to which the site's features are preserved stems primarily from flood scouring, which was limited to the site's early, Early Archaic deposits (especially Block H), and from pedoturbation, which was most prevalent in the upper portion of the B horizons of the site's paleosols (Chapters 3, 4, and 9). Most affected by pedoturbation were the Late Pre-Columbian and Late Archaic deposits encased in the modern soil and the uppermost portion of the Leon Creek paleosol, respectively. One of the site's Middle Archaic deposits (Block U) in the uppermost portion of the Medina pedocomplex was also substantially pedoturbated. Features in the lower portion of the Leon Creek and Elm Creek paleosols as well as the Medina pedocomplex tended to be well preserved. Several "features" initially thought to be cultural in origin were subsequently determined to have resulted from natural processes, including tree root burns and rodent burrowing (cf. Butzer 1989; Schiffer 1987). There are also numerous artifact concentrations in the upper Perez components, especially Block H, that are lag concentrations formed by flood scouring, as evidenced by an abundance of stream-worn pebbles intermixed with artifacts. Some of these concentrations, notably those with large pieces of FCR, were assigned feature numbers and designated as "lagged" remains of heating elements in earth ovens.

Cultural and Experimental Contexts for Feature Assessments

Ethnoarchaeological studies have identified broad patterns in the types of features and site structure characteristic of short-term, hunter-gatherer encampments. Knowledge of these features is especially useful in developing expectations about the nature of feature assemblages and making functional interpretations about the remains of features found in the archaeological record. Ethnohistorically and ethnographically derived data about foods and cooking methods are also integral to feature research. So too, experimental work with FCR has also proven to be useful in determining how different types of cooking features are likely to have functioned.

Ethnoarchaeology Studies

Intra-site spatial organization studies have shown that the presence, arrangement, and distribution of cooking fires in residential settings are important elements of site structure (Binford 1978a, 1978b, 1983; Kent 1984; Stevenson 1991; Yellen 1977). Binford (1978a) focused on the spatial organization of Nunamiut men's hearths. He observed that disposal patterns formed artifact rings, termed inner drop zones and outer toss zones, around extramural hearths. Most artifacts in the inner drop zone were small in size, while large and small items were found in the outer toss zones.

Yellen (1977:158) generated spatial models for !Kung campsites wherein he also identified ring patterns of artifact distribution. In this case, generalized domestic activities took place in the inner ring or "limit of nuclear area," and special activities occurred in the outer ring or "absolute limit of scattered artifacts." His fieldwork and resulting models showed that smaller, central fires were built within or near the dwelling space and larger fires were built well away from domestic structures. While broad patterns in site structure are found in environmentally diverse regions of the world, the specific nature of individual encampments as presented in a variety of forager-collector models depends on local conditions, including location, duration of stay, weather, population size, and food storage needs (Binford 1987:449–512; O'Connell 1987).

For mobile hunter-gatherers, houses may be ephemeral in nature, but distinctions can be made when assessing whether feature types are likely to be found inside residential structures (Binford 1983). Ovens or other sizable fire structures that produced large amounts of smoke, soot, sparks, and ash are not likely to be constructed inside a dwelling, but are usually well removed from it. So too, large-size residue, such as FCR and bone, is likely to be removed periodically as part of routine cleaning activities, as is ash and charcoal from small, repeatedly used cooking facilities, whether inside or outside a dwelling. Within structures as well as in nuclear areas in general, items deposited on the ground around cooking facilities are often swept back away from the domestic area as well as into a central hearth area. This basic paradigm is used herein to interpret probable feature function and use at the Richard Beene site. Mason, in Chapter 14, uses results of density and cluster analyses to identify domestic and peripheral zones within block excavation areas.

Ethnographic Records

The kinds of cooking facilities described in hunter-gatherer ethnographic records from around the world tend to fall into one of two general classes: (1) those that rely on direct heat (flames and coals) generated from combustion, usually of wood; and (2) those that rely on indirect heat, usually from rocks heated by flames and coals that serve as heating elements in earth ovens and griddles (Wolynec 1977:221). Cooking is typically done using a fire built on the ground surface (i.e., open air campfire). With repeated use of the fire a shallow depression may develop as a result of removing the ash. Cooking fires can also be built directly in a shallow depression, in which case food also would be cooked in an open-air setting, directly on/above the coals. Alternatively, the coals could be covered with a lens of vegetation upon which food was placed and then covered with lenses of vegetation and earth to produce an earth oven. Both types of cooking facilities function with coals alone or with rock heating elements (Clabaugh 2002). Water is sometimes added to earth ovens, especially those with rock heating elements, to facilitate cooking (Wandsnider 1997) or simply to briefly steam foods. In open-air cooking facilities, food can be placed directly in hot ashes, skewered on a stick stuck into the ground over a fire, or cooked over rock griddles in the fire ('Ksan 1980). The size and shape of cooking facilities, of course, depends in large measure on what and how much food is being cooked and how many people are eating.

Álvar Núñez Cabeza de Vaca, writing in the early 1500s, provided the earliest accounts of Indian lifeways in south-central and west Texas and northern Mexico (Krieger 2002). His accounts describe use of outdoor earth ovens to cook a wide variety of foods as well as open-air hearths, inside and outside wickiups, used for heating and cooking. As noted in Chapter 8, however, Cabeza de Vaca's accounts do not mention the use of cook stones in any of the cooking facilities, although such usage is implied.

Two ethnographic accounts not reviewed in Chapter 8 attest to locations and types of cooking facilities similar to those described by Cabeza de Vaca. The first account is by José Maria Sanchez who was with Manuel de Mier y Teran and Jean Louis Berlandier on an inspection tour of Texas for the Mexican government in April of 1828 (Sanchez 1926). The English translation of Sanchez's narrative describes a hearth feature observed inside a wickiup not far from San Antonio: "In the center of each [wickiup] is located the fireplace around which lie the male Indians in complete inaction, while the women are in constant motion either curing meat of the game, or tanning the skins, or preparing the food, which consists chiefly of roast meat, or perhaps making arms for their indolent husbands" (Sanchez

1926:269). The second account is from northern Mexico and pertains to cooking techniques in the mid-1600s as reported by Alonso de Leon, the Governor of Nuevo Leon. He described how the local Indians cooked agave in an earth oven. “The general food they eat in the winter time is one they call mescale. It is made from the heart and fleshy leaves of the lechugilla. Their method is to barbecue it. This method takes two days and three nights to cook” (Duaine 1971:29).

In the first account, we are told that there was a hearth in the center of the wickiup. Activities conducted in and near the fire included curing meat, tanning hides, and cooking meat. Given the kind of processing activities and the proximity of the male inhabitants to the fire, this may also suggest cooler seasonal temperatures. By most standards, this feature would be considered a domestic hearth. In the second account, relevant information also conveys seasonality, lechugilla processing, and specific cooking requirements. Given that it required two days and three nights to “barbecue” lechugilla, an earth oven with a rock heating element probably would be the only cooking facility that would stay sufficiently hot for that amount of time (Thoms 2003).

Earth ovens come in many sizes and shapes, both with and without cook stone (Ellis 1997). Ethnographic accounts and archaeological records from throughout much of North America in general attest that hunter-gatherers used cook stones in non-oven cooking facilities as well (Thoms 2003). Allan Smith’s (2000) accounts pertaining to the Kalispell, a hunter-gatherer group in the Northern Rocky Mountains, attest to four generic types of hot-rock cooking facilities: (1) earth ovens, sometimes called dry ovens, with a rock heating element heated in situ; (2) steaming pits, sometimes called wet ovens, with rocks heated outside the pit; (3) open-air hearths with cook-stone griddles; and (4) stone boiling in pits with rocks heated nearby (Chapter 8; Figure 8.4). Driver and Massey (1957) documented a similar range of cook stone facilities elsewhere in North America. Smith’s accounts are comparatively detailed, however, and thereby provide a reliable basis for generating expectations about how remains of these generic types should appear in the archaeological record. Table 13.1 summarizes how selected cook-stone facilities were constructed and used by the Kalispell and Table 13.2 summarizes how the remains of those facilities (i.e., features) are expected to be manifested in the archeological record. Information summarized in Tables 13.1 and 13.2 guided interpretations in this chapter about feature function.

Experimental Archaeology

Experimental archaeology uses the kinds of materials found in archaeological record, especially stone, bone, and ceramics, to replicate techniques believed to have been employed in the past to manufacture and use tools and features. This approach has been useful in simulating cooking strategies in an effort to define and evaluate methods, techniques, assumptions, hypotheses, and theories about archaeological and ethnographic features (Bond 1978; Ingersoll et al. 1977; Thomas 1991:150–155; Thoms 2006). Controlled studies in building, using, and excavating cook-stone features—stone boiling, baking in earth ovens, roasting on skewers over open fires, cooking meat on top of coals or buried in ash, grilling on hot stones, etc. (e.g., Thoms 2006)—have improved our interpretations of feature remains found in the archaeological record.

Much of the present-day interest in FCR studies was introduced by cultural resource management projects in the late 1970s and 1980s (e.g., McParland 1977; Schalk and Meatte 1988; Thoms 1986, 1989). National and international research and symposia focusing on burned rock and domestic fire structures are gaining momentum (Black et al. 1993; Buckley 1990; Frere-Sautot 2003; Hodder and Barfield 1991; Trigger 1989:20–21). Through experimental work with FCR, researchers are assigning new meaning to this artifact class, its constituent features, and their potential to tell us about land-use patterns.

Pierce (1984) explained the difference in raw material selection for cook stone and thermal properties of rock types (i.e., differential heat treatment) in a Chumash village site in southern California. He compared the distribution of FCR by their physical properties and breakage patterns before and after heat alteration. Lintz (1989:320) addressed the nature of caliche FCR in the Llano Estacado, and

Table 13.1. Summary of Ethnographically Documented Hot-Rock Cooking Facilities Used by the Kalispel People, Montane Hunter-Gatherers of Northeastern Washington and Northern Idaho (Thoms 2006).

Hot-Rock Cooking Facilities	**Foods Prepared in the Facility**	**Basic Construction and Cooking Techniques for the Facility**
Earth oven in a shallow, closed pit; rocks heated therein (aka steam-roasting pit; Smith 2000: 7.8-7.15)	Camas (*Camassia quamash*) wild onion (*Allium*, spp.), unnamed roots, black tree lichen (*Alectoria fremonti*)	For camas [other foods probably cooked in smaller ovens*****], a round (ca. 2.4-3.1 m dia., 0.15 m deep) or elliptical pit (ca. 2.1 x 1.5 x 0.15 m) is dug and sometimes lined with rocks (ca. 0.17 m dia); a large quantity of firewood (sticks and some logs 0.15 m dia.) is added and then another layer of rocks; the wood pile is fired, burns down, and the heated rocks are spread across the bottom of the pit; green boughs, grass, or skunk cabbage leaves are used to cover the hot rocks and coals; camas bulbs are added (in woven sacks or baskets, but containers sometimes not used when black tree lichen is cooked with camas or onions), then covered with green plant material and finally with earth; sometime a fire is built on top of the low mound and quickly covered with sod to keep the wood from burning too fast and to hold in the heat (an upper fire was not used when black tree lichen was included with camas or onions); the bulbs cook for 48 hours before the oven is opened
Earth oven in a shallow open pit; rocks heated nearby (aka roasting pit; Smith 2000: 7.14-7.16)	Bear, deer, and meat of any kind, as a first step in drying process or for immediate consumption	A shallow pit is dug, similar in shape but smaller than that used for camas; a few hot rocks, heated in a nearby fire, are put in the pit and covered with green boughs on which are placed large pieces of meat that are then covered with additional green boughs or grass, and allowed to cook for ca. 30 minutes, in preparation for subsequent drying or stone-boiling if consumption is imminent; for cooking meat ca. 20 minutes for immediate consumption, several hot, flat rocks are placed in the bottom of the pit and covered with green boughs on which is placed meat cut into strips, then covered with a layer of green branches, and weighted down with unheated rocks
Surface oven; rock[s] heated therein (aka drying oven; Smith 2000: 7.20)	Bear, deer, other meat, as final step in drying process (for eating later)	A large rock is heated in place, presumably by a fire built on the surface, and, after the fire burns down [presumably the remaining coals are scraped away to avoid burning the green-boughs covering the rock], it is covered by green branches upon which is placed the half-roasted meat that is then covered with green boughs held in place by a few cold rocks; the meat is cooked for about 30 minutes
Steaming pit; with rocks heated nearby (aka steaming oven; Smith 2000: 7.19-7.20)	Eggs and small amounts of root foods	Hot rocks, sometime only one large flat rock, are heated in nearby fire and placed in a shallow pit [presumably basin-shaped, ca. 0.75 m in dia. and 0.3 m deep] and covered with green twigs or grass; food is added and covered with a layer of green grass; a stick is placed upright in the pit and the whole is covered with earth; the stick is then removed and a little water is added through the resulting hole, which is then covered, and the food allowed to cook
Stone-boiling pit; with rocks heated nearby; (Smith 2000: 7.16-7.19)	Mammals, birds, reptiles, fish, eggs, many root foods, berries, and teas	A bucket-shaped [near-vertical sidewalls] pit is dug, ca. 0.3 m in dia., and 0.1-0.3 m deep and lined with inner bark from an evergreen tree, or sometimes a deer paunch and rarely an untanned hide; water is added until the container-lined pit is about half-full and then the food, which is cut in small pieces; hot rocks "of any kind," up to four or five at a time, are carried to the pit with stick tongs and placed in water; as the rocks cool, they are replaced by hot ones as need; most foods cooked within 15 to 30 minutes
Stone-boiling container, above-ground container; with rocks heated nearby; (Smith 2000: 7.16-7.19)	Same as in stone boiling pits	The same general cooking techniques are employed, but boiling is done in woven baskets, as well as wooden vessels (Smith 1984) [no mention is made of boiling in suspended containers made of hide, as is reported for many Plains Indian groups]

*****Comments in brackets are Thoms' "working ideas," as opposed to information compiled from Smith's data.

Table13.2. Summary of Expected Archaeological Correlates for the Nature and Distribution of Fire-Cracked Rocks Used in Hot-Rock Cooking Facilities listed in Table 13.1 (Thoms 2006).

Hot-Rock Cooking Facility	**Expected Archaeological Characteristics of Resulting Fire-Cracked Rock (FCR) Feature(s)**	**Expected Archaeological Characteristics of Non-Feature FCR**
Earth ovens, rocks heated therein (Smith 2000: 7.8-7.15)	Basin-shaped pit, 1-3 m in dia. and 0.1-0.3 m deep, sometimes with rock lining and always with a lens of FCR (i.e., heating element) underlain by and intermixed with thermally altered (oxidized, carbon-stained) sediments; FCR (small to large *****), typically carbon-stained and mostly fragments, varies considerably in size, whole rocks often found along edges of heating elements; burned bone (possibly from fuel residue), flakes and tools expected therein as discard from routine clean-up activities	Scattered FCR in the immediate vicinity of remains of earth ovens, representing discard and scavenging activities, and perhaps rocks used with oven-top fire; also other scattered camp debris, furniture rocks, and unused cook stones
Open-pit drying ovens, rocks heated elsewhere (Smith 2000: 7-15-7-16)	Basin-shaped pit (ca. 1 m dia. x 0.3 deep**)** with FCR lens, mostly medium-size large rocks, underlain by thermally unmodified sediment; nearby surface hearths (ca., 1 m dia.) where rocks were heated, represented by ash, oxidized sediments, and a few pieces of FCR, burned bone (possibly from fuel residue), flakes and tools expected therein as discard from routine clean-up activities	Scattered FCR in the immediate vicinity of remains of open pits, representing discard and scavenging activities; also other scattered camp debris, furniture rock, and unused cook stones
Surface "oven," rock(s) heated therein (Smith 2000: 7.20)	Large to medium, presumably flattish, rock(s) on or just below the occupation surface, underlain and encompassed by thermally altered sediment (oxidized, perhaps some carbon-stained); burned bone (possibly from fuel residue), flakes and tools expected therein as discard from routine clean-up activities	Scattered FCR in the immediate vicinity of remains of surface "ovens" (i.e., open-air griddles) representing discard and scavenging activities; also other scattered camp debris, furniture rock and unused cook stones
Steaming pits; rocks heated nearby (Smith 2000: 7.19)	Basin-shaped pit (ca. 1 m dia. x 0.3 m deep) partially filled or lined with medium and large FCR (typically not carbon-stained), or occasionally a large flat rock, underlain by thermally unaltered sediment; nearby surface hearths (ca. 1 m dia.) where rocks were heated, represented by ash, charcoal, oxidized sediments, and a few pieces of FCR	Scattered FCR in the immediate vicinity of remains of steaming pits, representing discard and scavenging activities; also other scattered camp debris, furniture, and unused cook stones
Stone-boiling in a pit; rocks heated nearby (Smith 2000: 7.16-7.19)	Bucket-like (i.e., near-vertical side walls) pits, 0.3-0.45 m in dia. and 0.15-0.45 m deep, partially filled with small, possibly medium-sized, FCR, not typically carbon-stained, underlain by thermally unmodified sediment; nearby surface hearths where rocks were heated, represented by ash, charcoal, oxidized sediments, and a few pieces of FCR, burned bone (possibly from fuel residue), burned flakes and tools discarded in the fire pit	Comparatively dense, scattered FCR in the immediate vicinity of remains of stone boiling pits or concentrations representing discard and scavenging activities; also other scattered camp debris, furniture, and unused cook stones
Stone-boiling in a container; rocks heated nearby Smith 2000: 7.16-7.19)	Surface hearths where rocks were heated, represented by ash, charcoal, oxidized sediments, and FCR (not typically carbon-stained); concentrations of discarded small- and possibly medium-sized FCR, burned bone (possibly from fuel residue), burned flakes and tools, possibly discarded in fire pit	Comparatively dense, scattered FCR in the immediate stone-boiling area, representing discard and scavenging activities; also other scattered camp debris, furniture rock, and unused cook stones

*****Original rock sizes: large rocks, >25 cm in diameter; medium rocks, 0-25 cm in diameter; small rocks, <than 10 cm in diameter

discussed the results of heating experiments (i.e., grass fire versus intentional heating) to understand thermal shock (i.e., stone boiling) under controlled conditions. The wide spread distribution of discolored caliche led to questioning the assumption that discolored caliche in and of itself was necessarily associated with cultural activities. Jackson (1998) examined cultural activities and behavioral patterns that can be inferred when controlled experiments are used to characterize attributes of FCR (baking versus stone boiling rocks).

A workshop several years ago, known as the *Headwaters Experimental Workshop Series*, was designed to study "hot rock" features, specifically to "share interesting and potentially productive approaches to studying burned rock features in Texas" (Black 1995). Data recovery and analytical methods discussed in this workshop included fine screen sampling, standards for recording, documenting and sampling burned rock middens, micromorphology, detecting evidence for burning, analyzing the morphology of FCR, illustrating and interpreting hot-rock features, experimental archaeology, and paleomagnetic sampling. These studies contributed to a better understanding of how cooking features may have been used along the middle reach of the Medina River throughout the Holocene.

Feature Recovery, Laboratory Processing, and Data Management

Field Methods

The project's excavation strategy was directed toward identification and recovery of intact features. Extensive backhoe work, hand-dug cross trenches, and large block excavations resulted in the identification of the 74 cultural features and numerous natural features described in the next section. Features encountered in hand-dug cross trenches and block excavations were documented in detail, whereas those "salvaged" from the pan scrapers (Figure 13.1) often received less systematic treatment. Feature provenience data in Blocks A–F were recorded using a transit and stadia rod. A Sokkia Set 5 total station (electronic distance measurer or EDM) was

Figure 13.1. Salvage excavation of Feature 64 in the Early Archaic period (Block K), an earth oven in the Elm Creek component.

introduced to the project when Block G (the lower Medina pedocomplex or late, Early Archaic period) was excavated and was used thereafter (i.e., Blocks H–U) to document features. Features in the spillway trench that were exposed by pan scrappers or erosion were plotted with the EDM and described in field notes, but not excavated.

Most features at the Richard Beene site were identified by the nature and configuration of their constituent elements, typically FCR, burned sediments, mussel shells, and chipped stone. When a feature was discovered, feature level forms were used concurrently with regular level forms to maintain control. Features extending into more than one excavation unit (1 m x 1 m) were dug as separate units, but the resulting data were combined as needed for descriptive and analytical purposes. Most features were cross sectioned and one or more profiles drawn or photographed. Due to time constraints, only a portion of many features was excavated, with the remainder being left to the pan scrapers. Feature summary forms documented unit(s) provenience, described soils, including Munsell colors, provided a narrative description as well as scaled planview and profile maps that illustrated the nature of feature boundaries, and cross-referenced photographic logs. Features subsequently determined to be non-cultural in origin (e.g., krotovina, tree burns) were so noted in the feature summary. The summary forms and attachments were transcribed, digitized, and linked to the feature analysis database system.

Feature excavations generated several kinds of samples: (1) “all screened materials” (ASM) that were water-screened through 1/8 inch (ca. 0.3 cm) hardware cloth; (2) a fine-screen constant volume sample of one liter that was water-screened through 1 mm netting; and (3) bulk-sediment samples up to five liters in size for future studies of floral, faunal, and micro-artifact contents. In some cases, additional fine screen and bulk samples were collected from above, inside, and below feature boundaries for future studies. Feature and non-feature soil columns were collected from the various components for future micromorphology analysis. Finally, non-cultural soil and rock samples were collected on and off site for use as control samples in residue analysis (Appendix H and I) and in FCR studies (Jackson 1998).

Laboratory Methods

Many ASM’s and fine-screen samples from features required further processing to dissolve burned sediment and clay nodules that formed during water screening and sometimes encased small pieces of cultural material. A Calgon® solution (sodium hexametaphosphate–a surfactant that acts as a defloculant) was used to break down the clay nodules. Sediment samples were placed for two hours or longer in buckets filled with water and two tablespoons of the commercial solution. The mixture acted to dissolve the nodules, which allowed the saturated sediment to filter through the appropriate size screen and thereby revealed the encased materials. Special feature samples were treated according to the purpose for which they were intended (e.g., radiocarbon or residue samples).

Feature samples containing charcoal were prioritized in the field and in some cases sent to the lab for immediate attention and preparation for radiocarbon dating. Charcoal was examined to identify wood type before the samples were submitted for radiocarbon assay (Chapter 12). Several AMS ages were derived from very small pieces of charcoal (20–50 mg) collected in situ from cultural and non cultural features (Table 4.2a). Additional charcoal fragments were sorted from burned and unburned matrix using stereo microscopes. The few larger pieces of charcoal were divided; one piece for radiocarbon dating and the other preserved for future study. A sample of FCR remained unwashed for special studies including microscopic analysis (Appendix H and I). Other FCR samples were used for thermochemical analysis (Jackson 1998), and paleomagnetic analysis (Appendix G). “Raw” cookstone was also subjected to thermal experiments to simulate its use in hearths and ovens (Clabaugh 1996, 2002).

Data Compilation

Most feature-related screened materials (ASM and fine-screen samples) were sorted into basic categories—stone, fauna, flora—counted, weighed (Appendix B), and, as appropriate, washed. Charcoal (a total of 52.8 g) and burned matrix (a total of 28.3 kg) remained unwashed and were recorded by weight only. Burned matrix (i.e., oxidized and/or carbon-stained/blackened sediment), which resulted from cultural as well as natural fires, was abundant and what ended up as ASM was usually retained. Charcoal, however, was rarely recovered and much of what was encountered resulted from tree and root burns. Samples that appeared in the field and laboratory to be charcoal or carbon-stained sediment from cultural features often turned out to be the inorganic fraction of burned wood (Chapter 4). The term *carbon-stained/blackened sediment* most appropriately describes most of the site’s burned sediment.

Stone. Lithic materials recovered from features included FCR (n=2,689; 84.3 kg), chipped stone debitage (n=2,886), chipped stone tools (n=51), a hammerstone, and one sandstone ground stone tool. Raw material for approximately 95 percent of the cook stone and ground stone probably was derived from extensive outcrops of Eocene-aged, Wilcox sandstone (Taylor et al. 1966) that, today, is exposed within 500 m of the site (Figure 13.2). During the early and middle Holocene, prior to the deposition of 5–10 feet of overbank flood deposits, exposures of Wilcox sandstone probably occurred nearer to the site. Less than five percent of the site’s cook stone was caliche, presumably derived from the Somerset paleosol’s petrocalcic horizon that was exposed on-site prior to about 8000 B.P.

Figure 13.2. Eocene-aged Wilcox sandstone outcrop less than .5 km west of the Beene site, used for replication studies and experimental archaeology.

Chipped stone was abundant throughout the site's cultural deposits. Gravel bars within 100 m of the site contained an abundance of Edwards Plateau chert cobbles and are the likely source for almost all of the site's chipped stone (Chapter 10). These gravel bars also contained limestone cobbles and small boulders, some of which may have been used to produce the site's few ground stone artifacts made from limestone. In any case, raw materials for most the site's stone artifacts were readily available (Chapter 2).

Faunal Material. Recovered material in this category included burned and unburned bone, mussel shells, and gastropods. Bone fragments (n=1,777; .22 kg) and complete mussel shells and umbos (n=1,631) were counted and weighed. Gastropods and fragments of mussel shell were recorded by weight only. The faunal analysis is presented in Chapter 11 and Appendix D provides a tabulation of identified faunal remains by provenience. Faunal remains from feature and non-feature contexts tended to be poorly preserved due to high soil pH levels, percolation of the carbonate-rich ground water, soil development, and argilliturbation (Chapter 11).

It is important to note that while bone fragments were a common component of many features and non-feature areas, the majority of the pieces were less than a centimeter in diameter, but still large enough to be retained in 0.3-cm-mesh (ca. 1/8 in.) screens. The very small size of most bone fragments found in features is illustrated by relating the number of specimens recovered from a given feature to the combined weigh of those specimens. For example, approximately 580 small fragments were recovered from one of the site's sheet middens (Feature 45, middle, Early Archaic) and some 280 pieces came from an unusually large earth oven (Feature 12, Late Archaic) but the total weight of the former was only 0.027 kg and 0.3 kg for the latter. Smaller and better preserved hearth features often yielded a few dozen fragments, but they seldom weighted more than a few grams.

Floral Material. Botanical remains associated with features were limited to fragments of wood charcoal. As noted, burned matrix that contained charcoal was sorted and weighed separately. Again, charred plant remains were rare and only a few of the sizable pieces of wood charcoal were identified to the species level (Chapter 12). In short, the kinds of charred plant remains often associated with cooking features (e.g., fuel and plant food remains) were simply not preserved at the Beene site.

Feature Evaluation and Analytical System

Feature analysis systems are variable and comparative analyses are difficult to carry out (Ricklis and Collins 1994:327). Black and Ellis (1997a) assessed this problem and brought to light the challenges of managing the feature record. They recommend using a comprehensive or "ideal" feature observation list for recording purposes (Black and Ellis 1997b:779–783). In developing a descriptive and analytical system for the Richard Beene site, Clabaugh (2002) drew from existing feature recording systems (Black and Ellis 1997b, Black et al. 1997; Bruier and Thomas 1986; Collins 1998; Collins et al. 1990; Ellis 1997; Johnson 1991; Ritchie 1957, Stewart 1977:149; Wandsnider 1997; Wolynec 1979).

The feature evaluation and analytical system (FEAS) used for the present project was designed as a computer-based descriptive and analytical system for grouping features based on shared characteristics or attributes (Clabaugh 2002). Its use here, however, is primarily descriptive. An example of the FEAS form is provided in Appendix F. Grid and metric data (e.g., provenience, size, volume, weights, etc.), observable attributes (e.g., content, plan view and cross-section shape) were recorded on a feature analysis form as was information pertaining to context, including relative integrity and observations on relevant site-formation processes. Feature-specific results of analyses (e.g., radiocarbon assay, macrobotanical identification, paleomagnetic analysis, etc.) and assessments of overall component integrity were also recorded on the FEAS forms as was feature integrity and related site-formation observations (cf. Brown 1997; Butzer 1989; Thoms 1989; Thoms and Ahr 1995; Thoms et al. 1994; Waters 1992).

Reliable data preservation and management depends on constructing and managing primary databases and controlling data flow (Huggett 1985: 123 142; Plog and Carlson 1989:256–267; Reily and Rahtz 1992). Toward that end, the visual graphics and digital data section on the FEAS form includes information on data transfer, data migration schedules, and revised coding systems (Beagrie and Greenstein 1998; cf. Condron et al. 1999:104). Attachments to the FEAS form include drawings and computer generated feature plots.

Feature Nomenclature and Definitions

As noted, the site's cultural features were grouped into one of two generic classes (i.e., broad categories): cooking-related features and debris concentrations. Natural features, including krotovinas (e.g., in-filled animal burrows and rodent runs) and tree/root burns also occurred at the site and were sometimes mistaken for cultural features. Cultural and natural fires were recognized in the field by the presence of burned sediment, typically oxidized, often carbon-stained, and sometimes accompanied by charcoal fragments. Natural surface fire were evidenced in profile by thin lenses of burned sediment that extended for at least several meters at the same elevation (Chapter 4). Oxidized and carbon-stained sediments found in depressions with linear or amorphous extensions, as well as in linear configurations per se, were judged to represent burned tree stumps and roots, respectively.

Some of the obvious tree-stump burns contained burned as well as unburned flakes, FCR, mussel shell, or bone, but it is unclear how cultural materials came to be in ostensibly natural features. It is plausible, of course, that the site's inhabitants tossed camp debris into tree wells that resulted from naturally burned-out stumps or perhaps cultural material simply fell into the tree wells along with sediment that subsequently in-filled them. It was readily apparent in the field that bone fragments found in tree wells were better preserved (i.e., less weathered) than those found in cultural features. Natural features recognized as such in the field were not assigned feature numbers. As noted, however, a few natural features that initially appeared to be cultural were assigned feature numbers.

Fire-related cultural features tended to be circular to oval in planview, flat to basin-shaped in profile, and generally contained a variety of burned and unburned cultural material. For heuristic purposes, the remains of built fires are designated as "cooking-related," but this designation is not intended to deny a likelihood that some fires in any given multi-day encampment may have been primarily for non-cooking purposes (e.g., warmth, hide smoking, or heating rocks for sweat bathing)

Cooking-related features are subdivided according to size, with large features being greater than 60 cm but less than 1.5 m in diameter and small ones less than 60 cm in diameter. A single feature—ca. 2.0 m in diameter—was classified as very large. The rationale for imposing size as a defining criterion is to distinguish between cooking facilities small enough for hands-on cooking and those too hot (i.e., too large) to work around or cooking on without being burned. As noted among ethnographically known hunter-gatherers, smaller fires were especially characteristic of domestic zones, both inside and outside residential structures, but they were built elsewhere around the camp as well. Larger fire structures tended to be built in peripheral zones where ample space was available to work around them and carry out associated tasks (e.g., excavate basins, cache fuel, gather cook-stones and packing materials, and dispose of FCR, charcoal, and food remains [cf. Binford 1983:187-190]).

Descriptive Category

Descriptive feature categories are subdivisions of the generic cooking-related and debris-concentration classes. Categories were derived by reviewing FEAS data to identify and group features with shared morphological, content, and post-depositional feature-formation attributes (Clabaugh 1994).

- *Debris concentrations* (n=23) were subdivided into descriptive categories based on the dominant type(s) of artifact types in a given concentration.

- *Mussel shell lens* (n=6) ca. 3–.25 m in maximum horizontal dimension and ca. 5 cm thick, usually accompanied by a few pieces of FCR, chipped stone, and occasionally bone.

- *Chipped stone lens* (n=1): ca. 1 m in maximum dimension and ca. 5 cm thick, accompanied by a single bone fragment.

- *Mixed artifact concentrations* (n=16; 8 sheet middens, 8 lag deposits): ca. 12–.6 m in maximum dimension and ca. 10 cm thick (but up to 40 cm in pedoturbated contexts) and including FCR, chipped stone, mussel shell, and often bone fragments; this is a catchall category that encompasses discrete concentrations (e.g., thin sheet middens), including lag-deposited artifacts and expansive, comparatively thick pedoturbated artifact-rich deposits that lack intact features.

Descriptive categories for small and large cooking-related features (n=56), most of which were circular to oval in plan view and contained burned sediment, were based on shared profile attributes and similarities in FCR (i.e., cook stone) content. Profile categories were: (1) basin-shaped; (2) flat-bottomed, presumably built on/near the surface; (3) lens-shaped, presumably built on the surface; and (4) FCR concentrations lacking oxidized sediment and presumably built/deposited on the surface. Cook-stone categories for basin-shaped and surface features were: (a) clast-supported (i.e., overlapping/adjacent rocks) lens of FCR representative of an intact rock heating element; (b) loose concentration of FCR; (c) a few pieces of matrix-supported (i.e., surrounded by sediment) FCR; and (d) lacking FCR. Cooking-related features were subdivided into 12 descriptive categories.

- *Very large, basin-shape with FCR* (n=1): ca. 2.0 m in maximum dimension and ca. 0.3 m deep, with scattered pieces of FCR in the fill; lined or partially filled with burned and sometimes carbon-stained/blackened sediment.

- *Large, basin-shaped with FCR* (n=7): ca. 0.6–1.5 m in maximum dimension and ca. 0.15–.3 m deep, with scattered pieces of FCR; lined or partially filled with burned and sometimes carbon-stained/blackened sediment.

- *Large, flat-bottomed with FCR lens (i.e., intact heating element)* (n=2): ca. 0.6–1.5 m in maximum dimension, with little or no depth, presumably built on/near the surface, and containing enough FCR to form a discrete lens that tends to be underlain by burned and carbon-stained/blackened sediment.

- *Large FCR concentration* (n=6): ca. 0.6–1.5 m in maximum dimension, with little or no depth; presumably built on/near the surface, sometimes associated with oxidized sediment.

- *Large, basin-shaped without FCR* (n=1): ca. 0.6–1.5 m in plan view and ca. 0.15–.3 m deep; lined or partially filled with burned and sometimes carbon-stained/blackened sediment.

- *Large oxidized (i.e., burned sediment) lens without FCR* (n=2): ca. 0.6–1.5 m in maximum dimension, with little or no depth; presumably built on/near the surface.

- *Small, basin-shaped with FCR* (n=2): ca. 0.3–.6 m in maximum dimension and ca. 0.05–.2 m deep, with scattered pieces of FCR in the fill; lined or partially filled with burned and sometimes carbon-stained/blackened sediment.

- *Small, basin-shaped with FCR lens (i.e., intact heating element)* (n=6): ca. 0.3–.6 m in maximum dimension and ca. 0.05–.2 m deep; lined or partially filled with burned and sometimes carbon-stained sediment; containing enough FCR to form a discrete lens that covers a portion of the basin and tends to be underlain by burned and carbon-stained sediment.

- *Small oxidized (i.e., burned sediment) lens with FCR* (n=3): ca. 0.3 –.6 m in maximum dimension, with little or no depth; presumably built on/near the surface; containing scattered pieces of FCR.

- *Small FCR concentration* (n=7): ca. 0.3–.6 m in maximum dimension, with little or no depth; presumably built on/near the surface, sometimes associated with oxidized sediment.

- *Small basin-shaped without FCR* (n=12): ca. 0.3–.6 m in maximum dimension and ca. 0.15–.3 m deep; lined or partially filled with burned and sometimes carbon-stained/blackened sediment.

- *Small oxidized (i.e., burned sediment) lens without FCR* (n=7): ca. 0.3–.6 m in maximum dimension, with little or no depth; presumably built on/near the surface.

Suggested Feature Function

Functional distinctions among cook-stone features are based on: (1) similarities between attributes of a specific feature and attributes of ethnographically known coo- stone facilities, as exemplified by examples summarized in Table 13.1 (Chapter 8); and (2) expectations about the likely manifestations of those features in the archaeological record, as listed in Table 13.2. For some features at the Richard Beene site, however, it was simply not practical to suggest a probable function due to the effects of post-occupation site-formation processes that significantly disarticulated or otherwise altered a given feature's spatial and content attributes.

In general, large basin-shaped features with carbon-stained fill, with or without FCR, were judged to be remains of earth ovens. The presence of substantial quantities of carbon-stained sediment is indicative of a closed cooking facility wherein charcoal continued to burn, albeit it in an oxygen-poor environment. Large, flat-bottomed lenses of FCR and substantial quantities of carbon-stained sediments were judged to be intact heating elements in earth ovens. Large FCR concentrations lacking carbon-stained sediments may represent rock heating elements in earth ovens built on the ground surface. This type of feature may also represent disturbed surface hearths or perhaps simply discarded cook stones.

Small basin-shaped features, with or without FCR, and that either lacked carbon-stained sediment or contained only minor amounts were considered to be the remains of open-air hearths wherein most of the fuel burned to ash. In some cases, enough charcoal remained in the presumably open-air hearths to obtain a radiocarbon age estimate.

Features with a small lens of FCR were termed griddle hearths; those without FCR were simply termed hearths; oxidized lenses, with or without FCR, were considered to represent surface hearths of one type or another. Small FCR concentrations with small (ca. <10 cm) rocks that appeared to have been deposited on/near a surface were considered to represent remains of possible open-air surface hearths. This type of discrete concentrations may also represent disturbed heating elements from surface ovens or perhaps discarded oven or stone boiling rocks.

For heuristic purposes, the various artifact concentrations were also assigned a suggested function. Mussel shell lenses were designated as mussel shell dumps, insofar as they appeared to represent little more than the residue from a family meal. The only identified chipped stone lens was considered to represent a chipping station, given that most the flakes therein appeared to have come from a single core or perhaps a preform. Admixtures of artifacts that appeared to be essentially in situ were designated as sheet middens, whereas those that also contained stream worn pebbles or imbricated artifacts and pebbles indicative of flood scouring were designated as lag concentrations.

Special Feature Studies

Fire-Cracked Rock Analysis

Sandstone bedrock now-buried by Applewhite terrace fill was likely exposed near the site during much of the Holocene. Bedrock exposures along the river today exhibit the sandstone's platy structure. Lenses tend to separate "naturally," along weakly cemented bedding planes into tabular pieces less than five cm thick. Some of the most indurated/least-friable lenses yield "solid" pieces that are 10–20 cm thick.

Samples of local Wilcox sandstone were comprised on average of 50–60 percent detrital grains (mostly quartzite and feldspar) and 40–50 percent calcite cement (Jackson 1998:73, 106). Compared to silica-cemented quartzose sandstone or basalt, the calcite sandstone in the site area was found to be a "low-strength rock because of the weak cement, matrix-supported structure, high porosity, and the presence of several discontinuities (bedforms)" (Jackson 1998:73).

For experimental purposes, pieces of Wilcox sandstone from the site area were sawed into rock plates (ca. 3 x 5 x 1 cm) and heated in a small industrial furnace to about 800° C then cooled differentially: (1) cooled rapidly by immersing in water to simulate stone boiling; (2) cooled over a period of 24 hours to simulate cook stones used in open-air hearth griddles; and (3) cooled over 48 hours to simulate a long-cooking earth oven. Compared to quartzose sandstone and basalt, all of the Wilcox sandstone plates performed poorly after being heated and cooled one time. The stone boiling plates became markedly crumbly and one plate disintegrated into loose sand. The rock plates heated and cooled to simulate hearths and earth ovens developed numerous macrocracks and broke down into small cuboid fragments (Jackson 1998:74).

Jackson also used pieces of local Wilcox sandstone as griddle stones in an open-air hearth similar to those found at the Richard Beene site. These rocks were heated and cooled three times in the hearth. Fire temperatures (i.e., the coals) reached 700° C and the top of the rocks (i.e., the exposed surface) reached 150–200° C. In general, the griddle rocks became redder with each use, developed more microcracks, and fractured into more pieces (Jackson 1998:106–109).

Jackson's experiments suggest that while calcite sandstone from local Wilcox outcrops was sufficiently resistant to thermochemical weathering to function adequately as cook stone, it was not nearly as resistant as other rock types, including quartzose sandstone, quartzite, basalt, and hard limestone. Importantly, his experiments also showed that the degree of measurable thermochemical weathering increased more or less proportionately in relation to the amount of time the rock remained hot. As discussed later in this chapter, Jackson also detected readily apparent differences in the degree of thermochemical weathering exhibited by sandstone FCR recovered from three morphologically different kinds of cook-stone features at the Richard Beene site.

Paleomagnetic Analysis

Paleomagnetic analysis can detect remnant magnetization in previously heated rocks by measuring concentrations of magnetic minerals such as magnetite and hematite (Gose 2000). In applying paleomagnetic procedures to burned rock, thermo-remnant magnetization parallel to the earth's magnetic field can be detected and used to determine whether rocks remained in place after the last heating/cooling event. Temperature ranges and multiple reheating events can also be identified. Paleomagnetic analysis can also reveal the dismantling processes of earth ovens and other cooking facilities (Gose 2000). Extensive studies using this method have been undertaken on hard limestone, the cook stone that dominates burned rock middens in Central Texas (Black and Creel 1997; Collins 1998; Ricklis and Collins 1994).

To prepare the rocks for collection, pliable cardboard was fitted around each rock to create a form to pour and hold plaster of Paris onto the top of the rock until it dried. Careful orientation of the sample was necessary to determine in situ the magnetic direction. After the plaster set, an up arrow was written on the side of the rock and the top of the plaster cap was leveled with a trowel. Using a compass, a magnetic north arrow was scribed on top of the plaster to permanently orient the sample. A better method for extracting the FCR is the use of low impact rock drills to remove smaller, more uniform samples (Ricklis and Collins 1994).

Samples from an early, Early Archaic FCR feature (No. 107, Block T) were submitted for paleomagnetic analysis. Results indicated the feature was intact, but some of the rocks had been displaced since they were heated (Appendix G).

Organic Residue Analysis

Organic residue analysis (cross-over electrophoresis with anti-serum) was conducted on FCR from two cook-stone features to explore the possibility of detecting traces of protein that could be used to infer feature function (Appendices H and I). Cook stones from each feature were broken in two and each piece submitted to two different laboratories. One laboratory identified traces of rabbit protein on a cook stone from a middle, Early Archaic earth oven (Feature 30, Block G); the second laboratory did not detect any protein residue on the same rocks. In 1994, blind studies were conducted with cook stones from a site in north-central Texas to test the accuracy, reliability, and consistency of this type of analysis (Thoms and Clabaugh 1994). These studies demonstrated similar inter-lab discrepancies and in some cases fresh deer blood remained undetected. With these results in hand, it was decided to abandon residue analysis for the present project. Hopefully, the technology for and accuracy of protein residue analysis will improve as more controlled studies are undertaken.

Feature Assemblages by Component

This section describes and discusses features within each of the site's components. Table 13.3 lists descriptive feature types and their frequencies by component and cultural period. Plan view maps for the major block excavation areas illustrate feature locations and their mapped content along with distributions of mapped artifacts in non-feature areas. Feature summary tables listing feature size, content, and nomenclature are provided for each archaeological component as well.

It is important to note that the plan view maps illustrate mainly artifacts larger than about 2.5 cm in maximum dimension that were found and mapped in situ. Given the exigencies of "salvage" excavation, it was simply not possible to map the distribution of smaller artifacts other than tools and unusual items. This approach yielded plan view maps that accurately display the general distribution and density of FCR and mussel shell as well as the overall distributions of chipped stone and bone. The resulting maps, however, under-represent the relative densities of chipped stone and, more so, bone fragments insofar as their size ranges tend to be skewed toward the small end.

Shovel skimming and trowel excavation in the clayey sediments, however, often resulted in artifacts being dislodged and remaining undetected until they were recovered in the screens. As part of the ASM sample, these items were included in the data base, but they are not illustrated on plan view maps. For the most part, this applies to small items, but larger specimens, including FCR from features were "missed" during excavation and therefore not mapped in place. Given the "salvage" environment, it was sometimes necessary to "save time" by mapping FCR and mussel shells in place but not recovering them. The total numbers of non-feature artifacts within each 1 x 1 m excavation unit are displayed in artifact-density block maps presented in Chapter 14.

Late Pre-Columbian (ca. 1200–400 B.P.), Payaya Component (upper Block B)

Backhoe trenching and test excavations at the site began in the area with the highest density of surface artifacts, which was along the edge of the Applewhite terrace tread and on the gently sloping portion of the terrace scarp (McCulloch et al. 2008). This work identified the site's three uppermost com-

Table 13.3. Descriptive feature types and their frequencies by component and cultural period.

Cooking (Heating) Related Features													
Components	Very large > 175 cm diameter	Large Size (60 to 175 cm diameter)					Small (< 60 cm diameter)						
Cultural Period (Block)	Basin w/ few FCR	Basin w/ FCR	Lens of FCR	Basin w/o FCR	Oxidized lens w/o FCR	FCR concen.	Basin w/ few FCR	Basin w/lens FCR	Basin w/o FCR	Oxidized lens w/ FCR	Oxidized lens w/o FCR	FCR concen.	SUB TOTALS
Payaya (upper B) Late Pre-Columbian	-	-	-	-	-	-	-	-	-	-	-	-	-
Upper Leon Creek (lower B) Late Archaic	1 (12)	1 (25)	-	-	-	1 (19)	1 (10)	2 (21, 27)	1 (14)	1 (28)	2 (5, 9)	1 (18)	11
Lower Leon Creek (upper A) Middle Archaic	-	-	-	-	-		-	-	1 (4)	-	1 (23)	-	2
Upper Medina (lower A & U) Middle Archaic	-	-	-	-	-		-	1 (26)	1 (11)	-	4 (42, 53, 67, 74)	-	6
Lower Medina (G) middle, Early Archaic	-	5 (30, 33, 51, 59, 77)	-	1 (79)	2 (46, 63)		-	3 (68, 72, 73)	9 (43, 44, 48, 54, 62, 70, 75, 29a, 29b)	2 (65, 66)	-	2 (69), 78)	24
Elm Creek (K, M, & O) middle, Early Archaic	-	1 (109)	2 (64, 80)	-	-		-	-	-	-	-	-	3
Upper Perez (H, Q, & T) early, Early Archaic	-	-	-	-	-		1 (107)	-	-	-	-	4 (84, 90, 102, 114)	5
TOTALS	1	7	2	1	2	1	2	6	12	3	7	7	51

continued

Table 13.3. Continued.

Components (Block) Cultural Period	Debris (Artifacts and Ecofacts) Concentrations				Natural Features				
	Mussel shell	Chipped stone	Sheet midden	Lag deposit	Tree/root burn	Krotovina	Undetermined (e.g., organic stain)	SUB TOTAL	TOTAL
Payaya (upper B) Late Pre-Columbian	-	-	1 (96)	-	-	-	-	1	1
Upper Leon Creek (lower B) Late Archaic	2 (22, 97)	-	-	-	2 (8, 15)	1 (13)	-	5	16
Lower Leon Creek (upper A) Middle Archaic	1 (3)	-	-	-	1 (7)	-	-	2	4
Upper Medina (lower A & U) Middle Archaic	-	1 (34)	1 (115)	-	1 (2)	-	-	3	9
Lower Medina (G) middle, Early Archaic	1 (41)	-	4 (45, 49, 60, 71)	-	2 (47, 76)	-	-	7	31
Elm Creek (K, M, & O) middle, Early Archaic	1 (61)	-	-	-	-	-	-	1	4
Upper Perez (H, Q, & T) early, Early Archaic	1 (93)	-	2 (106, 108)	8 (82, 83, 86, 89, 94, 99, 101, 113)	2 (95, 97)	-	2 (98, 104)	15	20
TOTAL	6	1	8	8	8	1	2	34	85

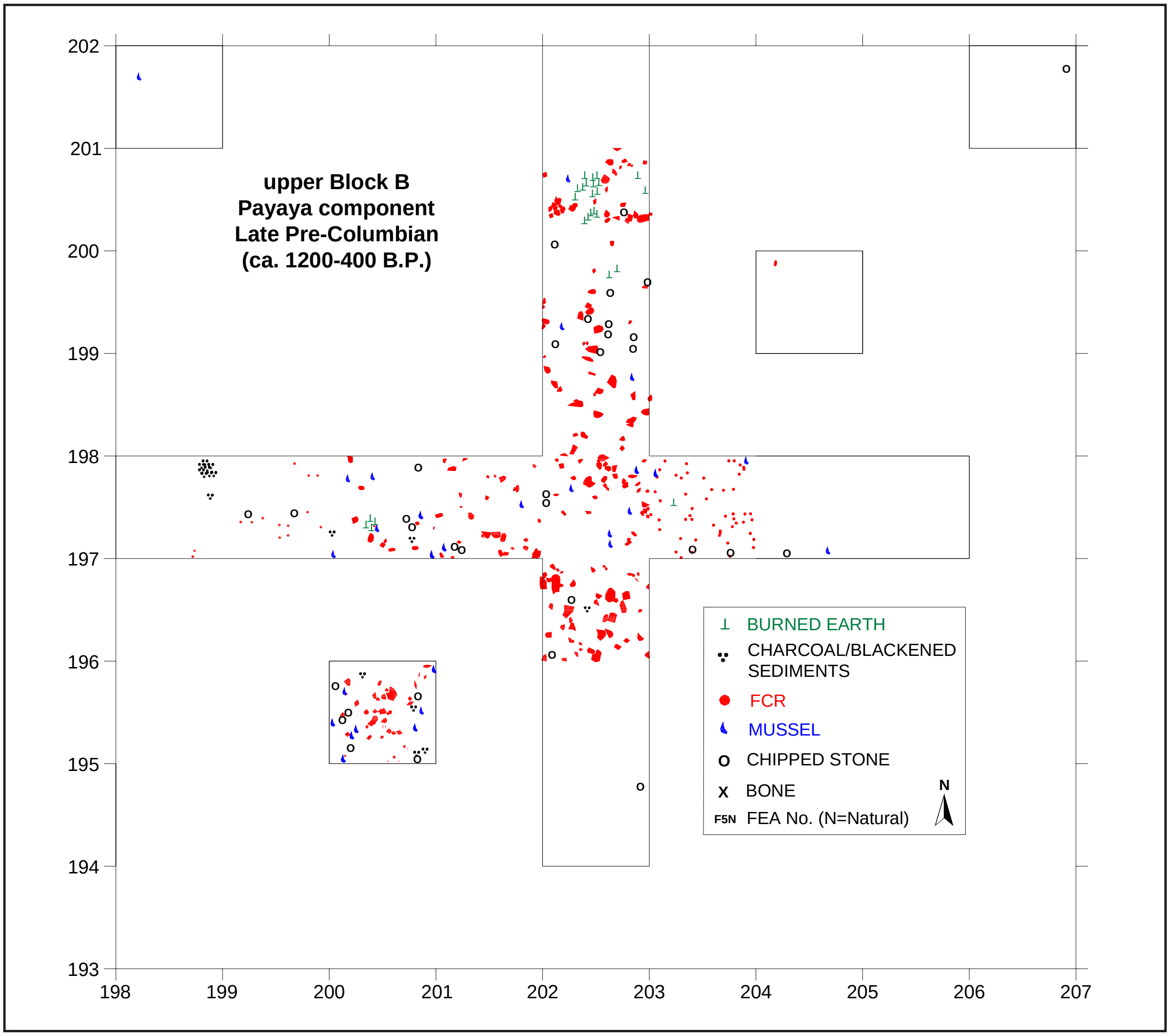


Figure 13.3. Excavations in upper Block B (Late Pre-Columbian period, Payaya component) revealed an FCR scatter, sometimes rather dense, along with lower frequencies of mussel shells, chipped stone and bone.

ponents, including the Payaya component in the upper 40 cm of the modern soil. Full-scale excavation began with excavation of a cross trench and several 1 x 1 m excavation units (upper Block B). An FCR scatter, sometimes rather dense, was identified along with lower frequencies of mussel shells, chipped stone, and bone (Figure 13.3). Modern tree roots, as well as tree-stump and root burns permeated this deposit. Some of the naturally burned places were especially difficult to distinguish from oxidized (i.e., burned sediment) lenses that may have resulted from cooking features.

FCR concentrations within the larger artifact scatter in upper Block B were not associated with oxidized sediments and, as such, they did not appear in the field to represent cooking-related features per se. Some of the denser concentrations, however, may well represent remains of cook-stone facilities that simply did not generate much oxidized sediment and or that were disarticulated by centuries of pedoturbation that dispersed cook stones and turned them on edge (cf. Shiffer 1987; Thoms 1994a). It is also possible that the FCR-rich artifact scatter resulted from cleaning out nearby cook-stone facilities or perhaps from discarding stone boiling rocks. As noted, however, the site's calcite-cemented sandstone crumbled when used experimentally for stone boiling. As such, stone-boiling is less likely as an explanation for the observed FCR distribution, although it does not eliminate the possibility that some of the cook stones were used for that purpose.

The concentration area, at least 8 x 8 m, was sampled by 18 1 x 1 m units that yielded: (1) 626 pieces of chipped stone debitage; (2) 570 pieces of FCR weighing 3.38 kg; (3) 128 mussel shell umbos; (4) 43 bone fragments weighing .003 kg; (5) 5 cores and chipped stone tools, including Perdiz and Scallorn-like arrow points; and (6) 9 bone-tempered pottery sherds similar to Leon Plain. In the absence of discrete features, the entire artifact concentration in upper Block B was designated as a sheet midden area, Feature 96. Additional excavation was not undertaken in this area insofar as other sites in the reservoir, already scheduled for mitigation, had well preserved Late Pre-Columbian features (McCulloch et al. 2008). In general, cook-stone features from this period are well-represented throughout south-central Texas (Chapter 8).

Late Archaic (ca. 3500–2800 B.P.), Upper Leon Creek Components (lower Block B)

Backhoe trenching during the testing phase of the project (McCulloch et al. 2008) revealed a Late Archaic component buried beneath the Payaya com-

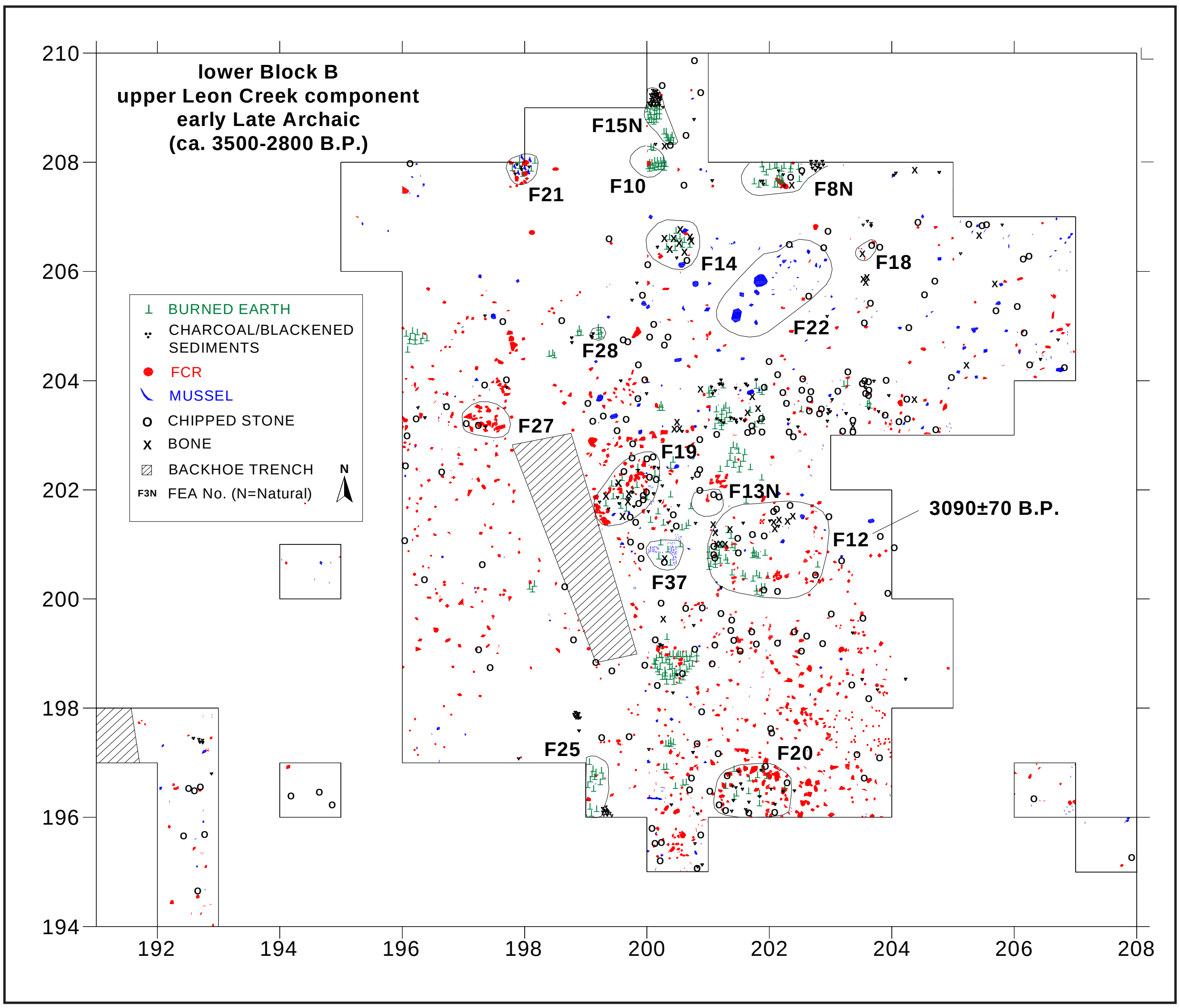


Figure 13.4. Excavations in lower Block B (Late Archaic period, upper Leon Creek component) resulted in the identification of 10 cooking-related features, two debris concentrations, and three natural features.

ponent and designated as lower Block B. Excavations therein resulted in the identification of nine cooking-related features, two debris concentrations, and three natural features (Figure 13.4). Cooking-related feature diversity is high, with 8 of 12 categories represented: (1) one very large basin with FCR; (2) one large basin with FCR; (3) one large FCR concentration; (4) one small basin with FCR; (5) two small basins with an FCR lens; (6) one small basin without FCR; (7) one oxidized lens with FCR; and (8) one small FCR concentration. Two mussel shell lens features were identified in the block area, along with three natural features: two tree/root burns and one krotovina. Table 13.4 lists each feature along with its size, approximate percentage excavated, artifact and ecofact (e.g., burned sediment and charcoal) content.

FCR, chipped stone, and mussel shell occurs throughout the block, with chipped stone being especially widespread, albeit more densely concentrated in the central part of the block. As Figure 13.4 illustrates, the highest density of FCR occurs in the southwest half of the excavation block and mussel shell density is relatively high in the northeast portion, which is nearest the terrace scarp. The overall artifact distribution is reminiscent of a sheet midden and, in a few places, perhaps of an incipient burned rock midden. Although some cooking features, with and without cook stones, occur where mussel shells are comparatively abundant, most of the cook-stone features and all of the large cooking features are in FCR-rich areas where there was comparatively little mussel shell.

Features in this block tend to be poorly to moderately well preserved, as is the case for most features in the uppermost portion of the site's B horizons. As noted in Chapters 4 and 9, lower Block B contains several artifact rich subzones that yielded a variety of broad-blade, barbed, projectile points in essentially correct stratigraphic order. Of the two mussel shell concentrations, Feature 37 (Figure 13.4) was the most discrete and may represent a single event. Feature 22 is larger, has a more scattered distribution of shells and a greater variety and density of artifacts. Cooking-related features are well represented. Large sized features are better repre-

Figure 13.5. Feature 12 (lower Block B, Late Archaic period, upper Leon Creek component), a basin-shaped pit, interpreted as an earth oven, yielded a radiocarbon age estimate of 3090±70 B.P.

sented (3 of 9) than is the case for the Middle Archaic and Early Archaic components (Table 13.3).

Feature 12 (Figure 13.5), the largest (ca. 2 m diameter) cooking-related feature recorded at the site, was substantially impacted by roots, root burns, and burrowing animals. It remained readily recognizable, however, as a large shallow (ca. 03 m deep) pit lined by oxidized sediment and filled with a higher density of artifacts than the surrounding surface(s). This basin-shaped pit, interpreted as an earth oven, contained 7.8 kg of burned sandstone, mostly small pieces. The larger pieces of FCR tended to be at the bottom of the basin. Charcoal from this

Figure 13.6. Feature 19 (lower Block B, Late Archaic period, upper Leon Creek component), a large FCR concentration, contained few artifacts and ecofacts and comparatively little burned sediment.

Table 13.4. Upper Leon Creek component features (Late Archaic period, Block lower B): nomenclatures; planview size; and recovered content (note that some features were only partially excavated such that artifact counts/weights do not reflect overall feature content).

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
12	Basin w/ FCR	200 x 200	Cooking V. large	Earth oven	100%	566	7.8 60	119	.03 280	3 TKMF 1 TNBF 2 TNUF	28,180	4.0	3090±70
19	FCR concentration	140 x 90	Cooking, large	Earth oven (?)	100%	58	3.5 94	1	.003 5	1 1	5	.2	-
25	Basin w/ FCR	100 x 50	Cooking, large	Earth oven (?)	25%	31	.2 34	10	.003 9	-	-	.2	-
10	Basin w/ FCR	62 x 60	Cooking, small	Hearth; few rocks	50%	1	.2 4	1	-	-	-	-	-
21	Basin w/ FCR lens	52 x 35	Cooking, small	Hearth, griddle	75%	12	3.1 30	6	.0002 2	1 TNBF 1 DP	1	.2	-
27	Basin w/ FCR lens	65 x 50	Cooking, small	Hearth, griddle	100%	[3]MD	- ca. 10	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	-
14	Basin w/o FCR	60 x 60	Cooking, small	Hearth	100%	-	-	-	.0001 10	-	-	.1	-
28	Oxidized lens	25 x 22	Cooking, small	Surface hearth w/ FCR	100%	2	.5 3	1	-	-	2	.9	-
18	FCR concentration	25 x 25	Cooking, small	Undetermined	100%	3	[3]MD 3	-	.006 2	-	1	-	-

continued

Table 13.4. Continued

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count					Artifact / Ecofact: Weight (gm)		^{14}C B.P.
						Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Burned Sediment	Charcoal	
22	Mussel lens	300 x 100	Debris concentration	Mussel shell dump	100%	30+	[2]P	[2]P	[3]MD	[3]MD	[3]MD	[3]MD	-
37	Mussel lens	60 x 40	Debris concentration	Mussel shell dump	50%	1	.01 7	62	.0001 1	-	4	-	-
8	Non cultural	120 x 90	Natural	Tree/root burn	ca. 50%	25	.02 16	5	.006 26	-	3.8	.3	-
15	Non cultural	96+ x 30+	Natural	Tree/root burn	ca. 50%	-	-	-	-	-	-	-	-
13	Non cultural	35 x 25	Natural	Krotovina	100%	-	-	-	-	-	-	-	-

[1] Feature identified during post-field analysis
[2] P=Present, missing data
[3] MD=Missing data
[4] Tools=PP Projectile point, DP Dart point, AP Arrowpoint, TK/TN Thick (>1cm)/ Thin <1cm), BF biface., MF Modified flake, UF Uniface, HM Hammerstone

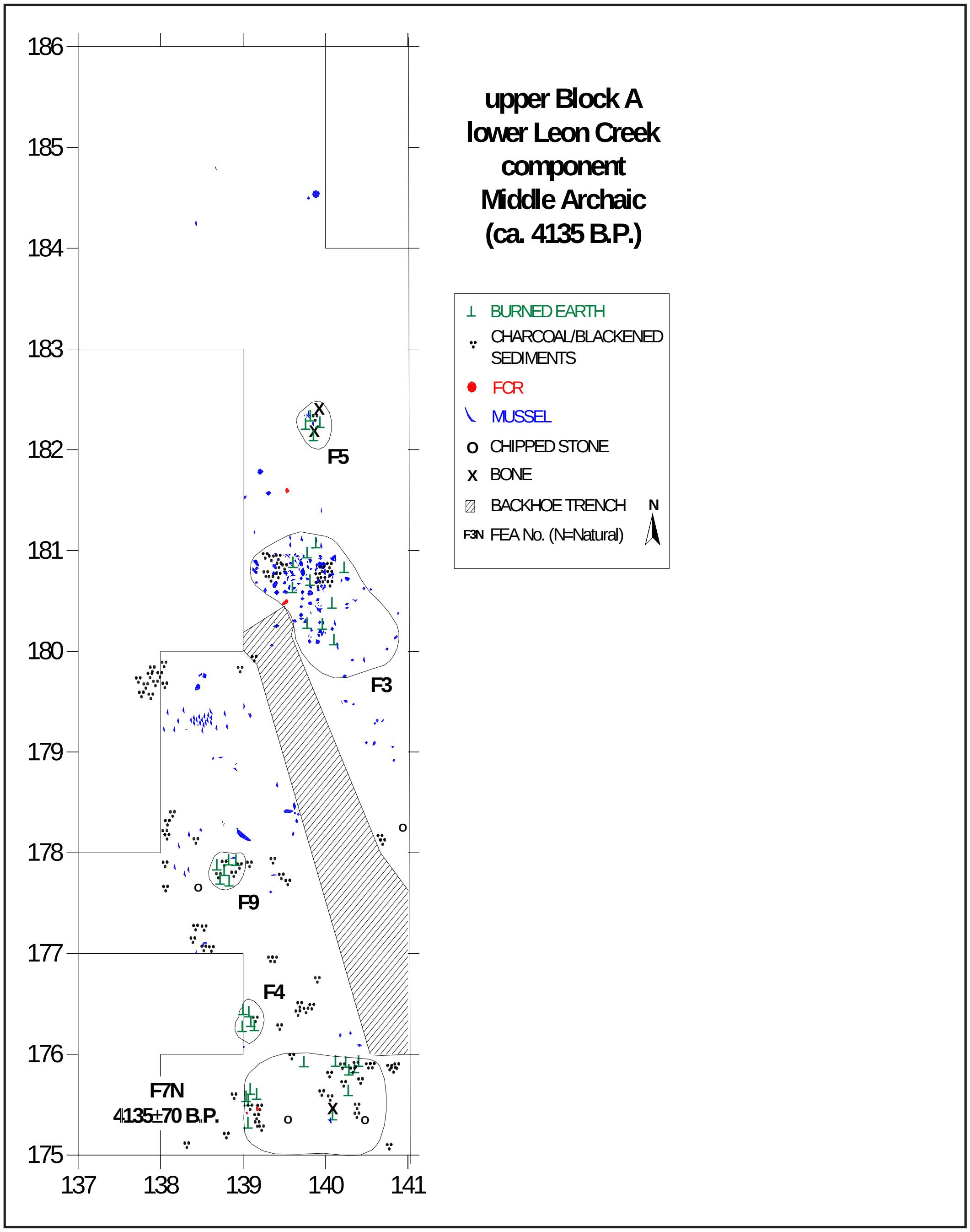


Figure 13.7. Excavations in upper Block A (Middle Archaic period, lower Leon Creek component) resulted in the identification of three cooking-related features, two debris concentrations, and one natural feature.

feature yielded a radiocarbon age estimate of 3090±70 B.P. (Table 4.2a).

Feature 19, a large FCR concentration (Figure 13.6), contained far fewer artifacts and ecofacts than did Feature 12 and comparatively little burned sediment. FCR distribution in a single level defined this feature. Its function is unclear but, judging from the large size of some of the FCR, it may be the remains of a pedoturbated earth oven heating element, insofar as most of the flakes were burned. On the other hand, this feature could be an FCR dump that resulted from general camp cleanup activities.

Feature 27 is a small discrete concentration of FCR in a shallow basin, judging from the elevation

Table 13.5. Lower Leon Creek component features (Middle Archaic period, Block upper A): nomenclature; planview size; and recovered content (note that one feature was only partially excavated such that artifact counts/weights do not reflect overall feature content).

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
4	Basin w/o FCR	40 x 32	Cooking, small	Hearth, rockless	60%	5	-	5	-	-	-	0.1	-
5	Oxidized lens	46 x 40	Cooking, small	Surface hearth, rockless	100%	-	-	-	2	-	1	0.1	-
9	Oxidized lens	38 x 30	Cooking, small	Surface hearth, rockless	100%	-	-	-	-	-	-	-	-
3	Mussel lens	200 x 100	Debris concentration	Mussel shell dump	100%	5	.05 kg 5	75	4	1 PP	[3]MD	0.3	-
??	Mussel lens	150 x 75	Debris concentration	Mussel shell dump	100%	[3]MD	[3]MD	ca. 20	[3]MD	[3]MD	[3]MD	[3]MD	-
7	Non cultural	175 x 100	Non cultural	Tree / root burn	100%	1	-	-	-	-	-	-	4135±70

[1] Feature identified during post-field analysis
[2] P=Present, missing data
[3] MD=Missing data
[4] Tools=PP Projectile point, DP Dart point, AP Arrow point, TK/TN Thick/ Thin, BF biface., MF Modified flake, UF Uniface, HM Hammerstone

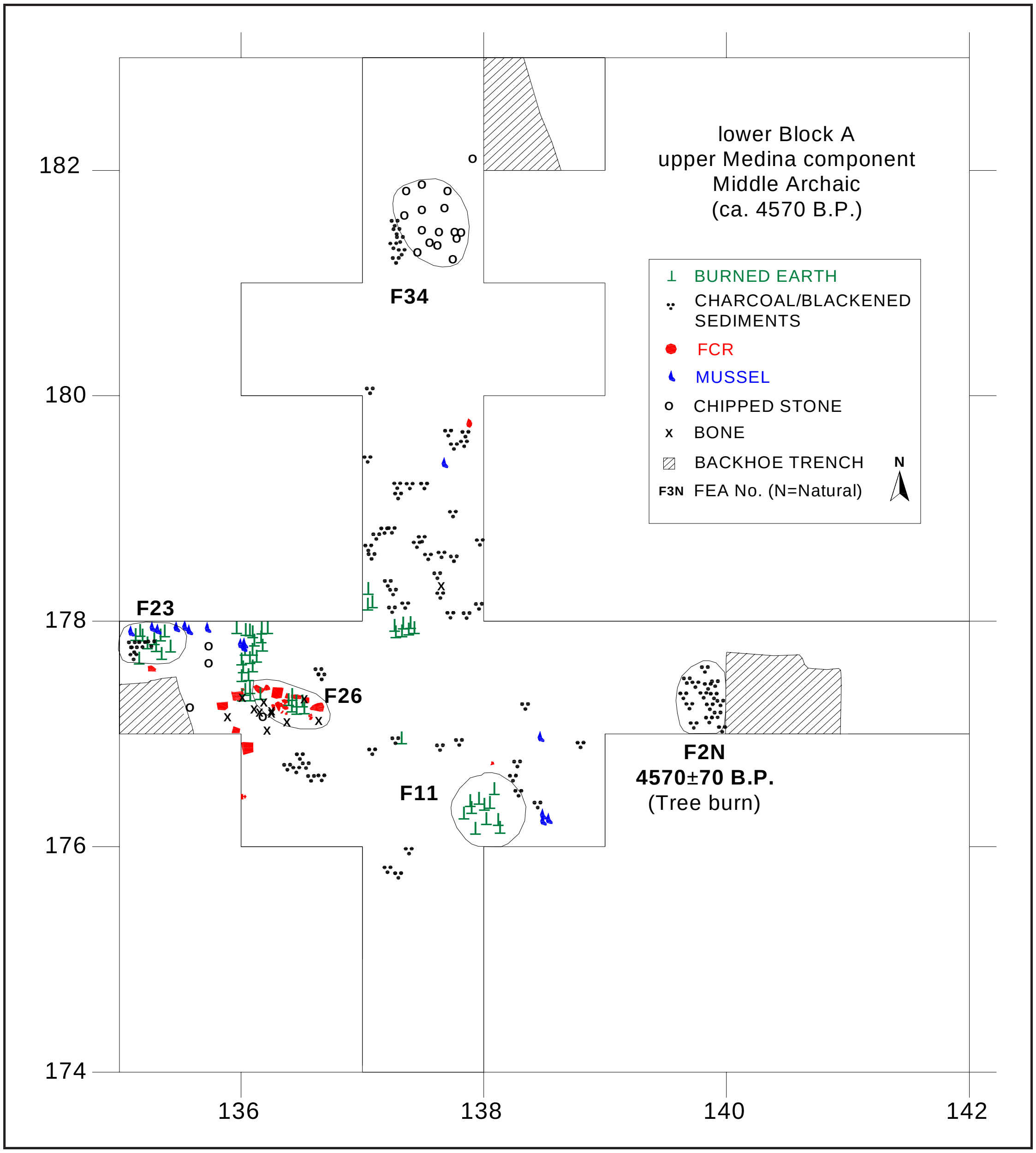


Figure 13.8. Mapped in situ artifacts in lower Block A (Middle Archaic period, Upper Medina component) resulted in the identification of three cooking-related features, one debris concentrations, and one natural feature.

of the pieces of FCR. It is interpreted as the remains of a hearth with a cook-stone griddle. Feature 21 (Figure 13.7) is somewhat smaller, but similar in morphology and contains less FCR. Feature fill included a thin biface fragment and an Ensor dart point, along with chipped stone debitage and mussel shells. Well preserved examples of small basin-shaped hearths with cook-stone griddles were found in Block G, the site's late, Early Archaic components.

Middle Archaic (ca. 4600–4400 B.P.), Lower Leon Creek (upper Block A) and Upper Medina Components (lower Block A and Block U)

Excavations in upper (Figure 13.7; Table 13.5) and lower (Figure 13.8; Table 13.6) Block A revealed two well-preserved Middle Archaic occupation surfaces that contained six small cooking-related features: (1) one basin-shaped with a lens of FCR; (2)

Table 13.6. Upper Medina component features (Middle Archaic period, Blocks lower A and U): nomenclatures; planview size; and recovered content (note that some features were only partially excavated such that artifact counts/weights do not reflect overall feature content).

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
lower Block A													
11	Basin w/o FCR	60 x 55	Cooking, small	Hearth, rockless	100%	-	-	-	-	-	-	-	-
23	Oxidized lens	50 x 50	Cooking, small	Surface hearth w/o FCR	80%	4	-	4	-	-	-	0.1	-
26	Basin w/ intact heating element	60 x 38	Cooking, small	Hearth, griddle (?)	100%	46	3.3 67	-	.0006 16	1 TNBF	10	-	-
34	Chipped stone lens	100 x 80	Debris concentration	Chipping station	100%	16	-	-	.0004 13	-	-		4570±70
2	Non cultural	68 x 48	Natural	Tree / root burn	70%	1	-	-	-	-	-	9.2	-
Block U													
115	Artifact concentration	120 x 800	Debris concentration	Sheet midden	<25%[1]								4380±100 4510±110

[1] Feature identified during post-field analysis
[2] P=Present, missing data
[3] MD=Missing data
[4] Tools=PP Projectile point, DP Dart point, AP Arrow point, TK/TN Thick (>1cm)/ Thin <1cm), BF biface., MF Modified flake, UF Uniface, HM Hammerstone

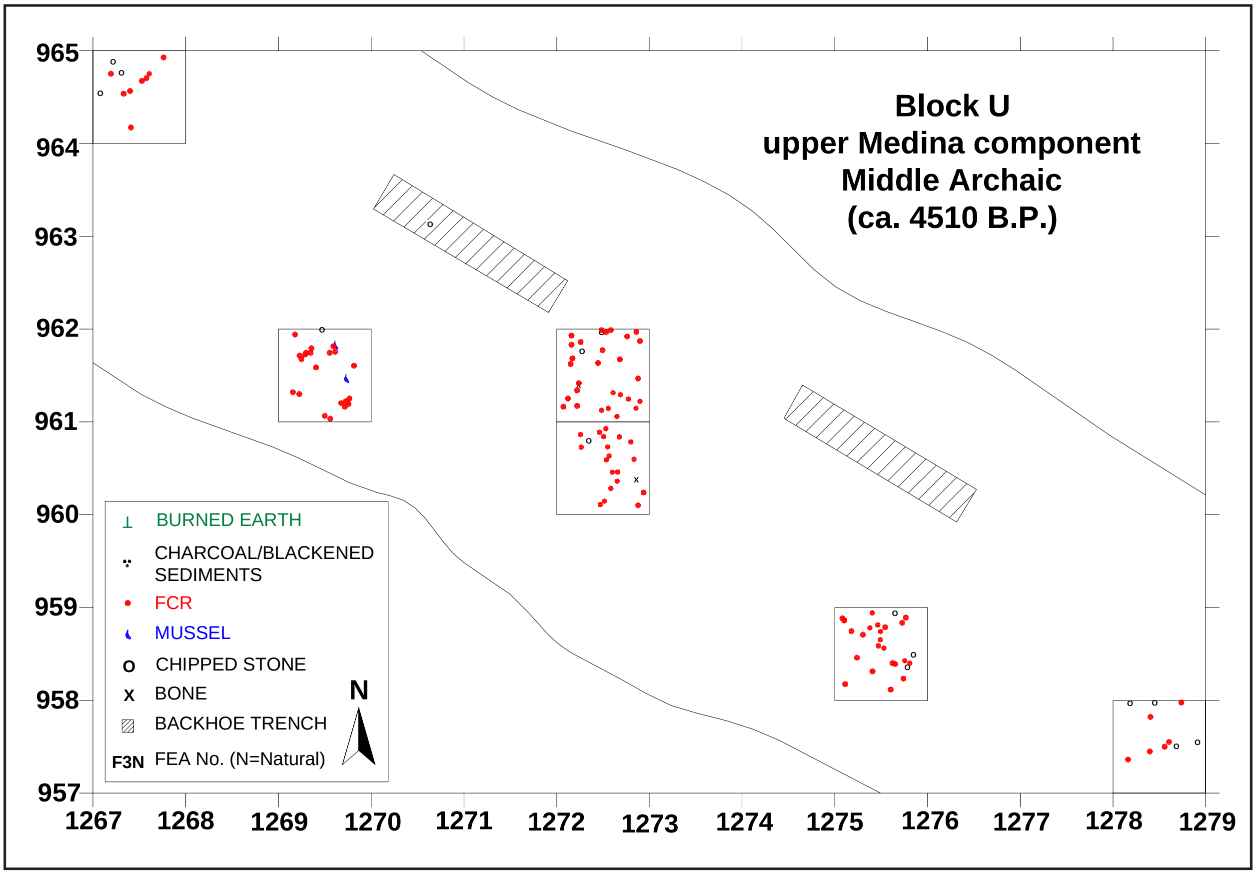


Figure 13.9. Mapped in situ artifacts in Block U (Middle Archaic period, Upper Medina component) were interpreted as the remains of one debris concentration that encompassed the excavation area.

two basin-shaped without FCR; and (3) three oxidized lenses. These two small blocks also contained a mussel shell concentration and a chipped stone concentration. Chronological control was obtained from charcoal fragments in two tree/root burns that appeared to originate from in/near each of the occupation surfaces. The lower Leon Creek component in upper Block A yielded an age estimate of 4135±70 B.P. and upper Medina component in lower Block A yielded an age estimate of 4570±70 B.P. (Table 4.2a).

Block U also sampled the uppermost portion of the upper Medina pedocomplex (Figure 13.9). Scattered pieces of wood charcoal within the 30-cm-thick deposit yielded radiocarbon ages in correct stratigraphic order of 4380±100 B.P., 4430±55 B.P., and 5410±110 B.P. (Table 4.2a). Discrete features were not encountered in Block U and the artifact concentration found in each of the excavations units was judged to be an argilliturbated sheet midden deposit (Feature 115). The sheet midden area, at least 12 x 5 m, was sampled by 6 1 x 1 m units that yielded: (1) 192 pieces of chipped stone debitage; (2) 389 pieces of FCR weighing 12.9 kg; (3) 10

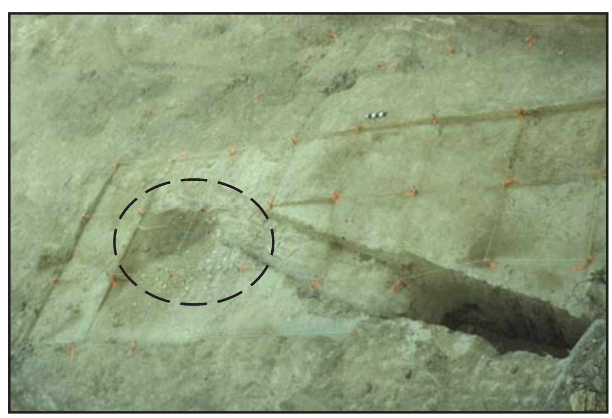


Figure 13.10. Feature 3 (upper Block A, Middle Archaic period, lower Leon Creek component), a concentration of flat-lying mussel shells composed 75 umbos within an area ca. 2 x 1 m in size.

Figure 13.11. Feature 4 (upper Block A, Middle Archaic period, lower Leon Creek component), a basin shaped pit defined by its fill; oxidized and blackened sediment.

mussel shell umbos; (4) 33 bone fragments weighing .014 kg; and (5) 3 cores and chipped stone tools.

Mussel shells are widespread in upper Block A and a concentration of flat-lying shells composed of 75 umbos within an area about 2 x 1 m in size was excavated as Feature No. 3 (Figure 13.10). This block also contained three small, rockless cooking features, each of which was oval in shape and approximately 40 cm in maximum dimension. Two of these (Features 5 and 9) were represented by a readily apparent oxidized lens, one of which contained two very small bone fragments. Feature 4 (Figure 13.11) was basin shaped, as defined by oxidized and blackened sediment that lined and partially filled the shallow basin. The excavated portion of the feature yielded five pieces of chipped stone debitage, five mussel shell umbos, and numerous fragments. The uppermost elevation of each of this block's features varied less than 10 cm and almost all of the scattered mussel shells, which were concentrated within the same elevation range, were in horizontal angles of repose. As noted, this block also contained a tree/root burn (Feature 7N) that appeared to be from a tree that grew on or within a few centimeters of the occupation surface.

Lower Block A, excavated in the upper Bk horizon of the Medina pedocomplex (ca. 50 cm below upper Block A), contained less mussel shell and considerably more chipped stone than did upper Block A. A concentration of 16 pieces of flat-lying

Figure 13.12. Feature 11 (upper Block A, Middle Archaic period, lower Leon Creek component), a rockless, basin-shaped pit about 25 cm deep, was well defined by its oxidized and somewhat blackened fill that had an abrupt boundary with the surrounding sediment.

Figure 13.13. Feature 116 (near Block U, Middle Archaic period, upper Medina component) is typical of the small FCR concentrations observed on the eroded and mechanically cut exposures of the uppermost Bk horizon of the Medina pedocomplex.

chert debitage that appeared to be from a single core or preform was excavated as Feature 34 (Figure 13.8). Also present were three well-defined, small cooking features, each of which was 50–60 cm in maximum dimension.

Feature 26, a shallow (ca. 12 cm deep) basin-shaped pit yielded 67 pieces of FCR, most of which were less than 2 cm in size. The larger (ca. 5–10 cm) pieces of FCR were similar in size to those in the better preserved basin-shaped features found in Block G that were interpreted as remains of cook-stone griddle hearths. A few other pieces of tabular FCR occurred near Feature 26. In general, however, FCR was comparatively rare in this component. Feature 26 also yielded 46 flakes, most of which were unburned, a dart point barb, and 16 small bone fragments, only a few of which were charred or calcined. Feature 11, a rockless, basin-shaped pit about 25 cm deep, was well defined by its oxidized and somewhat blackened fill (Figure 13.12); it did not contain chipped stone artifacts, mussel shell, or bone fragments. As noted, lower Block A also contained a tree/root burn (Feature 7N) that appeared to be from a tree that grew on or within a few centimeters of the occupation surface.

Feature 116 is exemplary of several small FCR concentrations observed on the eroded and mechanically cut exposures of the uppermost Bk horizon of the Medina pedocomplex in the vicinity of Block U. It was photographed (Figure 13.13) and described in conjunction with mapping efforts, but not excavated, as was the case for several small FCR concentrations observed in that part of the site. Feature 116 contained at least 25 pieces of tabular FCR, but only five of those were larger than 5 cm in size. Several flakes and mussel shell fragments were found in the immediate vicinity and may well have been part of the FCR feature before it became disarticulated. In terms of its plan view size and content, Feature 116 resembles Feature 26, a basin-shaped feature with a small lens of FCR, in lower Block A. Feature 26 was interpreted as the remains of a hearth with a rock griddle. Moreover, the size and shape of FCR in Features 116 and 26 are consistent with the vast majority of FCR found in Feature 115, the sheet midden deposit in Block U (Figure 13.9). This suggests that the cook stone in Feature 115 is derived primarily from small cooking hearths as opposed to earth ovens with comparatively large pieces of rock.

Late, Early Archaic (ca. 6900 B.P), Lower Medina Component (Block G)

The lower Medina component is the best preserved component at the Richard Beene site and it yielded the most features (n=35). It is represented by the largest excavation area (ca. 230 m^2), including one large block (Gb) and several smaller sub-block areas (Figures 13.14–13.17). Overall, artifact density was moderate compared to the low densities seen in the Middle Archaic components and the significantly higher density in the Late Archaic component. Mussel shells, however, were especially widespread as were bone fragments and chipped stone debitage. FCR density was lower in comparison with most other components.

Rockless cooking features were considerably more common than those with cook stones. Overall, however, the diversity of cooking-related features was high with 8 of 12 represented: (1) five large basins with some FCR; (2) one large basin without FCR; (3) two oxidized lenses without FCR; (4) three small basins with a lens of FCR; (5) nine small basins without FCR; (6) two oxidized lenses with FCR; (7) four oxidized lenses without FCR; and (8) two small FCR concentrations. In addition, Block G contained a mussel shell scatter, Feature 41 (Figure 13.18), and four miscellaneous artifact scatters interpreted as sheet middens. As illustrated in Figure 13.15, some of the sheet middens (e.g., Feature 45) encompass small cooking features or overlap with other sheet middens (e.g., Feature 71). Table 13.7 presents information on feature nomenclature, size, and content.

Small cooking-related features clearly dominated the assemblage. Three small, basin-shaped features with an FCR lens were excavated, including Nos. 68 (originally designated No. 45) (Figure 13.19a) and 73 (Figure 13.19b). Feature 72 is an especially well preserved example of small, basin-shaped features with an FCR lens (Figures 13.19c and 13.19d). Cook-stone lenses in these features tended to be made of 6–10 tabular pieces of sandstone between 5 and 10 cm, although a few pieces

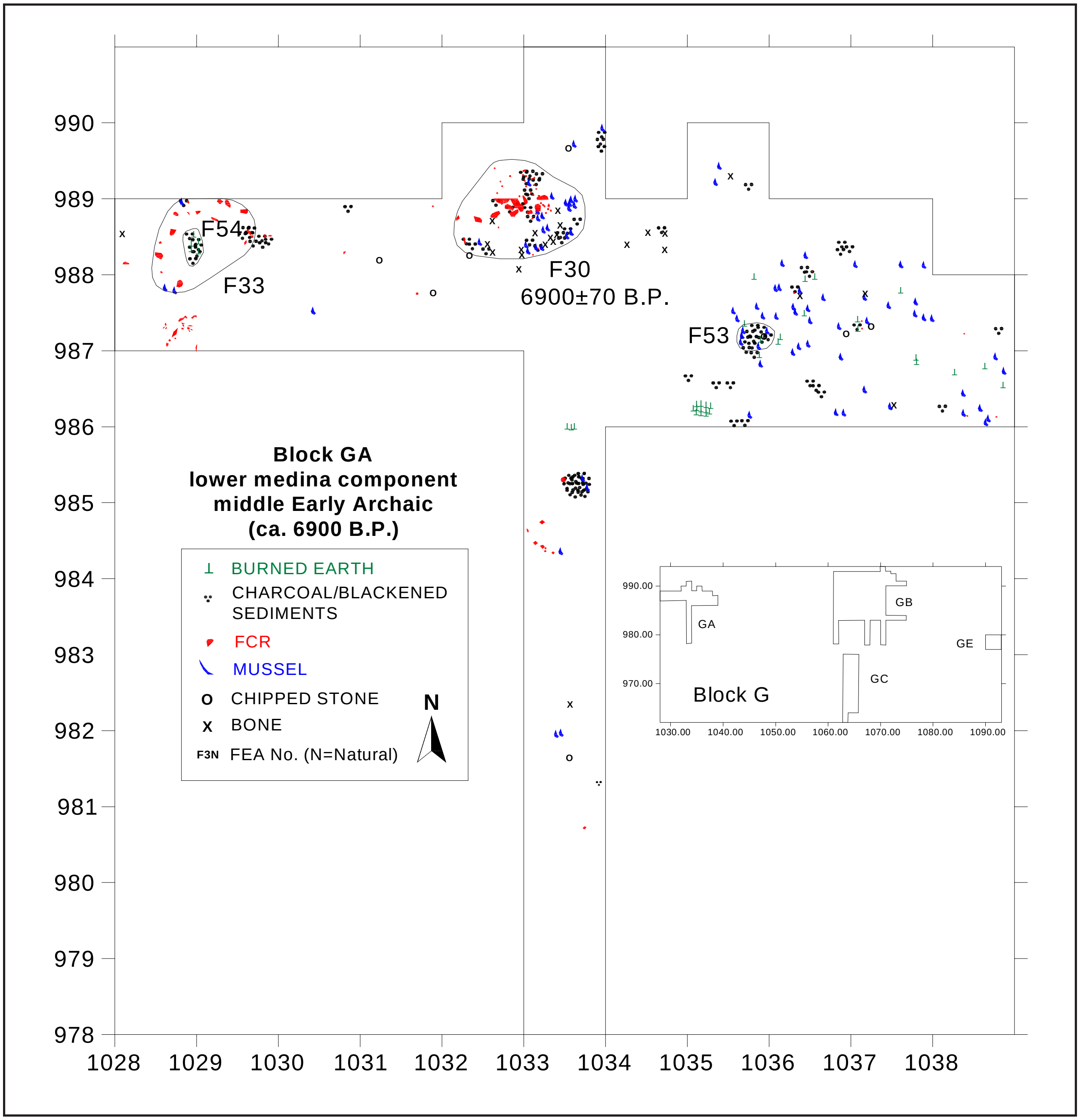


Figure 13.14. Excavations in Block Ga (late, Early Archaic period, lower Medina component) resulted in the identification of three cooking-related features, one debris concentration, and one natural feature; in this case in an oxygen-poor environment that produced the carbon-stained sediment.

ca. 0.25–2 cm were present as well, presumably fragments of larger pieces. Total weight of the cook stone in these features ranged from .75 to 3 kg. The cook stones typically covered more than half of the oval basin, and were often absent from one end of the feature. Oxidized and carbon-stained/blackened sediments underlay the cook stone and lined the bottom of the basin, indicating that a fire burned beneath the rocks. Feature fill usually included a few pieces of burned and unburned chipped stone, mussel shell, and bone.

Feature 72 contained 14 pieces of cook stone weighing 0.8 kg, but only five were greater than 5 cm in size. One tabular piece from this feature was sawed in half and its interior was analyzed micro-

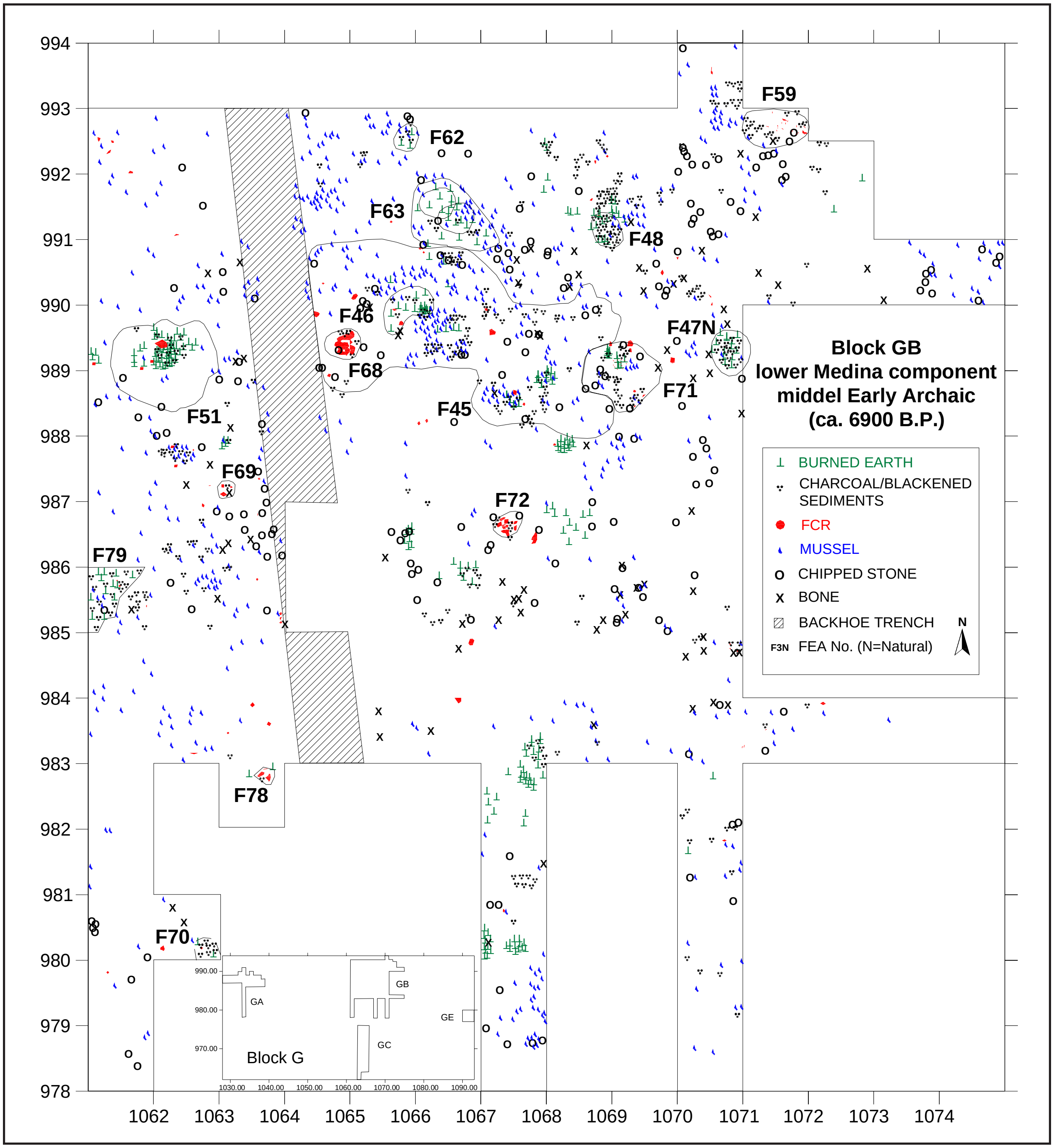


Figure 13.15. Excavations in Block Gb (late, Early Archaic period, lower Medina component) resulted in the identification of 14 cooking-related features, two debris concentrations, and one natural feature.

scopically to assess the degree of thermochemical weathering (Jackson 1998). It was not nearly as weathered as the rock plate experimentally heated to simulate an open-air hearth. While the feature rock was somewhat reddened on the bottom side, it retained most of the calcite cement and the edges were only slightly friable and not very rounded. It was, however, significantly more weathered, in terms of cement and grain loss, than the unheated control sample. Whereas the unheated control sample "naturally" exhibited only a 2 percent grain loss, due to breakdown of the calcite cement, near the outer surface, the specimen from Feature 72 exhibited a 10 percent grain loss near the surface

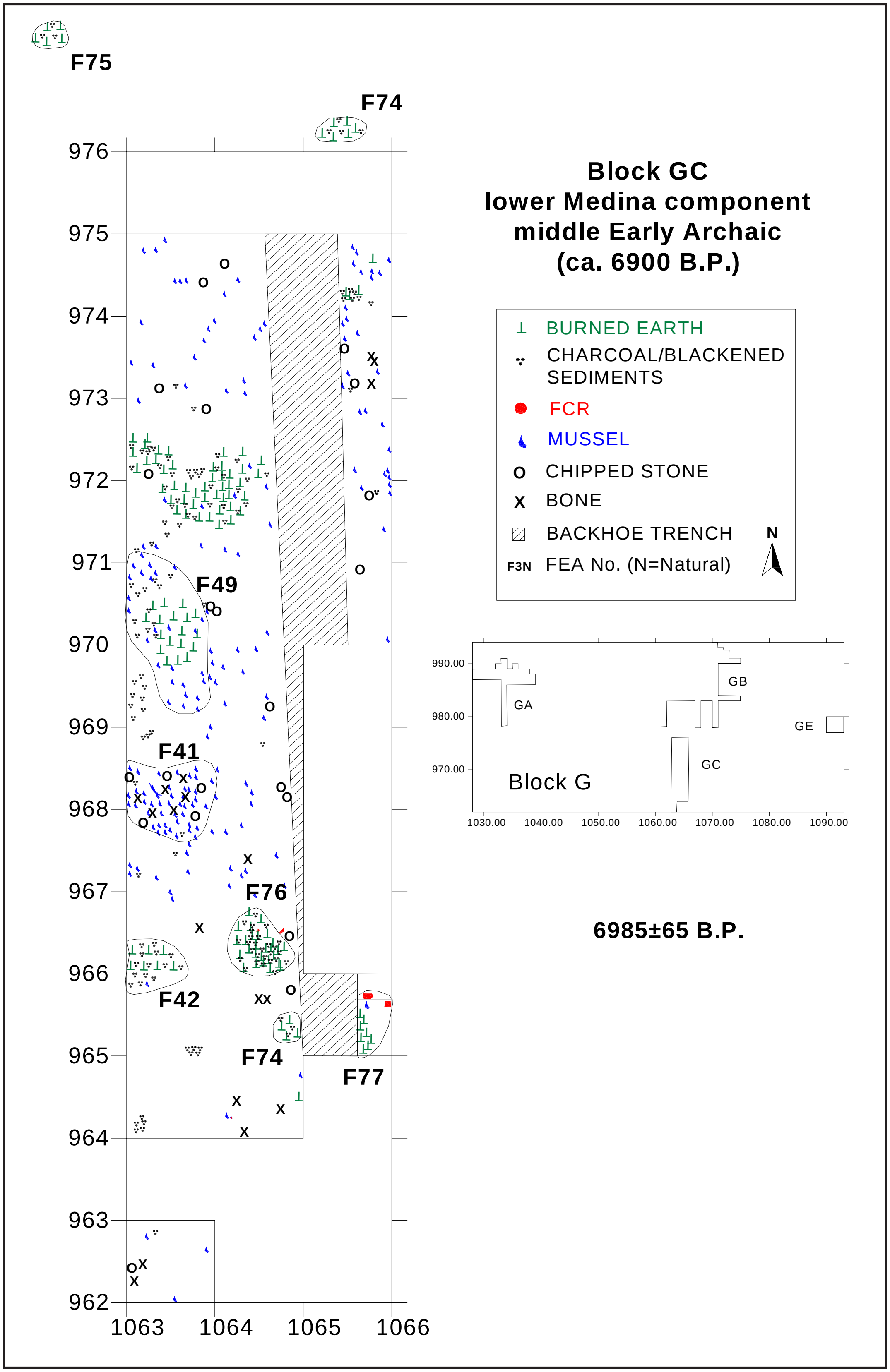


Figure 13.16. Excavations in Block Gc (late, Early Archaic period, lower Medina component) resulted in the identification of five cooking-related features and one debris concentration.

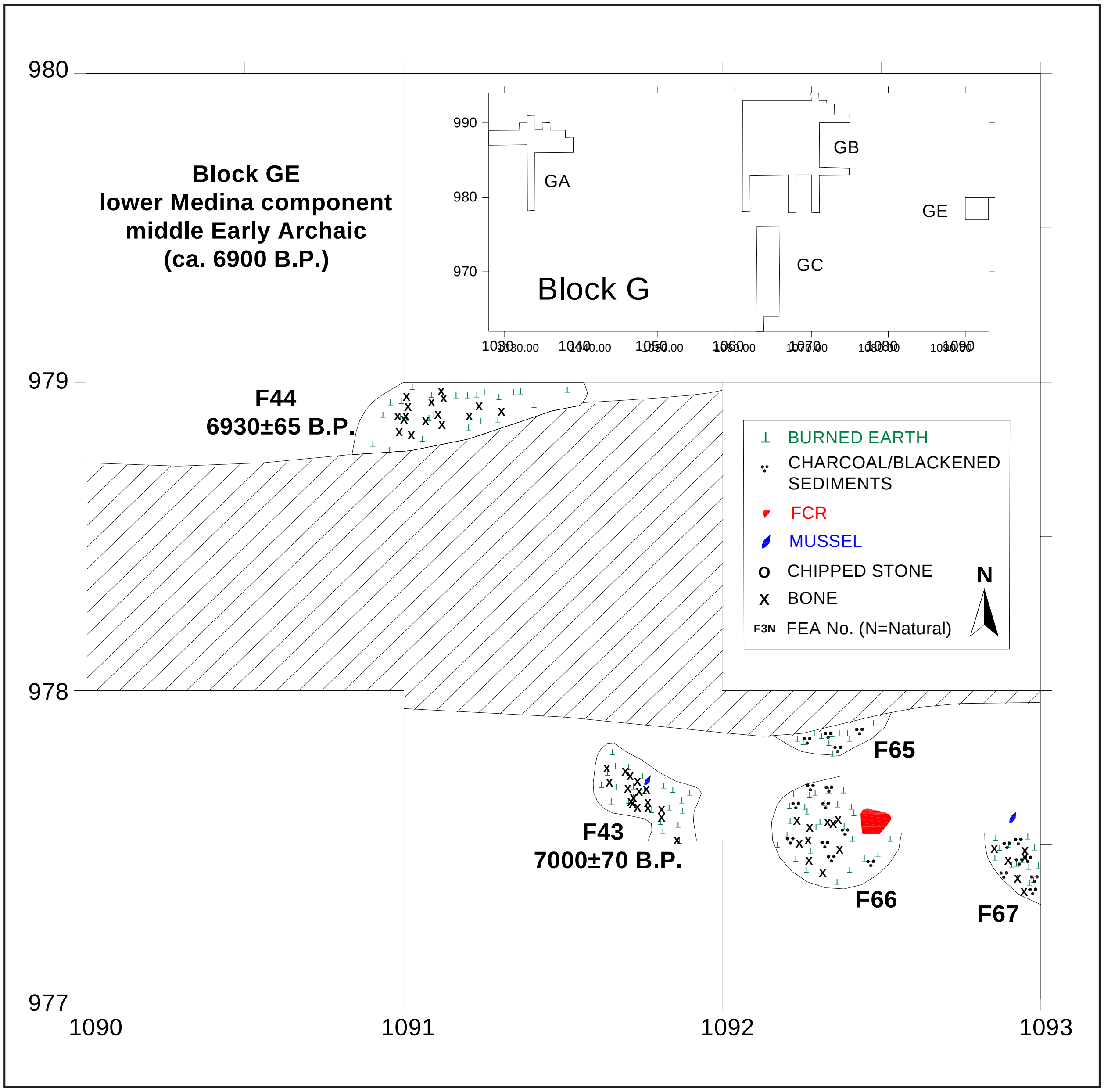


Figure 13.17. Excavations in Block Ge (late, Early Archaic period, lower Medina component) resulted in the identification of five cooking-related features.

and less than 5 percent in the interior (Jackson 1998:122). It is unclear why this piece of cook stone exhibited only moderate thermochemical weathering compared to the experimentally heated specimen. Perhaps it was added to the hearth after most of the coals had burned down, or its calcite cement may have been more resistant to heat, or the specimen may have other attributes that rendered it a higher quality cook stone (i.e., less friable).

Small, basin-shaped features without cook stones, or with only one or two small pieces, were the most common cooking-related feature in the late, Early Archaic component. These features probably functioned as rockless hearths. This feature type was defined by oxidized and carbon-stained/blackened sediments that lined and partially filled the shallow basin. The excavated portion of Feature 43 contained three pieces of chipped stone and 19 small bone frag-

Figure 13.18. Feature 41 (Block G, late, Early Archaic period, lower Medina component), a mussel shell scatter.

ments, as well as charcoal that yielded a radiocarbon age estimate of 7000±70 B.P. (Figure 13.20). A single piece of FCR and several mussel shell fragments were observed in the profile of the unexcavated portion of Feature 44; the excavated portion contained a mussel shell umbo and 14 small fragments of bone, along with charcoal that yielded a radiocarbon age estimate of 6930±65 B.P. (Figure 13.21). The size and content of rockless hearths was quite similar to those with an embedded cook-stone griddle.

Also common in this component were small oxidized lenses with and without FCR. Given that oxidized-lens features were similar in plan view size and content to the small basin-shaped hearths, they too are considered to represent remains of surface hearths. It is plausible that the shallow depressions characteristic of basin-shaped hearths resulted more from repeated use and clean-out than they did from building a fire within an excavated basin per se.

Feature 30 (Figure 13.22), which yielded a radiocarbon age estimate of 6900±70 B.P., is exemplary of large, basin-shaped cooking features in this component with varying amounts of FCR. Some of the FCR was larger in size than the cook stones typically found in the small basin-shaped features and it tended to be blocky in shape, as opposed to tabular. This feature type, as well as large basins and oxidized lenses without FCR, was defined by carbon-stained/blackened and oxidized sediments. FCR tended to be in the fill rather than lining the basin.

None of the late, Early Archaic features exhibited a clast-supported lens of FCR characteristic of features in other components interpreted as earth ovens. Nonetheless, the large size of the FCR and the presence of considerable quantities of carbon-stained/blackened sediment indicate that Feature 30 may have functioned as an earth oven. As suggested earlier, earth ovens are likely to produce more carbon-stained sediment that open-air hearths. Large cooking features, both basin-shaped and oxidized lenses, in this component contained burned and unburned cultural material, sometimes in considerable quantities, including chipped stone, mussel shells, and bone fragments (Table 13.7). Judging from the quantity of unburned material in what are ostensibly cooking features, it seems that they also served as disposal places during their post-cooking use life.

Early, Middle Archaic (ca. 8100–7500 B.P), Elm Creek Components (Blocks K, M, O)

All identified features in the Elm Creek component were exposed by pan scrapers and, in the cases of those described here, what remained of them was salvage excavated (Figure 13.23). Compared to the site's other Holocene-aged paleosols, most of the Elm Creek paleosol yielded a modicum of cultural material, the exception being Block K, which was buried about a meter below the late, Early Archaic component (Block G). Block I was set up over a comparatively dense artifact scatter that included a discreet mussel shell concentration (Figure 13.24).

Table 13.7. Lower Medina component features (late, Early Archaic period, Block G): nomenclatures; planview size; and recovered content (note that some features were only partially excavated such that artifact counts/weights do not reflect overall feature content).

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count					Artifact / Ecofact: Weight (gm)		^{14}C B.P.
						Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Burned Sediment	Charcoal	
30 (Ga)	Basin w/ FCR	130 x 120	Cooking, large	Earth oven (?)	75%	24	1.2 27	32	.12 403	-	6.6	35.7	6900±70
33 (Ga)	Basin w/ FCR	150 x 100	Cooking, large	Undetermined	90%	170	0.2 36	5	.003 27	1 TNMF	0.2	-	-
51 (Gb)	Basin w/ FCR	140 x 120	Cooking, large	Undetermined	100%	-	0.7 4	-	.0001 4	-	0.8	-	-
59 (Gb)	Basin w/ FCR	100 x 60	Cooking, large	Undetermined	90%	32	0.9 26	3	.0013 40	-	1.6	-	-
77 (Gc)	Basin w/ FCR	75 x 40+	Cooking, large	Undetermined	50%	-	[3]MD 2+	-	.0009 9	-	-	-	-
79 (Gb)	Basin w/o FCR	100+ x 100+	Cooking, large	Undetermined	25%	[3]MD	-	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD
46 (Gb)	Oxidized lens	80 x 70	Cooking, large	Undet. Surface hearth (?)	100%	29	.006 2	3	.0008 24	-	-	-	-
63 (Gb)	Oxidized lens	150 x 90	Cooking, large	Undet. Surface hearth (?)	100%	47	-	39	.001 29	-	-	-	-
29a (Gb)	Basin w/o FCR	60 x 50	Cooking, small	Hearth, rockless	100%	1	2.02 -	-	.0003 4	-	1.3	-	-
29b (Gb)	Basin w/o FCR	40 x 40	Cooking, small	Hearth, rockless	100%								
43 (Ge)	Basin w/o FCR	50 x 20	Cooking, small	Hearth, rockless	100%	3	-	-	.0002 19	-	1.5	-	7000±70

continued

Table 13.7. Continued.

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
44 (Ge)	Basin w/o FCR	54 x 20	Cooking, small	Hearth, rockless	50%	-	-	1	.0002 14	-	-	-	6930±65
48 (Gb)	Basin w/o FCR	58 x 37	Cooking, small	Hearth, rockless	100%	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	?
54 (Ga)	Basin w/o FCR	50 x 25	Cooking, small	Hearth, rockless	100%	[3]MD	-	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	?
62 (Gb)	Basin w/o FCR	30 x 20	Cooking, small	Hearth, rockless	100%	2	-	-	.0001 31	-	-	-	-
70 (Gb)	Basin w/o FCR	33+ x 27	Cooking, small	Hearth, rockless	60%	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	-
75 (Gc)	Basin w/o FCR	40 x 38	Cooking, small	Hearth, rockless	50%	-	-	-	-	-	-	-	-
66 (Ge)	Oxidized lens w/ FCR	50 x 50	Cooking, small	Hearth, griddle	100%	1	1.5 11	-	.0001 12	-	1.2	-	-
65 (Ge)	Oxidized lens w/o FCR	50 x 15	Cooking, small	Surface hearth, griddle	25%	-	.3 1	-	-	-	-	-	-
42 (Gc)	Oxidized lens w/o FCR	55 x 50	Cooking, small	Surface, hearth, rockless	75%	13	-	-	-	-	-	-	-
53 (Ga)	Oxidized lens w/o FCR	40 x 35	Cooking, small	Surface hearth, rockless	100%	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD
67 (Ge)	Oxidized lens w/o FCR	40 x 30+	Cooking, small	Surface hearth, rockless	25%	1	-	-	.0002 19	-	-	-	-

continued

Table 13.7. Continued.

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
74 (Gc)	Oxidized lens w/o FCR	30 x 20+	Cooking, small	Surface hearth, rockless	75%	-	-	-	-	-	-	.09	-
68 (Gb)	Basin w/ intact heating element	45 x 45	Cooking, small	Hearth, griddle	100%	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	-
72 (Gb)	Basin w/ intact heating element	55 x 32	Cooking, small	Hearth, griddle	100%	11	12 [3] MD	-	.0002 21	1 CORE	-	-	-
73 (Gc)	Basin w/ intact heating element	38 x 22	Cooking, small	Hearth, griddle	?	1	[3] MD	-	-	-	-	-	-
74 (Gc)	Oxidized lens w/o FCR	30 x 20+	Cooking, small	Surface hearth, rockless	75%	-	-	-	-	-	-	.09	-
69 (Gb)	FCR concentration	20 x 15	Cooking, small	Hearth, griddle (?)	100%	1	See plan 3	-	.0002 22	-	-	-	-
78 (Gb)	FCR concentration	30 x 30	Cooking, small	Hearth, griddle (?)	100%	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	-
41	Mussel lens	100 x 100	Debris concentration	Mussel shell dump	100%	5	-	[1]4	.00005 9	-	-	-	-
45	Artifact scatter	480 x 200	Debris concentration	Sheet midden	100%	1378	1.7 46	177	.027 583	2 TNMF 1 TNBF	34.0	-	-
49 (Gc)	Artifact concentration	200 x 100	Debris concentration	Sheet midden	90%	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	-
60 (Gb)	Artifact concentration	?	Debris concentration	Sheet midden	?	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	[3] MD	-

continued

Table 13.7. Continued.

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact							^{14}C B.P.
						Weight (kg) and/or Count					Weight (gm)		
						Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Burned Sediment	Charcoal	
71 (Gb)	Artifact concentration	75 x 75	Debris concentration	Sheet midden	[4]100%	9	-	-	.0002 8	-	0.8	-	-
47 (Gb)	Non cultural	?	Natural	Tree / root burn	?	2	.0005 1	1	.0001 1	-	[2]P	-	-
76 (Gc)	Non cultural	?	Natural	Tree / root burn	?	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	6985±65

[1] Feature identified during post-field analysis
[2] P=Present, missing data
[3] MD=Missing data
[4] Tools=PP Projectile point, DP Dart point, AP Arrow point, TK/TN Thick (>1cm)/ Thin <1cm), BF biface., MF Modified flake, UF Uniface, HM Hammerstone

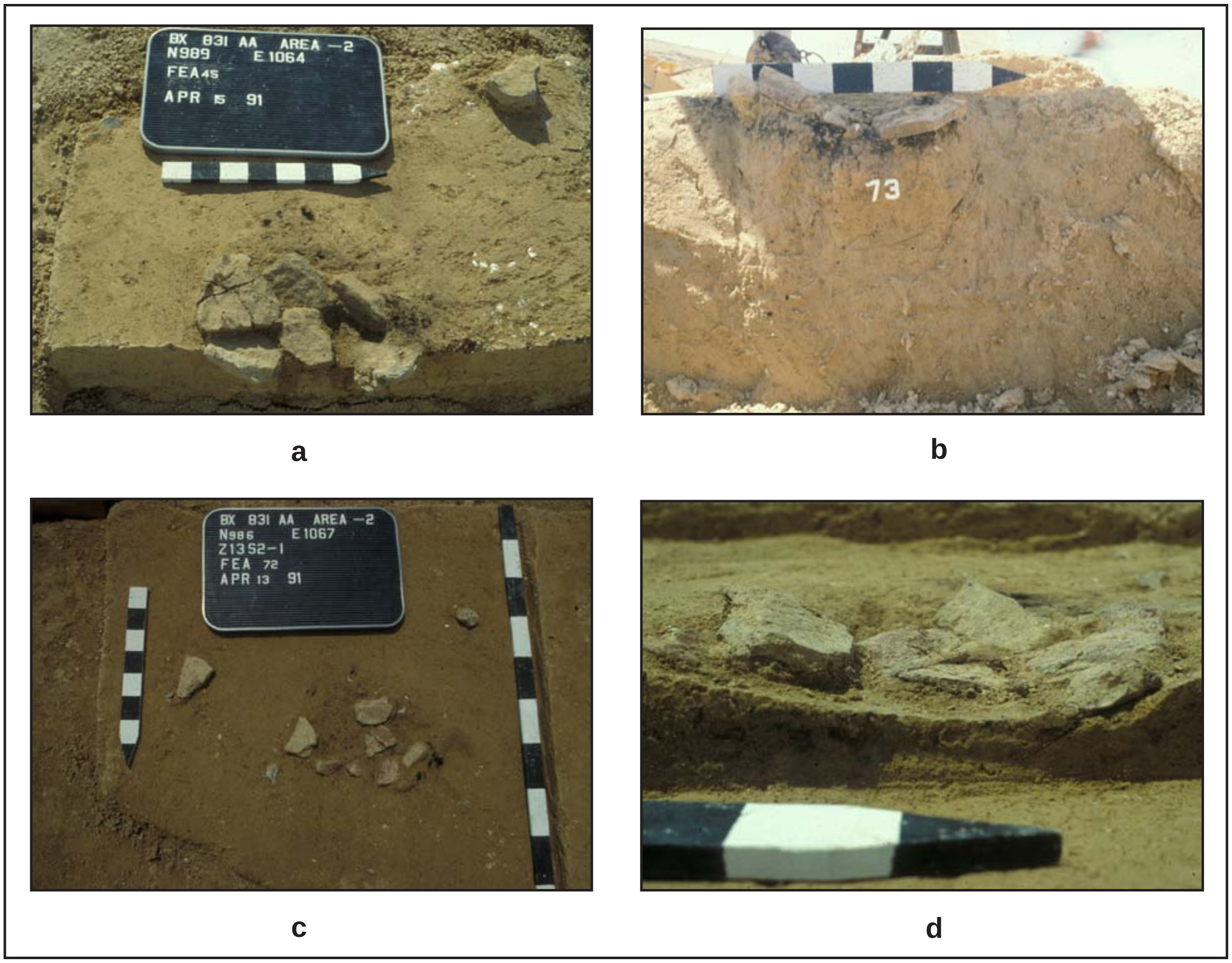


Figure 13.19a-d. Block G (late, Early Archaic period, lower Medina component), was dominated by small basin-shaped cooking features with FCR lenses including (a) Feature 68 (originally designated Feature 45); (b) Feature 73; (c) Feature 72 planview; and (d) Feature 72 in profile.

Figure 13.20. Feature 43 (Block G, late, Early Archaic period, lower Medina component), a small, basin-shaped cooking feature without FCR that yielded a radiocarbon age estimate of 7000±70 B.P.

Figure 13.21. Feature 44 (Block G, late, Early Archaic period, lower Medina component), a small, basin-shaped cooking feature without FCR that yielded a radiocarbon age estimate of 6930±65 B.P.

Figure 13.22. Feature 30 (note: trench cut by mechanical scraper tooth) (Block G, late, Early Archaic period, lower Medina component), a large, basin-shaped cooking feature with varying amounts of FCR which yielded a radiocarbon age estimate of 6900±70 B.P.

This area of the site was subsequently flooded and then destroyed by heavy machinery that slipped into the block (Chapter 9). Given the sparseness of the

Figure 13.23. View of the Elm Creek component (ca. 8 m below surface) where all identified features were exposed by pan scrapers.

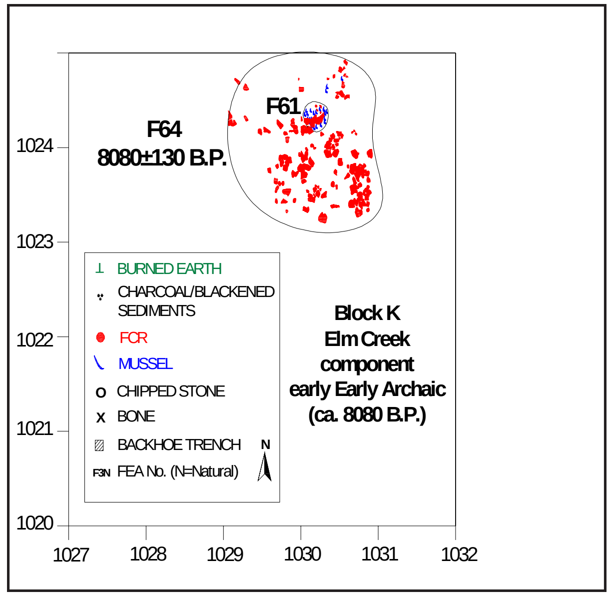


Figure 13.24. Planview of Feature 64 (Block K, middle, Early Archaic period, Elm Creek component), a large, flat-bottomed FCR lens, along with a spatially associated small mussel shell concentration (Feature 61).

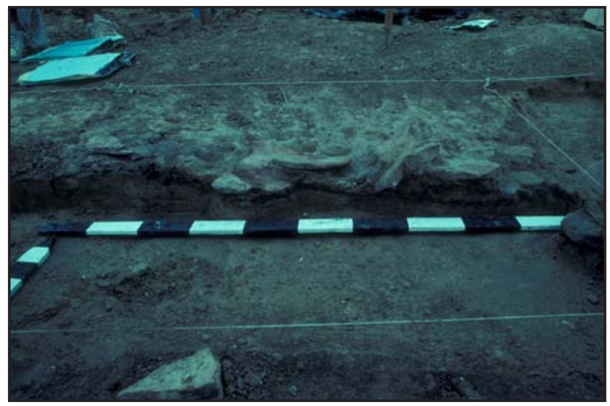
Figure 13.25. Feature 64 (Block K, middle, Early Archaic period, Elm Creek component), consisted of a dense (i.e., clast-supported) lens of FCR, 1-3 rocks thick; charcoal fragments from the feature yielded a radiocarbon age estimate of 8080±130 B.P.

Table 13.8. Elm Creek component features (late, Early Archaic period, Blocks K, M, and O): nomenclatures; planview size; and recovered content (note that some features were only partially excavated such that artifact counts/weights do not reflect overall feature content).

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count					Artifact / Ecofact: Weight (gm)		^{14}C B.P.
						Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Burned Sediment	Charcoal	
64 (K)	FCR Platform	150 x 100	Cooking, large	Earth oven	40%	43	8.4 195	12	.0006 40	-	-	-	8080±130
80 (M)	FCR Platform	150 x 100	Cooking, large	Earth oven	30%	3	17.7 63	1	10 .0001	-	-	-	7910±60 7740±50
109 (O)	Basin with FCR	90 x 90	Cooking, large	Earth oven	5%	[3]MD	[3]MD 2+	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	7645±70
61 (K)	Mussel shell lens	25 x 25	Debris concentration	Mussel shell dump	100%	[3]MD	[2]P [3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	-

[1] Feature identified during post-field analysis
[2] P=Present, missing data
[3] MD=Missing data
[4] Tools=PP Projectile point, DP Dart point, AP Arrow point, TK/TN Thick (>1cm)/ Thin <1cm), BF biface., MF Modified flake, UF Uniface, HM Hammerstone

a



b

Figure 13.26a–b. (a) Feature 80 (middle, Early Archaic period, Elm Creek component, Block M) a large cooking feature interpreted as an earth oven built on/near the surface; and (b) FCR lens was underlain by a distinctive lens of charcoal and carbon-stained sediment; charcoal fragments from the feature yielded radiocarbon age estimates of 7740±50 B.P. and 7910±60 B.P.

cultural deposits, only ca. 7 m^2 were excavated within the Elm Creek paleosol, which in some places was almost 2 m thick.

Whereas most of the site's components contained readily apparent scatters of chipped stone, mussel shells, and FCR along with small cooking features, the Elm Creek components were represented mainly by isolated features: two large, flat-lying FCR lenses (Features 64 and 80); one large basin-shaped feature with a few pieces of FCR (Feature 109); and one small mussel shell concentration (Feature 21) adjacent to Feature 64 (Table 13.8). Just what accounts for the unusual nature of the Elm Creek components remains unclear. The seemingly isolated nature of the features could be "real" and thereby indicative of a different kind of site usage, perhaps due to climatic or seasonal differences. Alternatively, the ostensible lack of sheet middens and small cooking features may simply be due to sampling error.

Feature 64, one of the large, flat-bottomed FCR lenses was excavated, along with a spatially associated small mussel shell concentration (Feature 61), in Block K (Figure 13.24). It consisted of a dense lens (i.e., clast-supported) of FCR, 1–3 rocks thick, underlain and interspersed with small pieces and flecks of charcoal as well as patches of carbon-stained/blackened sediment. Feature fill in/around the rock lens contained 43 pieces of chipped stone and 40 small fragments of bone. A Clear Fork tool was found just beyond the feature, but clearly on the same occupation surface. Charcoal fragments from the feature yielded a radiocarbon age estimate of 8080±130 B.P. (Table 4.2a). Most of the FCR was small (<10 cm) and tabular, but larger blocky pieces were present as well (Figure 13.25). Judging from the size and the abundance of FCR, only a portion of which was recovered, as well as the presence of charcoal and carbon-stained/blackened sediments beneath the lens, this feature is probably the remains of an earth-oven heating element. The oven appears to have been built on/near the surface, given its flat-bottomed character and the presence of artifacts adjacent to the feature and at essentially the same elevation. While it is possible that Feature 64 represents a large, open-air griddle, a griddle facility of that size is likely to have been too hot for much in the way of hands-on cooking.

Feature 80 was similar in size to Feature 64 and less damaged by heavy machinery; it contained considerably more large-size FCR (Figure 13.26a). Approximately 30 percent of the feature was excavated; it yielded 63 pieces of cook stone that weighed 17.3 kg, such that the entire feature probably weighed about 60 kg. Given that the FCR layer was underlain by a distinctive lens of charcoal and carbon-stained sediment (Figure 13.26b), this feature was also interpreted as remains of an earth-oven heating element built on/near the surface. Three pieces of chipped stone, 10 bone fragments, one mussel shell umbo, and several fragments thereof were found within and adjacent to the FCR lens. Two radiocarbon age estimates were obtained on charcoal recovered from beneath the FCR lens: 7910±60 B.P. and 7740±50 B.P. (Table 4.2a). It is unclear why these ages differed by more than a century.

One of the larger pieces of tabular sandstone from feature 80 was analyzed microscopically to assess the degree of thermochemical weathering (Jackson 1998). This specimen was decidedly red throughout its interior. The exterior surface was highly weathered and crumbly; the outer portion of the rock's interior exhibited a 20 percent grain loss, while the central portion showed only a 5 percent grain loss. Overall, it did not exhibit nearly as much thermochemical weathering as did the rock plate heated experimentally to simulate an earth oven. Jackson (1998:123–124) suggested, in light of the

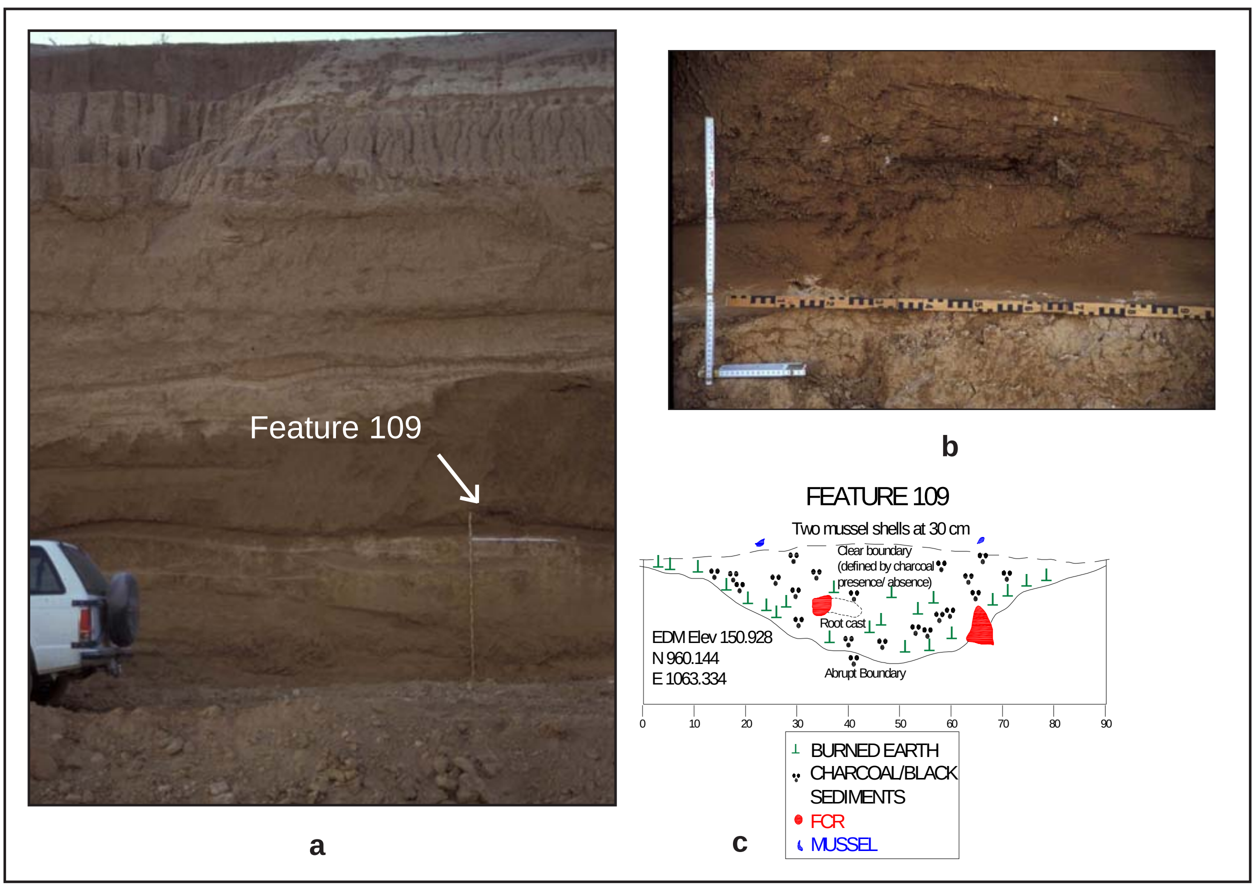


Figure 13.27a-c. Feature 109 (Block O, middle, Early Archaic period, Elm Creek component) a shallow, basin-shaped cooking feature that probably functioned as an earth oven, was exposed in profile in the spillway trench wall; charcoal fragments from the fill yielded a radiocarbon age of 7645±70 B.P.

Table 13.9. Upper Perez component features (early, Early Archaic period, Blocks lower H, Q, and T): nomenclatures; planview size; and recovered content (note that some features were only partially excavated such that artifact counts/weights do not reflect overall feature content).

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
BLOCK H													
81 (Ha/Hb)	FCR concentration	125x100	Cooking, large	Undetermined	100%	13	1.7 37	6	-	-	-	-	-
87/88 (Hc)	FCR concentration	200x100	Cooking, large	Undetermined	50%	29	2.4 90	24	-	1 CR 1 TKMF 1 TNUF	-	-	-
91/102/103 (Hc)	FCR concentration	90 x 60	Cooking, large	Earth oven (?)	100%	14	3.4 207	13	-	2 CR 2 TKMF 1 TNMF	-	-	-
100 (Ha/Hb)	FCR concentration	100x90	Cooking, large	Undetermined	100%	26	1.9 59	3	.0001 1	1 TKMF 1 COB	-	-	-
84 (Ha/Hb)	FCR concentration	60 x 30	Cooking, small	Undetermined	70%	6	.5 33	3	-	2 CR	-	-	-
90 (Hc)	FCR concentration	40 x 40	Cooking, small	Undetermined	100%	28	1.8 71	10	-	1 TNMF	-	-	-
102 (Hc)	FCR concentration	75 x 35	Cooking, small	Undetermined	100%	2	.5 12	3	-	-	-	-	-
93 (Hc)	Mussel shell lens	100x80	Debris concentration	Mussel shell dump (?)	100%	7	.07 8	12	-	-	-	-	-
82 (Ha/Hb)	Artifact concentration	75x50	Debris concentration	Lag deposit	100%	1	.1 3	-	-	??	-	-	-
83 (Ha/Hb)	Artifact concentration	60 x 40	Debris concentration	Lag deposit	100%	14	.9 31	13	-	1 TKMF 3 TNMF 1 PP	-	-	-
86 (Ha/Hb)	Artifact concentration	200x100	Debris concentration	Lag deposit	80%	27	1.9 48	34	-	2 CR 1 TKMF 1 TKUF 1 TNBF	-	-	-

continued

Table 13.9. Continued.

Fea No.	General Description	Size (cm) L x W	Generic Class	Suggested Function	Approx. Percent Excavated	Artifact / Ecofact: Weight (kg) and/or Count: Debitage	FCR	Mussel (umbos)	Bone	[4]Tools/ Cores	Weight (gm): Burned Sediment	Charcoal	^{14}C B.P.
BLOCK H													
94 (Hc)	Artifact concentration	90 x 50	Debris concentration	Lag deposit	50%(?)	15	.1 14	12	-		-	-	-
99 (Ha/Hb)	Artifact concentration	250x120	Debris concentration	Lag deposit	100%	59	3.8 104	-	.0001 1		-	-	-
101 (Ha/Hb)	Artifact concentration	60 x 50	Debris concentration	Lag deposit	100%	2	.4 9	5	-		-	-	-
113 (H?)	Artifact concentration	?	Debris concentration	Lag deposit	?	[3]MD 3	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	
98 (H)	Organic stain	?	?	Undetermined	?	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	
104 (H)	Organic stain	30 x 30	?		100%	3	.2 40	1	-	-	-	-	-
BLOCK Q													
89 (Q)	Artifact concentration	140x80+	Debris concentration	Lag deposit	70%	[3]MD	[3] MD	[3]MD	[3]MD	[3]MD	[3]MD	[3]MD	-
BLOCK T													
107 (T)	Basin with FCR	50 x 30	Cooking, small	Hearth, containment	100%		5.2 15						-
106 (T)	Artifact concentration	300x300	Debris concentration	Sheet midden	100%	1	1.7 54						8640±60
108 (T)	Artifact concentration	400x200	Debris concentration	Sheet midden	90%								8805±75

[1] Feature identified during post-field analysis
[2] P=Present, missing data
[3] MD=Missing data
[4] Tools=PP Projectile point, DP Dart point, AP Arrow point,, TK Thick (>1cm), TN Thin <1cm), BF biface., MF Modified flake, UF Uniface, HM Hammerstone, COB Cobble tool

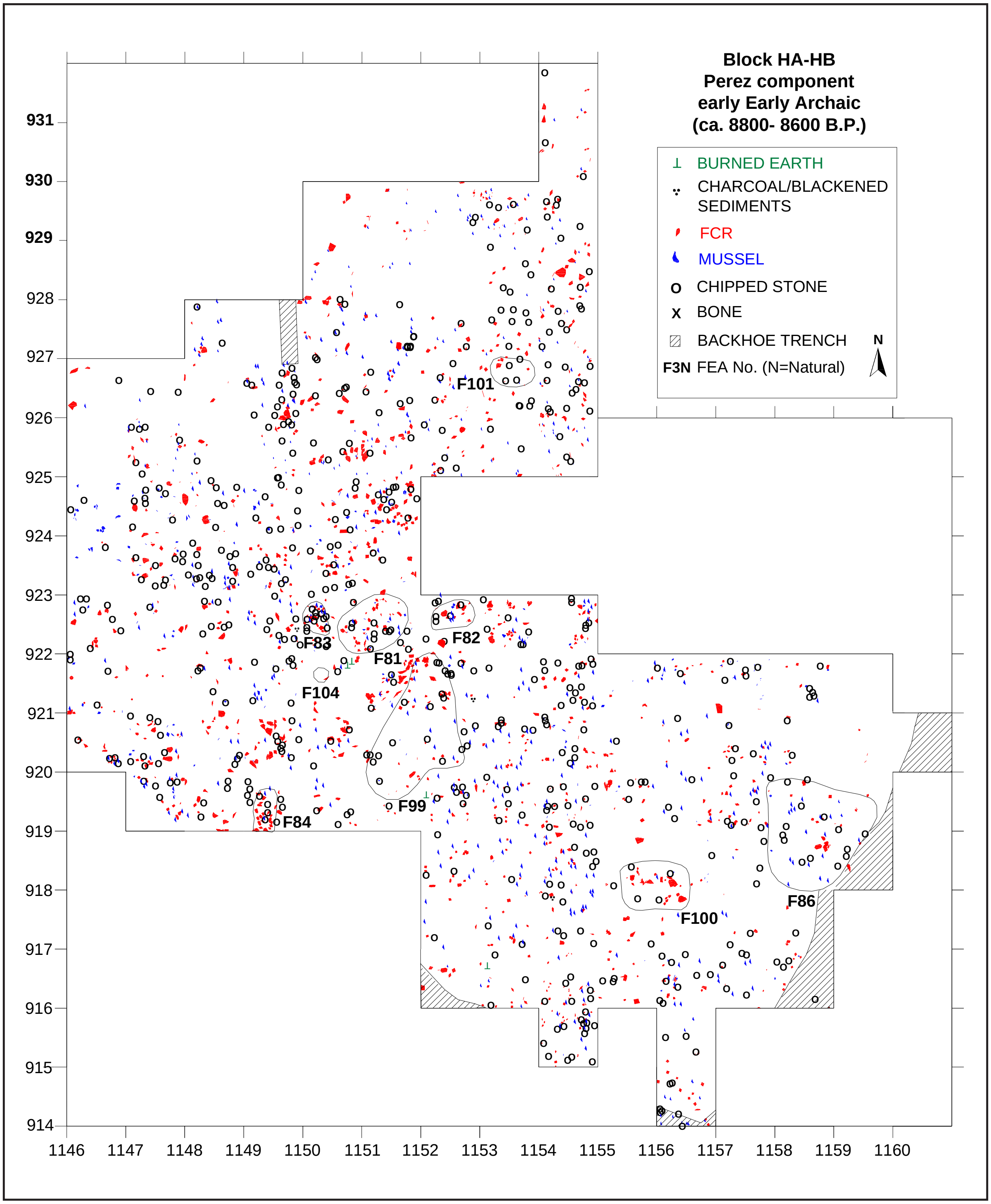


Figure 13.28. Excavations in Blocks Ha/Hb (early, Early Archaic period, upper Perez component) resulted in the identification of three cooking-related features and five debris concentrations.

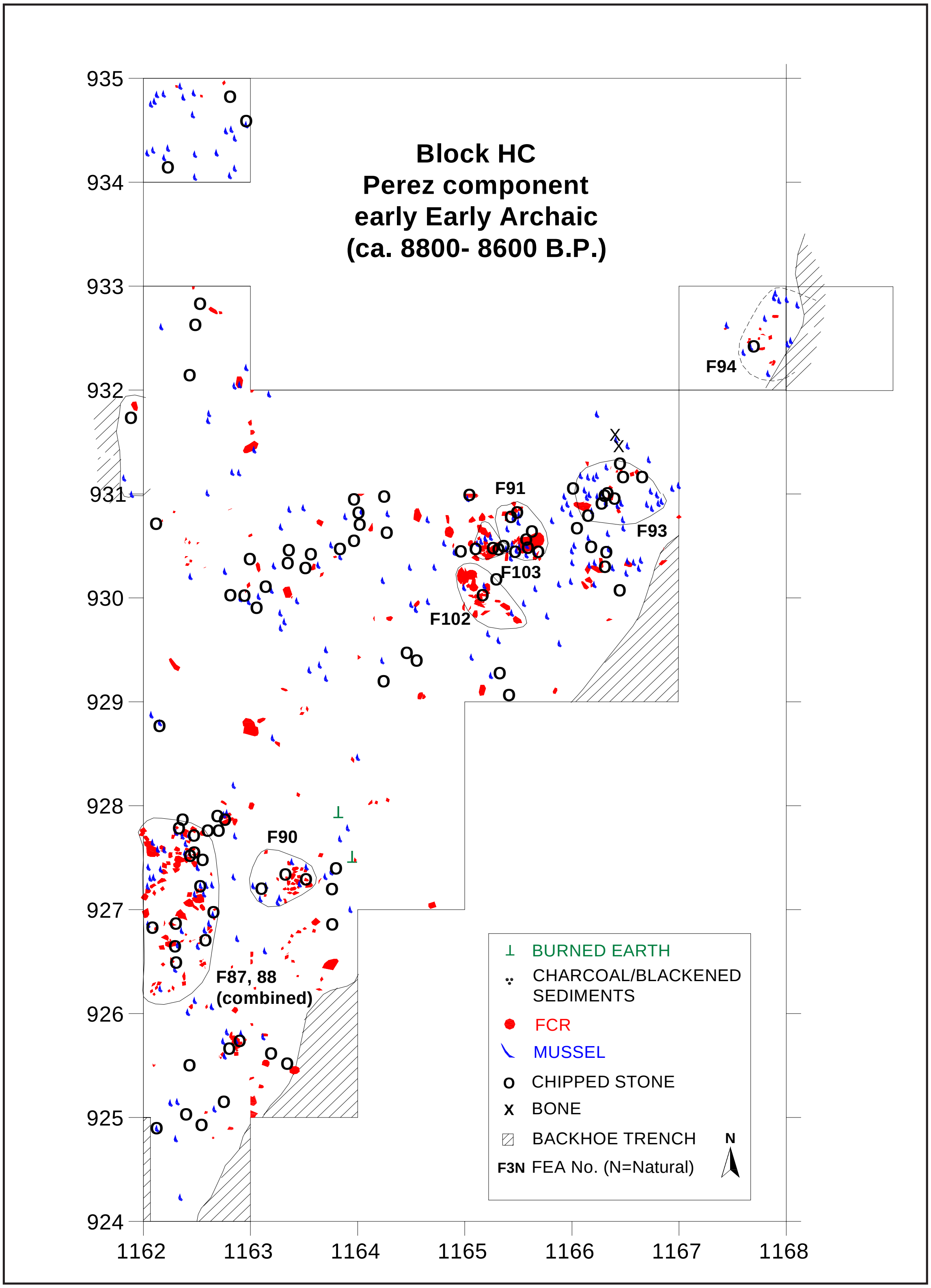


Figure 13.29. Excavations in Blocks Hc (early, Early Archaic period, upper Perez component) resulted in the identification of three cooking-related features and five debris concentrations.

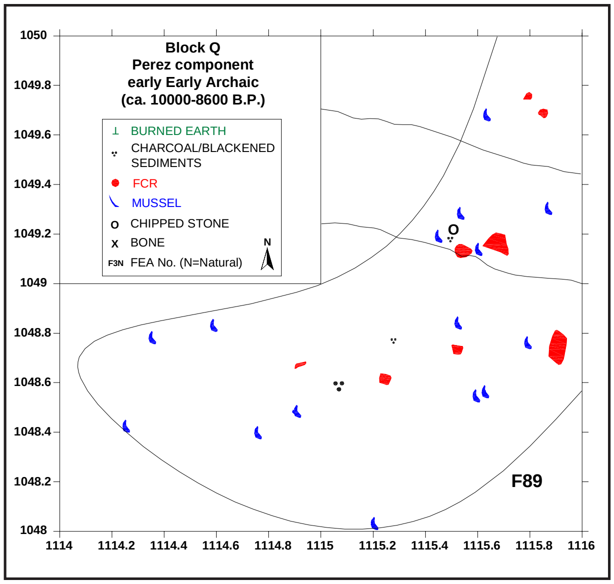


Figure 13.30. Excavations in Block Q (early, Early Archaic period, upper Perez component) resulted in the identification of one debris concentration.

markedly red color of the rock's interior and only moderate grain loss, that this specimen may be the interior portion of a large piece that fractured (i.e., exfoliated) along bedding planes during use.

Feature 109 was exposed in profile in the spillway trench wall (Figure 13.27a–c). Its basin-shaped morphology was readily apparent and the abundance of charcoal and burned sediment in the fill indicates that it functioned as an earth oven. Charcoal fragments from the fill yielded a radiocarbon age of 7645±70 B.P. (Table 4.2a). The portion of the fill that was examined contained one piece of FCR and several mussel shell fragments. Other mussel shells were observed in the wall profile at essentially the same elevation from which the basin was originally excavated. A fully grooved cobble, possibly a bola stone (Chapter 12), was recovered as well, a few meters away at about the same elevation.

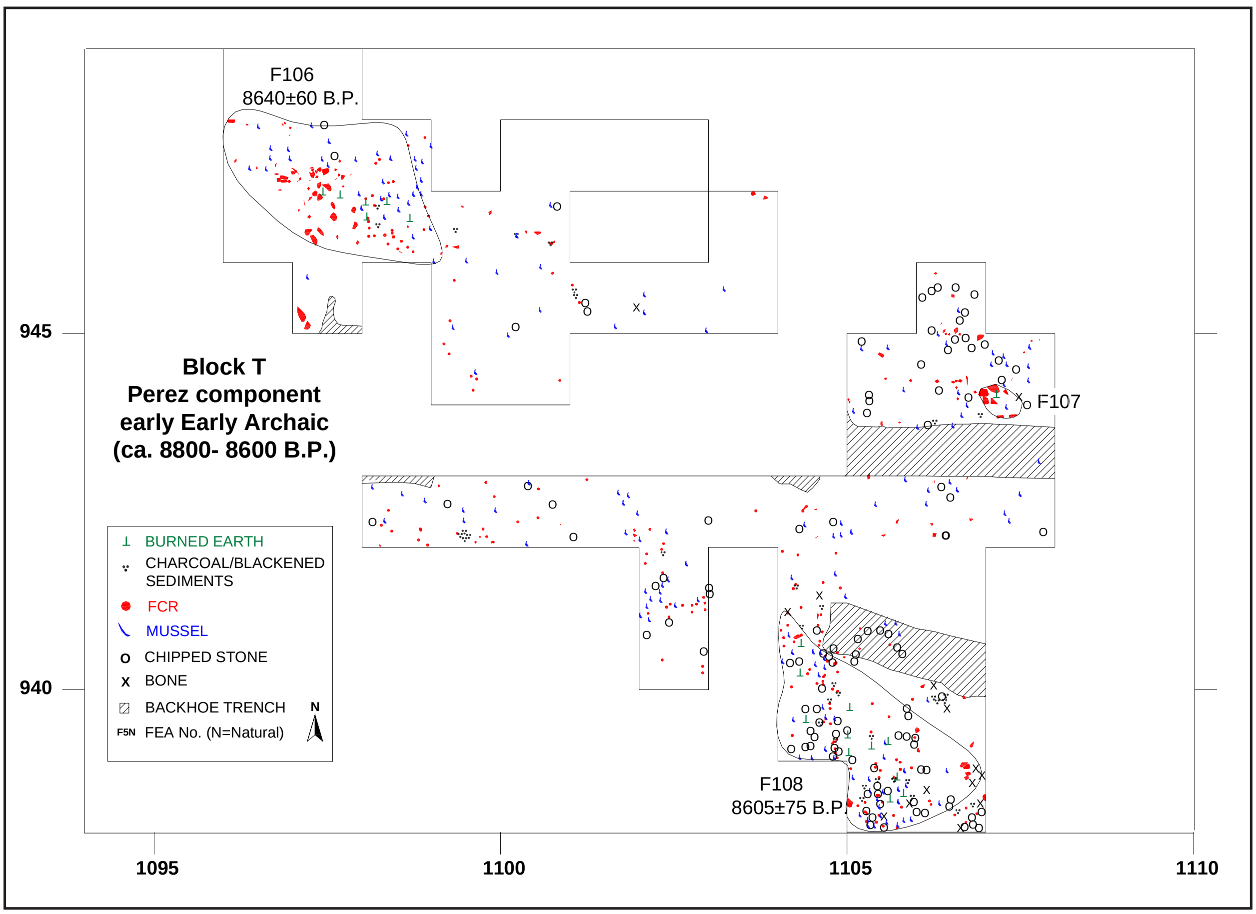


Figure 13.31. Excavations in Block T (early, Early Archaic period, upper Perez component) resulted in the identification of one cooking-related feature and two debris concentrations.

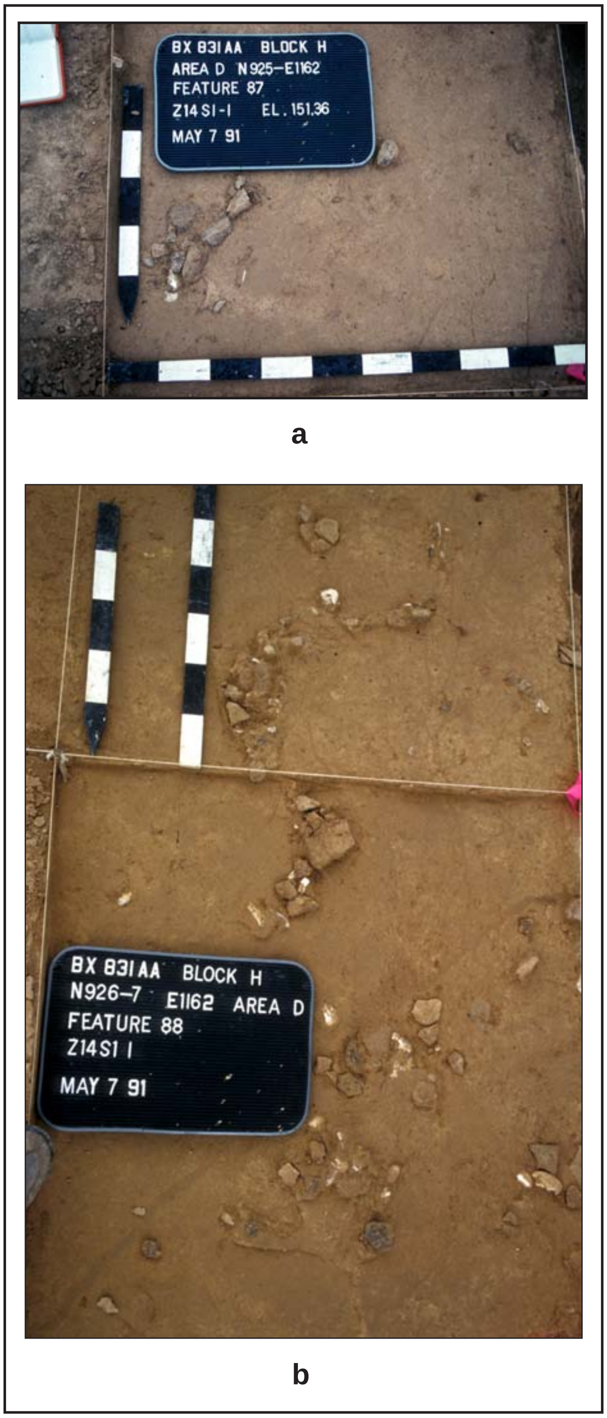


Figure 13.32a–b. Composite feature 87/88 (Block Hc, early, Early Archaic period, upper Perez component) a large cooking feature showing: (a) linear concentration of artifacts within the Feature 87 portion of composite Feature 87/88; and (b) linear concentration of artifacts within the Feature 88 portion of composite Feature 87/88.

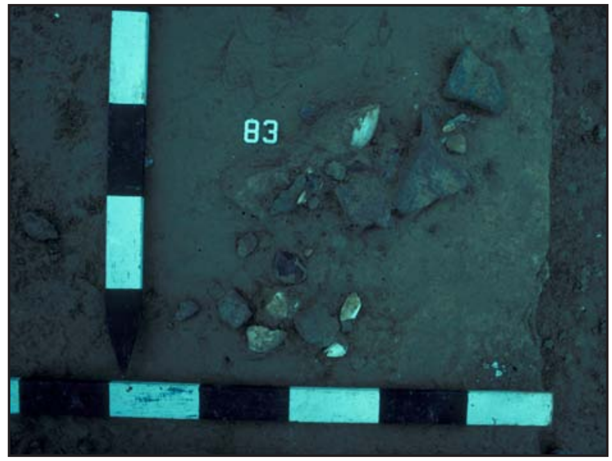


Figure 13.33. Feature 83 (Block Ha/Hb, early, Early Archaic period, upper Perez component) an amorphous artifact concentration showing FCR, mussel shells, and chipped stone, some are in vertical angles of repose.

Early, Early Archaic (ca. 8800–8600 B.P), Perez Components (Blocks H, Q, and T)

Features were differentially preserved in Blocks H, Q, and T (Table 13.9) of the Perez component (Chapter 9). Features were not found in Block N. Block H was decidedly flood scoured as evidenced by the admixture of cultural materials and stream-worn pebbles. The 15 artifact concentrations identified as features in Block H, along with others not designated as features, are flood-created lag deposits, some of which may represent lagged cook-stone features (Figure 13.28–13.29). Block H also contained two organic stains of ostensibly natural origin, possibly remains of root casts or animal burrows. Block Q was established over an artifact concentration, also a lag deposit, exposed by heavy machinery in the bottom of the spillway trench in the C horizon of the Perez paleosol (Figure 13.30). Cultural deposits in Block T were comparatively intact but, judging from the quantity of stream worn gravel therein, these deposits were also impacted, to some extent, by floods. Nonetheless, one discrete cooking related feature and two sheet middens were identified (Figure 13.31).

Block H, a sizable area of 170 m^2, is represented by a dense artifact scatter, with embedded concentrations of FCR, mussel shells, and chipped stone,

Figure 13.34. Feature 91 (Block Hc, early, Early Archaic period, upper Perez component), a component of composite Feature 91/102/103, with an amorphous artifact concentration around a large piece of FCR.

distributed through 10–40 cm of stratified fine-grain sediment. Feature 88/87 is exemplary of artifact concentrations—FCR, mussel shells, chipped stone—and stream-worn pebbles in linear arrangements, with some specimens in vertical angles of repose (Figure 13.32a–b). Features 83 (Figure 13.33) and 91/102/103 (Figures 13.34 and 13.35) are exemplary of similar artifact concentrations in amorphous arrangements. Some items were in vertical angles of repose and large pieces of FCR were surrounded by smaller artifacts and stream-worn pebbles.

Figure 13.35. Feature 102 (Block Hc, early, Early Archaic period, upper Perez component), an oval shaped concentration of FCR, possibly remains of an earth oven associated with composite Feature 91/102/103.

Figure 13.36. Feature 99 (Block Ha/Hb, early, Early Archaic period, upper Perez component), a FCR concentration showing the imbricated character of small size FCR associated with larger pieces.

Feature 99, an FCR concentration that contained several dozen flakes and five chipped stone tools, is exemplary of features with numerous large pieces of FCR and smaller specimens that are partially imbricated in what appears to be shallow erosion channels (Figure 13.36). Given the abundance of large FCR, this feature may represent remains of a rock heating element from a large earth oven similar Feature 80 in the overlying Elm Creek Component. Feature 102, a smaller FCR-dominated concentration (Figure 13.35), may also represent remains of a rock heating element, in this case one comprised of comparatively small pieces of FCR.

Feature 107 in Block T is the best preserved cooking-related feature in the Perez component. It is comprised of seven pieces of sandstone FCR 5–10 cm in maximum dimension, arranged in a roughly circular pattern, and eight relatively small pieces, some or all of which may have exfoliated from the larger pieces. Feature 107 is classified as a small basin-shaped feature with FCR (Figure 13.37a). Its function was not discerned with any certainty.

Figure 13.37a-b. (a) Feature 107 (Block T, early, Early Archaic period, upper Perez component), possible containment ring or concentration of FCR used in an earth oven or steaming pit; and (b) showing the results of paleomagnetic analysis.

Five of the larger pieces of FCR from Feature 107 were submitted for paleomagnetic analysis to determine whether the rocks were heated and cooled in place (Appendix G). Results showed that these rocks had been heated to an average temperature of 300° C and that three of them had not moved substantially since last being heated and cooled (Figure 13.33b). Two of the analyzed rocks had moved since they cooled and they were located about 10 cm above the base of the other sizable pieces of FCR.

Figure 13.38. A portion of Feature 106 (Block T, early, Early Archaic period, upper Perez component), a sheet midden deposit showing a concentration of FCR within the deposit that included one piece in a vertical angle of repose; charcoal fragments from the fill yielded a radiocarbon age of 8640±60 B.P.

The two sizable pieces of sandstone FCR not subjected to paleomagnetic analysis were analyzed microscopically to assess the degree of thermochemical weathering (Jackson 1998). Both specimens evidenced considerably greater weathering than did the griddle rock from Feature 72 in the late, Early Archaic component (Block G) or the oven rock form Feature 80 in the middle, Early Archaic component (Block M). In cross section, both specimens showed to be markedly redder on the side of the rock facing the shallow basin, indicating that the heat source area was within the basin. The larger specimen showed a 90 percent grain loss (due to the breakdown of the calcite cement) near the rock's surface and a 20 percent grain loss in the interior portion of the rock; the smaller specimen showed a 50 percent gain loss near the surface and a 10 percent grain loss in the interior portion (Jackson 1998:118–121). While these findings are consistent with the rocks being used to contain a fire within the shallow basin, the feature was altogether lacking in oxidized and carbon-stained sediments indicative of an in situ fire. In that light, it is conceivable that these rocks were heated nearby to more than 300° C then moved to the shallow basin, which may have served as a steaming pit or perhaps a fireless earth oven. In this scenario, however, it would also be necessary to evoke an unidentified force to upwardly displace two of the rocks.

Block T also contained two comparatively high density artifact concentrations (Features 106 and

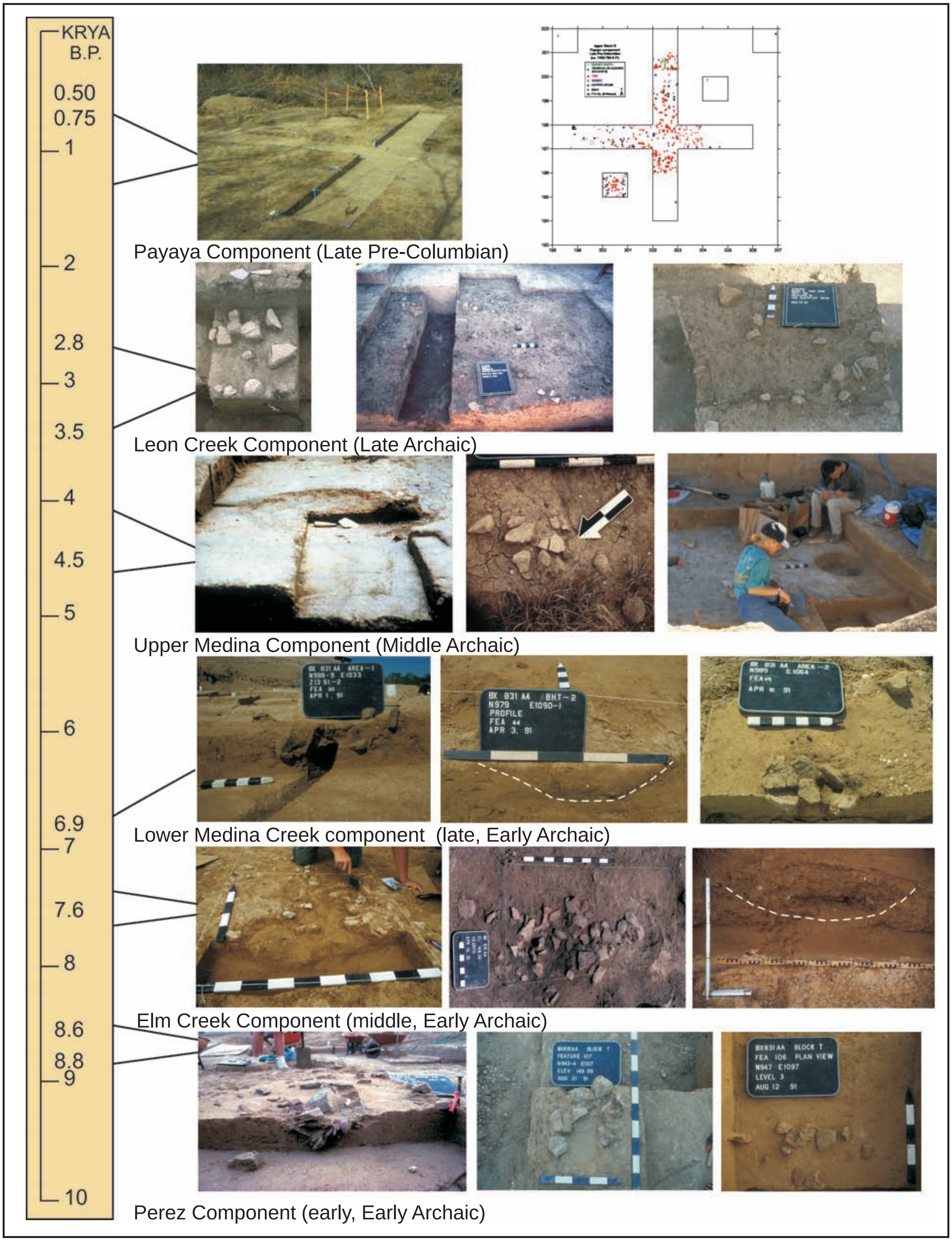


Figure 13.39. The feature assemblage (including intact cooking-related features) at the Richard Beene site spanning almost 10,000 years (i.e., 9,000 radiocarbon years) representing the Early, Middle, and Late Archaic archaeological periods, as well as a Late Pre-Columbian sheet midden deposit.

107), each of which contained FCR, chipped stone, bone, and charcoal fragments, along with small stream-worn cobbles. Both of these features were interpreted as sheet middens insofar as the vast majority of artifacts were found in a lens less than 10 cm thick. Feature 106 covered and area at least 3 x 3 m in size and consisted primarily of FCR (Figure 13.38); charcoal fragments from it yielded a radiocarbon age estimate of 8640±60 B.P. (Table 4.2a). Feature 108, a somewhat larger sheet midden deposit (Figure 13.28), contained a comparatively high density of bone and charcoal fragments and yielded a radiocarbon age estimate of 8805±75 B.P. (Table 4.2a).

Concluding Comments

The feature assemblage at the Richard Beene site spans almost 10,000 years (i.e., 9,000 radiocarbon years) and includes intact cooking-related features representative of the Early, Middle, and Late Archaic archaeological periods, as well as a Late Pre-Columbian sheet midden deposit (Figure 13.39). Although botanical and faunal preservation conditions are poor, feature morphology is sufficiently well preserved to recognize considerable inter- and intra-component variation in cooking facilities interpreted as remains of open-air hearths and closed earth ovens. Most of the site's components also contain areas of comparatively high artifact densities that were interpreted as refuse dumps, including mussel shells and sheet middens composed of varying densities of FCR, chipped stone, mussel shells, and bone fragments. Conspicuously absent are pit features of any kind with vertical or steep walls (e.g., storage pits, post holes, deep [< 30 cm] cooking pits). It is plausible that the lack of these features is simply a reflection of the site's clayey soils, which compared to sandy soils, are not particularly conducive to pit-digging. The apparent absence of pit features might also reflect site usage during the raining seasons when pit storage or deep-pit cooking would not have been viable due to wet or saturated sediments. A better understanding of the apparent absence of such features awaits future research that necessarily would entail an analysis of the general nature and distribution of pit features in clayey sediments on the inner Gulf Coastal Plain and in surrounding ecological zones.

Small (ca. 0.4–0.6 m in plan view) cooking-related features clearly dominate the feature assemblage at the Richard Beene site (Table 13.3). They are represented by shallow basin-shaped hearths, with (ca. .7–2 kg) or without cook stone griddles, as well as by circular- or oval-shaped oxidized areas, also with or without FCR, judged to be remains of surface hearths. One small cooking feature in an Early Archaic component (Feature 107, Block T) was anomalous in that it consisted of seven pieces of thick cook stone (ca. 5 kg) in a circular pattern and may have functioned as a containment ring for a small fire or perhaps the heating element for a small earth oven or steaming pit.

Comparatively large (ca. 0.8–1.5 m in plan view) cooking-related features were morphologically similar to the small ones in that they too occurred in shallow basins and on the surface. Large-sized basins filled with carbon-stained sediments and various quantities of FCR are interpreted as earth ovens. Those features defined by a flat-lying lens of FCR (ca. 40 kg) underlain by carbon-stained and oxidized sediment may be the remains of earth ovens built on/near the surface. Only one feature—Feature 12 (Late Archaic), judged to be remains of a 2 m diameter basin-shaped earth oven—is large enough to be considered a bulk-processing feature used to prepare food for multiple families for immediate consumption or for storage purposes.

The size of most of the site's features is consistent with the kinds of family or small-group hearths that can be inferred from ethnohistorical and ethnographic accounts of cooking facilities in North America. Family-sized cooking facilities were used outdoors as well as inside wickiup structures in the Gulf Coastal Plains. A similar variety of small features was also found at the Cherry Tree rock shelter site in Travis County (Kotter 1985).

Earth ovens and other large-sized cooking-related features at the Richard Beene site are clearly too large to have been used inside residential structures. These large features are comparable in size to FCR features at other sites in the Applewhite Reservoir area (McCulloch et al. 2008), as well as to those typically found at sites in the Choke Canyon Reservoir area to the south (Hall et al. 1986; Scott 1982; Thoms et al. 1981) and throughout south Texas (Hester 1991b). They are also similar to earth ovens found along Yegua Creek to the north (Thoms 2004b) and throughout the Post Oak Savannah region (Fields 1995). With the notable exception of Feature 12, however, large cooking features at the Richard Beene site are not nearly as large as those found at burned-rock midden sites in the Edwards Plateau and adjacent parts of the Blackland Prairie that have rock heating elements 2–3 m in diameter (Black and Creel 1997; Ricklis and Collins 1994).

We have down played the importance of stone boiling at the Richard Beene site, in comparison to open-air-hearth and earth-oven cooking, largely because experimental work indicates that the local calcite sandstone tends to crumble during a single stone-boiling episode (Jackson 1998). Moreover, rock types more suitable to stone boiling, including quartzite and hard limestone, are readily available in the gravel beds near the site, but they were not part of the site's FCR assemblage. Furthermore, the site is lacking in rock-filled pit features characteristic of stone-boiling pits at many sites on the Great Plains (Frison 1992; Reeves 1990). We cannot entirely rule out stone boiling, insofar as the thick version of the local calcite sandstone probably would be adequate for a single-episode stone boiling. It is also possible that some of the surface hearths with FCR could have been used to heat stone-boiling rocks. Of course the FCR scatters found in most components may have resulted from discarding stone-boiling rocks used in baskets or above-ground hide containers (cf. Quigg et al. 2001).

Jackson's (1998) laboratory analysis and field experiments with cook stone clearly demonstrate a relationship(s) between the amount of time a given piece of cook stone remains hot (i.e., > 100^{o}C) and the degree of thermochemical weathering it undergoes. FCR from each of three morphologically different cook-stone features at the Richard Beene site exhibited significant differences in the degree of thermochemical weathering. These results suggest that comparisons of relatively straightforward observations on the internal structure of FCR from different kinds of archaeological features, using raw and experimentally used cook stones as controls, are likely to reveal patterns useful in explaining morphological and functional variation in cook-stone features.

The site's debris scatters, including mussel shell concentrations, sheet middens, and chipped-stone concentrations tend to be small in size or vertically thin, attributes indicative of occupations by small groups for a few days or weeks at most. Many of the cooking-related features at the Richard Beene site contained varying quantities of FCR, burned and unburned pieces of chipped stone and mussel shells, and often bone fragments as well. Similar kinds and sizes of artifacts dominate the site's sheet middens and general artifact scatters, suggesting that these debris concentrations may well have resulted from cleaning out and disposing of feature fill, including items that may have been placed there as part of clean-up activities around cooking fires. Chapter 14 explores this idea by analyzing artifact distributions in each component for spatial patterning indicative of domestic and peripheral zones.

14

SPATIAL ANALYSIS OF SITE STRUCTURE

J. Bryan Mason

This chapter describes and analyzes spatial patterning of artifact assemblages from block excavations at the Richard Beene site. Its objectives are: (1) to illustrate artifact distributions by density (i.e., items/m^2); (2) to statistically identify patterns (i.e., clusters) in the co-occurrence of artifacts and interpret them in terms of domestic versus peripheral activity areas typical of hunter-gatherer encampments; and (3) to compare distribution patterns between well-preserved occupation surfaces and poorly preserved occupation zones, including those impacted by floods. Theoretical underpinnings and analytical methods used herein are discussed in an earlier study that focused on two of the site's major excavation areas: Block G, a late, Early Archaic component embedded in the lower Medina pedocomplex and Block H, an early, Early Archaic component embedded in the upper Perez paleosol (Mason 2003).

Site Structure

Site structure has been defined as the patterns and associations between artifacts, features, and shelters within an archaeological site (South 1979:213). The present study is exploratory in nature and derives site-structure information from patterns in the densities of various artifacts and from the results of a quantitative spatial analysis of the co-occurrences of categories of artifacts. Artifact categories used in this study are: (1) lithic debitage; (2) bone; (3) fire-cracked rock (FCR); and (4) mussel shell. Each of these categories is broadly associated with specific materials used and discarded during activities expected to have been carried out at a given hunter-gatherer encampment.

This study relies on both qualitative and quantitative methods to identity site structure. Visual (i.e., qualitative) inspection of artifact and feature distribution maps allows the identification of low- and high-density areas and illustrates their spatial relationships to identified features. Quantitative spatial analysis assesses spatial relationships among the artifact categories. By comparing the results of each technique, site structure can be identified and comparisons can be made between well-preserved and poorly preserved encampments.

Ethnoarchaeological studies show hunter-gatherer sites are typically organized into two main use areas: the domestic zone and the peripheral zone. Domestic zones—Yellen's (1977) nuclear areas and Binford's (1987) domestic spaces—are expected to contain at least one hearth, a shelter, and a sleeping area. Activities performed within the domestic zone are also expected to occur within the peripheral zone. Messy activities and activities that take up large amounts of space, such as cooking in earth ovens or butchering large game, are conducted within the peripheral zone and are not expected to occur within the domestic zone (Binford 1983:165–190).

Primary debris patterns within the domestic zone are expected to follow Binford's (1978b) toss-and-drop model. Domestic zone items are differen-

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tially subject to secondary disposal in refuse dumps. Clean up within the domestic zone is common to reduce the quantity of large-size debris (e.g., fire-cracked rocks and mussel shells) located in heavily used areas, but smaller items may be overlooked. Clean-up activity is less likely to take place in the peripheral zone, which tends to be subjected to less "traffic" and perhaps fewer kinds of activities in general. Peripheral zones typically become focal points for the dumping of material from domestic zones. Overall, clean up in a domestic zone is expected to result in a low total density of artifacts while activities conducted in a peripheral zone and dumping in these areas should produce a high total density of artifacts. Areas not used as dumps also would have a low to moderate total density of artifacts.

One problem in applying ethnoarchaeological data to archaeological sites is the effect of post-depositional disturbance. Schiffer (1987) called attention to post-depositional disturbance processes, which include cultural transformations such as disposal and reuse during and after occupation and natural transformations such as alluviation and animal activity. Re-occupation of encampment localities, in the absence of sedimentation and even during periods of low sedimentation, is also likely to blur distinctions between domestic and peripheral zones. At the Richard Beene site, these kinds of natural and cultural site formation processes impacted all of the block excavations, albeit to varying degrees (Chapter 4).

While formation processes can completely obscure patterns of primary and secondary cultural deposition, cultural deposits at the Richard Beene site arguably retain sufficient spatial integrity for the identification of meaningful site structure (Chapter 9). To illustrate the point that even substantially disturbed sites can retain meaningful structure Gregg et al. (1991) simulated post-depositional site-formation processes on an ethnographically recorded site (Camp 14 from Yellen's [1977] study). The computer-based simulation involved "deleting" about 60 percent of the floral and faunal items and randomly "moving" other artifacts to represent post-depositional deterioration and translocation of artifacts in an archaeological site. In comparing the results of spatial analysis of these "archaeological" data with conclusions drawn from ethnographic analogies, Gregg et al. determined that "the original spatial organization of a human site may be maintained in large part, though probably with some generalization or loss of resolution" even with high levels of disturbance (1991:195).

Ethnographic theory has been applied directly to archaeological sites, as exemplified by Kimball's (1981, 1993) studies at the Rose Island site in Tennessee, which is similar in its geomorphic setting to the Richard Beene site. Using spatial analysis, Kimball (1981) identified locations of structures and features and characterized activity areas at the site. He concluded that site structure at the Rose Island site followed expectations derived from ethnoarchaeological research (Kimball 1981:72–74).

Patterning of artifacts in each of the four categories used in the present study is affected by both primary and secondary disposal patterns. Lithic debitage is created during the manufacture and maintenance of stone tools. Most of this activity occurs within the domestic zone, but it may occur in the peripheral zone as well. In either case, some lithic debitage is dropped as it is created, while other debitage and broken tools are removed from the activity area. Within domestic zones, small fragments of debitage are less likely to be removed from the activity area. Accordingly, comparatively low-density concentrations of debitage are expected within domestic zones and high-density concentrations are expected in peripheral zones.

Small bone fragments are expected to be common within domestic zones where final butchering and consumption is likely to occur. Bone debris is created similarly to lithic debitage in that some fragments may be dropped, while others are tossed away. While dropped fragments may not be removed, high-density concentrations of bone most likely indicate secondary disposal and are expected within peripheral zones. Dropped fragments not removed from the domestic zone may be mixed with lithic debitage and become part of low-density artifact scatters.

Primary deposition of FCR would be in the cooking facility where it was used. Frequent cleaning out of hearths and ovens creates secondary deposition of FCR. Within a domestic zone, FCR should be primarily limited to within or near a small cooking facility or within a secondary refuse dump along the edge of the domestic zone. Concentrations of FCR and large cooking features such as earth ovens should occur primarily in the peripheral zone. Mussel shell debris is created when mussels are eaten, which typically occurs in large quantities. This eating pattern would allow the clean up of mussel shell to occur easily; therefore, most mussel shell is expected to be located in a secondary refuse dump within a peripheral zone.

Identification of features is an important step in distinguishing domestic zones from peripheral zones. Features are typically a focal point for activities carried out at an archaeological site. Identified features at the Richard Beene site fall into one of four major types as described in Chapter 13: (1) small cooking features; (2) large cooking features; (3) mussel shell concentrations; and (4) sheet middens (Table 14.1). Small cooking features, which may or may not contain FCR, are expected in domestic zones. These features would have been used for various types of cooking (e.g., baking, boiling, roasting, grilling) and warmth. As noted, they tend to be focal points for multiple daily activities such as tool manufacture, plant food processing, and socialization (Binford 1978b; Yellen 1977). It should be noted that small cooking features can also be located within peripheral zones, but there too, they may indicate domestic activities.

Large cooking features, including earth ovens, are expected to be located in peripheral zones because their use results in the production of large fires and considerable quantities of charcoal, smoke, and carbon-stained sediments (Thoms 1989). Depending on the food product being cooked, large cooking features may contain large amounts of FCR (Thoms 2003). Mussel shell concentrations represent secondary disposal related to mussel cooking and eating and are expected to be located in the peripheral zone. Repeated use of features near one another can lead to the formation of a sheet midden, a very large concentration of FCR and associated debris.

The identification of domestic and peripheral zones also depends on the location of shelters. Shelters recorded in ethnoarchaeological studies vary according to the climate in which they were occupied (Binford 1978b, 1983; Yellen 1977). Shelter types in south-central Texas were documented by Henri Joutel, who traveled in the region in 1687 with La Salle. Joutel described shelters as domed huts (i.e., wickiups) covered with reed mat. At times, many families lived together in large encampments of "at least 200 to 300 Indian huts . . . judging from the number of huts, there must have been 1,000 or 1,200 people" (Foster 1998:160). At other times Joutel encountered small hunting camps consisting of only about 15 people. "There were only three huts; they had women and children . . . situated in a small woods beside a stream" (Foster 1998:186–187). These descriptions suggest that a family of four or five people lived in each hut. Joutel also described larger huts at some encampments: "there were 24 or 25 huts and in each one there were five or six men and many women and children" (Foster 1998:167).

Wickiups in the smaller size range probably encompassed at least 10 m^2. Ethnographic sources indicate that single-family shelters typically contain a hearth around which a variety of daily tasks are performed. Debris is cleaned out regularly, creating an outer disposal area (Kimball 1993). An exterior hearth may also be present. Archaeological expectations of this type of shelter would include an area 6 to 15 m^2 in size with a single hearth and a low total-artifact density. An area of higher total-artifact density may be located outside the shelter, indicating a disposal area. Large, multifamily shelters such as those described by Joutel (Foster 1998) would encompass most of the domestic zone. Large shelters such as these are more typical of a cold-weather campsite than one occupied during warm weather (Kimball 1981).

Archaeological remains of wickiups similar to those described by Joutel and other Europeans who traversed south-central Texas (Chapter 8) would be indicated by the co-occurrence of low-density areas and small cooking features. Unconstrained clustering is useful in identifying suites of artifacts that are consistent with expectations for domestic and peripheral zones. Domestic zones should contain

Table 14.1. Features defined within selected blocks.

Block	Feature	General Description	Suggested Function
		early, Late Archaic	
Bl	10	Basin w/ FCR	Small cooking facility; hearth
Bl	12	Basin w/ FCR	Large cooking facility; earth oven
Bl	14	Basin w/o FCR	Small cooking facility; hearth
Bl	18	FCR concentration	Small cooking facility; griddle hearth
Bl	19	FCR concentration	Large cooking facility; earth oven (?)
Bl	21	Basin w/ FCR; intact heating element	Small cooking facility; griddle hearth
Bl	25	Basin w/ FCR	Large cooking facility; earth oven (?)
Bl	28	Oxidized lens	Small cooking facility; surface hearth
		Middle Archaic	
Au	4	Basin w/o FCR	Small cooking facility; hearth
Au	5	Oxidized lens	Small cooking facility; surface hearth
Au	3	Mussel lens	Debris concentration; mussel shell dump
		Middle Archaic	
Al	9	Oxidized lens	Small cooking facility; surface hearth
Al	11	Basin w/o FCR	Small cooking facility; hearth
Al	26	Basin-shaped with FCR	Small cooking facility; hearth
		Middle Archaic	
U	115	Artifact concentration	Debris concentration; sheet midden
		late, Early Archaic	
Gb	1	FCR Concentration	Small cooking facility; hearth
Gb	2	FCR Concentration	Small cooking facility; hearth
Gb	3	FCR Concentration	Small cooking facility; hearth
Gb	4	FCR Concentration	Small cooking facility; hearth
Gb	29a-b	Basin w/o FCR	Small cooking facilities; hearths
Gb	45	Artifact concentration	Debris concentration; sheet midden
Gb	46	Oxidized lens	Large cooking facility; undet. surface hearth
Gb	48	Basin w/o FCR	Small cooking facility; hearth
Gb	51	Basin w/o FCR	Small cooking facility; hearth
Gb	59	Basin w/ FCR	Large cooking facility; undetermined
Gb	60	Artifact concentration	Debris concentration; sheet midden
Gb	62	Basin w/o FCR	Small cooking facilities; hearths
Gb	63	Oxidized lens	Large cooking facility; undet. surface hearth
Gb	68	Basin w/ FCR; intact heating element	Small cooking facility; griddle hearth
Gb	69	FCR Concentration	Small cooking facility; griddle hearth (?)
Gb	70	Basin w/o FCR	Small cooking facility; hearth
Gb	71	Artifact concentration	Debris concentration; sheet midden
Gb	72	Basin w/ FCR; intact heating element	Small cooking facility; griddle hearth
Gb	78	FCR Concentration	Small cooking facility; griddle hearth (?)
Gb	79	Basin w/o FCR	Large cooking facility; undetermined
Ga	30	Basin w/ FCR	Large cooking facility; earth oven (?)
Ga	33	Basin w/FCR	Large cooking facility; undetermined
Gb	41	Mussel lens	Debris concentration; mussel shell dump
Gc	42	Oxidized lens w/o FCR	Small cooking facility; surface hearth
Ge	43	Basin w/o FCR	Small cooking facility; hearth

continued

Table 14.1. Continued.

Block	Feature	Feature Type	Feature Function
		late, Early Archaic	
Ge	44	Basin w/o FCR	Small cooking facility; hearth
Ga	54	Basin w/o FCR	Small cooking facility; hearth
Ge	65	Oxidized lens w/o FCR	Small cooking facility; surface griddle hearth
Ge	66	Oxidized lens w/ FCR	Small cooking facility; griddle hearth
		late, Early Archaic	
Ge	67	Oxidized lens w/o FCR	Small cooking facility; hearth
Gc	73	Basin w/ FCR; intact heating element	Small cooking facility; griddle
Gc	74	Oxidized lens w/o FCR	Small cooking facility; surface hearth
Gc	75	Basin w/o FCR	Small cooking facility; hearth
Gc	77	Basin w/ FCR	Large cooking facility; undetermined
		early, Early Archaic	
Ha/Hb	81	FCR concentration	Large cooking facility; undetermined
Ha/Hb	82	Artifact concentration	Debris concentration; lag deposit
Ha/Hb	83	Artifact concentration	Debris concentration; lag deposit
Ha/Hb	84	FCR concentration	Small cooking facility; undetermined
Ha/Hb	86	Artifact concentration	Debris concentration; lag deposit
Hc	90	FCR concentration	Small cooking facility; undetermined
Ha/Hb	99	Artifact concentration	Debris concentration; lag deposit
Ha/Hb	100	FCR Concentration	Large cooking facility; earth oven (?)
Ha/Hb	101	Artifact concentration	Debris concentration; lag deposit
H	104	Organic stain	Undetermined
Hc	87/88	FCR concentration	Large cooking facility; undetermined
Hc	91/103	FCR concentration	Large cooking facility; earth oven (?)
Hc	93	Mussel shell lens	Debris concentration; mussel shell dump
Hc	102	FCR concentration	Small cooking facility; undetermined
		early, Early Archaic	
T	106	Artifact concentration	Debris concentration; sheet midden
T	107	Basin w/ FCR	Small cooking facility; containment hearth
T	108	Artifact concentration	Debris concentration; sheet midden

clusters made up of mainly lithic debitage and bone, but not contain high-density concentrations of either. Small amounts of mussel shell may also be present in domestic zones. Peripheral zones can contain clusters made up of a variety of materials, indicating multiple activities or the location of a secondary refuse dump. Clusters made up almost entirely of mussel shell and FCR should be located in the peripheral zone.

Methods for Density and Cluster Analyses

This study uses visual interpretation of density maps and feature locations (qualitative) in conjunction with unconstrained clustering (quantitative) to identify site structure and characterize differences between well-preserved and poorly preserved components. These analyses rely on numeric data from the main site database (Appendix B), which includes all artifacts in a given “target zone” that were mapped in place (Chapter 9) along with the many items recovered during screening and, hence, not mapped. As noted, this study groups artifacts into one of four categories: (1) lithic debitage; (2) bone; (3) FCR; and (4) mussel shell. Each of the major block excavation areas is analyzed: (1) upper Block B, the Late Pre-Columbian Payaya component; (2) lower Block B, a Late Archaic, upper Leon Creek component; (3) upper Block A, a Middle Archaic, lower Leon Creek component; (4) lower Block A, a

Middle Archaic, upper Medina component; (5) Block U, a Middle Archaic, upper Medina component; (6) Block G, a late, Early Archaic, lower Medina component; (7) Block H, an early, Early Archaic, upper Perez component; (8) Block T, an early, Early Archaic, upper Perez component; and (9) Block N, an early, Early Archaic, upper Perez component.

Five density maps are illustrated for each component, one for each of the four artifact categories and one for total-artifact density. These maps depict general spatial patterns in relation to features and are used in the identification of density-based domestic zones. They also set the stage for the quantitative spatial analysis and provide visual bases for comparing site structure in well-preserved and poorly preserved components.

Unconstrained clustering was chosen for the quantitative analysis because it is a well-designed method for producing maps of artifact clusters. Other benefits of unconstrained clustering, as they apply to the current study, include: (1) it is theoretically sound (Blankholm 1991); (2) it has been shown to perform similarly with point-plotted data as well as grid-plotted data; (3) it can be used with irregularly shaped blocks, small blocks, and blocks separated by unexcavated areas without distortion of the results; and (4) data from separate calculations are easily plotted allowing for intra-site and inter-site comparison of results. Throughout this study, Whallon's (1984) clustering method is followed. Clusters are created according to the similarity of the artifact assemblage at each data point and defined on the basis of different relative frequencies of the four artifact categories, which are considered to represent different activities that tend to be represented throughout the site. This method allows clusters to be assigned to expectations about artifact patterning, as discussed later in this chapter.

Unconstrained clustering is a multistep process involving data smoothing, calculation of absolute and relative densities, and clustering of the resulting density vectors (Blankholm 1991:75–76). Whallon suggests using Ward's (1963) statistical method for the clustering portion of his method. Ward's (1963) method combines data points into clusters by their homogeneity and calculates the amount of variance (heterogeneity) within each cluster. The clustering continues in steps until all the data have been combined into one large cluster. Researchers can then identify the optimal number of clusters by reviewing the amount of variance at each step and selecting the best point at which clusters should be defined.

The optimal number of clusters occurs at the point where the fewest number of clusters can be defined with the least amount of variance in their composition (Ward 1963). This point is typically signaled by a large deviance in variance between two adjacent steps. Each cluster defined using this method is internally homogenous in the relative amounts of each artifact class represented. The composition of these clusters can then be analyzed and compared with the expected material signatures of activities present at an archaeological site to define site structure.

Density Analysis Results

Domestic zones are proposed based on the locations of small cooking features and low-total-density areas. The co-location of small cooking features with low-density areas is consistent with the descriptions of domestic zones by ethnoarchaeological and archaeological researchers (Binford 1978b, 1987; Bousman 1998b; Kimball 1993: O'Connell 1987; Yellen 1977). Locations of proposed domestic and peripheral zones are compared to the results of unconstrained clustering later in this chapter to refine the designation of the zones. The analysis here focuses on the "target zone" in each block excavation, which is the artifact zone excavated beyond the cross trenches (Chapter 4). Artifacts recovered from above and below the target zone were excluded from density maps and the cluster analysis.

Late Pre-Columbian, Payaya Component

Upper Block B consists of a cross trench and several isolated test pits. Discrete features were not identified, but the overall distribution of FCR and mussel shells is suggestive of a large sheet midden

(Figures 14.1a–e). Total density is moderate throughout the block and is dominated by lithic debitage and FCR (Figures 14.1b and 14.1c). In the absence of small cooking features, domestic zones were not defined and this block is considered to represent a peripheral zone. Domestic zones, however, may well have existed in adjacent areas that were not excavated.

Late Archaic, Lower Leon Creek Component

The target zone of lower Block B contains relatively high densities of FCR and mussel shell per unit as well as one of the highest total densities per unit (Table 14.2). It is a large excavated area with many defined features (Figures 14.2a–14.2e). This block has a generally moderate to high total density of artifacts with some lower-density areas. Low-density areas are very obvious on the lithic debitage and FCR density maps (Figures 14.2b and 14.2c). The low-density areas coincide with the locations of most of the small cooking features. It should be noted that the low-density area near Feature 19 is created in part by three features nearby that were not excavated.

Within the lower Block B target zone, domestic zones are proposed for three low-density areas that contain small cooking features (Figure 14.2f). It is interesting to note that areas of high bone density surround these domestic zones. Feature 12 is centrally located with respect to the proposed domestic zones and could have served as a communal feature.

Middle Archaic, Lower Leon Creek Component

The target zone of upper Block A contains a low total density throughout most of the block, with one unit containing a high density of artifacts (Figure 14.3a). Figures 14.3b–14.3e shows that the high-density unit is dominated by lithic debitage. Overall, this block has the second lowest average total density per unit (Table 14.2). The features in this block are all in low-density areas. Feature 3, a large area of oxidized soil with charcoal and mussel shell, may have served as a large cooking feature. The low-density areas surrounding Features 4 and 5 are proposed domestic zones, while the high-density area and Feature 3 is more consistent with a peripheral zone (Figure 14.3f).

Middle Archaic, Upper Medina Component

Figure 14.4a depicts the total density for lower Block A; density maps for each artifact category within the block follow (Figures 14.4b–e). Artifacts in this block are concentrated in two areas near Feature 26 and in the northern portion of the block. Inspection of the individual density maps shows that the block is dominated by lithic debitage. Table 14.2 shows

Table 14.2. Average densities (m^2)of artifact categories within selected blocks.

Block	Cultural Period	Count	Average Density				
			Lithic Debitage	FCR	Mussel Shell	Bone	Total
Bu	late, Late Pre-Columbian	22	28.45	25.91	5.82	1.95	62.14
Bl	early, Late Archaic	102	26.95	58.66	9.43	5.18	100.22
Au	Middle Archaic	27	8.26	4.59	3.37	1.96	18.19
Al	Middle Archaic	18	69.33	2.06	2.39	6.33	80.11
U	Middle Archaic	6	32.00	50.33	1.67	5.50	89.50
G	late, Early Archaic	233	38.09	3.26	7.67	16.72	65.73
H	early, Early Archaic	158	31.89	46.34	12.39	1.92	92.54
T	early, Early Archaic	52	27.63	71.35	3.96	6.81	109.75
N	early, Early Archaic	16	3.44	1.31	0.75	0.56	6.06

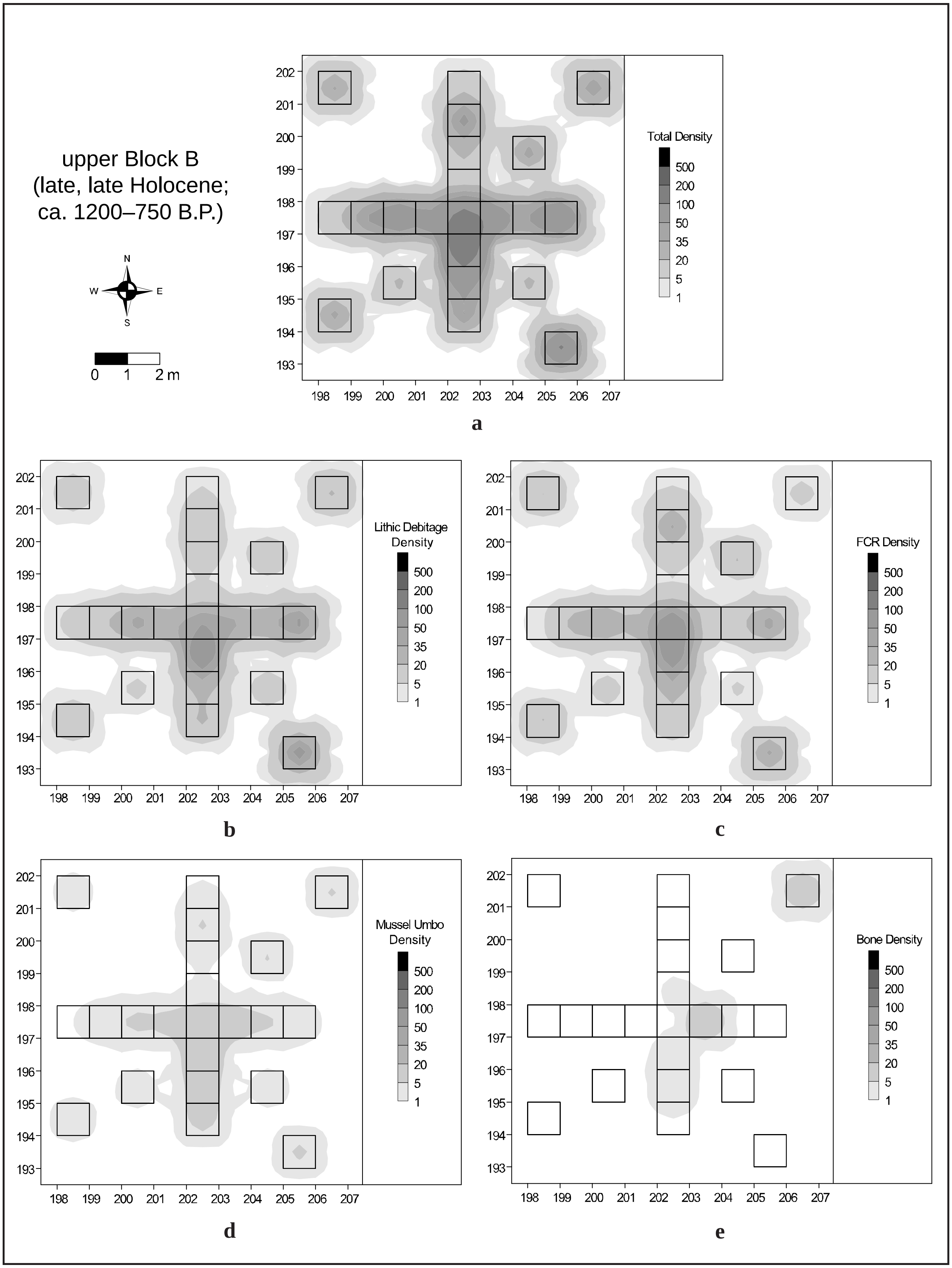


Figure 14.1 Artifact density (items per m²) within upper Block B: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell ; and (e) bone.

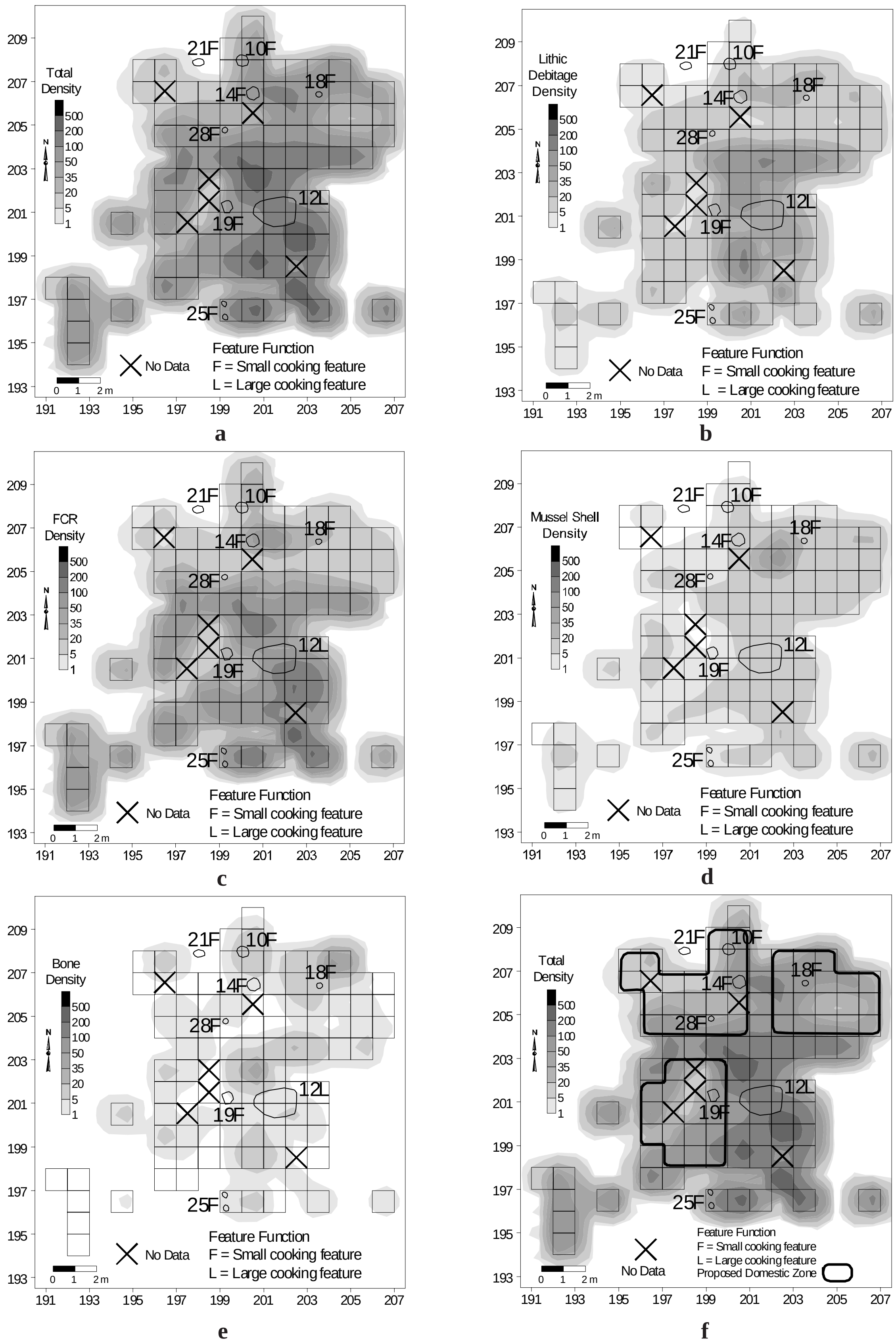


Figure 14.2. Artifact density (items per m²) within lower Block B: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell ; (e) bone; and (f) proposed domestic zones.

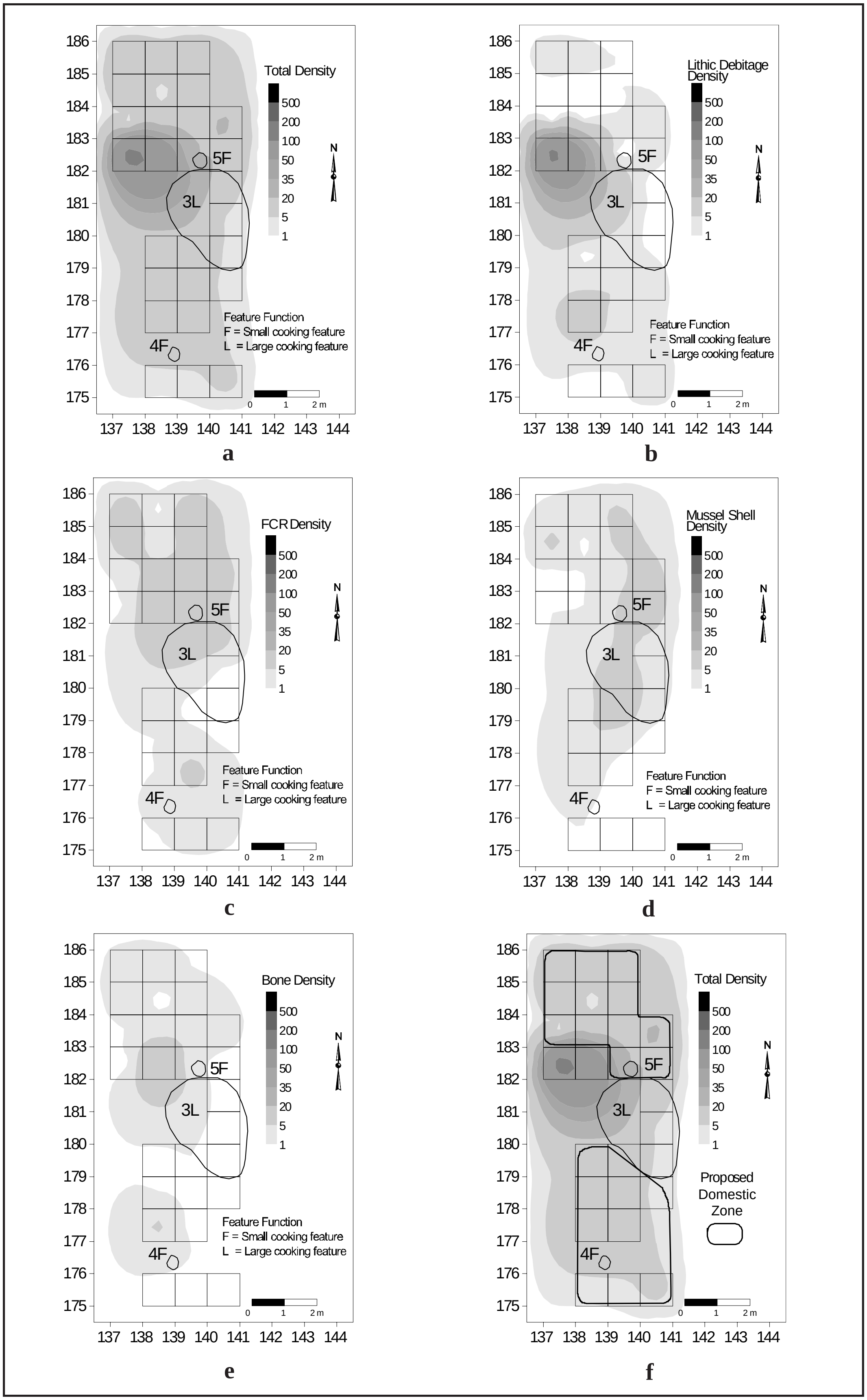


Figure 14.3. Artifact density (items per m²) within upper Block A: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell; (e) bone; and (f) proposed domestic zones.

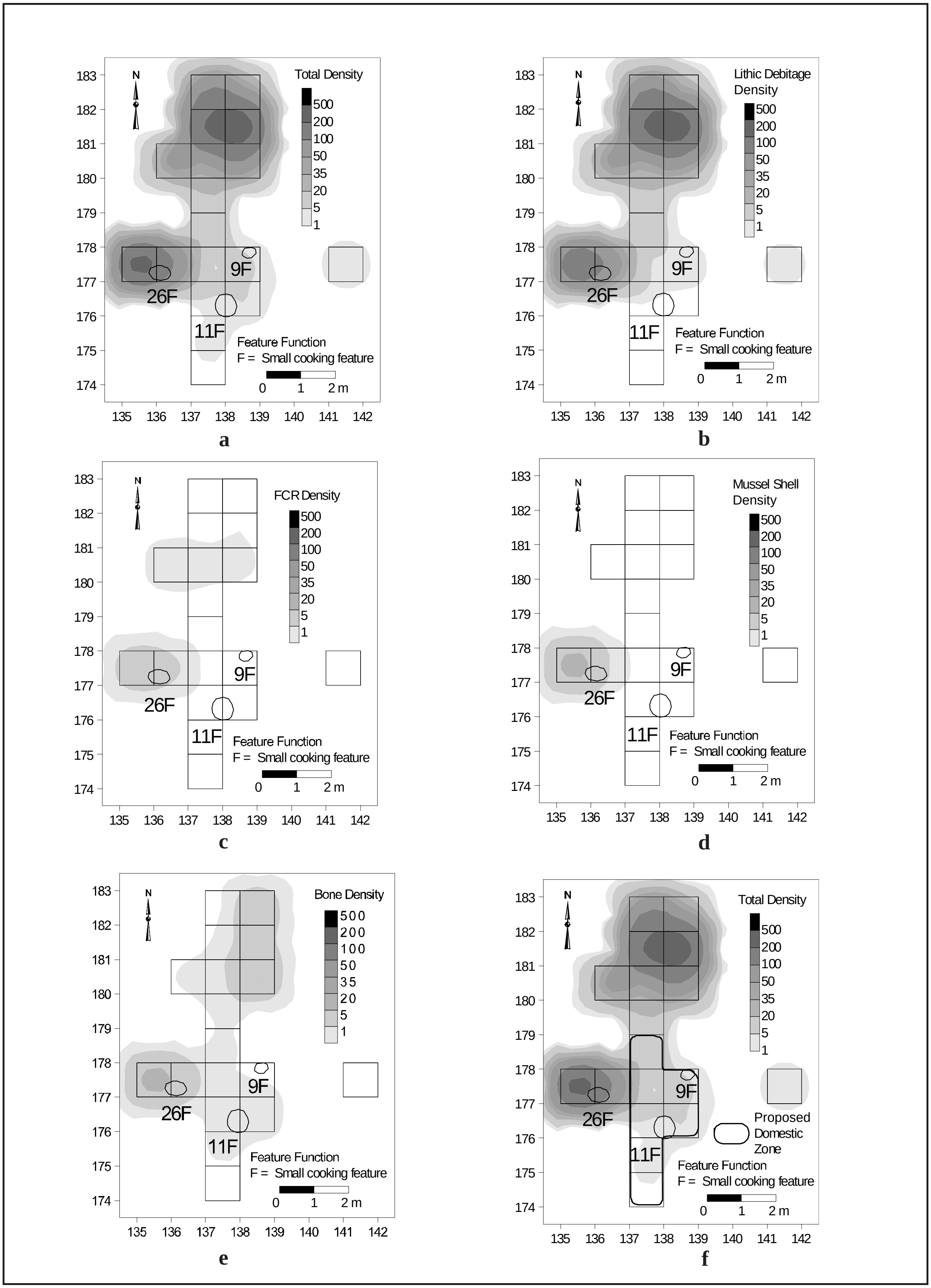


Figure 14.4. Artifact density (items per m^2) within lower Block A: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell; (e) bone; and (f) proposed domestic zones.

that lower Block A has the highest average density of lithic debitage per unit. The concentration of artifacts near Feature 26 is made up of artifacts from each category (Figures 14.4b–e), which may indicate that this feature was used as a trash dump. Concentrations of lithic debitage and bone in the northern portion of the block may indicate special-use areas. Features 9 and 11 are in an area of low artifact density, and thus, may be within a domestic zone (Figure 14.4f). Feature 26 is found in a high-density area that likely represents a peripheral zone.

Block U consists of six excavated units containing what was designated a sheet midden, Feature 115 (Figures 14.5a–e; Chapter 13). Each unit has a moderately high total density and is dominated by lithic debitage and FCR. This has one of the highest densities of FCR per m^2 (Table 14.2). While there is a low density of artifacts near what was identified as a small cooking feature, domestic and peripheral zones are not proposed due to the limited area excavated. This and other small-block excavation areas are examined as part of the cluster analysis.

Late, Early Archaic, Lower Medina Component

Block G was analyzed using the same methods as used in the study by Mason (2003), which included only the largest subarea therein (Figure 14.6). The smaller sub-blocks are presented on a separate figure from the large sub-block (Figures 14.7a and 14.7b).

Figures 14.7a and 14.7b illustrate the total density within the block. Figures 14.8a–14.11b shows density by artifact type. Feature 45 is best described as a sheet midden consisting of debitage and bone with some FCR and mussel shell as well as embedded cooking features (Clabaugh 2002 Figure 18). Another prominent area of the map is the low-total-density area surrounding Feature 69, a small griddle hearth (Figure 14.7a). Feature 51, a small basin-shaped cooking feature without FCR, is surrounded by an area of high density of FCR (Clabaugh 2002).

The density maps show that high density areas tend to co-occur with identified features. This pattern is different from ethnoarchaeological patterns wherein artifact concentrations surround features rather than encompass them per se. However, the distribution of mapped artifacts (Chapter 9) reveals a low density of what are presumably the larger artifacts, which indicates that the ostensibly high artifact density results primarily from the quantity of small artifacts. The ostensible merging of features and artifact concentrations may indicate that once-used small features and their immediate confines served as trash dump areas. It is also possible that the juxtaposition of midden areas and cooking features results from multiple occupations of the same part of the site, such that overprinting obscures what might otherwise have been discrete domestic zones.

Proposed domestic zones are presented in Figures 14.12a and 14.12b and are based on the co-location of low-density areas with small cooking features. The area of low total density surrounding Feature 69 is consistent with the expectation of a domestic zone with a small cooking feature within a shelter (Figure 14.12a). If this is the case, Feature 51 may represent an outer roasting pit (Figures 14.9a, 14.10a, and 14.11a). Feature 79 may represent a secondary small cooking feature or a separate domestic zone, perhaps with its own hearth and shelter. Concentrations of artifacts surrounding the low-density area are interpreted as secondary refuse dumps.

Features 1, 2, and 72 are surrounded by an area of low total density (Figure 14.12a). The location of these features together is interesting in that it may indicate the repeated use of this area as a domestic zone during different occupations. Kimball (1981) observed this pattern in his study at Rose Island. Other low-density areas near Features 3, 4, 59, 70, and 78 are also suggestive of domestic zones (Figure 14.12a). In any event, these areas tend to be surrounded by high-density areas interpreted as possible refuse dumps in peripheral zones.

Low-density areas near Features 73 and 30 may also indicate domestic zones (Figure 14.12b). Although the proposed domestic zone near Features 30 and 33 is bounded by these two large cooking features, there is a small cooking feature defined within Feature 33. A domestic zone is also proposed

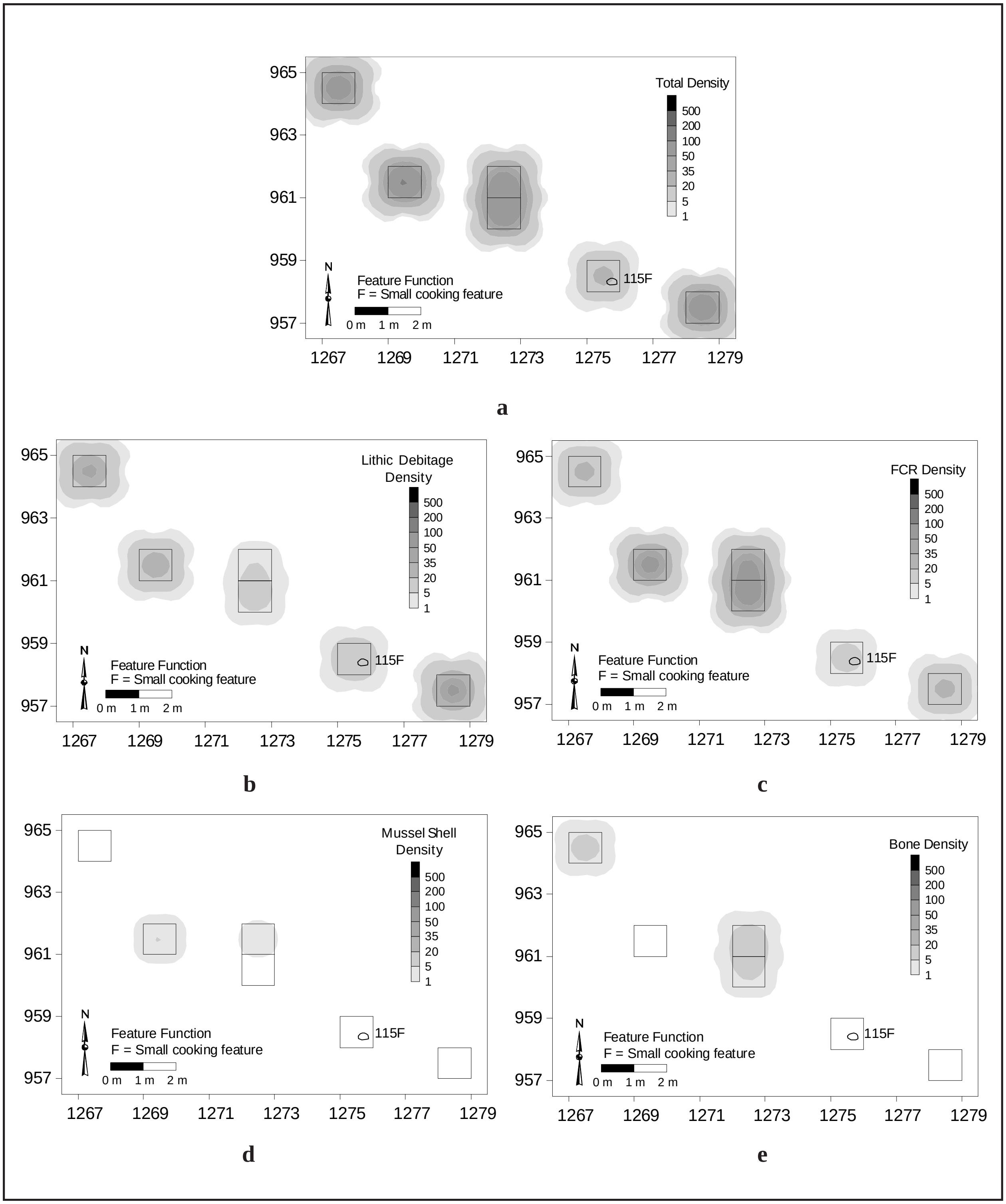


Figure 14.5. Artifact density (items per m²) within Block U: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell; and (e) bone.

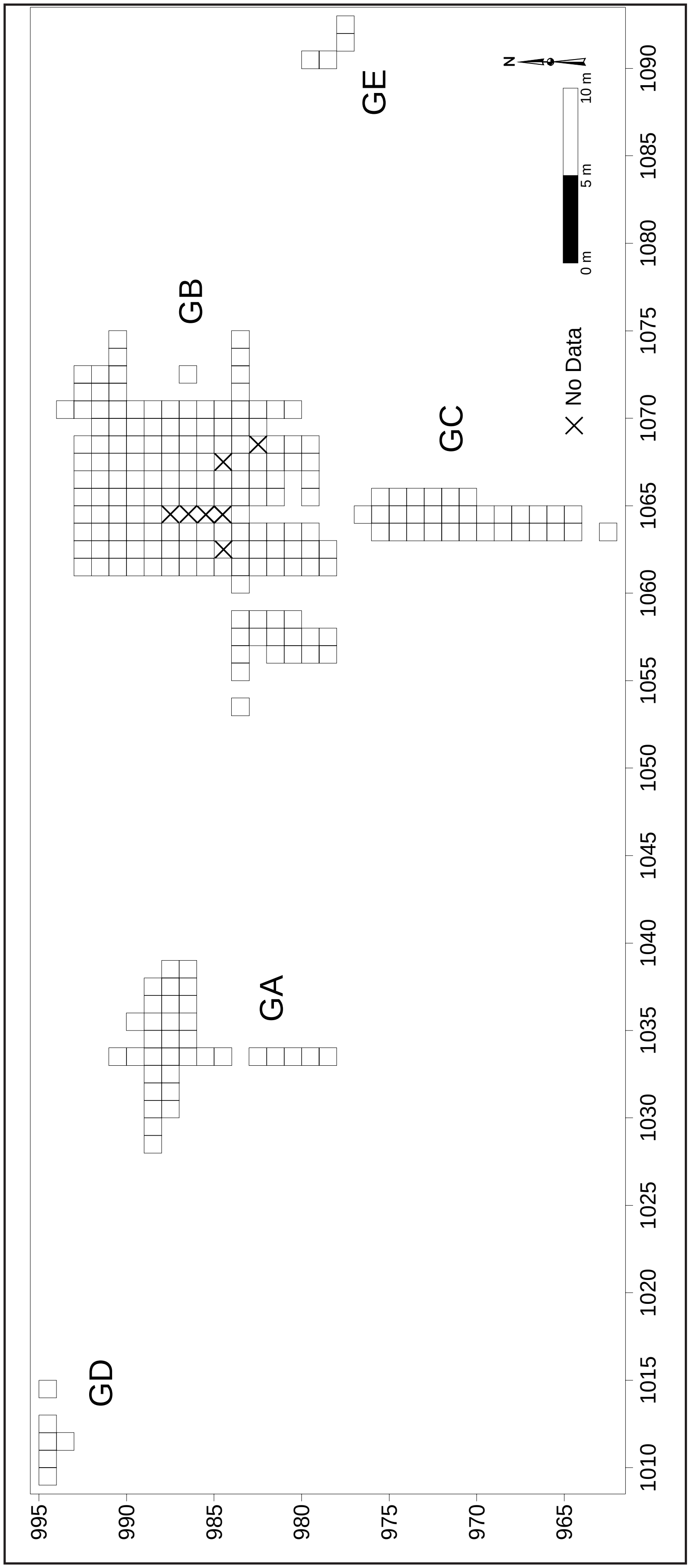


Figure 14.6. Excavation area of Block G showing the location of sub-blocks Ga-Ge.

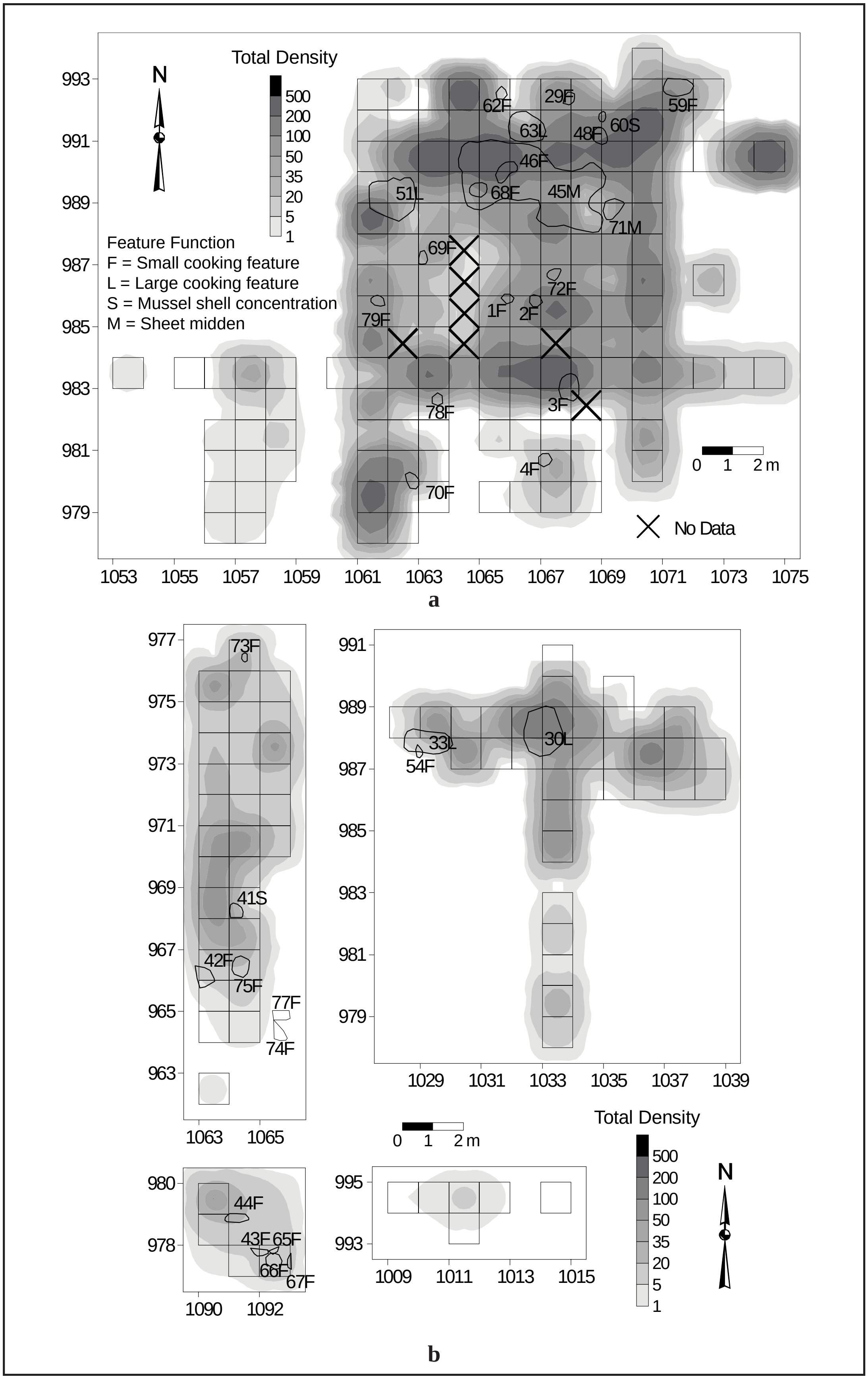


Figure 14.7. Total density (items per m²) for Block G: large block (Gb); and (b) small blocks (Ga, Gc-e).

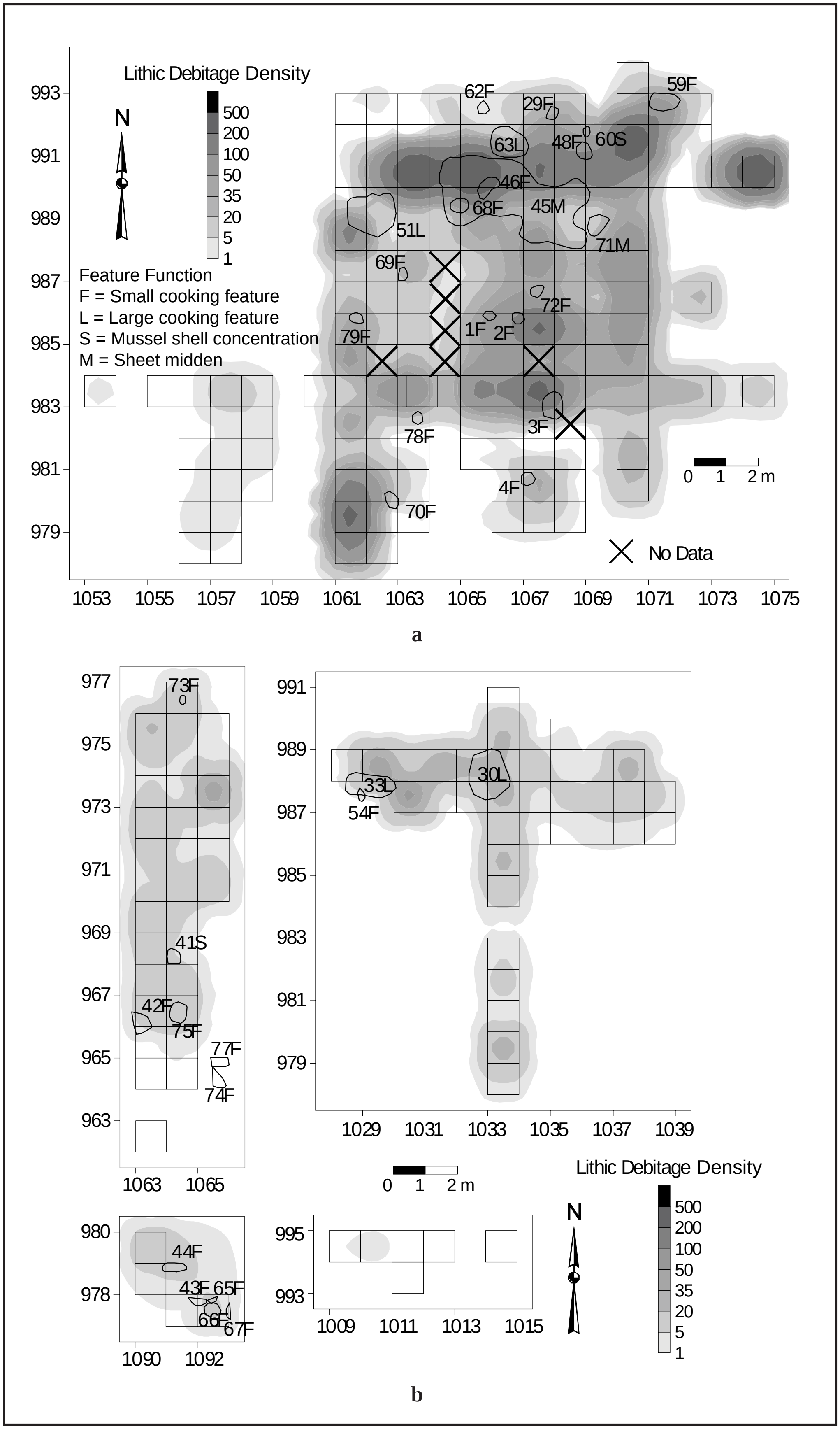
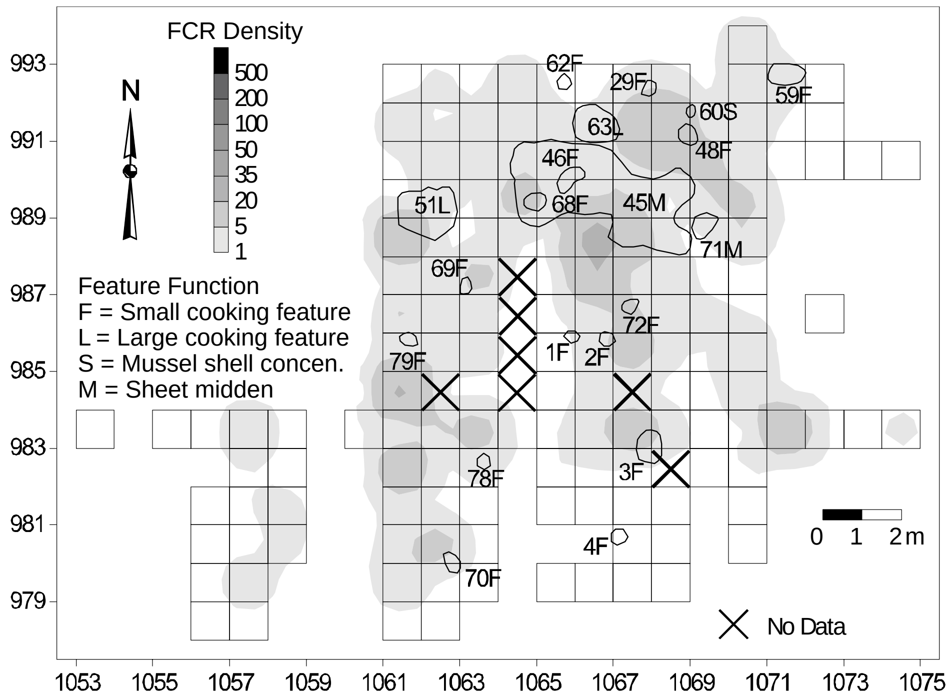
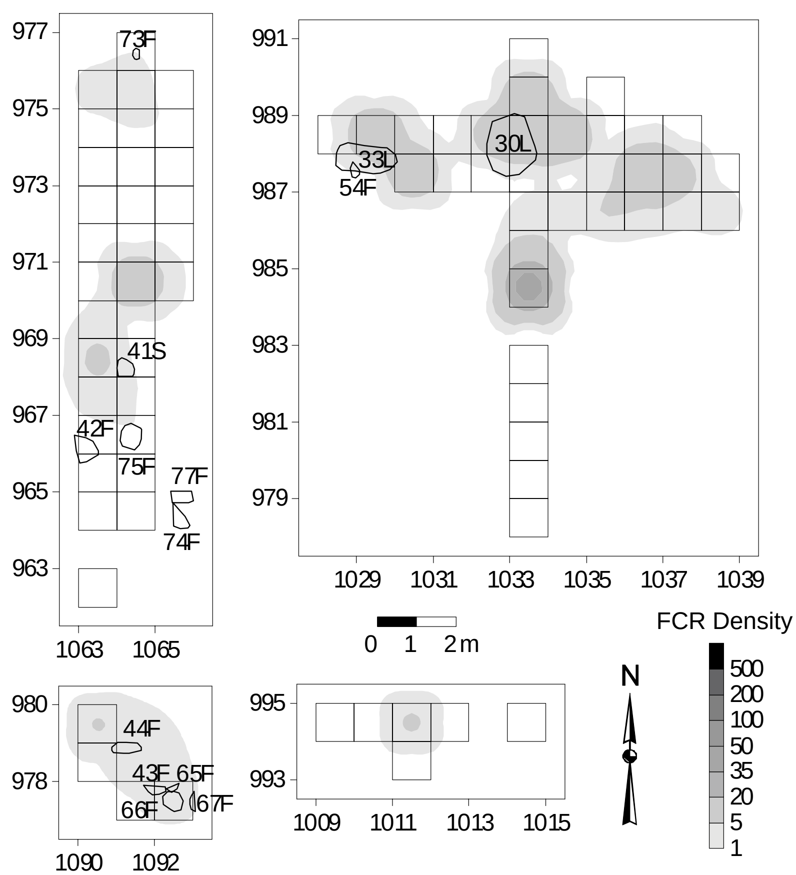


Figure 14.8. Lithic debitage density (items per m²) for Block G: (a) large block (Gb); and (b) small blocks (Ga, Gc-e).



a



b

Figure 14.9. Fire-cracked rock density (items per m²) for Block G: (a) large block (Gb); and (b) small blocks (Ga, Gc-e).

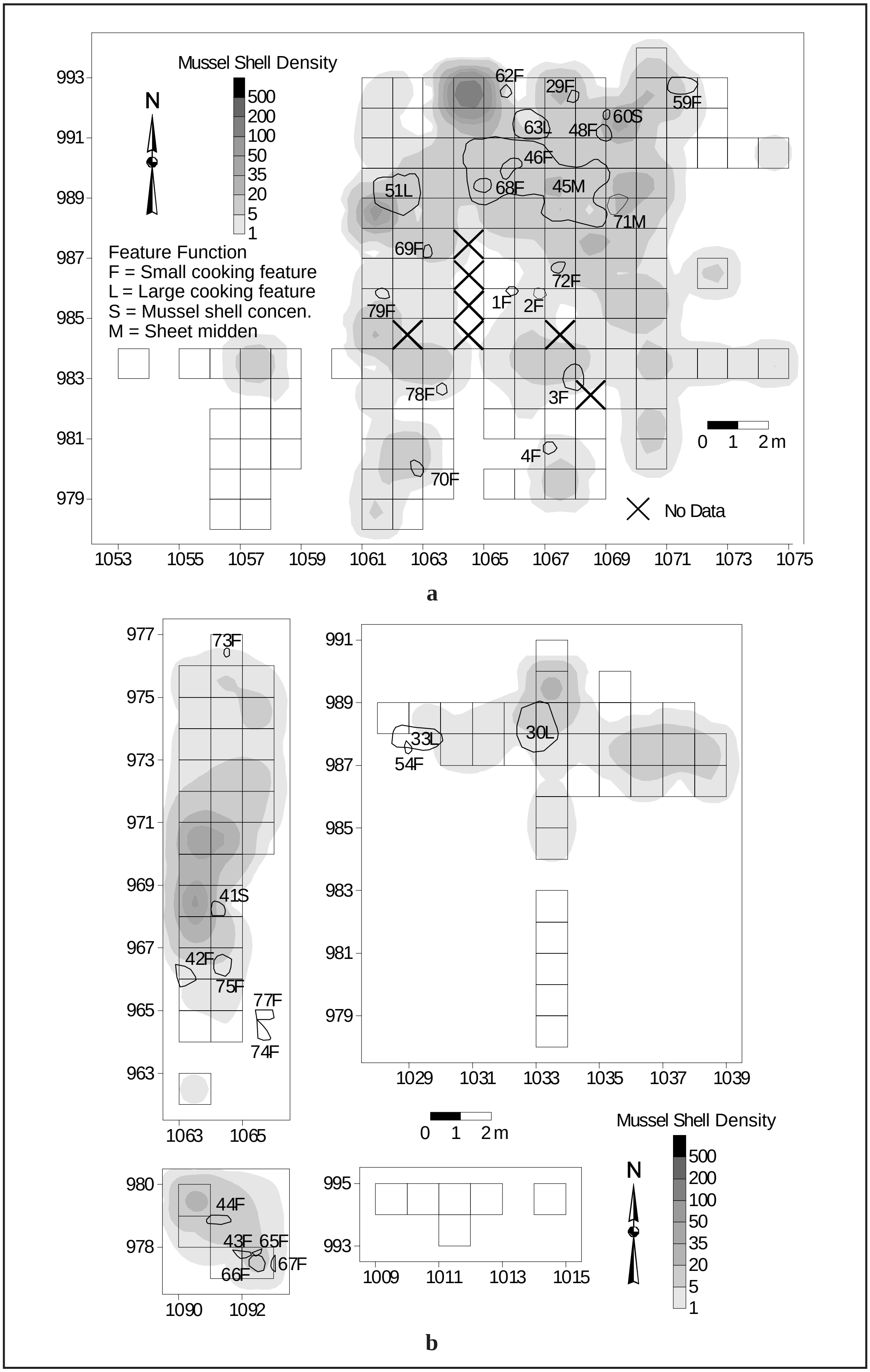


Figure 14.10. Mussel shell density (items per m²) for Block G: (a) large block (Gb); and (b) small blocks (Ga, Gc-e).

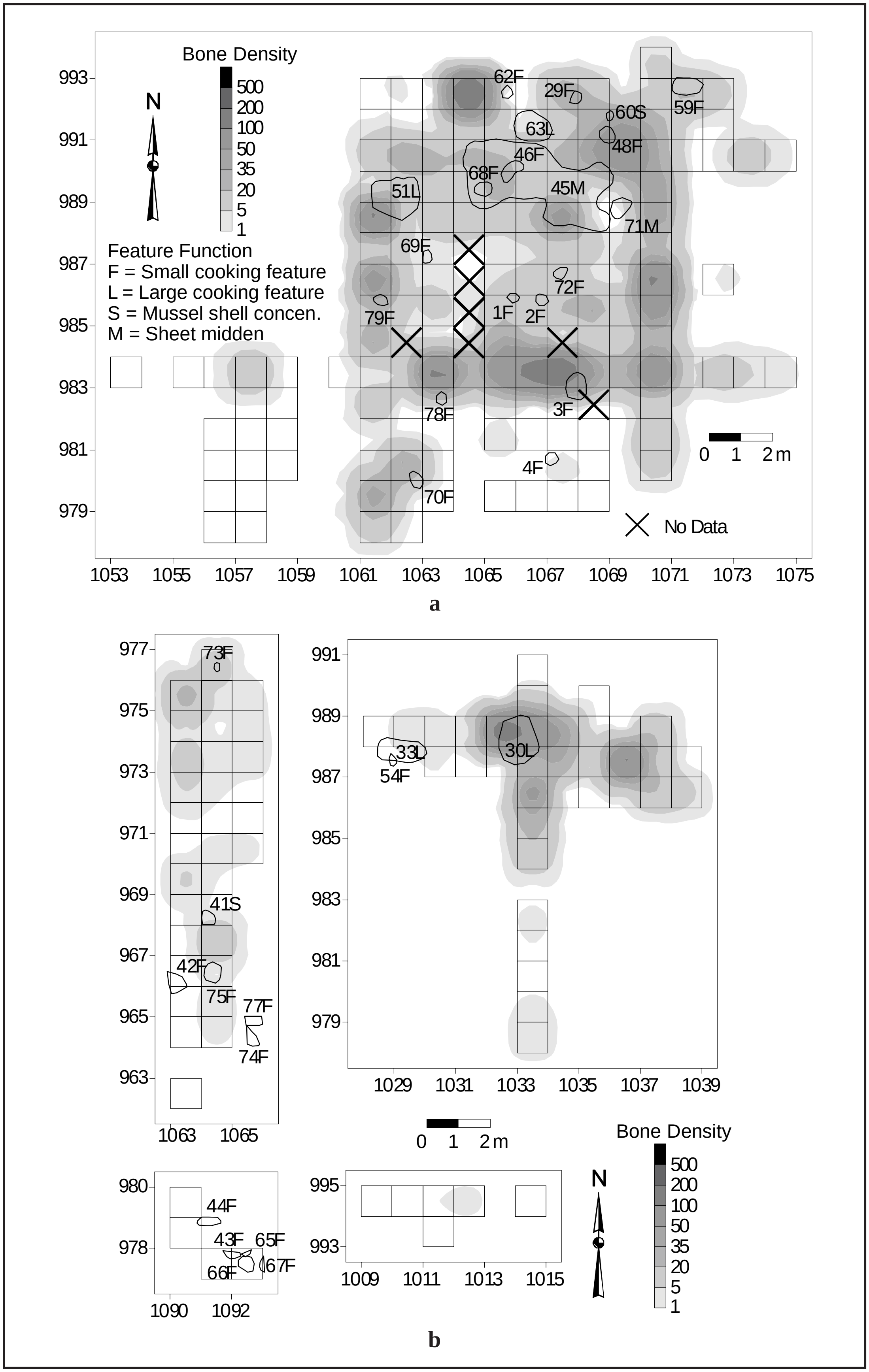


Figure 14.11. Bone density (items per m²) for Block G: (a) large block (Gb); and (b) small blocks (Ga, Gc-e).

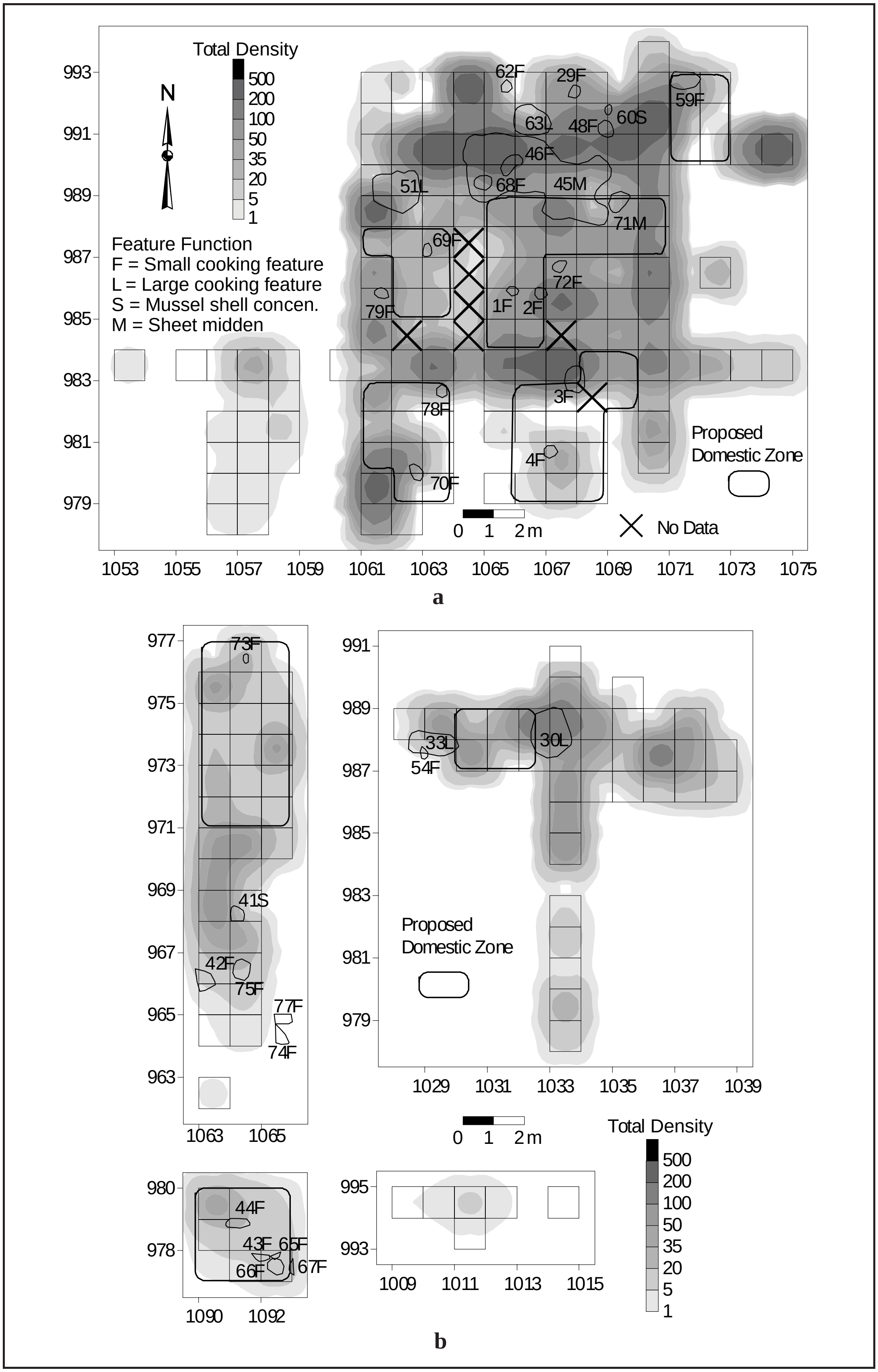


Figure 14.12. Proposed domestic zone density (items per m^2) for Block G: (a) large block (Gb); and (b) small blocks (Ga,G c-e).

in Block Ge. While not many units were excavated, there is a low total density of artifacts along with small cooking features.

Small cooking features (Features 29, 48, 60, and 62) that are in high density areas in Block Gb may represent deliberate construction of small features for specific activities within the peripheral zone or perhaps multiple occupations in which the domestic zones associated with these features were mixed with peripheral zones.

Early, Early Archaic, Upper Perez Component

Whereas Mason (2003) analyzed Block H using the entire assemblage, the present study uses only target zone data. Figure 14.13a illustrates total artifact density for Block. Mason's (2003) earlier conclusion was that the homogeneous artifact distribution pattern in Block H was consistent with what would be expected to have resulted from flooding that left lag concentrations of artifacts (Figure 9.26a and 9.26b). As noted in Chapter 9, lag concentrations were often linear (i.e., stream-lined).

The other density maps show evidence of disturbance as well. The lithic debitage (Figure 14.13b), FCR (Figure 14.13c), and mussel shell (Figure 14.13d) maps all show concentrations in the same locations. What is not shown in these figures, but is nonetheless important in assessing disturbance processes, is that most of the feature-like artifact concentrations contained an abundance of stream-worn pebbles. This condition indicates the co-occurrence of lithic debitage, FCR, and mussel shells is at least partially the result of flood scouring. The distribution of bone (Figure 14.13e) differs markedly from the other categories and may well result from differential deposition, albeit still flood related (Chapter 9).

While the overall density of cultural materials in Block H, especially FCR, is reminiscent of a sheet midden, the paucity of small areas with concentrations of any single artifact category (i.e., dump-disposal areas) is consistent with the idea of flood-created concentrations of lagged artifacts. As discussed in Chapter 13, some of the concentrations of large-size FCR may well represent "lagged" remains of earth oven heating elements.

Preliminary interpretations about activities within this block can be made using the individual-artifact density maps. Debitage and FCR (Figures 14.13b and 14.13c) seem to be evenly distributed over the entire site. The distribution of mussel shell shows concentrations throughout the block but, given the evidence for flood scouring, it is not likely that the concentrations represent disposal areas. Bone density in this block was very low and most of the bone was concentrated along the southern boundary of the excavation, which may indicate a refuse area. Here too, it seems more likely that these concentrations resulted from flooding.

Lower total-density areas near some of the small features could represent domestic zones, including areas east of Feature 100 and northwest of Feature 101 (Figure 14.13f). If so, however, flooding would have altered the original distribution of the artifacts and created spurious patterns.

Block T has the highest overall artifact density (Table 14.2). Moreover, sizeable low-density areas are lacking and most artifact categories are evenly distributed across the block (Figures 14.14a–e). This pattern may indicate post-depositional disturbance similar to that described for Block H. The density of stream-worn pebbles, however, is much lower than in Block H (Chapter 4) and the artifacts, especially FCR, tend to be much smaller than in Block H.

Artifact density in Block T is dominated by FCR (Figure 14.14c), which occurs in a higher density than in other blocks. Artifact density near features is no lower than in other areas of the block, but here too artifact size is an issue. Consistent with identifications as sheet middens (Chapter 13), Feature 107 and 108 are surrounded by high densities of all artifact categories. All artifact categories except bone are present near Feature 106. This block appears to represent primarily a peripheral zone, perhaps an extensive sheet midden.

The target zone of Block N yielded the lowest artifact density of all the components (Figure 14.15a, Table 14.2). Lithic debitage dominated the sparse assemblage (Figure 14.15b–e). No features were defined. These meager data are not conducive to a density-dependent spatial analysis.

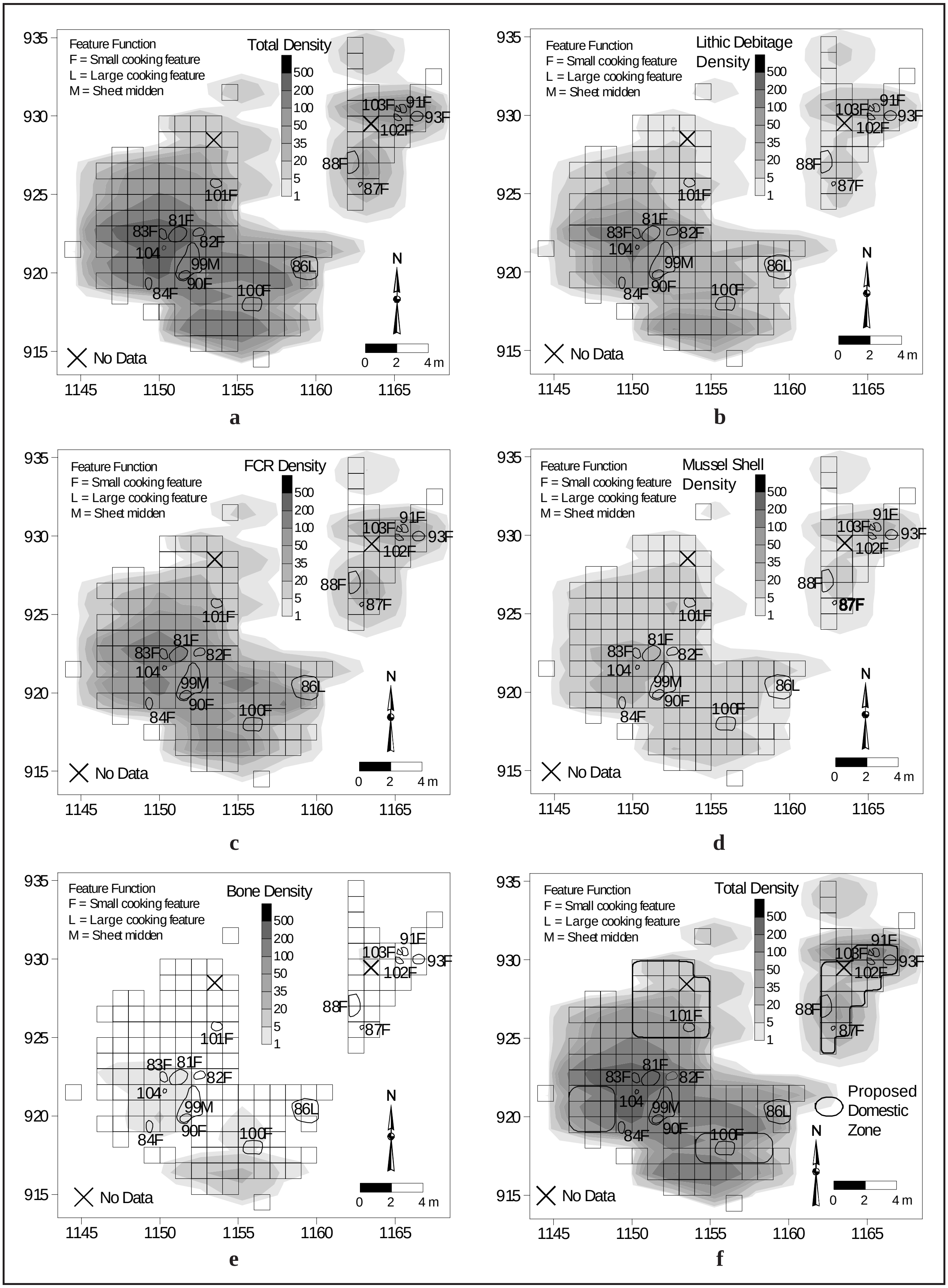


Figure 14.13. Artifact density (items per m²) within Block H: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell; and (e) bone; and (f) proposed domestic zones.

Cluster Analysis Results

Cluster analysis is performed by grouping units based on their similarity of artifact composition. The lowest amount of error caused by clustering would be achieved by assigning each unit to its own cluster, which would recognize each unit's uniqueness but would not contribute to pattern identification. Grouping units into larger clusters causes some variance in artifact similarity within the cluster. The optimal cluster grouping allows units to be grouped together in a small enough number of clusters to be easily described while still representing a low amount of variance in artifact similarity.

Spatial relationships among the clusters are more important in determining site structure than their designations as domestic or peripheral. The composition and location of the clusters allow characterization of specific areas within a given block. Of particular interest is the characterization of disturbed areas at the Richard Beene site. These areas are expected to have lost much of the ethnographically defined spatial patterning.

The resulting dendrogram from the unconstrained cluster analysis (Figure 14.16) illustrates that a relatively low amount of error is created by grouping the units into ten cluster types. This error is approximately 12.9% of the total error that would be represented by grouping the units into one cluster. Following a brief discussion of the clusters as they apply to the entire data set, analytical results are presented for various components.

Cluster types are described relative to the domestic and peripheral zones, as discussed earlier.

- Cluster type 1 is mainly lithic debitage with some mussel shell, and lesser quantities of FCR and bone (Table 14.3). Since it is assumed that mussel shells were easily cleaned up, clusters of type 1 are most likely indicators of peripheral zones.

- Cluster type 2 is mostly bone with some lithic debitage (Table 14.3). In low-density areas, clusters of type 2 may be located in a domestic zone. Like mussel shells, bone is an easily cleaned up item and should mainly be found in the peripheral zone. In cases where clusters of type 2 are in low-density areas, they may be within domestic zones.

- Cluster type 3 is dominated by lithic debitage, which is expected of either a domestic zone or a specialized tool manufacturing area.

- Cluster type 4 is mainly mussel shell and is an indicator of a peripheral zone.

- Cluster type 5 contains all artifact categories with FCR as the dominant artifact type and bone only slightly represented. Because of the high amount of FCR, type 5 clusters may be located near features but are more likely indicators of trash dumps within the peripheral zone. Type 5 clusters may also indicate post-depositional disturbance.

- Cluster type 6 is mainly mussel shell and lithic debitage. The predominance of mussel shell is consistent with a peripheral zone.

- Cluster type 7 is a mixture of lithic debitage and bone and a lesser quantity of mussel shell. In low-density areas, this cluster type indicates a domestic zone.

- Cluster type 8 contains roughly equal amounts of FCR and lithic debitage. Clusters of this type should be located in peripheral zones or possibly near features.

- Cluster type 9 is roughly equal amounts of lithic debitage and FCR, and a lesser quantity of mussel shell. The mixture of these items together is indicative of a trash dump in a peripheral zone. Type 9 clusters can also indicate post-depositional disturbance.

- Cluster type 10 is dominated by FCR and significantly less lithic debitage along with a few mussel shell and bone fragments.

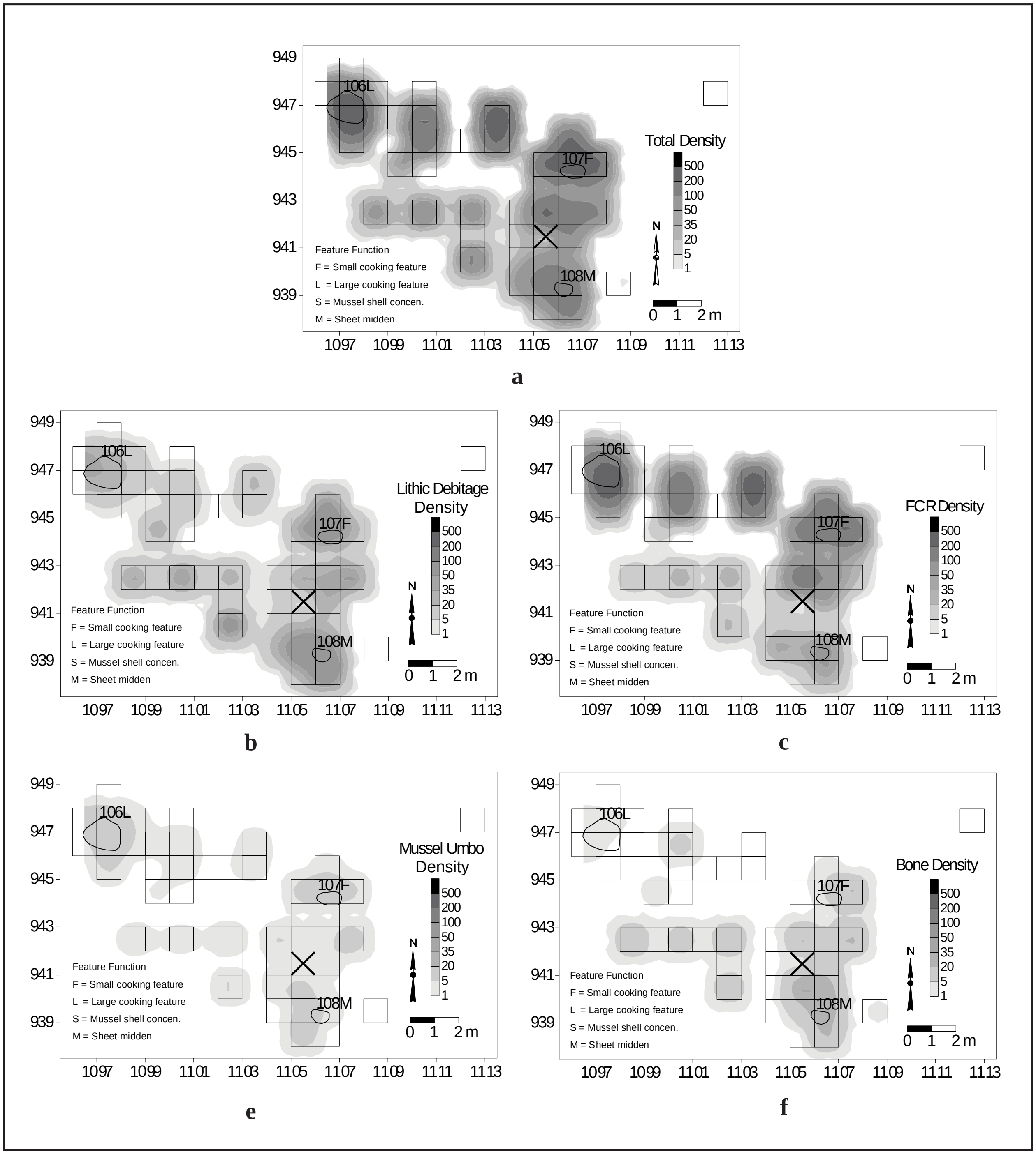


Figure 14.14. Artifact density (items per m^2) within Block T: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell; and (e) bone.

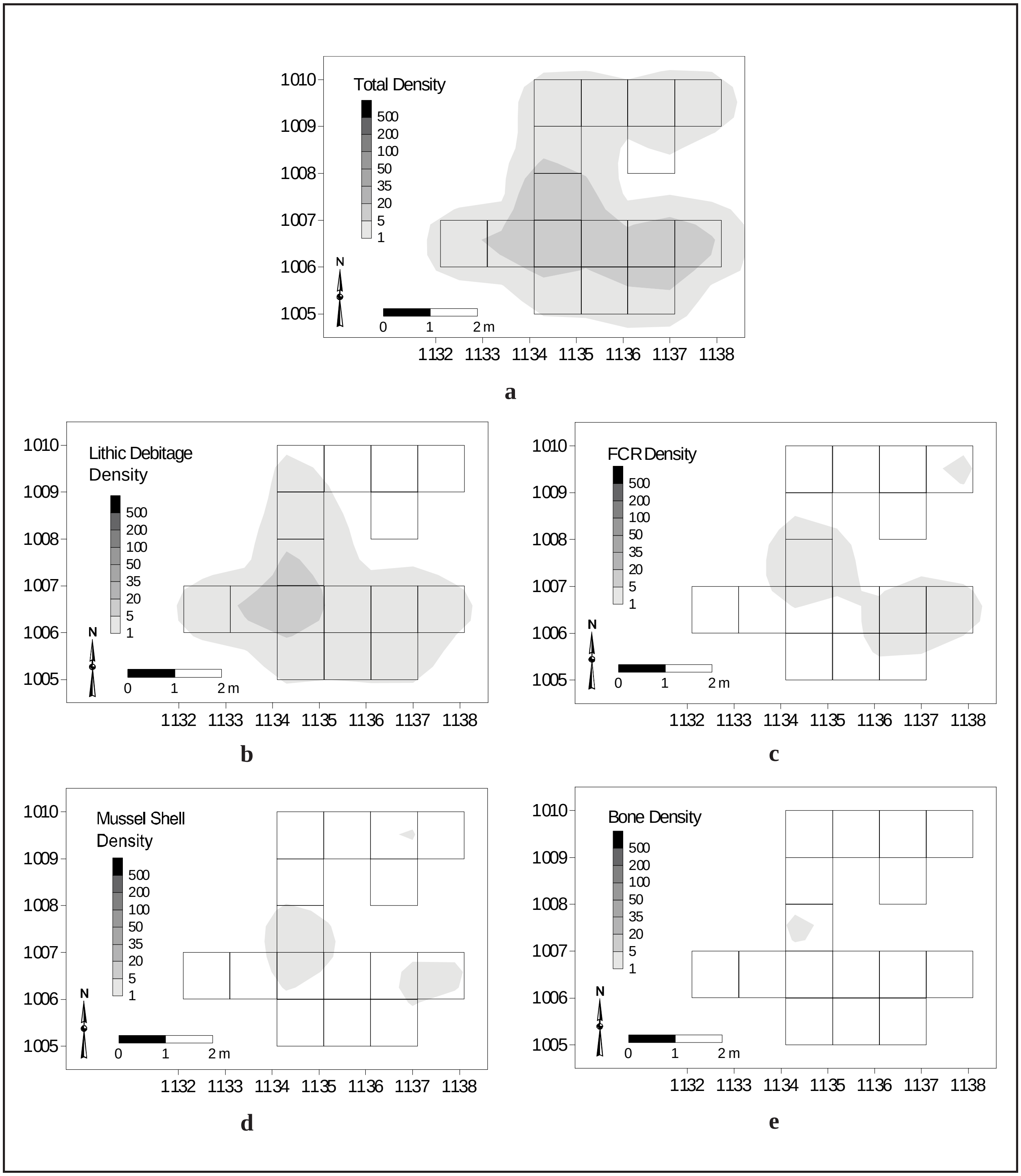


Figure 14.15. Artifact density (items per m²) within Block N: (a) total density; (b) lithic debitage; (c) fire-cracked rock; (d) mussel shell; and (e) bone.

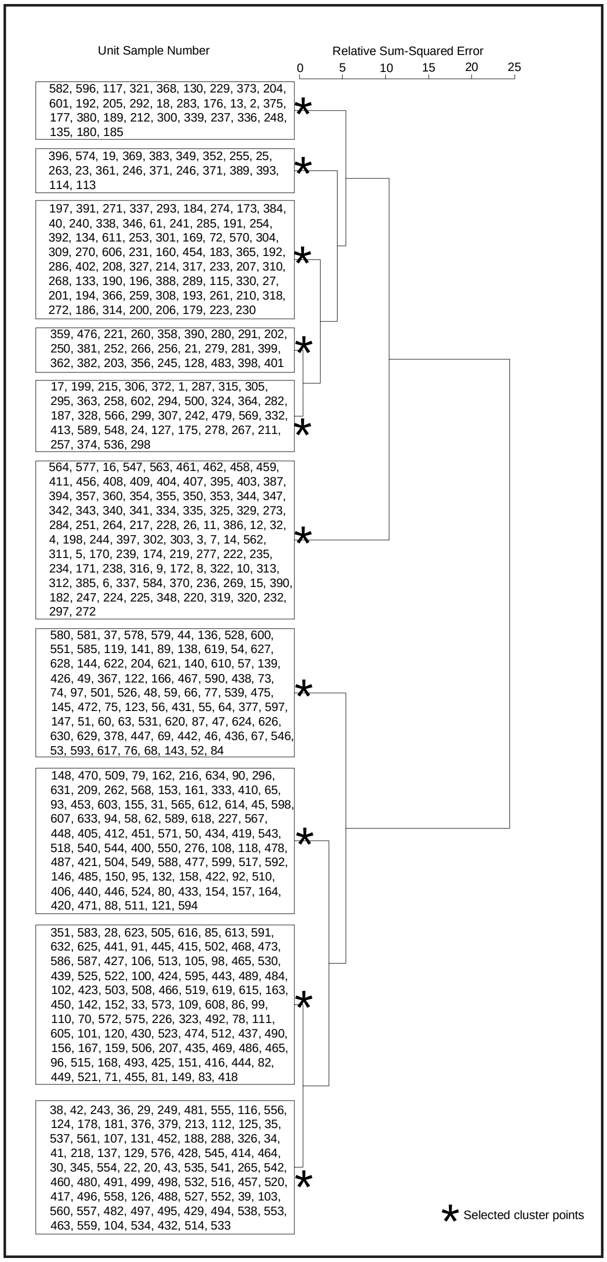


Figure 14.16. Dendrogram of cluster analysis.

> Clusters of this type should be located in a peripheral zone or near a feature.

Late Pre-Columbian, Payaya Component

Domestic and peripheral zones were not proposed for upper Block B during density analysis mainly due to the lack of clearly defined features within the block. Cluster analysis reveals that upper Block B contains only cluster types 7 through 9 (Figure 14.17). Only two separated units of cluster type 7 exist, therefore a domestic zone is not likely within this block. There are ten units assigned to cluster types 8 and 10, which contain high amounts of FCR, but no features are defined within the block, although the entire block is characterized as a sheet midden (Chapter 13). Ten units are also assigned to cluster type 9, which is a good indicator of a trash dump. Upper Block B most likely represents a peripheral zone within a camp. Clearly defined features may exist in the unexcavated portions of this block.

Late Archaic, Upper Leon Creek Component

Three domestic zones are proposed for lower Block B, although the three units with no data near Feature 19 are suspected of skewing the low-density area in that location (Figure 14.2f). Cluster analysis assigned units in lower Block B to all of the nine cluster types; cluster type 3 (a domestic zone indicator), was not represented (Figure 14.18). Overall, lower Block B is dominated by units of cluster type 10 (40% of the block), which contain a comparative abundance of FCR. When cluster types within the block containing high amounts of FCR (5, 8, and 10) are added, they make up 73% of the block.

Only 5% of the units within the block are assigned to cluster type 7, which is characteristic of a domestic zone. Of these, four are within previously proposed domestic zones. Of the previously proposed domestic zones, only one contains several clusters that could indicate a domestic zone. The proposed domestic zone surrounding Feature 18 contains three clusters of type 7. It also contains one unit assigned to cluster type 1 and two units assigned to cluster type 2. While these are more indicative of peripheral zones, in low-density areas they may be considered part of a domestic zone. Three units near Feature 18 and one unit containing Feature 18 are assigned to cluster type 5. While usually located within the peripheral zone, this arrangement could be a signature of a dispersed feature within a domestic zone. Figure 14.18 illustrates the refined domestic zone boundary near Feature 18. The definition of this domestic zone is tentative at best. The dispersal of Feature 18 into other units (cluster type 5 within the domestic zone) indicates that this feature would have been an outside feature. If a shelter were in this domestic zone it was very small.

Table 14.3. Cluster frequencies, content, and zone designation.

Cluster	Count	Relative Density				Zone Designation	Symbol
		Lithic Debitage	FCR	Mussel Shell	Bone		
1	40	60.41	9.61	23.87	6.12	Peripheral (Domestic if low density)	
2	31	18.22	3.74	2.86	75.17	Peripheral (Domestic if low density)	
3	96	91.01	0.95	2.05	6.00	Domestic	
4	18	9.00	2.86	87.40	0.73	Peripheral	
5	81	19.20	47.83	25.52	7.45	Peripheral or near feature (disturbed)	
6	27	37.64	4.48	51.95	5.93	Peripheral	
7	71	46.34	6.63	13.33	33.70	Domestic	
8	98	34.90	53.97	8.51	2.62	Peripheral or near feature	
9	88	51.87	33.11	11.02	4.00	Peripheral (disturbed)	
10	84	14.03	79.09	5.50	1.38	Peripheral or near feature	

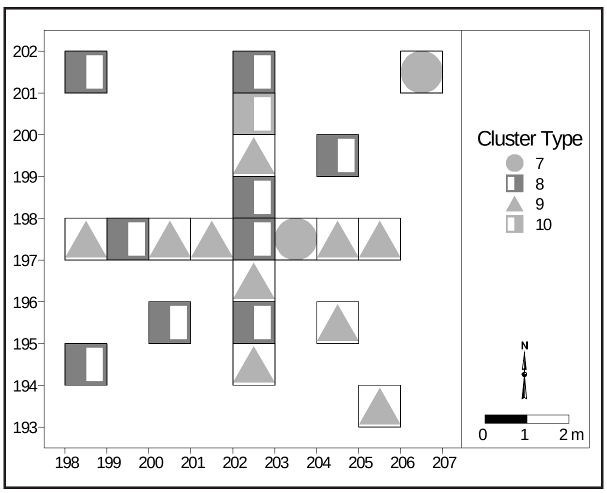


Figure 14.17. Cluster analysis for upper Block B.

Middle Archaic, Lower Leon Creek Component

Units in upper Block A are assigned to 9 of 10 clusters, excluding cluster type 2 (Figure14.19). Cluster type 5 comprises 44 percent of the block. This cluster type is expected in peripheral zones. The proposed domestic zone in the northern portion of upper Block A is almost completely made up of units assigned to cluster type 5. Only four units are assigned to cluster types 3 or 7 (expected within domestic zones) and only three of these are within the density-defined domestic zones. Overall, the cluster analysis does not support the presence of domestic zones within this block. This block is represented by clusters high in either FCR (5, 8, and 10) or mussel shell (4 and 6), both of which are more likely in peripheral zones.

Middle Archaic, Upper Medina Component

Lower Block A contains cluster types 1, 2, and 3 (Figure 14.20) and is dominated by cluster type 3. While only a small portion of this block was proposed as a domestic zone (based mainly on low density), cluster analysis characterizes the entire block as a domestic zone. Cluster types 1 and 2 in this case are in low-density areas and, along with the presence of units of cluster type 3, can be considered within the domestic zone. The northern portion of this block may still have served as a specialized activity area. It contains a high density of lithic debitage and bone and, therefore, is not included as part of the cluster-defined domestic zone.

Because of the limited excavated area in Block U, no determination was made on the locations of domestic and proposed zones during the analysis of the density maps. Cluster analysis assigned units within Block U to clusters of type 8, 9, and 10 (Figure 14.21). These clusters are expected within pe-

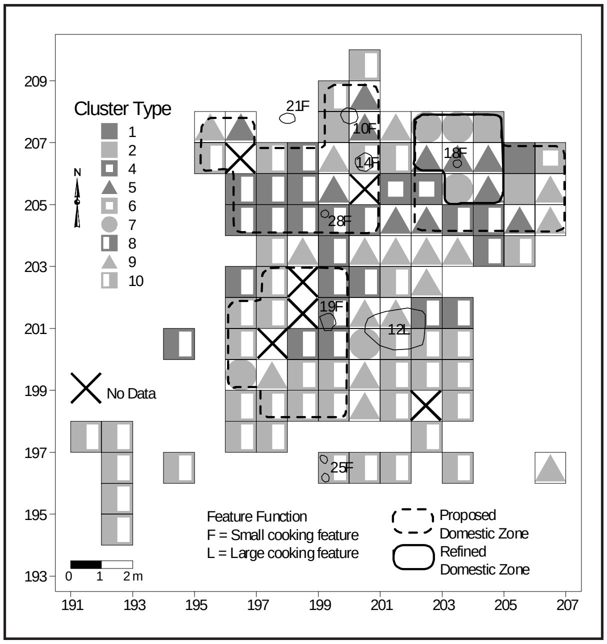


Figure 14.18. Cluster analysis for lower Block B.

ripheral zones and that, combined with the moderately high density within the block, indicates that a domestic zone is not located within the block.

Late, Early Archaic, Lower Medina Component

Block G contains all defined cluster types (Figures 14.22–14.23). Most of the density defined domestic zones from the density analysis (Figures 14.12a–b) contain cluster types 3 and 7, which are expected in domestic zones. Cluster types 3 and 7 outside the proposed domestic zones could represent either activity areas (following special activity areas defined by Yellen [1977]) or secondary refuse dumps that exhibit characteristics of the expected pattern of artifacts within the domestic zone. Occurrences of cluster types 3 and 7 in proposed peripheral zones may indicate domestic zones not identified by interpreting features and density maps.

Area A of Gb (Figure 14.22) contains cluster types expected in domestic zones as well as several small cooking features. This area was not categorized as a possible domestic zone because of the high density of artifacts (Figure 14.7a). It is possible that this area was used as a domestic zone at one time. Area B of Gb (Figure 14.22) is an area of low total density, but does not contain a defined feature. Most of the units in this area are cluster types expected within a domestic zone. It is possible that this area was used as a domestic zone and the associated hearth is not preserved in the archaeological record. Domestic zones proposed for the smaller Block G sub-blocks mostly contain clusters of type 3 or 7 (Figure 14.23).

The domestic zone proposed for Block Ge, however, is redefined as a peripheral zone, as cluster types 6 and 9 are not expected within domestic zones. Many units assigned to cluster types 3 or 7 fall outside the proposed domestic zones. Most of these are in high-density areas. The fact that domestic zone cluster types fall within peripheral zones follows expectations. It is expected that all activities conducted inside the domestic zone will also be performed within the peripheral zone, while some activities are exclusive to the peripheral zone. It is also expected that secondary disposal of artifacts from within the domestic zone is represented in the peripheral zone.

Early, Early Archaic, Upper Perez Component

As mentioned above, Block H was previously analyzed using these same methods (Mason 2003). The use of only target zone data in this study appears to have made a significant difference in the results of the cluster analysis. While Mason's 2003 study identified only four cluster types within the block, the current analysis produced eight cluster types. Cluster types indicative of domestic zones (3 and 7) represented only eight percent of the area within the block, and the units assigned to these cluster types are restricted to the edge of the excavation area (Figure 14.24). The cluster analysis does not support the density-defined domestic zones. The block is dominated by cluster types which contain high concentrations of FCR (5, 8, and 10 make up 66% of the area). Interestingly, while FCR concentrations in the density maps did not always coincide with the locations of features, almost every feature is within a unit assigned to one of these cluster types.

Clusters of type 8 and 10 (which contain the highest FCR densities) tend to be surrounded by clusters of type 5 and 9 (containing lower FCR and

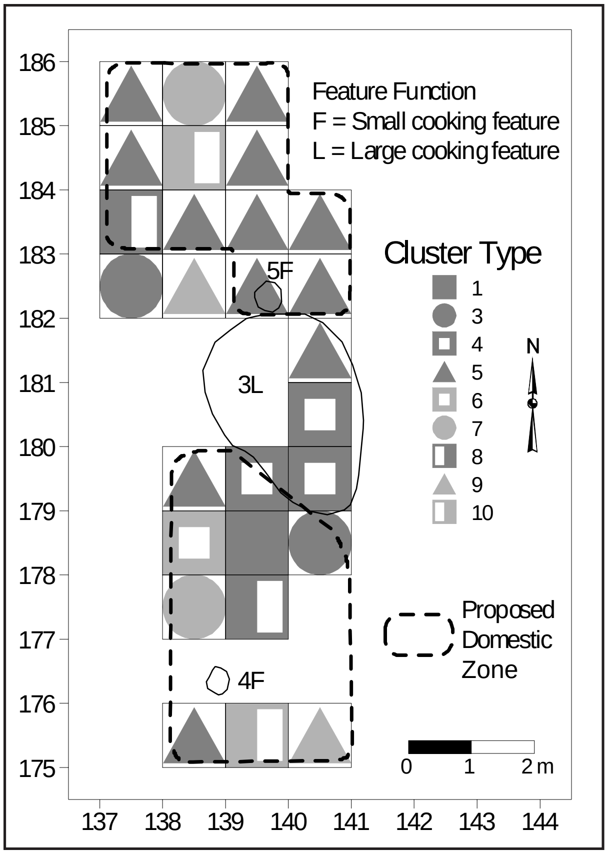


Figure 14.19. Cluster analysis for upper Block A.

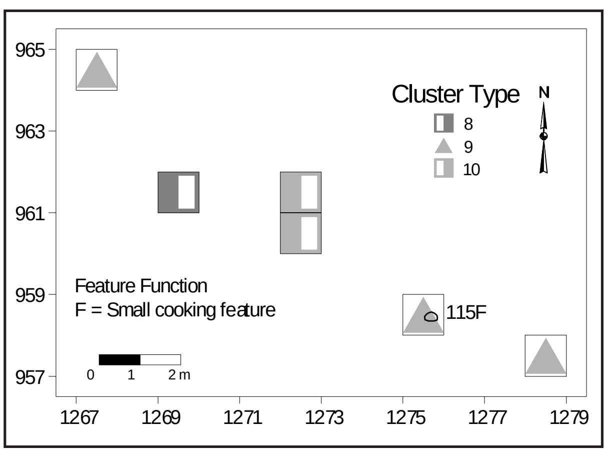


Figure 14.21. Cluster analysis for Block U.

higher debitage and mussel shell densities). This arrangement may indicate the locations of large cooking features surrounded by discard (i.e., expended) FCR and used as trash dumps.

While Block H contains many units assigned to clusters of type 5 and 9 (possible indicators of mixed

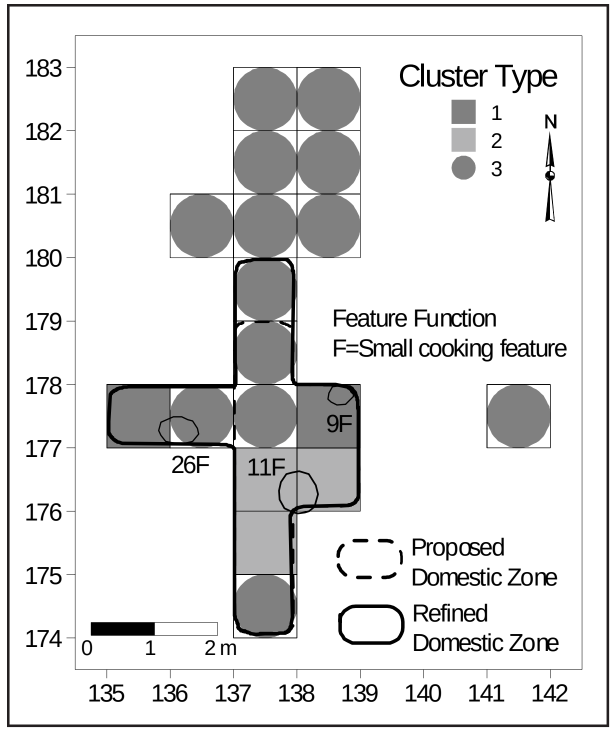


Figure 14.20. Cluster analysis for lower Block A.

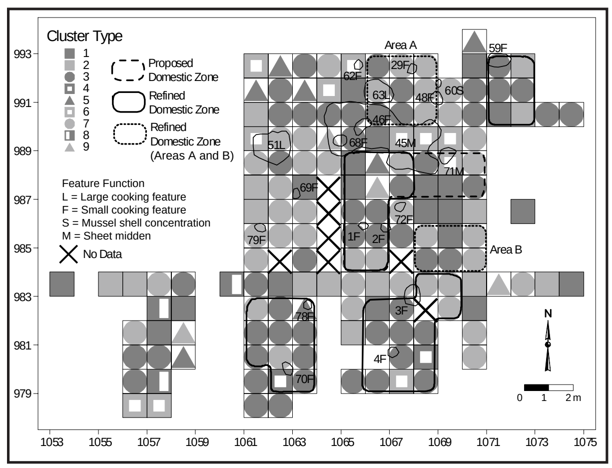


Figure 14.22. Cluster analysis for the large sub-block Gb.

or disturbed areas), the overall pattern is more indicative of the preserved site structure. This interpretation is different from Mason's (2003) that the block was almost completely disturbed. The difference appears to be due to the selection of a target zone within the block.

Density-defined domestic zones were not proposed for Block T given its high overall artifact den-

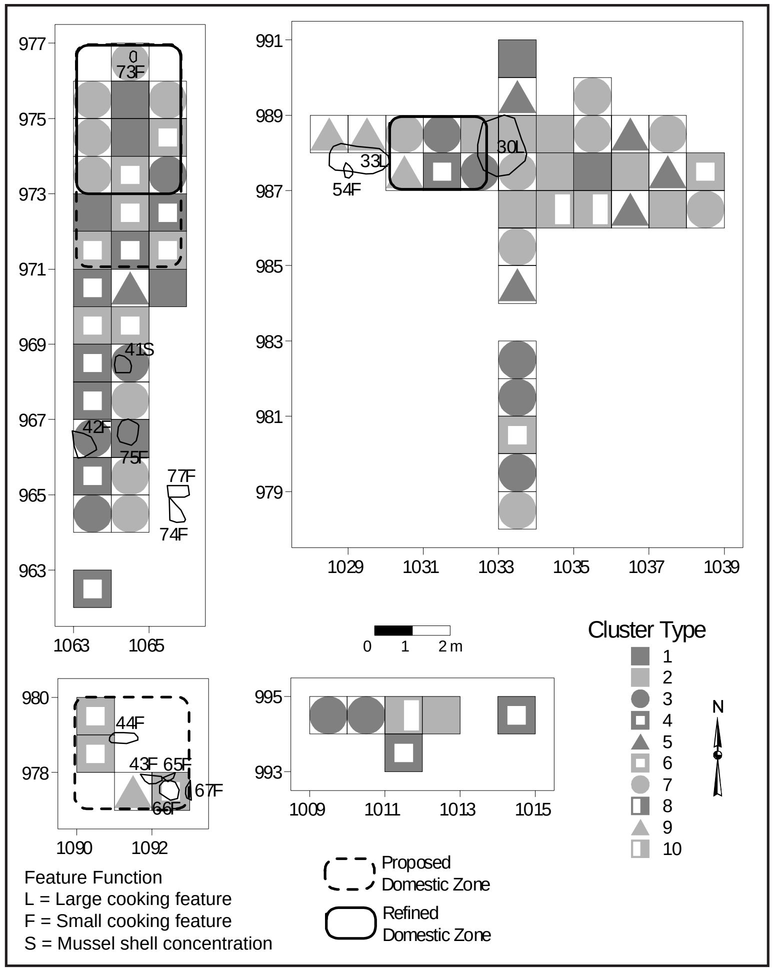


Figure 14.23. Cluster analysis for the smaller sub-blocks of Block G (Ga, Gc-e).

sity. Because this block has the highest density of FCR per unit within the study (Table 14.2), it is not surprising that the block is dominated by clusters that contain high amounts of FCR (cluster type 8 [25%], cluster type 9 [21%], and cluster type 10 [39%]) (Figure 14.25). The cluster analysis did not isolate domestic zones, such that this block most likely represents an area used as a trash dump or specialized cooking area.

In the absence of features, no density-defined domestic zones were identified in Block N. Cluster analysis assigned units within Block N to most cluster types (Figure 14.26). Block N still appears not to contain a domestic zone, although there are four units assigned to either cluster type 3 or 7 in the southern portion of the block. This block is difficult to characterize because of the variation in cluster type throughout the block. The degree to which it may have been affected by floor scouring merits further study.

Conclusions

Results of the density analysis provided an informative view of the Richard Beene site. Intra-block variation in densities was used with the location of features to identify potential domestic, peripheral, and disturbed areas. Domestic zones were identified based on the co-location of large low-density areas and small cooking features. It is important to note that areas with high densities of all artifacts are consistent with the definition of sheet middens, which were identified in some blocks. This density signature on a larger scale is characteristic of a highly disturbed area. FCR and mussel shell concentrations

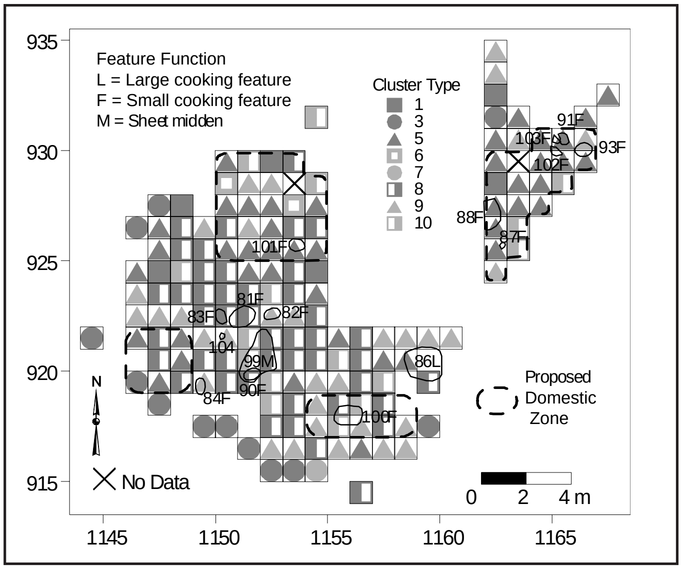


Figure 14.24. Cluster analysis for Block H.

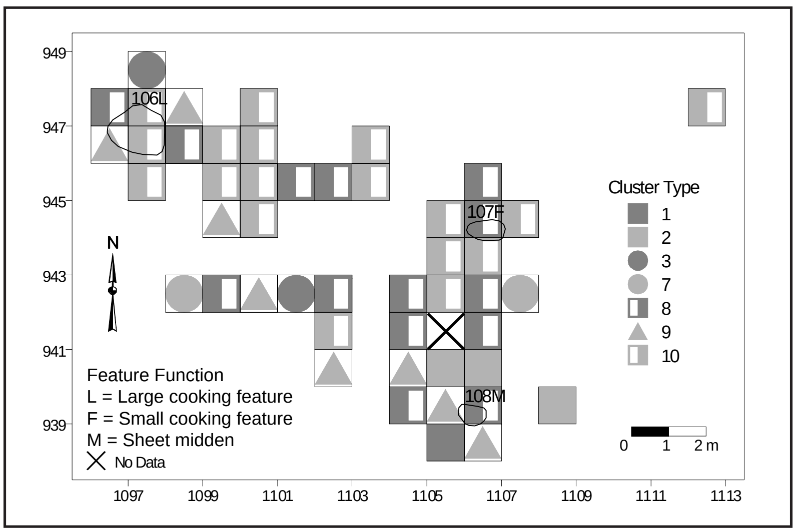


Figure 14.25. Cluster analysis for Block T.

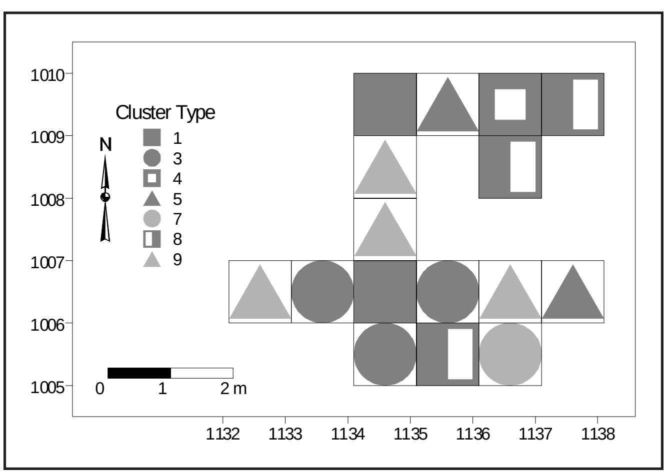


Figure 14.26. Cluster analysis for Block N.

were indicators of secondary deposition of material into a sheet midden as well as indicators of possible disturbed areas.

Cluster analysis was used to group the units of the entire site into only ten homogeneous clusters, insofar as the variance of artifact types within each cluster was very low. This indicates that similar kinds of activities are represented at the site throughout the Holocene. Cluster analysis refined the dimension of density-defined by assessing the spatial relationship between low-density areas and features and the relationships among the artifacts per se. The cluster analysis also identified domestic and peripheral zones in blocks where they were not identified by the density-defined analysis. Finally, cluster analysis was used in Block H to identify potential site structure in a heavily disturbed area. These results can be used to target specific areas of the site for further study. Further study of domestic and peripheral zones, as well, may better identify the locations of structures and the specific types of activities that occurred at the site.

15

ARCHAEOLOGICAL AND PALEOECOLOGICAL RECORDS: SUMMARY AND SYNTHESIS

Alston V. Thoms

The Richard Beene site virtually stands alone in Texas as a well-dated, deeply buried, well-stratified locality with discrete artifact and feature assemblages that span almost all of the Holocene epoch. It is one of only a handful of excavated sites along North America's entire Gulf Coastal Plain to yield fairly complete archaeological records of 10,000 years of human occupation (Anderson and Sassaman 1996; Cable 1996; Kimball 1993). Excavations at the site totaled approximately 730 m^2 (ca. 168 m^3) and sampled 20 stratigraphically distinct archaeological deposits buried in 12 m of fine-grained, overbank alluvium, comprising the Applewhite terrace fill. Forty-four ^{14}C ages derived from soil bulk carbon (i.e. total decalcified soil carbon) and charcoal in archaeological features, tree-burns, and artifact-bearing sediments establish a chronological framework for the site's occupation history. Well-stratified and varyingly preserved archaeological deposits are representative of the Early (ca. 8700–6500 B.P.), Middle (ca. 4100 and 4500 B.P.) and Late (ca. 3500–2800 B.P.) Archaic sub-periods, as well as the Late Pre-Columbian (ca. 1200–400 B.P.) period.

Archaeological and paleoecological data from the Richard Beene site provide a long-term perspective on the use of a riverine locality in a subhumid, subtropical savannah setting near the western edge of North America's Gulf Coastal Plain. The site lies within the northern limits of today's Tamaulipan biotic province, which is characterized, in part, by Neotropical species such as jaguar, peccary, coati, armadillo, and alligator (Blair 1950). Its setting is decidedly riverine, buried beneath a 15 m high terrace along the Median River. Its position on the regional landscape is notably ecotonal, near the intersections of four major ecological zones: (1) Post Oak Savannah; (2) South Texas Plains; (3) Edwards Plateau; and (4) Blackland Prairie (Chapter 2). Hickory, oak, pecan, sycamore, and cypress trees along with raccoons, white-tailed deer, turkeys, and alligators call attention to the site's proximity to forests that dominate the continent's southeastern quadrant.

Throughout the Holocene, hunter-gatherer lifeways persisted in south-central Texas. Corn, beans, and squash were grown during the Late Pre-Columbian era by native groups living within a few hundred kilometers to the north, northeast, south, and west. In the early 1500s, when Europeans first traversed parts of what is today south-central Texas, important food resources for the hunter-gatherers in this region included white-tailed deer, rabbits, fish, shellfish, prickly pear, pecans, mesquite beans, and roots. Later, in the 1600s and 1700s, Europeans reported that bison and pronghorn were plentiful and that they were hunted by Indians. During the mid 1800s, Lipan Apache groups occasionally planted corn and other crops along Hondo and Cibolo creeks, southwest and southeast of San Antonio, respectively, and along the Guadalupe River to the west (Smith 2005:189).

The Richard Beene site (Figure 15.1) is one of about 90 archaeological sites discovered and test excavated between 1981 and 1990 as part of cul-

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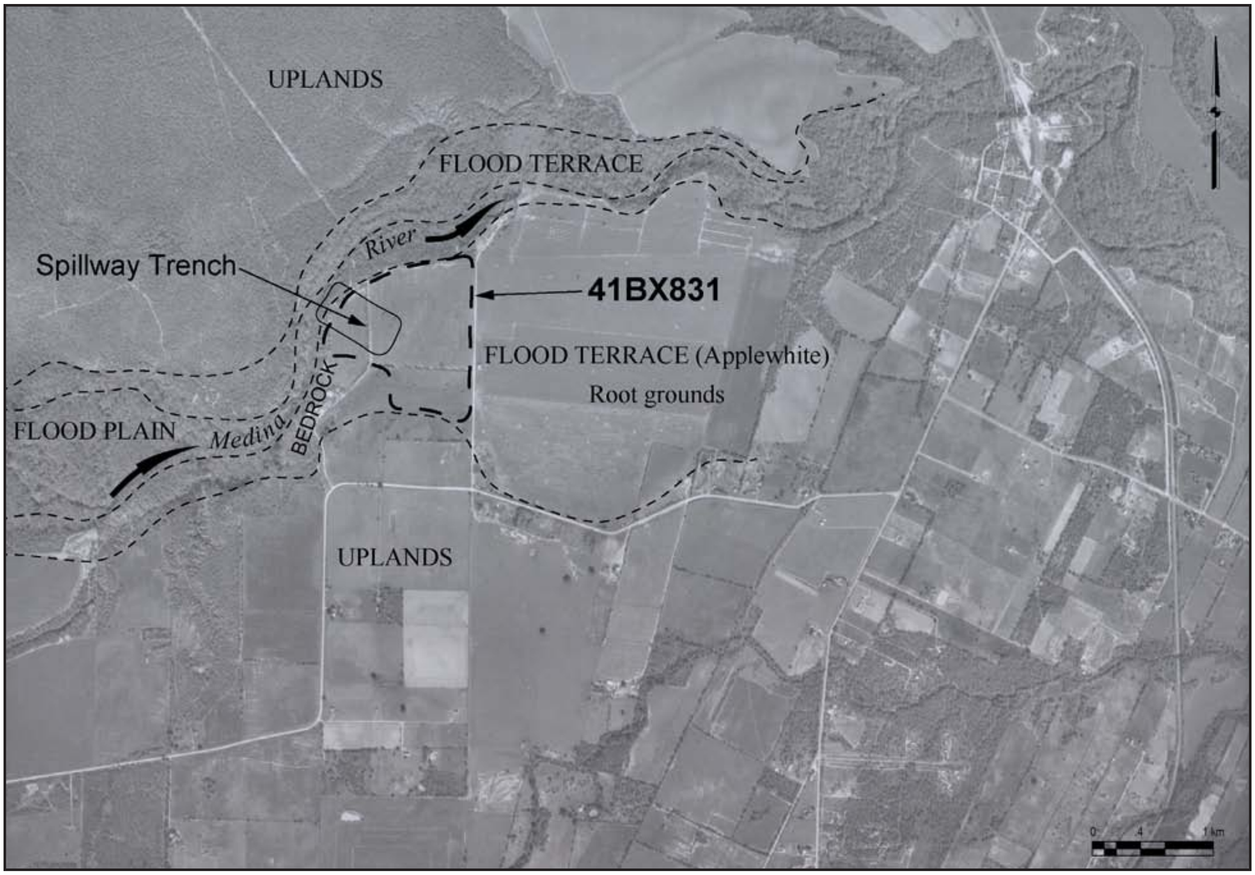


Figure 15.1. Aerial photograph (1985) showing the location of the Richard Beene site in relation to source areas for the subsistence-related archaeological remains recovered from each.

tural resources investigations undertaken for the proposed construction of Applewhite Reservoir by the San Antonio Water System. Officially designated as 41BX831, it was among 15 sites determined eligible for inclusion on the National Register of Historic Places and for official designation as State Archeological Landmarks (Carlson 2008). Due to its location within the dam's footprint, mitigation-level excavations began there in 1990. When spillway-trench construction was well underway in early 1991, a public referendum halted construction and on-going archaeological fieldwork. A second referendum in 1994 resulted in cancellation of the overall project. Since the mid 1990s, various organizations have worked to preserve the Richard Beene site as a center piece for the Land Heritage Institute of the Americas, a 1,200-acre land-based, educational, research, and recreational facility in the abandoned reservoir area. These include, American Indians in Texas at Spanish Colonial Missions, Taap Piilamm-Coahuiltecan Nation, Friends of the Medina, Bexar Land Trust, Inc., and the Land Heritage Institute Foundation, SAWS and TAMU.

Short-term field work—small-scale excavation of under-sampled components, "surface" survey in the aftermath of floods, monitoring of construction activities, and mapping—continued through 2005. The final rounds of reservoir-related field work—survey, monitoring, and feature-salvaging—took place in conjunction with SAWS' landscape stabilization project. Bulldozers cut back the top of the steep walls of the spillway trench and filled in the lower sections to create a slope that would support vegetation, especially grass, and thereby resist erosion (Thoms et al. 2005; Appendix J). Unfortunately, drought conditions prevailed, grass did not cover the slope, meter-deep rills formed within a year, and runoff continues to expose and erode archaeological deposits (Figure 15.2).

Figure 15.2. Post-stabilization views (2006) of the spillway-trench slopes at the Richard Beene site showing denuded surfaces and rill formation: (a) a deep rill formed in the upper Medina pedocomplex, ca. 3 m below the modern surface that encompassed the Middle Archaic components, ca. 4500 B.P.; and (b) multiple rills formed in the upper Perez paleosol, ca. 9 m below surface, that encompassed the early, Early Archaic components, ca. 8700 B.P.

The remainder of this chapter summarizes and synthesizes information presented in the preceding 14 chapters. It begins with an overview of the site's environmental setting, followed by chronologically organized summaries of the archaeological components. These descriptive sections are followed by discussions about and responses to research questions concerning paleoenvironments, archaeological assemblages, site structure, and land-use patterns. Research questions pertaining specifically to lithic technology are addressed in Chapter 10. The present chapter cites other chapters as sources for most of what is being summarized. Additional citations are provided for information not presented in the preceding chapters. Summary and synthetic statements not otherwise cited are the present author's interpretations of the data at hand.

Site Setting: Lower Medina River Valley

Throughout the last 10,000 calendar years (ca. 9000 radiocarbon years), the Richard Beene site was well-placed as a locality for efficient exploitation of subsistence-related resources, remains of which were found or inferred to once have been present in the site's archaeological deposits (Figure 15.1). Among the salient characteristics of the local setting throughout the Holocene are:

- Proximity–ca. 100 m to the channel of the Medina River, which provided potable water, fish, turtles, river mussels, and gravel bars with chert and limestone cobbles suitable for tool making (Figure 15.3a)

- Proximity–ca. 200–300 m to sandstone outcrops that provided cook-stone raw material for use in earth ovens and other cooking facilities, and raw material for grinding slabs (Figure 15.3b)

- Adjacency to a comparatively wide portion of the late Holocene floodplain that served as a ready source of fuel, wood for shelters and tool/utensil manufacturing, plant material for making mats and baskets, as well as pecans, deer, and other wild foods (Figure 15.3c,d)

Figure 15.3. The riverine setting of the Richard Beene site today probably resembles how it may have appeared, perhaps with significantly fewer trees, throughout most of the Holocene: (a) the floodplain; (b) the Medina River; (c) a flood-chute/tributary channel through the floodplain; (d) a bedrock outcrop overlooking the floodplain; (e) the valley bottom–Applewhite and Leon Terraces–2km upstream from the site, view to the south; and (f) the Applewhite terrace at the site, view to the north.

- Adjacency to wooded margins along the Holocene floodplain and flood terrace and proximity (ca. 0.5–1 km) to upland savannahs, which provided ideal hunting grounds for white-tailed deer, other ungulates, a variety of small animals, and to plant resources including prickly pear (Figure 15.3e)

- Adjacency to the downstream end of an expansive stretch of the late Pleistocene to middle Holocene floodplain and flood terrace (i.e., the occasionally flooded Applewhite terrace) that would have supported a variety of game animals and plant foods, including false garlic, onions, rain lily, and perhaps camas (Figure 15.3f)

Paleoecological studies demonstrated that rates of sedimentation and pedogenesis fluctuated during the late Pleistocene and throughout the Holocene. Isotopic analyses revealed changes in temperature, moisture, and vegetation regimes (Chapters 3, 5–7, 12). Pollen data for south-central Texas as a whole indicate a mosaic vegetation pattern (i.e., savannah), similar to that documented for the early historic period, probably prevailed throughout the Holocene (Bryant and Holloway 1985). There is clear evidence, however, that grasslands expanded appreciably during relatively dry periods and arboreal coverage increased during wet periods (Bousman 1998a). Although climatic fluctuations certainly affected the region's food-productivity potential, the extent to which these climatic fluctuations are reflected in the human record at the Richard Beene site remains unclear.

Significant environmental changes occurred in the surrounding uplands during the last 10,000 years, but concurrent changes on the Medina River bottomland may not have amounted to much more than fluctuations in the relative amount of arboreal coverage and types of grasses. As such, the site's microenvironment (i.e., adjacent portions of the river and floodplain) would have been rather stable. Geomorphologic studies show that over the last 15,000 years, the lower Medina River had a low gradient, and was flood-prone. Since the late Pleistocene, the river in the vicinity of the site has been confined to the modern meander belt. Floodplain alluvium consisted mainly of silty clay (Chapter 3). Analysis of river mussel shells from archaeological deposits at the Richard Beene site show that same species of river mussels were exploited throughout the Holocene (Chapter 5 and 6). Analysis of snail-shell recovered from 22 soil horizons between the modern surface and the base of the Perez paleosol indicate a grass-dominated, prairie to savannah setting, with only moderate occurrences of wood species.

Pollen analysis, albeit based on poorly preserved samples, shows that the arboreal assemblage 3,000 radiocarbon years ago was similar to the modern one. Oak, pecan/hickory, mesquite/acacia, and willow-type charcoal fragments were recovered from tree burns and cultural features in deposits dating between about 8800 and 4100 B.P. All of these are common in the area today. The significance of a single piece of bois d'arc charcoal, dated to about 8700 B.P. is not well understood. This species is among the hard woods routinely used as tool wood by native people in the American Southeast. Its present-day distribution is north and west of the site, but it may have grown nearer the site in the past (Chapter 12).

Important taphonomic issues with the faunal assemblage remain to be resolved, especially those concerning differential bone preservation. Nonetheless, the general nature of faunal remains from all components is similar and does not suggest major changes in the relative contributions of key subsistence resources. With one exception, a pronghorn medial phalanx, all of the identified faunal remains represent species common to bottomland settings. Pronghorn tend to inhabit the kind of open terrain that would have been common in the adjacent uplands (Yoakum 1978). Deer, rabbit, and rats were the most common terrestrial remains. Turtles, snakes, and fish were present as well (Chapter 11). Freshwater mussel shells constituted the most ubiquitous food remains (Chapter 9). Excepting pronghorn, all of the identified fauna could have been procured readily within 100 m of the site.

Archaeological Components: Condition, Structure, Assemblages

The site's 20 excavation areas, representing components of the Early, Middle, and Late Archaic and the Late Pre-Columbian periods, are similar insofar

Table 15.1. Artifact-class density comparisons per excavation block/cultural period, listed in rank order.

Artifact density per component	Debitage density by component (count/m^3)		FCR density by component (count/m^3)		Mussel umbo by component (count/m^3)		Bone density by component (count/m^3)	
Low	MA(uA)	8	MA(lA)	9	MA(U)	6	eEA(H)	8
	eEA(N)	26	lE(G)	20	eEA(N)	8	LPC(uB)	9
			MA(uA)	23	MA(lA)	11	MA(uA)	11
			eEA(N)	29				
Moderate	MA(U)	106	LPC(uB)	124	eEA(T)	18	MA(U)	18
	eEA(T)	119	MA(U)	168	LPC(uB)	28	eEA(N)	22
	LPC(uB)	136			MA(uA)	28	MA(lA)	28
	eEA(H)	156					eEA(T)	30
							LA(lB)	39
High	LA(lB)	191	eEA(H)	238	lEA(G)	48	lEA(G)	105
	lEA(G)	238	eEA(T)	309	eEA(H)	60		
	MA(lA)	304	LA(lB)	341	LA(lB)	63		

* Abbreviations: LPC (uB)=Late Pre-Columbian, upper Block B; LA(lB)=Late Archaic, lower Block B; MA(uA, lA, U)=Middle Archaic, Blocks upper A, lower A, and U; lEA(G)=late, Early Archaic, Block G; eEA(H, T, N)=early, Early Archaic, Blocks H, T, N.

as they all contained chipped stone, FCR, mussel shells, and bone fragments scattered in varying densities within and between features. Archaeological components differ markedly, however, in terms of artifact densities (Table 15.1) and proportional representation (Table 15.2; Figure 15.4). As discussed

Table 15.2. Comparison of artifact-class proportions per excavation block/cultural period, listed in chronological order (also see Figure 15.3).

Artifact Class	LPC* (uB) %	LA (lB), %	MA (uA), %	MA (lA), %	MA (U), %	lEA (G), %	eEA (H), %	eEA (T), %	eEA (N), %
Debitage	45.67	27.70	24.25	74.99	38.77	53.53	35.84	53.19	31.27
FCR	40.72	53.41	37.03	3.07	53.44	7.44	46.28	23.72	54.84
Umbos	10.20	11.28	28.49	1.64	1.56	18.84	16.68	12.79	4.83
Bone	3.42	7.61	10.23	20.30	6.22	20.19	1.21	10.30	9.06
Total %	100	100	100	100	100	100	100	100	100

* Abbreviations: LPC (uB)=Late Pre-Columbian, upper Block B; LA(lB)=Late Archaic, lower Block B; MA(uA, lA, U)=Middle Archaic, Blocks upper A, lower A, and U; mEA(G)=middle, Early Archaic, Block G; eEA(H, T, N)=early, Early Archaic, Blocks H, T, N.

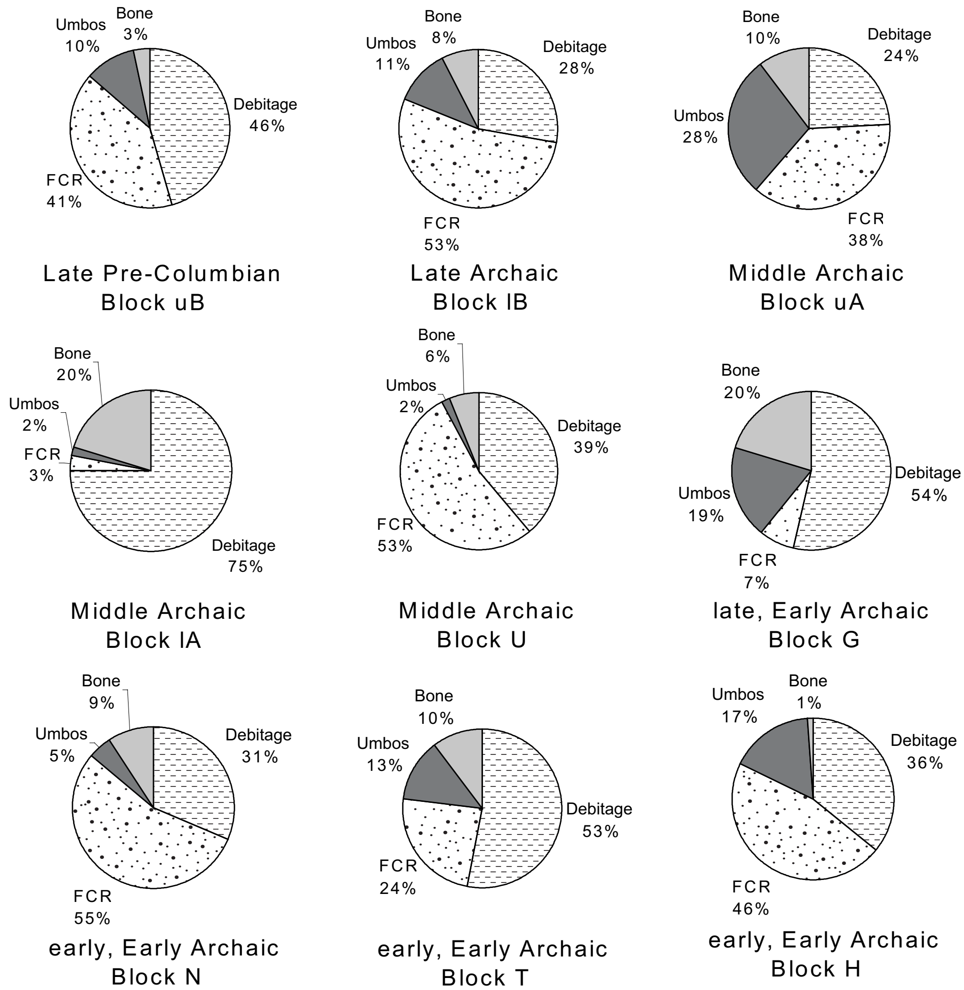


Figure 15.4. Pie charts showing proportions of artifact-classes within each of the major excavation blocks/ culture periods (also see Table 15.2).

in Chapter 14, these differences afford measures of the relative importance of different subsistence activities. There are significant inter-component differences in the relative frequencies of tool types, as well as core-to-debitage ratios, as described in Chapter 10. Feature types vary in density but similar kinds of features, including open-air hearths, earth ovens, mussel shell concentrations, and sheet middens, are represented in most components (Chapter 13).

Photographs of excavation areas and artifacts characteristic of archaeological component are included in this section to augment summary descriptions. Artistic illustrations of residential encampments are also included to illustrate that the site's archaeological record primarily represents short-term, multi-family encampments where food-preparation activities are well represented.

Residential Structures

Generic wickiups illustrated in the artistic representations depict the kinds of residential structures described by Europeans who visited Indian encampments on the Gulf Coastal Plain between the early 1500s and the early 1800s (Chapters 8 and 14). Similar residential structures are likely to have been present at most encampments in south-central Texas throughout the millennia.

Physical remains of these kinds of pole-framed, mat/hide/bough-covered, temporary structures are unlikely to be preserved, even under the best of open-site conditions. Small post holes indicative of where support poles were anchored are not likely to survive even a few decades of pedoturbation, nor are low earthen berms that may have surrounded such residences and to secure their coverings and minimize intake of cold air. Rock supports/weights along a structure's perimeter, however, would provide a long-lasting signature, but such features have not been reported from sites in the region. Given fairly rapid rates of sedimentation characteristic of the Richard Beene site, basin-shaped hearths and other pit features, whether they were inside or outside a wickiup, would likely survive long enough to be buried by alluvium, and thereby preserved.

Spatial analysis of artifact distributions presented in Chapter 14 indicate that: (1) most block excavations revealed interspersed areas of high and comparatively low artifact densities that were interpreted as peripheral and domestic zones, respectively; (2) peripheral and domestic zones contained remains of small cooking facilities and mussel shell concentrations; (3) large FCR features and mussel shell concentrations only occurred in peripheral zones; (4) most of the variation in artifact frequencies in the excavated areas is represented by 10 statistically-defined artifact clusters that occurred in domestic and peripheral zones. Small cooking features occurred in the midst of domestic zones, which is where residential structures would have been located would have been located, as per ethnographic and ethnoarchaeological studies reviewed in Chapter 14. As interpreted here, these results are consistent with the concept that most encampments contained some kind of covered residential structure.

FCR and Cook-Stone Functions

Laboratory experiments in the use of Wilcox formation calcite sandstone, which comprises almost all of the FCR at the Richard Beene site, revealed that it functioned adequately when heated and cooled in a kiln to simulate baking in an earth oven and roasting for a few hours over open-air griddles. When used a single time to simulate stone boiling and sweat bathing, however, the calcite sandstone partially or wholly disintegrated (Chapter 13). As such, FCR made of calcite sandstone from the Wilcox formation in the site is not likely to have been used routinely for stone boiling (Jackson 1998), given that more suitable rocks (e.g., quartzite and limestone) were available from nearby gravel bar deposits.

Cabeza de Vaca did not report stone boiling anywhere in the Gulf Coastal Plain but he did comment on the use of ceramic vessels for boiling food in that region (Krieger 2002). The ostensible absence of stone boiling in the region at that time is consistent with the concept that pot boiling replaced stone boiling in the Post Oak Savannah sometime during the last thousand years. Fields (1995) and Rogers (1997) argued that decreases in the use of earth ovens in the Post Oak Savanna during the Late Archaic period coincided with the onset of food boiling in general. There is, however, widespread evidence that earth-oven baking was quite common during the late Pre-Columbian period when ceramic vessels were in use (Thoms 2004c).

At the Richard Beene site (Chapters 9 and 13), and elsewhere along the middle reach of the Medina River, large pieces of FCR, arguably derived from earth ovens, often co-occur with ceramics and arrow points (McCulloch et al. 2008; Thoms et al. 2008a, 2008b). Ceramic sherds are found at sites in the Post Oak Savannah that contain remains of earth ovens (Thoms 2004c), and at sites in south Texas with an abundance of FCR (Hall et al. 1986). It also is evident that baking in earth ovens resulted in accumulations of burned rock middens on the Edwards Plateau, continuing during the post-ceramic era, perhaps at unprecedented rates (Black and Creel 1997).

Cabeza de Vaca reported that a variety of foods were baked in earth ovens for a few hours to as long as two days, in the case of some root foods (Krieger 2002). Ethnographic records for western North America in general indicate that baking roots for two-days in ovens required a rock heating element. Once sufficiently heated and buried, a lens of hot rocks afforded an effective and efficient means of maintaining adequate cooking temperatures for two days or more needed to make render some plant foods readily digestible. Such prolonged cooking was not practical with wood coals alone (Thoms 1989, 2003; Wandsnider 1997).

As described and discussed in Chapter 13, well-preserved features at the Richard Beene, site with sandstone heating elements about a meter in diameter and weighing 30–40 kg, usually contained large pieces of rock more than 10 cm wide and about 5 cm thick. Small cooking features, less than .6 m in diameter, filled or partially filled with cook stones (ca. 5–10 kg), tended to contain smaller tabular pieces of FCR. In several cases, griddle-like configurations of tabular pieces of cook stone covered one end of oval-shaped hearths. In light of these cooking-feature patterns, an abundance of large pieces of FCR in sheet midden deposits was interpreted as strong inferential evidence for the use of earth ovens with rock heating elements.

Late Pre-Columbian Period—Payaya Component (upper Block B)—ca. 400–1200 B.P.

Climatic conditions for this period approximated those of today and were probably cooler and perhaps moister than during the preceding several millennia (Chapters 3, 5–7). Rates of sediment deposition were comparatively slow. At the Richard Beene site, less than a meter of alluvium accumulated between about 2,500 and 400 years ago. The modern, well-developed soil encases this component. Elsewhere in the reservoir area, bulk soil carbon in the modern soil yielded a ^{14}C age of ca. 1400 B.P., which provides an approximation of the average amount of time the soil has been developing (Mandel et al. 2008; Chapter 3).

The Payaya component was exposed on the surface and buried up to 40 cm in the modern soil. It was substantially disturbed by bioturbation and argilliturbation. Insofar as the Late Pre-Colombian period was better-represented and better-preserved at other sites slated for excavation in the project area (Carlson 2008), excavations at the site were limited to a cross trench and a several 1 x 1 units, totaling 22 m^2 (Figure 15.5).

Compared to other components, the Payaya yielded moderate densities of debitage, FCR, and mussel shells, along with a low density of bone fragments (Chapters 8 and 14). Tool density was comparatively moderate. This component is dated by its Perdiz and Scallorn/Edwards arrow points and several sherds of bone-tempered plainware regionally known as Leon Plain (Figure 15.6). Its most distinguishing characteristic in terms of lithic technology is that hard- and soft-hammer flakes are equally represented, whereas hard-hammer flakes clearly dominate all other component assemblages (Chapter 10).

Excavations revealed a large, moderate-density, and rather homogenous scatter of FCR, flakes, and mussel shells that was interpreted as a sheet midden. Some of the FCR concentrations within the scatter, (Figure 15.5), however, may well represent disarticulated remains of cooking features. Burned and carbon-stained sediments in circular patterns were interpreted in the field as tree-root burns but it is possible that some of these were remains of rockless hearths (Chapter 13). Based on cluster-analysis results, the block area most resembles a peripheral zone. Two of the 1 x 1 m excavation units were classified as domestic zones but the excavated area was too small to suggest places where residential structures may have stood (Chapter 14).

The Payaya component likely spans several centuries and represents remains of multi-family, short-term encampments (Figure 15.7). Given that the kinds and relative frequencies of artifacts are similar to other components, it is likely that the Payaya component contains residential structures, although not necessarily in the area that was excavated. Tool manufacturing and reconditioning and cooking activities are well represented. Deer-sized bones were among the sparse faunal remains. Hunting activities may have been less important than gathering, judging from the relative paucity of bone fragments and thin, knife-like bifaces and the abundance of FCR.

Late Archaic Period—upper Leon Creek Component (lower Block B)—ca. 3500–2800 B.P.

Climatic conditions for this time period, as well as those during the preceding 1,000 years or so, were drier and probably warmer than present (Chapters 3, 5–7). Compared to the preceding 2,500 years, rates of deposition were relatively rapid, with at least 1.5 m of fine-grained alluvium accumulating in just over a thousand years (Chapter 3).

The upper Leon Creek component is buried in the A/Bk horizon of the Leon Creek paleosol between about 0.75 and 1.75 m below surface. It is

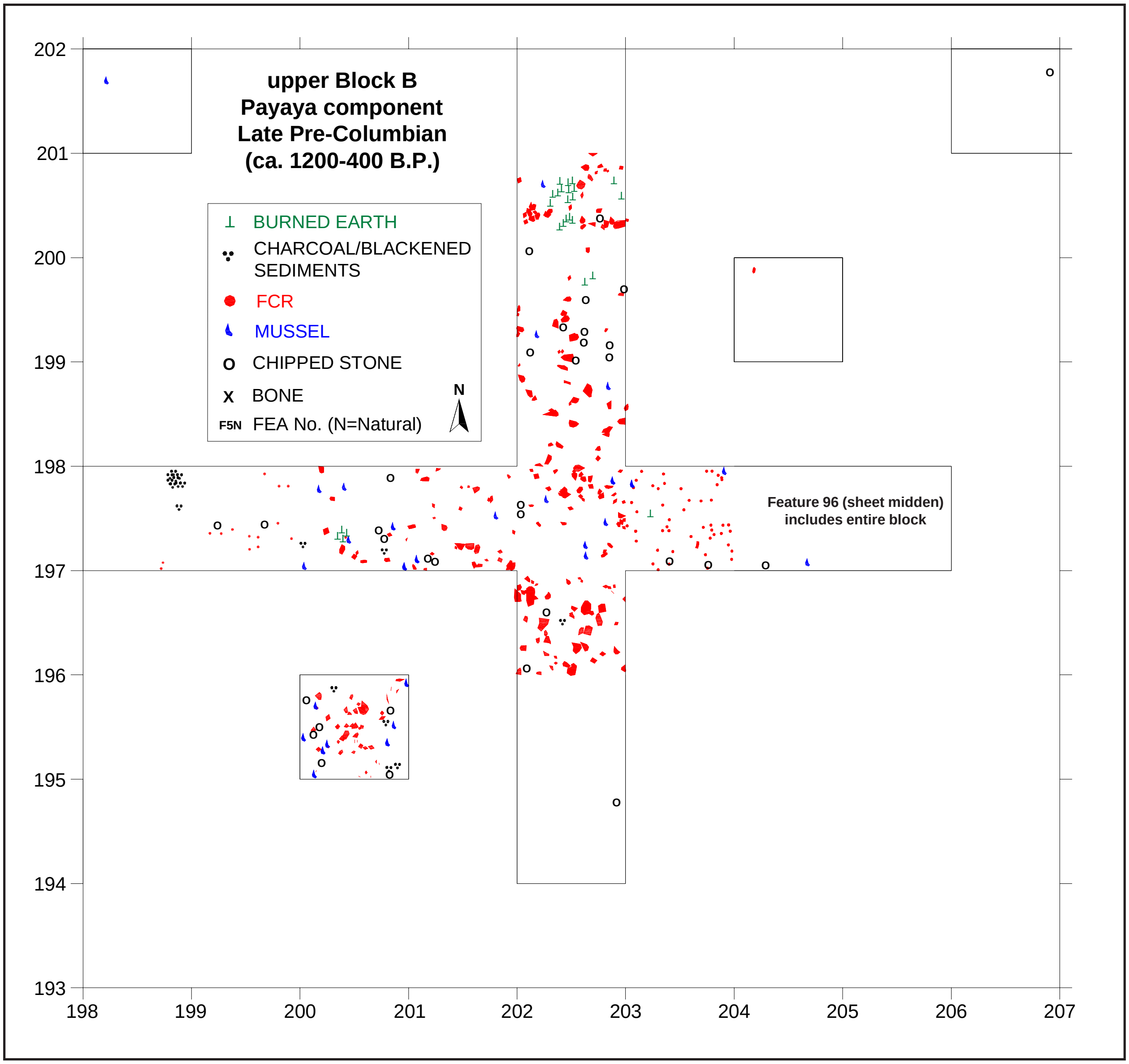


Figure 15.5. The upper Block B excavation area (Payaya component), which yielded arrow points and ceramics embedded in an FCR sheet midden (Feature 96); contained the highest FCR density of any block (Late Pre-Columbian period, ca. 1200–400 B.P.).

only moderately well preserved due to bioturbation and argilliturbation. Weak cultural stratigraphy—three comparatively high-density sub-zones—was discernible, however, within the meter-thick zone of artifact-bearing alluvium (Figure 15.8). Excavation, totaling some 120 m^2, focused on the middle or "target" zone, which had the highest density of FCR and several features (Chapters 4 and 8). The upper Leon Creek component was dated by a single ^{14}C age—3090 ± 70 B.P.—obtained on wood charcoal from a probable earth oven in the target zone. Overall, this component has the general appearance of a sheet midden, or perhaps an incipient burned rock midden, with embedded features. It also exhibits comparably dense scatters of FCR, mussel shells, and chipped stone that are somewhat spatially separate (Chapter 9), but were not designated as features. This pattern suggests the presence of distinctive activity areas or perhaps that different materials were discarded in different place.

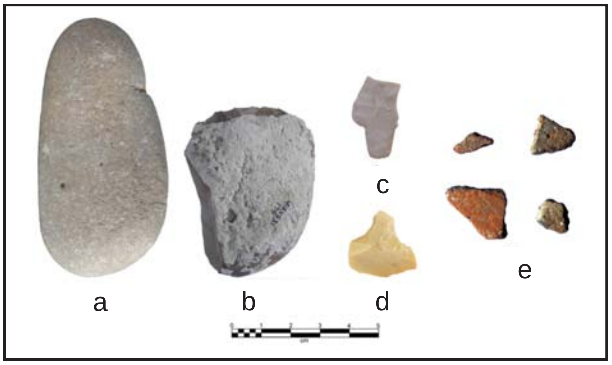


Figure 15.6. Selected artifacts from the Payaya component, Late Pre-Columbian period (ca. 1200–400 B.P.): (a) non-flaked cobble tool; (b) thick edge-modified tool; (c) fragment of a Perdiz arrow point, (d) drill fragment; and (e) ceramic sherds.

Compared to other components, the upper Leon Creek component yielded the highest overall density of FCR (Table 15.1), including many large pieces. This suggests that earth ovens and probably plant foods, perhaps roots, were especially important. Mussel shell density was also the highest of all components and chipped stone debitage density was comparatively high density as well (Table 15.1).

Figure 15.8. The lower Block B excavation area, showing the horizontal and vertical positions of several FCR features and excavation zones that yielded cultural materials and features assigned to the Upper Leon Creek component at the Richard Beene site (lower Block B, Late Archaic period, ca. 3500–2800 B.P.

Tool density was higher than all but the early, Early Archaic components. Broad-bladed barbed projectile points and other thin bifaces indicative of hunting activities dominate the assemblage (Chapter 10). Temporally diagnostic projectile points were found

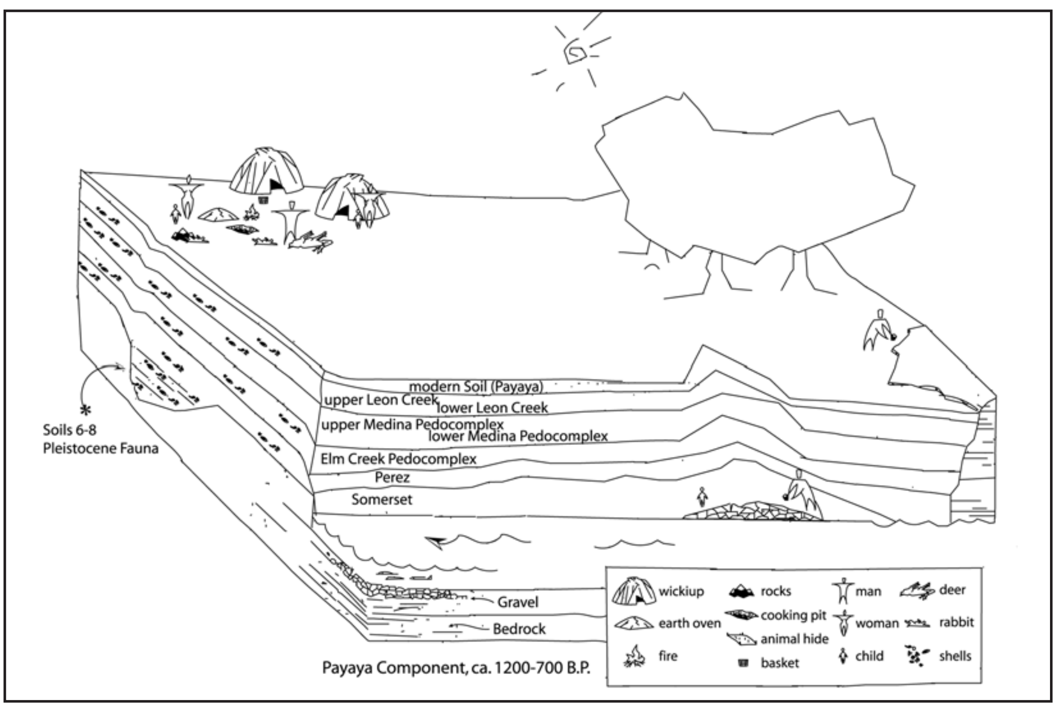


Figure 15.7. Artist's reconstruction of a Payaya component occupation (Late Pre-Columbian period, ca. 750 years ago) at the Richard Beene site.

in essentially correct stratigraphic order. Ensor points tend to be in the upper sub-zone, Marcos and Lange in the target sub-zone, and Marshal and Nolan in the lower zone (Figure 15.9). Wide, thin, knife-like bifaces were common. Heavy-duty tools, including adzes and choppers, were present in lower densities (Figure 15.10). Grinding slabs were better represented than in any other component (Figure 15.11). Core reduction and biface manufacturing are both characteristic of the upper Leon Creek component (Chapter 10).

Faunal remains occurred in comparatively moderate densities and preservation was better than in most of the components (Table 15.1). Deer and rabbit bones were identified to species and deer-sized bones were common, along with a few teeth fragments. Charred, calcined, and spirally fractured fragments were present. Water turtle, gopher, beaver, and canids (i.e., dog, coyote, and/or wolf) were represented, along with snake and wood rat (Chapter 11). Judging from the number of deer and deer-sized bones, it seems likely that deer provided most of the meat. The relative abundance of projectile points and thin bifaces also attests to the importance of big-game hunting.

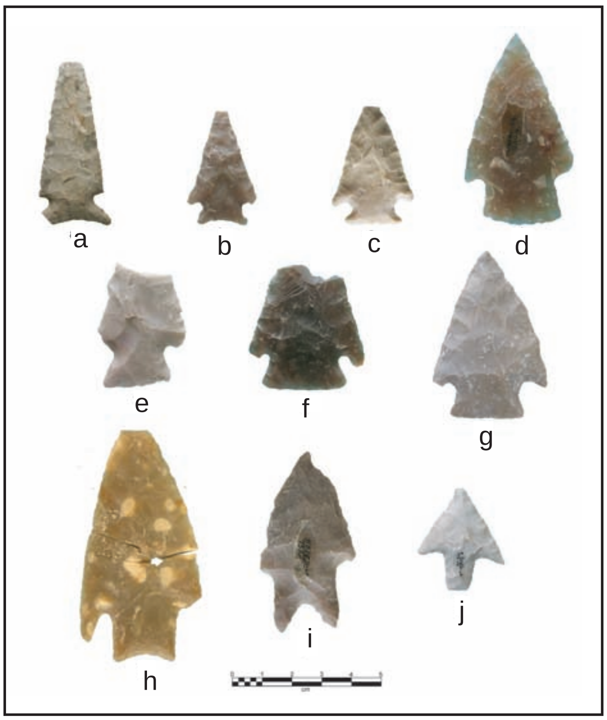


Figure 15.9. Selected projectile points: (a–c) Ensor; (d) Lange; (e–f) Marcos; (g) Marshall; (h–i) Pedernales; (j) Langtry from the upper Leon Creek component, Late Archaic period (ca. 3500–2800 B.P.).

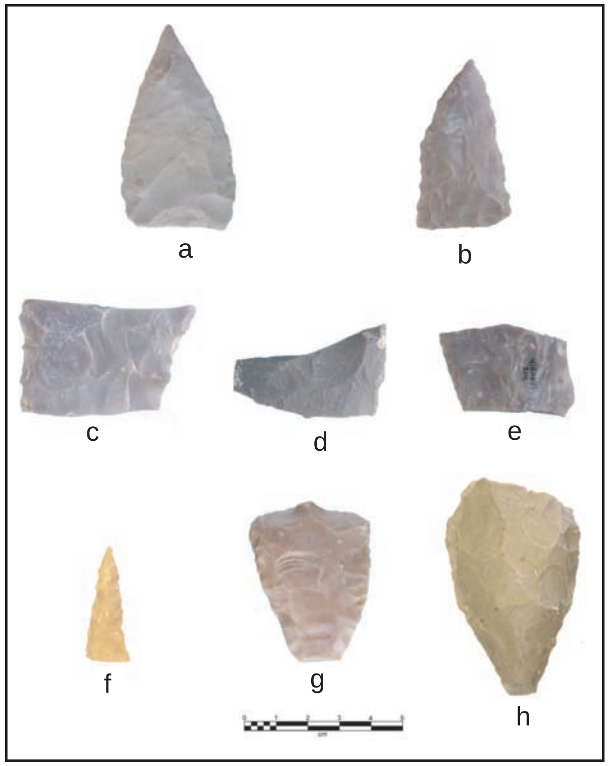


Figure 15.10. Selected artifacts from the upper Leon Creek component, Late Archaic period (ca. 3500–2800 B.P.): (a–e) thin wide blade bifaces; (f) drill fragment; and (g–h) adzing tools.

This component yielded the site's only very large cooking feature, a 2-m-wide, basin-shaped earth oven with a modicum of FCR. Other feature types included remains of small, basin-shaped, rockless cooking facilities, a small, cooking facility with a cook-stone griddle, several FCR concentrations, a mussel-shell lens, and a small oxidized lens, probably a rockless cooking feature (Figure 15.12). With nine features, the density rate was one feature per 11 m^2 (Chapter 13). Density and cluster analyses showed the upper Leon Creek component to be dominated (73%) by units with high densities of FCR that were interpreted as sheet midden deposits and peripheral zones. Only five percent of the units were characteristic of domestic zones, and these tended to cluster around remains of small cooking facilities (Chapter 14).

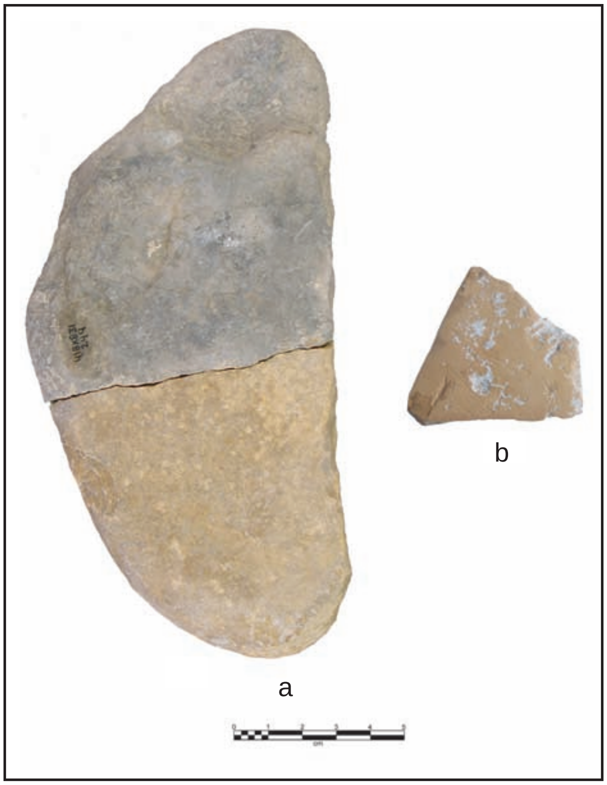


Figure 15.11. Selected artifacts from the upper Leon Creek component, Late Archaic period (ca. 3500–2800 B.P.): (a) grinding slab fragment and (b) hematite fragment.

This component's high density of material and multiple features in three sub-zones characterized by different types of dart points are consistent with the concept of multi-family, short-term encampments (Figure 15.13). In general, hot-rock cooking, arguably including plant foods, is well represented by densely scattered FCR and remains of rock-filled, oven-like features. It seems likely that at least some of the small cooking features would have been inside residential structures. River mussels appear to have been used more intensively than during any other time period. Tool manufacturing, reconditioning, and hunting-related activities are well represented (Chapter 10).

Middle Archaic Period—Lower Leon Creek and Upper Medina Components (lower Block A, upper Block A and Block U, respectively)—4100–4500 B.P.

Climatic conditions for this relatively short time period appear to have been cooler and wetter compared to the several centuries that preceded or followed it. There does appear to have been a short-term, markedly warm episode at the outset of this comparatively cool/wet period. By 4500 B.P., sediment deposition had slowed considerably and substantial soil development occurred in the upper portion of the Medina pedocomplex. Deposition increased rapidly just before 4100 B.P. Flood sediments—parent material for the Leon Creek paleosol—soon buried the underlying Medina soil (Chapters 3, 5–7).

About 60 m^2 were excavated in three areas that dated to this time period. The lower Leon Creek component (upper Block A) is buried in the BC

Figure 15.12. Feature types from the upper Leon Creek component of the Late Archaic period: (a) large, basin-shaped, earth oven (Feature 12); (b) small, griddle-like working feature (Feature 21).

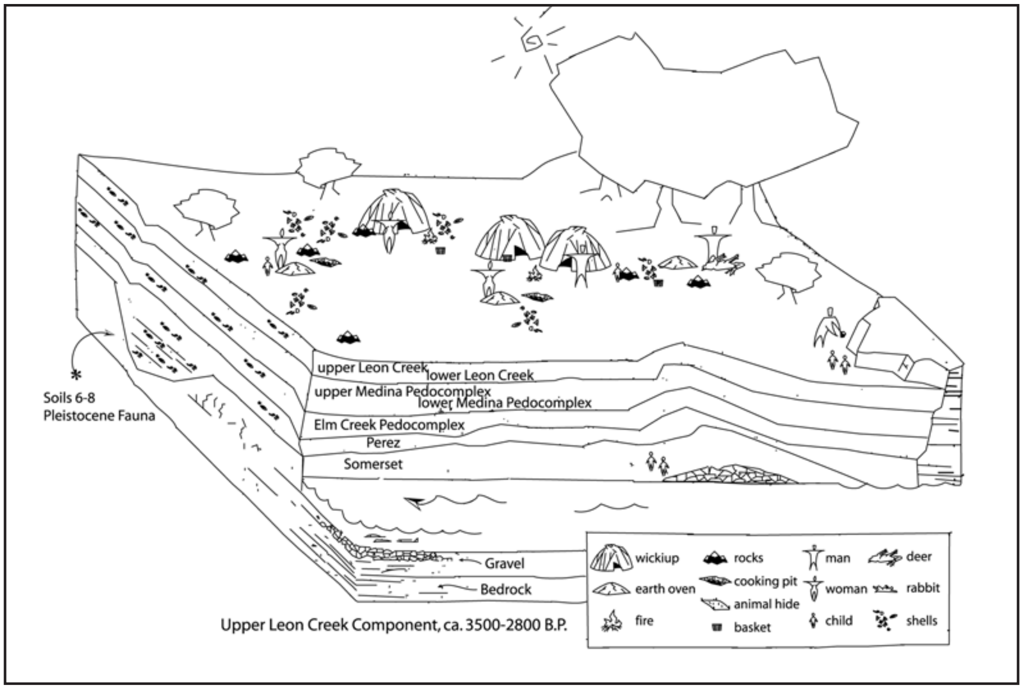


Figure 15.13. Artist's reconstruction of the upper Leon Creek component occupation (Late Archaic, ca. 3100 B.P.).

horizon of the Leon Creek paleosol, about 3.0 m below surface. It immediately overlies the upper Medina component, which is represented by excavations in lower Block A as well as Block U (Chapters 4 and 8). Portions of lower and upper Block A were well preserved (Figure**s** 15.14 and 15.15), whereas Block U was poorly preserved (Figure 15.16). Radiocarbon age estimates were obtained from three stratigraphically distinct deposits: (1) charcoal from a burned tree root that appeared to originate in the BC horizon of the Leon Creek paleosol yielded an estimate of 4135±70 B.P.; (2) charcoal from a tree burn in the lower Block A (ABkb2 horizon of the Medina pedocomplex) yielded an estimate of 4570±70; and (3) isolated charcoal fragments from Block U (ABkb2 horizon

Figure 15.14. The upper Block A excavation area, showing a small, rockless, basin-shaped cooking feature (No. 12) on the buried surface that yielded cultural materials and features assigned to the lower Leon Creek component (upper Block A; Middle Archaic period, ca. 4100 B.P.).

Figure 15.15. The Lower Block A excavation area, showing a mussel shell feature (No. 3) exposed on the surface that yielded cultural materials and features assigned to the upper Medina component (Middle Archaic period, ca. 4500 B.P.).

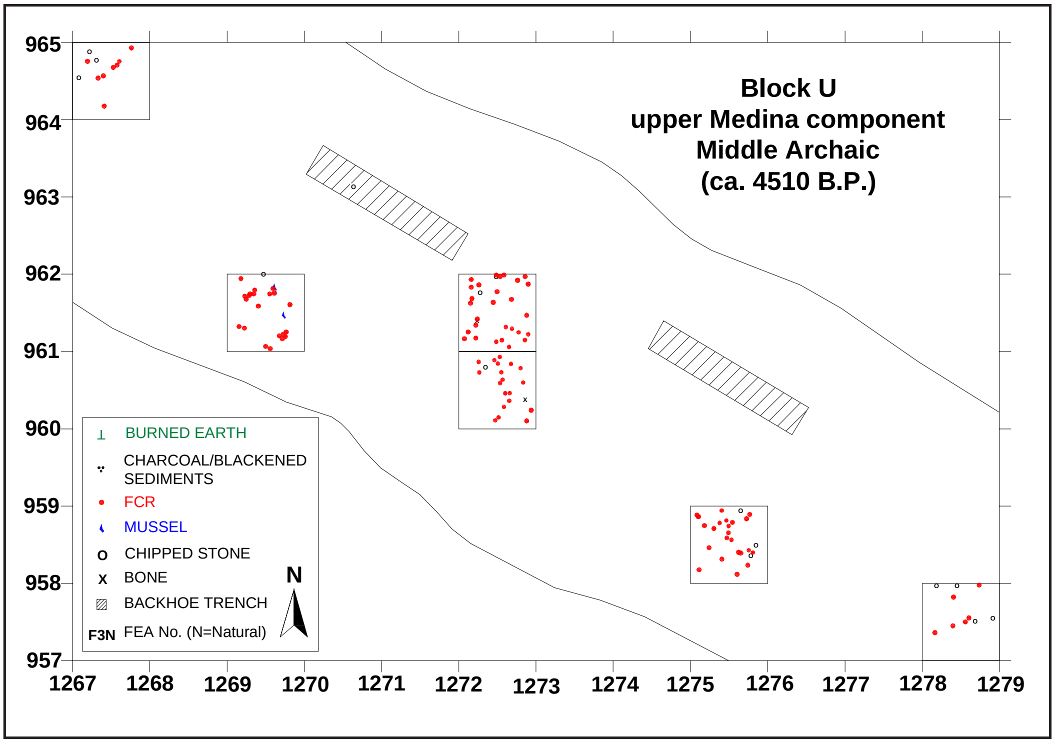


Figure 15.16. The Block U excavation area (upper Medina component), revealed a sheet-midden scatter (No. 115) of primarily FCR (Middle Archaic, ca. 4500 B.P.).

of the Medina pedocomplex) yielded estimates of 4430±50 and 4510±110 (Chapter 4).

Compared to other components, these had low to moderate densities of most artifact types, with the notable exception of a very high chipped-stone debitage density in the upper Medina component in lower Block A (Tables 15.1). Only a few tools were recovered from the three blocks (Chapter 8). Upper Block A (lower Leon Creek component) had the highest proportion of mussel shells; Block U (upper Medina component) had the highest proportion of FCR; and lower Block A (upper Medina component) had the highest proportion of bone fragments (Figure 15.4; Table 15.2).

Projectile points recovered from these blocks and nearby mechanically exposed surfaces of upper Medina pedocomplex include Desmuke and Bell/Andice-like specimens, and a reworked Travis point (Figure 15.17). One Uvalde point, ostensibly an Early Archaic type, was also collected; it had a patina that develops from prolonged exposure to sun and could have been collected elsewhere and brought to the site by one of its Middle Archaic occupants. The Middle Archaic components also yielded a few thin bifaces and adzes (Figure 15.18).

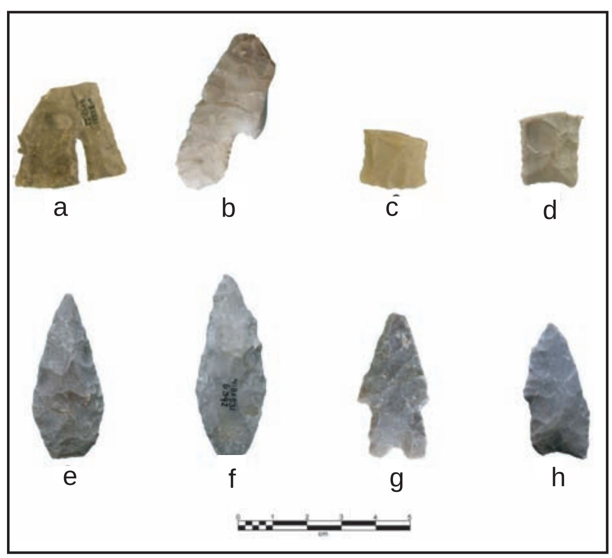


Figure 15.17. Selected artifacts from the upper Medina Component, Middle Archaic period (ca. 4500 B.P.): (a–b) Bell/Andice points and (c–d) stems thereof; (e–f) Desmuke points; (g) Uvalde point; and (h) Travis point.

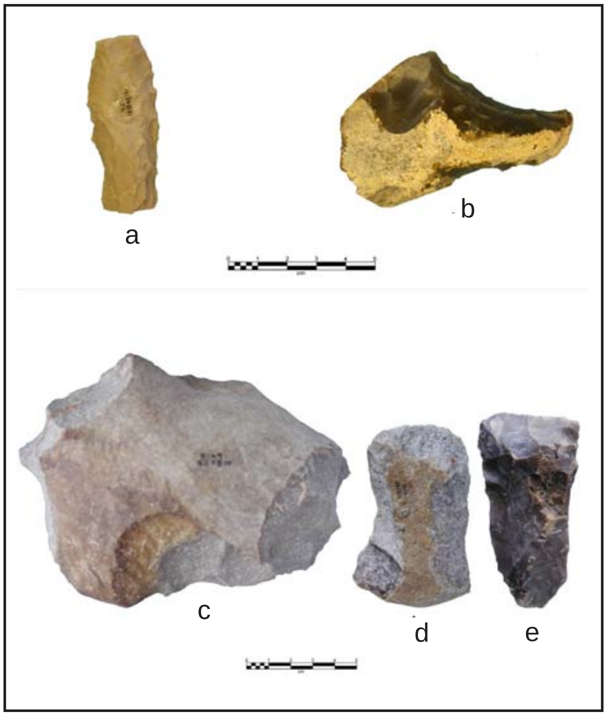


Figure 15.18. Selected artifacts from the upper Medina Component, Middle Archaic period (ca. 4500 B.P.): (a) lenticular biface; (b) thick uniface; (c) hafted cobble tool; and (d–e) adzing tools.

Figure 15.19. FCR feature, probably the remains of a small, griddle-like cooking feature, on the surface of the spillway trench near Block U in the uppermost Bk horizon of the Medina pedocomplex which encased cultural materials and features assigned to the upper Medina component (Middle Archaic period, ca. 4500 B.P.).

Block U had an unusually high debitage-to-core ratio. Overall, there is considerably less evidence for biface reduction in the Middle Archaic assemblage than there is for the late, Early Archaic component that preceded it or the Late Archaic component that followed (Chapter 10).

The sample of faunal remains from the Middle Archaic components is small. Charred, calcined, and spirally fractured deer- and rabbit-sized bones are present, along with a few small rodent bones (Chapter 11). Here too, it seems likely that deer provided the bulk of the meat diet. Moreover, the relative abundance of projectile points and thin bifaces, attest to the importance of big-game animals.

Feature types included small, basin-shaped, rockless hearths, a small, basin-shaped hearth with a cook-stone griddle, small FCR concentrations, small rockless hearths, a chipped stone concentration, and a mussel shell concentration (Figure 15.14–15, 15.19). The small cooking features tended to be well preserved and to contain the same kinds of artifacts as did the identified domestic and peripheral zones. Several of these cooking features were within identified domestic zones (Chapter 13) and it is possible they were built within residential structures.

Based on density and cluster analyses, upper Block A (lower Leon Creek component) is quite diverse, with 9 of 10 clusters represented. This diversity is interpreted as representative of peripheral areas where mussel shell processing and hot-rock cooking occurred. For lower Block A (upper Medina component) artifact densities were lower and characteristic of domestic zones. Block U resembled upper Block A in that excavation units were classified as peripheral zones but, in this case, hot-rock cooking was better represented than in any of other Middle Archaic deposits (Chapter 14).

The lower Leon Creek component likely represents remains of short-term family encampments that spanned a decade or so (Figure 15.20). Considerably more time may be represented in the upper Median components that are encased in well-developed Bk horizons. Cooking activities are represented by small features, most with little or no FCR and by remains of an earth oven with considerably more cook stone. The comparatively high density of scattered FCR in Block U is also suggestive of earth-oven cooking. Manufacturing and reconditioning stone tools was comparatively important in one of the upper Medina components (lower Block A; Chapter 10). River mussel usage was comparatively high in the lower Leon Creek component (upper Block A).

Late, Early Archaic period—lower Medina Component (Block G)—ca. 6900 B.P.

This period falls within the long Altithermal, which was interrupted by comparatively cool conditions between about 8000 and 7000 B.P. and peaked about 5,000 radiocarbon years ago. Rates of sediment deposition were especially rapid during this long drying trend, with as much as 4 m of alluvium accumulating between about 7300 and 5000 B.P. Deposition rates were highest at the outset of this period, as evidenced by still-stratified sediments in the lowermost part of the Medina pedocomplex (Chapters 3, 5–7).

Some 230 m^2 were excavated within several sub-blocks of the Block G area, approximately 6.5 m below surface (Figure 15.21). All of the sub-blocks were in the 3Bk3 horizon of the Medina pedocomplex, immediately overlying the BC horizon (Chapters 3 and 4). This is the site's best-preserved component. There is ample evidence, however, for bioturbation, primarily from tree-burns on the occupation surface and tree roots that later grew through the deposits (Figure 15.21).

Compared to other components, the lower Medina yielded high densities and proportions of chipped stone debitage and mussel shells. It produced the second highest density of bone fragments. FCR density was lowest of all the major components (Tables 15.1 and 15.2; Figure 15.4). This component is well-dated to ca. 6900 B.P. by five radiocarbon ages on wood charcoal from features and a tree burn that appeared to originate from the same

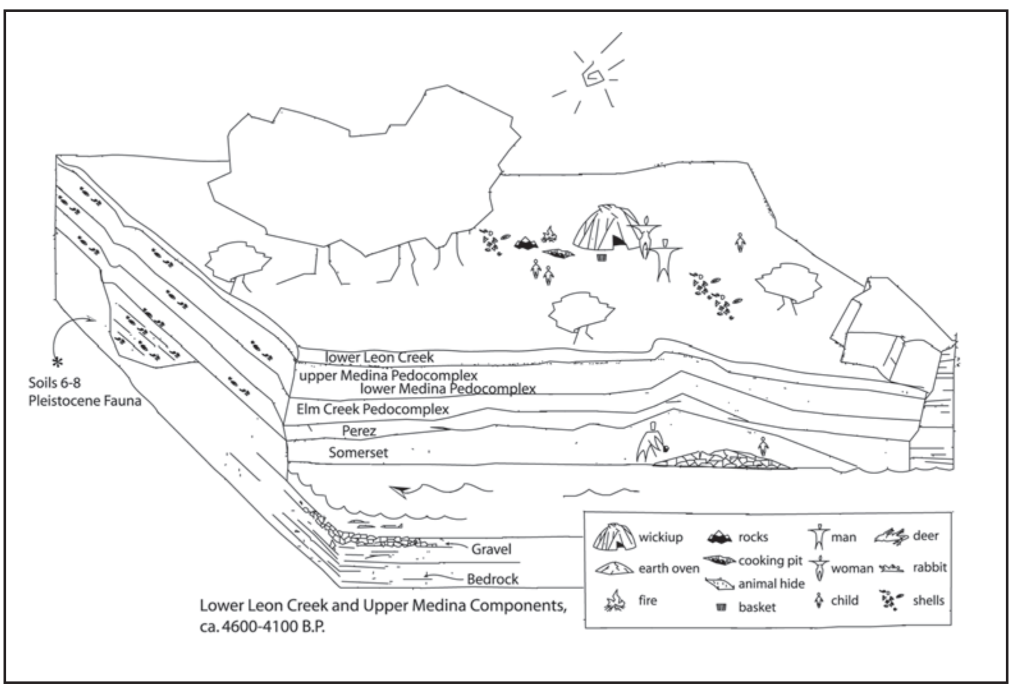


Figure 15.20. Artist's reconstruction of a Middle Archaic occupation (lower Leon Creek and upper Medina components, ca. 4100–4500 B.P.).

Figure 15.21. A portion of the Block G excavation area showing the distribution of artifacts and feature outlines, as designated by pieces of flagging tape, on the target surface that contained cultural materials and features assigned to the lower Medina component at the Richard Beene site (middle, late, Early Archaic period, ca. 6900 B.P.)

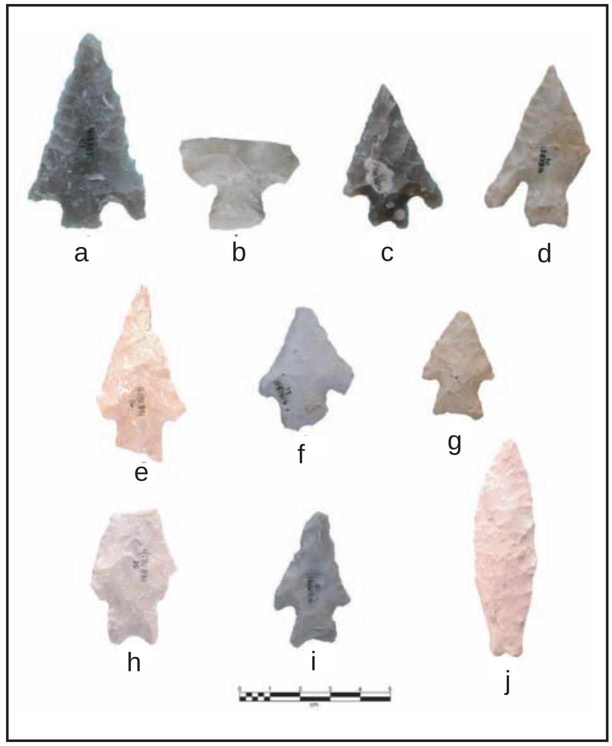


Figure 15.22. Selected artifacts from the lower Medina component, late, Early Archaic period (ca. 6900 B.P.): (a–b) stemmed, corner-notched, straight-based points, Martindale/Bandy-like; (c–i) stemmed, corner-notched; (h) Baker points; (j) lanceolate specimen, Pandale-like or heavily reworked, stemmed point.

surface as the features. Almost all of the projectile points were stemmed and barbed types with indented-bases, including Bandy, Baker, Martindale, and Uvalde (Figure 15.22). Many of the points were reworked and often exhibited beveled edges and incurvate blades. Other tools included preforms, thin biface fragments, a drill tip, and several thick bifaces, including a Clear Fork tool (Figure 15.23). Small burin blades and cores were also recovered. Overall, the late, Early Archaic assemblage has a greater diversity of artifacts than the Middle Archaic assemblage but less than the early, Early Archaic assemblage. The flake-to-core ratio was highest of all components and small, interior flakes were unusually common, suggesting that biface manufacturing and reconditioning may have been considerably more important than during other periods (Chapter 10).

Deer and deer-sized bones were well represented and several long-bone fragments exhibited spiral fractures characteristic of green bone. The only definite pronghorn remains, a single toe bone, came from this component as well. Rabbit bones were unusually common, including one small bone tool made from a radius. Turtles, hard- and soft-shell, were common as well. Other identified vertebrate fauna include fish, snake, squirrel, gopher, rat, porcupine, and canid. Many bone fragments were charred or calcined (Chapter 11). Here, too, it seems likely that deer provided the bulk of the meat diet. In any event, projectile points and thin bifaces were common.

As with other components, small cooking features outnumbered large ones. Those in this com-

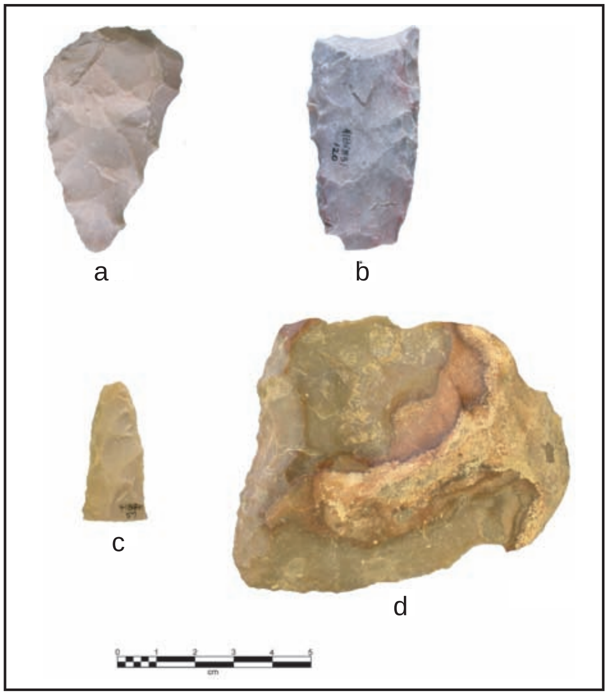


Figure 15.23. Selected artifacts: (a–b) adzing tools; (c) drill fragment; and (d) thick uniface from the lower Medina component, late, Early Archaic period (ca. 6900 B.P.).

ponent were especially well persevered and, as such, some of them were "type features" for the site (Chapter 13). Feature types included small (>.6 m diameter), basin-shaped, shallow, rockless pits (i.e., hearths), small, basin-shaped pits with FCR (i.e., hearths with an inset cook-stone griddle), a large (ca. 1 m diameter) oven-like feature with a rock heating element, FCR concentrations of undetermined function (2 small, 1 large), mussel shell concentrations, a large sheet midden, and oxidized areas (7 small, 1 large), possibly surface hearths or rockless ovens (Figure 15.24). Feature density was especially high in this component, with one feature per 6.9 m^2.

Density and cluster analyses identified proportionately more domestic zone units than in any other component, and most of these were areas with low artifact densities that contained small cooking features. Peripheral zones with varying quantities of artifacts and a diversity of features, including a sheet midden with superimposed small cooking features, were widespread and accounted for most of the occupation area (Chapter 14).

Spatial distributions of artifacts and features in this block are consistent with the presence of multiple residential structures and provide the best evidence at the site for temporary, family-sized (ca. 3–6 m diameter) lodges or huts similar to those described by Cabeza de Vaca and later-day Spanish and French travelers (Foster 1995; Foster 1998; Krieger 2002). Areas with fairly high density scatters of non-featured mussel shells, chipped stone, and bone were somewhat spatially separate, suggesting discrete activity areas or perhaps dumping grounds that were less used than those designated as sheet middens.

The lower Medina component most clearly represents remains of short-term, multiple-family encampments (Figure 15.25). Judging from its well preserved character, a paucity of overlapping cooking features, and considering that the vast majority of artifacts and features were confined to a lens not much more than 15 cm thick, this area was probably occupied intermittently for no more than a few decades before the encampment remains were buried beyond the usual reach of pedoturbation.

Cooking activities are well represented by small hearths, some of which are likely to have been inside residential structures. A few larger, outdoor-sized cooking features were present as well. River mussels were consumed in relatively high numbers as were rabbits and turtles. Deer were probably the primary big game animal, although pronghorn were hunted. Final manufacturing and reconditioning stone tools were important activities. Uncharacteristically of the site as a whole, all stages of projectile-point manufacturing were represented in the late, Early Archaic component (Chapter 10).

Middle, Early Archaic Period Occupations—Elm Creek Components (Blocks, I, K, M, O, and P)—ca. 7300–8300 B.P.

Climatic conditions appear to have fluctuated considerably during this time period, but overall it was cooler and probably wetter than the centuries that preceded or followed it. Rates of sediment deposition were rapid, albeit sufficiently punctuated to allow for comparatively moderate soil development. From 8500 B.P. or so until about 7500 B.P., as much

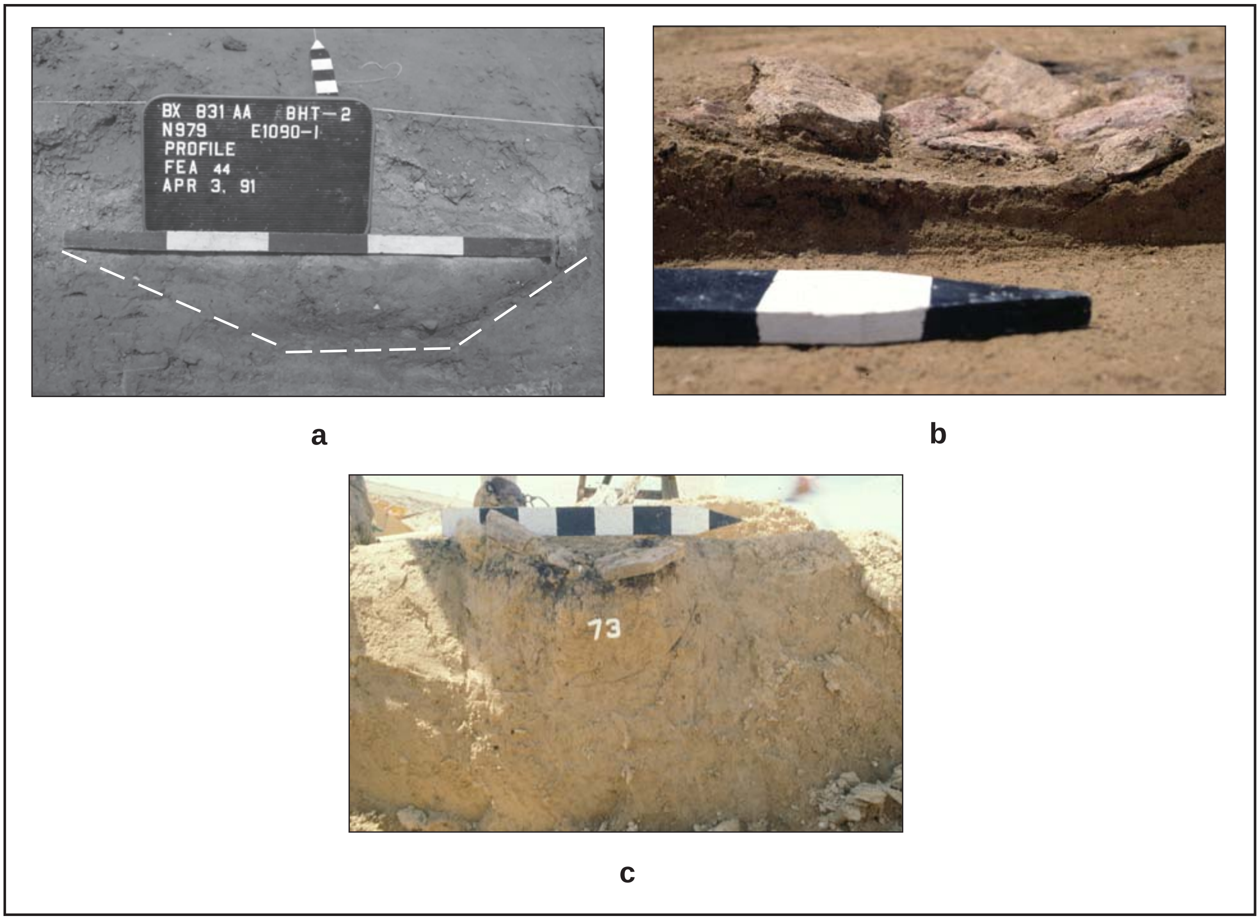


Figure 15.24. Feature types from the lower Medina component of the late, Early Archaic period: (a) small, rockless cooking feature (No. 44); (b–c) small, cooking features with cook stone griddle (Nos. 72 and 73, respectively).

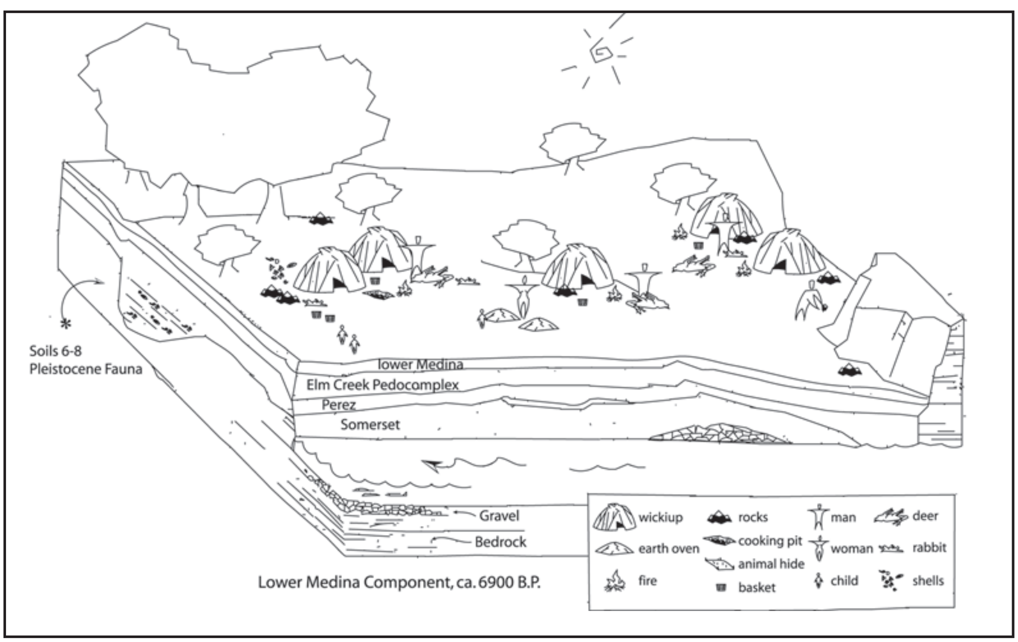


Figure 15.25 Artist's reconstruction of the lower Medina component (late, Early Archaic period, ca. 6900 B.P.).

as two meters of fine-grain alluvium accumulated. Deposition was especially rapid when the Perez paleosol was buried sometime soon after 8600 B.P. (Chapters 3, 5–7).

Only 28 m^2 were excavated within several blocks comprising the Elm Creek components. Three small areas (O, K, and M) were excavated to salvage features exposed by pan scrapers. Block P (4 m^2) was excavated through the paleosol, which extend from about 7.7 to 9 m below surface. Block I (15 m^2) was opened and partially excavated. Only a few artifacts were recovered before it was flooded and destroyed (Figure 15.26). In general, the excavated areas had a lower artifact density than did the other occupation surfaces/zones (Chapters 3 and 4).

Compared to other components, several of the Elm Creek blocks yielded very high densities of FCR, but almost all of the rocks came from features. Wood charcoal from three isolated earth ovens yielded radiocarbon age estimates of ca. 8080 B.P. (Block K), 7910 B.P. and 7740 B.P. (Block M), and 7645 B.P. (Block O). Several stone tools (Figure 15.27), including edge-modified flakes, a thin-biface fragment, a Clear Fork tool, and a possible bola stone were recovered along with ubiquitous mussel shells and a few bone fragments too small and weathered to be identified. A tabular sandstone grinding slab was recovered from an exposure of

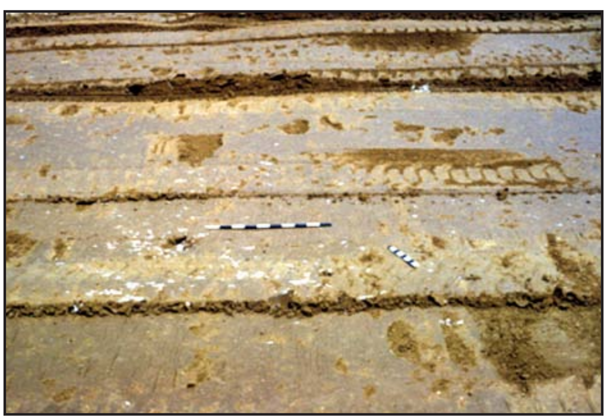


Figure 15.26. The Block I excavation area, as it was first seen following its exposure by pan scrapers; cultural materials on this surface, including this mussel shell concentration, were assigned to the Elm Creek component (middle, Early Archaic period, ca. 7800–7200 B.P.).

Figure 15.27. Selected artifacts: (a) bola stone and (b) adze, from the Elm Creek component, middle, Early Archaic period (ca. 7800–7200 B.P.).

the Elm Creek paleosol in a backhoe trench and two stone axes were found on exposures of the paleosol in the spillway trench (Figure 15.28).

Feature types included a large, basin-shaped pit with carbon-stained sediment and FCR (probably an earth oven), two large (ca. 1 m diameter), flat-bottomed earth ovens with rock heating elements that contained large and small pieces of sandstone (Figure 15.29). The flat-bottomed features were

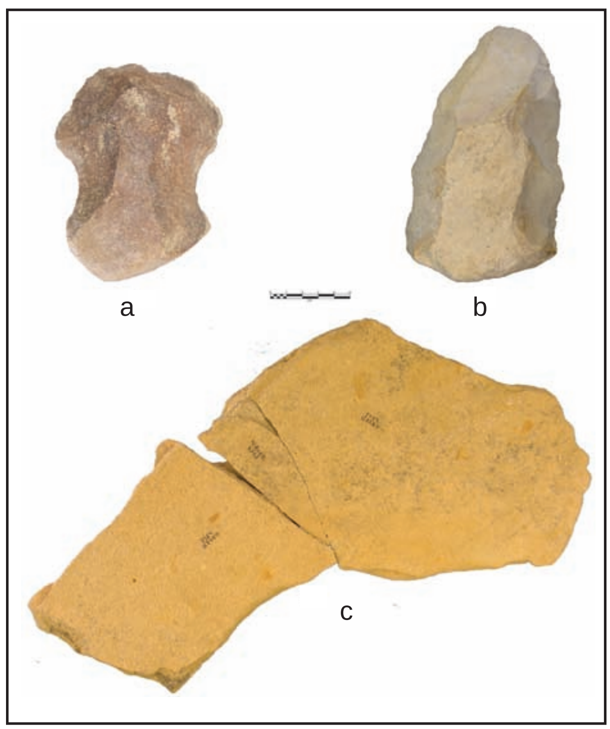
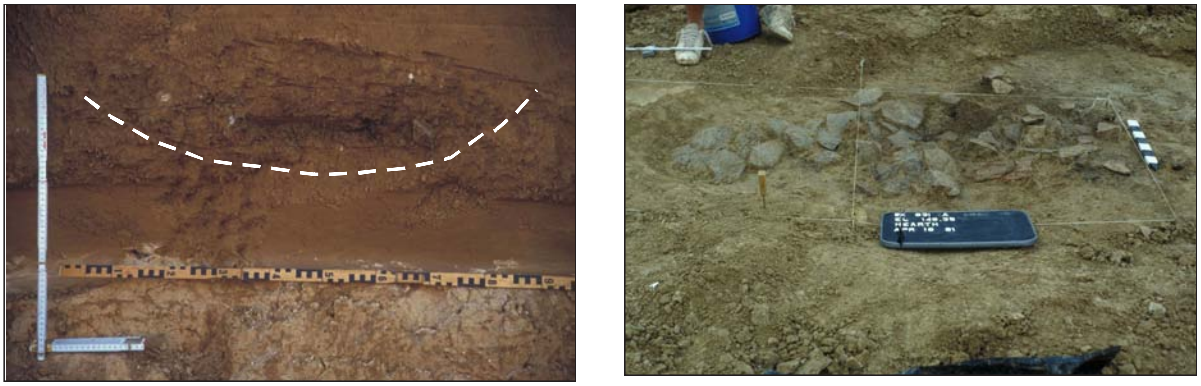


Figure 15.28. Selected artifacts: (a–b) axes and (c) tabular sandstone from the Elm Creek component, middle, Early Archaic (ca. 8500–7500 B.P.).



a b

Figure 15.29. Feature types from the Elm Creek components (middle, Early Archaic period, ca. 8080–7640 B.P.): (a) earth oven with carbon-stained sediments and FCR (Block O), ca. 7645 B.P.; and (b) heating element in a large platform oven (Block M), ca. 7800 B.P.

probably built on the surface, such that their heating elements were "platforms" covered with earth when the oven was sealed (Chapter 13). These were the best preserved earth ovens at the site and, as such, they served as "type features" for interpreting remains of other oven-like FCR concentrations.

The Elm Creek components appear to represent sporadic, short-term encampments occupied by a few families at most. Construction and use of relatively large earth ovens with rock heating elements is especially well represented (Figure 15.30). Judging from the isolated nature of identified features

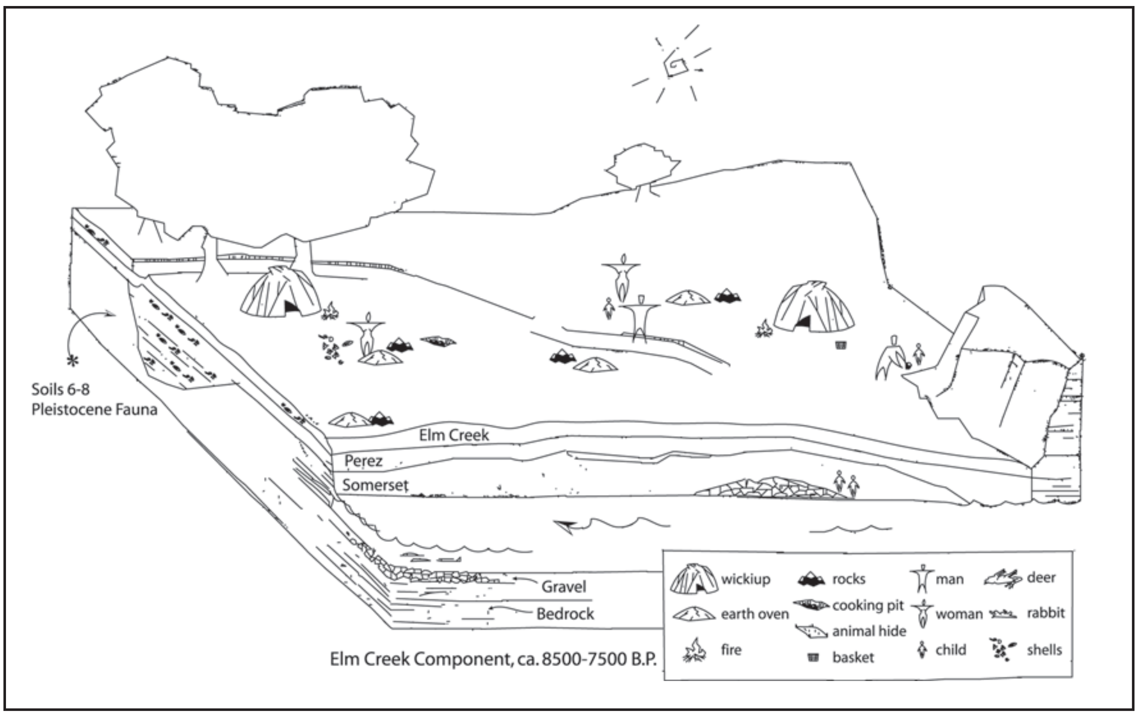


Figure 15.30. Artist's reconstruction of an Elm Creek component occupation (middle, Early Archaic period, ca. 7800 B.P.).

and the low artifact densities and diversity overall, it seems likely that use of the site area during Middle Archaic times was by fewer people for a limited range of activities.

Early, Early Archaic Period—Upper Perez Component (Blocks H, J, T, N, Q)—ca. 8600–8800 B.P.

This period post-dates the well-known Younger Dryas period, which was the most prominent cooling period of the last 10,000 years, and it coincides with the onset to of the Altithermal. Rates of sediment deposition were steady, but comparatively slow, which resulted in the thick, cumulic profile that characterizes the Perez paleosol (Chapters 3, 5–7). Radiocarbon ages of 8640±60 B.P. and 8805±75 B.P. were obtained on wood charcoal from sheet middens in Block T. A charred nut hull from artifact bearing sediments in Block N yielded an age estimate of 8810±60 B.P. Insofar as age estimates on soil bulk carbon in Blocks H and T overlapped, the charcoal ages from Block T are considered applicable to Block H as well (Chapter 4).

Some 240 m^2 were excavated between about 9 and 12 m below surface in three large blocks (H, T, and N) and one small block (Block Q). All of the large blocks were excavated in the Bk horizon of the Perez paleosol. Block Q was the deepest excavation area with artifacts. It was exposed by pan scrapers in what appeared to be a flood scoured area, possibly the C horizon of the Perez paleosol; it did not contain temporally diagnostic artifacts. The other blocks comprising the Perez component were also impacted by flood scouring to one degree or another, with Block H being most effected and Block N least effected (Figures 15.31–15.34). These blocks yielded the highest densities of stream-worn pebbles, and had more artifacts in vertical angles of repose than did the other components (Chapters 4 and 13). Argilliturbation was evident in all of the upper Perez excavation areas. “Block” J was used in reference to exposures of the upper Perez paleosol created by pan scrapers working in the spillway trench. Numerous artifacts, including Angostura points, Lerma bifaces, and Clear Fork tools, were surface-collected from those exposures.

Each of the blocks representing this component has decidedly different artifact densities and pro-

Figure 15.31. The Block H area as excavation was winding down, showing the exposed zones that were assigned to the Perez components (early, Early Archaic period, ca. 8800–8600 B.P.)

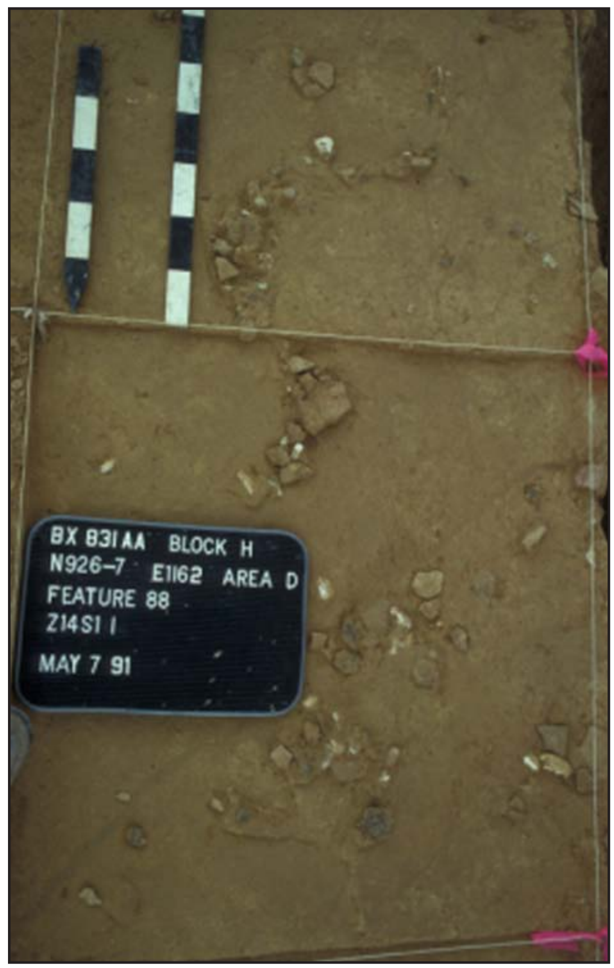


Figure 15.32. Close-up view of Feature 88, one of several lag deposited features exposed in a zone assigned to the Perez components (early, Early Archaic period, ca. 8800–8600 B.P.)

Figure 15.33. Close-up view of a comparatively well-preserved FCR feature (No. 107) in Block T within the zone assigned to the Perez component (early, Early Archaic period, ca. 8800–8600 B.P).

Figure 15.34. The Block N excavation area, which was unusually artifact poor and did not contain any features; it was assigned to the Perez components (early, Early Archaic period, ca. 8800–8600 B.P.).

portions (Tables 15.1 and 15.2; and Figure 15.4). FCR densities were high in Blocks H and T; debitage densities were moderate. Mussel shell density was high in Block H, moderate in Block T, and low in Block N. As a whole, the Perez tool assemblage was more diverse than the other components (Figures 15.35–15.38). Beaked, graver-like tools were especially common, as were thick bifaces, blades, large burin spalls, and a wide variety of edge-modified items. Biface densities were similar to the other components. Lerma bifaces and Angostura points occurred only in the Perez component. Almost all the projectile points were Angostura types, most of which were represented by proximal ends. Some of the Angostura points were reworked into drills. Core reduction and the manufacture of flake tools were well represented. Biface manufacturing was poorly represented. Clear Fork tools, along with a variety of beaked and notched edge-modified tools, and perhaps burins, indicate that woodworking was important as well (Chapter 10).

Faunal remains, other than mussel shells, were scant. Bone fragments from Block H were small and rounded, whereas those from Block T were somewhat larger and significantly less rounded. Bock N contained only a few highly weathered fragments. Deer- and rabbit-sized animals were comparatively well-represented (Chapter 11). Here too, it seems likely that deer provided the bulk of the meat diet.

Feature types included mainly amorphous FCR concentrations. Sheet midden areas were identified only in Block T, which also had the best-preserved FCR feature (Figure 15.33). Large pieces of FCR were especially common in Block H. Features were not found in Block N. Two FCR concentrations in Block H were interpreted as "lagged" remains of earth ovens similar to the well-preserved heating elements in the Elm Creek components. Four small FCR concentrations were identified in Block H. A few of these probably represent small cooking fea-

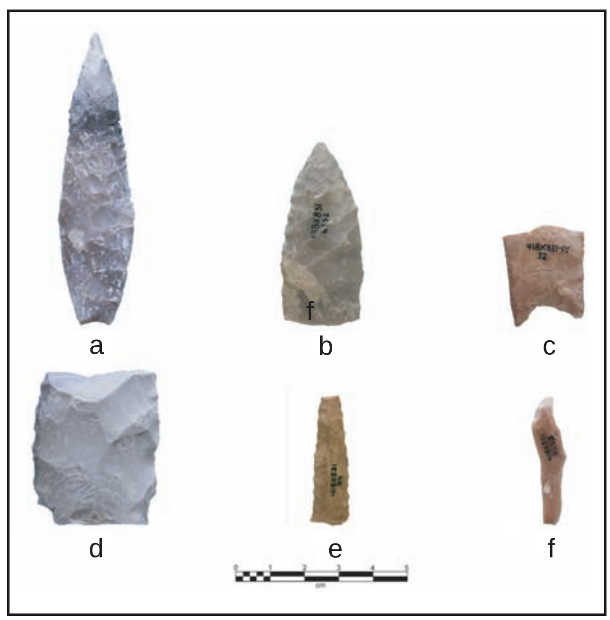


Figure 15.35. Selected artifacts from the Perez component (Block T), early, Early Archaic period (ca. 8800–8600 B.P.): (a–b) Angostura points; (c) Plainview-like point; (d) adze; (e) drill; and (f) burin spall.

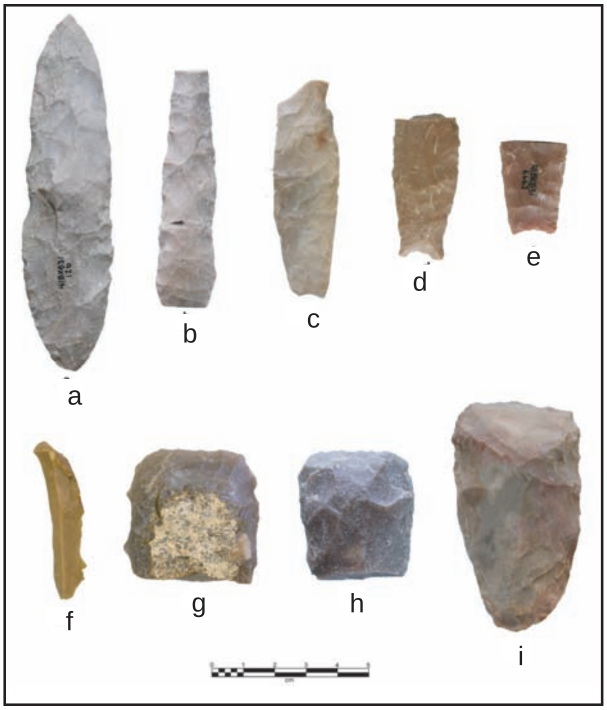


Figure 15.36. Selected artifacts from the Perez component (Blocks J, N and Q), early, Early Archaic period (ca. 8800–8600 B.P.): (a) Lerma point (b) preform; (c–e) Angostura points; (f) blade; (g) thick uniface; and (h–i) adzes.

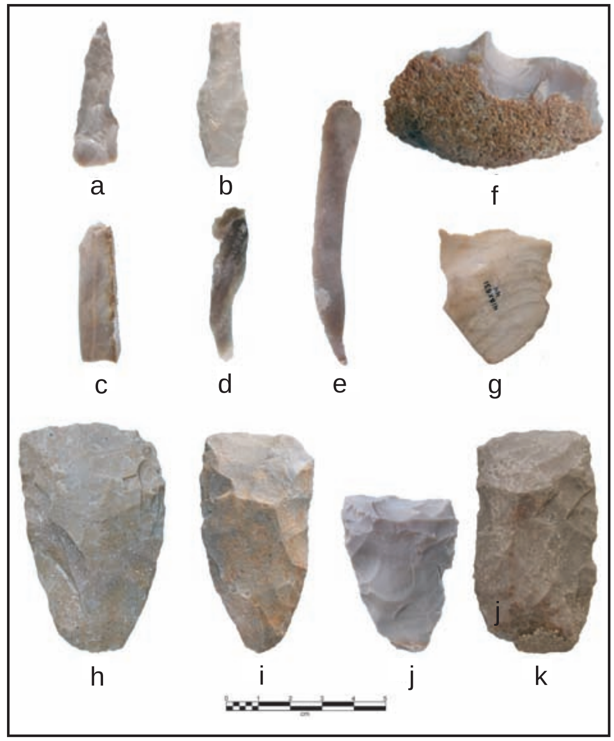


Figure 15.37. Selected artifacts from the Perez component (Block H), early, Early Archaic period (ca. 8800–8600 B.P.): (a–b) drills, (c) blade; (d–e) burin spalls; (f–g) gravers; and (h–k) adzes.

tures, as does one in Block T (Figure 15.33) but most are likely to be fortuitous lag deposits (Figure 15.39). With a total of 22 features in more than 60 m^3 of excavated sediments, the feature density is only 0.4 per m^3, which is low compared to most other components (Chapter 13).

Although Block H was heavily affected by flood scouring, there were nonetheless areas with substantially lower artifact densities that were identified as domestic zones. Block T, while less affected by floods, did not have house-size areas with relatively low artifact densities, although the density and cluster analyses identified eight percent of the excavation units as likely domestic zones. In general, units with high densities of FCR were near the larger FCR concentrations or within sheet middens that contained high densities of chipped stone and mussel shells (Chapter 14).

As with the other components, those encased in the upper Perez paleosol appear to represents remains of short-term, multi-family encampments (Figure 15.40). Block H may well represent more occupations than the other blocks, but because it

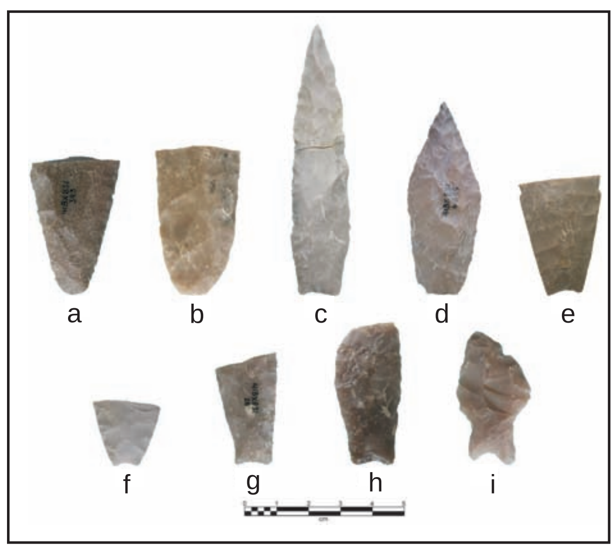


Figure 15.38. Selected artifacts from the Perez component (Block H), early, Early Archaic period (ca. 8800–8600 B.P.): (a–b) Lerma bases; (c h) Angostura points; and (i) stemmed point.

Figure 15.39. Feature types from the Perez components of the early, Early Archaic period, ca. 8800–8600 B.P.: (a) large, fire-cracked rock "lagged" feature in Block H (Feature 83); (b) small, fire-cracked rock "lagged" feature in Block H (Feature 87).

was also most affected by flood scouring; it is not possible to determine just how much time is represented. Block T is better preserved. Judging from rates of sediment deposition, as determined by radiocarbon ages on a vertical series of sediment samples (Figure 4.8), Block T's excavated archaeological deposit represents several decades, though perhaps not more than a century. Construction and use of earth ovens with rock heating elements as well as small cooking facilities is well represented in Blocks H and T, but hardly at all in Block N. The overall tool assemblage is representative of woodworking, bone-working, butchering, hide processing, gearing up for hunting forays and manufacturing expedient tools.

Discussion

As originally developed, the research design for the Applewhite Reservoir archaeological project focused on relating temporal changes in site structure and mobility strategies to environmental changes (Carlson 2008). Carlson et al. (1990) identified numerous research topics and questions that could potentially be addressed with information gleaned from excavation and analysis of the deeply stratified Richard Beene site. These questions, also listed in Chapter 1, are addressed in the following subsections by drawing primarily from information in the foregoing chapters.

Climatic Change

What was the nature of the environment (climate, flora, fauna, etc.)? The Medina River always flowed in proximity to the Richard Beene site. The site's setting is broadly ecotonal, along boundaries between comparatively wet and dry regions, as well as between relatively forested areas and grasslands. Its climate is subhumid and subtropical (Chapter 2). Although the site lies within the northern tier of the Tamaulipan biotic province, its riverine setting probably provided habit for plants and animals more typical of the Texan biotic province. Accordingly, the flora and fauna may have been more characteristic of today's Post Oak Savannah and the continent's eastern woodlands than they were of the drier South Texas brush country.

What local environmental resources (meso-environment and micro-environment) were available for human exploitation? Prickly pear patches were probably widespread on the higher terraces. Pecan groves and greenbrier thickets with starch-rich roots should have been a common component of the riverine landscape. Locally available fauna included white-tailed deer, rabbits, river mussels, turtles, and fish. Throughout the Holocene, the bottomland setting was one of riparian vegetation along the river's margins and open savannah, with varying amounts of arboreal coverage, on the surrounding floodplain (Chapters 2, 3, 5–7, 11, 12). The savannah areas likely provided an abundance of root foods, prob-

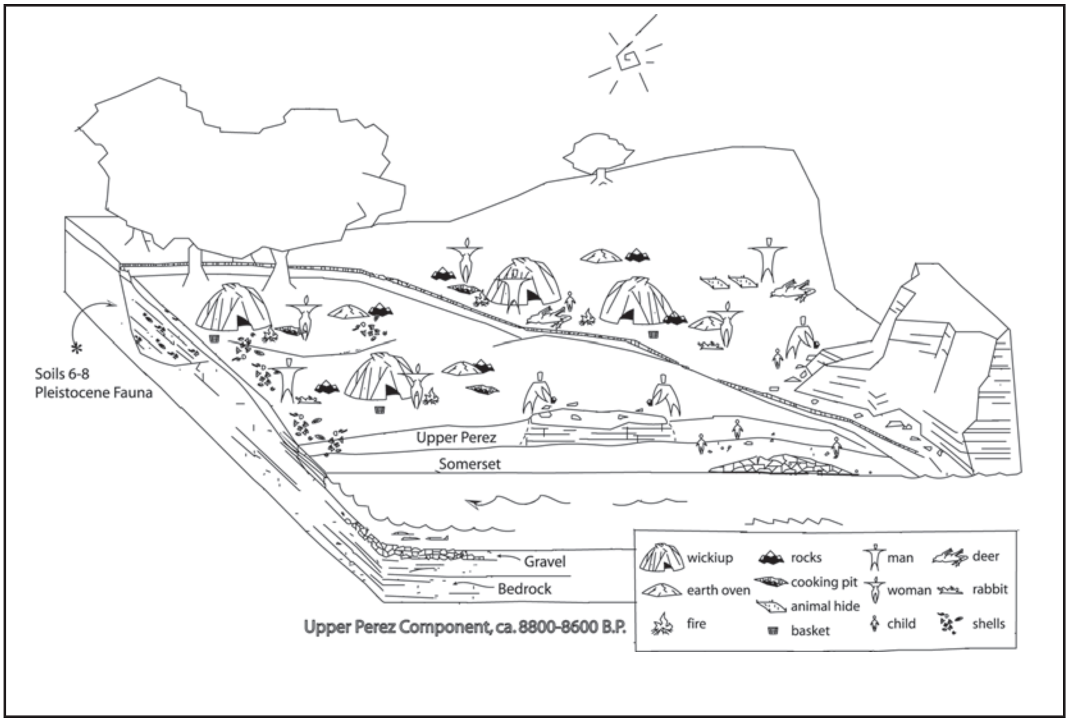


Figure 15.40. Artist's reconstruction of the Perez component (early, Early Archaic period, ca. 8700 B.P.).

ably including onions, false garlic, winecup, and thick leaf yucca; plants common there today.

Was the climate stable or changing and, if changing, does it represent a sufficiently major change that could have affected prehistoric adaptation patterns? Environmental conditions, including temperature, precipitation, rate of sediment deposition, arboreal coverage, and relative percentages of land snail species, changed moderately through the millennia. Compared to today's patterns, overall climatic conditions fluctuated between somewhat wetter/cooler to markedly drier/warmer (Chapters 3, 5–7). These changes are well expressed in a series of buried soils and pedocomplexes spanning approximately 10,000 calendar years (Chapter 3). Nonetheless, the basic structure of potentially important and locally available resources probably remained fairly stable, as did local land-use patterns.

Do the changes in environment appear to correlate with suggested changes in subsistence and settlement patterns derived from the archeological record that have been assigned to various cultural periods (such as phases)? At the Richard Beene site, there is ample evidence for climatic change as well as for changes in the manner in which the site was used through time. It is not clear, however, just how or even whether changes in site usage might be attributed to climatic change. Available data point to disjunctions between inferred trends in climatic conditions and differences in encampment activities as indicated by variation in relative and absolute artifact densities (Table 15.1; Figures 15.4 and 15.41). Comparatively high proportions of FCR, mussel shells, and chipped-stone debitage occur during the warmest and coolest of times, as do comparatively low densities of these artifact categories. This kind of variation, which arguably suggests differences in the magnitude of diverse subsistence activities, may result from occupations during different seasons. The dynamics of long-term population growth probably played key roles as well in shaping adaptive strategies. Although the relative contributions of plant foods, game animals, mussels and fish to the diets of the site's inhabitants varied through time, it does not follow that such patterns were necessarily caused by climatic changes per se.

Natural Resources

Were the raw materials used in the manufacture of tools and other objects of local origin or were they imported? More than 90 percent of the chipped

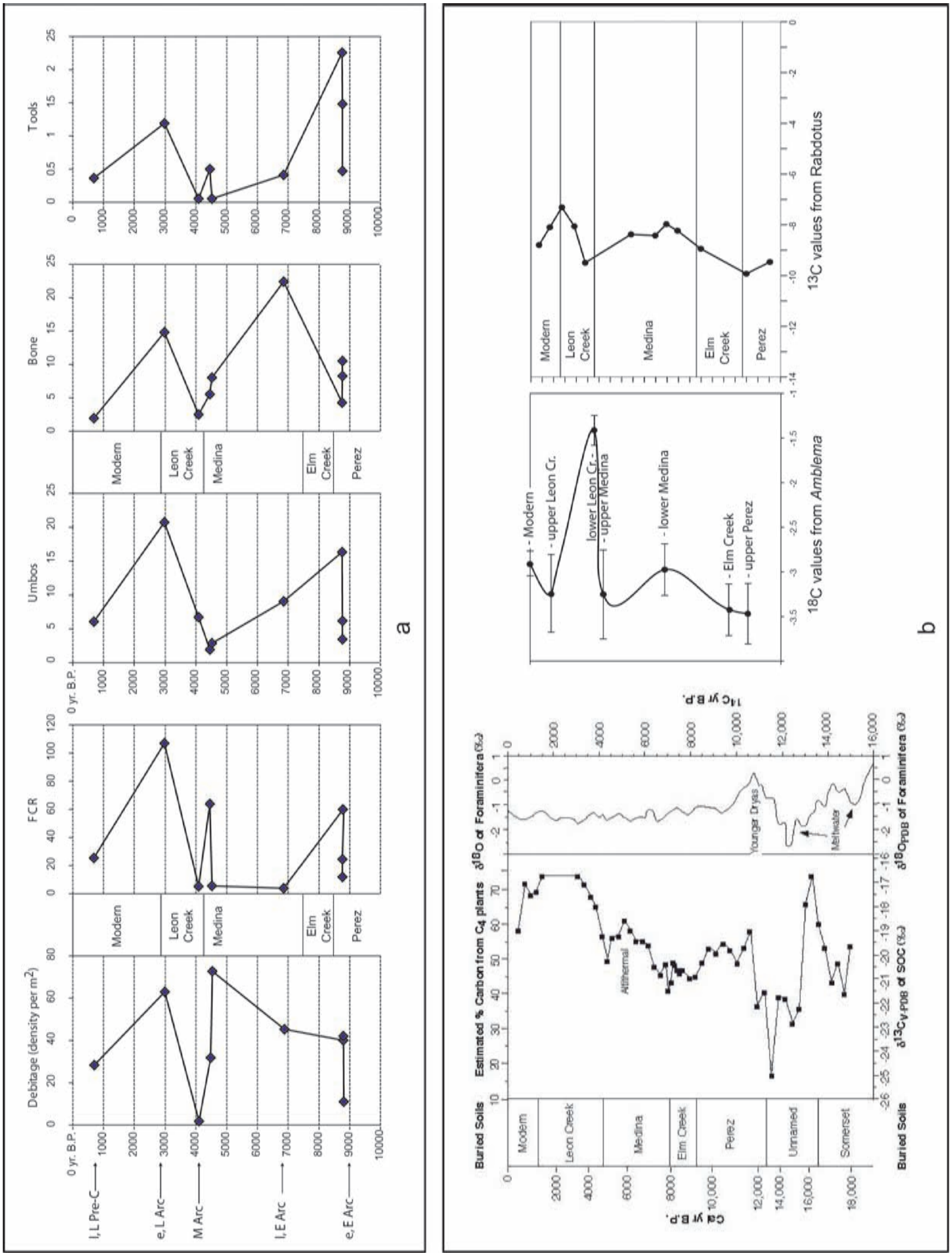


Figure 15.41. Line graphs showing: (a) percentages of artifact as distributed through the major archaeological components/paleosols; and (b) carbon isotope ratios for the paleosols/archaeological components, as derived from sediments, terrestrial snails, and river mussels.

stone debitage from every component appears to have been derived from Edwards chert cobbles identical to those found in gravel bars within 100 m of the site. A single piece of chalcedony and one flake of Georgetown chert are non-local. Several dozen pieces of unidentified chert debitage may represent variation in the types of local Edwards chert cobbles (Chapter 10). In any event, the unidentified specimens do not closely resemble any of the major toolstone types described by Banks (1990). The site's quartzite hammerstones and stone axes are made from cobbles likely to have come from local gravel bars or perhaps exposures of Uvalde gravel in the nearby uplands (Mandel et al. 2008). Limestone nodules used for grinding stones and hammerstones are likely to have originated nearby in Medina River gravel bars as well, given that suitably sized limestone cobbles occur there today.

The overwhelming majority (ca. 98%) of the site's cook stone (i.e., FCR) probably was obtained from nearby sandstone outcrops (Chapter 13). The remainder likely came from local caliche outcrops (i.e., petrocalcic horizon of the Somerset paleosol), which appear to have been used only during the early, early Holocene when on-site outcrops were still exposed (Chapters 9, 13). Raw material for sandstone grinding slabs probably originated from local bedrock outcrops as well.

Was a particular type of lithic raw material utilized in manufacturing projectile points and other tools more than any other type and was this due to greater availability or a preference for the material type because of inherent characteristics? Projectile points and thin bifaces are commonly, but not dominantly, made from what we termed "coffee-colored" chert, a high-quality, glassy, semi-translucent variety of locally available Edwards cobbles. Varieties of tan, high-quality opaque Edwards chert, also available from local gravel bars, were used as well to manufacture many of the site's points and thin bifaces. Chipped stone axes tended to be made from stream-worn quartzite cobbles or coarse-textured (i.e., sugary) opaque Edwards chert, also available locally. Coarse-textured, opaque chert was also the predominant material used to manufacture Clear Fork tools (i.e., adzes). Coarse-grained and coarse-textured raw material tends to be more resistant to heavy-duty chopping tasks than fine-grained or glassy material, which is used routinely for points and thin knives. Insofar as a variety of chert types is readily available in local gravel bars, it seems likely that preference rather than relative availability governed the selection of raw materials for the manufacture of different types of tools (Chapter 10).

Were bison present in the region? Bison may well have been present in the vicinity of the Richard Beene site at many times in the past, as they were in the 18th century, but their remains were not found associated with cultural materials at the site. Fragments of very large mammal bones, probably bison, were recovered from sediments at the Richard Beene dated to more than 11,500 radiocarbon years ago, however, they were not associated with any evidence of human occupation (Chapter 11).

Were pronghorn available (from the adjacent uplands)? Only one pronghorn specimen (*Antilocapra americana*) was identified, but some of the unidentified deer-sized fragments could well be from pronghorns as well. The identified specimen was recovered from the well-preserved, 6,900-year-old lower Medina component (Chapter 11). Pronghorns were not likely to frequent wooded and gullied bottomland around the Richard Beene site. Their natural habitat would have been in the upland grasslands, given their propensities to: (1) inhabit wide-open and expansive terrain; (2) obtain water in non-forested settings; and (3) avoid dense brush, trees, and escarpments that inhibit their mode of high-speed escape from predators (Yoakum 1978:109–110).

Were pecans available in the drainage? Pecan trees (*Carya illinoinensis*) more than a meter in diameter at chest height grow on the floodplain today and they also grow well in substantially warmer/drier as well as cooler/wetter environments (Hall 2000). Given their widespread distribution in Texas today, there can be little doubt that pecans were available in the local bottomlands throughout the last 10,000. One of the Perez components (Block N) at the Richard Beene produced a charred pecan/hickory (*Carya* spp.) hull that yielded a radiocarbon age estimate of ca. 8810 B.P. Pecan/hickory pollen was found in the Leon Creek paleosol (ca.

4100–3100 B.P.). Although pecan and hickory trees are present on the modern floodplain in the immediate vicinity of the site, pecan/hickory pollen was not found in a modern sample of surface sediment from the site area (Chapter 12).

To what extent were deer utilized as compared to other food sources? Poor bone-preservation conditions in general preclude addressing this question in full but, from what the site's meager faunal record indicates, deer (*Odocoileus* spp.) were probably the most important food resource throughout the Holocene epoch. Deer bones were recovered from early and late, Early Archaic and Late Archaic deposits. Remains identified to the "deer/pronghorn" taxon came from Middle Archaic deposits (Chapter 11). Overall, deer-sized bone fragments clearly represent more food than the do remains from the other species, including rabbits and rats, which were well represented.

Plant-food resources were undoubtedly important throughout the Holocene as well, given the ubiquitous presence of FCR features identified as earth oven remains. Many, perhaps most, of these features may have been to cook geophytes (i.e., root foods). In any event, oven-cooked root foods were especially important for all groups with whom Cabeza de Vaca was familiar. The site's archaeological record, however, remains mute in the absence of charred food remains. The inferred importance of geophytes during the prehistoric era stems from the widespread presence of charred bulbs in rock-filled earth ovens and other cooking features at sites in the Post Oak Savannah, Blackland Prairie, and Edwards Plateau where flora preservation conditions are markedly better than at the Richard Beene site (Chapters 2 and 8).

Were mussels and snails used as a food source? River mussel shells are well preserved throughout the archaeological profile and they constitute a significant element of every component investigated at the Richard Beene site. Although ubiquitous, mussel shell density exhibits considerable variation through time. Density figures also vary substantially among excavation blocks in similar pedostratigraphic positions (Table 15.1). Comparatively high densities are characteristic of some Early Archaic occupations (Blocks H and G) and they occur during the Late Archaic (lower Block B) as well. Much lower densities occurred within two of three Middle Archaic deposits (Blocks U and lower A), as well as in one early, Early Archaic deposit, Block N. Other excavation areas (i.e., components) yielded comparatively moderate mussel shell densities.

We did not conduct formal studies at the Richard Beene site to determine whether snails were a routine element of native diets. Snails are very common in the site area today, however, and snail shells occur in considerable abundance throughout the terrace fill. In marked contrast to mussel shells, snail shells routinely occur as natural concentrations and lenses, in the complete absence of cultural material. Furthermore, these concentrations tend to contain young (i.e. small) and mature (i.e., large) individuals (Chapter 5). This was also the case for most snail-shell concentrations in block excavation areas. These concentrations tended to be circular to oval in shape and 50 cm or so in diameter. Similar clusters of differently sized snail shells occur under acacia trees and large shrubs that grow around the site today. Insofar as hunter-gatherers tend to forage efficiently, it seems likely that snail shell concentrations representative of human predation would contain almost exclusively large-sized snails. This line of anecdotal reasoning suggests that non-human factors are likely to account for the presence of most snail shells at the Richard Beene site. It does not, however, rule out the possibility that the site's inhabitants occasionally snacked on wild escargot.

Inter-Component Assemblage Comparisons

As has been emphasized, one of the salient characteristics of the Richard Beene site is the considerable inter-component homogeneity among its artifacts and feature assemblages. For example, almost all of the recovered cores are made from stream-worn, chert cobbles identical to those readily available in gravel bars and cutbanks along the river today. There are also inter-component similarities in the densities of hammerstones, cobble and bifacial cores, and chipped-stone debitage (Figure 15.42). Homogeneity is apparent as well in the general approach to tool manufacturing, especially for expediency tools (edge-modified and utilized flakes), although there are important differences in the sizes and types debitage within a few of the components (Chapter 10).

Inter-component heterogeneity is also characteristic of the site's assemblages, as measured by differences in projectile point types and in densities of stone tool types (Figures 15.42 and 15.43). Variability is complex and remains poorly understood, but a few patterns are evident. The early, Early Archaic assemblage (Blocks H, T, and N) is the most diverse but it is also the largest. This assemblage may represent several centuries of intermittent occupation but, in its totality, it is most residential-like of the site's components. Adzes and gravers are far more common, especially in Block H, than they are in any other assemblage. Tool diversity is high even within the spatially and numerically smaller assemblage from Block T, where features are comparatively well-preserved. Block H, with its high density of scattered FCR resembles an incipient burned rock midden. Another distinctive characteristic of the early, Early Archaic assemblage (Blocks H, T, and N) is that most of the projectile points are basal fragments and re-worked specimens. This pattern is probably indicative of retooling with already-made preforms, as opposed to manufacturing points from locally available chert cobbles (Chapter 10).

Adzes, gravers, drills, and well-made scrapers are rare in the late, Early Archaic assemblage (Block G), but the sample of tools (n=96) is less than one-fourth the size of the early, Early Archaic sample (n=469). The late, Early Archaic projectile point assemblage, including Bandy, Baker, and Martindale points, is distinctive insofar as basal fragments are rare and most specimens either have broken barbs or their lateral edges have been resharpened. This suggests a different aspect of hunting-related activities than what is evident for the early, Early Archaic point assemblage that is dominated by basal fragments.

The Late Archaic assemblage (lower Block B) is residential-like, in that it is diverse and has considerable intra-class variability, but it is also a comparatively large sample. The highest frequency and density of preforms and other thin bifaces occurs in this assemblage (Figure 15.44). Thick, early-stage bifaces are poorly represented, suggesting that preforms were brought to the site rather than made there. Most of the projectile points are complete, or nearly so, and there is little evidence of resharpening. These assemblage attributes suggest preparations for hunting-related tasks, but they appear to represent a still different type of gearing-up than is indicated by the other assemblages.

FCR and mussel shells are elements common to all components (Figure 15.45). As noted, inter-component variation in densities of these materials clearly indicates differences in use intensity. It is also worth noting that there is a better correlation between the density of mussel shells (Figure 15.45) and chipped stone tools (Figure 15.44) than there is between FCR and mussel shells. Furthermore, in most of the components, areas with fairly dense mussel-shell scatters are often spatially separate from FCR scatters (Chapter 9). Said differently, cook stones do not appear to have been integral to cooking river mussels, at least not in general.

The one "very large" earth oven at the site and the densest accumulation of FCR occur in the Late Archaic deposit, which hints of land-use intensification. There is another hint of land-use intensification: an increase through time in the density of mussel shells and in the number of exploited species. Moreover, the average size of harvested river mussels may have decreased through time (Chapter 5). Although there was an almost exclusive use of resources available in the immediate vicinity of the site, land use never seems to have been very intensive for very long. No doubt there was ample occupation space along the river and many different localities probably provided access to the same basic resources. As such, land-use intensification in this particular reach of the Medina valley is likely to remain undetected at the Richard Beene site or any other single site. Nonetheless, if the site is at all representative of local land-use patterns, we must conclude that the riverine landscape was used extensively, and periodically intensively, for the last 10,000 years or more.

Compared to many other sites, including the Wilson-Leonard, Woodrow Heard, and Armstrong sites (Mason 2003), the Richard Beene site is tool poor,

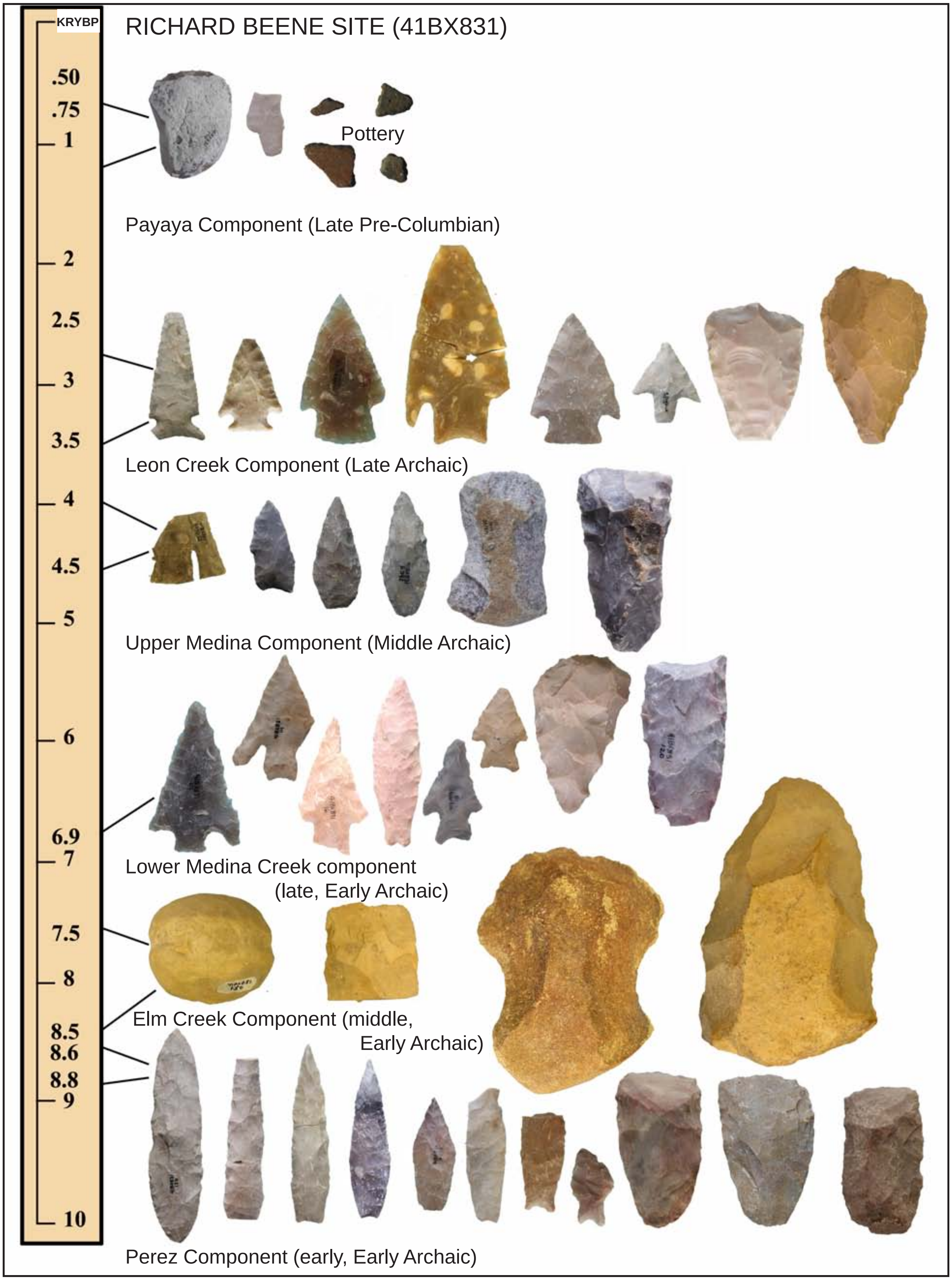


Figure 15.42. Chronological ordering of representative projectile points, adzes, and other selected items recovered from the Richard Beene site.

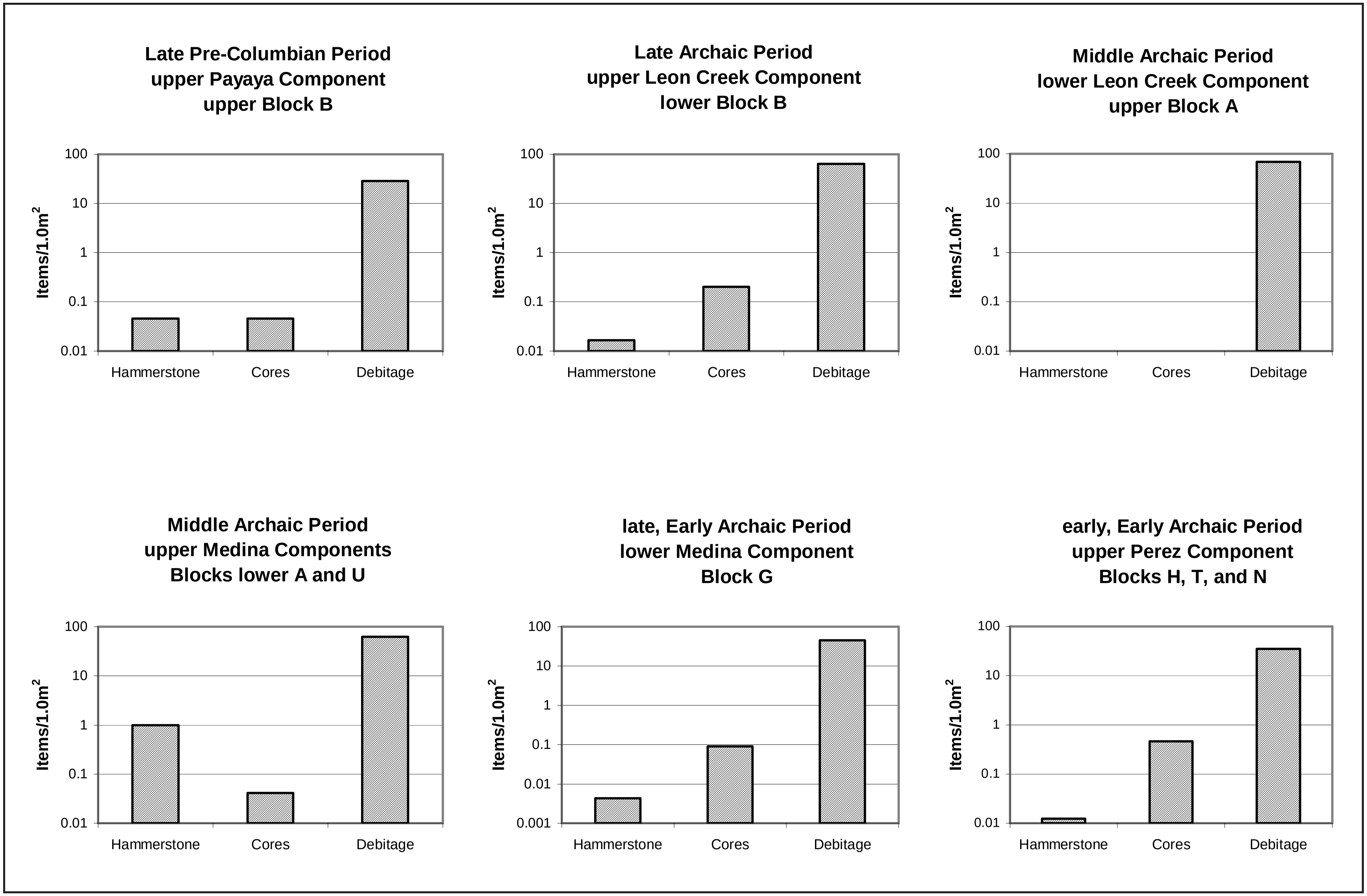


Figure 15.43. Log-scale bar graphs of the densities of hammerstones, cores, debitage, and thick bifaces with sharp edges (probable cores) from the major components.

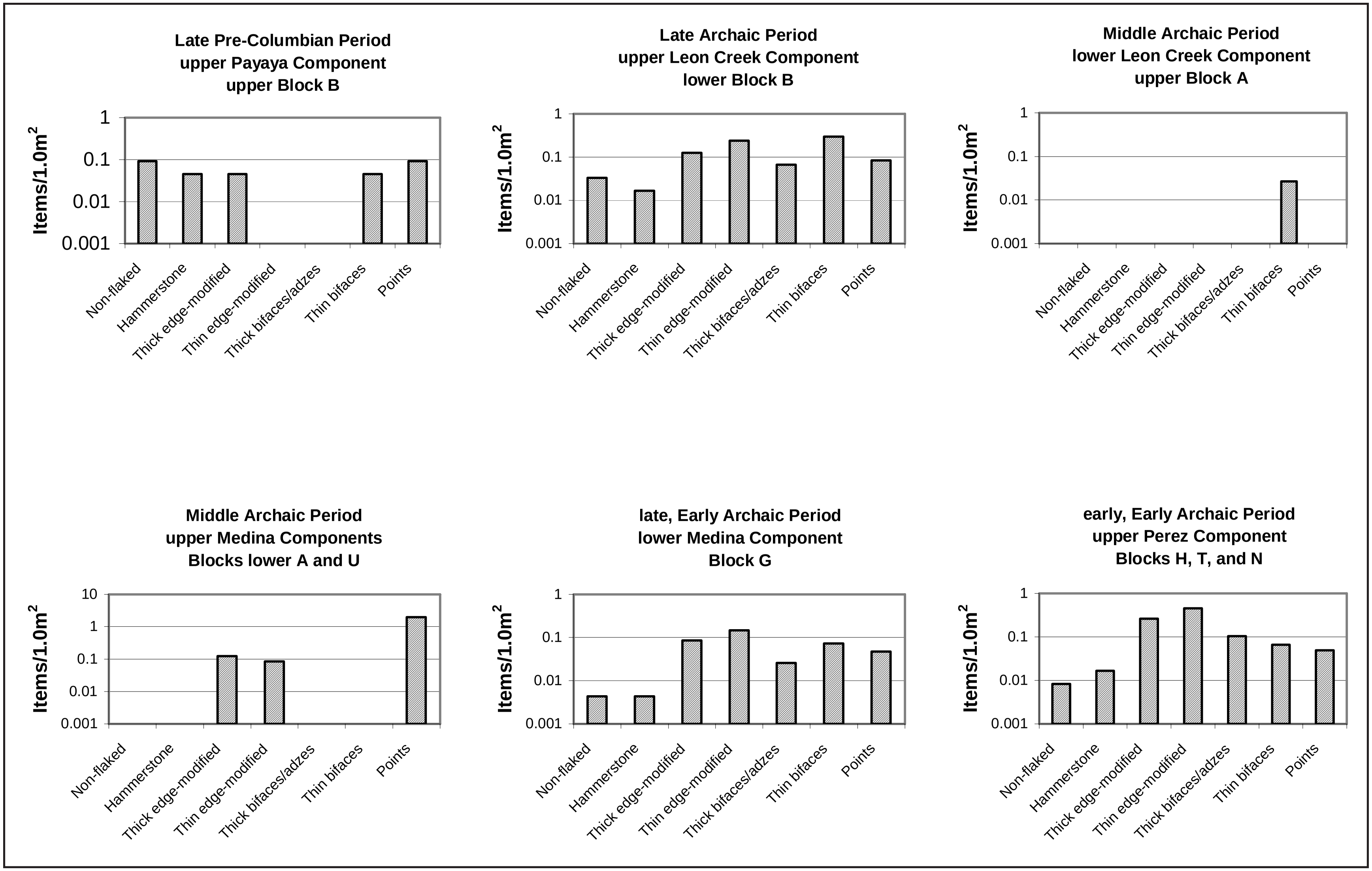


Figure 15.44. Bar graphs of the densities of stone tool types from the major components.

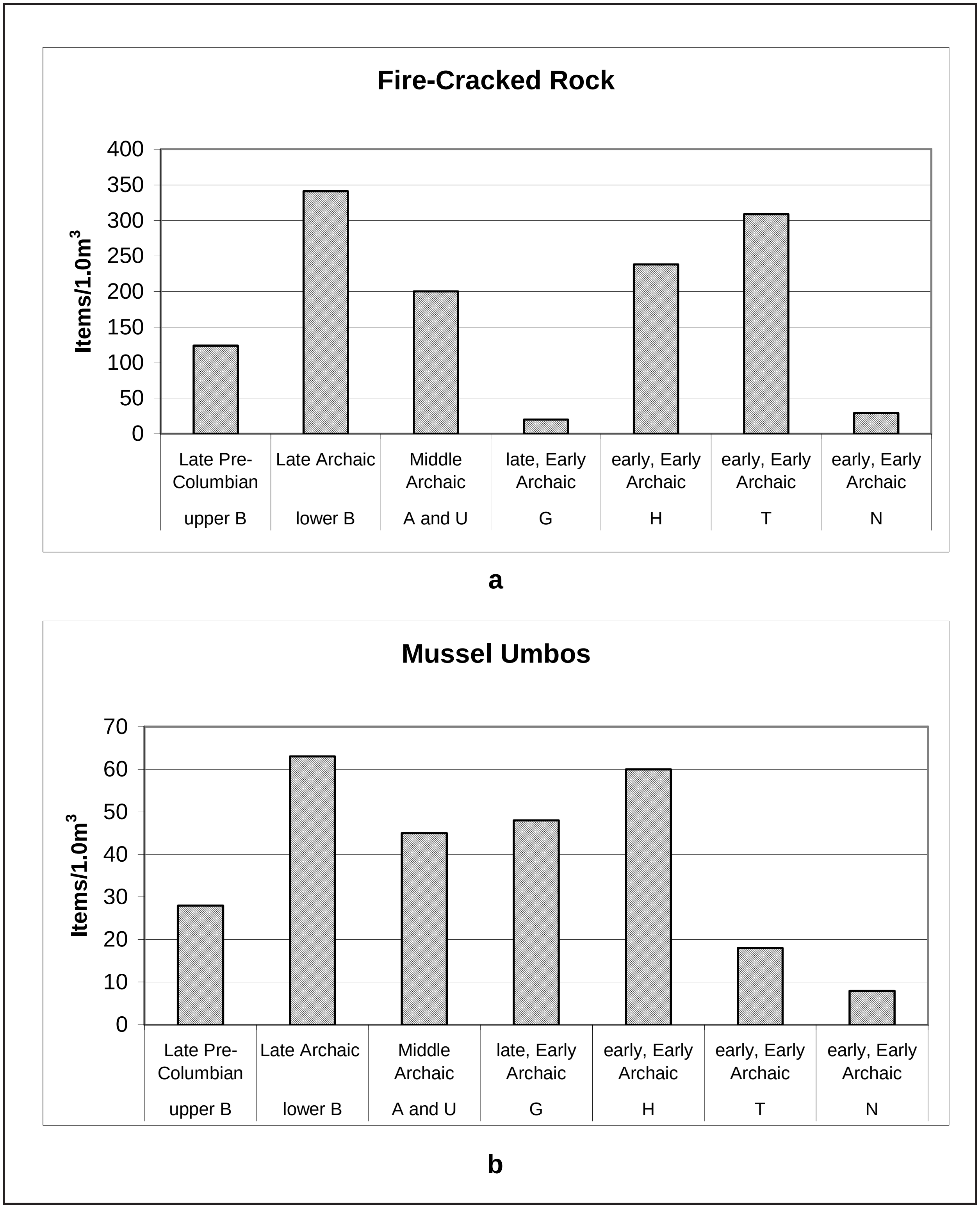


Figure 15.45. Bar graphs of the weight/density of: (a) fire-cracked rocks and (b) mussel shell umbos recovered from the major components.

with densities seldom exceeding five tools per cubic meter. Importantly, it is a feature-rich site with almost twice as many features (n=82) as projectile points (n=46). Features, by their nature as composites of functionally related artifacts, contain more information about land use than do most artifacts per se because they represent more complex behavior (Chapter 13).

Late Pre-Columbian Period

Are the Austin and Toyah phases distinguishable in the project area and, if so, are there differences in subsistence and settlement patterns? Artifacts representative of the Austin phase (Scallorn/Edwards arrow point) and Toyah phases (Perdiz-like arrow point and bone-tempered pottery) co-occurred in A and B horizons of the modern soil, which was significantly affected by pedoturbation (Chapter 9). As such, it was not possible to distinguish which of the other artifacts and features in the Late Pre-Columbian component might be contemporary with temporally diagnostic artifacts.

Were there major changes in subsistence orientation from the Late Archaic to the Late Pre-Columbian period? Occupation of the excavated portions of the site during the Late Archaic period was much more intensive than during the late Pre-Columbian period, as measured by higher artifact densities in most categories (Table 15.1; Figures 15.43–15.45; Chapter 9). The kinds of activities carried out, however, were probably quite similar during both periods (Chapter 14). A major difference in terms of relative percentage of artifact categories is that lithic debitage represented 45.8 percent of the Late Pre-Columbian assemblage whereas it accounted for only 30.6 percent of the Late Archaic assemblage. Conversely, FCR represented a greater proportion (52.4%) of the Late Archaic assemblage in comparison to the Late Pre-Columbian assemblage, wherein FCR accounted for only 41.7 percent of the items (Table 15.2; Figure 15.4). This may indicate that, at the Richard Beene site during the Late Pre-Columbian period, hunting was more important and oven-baking plant foods was less important than during the preceding millennia.

Does the Toyah phase represent an influx of new people following bison herds down from the north and, if so, what was the impact on populations living in the project area (absorption, displacement, annihilation)? Given that bison bones were not recovered from the Payaya component, which represents the Toyah phase at the Richard Beene site, there is nothing to indicate that people who occupied the locality at that time were bison hunters at all. It is important to point out, however, that the Toyah phase at the site is represented only by a single Perdiz-like arrow point and several sherds of bone-tempered plainware.

Is the exploitation of bison evident in Toyah phase sites/components in the project area? The Payaya component at the Richard Beene site did not yield bison bones or tools commonly associated with bison processing during Late Pre-Columbian times (e.g., beveled knives and large end-scrapers). Elsewhere in the Applewhite Reservoir area, including 41BX528, there is indirect artifactual evidence (e.g., Perdiz and Guerrero points, large end-scrapers, thin bifaces) as well as indirect faunal evidence—bison-sized bones—for bison exploitation during the late, Late Pre-Columbian period and perhaps during the proto-historic period as well (Ahr 1998; McCulloch et al. 2008; Thoms et al. 2008b).

Late Archaic Period

Are there specialized hearth facilities that suggest greater reliance on foods requiring roasting or baking? Most of the Late Archaic features were remains of small cooking facilities, primarily open-air hearths with and without cook-stone griddles. Also present were large FCR features that may represent the remains of earth ovens used to cook roots or prickly pear fruit (*tunas*) and pads (*nopals)*, as was reported by Cabeza de Vaca (Krieger 2002). Family-size cooking facilities with cook-stone are represented in most of the site's components beginning as early as 8,800 radiocarbon years ago (Chapter 13). The only radiocarbon age (ca. 3090 B.P.) for the upper Leon Creek component (Late Archaic, lower Block B) came from charcoal in a very large (ca. 2 m diameter), basin-shaped earth oven that contained an abundance of carbon-stained and oxidized sediment along with some FCR (Chapter 13). This feature is the only example from the entire site of a cooking facility large enough to cook food for several families or perhaps for a single family for several days or weeks.

How were potential food resources distributed across the region? This question cannot be addressed adequately with data from a single site. It is worth emphasizing, for example, that the site's Late Archaic deposits had the highest overall FCR density, which argues for more intensive earth-oven usage and by inference plant foods in general. Moreover, these same deposits also yielded the highest overall mussel shell density. In other parts of North America, including the greater Southeast, river-mussel shells are often associated with FCR and it has been assumed that river mussels were cooked in one way or another with hot rocks (Parmalee and Klippel 1974). At the Richard Beene site, however, high mussel-shell densities also occur in components with very low FCR densities, including in the lower Medina component of the late, Early Archaic period (Tables 15.1 and 15.2; Figure 15.4). This suggests that cooking river mussels did not necessarily entail usage of substantial quantities of cook stone.

How does the population density indicated by sites in south-central Texas compare with the postulated increases in population in central Texas to the north and low population densities in the western Gulf Coastal Plain to the east and south? There is little in the Richard Beene site's archaeological record that attests to population dynamics per se. However, the combination of high FCR, mussel shell, and chipped stone densities (Table 15.1) is consistent with the concept of increasing occupation intensity during the Late Archaic. That comparatively high artifact densities are characteristic of the upper Leon Creek component is also consistent with long-term land-use intensification and population growth.

Comparisons with a Nearby Late Archaic Component (41BX859)

Excavations at 41BX859, a site located on the Applewhite terrace a few km upstream from the Richard Beene site, revealed a comparatively well-preserved Late Archaic/upper Leon Creek occupation that dated to ca. 3300 B.P. (Thoms 2008b; Chapter 9). The site overlooks the Medina River at a point where the floodplain is comparatively narrow. In marked contrast to the upper Leon Creek component at the Richard Beene site (dated to ca. 3090 B.P.), the component at 41BX859 yielded a low density of FCR and chipped stone, along with a few mussel shells and small fragments of bone. The site contained other stratigraphically distinct artifact lenses in the upper part of the Leon Creek paleosol with even lower artifact densities. Artifacts in the excavated component occurred in a 12-cm-thick lens buried about a meter below surface. Cultural materials extended more than 50 m across the terrace tread but the highest concentration was within 20 meters of the scarp, as was the case at the Richard Beene site.

Only a few tools were found in the upper Leon Creek component at 41BX859. These included a probable Clear Fork tool reworked into an end scraper and two thin biface fragments, possibly from knives or unfinished projectile points. Chipped stone debitage was scattered in low densities throughout most of the excavated area, the exception being a discrete chipping station that contained several flakes from the same core or preform. As a whole, the component's chipped stone assemblage was indicative of final-stage biface manufacturing and reconditioning (Thoms et al. 2008a).

Most FCR at 41BX859 was found in relatively horizontal angles of repose and almost always in a single lens consisting of a few pieces of matrix-supported FCR separated by several decimeters. This distribution is suggestive of discard patterns rather than disturbed FCR features, in which case some of the FCR should have been superimposed or otherwise clast-supported, as was the case with discrete FCR features at the Richard Beene site (Chapter 13). Moreover, the totality of FCR from 41BX859 was a fraction of the ca. 2.4 kg of FCR contained in the average small hot-rock cooking feature in the Late Archaic component at the Richard Beene site (Chapter 14). While the differences in FCR density in these two components may be indicative of differences in cooking methods, differential access to cook-stone raw material also affords a parsimonious explanation. At the Richard Beene site, where several components have a high density of FCR (Table 15.1 and 15.2), sandstone bedrock outcrops were located within 200 m of the site throughout the Holocene. The nearest sandstone outcrop to 41BX859 was several hundred meters away and across the river.

Given the paucity of artifacts and the discreetness of the artifact lens, the upper Leon Creek component at 41BX859 was interpreted as the remains of a short-term occupation by a small group, possibly a family, engaged primarily in hunting-related activities, but also partaking in river mussels and hot-rock cookery (Thoms 2008a). These same kinds of activities are well-represented in the upper Leon Creek component at the Richard Beene site.

What distinguishes the Leon Creek component at 41BX859 is its spatio-temporal discreteness, a rare quality for Late Archaic sites in south-central Texas (Black et al. 1989a, 1989b). That the remains were well preserved is evidenced as follows: (1) most artifacts were found in relatively horizontal angles of repose and 95 percent of them were distributed vertically over only 12 cm, suggesting minimal impact from pedoturbation; (2) a well-defined concentration of flakes and a broken biface nearby made of the same material, suggesting a discrete activity area; (3) several flakes found within 2 horizontal meters and 12 vertical centimeters could be refitted, also suggesting a discrete activity area; (4) artifacts were encased in a buried ABk horizon, which is welded to the Bk horizon of the modern soil, indicating that post-occupation deposition outpaced soil formation; and (5) the fine-grained texture of the sediments and a lack of coarse-grained materials (e.g., gravel), indicating a low-energy depositional environment (Thoms et al. 2008a). In contrast, the upper Leon Creek component at the Richard Beene site evidenced considerable bioturbation and argilliturbation that resulted in the mixing of cultural materials that were probably deposited over several centuries.

Middle Archaic Period

Do the suggested changes in settlement pattern correlate with the postulated end of the long drought around 4000 B.P.? The lower Leon Creek component (upper Block A) of the Middle Archaic period provides the only evidence for occupation around 4,000 years ago. This component's most distinguishing characteristic is its unusually high proportion of mussel shells but, as a single case, it tells us little about relationships between droughts and settlement patters per se. Isotope studies of snail shells indicated a cooling trend and more mesic conditions from ca. 4500 to 4000 B.P. (Chapter 7). Mussel shell isotope studies indicated the lowest mean annual temperature at the site during the last 10,000 years occurred sometime around 4100 B.P. (Chapter 6).

Was there a substantial increase in population densities, as has been proposed? Is the formation of smaller territories indicated? Was there an increase in the interaction sphere of south-central Texas groups? Here too, little can be inferred about demographic dynamics and territoriality from any single site. That said, it is readily apparent that occupation intensity at the Richard Beene site, as measured by artifact densities, was low to moderate during the Middle Archaic and comparatively high during the Late Archaic and late, Early Archaic periods (Table 15.1).

Early Archaic Period

With the discovery of what came to be called the Angostura component and acquisition of radiocarbon age estimates of ca. 9800 B.P. on soil bulk carbon in the Bk horizon of the Perez paleosol, we envisioned excavating a late Paleoindian occupation, finding bison remains, and recovering tools left by the last of the big-game hunters. What we found instead was an abundance of FCR and woodworking tools, especially adzes. Once we obtained radiocarbon ages of ca. 8800–8600 B.P. from charcoal fragments in sheet midden deposits (Block T) in the upper Perez paleosol, it was evident that the deposits were more characteristic of the early, Early Archaic period along the continent's plains/woodland ecotone (cf. Butzer 1990). A key indicator of the "Archaic-ness" of the lower Perez component is that cook-stone debitage (n=14,939) significantly outnumbered chipped-stone debitage (n=8,531) (Table 9.1). In that light, some of the original research questions about the late Paleoindian period were recast to pertain more directly to the site's early, Early Archaic manifestation.

Did the transition from Paleoindian lifeways to those of the Archaic in south-central Texas represent a significant shift in the types of resources that were utilized (e.g., from large to small game animals or from rockshelters to open campsites)? In the absence of evidence for late Pleistocene occupations by classic "Paleoindians" with fluted points and sans FCR, data from the Richard Beene site are not amenable to addressing this question per se. Given, however, that Paleoindian and Archaic artifacts often co-occur in upland settings, key elements of their respective lifeways also may have been shared, as suggested above. Nonetheless, it is readily apparent from excavations at sites in surrounding regions, including Wilson-Leonard (Collins et al. 1998) and Gault (Collins 2002), that there are substantial differences in assemblages and faunal remains attributable to late Pleistocene and early, Early Holocene occupations. The presence of now-extinct faunal remains is a primary criterion that distinguishes many Paleoindian from Early Archaic sites, as is the common presence of exotic types of tool stone. Even more distinguishing is the marked paucity or absence of FCR at Clovis, Folsom, and Plainview sites and its abundance in Angostura or other early Holocene deposits. This particular difference has long signaled the onset of increasing importance of plant foods and decreasing mobility (Bousman et al. 2002; Caldwell 1958; Thoms 1989, 2003; Willey and Phillips 1958; Wissler 1940).

When did a broadly-based hunting and gathering adaptation begin? Deer and small game remains, earth ovens, and woodworking tools, all manifestations of broad-spectrum Archaic foraging, are well represented by early, Early Archaic times at the Richard Beene site. This indicates clearly that Archaic lifeways were in full swing by 10,000 calendar years ago in south-central Texas. That these lifeways were "full-blown" at that time suggests that they developed considerably earlier, as is often argued for the Southeast culture area in general (Anderson and Sassaman 1998).

W*hat accounts for the perceived greater density of Early Archaic sites in the project area than is found in the adjacent regions?* The Early Archaic period is indeed unusually well-represented at the Richard Beene site by multiple occupation zones and surfaces in the Perez paleosol (ca. 8800–8600 B.P.), as well as in Elm Creek paleosol (ca. 8100–7600 B.P.) and the lower Medina pedocomplex (ca. 6900 B.P.). Early Archaic projectile points were comparatively under-represented at reservoir area sites recorded or tested by TAMU personnel (Chapter 10; Carlson 2008). They were better represented, however, at sites recorded by UTSA personnel (McGraw and Hindes 1987). In short, observed differences in site densities are as likely to result from differences in survey strategies or ideas about which tool types are indicative of Early Archaic occupations as they are to result from differences in habitat type or resource productivity. On the other hand, it is possible that sediment packages dating to the early Holocene are better preserved or exposed in some parts of the reservoir area than they are elsewhere in south-central Texas.

Were the landforms inhabited and utilized by early, Early Archaic peoples similar to those of the later periods (e.g., bluff lines and terraces)? Evidence from the Richard Beene site shows that early, Early Archaic inhabitants occupied the same portion of the floodplain edge, now the Applewhite terrace edge, as did native and non-Indian inhabitants for the succeeding 10,000 years. Only one of the tested sites in the reservoir area–41BX793–yielded a lanceolate point and it too was classified as Angostura (Dockall and Pevny 2008). Site 41BX793 also produced projectile points representative of the Middle Archaic period (McCulloch et al. 2008; Chapter 10). Upland sites in south-central Texas with Paleoindian points (e.g., Clovis, Folsom, Plainview, Golondrina) routinely contain early, Early Archaic points (e.g., Angostura and Bandy), along with various younger Archaic dart points and arrow points (Black 1989a; Hester 1995; Thoms et al. 1981). This pattern indicates considerable overlap in settlement localities throughout the millennia.

Do early, Early Archaic diagnostics (e.g., Angostura points) co-occur in good context with late, Early Archaic diagnostics (e.g., Bandy, Gower, Martindale points) in sites in the project area and does this seem to reflect a transition in lifestyles *between two cultural stages?* At the Richard Beene site, the early and late Early Archaic assemblages are separated stratigraphically by 2.5 m of fine-grained alluvium and temporally by 2,000 radiocarbon years. Angostura points account for approximately 90 percent of the projectile points from the early, Early Archaic occupations. The balance is made up by a Plainview point and a Hoxie/Gower-like specimen (Figures 15.35–15.38) that hints of a substantially reworked Angostura point (Chapter 10). About 95 percent of the points from the late, Early Archaic occupations are stemmed, indented-base, usually-barbed specimens classified as Bandy, Baker, and Martindale (Figure 15.22). A single unclassified, lanceolate-shaped specimen (Pandale-like), which could be a reworked Angostura point, was the only exception. It has a narrow, indented base and may be a substantially resharpened stemmed-indented base point (Chapter 10). On the whole, the early and late, Early Archaic projectile point assemblages are quite distinctive. Nonetheless, the lifeways in both sub-periods evidence considerable overlap, as represented by feature types (Chapter 13) and general artifact categories (Chapter 10).

Does the change in projectile point manufacturing techniques from lanceolate point to stemmed points represent a major shift in technology or only minor stylistic changes? While there are indeed clear differences in point morphology and manufacturing techniques between the early and late, Early Archaic deposits at the Richard Beene site, as well as in lithic technology in general (Chapter 10), the overall character of tool assemblages at site remained decidedly similar throughout the Holocene. Adzes are part of every major assemblage, as are projectile points, thin bifaces, drills, and thick, heavy-duty tools, although their relative frequencies vary from component to component (Figures 15.42 and 15.43). Large burin spalls and true blades occurred only in the Perez component. Well made bifacial Clear Fork tools were found only in the Early Archaic deposits. A few small burin spalls were found in the lower Median component (late, Early Archaic). Well made chipped stone axes were characteristic only of Elm Creek components (middle, Early Archaic period, ca. 7100–8300 B.P.). Less obvious axes (i.e., thick bifaces with possible hafting modifications) were recovered from Middle Archaic deposits. Grinding slabs were recovered from all but the early, Early Archaic and Late Pre-Columbian deposits. Some artifact types typically found at south-central Texas sites, including Waco sinkers, beveled knives, and well-made hide scrapers, are conspicuously absent.

Land-Use Issues

When prehistoric inhabitants left the project area, where did they go and why was this particular seasonal round selected? There is little in the archaeological record at the Richard Beene site to indicate where people lived when not at the site. Virtually all of the tool-stone material is available from gravel bars along the river or in the nearby uplands. It is entirely conceivable, however, that the inhabitants' foraging territory was confined, for the most part, to areas within 30 or 40 km of the site where regularly used subsistence items–deer, rabbits, *tunas*, *nopals*, roots, pecans, and river mussels–could be obtained during the appropriate season. Such a pattern is consistent with Cabeza de Vaca's accounts of native land-use practices and similar land-use models are proffered by others (e.g., Black 1989a, 1989b; Campbell 1975; Campbell and Campbell 1981; Hester 1995; Foster 1995, 1998; Krieger 2002; Chapter 8).

Within the time span of the site's occupation, were there times when the project area was not inhabited? There is little to indicate that the area was abandoned for any archaeologically significant time period insofar as the record at the Richard Beene site attests to intermittent occupations throughout the last 10,000 years. Occupation intensity and emphasis of subsistence pursuits, however, varied across space and through time (Figure 15.41). Arrow points and bone-tempered pottery attest to occupations between about 1,200 and 400 years ago. Radiocarbon ages derived from wood charcoal attest to occupations at ca. 3090, 4135, 4380–4510, 4570, 6700–7000, 7650, 7740–7910, 8080, and 8640–8810 B.P. A radiocarbon age on bulk carbon (ca. 6450 B.P.; Block F) attests to a brief occupation during the 2,200-year interval between ca. 4500 and 6700 B.P., which is otherwise unrepresented at the site (Chapters 4 and 9). While none of the excavated areas at the Richard Beene site dated between 1,200 and 3,000 B.P., other sites in the reservoir area yielded ages within this range and projectile points representative of these two millennia are common in the project area as well (Dockall and Pevny 2008; McCulloch et al. 2008; Chapter 10).

Are there undisturbed deposits dating to periods of low-intensity or non-occupation within the project area and, if so, where are they? Available evidence indicates that the Applewhite terrace fill represents virtually continuous sedimentation and variable degrees of soil development throughout the last 15,000 radiocarbon years. Cutbank exposures in the reservoir area reveal little evidence for unconformities of significant duration (Chapter 3; Mandel et al. 2008). As such, undisturbed sediments spanning periods of comparative under-occupation (e.g., 8300 to 7100 and 6500 to 4500 B.P.), as well as periods presently unrepresented at the Richard Beene site by buried archaeological deposits (e.g., 2800 to 1200 B.P.), abound in the project area and presumably for undetermined distances upstream and downstream.

What season or seasons of the year were the project area sites used by prehistoric peoples and what was the estimated population at each site? Inferential evidence suggests that most occupation occurred during the winter. Geophyte exploitation is inferred by the ubiquitous presence of rock-filled earth ovens, along with scattered large pieces of FCR that also are indicative of earth ovens. Morphologically similar FCR features at sites in adjacent regions have yielded charred bulbs from onions, false garlic, and camas, all of which are known or suspected to have grown in the immediate vicinity of the Richard Beene site (Chapter 8). In general, geophyte exploitation is expected to have been maximized during the winter season when carbohydrate storage in the "roots" is at its maximum in anticipation of the spring growing season (Thoms 1989, 1998). Ethnographic patterns documented by Cabeza de Vaca during the early sixteenth century are consistent with the importance of root foods during winter months. As noted, Cabeza de Vaca reported that women baked roots in earth ovens for two days and to do so probably required rock heating elements. He also emphasized that cold-season encampments tended to be along the major rivers (Chapters 2 and 8).

Non-winter occupation undoubtedly occurred as well and could possibly be represented by some of the components with low densities of FCR. There is little in the mammalian faunal record to suggest seasonality. A few deer teeth were recovered and, at some future time, could yield information about the season of death. So too, some of the better-preserved mussel shells may eventually yield data pertaining to occupation seasonality.

Within each stage or period, are settlement patterns and associated technology sufficiently distinctive and different throughout the stage or period to support the concept of phases? Presently available data do not permit a reliable assessment of settlement patterns other than to reiterate that the same place on the landscape–the Richard Beene site–was occupied intermittently for 10,000 calendar years. Site structure through time varied on a common pattern of cluttered peripheral zones and at lease a few clean areas interpreted as domestic zones with small cooking features (Chapter 14). Feature assemblages are dominated overwhelmingly through time by remains of family-sized cooking facilities (Chapter 13; Figure 13.35). Mussel shell concentrations occur as well, and they tended to be a few meters in diameter at most and are usually represented by a single layer of shells. Sheet middens were also rather small and they contained closely spaced rather than stacked artifacts (Chapter 13). Only one feature, an earth oven two meters in diameter, was large enough to be considered a communal cooking facility. In other words, the site's overall feature assemblage is remarkably homogeneous and could well have resulted entirely from short-term encampments occupied by a few families.

Lithic technology at the Richard Beene site, as represented by the various assemblages, consistently focused on core reduction and flake production, primarily for expedient tools. Projectile points were a significant element of all but the Elm Creek components (ca. 8100–7600 B.P.) and adzes of one form or another were represented in all but the Payaya component of the Late Pre-Columbian period (Figure 15.42). Insofar as the Elm Creek and Payaya components were comparatively under-sampled, their seemingly aberrant character may well result from sampling error.

Projectile point types are the best single indicator of temporal periods. While there is considerable variation in point types within some time periods (e.g., Middle and Late Archaic), there is little overlap in point types characteristic of the various time periods distinguished at the Richard Beene site (Figure 15.42). Angostura points and Lerma bifaces are characteristic of the early, Early Archaic (ca. 8800–8600 B.P.), as are well-made, sub-rectangular, bifacial adzes that resemble Dalton adzes or what might be called "classic" Clear Fork tools (Chapter 10). Stemmed, indented-base, usually barbed or distinctly shouldered, and often substantially re-worked points, including Bandy, Baker, Martindale, and Uvalde types, are diagnostic for the lower Medina component of the late, Early Archaic period (ca. 6900 B.P.). Desmuke and Bell/Andice points dominated the Middle Archaic assemblage (ca. 4500–4100 B.P.), but a Travis-like point was present as well, along with a Uvalde point. A series of broad-bladed, barbed or distinctly shouldered points (e.g., Ensor, Marcos, Marshall, Pedernales, and Nolan-like), comparatively few of which are reworked, represent the Late Archaic period (ca. 3500–2800 B.P.). Perdiz and Edwards/Scallorn arrow points, along with bone-tempered pottery, are characteristic of the Late Pre-Columbian period (ca. 1200–400 B.P.).

Early Archaic Hunter-Gatherers

Anthropologists and archaeologists have not been in agreement as to just where to draw the western boundary of the southeastern Woodland cultural area. Some specialists exclude east Texas altogether, while others include various parts of east Texas. Clark Wissler (1917) placed the boundary as far west as the Edwards Plateau area of central Texas. Bruce Smith (1986:1) refers to the absence of a clear-cut dividing line as a "boundary blur" that, rather than representing a problem, affords the geographic freedom to include different areas depending on the topic or time period at hand.

The area in the vicinity of Richard Beene has a decidedly eastern Woodland flair, but the patchy upland grasslands hint of the Plains. Live oaks and post oaks dot the uplands, but it is the riparian forest, including pecan, elm, sycamore, and cypress trees, that is especially reminiscent of the eastern Woodlands. The site lies within what has been called the *main* edge of the oak-hickory forest of the eastern Woodlands. Drier oak-juniper savannahs on the Edwards Plateau and the oak-mesquite savannahs in the South Texas Plain represent *secondary woodland edges* (Johnson 1989:9–12).

Wissler (1917:222) was among those who first recognized the area in the vicinity of the Richard Beene site as being ecotonal between the Plains and Southeastern culture areas. His illustration of North American *ethnographic food areas* places San Antonio in the southeastern corner of the bison area, within about 200 km of the continent's eastern maize area (Wissler 1917:8). His map of *culture areas* places the San Antonio region well within the Southeastern area (Wissler 1917:205). However, he notes that the Tonkawa, Carrizo and other groups who lived there were not agriculturists and that some groups lived in tepees and were "almost true buffalo Indians" (Wissler 1917:222). Wissler's map of *archaeological areas* places the San Antonio region very near the southwestern corner of the Mississippi-Ohio area (Wissler 1917:246). He noted that "the margin of the Gulf Coast and over into Texas is one of simpler archaeological culture, though the absence of the grooved ax and some other forms suggests similarities to the South Atlantic area." (Wissler 1917:252).

It is the Angostura projectile points, and perhaps the Lerma bifaces, that lead one to perceive the Perez component as representative of Plains Paleoindian lifeways. The presence of Angostura points at the Long site in southwestern South Dakota, the type site for the Angostura point, led archaeologists to designate it as a Plains Paleoindian occupation (Hughes 1949; Thoms 1993a). The Long site's assemblage is similar to the Perez component, in that it contained reworked Angostura points, a Plainview-like specimen, a Lerma biface, and a Clear Fork tool. Faunal remains were not recovered from the Long site, but well-made end and side scrapers were common, suggesting the primary importance of bison hunting (Hughes 1949). Overall, similarities between these two assemblages are striking, given their decidedly different regional settings. The abundance of well-made scrapers at the Long site is typical of Plains sites whereas the comparative abundance of adzes in the Perez component is much more characteristic of the eastern Woodlands.

A projectile point assemblage dominated by lanceolate specimens is an ostensibly reasonable proxy for big game hunting in fairly open terrain by small, mobile groups of people. Bison-sized remains, however, were not found in the Perez component, and deer-sized animal remains were fewer in number than small-animal bones. Nonetheless, it is likely that smaller species were supplemental foods, insofar as their combined weight probably represented only a fraction of the food and non-food yield from the deer-sized remains. Certainly, deer remains in the lower Medina component (ca. 6900 B.P.) would have contributed far more meat and exploitable resources (e.g., bone, hide, and sinew) than all the other identified taxa combined. Faunal remains are poorly preserved at most early Holocene sites in the southeast Woodlands but, where preservation conditions are adequate, white-tailed deer almost always dominate the faunal assemblage in terms of their inferred contribution to the diet (Smith 1986:12–13).

One can assume that the rabbits/hares, wood rats, gophers, fish, and snakes represented by the skeletal remains recovered from the Perez component were not killed with Angostura points and that, in general, dart points were made to kill much larger animals. No doubt, Lerma and other large thin bifaces were designed to process big game animals, although they may have been used routinely to butcher small animals. The lack of well-used end and side scrapers indicates that hide-processing was not a major activity at the Richard Beene site. To better understand this particular pattern, we need to know more about the degree to which these classic hide-working tools are similarly under-represented in the Southeast at sites where there is ample evidence for deer hunting.

Mussel shells are well represented in all of the components but especially so in the Late Archaic and early, Early Archaic periods. Nonetheless, the density of mussel shells in the Perez component is less than at many early Holocene sites in the southeast Woodlands (Smith 1986:12). This difference may well result from the small size of the Medina River compared to large and more productive watercourses in the Southeast heartland.

Intensive exploitation of the local habitat and smaller home ranges are typically considered to be hallmarks of Early Archaic land-use strategies. The virtual absence of exotic raw materials in the Perez component and the almost exclusive use of tool stone available from local gravel bars also points to an Archaic land-use strategy. A relative abundance of adzes and other woodworking tools, including gravers, drills, notched and denticulated, spokeshave-like tools, is consistent with the concept of reduced mobility (Chapter 10). These tools imply the manufacture and use of wooden utensils, possibly including bowls, mortars and pestles, spoons, and handles for various tools. Adzes and other woodworking tools were probably used as well in the construction of residences, arbors, and storage platforms.

In short, there is little support from the faunal and lithic assemblages for the contention that either interlopers from distant lands or highly mobile bison hunters with vast home ranges are likely to account for the Perez component. Neither is the abundance of FCR consistent with what we tend to think of when we think about Paleoindians on the southern Great Plains. Given the paucity of butchering and hide-processing tools and related debitage, the likelihood seems remote that the FCR was used for stone boiling to process bone grease or similar foods. Furthermore, experimental work shows that the local calcite sandstone is not suitable for stone boiling, as it tends to disintegrate upon a single use (Jackson 1998; Chapter 13).

An abundance of FCR is consistent with the preparation of plant foods, especially roots (Thoms 1989, 2003; Wandsnider 1997). Ethnographic records for south-central Texas from the sixteenth century attest to the importance of root foods during the winter months. Women dug various roots within a few kilometers of their residential base; processing took place at these encampments, often by cooking the roots in earth ovens for two days (Campbell and Campbell 1981). As noted, this kind of prolonged cooking is almost always done in earth ovens with rock heating elements (Thoms 1989, 2003). The kinds of tools generally associated with processing seed foods (e.g., nutting stones, manos, and metates) were not recovered from the Perez component. Stone pestles, which are characteristic of root-food and nut processing, are lacking in the Richard Beene site assemblage and they are not characteristic of any of the surrounding savannah regions. If pestles and mortars were ever used regularly in these regions, they must have been made from wood.

In summary, the 10,000-year-old upper Perez component at the Richard Beene site appears to be more like a typical early Holocene site in the eastern Woodlands than sites of the same age in decidedly Plains settings to the north or west. It fits comfortably with Butzer's (1990:30) assertion that along the eastern margins of the Great Plains the transition away from a megafauna hunting Paleoindian tradition was complete by 9000 B.P. As interpreted here, the Perez component represents a series of short-term, residential or domestic encampments, most likely occupied sometime from late fall to the early spring, when the floodplain would have been comparatively cool and dry and nearby root grounds would have been at their maximum productivity. In terms of subsistence patterns, available evidence points to heavy use of the local bottomlands, including the exploitation of river mussels. By inferential argument, the abundance of FCR suggests the importance of roots and other plant foods. Lanceolate-shaped points and laurel-leaf-shaped knives attest to the importance of hunting and the faunal record, albeit limited, indicates that white-tailed deer provided the bulk of the meat.

The kind of use-wear and edge-beveling that Angostura points from the Richard Beene site exhibit is characteristic of other lanceolate forms found along the western margin of eastern Woodlands (Johnson 1989). In recognition of this type of use wear and re-sharpening, which likely results from repeatedly cutting hides and meat, Daniel Morse (personal communication 1995) referred to beveled-edge specimens as Plains "wannabes." From the savannah perspective presented here, the Perez assemblage as a whole attests to the presence of Early Archaic hunters and gatherers, while the Angostura points allude to Late Paleoindian phantoms from the Plains. The site's early Holocene occupants may have been among the last of the region's big-game hunters, but perhaps more importantly from a long-term land-use perspective, they appear to have been among the first of the region's adze-using woodworkers. They were well along the road toward decreasing residential mobility and increasing use of plant foods.

Conclusions

One of the more important conclusions that stems from archaeological and paleoenvironmental investigations undertaken at the Richard Beene site is that the Applewhite terrace preserved an unusually complete record of the region's cultural and natural history spanning the late Pleistocene and Holocene epochs. This evidence has an extraordinary potential to contribute significantly to our understanding of long-term human adaptations, site formation processes, and paleoenvironments in general. The Richard Beene site serves as a "type site" against which less well-preserved or less complete archaeological records can be compared. It exemplifies the idea that river valleys along the inner Gulf Coastal Plain of Texas, from the Sabine River to the Rio Grande, are likely to contain deeply buried and well-preserved archaeological, paleontological, and paleoenvironmental records. The challenge is to learn more about the nature and distribution of these records.

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APPENDIX A

DESCRIPTION OF PROBOSCIDEAN BONE SPECIMEN

Eileen Johnson

The bone specimen is that of a mid diaphyseal cylinder portion of a proboscidean long bone (Figure A.1 a-b). Based on comparative material, the element represented is most likely that of a tibia, although conformation is not exact. Both mammoth and mastodon are found in late Pleistocene deposits in Texas (Graham and Lundelius, 1994). It is difficult to separate these two extinct proboscideans on portions of bones. In general, however, mastodon bones are shorter and somewhat stockier than mammoth (Olsen, 1972:5). Based on the size of the element portion and cortical thickness, the specimen is referred to mammoth (cf. *Mammuthus columbi*).

At least three taphonomic processes have affected the bone specimen prior to burial. One process is that of subaerial weathering. The cortical surface is checked and desiccation lines that are parallel to the longitudinal axis of the bone abound on all sides. Most are very thin and shallow, with a few thicker and deeper. However, none reach the desiccation crack stage. No root etching is discernable on the specimen, suggesting that the exposed surface was not heavily vegetated. In general, climatic conditions would have been subhumid (Johnson, 1991). This weathering pattern and associated circumstances indicate that the specimen lay exposed on the surface for some time prior to burial (perhaps less than 5 years) (Coe, 1978; Johnson, 2000).

The second process is that of geologic abrasion. The cortical surface is worn, with patches of wear spots where the cortical surface has been removed. Edges are rounded and a few pits occur on the bone surface. This type of damage is caused by frictional forces applied to the surface and edges. In general, the major forces leading to abrasion are sedimentary, aeolian, and fluvial (Shipman and Rose, 1988; Johnson, 1985). The wear pattern is on all surfaces and sides of the specimen. Therefore, the cause is not aeolian, as wind induced damage generally is on one side. The specimen is not water worn. The cause more likely is sedimentary abrasion.

The third process is that of bone breakage. Bone breakage can be caused through natural means or by cultural manipulation. Breakage patterns are different for dry bone and wet (fresh) bone (Johnson, 1985, 1991). Bone broken through sediment compaction has a distinctive pattern (Johnson, 1985). Both large carnivores and people modify bone. The general pattern of carnivores is to attack the ends of long bones, chewing on the cancellous tissue. Bones broken by large carnivores generally are dry and are broken through static loading. The most common strategy in breaking bones is to break the bone cylinder (produced from chewing off the ends) through static loading. In the late Pleistocene, the dire wolf (Canis dirus) and short faced bear (Arctodus simus) are the major large carnivores with powerful jaw muscles and appropriate tooth structure for bone gnawing and crushing. Neither has the masticatory apparatus and facial structure to dynamically or statically fracture intact, wet mammoth limb bones (Johnson, 1985, 1991).

This specimen exhibits a helical breakage pattern on both ends. This type of pattern is associated with breakage of intact wet bone through dynamic loading. Particularly for mammoth bones, this pattern indicates cultural manipulation. At least one anvil was involved, along with a large (small boulder size) hammerstone. One of the helical fracture surfaces exhibits intersecting fracture fronts. Fracture fronts emanate out from the point of impact. As they circle around the diaphysis, a front can encounter another front. No point of impact is identified for either fracture surface. Having a bone cylinder created through dynamic fracture of both ends of a long bone is unusual. The common pattern is to impact the intact element mid diaphysis and fracture the element into two main portions (distal and proximal ends). The cylinder pattern indicates that the element was impacted near both the proximal and distal ends.

Dynamic loading of intact wet bone is the most common strategy of early inhabitants in breaking open long bones. Generally, people break bones for two purposes, to extract the marrow or to obtain raw material for production purposes (such as for expedient butchering tools or more stylized, formal tools such as awls and needles; Johnson, 1985). The marrow in proboscidean bones is contained in a three dimensional trebecular lattice within the medullary cavity and is not conducive to extraction through

a

b

Figure A.1. (a-b) Mid-diaphyseal cylinder of a proboscidean long bone from the Richard Beene site (41BX831).

bone breakage (Haynes, 199/). Mammoth bone generally is broken by people to use as a technological resource (Johnson, 1985, 2004). Whether this specimen is a piece of fracturing debris or a selected piece for further modification could not be determined.

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APPENDIX B
(SEE COMPACT DISC ATTACHED TO BACK COVER)

PROVENIENCE TABLE

Compiled by Patricia A. Clabaugh

APPENDIX C

ANALYTICAL AND DESCRIPTIVE DATA FOR STONE TOOLS

(SEE COMPACT DISC ATTACHED TO BACK COVER)

John E. Dockall

APPENDIX D
(SEE COMPACT DISC ATTACHED TO BACK COVER)

FAUNAL ANALYSIS

Barry W. Baker

APPENDIX E

DESCRIPTIVE ANALYSIS OF HUMAN TEETH

Lori Wright

TEXAS A&M UNIVERSITY
College of Liberal Arts
Department of Anthropology

Dec. 18, 2003

Memorandum

To: Alston Thoms
From: Lori Wright LSW
Re: Human teeth from the Richard Beene Site

Below is a brief analysis of two teeth recovered at the Richard Beene Site. Both are poorly preserved, with considerable post-depositional erosion of the root surfaces, and some etching of the enamel.

41BX831, Unit 674, Lot# 1208, FS# 2840

This tooth is a left maxillary third molar, and indeed is human. The lingual root is fractured and missing, but given the post-depositional erosion of the root (and enamel) surfaces, it is not possible to determine if this breakage was pre- or post-mortem. The tooth crown shows significant attrition, and is inclined such that crown is completely removed by the wear on the lingual side, while the buccal side retains 3.8mm of enamel crown height. This attrition has penetrated to the secondary dentine on the protocone, and would be scored as Stage 7 or 8 using Smith's (1984) dental wear system. The angle of this wear is typically consistent with a diet of ground and processed food, rather than a strictly hunting and gathering diet, however, subsistence mode cannot be reliably assessed from a single tooth, and especially from a third molar. The tooth does not show any caries, nor is calculus present, however, any calculus originally present would likely have been eroded postmortem given the condition of the root. The crown size cannot be measured due to the advanced stage of attrition. Apices of the buccal roots were completely formed, indicating an age at death (or ablation if lost antemortem) greater than 19 years, and the considerable attrition indicates a much older adult age, however, greater precision is not possible without a comparative sample from the same culture.

41BX831, Unit 368, Lot# 1291, FS# 3115

This tooth is either a right maxillary third molar or a right maxillary second premolar, although the former identification is most likely. The crown size is very small and consistent with a premolar (MD= 7.89mm, BL=9.07mm), but its morphology more closely resembles a reduced "peg-like" third molar. Only a single root is present, and its morphology is consistent with the union of three roots as seen in maxillary molars, rather than the mesio-distally flattened form that would be expected in a premolar. There is a large interproximal facet on the mesial surface, and no distal interproximal facet is evident, supporting the third molar interpretation. The enamel surfaces are well preserved, and show a generalized polish of the occlusal surface rather than distinct attritional facets, although there does appear to be significant blunting of the cusp tips. This would be scored as Smith's (1984) stage 1 or 2. A small carie is evident in the distal fissure of the occlusal surface that does extend into the dentine, however, it is barely larger than the diameter of a #5 dental probe, and is unlikely to have been responsible for early loss of this tooth. The root is complete, indicating an adult age. The minimal wear would imply death or ablation during young adulthood, but given the small size of the tooth, and the nature of the wear, it may have not been in alignment with the plane of mastication, and the individual may have been older than the wear would otherwise indicate.

Smith BH (1984) Patterns of molar wear in hunter-gatherers and agriculturalists. *American Journal of Physical Anthropology* 63:39-56.

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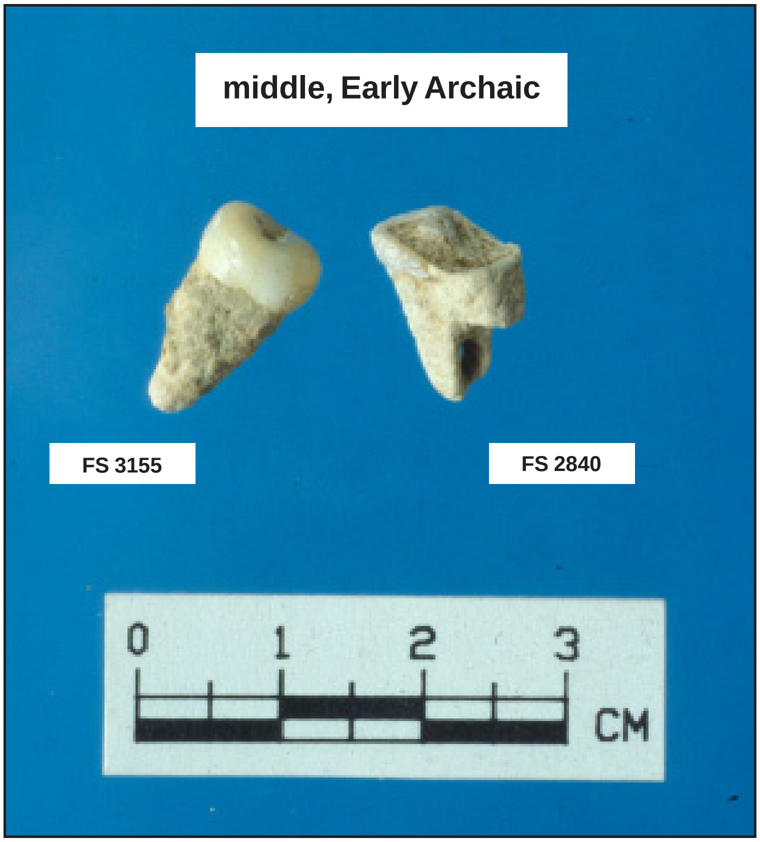

Figure B.1. Two human teeth from the middle, Early Archaic period, Block G.

APPENDIX F

FEATURE ANALYSIS
(SEE COMPACT DISC ATTACHED TO BACK COVER)

Patricia A. Clabaugh

APPENDIX G

ARCHEOMAGNETIC ANALYSES OF ROCKS FROM FEATURE 107

Wulf Gose

Two oriented specimens were drilled from all but one of 5 fire-cracked rocks and subjected to archeomagnetic analyses. After measuring the natural remnant magnetization (NRM), the specimens were thermally demagnetized at 150°C, 200°C, 300°C, 350°C, 400°C, and 450°C. The progressive demagnetization proved to be crucial because the directions of magnetization at a given temperature step would erroneously indicate inconsistent results among the subsamples. Principal component analysis of the data reveals two directions of magnetization in samples 1, 3, and 5 and only one component in samples 4 and 6. The directions of the low temperature component, i.e. the magnetization stable up to 300°C, and the high temperature component are shown in Figure G.1. The directions of magnetization between the subsamples agree reasonably well. The directions of samples 1, 3 and 4 fall close to the expected direction the field area whereas samples 5 and 6 are far removed (note their reversed directions). The high temperature components show a similar picture but the scatter is significantly increased. The interpretation of these results is straight forward. The samples experienced an average heating temperature of about 300°C. Samples 1, 3, and 4 have remained undisturbed since their last heating. By contrast, samples 5 and 6 have moved significantly, in excess of 110°C.

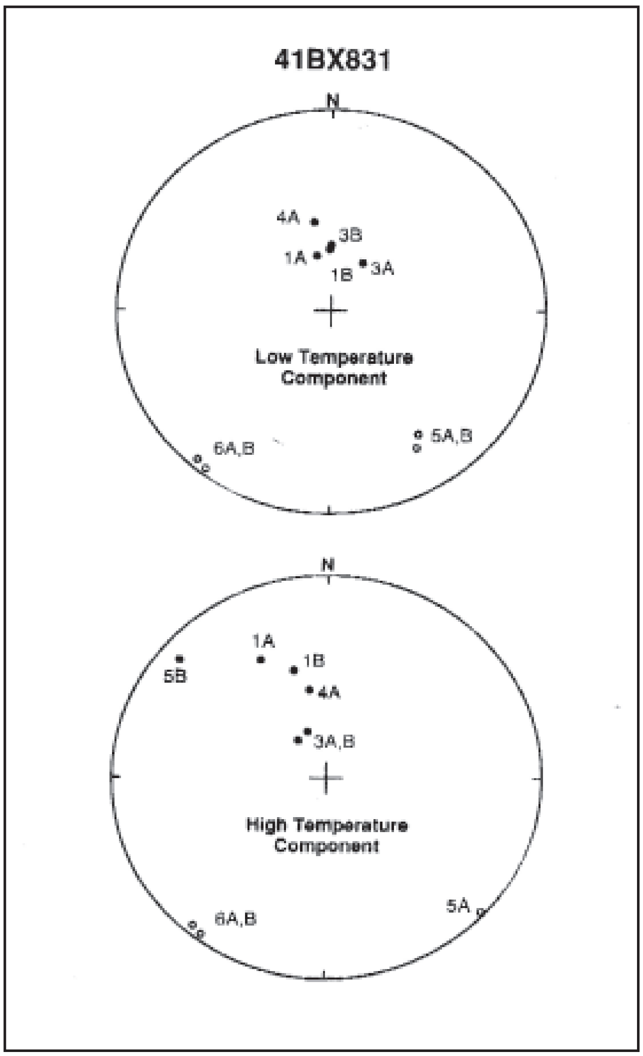

Figure G.1. Archaeomagnetic directions of the low temperature component, i.e. the magnetization stable up to 300°C, and the high temperature component from FCR samples.

APPENDIX H

IMMUNOLOGICAL ANALYSIS OF ARTIFACTS

Margaret E. Newman

IMMUNOLOGICAL ANALYSIS OF ARTIFACTS FROM THE RICHARD BEENE SITE (41BX831), TEXAS.

Prepared for
Archaeological Research Laboratory
Texas A & M University

by

Margaret E. Newman
Laboratory of Archaeological Science
California State University, Bakersfield

February 23, 1992

Recent studies have demonstrated that lithic artifacts often retain traces of organic residue resulting from their original use (Briuer 1976; Broderick 1979; Downs 1985; Hyland *et al.* 1990; Kooyman *et al.* 1991; Newman 1990; Newman and Julig 1989; Shafer and Holloway 1979; Yohe *et al.* 1991). Through the use of immunological and biochemical techniques the animal of origin can be identified to at least the family level of identity. This information can be used in the reconstruction of prehistoric subsistence patterns and possibly in identifying artifacts used for specific tasks.

Immunological tests have been used for many years to characterize bloodstains in medico-legal work. Since the introduction of the precipitin test for the medico-legal identification of bloodstains at the turn of the century (Culliford 1964; Gaensslen 1983), several new techniques have been introduced. However, the basis of all subsequent tests is the antigen-antibody reaction first observed in the classic precipitin test (Gaensslen 1983:53). The successful identification of such residues is dependent on the amount and condition of antigen retained in the stain. However, forensic studies have demonstrated that blood proteins can generally withstand harsh treatment and still be identified (Gaensslen 1983; Macey 1979; Sensabaugh *et al.* 1971, among others). The sensitivity and specificity of precipitin reactions makes them an extremely effective method for the detection of trace amounts of protein (Kabat and Meyer 1967:22).

Materials and Methods

The method of analysis used in this laboratory is cross-over electrophoresis (CIEP). This is based on the work of Culliford (1964) with minor changes made following the methods of the Royal Canadian Mounted Police (RCM Police) Serology Laboratory (Ottawa) and the Centre of Forensic Sciences (Toronto). The test is extremely sensitive and can detect 10^{-8}g of protein (Culliford 1964:1092). This procedure is discussed fully in Newman and Julig (1989).

Seventeen artifacts recovered from excavations at the Richard Beene Site (41BX831), Texas were submitted for protein residue analysis. Eleven soil samples collected from the same stratigraphic unit as the artifacts were also included for testing.

Possible residues were removed from the artifacts by the use of a 5% ammonium hydroxide solution. This has been shown to be the most effective extractant for old and denatured bloodstains and does not interfere with subsequent testing (Dorrill and Whitehead 1979; Kind and Cleevely 1969). Artifacts were placed in shallow plastic dishes and 0.5 cc of the 5% ammonia solution applied with a syringe and needle. Initial disaggregation of residue is carried out by floating the plastic dish and its contents in an ultrasonic cleaning bath for two to three minutes. Extraction is continued by placing the boat and contents on a rotating mixer for thirty minutes. The resulting ammonia solution is removed with a pipette and placed in a numbered plastic vial and refrigerated prior to further testing.

Contaminants in soils, such as bacteria, lipoproteins and chemical oxidants, may cause nonspecific precipitation of preimmune serum (serum from a non-immunized animal) and of the animal antisera (Culliford 1971; Gaensslen 1983; Heglar 1972; Wadstrom 1983). It is, therefore, important that site soils be included in immunological testing of artifactual materials.

Approximately 1 g of each soil sample was added to 1.0 ml of Tris buffer, pH 8.0, and allowed to mix for two days at 4^0C. The resulting supernatant was removed and tested together with the artifact samples.

All specimens, artifacts and soils, were first tested against pre-immune serum (i.e., serum from a non-immunized animal). A positive result against pre-immune serum could arise from non-specific protein interaction not based on the immunological specificity of the antibody. No positive results were obtained. All extracts from artifacts were then tested against the anti-sera shown in Table 1. Duplicate testing is carried out on all positive reacting specimens.

Except where noted, the animal anti-sera used in this analysis are primarily obtained from commercial sources and are developed specifically for use in Forensic Medicine. These anti-sera are polyclonal, that is they recognize epitopes shared by closely related species. For example, anti-deer will give positive results with other members of the Cervidae family such as deer, moose, elk and caribou as well as with pronghorn (Antilocapridae family). Two additional anti-sera, elk and trout, were raised at the University of Calgary. The elk anti-serum is species-specific while the anti-trout will elicit positive reactions with all members of the Salmonidae family. Immunological relationships do not necessarily bear any relationship to the Linnaean classification scheme although they usually do (Gaensslen 1983).

Results

The positive results of CIEP analysis are shown in Table 2 and discussed below.

TABLE 1

ANTI-SERA USED IN ANALYSIS

ANTI-SERA	SOURCE
anti-deer	Organon/Teknika
anti-human	Forensic Medicine
anti-cat	
anti-dog	
anti-bovine	
anti-bear	
anti-rabbit	
anti-guinea-pig	Sigma Chemical Co.
anti-mouse	
anti-rat	
anti-pigeon	Nordic Immunological
anti-pig	
anti-duck	
anti-chicken	
anti-pronghorn	University of Calgary
anti-trout	

TABLE 2

POSITIVE RESULTS OF CIEP ANALYSIS

SAMPLE NUMBER	SAMPLE TYPE	RESULT
41BX831-1	Dart Point Lange	Rabbit
41BX831-3	Dart Point	Rat
41BX831-17	FCR Fea 30	Rabbit

Positive results to rabbit anti-serum were obtained on two artifacts, a dart point and a piece of fire cracked rock. Other members of the order Lagomorpha (rabbits, hares or pikas) may be represented by these results, but cross-reactions with other orders are not known to occur.

Rat proteins were identified on one artifact, a dart point. Although cross-reactions with mouse may occur none were found in
this analysis. Cross-reactions sometimes occur with other members of the order Rodentia such as squirrel and beaver. No definite species identification can be made at this time however, it is suggested that some species of rat, present in the area, may be represented.

The absence of identifiable proteins on other artifacts may be due to a number of factors including insufficient protein retained on artifact to permit identification, non-utilization of tool or the presence of species other than those tested.

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APPENDIX I

BLOOD RESIDUE ANALYSIS

John L. Fagan

ARCHAEOLOGICAL INVESTIGATIONS NORTHWEST
RESIDUE ANALYSIS LABORATORY

Laboratory Methods and Procedures

Blood residue analysis performed at Archaeological Investigations Northwest's (AINW) Residue Analysis Laboratory uses the technique of cross-over electrophoresis, a form of immunoelectrophoresis to analyze surface residues extracted from stone artifacts and other objects. Cross-over electrophoresis uses an agarose gel base with known antisera as reactants to identify the types of animals that left protein residues on the surface of tested artifacts.

Antisera are used as reactants in determining the identity of proteins extracted from artifacts, and are obtained from certified laboratories. An antiserum is made by injecting a laboratory animal, most commonly a goat or rabbit, with a protein from some other animal. The injected animal's immune system reacts with the foreign substance to produce a new substance, an antibody, that will react with the originally introduced antigen (protein). All vertebrates produce antibodies (immunoglobulins) as part of their immune systems. In solution these antibodies recognize specific foreign proteins (antigens), bind with them, and then precipitate out of solution. This antigen-antibody reaction and subsequent precipitation is a well known and useful property in medical and forensic research (Gaensslen 1983), and is the basis of cross-over electrophoresis.

Antigen-antibody reactions can be highly specific, although proteins from closely related species share enough of the same binding sites on the immunoglobulin molecule to react in similar ways. (Immunoglobulins are large Y-shaped proteins with binding sites located on the V portion of the Y.) Quantification of this type of reaction with sophisticated tests such as radioimmunoassay have been used to determine taxonomic relationships between living and extinct animals (for example, see Lowenstein [1980, 1985]), although that is outside the scope of cross-over electrophoresis.

In the AINW Residue Analysis Laboratory, residues to be tested are extracted from the surface of artifacts placed in a pre-washed tray. The extraction solution used is a 5% ammonia solution. This type of solution has been used for similar testing in forensic medicine (Kind and Cleevely 1969; Dorrill and Whitehead 1979), and generally shows better lifting power for proteins than either distilled water or saline solution, which can also be used. The extraction solution is pipetted underneath the artifact and the tray is floated in an ultrasonic cleaner for five minutes. The artifact and extraction solution are then placed on a rotator for five minutes. The extracted solution is then drawn off and stored in an airtight microcentrifuge tube. It is refrigerated if testing is to be done within a week, or frozen if testing is to be done a week or more later. Cross-over electrophoresis uses approximately five microliters (one-millionth of a liter) of the extracted surface residues per test, which is a great advantage in archaeological work where there is usually only a small amount of residual protein available for testing. Details of the extraction process, such as amount of solution used, extraction time, side tested, and type of solution used, are recorded for each artifact, along with data from the microscopic analysis if that step is performed.

To perform the electrophoresis, an agarose gel on gel bond (from Sigma Chemical Company and FMC Corporation, respectively) is prepared, which is a thin, flat sheet. Pairs of wells, or depressions, are punched out of the gel. Several liquid specimens extracted from the surface of the artifacts, plus positive and negative controls, are placed in the wells on each gel. Each pair of wells is a test for one artifact against one antiserum: one known antiserum is placed in a well opposite a well containing the solution extracted from the surface of the artifact. The paired specimens are situated on the gel bond in such a way that when placed in the electrophoresis, the extracted solutions to be tested are in wells oriented near the cathode and the antisera are in the wells near the anode. The agarose must have a high electroendosmosis rating.

Each gel is numbered and the specific antiserum and the extracted solution from each specific artifact are recorded on a laboratory form (Cross-over Electrophoresis Record) for each electrophoresis run. The results of each run, including the non-immune serum (NIS) and controls for each antiserum used, are also recorded on the laboratory record form for each group of artifacts analyzed. The Comparative Results form lists the artifact number, our assigned specimen number (if different than the submitted artifact number), our tracking number for the prepared gel, and the antisera used for the test. This form shows both the results of the analysis (negative and positive reactions) for the solutions extracted from the surfaces of the artifacts and the results of the non-immune serum tests.

Electrophoresis is done by placing the prepared gel between two troughs containing barbital buffer (obtained from Sigma Chemical Company). Cotton flannel wicks are placed in the liquid buffer and contact is made with each end of the sheet-like gel to form a complete circuit. Electrodes in each trough are connected to a power source for the electrophoresis operation. An electric current is applied across the gel (130 volts) for 40 minutes, and the high endosmosis of the agarose allows serum gamma globulins (IgG) in the antiserum (in the anodal well) to move towards the cathode while other proteins (albumin, and alpha and beta globulins) in the extracted solution (in the cathodal well) move towards the anode. When a positive reaction occurs, a protein precipitate forms between the two wells and may be visible as a white line or arc (Culliford 1971). This indicates a match between a known antiserum and unknown residue specimen, and occurs when the antigen in the specimen and antibodies in the antiserum bind and precipitate out of solution. Although this precipitate shows up as a white line between the two reactants, it may not be visible until stained with dye. After blotting and an overnight saline bath, the gel is dried and stained with Coomassie blue (a standard protein stain) to facilitate the viewing of positive reactions and as a permanent record of the cross-over electrophoresis results. The gel is archived at the AINW Laboratory.

A cross reaction (not to be confused with the cross-over electrophoresis reaction), or anomalous positive, sometimes occurs when an antibody recognizes the shape, rather than the chemical composition, of an antigen and partially reacts to it. Non-specific reactions to other proteins present in the extracted solution may occur as well. Therefore, in order to rule out false positives, extracted solutions from artifacts are run against a non-immune serum (derived from dried blood and not an antiserum) as part of a protocol to eliminate any cross reactions. If this step results in all negative reactions, then the extracted solution from the surface of the artifact is assumed to provide valid results during the cross-over procedures with antisera. However, if a positive reaction to the non-immune serum occurs, then a second step is needed to confirm or negate the cross reaction. In this second step, a 1% solution of a non-ionic detergent (Tween 80, obtained from Sigma Chemical Corporation) is added to each extracted solution; the addition of the detergent solution leads to a stronger binding of antigen by breaking weak, non-specific bonds (for example, see Newman 1990). The extracted solutions from the artifacts' surface are then rerun against the non-immune serum and if all negative results are obtained, then the positive results of the following cross-over reactions with antisera can be accepted (Newman and Julig 1988). If, however, the reactions to the 'cleaned' non-immune serum are positive, then the positive reactions of any subsequent cross-over electrophoresis with antisera reactants are not accepted.

The electrophoresis unit of the Residue Analysis Laboratory at AINW uses a Heathkit regulated H.V. power supply (model #EIA-416, 120/240 VAC, 50-60 Hz, 150 watts) which supplies the constant 130 volts needed for the electrophoresis. An acrylic chamber for the electrophoresis has removable troughs for holding the buffer, and the electrodes built into the troughs are made of platinum wire to prevent electrons from the metal from entering the solution. The Residue Analysis Laboratory uses an electronic scale that meets specifications of 0.01 gram accuracy. Other equipment includes an Olympus binocular microscope (240X maximum magnification), an ultrasonic cleaner, and a rotomix rotator.

Forensic antisera are obtained from Organon Teknika Corporation, Sigma Chemical Company, and Nordic Immunological Laboratories. The type of antisera used has been solid phase absorbed to prevent cross reactions. As noted above, this type of antiserum will react not only with similar proteins from the target animal, but with proteins from closely related species as well. The forensic antisera used with this type of electrophoresis will give positive reactions at approximately the family level. For example, deer antiserum should react with blood proteins from other cervids such as moose or elk, but not with bovine proteins.

Although not performed for this particular analysis, artifacts may be examined under a binocular microscope to identify the location of residues. Although microscopic examination is not always desired or necessary, in many cases tissues, hair, and other residues may be identified through microscopic examination. In some cases, residues which were not visible under the microscope may be identified using cross-over electrophoresis. Nevertheless, microscopic examination can be used as a means of screening a collection to identify those artifacts with visible residues.

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RESULTS - RICHARD BENE SITE (41BX831)

APPLEWHITE RESERVOIR ARCHAEOLOGICAL PROJECT
TEXAS A & M UNIVERSITY

Site & Sample No.	AINW RAL #	bear	** bovine	camel	cat	** chicken	** deer	dog	eleph	goat	horse	human	** rabbit	rat	sheep	swine	** NIS	** TN
		TYPE OF ANTISERUM																
41BX831-18	1		-			-	-						-				-	-
41BX831-19	2		-			f+	-						-				-	-
41BX831-20	3		-			-	-						-				-	-
41BX831-21	4		-			-	-						-				-	-
41BX831-22	5		-			-	-						-				-	-
41BX831-23	6		-			-	-						-				-	-
41BX831-24	7		-			-	-						-				-	-
41BX831-25	8		-			-	-						-				-	-
41BX831-27	10		-			-	-						-				-	-
41BX831-28	11		-			-	+						-				-	-
41BX831-29	12		-			-	f+						-				-	-
41BX831-30	13		-			-	-						-				-	-
41BX831-31	14		-			-	-						-				-	-
GEL NO.			117			117	118						118				116	116
GEL NO.						126	126											
GEL NO.							125											

Technicians:
Shirley Williams, Monique Cushing

Key: - = negative reaction; + = positive reaction; f+ = faint positive reaction;
** antisera, non-immune sera, and tweened NIS sera used for testing.

APPENDIX J

ARCHAEOLOGICAL SURVEY AND MONITORING IN 2005 AT THE RICHARD BEENE SITE, SOUTH–CENTRAL TEXAS

Alston V. Thoms, Patricia A. Clabaugh, Sunshine Thomas, and Masahiro Kamiya

ARCHAEOLOGICAL SURVEY AND MONITORING IN 2005 AT THE RICHARD BEENE SITE, SOUTH–CENTRAL TEXAS

Alston V. Thoms
Patricia A. Clabaugh
Sunshine Thomas
Masahiro Kamiya

with a contribution by
Jesus J. Reyes, Jr.

Co-Principal Investigators
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Technical Editor
Patricia A. Clabaugh

Texas Antiquities Permit No. 3836

Technical Report No. 7
Center for Ecological Archaeology
TAMU

2005

ABSTRACT

This report presents methods and results of archaeological monitoring conducted during the summer of 2005 at the Richard Beene archaeological site (41BX831) located about 20 km south of San Antonio in south–central Bexar County. The site is formally listed as a State Archaeological Landmark and the work reported herein was undertaken in conjunction with mechanical stabilization of the massive spillway trench walls for the now-abandoned Applewhite Reservoir project that encompassed a significant portion of the archaeological site. Detailed topographic maps illustrate: (1) the shape of the spillway trench and the location of excavation areas as they appeared in 1995; (2) the trench and its exposed archaeological features and artifacts as they appeared in 2005 following a decade of erosion and several floods; and (3) the spillway trench and exposed artifacts as they appeared after the trench walls were sloped back and gullies were infilled. Survey and monitoring work in the spillway trench area (ca. 300 x 200), where well stratified sediments and archeological deposits dated to the last 10,000 years, led to the documentation of dozens of isolated in situ artifacts including chipped stone, fire-cracked rocks, and mussel shells on exposed surfaces of four paleosols dated to ca. 2800–3200, 4500–6900, 7000–8600, and 8800–9000 before present (B.P.). Six in situ features were also documented: two small, basin-shaped hearths were found in deposits dated to 4500 and 6900 B.P.; two concentrations of fire-cracked rock in sediments dated 4500 B.P.; one sheet-midden area in deposits dated to ca. 3000 B.P.; one lag-concentration of stone tools, fire-cracked rock; and mussel shells in deposits dated to ca. 8800 B.P. The nature and distribution of the artifacts and features demonstrated that significant portions of well-preserved components of the Richard Beene site remain buried and readily accessible from the newly sloped spillway trench.

ACKNOWLEDGMENTS

This project was funded by the San Antonio Water System (SAWS) and followed recommendations put forth by the Texas Historical Commission for the scope of archaeological investigations to be conducted in conjunction with mechanical landscape stabilization of the abandoned Applewhite dam/spillway trench that encompassed portions of the Richard Beene site (41BX831). Mr. Christopher Powers, Director of Data Resources for SAWS, worked closely and productively with the archaeological team and the bulldozer operators to insure timely and successful completion of the stabilization project. Ramon Vasquez, Director of the American Indians in Texas at Spanish Colonial Missions and a member of Tap Pilam-Coahuiltecan Nations, visited the site on several occasions during field work, participated in the monitoring operations, and kept us apprised of preservation concerns of those organizations.

The archeological team members for this project and their respective roles were as follows:

Patricia A. Clabaugh	Co-Principal Investigator, Technical Editor, Author
David A. Foxe	Graphics Assistant
Rhonda K. Holley	Laboratory Assistant and Copy Editor
Masahiro Kamiya	Field Archaeologist and Author
Jesus J. Reyes Jr.	Field Archaeologist
Julian Reyes	Volunteer Field Assistant
Sunshine Thomas	Field Archaeologist and Author
Alston V. Thoms	Co-Principal Investigator, Director, Author
Walter H. Thoms	Volunteer Field Assistant

Although we, the authors, acknowledge the contributions made by the people and organizations listed above, as well as others who inadvertently remain unnamed, we remain responsible for any errors in fact or omission herein.

TABLE OF CONTENTS

LIST OF FIGURES

ARCHAEOLOGICAL SURVEY AND MONITORING IN 2005 AT THE RICHARD BEENE SITE, SOUTH–CENTRAL, TEXAS

By Alston V. Thoms, Patricia A. Clabaugh, Sunshine Thomas, and Masahiro Kamiya

This report documents archaeological survey and monitoring work undertaken in 2005 at the Richard Beene archaeological site (41BX831) by the Department of Anthropology–Archaeology Ecology Laboratory at Texas A&M University. The Richard Beene site was one of several dozen archaeological localities discovered during the late 1980s along the Medina River some 15 miles south of San Antonio Texas within an area proposed for the location of the Applewhite Reservoir. The site, now a State Archaeological Landmark, was first located on the surface of the proposed dam site and later found to extend into the massive spillway trench and, there, to be buried more than 12 m below surface, spanning at least 9,000 years of intermittent occupation by the region's hunter–gatherer populations (Figure 1).

Archaeological investigations reported herein were carried out primarily during July 2005 in conjunction with the San Antonio Water System's (SAWS) landscape stabilization project for the abandoned spillway trench at the reservoir's dam site. Stabilization work entailed the use of bulldozers to mechanically slope vertical walls and infill gullies in the spillway trench (ca. 400 m x 200 x 15 m). Surface survey of areas not covered by dense grass along the trench walls and slopes, along with monitoring of fresh mechanical cuts during mechanical stabilization, resulted in the discovery of artifacts and features buried from about 50 cm to 10 m below the surface and encased in sediments known to date to approximately 700, 3000, 4500, 7000, 8200, and 8800 years B.P.

The spillway trench area was also remapped to depict it as it appeared after 14 years of slope erosion and Medina River floods and to allow future investigators to readily locate intact deposits and distinguish them from post–1995 slope-washed and mass-wasted sediments.

While results presented herein attest to adverse impacts, it is readily apparent that significant portions of the Richard Beene site's archaeological and paleontological components remain well preserved, well represented, and readily accessible to future scientific investigations. These deposits nonetheless remain subject to adverse impacts from erosion and, as such, there is a clear need for long-term planning to control endemic slumping and gullying.

The following section places the present project in historical perspective by providing background information about the reservoir project and related archaeological studies. Next come sections on field methods and project results. Summary comments and recommendations follow for the continuing protection of the site from erosion and for incorporating existing features (e.g., roads, drainage ditch, and sediment pond) into future development of the site for heritage tourism and research purposes. Photographs and maps supplement the text throughout the report. The report concludes with Jesus Reyes' narrative entitled "A Personal Native American Perspective on the Richard Beene Archaeological Survey and Monitoring Project."

PROJECT BACKGROUND

The Center for Archaeological Research at the University of Texas at San Antonio carried out the initial round of literature reviews, field surveys, and

Archaeological Survey and Monitoring in 2005 at the Richard Beene Site 41BX831, South–Central Texas, 2005, by A. V. Thoms, P. A. Clabaugh, S. Thomas, and M. Kamiya. Technical Report No. 7. Center for Ecological Archaeology, Texas A&M University, College Station, Texas.

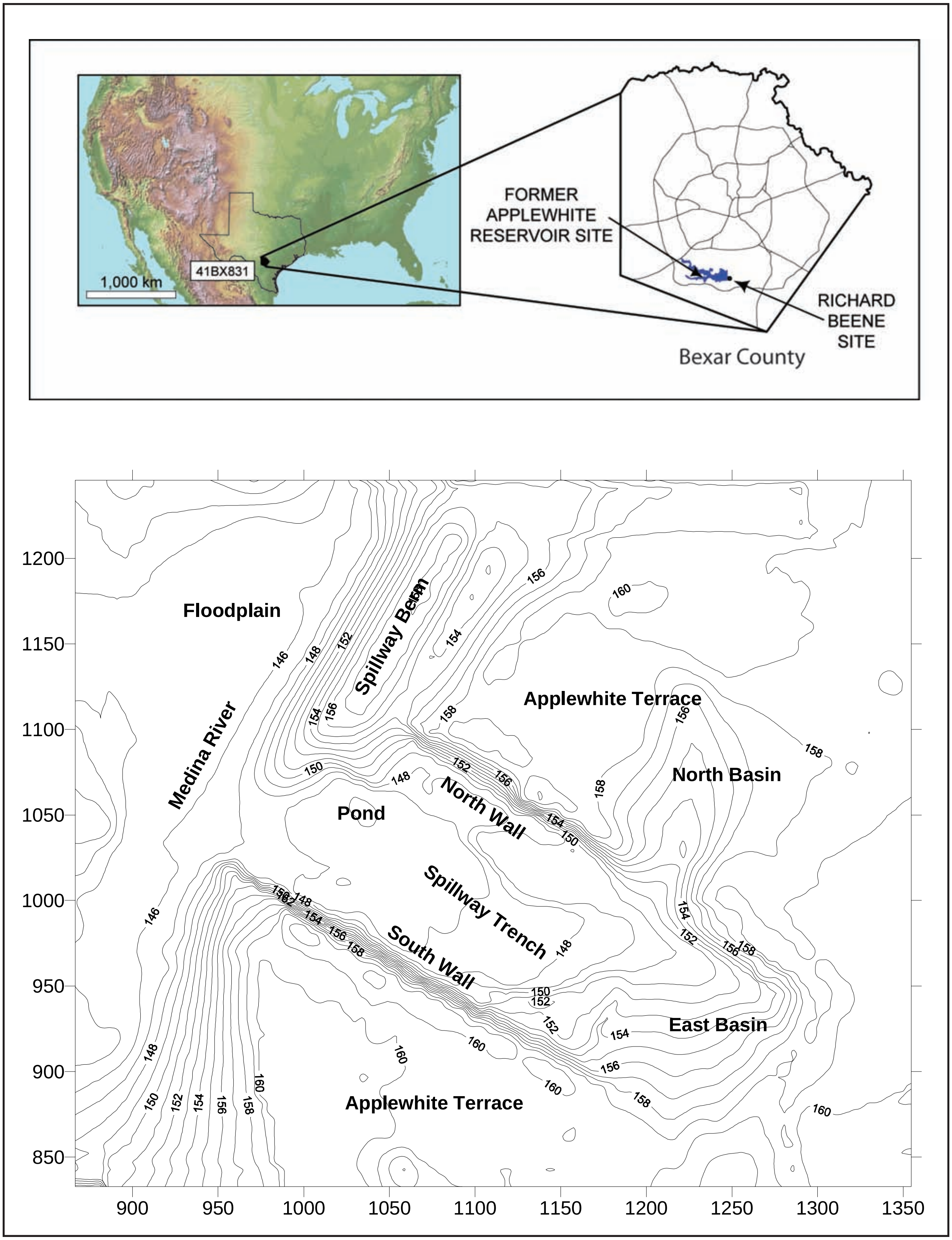


Figure 1. Maps showing the location of the Richard Beene site and the spillway trench area (1995) of the site where its buried components are exposed.

test excavations in the mid 1980s for the proposed Applewhite reservoir project (McGraw and Hindes 1987). Beginning in 1989 and continuing through 1990, SAWS funded Texas A&M archaeologists to conduct additional surveys and test several dozen sites within the proposed flood pool of Applewhite Reservoir. New survey work led to the discovery of the Richard Beene site and subsequent testing demonstrated that it and 14 other sites were eligible for formal listing as State Archaeological Landmarks. As such, these sites merited full-scale data-recovery studies prior to inundation by the proposed reservoir (Carlson 2005).

Data recovery excavations began in the fall of 1990 at the Richard Beene site, which was located in the footprint of the dam where construction was scheduled to begin (Figure 2). Test excavations showed that the site's cultural deposits extended to at least 3 m below surface. New archeological discoveries made in the spillway trench, as it was deepened by dozens of bulldozers and pan-scrapers, soon revealed that artifacts and features representing well preserved campsites extended to 12 m below surface and were as much as 9,000 years old (Thoms and Mandel 2005).

Construction of the spillway trench had been underway for six months when, as a result of two public referenda, SAWS first suspended ongoing construction project in the spring of 1991 and then, in 1994, cancelled the entire reservoir project. A final round of archaeological excavation work was conducted at the Richard Beene site in 1995 to further sample two under-represented archaeological components that were exposed along the steep walls of the partially constructed spillway trench at the dam site (Thoms et al. 1996).

Seven months of full-scale fieldwork (1990–1991) in the midst of ongoing dam construction had resulted in the excavation of more than 650 m^2 from

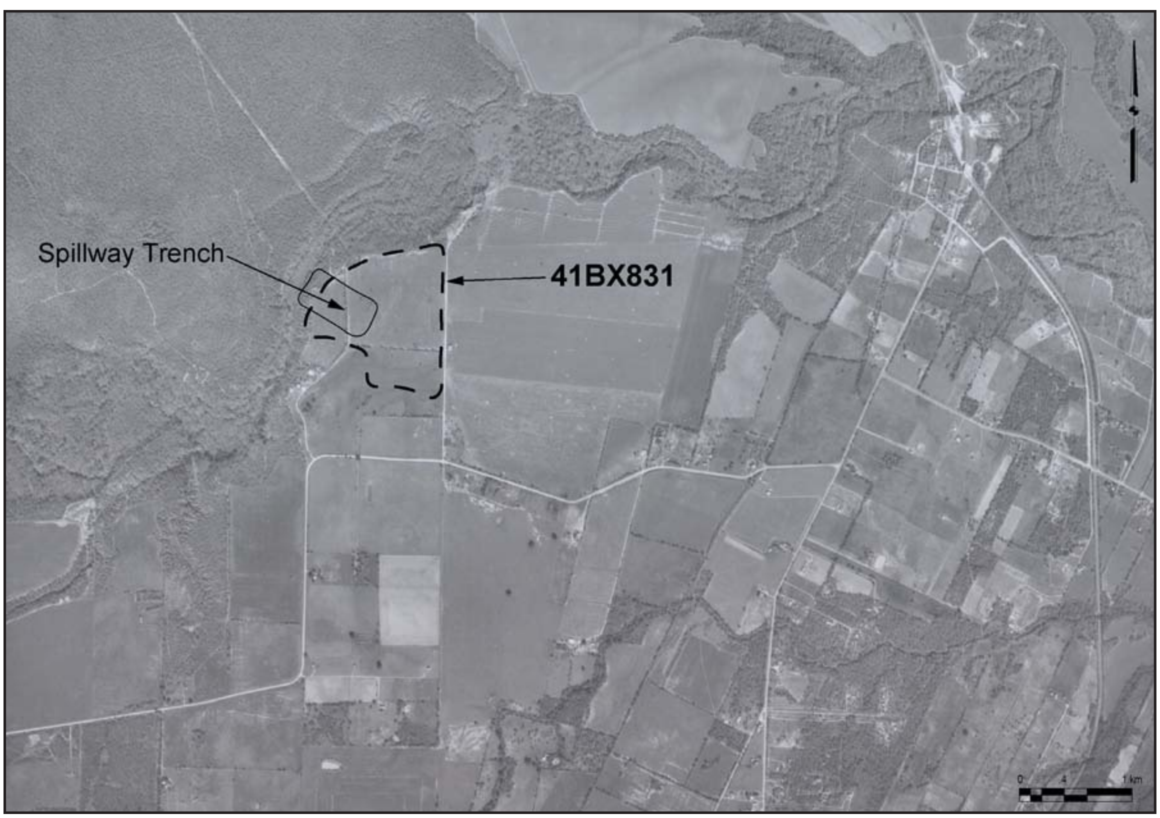


Figure 2. Photographs of the Richard Beene site, located along the right bank of the Medina River in south Bexar County, Texas: a pre-construction (ca. 1989) aerial photograph of the area and vicinity.

Figure 3. Wide-angle photograph of the central section of the south wall of the spillway trench showing the approximate boundaries of paleosols and pedocomplexes and the locations of type profiles for stratigraphic units.

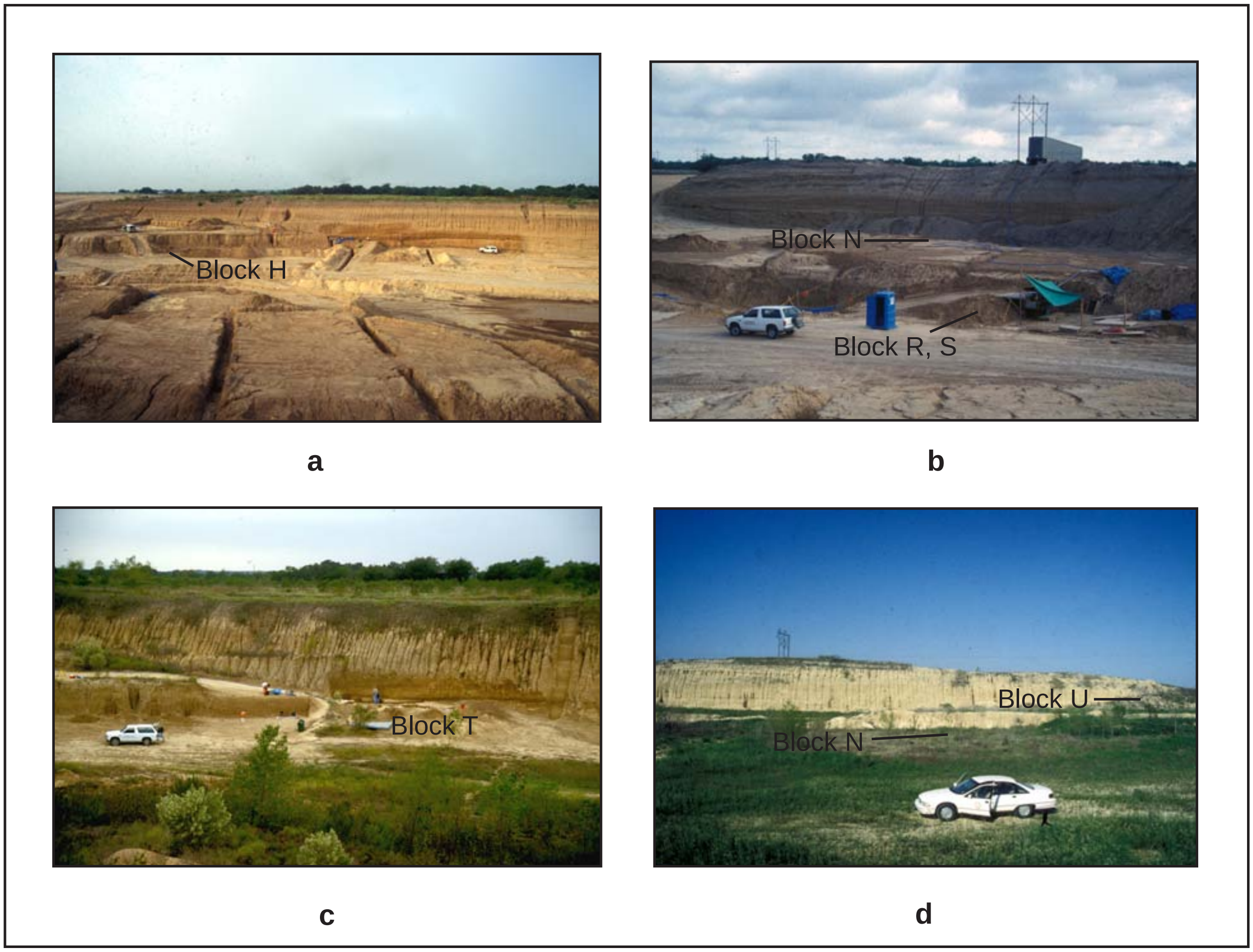


Figure 4. Wide-angle photographs (1991 and 1995) of the spillway trench portion of the Richard Beene site, showing 10 m of stratified archaeological deposits representing 20 components and spanning the last 9,000 years: (a) south wall of the spillway trench in 1991 when construction of the Applewhite reservoir project was suspended, illustrating major paleosols and showing archaeological excavation areas, including Blocks H, N, and T, and exploratory backhoe trenches on the floor of the spillway trench; (b) north wall of the spillway trench when construction of the Applewhite reservoir project was suspended, showing archaeological excavation areas, including Blocks N, R, and S; (c) south wall of the spillway trench in 1995, showing the location of the final season of excavation work at Block T; note the erosion that had occurred since 1991; and (d) north wall of the spillway trench in 1995, showing the amount of vegetation that had developed since 1991 in the Block N excavation area and vicinity.

20 well preserved archaeological components encased in five well demarcated paleosols and pedocomplexes (Figure 3 and 4 a, b). These components represented remains of temporary encampments occupied by small groups of hunter–gatherer families who lived intermittently along this particular stretch of the Medina River throughout the last 9,000 years (Thoms 2005a). The final round of excavation in 1995 focused on components dated to ca. 9,000 (Block T) and 4,500 years ago (Block U) and buried 10 m and 3 m below surface, respectively (Figure 4c and 4d).

In the aftermath of the second referendum to abandon the reservoir project, a nonprofit organization—Friends of the Medina—was formed in 1996 with the objective of spearheading a public effort to develop the abandoned, but still city-owned, reservoir area as a recreation, education, and tourism site, which eventually became known as the Land Heritage Institute of the Americas (LHIA). In 1999, SAWS funded Texas A&M University to conduct a study entitled "Assessment of Resources for the Development of LHIA" (Texas A&M University 2000). Soon thereafter the Land Heritage Institute Founda-

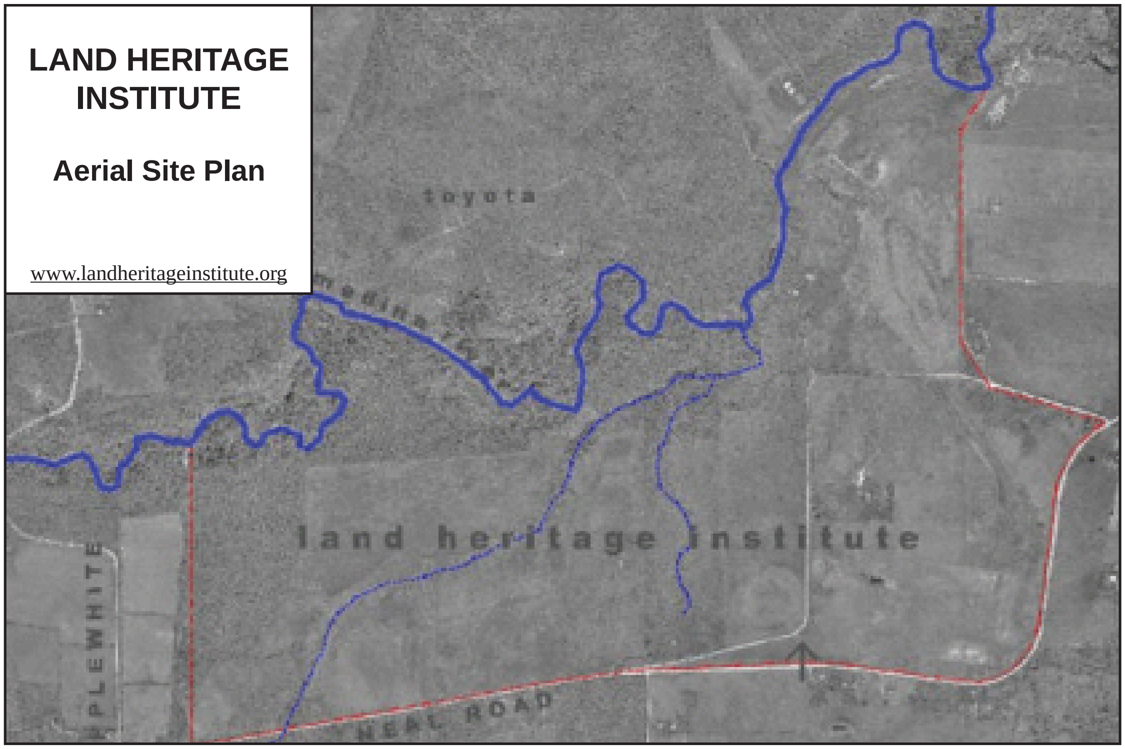


Figure 5. Map showing the location of the Richard Beene site and the abandoned Applewhite reservoir spillway trench in relation to the proposed Land Heritage Institute (from www.landheritageinstitute.org, August 20, 2005).

tion (LHIF) was founded by a local consortium of nonprofit organizations, educational institutions, and land-management agencies to acquire a 1,200 acre tract of the once-proposed reservoir area, including the Richard Beene site, and develop LHIA (Figure 5). At present, LHIF is working with the City of San Antonio (CSA) to finalize transfer of the property to the Foundation and with representatives of the new Toyota Manufacturing Plant, which is located just across the Medina River, to insure that property use is consistent with agreements between CSA and Toyota (www.landheritageinstitute.org, July 2005).

Occasional field visits to the Richard Beene site and surface reconnaissance continued through 2004. These resulted in recordation of features and diagnostic artifacts exposed in the walls and on slopes of the spillway trench, which, once abandoned, underwent substantial erosion that revealed additional archaeological deposits. Much of the erosion occurred within a few years of after abandonment and prior to establishment of vegetation on the once-bare slopes. In 2002, a major flood inundated the spillway trench that cut back its north wall by several meters (Figures 6 and 7).

In early 2005, SAWS finalized plans for stabilizing further erosion of the Richard Beene site by mechanically sloping the steepest spillway-trench walls and infilling the deepest gullies on the slopes in the eastern part of the trench. Figures 8 and 9 show the spillway trench area as it appeared in the summer of 2005. In keeping with tenets of the Antiquities Code of Texas as amended in 1997, the Texas Historical Commission (THC) required SAWS to map important archaeological deposits exposed on the eroded surfaces of the spillway trench and to record potentially important archaeological deposits that would be adversely impacted during mechanical stabilization. The required mapping and monitoring work was undertaken between June 25 and August 5, 2005 by a four–to–six–person archaeological crew under the direction of Principal Investigator Alston Thoms working through the Department of Anthropology at Texas A&M University. A total of 57 person days was spent in the field surveying, mapping, and monitoring and approximately 20 person days were spent preparing the final report and processing recovered artifacts. This work was carried out according to terms specified in Texas Antiquities permit number 3836. Artifacts and samples recovered during the

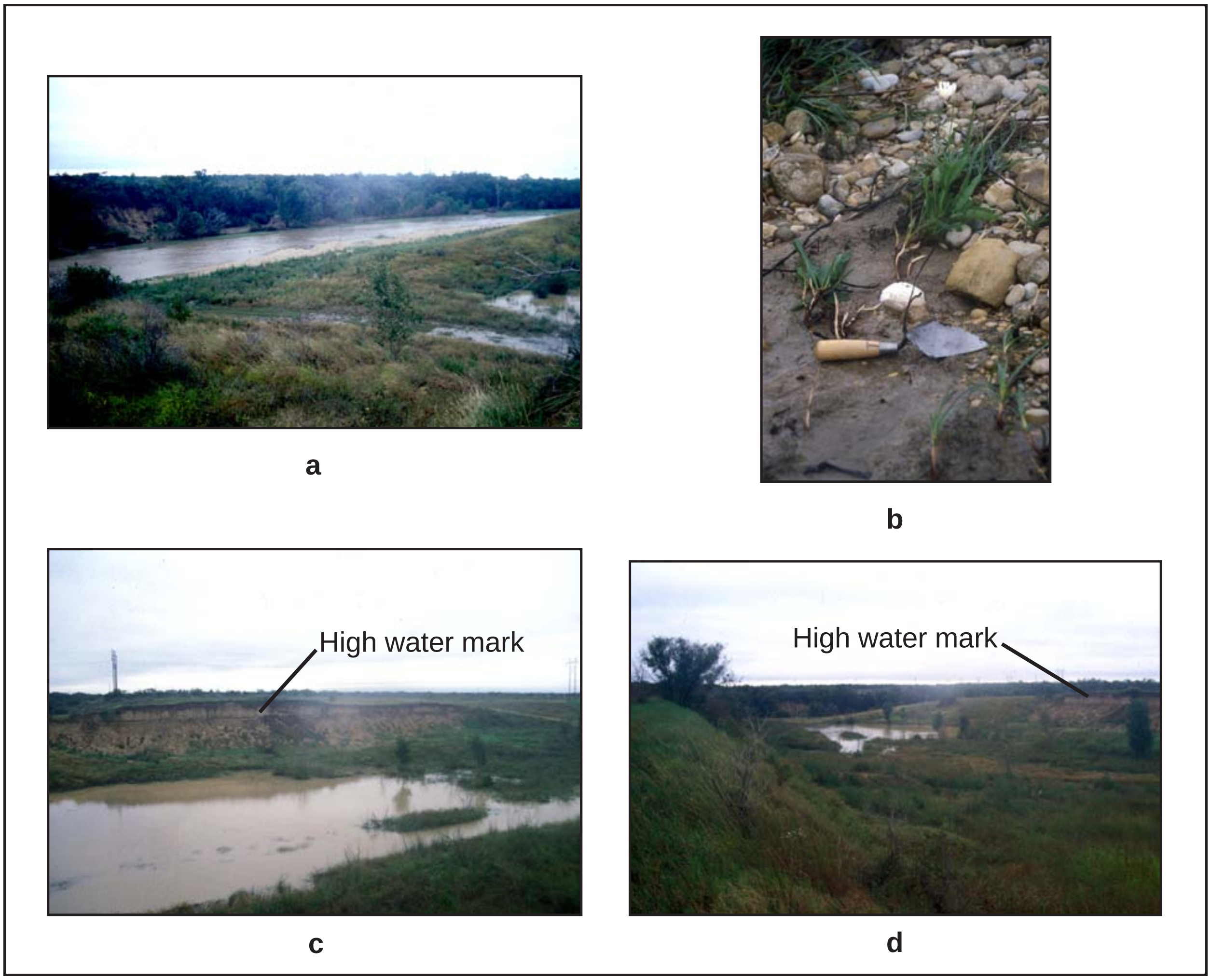


Figure 6. Photographs of the spillway trench area during the waning phase of the 2002 flood of record and illustrating the major paleosols visible in the exposed cutbanks and trench walls: (a) flood water covering the lower portion of the floodplain; note the broken and bent tree branches that document earlier flood phases and, along the left cutbank, the high-water mark indicated by the linear "undercut" about 4 m below surface; (b) close-up of newly formed gravel bar, that covers the higher portion of the floodplain where the mammoth tibia fragment was found; note the river mussels, some of which probably date to the late Pleistocene; (c) north wall of the spillway trench; note the high water mark and the large slump blocks that form the talus slope below the remaining vertical portion of the wall; (d) southeast portion of the spillway trench showing the floor and parts of the south and north walls; note the well-established vegetation on the slopes and floor of the trench.

present project, along with supporting documentation, are permanently curated at the Department of Anthropology, Texas A&M University, College Station.

FIELD METHODS

THC noted that while mechanical stabilization would afford protection for the portion of the Richard Beene site exposed in the spillway trench, further archeological documentation and monitoring was required to assure that the stabilization work itself did not adversely impact the site's important archaeological deposits (Martin 2005). Fieldwork undertaken for the present project included: (1) identifying, documenting, and mapping features, diagnostic artifacts, and other cultural remains exposed in the spillway trench and vicinity; and (2) archaeological monitoring of mechanical stabilization work to identify, salvage, document, and map potentially important arti-

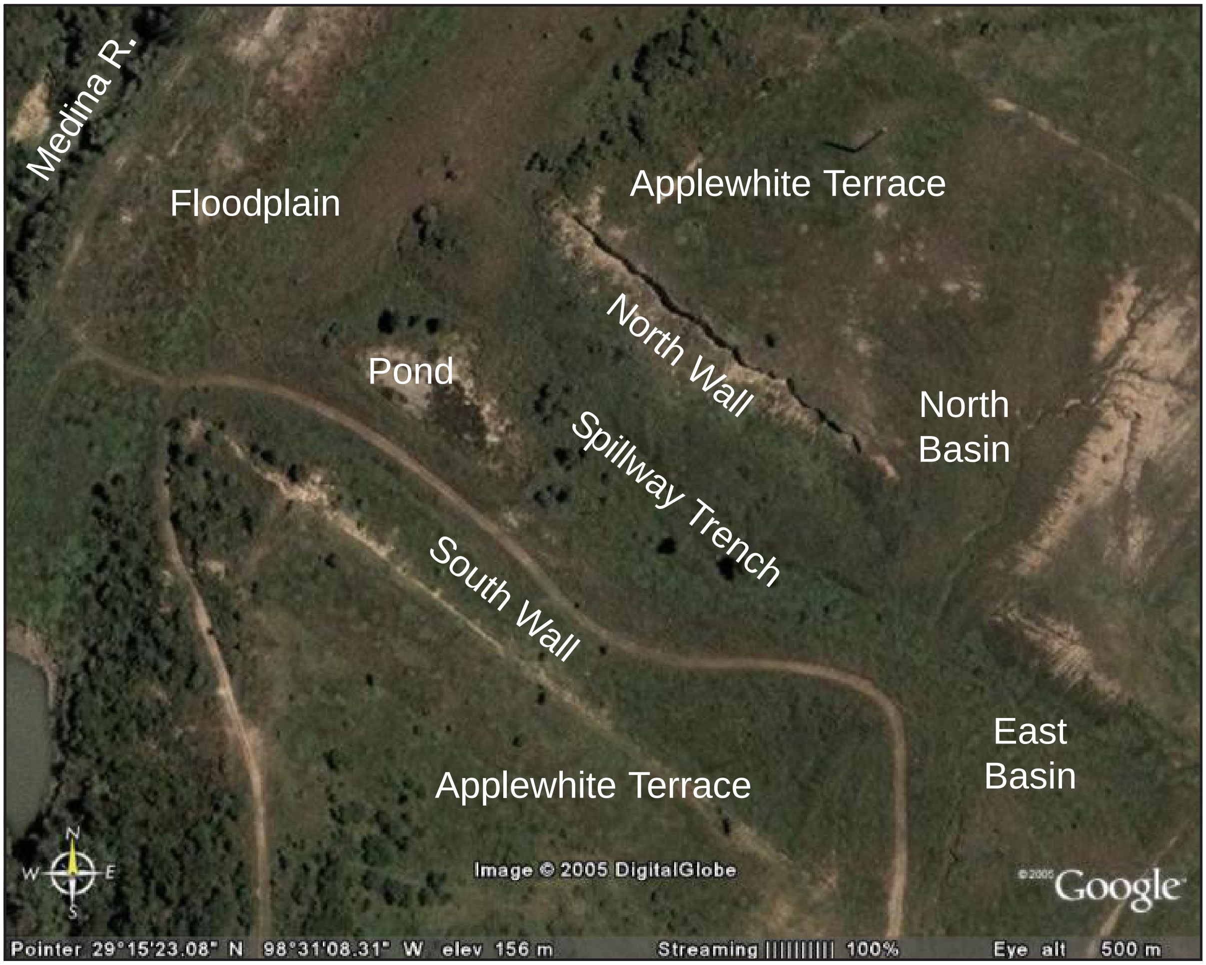


Figure 7. A satellite photograph of the spillway trench and site area in 2002 after a major flood.

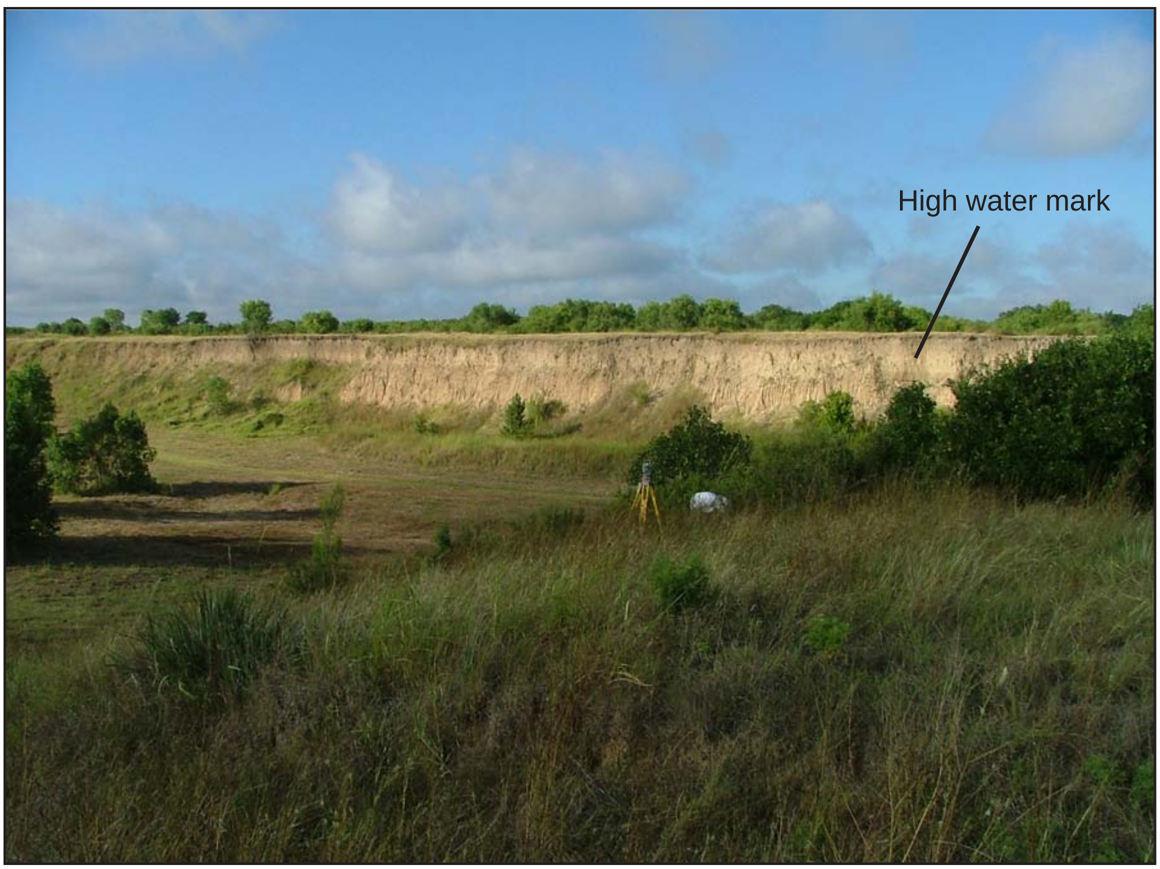
facts and features exposed by heavy machinery (Thoms 2005b). Associated lab work included cleaning, cataloging, and describing recovered artifacts and features, as well as preparing maps and photos. As noted, the present report documents the 2005 field methods and results and summarizes results of site reconnaissance work carried out between 1995 and 2002.

Surface Survey

The first round of post-abandonment survey and topographic mapping in the spillway trench occurred in 1995 as part of the annual Southern Texas Archaeological Association field school. Fieldwork focused on excavating a 4,500 year old component (Block U) exposed along steep slopes in the eastern part of the trench and a 9,000 year old component (Block T) exposed along the south wall (Figure 4; Thoms et al. 1996). Some "surface" survey work was undertaken in the spillway trench. Several fire-cracked rock (FCR) features were documented where vegetation had not yet completely covered the exposed sediments and a number of chipped stone tools and cores were recovered as well.

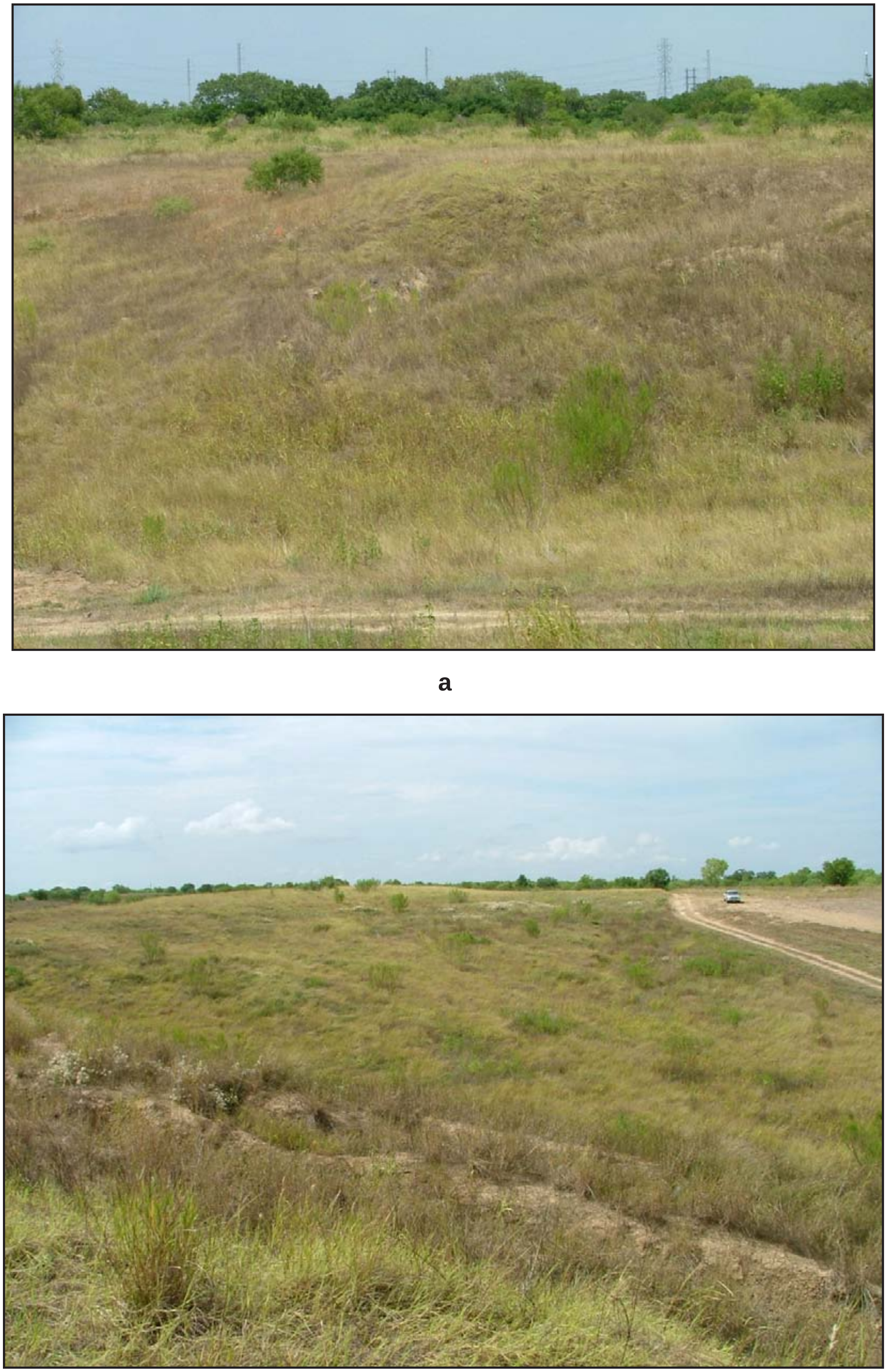
Several times during the following ten years the site was reconnoitered and a few more stone artifacts were collected. Additional mapping also was undertaken to produce an accurate topographic map of the spillway trench and to illustrate the location of the recovered artifacts. The resulting map depicted the area as it appeared prior to the flood–of–record in 2002, which resulted in considerable slumping of the vertical wall, especially along the north

a



b

Figure 8. The spillway trench walls as they appeared in the summer of 2005 prior to cutting/sloping the vertical portions of the massive trench walls: (a) view to the northeast of the north wall of the spillway trench; and (b) view to the southwest of the south wall of the spillway trench.



a

b

Figure 9. The east end of the spillway trench in 2005: (a) view to the northeast of the "north basin" portion of the spillway trench; and (b) view to the southeast of the "east basin" portion of the spillway trench.

a

b

Figure 10. Survey conditions in the spillway trench in 2005: (a) view to the northwest of surveyors covering the north wall; and (b) view to the east of surveyors covering the east basin.

wall. This flood reached an elevation of 155.64 m above sea level or some 13.76 m (45.1 ft.) above the normal level of the Medina River.

In 2005, dense vegetation, mostly Bermuda and bunch grass along with sunflowers, covered all but the steepest slopes and deepest gullies. Accordingly, survey work focused on the least vegetated and most accessible exposures along the base of the vertical portion of the south and north walls (i.e., above the talus slope) and on upper reaches of slopes in the eastern part of the trench (Figure 10). Survey work, as well as related mapping and documentation of artifacts and features, were carried out primarily by a two person team working from June 29 through July 2.

Topographic Mapping

Mapping work was undertaken using a Sokkia Set 5 total station electronic transit (Figure 11). The primary objectives were to: (1) document the spillway trench landscape as it appeared in 2005 following 14 years of erosion; (2) document the trench as it appeared following the mechanical sloping of the north and south walls; and (3) spatially relate artifacts and features recorded during the stabilization project to the areas of the site excavated in the early 1990s. Mapping took place throughout field work, from June 29 through July 20 and again on August 4, 2005. Approximately 24 person days were devoted to mapping work, including mapping the location of artifacts and features.

Erosion in the spillway trench resulted in rill and gully formation along slopes in the eastern part of the trench (i.e., in the "east" and "north" basins), especially between 1991 and 1995 prior to the establishment of a dense cover of grass. Several small-scale floods also caused minor undercutting along the lower spillway trench walls. In marked contrast, the 2002 flood resulted in considerable undercutting and slumping of the upper four meters of spillway trench wall (Figure 6).

Monitoring Bulldozer Work

Mechanical stabilization of the spillway trench walls entailed cutting back sediments comprising the upper 2–4 m of north and south walls and pushing the backdirt forward to form the lower part of the slopes. The cut-depth varied depending on the height of the vertical wall, which, in turn, depended on how much of the terrace fill had been scraped away during construction of the spillway trench in the early 1990s. Along the westernmost sections of the spillway

a

b

Figure 11. Topographic mapping operations and conditions in the summer of 2005: (a) EDM station and operator mapping a portion of the spillway trench; and (b) prism and operator working along north wall

trench walls, the walls were cut back as much as 10 m and as deep as 4 m below the original surface, such that the sediments (i.e., buried soils or paleosols) being cut away and the cultural material they contained dated to the last 4,500 years or so. Along the eastern portion of the spillway trench walls, as much as 3 m of sediments had already been removed, such that a 3–4 m vertical cut from the existing surface extended to 6 m or more below the original ground surface and thereby impacting in situ artifacts and features that date between ca. 3000 and 7000 B.P.

In most cases, however, sediments more than 6,000 years old were buried by existing talus that resulted from erosion or by fill mechanically cut in the overlying sediments and pushed over the wall's edge to form the lower slopes. Some cuts were made into sediment as much a 9,500 years old, however, and includes the eastern end of the spillway trench, in the vicinity of a previously excavated area (Block H) that dated to about 8,800 radiocarbon years ago (i.e., 8800 B.P.). Mechanical in-filling of deep gullies elsewhere in the eastern part of the spillway trench also impacted sediments know to be between 6,000 and 9,000 years old.

In general, archaeological monitoring was accomplished by a 3–4 person team, with one or two people watching each bulldozer as it cut back and graded the slopes (Figure 12). Bulldozer work began on July 6 and continued through July 21, with one machine working for the first the first week and two thereafter. A total of 27 person days was devoted to archaeological monitoring. Topographic mapping and mapping of artifacts and features exposed during construction effort continued throughout the monitoring phase of fieldwork.

RESULTS OF FIELDWORK

The first post-construction topographic map of the spillway trench area (Figure 13) was prepared during the 1995 field season and published in an article on the results of the Southern Texas Archaeological Society's annual field school (Thoms et al. 1996). That map (Figure 13) was updated in early 2002 to show the location of new permanent data points on the spillway berm. It had become evident that "old" data points in the spillway trench were subject to loss from erosion and plans were underway to replace the wooden power line poles that served as control points on the original surface immediately north of the trench with large, metal poles.

Mapping and Survey Work, 1995–2002

When the spillway trench was first mapped in 1995 (Figure 13), the north and south walls (up to 15 m high) remained essentially vertical, as they were in 1991 when the construction project was abandoned. The walls, however, had become considerably eroded by deep, near-vertical channels that had formed from runoff (Figure 4c and 4d). As noted, deep gullies also had formed in the east and north basin portions of the trench. The block excavation areas were still readily apparent as "benches" on the spillway trench floor with rounded edges and near-vertical walls 1–3 high. Backhoe trenches that had been dug across the benches were backfilled when fieldwork ended in 1991 but rainfall runoff on the then denuded surface had washed out much of the fill.

By 1995 vegetation was becoming well-established in the spillway trench but bare ground was still widespread and gullies were continuing to form, albeit at much reduced rates. Within a few years, Bermuda and bunch grasses covered all but the vertical walls and gully formation had slowed even more. Near-vertical channels continued to deepen along the north and south walls, however, and mass wasting was evidenced by large chunk of sediment that formed talus-slopes at the base of the walls. A wildfire burned most of the vegetation in the spillway trench in the late 1990s and probably resulted in accelerated erosion, but by 2002 dense grass again covered most of the trench and obscured artifacts and features exposed on the surface.

Most of the erosion caused by the major flood in 2002 was along the north wall and the west end of the south wall where the currents were sufficiently swift to undercut the walls and cause sediment blocks as large as 3 x 3 x 3 m to slump and form hummocky talus slopes (Figure 6c and 6d). The flood also substantially changed the surface of the Medina River

a

b

Figure 12. Archaeological monitoring operations and conditions in the summer of 2005: (a) inspection of fresh bulldozer scrapes across artifact-bearing sediments exposed along the north wall; (b) close-up of monitors inspecting fresh vertical exposures along the north wall as it was being cut back.

c

d

Figure 12. cont.: (c) close-up of monitors inspecting slopes along the south wall as it was being sloped back; and (d) inspection of fresh cuts along the south wall as it was being cut back.

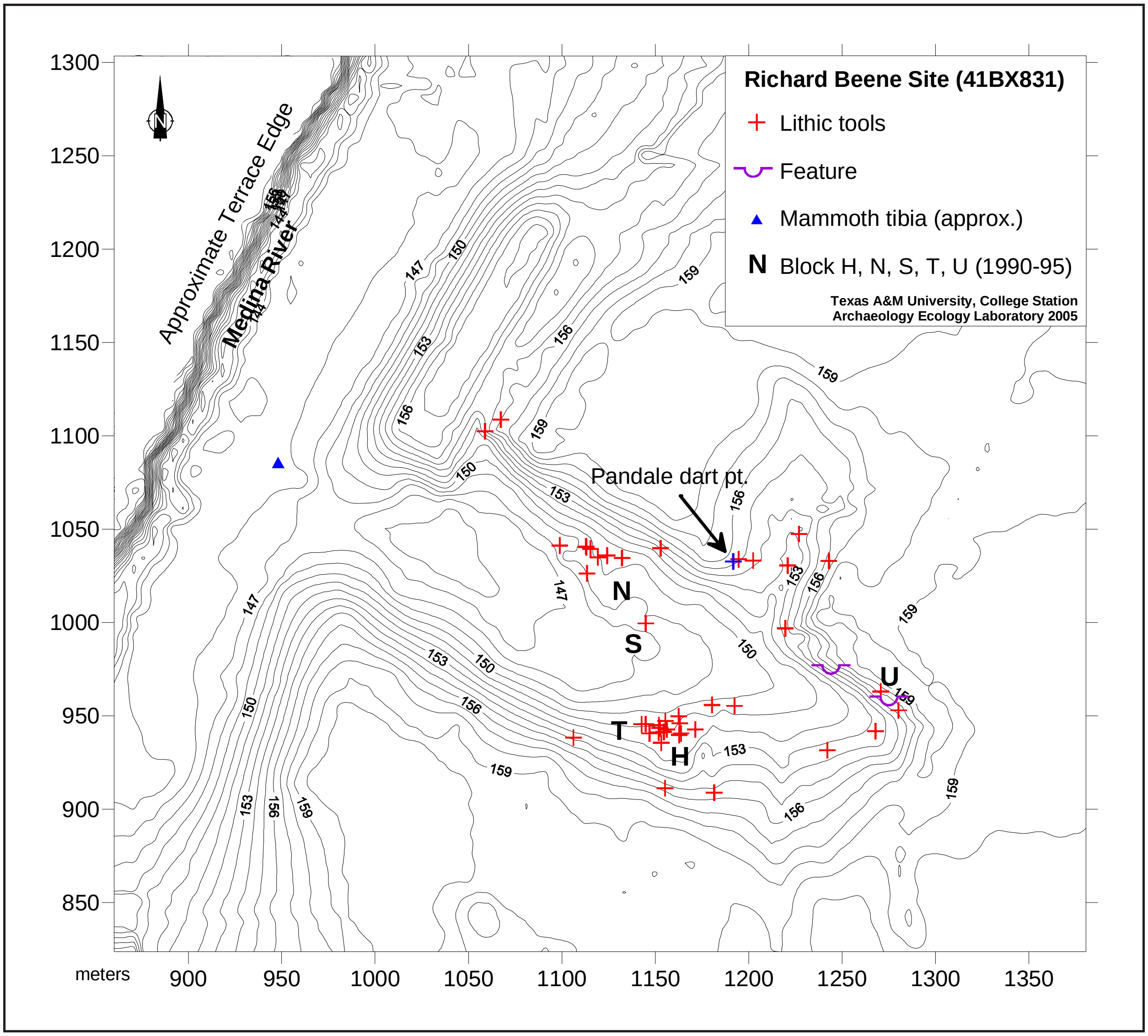


Figure 13. Topographic map of the spillway trench showing the distribution of lithic tools, mammoth tibia, and features exposed on the eroded surfaces as recorded from 1995 through 2002.

Figure 14. (a–b) Mid-diaphyseal cylinder of a proboscidean long bone that appears to have been intentionally shaped by humans, perhaps in the process of obtaining raw material for the manufacture of bone tools.

floodplain where it abutted the spillway trench. Sandy sediments were stripped from the surface of the floodplain, exposing the underlying gravel that was then reworked by the strong currents into a massive gravel bar (Figure 6a). The newly formed gravel bar contained an abundance of weathered mussel shells, some of which were unusually large and probably dated to the late Pleistocene. A few pieces of redeposited chipped stone were also observed on the gravel bar (Figure 6b).

Among the probable cultural material found on the new gravel bar was a mammoth bone fragment that appears to have been modified by humans (Figures 6a, 13, and 14). The fragment was recovered soon after the 2002 flood subsided by Ramon Vasquez, Director of the American Indians in Texas at Spanish Colonial Missions, which is one of the lead partners in the Land Heritage Institute Foundation. Analysis revealed that the fragment was the mid-diaphyseal cylinder portion (ca. 20 cm long) of a proboscidean long bone, probably a *Mammuthus columbi* tibia (i.e., thigh bone of a Pleistocene elephant). Importantly, the fragment exhibited helical breakage patterns at both ends of a type associated with wet bone fracture through dynamic loading. In this case, breakage may have involved at least one anvil stone and a small boulder-size hammer stone (Figure 14). That the bone is so fractured at both ends is unusual indeed but use of large anvil and hammerstones is entirely consistent with known breakage techniques for obtaining pieces of fresh thick bone as raw material for bone tools (Johnson 2005, Thoms et al. 2005).

The 1995 base map is used here to plot the distribution of features recorded between 1995 and 2002 (Figure 13). Figure 13 also illustrates the location of stone tools recovered during survey work prior to the 2005 field season. These tools were described and illustrated in the final report on the Richard Beene site (Dockall 2005).

Two fire-cracked rock features, presumed to be the remains of small hearths, were recorded on the relatively open slopes in the eastern part of the spillway trench and along the vertical walls of the western portion of the trench (Figure 15). These features were described in the final report covering excavations at the Richard Beene site (Clabaugh and Thoms

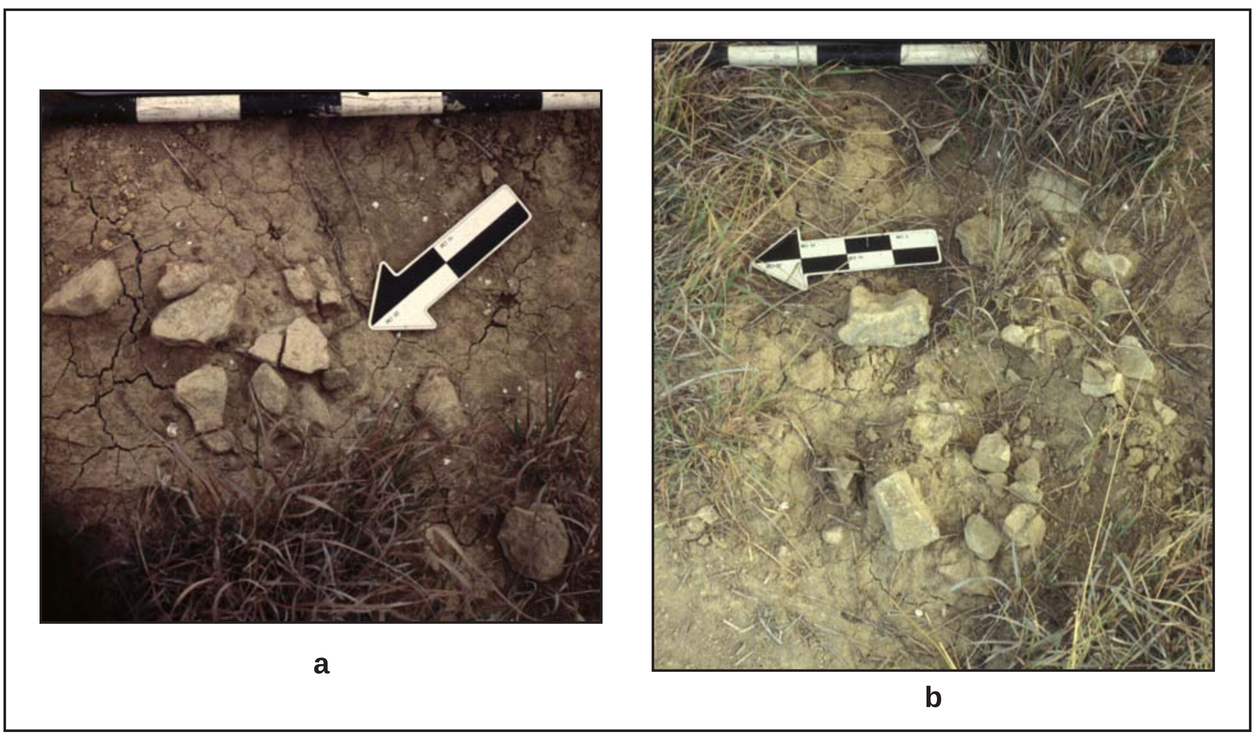


Figure 15. Examples of features documented (1995–2002) on exposed surfaces of the spillway trench: (a) Feature 116, a probable hearth exposed in the North Basin in the Upper Medina paleosol; (b) Feature 117, a probable hearth exposed in the 117 basin in the Upper Medina paleosol.

2005:275-277). Numerous artifacts including a Pandale-like dart point (see Figure 22a) were also collected from the slopes.

Mapping and Survey Work in 2005

The 2005 topographic map (Figure 16) was developed by remapping the spillway trench and thereby documenting landscape changes since 1995. It is used here to plot features and artifacts found during the present survey that preceded mechanical stabilization work. As noted, the most dramatic landscape changes resulted from the 2002 flood that inundated the spillway trench floor by as much as 10 m. A comparison of the 1995 and 2005 topographic maps indicates that undercutting and slumping cut back the north wall by 2–4 m, with the thickest cuts being along the wall's mid-reach, and that the west end of the south wall was also cut back by 2–4 m. Somewhat surprisingly, the 1991–1995 mapping station on the spillway trench floor was readily visible in 2005, which indicated that very little sediment was deposited on the spillway floor beyond the limits of the talus slopes at the base of the vertical walls.

Since 1995, floodwaters and local rainfall runoff have continued to erode the edges of the benches that encompassed block excavation areas H, N, T, and U and to remove fill from the old backhoe trenches. By 2005, what had been vertical walls around the benches became steep slopes and the washed-out backhoe trenches served to further dissect the benches and create hummocky surfaces on what had been flat-topped benches (Figures 8 and 16). Nonetheless, significant portions of the benches and the block excavations contained therein remained intact. As such, these areas hold promise for future excavations. Moreover, very little erosion occurred on the well-vegetated slopes during the flood, such that many artifacts and features that were visible on the surface in 1995 were re-mapped in 2005, especially along the eastern rim of the north basin area (Figure 8 and 16).

The most productive survey work in 2005 occurred along the vertical spillway trench walls where several intact features were exposed, as were isolated artifacts, primarily sandstone FCR and mussel shells. Most of the artifacts and features were encased in the upper portion of the Medina pedocomplex, some 3–4 m below the original ground surface and previously dated to about 4500 B.P. (Thoms 2005a). Several artifacts, however, and one feature were recorded in the lower portion of the pedocomplex and in the uppermost portion of the underlying Elm Creek paleosol. Figure 17 illustrates the vertical distribution of artifacts and features observed in the north and south walls, respectively, of the spillway trench. In general, features were photographed in place then dug out of the walls to determine feature morphology, recover associated artifacts, and collect charcoal samples for future dating.

Feature 120, exposed in the north wall (Figure 18a), was a concentration of four pieces of sandstone FCR lying in horizontal angles of repose, possibly remains of a hearth or part of a sheet midden deposit. Feature 121, exposed in the south wall (Figure 18b), was a small, basin-shaped hearth with a few pieces of tabular fire-cracked sandstone. The basin portion of Feature 121 contained oxidized and carbon-stained sediments and small fragments of wood charcoal. Feature 122, a linear arrangement of several pieces of FCR (Figure 18c), was found a few meters west of and at about the same elevation as Feature 121. Feature 122 did not appear to be intact and probably represents discarded FCR that fell into a crack where several pieces came to rest in steep angles of repose. These three features were embedded in the upper part of the Medina pedocomplex and probably date to about 4500 B.P. In several cases, including Feature 121 (Figure 18a), remains of burned out tree roots represented by curvilinear patterns of carbon-stained and oxidized sediments with wood charcoal were found 30–50 cm below the features and artifacts in the upper part of the Medina pedocomplex.

Feature 123 was found in the lower part of the Medina pedocomplex along the central section of the south wall, approximately 6 m below surface (Figure 18d). This stratigraphic position and elevation is essentially the same as those for the site's best preserved features, which were dated in 1991 to ca. 6900 B.P. (Thoms 2005a). Feature 123 was an intact small, basin-shaped hearth with a few pieces of FCR, a large flake, and mussel shells along with car-

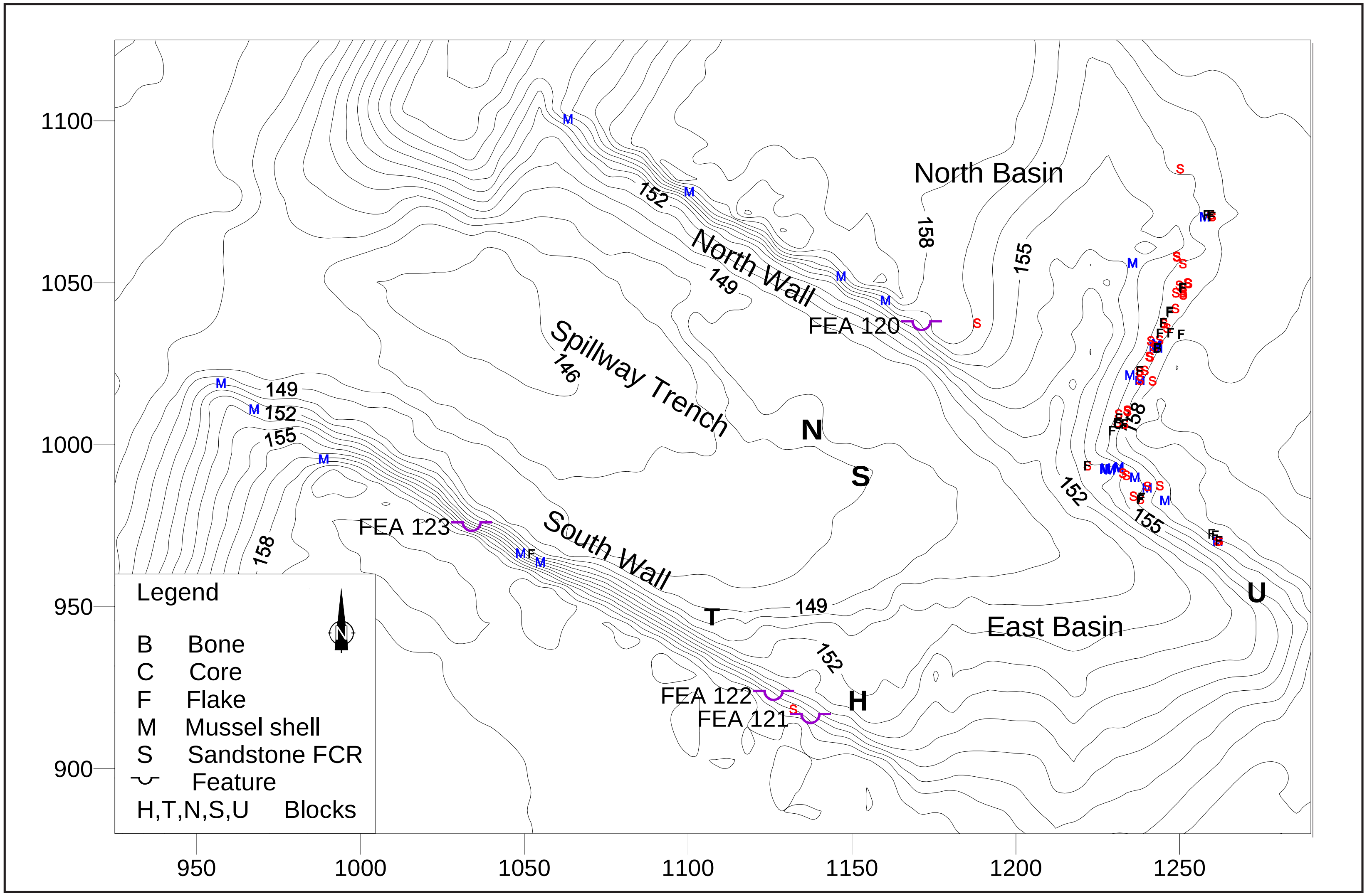


Figure 16. Topographic map of the spillway trench showing the distribution of artifacts and features exposed on the eroded surfaces as recorded in 2005 (see Figures 17, 19, and 20 for illustrations of these artifacts and features).

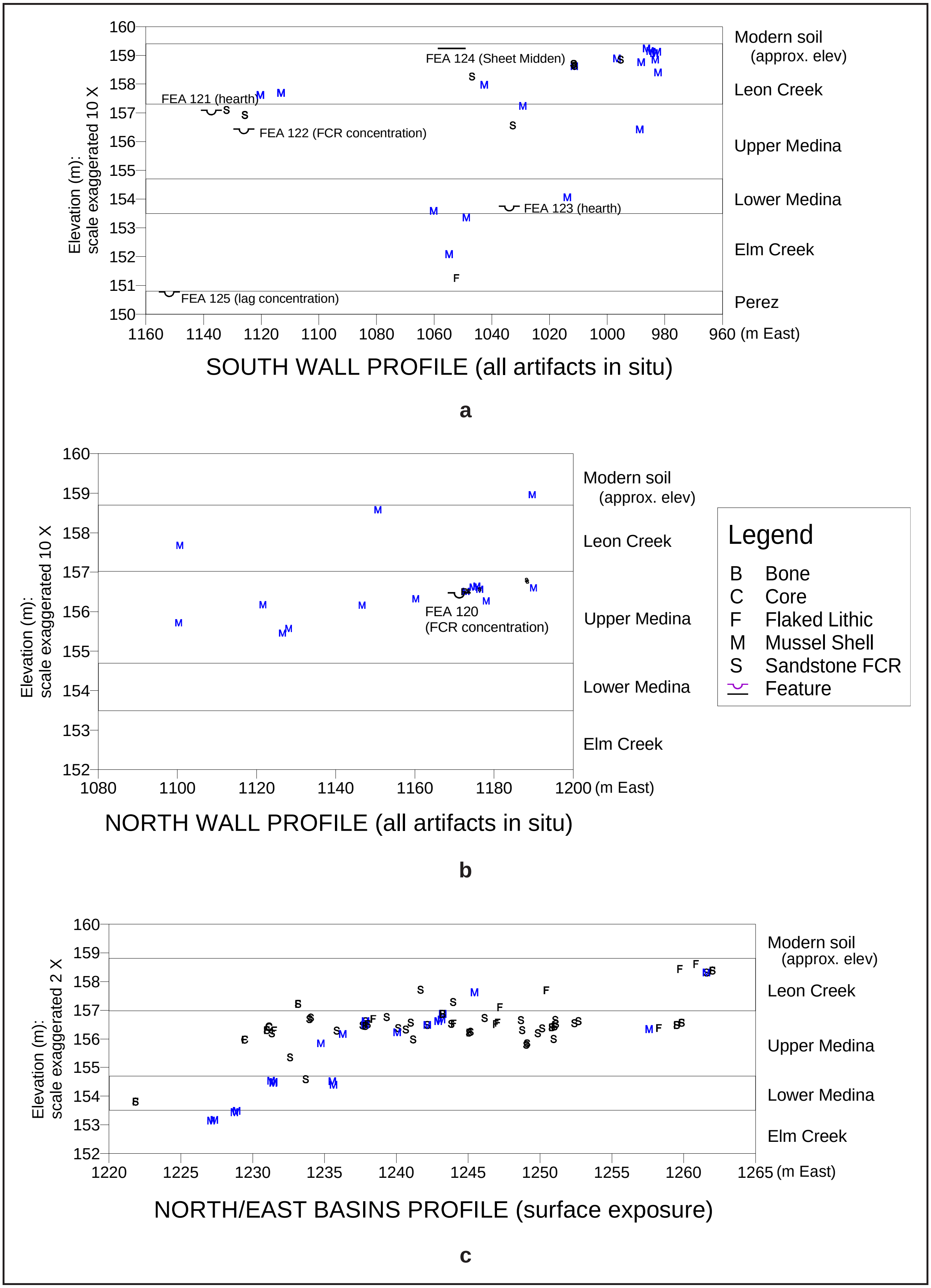


Figure 17. Profiles of vertical sections of exposed walls recorded during survey work in 2005 showing the distribution of artifacts and features: (a) South wall; (b) North wall; and (c) North and East Basins.

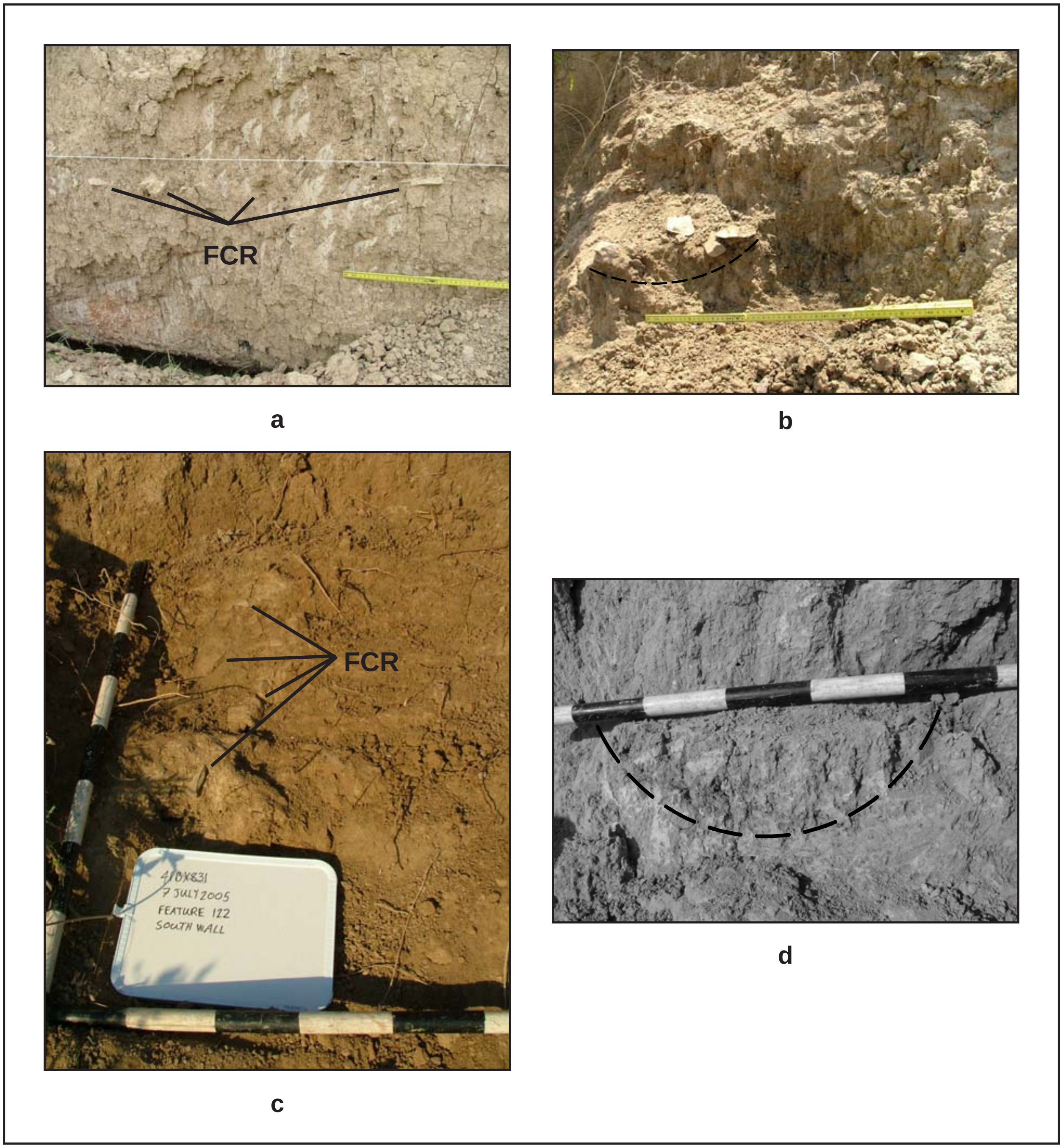


Figure 18. Photographs of features exposed along the vertical sections of the spillway trench walls in 2005: (a) Feature 120, a concentration of fired-cracked sandstone hearth exposed along the north wall in the upper part of the Medina pedocomplex, which dates to ca. 4500 B.P; (b) Feature 121, a small basin-shaped hearth with a few pieces of tabular sandstone and mussel shell exposed along the south wall the upper part of the Medina pedocomplex, which dates to ca. 4500 B.P; (c) Feature 122, a curvilinear concentration of tabular sandstone FCR exposed along the south wall in the upper part of the Medina pedeocomplex, which dates to ca. 4500 B.P; judging from their sharp angles of repose, these artifacts may have fallen into a large crack; (d) Feature 123, a small basin-shaped hearth with a few pieces of tabular sandstone, mussel shell, and a large edge-modified flake, exposed along the south wall in the lower part of the Medina pedocomplex, which dates to ca. 6900 B.P.

bon-stained and oxidized sediment and small fragments of wood charcoal. Several isolated pieces of in situ FCR and mussel shell were found nearby at about the same elevation. A few others were found along the south wall embedded in the underlying Elm Creek paleosol, some 8 m below surface (Figure 17). All of the in situ artifacts found in the north wall were within or near the upper part of the Medina pedocomplex (Figure 17). Isolated chipped stone tools were not found in any of the wall exposures and only a few isolated pieces of debitage were encountered. Debitage, including several cores and core-fragments, along with a few edge-modified flakes (i.e., expedient tools), was more common on the exposures of the upper Medina pedocomplex in the east basin, especially in sparsely vegetated areas (Figure 16).

Monitoring Work 2005

Archaeological monitoring of mechanical sloping along the north and south walls resulted in the documentation of two additional features and numerous isolated artifacts. Figures 19 and 20 illustrate the shape of the spillway trench after the vertical north and south walls were sloped back and the major gullies in the north basin were mechanically filled in with adjacent sediments. These figures also show the distribution of several in situ artifacts that were observed on the freshly cut slopes after a brief rain shower. Figure 17 illustrates the vertical positions of artifacts and features that were discovered during monitoring work.

Feature 124, a sheet midden deposit(s) of FCR, mussel shell, and chipped stone (Figure 21a) was found in the upper part of the Leon Creek paleosol midway along the south wall and about 1.25 m below the original ground surface. Among the artifacts in the sheet midden deposit were a midsection fragment of a large, wide-bladed biface and a large edge-modified flake (Figures 22b and 22c). Most of the artifacts in the feature area were lying at essentially the same elevation and in horizontal angles of repose, indicating they were in situ. Several isolated pieces of FCR and mussel shell, however, occurred as much as 50 cm below the sheet midden deposit. It was not clear whether these items were in place or had migrated down the profile via natural pedoturbation.

Isolated pieces of FCR and mussel shell were also found along the south wall in the upper part of the Leon Creek paleosol 0.75–1.25 m below the original surface, especially near the west end of the trench (Figure 20). The presence of artifacts in the upper part of the Leon Creek paleosol is consistent with the 1990–1991 excavations that revealed remains of numerous encampments dated to ca. 2800–3200 B.P. in a stratigraphically similar position some 50 m north of the north wall (Thoms 2005a). Monitoring also revealed a thin scatter of mussel shells and small

a b

Figure 19. Photographs of the spillway trench after sloping and infilling in 2005: (a) the newly sloped north and south walls; and (b) the newly infilled gullies in the north basin.

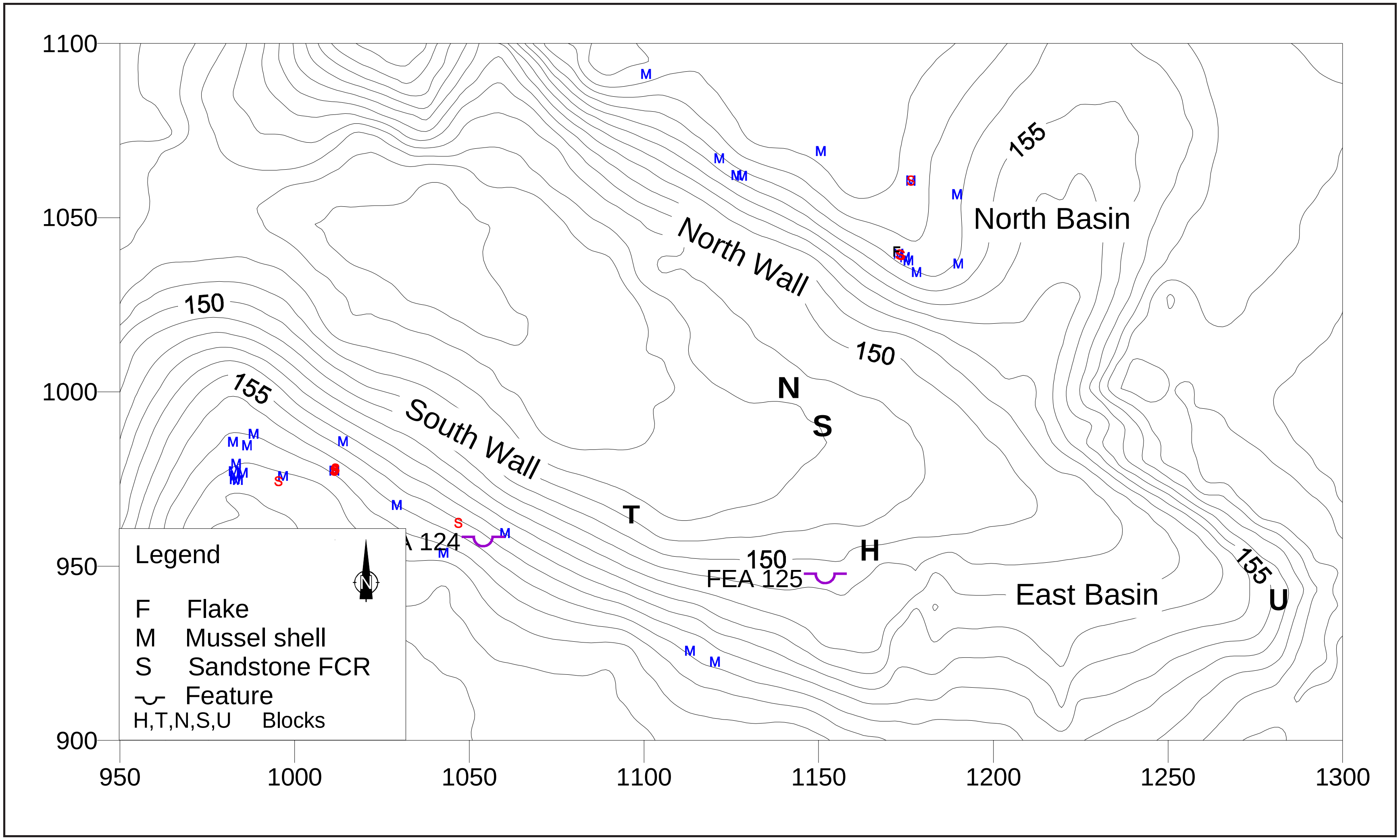
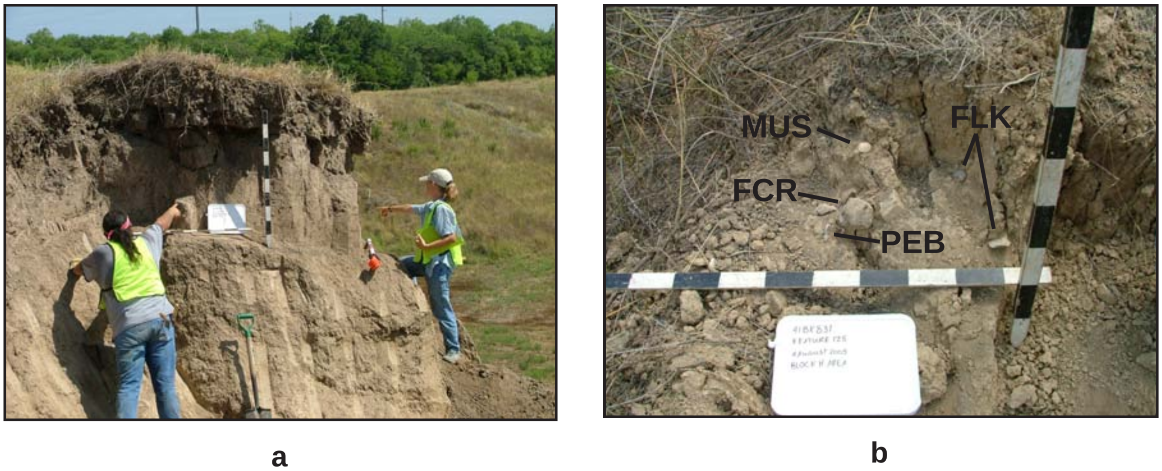


Figure 20. Topographic map of the spillway trench after the walls were sloped, showing the location of artifacts and features found during monitoring work on 2005.



Figures 21. Features recorded in fresh bulldozer cuts and scrapes in 2005: (a) Feature 124, a sheet midden deposit of tabular pieces of sandstone FCR, mussel shells, and chipped stone exposed along the south wall in the upper part of the Leon Creek paleosol, which dates to ca. 3000 B.P.; and (b) Feature 125, a lag-concentration of two edge-modified stone tools, one chunk of sandstone FCR, two mussel shell fragments, and a small steam-worn pebble exposed along the south wall in the vicinity of the Block H excavation area in the upper part of the Perez paleosol, which dates to ca. 8900 B.P.

pieces of FCR buried in the modern soil, some 0.3–0.5 m below the original surface (Figure 20). Excavations in 1990/1991 recovered remains of encampments dated to about 700 B.P. in similar stratigraphic positions to the north (i.e., the modern soil and the Payaya component).

Feature 125 occurred near the floor of the spillway trench along the eroded edge of the bench where the Block H excavation area was located (Figure 21b). It was encased in the uppermost part of the Perez paleosol and exposed by a bulldozer during preparation of the lower slope of the spillway trench. Feature 125 is a lag concentration of FCR, mussel shells, two large pieces of chipped stone, a cobble tool and a core (Figures 22d and 22f), and one small stream-worn pebble broken into two pieces. An edge-modified flake was also found in situ about 2 m west of Feature 125 and at the same elevation (Figure 22e) Similar features were discovered in Block H, which yielded a component dated to about 8800 B.P. Most features in Block H were lag-concentrations of a diversity of artifacts that had been transported short distances during one or more floods that eroded the uppermost portion of the Perez paleosol (Thoms 2005a).

CONCLUDING COMMENTS

During the course of full-scale excavations at the Richard Beene site in the early 1990s it became apparent that the site's boundaries extended well beyond the block excavation areas and into the walls and slopes of the spillway trench. Intermittent site visits over the next dozen years, including inspection of the trench walls following the 2002 flood, confirmed this conclusion.

Survey and monitoring results of the present project reaffirm these conclusion and further demonstrate that cultural materials extend beneath new slopes of the spillway trench (Figure 23). Said differently, much of the Richard Beene site remains in undisturbed and well preserved condition. Still buried features and artifacts as much as 4500 years old extend in all directions from the spillway trench and include remains of many campsites encased in the modern soil (Payaya component) as well as in the Leon Creek paleosol and upper Medina pedocomplex. Moreover, slopes in the north and east basin areas also afford ready access to encampment remains dating between about 4500 and 9000 B.P. in the lower

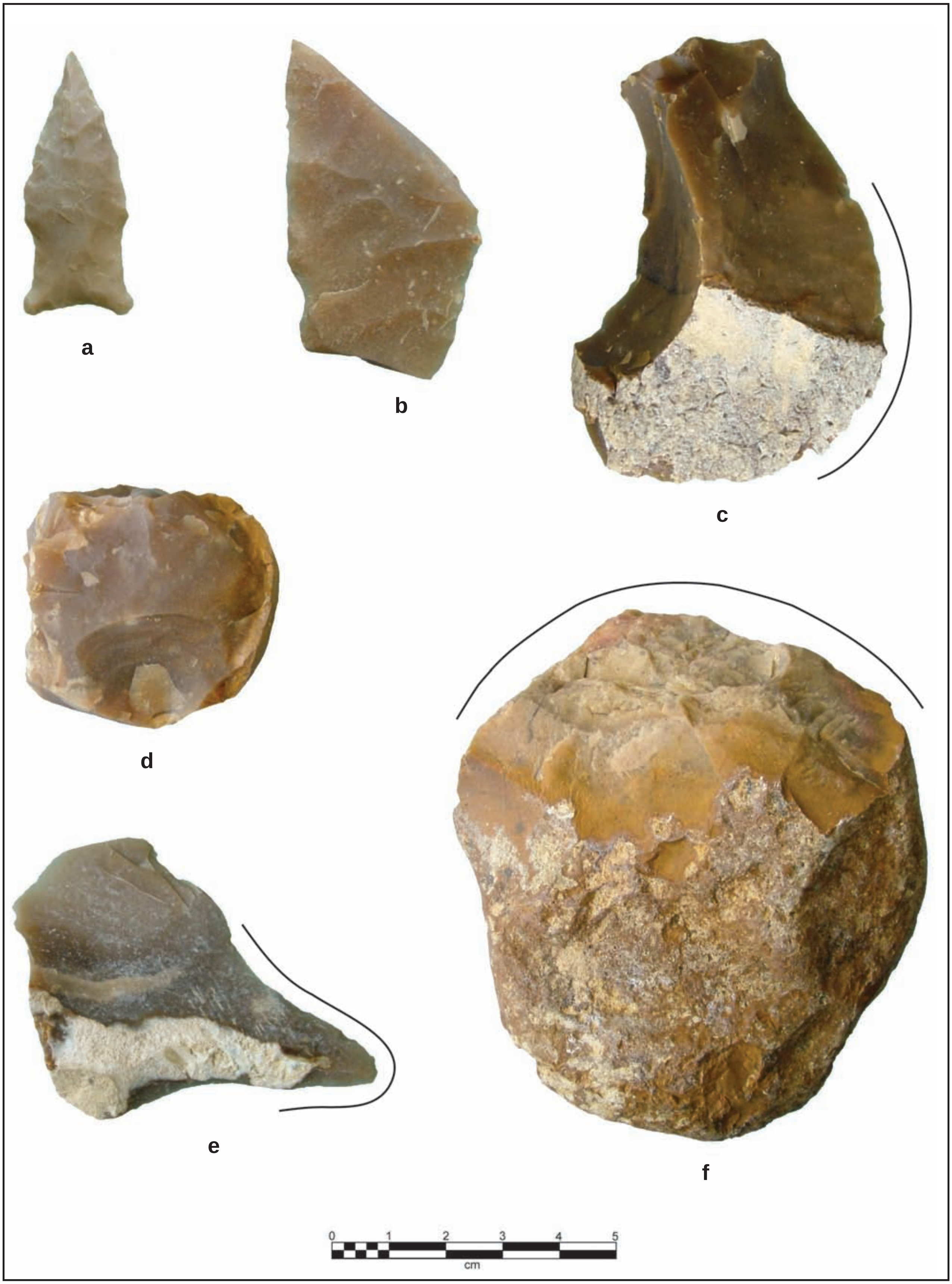


Figure 22. Chipped-stone tools recovered in 2002 and 2005: (a) Pandale-like dart point found in 2002 (see Figure 16 for location); (b) biface fragment from Feature 124; (c) edge-modified flake from Feature 124; (d) core from Feature 125; (e) edge-modified flake found 2 m west of Feature 125; and (f) cobble tool from Feature 125.

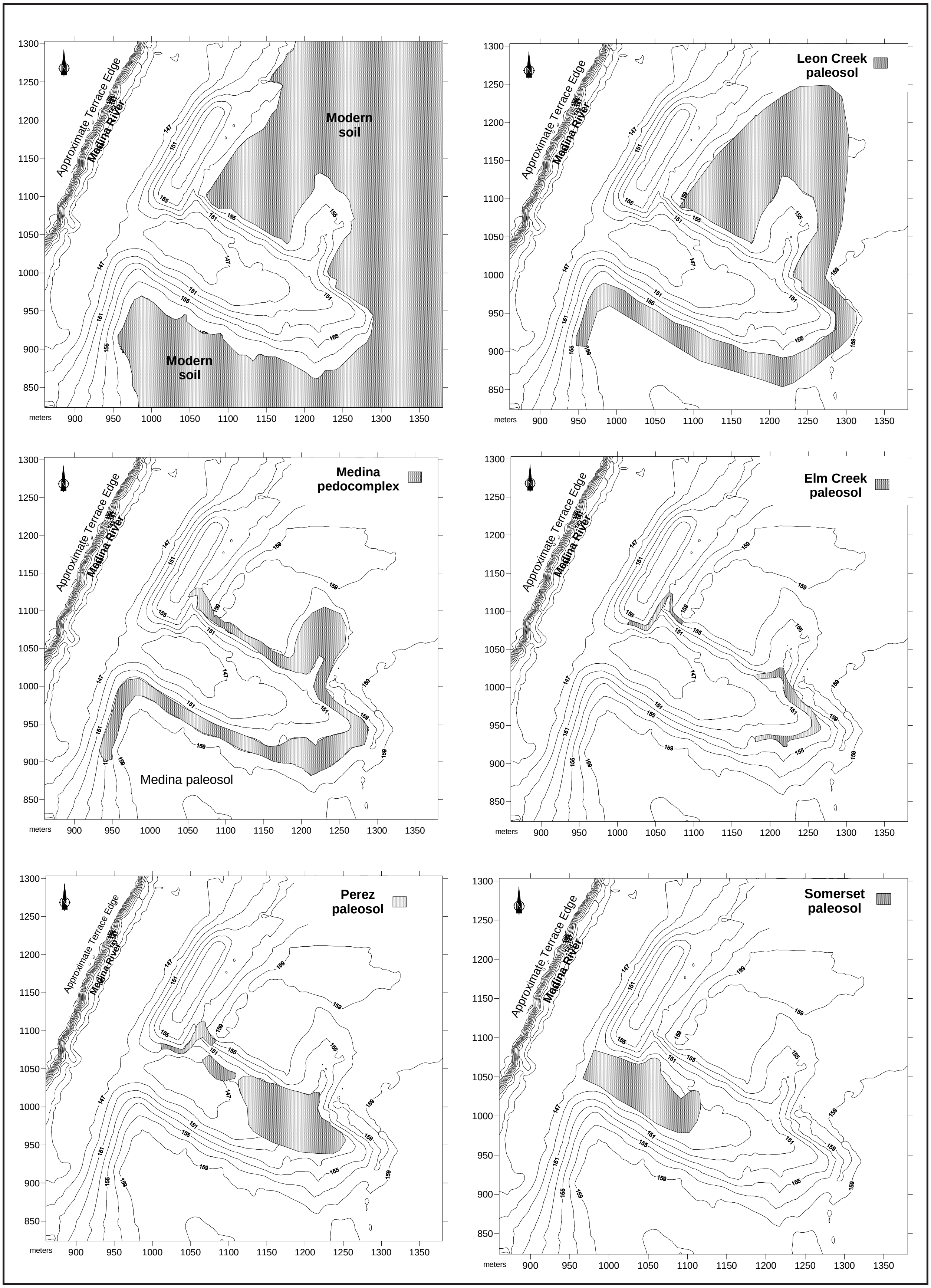


Figure 23. Maps of the spillway trench showing where the various paleosols are exposed along the edges and on the bottom of the newly sloped spillway trench.

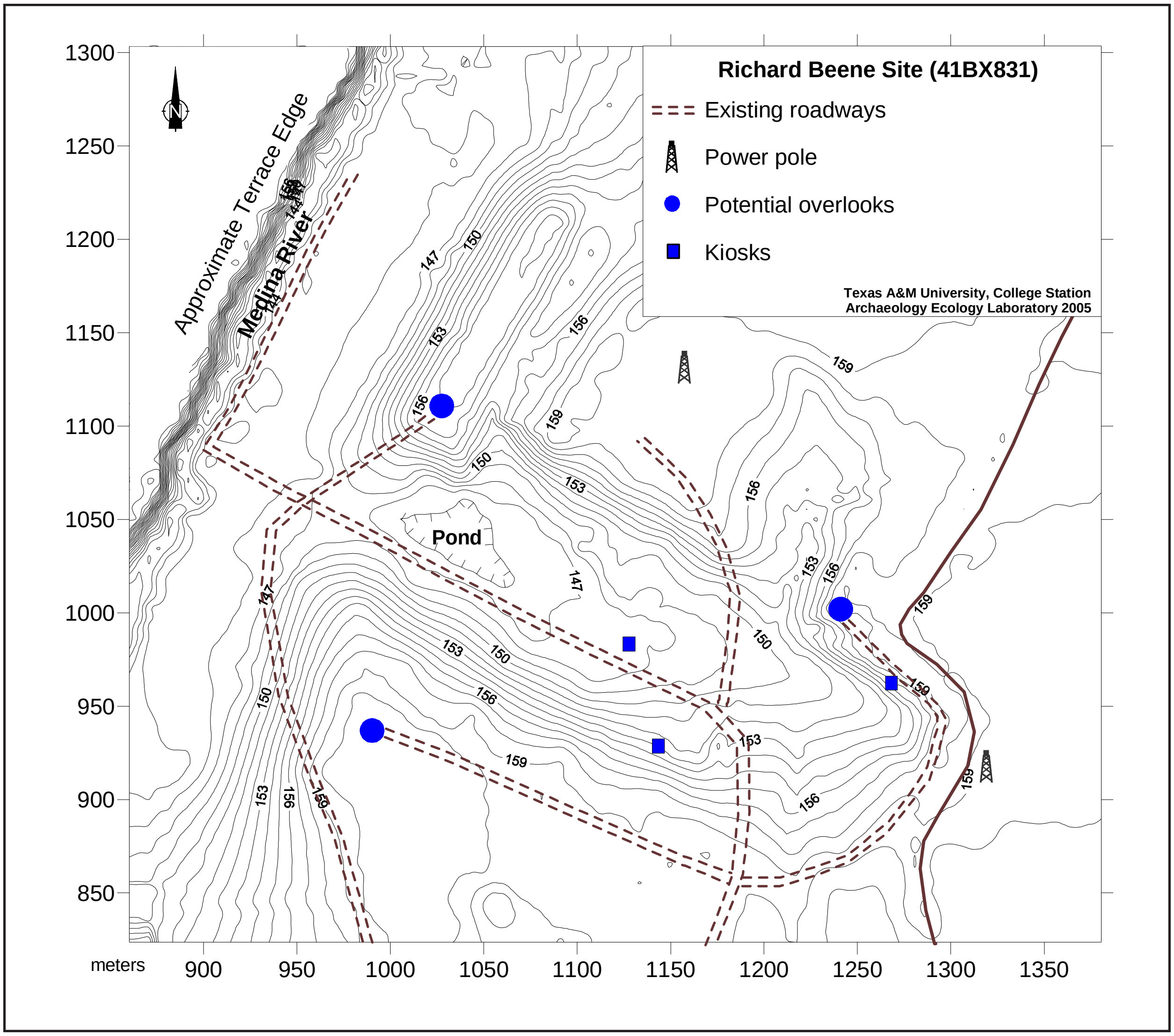


Figure 24. Topographic map of the newly sloped spillway trench area showing the block excavations as well as roads, pond, drainage ditch, and potential overlooks and kiosk locations.

Medina pedocomplex and Elm Creek and Perez paleosols. The eroded benches encompassing excavation Blocks H and N also contain well preserved remains of components dated to about 8800 B.P. (Thoms 2005a).

Much older deposits known to contain paleontological remains and, potentially, evidence of human occupation prior to 10,000 B.P occur on and below the floor of the spillway trench. Deposits in western half of the trench floor are part of the Somerset paleosol that dates between 20,000 and 35,000 B.P Figure 23. The eastern half of the floor, in the vicinity of excavation blocks H, N, and U is composed of sediments dating between about 10,000 and 16,000 B.P. that extend 3 m or more below the floor (Mandel 2005).

The dense stand of grass that covers most the of eastern half of the spillway trench as well as the trench floor, and surrounding uplands affords a significant control over slope erosion, but new gullies continue to form on the slopes and old ones become longer and deeper, especially in their upper reaches. As planned, the newly graded slopes and infilled gullies will be hydro-mulched and watered until grass is well established. This, too, promises to afford a significant measure of erosion control. What remains to be demonstrated, however, is whether these measures will afford protection for the underlying archaeological deposits over the long term. Toward that end, it is recommended that a long-term monitoring plan be developed and implemented by the Land Heritage Institute Foundation or the land-managing entity responsible for the property. It should include studies to identify best-management practices for minimizing runoff resulting in rill and gully formation slopes as well as undercutting caused by floods.

As presently configured, the spillway trench and vicinity contain roadways, a sediment pond, and a runoff diversion ditch (Figure 24). Consideration should be given to incorporating these features, with some modification, to facilitate site visitation. The drainage ditch around the east end of the spillway trench could be revamped to divert runoff water around the site. Existing roads provide ready access to both ends to the spillway trench as well as to archaeological deposits exposed along the slopes, the floodplain, and the Medina River. Other roads could serve as pathways to upland settings, observation posts, and kiosks for interpretative overviews of the surrounding terrain. The sediment pond on the bottom of the trench floor could well serve as a shallow lake or wetland, an ideal setting for picnic tables and natural history and land heritage exhibits consistent with the mission of the Land Heritage Institute Foundation.

A PERSONAL NATIVE AMERICAN PERSPECTIVE ON THE RICHARD BEENE ARCHAEOLOGICAL SURVEY AND MONITORING PROJECT

Jesus J. Reyes Jr.

I have participated in south Texas field schools sponsored by the Texas Archeological Society (2003) and Texas A&M University at Kingsville (2001), as well as one in central Texas sponsored by Texas Tech University (2004), but the present project is my first experience as a paid member of an archaeological field crew. My professional goal is to be an anthropologist specializing in linguistics. I am a Native American who holds membership in Taap–Piilamm Coahuiltecan Nations and an affiliated nonprofit organization known as American Indians in Texas at Spanish Colonial Missions.

This is my first publication. It may be a first of its kind in south–central Texas written by a Native American and published in a cultural resources management report that is required by the Texas Historical Commission. My job on this project was to help insure that important archaeological remains at the Richard Beene site were not inadvertently destroyed by the San Antonio Water System's bulldozers that graded the steep walls of what, in 1991 when I was 23 years old, was to be spillway trench for the proposed Applewhite Reservoir.

As an archaeological monitor, I kept a watchful eye for two weeks in search of artifacts and features left by my south Texas cultural ancestors who scholars first called "Coahuiltecans." The Richard Beene site offers an enormous amount of information due to the long period, 12,000 or more years, during which remains of Native American encampments were buried by flood deposits. The site's chronology is what makes it unique and of the utmost importance to the people of San Antonio, south Texas, and northeast Mexico. This, in turn, gives substance to the many Native American families, including mine, who trace their ancestry to the Coahuiltecan bands that once lived throughout the region.

The ages of the site's buried soils, artifacts, and camp fires are well known from previous work by Texas A&M University archaeologists and other scientists working under the direction of Dr. Alston Thoms. I am not trained in soil science but, as Dr. Thoms explained it, each soil layer or level represents a certain time period and has a distinctive ap-

Figure 25. Crew members (Jesus Reyes, Jr., left and Masahiro Kamiya, right) monitoring bulldozer cuts along the South wall of the Richard Beene site.

pearance because it was exposed for a different amount of time under different environmental conditions. In addition to finding and recording artifacts and features, we also observed a unique natural feature that helped me understand landscape evolution processes. It was a 5000 year old creek bed that had been filled in by clay and was exposed in profile in the spillway trench wall. The creek's existence and its infilling showed step by step changes that occurred over thousands of years and could be related to other ecological changes. All in all, the Richard Beene site is an enormous source of knowledge for reconstructing natural events and early lifeways of the native people who developed and changed to different degrees through time.

As a native person soon to graduate with a double major in Anthropology and History from the University of Texas at San Antonio, I understand the proficiency of conducting archaeological monitoring according to established professional and scholarly standards. I know that the same holds true for ethnohistoric studies and anthropological investigations in general. For me, it is very important that Dr. Thoms' work at the site has challenged the slow incorporation of Native Americans into archaeological studies in south–central Texas. By affording me an opportunity to work on this project he has opened a door to what I call a full-scope spectrum of inquiry.

As a college student, I have learned that paradigms for scholarly anthropological research in south Texas and northeast Mexico have changed through the years but, for the most part, the related theories were developed without an Indian point of view. It seems to me that a Coahuiltecan perspective would contribute to a strong and more complete paradigm. In the past, however, studies of Native American archaeological sites attributed throughout the region to Coahuiltecans in general have lacked a modern "Coahuiltecan" perspective. This is due to a lack of effort in asking about and looking for Coahuiltecan descendents in the local communities. An important question is: Who are the human descendants of the Native Americans that created those archeological sites and what are those people doing today? Addressing this question opens doors and encourages efforts to incorporate descendants of the people being studied.

Today's professional and ethics guidelines for the conduct of scholarly archaeology encourage incorporation of descendant groups and discourage all forms of ethnocentrism. As an anthropology student and a newcomer to archaeology, perhaps the most important thing I have learned is that most investigations about past Native American populations lack perspectives and viewpoints of the descendants of the people being studied. Fortunately, the present monitoring project and a few other archaeological investigations, including my south Texas field schools, have endeavored to include Indian people.

Unfortunately, we still have to contend with many years of treaty and trust violations between native and non-native peoples. It is clear to me, for example, that my community's elders with Indian ancestry have not exactly stepped out and eagerly volunteered information for the sake of science. While there is a great deal of useful information in scholarly archaeological reports, those publications lack a full spectrum of perspectives and this cuts short all good works to date from being great works. This especially holds true for us, the aboriginal people who scholars call "Coahuiltecan Indians."

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