THESIS

BRINGING IT ALL BACK HOME: EARLY CERAMIC PERIOD RESIDENTIAL OCCUPATION AT THE KINNEY SPRING SITE (5LR144C), LARIMER COUNTY, COLORADO

Submitted by

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ABSTRACT

BRINGING IT ALL BACK HOME: EARLY CERAMIC PERIOD RESIDENTIAL OCCUPATION AT THE KINNEY SPRING SITE (5LR144C), LARIMER COUNTY, COLORADO

The Kinney Spring site (5LR144c) was excavated by the Colorado State University archaeological field school during the summers of 1983 through 1985. Rich cultural deposits were recovered which indicated reoccupation of the site from the Middle Archaic period through the Early Ceramic period, however the densest concentrations of artifacts were associated with Early Ceramic occupations (A.D. 150-1150). This research focuses on the Early Ceramic period at the site. The first part of this thesis aims to define the Late Prehistoric period chronology for the site by first defining where the Late Prehistoric component begins in the stratigraphic column. Analysis determined that there is sparse evidence for Middle Ceramic and possibly Protohistoric period occupation of the site based on diagnostic artifacts, although this is not sufficient to define any Middle Ceramic or Protohistoric components. The second part of this thesis explores the Early Ceramic component in greater detail. Artifact accumulations and radiocarbon dates suggest that Kinney Spring was reoccupied multiple times during the Early Ceramic period, suggesting that the site was an important part of the regional Early Ceramic era settlement system. Multiple lines of evidence suggest that occupational intensity increased here during the Early Ceramic, likely in response to increasing regional population pressure.

ACKNOWLEDGEMENTS

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Gratitude must naturally be extended to Dr. Liz Morris and her field school students who conducted the original excavations and made this research possible. Field school students from the original excavations Mary Williams and "Trapper" John Rudd also generously shared their recollections of working at Kinney Spring with me. Dr. Jason

LaBelle and students from several Anth 457/Lithic Technology classes were responsible for the initial organization and sorting of artifacts from the site. Numerous undergraduates contributed countless hours helping me count and weight thousands of flakes, and catalog hundreds of tools, but in particular I would like to thank Connor Johnen and Ashley Packard for their dedication and hard work. Chris Johnston generously donated his time and computer skills to helping with many of the graphics and maps in this thesis. My graduate school cohort has turned into a crew of life long friends and I am thankful for all of them, however I am especially indebted to Chris Johnston, Spencer Pelton, and Michael Troyer for so many engaging conversations on life and archaeology that made this experience so much fun.

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CHAPTER 1: INTRODUCTION, BACKGROUND, AND RESEARCH OBJECTIVES

Excavations began at the Kinney Spring site (5LR144c) over 30 years before the publication of this thesis and much has changed in both our understandings of the prehistory of the Front Range of northern Colorado as well as how archaeologists approach field and lab work. Because no formal publications on the site were ever produced following excavation, this thesis is designed to use the existing collection of artifacts and excavation notes to integrate the site into current understandings of regional prehistory. In fact, the lapse in time between excavation and this thesis research is an asset that can help extract the maximum amount of information from the site because we have can draw from 30 additional years of research to help frame research questions and interpret data.

This thesis is not intended to be a site report for Kinney Spring. Instead this thesis has two primary goals. First, this thesis aims to place the site within an established regional culture-historical context. Second, this thesis will employ a selection of theoretical approaches to address important questions about what the site means with regard to the organization of hunter-gatherer behavior at both site-specific and regional levels.

The temporal focus of this thesis is the Early Ceramic period of the Late Prehistoric stage, and in the time since the site was excavated, the picture of this time as one of a complex series changes in demography, mobility, and technology has come into sharper focus. This thesis approaches the site from a regional perspective in order to address how it fits in with contemporary understandings of these changes. Once the Early Ceramic component at the site is defined, data from the site is used to examine the role of Kinney Spring within regional settlement and subsistence strategies.

Specifically, this thesis focuses on the decision to reduce residential mobility and adopt a more sedentary lifestyle as an adaptive strategy in response to increasing regional population pressure. This decrease in residential mobility, coupled with the regular reoccupation of suitable locations is demonstrated herein using multiple lines of evidence from Kinney Spring. The relative increase in occupation span at base camps like Kinney Spring is considered to be a central component within a package of related changes in diet and technology that allowed hunter-gatherer populations to survive and grow in the face of increasing population pressure and competition for resources.

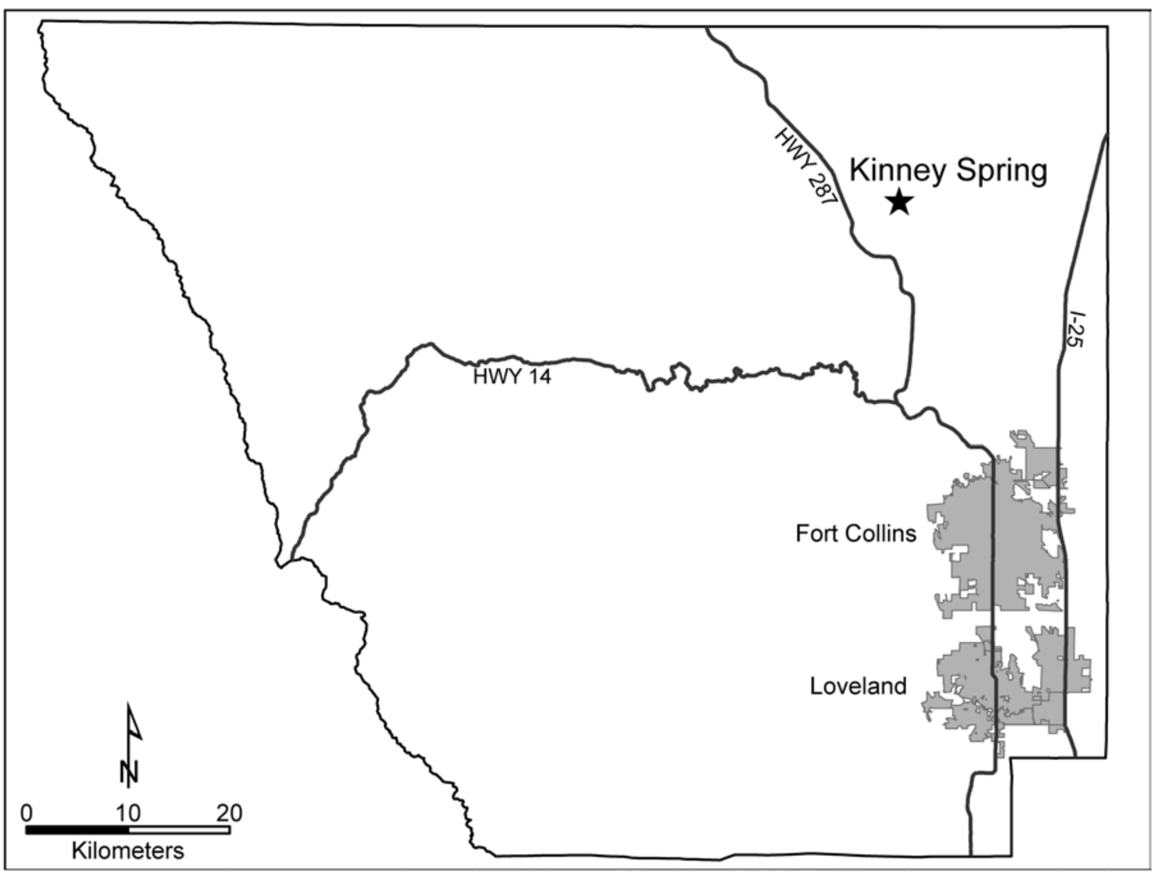

Figure 1.1: Map of Larimer County, Colorado, showing the location of Kinney Spring.

Physical Environment

The Kinney Spring site is located near the town of Livermore, approximately 29 miles north of Fort Collins in northern Larimer County, Colorado (Figure 1.1). The site is situated at 1814 m (5950 ft) above sea level, located in the ecotone between the Central Shortgrass Prairie of the western High Plains and the foothills of the Southern Rocky Mountains. The diversity of climate, geology, elevation, and soils in Larimer County provides the region with a range of ecological systems, which supports a high level of biodiversity (Doyle et al. 2005). This diversity of geology, landscapes, and wildlife would have made the region as attractive to prehistoric hunter-gatherers as it does for present day residents.

The site is situated on a southeast-facing bench within a low valley formed by uplifted hogback ridges (Figure 1.2; Figure 1.3). The site is bordered to the south and east by deeply cut arroyos. The main drainage channel of the valley forming the eastern boundary of the site was formed by a permanent spring located at the head of the valley, just north of the site (Figure 1.4). This spring would have provided year round water for prehistoric occupants. The site's location within a hogback valley would have provided shelter from prevailing winds. Kinney Spring is located within a lithic raw material rich area. Abundant, fine-grained yellow-gray quartzite from the Morrison Formation is available along Campbell Spring Draw, 1.7 km south of Kinney Spring. Campbell Mountain quartzite is the most frequently encountered raw material on the Roberts Ranch property (Pelton et al. 2013). The prevalence of this material on prehistoric sites in this area points to its importance in local hunter-gatherer economies (Flayharty 1972; Kainer 1976; Thompson 1986; Witkind 1971).


Figure 1.2: View of site location, main excavation area indicated by dashed circle, facing west. Spring 2012. Photograph by Ben Perlmutter.

The site is also located roughly 5.5 km from the Owl Canyon Pinyon Grove. Owl Canyon is the northern most isolated stand of pinyon pine (*Pinus edulis*) in Colorado. Based on pollen and macrofossil evidence, this stand of pinyon is believed to be approximately 1290-420 years old (Betancourt et al. 1991). The earliest potential colonization date for the pinyon grove corresponds with the end of the Early Ceramic period. Pinyon nuts may have been an attractive, if unpredictable resource, for hunter-gatherers in the area if the oldest age of the pinyon grove is correct.

History of Research

The Kinney Spring site is located on the Roberts Ranch property where Colorado State University conducted numerous archaeological surveys and recorded dozens of

Figure 1.3: View of Kinney Spring (5LR144c) during excavation (center of photo), facing west, circa 1983. Photograph on file, Colorado State University Archaeological Repository. Photographer unknown.

prehistoric sites beginning in the late 1960s and continuing through the mid 1980s. Several of these sites were intensively excavated by CSU archaeological field schools and resulted in several Masters theses (Flayharty 1972; Kainer 1976; Thompson 1986; Witkind 1971).

Kinney Spring was first recorded during a pedestrian survey by the field school in 1975 under the direction of Dr. Elizabeth Ann Morris (Mayo 1980). The site was identified based upon abundant pieces of debitage, tool fragments, and several hearths eroding out of a steep arroyo cut bank. The site was divided into five subareas, labeled alphabetically 'a' through 'e' (Figure 1.5). Multiple visits were made to the site over the following summers to conduct additional surface collections. The boundary between areas 'a' and 'b' was eventually dissolved and these two subareas were eventually combined under area a.

Figure 1.4: View facing northwest showing location of the spring, indicated by dashed circle. Site location is just outside of the frame to the left, indicated by arrow. Spring 2012. Photograph by Ben Perlmutter.

These surface collections presently remain un-studied, and are housed in the Archaeological Repository of Colorado State University (AR-CSU). Area c, the subject of this thesis, was ultimately selected for excavation because it contained numerous hearths visible in the arroyo cut bank, and because the depths of the cultural deposits were expected to reflect a long span of time (Morris et al. 1984).

Excavations began at the site in the late spring of 1983 by the field school under the direction of Dr. Morris. A total of three field seasons were spent excavating the site from 1983 through 1985. The site revealed a dense Early Ceramic period component overlaying a deeply buried Archaic period component, ranging from approximately 3500 B.C.- A.D. 1000. Data from the site was presented in two conference papers (Morris et al. 1984;

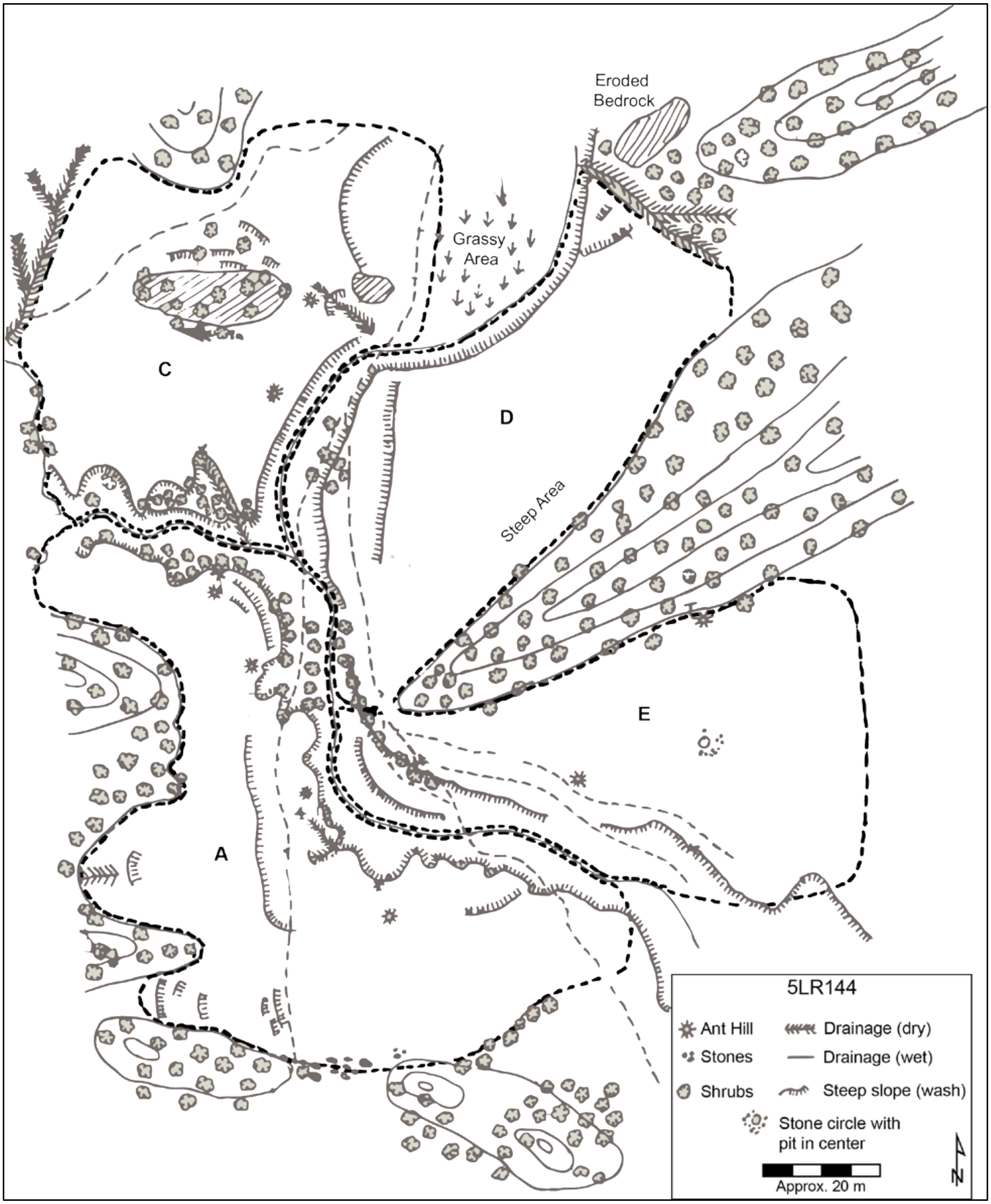

Figure 1.5: Sketch map of 5LR144 showing the location of areas a, c, d, and e, circa 1981. Digitized from original sketch on file at the Archaeological Repository of Colorado State University.

Morris and Litzinger 1985), as well as a symposium of McKean archaeology (Morris et al. 1985) but no formal or final publications were ever presented.

Over the course of the 1983-1985 field seasons, the Colorado State University archaeological field school excavated a total of 41 2x2 m square excavation units. Units were laid out along an east-west baseline and units were labeled according to an alpha-numeric grid system. East to west transects are labeled with letters, while north to south transects are labeled with numbers.

Units were excavated in arbitrary 10 cm levels, using the northwest corner as a unit datum, which was typically established 5 cm above ground surface. Units were excavated with level floors, which means the upper 2-4 levels contained a variable volume of soil excavated depending on surface slope. Several units were excavated down to bedrock, in some cases through over a meter of sterile soil, while other units were terminated earlier. All soil was screened through ¼ inch mesh. Selected samples were screened through finer mesh in order to recover smaller materials (Morris et al. 1984), however it is no longer apparent which samples these were. Charcoal and soil samples were collected from excavated hearth features. Theses samples are currently housed with the rest of the Kinney Spring collection at the Archaeological Repository of Colorado State University (AR-CSU).

The majority of the units were excavated on a southeast sloping bench bordered to the east and south by a deep, steeply cut arroyo that cuts through the site (Figure 1.6). This is referred to as the main excavation area (Figure 1.7). Additional units were excavated into the wall and floor of the arroyo to investigate cultural features eroding out of the wall.

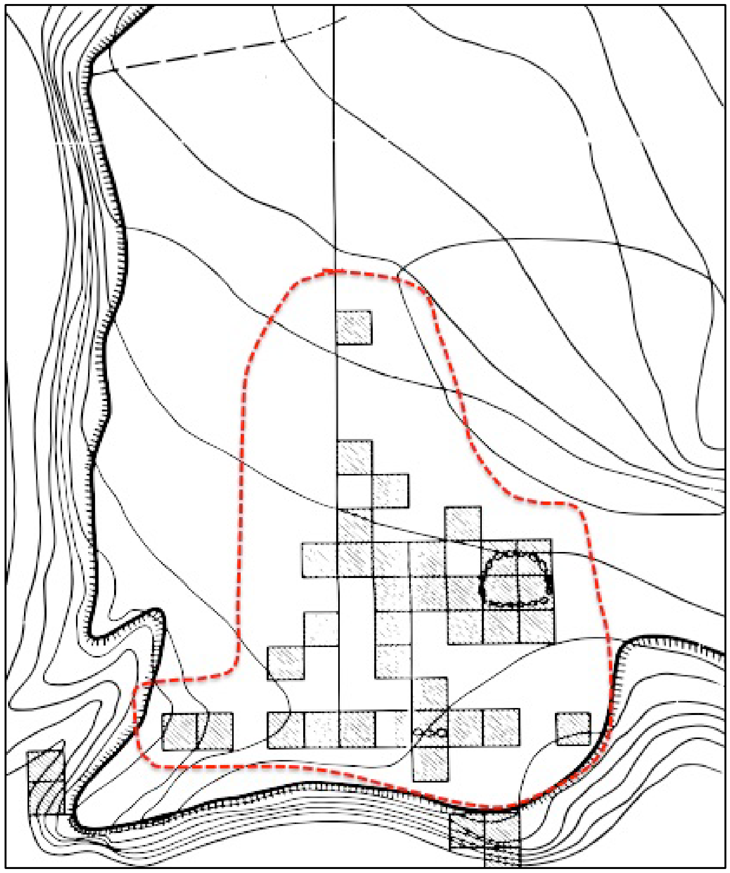

Figure 1.6: Sketch of excavation grid and baseline showing the location of excavation units relative to the arroyo cutbanks. The main excavation area is outlined in red, showing the units that are discussed in this analysis. Units outside of this area are not considered for this thesis. The date of this map is unknown and does not reflect all units known to have been excavated. Original sketch on file, Archaeological Repository of Colorado State University.

This thesis focuses exclusively on the main excavation area and does not consider the units excavated in the arroyo for analysis because of the vertical differences between these two excavation areas. It is presumed that Late Prehistoric occupations within the main excavation area are distinct from earlier and later occupations documented in the arroyo.

During the 1984 field season portions of a semi-circular, dry-laid multi course rock alignment was discovered. During the following field season, further excavation of this feature (Feature 30) revealed a large, semi-circular rock wall interpreted to be the foundation of a house (Figures 1.8-1.11). Morris and Litzinger (1985) believed that a gap in the rocks along the southeast portion of the wall represented a door opening. She noted that the interior of the house contained a distinct absence of small rocks and gravel, which was present across the rest of the site.

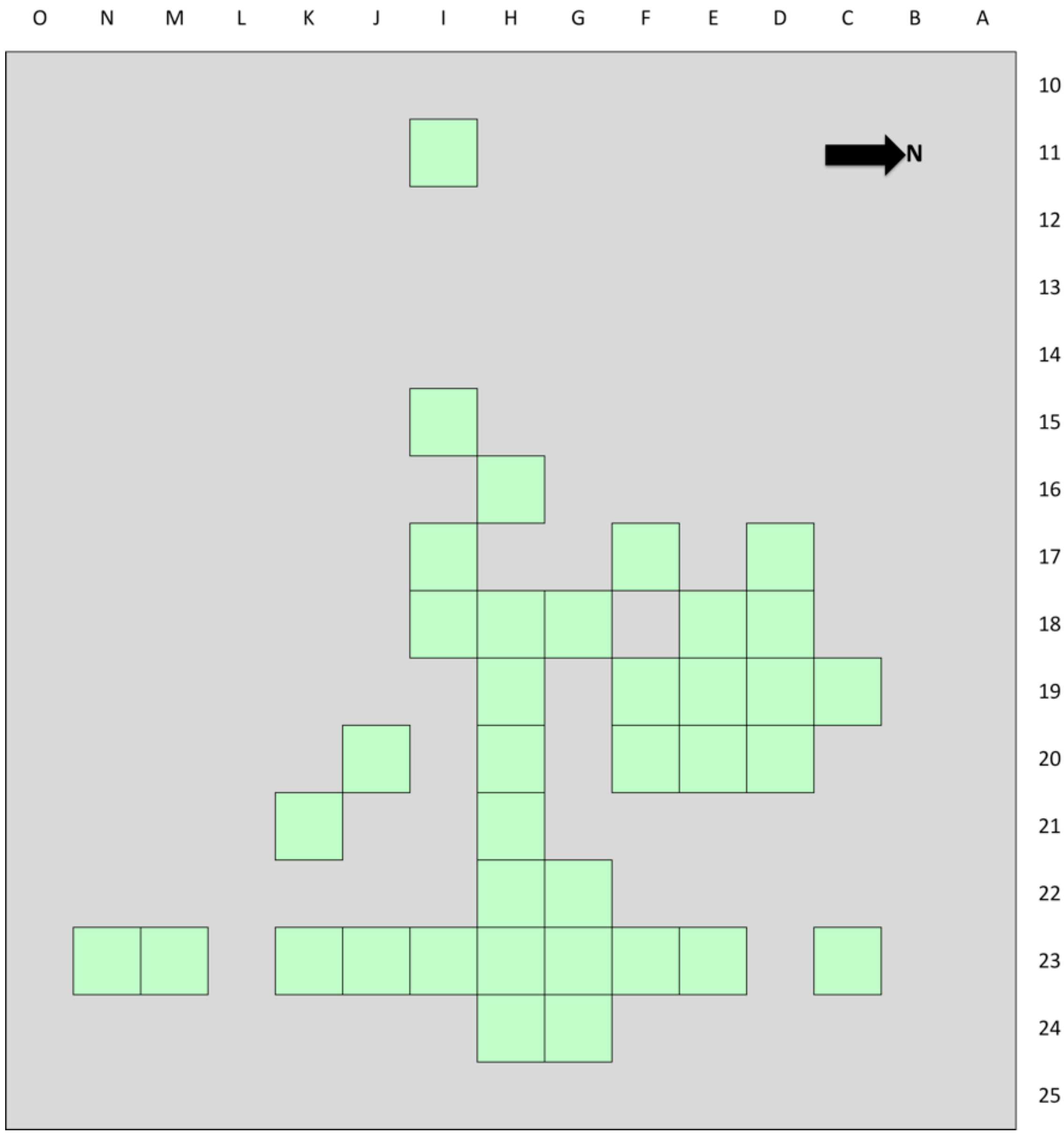

Figure 1.7: Plan view diagram of excavation grid within the main excavation area of the site. Each square represents a 2x2 m excavation unit.

The interior of the structure was divided into small excavation units measuring 25 x 25 x 5 cm, with each unit sampled and bagged separately. These samples, along with samples from several hearth features, were submitted for water separation analysis to identify whether any plant remains, bone fragments, or micro-debitage could be identified.

The results of this water separation are presently only available for one excavation unit,

Figure 1.8: the Kinney Spring house feature (feature 30) facing northeast during excavation, circa 1985. Photograph on file, Archaeological Repository of Colorado State University.

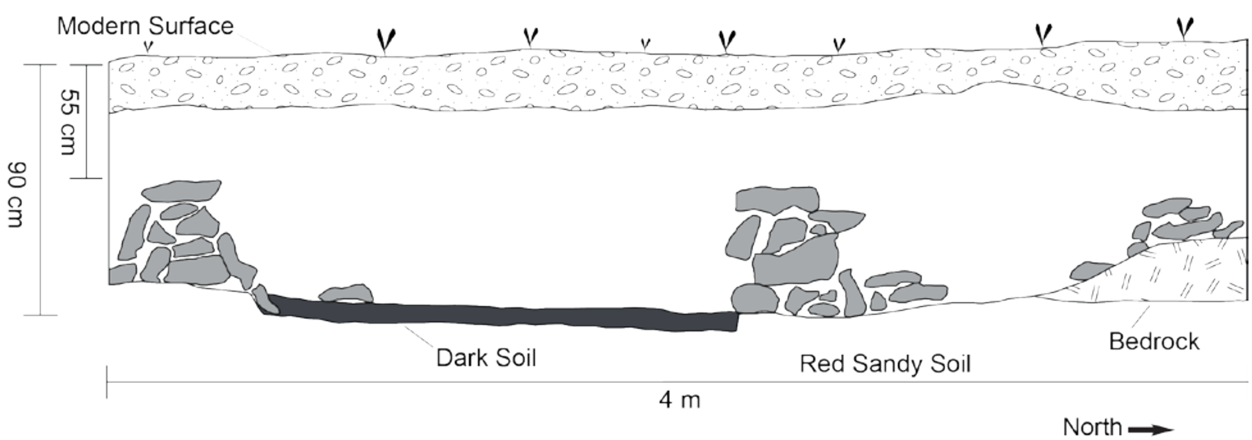

Figure 1.9: Profile sketch of house feature (feature 30) facing west, circa 1985. Digitized from original sketch on file at the Archaeological Repository of Colorado State University.

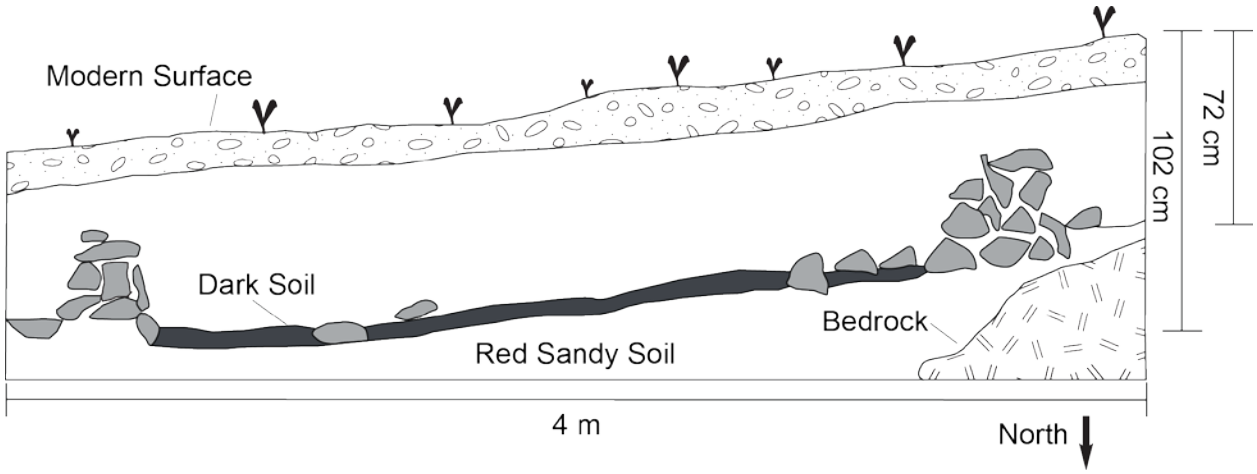

Figure 1.10: Profile sketch of house feature (feature 30) facing south, circa 1985. Digitized from original sketch on file at the Archaeological Repository of Colorado State University.

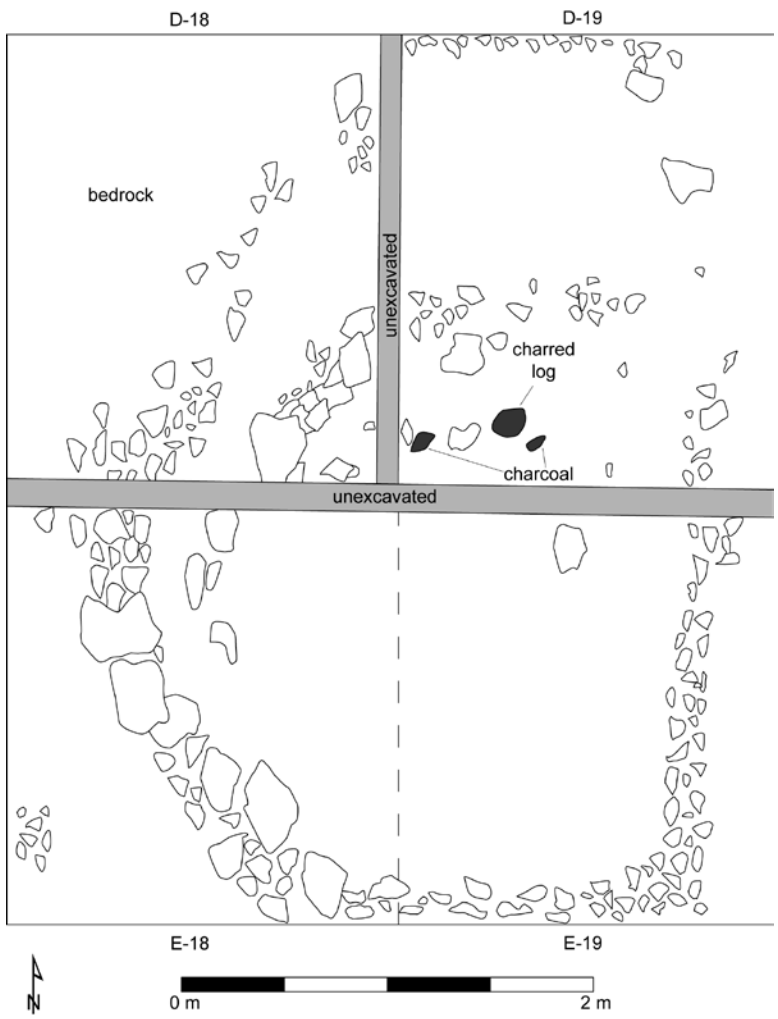

Figure 1.11: Plan view sketch map of house feature (feature 30), circa 1985. Digitized from original sketch on file at the Archaeological Repository of Colorado State University.

and it is unclear whether additional water separation was conducted on samples from the rest of the house. The distribution of micro-debitage and bone fragments was interpreted to indicate an opening along the southeastern wall of the structure because micro-flakes and bone fragments were concentrated outside of the hypothesized opening (Morris and Litzinger 1985). If additional analysis of this data was ever completed, the results are no longer available, and the location of the hypothesized opening cannot be determined from available notes and drawings.

Over the course of the three excavation seasons, a total of 11 charcoal samples were submitted for radiocarbon dating. This produced a sequence of dates ranging from the Early Archaic period through the Early Ceramic period (Table 1.1). The date from level 15 of E23, which produced an Early Ceramic period date of 1650±70 was found in a level with mixed diagnostics and noted rodent disturbance and was considered to be intrusive. For this reason, this date is not considered further in this thesis.

Table 1.1: Radiocarbon dates processed during the 1983-1984 field seasons by the CSU field school.

Radiocarbon Years Before Present	Sample ID	Unit	Level	Feature	Year Collected
950±60	Beta-10196	E19	6 or 7	Fill/Floor of Feature 30 (house)	1984
1120±60	Beta-10195	D20	7 or 8	FCR Feature in/under house floor	1984
1510±70	Beta-7328	E23	6	Feature 4	1983
1600±100	Beta-5126	M23	2	Feature 2	1983
1650±70	Beta-7329	E23	15	Unknown	1983
3160±130	Beta-7330	I23	26	14	1983
3250±80	Beta-6847	Unknown	Unknown	Feature B, Sample 2	1983
3850±70	Beta-7333	R24	Unknown	Feature 9	1983
3950±150	Beta-6846	Unknown	Unknown	Feature A, Sample 1	1983
5410±70	Beta-7332	P28	Unknown	Unknown	1983

Research Questions

There are challenges involved in collections-based projects such as this. Because the site was excavated in 2x2 m units, the horizontal resolution of the excavation is coarse. Although the units were excavated in 10 cm levels, starting and closing depths of levels were inconsistently recorded, which often makes vertical provenience an approximation. Additionally, there is a wide range in the quality of excavation notes available from the site. Documentation ranges from excellent attention to detail to practically non-existent notes. In some cases, notes from excavated units, from which we have artifacts, have gone missing. Because all data was recorded in field notebooks, as opposed to standardized excavation forms, even simple questions can be difficult to answer.

Despite these many challenges, there is still a tremendous amount of potential information to be derived from the site. The research questions for this thesis were designed to focus on broad, general issues regarding Early Ceramic period occupations at the site that could be addressed within the limitations of the available data.

Five main questions are answered in this thesis. These questions are designed to provide a preliminary understanding of site chronology and demonstrate how some of the major changes associated with the Early Ceramic period were experienced by occupants of Kinney Spring

Question 1. Where in the stratigraphic column does the Early Ceramic component begin at Kinney Spring? For this thesis, a component refers to the widely adopted Willey and Phillips definition (2001:21-22) as the site level manifestation of a regional phase. In the South Platte River basin of Colorado, the Early Ceramic period fits the Willey and Phillips definition of a phase because the introduction of new technology, demographic changes, shifting settlement patterns, and cultural influence from the Central Plains distinguish this period from earlier and later times.

Because the Early Ceramic period represents such a dramatic divergence from Archaic Period lifeways, it is critical to define the site chronology and establish where in the stratigraphic column this change occurred. This will allow the site and it's assemblage to be broken down into basic, chronological units, allowing research to focus on specific periods of the site's occupation. Questions regarding the role of Kinney Spring in the local Early Ceramic period settlement system and economy can not be addressed *without first* defining the Early Ceramic component at the site. Question 1 will be addressed in Chapter 4.

Question 2. While Question 1 answers where the Ceramic component begins at the site, Question 2 aims to answer whether there were any Middle Ceramic or Protohistoric period occupations at the site as well. The large number of diagnostic Early Ceramic materials suggests that the majority of Late Prehistoric period occupations took place primarily within the Early Ceramic period. The definition of the site's chronology must not only focus on where the Early Ceramic period begins, but also what happened after. The Middle Ceramic in the South Platte drainage is also associated with a shift in hunter-gatherer mobility and material culture from the previous 1000 years, so an in-depth study of the Early Ceramic occupation of Kinney Spring is not possible without also defining the site chronology after that period. Question 2 will be addressed in Chapter 5.

Question 3. Once the site chronology has been defined, Question 3 will examine the nature of the Early Ceramic period occupation of Kinney Spring. Specifically, Question 3 asks whether site occupation spanned the Early Ceramic period, and whether the site was continuously occupied during that time. For the purpose of this thesis, continuous occupation refers to the site's role within regional settlement patterns. It demonstrates that while the site may have been unoccupied at certain points during the period in question, the role of the site within a regional settlement system remained relatively constant throughout the Early Ceramic period, and the span of time between reoccupations was not long enough to be archaeologically visible. Question 3 will be addressed in Chapter 6.

Question 4. This question will determine whether the chronology of the Early Ceramic component can be further subdivided into distinct cultural levels. Cultural levels correspond with discrete periods of site use and can be distinguished based on site stratigraphy or artifact distributions. Defining these levels would allow individual episodes of site occupation to be distinguished from each other, rather than lumping all occupations into a single unit, such as a component. This would provide a higher resolution understanding of how a site was occupied over a period of time. Question 4 will also be addressed in Chapter 6.

Question 5. Question 5 explores the nature of the Early Ceramic period occupation of Kinney Spring. Question 5 asks whether occupational intensity increased during the Early Ceramic period, and if so, whether these changes were gradual or abrupt. Increasing population during the Early Ceramic period in the South Platte River basin is one of the most important changes associated with this time (Gilmore 2008), and this question aims to look at how occupational intensity at the site level of a residential base camp reflects these changes. Question 5 will be addressed in Chapter 7.

CHAPTER 2: NORTHERN COLORADO PREHISTORY AND THE EARLY CERAMIC PERIOD

Humans have lived in northern Colorado since at least the end of the Pleistocene (Table 2.1). The Paleoindian stage refers to the earliest documented human occupations in North America. The Clovis period is the earliest, well-established Paleoindian occupation of the region. Although sparse, Clovis sites along the foothills of the Colorado Front Range point to their presence in the area at least 12,000 years ago. Clovis is still a relatively poorly understood period, however Clovis hunters are known to have pursued large, extinct megafauna such as mammoths with their signature fluted spear points (Chenault 1999a).

The Folsom period, following Clovis, is well represented in the area due to the presence of the Lindenmeier site (5LR13), one of the largest Folsom sites in the country. Folsom people lived on the landscape during the transition between the Pleistocene and Holocene. They adapted to these changing environmental conditions through strategic use of a combination of residential and logistical mobility (Andrews et al. 2008). Mammoth were most likely extinct by Folsom times, and Folsom hunters had shifted their focus towards a large, now extinct, species of bison (*Bison antiquus)* as well as a range of smaller species. Folsom assemblages are known for their high quality flint knapping and bone working (Chenault 1999a; Kornfeld et al. 2010).

The Middle-Late Paleoindian period, also referred to as the Plano period, includes a range of cultural complexes, including Hell Gap, Agate Basin, Cody, Firstview, and Kersey. These complexes can be distinguished based on their distinct forms of large, un-fluted spear points.

Table 2.1: Prehistoric chronology of the South Platte River basin. From Chenault (1999b:3).

Stage	Period	Date Range
Paleoindian	Clovis	12,040-9750 B.C.
	Folsom	11,340-8720 B.C.
	Plano	10,850-5740 B.C.
Archaic	Early	5500-3000 B.C.
	Middle	3000-1000 B.C.
	Late	1000 B.C.-A.D. 150
Late Prehistoric	Early Ceramic	A.D. 150-1150
	Middle Ceramic	A.D. 1150-1540
Protohistoric		A.D. 1540-1860

This period saw a continued reliance on large game, as well as increasing reliance on smaller game and plant resources (Chenault 1999a). The Plano period is represented in the South Platte River basin most notably by the Frazier site, an Agate Basin bison kill site and processing location (Slessman 2004), and the Jurgens site, a Cody complex bison processing site (Wheat 1979), both located on the Kersey Terrace of the South Platte River near Greeley, Colorado.

Based on projectile point forms, it appears the transition from the Late Paleoindian period to the Early Archaic period was relatively abrupt. Although still poorly understood, this transition is thought to have occurred some time between 8000-7500 years ago (Kornfeld et al. 2010). The replacement of Pleistocene fauna by modern species potentially triggered a shift in subsistence strategies with a greater emphasis on a wider range of animals, including small game such as rabbits. An increasing reliance on plant resources in the Archaic is demonstrated by the initial appearance of rock filled hearths (Troyer 2014). Corner and side-notched projectile points replaced lanceolate points and plant grinding stones become increasingly common in archaeological assemblages (Tate 1999). Overall, the Archaic stage can be thought of as one of continuity involving gradual shifts in subsistence and mobility strategies.

The Archaic stage can be subdivided into Early, Middle, and Late periods. The Early Archaic period coincides with the Altithermal climatic episode, a drought that affected much of the North American West (Antevs 1955). This drought would have affected human occupation of the Colorado Front Range. Although the nature of those affects remains subject to debate (Meltzer 1999), this would have been a difficult time to live on the Great Plains. Some have argued for a temporary abandonment of the Plains by some groups during this time, as drought conditions pushed hunter-gatherers to seek the cooler, moister climates of mountain environments (Benedict and Olson 1978). The Mount Albion complex was defined for a series of high altitude Early Archaic hunting and campsites located above tree line in the mountains west of Boulder, Colorado. Mount Albion people were argued to be a Plains-based group who sought refuge in the mountains from the harsh conditions of the Plains at this time (Benedict 2012; Benedict and Olson 1978)

The Middle Archaic period is similar to previous stages, and is distinguished largely by the presence of McKean complex projectile points. McKean complex sites are well documented in the South Platte River basin of northern Colorado (Morris et al. 1985). This period is also associated with a greater number of dated sites and a greater reliance on plant foods over previous periods (Kornfeld et al. 2010).

The Late Archaic period is again distinguished by a change in projectile point styles, and an increase in the number of dated features over the preceding Middle Archaic period. Otherwise, the Late Archaic period could be thought of as a continuation of Middle Archaic cultural practices and subsistence strategies with perhaps a diversification of diet, more ground stone, and reliance on storage features (Tate 1999). The Late Archaic period also saw an increase in large-scale bison hunting, as evidenced by larger number of bison kill sites from this time (Kornfeld et al. 2010). This trend is best represented locally at the Kaplan-Hoover site, a communal bison kill and butchering site located outside of Fort Collins, Colorado, which dates to 2724 ± 35 uncalibrated radiocarbon years before present. (Todd et al. 2001).

The Late Prehistoric stage within the South Platte River basin of northern Colorado can be divided into the Early Ceramic, Middle Ceramic, and Protohistoric periods. In contrast to the Archaic stage, the Late Prehistoric stage saw many changes in hunter-gatherer subsistence and mobility strategies. The Early Ceramic period, which will be discussed in greater detail later in this chapter, is defined archaeologically by the introduction of pottery and the bow and arrow into hunter-gatherer's tool kits, as well as more sedentary campsites and cultural influences from the Central Plains (Brunswig 1996; Butler 1988; Gilmore 1999).

The Middle Ceramic period within the South Platte basin is defined by the replacement of corner-notched arrow points with side-notched points, the introduction of Central Plains tradition pottery, and a decline in regional population, however this time is still comparatively poorly understood (Gilmore 1999). Unlike Middle Ceramic period cultures of the Central Plains, hunter-gatherers along the foothills of northern Colorado never aggregated into villages. In fact, the opposite seems to be the case, as Middle Ceramic campsites are typically much more ephemeral than Early Ceramic campsites suggestive of greater residential mobility (Gilmore 1999: 267). Examples of Middle-Ceramic period campsites are sparse compared with the Early Ceramic period. One such site is the T-W-

Diamond site (Flayharty 1972; Flaharty and Morris 1974), a stone circle site located just a couple miles from Kinney Spring. Although the dates from the site suggest an occupation during the 11^{th}-12^{th} centuries A.D., which is early for the Middle Ceramic period, the diagnostic artifacts such as triangular and side-notched arrow points, and plainware pottery, are distinctly different from Early Ceramic assemblages and reflect the transition to the Early Ceramic period. The low artifact densities at the site are also indicative of a shorter occupation span (Flayharty and Morris 1974).

The Protohistoric, alternately referred to as the Late Ceramic period begins with European contact and was a period of rapid cultural and technological change. The Protohistoric period continues until permanent settlement of Europeans in the region, which corresponds with the discovery of gold along the South Platte River in 1858 (Clark 1999).

The Early Ceramic Period

The Early Ceramic period in the South Platte River drainage of Eastern Colorado stands in contrast to the preceding several thousand years of prehistory because of a suite of changes, which occurred around 1850 years ago and persisted until approximately 900 years ago (A.D 150-1150). The most important changes associated with this period include increasing regional population, the introduction of the bow and arrow and pottery, more sedentary occupations, and an increase of cultural influence from the central Great Plains (Brunswig 1996; Butler 1988; Gilmore 1999; Gilmore 2008). Each of these changes are discussed individually to provide context for the Early Ceramic period occupations at Kinney Spring.

Increasing Population

Hunter-gatherer population on the High Plains had been gradually increasing throughout the Holocene (Gilmore 2008). This trend appears to have increased sharply around the Late Archaic-Early Ceramic period transition and peaked at the end of the Early Ceramic period. Gilmore (2008) used the summed probability distribution of calibrated radiocarbon dates as a population proxy to model relative population fluctuations in the South Platte and Arkansas River basins. In both the South Platte and Arkansas River basin there is an increase in the summed probability of radiocarbon dates, beginning around 2000-1800 years ago and continuing for approximately 800 years, peaking at the end of the Early Ceramic period (Figure 2.1).

Following this period of relatively rapid population growth, the summed probability curve suggests an abrupt and steep decline in population during the Middle Ceramic period, beginning around 1000-850 years ago. This decline in population coincides with a decrease in site size and density, and is believed to represent a return to a more mobile lifestyle (Gilmore 1999).

New Technology

One of the most archaeologically visible changes associated with the Early Ceramic period transition is the appearance of new technologies in the form of ceramics and the bow and arrow. These technologies were not present in the region in the Late Archaic period so the introduction of these technologies, especially pottery (Gilmore 1999:177), is

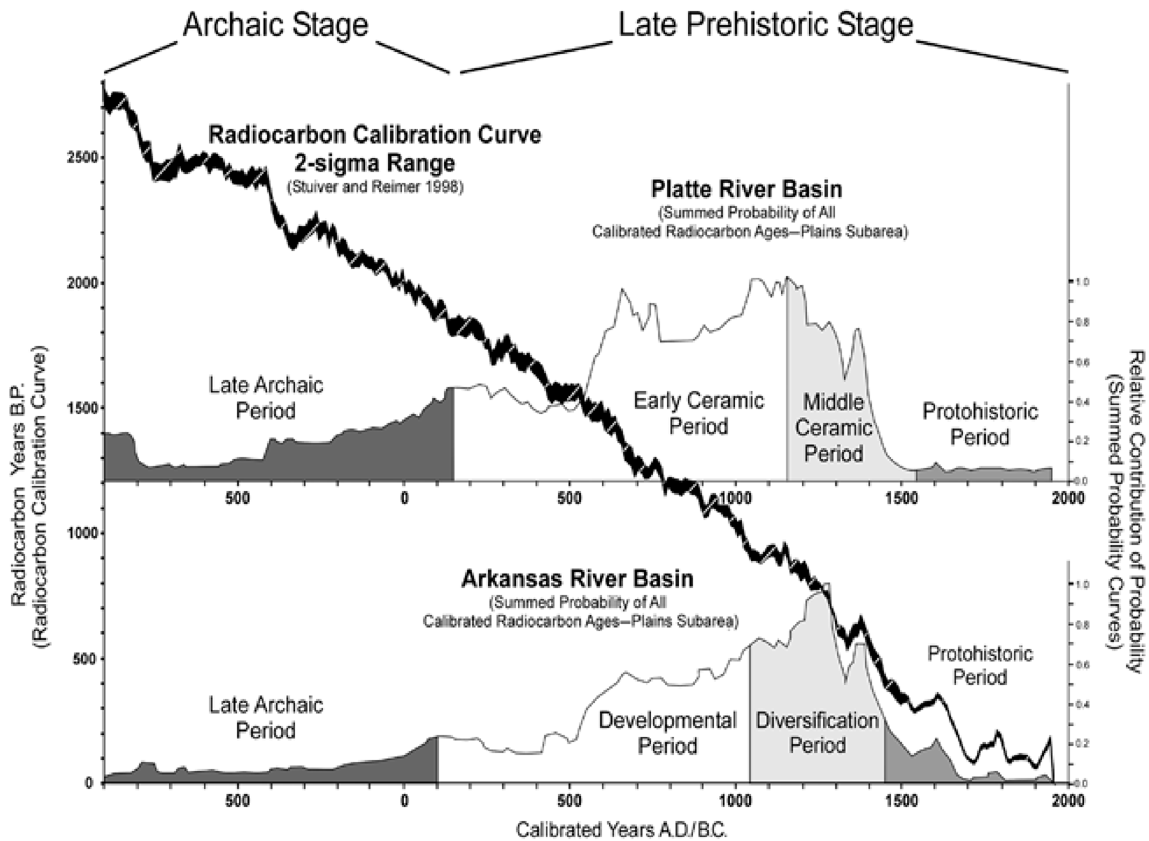

Figure 2.1: Summed probability of radiocarbon dates for the South Platte and Arkansas River valleys. From Gilmore (2008:81)

one of the definitive diagnostic traits of the Early Ceramic transition. The earliest documented appearance of pottery in the region comes from the Michaud A site in Arapahoe County (Wood 1971) where cord-marked pottery sherds were found in association with a burial dated to approximately A.D. 150. Perhaps the transition occurred slightly earlier, as pottery from the Indian Mountain site in Boulder County was found in association with a stone circle dated to approximately 340 B.C.-A.D. 60 (Cassells and Farington 1986), however Gilmore has suggested that the association of pottery with this date is not reliable (Gilmore 1999:205). Thus, the date from Michaud A has generally become accepted as the beginning of the Early Ceramic period in Northeastern Colorado (Butler 1988; Gilmore 1999) representing the earliest documented pottery.

Early Ceramic period pottery in Colorado is often referred to as "Plains Woodland" (Butler 1988) because it is most comparable to cord-marked pottery from Central Plains cultures such as the Keith and Valley focus of Kansas and Nebraska (Butler 1988), which in turn assumed the "Plains Woodland" designation because of general similarities to the archaeology of the Woodland cultural tradition of the Eastern United States (Wedel 1986). Early Ceramic period "Plains Woodland" pottery is identified by their conical or pointed bases, straight or incurving rims, and cord marked surfaces (Ellwood 2002).

Considering the stylistic similarities to pottery from the Central Plains, it is possible that at least some of the Early Ceramic "Plains Woodland" style pottery in the South Platte basin was obtained through exchange or contact with these Eastern groups. However there is also evidence to suggest that a there was a local ceramic manufacturing tradition as well. A petrographic analysis of sherds recovered from the Rock Creek site (5BL2712) in Boulder County demonstrated that all of the vessels at the site were manufactured locally using locally available clay and temper sources (Ellwood and Parker 1995). Even if cord-marked pottery in Colorado was locally manufactured, the design of the vessels and methods of manufacture are clearly derived from the east. Contemporaneous pottery from other regions, such as the southwest, does not resemble these Early Ceramic period cord-marked vessels.

The second technological addition of the Early Ceramic period, the adoption of the bow and arrow, is part of a more complex trajectory of diffusion and invention. Current perspectives on the adoption of the bow and arrow across North America suggest that this technology was adopted through diffusion in some regions having been originally imported by immigrants from Northeastern Asia, and independently invented in other regions. In some areas, the technology was adopted abruptly, while in others it was adopted more gradually (Nassaney and Pyle 1999). Archaeological evidence also suggests that across the continent, dart technology was not simply replaced by the bow and arrow, but rather that these two technologies were used side by side for some time (Nassaney and Pyle 1999:259).

It is difficult to determine the source of bow and arrow technology in the South Platte River basin. Unlike pottery, it cannot be presumed to have an Eastern origin, since similar points are also found in the Northern Plains and Great Basin, and it is not clear where this technology is derived from (Gilmore 1999:295). However the abrupt appearance of small, corner-notched arrow points in the regional archaeological record suggests that this technology was adopted through some mechanism of cultural transmission rather than independent invention, as was seen in some areas of south east Texas (Nassaney and Pyle 1999:256).

Evidence for bow and arrow use comes from the appearance of small, finely flaked corner notched arrow points. These often feature serrated edges and many have been retouched. Regional literature refers to these points as "Hogback Corner-Notched" points (Nelson 1971) or "Foothills Corner-Notched" points (Taylor 2006). Within this style is a wide range of morphological variation, however they all feature expanding stems, straight to convex bases, barbed shoulders, and neck widths that rarely exceed 8 mm.

The Michaud A burial remains the earliest dated appearance of Early Ceramic style corner notched arrow points. Further research is needed to better define when, and how rapidly this technology was adapted, however the radiocarbon record suggests that the introduction of pottery and the bow and arrow were roughly contemporaneous (Gilmore 1999:287-299).

Increasing Sedentism

As the population within the South Platte basin increased during the Early Ceramic period, there was a general trend towards more sedentary occupation of residential camp sites. Several lines of evidence suggest a shift towards decreasing residential mobility patterns occurred during this time.

When compared with the preceding Archaic period, there is an increase in the number of thermal features (Troyer 2014), burials, and structures dating to the Early Ceramic period. This is interpreted to reflect decreasing mobility through longer occupations of sites (Gilmore 1999:179). Additionally many Early Ceramic period campsites are spatially larger, and feature much denser assemblages of artifacts than either Archaic or Middle Ceramic period sites, also suggesting that Early Ceramic sites were occupied for longer periods. This may also be the product of certain locations being repeatedly reoccupied for extended periods.

Changes in mobility are often associated with changes in subsistence strategies as well. While the relationship between mobility and horticulture is far from straightforward (Kelly 1992), reliance on horticulture is associated with more sedentary occupations. Evidence of horticulture in the South Platte River basin is sparse and ambiguous, but what evidence there is comes from Early Ceramic period contexts. Corn, the only documented cultigen in the area, was recovered in trace amounts from a small handful of sites, even fewer of them with well-associated radiocarbon dates (Gilmore 1999). The role of horticulture in northern Colorado during the Early Ceramic Period remains unclear, but the sparse evidence suggests that hunter-gatherers were experimenting with cultigens to some degree.

Increasing Cultural Influence From the Central Plains

Compared to the previous Archaic period, there is a notable increase in cultural influences apparently derived from the Central Plains, which in turn was influenced by Hopewellian cultures farther east. The relationship of Early Ceramic period sites on the western High Plains to Woodland sites in Nebraska and Kansas remains poorly understood, perhaps because shared traits between the two regions, including pottery, small corner-notched arrow points, and select aspects of burial practices, represent a small percentage of cultural traits for both regions (Gilmore 1999). It may be generally summarized that as one moves from east to west, the traits that constitute Woodland culture become more simplified. Gilmore (1999:295) argues that this suggests a migration of ideas, rather than people, to the western High Plains region. Similarities between Central Plains and Western Plains burial practices during the Early Ceramic period include grave goods such as bone and shell beads (Anderson 2012; Calhoun 2011), flaked and ground stone tools, as well as increasingly frequent secondary burials (Gilmore 2008). This is suggestive of a common cultural identity between the two regions during this time (Gilmore 1999).

Numerous sites on the Roberts Ranch property contain Early Ceramic period burials featuring Plains-Woodland style burial goods. The Roberts Ranch Burial (5LR1683) consisted of an adult female who was buried with a large collection of shell disc beads, tubular bone beads, and a freshwater mollusk shell pendant as well as a collection of flaked stone and ground stone tools (Black 1997). The Lightning Hill site (5LR284), also located on the Roberts Ranch, contained two Early Ceramic period burials, both adult males. Burial goods found in association with these internments included a large quantity of tubular bone beads, as well as two large shell pendants (Morris and Mayo 1979 cited in Gilmore 1999:229). An Early Ceramic period burial was also found at the Kinney Spring site, along the edge of the arroyo along the southeastern boundary of the site (Appendix D). This burial contained a shell pendant that appears almost identical to the pendant recovered from the Roberts Ranch burial (Black 1997:9), as well as a tubular bone bead. These burials and their associated grave goods provide evidence that select cultural traits from central plains populations were well represented in this region during the Early Ceramic period.

Early Ceramic Period Settlement Systems

While evidence suggests that people were less mobile during the Early Ceramic period, they were still practicing at most a seasonal variety of sedentism. Groups still made several residential movements, and employed frequent logistical mobility throughout the year. This mobility, and the associated diversity in site types, which include residential base camps, field camps, hunting sites (kill sites and butchering areas), plant processing locations, caches, and burials comprise the settlement system practiced by Early Ceramic peoples. The most well-known and archaeologically established model of Early Ceramic settlement was proposed by Benedict (1992) with his rotary model of seasonal transhumance (Figure 2.2). In this model, groups would spend the winter in the hogback valleys along the base of the Front Range, and then follow a circular route through the high

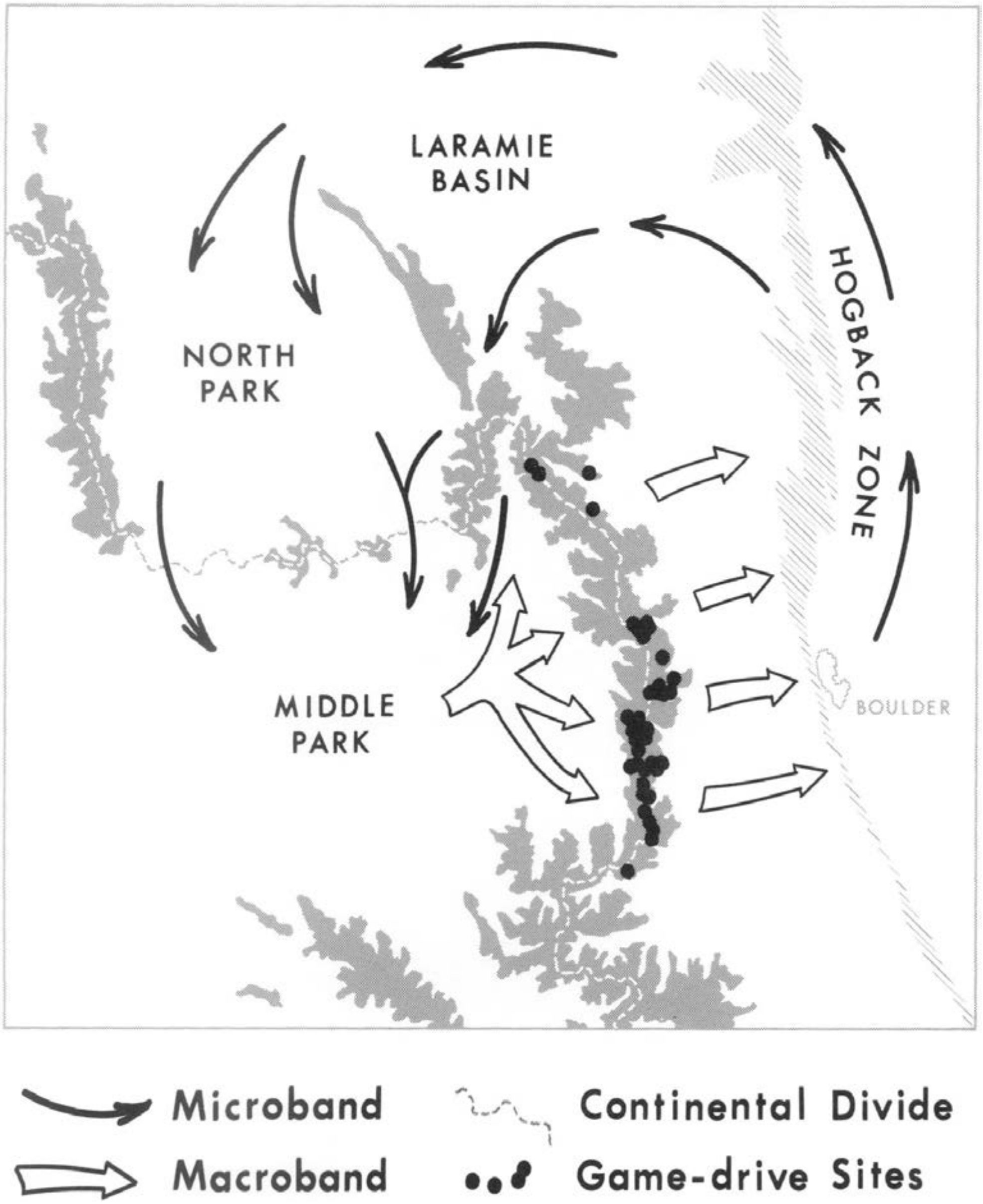

Figure 2.2: Jim Benedict's Early Ceramic period rotary model of seasonal transhumance. From Benedict (1992).

mountain valleys of North and Middle Park in the Spring and Summer, before finally returning back down to the hogbacks by the late fall. Included within this model are the various site types described above, and each type should be distinguishable in the archaeological record by the types and quantities of artifacts and features encountered. Kinney Spring certainly fits in with our expectations for a seasonal winter base camp within this model, based on its location within a sheltered, south facing hogback valley, large and diverse artifact assemblage, and substantial architectural feature with an interior hearth. A more detailed discussion of Early Ceramic period settlement systems can be found in Chapter 8.

Summary

Human occupation is well documented in the South Platte River basin of Colorado extending back to the Paleoindian period, at least 13,000 years ago. The prehistoric chronology of the region is subdivided into stages based on changes in technology as well as subsistence and settlement strategies. The Early Ceramic period of the Late Prehistoric stage, which is the subject of this research, represents a divergence from the continuity of the Archaic period, marked by the appearance of new technology, settlement patterns, and cultural influences.

CHAPTER 3: THEORY AND METHODS

Kinney Spring is a complex site, which could be approached from many different perspectives. The theoretical approaches and methods used in this thesis were designed and selected to answer the research questions outlined in Chapter 1 within the limitations of the available data

Theoretical Perspectives

In order to address these research questions a combination of theoretical perspectives are applied. These perspectives can be conceptualized as a pyramid, building upon and refining each other and progressing from broad and general to more specific. These approaches are used to both interpret and explain data from the site (Figure 3.1).

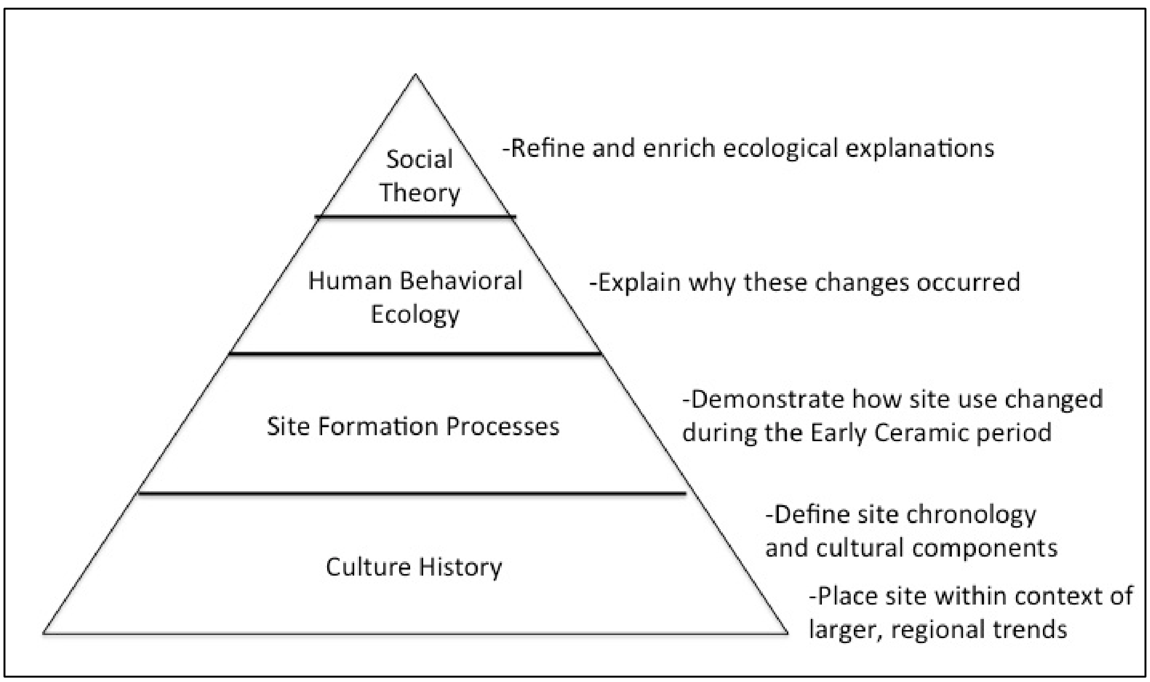

Figure 3.1: Theoretical perspectives employed in this thesis, and their applications.

Culture history is the attempt to trace the development of an archaeological "culture" through changes in common material culture, or traits (Trigger 2006). While many elements of culture history are problematic, it retains some utility for documenting when and where major changes in technology occurred in the archaeological record. Culture history is employed to place the site into a chronological and cultural context based on the presence of common technological traits. Understanding how the site relates to broader regional trends taking place in the South Platte River basin during the Early Ceramic period is foundational to the interpretations of how the site was occupied during this time.

Once the cultural and chronological context has been established, cultural formation processes are then used to explain how site use changed during the Early Ceramic period. Cultural formation processes can be defined as "the processes of human behavior that affect or transform artifacts after their initial period of use in a given activity" (Schiffer 1987:7). Of particular relevance to this research are site formation processes (Ammerman and Feldman 1974, Shott 1989), which consider the cultural processes affecting how artifacts are deposited and enter the archaeological record.

Finally, behavioral ecology and social theory, while not the focus of this research, are both touched on the final discussion of this thesis to help explain why some of the changes that we see in site occupation occurred during this time.

Assemblage Formation Processes

In addition to looking at the frequency of debitage, the size and diversity of the tool assemblage is also a useful approach to understanding changes in occupational intensity.

This approach is based on processes affecting the discard and accumulation of different tool classes in the archaeological record. There are two main components to assemblage formation relevant to this thesis. The first is the theoretical model of the different factors that affect the accumulation of a particular class of artifact, also known as the discard equation (Schiffer 1975, 1987). The second is the relationship between occupation span and the number of different types or classes of artifacts discarded at a site.

Schiffer's basic discard equation states that the total frequency of a particular artifact class is a function of the number of that type of tool in use at a given time (also referred to as the systemic number) multiplied by the span or frequency of use of that type of tool divided by that tool's use life (Schiffer 1975). This is important to consider because it takes into account the population size of a group occupying a site. A general assumption is made that more people use more tools, thus increasing the systemic number of tools in use at a site and increasing the number of tools discarded. It also takes into account occupation span, because a longer occupation is presumed to increase the use frequency of a tool as well since more time spent on site allows for more episodes of tool use. Thus the discard equation takes into account both factors of occupational intensity. From this it can be inferred that a larger assemblage of tools must be the product of larger on-site population, longer occupation span, or a combination of the two.

The second component of assemblage formation applied in this thesis is the relationship of the length of occupation to the diversity of tool types discarded on site. The "Clarke Effect" (Schiffer 1975) describes the positive correlation between occupation span and assemblage diversity (Figure 3.2). The underlying principle of this relationship is simple. As stated in the basic discard equation, the likelihood of a tool being discarded at a

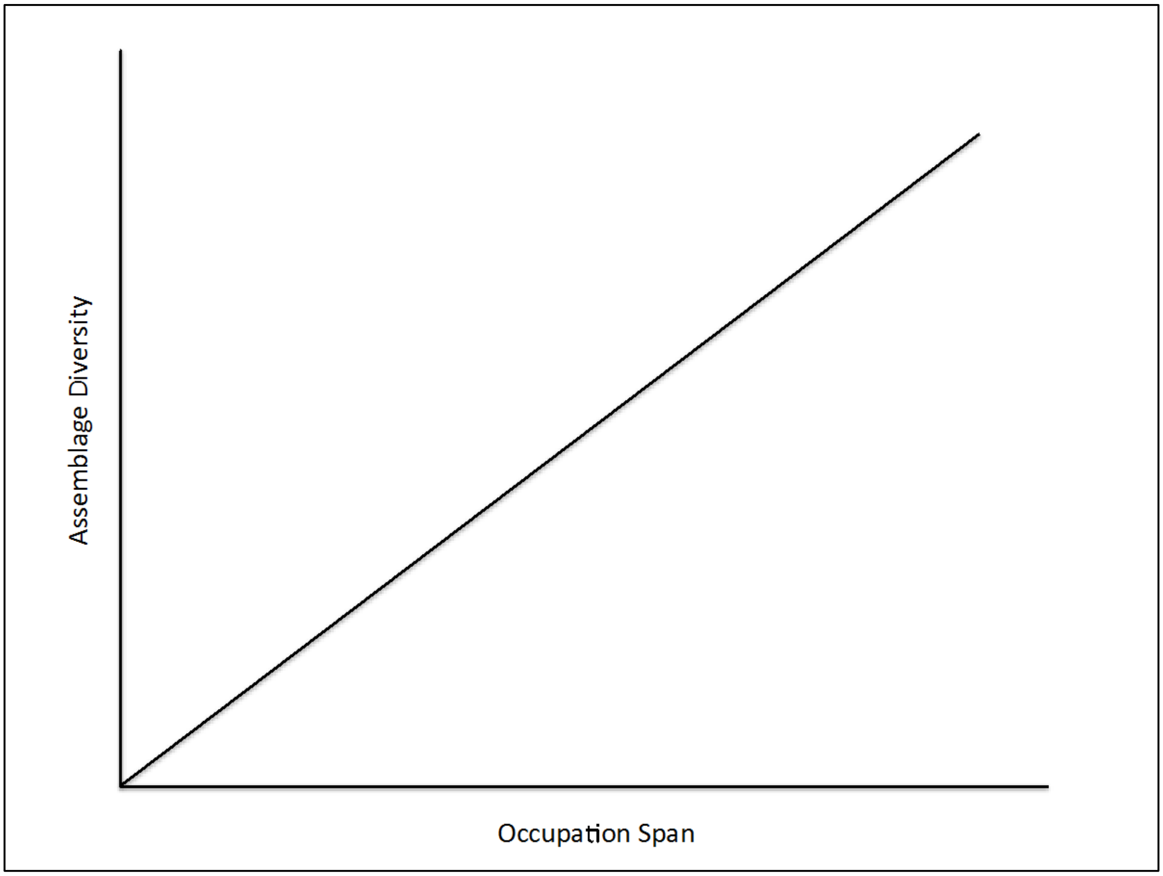

Figure 3.2: Model of the relationship between assemblage diversity and site occupation span, adapted from Schiffer (1975).

particular site is partially a function of the use life of that tool. For sites occupied for a relatively short period, tools with long use lives are less likely to be deposited there. As the ratio of occupation span to tool use life increases, the probability of that tool being discarded also increases (Schlanger 1991). Therefore, as occupation span increases, the likelihood of each class of tool in systemic context being discarded also increases. Transporting tools between sites at various stages in their use life, which Schiffer (1975) refers to as curate behavior, can complicate this relationship for sites with a short occupation span, and Schlanger (1991) argues that diversity measures are not useful for these sites. However, this thesis is interested in identifying relative changes in occupational intensity at the intra-site level over time and considers assemblage diversity in conjunction with multiple lines of evidence.

Accumulation Research

Accumulation research is another aspect of the site formation process that considers the relationship between the rate of accumulation of archaeological materials and the cultural processes responsible for that accumulation (Varien and Mills 1997). This approach assumes that there is a relationship between the amount of material accumulated and the number of people occupying a site coupled with the length of their occupation.

It is important to highlight one of the primary challenges of using these approaches to examine occupational intensity at a hunter-gatherer site. Because occupational intensity is the combination of two factors-site population size and length of occupation- it is very difficult to identify to what degree both of these factors are affecting occupational intensity. Theoretically, one person occupying a site for five days could occupy that site with the same intensity as five people occupying the site for one day. Multiple lines of evidence must be used to attempt to discern the degree to which these two factors are affecting occupational intensity. The underlying premise of accumulation research is that for artifacts with a predictable rate of use and discard, the total frequency of that class of artifact can be used to infer occupation span (Nelson et al. 1994:128).

A strong case study in artifact accumulation rates comes from the American Southwest where it was demonstrated that the quantity of cooking pottery sherds could be used to estimate the occupation span of residential sites (Varien 1999; Varien and Mills 1997). What makes cooking pottery a sensitive indicator of occupation span is that cooking pots are used on a daily basis and exposed consistently to thermal stress, which gives these vessels a comparatively short use-life and causes these vessels to be discarded at a predictable rate (Figure 3.3).

At the Duckfoot site, a Pueblo I habitation in southwestern Colorado, archaeologists were able to approximate the annual rate of accumulation of cooking pottery sherds per household. This site is an ideal case for accumulation research

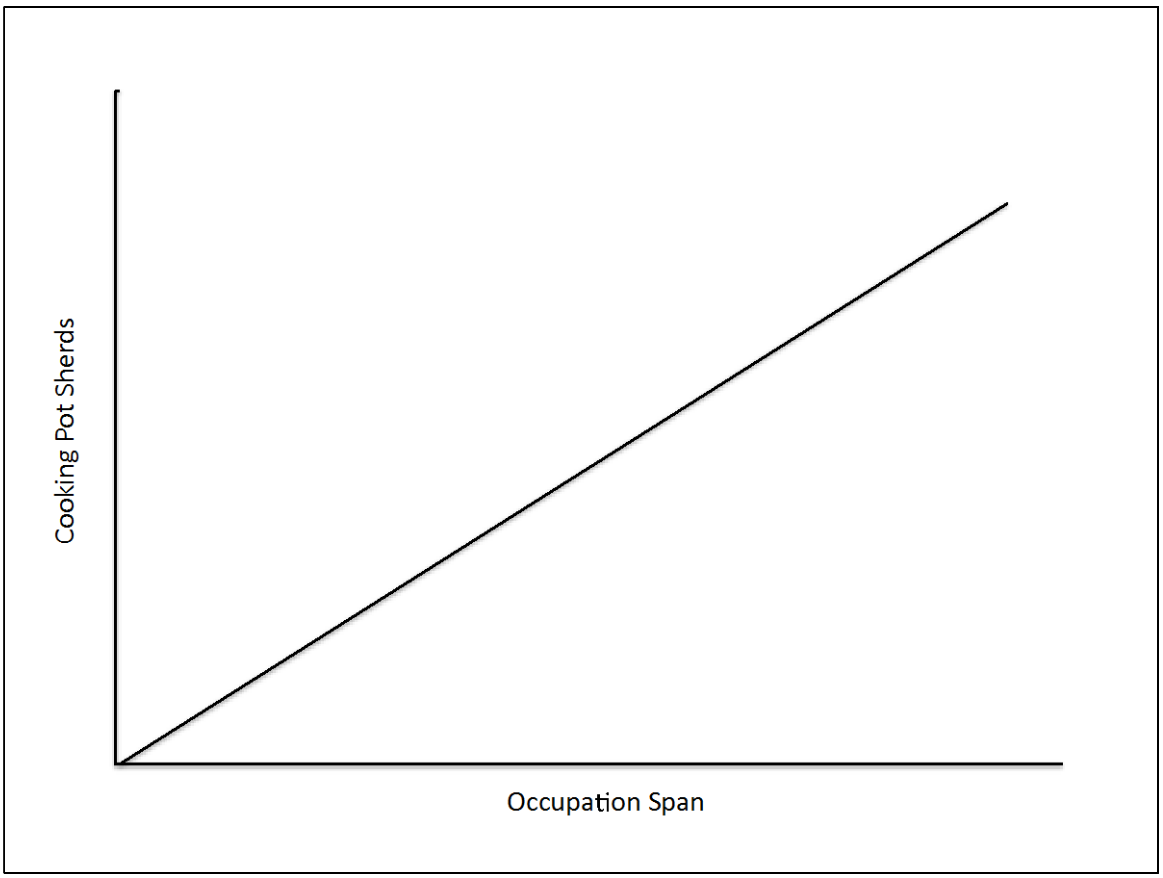

Figure 3.3: Hypothetical relationship between accumulation of cooking pot sherds and site occupation span. Adapted from Varien and Mills (1997)

because both the site population and occupation span could be defined. The site population, measured by the number of households at the site could be identified through architectural analysis. The span of occupation was defined through a fine-grained sequence of tree ring cutting dates and the definition of the contstruction sequence. By dividing the total amount of cooking pot sherds excavated from the site by the number of households and then inferred occupation span, an annual rate of cooking pot sherd accumulation per household could be approximated (Varien and Mills 1997). Thus the total amount of cooking pot sherds at a site is a function of both site population and occupation span.

Of particular relevance to this thesis is the observation that the accumulation of chipped stone debitage is highly correlated with the accumulation of pottery (Figure 3.2; Nelson et al. 1994; Varien 1999; Varien and Ortman 2005).

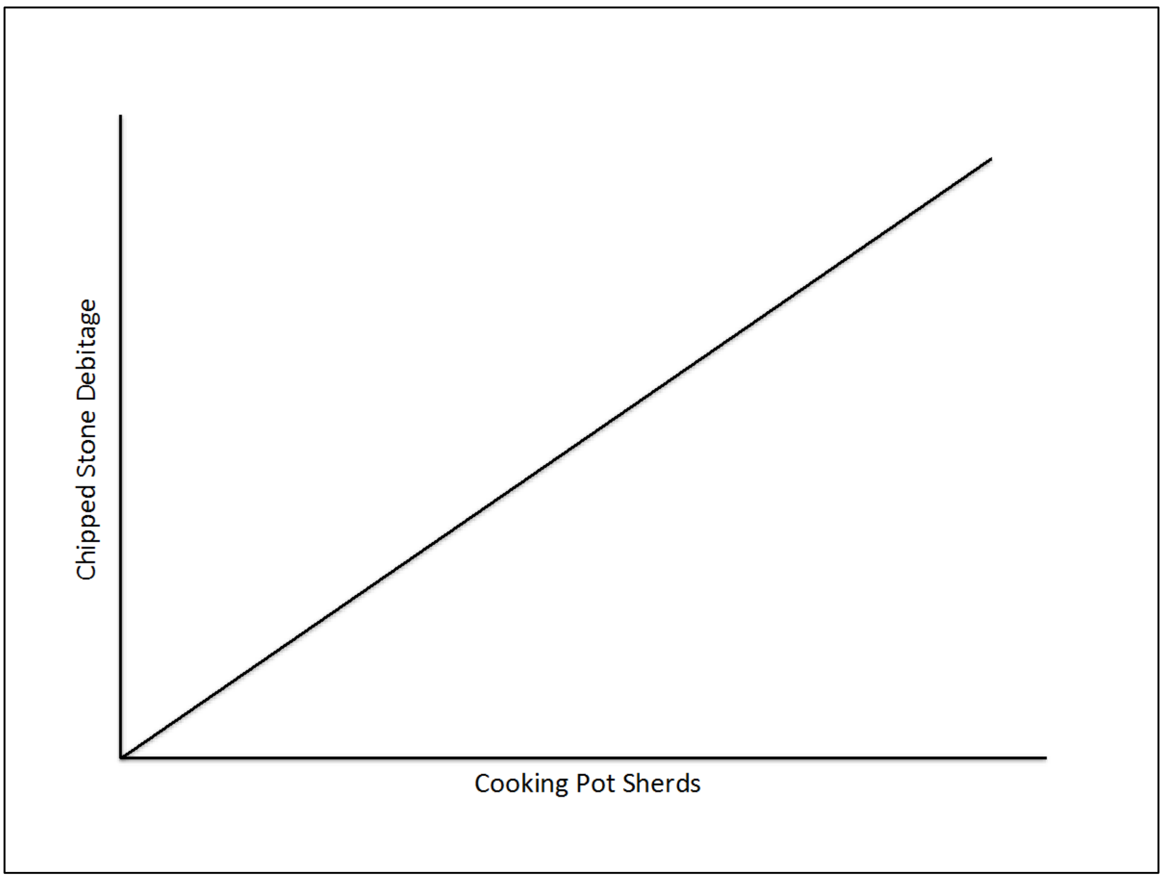

Figure 3.4: Model of the relationship of accumulation of chipped stone debitage and cooking pot sherds, adapted from Varien (1999).

Varien and Ortman (2005:137) summarize the relationship between the accumulation of cooking pottery and debitage: "Because chipped stone-debris and broken cooking pots both accumulate as a result of daily domestic activities, the strong correlation seen in these data could only result from both artifact types accumulating at regular, consistent rates through time and in a variety of settlement contexts." While population size and precise occupation span are much more difficult to define for hunter-gatherer sites, the implications of this relationship suggest that the total frequency of debitage in an assemblage is sensitive to changes in occupational intensity. Schlanger (1991) also notes that the best indicator of changes in relative sedentism is the frequency of the fastest accumulating type of artifact, which in the case of the Kinney Spring site is debitage. It can therefore be presumed that greater accumulations of debitage reflect longer occupation span, larger site populations, or both.

Methods

Assemblage data for this thesis is based on an inventory of the Kinney Spring materials currently housed in the Archaeological Repository of Colorado State University. All debitage was counted and weighed by individual excavation level and unit. Ceramic sherds were counted and weighed per unit and excavation level. All tools were cataloged individually according to unit, level, tool type and raw material. Raw data from the site are presented in Appendices A and B. The horizontal distribution of different artifact classes was mapped per excavation unit by vertical level using Microsoft Excel (Appendix C). The horizontal distribution of pottery and Early Ceramic period arrow points is mapped by level in Chapter 4 to document the earliest (deepest) occurrence of these diagnostics and define the Late Prehistoric component at the site. The horizontal distribution of debitage is mapped by level in Chapter 6 to demonstrate the continuous use of the site throughout the Early Ceramic period.

Tool Classification

In order to elucidate arguments of assemblage diversity, flaked stone tools from the original excavations were inventoried individually according to excavation unit, stratigraphic level, tool type, and raw material. Each tool was assigned an individual artifact number based on its excavation unit, and the order that tool was inventoried for that unit. For example, the first tool inventoried from Unit E19 would be assigned the artifact number E19.1. Following the 1980s fieldwork, each tool had its provenience information hand-written on the artifact, which proved invaluable for investigations regarding the horizontal and vertical provenience of artifacts.

The flaked stone tool typology was designed to demonstrate the diversity of tool form in the assemblage. The relationship between tool form and function is not straight forward, and the relative frequency of certain tool forms cannot be assumed to directly reflect the frequency of certain activities (Odell 1981; Shott 1989). However, the goal of this typology is not to identify what activities took place at the site, but rather to identify the diversity of distinct tool morphologies within the assemblage. As previously discussed, the diversity of tool forms has been shown to increase with occupation span, which increases the likelihood that a tool will be discarded on site. Therefore, the diversity of tool form is of primary interest to addressing issues of occupational intensity at Kinney Spring, regardless of the “mapping relations” (Ammerman and Feldman 1974) between tool form and activity.

Flaked stone tools were subjectively classified into 28 categories based upon a combination of morphological and functional attributes (Table 3.1). Due to the general similarity in assemblages, a modified version of the typological classification system used to describe tools from the Reuter-Hess Reservoir (Gantt 2007) was used to classify the Kinney Spring flaked stone tool assemblage. In the interest of best capturing the diversity of tool forms, this typology conservatively emphasizes a splitting rather than a lumping approach. Functional categories, such as scrapers, spokeshaves, and gravers were employed because these terms are associated with specific morphologies that are widely recognized and useful for the description of certain tool classes. Using common terminology also facilitates comparisons between sites. Additionally, functional categories such as knives and choppers were used when the function of the tool imparted a distinct and identifiable morphology. Low powered (10-25x) magnification (Odell and Odell-Vereecken 1980) was occasionally used to confirm the presence of knife-edge wear on these tools, however the majority of the classifications were based on macroscopically visible attributes. General tool categories as well as specific tool types used for this analysis are described below. See Table 7.2 for total frequencies of each tool class. See Appendix B for a complete tool catalog for the main excavation area with provenience information.

Bifacial Tools

Bifaces are tools that feature flaking on both surfaces of the tool. These surfaces meet to create a sharp edge, which extends around the entire circumference of the tool.

Table 3.1: Summary of tool classification system used in the inventory of the Kinney Spring tool assemblage.

Tool Class	Tool Type
Hafted Bifaces	Projectile Point
	Miscellaneous Hafted Biface
	Hafted Knife
Unhafted Bifaces	Hafted Scraper
	Early Stage Biface
	Mid Stage Biface
	Late Stage Biface
	Preform
	Early Stage Bifacial Knife
	Mid Stage Bifacial Knife
	Late Stage Bifacial Knife
	Early Stage Bifacial Scraper
	Mid Stage Bifacial Scraper
	Bifacial Drill
	Chopper
Flake Tools	End Scraper
	Side Scraper
	Disto-Lateral Scraper
	Scraper Fragment
	Spokeshave
	Retouched Flake
	Edge Modified Flake
	Multi-Functional Tool
Cores	Multidirectional Core
	Bipolar Core
	Tested Cobble
Unclassifiable Fragments	Undetermined Tool-Distal Tip
	Undetermined Tool-Edge Frag.
Groundstone	Handstone
	Netherstone
Bone and Shell	Bone-Awl
	Bone-Bead
	Bone-Misc.
	Shell

Hafted Bifaces

Hafted bifaces include all bifacial tools which have proximal modification to facilitate the attachment of the tool to a handle or dart/arrow shaft. Proximal modification for hafting may include basal notching or basal grinding.

Projectile Points

Projectile points are hafted bifaces that were manufactured to be attached to a spear, dart, or arrow shaft. They often display evidence of having been retouched or resharpened while in the haft. Sometimes impact fractures are visible on the tip. Hafted bifaces were classified as projectile points when they displayed enough of the proximal end to be identifiable, and had not been subsequently modified into another tool form.

Hafted Knives

Hafted knives were distinguished from projectile points based on the presence of clear lateral edge wear and/or retouch that suggested a cutting function. Edge modification used to identify knives included edge rounding, polish, abrasion, step fracturing, and micro flaking, as well as asymmetrical retouch. Every effort was made to be conservative in classifying only the most clearly used artifacts as knives. In some cases, hafted knives displayed a bunted, retouched distal end, which would have rendered the point useless as a projectile point, but still functional as a knife

Hafted Scrapers

Hafted scrapers include all hafted bifaces featuring a steeply angled unifacially retouched distal working edge. Hafted scrapers may have been manufactured from broken projectile points or hafted knives, which were then distally retouched into a scraper. Alternately this represents a very specialized bifacial scraping tool form.

Bifacial Drill

Bifacial drills feature a narrow bifacially flaked bit with parallel sides. These tools feature a low width:thickness ratio, and a diamond shaped cross section. When present, the bases are usually wider than the bit to facilitate hafting. The single drill in the Kinney Spring assemblage is the mid-section of a bifacial drill bit that features the distinctive diamond shaped cross section of this type of tool.

Miscellaneous Hafted Bifaces

This group includes all bifaces that display attributes of hafting modification, but are too fragmentary or incomplete to determine whether they were projectile points or knives. Included in this group are all stems and bases that cannot be typed more precisely.

<u>Unhafted Bifaces</u>

Unhafted bifaces include all bifacial tools that have not been modified for hafting. This group has been subdivided according to the stage of the biface within a generalized continuum of bifacial reduction. All bifaces change morphology during reduction as more and more flakes are removed, and they can be classified according to these changes, which are arbitrarily divided into stages. Callahan's (1979) bifacial reduction stages are employed because they are useful for describing the generalized bifacial reduction sequence.

Early Stage Bifaces

Early stage bifaces conform to Callahan's Stage 2 bifaces, which have undergone initial bifacial edging. These bifaces are generally thick, and biconvex in cross section. A bifacial edge extends around the entire tool, but the outline is irregular, the flaking is irregular and widely spaced, and the edge is steeply angled and highly sinuous.

Middle Stage Bifaces

Middle stage bifaces conform with Callahan's Stage 3 bifaces, which have undergone the initial bifacial thinning. They are thinner than Stage 2 bifaces and feature a semi-regular outline, and more acute edge angles. Flaking intervals are closer and more regularly spaced. Flake scars often reach the mid-line of the biface, removing major ridges, step fractures, or humps on either face.

Late Stage Bifaces

Late stage bifaces have undergone secondary thinning and conform with Callahan's Stage 4 bifaces. This bifaces feature width:thickness ratios that generally exceed 4.0 and have a flatter cross-section and sharper edge angles than Stage 3 bifaces. Flaking is closely spaced at regular intervals, and frequently extends past the mid-line of the tool. The edges have often been initially shaped to assume the final outline of the tool.

Preforms

Preforms are late stage bifaces intended for the manufacture of projectile points. Preforms have been fully shaped and prepared for the final notching, fluting, or finishing of the tool. Preforms conform to Callahan's Stage 5 bifaces, which have outlines that have been formally shaped and prepared for hafting modification, or utilization.

Unhafted Bifacial Knives

Bifaces that show clear edge modification indicating the tool was utilized are classified as knives in addition to their manufacturing stage. Marginal retouch, edge rounding, polish, micro flaking, and step fracturing was used to distinguish knives from unhafted bifaces.

Unhafted Bifacial Scrapers

This class was created to describe bifacial tools that displayed working edges featuring steeply angled, unifacial retouch and edge-wear. Although scrapers are typically associated with unifacial flake technology, several bifaces in this assemblage displayed clear retouch and heavily used scraper edges and were classified as scrapers in addition to their manufacturing stage.

Choppers

Choppers are typically early stage bifaces that display a combination of battering, crushing and flaking along an edge that suggests the tool was used for intensive, heavy-duty tasks such as splitting open bones for marrow extraction. Large flakes or otherwise unmodified nodules of raw material may also occasionally be classified as choppers.

<u>Flake Tools</u>

The flake tool group includes all tools manufactured from flakes, which retain at least some diagnostic flake attributes such as identifiable dorsal and ventral surfaces, striking platforms, or bulbs of percussion.

Edge Modified Flakes

Edge Modified Flakes (EMFs) are the most informal tool in this classification system. These are flake tools that only feature edge modification that is the result of use, rather than intentional flaking or retouch. These flake tools were used in their unmodified state and then discarded without further alteration. Edge modification for these tools includes patterned micro flaking, edge rounding, polish, step fracturing, or abrasion. This edge wear is macroscopically visible, however in some cases low powered magnification was used to confirm that it was the result of use rather than non-cultural processes such as trampling or repository bag-wear.

Retouched Flakes

Retouched flakes are flake tools that have been intentionally modified in some way to improve or maintain the functionality of that tool. These tools feature edge modification, such as pressure or percussion flaking, that is larger and more invasive onto the face of the tool than on EMFs. Retouched flakes may feature unifacial or bifacial retouch, but do not qualify as bifaces or any other formal tool class.

End Scrapers

End scrapers are flake tools that feature a steeply angled, unifacially retouched working edge along the distal end of the flake. Scraper retouch almost exclusively occurs on the dorsal surface of the flake. Lateral margins are often parallel or slightly tapered towards the proximal end of the flake.

Side Scrapers

Side scrapers feature steeply angled unifacial retouch along one or both lateral margins of the flake. These are often more irregular in outline than end scrapers.

Disto-Lateral Scrapers

Disto-lateral scrapers feature scraper retouch along the distal and lateral edges of the tool. Lateral retouch on these tools may be the result of use of these edges, or the preparation of the scraper for hafting (Shott 1995).

Scraper Fragment

Scraper fragments display a portion of an identifiable scraper edge, but are too fragmentary to further identify the tool's morphology.

Spokeshaves

Spokeshaves are flake tools that feature a working edge with a concave outline and unifacial retouch and use wear. This concavity, often referred to as a notch, ranges in size and depth from wide and shallow to narrow and deeply invasive into the body of the tool. The spokeshave edge may be a natural feature of the flakes original outline, or the edge may have been retouched into a concave shape.

<u>Cores</u>

Cores are pieces of lithic raw material from which multiple flakes have been detached. Cores serve as a source of material for manufacturing flake tools, but they may also be used as tools themselves.

Multi-Directional Cores

A multi-directional core is a tool that displays multiple flake removals that originate in different locations on the core and are detached in different directions.

Tested Cobbles

A tested cobble is a minimally modified piece of raw material that displays no more than 3 flake removals. Presumably, these are pieces of raw material that were tested for quality and knappability, but were either considered unsuitable for use or discarded before further reduction could take place.

<u>Miscellaneous Tools</u>

Miscellaneous tools include all tools that cannot easily be classified into one of the previously described categories. These include tools with multiple functions or morphological traits or fragments of tools that cannot be further identified.

Multi-Functional Tools

A Multi-functional tool is a tool that clearly displays morphologies of multiple tool types, and cannot be easily classified into any of the previously described tool classes. For example, a bifacial knife that displayed a clearly polished and rounded distal tip suggesting a drilling or graving function was classified as a multi-functional tool.

Undetermined Tools

Undetermined tools are too fragmentary to be classified into any of the previously described typologies. Undetermined tools can be subdivided into distal portions of projectile points or late stage bifaces, and edge fragments of bifaces that are too fragmentary to identify reduction stage.

<u>Ground Stone</u>

Ground stone tools are rocks which been shaped by abrasion, either through use, or intentionally ground into a desired form (Adams 2002). In contrast, flaked stone tools are shaped via percussion. All of the ground stone from Kinney Spring can be classified as processing tools, which were used to process vegetal and animal products that required grinding or abrasion to render the resource useable for human consumption.

Handstones

Handstones, alternately referred to as manos, are ground stone tools that were used for grinding on a stationary tabular netherstone (Adams 2002). They are typically manufactured from rounded cobbles of a variety of rock types. They may be bifacially or unifacially ground. Some feature pecking on the edges suggesting they were either intentionally shaped or also used as a hammerstone.

Netherstones

Netherstones, alternately referred to as metates, are flat, tabular pieces of rock featuring one or both faces smoothed by grinding. Netherstones served as the base for a handstone to grind a variety of resources. They are typically manufactured from tabular sandstone, although occasionally other flat rock types were used.

Bone Tools

Bone Awls

Bone awls include all bone tools that have been carved into a point on one end. Some of these may have been needles or other types of perforating tools. They are typically carved from the long bone of a large mammal. These tools are associated with a range of domestic functions including clothing manufacture, leatherworking, or basketry.

Bone Beads

Bone beads are manufactured from tubular bones and usually feature ends that have been smoothed and shaped, rather than simply snapped. They are usually narrow with thin walls, suggesting they were manufactured from bird and rabbit bones.

Miscellaneous Bone Tools

Miscellaneous bone tools include all culturally modified bone that does not fit into the awl or bead category.

Shell

Shell artifacts are not well represented in the assemblage so all fragments of shell are classified under this category. These include a single shell bead fragment and other unidentifiable fragments of freshwater mollusk shell. Shell artifacts are often, but not exclusively ornamental, and are commonly found in sites dating to the Early Ceramic period (Calhoun 2011).

Additional Methods

Direct Dating

Direct dating of the Ceramic component is based on a combination of dates obtained during the original 1983-1985 field seasons, as well as 10 additional dates obtained from charcoal samples collected during the original field work and submitted in the fall of 2013 for Accelerator Mass Spectrometer (AMS) dating to DirectAMS of Bothell, Washington. Dates were also obtained from samples collected by the Colorado State University field school during the 2013 field season, as well as two charcoal samples collected from above and below a human burial discovered eroding from an arroyo sidewall by the CSU field school in the summer of 2013 (Appendix D). In order to combat the potential effects of dating old wood (Schiffer 1986) every effort was made to collect and date small pieces of burned twigs, rather than chunks of larger logs. Radiocarbon dates were calibrated using the IntCal 13 calibration curve (Reimer et al. 2013) in OxCal 4.2 (Bronk Ramsey 2009). All dates presented herein from Kinney Spring are calibrated. Refer to Chapter 6 (Table 6.1) for a complete summary of all dates from the Late Prehistoric component.

Field Notebooks

Students who worked at Kinney Spring were required to document his or her excavations in a field notebook. These are kept in a file at the AR-CSU, along with slides, conference reports, and limited additional notes from the project. These served as one of the primary sources of information about the excavations. Each notebook documented the units that students worked on during the field season. Some notebooks contain information pertaining to several different units, while other books describe only a single unit. Ideally, information recorded in field notebooks included the date of excavation, unit, level, corner depths below datum, artifacts collected, and features identified from that level. General observations, interpretations, and sketch maps were also included when necessary. Unfortunately, not all notebooks were so complete, and the level of detail recorded varied considerably between student notebooks. However they remain the main source of firsthand information about the excavations, and provided much information to help with interpretations. For example, field notebooks were the only source of information pertaining to the large number of cultural features identified during excavations. Because a complete inventory of all features recorded at the site could not be located, each notebook was examined for references to features and a feature log was generated using this information. Excavation notebooks were also used to determine the number of levels excavated for each unit.

CHAPTER 4: DEFINING THE LATE PREHISTORIC COMPONENT

This chapter addresses the question of where in the stratigraphic column does the Late Prehistoric component begin. The Early Ceramic period represents the beginning of the Late Prehistoric stage in the South Platte River basin of Colorado. Therefor, the start of the Late Prehistoric component at Kinney Spring corresponds with the start of the Early Ceramic component. Chapter 5 will address whether Late Prehistoric stage occupations at Kinney Spring include Middle Ceramic and Protohistoric, as well as Early Ceramic period occupations.

Defining the start of the Early Ceramic component will utilize relative as well as absolute dating techniques. The first line of evidence to consider in defining the Early Ceramic component at Kinney Spring is the stratigraphic location of corner-notched arrow points and pottery. These are the primary diagnostic artifacts of the Early Ceramic period in the South Platte drainage of Colorado, and mark the start of the Late Prehistoric stage. Their presence in the stratigraphic column at Kinney Spring is used to define the start of the Late Prehistoric component at the site. The age of these artifacts is reinforced by absolute dates provided by radiocarbon dating of hearth features.

Diagnostic Artifacts

The deepest appearance of corner-notched arrow points and pottery in the stratigraphic column are closely associated, which suggests that these new technologies were roughly contemporaneous in their introduction at the site. The introduction of these technologies at the site should correspond with the deepest stratigraphic level where they were first encountered, thus reflect the beginning of the Ceramic component.

The deepest stratigraphic appearance of corner notched arrow points is from excavation level 8 in units F17 and G18. Pottery also first appears in level 8 in excavation unit C19. These artifacts are found with increasing frequency in shallower excavation levels (Figure 4.1; Figure 4.2), but none are found below level 8. Therefore, the Late Prehistoric component is defined as beginning in level 8. There are a few exceptions to this that will be described in the following paragraphs.

Because the underlying bedrock slopes downwards to the east, there is a greater amount of soil deposition in these eastern units, and some of the eastern-most units in the main excavation area were excavated to depths greater than 4 m below ground surface before reaching bedrock. In contrast, bedrock was reached in the western-most units in as few as 1.5 meters (Figure 4.4). Therefore, reduced soil deposition in the western portion of the site including units I15, J12, and I11 results in a shallower Late Prehistoric component in this portion of the site. Radiocarbon dates from hearths in units I11 and I15 supports that the Early Ceramic component is shallower in this area (see Table 6.1 for a detailed summary of radiocarbon data from the site). A hearth from level 3 of I15 returned a calibrated date of A.D. 422-563, and a hearth from level 2-3 in I11 returned a calibrated date of A.D. 133-322.

These are the two earliest Late Prehistoric dates from the site, and they are also vertically the two shallowest of all dated features. Additionally, excavation notes for unit I15 indicate that by the bottom of level 4, approximately 40 cm below ground surface, the

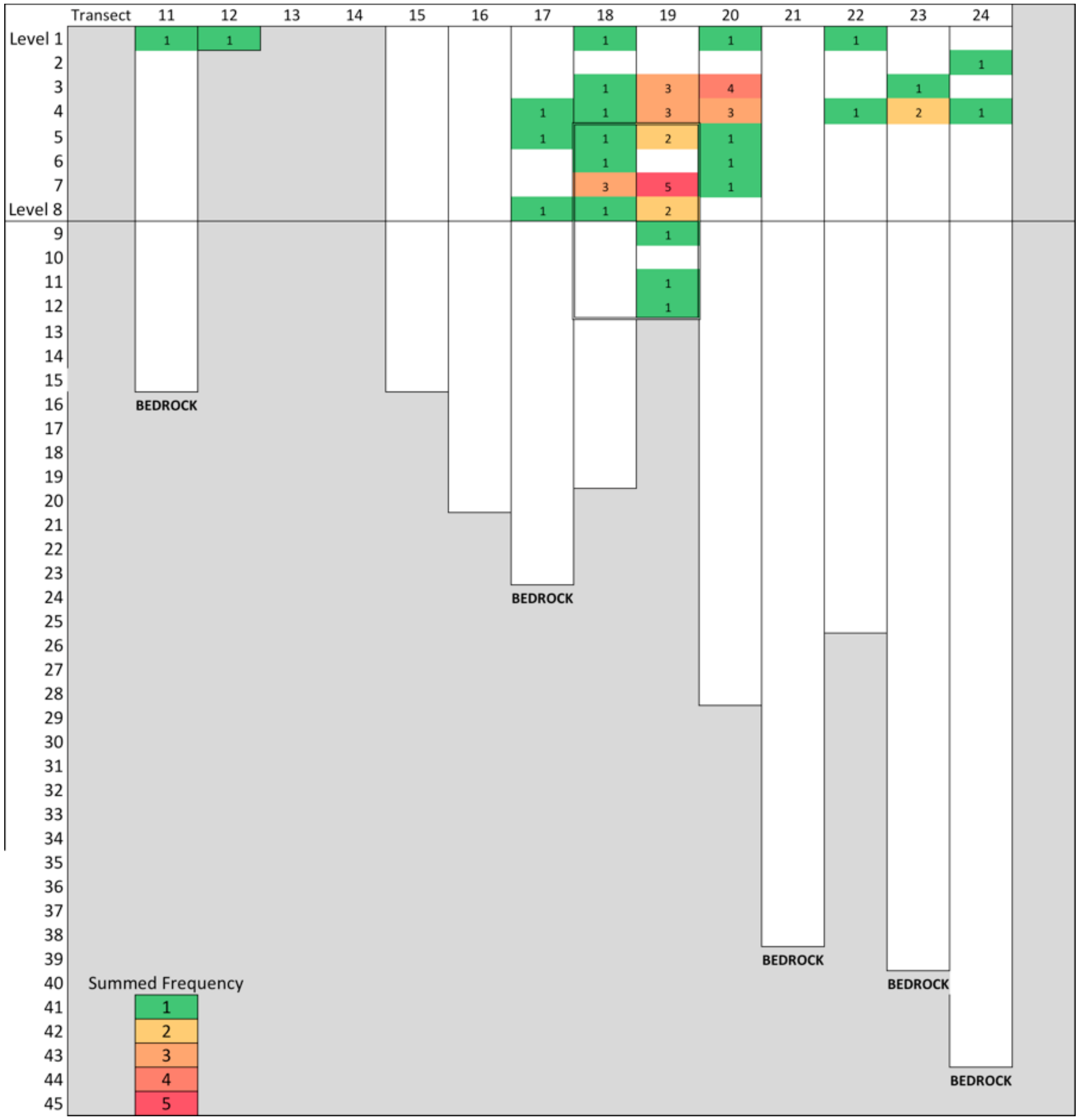

Figure 4.1: Site wide cross-section (back plot) facing north (not to scale) of summed of Early Ceramic corner notched arrow point frequencies facing north. White boxes represent excavated units. Gray ares represent unexcavated portions of the site. The approximate location of the house feature is outlined. The location of the cross section is shown in figure 4.3.

dark, artifact bearing soil which was associated with the Early Ceramic component transitioned to the red sandy-clay stratum found beneath this dark, upper horizon across the site. For these reasons, the Late Prehistoric component begins in level 4 of I15 and level 3 of I11 and J12 (Figure 4.4; 4.5).

Unit H16, the only unit excavated on transect 16, contained a cord-marked pottery sherd in level 5. Considering the location of this transect between I15, where the Ceramic component begins in level 4 and transect 17, where it begins in level 8, the Ceramic component for H16 is defined as beginning in level 6 (Figure 4.4; Figure 4.5).

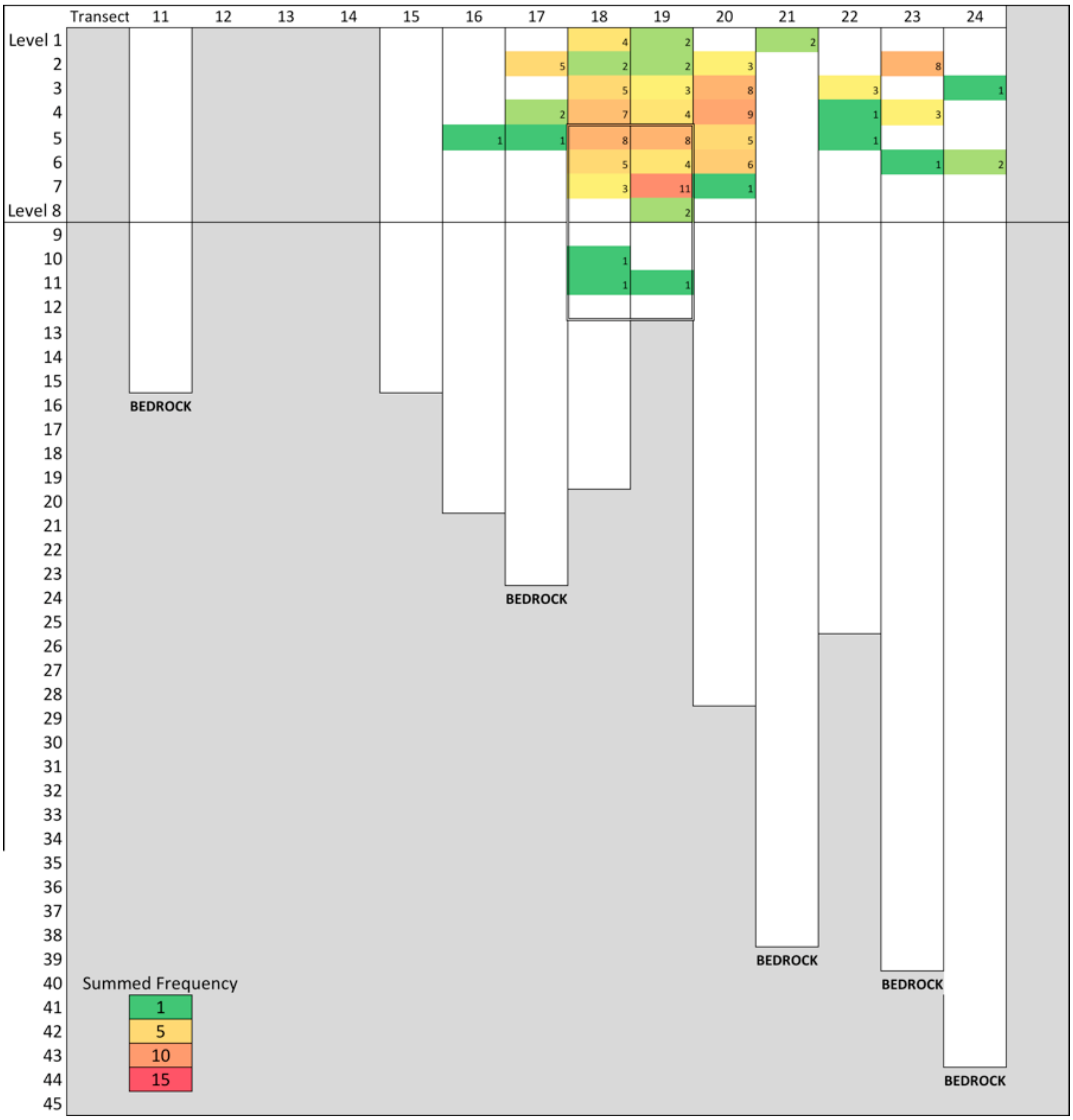

Figure 4.2: Site wide cross-section facing north (not to scale) of summed frequency of Early Ceramic pottery fragments. The approximate location of the house feature is outlined. The location of the cross section is shown in figure 4.3.

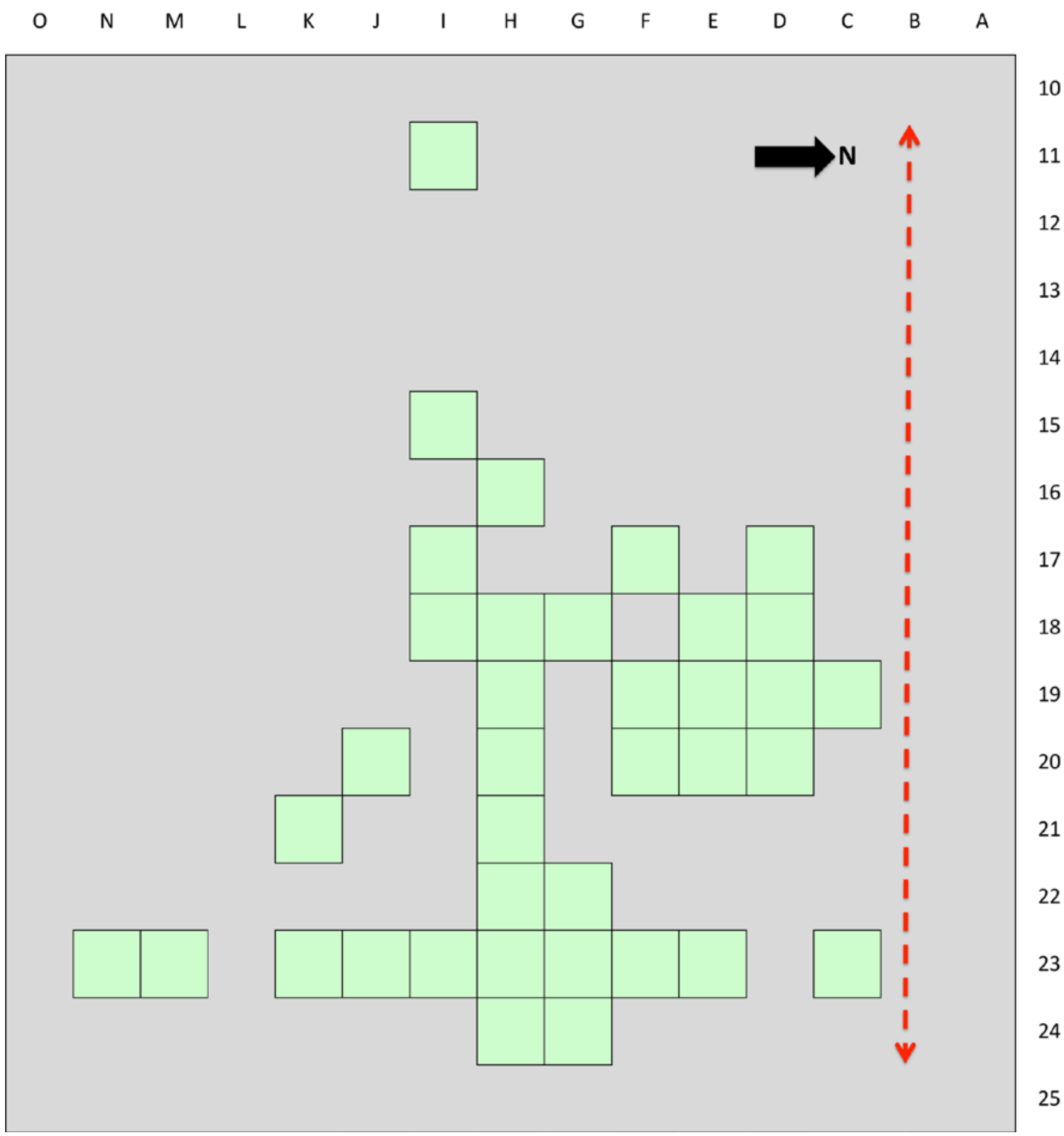

Figure 4.3: Planview map showing the location of backplot from Figures 4.1 and 4.2.

Radiocarbon dates

The radiocarbon data from the main excavation area is consistent with the distribution of diagnostic artifacts (Figure 4.6). Refer to chapter 6 and table 6.1 for a more detailed summary of radiocarbon data from the site. All of the dated features from levels 1-8 produced dates within the range the Early Ceramic period, however only one feature

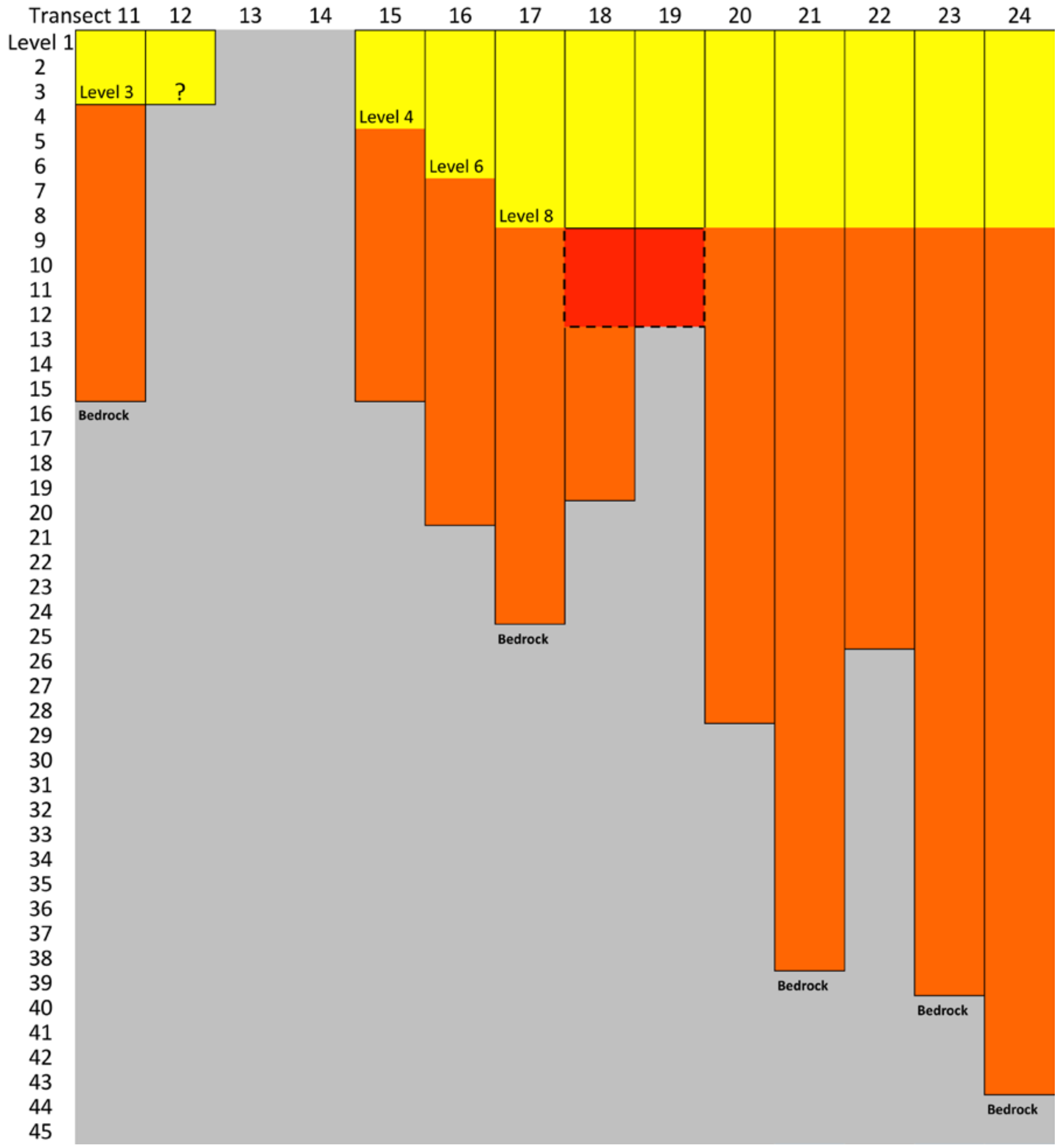

Figure 4.4: Profile of main excavation area, facing north, showing the Archaic component (orange) and the Late Prehistoric component (yellow). The approximate location of the structure is indicated by dashed line. Transects which contained units that were excavated down to bedrock are indicated. Base of Archaic component represents the deepest level excavated for that transect. Excavation notes for unit J12 are not available to determine how deep this unit was excavated. The location of the cross section is shown in figure 4.3.

returned a date that coincides with the start of the Early Ceramic period. As previously discussed, a hearth from levels 2-3 in unit I11 returned a date of A.D. 133-322 however, because this feature is located in an area that contains reduced soil deposition and shallower cultural deposits than the rest of the site, this date should not be used to infer the start of the Ceramic for the rest of the units in the main excavation area.

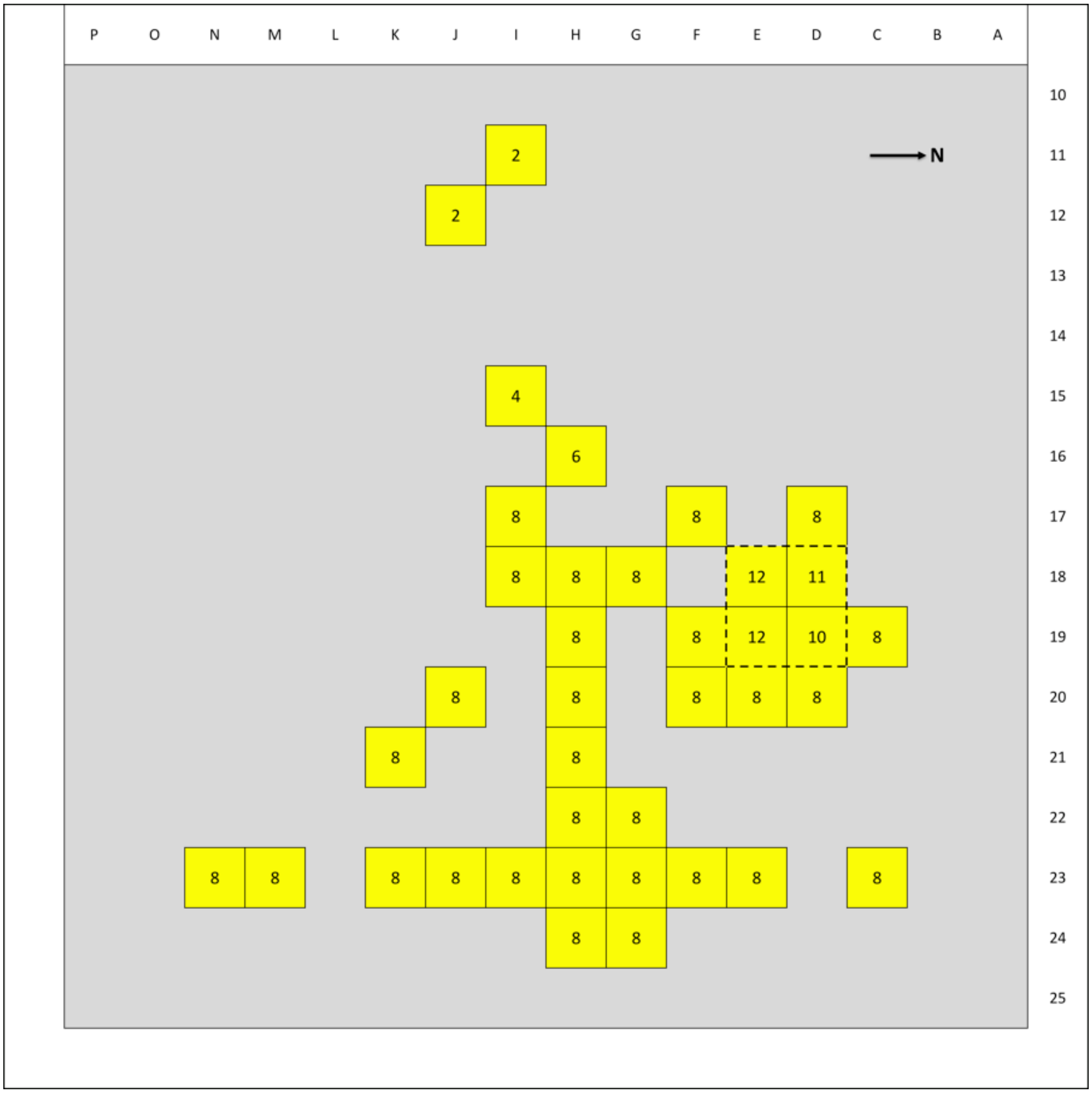

Figure 4.5: Plan view of main excavation area. Depth of Late Prehistoric component, measured in 10 cm excavation levels is indicated within each unit. Units containing the structural feature are indicated with a dashed line.

House Stratigraphy

The deepest stratigraphic location of pottery and arrow points comes from inside the architectural feature (units E19, E18). Despite the greater depth below surface, this does not represent the earliest introduction of these two technologies. Corner-notched arrow points were found in level 12 in unit E19, while pottery is found as deep as level 11 in units E19 and D18. The interior of the structure, which extends down to level 12 in units

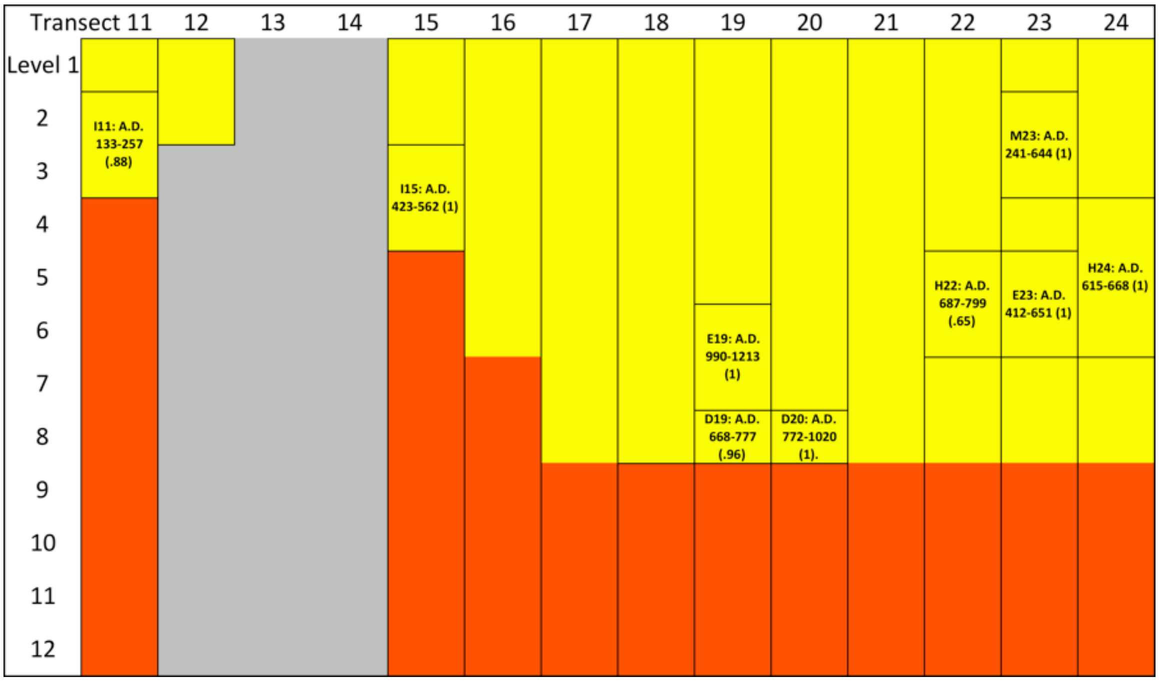

Figure 4.6: Profile of main excavation area, facing north, showing the approximate vertical location of radiocarbon dated features with Early Ceramic period affiliations. The unit containing that date is indicted followed by the calibrated date and the 2 sigma probability. The location of the cross section is shown in figure 4.3.

E18 and E19 and levels 10 in D18 and D19 is considered part of the Ceramic component. The artifacts from levels 11 and 12 are associated with the living floor of this structure and are not the chronologically earliest occurrences of Early Ceramic diagnostic material. Instead they are associated with the occupation of the house, which radiocarbon dates indicate occurred during the latter half of the Early Ceramic period. Radiocarbon dates suggest an occupation of this structure between A.D. 772-1213.

Excavation notes and drawings do not refer to the house as having a subterranean floor. At the time of the discovery of the Kinney Spring architectural feature, the only other Early Ceramic period structure known from the area was the Lindsay Ranch site (Nelson

1971) and it is possible that the nature of this feature type was not fully recognized during the 1980s excavations. The floor was believed to begin at the base of the rock wall, where the soil changed from hard packed and red above the fill of the house to a soft, dark brown soil along with a noted increase in flakes and bone within the fill. However, there are multiple lines of evidence that suggest the original occupation surface of the structure was a shallow basin that was slightly deeper than the base of the stone foundation. These are summarized in order to demonstrate the diagnostics from this context are not indicative of the start of the Early Ceramic component at the site.

First, the base of the rock wall of the structure was encountered around level 7 in units E18 and E19 (Figures 4.7; 4.8) however the recovery of artifacts associated with levels 11 and 12 (40 cm deeper) in the same units are indicative of a deeper domestic occupational surface. Artifacts associated with this surface include projectile points, pottery, ground stone, debitage, and bone tools. The presence of a hearth within the structure in Level 12 of E19 is especially indicative of an occupational surface.

Second, a fragment of a chert core found in association with this hearth has been refit with an artifact from Level 4 approximately 10 m to the southeast of the structure (Figure 4.9). This provides a link between the proposed floor of the structure with shallower stratigraphic levels in the surrounding excavation area, and further supports the argument that artifacts from the floor of the structure do not represent the start of the Ceramic component.

Third, at least three charred logs were found in situ at the base of levels 11 and 12 within the structure of units E18 and E19. These were described as being concentrated towards the middle of the structure and were arranged roughly parallel to each other (Figure 4.10). The large quantity of charcoal recovered in the fill of the structure is

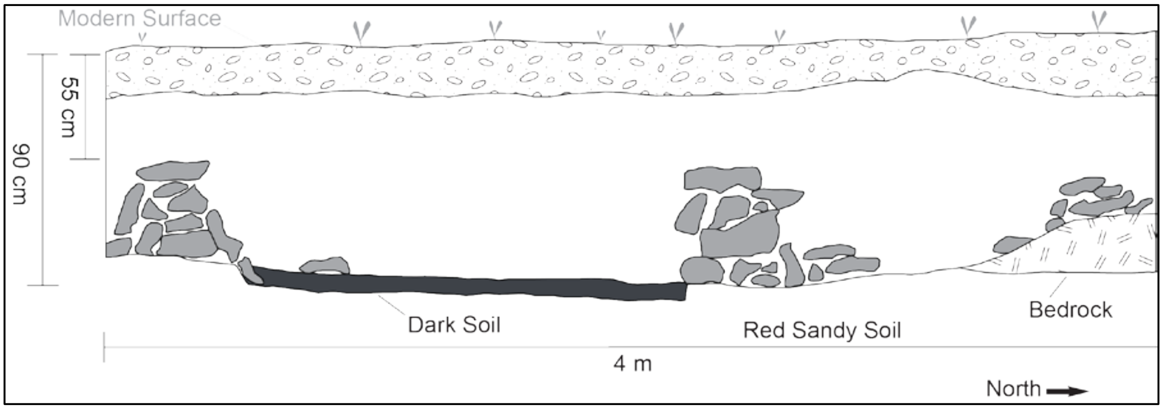

Figure 4.7: Cross-section of house feature facing west. Digitized from original sketch on file at the Archaeological Repository of Colorado State University.

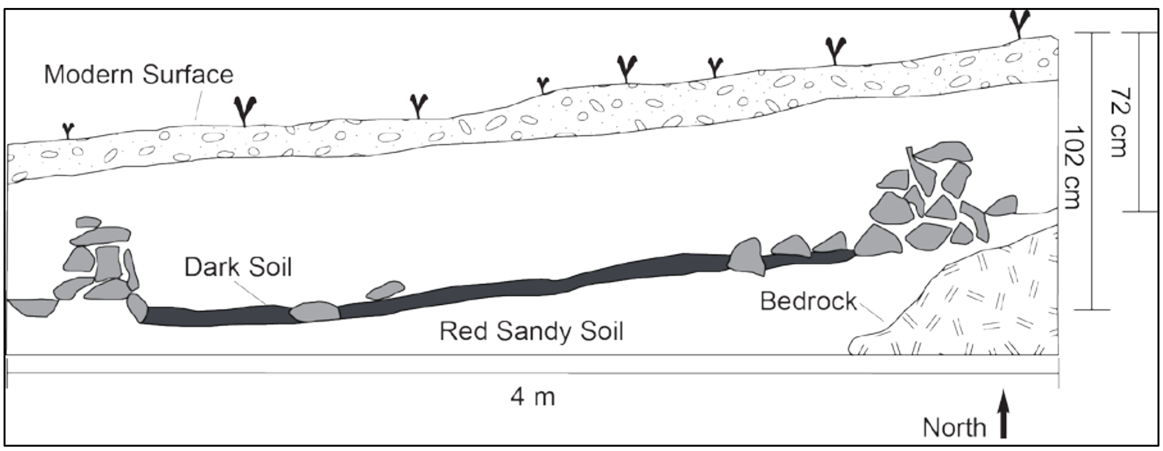

Figure 4.8: Cross-section of house feature facing north. Digitized from original sketch on file at the Archaeological Repository of Colorado State University.

suggestive that the structure burned, and these logs are interpreted to be charred timbers from the collapse of the original superstructure. Their in situ arrangement is further evidence that levels 11 and 12 are the original occupational surface of the structure. The previously described cultural assemblage from these excavation levels was described in field notes as being interspersed with these charred wood logs. Excavation photographs show this surface to be well below the base of the rock wall (Figure 4.11). Immediately beneath these logs, a soil change occurs from the dark, charcoal stained, organic and artifact rich fill of the structure to the reddish sandy soil described for the surrounding site.

Figure 4.9: Refit chert core. Left half recovered from Level 4, Unit G23. Right half recovered from feature 54 (hearth feature), Level 12, Unit E19, house feature interior.

Finally, Early Ceramic period arrow points (Figure 4.12; Figure 4.13) and pottery (Figure 4.14; Figure 4.15) recovered from the units associated with the structure occur approximately 10-40 cm deeper below the modern ground surface than the rest of the diagnostic Early Ceramic period diagnostics recovered outside of the house.

This suggests that the occupational surface of the structure is located as much as 20-40 cm beneath the base of the rock wall in the southern half of the structure, corresponding with units E18 and E19. The base of the wall in E18, the southwestern portion of the house, was encountered in level 7 between 65 and 75 cm below datum, while the house floor in that unit was excavated to level 12. The base of the rock wall was encountered

Figure 4.10: Photo of levels 11 and 12, Units E18 and E19 showing charred timbers in situ on the floor of the structure, circa 1985. Note depth of timbers below the base of the rock wall. Photograph on file, Archaeological Repository of Colorado State University.

Figure 4.11: Photo of level 12, E18 and E19 showing depth of floor below the circular rock foundation, and dark, charcoal stained feature fill, circa 1985. Note depth of floor below the base of the rock wall. Photograph on file, Archaeological Repository of Colorado State University..

somewhat deeper below datum in the eastern (downslope) portion of the house, however it was also excavated to level 12. The floor would have been deepest in the southwestern portion of the house in order to provide a more level occupational surface since the house is constructed on a southeast-facing slope. The rock wall may have been constructed as the foundation for a superstructure of juniper logs, and sticks, branches, hides, or mud.

The Kinney Spring structure is similar to Structure 2 from the Valley View site, a shallow pit structure with a circular stone foundation located in the foothills southwest of Loveland, Colorado. This structure was also dated to the Early Ceramic period. This feature was described as having approximately 40 cm of blackened, organic fill containing large quantities of charcoal, bone, and lithics (Brunswig 1999). Despite these similarities, the Valley View site contained a considerably smaller collection of artifacts than Kinney Spring.

Two charcoal samples from the Kinney Spring structure were submitted following the 1984 field season, returning calibrated dates of A.D. 772-1020 and A.D. 990-1214. The later of these two dates comes from the fill of the feature and may not directly relate to the occupation of the structure. The earlier date comes from an FCR feature described as being below the rock wall, however it is not clear from notes whether this feature was located within or outside of the house feature or how this date relates to the occupation of the structure. These dates suggest that the feature was occupied at some point during the second half of the Early Ceramic period (A.D. 650-1150). Therefore, the Early Ceramic diagnostic material associated with levels 11 and 12 within the structure are most likely affiliated with the second half of the Early Ceramic period, and not the start of it.

Summary

Small, corner-notched arrow points and Plains-Woodland cord marked pottery are well established as diagnostic indicators of the start of the Early Ceramic period in Northern Colorado. The occurrence of these Early Ceramic diagnostics is therefore the most reliable information for subdividing of the Kinney Spring stratigraphic column and artifact assemblage into cultural components. The Ceramic component corresponds with level 8 for the majority of the main excavation area, however reduced soil deposition for units in the western portion of the site results in a shallower Ceramic period component for units I11, J12, and I15. This should be considered a soft boundary considering the resolution of the data, and Ceramic period occupations may have occurred slightly above or below this level. The architectural feature contained Early Ceramic period diagnostic artifacts as deep as level 12, however this is due to prehistoric excavation of the floor of the structure into a shallow basin shape into the southeast-facing hillside. Radiocarbon dates suggest that artifacts associated with the occupation of the structure date to the second half of the Early Ceramic period.

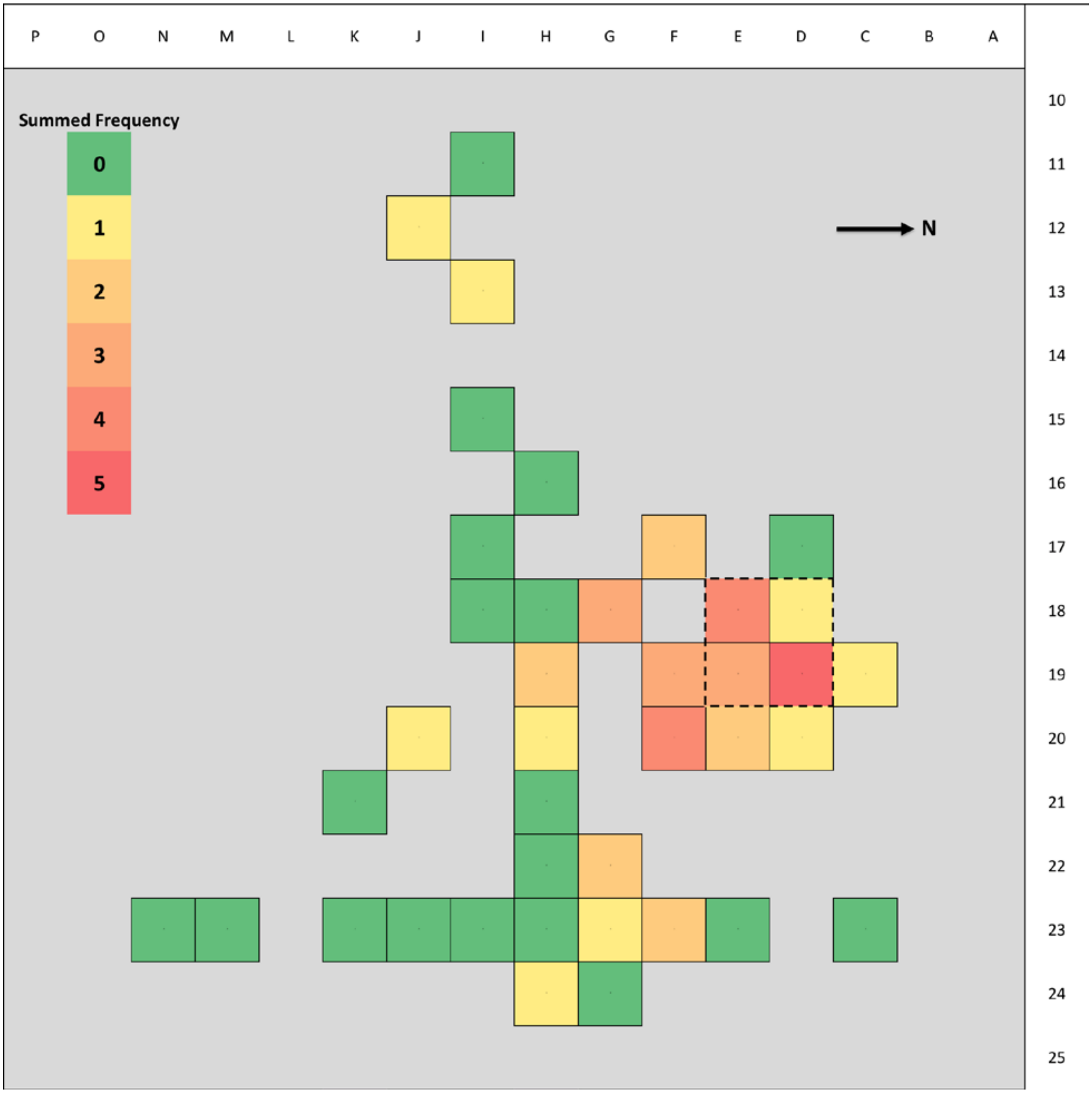

Figure 4.12: Plan view of summed Early Ceramic period diagnostic projectile point frequencies for levels 1-8. The location of units containing the house feature is indicated by dashed line.

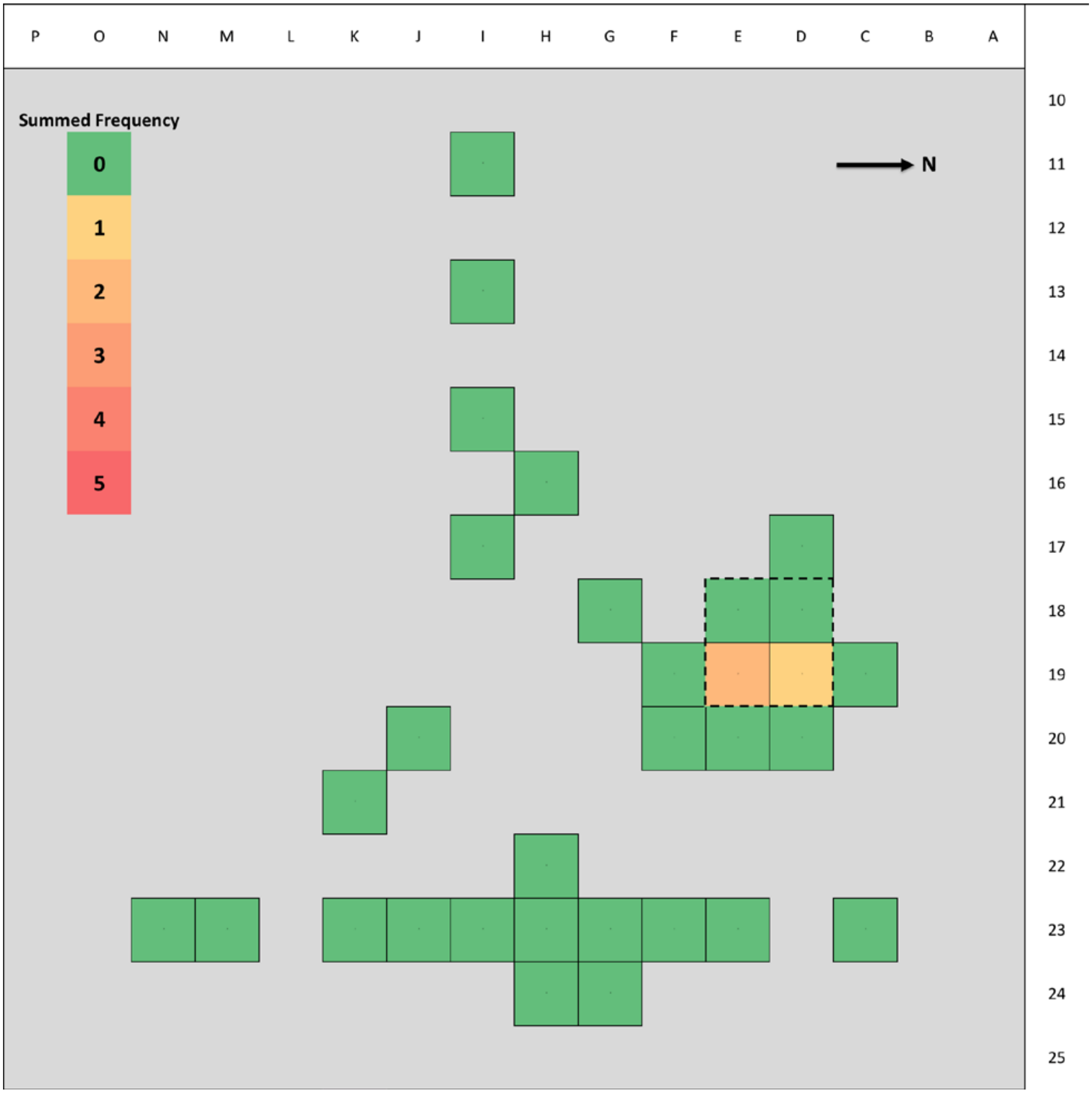

Figure 4.13: Plan view of summed Early Ceramic period diagnostic projectile point frequencies, levels 9-12. The location of units containing the house feature is indicated by dashed line. The presence of Early Ceramic arrow points within the house at these depths demonstrates its prehistoric subterranean excavation.

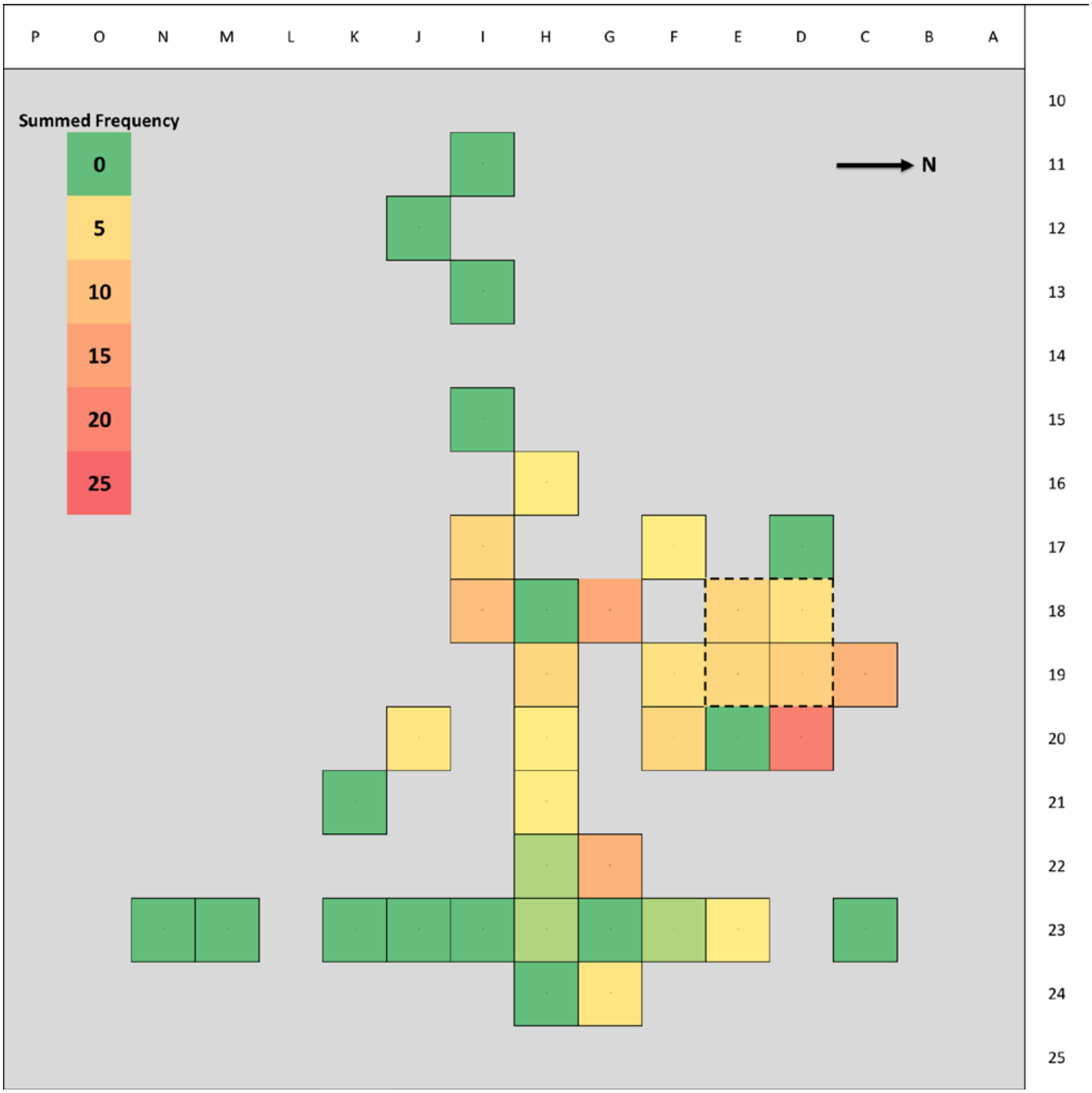

Figure 4.14: Plan view of summed ceramic sherd frequencies, levels 1-8. The location of units containing the house feature is indicated by the dashed line.

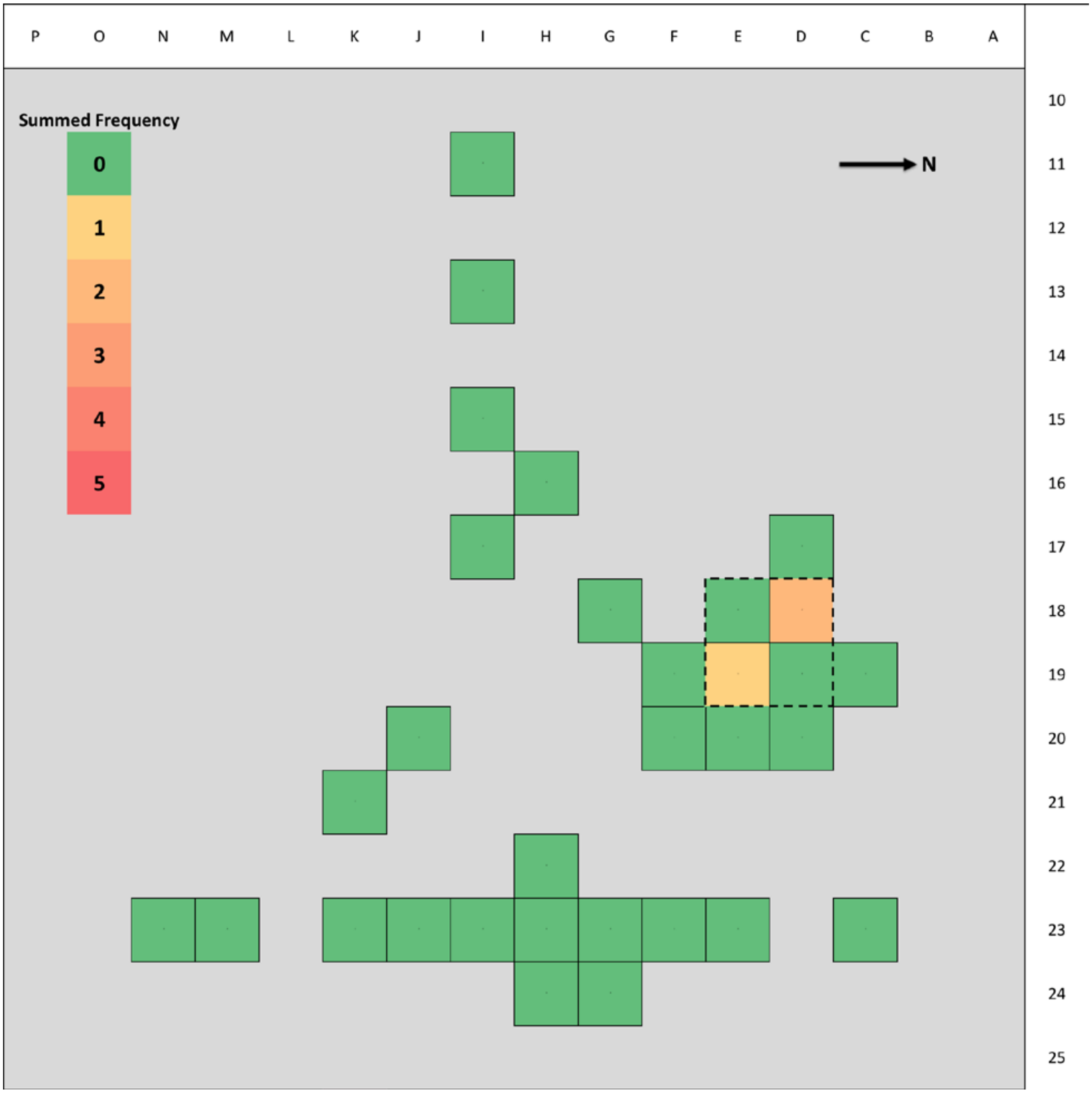

Figure 4.15: Plan view of summed ceramic sherd frequencies, levels 9-12. The location of units containing the house feature is indicated by the dashed line. The presence of Early Ceramic pottery within the house at these depths demonstrates its prehistoric subterranean excavation.

CHAPTER 5: IDENTIFYING MIDDLE AND LATE CERAMIC PERIOD COMPONENTS AT KINNEY SPRING

Chapter 4 defines where the Late Prehistoric component begins at the site using the presence of Early Ceramic period diagnostic artifacts. The next step in defining the Late Prehistoric component chronology for the site will determine whether Middle Ceramic or Protohistoric components are also present at the site, and whether these components are stratigraphically distinct from the Early Ceramic component. As in Chapter 4, diagnostic artifacts and radiocarbon dates are the primary lines of evidence available to answer this question.

Projectile Points

The assemblage of projectile points from the Early Ceramic component at Kinney Spring suggests there was some degree of continuity in projectile technology between Late Archaic occupations and Early Ceramic occupations. Within the Late Prehistoric component there are both Late Archaic style dart points as well as Early Ceramic period arrow points. This suggests that dart points and arrow points were used side by side for a period of time and suggests continuity in site occupation between these two times. Alternately this may simply be the product of overlapping Late Archaic and Early Ceramic period occupations. However the projectile point record demonstrates very little evidence for occupation of the site after the Early Ceramic period.

The Late Prehistoric component contains 64 points displaying a diagnostic hafting element (Figure 5.1). Out of these points, 23% (n=15) do not resemble Ceramic period

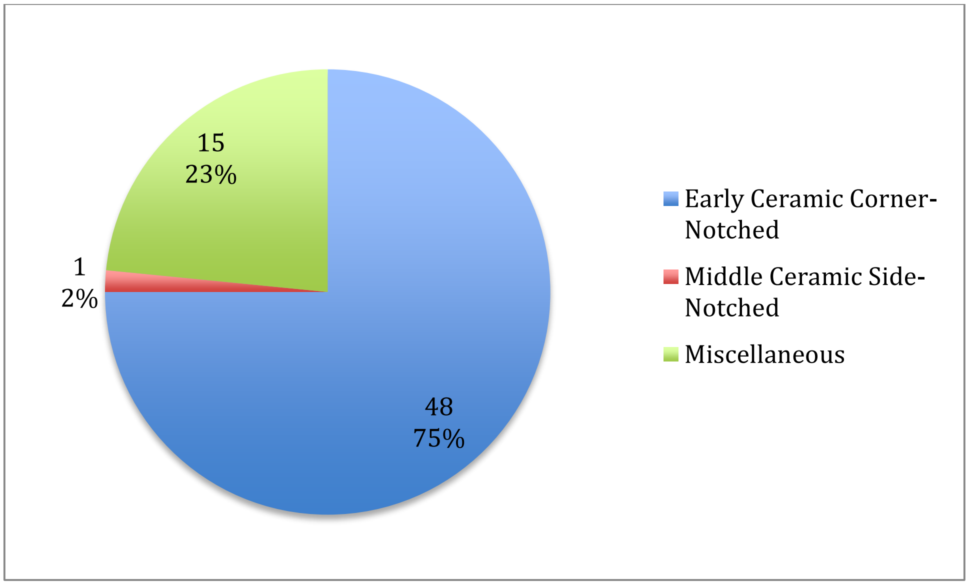

Figure 5.1: Frequency and percentage of Late Prehistoric period component projectile points by style.

diagnostic artifacts. Some of these artifacts display retouch and wear patterns that suggests they were not used as projectile points, but instead functioned as other forms of hafted tools. A large corner-notched hafted biface from level 4 of unit F20 displays a distinct, rounded distal edge with steep, unifacial retouch and step fracturing along the edge that indicates this tool functioned as a hafted scraper (Figure 5.2a). Other corner-notched points display lateral retouch, step fracturing, and flaking to suggest they functioned as hafted knives as well as projectile points (Figure 5.2b-c).

A point recovered from level 4 of unit D18 resembles Besant style dart point points (Figure 5.3a) recovered from the Ruby site in north-central Wyoming (Frison 1971), the Butler-Rissler site in central Wyoming (Miller et al 1987) and the Roth Site from Northeastern Colorado (Taylor 2006). Dates from Besant sites are contemporaneous with the start of the Early Ceramic period on the northern Plains, and are frequently found in association with Plains Woodland style ceramics. At least 3 large corner notched bifaces resemble large corner-notched dart points, diagnostic of the Late Archaic period

Figure 5.2: Hafted scraper (a; artifact # F20.5) and hafted knives (b-c; artifact #s E23.2, E23.3) from the Ceramic component.

(Kornfeld et al. 2010), which preceded the Early Ceramic period on the High Plains (Figure 5.3b-d). This may be the product of mixing of Late Archaic and Early Ceramic occupations, or the recycling of earlier projectile point forms by later site occupants. Additionally, the presence of Late Archaic projectile point styles in the Ceramic component suggests that the forms may have persisted into the Early Ceramic period, and that bow and arrow technology was used along side atlatl and darts for some time.

Seventy five percent (n=48) of the projectile points from the Late Prehistoric component are small corner notched arrow points referred by Nelson (1971) as "Hogback Points". These arrow points are one of the primary diagnostic artifacts of the Early Ceramic period in this region (Figure 5.4a-f).

In contrast, a single quartzite point from level 3 of unit G22 resembles the

Figure 5.3: Dart points from the Ceramic component. Catalog #s (L-R): D18.7, M23.1, F20.10, F19.11.

triangular, side-notched arrow points that are associated with the Middle Ceramic through Protohistoric periods (Figure 5.4g). Side-notched projectile points are fairly ubiquitous across the High Plains during this time. At the T-W-Diamond site, located on the Roberts Ranch a few miles from Kinney Spring, excavations produced similar side notched points, and the site is thought to have been occupied between A.D. 1000-1200 (Flayharty and Morris 1974). At the Vore site in northern Wyoming, side notched points were found in stratigraphic contexts dating between A.D. 1500-1800 (Reher and Frison 1980). Considering the long span of the use of side-notched point styles, the dominance of corner-notched arrow points over later forms is evidence that the most intensive site occupation was concentrated during the Early Ceramic period. The single side-notched point is suggestive of later site use, although with much reduced intensity compared to the Early

Figure 5.4: Representative Early Ceramic corner-notched arrow points (a-f) and Middle Ceramic side-notched arrow point (g). Catalog #s (L-R): D19.2, D19.17, I18.9, E18.6, G18.4, E19.19, G22.6.

Ceramic occupation. Because this artifact was found in stratigraphic contexts containing Early Ceramic diagnostics as well as intrusive historic materials, it cannot be used to define a discrete Middle Ceramic or Protohistoric component at Kinney Spring.

Pottery

The majority of the pottery recovered from Kinney Spring is typical of the Plains Woodland style cord-impressed vessels commonly found in Early Ceramic sites in the area (Figure 5.5). The earliest dated occurrence of similar cord-impressed pottery in this area was recovered from the Michaud site A (5AH2) where Plains Woodland style pottery was recovered in association with a burial dated to A.D. 150 (Wood 1971). At the Bayou Gulch site (5DA265), a large assemblage of cord marked pottery was recovered from contexts dating to A.D. 778-1268 (Ellwood 1987).

Figure 5.5: Early Ceramic period cord marked pottery from the Ceramic component. Catalog #s (L-R): I17.8, I17.7 (middle and right fragments).

Middle Ceramic pottery in Northeastern Colorado is typically associated with Upper Republican culture, and is argued to roughly correspond to A.D. 1000-1400 (Ellwood 2002). Upper Republican vessels are shorter in height than Woodland style vessels and feature rounded shoulders, globular bases, and thickened or flared collars. Rim morphology and vessel shape are the two diagnostic traits of this style of pottery. Surfaces are cord-impressed with short, choppy cord marks, which are often shallow and partially obliterated (Ellwood 2002). Obliteration of cord marking has been used as a diagnostic trait of Upper Republican pottery (Ellwood 2002; Gleichman et al. 1995), however this is a subjective trait that is known to vary within single vessels (Ellwood 2002: 96). For this reason, the obliteration of cord marking is not considered a diagnostic trait for this analysis. In the absence of any rim or base sherds, no diagnostic Middle Ceramic pottery from Kinney Spring can be identified, and it is interpreted that this ceramic assemblage is entirely of Early Ceramic affiliation.

Of great interest to this analysis are the 47 plain ware sherds collected from the surface of the Kinney Spring. These sherds are undoubtedly from a single vessel as they all share a similar thickness, color, and surface treatment. Several rim sherds have been refit and enough of the vessel is present to provide a general reconstruction of the vessel rim morphology (Figure 5.6).

Refiitting reveals the morphology of the out curving rim, sherd thickness, and smoothed surface, suggesting the vessel is similar to the Lovitt Plainware of the Dismal River aspect (Brunswig 1995). This rim fragment is similar in overall morphology to the Koshare Museum Vessel, an intact example of a Dismal River pot (Dwellis 1996, Ellwood 2002). However the rim diameter of the Kinney Spring rim fragment is approximately 11 cm, considerably smaller than the Koshare pot rim diameter (16.95cm). This rim fragment is also similar to Type K rim sherds from Old Man Mountain (Benedict 1985), although the Benedict notes the cultural affiliation of this pottery is uncertain.

Dismal River pottery is argued to represent proto-Apache Athapaskan groups who migrated into the region as early as the 14th century (Brunswig 2012; Gilmore and Larmore 2012). Dismal River aspect pottery is typically associated with the period of A.D. 1625-1725 (Brunswig 1995:177), however more recent research indicates that it could be a couple centuries older than that (Gilmore and Larmore 2012).

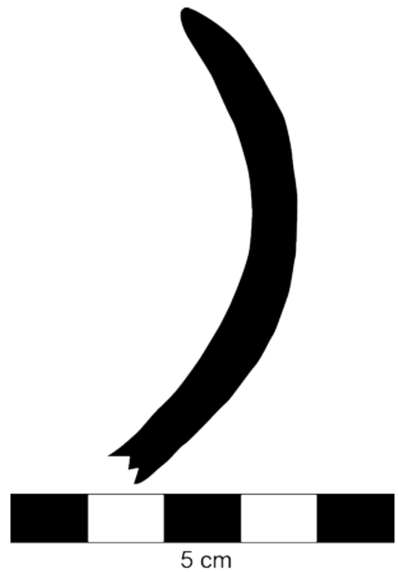

Figure 5.6: Profile of refit plane ware rim sherds from the surface of 5LR144c.

The similarity of the Kinney Spring vessel to Dismal River aspect pottery, and its recovery from the surface of the site suggests that this vessel is associated with the most recent prehistoric occupations of Kinney Spring, and further demonstrates that occupation of the site continued after the Early Ceramic period. However since this vessel was recovered from the surface, mixed with a range of earlier diagnostic artifacts, it is not sufficient evidence to define a discrete Middle or Late Ceramic period cultural component, or differentiate a distinct, separate assemblage.

Radiocarbon Dates

The latest date from Kinney Spring of A.D. 990-1214 is transitional to the Middle Ceramic period (Refer to table 6.1 for a more detailed summary of radiocarbon dates). However this date was recovered from unclear provenience from the fill of the house feature as opposed to an excavated thermal feature, and as such is can't be linked to an episode of site occupation. It is certainly plausible that Middle Ceramic period cultural traits, such as shorter-term occupation of campsites and a more mobile lifestyle, might have been present on the site by this time. However this date is not strong enough evidence to define a discrete Middle Ceramic component at the site.

Summary

The side-notched point, as well as the possible Dismal River vessel recovered from the surface both support that the site remained in use after the Early Ceramic period, albeit much less intensively. Because the side-notched point is from Level three is vertically mixed with Early Ceramic styles, and the plain ware sherds were recovered from the surface, the definition of a discrete Middle or Late Ceramic component at Kinney Spring is not possible. The presence of Euro-American historical materials from the same level as the side-notched point also indicates that there is some stratigraphic mixing of cultural material in the uppermost levels of the main excavation area, further complicating the definition of a post A.D. 1000 component at the site. It can be concluded that the Late Prehistoric component at Kinney Spring is dominated by occupation during the Early Ceramic period, which comprises the most intensive use of the site, however there is sparse evidence to suggest that the site was briefly reoccupied at some point later on during the Late Prehistoric stage.

CHAPTER 6: EXPLORING EARLY CERAMIC PERIOD RESIDENTIAL STABILITY AT KINNEY SPRING

Having defined in the previous chapters the basic site chronology of the Archaic-Ceramic period transition, and where in the stratigraphic column the Ceramic component begins, it is now possible to address specific questions about the nature of the Early Ceramic period occupations at the site.

The first portion of this chapter is aimed at defining the roll of Kinney Spring within the regional Early Ceramic period residential mobility pattern. This chapter will also attempt to identify whether occupation during the Early Ceramic period can be divided into discrete cultural occupations. This chapter will also answer whether occupation at Kinney Spring spanned the entire Early Ceramic period, and whether or not these occupations were continuous.

Continuous occupation at Kinney Spring does not imply that people were occupying the site every day throughout the year. Instead, continuous occupation here is used to define whether the site was abandoned for any period of time long enough to leave an archaeologically visible signature during the Early Ceramic period. Hunter-gatherers, by the nature of their subsistence practices occupy different locations on the landscape for variable lengths of time during different times of the year. The implication of a continuous occupation at Kinney Spring during the Early Ceramic period is that this site was a prominent and predictable location within a stable land-use pattern that existed for approximately 1000 years. In other words, continuous occupation of Kinney Spring suggests there was some combination of climatic, ecological, geological, and cultural features of this location that motivated hunter-gatherers to regularly return to this throughout the Early Ceramic period.

The definition of discrete cultural occupations within a cultural component requires a combination of both a specific type of depositional environment and an excavation strategy that is aimed at discerning those occupations. An excellent example of this comes from Gatecliff Shelter, a deeply stratified rock shelter in Nevada (Thomas 1983). The primary goal of the initial excavations was defining in detail the sites complex stratigraphy, as well as understanding the geologic history of the site. This ultimately allowed 16 distinct cultural occupations to be defined. Another example would be the Donovan site in northeastern Colorado located within an active alluvial environment and subjected to repetitive episodes of sedimentation, accumulation, and slope wash. These episodes of rapid deposition punctuated periods of surface stability, creating a well-defined stratigraphic sequence and enabled the definition of 11 cultural levels over a 250-300 year span (Scheiber and Reher 2007).

The present data does not allow a similar reconstruction of stratigraphy or levels of cultural occupation at Kinney Spring. A detailed stratigraphic sequence for the site was never defined beyond noting that the Ceramic component was contained mostly within the darker brown upper horizon of the site. Additionally, the site was excavated in 2x2 m units using 10 cm excavation levels, and identifying cultural occupation levels was not a goal of the excavation. Future work at the site should focus on defining the stratigraphic sequence at the site and identifying levels of cultural occupation.

The analysis presented in this chapter is admittedly coarse due to the data available to answer this question. Radiocarbon dates, as well as the quantity of artifacts recovered by excavation unit and stratigraphic level are the primary lines of evidence available to discern episodes of cultural occupation and periods of site abandonment at Kinney Spring.

Radiocarbon Dates

The radiocarbon record from the Ceramic component consists of eleven dates that span the entire Early Ceramic period (Table 6.1). At the 2 sigma range, the Ceramic component dates range from A.D. 133-1213 which bracket the Early Ceramic period in the South Platte River drainage (Table 2.1).

Additionally, the 11 dates from the Ceramic component provide an overlapping sequence of date ranges throughout the Early Ceramic period (Figure 6.1). There are no gaps in the chronological sequence of calibrated radiocarbon dates from the Ceramic component, which is indicative of multiple reoccupations of the site over this time.

The summed probability of these dates reveals 4 spikes that reflect intervals in intensity of site occupation (Figure 6.2). The initial interval of occupation spans from approximately A.D. 125-350, and reflects relatively low occupational intensity. The second interval spans from A.D. 400-600, and represents an increase in occupational intensity. The third interval spans from 600-750, which corresponds with the most intensive use of the site. The fourth interval spans A.D. 750-875, and reflects a decline in intensity of site use, similar in intensity to interval 2. There is a comparatively low summed probability of radiocarbon dates after this point, which suggests that around A.D. 900, there was a shift in settlement patterns and the site returned to being occupied less intensively.

These intervals are created by a greater or lesser number of overlapping dates for different periods of the site's occupation. More intensive intervals of occupation are suggested by a greater number of dates that overlap a particular span of time. At Kinney Spring, the most intensive interval of occupation begins around A.D. 600, which corresponds closely with the increase in regional population suggested by the summed probability of radiocarbon dates for the South Platte River basin (Figure 2.1). Because these dates only represent a sample of the features from the site, selected to document the span of occupation within the ceramic component, it is possible that additional dates from the site may increase the summed probability of dates for earlier or later intervals of occupation. However, based on this sample, it is suggested that the most intensive period of site use occurred from approximately A.D. 600-750.

This record could be potentially complicated by the "old wood" problem, or the dating of wood that predates the cultural events in question due to variable ages of wood in environmental and systemic contexts (Schiffer 1986:17). This phenomenon has been known to artificially increase the age of dated cultural deposits. Considering that the dominant fuel wood at Kinney Spring was juniper (Bach 2013), which can live upwards of 300 years on the Great Plains (Weakly 1971), it is possible that some of these dates are artificially old.

While sources of error from the radiocarbon dating of wood charcoal are important to consider, it is unlikely considering the number of radiocarbon dates available from the Ceramic component, as well as the span of time they represent, that the ages of all of these dates are artificially inflated by old wood. Additionally, Kinney Spring is not located in a heavily wooded area, and it is likely that the majority of fuel wood in the area would have been consumed before it reached excessive antiquity.

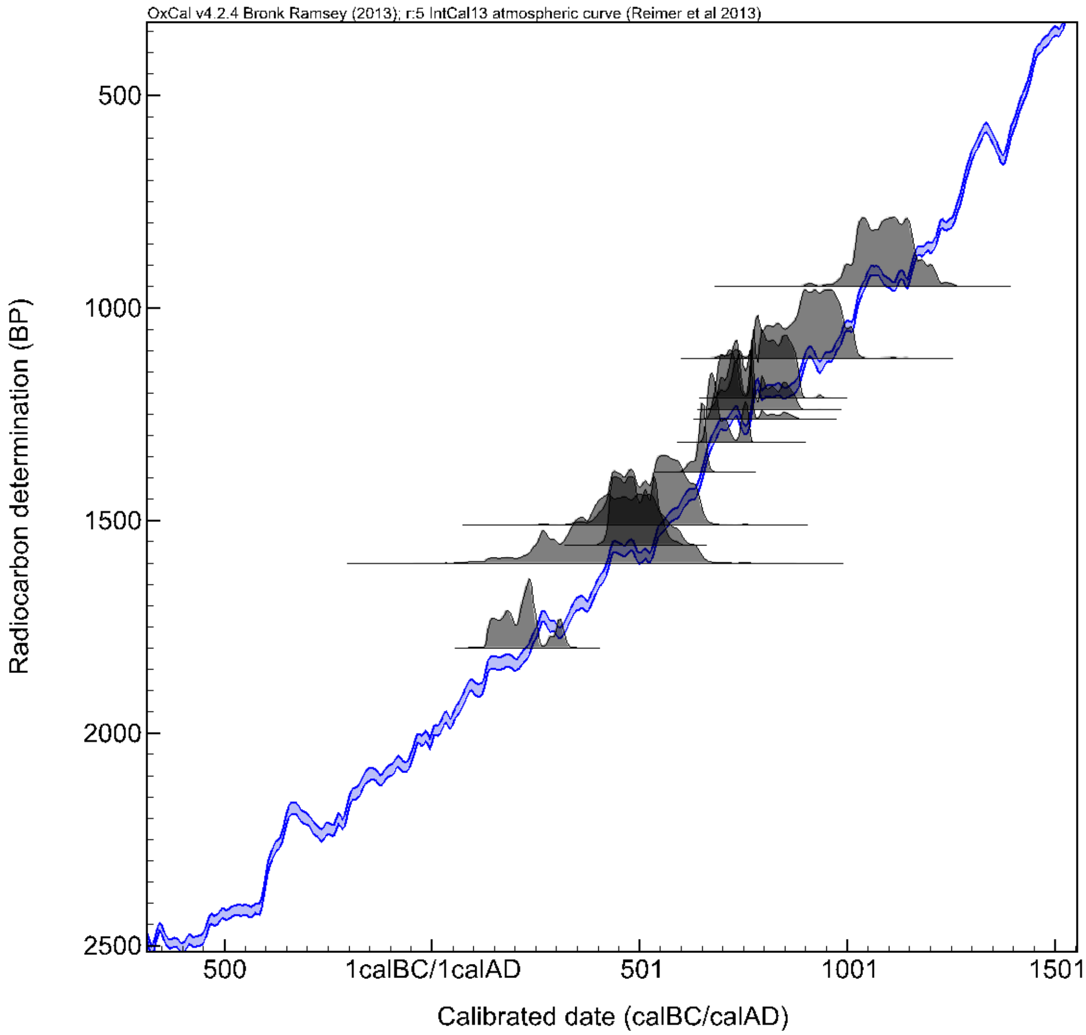

Figure 6.1: Calibrated radiocarbon dates from the Ceramic component.

Debitage

Because debitage is the most frequently discarded type of artifact in hunter-gatherer sites, its presence or absence can be used to infer periods of site use and disuse. Theoretically, if a site was abandoned for a long enough period of time, the archaeological record should reflect this period with stratigraphic levels containing very few flakes. However, excavation strategy, variable rates of soil accumulation and periods of ground surface stability, as well as the duration of site abandonment all affect whether separate

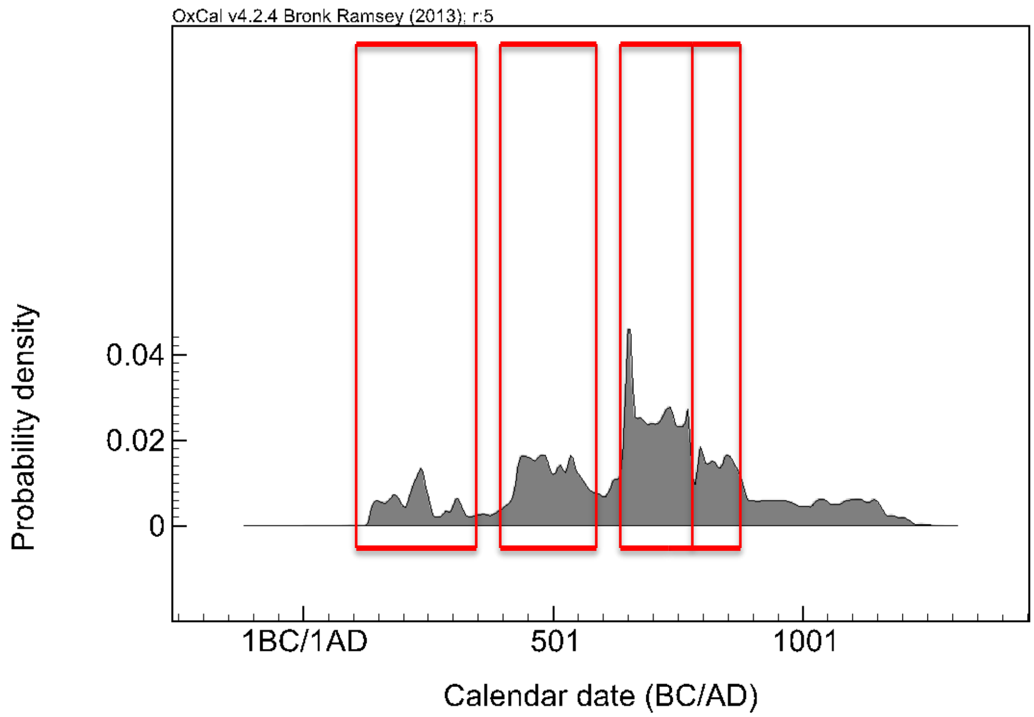

Figure 6.2: Summed probability of radiocarbon dates from the Ceramic component. Intervals of occupation are highlighted by red boxes.

episodes of site occupation will be visible through the vertical accumulation of debitage (Surovell et al. 2005).

The distribution of debitage at Kinney Spring is generally suggestive of a continuous occupation throughout the Ceramic component. When site-wide summed debitage frequencies are viewed in profile, debitage is distributed throughout the entire Ceramic component and gives no indication of a break in occupation (Figure 6.5). Because the number of units excavated per level varies by transect, the mean frequency of debitage per unit by transect and level was also plotted to show the continuous distribution of debitage (Figure 6.6).

Table 6.1: Summary of radiocarbon dates from the Ceramic component. All dates are taken from charred wood samples. See Appendix E for wood species identification.

Unit	Level	Comments/Association	Lab Code	14C Date	1 σ range (relative probability)	2 σ range (relative probability)
I11	2	Feature 7	D-AMS 003758	1799±23	A.D. 142-156 (.112)	A.D. 133-257 (.879)
					A.D. 167-195 (.264)	A.D. 284-290 (.011)
					A.D. 209-252 (.593)	A.D. 295-322 (.109)
					A.D. 307-311 (.031)	
M23	2	Feature 2	Beta-5126	1600±100	A.D. 347-370 (.077)	A.D. 241-644 (1)
					A.D. 377-567 (.923)	
I15	3	Feature 16	D-AMS 003757	1558±28	A.D. 430-493 (.767)	A.D. 423-562 (1)
					A.D. 511-517 (.07)	
					A.D. 528-542 (.163)	
E23	5	Feature 4	Beta-7328	1510±70	A.D. 431-491 (.365)	A.D. 412-651 (1)
					A.D. 531-616 (.635)	
H24	4	Feature 40	D-AMS 003756	1386±23	A.D. 642-651 (1)	A.D. 615-668 (1)
Burial		Charcoal sample #3 from burial pit	D-AMS 003754	1306±26	A.D. 665-694 (.613)	A.D. 659-724 (.705)
					A.D. 702-708 (.068)	A.D. 739-768 (.295)
					A.D. 746-763 (.318)	
Burial		Charcoal sample #2 from burial pit	D-AMS 003753	1316±25	A.D. 661-692 (.781)	A.D. 656-720 (.768)
					A.D. 748-762 (.219)	A.D. 741-766 (.232)
D19	8	Feature 49- Hearth built on bedrock outside house feature	D-AMS 003759	1262±26	A.D. 691-749 (.874)	A.D. 668-777 (.964)
					A.D. 761-769 (.126)	A.D. 792-803 (.014)
						A.D. 818-821 (.003)
						A.D. 842-859 (.019)
H22	5	Feature 41	D-AMS 003755	1238±25	A.D. 692-748 (.637)	A.D. 687-799 (.654)
					A.D. 762-777 (.189)	A.D. 788-874 (.346)
					A.D. 792-803 (.075)	

Unit	Level	Comments/Association	Lab Code	14C Date	1 σ range (relative probability)	2 σ range (relative probability)
					A.D. 843-858 (.099)	
FE20 13-1		From 2013 CSU field school-Hearth from wall of arroyo cut	D-AMS 003750	1212±26	A.D. 771-779 (.097)	A.D. 713-744 (.103)
					A.D. 789-869 (.903)	A.D. 765-889 (.897)
D20	8	Feature 38-FCR feature under rock wall of house	Beta-10195	1120±60	A.D. 779-789 (.053)	A.D. 772-1020 (1)
					A.D. 832-836 (.013)	
					A.D. 867-994 (.934)	
E19	6	From upper levels of fill of Feature 30 (house feature)	Beta-10196	950±60	A.D. 1025-1058 (.283)	A.D. 990-1213 (1)
					A.D. 1065-1068 (.022)	
					A.D. 1072-1154 (.695)	

The three-dimensional distribution of debitage in the Ceramic component can also be displayed when the debitage frequency for each excavation unit is viewed in plan-view, by individual excavation levels (Figures 6.5-6.12). Concentrations of debitage, as well as units containing no flakes shift horizontally however there are no levels that reflect prolonged periods of site abandonment.

	Transect													
Level	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	18				9	2	22	80	46	135	187	18	355	6
2	72				25	7	39	26	99	254	139	42	390	13
3	8				11	14	86	238	143	412	16	132	264	75
4					5	39	85	107	166	567	19	184	338	126
5						15	112	207	570	530	21	56	150	60
6						2	68	135	618	254	3	24	93	73
7							63	124	1223	103	2	0	77	4
8							8	190	233	66	1	7	51	19
9								393	64					
10								85	13					
11								135	3					
12								31	165					

Summed Frequency
1
100
500
1000
1500

Figure 6.3: Site wide backplot facing north (not to scale) of the Ceramic component, facing north, showing summed frequencies of debitage by transect and level. Location of cross-section shown in figure 4.3.

	Transect													
Level	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	18				9	2	7.3333	26.667	9.2	27	93.5	9	35.5	3
2	72				25	7	13	8.6667	19.8	50.8	69.5	21	39	6.5
3	8				11	14	28.667	79.333	28.6	82.4	16	66	26.4	37.5
4					5	39	28.333	35.667	33.2	113.4	19	92	33.8	63
5						15	37.333	69	114	106	21	28	16.667	30
6						2	22.667	45	154.5	63.5	3	12	10.333	36.5
7							21	41.333	305.75	25.75	2	0	8.5556	2
8							2.6667	63.333	58.25	16.5	1	7	5.6667	19
9								131	16					
10								28.333	3.25					
11								45	1.5					
12								15.5	82.5					

Average Frequency
1
100
500
1000
1500

Figure 6.4: Site wide backplot facing north (not to scale) of the Ceramic component showing average frequencies of debitage per transect and level. Location of cross-section shown in figure 4.3

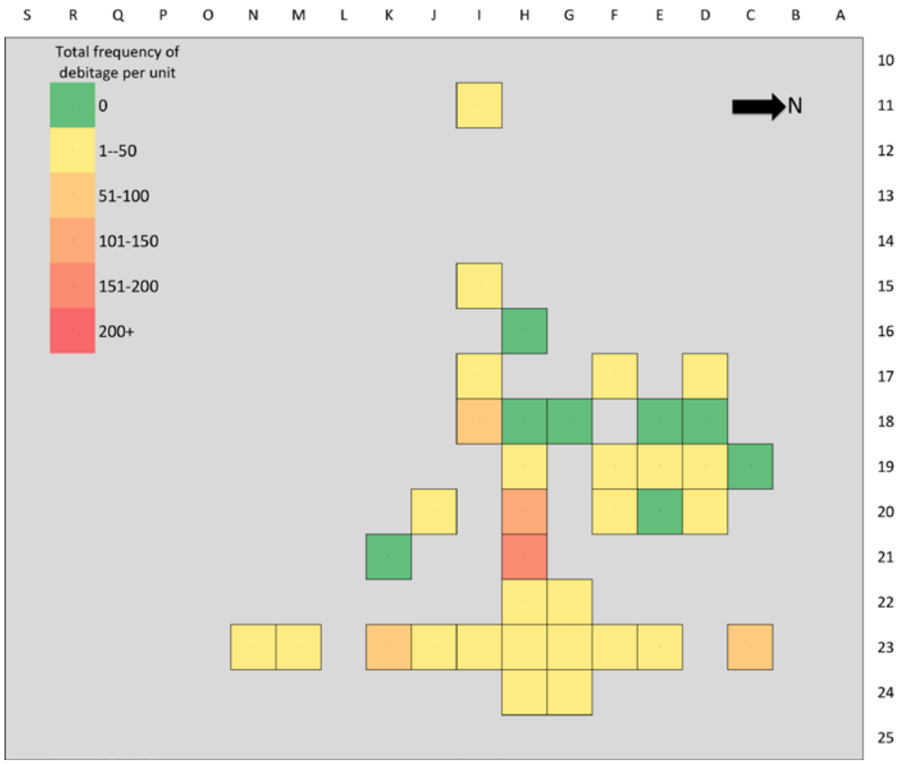

Figure 6.5: Level 1 plan view map showing total frequency of debitage per 2x2 m unit.

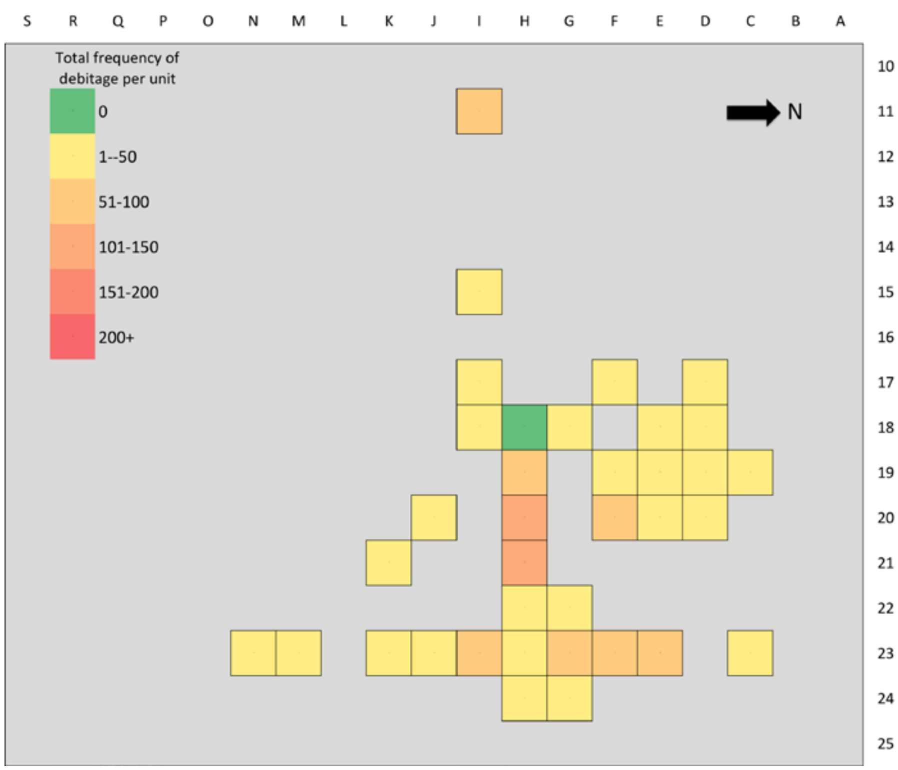

Figure 6.6: Level 2 plan view map showing total frequency of debitage per 2x2 m unit.

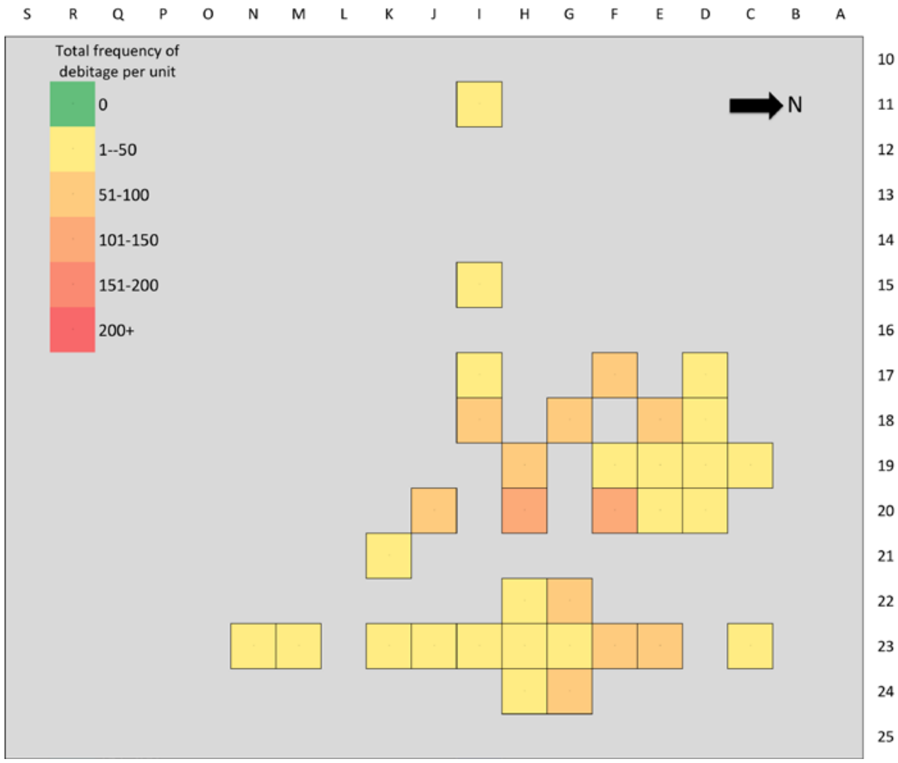

Figure 6.7: Level 3 plan view map showing total frequency of debitage per 2x2 m unit.

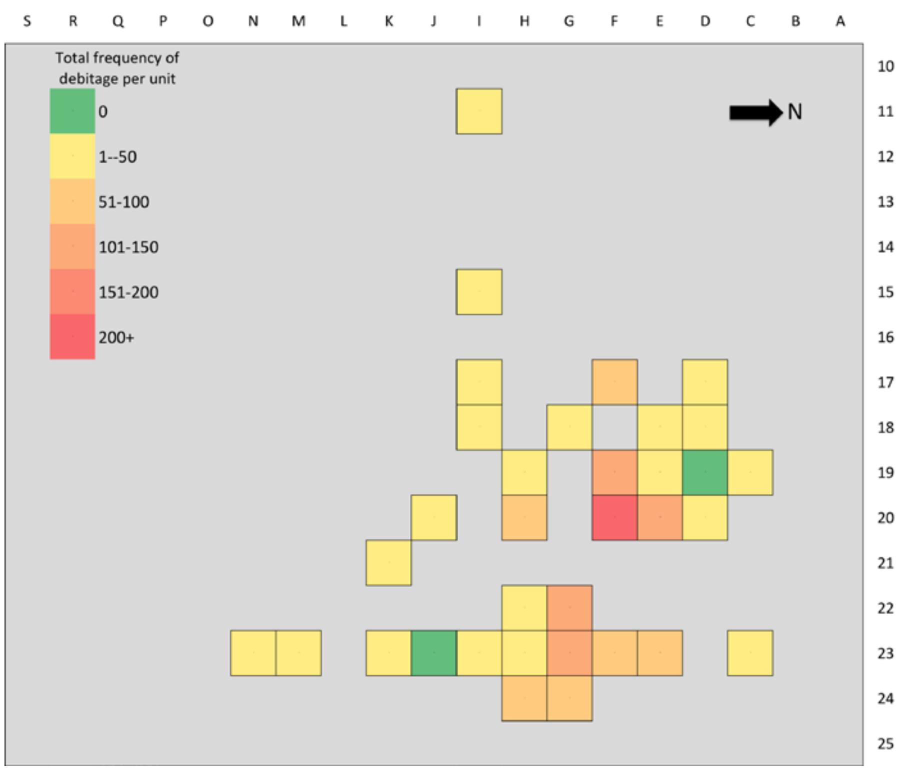

Figure 6.8: Level 4 plan view map showing total frequency of debitage per 2x2 m unit.

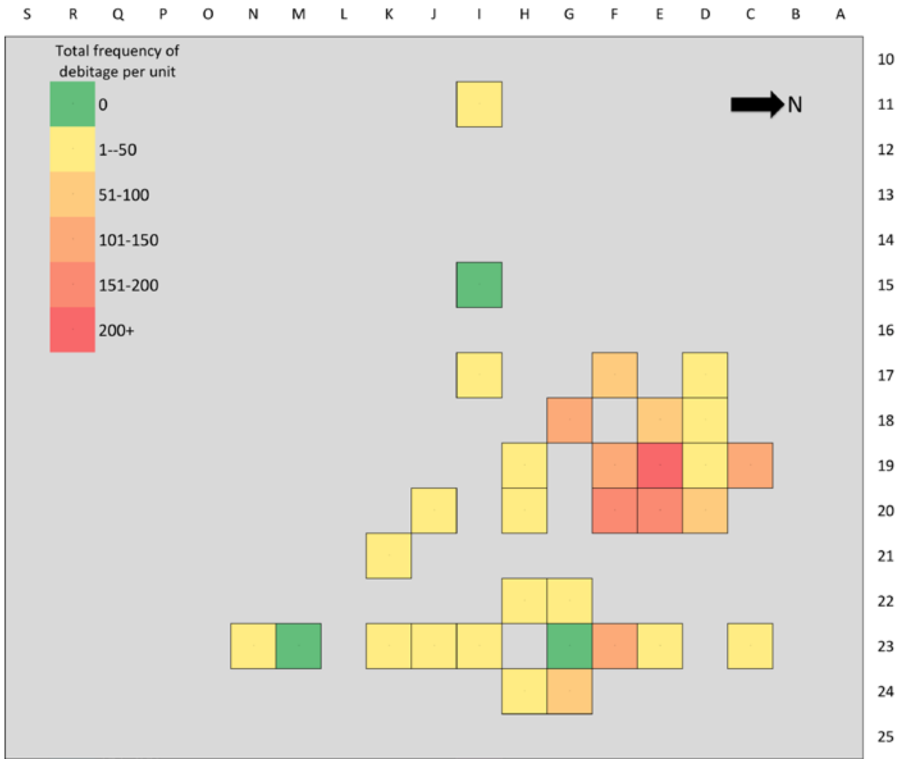

Figure 6.9: Level 5 plan view map showing total frequency of debitage per 2x2 m unit.

Figure 6.10: Level 6 plan view map showing total frequency of debitage per 2x2 m unit. Approximate location of house feature is indicated with a double border.

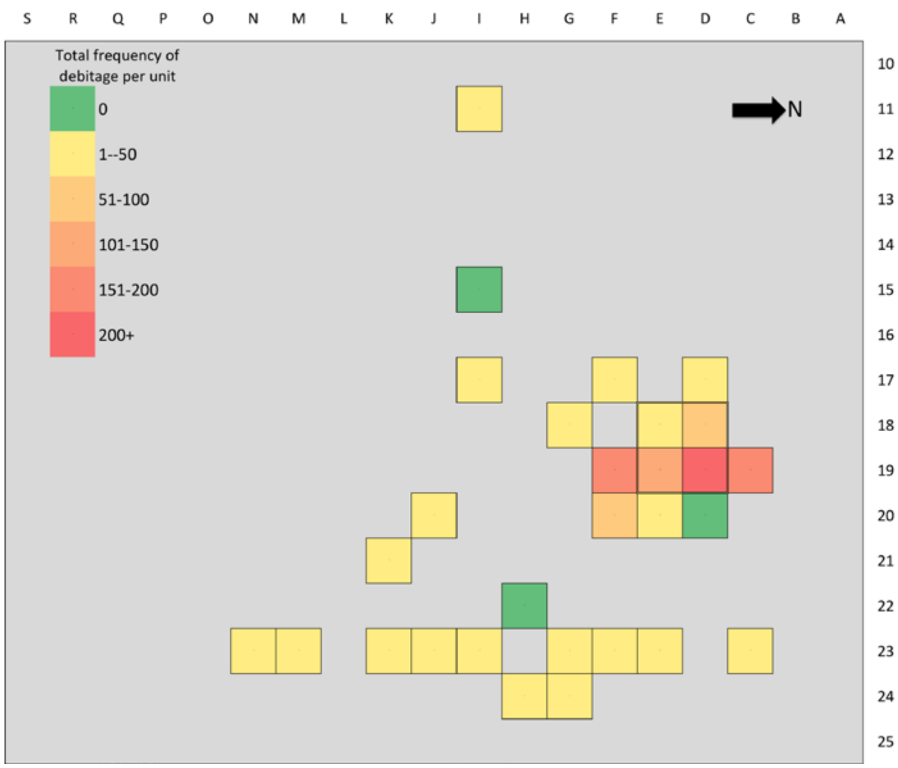

Figure 6.11: Level 7 plan view map showing total frequency of debitage per 2x2 m unit.

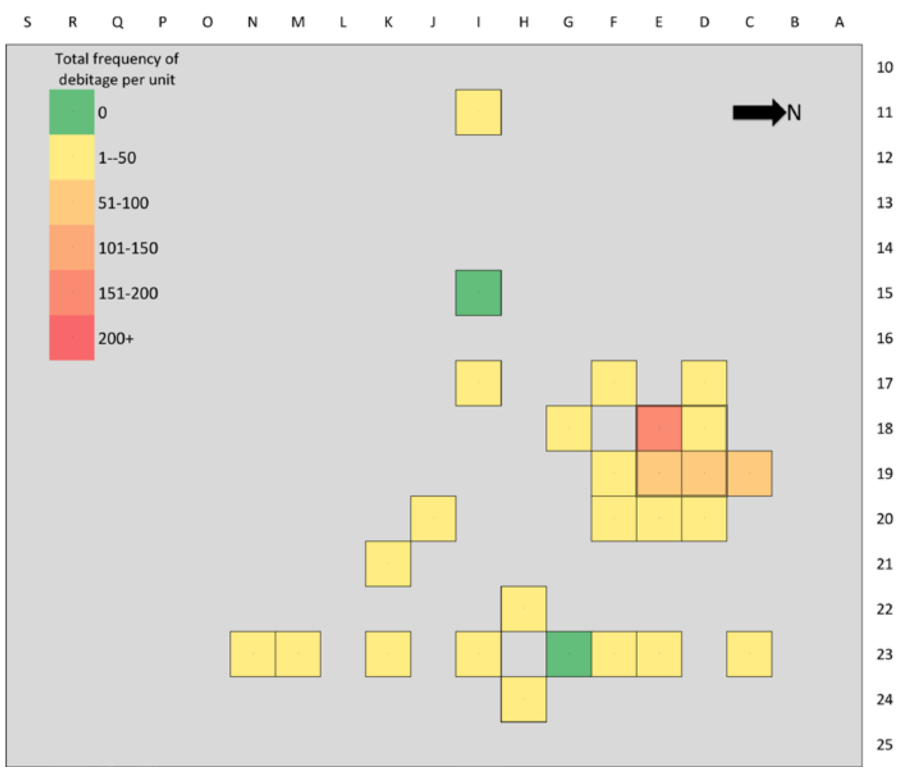

Figure 6.12: Level 8 plan view map showing total frequency of debitage per 2x2 m unit.

Hearth Features

Features are useful for documenting occupational surfaces because unlike artifacts, they do not move vertically or horizontally and can provide a reliable indication of the prehistoric occupational surfaces. Unfortunately a complete feature log of all documented features from the three field seasons could not be located. In the absence of a feature log, available field notes from the 1983-1985 excavation seasons were examined and every reference to a feature was noted. At least 29 confirmed hearth features were described within the Ceramic component. Documentation of these features ranged from detailed, plan view and profile drawings to, more frequently, simply noting that a hearth was encountered somewhere within an excavation level. For some features the depth below datum was noted, but for many features their stratigraphic location can only be approximated based on what level it was encountered. Some features encountered were described in field notes as "possible" hearths but were never assigned a feature number and their status as a cultural feature cannot be confirmed. Only features with an assigned feature number were used for this analysis. When hearth features extended into multiple excavation levels, the level it was first encountered in was used to plot its location. Complicating the picture, different students' excavation notes described encountering the same feature in different levels so the reliability of this data is somewhat questionable. The feature data can only be applied at a general level in support of the other lines of evidence discussed in this Chapter.

The horizontal and stratigraphic distribution of hearth features is indicative of multiple overlapping occupational surfaces throughout the Ceramic component, and further supports a continuous occupation during the Early Ceramic period. Hearth features were encountered in multiple locations within every excavation level of the Ceramic component, except for level 1 (Figure 6.15). Although the hearth data is relatively imprecise, it does imply that people were occupying the site beginning at the start of the Early Ceramic period, and that the site was reoccupied on multiple occasions throughout the Ceramic component.

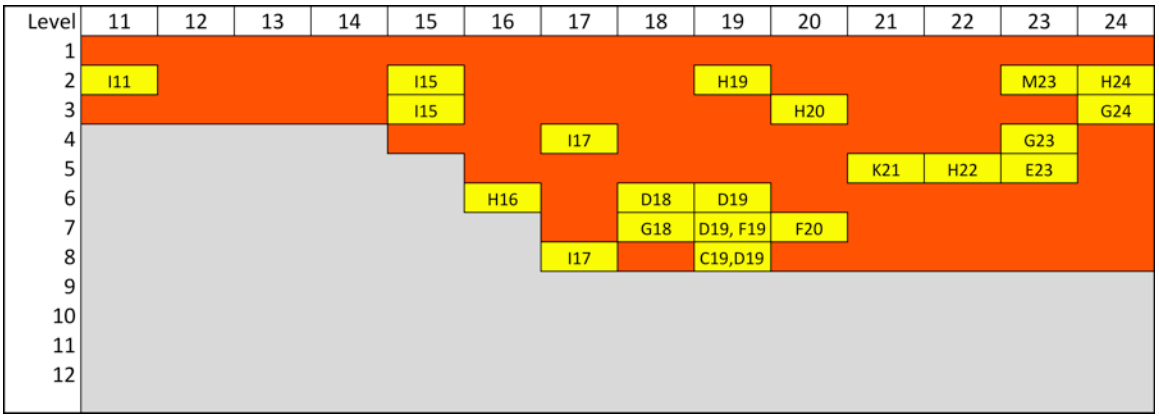

Figure 6.13: Site wide profile facing north showing the approximate location of hearth features within the Ceramic component, indicated in orange. The location of hearth features is indicated in yellow, and the unit(s) containing the feature is specified. The location of the cross section is shown in figure 4.3.

Summary

The three lines of evidence discussed in this chapter (radiocarbon dates, debitage, and features) demonstrate a sequence of reoccupations of Kinney Spring spanning the Early Ceramic period. The radiocarbon record from the

Ceramic component provides an overlapping sequence of 11 dates that span the entire Early Ceramic period. Debitage is distributed vertically and horizontally throughout the Ceramic component, and no stratigraphic breaks in debitage accumulation can be identified, which further supports a continuous period of frequent site reoccupation. Finally, hearth features were identified in every level within the Ceramic component, which is indicative of multiple occupational surfaces and the reoccupation of the site.

It is not presently possible to hypothesize how regularly the site was reoccupied, as well as how long the site was abandoned between occupations. The important points to consider are that over the course of the Early Ceramic period, groups of hunter-gatherers returned to the site on multiple occasions, suggesting that Kinney Spring was an important and predictable location within Early Ceramic period settlement patterns. These occupations left a strong enough signature that individual episodes of occupation are not visible with the resolution of the available data. It remains an exciting research opportunity to look for this pattern with new excavations in area sites to answer questions about how certain locations were reoccupied over time including the frequency of reoccupation as well as the duration of site abandonment between occupations.

CHAPTER 7: EXPLORING EARLY CERAMIC PERIOD OCCUPATIONAL INTENSITY AT KINNEY SPRING

Having established that the Late Prehistoric component at Kinney Spring was predominantly occupied during the Early Ceramic Period, and that Late Prehistoric occupations at Kinney Spring spanned the entire Early Ceramic period, it is now possible to focus on site occupation during the Early Ceramic period and explore how occupation of the site changed during that time. Specifically, this chapter will look at how the effects of regional population trends were experienced at Kinney Spring.

The transition from the Late Archaic to the Early Ceramic period in the South Platte River basin of Colorado is associated with an increase in regional population, coupled with a decrease in residential mobility (Gilmore 1999). In other words, there were more people on the landscape, and larger groups of people were occupying campsites for longer periods. Evidence for this comes from an increase in radiocarbon-dated features from this period, as well as an increase in the size and density of Early Ceramic period campsites and burials (Gilmore 1999; Gilmore 2008).

The site level effect of a larger population occupying a site and/or a longer occupation span is an increase in occupational intensity. Occupational intensity refers to the total number of people who occupy a site multiplied by the duration of their occupation (Surovell 2003). Regional demographic models show a sharp spike in relative population size just prior to the start of the Early Ceramic period (Gilmore 2008). This increase peaks around A.D. 1150 at the transition to the Middle Ceramic period (Gilmore 2008). The question this chapter addresses is how occupational intensity at the site level of a large residential base camp mirrors these regional demographic changes. The accumulation of debitage, tools (chipped stone, ground stone, and bone), as well as the horizontal distribution of these materials will be considered to answer this question.

It is difficult to discern with this dataset to what degree a larger site population versus a longer occupation affected changes in occupational intensity. However multiple lines of evidence will be discussed to suggest that occupation span did increase during this time. What is important for this discussion is that some combination of these two factors was taking place at the site during this time, and is considered to be a response to increasing regional population.

Debitage

Debitage is the fastest accumulating and most frequently discarded artifact class found in hunter-gatherer archaeological sites. It has been demonstrated that debitage accumulates at predictable rates in response to increases in occupational intensity (Nelson et al. 1999, Varien 1999). At Kinney Spring, the total frequency of debitage by excavation level, as well as the average number of flakes per square meter increases sharply at the beginning of the Late Prehistoric component (Figure 7.1; Figure 7.3). The sharp increase in debitage frequency beginning in level 8, corresponding with the start of the Ceramic component, is interpreted to reflect increasing occupational intensity at the site. The decline in debitage frequency beginning around level 4 is more difficult to interpret due to excavation bias. Because the units were excavated with flat bottoms, and the site is located on a southeast trending slope, the volume of soil excavated by level decreases from level 3-4 to level 1, depending on the slope of the ground surface. This decline in debitage frequency for the levels 1-4 may to some degree reflect decreasing occupational intensity, but it is also a product of reduced volume of soil excavated.

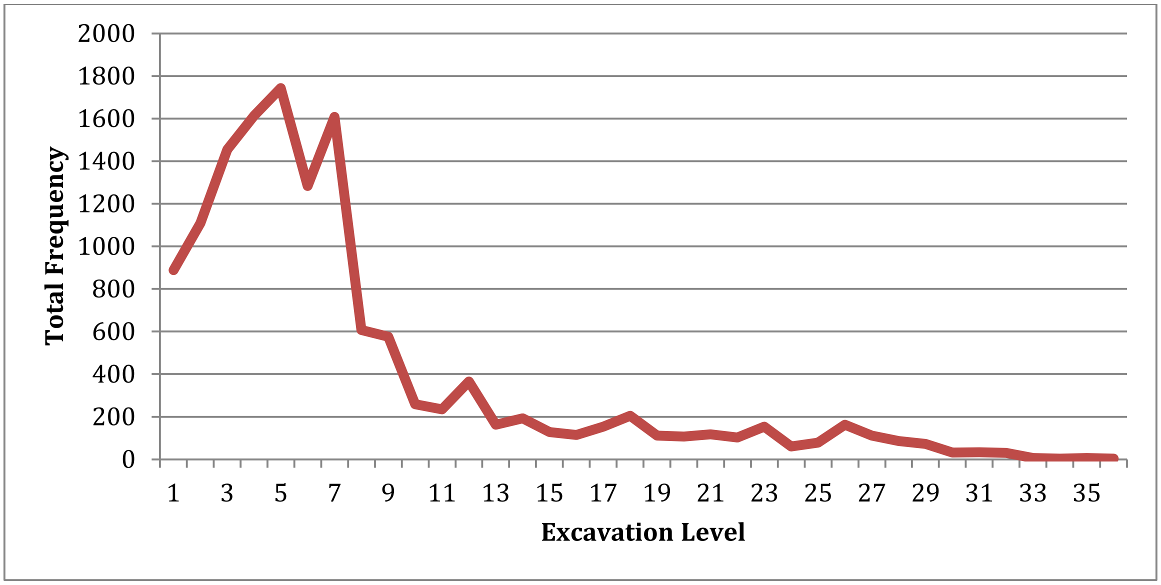

Figure 7.1: Total frequency of debitage by 10 cm excavation level. The number of units excavated per level decreases with depth so there is potential excavation bias due to the larger sample size of the upper 10 levels.

Average debitage frequency per square meter excavated was calculated to account for the potential excavation bias created by the decreasing number of units excavated by depth. The ceramic component clearly contains the greatest frequency of debitage, however it also contains the largest sample size of excavated area. For example, 36 units were excavated to a depth of level 2, while 17 units were excavated to level 15, and only three units were excavated deeper than level 30. Therefore, the higher frequency of debitage within the Ceramic component may be influenced by this discrepancy. Averaging the total frequency of debitage per level, by the number of units dug to that level attempts to account for this bias, and standardize the number of flakes recovered from each level (Figure 7.3). This generates a mean frequency of debitage per square meter by level. The averaged frequency still displays a similarly sharp increase in the Ceramic component.

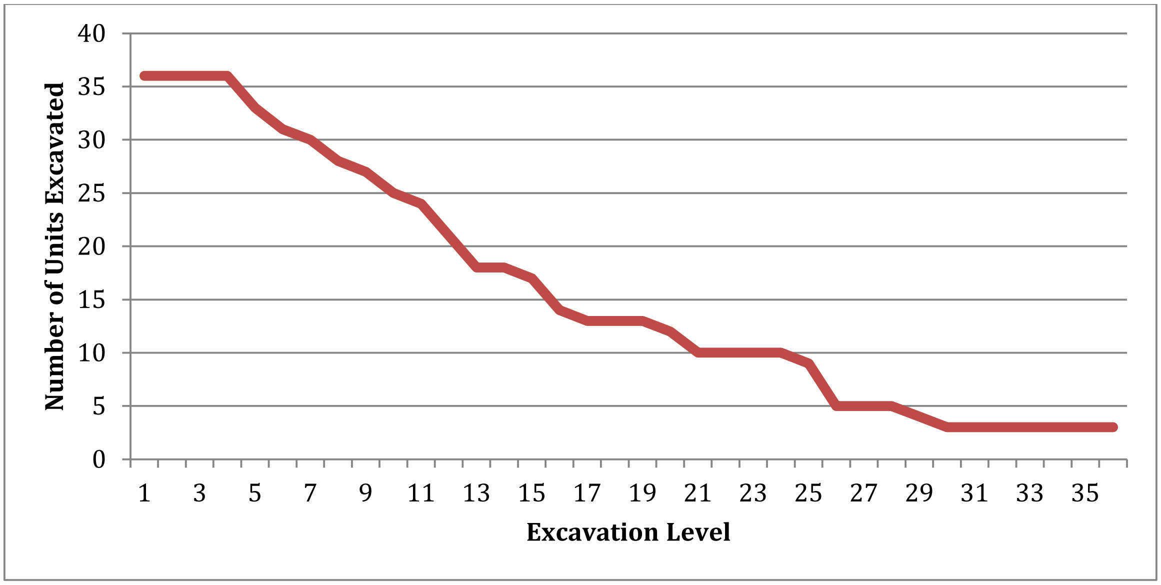

Figure 7.2: Total number of units excavated by level within the main excavation block showing decreasing sample size with depth.

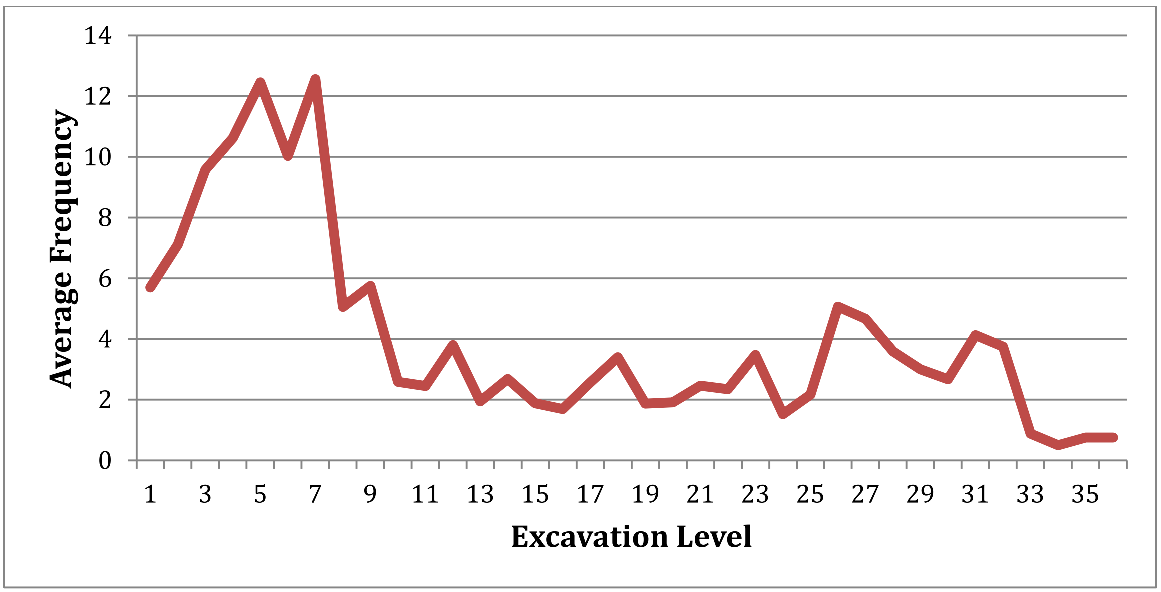

Figure 7.3: Average debitage frequency per square meter by 10 cm excavation level.

Furthermore, the number of units excavated per level decreases with depth in a linear trend (figure 7.2), and does not mirror the sharp increase of the debitage frequency. If the greater frequency of debitage in the upper units was simply a reflection of the amount of

Table 7.1: Site-wide summary statistics of debitage by level

LEVEL	UNITS DUG	TOTAL FREQ	TOTAL MASS (g)	MEAN FREQ	MEAN MASS (g)	STD DEV-FREQ	STD DEV-MASS (g)	RANGE FREQ	RANGE MASS (g)
1	36	878	906.6	24.4	25.2	38.5	38.3	187	161.5
2	36	1114	1555.1	30.9	43.2	33.1	84.3	134	493.8
3	34	1391	1598.8	40.9	47.0	36.7	43.2	140	152.44
4	34	1637	2366.1	48.1	69.6	60.9	81.9	316	357.8
5	33	1724	1761.0	52.2	53.4	67.5	71.1	274	300.6
6	31	1276	1541.8	41.2	49.7	64.5	70.9	297	330.8
7	30	1605	1123.5	53.5	37.4	137.9	74.4	728	386.97
8	28	584	614.3	20.9	21.9	36.9	37.5	169	139.93
9	27	566	343.8	21.0	12.7	64.7	32.3	336	160.13
10	25	230	191.0	9.2	7.6	14.6	16.2	58	71.55
11	24	215	178.0	9.0	7.4	17.2	12.9	64	61.53
12	22	310	281.7	14.1	12.8	34.7	21.5	165	84.13
13	19	127	118.4	6.7	6.2	5.9	6.6	19	7.76
14	17	98	87.9	5.8	5.2	6.7	6.0	19	8.91
15	16	125	104.4	7.8	6.5	12.2	10.7	43	40.87
16	14	108	121.5	7.7	8.7	10.2	11.2	33	31.76
17	13	152	94.6	11.7	7.3	19.5	9.7	70	34.6
18	13	195	241.2	15.0	18.6	15.4	25.0	46	89
19	13	111	114.6	8.5	8.8	13.3	12.8	46	43.09
20	13	107	84.5	8.2	6.5	9.7	9.2	27	30.3
21	11	118	69.7	10.7	6.3	12.1	6.1	43	19.6
22	10	103	103.1	10.3	10.3	9.1	8.6	28	23.4
23	10	153	173.4	15.3	17.3	16.6	20.2	42	63.2
24	10	61	81.5	6.1	8.1	9.0	12.9	28	38.3
25	9	78	102.5	8.7	11.4	15.7	15.9	49	47.4
26	6	82	67.6	13.7	11.3	18.5	17.0	46	42.6
27	6	112	82.8	18.7	13.8	25.5	17.1	64	42.3
28	6	86	147.6	14.3	24.6	31.7	57.4	79	141.7
29	5	72	124.5	14.4	24.9	17.3	29.1	40	62.6
30	3	31	20.9	10.3	7.0	11.7	8.5	15	12.1
31	3	33	57.5	11.0	19.2	12.1	21.5	15	27.3
32	3	30	26.3	10.0	8.8	10.5	8.9	12	9.3
33	3	7	24.6	2.3	8.2	4.0	14.2	7	24.6
34	3	4	0.8	1.3	0.3	2.3	0.5	4	0.8
35	3	6	6.9	2.0	2.3	3.5	4.0	6	6.9
36	2	3	0.8	1.5	0.4	2.1	0.6	3	0.8

space excavated, the frequency of debitage per level should also decrease with depth in a linear fashion. That this is not the case suggests that there are additional factors, beyond excavation bias, contributing to the spike in the accumulation of debitage.

The spatial patterning of debitage within the Ceramic component is also suggestive of increasing occupational intensity. In addition to the increasing frequency of debitage, both the range and standard deviation of debitage per excavation unit also increase in the Ceramic component (Table 7.1; Figure 7.4, Figure 7.5).

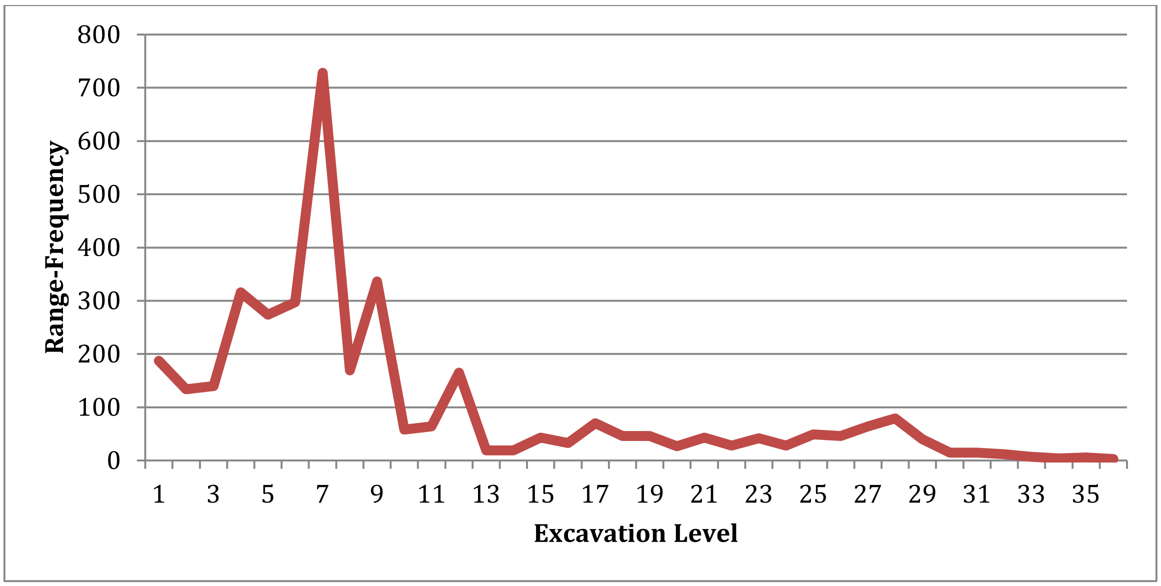

Figure 7.4: Range of frequency of debitage per excavation unit by level

This has important implications for understanding increasing occupational intensity at Kinney Spring because this demonstrates that horizontally there is a greater amount of variation in debitage density between units in the Ceramic component. Rather than being distributed evenly across the site, debitage becomes increasingly concentrated in discrete locations. This is suggestive of spatial maintenance and the formation of secondary refuse deposits, both of which are associated with larger populations and longer-term occupations (Murray 1980; Schiffer 1987). The sharp spike in the frequency range for level 7 is the

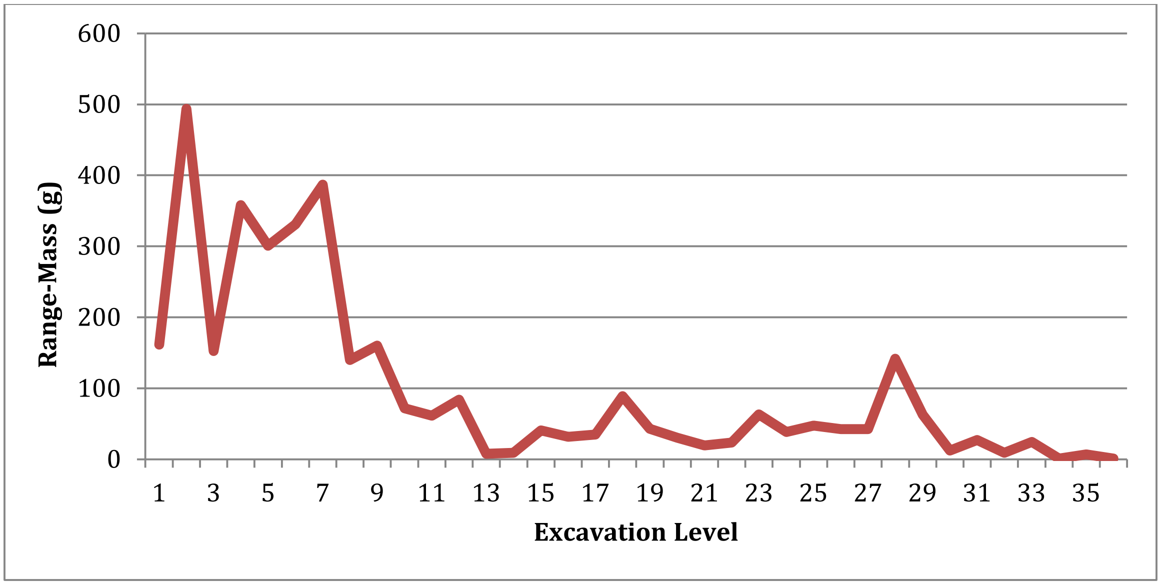

Figure 7.5: Range of mass of debitage per excavation unit by level

product of 728 flakes recovered from unit D19, which is most likely a secondary refuse deposit from the occupation of the structure. Sedentary occupations are also associated with the formation of specific activity areas (Kelly 1992), which may also be a contributing factor to the greater range of horizontal variation in debitage density within the Ceramic component.

While it is possible that the apparent increase of these values from the Archaic component may also be affected by excavation bias since the Ceramic component contains the largest amount of horizontal area excavated. The high range and standard deviation of debitage per unit from the Ceramic component is real, and demonstrates a patterned use of space that is consistent with longer-term occupations.

Tools

The tool assemblage (all flaked stone tools, ground stone, and bone and shell artifacts) also reflects increasing intensity of occupation at Kinney Spring over the course of the Early Ceramic period. Both the total assemblage size, as well as the diversity of tool classes represented, are indicative of an increasingly intensive occupation of the site.

While debitage, as the most frequently discarded artifact class is the most sensitive to changes in occupational intensity, the total number of artifacts has also been shown to be a good indicator of occupational intensity (Schlanger 1990). The formation of an archaeological assemblage is the result of a complex series of interactions between artifact use-lives, use frequency, curation behavior, and the relationship between specific tool classes with particular activities (Ammerman and Feldman 1974; Schiffer 1975; Shott 1989). However, because this analysis is based upon broad generalizations of assemblage formation, this relationship can simplified to state that as occupation span of a site increases, the probability that a tool will be discarded there increases regardless of the use-life of the tool (Schiffer 1975). In other words, the longer a site is occupied, the greater the chance a tool will be discarded there (Figure 3.3).

However, occupation span is not the only factor that affects the accumulation of artifacts, and occupational intensity is a product of both occupation duration as well as the number of site occupants. According to Schiffer's (1987) basic discard equation, the number of a particular class of artifact discarded at a site is a function of the length of occupation, the use-life and use-frequency of that type of artifact, as well as the number of those artifacts in use at any given time. The assumption can be made that more people use more tools, so that a larger site population increases the number of tools in systemic context. Thus both factors of occupational intensity-site population size and occupation span- have been shown to affect the accumulation of artifacts in a site, and increases in assemblage size are interpreted to reflect increasing occupational intensity.

The total number of tools per level, as well as the average number of tools per square meter, show a sharp increase beginning around level nine, just below the start of the Ceramic component (Figure 7.6, Figure 7.7). As with the debitage, tool frequency declines in levels four through one, however this is difficult to interpret due to the excavation bias created by excavating flat unit floors on a sloping ground surface. As with debitage frequency, additional excavation bias comes from the decreasing sample of excavated units with depth. Again, as with debitage, the average frequency of tools per square meter fluctuates throughout the Archaic occupations then increases sharply in the upper 8 levels, and does not mirror the linear trend of sample size decreasing with depth. This again suggests that there are additional processes affecting the assemblage formation other than sample size. While acknowledging the potential effects of excavation bias on the tool assemblage, the number of tools discarded at Kinney Spring shows a clear increase within the Ceramic component over preceding Archaic period occupations. The larger tool assemblage within the Ceramic component must be, at least in part, a reflection of increasing occupational intensity at the site.

Assemblage Diversity

This discussion of diversity refers to the number of different artifact classes discarded on site, as opposed to the diversity of tool classes in systemic context at a given time. The "Clarke Effect" describes the tendency of assemblage diversity to increase relative to increasing occupation span (Schiffer 1975). Assuming that the entire tool kit was not discarded upon site abandonment, and that tools that were still useable were transported off site for future use in another location, the number of different tool types

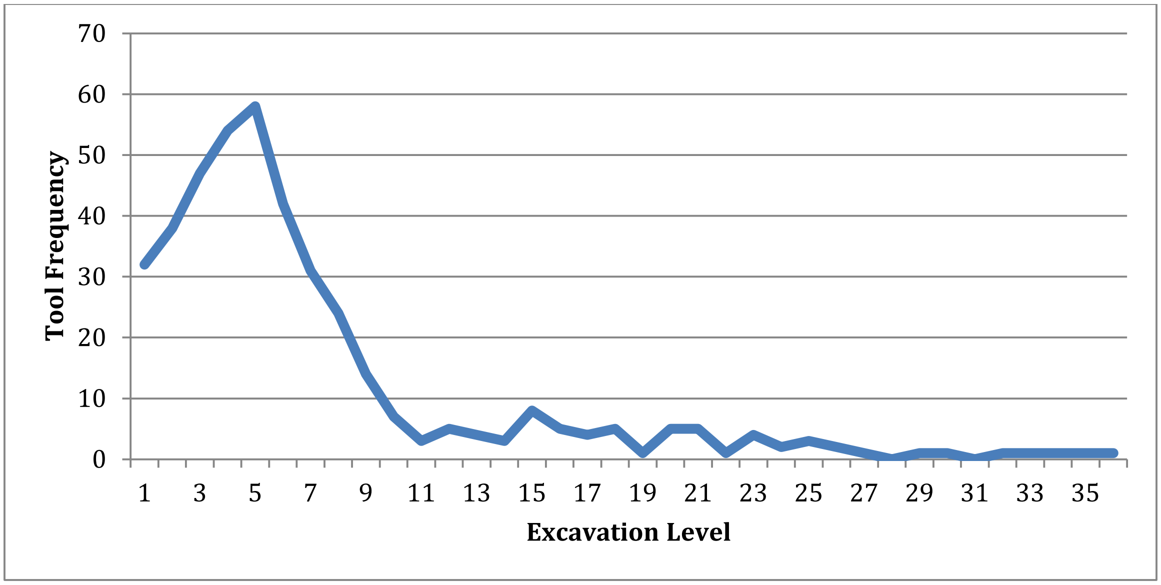

Figure 7.6: Total frequency of tools per level.

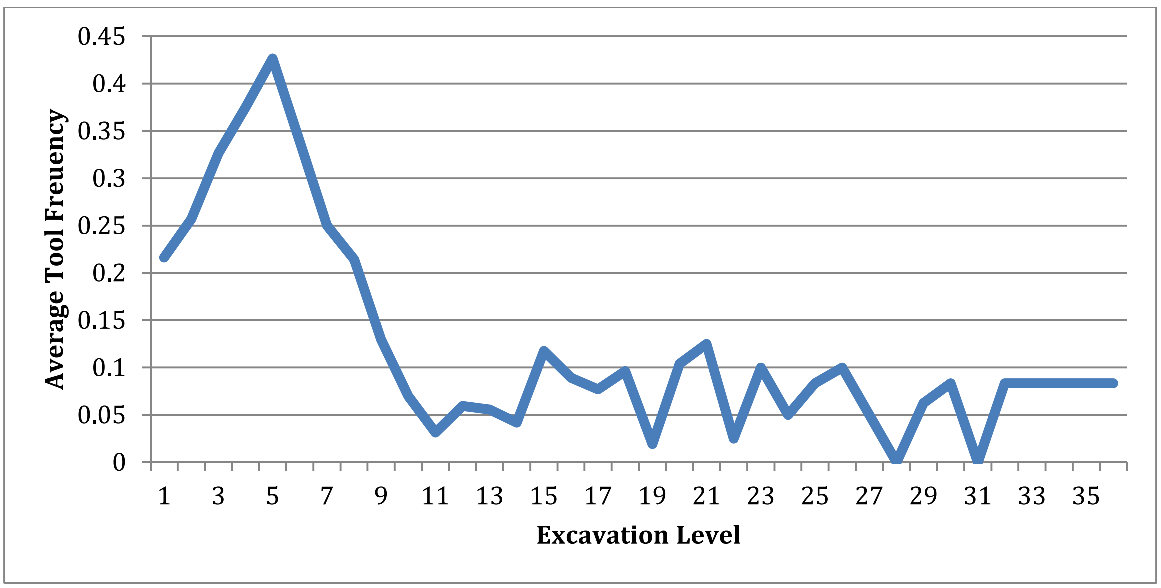

Figure 7.7: Average frequency of tools per square meter by excavation level.

discarded on site should be a reflection of site occupation span. Longer term occupations should therefor produce not only larger, but more diverse assemblages since even long use-life tools will have a greater chance of being discarded on site.

The assemblage of tools was divided into 34 artifact classes, including 28 classes of flaked stone tools, as well as ground stone, bone awls, bone beads, miscellaneous bone tools, and shell artifacts (Table 7.2). Ceramics were not considered for this analysis of assemblage diversity because pottery was not a part of hunter-gatherer's tool kits in this region until the start of the Early Ceramic period, so including ceramics would unfairly increase the diversity of tool classes within the Ceramic component.

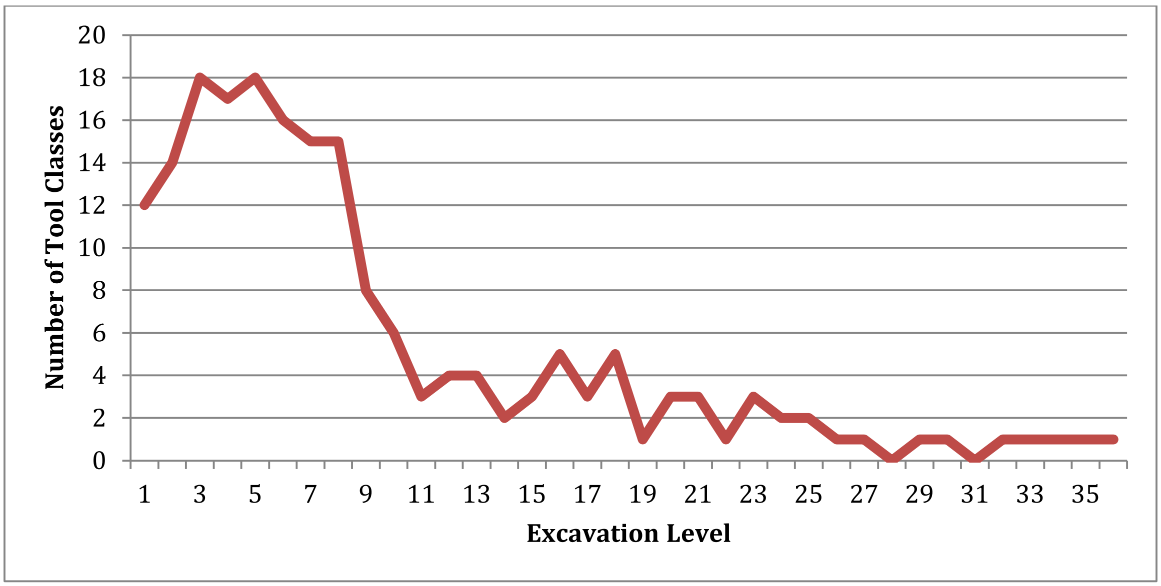

Figure 7.8: Tool class diversity by excavation level

The diversity of tool classes discarded at Kinney Spring mirrors the tool and debitage frequency data, showing a sharp increase in diversity around level 9, just below the Ceramic component (Figure 7.8; Table 7.3). Diversity increases continuously through level 3. Although there is a decline in tool diversity within levels 1 and 2, these levels still feature much greater diversity than any of the earlier Archaic levels.

The relationship between assemblage size and diversity is important to consider. Thomas (1983:425-430) has demonstrated that assemblage diversity is positively correlated with assemblage size, and argues that measures of diversity must be applied carefully. The diversity of tool classes at Kinney Spring shows a similar relationship between assemblage size and diversity. The increase in assemblage size that occurs within the Ceramic component is associated with a considerable increase in assemblage diversity (Figure 7.9). However, even if large assemblages are statistically more diverse, these variables are still important for a discussion of site-level occupational intensity.

As discussed earlier, the larger assemblage size of the Ceramic component may, in part, be affected by the larger amount of area excavated for the upper levels. However it is also a product of increasing occupational intensity at the site. While an increasing assemblage size could be the product of longer occupation span, larger on-site population, or some combination of the two, the diversity of the tool assemblage suggests that longer occupation span was a contributing factor to the larger, more diverse Ceramic period assemblage. In this case, greater diversity is not simply the product of a larger sample size. Instead, larger sample size and greater assemblage diversity are both the products of

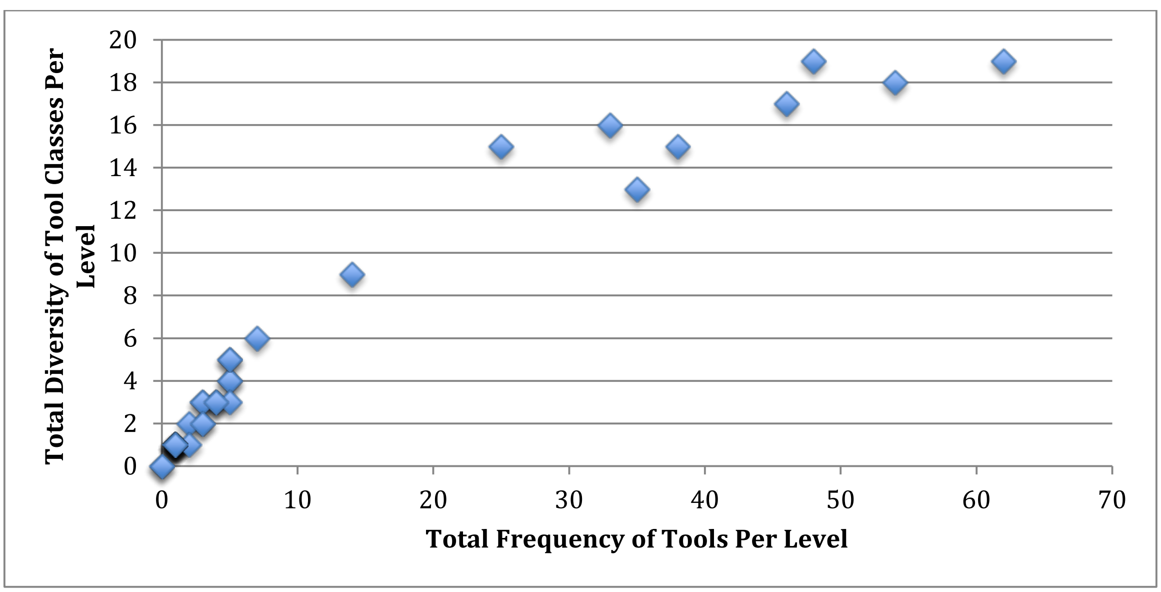

Figure 7.9: Scatterplot showing positive correlation between assemblage size by level, and tool class diversity.

Table 7.2: Frequency of Tools by Tool Class. See Chapter 3 for a detailed description of individual tool classes.

Tool Class	Frequency
Projectile Point	78
Misc. Hafted Biface	8
Hafted Knife	5
Hafted Scraper	3
Early Stage Biface	8
Mid Stage Biface	20
Late Stage Biface	16
Preform	22
Early Stage Bifacial Knife	4
Mid Stage Bifacial Knife	10
Late Stage Bifacial Knife	17
Early Stage Bifacial Scraper	2
Mid Stage Bifacial Scraper	2
Drill	1
Chopper	1
End Scraper	3
Side Scraper	3
Disto-Lateral Scraper	12
Scraper Fragment	3
Spokeshave	2
Multidirectional Core	21
Bipolar Core	1
Tested Cobble	3
Retouched Flake	46
Edge Modified Flake	25
Multi-Functional Tool	2
Undetermined Tool-Distal Tip	27
Undetermined Tool-Edge Frag.	39
Bone-Awl	9
Bone-Bead	1
Bone-Misc.	2
Handstone	23
Netherstone	3
Shell	3

Table 7.3: Summary of tool frequency and diversity by excavation level.

Level	Units Dug	Tool Frequency	Tool Classes	Debitage	Average Tools per Square Meter	Average Tool Classes per Square Meter
1	36	35	13	878	6.10	0.09
2	36	38	15	1114	7.74	0.10
3	36	48	19	1391	10.23	0.13
4	36	54	18	1637	12.04	0.13
5	33	62	19	1724	13.06	0.14
6	31	46	17	1276	10.29	0.14
7	30	33	16	1605	13.38	0.13
8	28	25	15	584	5.21	0.13
9	27	14	9	566	5.24	0.08
10	25	7	6	230	2.30	0.06
11	24	3	3	215	2.24	0.03
12	21	5	4	310	3.52	0.05
13	18	5	4	127	1.67	0.06
14	18	3	2	98	1.44	0.03
15	17	4	3	125	1.95	0.04
16	14	5	5	108	1.93	0.09
17	13	4	3	152	2.92	0.06
18	13	5	5	195	3.75	0.10
19	13	1	1	111	2.13	0.02
20	12	3	3	107	2.06	0.06
21	10	5	3	118	2.68	0.08
22	10	1	1	103	2.58	0.03
23	10	4	3	153	3.83	0.08
24	10	2	2	61	1.53	0.05
25	9	3	2	78	2.17	0.06
26	5	2	1	82	3.42	0.05
27	5	1	1	112	4.67	0.05
28	5	0	0	86	3.58	0.00
29	4	1	1	72	3.60	0.06
30	3	1	1	31	2.58	0.08
31	3	0	0	33	2.75	0.00
32	3	1	1	30	2.50	0.08
33	3	1	1	7	0.58	0.08
34	3	1	1	4	0.33	0.08
35	3	1	1	6	0.50	0.08
36	3	1	1	3	0.38	0.08

increasing occupational intensity. Tool diversity suggests that longer occupation span is a contributing factor to this trend.

Architecture

Further evidence for increasingly sedentary occupations comes from the house feature excavated at the site (Figure 7.10). There is a general relationship between energy invested in housing and length of anticipated occupation. Structures constructed for longer-term occupations should reflect a greater investment of energy in their construction (Binford 1990; Smith 2003). The Kinney Spring structure features a dry-laid rock foundation, and a proposed semi-subterranean basin-shaped floor. Similar Early Ceramic period rock-walled structures are rare in the area, but include Structure 2 from the Valley View site (Brunswig 1999), and two rock-walled structures from the Lindsay Ranch site (Nelson 1971). The construction of a rock wall foundation represents a considerably greater investment of energy compared to more common and ephemeral types of architectural features in the area such as stone circles (Morris et al. 1983), and shallow basin houses that lack a similar stacked rock foundation (Shields 1998; Smith 2003).

Additionally, the units surrounding of the structure contain the densest concentrations of debitage, tools, and bone and were interpreted in excavation notes to be a midden from the occupation of the structure (Figures 6.11-6.13). The formation of secondary refuse deposits outside of a structure is also evidence of a longer-term occupation of that feature (Smith 2003).

Figure 7.10: House feature (Feature 30) looking northeast during excavation, circa 1985. Photograph on file, Archaeological Repository of Colorado State University.

As discussed in Chapter 6, this structure was likely constructed during the second half of the Early Ceramic period, however further work is need to more precisely define when this structure was occupied. The interior hearth from level 12 of unit E19 (Feature 54) is suggestive that this may have been a seasonal winter occupation. This structural feature is interpreted as supporting evidence that longer, more sedentary occupations contributed to increasing occupational intensity at the site.

Hafted Tools

The final line of evidence to consider for this analysis is the accumulation of hafted tools. While there are most likely other forms of once-hafted tools in the Kinney Spring assemblage such as knives and scrapers, this discussion considers projectile points because they can be easily identified as hafted tools based on their design. The underlying premise of this discussion is that longer-term occupations should show greater evidence of tool maintenance activities. Because replacing hafted tools is one of the most common types of tool maintenance for hunter-gatherers, long-term occupations should contain a high frequency of once hafted tools, especially because these tools tend to accumulate where they were replaced from their haft (Keeley 1982).

Presumably, because longer occupations have a greater amount of down time, this is the result of scheduling these maintenance activities during periods when time stress is low (Torrence 1983). In order to avoid interfering with subsistence activities when time stress is high, such as when game is encountered during a hunt, the maintenance of these tools is likely to occur in camp during longer-term occupations.

The total frequency of projectile points, hafted knives, and basal fragments (tips were excluded) per level shows the same sharp increase just around the Archaic-Late Prehistoric transition as seen with the debitage and tools (Figure 7.11). However in this case, the excavation bias created by the decreasing amount number of units excavated with depth makes this increase difficult to interpret. Because the number of units excavated decreases steadily with depth, the low overall sample size of projectile points is affected by small frequencies. For instance, even a single point can produce point densities similar to the Ceramic component (Figure 7.12). A similar lack of patterning is seen when looking at the percentage of the total assemblage, by level, comprised of projectile points. For example, only one tool (a projectile point) was recovered from level 32. Therefore projectile points comprise 100% of the entire tool assemblage for this level. Because it contains the largest total assemblage, the percentage of the Late Prehistoric component assemblage comprised of projectile points is actually the lowest for the entire site (Figure 7.13).

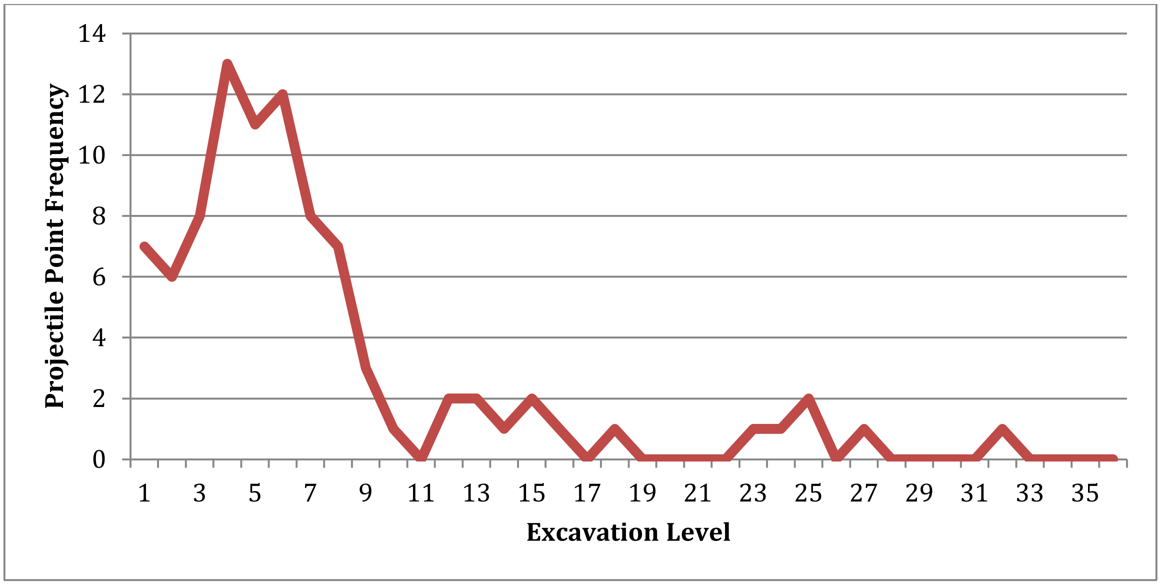

Figure 7.11: Total frequency of projectile points per excavation level.

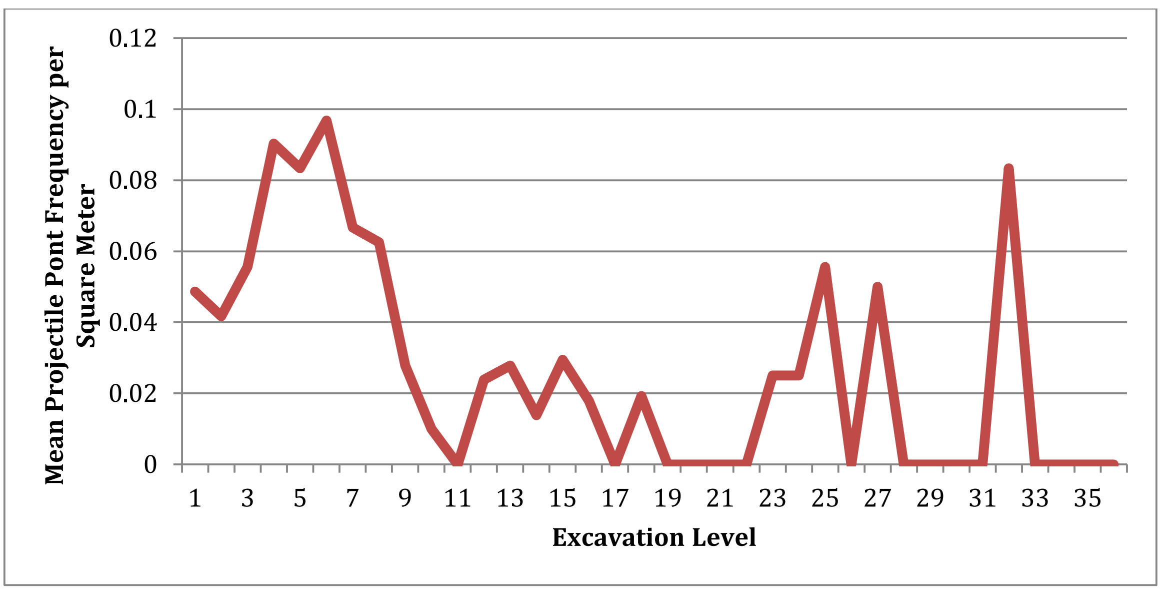

Figure 7.12: Mean frequency of projectile points per square meter by excavation level.

This does not change the fact that the Ceramic component has a high frequency of projectile points, however it makes comparisons between Ceramic and Archaic period occupations difficult.

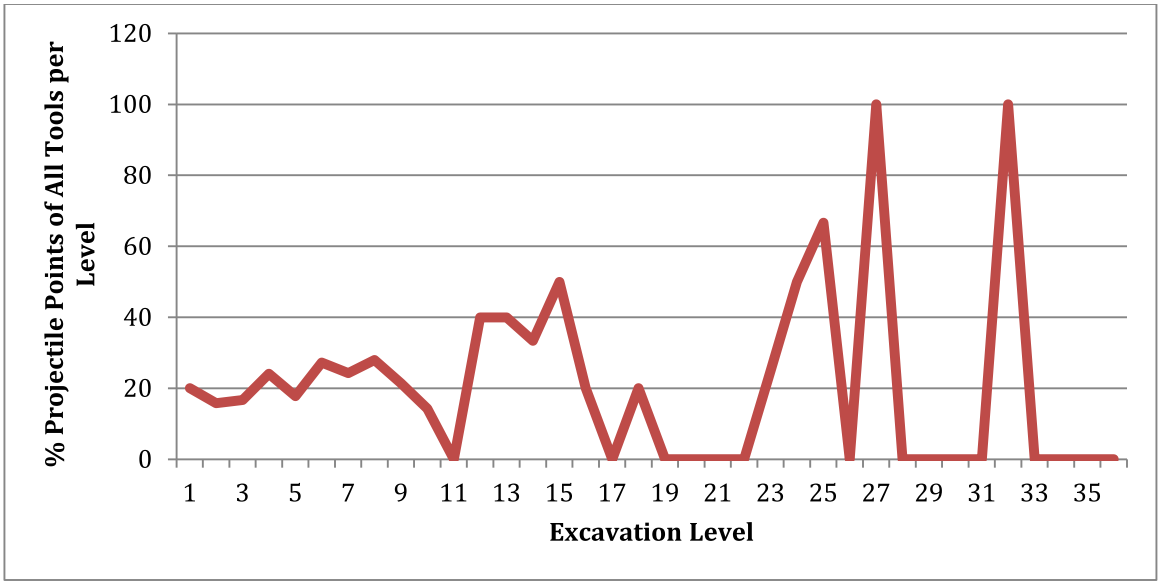

Figure 7.13: Percentage of all tools per level comprised of projectile points.

Despite these interpretive issues, the projectile point density is the highest in the Ceramic component. While the deeper levels from the Archaic component do show spikes in projectile point density that rival the Ceramic component, these are produced by a single artifact from a single level. Following these spikes, the point density drops off just as sharply. In contrast, the Ceramic component shows consistently high densities of projectile points per square meter throughout the upper eight levels. Additionally, as with debitage and tool frequencies, the drop off in projectile point density for levels nine through 20 does not reflect the linear decrease in excavation sample size which would be expected if the number of projectile points was purely a function of the number of units excavated. The high frequency of previously hafted tools, indicative of tool maintenance, is another line of evidence pointing towards longer occupation spans.

Summary

The transition to the Early Ceramic period is associated with a regional increase in population, and a landscape-level, regional increase in occupational intensity. In response to increasing population pressure, occupations of campsites became increasingly sedentary. At Kinney Spring, the data suggests that around 1800 years ago, corresponding with the beginning of this regional increase in population, occupations of the site became much more intensive. The site-level increases in occupational intensity also correspond closely with the first appearance of arrow points and pottery at the site. The assemblage reflects this through larger accumulations of debitage and tools, and it is likely that a combination of larger group size as well as longer occupation span contributed to this. Discerning the effects of group size from occupation span is difficult, however the increasingly diverse assemblage of tools suggests that occupation at Kinney Spring did become more sedentary during this time. The presence of a substantially constructed architectural feature is also strong evidence for a longer occupation span, as is the high frequency of once-hafted tools.

These data suggest that the transition to a more sedentary occupation at Kinney Spring occurred relatively abruptly in response to regional demographic changes. Prior to the appearance of pottery and arrow points at the site, the frequency of debitage and tools fluctuated by level, and any increases in artifact frequency were small and always followed by decreases. In contrast, the Ceramic component shows an abrupt, continuous increase in total assemblage size and tool class diversity that peaks around levels 3-4. It is unclear whether the decrease in artifacts in the upper 3 levels is the result of changes in site use, or the product of excavation methods. The resolution of the data is too course to define the pacing of these changes any more specifically, but it suggests that occupational intensity at Kinney Spring increased throughout the Early Ceramic period and peaked some time prior to the Middle Ceramic period transition. The house feature, which dates to the second half of the Early Ceramic period, supports this. This is interpreted to suggest that both site level occupational intensity and occupation span increased at the onset of the Early Ceramic period in response to increasing regional population pressure, which will be discussed in greater detail in Chapter 8.

CHAPTER 8: SUMMARY AND DISCUSSION

This chapter will provide a brief summary of the analyses conducted in this thesis and outline the main points of each chapter. Because the Late Prehistoric component has been shown to have been occupied primarily during the Early Ceramic period, the bulk of this chapter will be spent discussing Kinney Spring in the context of what is presently known about the Early Ceramic period and consider how the site fits in with the changes associated with this time. Theoretical perspectives derived from Human Behavioral Ecology are then applied to explain how and why these changes occurred.

Summary

Based on the presence of diagnostic Early Ceramic period artifacts, the Late Prehistoric component has been defined for Kinney Spring as the upper eight excavation levels within the main excavation area. The frequency of pottery and arrow points increases above this level, but none are found below it, with the exception of artifacts from the fill of the rock walled shallow basin house. The Late Prehistoric component was predominantly occupied during the Early Ceramic period. Evidence for later occupations comes in the form of a single side-notched triangular arrow point, and plain-ware vessel with an out curving rim, suggesting that people returned to the site more recently, however with greatly reduced occupational intensity.

The radiocarbon record suggests that the site was returned to multiple times over the course of an 800-1000 year span. The 11 radiocarbon dates from the Late Prehistoric component provide a continuously overlapping sequence of dates that span the entire Early Ceramic period.

The distribution of debitage also supports multiple reoccupations over the course of the Early Ceramic period. There are no sterile levels and debitage is distributed vertically and horizontally throughout the Ceramic component. Additionally, multiple hearth features are were identified in every level within the Ceramic component indicating multiple occupation surfaces within this component. The definition of discrete cultural levels within the Ceramic component is difficult given the resolution of the available data. In the absence of any breaks in the accumulation of debitage or a fine grained definition of the site's stratigraphy, the Ceramic component can best be described as a single continuous cultural level comprising multiple reoccupations of the site. These occupations were sufficiently intense to be archaeologically indistinguishable.

This does not imply that occupation at Kinney Spring was static during this time. Evidence suggests that occupation at Kinney Spring increased in intensity over the course of the Early Ceramic period. The total frequency of debitage, which is known to be sensitive to changes in occupational intensity, increases by level beginning around level eight and peaks in levels four to five. The following decline in debitage frequency for levels three to one is due, at least in part, to a smaller excavation volume due to the excavation of units with level floors on a sloping ground surface. Regardless, the total quantity of debitage per level and the average frequency per square meter shows a sharp increase in the Ceramic component. This suggests a shift in how the site was occupied occurred at the onset of the Early Ceramic period. The larger amount of debitage deposited on site is interpreted to reflect longer occupation spans, a larger group size, or both.

The horizontal distribution of debitage also becomes more uneven, with greater amounts of debris concentrated in discrete locations. This supports an increasing occupation span since the formation of secondary refuse deposits is associated with longer-term occupations.

The assemblage of tools is also indicative of increasing occupational intensity. The total frequency of flaked stone, ground stone, and bone demonstrates a similar sharp increase in the Ceramic component, mirroring the sudden spike in debitage. Although there are some complicating issues of a larger sample size for the upper levels, this does not appear to be the cause of this increase. Increasing total assemblage size is also interpreted to be the result of greater occupational intensity.

Because occupational intensity refers to the total amount of person hours spent on site, both the site population size and occupation span affect this. It can be difficult to discern to what degree group size and length of occupation contributes to increasing occupational intensity, however there are a couple lines of evidence to suggest that occupation span did increase during this time.

The diversity of the tool assemblage, measured by the number of different tool forms included, shows a sharp increase during this time. The diversity of tools that accumulate on a site has been shown to increase with occupation span, since longer occupations increase the likelihood that all tools in systemic context, even long use life tools will be discarded there. Although there is a correlation between sample size and tool class diversity, a larger, more diverse assemblage is interpreted to suggest that a longer occupation span at the site is a contributing factor to increasing occupational intensity.

Strong supporting evidence for increasingly sedentary occupation also comes from the architectural feature, interpreted as a domestic structure. The correlation between energy invested in housing and anticipated length of occupation is well documented, and the structure at Kinney Spring is more substantially constructed than other architectural features in the region. The presence of secondary refuse deposits immediately outside of the structure support the interpretation that this feature was occupied for a relatively long period. An internal hearth feature suggests a winter occupation of the structure.

Taken together, the evidence from Kinney Spring suggests that coinciding with the start of the Early Ceramic period, occupational intensity sharply increased at the site. It is suggested that occupational intensity increased through time and peaked during the second half of the Early Ceramic period. The lack of substantial evidence of Middle Ceramic or Protohistoric occupations suggests that following this peak in occupational intensity, the role of Kinney Spring within regional settlement patterns shifted and the site fell out of regular, intensive use.

Discussion: Sedentism and Residential Mobility in the Early Ceramic Period

What these data are interpreted to reflect is that hunter-gatherer settlement patterns shifted in response to large-scale regional demographic changes, and that this shift is visible in the archaeological record at the site level. Certain locations were selected for frequent reoccupation, and these occupations became increasingly intensive over time. It follows that as more people spend a longer time living in one location, the archaeological record should reflect this through a greater accumulation of artifacts and features.

Comparable examples of Late Archaic residential campsites containing substantial architectural features are absent in the archaeological record of the South Platte River basin. Most Late Archaic period campsites are short-term logistical open camps, with few longer-term base camps also represented (Tate 1999). This absence of architectural sites may be influenced by survey bias or poor preservation of features, however it also suggests that Late Archaic populations were practicing a high degree of residential mobility.

The increasingly intensive occupations at residential campsites like Kinney Spring represents a shift towards a more logistically organized, collector based settlement system. The forager-collector model of hunter-gatherer mobility (Binford 1980) is not meant to be a dichotomy, but rather a continuum between two different ways of moving around the landscape. Briefly, foragers make frequent residential moves between predictable resource patches, gathering food daily on an encounter basis, and moving the consumers to the resource. Food gathering is done within a relatively close radius of the main residential base camp, and there is little reliance on stored food. In contrast, collectors make less frequent residential moves, occupying residential base camps for longer spans. Rather than gathering food on an encounter basis, collectors target specific resources with small, specialized, logistical resource gathering task groups who bring those resources back to the consumers to the central location. These task groups target resources when they are available, often seasonally, and invest additional energy in the processing and storage of these resources in to be consumed by the larger group over an extended period (Binford 1980). It is critical to emphasize that these are not binary classifications, and groups are not either foragers or collectors. Instead, mobility strategies fall along a gradient with a shifting emphasis towards more foraging or collector-based strategies. For hunter-gatherers in the South Platte Basin of northern Colorado, the Archaic-Late Prehistoric period transition did not see a shift from Archaic foragers to Early Ceramic collectors. Instead, it makes more sense to view this transition as a shift towards the collector end of the spectrum, with a greater emphasis on logistical resource procurement along with a decrease in residential mobility.

Within any settlement system, we should expect to see a high degree of variability in site types, assemblages, and features. In an increasingly logistically organized system, such as the rotary model proposed by Benedict (1992), large seasonal residential base camps like Kinney Spring should be the least common, while smaller short term camp sites and logistical sites are encountered more frequently (Figure 8.1). This is the due to the nature of a logistically organized settlement system where frequent logistical excursions are necessary to provision a single residential base.

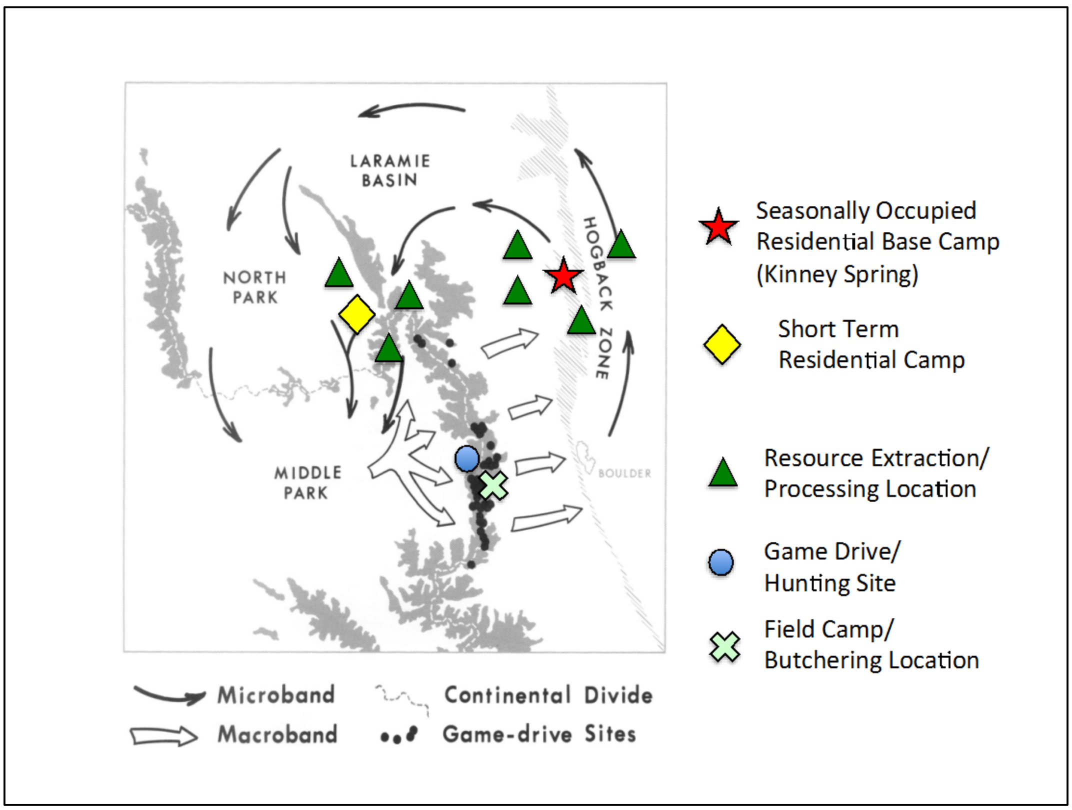

Figure 8.1: Hypothetical location of various site types within Benedict's rotary model of seasonal transhumance (Benedict 1990). Note the high ratio of logistical and short-term sites to seasonally occupied base camps.

The archaeological record of the South Platte River basin conforms to these expectations, and comparable residential sites along the base of the Front Range are rare compared to other types of sites. Other Early Ceramic residential sites containing architectural features include the Valley View site (Brunswig 1999), the Lindsay Ranch site (Nelson 1971), and the Box Elder-Tate Hamlet (Tucker et al. 1992), and the Magic Mountain site (Irwin-Williams and Irwin 1966; Kalasz and Shields 1997), which will be discussed in comparison to Kinney Spring to the highlight the variation in residential campsites. An additional architectural feature was also recovered at the Bayou Gulch site (Butler 1986; Gilmore 1991) however data regarding the architectural feature from these sites is problematic and will not be presently used for comparison.

The Valley View site (5LR1085) is located in the foothills of Larimer County, west of Loveland Colorado. Feature 2 is described as a shallow basin house featuring a dry-laid stacked rock wall, similar to the structure at Kinney Spring. However artifact counts are considerably lower at Valley View, which contained roughly 500 pieces of debitage, and just 14 projectile points (Brunswig 1999). The assemblage also contained an unspecified amount of chipped stone tools and ground stone was described as the most numerous artifact class at the site, although exact frequencies are also not specified. This site was interpreted as having been reoccupied on multiple occasions, however the small assemblage size suggests that these occupations were considerably less intense than at Kinney Spring.

The Lindsay Ranch site (5JF11), located in the foothills northwest of Denver, contains two rock walled architectural features, which did not contain a semi-subterranean basin-shaped floor (Nelson 1971). The artifact assemblage from this site is dominated by projectile points, while containing very sparse quantities of other flaked stone tools and just 85 pieces of debitage (Johnston 2012). No ground stone was recovered from this site.

The relatively sparse assemblage from this site, in comparison to Kinney Spring, suggests a very different, low-intensity use of these structures.

Two Early Ceramic basin houses were excavated at the Box Elder-Tate Hamlet (5DV3017), under the present location of the Denver International Airport (Tucker et al. 1992). These features did not contain any sort of rock wall or foundation, as was found at Kinney Spring, Valley View, and Lindsay Ranch. The assemblage from this site is most comparable to Valley View in size, based on the frequency of projectile points and debitage. Again, this suggests a much lower degree of occupational intensity of this site.

While Kinney Spring contains a larger assemblage of tools and debitage than most of the excavated Early Ceramic residential sites that contain architectural features, it is not the largest of this site type. While the architectural feature excavated at Magic Mountain was not intact enough to draw direct comparisons to the feature at Kinney Spring, the Early Ceramic component at this site contained 1,651 flaked stone tools and 32,019 pieces of debitage, a considerably larger assemblage than was recovered from Kinney Spring.

These data suggest a wide range of variation in the occupation of residential architecture within the regional Early Ceramic settlement system. This may imply that different groups were practicing different settlement strategies, or that architectural features were constructed at various site types within the settlement system, and that occupation span and the frequency of reoccupation varied among these sites. Additionally, certain locations like Kinney Spring and Magic Mountain may have been exceptionally well suited for long-term, seasonal occupations, making these locations prime real estate within the Early Ceramic settlement system.

Table 8.1: Assemblage comparisons of Early Ceramic sites representing different parts of a settlement system.

	Kinney Spring (5LR144c)	Cass (5WL1483)	Rock Creek (5BL2712)	Scratching Deer (5BL69)	Murray (5BL65)
Reference	Perlmutter 2015	Kalasz et al. 1992	Gleichman et al. 1995	Benedict 1975b	Benedict 1975a
Site Type	Residential base camp.	Lithic workshop/ field camp.	Residential camp site/ field camp.	Hunting Field Camp.	Hunting/ game drive.
Inferred activities	Resource processing, lithic reduction and maintenance, miscellaneous domestic activities	Lithic reduction, resource processing	Lithic reduction, projectile point manufacture, resource processing	Lithic reduction, tool maintenance, butchering, resource processing	Communal hunting, butchering, tool maintenance
Projectile Points	64	13	36	8	25
Flaked Stone Tools	305	476	118	2	4
Debitage	10,209	6,879	2,920	132	197
Ground Stone	26	33	142	84 (from 1 slab)	
Bone Tools	13		2		
Pottery	138	26	247		

As discussed previously, residential campsites comprise a small part of the Early Ceramic period settlement system. This system is comprised of a variety of site types, including seasonally occupied residential base camps, shorter-term base camps, and logistical sites including a variety of resource extraction and processing locations as well as associated short-term field camps. While the residential side of the Early Ceramic settlement pattern is represented by a small sample of sites, logistical activity is more strongly represented. These sites are diverse in terms of their physical location on the landscape as well as the size and composition of associated assemblages (Table 8.1). The archaeological signature of these logistical sites provides a strong contrast to the intensive residential occupations at Kinney Spring and highlights the variability encompassed in this system.

Brunswig (1996) argues that Early Ceramic period occupations featuring architecture and secondary midden deposits provides tentative evidence for increasing residential stability within a collector subsistence pattern. Kinney Spring provides further support that certain locations within the Early Ceramic settlement system were intensively reoccupied as residential base camps for long periods.

The transition to an increasingly sedentary occupation of residential campsites during this time was not accidental or random. Brunswig (1996) proposes that a more mesic climate resulted in a more productive landscape, which allowed for a decrease in residential mobility and the adoption of a centrally based collector lifestyle. I argue, in light of our current understandings of Late Prehistoric period demography in the South Platte River basin, that it was increasing regional population pressure that provided the primary push to adopt a more sedentary mobility pattern. Certainly a more productive landscape and favorable climatic conditions are closely related to population growth, as well as the ability of a landscape to support long term residential occupations. However basic principles of human behavioral ecology suggest that increasing population pressure, and greater competition for limited resources, provides the strongest impetus for changing mobility and subsistence strategies (Winterhalder and Smith 2000).

A larger population needs to consume more resources in order to survive, which can result in the over-exploitation of those resources. In response to increasing population pressure and more competition for resources, hunter-gatherers intentionally adopted a package of related changes in mobility, subsistence, and technology designed to maximize returns from an increasingly limited supply or resources. Multiple lines of evidence, which will be summarized in this discussion, suggest this is the case. This discussion considers both the motivating factors influencing the decision to decrease residential mobility as well as other associated changes seen during the Early Ceramic period that allowed this change to take place.

Changes in mobility and subsistence are closely related, and decreasing residential mobility may be understood through associated changes in subsistence strategies. Presumably, as resources are depleted, encounter rates with these resources also declines. According to human behavioral ecology, as encounter rates with highly ranked resources decreases, dietary breadth increases to include a greater proportion of lower ranked foods. These foods typically require greater time and energy invested in their processing (Winterhalder and Smith 2000). As groups invest more energy in logistical mobility and processing of locally available plant products, there should be a decrease in energy invested in residential mobility as long as the costs of moving exceeds the cost of staying in place.

Evidence suggests that decreasing mobility at a regional level in the Early Ceramic period was associated with an increase in dietary breadth and intensive plant processing. The Early Ceramic period in the South Platte River basin of Colorado can be thought of as a time of land-use intensification. Thoms (2009:575) defines land use intensification as the "expenditure of more energy per unit area to recover more food from the same landscape to feed more people". He proposes that as increasing population and land use intensification should result in an increase in the reliance on hot rock cooking, and greater frequencies of FCR hearths in the archaeological record. Troyer (2014) documents an increase in Fire Cracked Rock (FCR) hearths that occurs throughout northern Colorado at the onset of the Late Prehistoric period. FCR hearths are a distinct type of thermal technology used for the processing of a variety of plant products. The increase in FCR hearth technology around this time signals an increase in dietary breadth and reliance on low ranked plant foods that require more intensive processing. Troyer (2014:115) argues that the increase in FCR features suggests an increasing reliance on plant foods as a result of the need to extract the greatest amount of subsistence resources from the landscape. Although the feature record at Kinney Spring is incomplete, and macrobotanical data is lacking, numerous FCR concentrations and hearth features were encountered within the Ceramic component suggesting that this form of land use intensification was taking place at the site during the Early Ceramic period. It is probable that the decision to occupy the site for longer periods was at least partially possible due to a shift towards a reliance on intensively processed, low ranked plant foods and a centrally based mobility strategy.

A second component of shifting subsistence strategies associated with decreasing residential mobility involves increasing logistical mobility. Decreasing residential mobility is often associated with a "reorganization" of how energy is spent on mobility, rather than an overall reduction of mobility for every member of a group (Kelly 1992:52). In northern Colorado, this can be seen in the intensification of big game communal hunting in the high country of the southern Rocky Mountains during the Early Ceramic period. In addition to an increasing expenditure of energy in the processing of low ranking, locally available plant foods, there is also evidently a greater amount of energy being spent on travelling to, landscape modification of, and large game predation in different ecological zones. High alpine game drive sites are well documented in the high country of the Colorado Front Range (Benedict 1975, 1992, 1996, 2000, Cassells 2000, LaBelle and Pelton 2013). These elaborate and complex structures were constructed to facilitate communal hunting of large herds of game animals in the alpine tundra (Benedict 1992). Presumably a successful hunt at a game drive system would have resulted in enough meat to justify the impressive expenditure of energy necessary to travel to the high country, operate a game drive, process the meat, and transport the meat and associated animal products to another location.

These structures were constructed and in use from the late Paleoindian period (Benedict 1996) throughout the Archaic and Late Prehistoric periods (Benedict 1975; Benedict 1996; Benedict 2000; Cassells 2000; LaBelle and Pelton 2013). However, the Early Ceramic period saw an intensification of the utilization and construction of these alpine hunting systems. Both the Sawtooth game drive site (Cassells 2000) and the Olson site (LaBelle and Pelton 2013) were initially constructed during the Early-Middle Archaic periods. However based on radiocarbon dates, lichenometric dates, and diagnostic projectile points the most intensive periods of wall construction and game drive use occurred during the Early Ceramic period. The Murray site (Benedict 1975a), a rare single component game drive site, was apparently constructed and used entirely during the late Early Ceramic period. Benedict (1992) argued that these sites were occupied during the late summer and fall.

In light of the other evidence for changing subsistence strategies and increasing occupation span, this intensification of game drive use during the Early Ceramic period may be the product of increasing logistical mobility to provision long term residential occupations at lower elevations. LaBelle and Pelton (2013:60) propose that the over exploitation and depletion of resources at lower elevations as a result of increasing population may have "pushed" hunter-gatherers from lower elevations to increase their utilization of the high country in order to supplement the decreasing yield of locally available resources. Combined with increasing utilization of low ranked plant resources and low residential mobility, this strategy may have been the most efficient means of occupying an over-utilized landscape.

Although no direct association between Kinney Spring and these game drive systems can be made, the location of Kinney Spring in the foothills ecotone and relative proximity to the high country suggests that these two locations could be a part of the same centrally based, logistical mobility strategy. Assuming Kinney Spring was a seasonally occupied winter camp during the Early Ceramic period, logistical excursions to the high country during the fall may have been necessary to ensure an adequate supply of calories and supplies for clothing were available throughout the duration of the occupation.

Finally, the addition of two new technologies to the systemic inventory provided additional advantages for hunter-gatherers living in an increasingly pressured environment. Both the bow and arrow and pottery would have both provided clear advantages in a decreasingly mobile lifestyle in response to the need to efficiently extract the maximum amount of subsistence resources from a limited amount of space. Gilmore (2008:83) argues that the Early Ceramic period population increase may have been one of the driving mechanisms in the adoption of new technologies seen during the Early Ceramic period, since they both occur roughly contemporaneously. Because the bow and arrow and pottery were both in existence in other regions before they appear in northern Colorado, he argues that these technologies were actively adopted when regional conditions made it beneficial to do so.

Others have also argued that the adoption of new weapon technology occurs in response to changing conditions rather than as part of a passive trajectory of technological development. Archaeologists have argued that the European adoption of the bow and arrow in the Upper Paleolithic was a response to increasing population pressures and a need to hunt more efficiently (Churchill 1993). This argument makes sense when once considers the advantages of bow and arrow hunting. The bow can be used to target a wide range of prey species and can be used with all known hunting techniques employed by hunter-gatherers. Because this weapon system is more versatile, it improves the users success rates because it allows them to quickly adjust their hunting technique to local terrain and the prey being pursued (Churchill 1993:18). Additionally, the greater accuracy of the bow and arrow (compared to atlatl) improves the users' success rate, and minimizes the risk of returning from a hunt empty handed. The bow and arrow also encourages expansion of dietary breadth because of this versatility and its ability to be used upon a wide range of prey, including small mammals and birds (Bettinger 1999). Increased population pressure and competition for the same resources would provide a clear push to adopt a more versatile hunting technology that increases the users chance of a successful hunt. When faced with decreasing prey encounter rates, the advantages of a more versatile, and more successful weapon are obvious.

The presence of dart points in the Early Ceramic period assemblage suggests that the bow and arrow was initially added to the technological inventory along side, rather than in place of, dart and spear hunting techniques. The replacement of the former technology over the latter due to the greater efficiency of the bow and arrow is likely an oversimplification. A consideration of ethnographic data suggests that in fact atlatl and dart hunting is more efficient than the bow and arrow in terms of return rates of meat (kg) per hour (Shott 1993). For hunter-gatherers who hunt with both the arrow and dart, the dart accounts for much fewer kills, however the dart was used specifically to target large bodied, high yielding prey. In contrast, the bow and arrow was used much more frequently but to target a more diverse range of smaller prey. When used with "judicious restriction to contexts of optimal use" (Shott 1993:438), the dart retains advantages over the bow and arrow and vice-versa. In the context of land-use intensification, hunter-gatherers in northern Colorado would have recognized the advantages of both weapon systems in different applications and adopted the bow and arrow because of its versatility and advantages over the atlatl and dart for the pursuit of a diverse range of prey. However because the dart is more efficient in select circumstances, it was retained to ensure that the most efficient weaponry was available for all potential hunting encounters.

Pottery provides two primary advantages for hunter-gatherers in the context of decreasing residential mobility and land use intensification. The first advantage of pottery is that it allows a wide range of plant and animal products to be processed with greater efficiency and less effort than hot-rock boiling in skin bags or baskets. It also allows the maximum amount of nutrients to be extracted from a limited supply of foods, particularly ones that must be cooked in water to become digestible, allowing more people to be fed from a limited supply of food (Rice 1999).

Another equally important advantage of cooking pottery, particularly for the occupants of Kinney Spring, is its efficient use of fuel wood. Bettinger et al. (1994) note that pottery is frequently used by hunter-gatherers in environments where fuel wood is scarce. The advantage of pottery in these contexts is to: "…extend the adaptive range of hunter-gatherers by increasing the utility of locally available fuels needed to prepare a broad spectrum of resources that frequently includes plants. This permits the use of more marginal habitats and more intensive use of traditional habitats for longer periods (i.e. with decreasing residential mobility) than would otherwise be possible." (Bettinger et al. 1994:95). As occupation span increases, locally available fuel wood is rapidly depleted, so a cooking technology that is more conservative in its fuel consumption would have been beneficial for long-term occupations at Kinney Spring where trees are relatively sparse.

The general focus of this thesis is increasing occupational intensity at Kinney Spring, which is interpreted to be, at least partially, the result of decreasing residential mobility. The archaeological record for northern Colorado suggests that a decrease in residential mobility occurred, and that this transition was made possible by a package of changes in subsistence and technology that allowed people to occupy one location on the landscape for greater lengths of time. Both the population pressure hypothesis, as proposed by Gilmore (2008) and expanded on in this discussion, as well as a favorable climate and more productive landscape (Brunswig 1996) are sound explanations for what motivated people to adopt these changes. However, explanations of what and how people acted in the past is much easier to reconstruct than why they did so (Eerkens 2004). Population pressure and climate models provide a solid foundation for addressing these changes, however they also over simplify the motivations of why people chose to behave the way they did and fail to take into account the role of social factors in cultural change (Bettinger 1999; Eerkens 2004). The point of this argument is that there may not be a direct, down the line relationship between changing demography (or climate) to changes in subsistence and technology, and ultimately, to social changes. Rather, these factors most likely interact with each other in more complex ways than basic models of population pressure would suggest.

For example, in the Great Basin of western North America, the bow and arrow and pottery both appear in hunter-gatherer assemblages around the same time we see a regional increase in population, similar to what we see in the South Platte River basin of Colorado. However the appearance of these technologies in the Great Basin at this time may not simply be the result of dietary breadth expansion and land use intensification, as the basic population pressure model would suggest. Instead, increasing population pressure may have favored a changing relationship between food producers and consumers. Both the bow and arrow (Bettinger 1999) and pottery (Eerkens 2004) are technologies uniquely suitable for use by an individual to provide food for their own consumption, rather than for the group as a whole. For this reason, these technologies may have been adopted because they facilitated a shift towards the privatization of food, which in turn made possible a greater reliance on personal supplies of stored food. This allows individuals to extract the maximum benefits from their food gathering and processing efforts, as well as create surpluses to reduce the risk of future shortfalls and anticipated decreasing returns.

Gilmore (2008) illustrates another example of the relationship of social changes associated with the population pressure hypothesis. He argues, based on changes in mortuary practices and burial locations in the Early Ceramic period, that increasing population pressure resulted in a new perception of the landscape, and a greater sense of territoriality. As populations grew, hunter-gatherers were eventually forced to divide up into smaller groups and these groups became more and more spatially constrained as the number of these groups occupying the landscape increased. This limited peoples' access to a wide range of resources and forced them to intensify their use of locally available resources. In response people interacted with the landscape differently. Groups became more territorial over smaller geographic areas to ensure their group had sufficient access to resources to survive. Changing rituals and the establishment of sacred locations (burial plots) in prominent locations reinforced this changing relationship with the landscape (Gilmore 2008:101-103).

This argument is not entirely different from that proposed by Bettinger (1999) and Eerkens (2004). Similar to the privatization of production and consumption of critical subsistence resources, the shift to a more territorial sense of place could be thought of as an effort to privatize a geographic territory. This would ensure that the maximum amount of resources are available for your group, and that energy invested in the gathering of resources from this area would produce the greatest amount of returns. I bring this up not to disagree with Gilmore, but rather to suggest that social changes occurring in the region during this time should not be thought of as simply products of increasing population, changing mobility and subsistence strategies, and new technology. Instead, social factors, such as a shifting relationship between humans and their landscape might be thought of as active players in promoting the suite of changes that occurs at the onset of the Early Ceramic period.

For example, the adaptive advantages of the bow and arrow and pottery may not have been viewed as desirable by hunter-gatherers because of dietary breadth expansion but instead because by enabling them to occupy important locations for longer period; it encouraged and reinforced the changing relationship of the community to their landscape. Communal hunting may have become increasingly important not only because of the resources it provided, but because it provided a venue for groups to interact where they were not in competition with each other. By encouraging groups to work together who might otherwise be antagonistic, communal hunting might have served to resolve inter-group conflict that arose from competition between those groups for the same resources at lower elevations.

Of course, this remains speculation. The purpose of which is simply to highlight the type of social factors and motivations that a purely environmental or population-pressure based model of Early Ceramic period subsistence, mobility and technological changes tends to overlook. These social factors as well as the other documented changes in residential mobility, subsistence, and technology are the result of decisions people made in response to a changing environment. The decision to reduce residential mobility and adopt an increasingly sedentary lifestyle was one of the most influential of these changes.

What Kinney Spring shows is that certain locations were selected as being particularly suitable for more sedentary occupations and that these locations were returned to throughout the Early Ceramic period. The data suggests that as regional populations increased, people became more connected with certain locations and that these sites were subjected to increasingly intensive, longer-term occupations as the landscape-level impacts of a larger regional population became more acute. The effects of this are highly visible at the site level in the archaeological record. This reinforces the interpretation that decreasing residential mobility and adopting a more centrally based collector strategy was a critical component in the suite of adaptive strategies adopted during the transition from the Archaic to the Late Prehistoric period. On the other hand, the greater amount of relative sedentism seen at Early Ceramic period campsites such as Kinney Spring would not have been possible without associated changes in diet and technological inventory.

CHAPTER 9: FUTURE RESEARCH AND CONCLUSION

This thesis was designed to provide a foundation for future research at Kinney Spring, and along those lines the questions addressed examined general issues and trends. There is tremendous potential for future research on both site-specific topics, as well as questions about the site from a regional perspective. The following outlines some possible directions for future research on the site, however this list is by no means exhaustive.

Lithic Analysis:

The large assemblage size of both flaked stone tools and debitage provides ample opportunities to address the technological organization of the Early Ceramic period tool kit and lithic reduction strategies. For example, a decrease in mobility has been associated with an increasing reliance on informal technology as opposed to formalized tool forms (Parry 1987; Parry and Kelly 1987). A formal analysis of flaked stone tools, which could include overall tool morphology and edge wear, could address this issue, especially with regards to how a locally abundant raw material (such as the quartzite at Kinney Spring) would affect this strategy. Also, the debitage assemblage has not been formally examined for edge modified flakes, and this would provide another dimension to the question of formal vs. informal tool use at the site.

Lithic raw materials would also be useful to look at to address questions of group mobility. For example, do the lithic raw materials of the tools fit within expectations for Benedict's (1992) grand circuit model? What is the furthest identifiable lithic source at the site? Identifying mountain sources of tool stone would provide support for the hypothesis that short-term campsites and logistical sites in the high country are part of the same settlement system as long-term residential occupations in the foothills such as Kinney Spring.

Pottery Analysis

There is abundant potential for future research on the ceramics from Kinney Spring. For example, residue analysis of vessel sherds could provide valuable information about Ceramic period diet and what specific resources were being processed in these vessels. An analysis of temper raw materials would be helpful in addressing whether this pottery was manufactured locally or obtained through trade or exchange.

Site Structure

Much work remains to be done on the site structure of Kinney Spring. This research should focus on analyzing horizontal patterns in debris to identify whether specific activity areas can be defined for the site. For example, can certain areas be identified for food processing, cooking, or stone tool production based on concentrations of artifacts? Are these areas concentrated around hearths or secondary refuse deposits?

Diet

Macrobotanical evidence is entirely lacking for the site. The question of what the residents of Kinney Spring were eating is important to our understanding of Early Ceramic period subsistence strategies, especially in the context of reduced residential mobility. Unfortunately this is extremely difficult to identify at hunter-gatherer sites since plant remains are rarely preserved (Troyer 2013), and residue analysis of pottery may be the best way of getting at this information. However existing soil samples from Kinney Spring features in the AR-CSU could be submitted for flotation analysis to determine whether any macrobotanical evidence of diet can be identified.

Radiocarbon Dating

While the radiocarbon record for the Ceramic component is thorough, additional dates would further refine the chronology of occupation at the site during this time. Many additional charcoal samples from the original three field seasons remain in the AR-CSU collection. In particular, additional dates should focus on the house feature in order to more precisely define when this structure was occupied. The hearth feature (feature 54) from the occupational surface of the house would be useful for this goal.

Conclusion

The raw data from the Kinney Spring excavations has remained unchanged for 30 years, however certain aspects of the site would have almost certainly been interpreted differently if analysis were completed following the original fieldwork. The interpretive framework used in this thesis is largely the product of the past 30 years of archaeological fieldwork and research. In particular, our understanding of demographic changes in the South Platte River basin has evolved largely due to the increasing number of sites excavated for Cultural Resource Management (CRM) projects and academic research over the years (i.e. Gantt 2006; Tucker et al. 1992). This is not to say that any preliminary interpretations made about the site were wrong (Morris et al. 1984; Morris and Litzinger

1985), but rather the questions addressed in this thesis would not have been possible to ask without the prerequisite research that has occurred since Kinney Spring was excavated. On the other hand, the definition of site chronology based on diagnostic artifacts would probably not have changed significantly because Plains Woodland style pottery and arrow points were already well known of Late Prehistoric sites along the Front Range in the 1980s.

The data set from Kinney Spring is very rich, and there is a great deal of further potential for the site to enhance our understandings of various aspects of prehistoric occupation of the region. This thesis was designed to address some basic questions of site chronology, and then to use multiple lines of evidence from the artifact assemblage to place the site within a broad, regional context. Presenting this initial analysis, as well as all of the raw data from the site is intended to properly integrate Kinney Spring into a larger ongoing discussion of the Late Prehistoric stage in northern Colorado. Additional analysis of various aspects of the site in greater detail will contribute to this goal in the future.

Research on archaeological sites is ongoing, regardless of when information from the site was published or presented. Often sites are not revisited once they are excavated because there is rarely time or money to do so. New projects come along that demand attention, forcing previous projects to be set aside. However, archaeological sites are a finite resource, and while their excavation can provide a wealth of important knowledge, it also results in their destruction. Previously excavated sites like Kinney Spring, which have a high potential to inform our understanding of prehistory, should be thoroughly studied in order to extract the maximum amount of information possible from their excavation. Kinney Spring is an example of why these sites should not be confined to repository shelves. There is always the potential to return to an older excavation with new research questions and theoretical and methodological approaches to answer them. Often the types of questions that can be asked are limited by the resolution of available data, but this does not detract from the value of the data to inform ongoing research.

In the case of Kinney Spring, this was done to examine one specific aspect of Early Ceramic period settlement patterns. Specifically, the effects of decreasing residential mobility and more sedentary occupations of a residential base camp were examined at the site level and interpreted to reflect a restructuring of mobility in response to increasing regional population.

It is the primary goal of this thesis that these interpretations, and the data presented herein from Kinney Spring, be used to help define future research on both the site itself, as well as the Early Ceramic period in northern Colorado. This data was not intended to be the concluding report on Kinney Spring. Instead, this was meant to be the preliminary foundation that can be built upon and refined by further analysis. As more data becomes available through future fieldwork and analysis, Kinney Spring can be used to present a more complete picture of how hunter-gatherers in northern Colorado responded to changing pressures and environmental conditions during the Early Ceramic period, and throughout prehistory.

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Includes all Archaic and Late Prehistoric artifacts from the main excavation area.

Table A-A.1: Main excavation area artifact summary.

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/Shell
C19	1								
	2	4	2.5			0.2		1	
	3	20	21.4				1		
	4	38	23.84			3.3	1		
	5	121	134.75			43.7	1		
	6	27	46.8	3	27.9	48.1	5		1
	7	183	69.41	1	8.4	24.7	4	1	1
	8	98	40.27	2	44.4	57.1	1		
	9	15	9.14			8.1			
	10	12	1.07			9.8	1		
C23	1	56	59				1		
	2	33	28.9			4.5	1		
	3	16	18			0.2			
	4	18	12.9						
	5	13	10.1						
	6	20	12.5			41.4			
	7	33	69.5			29.8			
	8	13	16.5				1		
	9	49	61						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	10	43	42.9						
	11	23	21.6						
	12	25	31.9						
	13	7	3.3				1		
	14								
	Unknown	2	2.2				1		
	Surface	2	0.2						
	1	7	1.8						
	2	4	4.8						
	3	15	12.6						
D17	4	25	39.4			0.3	1		
	5	18	12.7			6.7	1		
	6	19	21			4.6			
	7	24	22.5			14.4	1		1
	8	5	5.9			11.6			
	9								
	1								
	2	8	5.8						
	3	39	38.4			0.2	3		
	4	26	16.86	1	1.9	130.5	1		
	5	17	25			0.2			
D18	6	31	33.62			53.4			
	7	90	121.63	3	9.2	30.2	1		
	8	1	5.1			0.6			
	9	57	23.78			3.5	2	1	
	10	58	7.23	1	9.3	7.4	3		
	11	59	15.04	1	4.8	7.1			

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	12	7	0.1			0.8			
D19	1	1	0.2						
	2	5	9.6						
	3	14	10.2						
	4			2	3.1				
	5	8	67.7			6.4	1		
	6	144	121.62			6.2	6		
	7	728	386.97	4	22.4	31.9	9	1	
	8	61	82.06	1	1.6	10.2	6		1
	9	32	32.34			13.9	3		
D20	1	3	7.4						
	2	43	16.06	3	2.6	1.2			
	3	26	62.4	4	10.6	0.9	1	1	
	4	11	117.82	7	28.3	37.3	4		
	5	88	123.4	2	18.5	32.8	5		
	6	80	72.25	1	3.2	34.7	2		
	7			1	1.5	9.9			
	8	24	31.13			17.3			
	9							1	
	10								
	11						1		
E18	1								
	2	1	1.8	2	3.4	0.5			
	3	60	110.03				1		
	4	41	50.49			3	1		
	5	60	62.96	5	25.4	0.6	3		
	6	54	99.46			0.3	2		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	7	32	13.39	1	1.2	0.2	2		
	8	169	139.1			31.4	2		
	9	336	160.13			36.73	3	1	
	10	27	71.55			8.1		1	
	11	64	61.53			22			
	12	31	61.31			11.9			
E19	1	1	0.4						
	2	10	5.4						
	3	4	0.36	1	2.5	1.4	1		
	4	19	2.76	1	3.1	1.8	3		
	5	274	118.9	2	3	16.7	8		
	6	297	104.16	1	15.3	244.63	2	3	2
	7	112	99.47	4	28.5	22.1	1		1
	8	62	139.93			27.4	4		1
	9	5	2.76			9			
	10								
	11								
	12	165	84.13	1	55.7	46	3		1
E20	Unknown	16	32.5						
	NA						2	1	
	1								
	2	8	5.3						
	3	41	122.6			6.1	1		
	4	119	208.3	2	3.4	42.2	2		
	5	166	245.5			118.5	9	3	
	6	140	330.8			168.4	2	2	
	7	6	16.1						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	8	5	16.1						
	9								
	10	13	5.5						
	11								
	12	9	1.5						
	13								
	14								
	15								
	16	10	11.1						
E23	Surface						1		
	1	46	58.03			5.2	2		
	2	68	97.51	2	15.9				
	3	81	65.3			21.3			
	4	93	99.04	2	26.6	10.7	3		
	5	1	21.7				1	1	
	6	12	68.19				1		
	7	4	2.8			7.1			
	8	13	14.8						
	9	7	3.13			10	1		
	10	17	19.56			0.1	1		
	11								
	12	2	0.7			2			
	13	19	7.76			0.2	1		
	14	19	8.91			5.3			
	15	29	40.87				3		
	16	33	31.76			4.8	1		
	17	70	34.6			8.7	1		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	18	32	10.57				2		
	19	46	43.09			3.4			
	20	1	0.5				1		
	21	13	7.36			0.3	1		
	22	22	19.16						
	23	41	29.25			2.7			
	24					11.4	1		
	25					6.6			
F17	1	8	3.9				1		
	2	22	12						
	3	58	36.2			1.5	3		
	4	56	156.9	1	6.4	0.9			
	5	87	115.3	1	6.1		4		
	6	47	93	1	2.9	7.7	1		
	7	37	40.6			4.9	2		
	8	1	2.6			10.6	1		
F19	Surface	1	1.2						
	1	7	4.8						
	2	17	11.6						
	3	43	31.1			0.5	4		
	4	103	238.9	1	19.9	12.5	1		
	5	142	300.6	1	4.8	63.7	5		
	6	150	117.4			46.5	7	2	
	7	200	91.6			50.8	4		
	8	12	7.4					1	
	9	12	9.6			2.9			
	11	3	9.4						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	10	1	0.2			4.9			
F20	Unknown						4		
	1	5	2.4						
	2	58	42.11				4		
	3	142	144.78			54.7	8		
	4	316	357.8	2	3.9	194.2	7	1	
	5	199	118.91			101.8	3		
	6	27	18.93	3	10.7	58	1		
	7	93	78.11			31.7			
	8	30	37.63			15.3	3		
	9	18	12.12			5.4	1		
	10	13	11.2						
	11	8	12.2			8.2			
	12	8	12.82			2.4	1		
	13	11	18.5						
F23	Surface						1		
	1	34	29.1						
	2	58	46.3				2		
	3	84	85.3						
	4	72	79				4		
	5	115	90.6			18.2			
	6	56	57.5			9.2			1
	7	10	10			1.7			
	8	14	17.7						
	9	13	5.1			7.4			
	10	3	1.3						
	11	12	8.8			5.9			

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	12	11	17.3						
	13	11	19.4			61			
	14	14	7.7			3			
	15	8	3.3						
	16	13	6.4						
	17	13	5.1			14.1	1		
	18	37	31			5.3	1		
	19								
	20	7	10.5			1.8			
	21								
G18	1					1.4	1		
	2	2	11.6						
	3	54	33.4	1	7.8		1		
	4	16	11.86	4	16.1	3			
	5	130	37.64	5	32.3	35.9	7		
	6	50	90.8	3	11.2	24	1	1	
	7	2	0.8	1	6.2	0.1	2		
	8	20	17.8				2		
	9								
	10								
	11	12	12			2.4			
	12								
	13								
	14	2	0.2			5.3			
	15								
	16					6.4			
	17					0.1			

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/Shell
	18								
	19								
G22	Unknown			1	2.5				1
	1	6	4.2			1.1	1		
	2	32	20.56	7	20.9	0.3	3		
	3	91	63.83	2	20.2		1		
	4	136	178.21			26.1	2		
	5	37	35.89			26.1	1		
	6	21	34.33			24.8			
G23	Unknown						2		
	1	48	67.26				1		
	2	67	60.8				8		
	3	11	4.2	2	1.8	2.9	3		
	4	120	93.52			8.5	4		
	5					0.4			
	6								
	7	9	25.3						
	8					4.5			
	9								
	10	8	5.8						
	11					1			
	12	5	1.73						
	13	8	10.8						
	14	12	13.3				1		
	15	8	5.89			2			
	16								
	17	32	14.03				1		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	18	46	39.63						
	19	22	16.36			3.9			
	20	26	15.92			3.7			
	21	9	2.46				1		
	22	9	4.9						
	23								
	24						1		
	25	3	17.8			1.5			
G24	Unknown			1	1.6				
	1	1	0.2						
	2	8	13.3						
	3	59	50.6			2.3		1	
	4	61	28.5			2.6	1		
	5	51	26.8			11.7	1		
	6	73	95	1	0.9		3		
	7	2	6.8			18.9			
H16	1	2	8						
	2	7	4.5						
	3	14	24.1			1.2	2		
	4	39	118.1			37.8	2		
	5	15	6.1	1	8.3	3.1	2		
	6	2	3.1			10			
	7	3	12.5			0.2			
	8	4	1.1						
	9								
	10	1	0.1			2.8			
	11	2	1.5				1		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	12	2	2.7			6.6			
	13					0.3			
	14								
	15	4	1.7						
	16								
	17	1	0.5						
	18								
	19								
	20								
H18*	Unknown						1		
	1								
	2								
	3								
	4								
	5						1		
H19	1	37	58.8	1	2.9		3		
	2	63	70.8	1	1.2	9.9	6		
	3	62	93.2	2	5.8	17.13	2		
	4	6	120.6			57.3	1		
	5	25	37			13.8	2		
H20	1	123	119.4	4	12.5	5.7	7		
	2	124	98.5			27.8	3		
	3	136	123.6	2	39.3	116.93	5		
	4	79	100.2			33.6	2		
	5	44	73.2			9.3	2		
H21	1	187	161.5	1	13.7	2	7		
	2	135	104			22.7	2		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
H22	Surface						1		
	1	12	4.4				1		
	2	10	3.9						
	3	41	60			1			
	4	48	41.7			1.2			1
	5	19	20.9	1	23	1.6	1		
	6	3	3.2			9.9			
	7					0.5			
	8	7	11						
	9								
	10								
	11	1	6.4						
	12	1	2.3			13.8			
	13	3	1.9			0.8			
	14	3	4.3			0.8			
	15	6	13.1			29.1	1		
	16	2	1.6			0.2			
	17	4	1						
	18	7	6.1						
	19	6	9.7			1.2			
	20	12	5.6			1.6			
	21	10	7.8						
	22	10	23.4						
	23	3	16.5			8.9	1		
	24	2	2.8						
	25								
H23	1	18	26.4			1.1			

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	2	3	7			1.2			
	3	46	52.7			2.4			
	4	20	12.8	4	34.7	4.2			
H24	1	5	5.6						
	2	5	2.5				1		
	3	16	39				1		
	4	62	81.5			20.4	4	1	
	5	9	6.8			5.6			
	6						1		
	7	2	0.4						
	8	19	8.3				1		
	9								
	10	2	1.1			5			
	11	3	2.6			0.1			
	12								
	13	15	12.6			8.6			
	14								
	15								
	16					152.2	1		
	17	7	9.4			20.8			
	18	22	89			80.9	2		
	19					89.9			
	20					28.1	1		
	21	43	19.6			23.3	1		
	22	28	18.3			26.5			
	23	14	6.7						
	24	8	2.4						
	25	8	3.6						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	26	9	5.7						
	27	31	19.8						
	28	3	1.6						
	29								
	30	8	4.4				1		
	31	9	15.1						
	32	21	17.8						
	33						1		
	34	4	0.8				1		
	35	6	6.9			1.7	1		
	36						1		
	37								
	38								
	39								
	40								
	41								
	42								
	43								
I11	1	18	24.7						
	2	72	37.2						
	3	8	5.85						
	4	9	14.95						
	5	3	0.7						
	6	6	7.3						
	7	6	3.8						
	8	5	4.6						
	9	7	7						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	10	20	12.8				1		
	11	15	10						
	12	9	12.9						
	13	7	5.3						
	14	11	20.6						
	15								
I15	1	9	7.7				1		
	2	25	73.9			3.2	1		
	3	11	15.6				1		
	4	5	74.8			1.2			
	5								
	6								
	7								
	8								
	9								
	10								
	11								
	12								
	13	3	1.4				1		
I17	1	7	5.8			0.4			
	2	21	495.6	6	54.9	0.6	1		
	3	13	20.7	1	1.1	1.7			1
	4	4	2	1	33.4		1		
	5	7	6						
	6	2	5.8			9.1			
	7	2	19.3			0.5			
	8	2	2.7			2.1	1		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	9	3	4.2			11.9	1		
	10								
	11	2	5.3			4.4			
	12	6	23			2	1		
	13	10	16.5			6.9			
	14	2	4.3			0.2			
	15								
	16	4	7.6			3			
	17					0.3			
	18								
	19								
	20					0.2			
	21	2	0.3						
	22								
	23								
	24								
I18	Unknown			1	7.3				
	1	80	105.5	4	14.6	0.6	1		
	2	15	9.3	1	23.5	2.4	1		
	3	85	152.8	1	7.5	90.3	4		
	4	24	12	2	9.2	38.4		1	1
	5					0.9			
I23	1	38	29.22				2		
	2	70	103.79			1.6	22		
	3	2	3.3						1
	4	2	1.2			1.2			
	5	10	6.4						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	6	2	9.6				2		
	7	1	2.2			5.2			
	8	1	0.03						
	9					1.1			
	10	3	2.4			0.2			
	11	1	6.8						
	12								
	13								
	14	9	9.5			6.2			
	15	43	19.05			67.7			
	16					13.4	1		
	17	10	14.33			31.2			
	18	5	1.8			4.5			
	19	12	11.46			9			
	20	3	2.9			4.6			
	21	6	6.8			3			
	22	3	1.5						
	23	28	35.2			0.1			
	24	14	17.86			13	1		
	25	10	11.73			0.4	1		
	26	25	18.96			1.2			
	27	17	20.73				1		
	28	4	4.3						
	29	24	49.1			0.03	1		
J20	Unknown							2	
	1	4	3.3				1		
	2	21	22.8			0.1			
	3	67	60	1	3.2	2.1	2		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/Shell
	4	42	53.4			9.5	4		
	5	33	28.9			2.7			
	6	7	5.4	1	6.7	1.3			
	7	4	0.8						
	8	7	1.8	1	5.6	2.4	1		
	9	1	0.03			4.2			
	10	1	3.1						
	11	1	0.2						
	12	2	0.3			0.1			
	13	3	2.8						
	14	6	4.8						
	15								
	16	14	18.1			3.5	1		
	17	3	0.5			20.8			
	18	20	22.2			16.6			
	19	7	10.4			17.3	1		
	20	15	13.5				1		
	21	17	14.1			0.2	1		
	22	7	9.7				1		
	23	7	8.8				2		
	24	2	0.9						
	25								
	26								
	27								
	28								
J23	1	15	2.2						
	2	27	19.8				1		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	3	11	16.9	0.4					
	4								
	5	2	1.1	31.5					
	6								
	7	6	5.5						
K21	1								
	2	4	2						
	3	16	10.6			6.4			
	4	19	18.5			3.9	2		
	5	21	18.8			5.5	1		
	6	3	1.3						
	7	2	5.5			9.1	1		
	8	1	2			5.9			
	9	2	4.4			1.1			
	10								
	11	2	2.5						
	12	2	4.8			1.5			
	13	7	8.8						
	14								
	15	4	7.5			1.9			
	16	5	11			42.3			1
	17	3	3.2						
	18	4	4.6						
	19								
	20	4	1.5			0.8			
	21	13	7.1			0.1	1		
	22	9	10.7						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/Shell
	23	18	13.7			17			
	24	7	19.2			3.6			
	25	8	22			2.5			
	26	2	0.3						
	27								
	28								
	29								
	30								
	31								
	32								
	33								
	34								
	35								
	36								
	37								
	38								
K23	1	54	55.6				1		
	2	24	9.9				1		
	3	5	7.9						
	4	4	0.6						
	5	7	5.2			5.6			
	6					0.7			
	7	3	0.6			1.2			
	8	6	3.7			4			
	9	2	6.3						
	10	4	1.1						
	11	4	1						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	12	15	4.7			6.4			
	13	7	2.2			1.1			
	14	18	11.4			11.5	2		
	15	18	9.6			0.7			
	16	24	31.6			0.9			
	17	6	9.9			2.4			
	18	15	28.3			36.6			
	19	15	23.1			17.6			
	20	27	30.3			35.1			
	21	5	4.2			1.2			
	22	15	15.4			0.5			
	23	42	63.2			11.9			
	24	28	38.3			1.9			
	25	49	47.4			8.3	2		
	26	46	42.6				2		
	27	64	42.3			3.6			
	28	79	141.7			4.6			
	29	40	62.6						
	30	23	16.5			0.2			
	31	24	42.4			0.2			
	32	9	8.5				1		
	33	7	24.6			0.2			
	34					0.7			
	35								
	36	3	0.8						
M23	1	22	14.2				1		
	2	28	77.1				1		

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	3	2	4.8						
	4	5	1.3						
	5								
	6	1	1.7				1		
	7	5	11.7			5.7			
	8	3	5			1.4			
	9	4	1.2						
	10	3	3.3						
	11	3	1.1						
	12	8	4.2						
	13	16	7.1			4.3	2		
	14	2	2.9			0.3			
	15	3	2.5						
	16	3	2.3			0.1			
	17	3	2				1		
	18	7	8			102.8			
	19	3	0.5			5.6			
	20	12	3.8						
N23	1	24	35.6			5	1		
N23	2	12	16.6						
N23	3	6	2.9						
N23	4	4	1.9			4.5			
N23	5	2	1.4						
N23	6	2	0.9						
N23	7	6	6.2						
N23	8	1	0.03						
N23	9	3	1.6						

Unit	Level	Debitage-Frequency	Debitage-Mass (g)	Ceramics-Frequency	Ceramics-Mass (g)	Faunal-Mass (g)	Flaked Stone Tools	Ground Stone	Bone/ Shell
	10	1	0.8						
	11								
	12	9	15.4						
J12*	1	1					2		

*Depth of excavation unknown.

APPENDIX B: TOOL CATALOG

See Chapter 3 for a description of each artifact class.

Chipped Stone Tool Raw Material Codes:
1: Quartzite
2: Non-dendritic chert
3: Dendritic chert
4: Non-dendritic chalcedony
5: Dendritic chalcedony
6: Petrified wood
7: Other

*NA: Vertical level unknown.

Table A-B.1: Main excavation area tool catalog.

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
C19	2	Late Prehistoric	Mano-Unifacial	C19.16	1	sandstone
C19	3	Late Prehistoric	Retouched Flake	C19.8	1	1
C19	4	Late Prehistoric	Undetermined Tool-Distal Tip	C19.12	1	4
C19	5	Late Prehistoric	Projectile Point	C19.3	1	3
C19	6	Late Prehistoric	Late Stage Biface	C19.10	1	4
C19	6	Late Prehistoric	Late Stage Biface-Knife	C19.11	1	3
C19	6	Late Prehistoric	Misc Hafted Biface	C19.7	1	4
C19	6	Late Prehistoric	Mid Stage Biface-knife	C19.9	1	1
C19	6	Late Prehistoric	Mid Stage Biface	C19.23	1	
C19	6	Late Prehistoric	Bone Awl Tip	C19.15	1	bone
C19	7	Late Prehistoric	Late Stage Biface	C19.1	1	1
C19	7	Late Prehistoric	Undetermined Tool-Distal Tip	C19.13	1	4
C19	7	Late Prehistoric	EMF	C19.4	1	3
C19	7	Late Prehistoric	EMF	C19.6	1	4
C19	7	Late Prehistoric	Bone Bead	C19.14	2	Bone
C19	7	Late Prehistoric	Metate-unifacial	C19.17	1	sandstone
C19	8	Late Prehistoric	Late Stage Biface	C19.5	1	4
C19	10	Archaic	Projectile Point	C19.2	1	1
C23	1	Late Prehistoric	Mid Stage Biface	C23.3	1	1
C23	2	Late Prehistoric	EMF	C23.1	1	1

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
C23	8	Late Prehistoric	Projectile point	C23.2	1	4
C23	13	Archaic	Undetermined Tool-Edge Frag	C23.4	1	1
D17	4	Late Prehistoric	Projectile Point	D17.1	1	4
D17	5	Late Prehistoric	Late Stage Biface	D17.4	1	1
D17	7	Late Prehistoric	EMF	D17.2	1	1
D17	7	Late Prehistoric	Bone Awl	D17.5	1	bone
D17	NA*	NA	EMF	D17.3	1	1
D18	3	Late Prehistoric	Retouched Flake	D18.2	1	1
D18	3	Late Prehistoric	EMF	D18.6	1	4
D18	4	Late Prehistoric	Projectile point	D18.7	1	1
D18	7	Late Prehistoric	Projectile point	D18.1	1	1
D18	9	Late Prehistoric	Early Stage Biface-Knife	D18.5	1	1
D18	9	Late Prehistoric	Misc Hafted Biface	D18.9	1	1
D18	9	Late Prehistoric	Mano Fragment	D18.11	1	sandstone
D18	10	Late Prehistoric	Mid Stage Biface -Scraper	D18.4	1	1
D18	10	Late Prehistoric	Mid Stage Biface	D18.8	1	1
D18	10	Late Prehistoric	Retouched Flake	D18.10	1	4
D18	NA	NA	EMF	D18.3	1	4
D19	5	Late Prehistoric	Scraper fragment	D19.11	1	5
D19	6	Late Prehistoric	Projectile Point	D19.8	1	2
D19	7	Late Prehistoric	Tested Cobble	D19.1	1	1
D19	7	Late Prehistoric	Projectile Point	D19.2	1	4
D19	7	Late Prehistoric	Projectile Point	D19.3	1	4
D19	7	Late Prehistoric	Projectile Point	D19.4	1	4
D19	7	Late Prehistoric	Projectile Point	D19.5	1	4
D19	7	Late Prehistoric	Preform	D19.9	1	4
D19	7	Late Prehistoric	Late Stage Biface-Knife	D19.12	1	2
D19	7	Late Prehistoric	Projectile Point	D19.13	1	4
D19	7	Late Prehistoric	Undetermined Tool-Distal Tip	D19.14	1	2
D19	7	Late Prehistoric	Mid Stage Biface	D19.27	1	5
D19	7	Late Prehistoric	Mano Fragment	D19.20	1	sandstone
D19	8	Late Prehistoric	Late Stage Biface	D19.7	1	1
D19	8	Late Prehistoric	Projectile Point	D19.10	1	4
D19	8	Late Prehistoric	Late Stage Biface	D19.15	1	2
D19	8	Late Prehistoric	EMF	D19.16	1	1
D19	8	Late Prehistoric	Undetermined Tool-Edge Frag	D19.28	1	

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
D19	8	Late Prehistoric	Antler Flaker	D19.19	1	antler
D19	9	Late Prehistoric	Undetermined Tool-Edge Frag	D19.6	1	4
D19	9	Late Prehistoric	Projectile Point	D19.17	1	5
D19	9	Late Prehistoric	Undetermined Tool-Edge Frag	D19.18	1	1
D20	3	Late Prehistoric	Late Stage Biface-Knife	D20.3	1	4
D20	3	Late Prehistoric	Metate-unifacial	D20.14	1	sandstone
D20	4	Late Prehistoric	Late Stage Biface	D20.9	1	4
D20	4	Late Prehistoric	Mid Stage Biface-Knife	D20.11	1	4
D20	4	Late Prehistoric	Disto Lateral Scraper	D20.13	1	2
D20	4	Late Prehistoric	Undetermined Tool-Edge Frag	D20.25	1	4
D20	5	Late Prehistoric	Retouched Flake	D20.1	1	3
D20	5	Late Prehistoric	Retouched Flake	D20.2	1	1
D20	5	Late Prehistoric	Projectile Point	D20.5	1	4
D20	5	Late Prehistoric	Undetermined Tool-Distal Tip	D20.12	1	4
D20	6	Late Prehistoric	Multi Core	D20.6	1	1
D20	6	Late Prehistoric	Undetermined Tool-Edge Frag	D20.10	1	1
D20	9	Archaic	Mano Fragment	D20.15	1	sandstone
D20	11	Archaic	Undetermined Tool-Distal Tip	D20.7	1	4
D20	NA	NA	Late Stage Biface-Knife	D20.4	1	2
D20	NA	NA	Projectile Point	D20.8	1	4
E18	3	Late Prehistoric	Multi Core	E18.4	1	4
E18	4	Late Prehistoric	Projectile Point	E18.6	1	1
E18	5	Late Prehistoric	Disto-Lateral Scraper	E18.3	1	1
E18	5	Late Prehistoric	Late Stage Biface-Knife	E18.8	1	4
E18	5	Late Prehistoric	Projectile Point	E18.11	1	4
E18	6	Late Prehistoric	Projectile Point	E18.5	1	1
E18	6	Late Prehistoric	Projectile Point	E18.19	1	1
E18	7	Late Prehistoric	Projectile Point	E18.7	1	1
E18	7	Late Prehistoric	Late Stage Biface-Knife	E18.13	2	1
E18	8	Late Prehistoric	Retouched Flake	E18.1	1	3
E18	8	Late Prehistoric	Retouched Flake	E18.10	1	1
E18	9	Late Prehistoric	Scraper Fragment	E18.2	1	1
E18	9	Late Prehistoric	Projectile Point	E18.9	1	4

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
E18	9	Late Prehistoric	Undetermined Tool-Edge Frag	E18.12	1	2
E18	9	Late Prehistoric	Metate-Unifacial	E18.14	3	sandstone
E18	10	Late Prehistoric	Mano-Bifacial	E18.15	1	sandstone
E19	3	Late Prehistoric	Projectile Point	E19.15	1	4
E19	4	Late Prehistoric	Retouched Flake	E19.4	1	7
E19	4	Late Prehistoric	Undetermined Tool-Distal Tip	E19.8	1	4
E19	4	Late Prehistoric	Projectile Point	E19.10	1	4
E19	5	Late Prehistoric	Retouched flake	E19.2	1	1
E19	5	Late Prehistoric	Late Stage Biface	E19.7	1	4
E19	5	Late Prehistoric	Late Stage Biface-Knife	E19.11	1	2
E19	5	Late Prehistoric	Undetermined Tool-Edge Frag	E19.13	1	4
E19	5	Late Prehistoric	Projectile point	E19.14	1	4
E19	5	Late Prehistoric	Projectile point	E19.18	1	4
E19	5	Late Prehistoric	Projectile point	E19.19	1	4
E19	5	Late Prehistoric	Late Stage Biface	E19.39	1	4
E19	6	Late Prehistoric	Undetermined Tool-Edge Frag	E19.5	1	2
E19	6	Late Prehistoric	Late Stage Biface	E19.6	1	3
E19	6	Late Prehistoric	Bone awl	E19.23	1	bone
E19	6	Late Prehistoric	Bone awl	E19.24	1	bone
E19	6	Late Prehistoric	Mano Fragment	E19.29	1	sandstone
E19	6	Late Prehistoric	Mano Fragment	E19.30	1	sandstone
E19	6	Late Prehistoric	Mano Fragment	E19.31	1	granite
E19	7	Late Prehistoric	Late Stage Biface-Knife	E19.38	1	1
E19	7	Late Prehistoric	Shell Fragment	E19.27	1	shell
E19	8	Late Prehistoric	Multi-Core	E19.1	1	2
E19	8	Late Prehistoric	Multi-Funtional Tool	E19.3	1	2
E19	8	Late Prehistoric	Projectile point	E19.17	1	2
E19	8	Late Prehistoric	Mid Stage Biface-Knife	E19.22	1	1
E19	8	Late Prehistoric	Shell Bead	E19.26	1	shell
E19	12	Late Prehistoric	Projectile point	E19.9	1	4
E19	12	Late Prehistoric	Projectile point	E19.16	1	2
E19	12	Late Prehistoric	Mid Stage Biface-Knife	E19.21	1	3
E19	12	Late Prehistoric	Tubular Bone	E19.25	1	bone
E19	NA	NA	Side Scraper	E19.20	1	2
E19	NA	NA	Mano-Bifacial	E19.28	1	granite

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
E20	3	Late Prehistoric	Projectile Point	E20.7	1	4
E20	4	Late Prehistoric	Projectile Point	E20.1	1	1
E20	4	Late Prehistoric	Multi Core	E20.5	1	1
E20	5	Late Prehistoric	Preform	E20.8	1	1
E20	5	Late Prehistoric	Retouched Flake	E20.9	1	3
E20	5	Late Prehistoric	Mid Stage Biface-Knife	E20.10	1	4
E20	5	Late Prehistoric	Mid Stage Biface	E20.11	1	1
E20	5	Late Prehistoric	EMF	E20.12	1	1
E20	5	Late Prehistoric	Tested Cobble	E20.13	1	6
E20	5	Late Prehistoric	Late Stage Biface-Knife	E20.22	1	3
E20	5	Late Prehistoric	Preform	E20.23	1	1
E20	5	Late Prehistoric	Projectile Point	E20.24	1	1
E20	5	Late Prehistoric	Mano Fragment	E20.17	1	sandstone
E20	5	Late Prehistoric	Mano Fragment	E20.18	1	sandstone
E20	5	Late Prehistoric	Mano Fragment	E20.19	1	sandstone
E20	6	Late Prehistoric	Preform	E20.2	1	1
E20	6	Late Prehistoric	Projectile Point	E20.3	1	4
E20	6	Late Prehistoric	Mano-Bifacial	E20.21	1	sandstone
E20	6	Late Prehistoric	Mano Fragment	E20.20	1	sandstone
E20	NA		Late Stage Biface-Knife	E20.4	1	1
E20	NA		Chopper	E20.6	1	1
E20	NA		Mano-Bifacial	E20.16	1	granite
E23	1	Late Prehistoric	Undetermined Tool-Edge Frag	E23.5	1	5
E23	1	Late Prehistoric	Early Stage Biface Knife	E23.18	1	1
E23	4	Late Prehistoric	Hafted Knife	E23.3	1	2
E23	4	Late Prehistoric	Drill	E23.6	1	2
E23	4	Late Prehistoric	Late Stage Biface	E23.7	1	1
E23	5	Late Prehistoric	Hafted Knife	E23.2	1	2
E23	5	Late Prehistoric	Mano Fragment	E23.22	1	sandstone
E23	6	Late Prehistoric	Late Stage Biface-Knife	E23.13	1	2
E23	9	Archaic	Early Stage Biface	E23.21	1	5
E23	10	Archaic	Retouched flake	E23.11	1	2
E23	13	Archaic	Projectile Point	E23.4	1	1
E23	15	Archaic	Projectile Point	E23.1	1	4
E23	15	Archaic	Late Stage Biface-Knife	E23.8	1	2
E23	15	Archaic	Mid Stage Biface-Knife	E23.15	1	1
E23	16	Archaic	Retouched flake	E23.17	1	2
E23	17	Archaic	Mid Stage Biface	E23.19	1	5

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
E23	18	Archaic	Mid Stage Biface	E23.12	1	1
E23	18	Archaic	Retouched Flake	E23.16	1	2
E23	20	Archaic	Multi-Core	E23.14	1	1
E23	21	Archaic	Retouched Flake	E23.9	1	2
E23	24	Archaic	Multi-Core	E23.20	1	1
E23	NA		Mid Stage Biface-Knife	E23.10	1	1
F17	1	Late Prehistoric	Undetermined Tool-Distal Tip	F17.7	1	4
F17	3	Late Prehistoric	EMF	F17.1	1	2
F17	3	Late Prehistoric	Undetermined Tool-Edge Frag	F17.8	1	2
F17	3	Late Prehistoric	Undetermined Tool-Distal Tip	F17.11	1	2
F17	5	Late Prehistoric	Scraper Fragment	F17.4	1	2
F17	5	Late Prehistoric	Projectile Point	F17.5	1	1
F17	5	Late Prehistoric	Chopper	F17.9	1	1
F17	5	Late Prehistoric	Projectile Point	F17.10	1	4
F17	6	Late Prehistoric	Late Stage Biface	F17.15	1	1
F17	7	Late Prehistoric	EMF	F17.2	1	8
F17	7	Late Prehistoric	Retouched Flake	F17.3	1	4
F17	8	Late Prehistoric	Projectile Point	F17.6	1	3
F19	3	Late Prehistoric	Preform	F19.2	1	4
F19	3	Late Prehistoric	Projectile Point	F19.8	1	3
F19	3	Late Prehistoric	Projectile Point	F19.10	1	4
F19	3	Late Prehistoric	Undetermined Tool-Edge Frag	F19.17	1	2
F19	4	Late Prehistoric	Undetermined Tool-Edge Frag	F19.16	1	3
F19	5	Late Prehistoric	EMF	F19.3	1	1
F19	5	Late Prehistoric	Multi-Core	F19.6	1	8
F19	5	Late Prehistoric	Projectile Point	F19.9	1	4
F19	5	Late Prehistoric	Undetermined Tool-Distal Tip	F19.13	1	4
F19	5	Late Prehistoric	Late Stage Biface-Knife	F19.20	1	4
F19	6	Late Prehistoric	Multi Core	F19.5	1	1
F19	6	Late Prehistoric	Multi Core	F19.7	1	1
F19	6	Late Prehistoric	Projectile Point	F19.11	1	5
F19	6	Late Prehistoric	Retouched Flake	F19.12	1	4
F19	6	Late Prehistoric	Undetermined Tool-Edge	F19.18	1	2

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
			Frag			
F19	6	Late Prehistoric	Retouched Flake	F19.21	1	1
F19	6	Late Prehistoric	Retouched Flake	F19.27	1	
F19	6	Late Prehistoric	Mano-Bifacial	F19.22	1	sandstone
F19	6	Late Prehistoric	Mano-Bifacial	F19.24	1	sandstone
F19	7	Late Prehistoric	Multi-Core	F19.4	1	4
F19	7	Late Prehistoric	Undetermined Tool-Edge Frag	F19.14	1	4
F19	7	Late Prehistoric	Undetermined Tool-Distal Tip	F19.15	1	1
F19	7	Late Prehistoric	Undetermined Tool-Edge Frag	F19.19	1	1
F19	8	Late Prehistoric	mano-bifacial	F19.23	1	sandstone
F20	2	Late Prehistoric	Undetermined Tool-Edge Frag	F20.25	1	1
F20	2	Late Prehistoric	Multi Core	F20.30	1	3
F20	2	Late Prehistoric	Late Stage Biface-Knife	F20.4	1	1
F20	2	Late Prehistoric	Hafted Knife	F20.10	1	2
F20	3	Late Prehistoric	Undetermined Tool-Edge Frag	F20.18	1	4
F20	3	Late Prehistoric	Retouched Flake	F20.26	1	2
F20	3	Late Prehistoric	Retouched Flake	F20.27	1	1
F20	3	Late Prehistoric	Undetermined Tool-Distal Tip	F20.28	1	2
F20	3	Late Prehistoric	Projectile Point	F20.12	1	1
F20	3	Late Prehistoric	Bipolar core	F20.13	1	3
F20	3	Late Prehistoric	Projectile Point	F20.14	1	2
F20	3	Late Prehistoric	Undetermined Tool-Distal Tip	F20.15	1	3
F20	4	Late Prehistoric	Preform	F20.17	1	1
F20	4	Late Prehistoric	Multi Core	F20.20	1	1
F20	4	Late Prehistoric	Disto Lateral Scraper	F20.2	1	2
F20	4	Late Prehistoric	Undetermined Tool-Edge Frag	F20.3	1	4
F20	4	Late Prehistoric	Hafted Scraper	F20.5	1	4
F20	4	Late Prehistoric	Projectile Point	F20.6	1	4
F20	4	Late Prehistoric	Projectile Point	F20.9	1	4
F20	4	Late Prehistoric	Mano Fragment	F20.32	1	sandstone
F20	5	Late Prehistoric	EMF	F20.21	1	1

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
F20	5	Late Prehistoric	Mid Stage Biface	F20.24	1	1
F20	5	Late Prehistoric	EMF	F20.11	1	1
F20	6	Late Prehistoric	EMF	F20.23	1	1
F20	8	Late Prehistoric	Late Stage Biface-Knife	F20.29	1	1
F20	8	Late Prehistoric	Side Scraper	F20.1	1	1
F20	8	Late Prehistoric	Early Stage Biface-Knife	F20.16	1	1
F20	9	Archaic	Early Stage Biface	F20.19	1	4
F20	12	Archaic	Undetermined Tool-Edge Frag	F20.7	1	4
F20	NA		Multi Core	F20.22	1	1
F20	NA		Tested Cobble	F20.31	1	1
F20	NA		Retouched Flake	F20.8	1	1
F20	NA		Retouched Flake	F20.34	1	1
F23	SURFACE	Surface	Undetermined Tool-Distal Tip	F23.7	1	2
F23	2	Late Prehistoric	Preform	F23.2	1	3
F23	2	Late Prehistoric	Mid Stage Biface	F23.4	1	2
F23	4	Late Prehistoric	Projectile Point	F23.3	1	4
F23	4	Late Prehistoric	Undetermined Tool-Distal Tip	F23.5	1	1
F23	4	Late Prehistoric	Projectile Point	F23.6	1	2
F23	4	Late Prehistoric	Retouched Flake	F23.9	1	1
F23	6	Late Prehistoric	Undetermined Bone Tool	F23.10	1	bone
F23	17	Archaic	Retouched Flake	F23.1	1	4
F23	18	Archaic	Early Stage Biface	F23.8	1	1
G18	1	Late Prehistoric	Late Stage Biface	G18.2	1	1
G18	3	Late Prehistoric	Projectile Point	G18.6	1	2
G18	5	Late Prehistoric	Retouched Flake	G18.3	1	1
G18	5	Late Prehistoric	Mid Stage Biface	G18.9	1	4
G18	5	Late Prehistoric	Retouched Flake	G18.11	1	1
G18	5	Late Prehistoric	Preform	G18.12	1	5
G18	5	Late Prehistoric	Preform	G18.13	1	1
G18	5	Late Prehistoric	Preform	G18.14	1	3
G18	5	Late Prehistoric	Preform	G18.21	1	5
G18	6	Late Prehistoric	Multi Core	G18.1	1	1
G18	6	Late Prehistoric	Mano Fragment	G18.15	1	sandstone
G18	7	Late Prehistoric	Projectile Point	G18.7	1	1
G18	7	Late Prehistoric	Mid Stage Biface	G18.10	1	1
G18	8	Late Prehistoric	Projectile Point	G18.4	1	1

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
G18	8	Late Prehistoric	Projectile Point	G18.5	1	1
G22	1	Late Prehistoric	Projectile Point	G22.7	1	4
G22	2	Late Prehistoric	Retouched flake	G22.1	1	4
G22	2	Late Prehistoric	Undetermined Tool-Distal Tip	G22.5	1	2
G22	2	Late Prehistoric	Projectile Point	G22.6	1	1
G22	3	Late Prehistoric	Disto Lateral Scraper	G22.3	1	4
G22	4	Late Prehistoric	Projectile Point	G22.2	1	2
G22	4	Late Prehistoric	Disto Lateral Scraper	G22.8	1	3
G22	5	Late Prehistoric	Retouched Flake	G22.4	1	4
G22	11	Archaic	Shell fragment	G22.9	1	shell
G23	1	Late Prehistoric	Preform	G23.8	1	1
G23	2	Late Prehistoric	Mid Stage Biface-Knife	G23.5	1	1
G23	2	Late Prehistoric	Hafted Scraper	G23.10	1	3
G23	2	Late Prehistoric	Retouched Flake	G23.11	1	8
G23	2	Late Prehistoric	End Scraper	G23.14	1	3
G23	2	Late Prehistoric	Mid Stage Biface-Scraper	G23.15	1	1
G23	2	Late Prehistoric	EMF	G23.17	1	4
G23	2	Late Prehistoric	Projectile Point	G23.19	1	1
G23	2	Late Prehistoric	Undetermined Tool-Edge Frag	G23.22	1	2
G23	3	Late Prehistoric	Mid Stage Biface-Knife	G23.2	1	1
G23	3	Late Prehistoric	Undetermined Tool-Distal Tip	G23.3	1	4
G23	3	Late Prehistoric	Projectile Point	G23.7	1	3
G23	4	Late Prehistoric	Retouched Flake	G23.6	1	5
G23	4	Late Prehistoric	Undetermined Tool-Distal Tip	G23.9	1	4
G23	4	Late Prehistoric	Mid Stage Biface-Knife	G23.20	1	3
G23	4	Late Prehistoric	Undetermined Tool-Edge Frag	G23.24	1	1
G23	14	Archaic	Retouched Flake	G23.4	1	1
G23	17	Archaic	Disto-Lateral Scraper	G23.1	1	3
G23	21	Archaic	Retouched Flake	G23.16	1	3
G23	23	Archaic	Mid Stage Biface	G23.12	1	1
G23	NA		Undetermined Tool-Edge Frag	G23.13	1	4
G23	NA		Projectile Point	G23.18	1	2
H16	3	Late Prehistoric	Early Stage Biface-Scraper	H16.4	1	1

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
H16	3	Late Prehistoric	Multi Core	H16.5	1	1
H16	4	Late Prehistoric	Undetermined Tool-Distal Tip	H16.1	1	3
H16	4	Late Prehistoric	Disto Lateral Scraper	H16.7	1	2
H16	5	Late Prehistoric	Mid Stage Biface-knife	H16.2	1	1
H16	5	Late Prehistoric	Preform	H16.3	1	5
H16	11	Archaic	Multi Core	H16.6	1	1
H18	5	Late Prehistoric	Side Scraper	H18.2	1	1
H18	NA		Retouched Flake	H18.1	1	1
H19	1	Late Prehistoric	Undetermined Tool-Edge Frag	H19.10	1	4
H19	1	Late Prehistoric	Undetermined Tool-Edge Frag	H19.16	1	4
H19	1	Late Prehistoric	Undetermined Tool-Edge Frag	H19.17	1	6
H19	2	Late Prehistoric	Preform	H19.1	1	4
H19	2	Late Prehistoric	Projectile Point	H19.4	1	4
H19	2	Late Prehistoric	Undetermined Tool-Distal Tip	H19.6	1	4
H19	2	Late Prehistoric	Undetermined Tool-Distal Tip	H19.8	1	4
H19	2	Late Prehistoric	Undetermined Tool-Edge Frag	H19.9	1	2
H19	2	Late Prehistoric	End Scraper	H19.11	1	1
H19	3	Late Prehistoric	Preform	H19.2	1	4
H19	3	Late Prehistoric	Preform	H19.15	1	4
H19	4	Late Prehistoric	Projectile Point	H19.3	1	4
H19	5	Late Prehistoric	Projectile Point	H19.5	1	4
H19	5	Late Prehistoric	EMF	H19.7	1	4
H20	1	Late Prehistoric	Projectile Point	H20.3	1	4
H20	1	Late Prehistoric	Projectile Point	H20.5	1	4
H20	1	Late Prehistoric	Misc Hafted Biface	H20.8	1	1
H20	1	Late Prehistoric	Undetermined Tool-Edge Frag	H20.14	1	4
H20	1	Late Prehistoric	Retouched Flake	H20.15	1	1
H20	1	Late Prehistoric	Mid Stage Biface	H20.16	1	1
H20	1	Late Prehistoric	Projectile Point	H20.22	1	3
H20	2	Late Prehistoric	Projectile Point	H20.2	1	1
H20	2	Late Prehistoric	Retouched Flake	H20.9	1	1

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
H20	2	Late Prehistoric	undiagnostic ground stone	H20.18	1	sandstone
H20	3	Late Prehistoric	Early Stage Biface-Scraper	H20.1	1	1
H20	3	Late Prehistoric	Undetermined Tool-Distal Tip	H20.4	1	1
H20	3	Late Prehistoric	Undetermined Tool-Edge Frag	H20.7	1	3
H20	3	Late Prehistoric	Undetermined Tool-Edge Frag	H20.11	1	4
H20	3	Late Prehistoric	Early Stage Biface	H20.13	1	1
H20	4	Late Prehistoric	Disto Lateral Scraper	H20.6	1	1
H20	4	Late Prehistoric	EMF	H20.17	1	1
H20	5	Late Prehistoric	Misc Hafted Biface	H20.10	1	2
H20	5	Late Prehistoric	Mid Stage Biface	H20.12	1	5
H21	1	Late Prehistoric	Undetermined Tool-Edge Frag	H21.1	1	3
H21	1	Late Prehistoric	Late Stage Biface	H21.2	1	1
H21	1	Late Prehistoric	Preform	H21.3	1	4
H21	1	Late Prehistoric	Misc Hafted Biface	H21.4	1	2
H21	1	Late Prehistoric	Retouched Flake	H21.5	1	4
H21	1	Late Prehistoric	Disto Lateral Scraper	H21.6	1	3
H21	1	Late Prehistoric	Late Stage Biface-Knife	H21.9	1	1
H21	2	Late Prehistoric	Preform	H21.7	1	4
H22	1	Late Prehistoric	Late Stage Biface-Knife	H22.2	1	1
H22	4	Late Prehistoric	Bone Awl	H22.7	1	bone
H22	5	Late Prehistoric	Hafted Knife	H22.6	1	1
H22	15	Archaic	Projectile Point	H22.1	1	4
H22	23	Archaic	Projectile Point	H22.4	1	4
H22	SURF ACE		Undetermined Tool-Distal Tip	H22.3	1	4
H24	2	Late Prehistoric	Projectile Point	H24.1	1	4
H24	3	Late Prehistoric	Retouched Flake	H24.15	1	1
H24	4	Late Prehistoric	Projectile Point	H24.2	1	4
H24	4	Late Prehistoric	Mid Stage Biface-Knife	H24.4	1	1
H24	4	Late Prehistoric	Undetermined Tool-Distal Tip	H24.10	1	4
H24	4	Late Prehistoric	Retouched Flake	H24.14	1	4
H24	4	Late Prehistoric	Mano Fragment	H24.20	1	sandstone
H24	6	Late Prehistoric	EMF	H24.16	1	7

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
H24	8	Late Prehistoric	Mid Stage Biface	H24.9	1	1
H24	16	Archaic	Disto Lateral Scraper	H24.13	1	2
H24	18	Archaic	Misc Hafted Biface	H24.11	1	3
H24	18	Archaic	Disto Lateral Scraper	H24.12	1	3
H24	20	Archaic	Mid Stage Biface	H24.3	1	4
H24	21	Archaic	EMF	H24.6	1	3
H24	30	Archaic	Retouched Flake	H24.5	1	2
H24	33	Archaic	EMF	H24.17	1	1
H24	34	Archaic	EMF	H24.18	1	1
H24	35	Archaic	Early Stage Biface	H24.8	1	1
H24	36	Archaic	Disto Lateral Scraper	H24.19	1	3
I11	10	Archaic	Undetermined Tool-Edge Frag	I11.1	1	2
I15	1	Late Prehistoric	Multi Core	I15.3	1	2
I15	2	Late Prehistoric	End Scraper	I15.1	1	1
I15	3	Late Prehistoric	Late Stage Biface	I15.4	1	4
I15	13	Archaic	Retouched Flake	I15.2	1	1
I17	2	Late Prehistoric	EMF	I17.1	1	1
I17	3	Late Prehistoric	Bone Awl	I17.6	1	bone
I17	4	Late Prehistoric	Hafted Scraper	I17.2	1	1
I17	8	Late Prehistoric	Retouched Flake	I17.4	1	2
I17	9	Archaic	Undetermined Tool-Distal Tip	I17.3	1	4
I17	12	Archaic	Early Stage Biface	I17.5	1	4
I18	1	Late Prehistoric	Undetermined Tool-Edge Frag	I18.6	1	1
I18	2	Late Prehistoric	Multi Core	I18.3	1	1
I18	3	Late Prehistoric	Undetermined Tool-Distal Tip	I18.2	1	1
I18	3	Late Prehistoric	Preform	I18.4	1	4
I18	3	Late Prehistoric	Multi Core	I18.5	1	1
I18	3	Late Prehistoric	Spokeshave	I18.7	1	1
I18	4	Late Prehistoric	Bone Awl	I18.8	1	bone
I18	4	Late Prehistoric	Mano-Bifacial	I18.9	1	sandstone
I23	1	Late Prehistoric	Undetermined Tool-Edge Frag	I23.4	1	5
I23	1	Late Prehistoric	Preform	I23.7	1	1
I23	2	Late Prehistoric	Projectile Point	I23.5	1	1
I23	2	Late Prehistoric	Undetermined Tool-Edge	I23.9	1	1

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
			Frag			
I23	3	Late Prehistoric	Bone Awl	I23.12	1	bone
I23	6	Late Prehistoric	Multi Core	I23.3	1	1
I23	6	Late Prehistoric	Retouched Flake	I23.10	1	1
I23	16	Archaic	Late Stage Biface-Knife	I23.1	1	3
I23	24	Archaic	Misc Hafted Biface	I23.8	1	2
I23	25	Archaic	Projectile Point	I23.6	1	1
I23	27	Archaic	Projectile Point	I23.2	1	4
I23	29	Archaic	Mid Stage Biface	I23.11	1	1
K21	4	Late Prehistoric	Early Stage Biface	K21.3	1	1
K21	4	Late Prehistoric	Mid Stage Biface	K21.5	1	4
K21	5	Late Prehistoric	Side Scraper	K21.4	1	4
K21	7	Late Prehistoric	EMF	K21.1	1	4
K21	16	Archaic	Bone Awl	K21.6	1	bone
K21	21	Archaic	EMF	K21.2	1	1
J12	1	Late Prehistoric	Retouched flake	J12.1	1	4
J12	1	Late Prehistoric	Projectile Point	J12.3	1	1
J20	1	Late Prehistoric	Preform	J20.11	1	2
J20	3	Late Prehistoric	EMF	J20.4	1	5
J20	3	Late Prehistoric	Multi Functional Tool	J20.6	1	4
J20	4	Late Prehistoric	Projectile Point	J20.2	1	4
J20	4	Late Prehistoric	Multi Core	J20.10	1	1
J20	4	Late Prehistoric	Undetermined Tool-Edge Frag	J20.13	1	4
J20	8	Late Prehistoric	Projectile Point	J20.1	1	2
J20	16	Archaic	Projectile Point	J20.3	1	4
J20	19	Archaic	Undetermined Tool-Edge Frag	J20.5	1	4
J20	20	Archaic	Retouched Flake	J20.14	1	1
J20	21	Archaic	Early Stage Biface	J20.9	1	1
J20	22	Archaic	Preform	J20.8	1	4
J20	23	Archaic	Retouched Flake	J20.7	1	1
J20	23	Archaic	Mid Stage Biface	J20.12	1	1
J20	NA		Mano Fragment	J20.15	1	granite
J20	NA		Mano Fragment	J20.16	1	sandstone
J23	2	Late Prehistoric	Retouched Flake	J23.1	1	1
K23	1	Late Prehistoric	Tested Cobble	K23.5	1	6
K23	2	Late Prehistoric	Undetermined Tool-Distal Tip	K23.2	1	4

Unit	Level	Component	Artifact Class	Catalog Number	Quantity	Raw Material
K23	14	Archaic	Retouched Flake	K23.1	1	4
K23	14	Archaic	Misc Hafted Biface	K23.8	1	2
K23	25	Archaic	Projectile Point	K23.4	1	1
K23	25	Archaic	Multi Core	K23.9	1	1
K23	26	Archaic	Retouched flake	K23.6	1	1
K23	26	Archaic	Retouched flake	K23.7	1	3
K23	32	Archaic	Projectile Point	K23.3	1	4
M23	1	Late Prehistoric	Undetermined Tool-Distal Tip	M23.4	1	1
M23	2	Late Prehistoric	EMF	M23.2	1	8
M23	6	Late Prehistoric	Projectile Point	M23.1	1	2
M23	13	Archaic	Projectile Point	M23.3	1	1
M23	13	Archaic	Late Stage Biface-Knife	M23.5	1	3
M23	17	Archaic	Mid Stage Biface	M23.6	1	1
N23	1	Late Prehistoric	Undetermined Tool-Distal Tip	N23.1	1	4

Flaked stone tool frequency

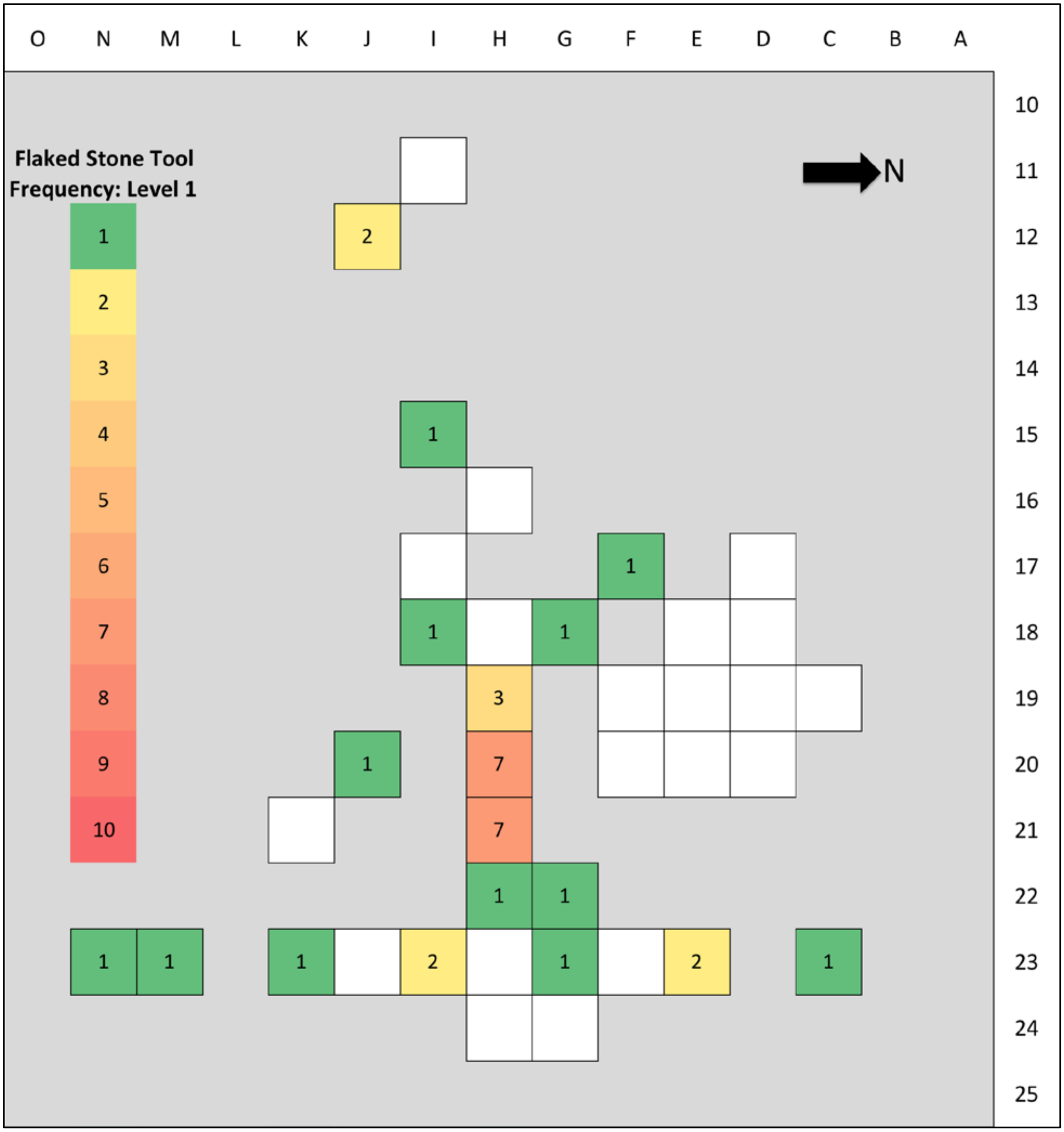

Figure A-C.1: Main excavation area chipped stone tool frequency, level 1.

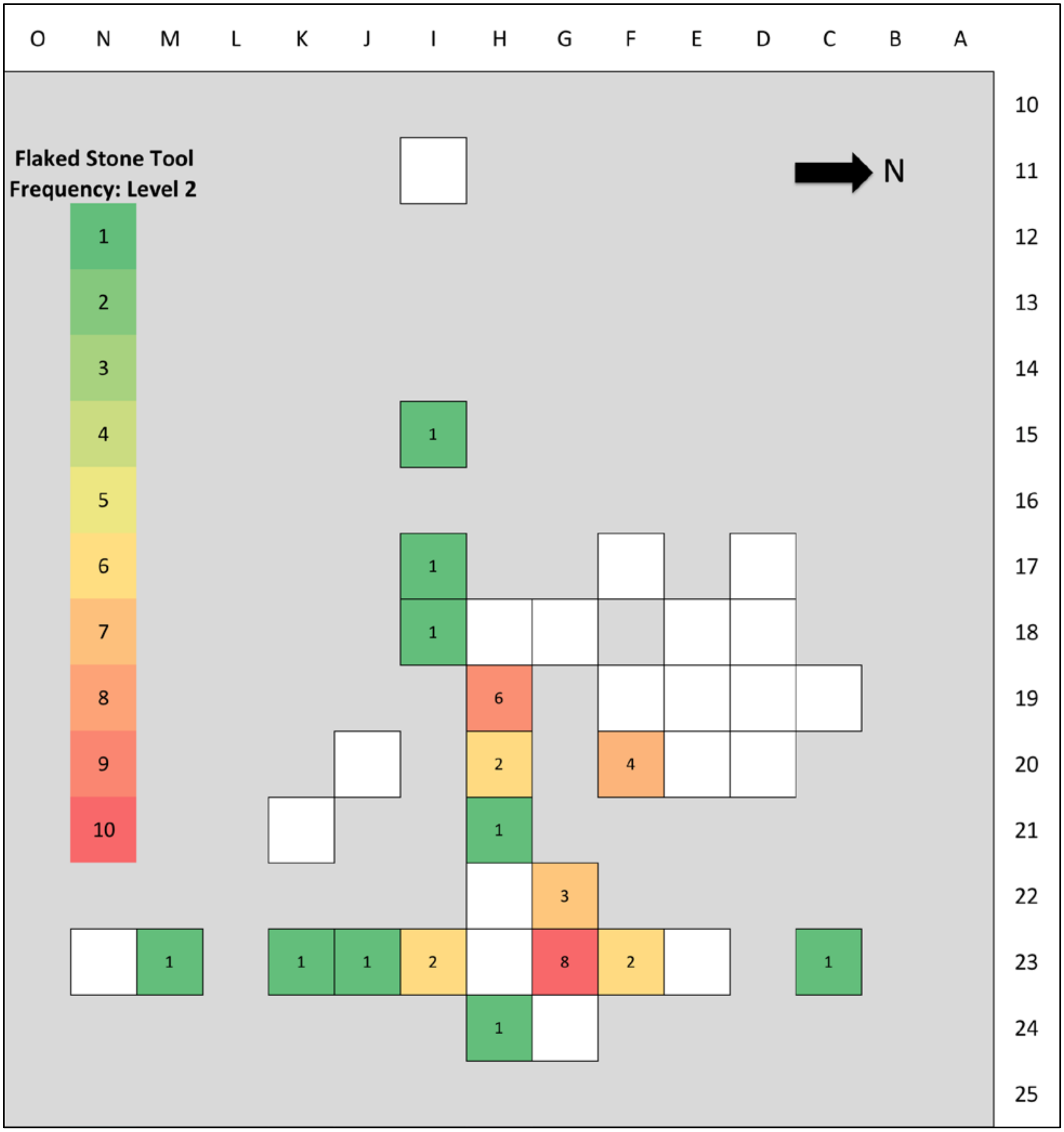

Figure A-C.2: Main excavation area chipped stone tool frequency, level 2.

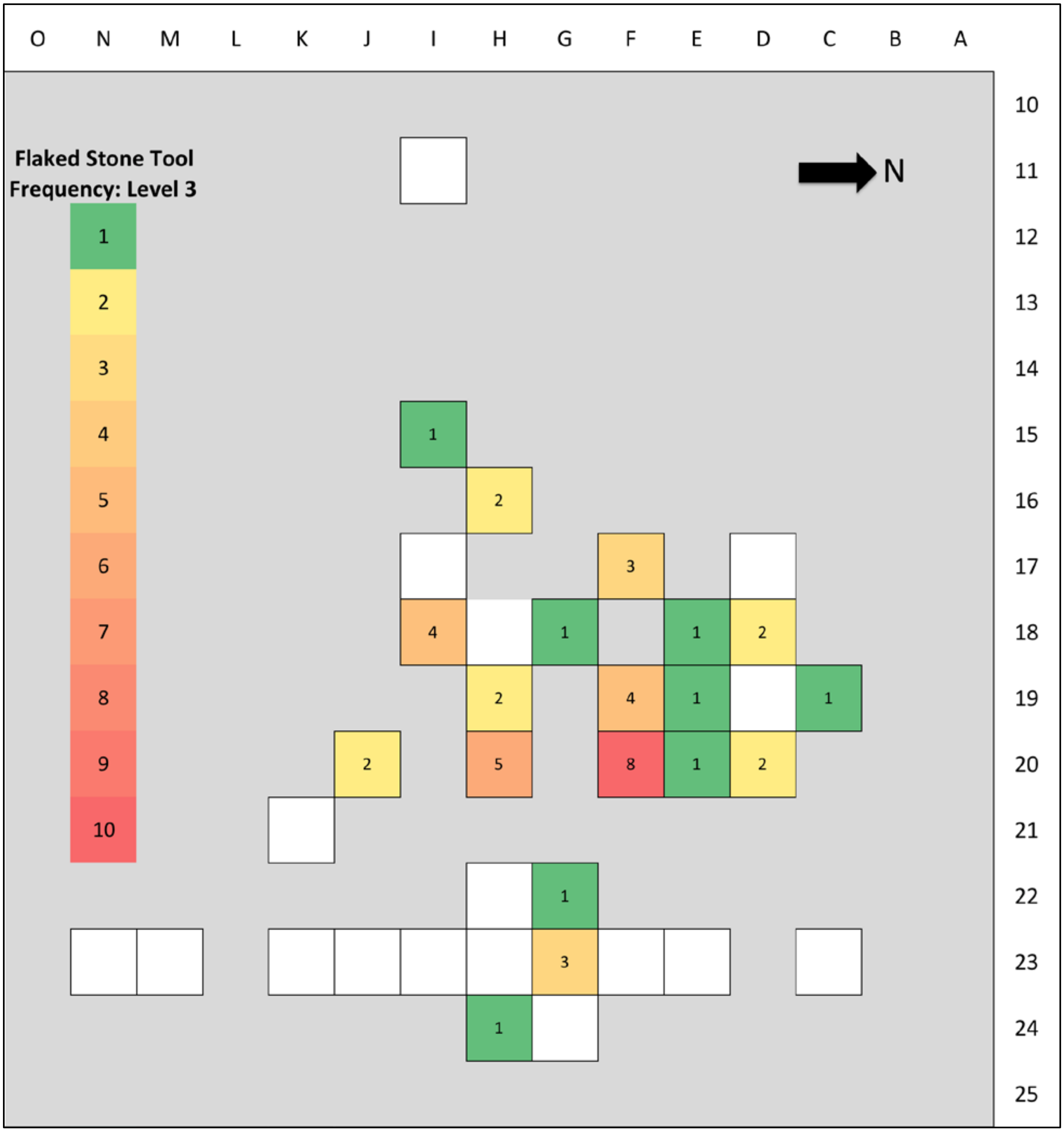

Figure A-C.3: Main excavation area chipped stone tool frequency, level 3.

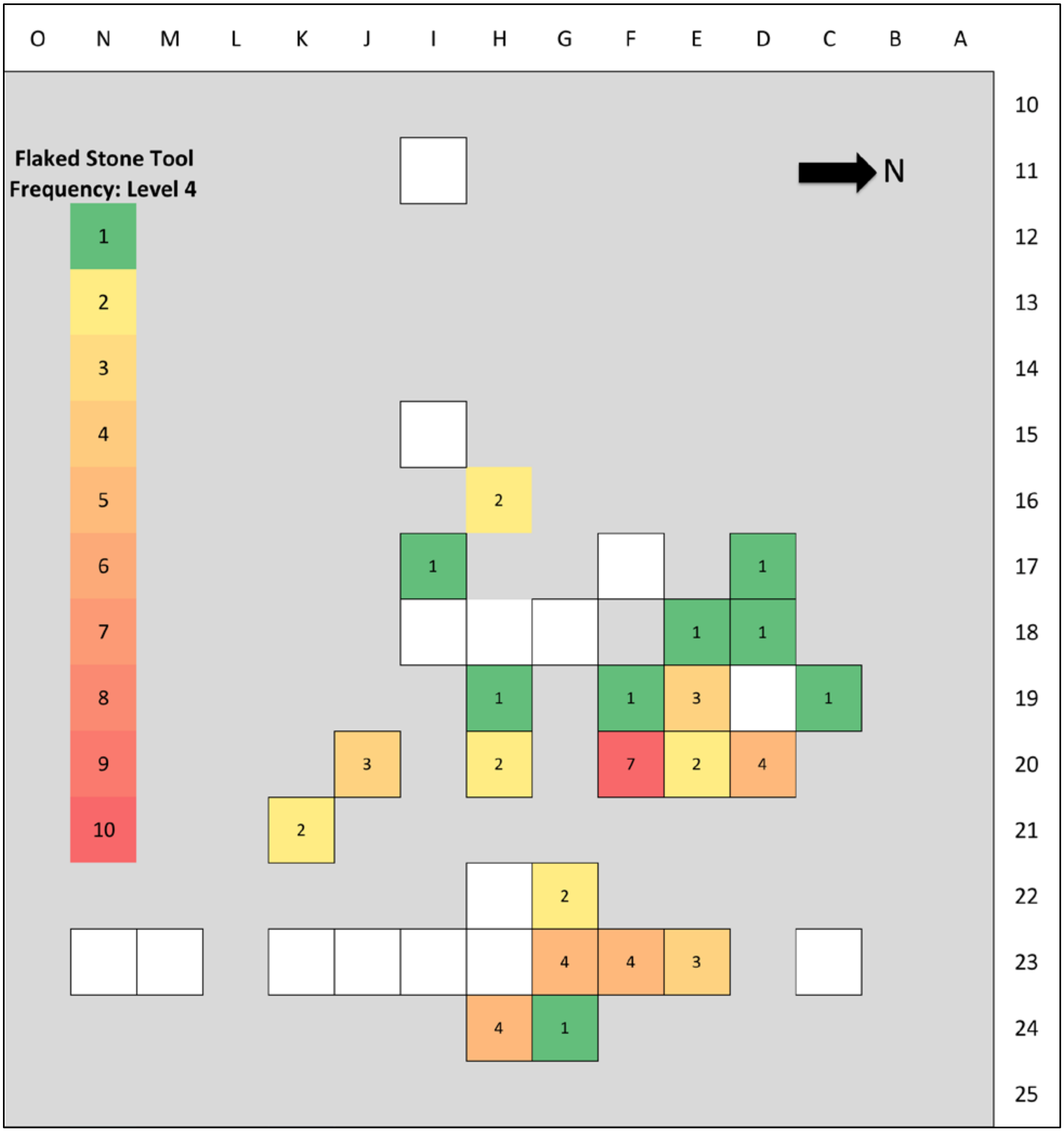

Figure A-C.4: Main excavation area chipped stone tool frequency, level 4.

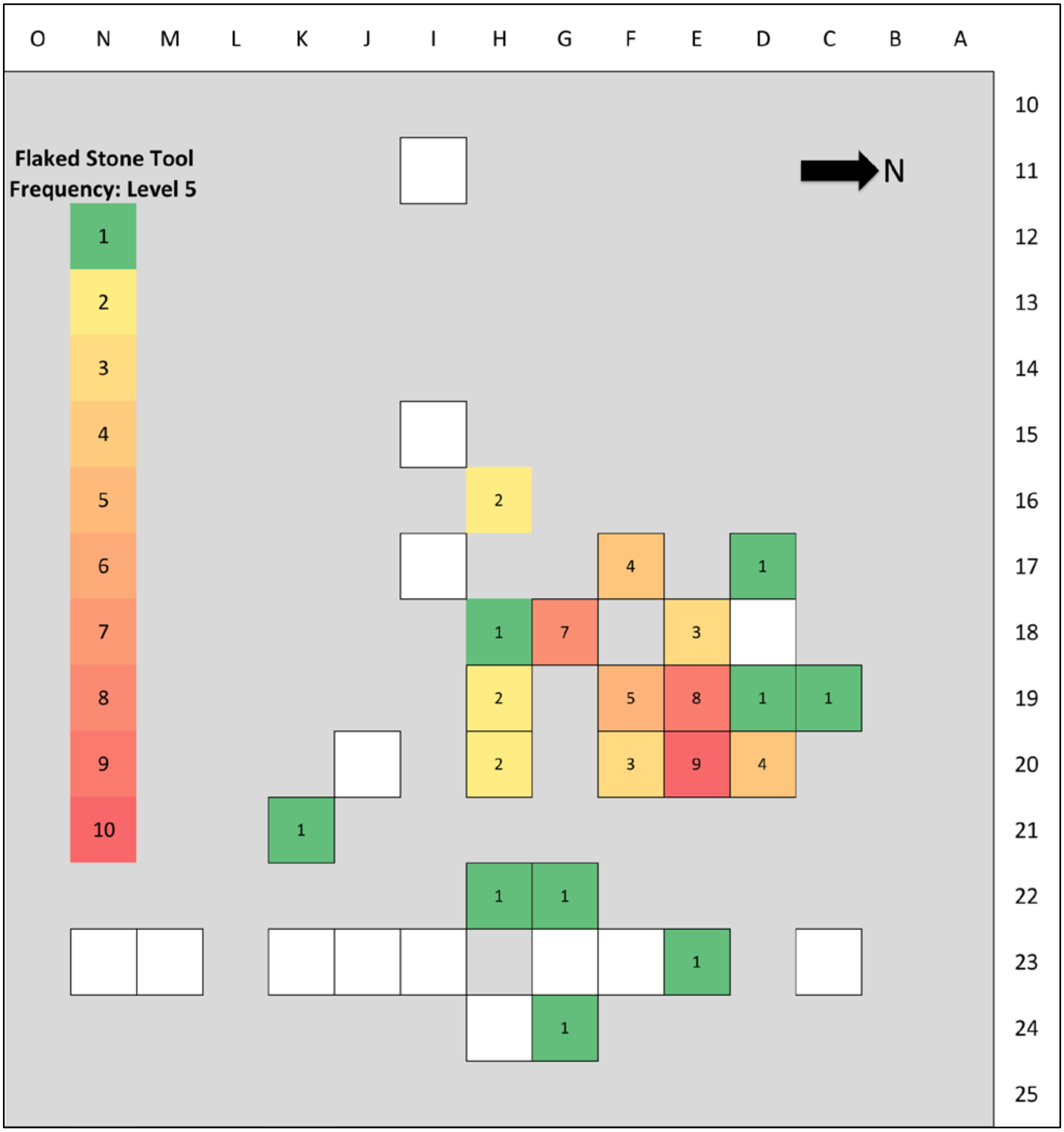

Figure A-C.5: Main excavation area chipped stone tool frequency, level 5.

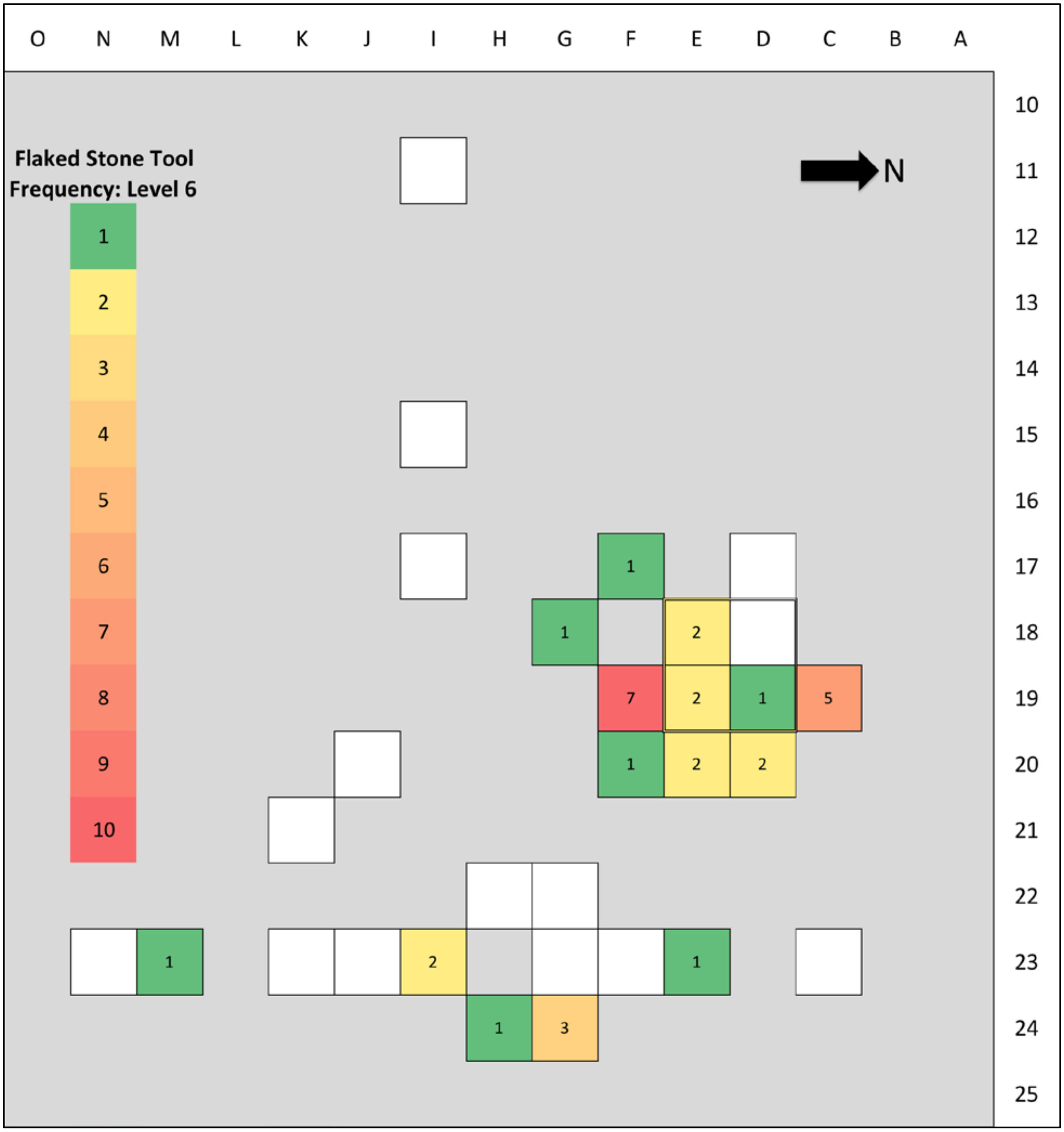

Figure A-C.6: Main excavation area chipped stone tool frequency, level 6.

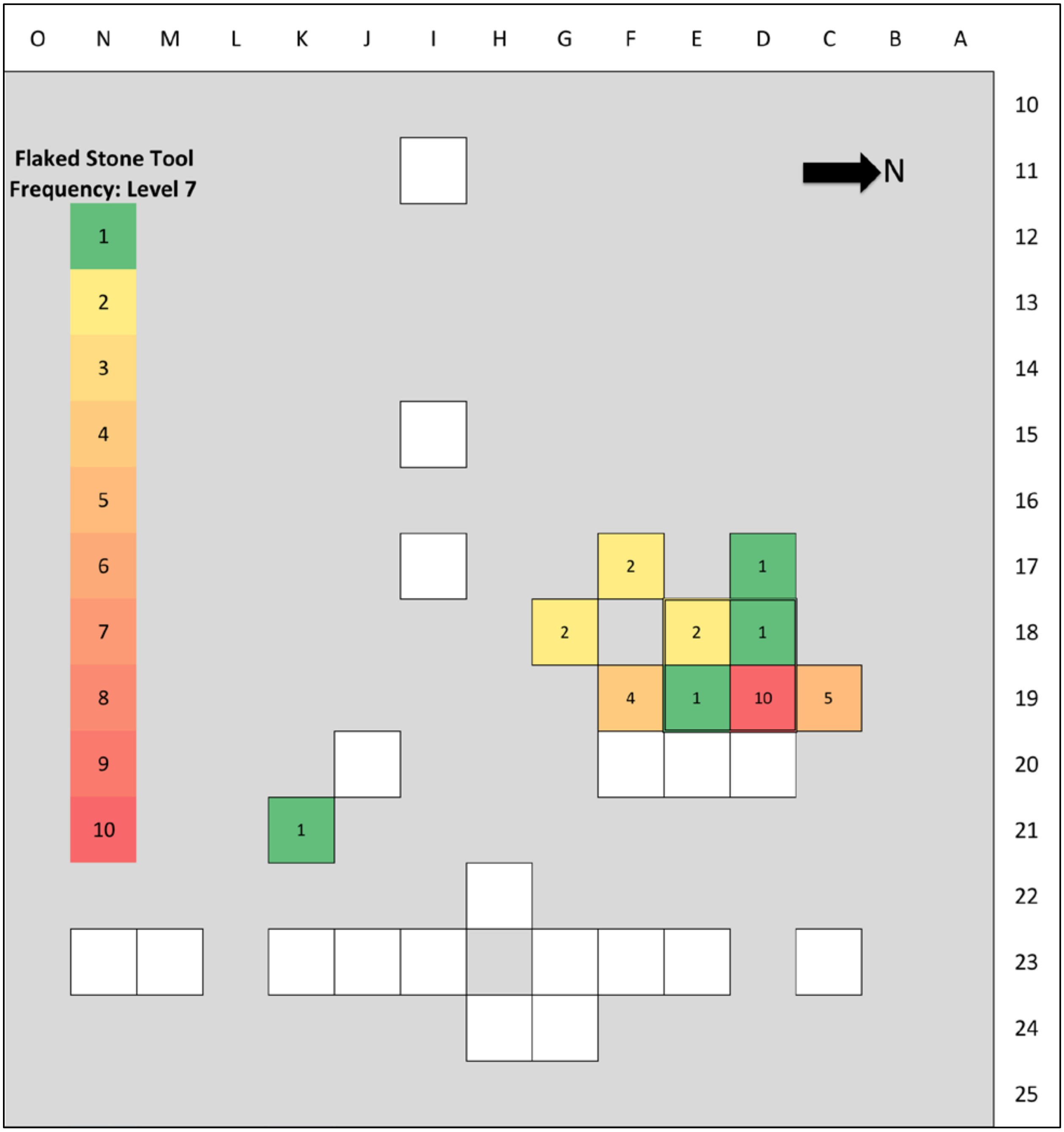

Figure A-C.7: Main excavation area chipped stone tool frequency, level 7.

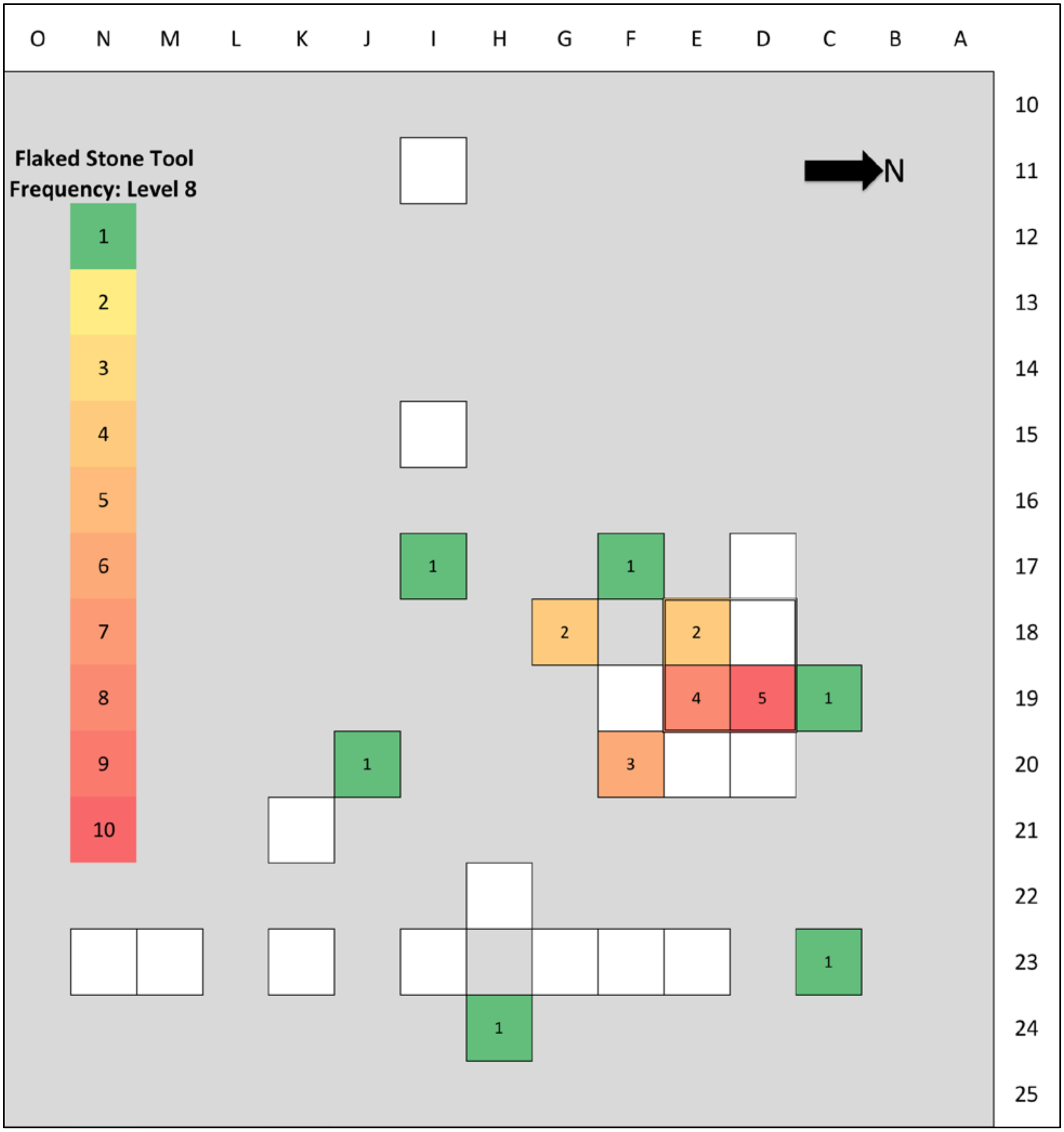

Figure A-C.8: Main excavation area chipped stone tool frequency, level 8.

Ceramics mass (g)

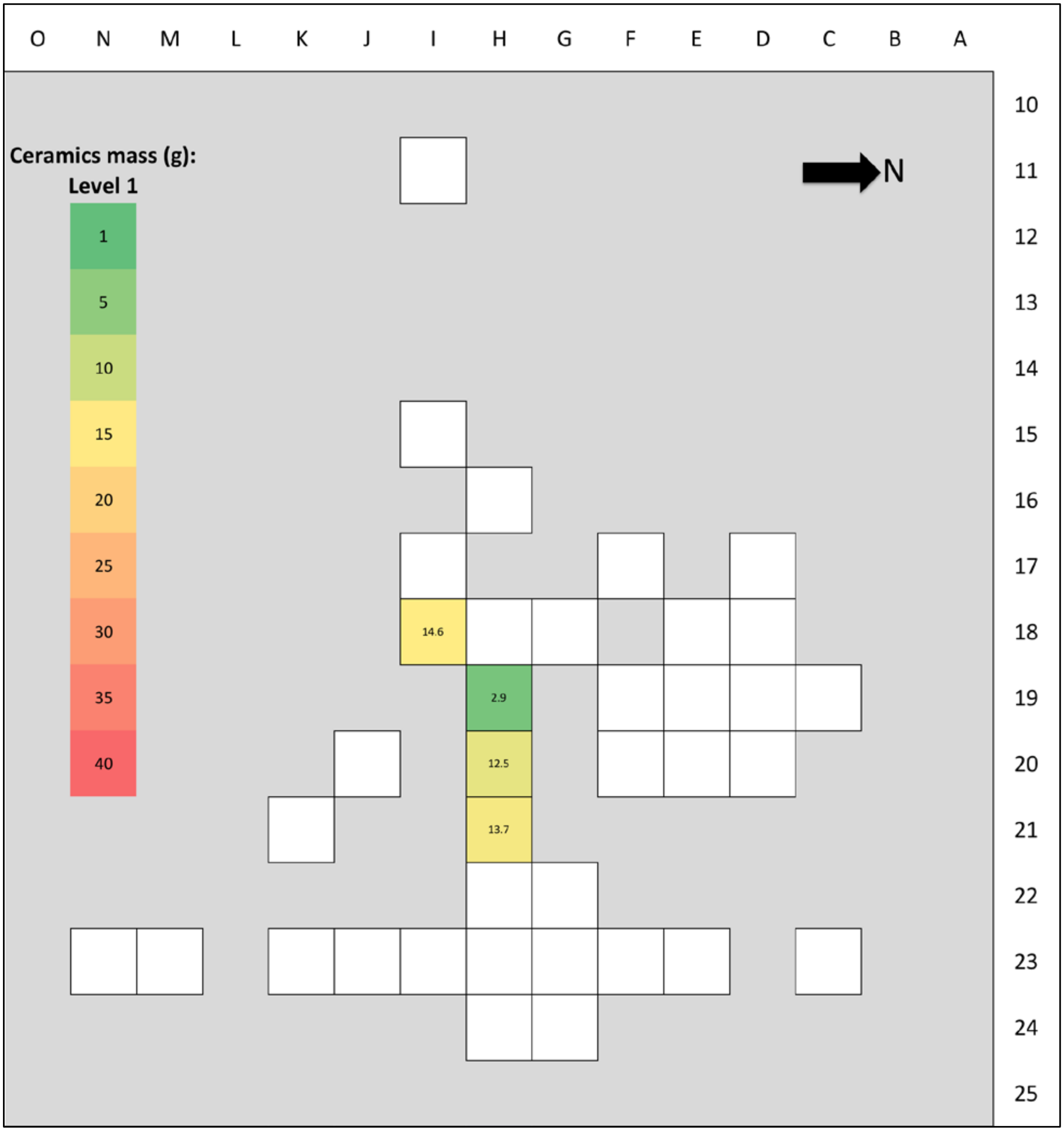

Figure A-C.9: Main excavation area ceramics mass (g), level 1.

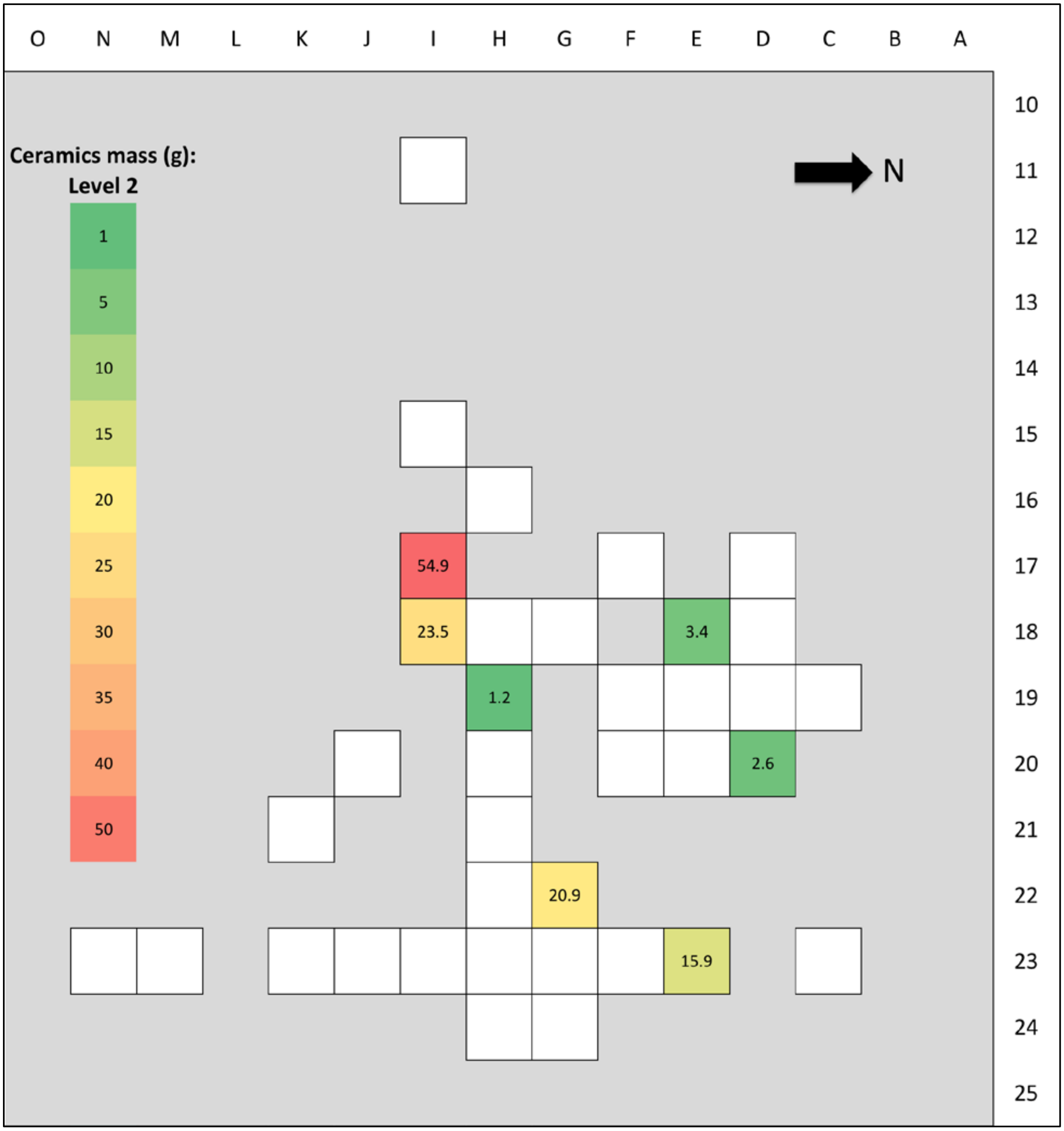

Figure A-C.10: Main excavation area ceramics mass (g), level 2.

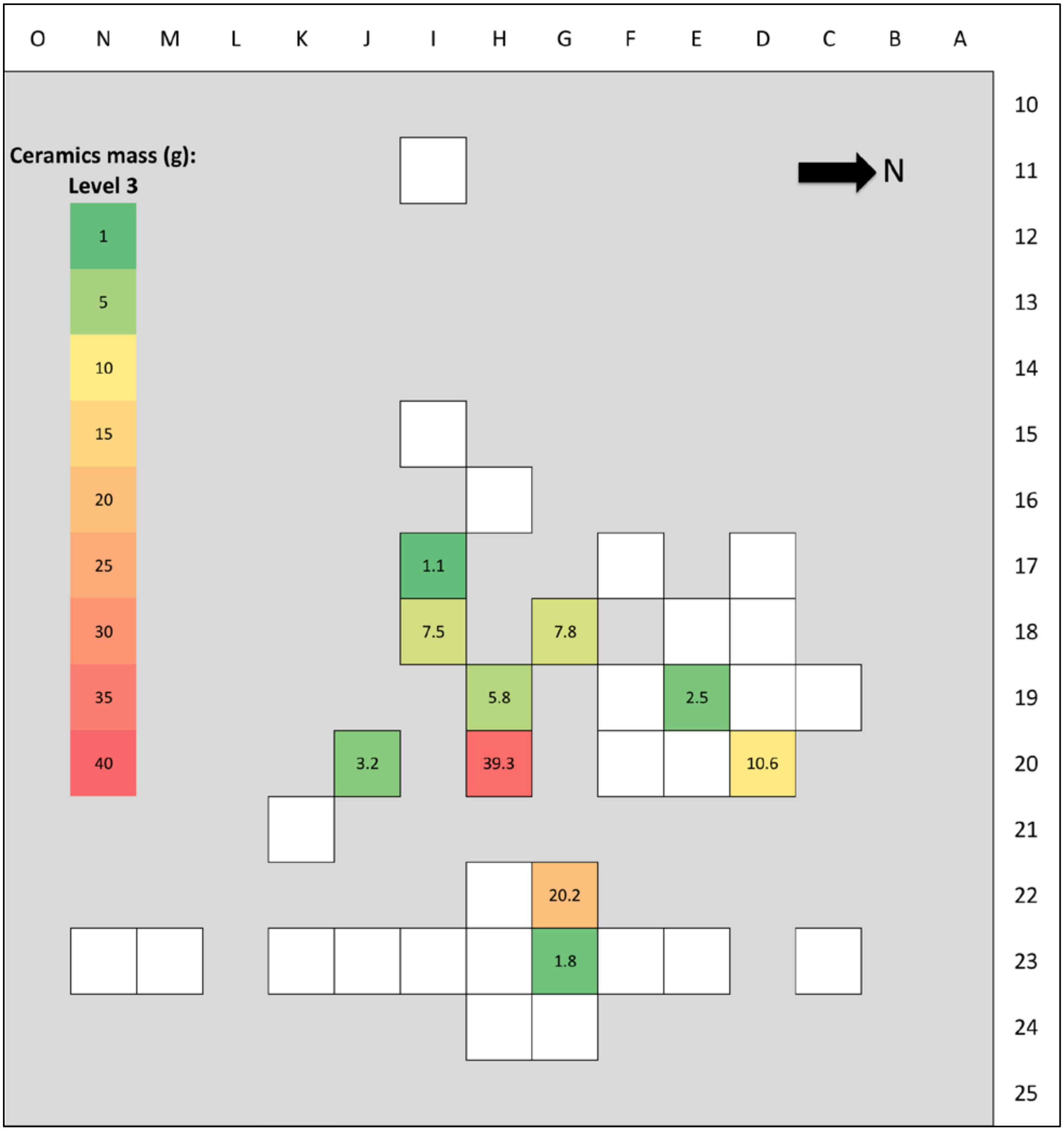

Figure A-C.11: Main excavation area ceramics mass (g), level 3.

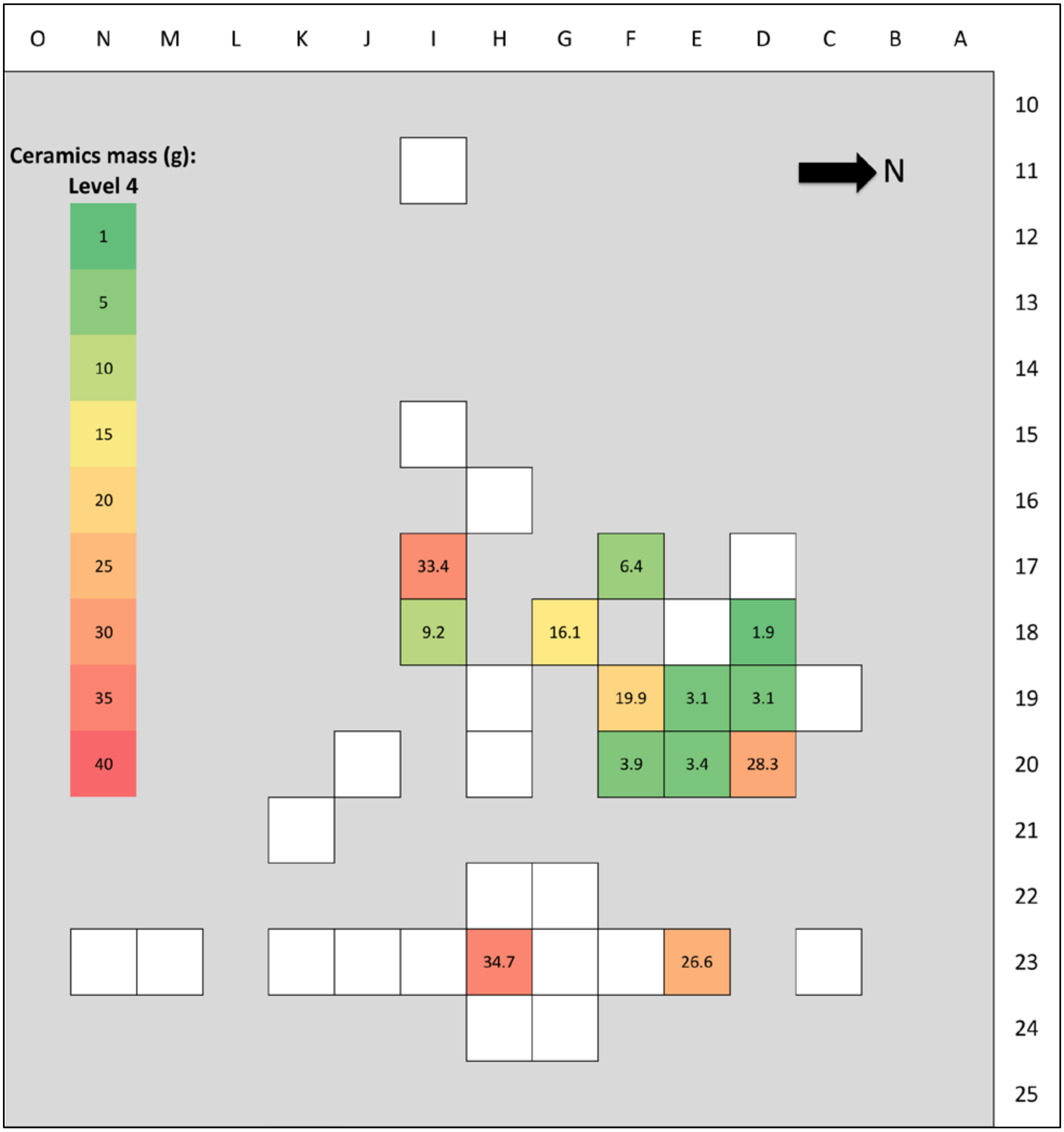

Figure A-C.12: Main excavation area ceramics mass (g), level 4.

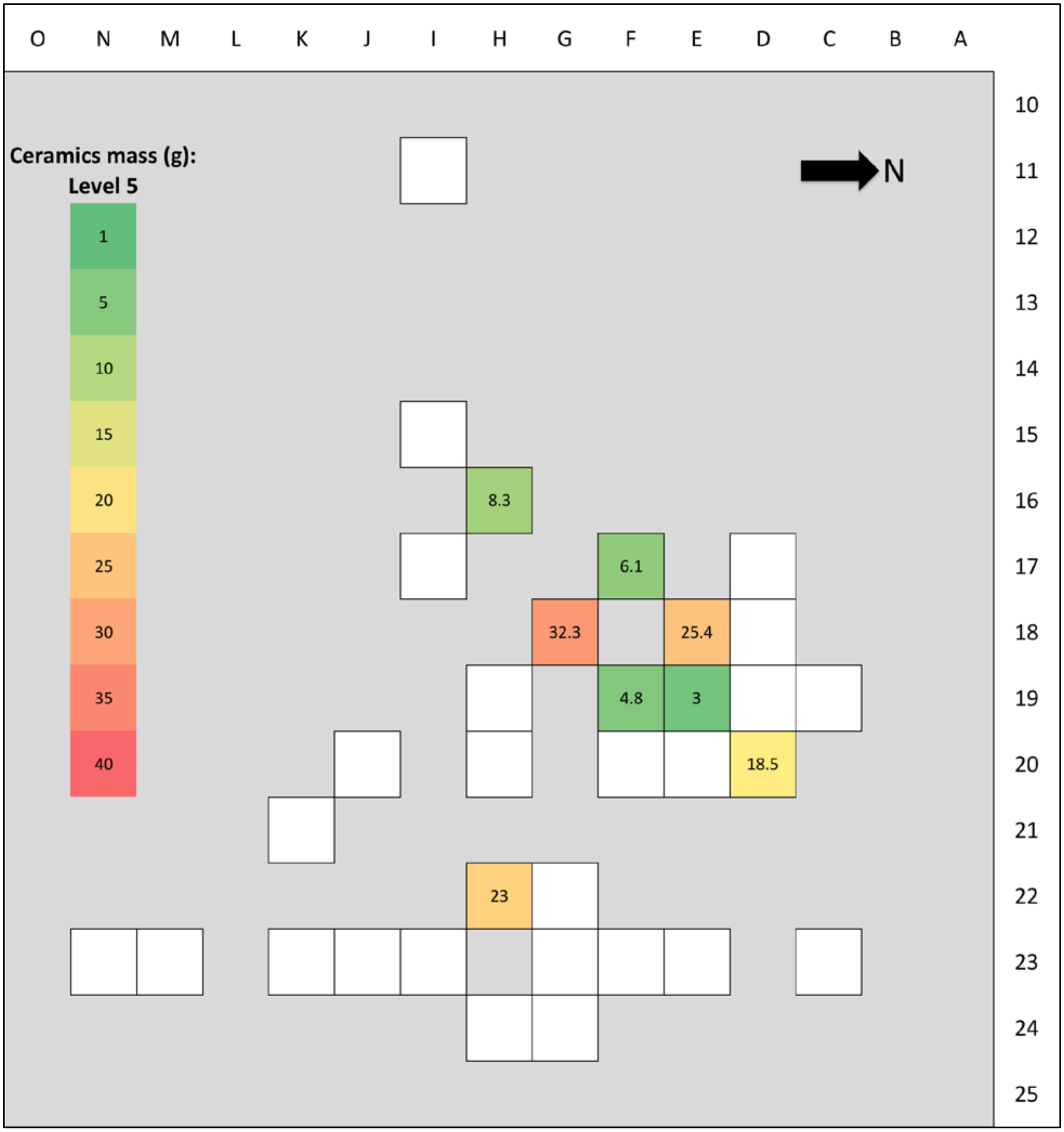

Figure A-C.13: Main excavation area ceramics mass (g), level 5.

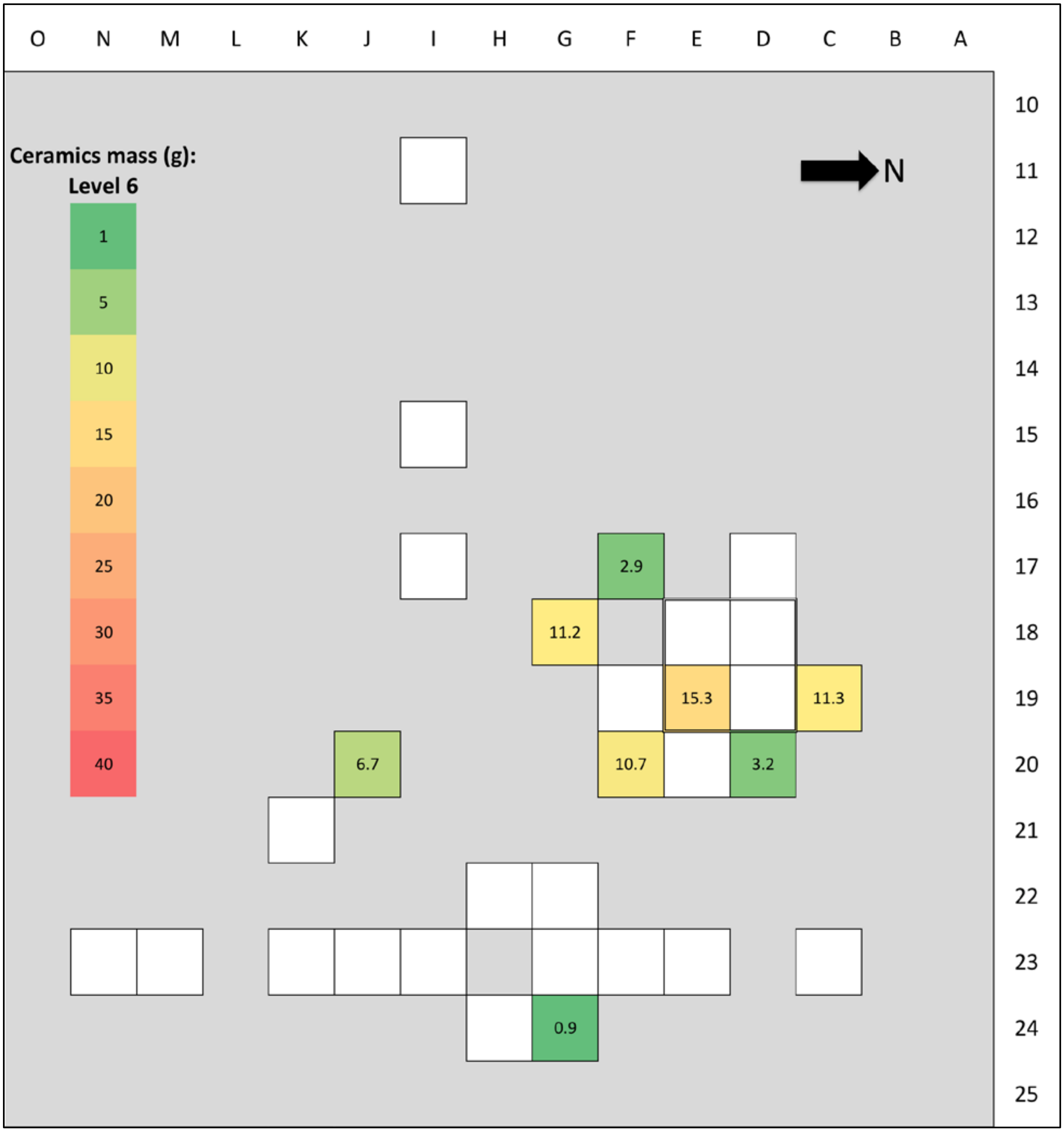

Figure A-C.14: Main excavation area ceramics mass (g), level 6.

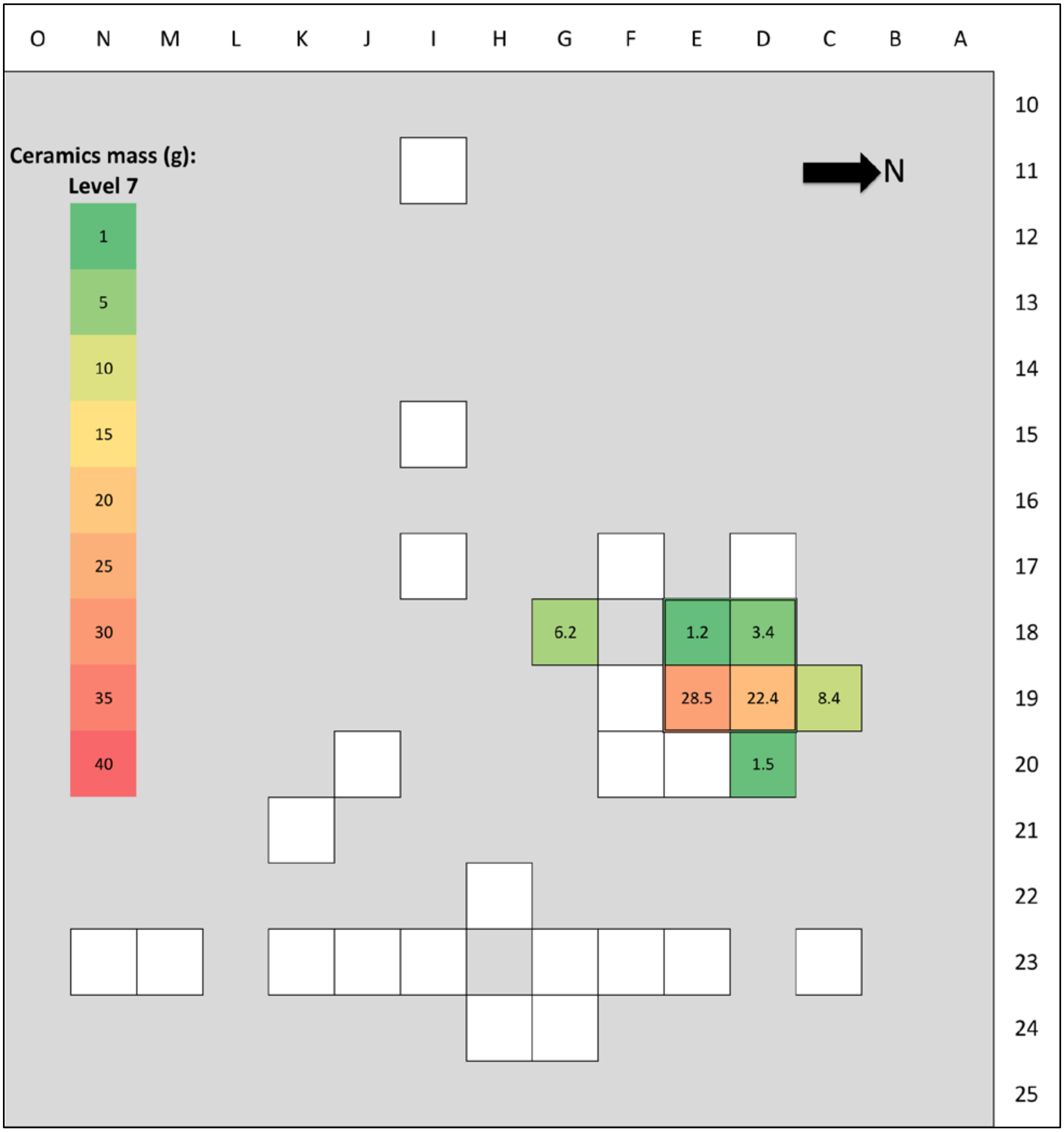

Figure A-C.15: Main excavation area ceramics mass (g), level 7.

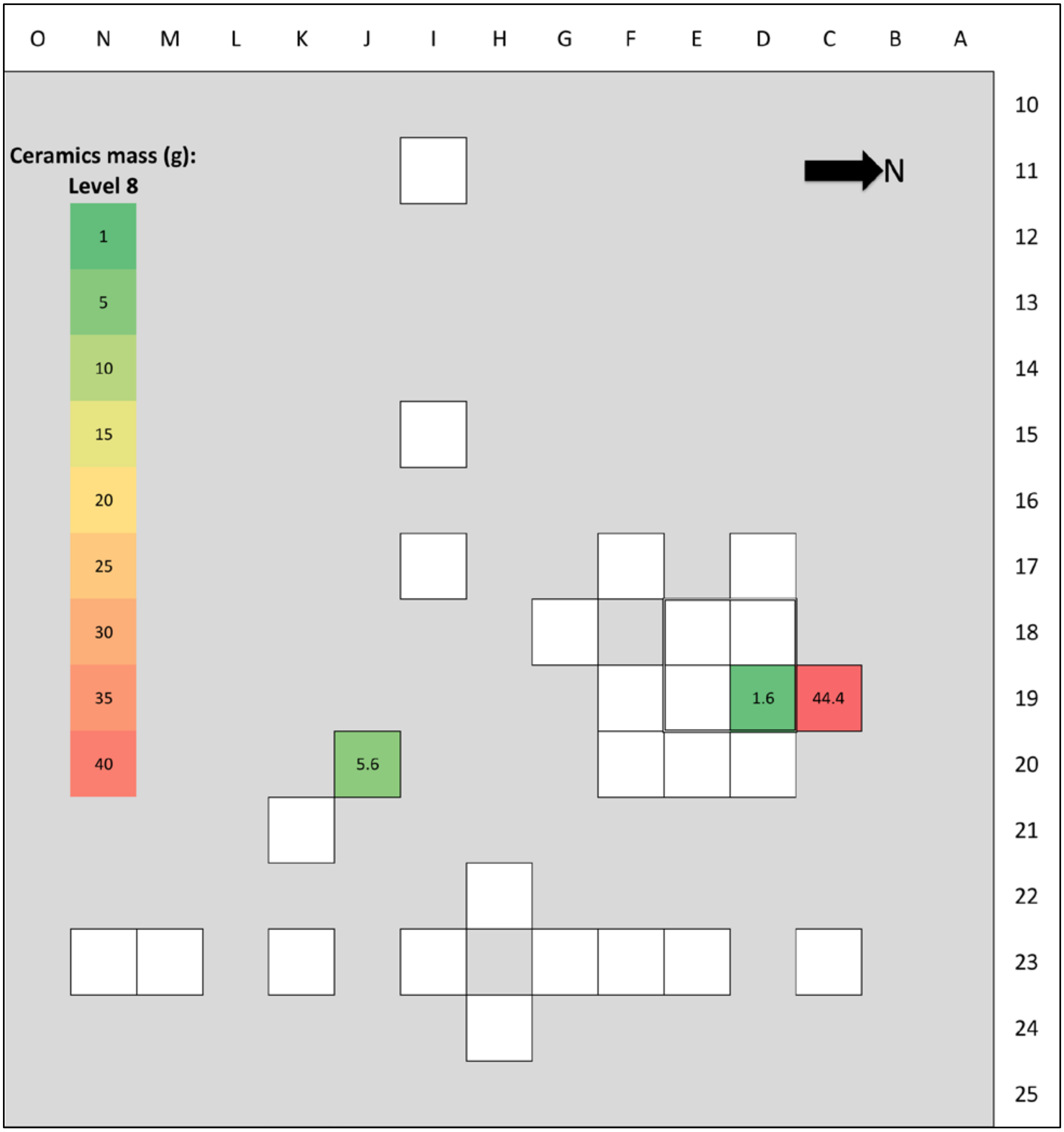

Figure A-C.16: Main excavation area ceramics mass (g), level 8.

Ground stone frequency

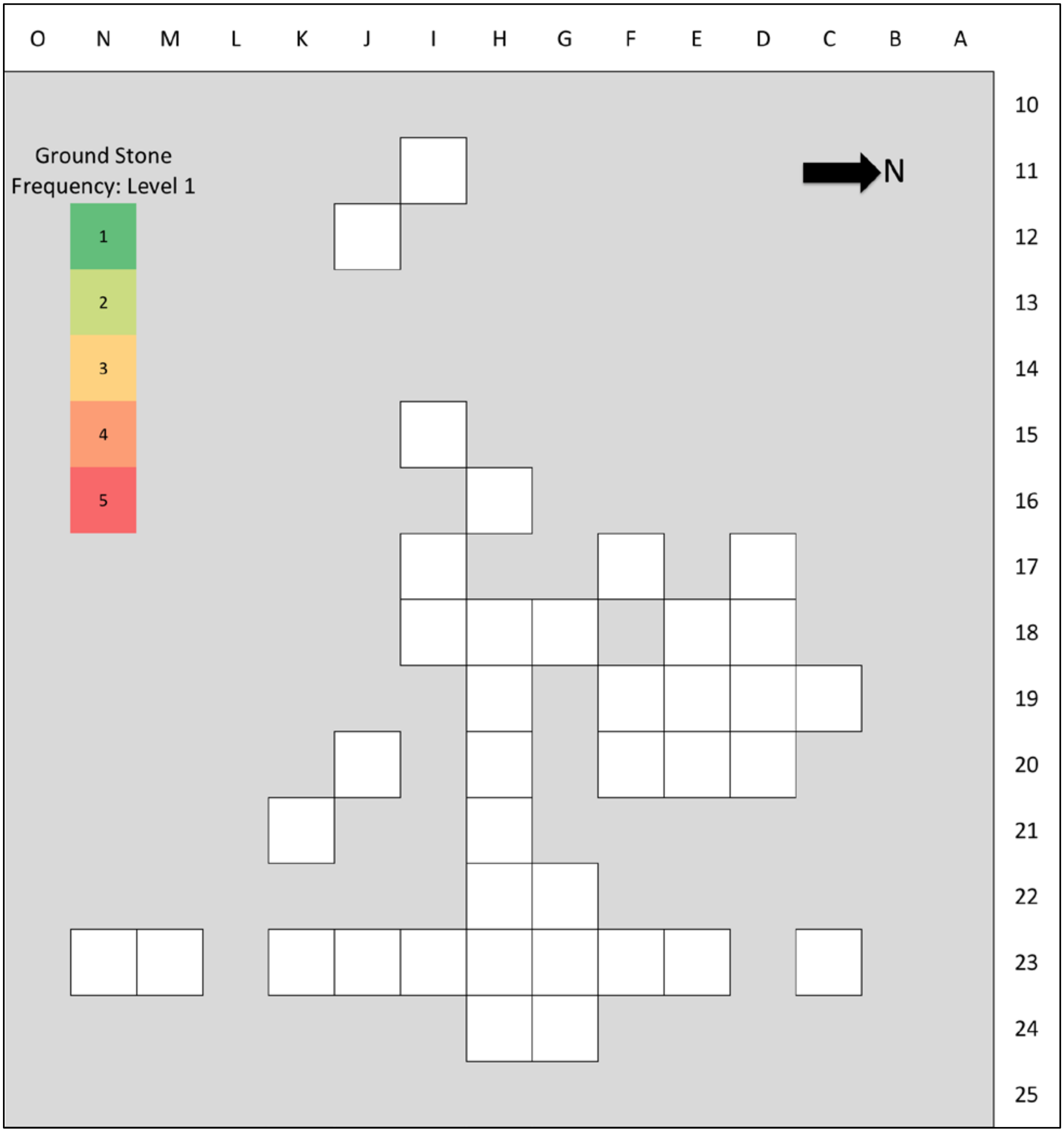

Figure A-C.17: Main excavation area ground stone frequency, level 1.

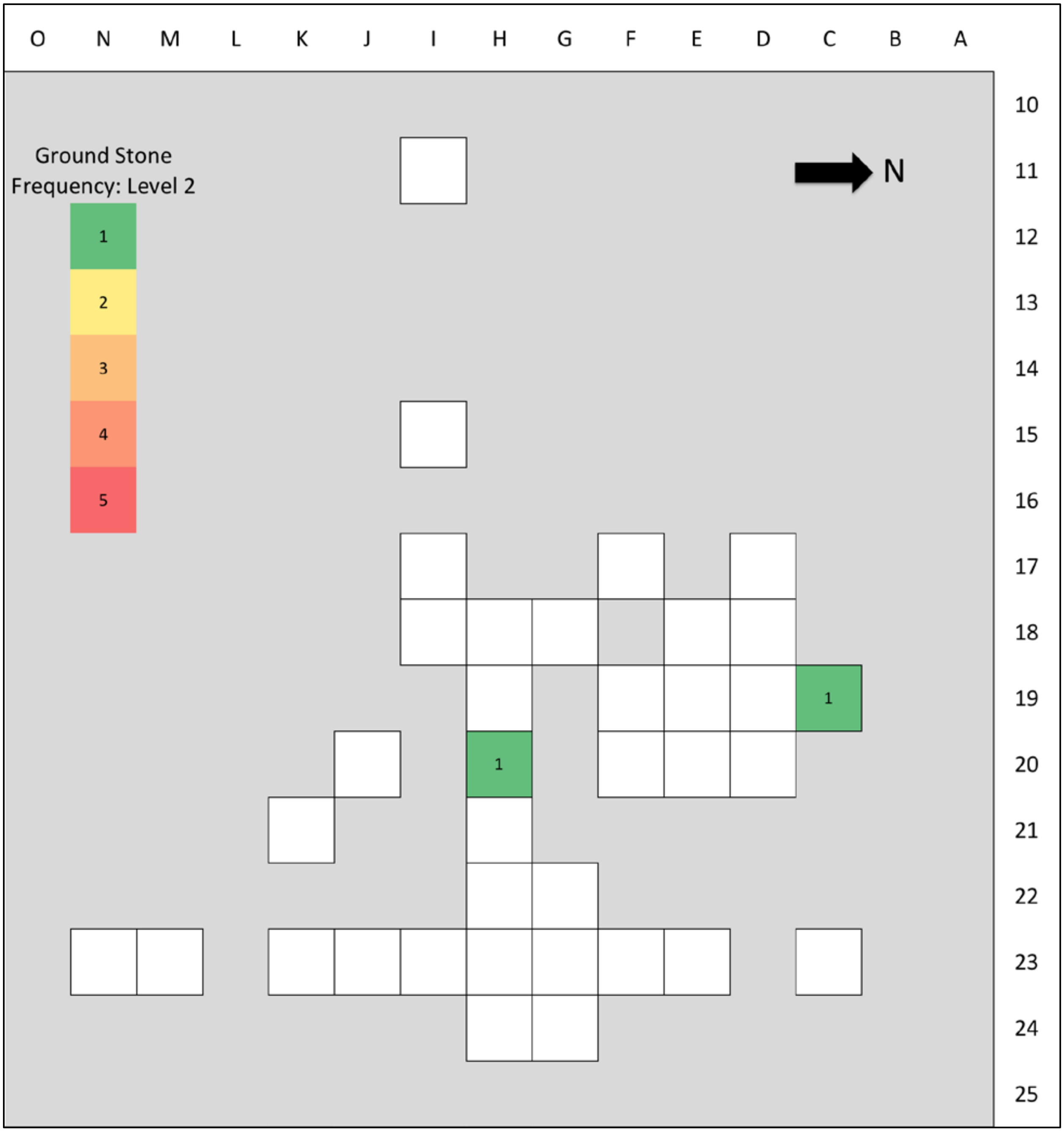

Figure A-C.18: Main excavation area ground stone frequency, level 2.

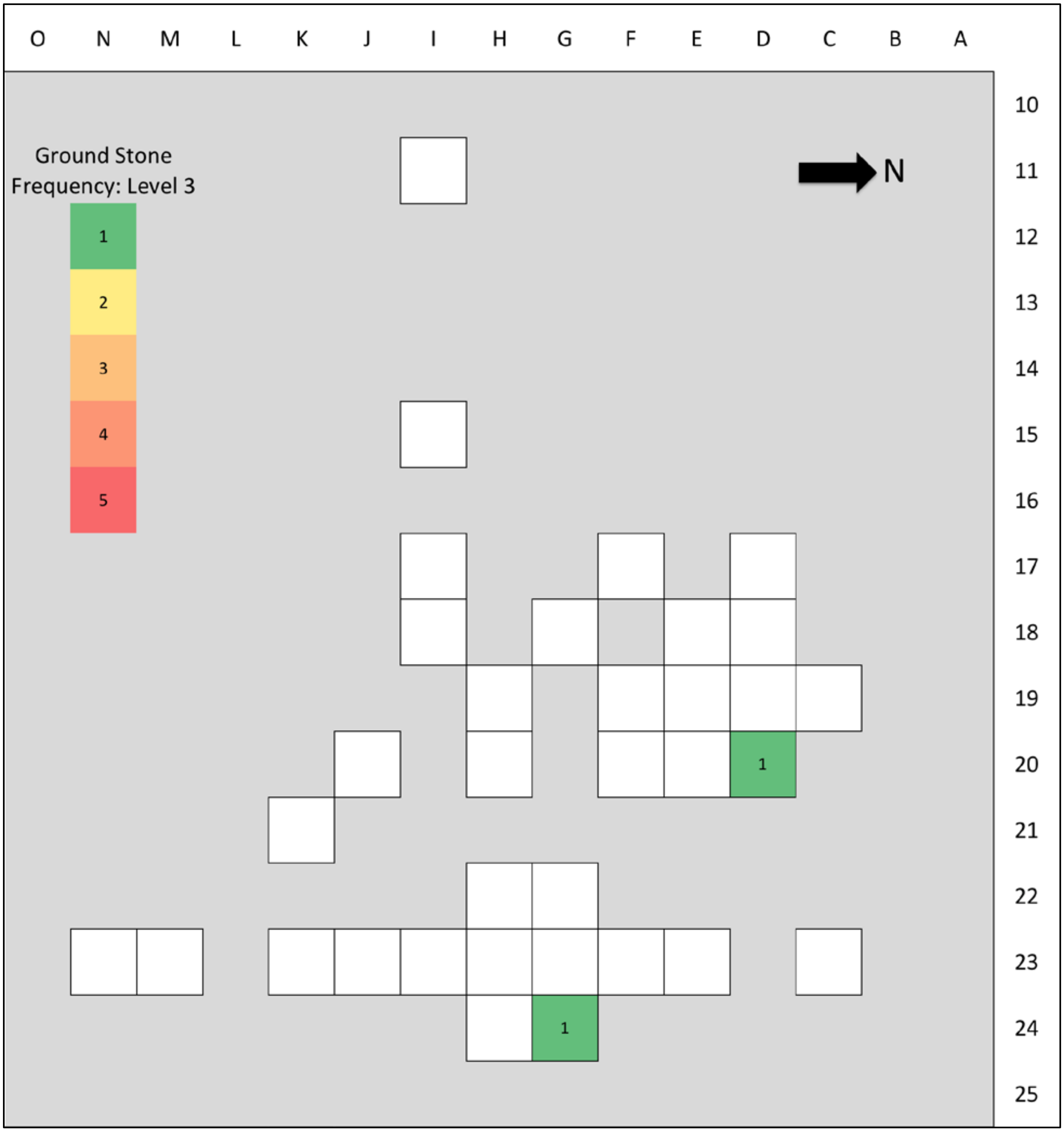

Figure A-C.19: Main excavation area ground stone frequency, level 3.

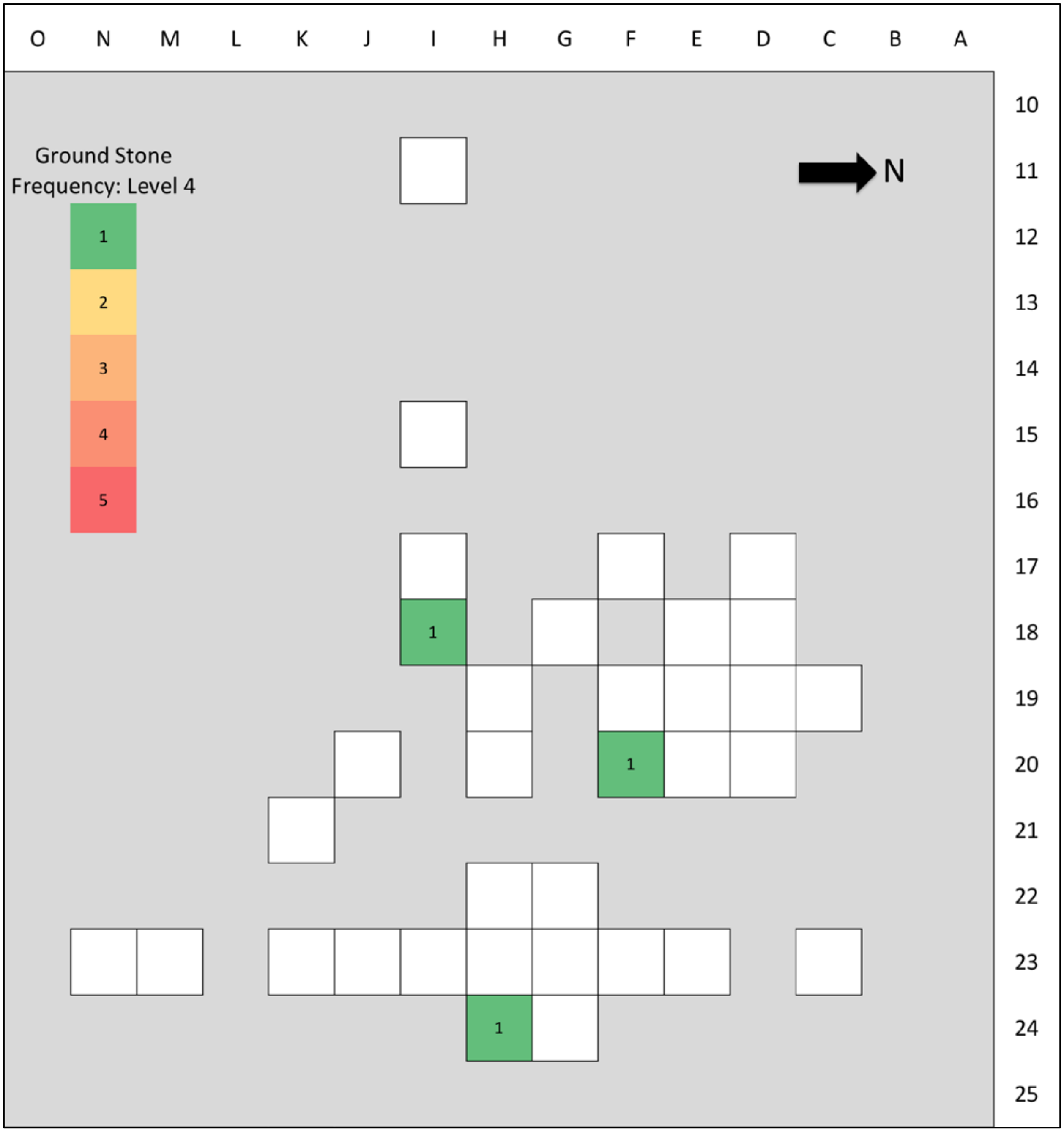

Figure A-C.20: Main excavation area ground stone frequency, level 4.

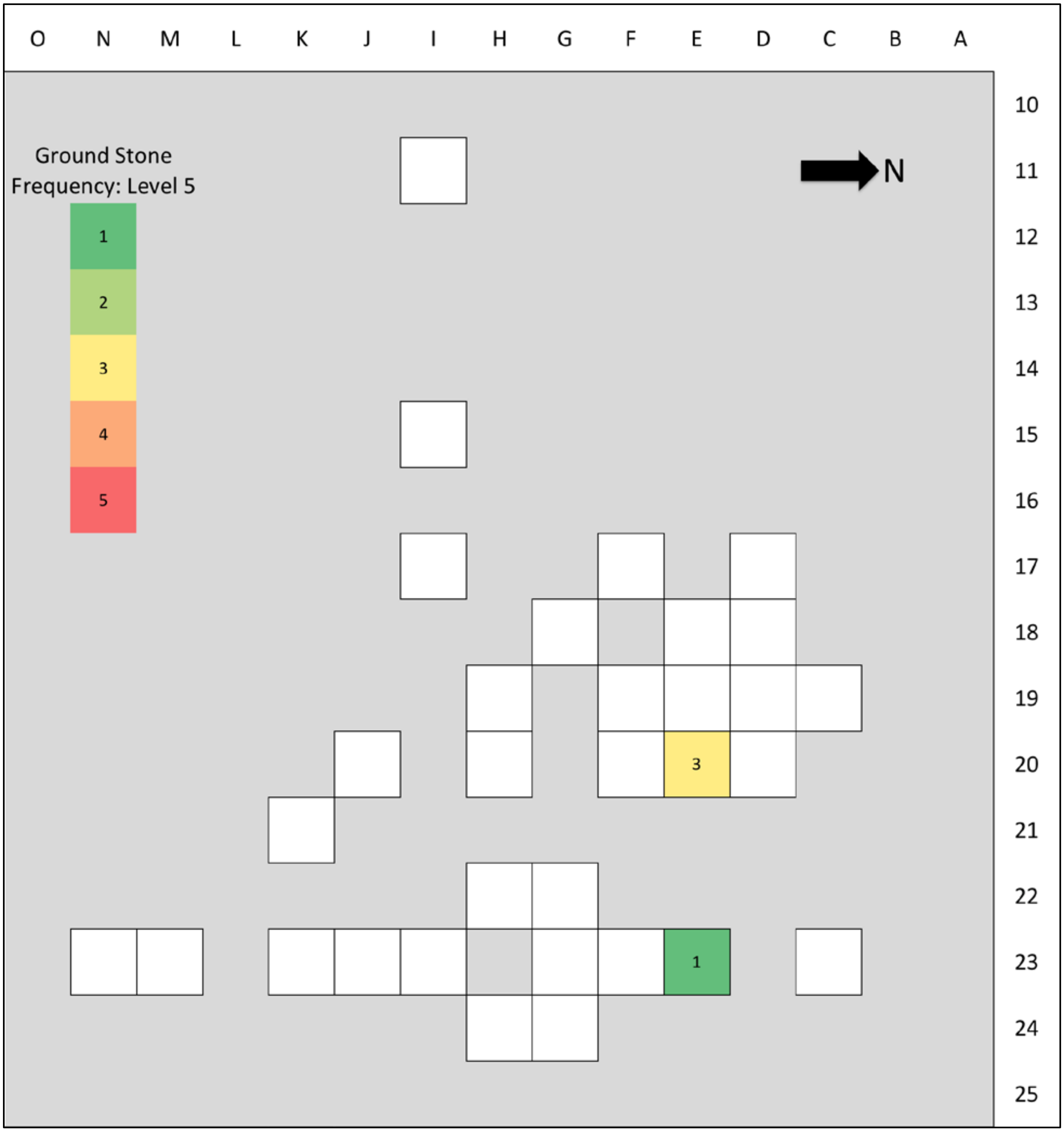

Figure A-C.21: Main excavation area ground stone frequency, level 5.

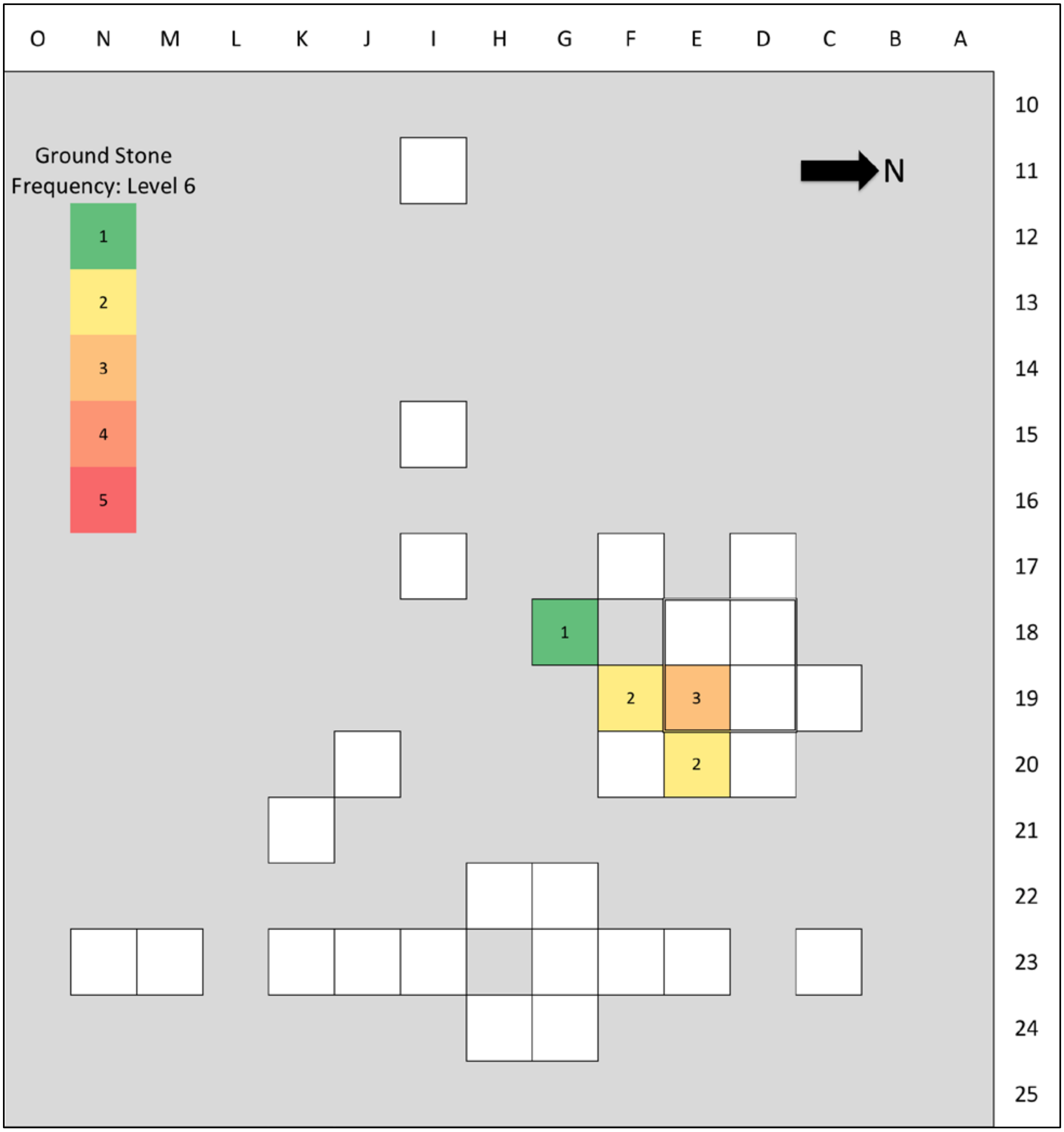

Figure A-C.22: Main excavation area ground stone frequency, level 6.

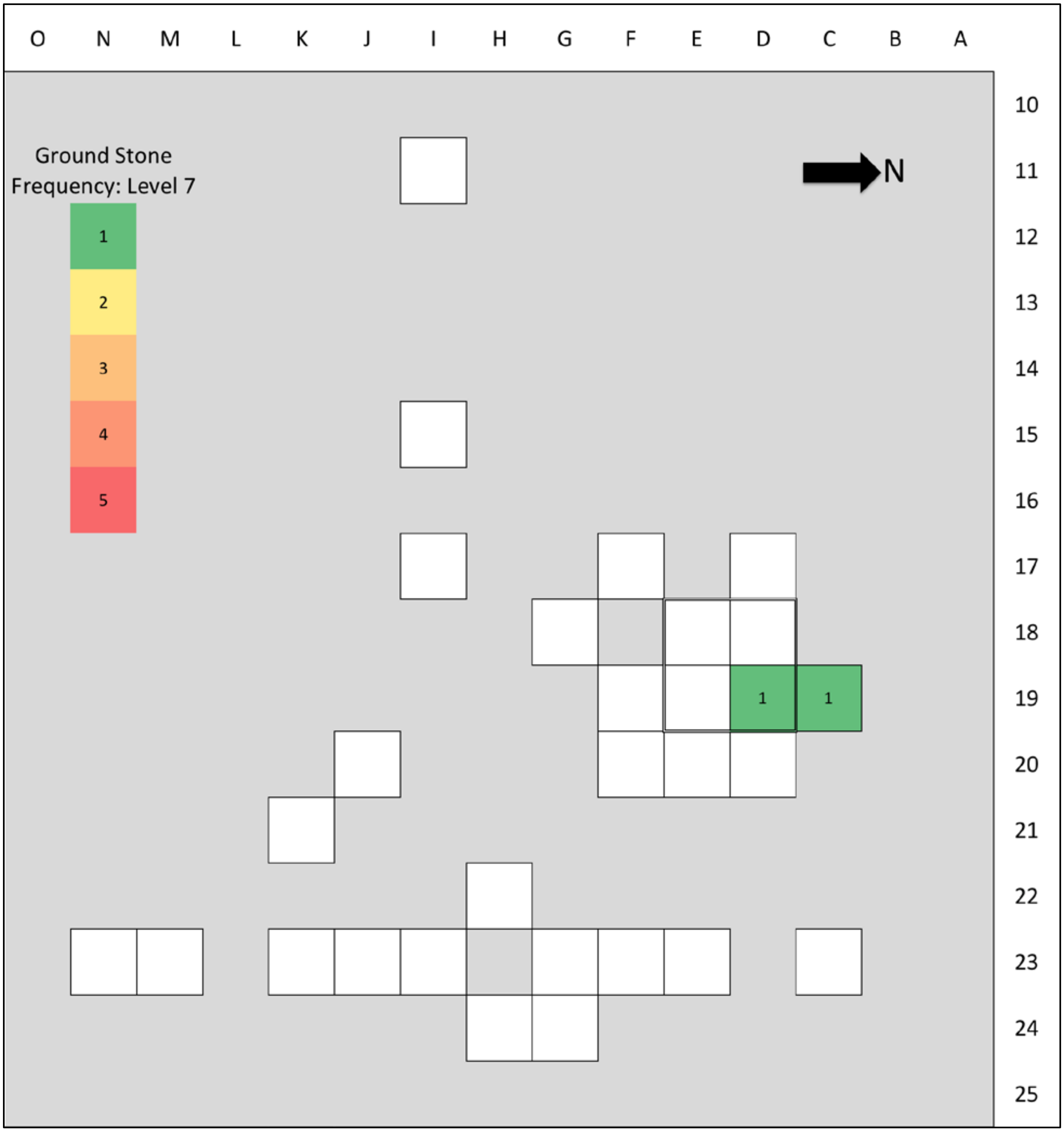

Figure A-C.23: Main excavation area ground stone frequency, level 7.

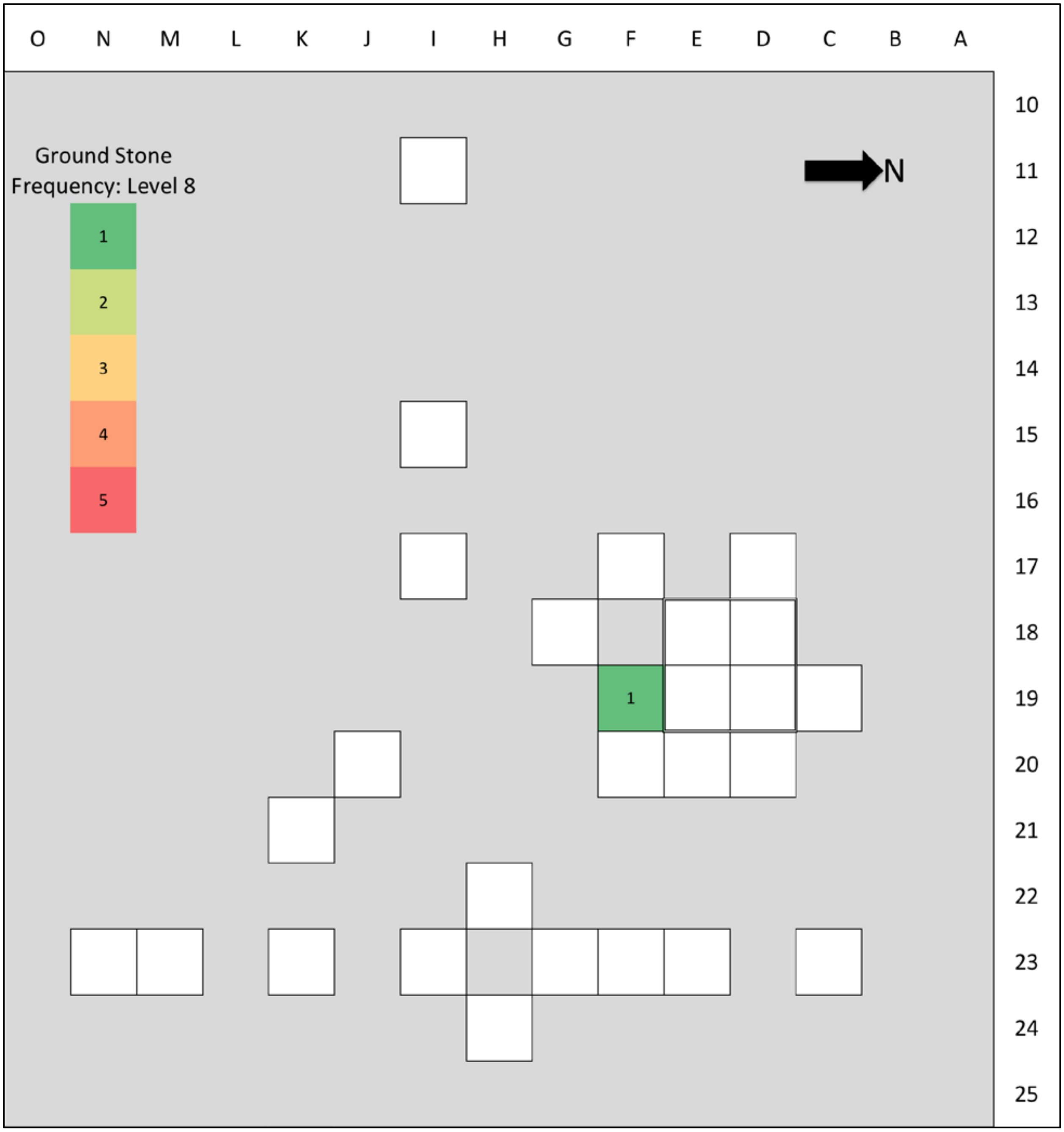

Figure A-C.24: Main excavation area ground stone frequency, level 8.

Faunal remains mass (g)

Provenience for some faunal remains may be incorrectly labeled. In a few cases, bone is indicated as present in a unit and level that may not have been excavated. Faunal remains are mapped as they are labeled.

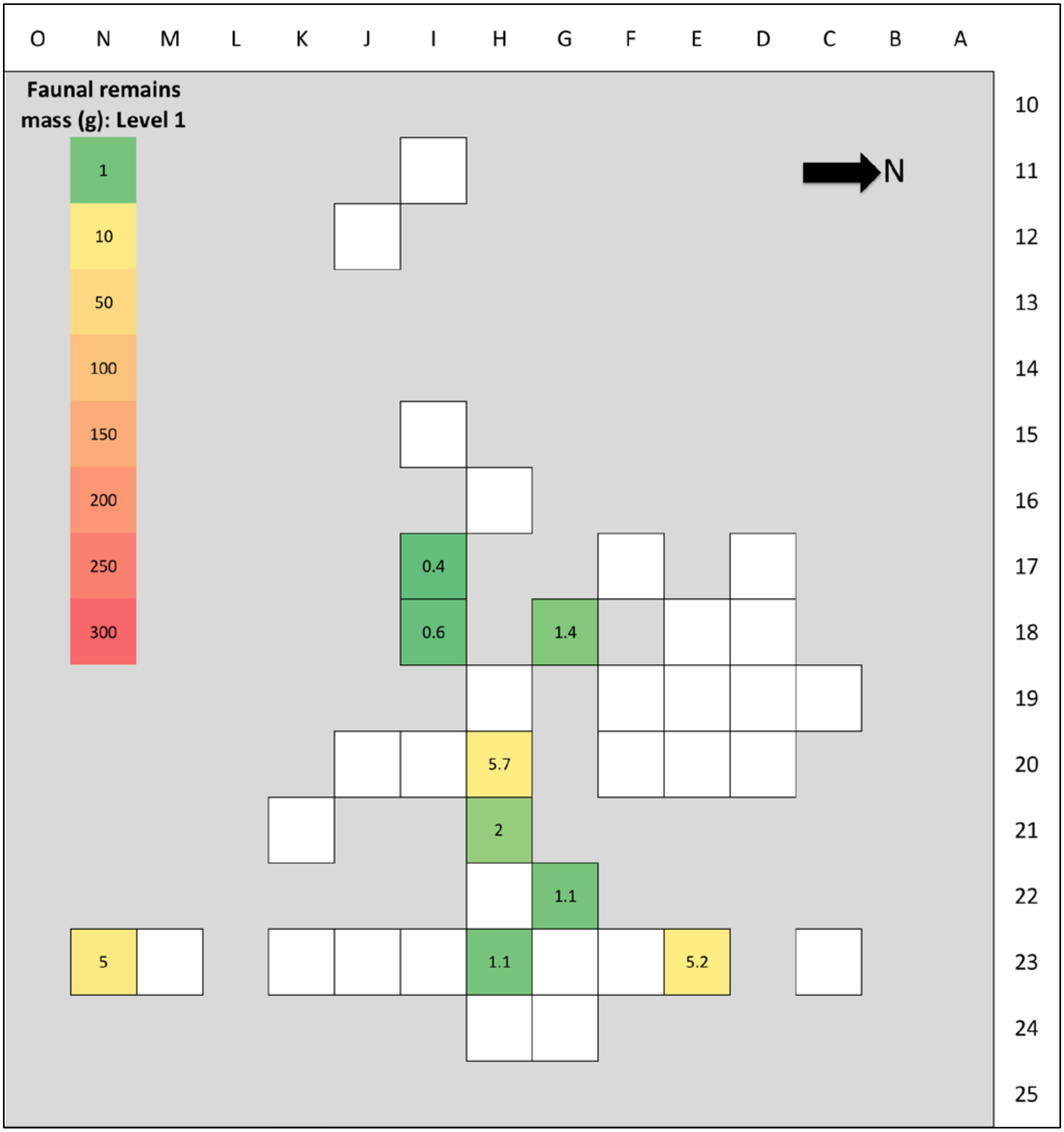

Figure A-C.25: Main excavation faunal remains mass (g), level 1.

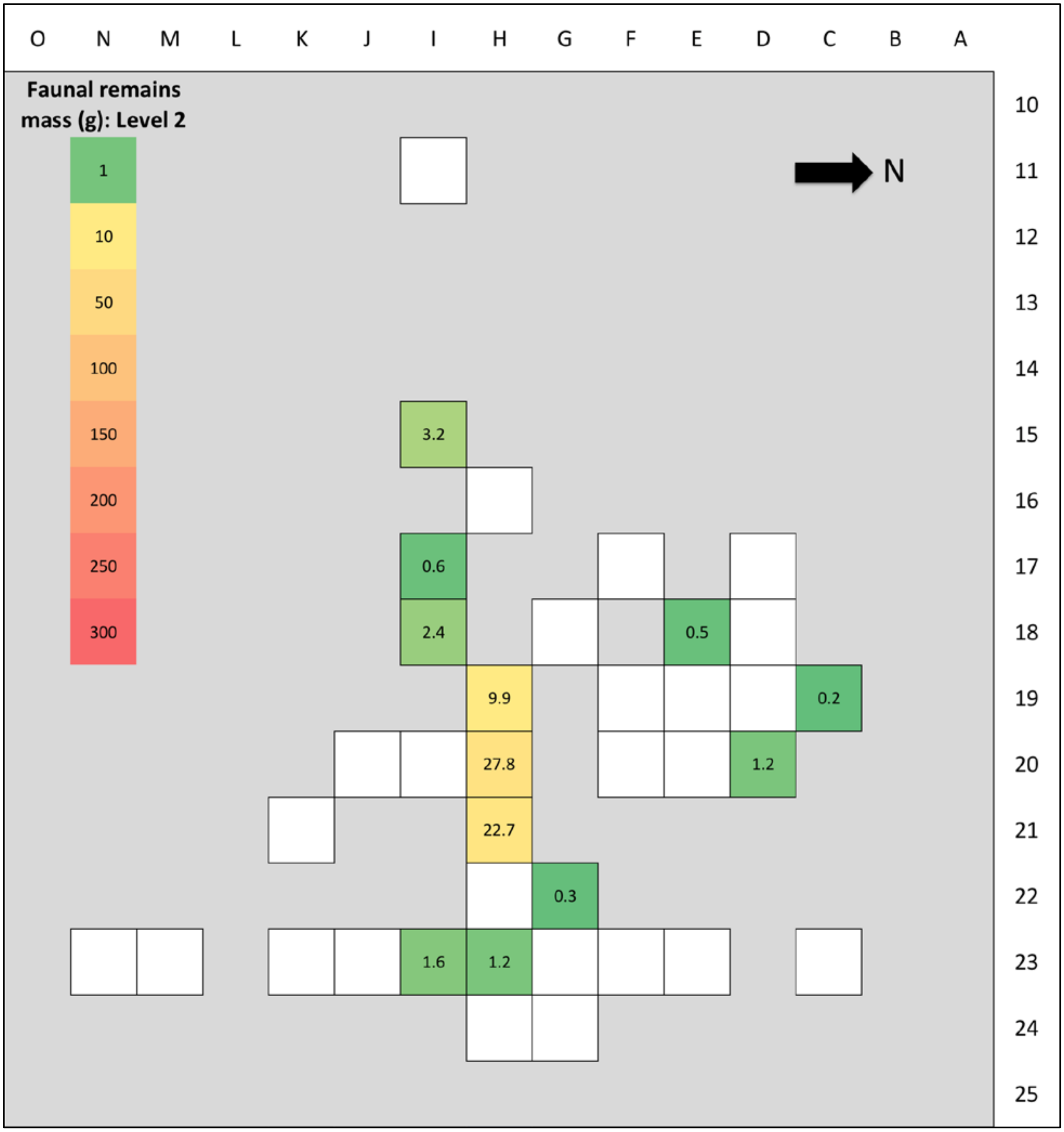

Figure A-C.26: Main excavation faunal remains mass (g), level 2.

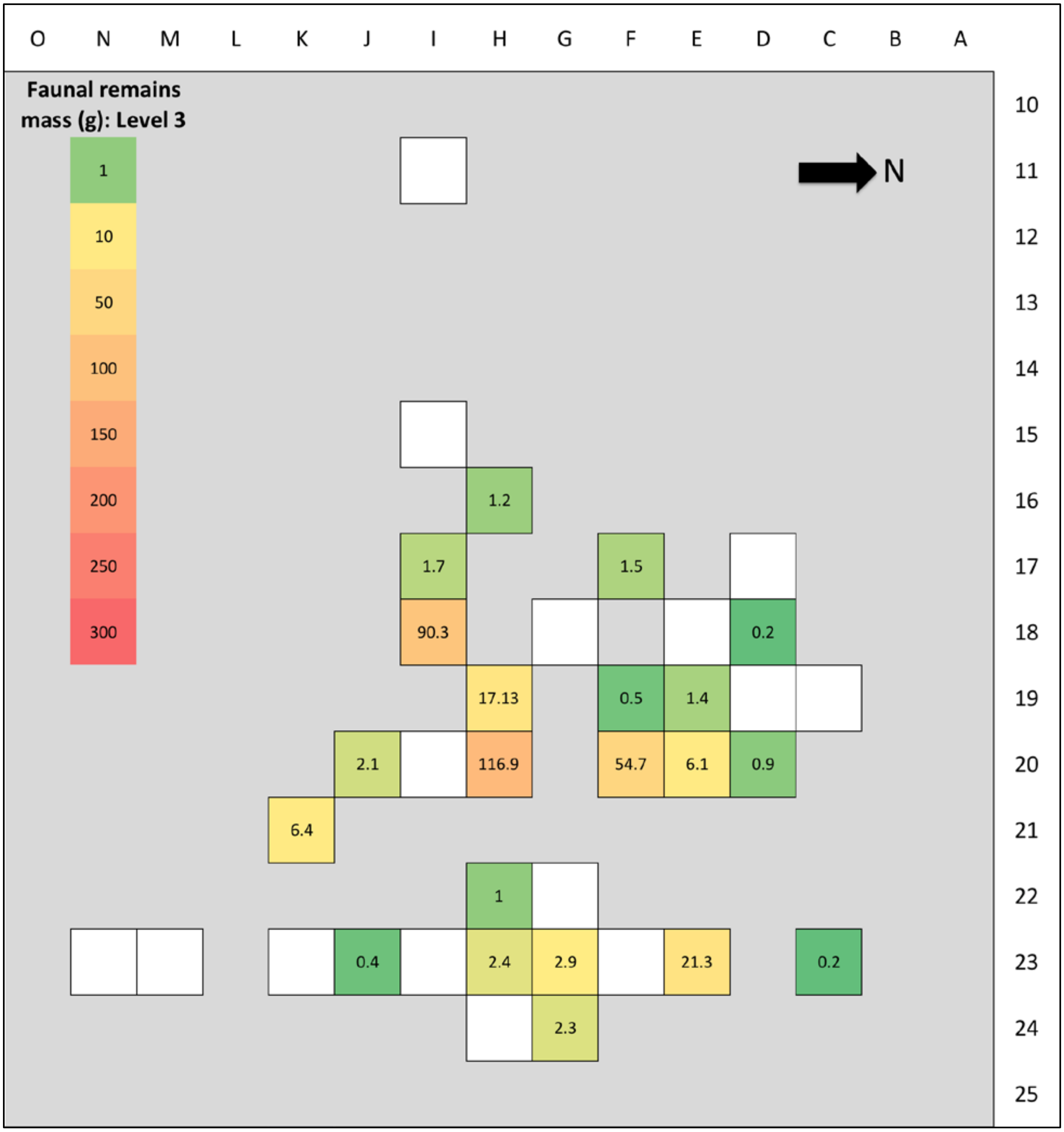

Figure A-C.27: Main excavation faunal remains mass (g), level 3.

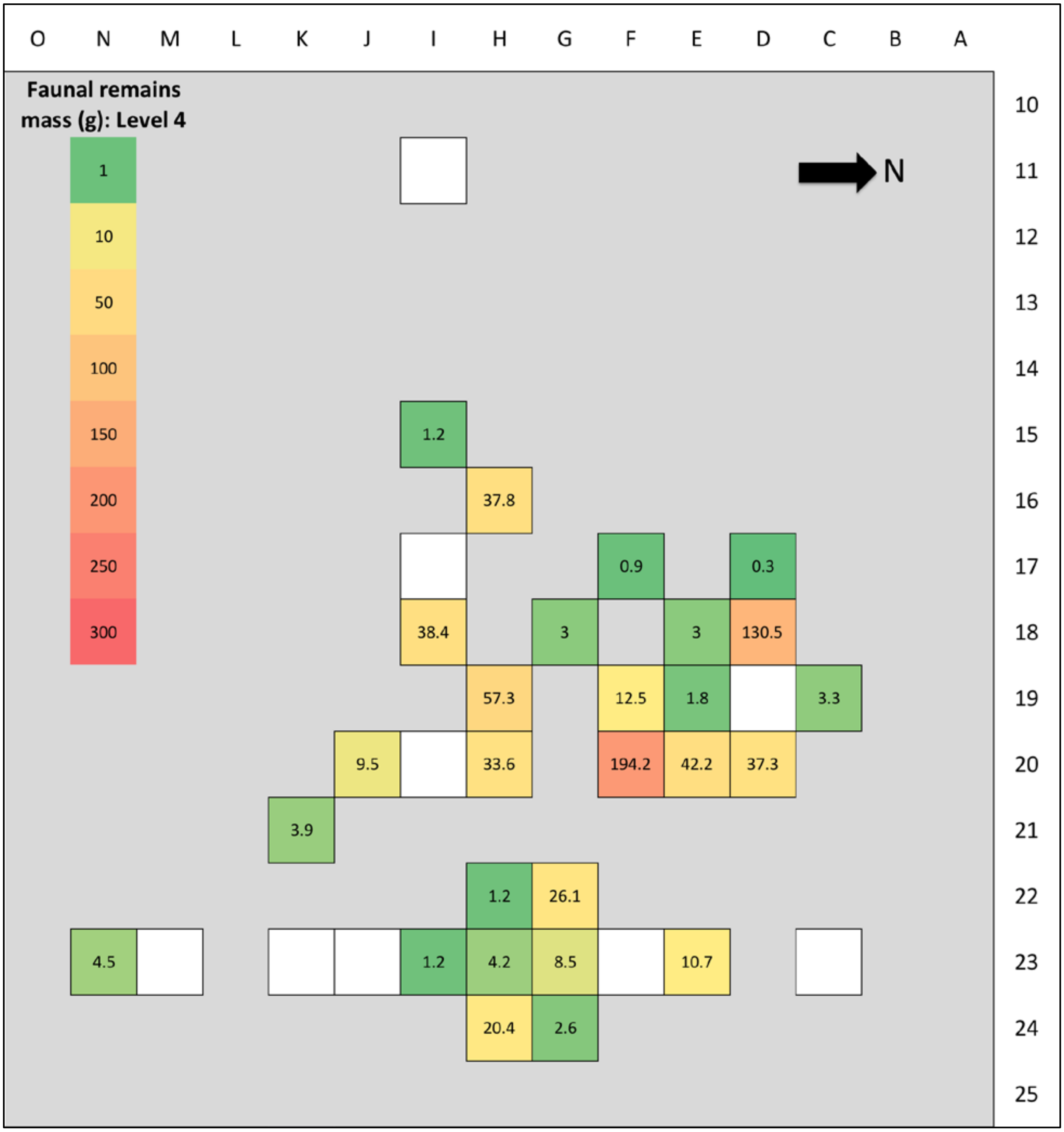

Figure A-C.28: Main excavation faunal remains mass (g), level 4.

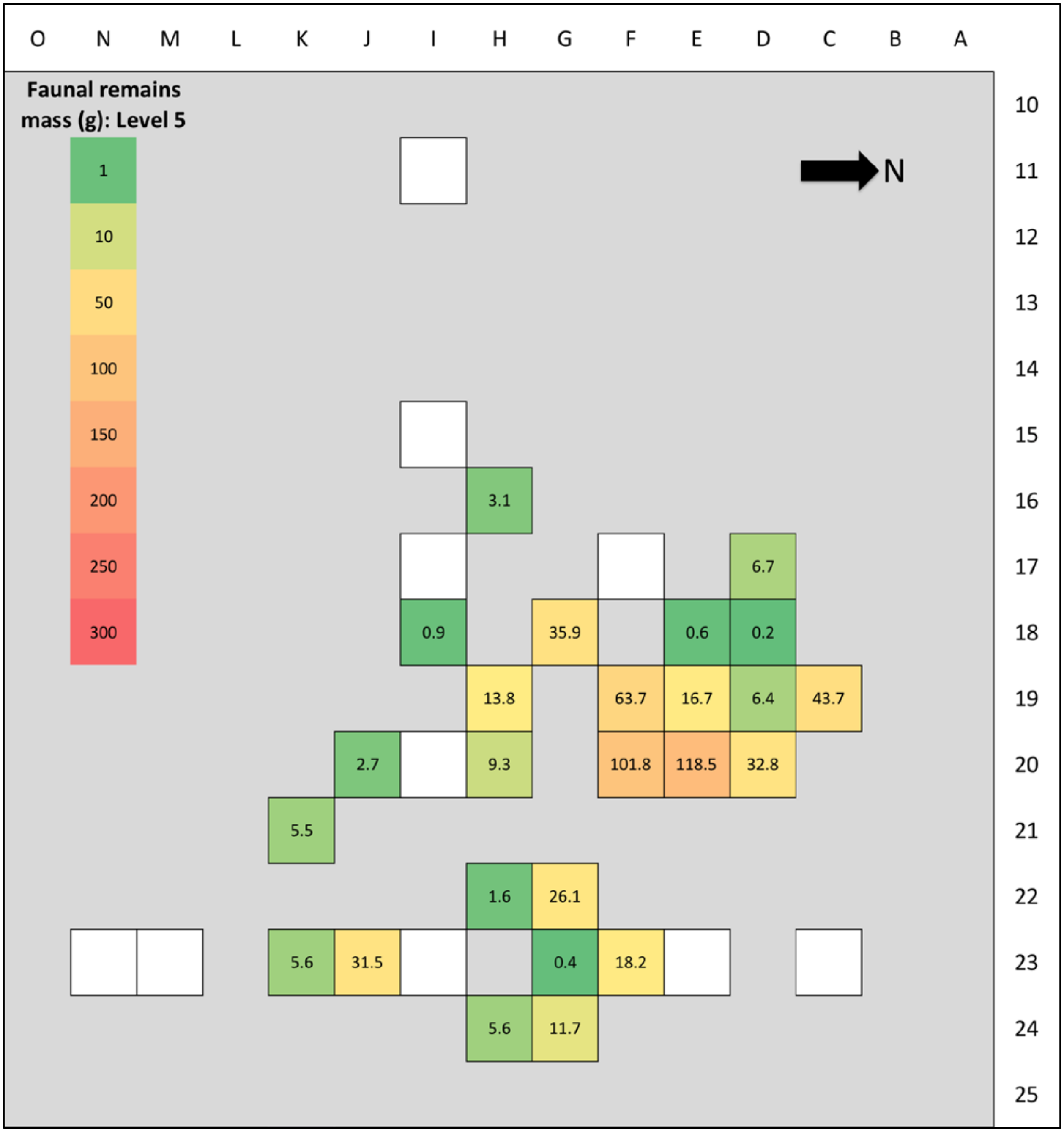

Figure A-C.29: Main excavation faunal remains mass (g), level 5.

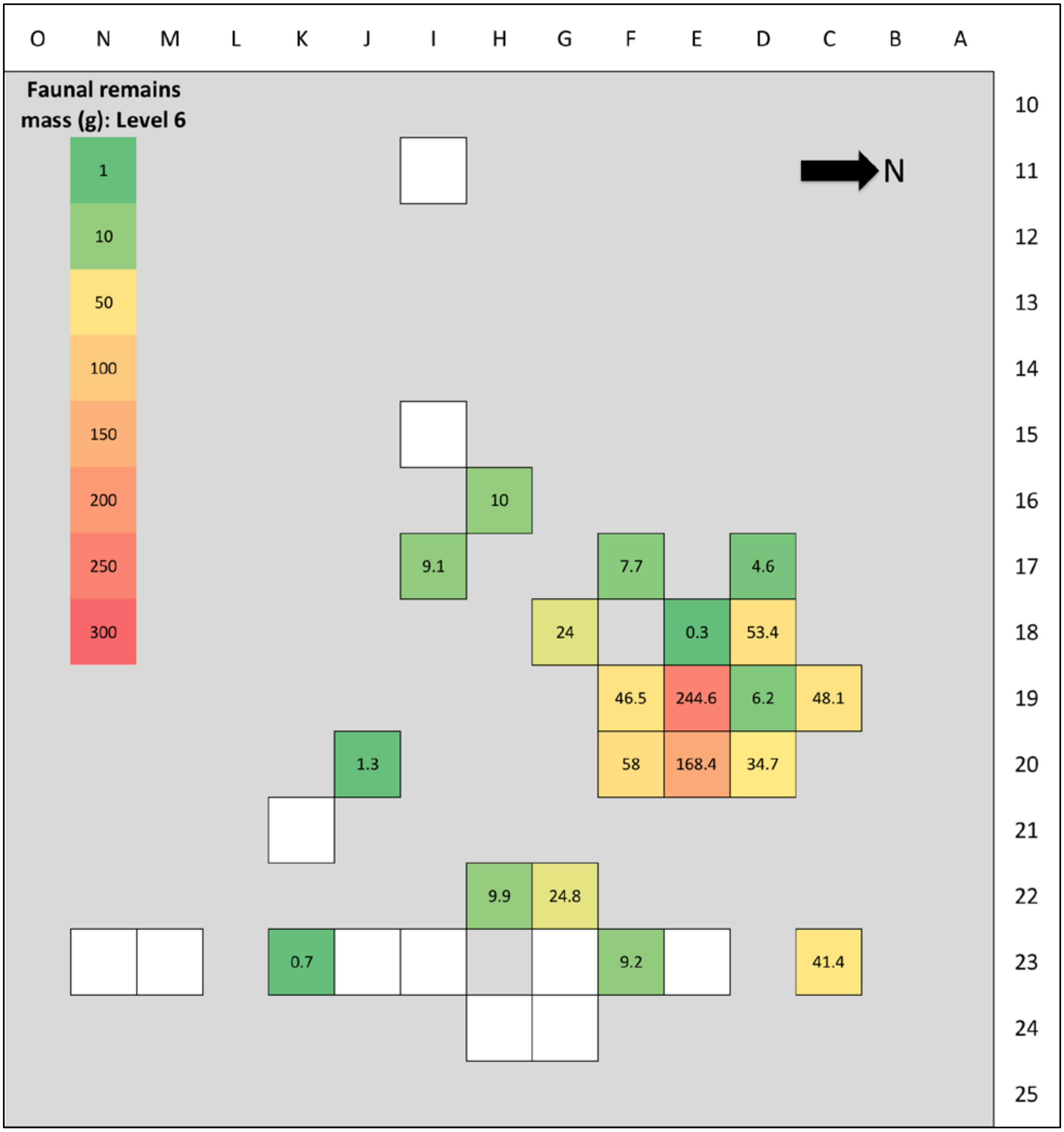

Figure A-C.30: Main excavation faunal remains mass (g), level 6.

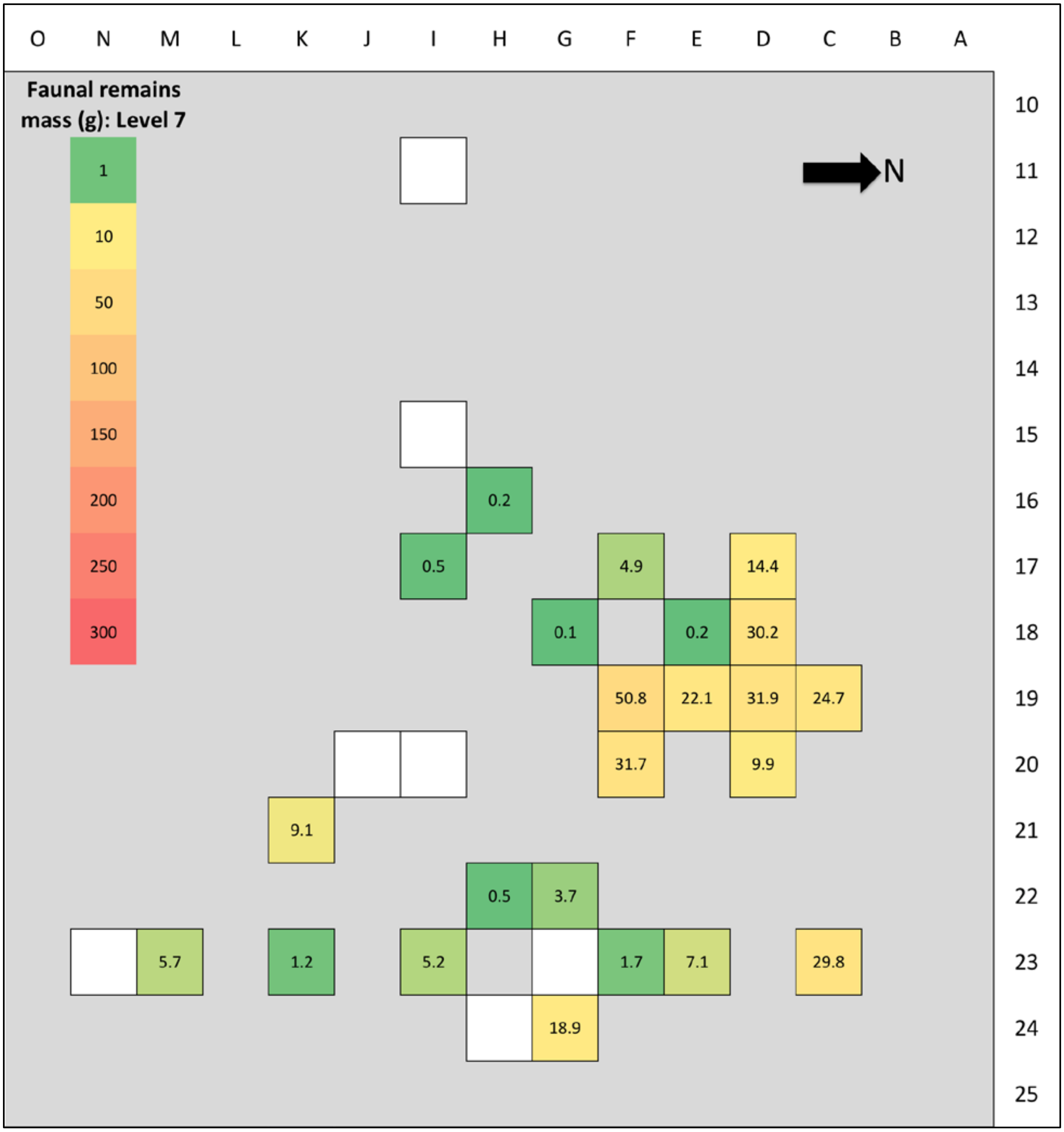

Figure A-C.31: Main excavation faunal remains mass (g), level 7.

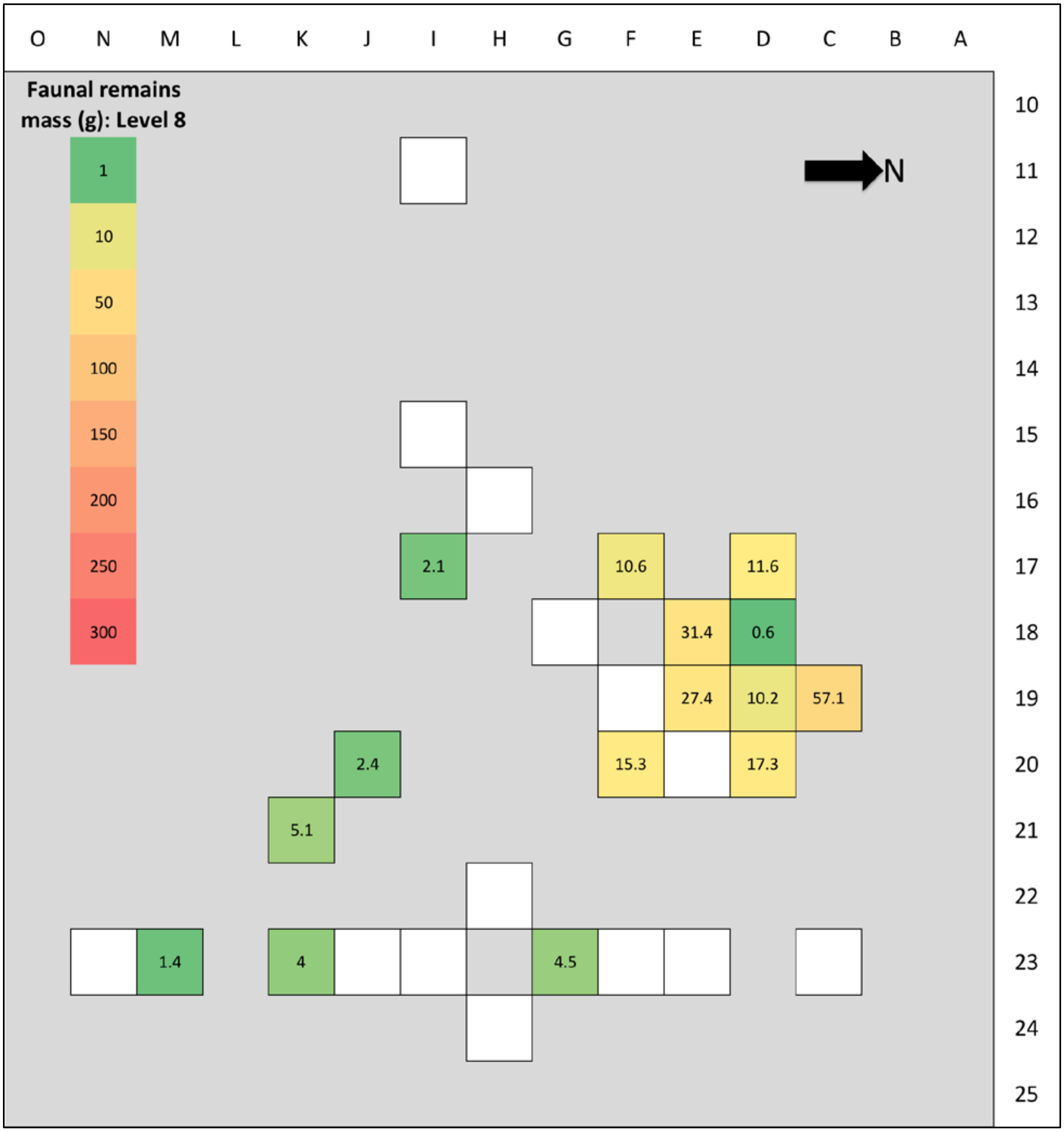

Figure A-C.32: Main excavation faunal remains mass (g), level 8.

APPENDIX D: AN EARLY CERAMIC PERIOD BURIAL AT KINNEY SPRING

In the summer of 2013, students from the CSU archaeological field school, under the direction of Jason LaBelle, identified bones eroding out of the top of a deeply cut arroyo bank along the eastern boundary of the Kinney Spring site (5LR144c). It was determined that these bones were human and they were left in place undisturbed.

Because the remains were exposed, and eroding out of an unstable cut bank, Tom Carr from the Office of Archaeology and Historic Preservation (OAHP) exhumed the remains and relocated them to a stable location nearby on the site in accordance with state regulations. This work took place on August 20, 2013. The burial consisted of a single primary internment of a flexed individual with the head oriented to the north, facing east. The skeleton was almost entirely complete. A large freshwater mollusk shell pendant was recovered immediately adjacent to the rib cage, and a cut bone bead was recovered from the back dirt pile at the base of the arroyo. These burial goods are consistent with other Early Ceramic period burials in the Platte River Basin reflecting influence from Plains-Woodland cultures from the eastern Plains.

Three samples of charcoal were collected from the burial, two of which were submitted for AMS dating. These two samples returned nearly identical dates indicating the individual died approximately 1300 years ago (See Table 6.1). The Early Ceramic period date of this internment is consistent with the Plains-Woodland burial goods.

COLORADO CULTURAL RESOURCE SURVEY

OAHP1405
Rev. 11/10

Cultural Resource Re-Visitation Form

A Re-Visitation Form can only be used when a Management Data Form and component forms have been previously filed with the land managing agency and/or the Colorado Office of Archaeology and Historic Preservation and no substantive changes to the character of the site are required as a result of the current re-visitation. Please use the Management Data Form and supporting forms (archaeological component, linear, vandalism, etc.) when changes are required to:

- Site type
- Linear resources
- Additional artifact assemblages and/or features
- Boundary size
- Vandalism
- NRHP recommendations

Official determination (OAHP use only)

☐Determined Eligible NR\SR
☐Determined Not Eligible NR\SR
☐Nominated
☒Need Data NR\SR
☐Contributing to NR Dist.\SR Dist.
☐Not Contributing to NR Dist.\SR Dist.
☐Supports overall linear eligibility NR\SR
☐Does not support overall linear eligibility NR\SR

1. **Resource Number:** 5LR144 2. **Temporary Resource Number:**

3. **Resource Name:**

4. **Project Name/Number:**

5. **Government Involvement:** ☒ Local ☒ State ☐ Federal
Agency: Larimer County Coroner's Office

6. **Site Categories:** (Check as many as apply)
Prehistoric: ☒Archaeological site ☐ Paleontological site
In existing National Register District? ☐ Yes ☒ No Name:
Local Landmark? ☐ Yes ☒ No Name:
Historic: ☒Archaeological site ☐Building (s) ☐ Structure(s) ☐Object(s)
In existing National Register District? ☐ Yes ☐ No Name:
Local Landmark? ☐ Yes ☒ No Name:

7. **Owner(s) Name and Address:** Catherine Roberts (Zach Thode property manager), 445 Larimer County Rd. 76-b, Livermore, Colorado, 80536

8. **Was the site relocated?** ☒ Yes ☐ No If no, why? (100% collected in previous recording, ground disturbance, etc.)

9. **Previous recordings:** Daniel R. Mayo, Colorado State University, 5/28/1980

10. **Most recent National Register Eligibility Assessment:** ☒ Eligible ☐ Not Eligible ☐ Need Data
Explain:

11. **Listed on Register:** ☐ National ☐ State ☒ None
Date Listed:

12. **Condition (describe):**

13. **Threats to Resource:** ☒ Water Erosion ☐ Wind Erosion ☒ Grazing ☐ Neglect ☒Vandalism ☐ Recreation ☐ Construction ☐ Other (specify):

14. **Existing Protection:** ☒ None ☐ Marked ☐ Fenced ☐ Patrolled ☐ Access controlled ☐ Other (specify):
Comments:

15. **Recorder's Management Recommendations:** None

Page 1 of 2

Cultural Resource Re-Visitation Form

Resource Number: 5LR144 **Temporary Resource Number:**

16. **Known Collections, Reports, or Interviews:** 1980 Site Inventory Record

17. **Site Description/Update:** The overall site remains largely unchanged. This update relates specifically to an exposed unmarked prehistoric burial located in the southeasten portion of subsection C (see annotated map attached to the Site Inventory Record). The burial was exhumed and reburied in accordance with the 2008 PROCESS for CONSULTATION, TRANSFER, and REBURIAL of CULTURALLY UNIDENTIFIABLE NATIVE AMERICAN HUMAN REMAINS AND ASSOCIATED FUNERARY OBJECTS ORIGINATING FROM INADVERTENT DISCOVERIES on COLORADO STATE and PRIVATE LANDS and the Historical, Prehistorical, and Archaeological Resources Act of 1973 (CRS 24-80-401 to 410) and CRS 24-80-1301ff.

The burial was a primary flexed inhumation, and was nearly complete excepting a majority of the hand and foot bones - due likely to exposure in the cutbank. The individual had been buried with their head oriented to the north and facing east. While there was not a clearly visible burial pit, the soil in the immediate vicinityof the remains was somewhat more organic and loose. There was also a fare amount of charcoal in the pit. Samples were taken for radiocarbon dating. The burial was located 69cm below the upper surface of an arroyo in a fine loam that was reddish in color. Two artifacts were recovered - a freshwater shell pendant and a bone bead. The freshwater shell was recovered from the burial pit and was immediately adjacent to the rib bones. The bone bead was found in the dirt at the base of the arroyo. We were unable to screen all of the dirt due to safety issues and dirt being lost over the edge of the arroyo.

After exhuming the remains, they were immediately reburied along with the two associated funerary objects in newly excavated burial pit. The location of the reburial pit was noted on the site map with the Site Inventory Record.

The burial and associated funerary objects appear to be consistent with Plains Woodland culture mortuary practices. This is also consistent with the Late Prehistoric/Early Ceramic period for the Platte River Basin. Radiocarbon dates of 1306-1316 rcybp for the burial pit also support this. Finally, the burial is very similar to another burial at the nearby site of 5LR1683 that was excavated by OAHP in 1993. That burial also contained a shell pendant and shell beads.

Radiocarbon Sample #	13C	Date	SD
D-AMS 003753 Charcoal 5LR144c-4	-16.9	1316	25
D-AMS 003754 Charcoal 5LR144c-5	-18.9	1306	26

18. **Photograph Numbers:**

Digital files at: S:\OAHP\OSAC\Burial Files\OSAC Case Files\298

19. **Artifact and Field Documentation Storage Location:** OAHP burial files

20. **Report Title:** Site forms only

21. **Recorder(s):** Thomas Carr

Date: 8/21/2013

22. **Recorder Affiliation:** History Colorado, Office of Archaeology and Historic Preservation

Phone Number/Email: 303-866-3498 / thomas.carr@state.co.su

Note: Please attach a sketch map, a photocopy of the USGS quad. map indicating resource location, and photographs.

History Colorado – Office of Archaeology & Historic Preservation
1200 Broadway, Denver, CO 80203
303-866-3395

APPENDIX E: CHARCOAL WOOD IDENTIFICATION

CHARCOAL IDENTIFICATION OF 10 SAMPLES FROM 5LR144.

Prepared for:

Mr. Ben Perlmutter
Center for Mountain and Plains Archaeology
Department of Anthropology
Colorado State University
Ft. Collins, Colorado 80523

Prepared by:

Mr. Daniel R. Bach, RPA
High Plains Macrobotanical Services
2433 Council Bluff
Cheyenne, WY 82009

September, 10 2013

Report #HPMS-11-2013

macrofloral@gmail.com
www.macrofloral.com

Introduction:

Charcoal identification was conducted on 10 samples from site 5LR144. This was done to ascertain what wood species were present and burned. The overall results primarily yielded juniper (*Juniperus* sp.) however, sample 5LR144C-10 yielded a cottonwood/willow sp. (*Populus* sp. or *Salix* sp.) while sample 5LR144C-6 yielded an unknown hardwood. Overall charcoal preservation was excellent. The presence of the predominately juniper charcoal provides a window into the past ecosystem at 5LR144 which appears to be very similar to, if not identical to, today's ecosystem at 5LR411.

Methodology:

The organic material was identified using an Omano OM-2300ST-V7 7X-45X trinocular boom microscope. Charcoal materials were identified using the author=s charcoal collection and wood identification manuals (i.e., Core et al. 1979, Hoadley 1990, Martin and Barkley 2000).

Scientific nomenclature of plant names changes over time (see Scianna and Majerus 2002, Weber 1990). Due to that, the new scientific name will be used throughout this report when appropriate.

Results:

The overall results yielded three unique fuel woods which were identified as juniper (*Juniperus* sp.), cottonwood or willow (*Populus* sp. or *Salix* sp.) and unknown hardwood, see Table 1.

Table 1: Summary of Charcoal Identification from 5LR144.

Sample #	Scientific Name	Common Name
5LR144C-1	*Juniperus* sp.	Juniper
5LR144C-2	*Juniperus* sp.	Juniper
5LR144C-3	*Juniperus* sp.	Juniper
5LR144C-4	*Juniperus* sp.	Juniper
5LR144C-5	*Juniperus* sp.	Juniper
5LR144C-6	Unknown hardwood	Unknown hardwood
5LR144C-7	*Juniperus* sp.	Juniper
5LR144C-8	*Juniperus* sp.	Juniper
5LR144C-9	*Juniperus* sp.	Juniper
5LR144C-10	*Populus* sp. or *Salix* sp.	Cottonwood or Willow

Discussion:

Charcoal identification was conducted on 10 samples from site 5LR144. This was done to ascertain which species were present. The overall results primarily yielded juniper (*Juniperus* sp.) however, sample 5LR144C-10 yielded a cottonwood/willow sp. (*Populus* sp. or *Salix* sp.) while sample 5LR144C-6 yielded an unknown hardwood. Overall charcoal preservation was excellent.

It was not possible for speciation of the charcoal. Tennessen *et al.* state "Accurate taxonomic identification is an essential part of archaeological wood analysis. However, making identifications more precise than the two level is usually not possible since species within the same genus typically possess very similar cellular morphology (Tennessen *et al.* 2002:521). This same principle also applies to trying to differentiate between the genera of *Populus* and *Salix*. Cellular morphology between the genera is very similar.

The presence of the predominately juniper charcoal provides a window into the past ecosystem at 5LR144 which appears to be very similar to, if not identical to, today's ecosystem at 5LR411.

The unknown hardwood from sample 5LR144C-6 is perplexing. A review of this author's wood/charcoal collection along with published data eliminated the more common hardwoods and softwood found in the area such as cottonwood/willow, rose, chokecherry, elm, ash, gooseberry, skunkbush, maple, pine, mountain mahogany etc. The closest possible morphologically similar species would be Chinese elm which is an introduced species. Other species of elm were examined but were not morphologically similar. Due to that, it is unknown what this species might be. A floral inventory of the area could provide the missing answer. Another option would be to seek a second opinion from another charcoal identification specialist.

To summarize, charcoal identification was conducted on 10 samples from site 5LR144. The overall results primarily yielded juniper however, sample 5LR144C-10 yielded a cottonwood/willow sp. while sample 5LR144C-6 yielded an unknown hardwood. The presence of the predominately juniper charcoal provides a window into the past ecosystem at 5LR144 which appears to be very similar to, if not identical to, today's ecosystem at 5LR411.

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APPENDIX F: 2013 RADIOCARBON DATES

Table A-F.1: Summary of charcoal samples submitted for AMS dating in the fall of 2013.

Sample ID	Excavation date	Unit	Level	Feature	Field Sample #
5LR144c-1	7/2/13	n/a	n/a	FE 2013-1	1
5LR144c-2	7/2/13	n/a	n/a	FE 2013-2	1
5LR144c-3	7/2/13	n/a	n/a	FE 2013-3	1
5LR144c-4	8/21/13	n/a	n/a	Burial	2
5LR144c-5	8/21/13	n/a	n/a	Burial	3
5LR144c-6	5/16/85	H22	6	41-hearth	n/a
5LR144c-7	5/17/85	H24	6	unknown #-hearth	n/a
5LR144c-8	6/8/83	I15	3	16-hearth	n/a
5LR144c-9	5/27/83	I11	2--3	7-hearth	n/a
5LR144c-10	6/3/85	D19	8	probably 49-hearth	n/a

DirectAMS | Radiocarbon Dating Services

Dr. Ugo Zoppi
Director, Accelerator Mass Spectrometry Lab

24 October, 2013

Ben Perlmutter
Colorado State University
Center for Mountain and Plains Archaeology
Fort Collins, Co 80523

Dear Ben,

Your samples submitted for radiocarbon dating have been processed and measured by AMS. Following results were obtained:

DirectAMS code	Submitter ID	$\delta(^{13}C)$	Fraction of modern		Radiocarbon age	
		per mil	pMC	1σ error	BP	1σ error
D-AMS 003750	Charcoal 5LR144c-1	-20.2	86.00	0.28	1212	26
D-AMS 003751	Charcoal 5LR144c-2	-18.9	50.04	0.18	5562	29
D-AMS 003752	Charcoal 5LR144c-3	-23.1	51.23	0.18	5373	28
D-AMS 003753	Charcoal 5LR144c-4	-16.9	84.89	0.26	1316	25
D-AMS 003754	Charcoal 5LR144c-5	-18.9	84.99	0.27	1306	26
D-AMS 003755	Charcoal 5LR144c-6	-23.3	85.72	0.27	1238	25
D-AMS 003756	Charcoal 5LR144c-7	-20.1	84.15	0.24	1386	23
D-AMS 003757	Charcoal 5LR144c-8	-14.5	82.37	0.29	1558	28
D-AMS 003758	Charcoal 5LR144c-9	-18.4	79.94	0.23	1799	23
D-AMS 003759	Charcoal 5LR144c-10	-16.6	85.46	0.28	1262	26

All results have been corrected for isotopic fractionation with $\delta^{13}C$ values measured on the prepared graphite using the AMS spectrometer. These can differ from $\delta^{13}C$ values of the original material, if fractionation occurred during sample graphitization or AMS measurement.

Best regards,

Ugo Zoppi

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Figure A-F.1: Results of AMS dating of charcoal from Kinney Spring.