Stone Tool Production in the Medio Periphery: Analysis of Debitage from the 76 Draw Site (LA 156980)

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By

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The undersigned, appointed by the Dean of the Graduate School, have examined the thesis entitled:

STONE TOOL PRODUCTION IN THE MEDIO PERIPHERY: ANALYSIS OF DEBITAGE FROM THE 76 DRAW SITE (LA 156980)

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A candidate for the degree of Master of Arts

And hereby certify that, in their opinion, it is worthy of acceptance.

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STONE TOOL PRODUCTION IN THE MEDIO PERIPHERY: ANALYSIS OF DEBITAGE FROM THE 76 DRAW SITE (LA 156980)

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ABSTRACT

Thousands of flaked stone artifacts have been recovered from the 76 Draw Site in Luna County, New Mexico. These artifacts were analyzed with regard to formal attributes (including presence or absence of a single interior surface, cortex, platform morphology, and margin morphology), in conjunction with mass analysis techniques. These data suggest that the inhabitants of 76 Draw reduced locally available material through generalized core reduction with hard-hammer percussors. In addition, intra-site variation within the assemblage indicates the presence of spatially separate reduction areas. Finally, a comparison of the 76 Draw flaked stone assemblage to several Medio Period Casas Grandes sites reflects the degree to which inhabitants of 76 Draw reduced stone in a manner similar to their neighbors to the South.

Chapter 1

Introduction

The Animas Phase of southern New Mexico, southeastern Arizona, northeastern Sonora, and northern Chihuahua has puzzled archaeologists studying the region for decades. The area has received irregular attention from archaeologists in the past and previous attempts at identifying the origins of sites in the Animas region have affiliated them with the Salado to the north and east, the Black Mountain Phase to the north, the El Paso Phase to the east, the Medio period of Casas Grandes to the south, or as independent of these larger groups (De Atley 1980; Douglas 1995; Findlow and De Atley 1978; Fish and Fish 1999; Kidder et al. 1949; Minnis 1984; Skibo et al. 2002). Each of these hypotheses have merit with respect to individual sites within the Animas phase region, and indeed, these are what we would expect from a region that shares borders with several groups. My research, however, is concerned with addressing the nature and strength of the influence of Medio period Casas Grandes (or Paqiumé) on Animas Phase sites in southwestern New Mexico. This will be done through a comparison of flaked stone reduction techniques between 76 Draw and other Medio period Casas Grandes sites.

While Paquimé certainly influenced sites within its immediate vicinity, the degree to which it had political and economic influences on other prehispanic peoples further abroad has been hotly contested. This debate began soon after Paqiumé's excavation by Charles Di Peso, who argued that the numerous Mesoamerican influences at Paquimé signified that the site was a trading center established by a class of traders from Mesoamerica, known as the pochteca (Di Peso 1974). According to Di Peso, the pochteca oversaw trade within a highly centralized regional system that linked Mesoamerica and the American Southwest (Di Peso 1974, 301). Similar notions are conveyed by Bradley (1992), Foster (1986), Reyman (1978) and Whitecotton and Pailes (1986), with the focus shifting from central Mexico to the Aztatlan tradition of West Mexico. However, others contend that Paqiumé's social and economic influences were less centralized. Many of these researchers agree with Di Peso and others that Paquimé had craft specialization and social hierarchy (Minnis 1998; Woosley and Olinger 1993; VanPool and Leonard 2002), but they suggest its power over significant social, economic, and political influence was limited (Douglas 1992:18; LeBlanc 1986:127; McGuire 1993:38; Mathien 1986:225; Vargas 1995; Whalen and Minnis 1996; Whalen and Minnis 2009). Some researchers find considerable evidence that links the southwestern New Mexican Animas Phase to the Medio period Casas Grandes culture (Brand 1943; De Atley 1980; Skibo et al. 2002), while others find the connection between Paquimé during the Medio period with Animas Phase sites sporadic or lacking (Kidder et al. 1949). Finally, Whalen and Minnis (1996; 2001) argue that although Paquimé influenced sites relatively far abroad, that it only heavily influenced or controlled sites within a 30km radius.

Despite claims that Paquimé did not controlled sites outside of 30km, it is worth noting that the Casas Grandes culture, as defined by Casas Grandes polychromes, covers roughly 100,000 km^2 (LeBlanc 1986: 116; Schaafsma and Riley 1999). As a site that is positioned at the northwest boundary of this area, 76 Draw, an Animas phase settlement 20 km south of Deming, New Mexico is a terrific site to analyze the extent of Paqiumé's regional system. 76 Draw is east of the 76 Draw arroyo (Rakita et al. 2011). Donald Brand (1933:68) labeled 76 Draw as the northernmost Medio period site, as it lies 180 km north of Paqiumé. A preliminary analysis of the excavated ceramics from 76 Draw confirm Brand's observation (Rakita et al. 2011). The goal of this project, then, is to confirm, or falsify these preliminary findings at 76 Draw through an analysis of lithic debitage that was collected during three summers of fieldwork.

Among the tens of thousands of artifacts gathered from 76 Draw thus far are several thousand pieces of lithic debitage. In this project, I analyzed over 4,000 of them using a combination of formal attributes (including presence or absence of a single interior surface, a bulb of force, and complete flake margins) and mass analysis techniques in order to provide multiple lines of evidence to study the reduction strategies used at the site. Variables measured included recording each piece of debitage's raw material, weight, length, width, thickness, percentage of cortex, and platform morphology. Artifacts displaying evidence of retouch were omitted from the study, as this study is explicitly concerned with unretouched flaking debris and not formal tools.

The data indicate that the flaked stone debitage across 76 Draw are characterized by a high proportion of complete flakes and angular debris, which are indicative of generalized core reduction (Sullivan and Rozen 1985). Coinciding with this, I find that a vast majority of the flake platforms were either plain or cortical, while a small proportion were faceted or crushed, which is also consistent with the presence of widespread generalized core reduction. This pattern is also displayed at other late prehistoric sites in the southwest (Di Peso et al. 1974: 342), as well as sites closer to Paquimé itself (VanPool et al. 2001). The mass analysis across all excavation areas at 76 Draw shows that debitage length ranges from 21mm to 36mm, with a fairly large amount of debitage over 41mm. This is similar to the pattern displayed by Ahler's (1989) experimental data produced by hard-hammer freehand and bipolar reduction techniques. Finally, an analysis of the frequency of raw materials present across the site demonstrates that the inhabitants of 76 Draw had access to a number of locally available igneous raw materials. As such, igneous rocks (undefined igneous, rhyolite, andesite) composed a majority of the collected assemblage. Quartzite, chert, and chalcedony were also present in varying quantities.

Inter-site patterning reveals that residents of 76 Draw reduced stone in a manner similar to that observed at both Paquimé and Galeana (in terms of reduction technique employed), but also reveals a disparity in terms of access to high-quality cryptocrystalline raw materials. I argue that the difference in the proportions of raw materials gathered from the sites may be the result the transportation of a large proportion of locally available cryptocrystalline silicates from the periphery into Paqiumé.

In Chapter 2, I will provide a detailed background on the Animas phase of the American Southwest as well as the Medio phase of the Casas Grandes culture region. In Chapter 3, I provide a summary of the methods used herein. In addition, a summary of the excavation methods used at the 76 Draw site is provided. Chapter 4 reports the results of several statistical tests that demonstrate the intra-site and inter-site patterning of lithic stone reduction and 76 Draw and abroad. In the final chapter, the results of these tests are discussed and their implications are addressed. Ultimately, I suggest that 76 Draw displays several stone reduction affinities that link it to the Casas Grandes world.

Chapter 2

Background

Animas phase communities are distributed around the Animas, San Luis, Playas and Hachita valleys as well as the surrounding areas in the southern Basin and Range Province (De Atley 1980, 10) of southern New Mexico and Arizona. The area is the Chihuahuan desert scrubland, which include many mesquite and creosote bushes, rabbit brush, snakeweed, cacti, and yucca (Rakita et al. 2011). 76 Draw is on the lower Mimbres Valley, and topographically, the site is on relatively flat ground, that is overlooked by the Tres Hermanas mountains, which are roughly 5km to the south (McCarthy et al. 2013). The site is on a working cattle ranch, but its long history of occupation that is immediately apparent as dense scatters of stone artifacts, ceramics, animal remains, and adobe walls are visible on the surface. Roughly ten percent of the site is managed by the Bureau of Land Management (Rakita et al. 2011: 31). 76 Draw displays numerous features that are typically ascribed to Animas Phase sites in the region, including large adobe pueblos and compounds, plazas located within the center of room blocks, a distinct lack of kivas, and a high proportion of Mogollon and Casas Grandes ceramic types.

The Beginnings of the Casas Grandes Culture

The Casas Grandes culture, which flourished between AD 1200 and 1450 was one of the most sprawling, and politically complex systems in the prehispanic southwest (Bradley 2000). At the heart of the culture was the site of Paquimé (also called Casas Grandes). Situated on the west bank of the Rio Casas Grandes in Chihuahua, Mexico, Paquimé was a large pueblo constructed of adobe, and was associated with influential ceremonial rituals and economic production areas. The site was initially excavated by Charles C. Di Peso in the late 1950s, and early 1960s (Di Peso 1974). As Di Peso excavated roughly forty-two percent of the site, he uncovered large quantities of flaked stone, ceramics, and shell, as well as numerous human burials (Di Peso 1974). In addition, turquoise originating from the American Southwest, obsidian from southern Chihuahua, and shell from the Gulfs of California and Mexico demonstrate distant trade. Finally, architectural features such as macaw and turkey pens, as well as dense concentrations of artifacts that were being worked, such as shell beads, were interpreted as evidence for specialized, large-scale production.

The Casas Grandes region has a storied history of inhabitation, as occupation extends from the Paleoindian period to modern time. Charles Di Peso, who partially excavated Paquimé as part of the Joint Casas Grandes Project in 1958, divides the occupation of the Casas Grandes region into Preceramic and Ceramic periods (Di Peso 1974). Di Peso provided a detailed chronology for the ceramic period, but many of his dates (especially as they related to the Medio period), were wrong as he relied heavily upon tree ring samples that had been trimmed to a uniform diameter, thereby resulting in the loss of an unknown number of rings (Dean and Ravesloot 1993). He also relied on obsidian hydration dating, which is notoriously unreliable in the North American Southwest (Ridings 1996), and radiocarbon dating during a period when calibration was poorly understood (Di Peso et al. 1974:4:28-33). As such, in dealing with the dating of the Medio period, this thesis follows those dates proposed by Dean and Ravesloot (1993) in lieu of those ascribed by Di Peso (1974).

The first evidence of human occupation of the valley comes in the form of several Clovis points, as well as Plainview type points, which indicate an occupation by 10,000 B.C (Di Peso 1974: 63; LeTourneau 1995). Unfortunately, there has been a fundamental lack of research aimed at discerning the exact nature of the earliest occupation of the valley. Phillips (1989) posits that the Chihuahuan expression of early Archaic occupation was simply similar to the known patterns of the prehistoric Southwest. The Early and Middle Archaic periods (8500–1500 BC) are understudied as well. MacNeish and Beckett (1987) posit that a Chihuahuan Desert Tradition characterized the region. This included microband exploitation of the desert floor and playas in the winter, as well as riverine and bajadas in the spring in fall. During the summer macrobands formed in alluvial zones.

The Late Archaic (1500 BC – AD 500) however, has benefited from additional research. In the 1950's, Robert Lister excavated Valle de los Cuevas, just west of Paquimé. These excavations yielded several preceramic remains, which Lister (1958) argued represented a camping location with no permanent settlement. Among the remains uncovered were pre-Chapalote maize, acorn remains, ash, charcoal, and utilized stone tools. Other researchers have since focused on a number of hilltop (or cerros) sites, which are found throughout the Rio Casas Grandes valley (Hard and Roney 1998, 1999, 2005; Hard et al. 1999). Numerous *Cerros de Trincheras* sites have been mapped, and each have hundreds of corresponding terraces constructed in their vicinity (Hard and Roney 2005). The sites themselves are characterized by groundstone artifacts (manos and metates), and diagnostic Late Archaic projectile points (Hard and Roney 1998). These sites have led to an upheaval of previous conceptions of Late Archaic culture in the region, as large aggregated village sites dependent on agriculture were thought to have occurred much later in time.

In his analysis of the stone tool technology from a Cerro de Trincheras site (Cerro Juanaqueña), Bradley Vierra (2005) analyzed 12,763 pieces of debitage, 29 cores, 9 cobble unifaces, 2 split pebbles, 7 manuports, a hammerstone, and 105 retouched formal tools. The debitage assemblage consisted primarily of rhyolite, chalcedony, and chert. A formal analysis of the flaked stone found that higher quality materials show evidence of being used for production of bifaces, whereas lower-quality materials were selected for expedient flake tools. Taking an interest in early village life and the transition to agriculture, Vierra (2005) proposes that if the chipped stone assemblage represents early village reliance on agriculture, then he should find: 1) a reliance on locally available materials; 2) a full range of reduction techniques, tool production activities, and maintenance; and 3) an increased emphasis on the production of expedient flake tools. Vierra finds that the first two premises prove to be true, while the third premise is untrue, as the assemblage shows signs of a mixture of formal and informal tools.

The transition from preceramic villages to the first ceramic period (A.D. 600) is poorly understood. Di Peso (1974) separates the Viejo period into three separate chronological phases: the Convento phase, the Pilon Phase, and the Perros Bravos Phase. Generally, we see a gradual transition from the nomadic lifestyle to small concentrations of widely dispersed villages. Typically, these villages consisted of a few pithouse structures concentrated about small farming fields (Stewart et al. 2005). Subsistence during the Viejo period shifted to a heavy reliance on cultivated crops. Stable isotope analyses of remains dating to the Viejo period highlight the degree to which life became reliant on the farming lifestyle. Webster's (2001) stable isotope analysis of human remains from sites in the Laguna Bustillos and the Santa Maria River Valley suggests a diet composed of roughly 72% maize, 8% beans, and 20% animal foods. In addition, a characteristic ceramic tradition emerged early in the Viejo period, one which transitioned from plainwares to painted red-on-brown wares with complex geometrically designs that might have been made as tradewares (Larkin et al. 2004). Coinciding with this, Viejo period sites have other exotic trade goods, including shell beads and pendants (likely from the Gulf of California), obsidian, copper bells, perforated sherd disks, malachite, and turquoise (Stewart et al. 2005).

The Medio Period and Paqiumé

It is not until the Medio period that we see the development of many of the traits that modern archaeologists use to characterize the Casas Grandes culture. During the Medio period Paquimé grew to its peak size, eventually becoming a regional center for both trade and religion (Di Peso 1974). Coinciding with this, we see an exponential increase in the production of polychrome ceramics, as well as the hoarding of trade goods, including copper, turquoise, shell and groundstone (VanPool et al. 2005). Di Peso (1974) excavated dense caches of these goods, horded in large storereooms. In alignment with Fish and Fish's (1999) idea that Paquimé was a regional religious center, VanPool et al. (2005) surmise that these caches were collections of offerings made by traveling pilgrims.

Di Peso (1974) saw a substantial cultural leap between the Viejo and Medio periods, a notion supported in more recent literature as well. Stephen Lekson (2000) describes the transition as the "13th century gap", or as a cultural discontinuity between the twelfth century Viejo, and the 14th century Medio periods. Other researchers, however, describe the "13th century gap" as resulting from a gap in our knowledge of the culture-history of the region, and not necessarily an instance of cultural discontinuity (Whalen and Minnis 2003; 2009; Stewart et al. 2005). Stewart et al. (2005) argue that the Viejo – Medio period transition was much more gradual than initially thought, as some Viejo and Medio period occupations were contemporaneous.

Regardless, the beginning of the Medio period saw a shift from small, clustered settlements to large aggregated villages such as Paqiumé. Corresponding with this was an intensification of agricultural practices in the area, or as Di Peso puts it, the Paquimians went from "simple Perros Bravos Phase soil parasites, into full-fledged Medio Period soil exploiters" (Di Peso 1974: 292). Perhaps the most characteristic change that occurred during the Medio period was the development of a unique polychrome ceramic tradition. Among the shifts in ceramic technology were: an increase in jars relative to bowls, an overall increase in vessel size across all vessel types, the invention of human and animal effigy jars, as well as cruciform-shaped containers (Rakita 2009:47). Vessel decoration also changed drastically, the most distinctive of which was an increase in the elaboration of polychrome decoration (VanPool and VanPool 2007). Much like with the Viejo, Di Peso (1974) divides the Medio period into three phases, which have explicit architectural correlates: the Buena Fé, the Paquimé, and the Diablo.

The most common wall construction technique at Paquimé is the use of puddled, or poured adobe (Di Peso 1974). The technique involves utilizing a stiff adobe mix, which is poured between forms to make horizontal wall sections. At Paquimé, the Buena

Fé phase saw the construction of numerous puddled adobe room-blocks, which were built over Viejo pithouse structures (Stewart et al. 2005). Di Peso notes that several other architectural features associated with the Medio period Casas Grandes culture arose during the Buena Fé phase, including T-shaped entries, raised fire hearths, alcove beds, square mud columns, and staircases (1974: 372). In addition, a water-control system was built to support the community of Paquimé (Di Peso 1974). Although once difficult to parse apart from other Medio period contexts, Whalen and Minnis (2009) suggest that early Medio period ceramic assemblages are characterized by a few early polychromes including Babícora, White-Paste Babícora, Dublan, and Villa Ahumada. Population estimates for Paquimé during the Buena Fé phase range from one hundred to seven hundred residents (Rakita 2009: 38).

The Paquimé phase ushered in a period of substantial remodeling and reconstruction at Paquimé (Di Peso 1974). The degree of remodeling was extensive enough for Di Peso (1974) to argue for the presence of a centralized ruling class, which oversaw and managed the high labor demands of the project. Evidence of burning in Rooms 3-16, 4-16, 1-19, and 2-19 may signify a burning event that spurred the need for substantial reconstruction (Rakita 2009:38). The reconstruction involved the combination of several of the Buena Fé phase roomblocks to form a larger settlement with communal structures and ceremonial buildings. New public spaces placed predominantly on the western edge of the site, included platform mounds, ballcourts, reservoirs, special burial forms, and effigy mounds (Rakita 2009:40). The site's water system was redesigned too (Rakita 2009). Neighboring Medio period sites underwent similar alterations (Di Peso 1974). Wilcox (1999) hypothesizes that these changes are likely the result of an increased need to promote social solidarity within the residents of Paquimé. The population of Paquimé during the Paquimé phase likely ranged between nine hundred and fifteen hundred (Rakita 2009:40).

The Diablo phase was characterized by a gradual increase in population size, which in turn, lead to architectural failure (Rakita 2009). Large portions of Paquimé fell into disrepair and upkeep remodeling was prevalent (Di Peso 1974; Rakita 2009). Furthermore, expansion of domestic space appears haphazard; colonnades were enclosed, plazas became domestic space, and trash-filled ramps were constructed to provide roof access (Rakita 2009:40). At the height of the Diablo phase, the population of Paquimé likely approached somewhere between fifteen hundred to two thousand residents (Rakita 2009: 40). The end of the Diablo phase saw the gradual abandonment of Paquimé, as portions of the site were burned. There is no consensus on the cause of Paquimé's fall, though Di Peso (1974) suggests that it may have been due to violence. Rakita (2009:51) proposes that the haphazard construction, disrepair, and poor building materials signify a loss of power of the Paquimé's elite ruling class. Regardless, Paquimé was fully abandoned and in ruins by the time the Spanish arrived in the sixteenth century (Di Peso 1974; Rakita 2009).

Stone Tool Reduction at Medio Period Sites

Unsurprisingly, the first published report on chipped stone from within the Casas Grandes culture area comes from Di Peso's volumes on Paquimé (Di Peso et al. 1974). While Volume 7 is devoted strictly to stone and metal artifacts, stone artifacts remain one of the least studied portions of the archaeological record from the region (Whalen and

Minnis 2009). Whalen and Minnis (2009) point out that nearly three times the number of pages devoted to stone tools are used to characterize the ceramics of the period in Di Peso's volumes, and that this disparity between research devoted to Medio period ceramics and Medio period lithics continues today.

While the Casas Grandes report (Di Peso et al. 1974) provides nearly 300 pages of analysis of the stone artifacts recovered at Paquimé, it does not account for the entire assemblage of chipped stone artifacts recovered from the site. The volumes (Di Peso et al. 1974) document the presence of 3,714 stone artifacts. As a point of comparison, my study accounts for a sample of 4,251 artifacts from the 76 Draw site, and Whalen and Minnis' (2009) regional summary of sites within 30km of Paquimé documents some 23,029 pieces of chipped stone.

Of the 3,714 artifacts documented in the Casas Grandes report, Di Peso et al. (1974: 341) break down the assemblage into functional categories, noting the presence of: 248 scrapers, a saw, 15 drills, 2 hoes, 122 picks, a single hand pick, 17 mattocks, 19 choppers, 7 gravers, a mescal knife, 320 knives, 114 slabs, 94 projectile points, 13 grass knives, 1 blade, 6 preforms, 122 cores, and 2,611 pieces of debitage. It must be noted that this ratio of tools to debitage (42%) is very high, and is not recorded elsewhere in the Casas Grandes culture region (Whalen and Minnis 2009).

Di Peso et al. (1974) subdivide their "debitage" category by "type of flake", and raw material. The flake types were based upon numerous formal attributes including the classifications primary decortication flakes, secondary decortication flakes, thinning flakes, irregular flakes, retouch flakes, core rejuvenation flakes, shatter, and bulbar flakes. A majority of the raw materials documented were the same as those reported by

Miller (1995), Rebnegger (2001), VanPool et al. (2001), Rowles (2004), and Whalen and Minnis (2009), as well as those reported in this study. These raw materials include chert, jasper, chalcedony, obsidian, quartz, quartzite, rhyolite, basalt, and other coarser grained materials (Di Peso et al. 1974: 339). Di Peso (et al. 1974) noted that the finer-grained raw materials were preferentially selected for smaller tools, while the coarser-grained igneous materials were used for larger tools. However, with regard to the raw materials reported by Di Peso et al. (1974), Whalen and Minnis (2009: 184) and VanPool et al. (2000) noted that the assemblage is classified by an inordinate amount of high-quality, fine-grain materials. Di Peso et al. (1974:341) reported that 90% of the scrapers obtained from Paquimé were made from these fine-grain raw materials, while Whalen and Minnis (2009: 184) report that only 45% of scrapers were fine-grained from Site 204, a neighboring Medio period site. Whalen and Minnis (2009) suggest that this stark difference could be the result of either: 1) differential access to fine-grained raw materials between Paquimé and its neighboring communities, or 2) differential excavation and collection methods at the sites. It is found herein that Paquimé does indeed display a high amount of high-quality stone relative to the assemblage analyzed from 76 Draw.

Regardless, the Di Peso volumes provide a few key insights into the means by which stone was reduced at Paquimé. A high number of unretouched flakes with prominent bulbs of force on locally available, minimally prepared cores as well as a lack of platform lipping illustrates the presence of direct hard hammer percussion in order to produce expediently manufactured flake tools. Expedient tools (in contrast to formal tools) have been described as those tools that require little or no effort in their production (Andrefsky 2005:31). The “expedient tool technology” characterizes much of the Late

Prehistoric period in the Southwest, and is found throughout the Pueblo cultures of the southwestern United States, as well as northwestern Mexico (Whalen and Minnis 2009: 184). As such, the Paquimé stone tool assemblage seems to fit the mold of the broader region at its time.

Following the analysis of the chipped stone at Paquimé, a twenty-year hiatus of studying Medio period lithics ensued. By the 1990's, however, a renewed interest resulted in the production of three master's theses, detailing chipped stone collections from in or around the Casas Grandes culture region (Miller 1995; Rebnegger 2001; Rowles 2004). These theses confirmed a number of the initial findings from Paquimé, namely the expedient nature of tool use in the region and similarity in the raw materials selected. Utilizing the same methodology used herein, VanPool et al. (2000) analyzed 1,121 flaked stone artifacts from the site of Galeana in northern Chihuahua, Mexico. The authors analyzed both the intra-site and inter-site patterning of the chipped stone artifacts. Much like Di Peso et al (1974) and the aforementioned masters theses, the authors find that their assemblage was typified by generalized core reduction and only small amounts of bifacial flaking (VanPool et al. 2000: 168). Further, the authors found that initial core reduction (which is discerned through amount of cortex present) was done in open plaza areas, while additional reduction was confined to habitation areas, or *conjuntos* (VanPool et al. 2000).

Since Galeana and the flaked stone assemblage from Paquimé are both characterized by generalized core reduction via hard hammer percussion, VanPool et al. (2000) looked at differences in intensity of reduction (i.e., amount of cortex present) and raw materials used between the sites to discern any inter-site differences. The amount of cortex present on artifacts from Paquimé as reported by Di Peso et al. (1974) falls within a range that VanPool et al. (2000) observe between those artifacts coming from the open public space, and the *conjuntos*, leading the authors to conclude that the intensity of reduction between the two sites was comparable. However, an analysis of the raw materials encountered between the two sites yield several statistically significant differences. The Paquimé assemblage had a greater proportion of cryptocrystalline silicates and obsidian (VanPool et al. 2000). Thus, the authors suggest that the prehistoric inhabitants of Paquimé had greater access to these resources than did their neighbors at Galeana due to trade. Finally, this difference in raw materials leaded the authors to conclude that the economic pattern present at Paquimé did not extend to Galeana, and potentially supports the theory that Casas Grande's sphere of economic influence did not extend past 30 km.

In 2009, Michael Whalen and Paul Minnis published a book that documented several seasons of fieldwork at four sites within the immediate vicinity (west) of Paquimé (Site 204, Site 231, Site 317, and Site 242). They dedicate one of the chapters of this extensive work to lithics from the Medio period. An issue that the authors saw as obscuring the nature of Medio period lithic studies was a lack of chronological control within the period (Whalen and Minnis 2009). As such, much of their analysis was concerned with delineating patterning within lithic reduction strategies throughout the period. In order to do so, the authors analyzed 26,694 pieces of chipped stone from the four sites. They begin with a "preliminary analysis" that involved sorting the chipped stone into flakes, cores, tools, and debris categories (Whalen and Minnis 2009: 185). Raw material designations were also made at this time. Flakes were further classified as primary, secondary, or tertiary based upon the amount of cortex present on the surface. Cores were either classified as whole or fragmentary, and tools were defined as any object showing signs of usewear (Whalen and Minnis 2009: 185). Finally, those items that matched none of the aforementioned criteria were classified as debris and counted.

In addition, the authors (Whalen and Minnis 2009) conducted a detailed analysis of 10,202 pieces chipped stone. Flakes were further analyzed in terms of their dimensions, platform type, presence of lipping, dorsal surface scar dimensions, bulb prominence, and type of termination. Cores were analyzed in terms of the direction of flake scars, core shape, and evidence of use. Tools were classified into functional groups. These data were used to analyze stone tool use through time at Site 204, an intra-site analysis of stone tool reduction at Site 204 and an inter-site comparison of Medio period sites.

Whalen and Minnis' (2009) analysis of Medio period stone tool reduction through time begins with an analysis of core frequencies, which are found to vary in a statistically significant manner. The authors noted that cores are more common than expected in the early Medio and less so in the late portions of the period (2009: 186). Analyses of core material types and frequencies, core shape frequencies, and flake scar direction frequencies all failed to present significant differences through time (Whalen and Minnis 2009:187).

In terms of stone materials at Site 204, the authors (Whalen and Minnis 2009) found that the assemblage was dominated by chert and rhyolite, following the pattern of other northwest Chihuahuan sites (Miller 1995; Rebnegger 2001; Rowles 2004; VanPool et al. 2000). Frequencies of material choice were not found to vary significantly through time. Moving on to flake size, the authors utilize T-tests to illustrate that early Medio period flakes are, on average, longer and wider than their late Medio period counterparts (Whalen and Minnis 2009). However, application of the F-test for equality of variances show that early and late Medio period flake dimensions are consistently variable (Whalen and Minnis 2009). This is in line with the idea of an expedient technology, which produces flakes of irregular shape (Parry and Kelly 1987:285).

An analysis of cortex on flake dorsal surfaces showed that levels of decortication differed significantly through time at Site 204, where higher levels of cortex are seen during the early Medio than expected. The reverse is seen in the late Medio (Whalen and Minnis 2009). The authors offer two possible explanations: 1) less early-stage reduction occurred on-site in the late Medio than the early, or 2) that reduction was simply more intensive in the late Medio than in the early (Whalen and Minnis 2009:190). Coinciding with this, the authors note that more broken flakes are exhibited in the late Medio period than in the early Medio, which also may denote more intensive reduction as the period progressed (Whalen and Minnis 2009).

The authors also analyzed the bulbs of percussion on flakes' ventral surfaces and recorded them as either prominent or diffuse (Whalen and Minnis 2009: 190). The frequencies of both diffuse and prominent bulbs were not found to vary significantly through time, and instead, were both prevalent throughout the Medio period. Although soft-hammer percussion is known to produce diffuse bulbs of force (Cotterell and Kamminga 1990:134), the authors argued that a lack of lipping on flakes signifies that hard-hammer percussion was the predominant reduction method throughout the period (Whalen and Minnis 2009: 190-191). However, since diffuse bulbs of force were encountered throughout the Medio period assemblage, and bipolar flaking can result in diffuse bulbs of force, Whalen and Minnis suggest that bipolar flaking was also quite prominent (Whalen and Minnis 2009). Bipolar flaking has been known to be utilized by those creating expedient tools, as it is efficient at producing viable flakes despite small nodule size (Andrefsky 2005; Parry and Kelly 1987:301). Furthermore, it must be noted that there are three types of flake initiations: Hertzian, wedging, and bending (Cotterell and Kamminga 1987). In discerning the presence of a "diffuse bulb of force" archaeologists in the past have confused diffuse bulbs with the characteristic bend of a bending flake, and we therefore must be cautious when making such distinctions (Cotterell and Kamminga 1987: 690).

Whalen and Minnis's (2009:191) analysis of platform type variation throughout the Medio also demonstrated statistically significant differences in the frequencies of cortical, crushed, and debitage lacking platforms. Cortical platforms were found to occur in greater frequency during the early Medio, while the late Medio was characterized by a high amount of crushed platforms and debitage lacking platforms. In each case, the researchers saw a statistically significant amount fewer of these platform types in the opposite period. The authors take this as additional evidence of intensive reduction in the late part of the Medio period. In addition, the higher than expected frequencies of crushed platforms and debitage lacking platforms, as well as a corresponding decrease in mean flake size and an increase in flaking debris are discerned as evidence for increasing bipolar flaking in the late Medio (Whalen and Minnis 2009: 192).

In terms of their inter-site analysis, the authors found that all three of their smaller sites (231, 317, and 242) had common raw materials (*i.e.*, chert, rhyolite, basalt and chalcedony) with Site 242 displaying the highest amount of "high quality raw materials" (Whalen and Minnis 2009: 214). Like Site 204, the reduction technology employed was likely expedient core reduction, primarily carried out by hard-hammer percussion (Whalen and Minnis 2009: 201). In addition, the small sites each had low frequencies of primary flakes, and high tertiary flake ratios. Since this was not the pattern seen at the large Medio period neighboring sites (Galeana and Site 204), the authors suggested that perhaps initial core reduction was done offsite. In terms of flake morphology at the three smaller sites, both Site 231 and Site 317 followed the pattern evident at Site 204, producing significantly higher amounts of broken flakes than complete flakes. This was not the case at Site 242, which was found to have a nearly even amount of the two flake types (Whalen and Minnis 2009: 215). The authors argue that this is evidence for more intensive reduction at Sites 231, and 317, and for potential off-site production at 242.

In my analysis, I have found similar patterns of stone tool reduction to those reported by all of the aforementioned researchers (Di Peso et al. 1974; Miller 1995; Rebnegger 2001; Rowles 2004; VanPool et al. 2000; Whalen and Minnis 2009). Indeed, many of the characteristics common to Medio period lithics that are highlighted by these researchers present themselves at 76 Draw. However, this is not to say that the 76 Draw assemblage is entirely typical either. Both intra-site and inter-site analyses provided insights into just how well lithics at 76 Draw fit the mold of Medio period lithics in general, as well as highlight some of the site's idiosyncrasies. Before I delve into my analysis, some background into chipped stone analysis is necessary.

Chapter 3

Methods and Analytical Background

The methodology used is focused on generating data relevant to the intra-site patterns of reduction strategies at 76 Draw, as well as inter-site differences in stone reduction at 76 Draw and abroad. The following discussion begins with a summary of the excavation methods used to collect the materials analyzed and then transitions into a summary of a description and justification of the methods used in this study.

Excavation methods and Background

Excavations of the 76 Draw site began in 2009 with a joint project from the University of Missouri and the University of North Florida (Rakita et al. 2011). Led by field director Dr. Christine VanPool (MU), and in conjunction with Dr. Todd VanPool (MU) and Dr. Gordon Rakita (UNF), field crews excavated the site with the goal of determining its cultural affiliation. Two test units were excavated and these indicated that although a great number of artifacts were strewn across the surface of the site, undisturbed contexts were present below the surface (McCarthy 2013: 8). Excavated units revealed standing adobe architecture, which was mapped and documented by Rakita et al. (2011). Unit one (XU-1) was on private land and was composed of twenty-five 2 by 2 m units (thirteen of which were excavated), containing an overall area of 10 by 10m. XU-1 revealed architecture common to both the Jornada Mogollon culture and Paquimé's Medio period. Jornada Mogollon influence was seen among three parallel adobe walls that were aligned north to south (McCarthy 2013: 8). Evidence for the use of the "drop key" adobe wall construction technique was also found (C. VanPool personal communication 2013). This unique construction method, which involves the use of tongues and grooves to fasten wall segments together, had only been found at Paquimé before excavation of 76 Draw (C. VanPool personal communication 2013). In addition, a Mimbres pithouse was found beneath the adobe walls, signifying an extended period of occupation at the site (McCarthy 2013). Ceramic types recovered from XU-1 included Mimbres Black-on-white, El Paso polychrome, and Ramos polychrome (McCarthy 2013). Excavation Unit 2 (XU-2) was on Bureau of Land Management (BLM) land, and produced fewer subsurface artifacts than XU-1. However, a GPR survey was undertaken, and revealed the presence of possible architectural features such as walls and possible plazas (Rakita et al. 2011).

In 2010, the project resumed focus on the privately owned portion of the site. The focus was to determine the boundaries of the site itself, as well as to excavate a potential room-block (McCarthy 2013: 11). In addition, Excavation Unit 3 (which lay due west of XU-1), Excavation Unit 4 (XU-4) and Excavation Unit 5 (XU-5) were all excavated. An abundance of lithic, ceramic and faunal artifacts were recovered (Rakita et al. 2011). Adobe architecture suggests that the site was occupied by both the Jornada Mogollon and Casas Grandes cultures, and multiple rebuilding episodes became apparent (Rakita et al. 2011; McCarthy 2013). Finally, in 2013, the site was revisited, and additional excavation units (Excavation Unit 6) were opened up north of XU-3. XU-6 yielded large numbers of ceramic and lithic artifacts, as well as several adobe walls, a bird burial, and shell artifacts. Debitage from each of the excavation units were sampled in this study, consisting of 1771 pieces of flaked stone from XU-1, 2 pieces from XU-2, 1137 from XU-3, 96 from XU-4, 115 from XU-5 and 1027 from XU-6.

Analytical Methods: Introduction

The analysis of debitage has come a long way from being largely neglected during archaeology's early years. Now, debitage analysis benefits from an abundance of different techniques that operate at different scales (Andrefsky 2005). Debitage analysis can be approached via flake type analyses, attribute analyses, and mass analysis techniques. Type designations such as a "bifacial thinning flake" or "bipolar flake" can be made, which ideally provide insights into the reduction methods and behaviors that produced the artifacts. Attribute analyses take a number of explicit measurements on each piece of debitage, which can include measurements such as amount of cortex, maximum flake length, platform morphology, etc. Mass analysis techniques operate at the population level, and examine the range of variation exhibited by artifacts in an assemblage. This range of variability is then used to make inferences into behavior (Andrefsky 2005: 113). Although some debate regarding the most effective way to approach debitage analysis has occurred, some researchers have noted that these methodological approaches are not mutually exclusive (Shott 1994; VanPool et al. 2001), and that they can be combined in order to produce robust results. As such, this study utilizes a flake typology, attribute analysis techniques, mass analysis techniques in combination with one another.

The chipped stone artifacts, which are currently stored at the University of Missouri in the Anthropology department, were analyzed from Fall 2012 to Spring 2014 by Kyle Waller, Richard Kennedy, and myself. During the analysis, random bags of lithics were selected for analysis until at least 1,000 artifacts were selected from each XU. XUs without 1000 artifacts in them were sampled entirely. Analyzed artifacts were then given individual artifact numbers. Once numbered, the artifacts in the bags were analyzed in terms of several attributes. The variables recorded were: 1) lithic raw material; 2) debitage type; 3) flake weight, width, length, and thickness; 4) the percentage of cortex present on the dorsal surface; 5) flake platform type; and 6) the presence or absence of retouch. Justifications for the recording of each of these variables are presented below.

Analytical Methods: Raw Material

In order to determine access to various stone resources both within the site and across the Casas Grandes culture area, the first variable recorded on each piece of debitage was raw material type. To ensure that raw material designations were accurate, samples of debitage were analyzed by Dr. Todd VanPool, who has experience analyzing flaked stone within the Chihuahua region of Mexico (VanPool et al. 2001). Among the most popular designations were chert, quartzite, rhyolite, andesite, chalcedony, and igneous stone. Small quantities of basalt, obsidian and sandstone were also present. Additionally, some igneous stones could not be further subdivided into andesite, basalt or rhyolite, and were instead simply classified as "igneous".

Analytical Methods: Debitage Type

The second variable measured for each piece of debitage was debitage type, which followed Sullivan and Rozen's (1985) "interpretation free" typological system.

Flakes could be complete flakes, flake fragments, broken flakes, or angular debris. In order to classify a single piece of debitage, the piece is evaluated based on the presence or absence of: 1) a single interior surface, 2) a point of applied force, and 3) complete margins. The debitage flows through a monothetic divisive dendrogram, which assigns classifications based on these variables. First, each piece of debitage is analyzed for the presence of a discernable single interior (ventral) surface. If there is no single interior surface present, then the piece is classified as debris, and the analysis of that piece of debitage ends. If there is a single interior surface, then the piece is evaluated further to discern a point of applied force (or platform). If the platform is absent, then the piece of debitage is classified as a flake fragment. If there is a platform, then the analysis continues with a search for complete flake margins. If the margins are not intact, then the flake is classified as a broken flake, and if the margins are intact, then the flake is a complete flake.

Sullivan and Rozen's (1985) typology was chosen over another set of commonly applied typologies, which typically ascribe "technological classifications" to artifacts. The authors developed their methodology as a response to perceived errors with these typologies. Reacting to the use of categories such as "bifacial thinning flakes", Sullivan and Rozen (1985) note that there has been a resounding lack of consistency in the definitions of technological classifications and that different attributes have been selected by different researchers to define the various types. Instead, their "interpretation-free typology" uses objective, replicable criteria that do not presuppose the final interpretations about the debitage being studied.

Sullivan and Rozen's (1985) typology is not perfect, and was subject to some criticism after its publication (Amick and Mauldin 1989; Ensor and Roemer 1989; Prentiss and Romanski 1989). However, these authors take issue predominantly with the interpretations made from the typology, and not the typology itself. For example, Sullivan and Rozen (1985) state that generalized core reduction produces higher percentages of complete flakes than flake fragments, broken flakes, and debris, while tool production produces higher amounts of flake fragments and broken flakes. Amick and Mauldin (1989) note that since the types within the typology are "interpretation free" (i.e. not tied to specific interpretations), that there is a fundamental lack of empirical evidence to support the interpretations that are eventually made. Further, these authors note that discerning generalized core reduction from formal tool production is not as clear-cut as Sullivan and Rozen (1985) propose. William Prentiss (1998) summarizes the critiques well; noting that while Sullivan and Rozen's typology is easy to use, even among relatively inexperienced researchers (i.e., it is relatively free of random error), its simplicity also seems to collapse potential variability in the archaeological record. In addition, Prentiss (1998) notes that one of the potential issues with Sullivan and Rozen's (1985) typology is that it can produce invalid results due to the fact that variability in debitage assemblages is typically partitioned by flake size. As such, without accounting for flake size the resulting data can become "homogenized" to the point where formal tool production and generalized core reduction have similar signatures (Prentiss 1998, 2001). In an attempt to correct for some of the issues with Sullivan and Rozen's (1985) typology, Prentiss (2001) suggests amending the typology via an application of size classes. Prentiss' (2001) amended typology allows the author to discern generalized core reduction from tool production, as variation in size is minimized through the use of size classes. With these potential pitfalls in mind, Sullivan and Rozen's (1985) typology was selected for use in this study due to its ability to minimize errors by the investigator(s), avoid types with several definitions, and consistently produce replicable results. In addition, much like Prentiss' (2001) study, flake size is measured and analyzed in conjunction with Sullivan and Rozen's (1985) typology in order to discern stone tool production methods.

Analytical Methods: Size and Weight

Next, a series of attribute analyses were undertaken, including flake size and weight. Length, width and thickness all allow for the measurement of flake size, which may reflect stage of production, as well as reduction technique. Larger flakes tend to be produced earlier in the stone reduction process, with average flake size decreasing as the core gets smaller. In addition, hard-hammer percussion tends to produce flakes that are relatively longer, and bulkier than those produced with soft-hammer percussion or pressure flaking. Although these patterns hold true at the level of the assemblage, there is considerable overlap in terms of flake size and load application, and the differences in flake size are not diagnostic at the level of the individual flake (Andrefsky 2005). Flake length was defined as the longest line perpendicular to the platform, and was measured from the most proximal point of the platform to the furthest point of termination. The length of flakes without a discernable platform was simply determined to be the longest axis. Width was defined as the largest point perpendicular to the length measurement. Thickness was defined as the widest measurement between the dorsal and ventral surfaces of the piece of debitage. Each of these measurements were taken to the nearest tenth of a millimeter using digital calipers. Finally, debitage weight was measured using a digital scale to the nearest tenth of a gram.

These variables were chosen because they can be used in conjunction with Ahler's (1989) mass analysis approach to provide supplemental information regarding the degree of reduction, and load application techniques employed. Ahler's methodology is a screened size graded aggregate analysis, involving the use of a series of nested sieves or screens to produce size groups. The methodology is designed to be incredibly time effective, as it minimizes examination of individual specimens. Ahler's (1989) study uses twenty-two different assemblage variables, which are obtained via a combination of different size grades by weight and count, ratios of different size grades, and combinations of size grades. The variables are used in a discriminate function analysis to effectively discern behaviors such as bipolar core reduction, hard-hammer reduction, hard-hammer edging, soft-hammer reduction, soft-hammer thinning, and coble testing.

Analytical Methods: Percentage of Cortex

In order to obtain additional information on the degree of reduction, each piece of debitage was analyzed in terms of the amount of cortex present on its dorsal surface. Andrefsky (2005:254) defines cortex as the "chemical or mechanical weathered surface of rocks." As a tool is progressively reduced, the amount of cortex on the core and the dorsal surface of flakes produced by those cores will decrease. Thus, the amount of cortex on the dorsal surface of flakes *may* represent the degree of reduction and production stages of a tool (Andrefsky 2005; Johnson 1989; Morrow 1984).

In this study, a popular method known as the "triple cortex typology" was intentionally avoided for reasons documented by Sullivan and Rozen (1985) and Daugherty et al. (1987). The triple cortex typology denotes pieces of debitage as primary, secondary, or tertiary based on the relative amount of cortex found on the dorsal surface of the flake. Primary flakes are said to have the most cortex intact, while secondary has less, and tertiary has little or none. The upshot of the technique is that it allows researchers to discern reduction stages, as it assumes that flakes with more dorsal cortex are representative of earlier reduction. This assumption is often reasonable, but Sullivan and Rozen (1985) note that there is a lack of consistency of definitions between researchers who employ the typology. These authors state that different researchers use different scales of measurement, leaving the designations of "primary, secondary, and tertiary" difficult to replicate and incomparable between studies. Other researchers (Daugherty et al. 1987: 92-104) note that there is a lack of distinction between what constitutes each flake type. The typology neglects to account for what kind of tool was being produced when the flakes were detached, which is important because tool form can alter the amounts of cortex present on debitage cortex (Andrefsky 2005). Biface manufacture for example, requires the removal of most or all of the cortex early in the reduction process, whereas generalized core reduction can result in flakes with a lot of cortex late in a core's reduction sequence (Andrefsky 2005; Mauldin and Amick 1989). Finally, Andrefsky (2005) also indicates that the amount of dorsal cortex found on a piece of debitage can vary depending on the amount of cortex present on the original nodule (which is also dependent on nodule size). Small cores for example, will tend to produce a greater proportion of cortical flakes relative to large cores.

While it must be kept in mind that cobble size and tool form can affect relative proportions of cortex produced, cortex often does reflect differences in reduction intensity and method. As such, the relative proportion of cortex was still measured. Flakes were classified into one of five groups based on the estimated percentage of cortex on the dorsal surface. The groups were: 1) flakes with no cortex present on the dorsal surface, 2) flakes with 1-25% coverage of the dorsal surface by cortex, 3) flakes with 26-50% coverage of the dorsal surface by cortex, 4) flakes with 51-75% coverage of the dorsal surface by cortex, and 5) flakes with 76-100% coverage of the dorsal surface by cortex. These classifications were chosen because they avoid the troubled terms "primary, secondary, and tertiary flakes", which have remained enigmatic and ill defined (Andrefsky 2005).

Analytical Methods: Platform Morphology

Flake striking platform morphology was then examined. Striking platforms (or the point of applied force) have been analyzed in a number of ways in the past, and variability in striking platforms has been used to determine load application (Cotterell and Kamminga 1987; Frison 1968; Hayden and Hutchings 1989), type of tool being modified (Magne and Pokotylo 1981), stage of tool reduction (Dibble and Whittaker 1981; Johnson 1989), and size of debitage (Dibble 1997; Shott et al. 2000). Magne and Pokotylo (1981:36) found that during biface production, a flake blank produces a far greater range of facet counts on debitage than does core reduction. Andrefsky (2005:90) notes that most generally, the more facets (or scars) that a debitage platform displays, the later the stage of biface production. This logic follows with general core reduction, as we should expect to find fewer facets on debitage produced via core reduction, as it is a less intensive reduction strategy. Additionally, Andrefsky (2005) notes that crushed platforms are typically associated with hard-hammer percussion. In this study, platform types were used to discern reduction strategies at 76 Draw. Flakes platforms were recorded as being plain, cortical, faceted, or crushed.

Analytical Methods: Retouch

Finally, all flakes were analyzed for the presence of retouch. Andrefsky (2005: 260) defines retouch as: "intentional modification of a stone tool edge by either pressure or percussion flaking technique." Since this study is only concerned with unretouched flaking debitage, all retouched flakes were set aside for future research.

Analytical Methods: Cores

Cores were analyzed in terms of their raw material, amount of cortex (using the same classes as described above), and their weight (measured to the nearest tenth of a gram) in order to provide insight into differences in reduction intensity and access to raw materials.

Chapter 4

Results

This project addresses two core issues: 1) the intra-site patterning of stone tool reduction at 76 Draw and, 2) the degree to which flaked stone recovered from 76 Draw is indicative of (or similar to) other Medio period assemblages. Below, I present my results. I begin by discussing the relationship between flake raw material, flake type and flake size within 76 Draw. This analysis provides insights into the different production strategies used across the site. Then, I consider the relationship between these variables and their correlates at other sites within the Casas Grandes culture area. The results provide insights into the degree to which the inhabitants of 76 Draw reduced stone in a manner typical of the culture area. Finally, an analysis of frequencies of cryptocrystalline silicates sheds light on the degree to which sites outside of the immediate vicinity of Paqiumé had access to high quality raw materials.

Stone Tool Reduction at 76 Draw

Table 1 presents a summary of the raw materials present at 76 Draw for each excavation unit (XU).

Table 1. Frequencies of Flake Raw Material by Excavation Unit (XU).

Excavation Unit	Andesite	Chalcedony	Chert	Igneous	Quartzite	Rhyolite	Total
1	90	188	602	509	273	86	1748
3	82	167	296	90	418	82	1135
4	11	16	17	8	29	15	96
5	7	6	38	10	47	7	115
6	103	97	229	155	330	99	1013
TOTAL	293	474	1182	772	1097	289	4107

Sandstone, obsidian and basalt were also encountered, but are so rare that they are omitted from the analysis. All of the excavation areas had roughly the same raw materials present, with a vast majority of the debitage being porphyritic igneous material. However, the relative frequencies of these raw materials across the site varies considerably. For example, XU-1 yielded a considerable amount more chert than the other XUs, while XU-3 and XU-6 display higher amounts of quartzite. To test whether these differences are statistically significant, I performed a Chi-square analysis comparing the numbers of chert, chalcedony, quartzite, and igneous stone artifacts recovered from each excavation area. In order to accommodate for the facts that 76 Draw displays a great diversity of igneous stone, and that distinguishing between the various types of igneous rock (rhyolite, andesite, basalt, etc.) proved difficult, I collapsed these raw materials into the group "igneous" to ensure accuracy for this analysis. The null hypothesis is that there are no differences in the frequencies of raw materials across the site, except by those potentially generated as a result of sample size. The alpha level of the test is set at .05, with 15 degrees of freedom. The Chi-square value is 278.9, which exceeds the critical value of 25.0 and signifies that the null hypothesis must be rejected. The residuals of the Chi-square values indicates that there are more chert and igneous artifacts in XU-1, as well as significantly fewer quartzite. XU-3 displays higher frequencies of chalcedony, and quartzite artifacts, as well as lower frequencies of chert, and igneous. XU-4 displayed significantly fewer chert. A high amount of quartzite, and a low amount of quartzite and igneous artifacts characterize XU-5. Finally, XU-6 presents high frequencies of quartzite as well as low frequencies of chalcedony, chert, and igneous. Thus, raw material is highly variable relative to where on the site the stone was deposited.

Table 2. Chi-square Analysis of Raw Material Frequency by Excavation Unit (XU).

Excavation Unit	Raw Material	Observed	Expected	Chi-square	Adjusted Residual
1	Chalcedony	188	201.6	0.9	-1.3
	Chert	602	502.8	19.6	6.9
	Quartzite	273	467.5	80.9	-13.9
	Igneous	685	576	20.6	7.3
3	Chalcedony	167	130.9	10.0	3.9
	Chert	296	326.5	2.8	-2.4
	Quartzite	418	303.6	43.1	9.0
	Igneous	254	374	38.5	-8.9
4	Chalcedony	16	11.1	2.2	1.6
	Chert	17	27.6	4.1	-2.4
	Quartzite	29	25.7	0.4	0.8
	Igneous	34	31.6	0.2	0.5
5	Chalcedony	6	13.3	4.0	-2.2
	Chert	38	33.1	0.7	1.0
	Quartzite	47	30.8	8.5	3.5
	Igneous	24	37.9	5.1	-2.8
6	Chalcedony	97	116.9	3.4	-2.3
	Chert	229	291.4	13.4	-5.0
	Quartzite	330	270.9	12.9	4.8
	Igneous	357	333.8	1.6	1.8

Additionally, an analysis of access to “high-quality” raw materials across the site strengthens the associations reflected in Table 2. XU-1 reflects greater frequencies of cryptocrystalline silicate raw materials, and “other” stone resources (including all forms of igneous stone, and quartzite) relative to the other areas. To see if this association is significant, I evaluated the null hypothesis that there are no differences in the frequencies of "high quality" raw materials across the site. The alpha level of the test is set at .05, with 5 degrees of freedom. The Chi-square value is 46.42, which exceeds the critical value of 11.07 and signifies that the null hypothesis must be rejected.

Table 3. Frequencies of Cryptocrystalline Stone and Other Raw Materials by Excavation Unit (XU).

Excavation Unit	Raw Material	Observed	Expected	Chi-square	Adjusted Residual
1	CCS	790	708.4	9.4	5.2
	Other	981	1062.6	6.3	-5.2
3	CCS	463	454	0.2	0.6
	Other	672	681	0.1	-0.6
4	CCS	33	38.4	0.8	-1.1
	Other	63	57.6	0.5	1.1
5	CCS	44	46	0.1	-0.4
	Other	71	69	0.1	0.4
6	CCS	326	408.4	16.6	-6.1
	Other	695	612.6	11.1	6.1

Cryptocrystalline silicates (chalcedony and chert here) are known to have more predictable fracturing mechanics when compared to other resources such as igneous stone (basalts, rhyolite, andesite, etc.) and quartzite (Andrefsky 2005: 24). As such, these raw materials are known to have been preferentially sought by peoples in the past. That XU-1 contains a substantially high amount of "high quality" stone, while XU-6 displays a large amount of other raw materials may reflect any number of processes, including social inequality, separate occupations of 76 Draw, or production zones within the site.

Table 4 presents the frequencies of complete flakes, broken flakes, flake fragments, and angular debris by XU. The assemblage from 76 draw has a high percentage of complete flakes, which is a pattern associated with generalized core reduction (Sullivan and Rozen 1985).

Table 4. Frequencies of Flake Type by Excavation Unit (XU).

Excavation Unit	Complete Flakes	Broken Flakes	Flake Fragments	Debris	Total
1	756	198	237	580	1771
3	674	88	196	179	1137
4	50	4	27	15	96
5	76	5	10	24	115
6	635	84	135	173	1027
TOTAL	2193	379	605	971	4148

However, flake type frequencies are not uniform across the site, and a Chi-square test reveals the presence of several statistically significant differences between the excavation units. Table 5 presents a Chi-square analysis comparing the numbers of complete flakes, broken flakes, flake fragments and debris recovered from each excavation area. Again, the null hypothesis is that there are no differences in the frequencies of flake type across the site except by those potentially generated as a result of sample size. The alpha level of the test is set at .05, with 15 degrees of freedom. The Chi-square value is 221.5, which exceeds the critical value of 25.0 and signifies that the null hypothesis must be rejected. The residuals of the Chi-square values indicates that XU-1 contained significantly more broken flakes and debris, as well as fewer complete flakes than can be explained by chance alone. XU-3, in contrast, displays significantly more complete flakes and flake fragments, as well as significantly less debris. XU-4 shows a substantial increase in flake fragments, while XU-5 is high in complete flakes. Finally, XU-6 shows high values of complete flakes, and low amounts of debris.

Table 5. Chi-square Analysis of Flake Type Frequency by Excavation Unit (XU).

Excavation Unit	Flake Type	Observed	Expected	Chi-square	Adjusted Residual
1	Complete Flake	756	936.3	34.7	-11.3
	Broken Flake	198	161.8	8.1	3.9
	Flake Fragment	237	258.3	1.8	-1.9
	Debris	580	414.6	66.0	13.5
2	Complete Flake	2	1.1	0.7	1.3
	Broken Flake	0	0.2	0.2	-0.5
	Flake Fragment	0	0.3	0.3	-0.6
	Debris	0	0.5	0.5	-0.8
3	Complete Flake	674	601.1	8.8	5.1
	Broken Flake	88	103.9	2.4	-1.9
	Flake Fragment	196	165.8	5.5	3.0
	Debris	179	266.2	28.6	-7.2
4	Complete Flake	50	50.5	0.0	-0.1
	Broken Flake	4	8.8	2.6	-1.7
	Flake Fragment	27	14	12.1	3.8
	Debris	15	22.5	2.5	-1.8
5	Complete Flake	76	60.8	3.8	2.9
	Broken Flake	5	10.5	2.9	-1.8
	Flake Fragment	10	16.8	2.8	-1.8
	Debris	24	26.9	0.3	-0.6
6	Complete Flake	635	543	15.6	6.6
	Broken Flake	84	93.8	1.0	-1.2
	Flake Fragment	135	149.8	1.5	-1.5
	Debris	173	240.4	18.9	-5.7

While XU-1 certainly follows the model of high relative amounts of complete flakes (which is expected in areas where generalized core reduction is practiced), it does display a few unusual traits. The most noticeable of which is the higher proportion of debris relative to complete flakes. This could be the result of three potential causes: 1) a higher proportion of chert, which was reduced through bipolar reduction at XU-1, 2) increased intensive reduction of all raw material types at XU-1, or 3) a high degree of post-depositional modification causing additional fracturing.

Since raw material type is known to alter the means by which stone is reduced, it is imperative to test if the higher proportion of chert at XU-1 is responsible for the variation in flake types. Chert could have been reduced in a different manner than other raw materials at 76 Draw. If it was reduced in the same manner across the site, and if we have more of it at XU-1 than at other XUs (as is the case here), we could expect to see differences in flake type frequencies to emerge. Table 6 presents the frequencies of flake type by raw material of the XU-1 assemblage. A Chi-square test reveals that raw material plays a statistically significant role in the relative frequencies of flake types at XU-1. The alpha level of the test is set at .05, with 9 degrees of freedom. The Chi-square value is 374.9, which greatly exceeds the critical value of 16.9

Table 6. Chi-square Analysis of Flake Type Frequency by Raw Material at XU-1.

Raw Material	Flake Type	Observed	Expected	Chi-square	Adjusted Residual
Chalcedony	Complete Flake	103	81.4	51.7	3.4
	Broken Flake	16	21.3	6.1	-1.3
	Flake Fragment	28	25.5	1.2	0.6
	Debris	41	59.8	45.7	-3.1
Chert	Complete Flake	228	260.8	66.6	-3.3
	Broken Flake	93	68.1	75.1	4.0
	Flake Fragment	69	81.5	17.3	-1.8
	Debris	212	191.6	30.1	2.2
Igneous	Complete Flake	300	296.7	0.6	0.3
	Broken Flake	61	77.5	30.9	-2.6
	Flake Fragment	94	92.8	0.1	0.2
	Debris	230	218	9.8	1.3
Quartzite	Complete Flake	127	119.1	5.7	1.0
	Broken Flake	28	31.1	1.7	-0.6
	Flake Fragment	46	37.2	12.7	1.7
	Debris	74	87.5	19.5	-1.9

Table 6 illustrates that the relative amounts of raw materials at XU-1 has an effect on the relative frequencies of complete flakes, broken flakes, and debris. Most importantly, we see that chert at XU-1 drives higher relative frequencies of broken flakes and flaking debris, as well as a lower relative frequency of complete flakes. Higher proportions of flake debris, and a corresponding decrease in complete flakes can signify more intensive reduction processes, including bipolar reduction practices (Sullivan and Rozen 1985). Although it could be hypothesized that more intensive reduction strategies were used at XU-1 generally, it appears as though more frequent reduction of chert is at the core of these differences, and not more intensive reduction of all raw material types. Table 7 displays the frequencies of flake type by raw materials for the entire 76 Draw lithic sample. A Chi-square test reveals that raw material plays a statistically significant role in the relative frequencies of flake types across the entire site. The alpha level of the test is set at .05, with 9 degrees of freedom. The Chi-square value is 100.7, which exceeds the critical value of 16.9.

Table 7. Chi-square Analysis of Flake Type Frequency by Raw Material at 76 Draw.

Raw Material	Flake Type	Observed	Expected	Chi-square	Adjusted Residual
Chalcedony	Complete Flake	272	251	1.8	2.1
	Broken Flake	28	40.3	3.8	-2.2
	Flake Fragments	75	73.8	0.0	0.2
	Debris	99	108.9	0.9	-1.1
Chert	Complete Flake	567	625.9	5.5	-4.1
	Broken Flake	141	100.4	16.4	5.0
	Flake Fragments	150	183.9	6.2	-3.2
	Debris	324	271.5	10.2	4.3
Igneous	Complete Flake	698	722.2	0.8	-1.6
	Broken Flake	126	115.9	0.9	1.2
	Flake Fragments	202	212.3	0.5	-0.9
	Debris	338	313.3	1.9	1.9
Quartzite	Complete Flake	644	581.9	6.6	4.4
	Broken Flake	55	93.4	15.8	-4.9
	Flake Fragments	215	171	11.3	4.3
	Debris	185	252.4	18.0	-5.6

Among the differences, we see that across the site that chert produces significantly more debris and broken flakes, and significantly fewer complete flakes, a pattern consistent bipolar reduction (Sullivan and Rozen 1985). Coinciding with this, chert cores were nearly all of the smallest weight class at 76 Draw (Table 8). Small core size could also signify more bipolar reduction of chert.

Table 8. Frequencies of Core Weight Class by Raw Material at 76 Draw.

Raw Material	0-9.9g	10-19.9g	20-29.9g	30-39.9g	40-49.9	50-59.9	60+g
Andesite	1	0	0	1	1	1	0
Chalcedony	12	2	1	0	0	0	0
Chert	23	12	4	2	0	0	3
Igneous	3	1	0	1	2	0	2
Quartzite	4	5	4	3	0	1	2
Rhyolite	2	2	0	0	0	0	2
Total	45	22	9	7	3	2	9

XU-1 also contains a relatively high proportion of broken flakes, which could signify that more bifacial reduction took place there (Sullivan and Rozen 1985). However, this could also be attributable to the higher proportion of bipolar-reduced chert as inhabitants of 76 Draw strained to produce additional usable chert flakes, causing substantial breakage and debris. In addition a relative lack of faceted platforms (Table 9) provides evidence that bifacial reduction was likely not the cause.

Table 9. Frequencies of platform types by Excavation Unit (XU).

XU	Plain	Cortical	Faceted	Crushed
1	562	68	139	177
2	2	0	0	0
3	429	53	133	147
4	28	3	8	15
5	53	3	7	14
6	425	36	117	142

A high percentage of broken flakes may be attributed to post-depositional disturbance (see: Mauldin and Amick 1989). Vanpool et al. (2000) see a similar pattern in a plaza area at Galeana, and hypothesize that disturbances during or after the prehistoric habitation of the site may have led to a biased frequency distribution of flake types in their sample. This is not out of the question at 76 Draw, as its use for cattle ranching through the years could have led to differential breakage of chert flakes.

XU-3 is distinguished by relatively high percentages of complete flakes and flake fragments, as well as low amounts of debris, and broken flakes. Most generally, this is indicative of an assemblage produced by generalized core reduction. While Sullivan and Rozen (1985) note that assemblages with inordinately high amounts of complete flakes are typically the result of non-intensive reduction practices, Table 10 shows that flakes recovered from XU-3 display a lack of cortex on their surface, and as such, it cannot be ruled out that more intensive reduction practices also took place there.

Table 10. Frequencies of Cortex Class by Excavation Unit (XU).

XU	0%	1-25%	26-50%	51-75%	76-100%	TOTAL
1	1226	395	119	28	6	1774
3	963	115	47	7	3	1135
4	83	3	6	3	1	96
5	104	8	2	1	0	115
6	881	91	39	14	15	1040
TOTAL	3259	612	213	53	25	4160

The higher number of flake fragments found at XU-3 signify that formal tool manufacture, including bifacial reduction may have been practiced more frequently at XU-3 than at other portions of the site. Sullivan and Rozen (1985) note that collections with many of these aforementioned attributes are likely the result of mixed reduction strategies.

XU-4 follows the general trend of the site as a whole: high amounts of complete flakes and plain platforms. Again, these signify generalized core reduction. A higher amount of flake fragments recovered from XU-4 may signify that the area was used for more formal tool production. However, XU-4 was one of the least sampled excavation units across the whole site, and more data will allow for stronger characterizations of the region.

XU-5 also has a small sample size. The 115 flakes that were analyzed from XU-5, however, paint a similar picture: high amounts of complete flakes and plain platforms. These too, are the result of generalized core reduction at the excavation unit. The area displays a higher than expected number of complete flakes, and Sullivan and Rozen

(1985) suggest that in these locations, a higher amount of complete flakes and cores may suggest less intensive reduction practices.

Finally, XU-6 is distinguished by a high amount of complete flakes. This, of course, is to be expected with generalized core reduction. However, Table 5 shows that XU-6 displays an inordinate amount of complete flakes relative to other XUs. This may hint at the practice of less intensive stone reduction at the excavation unit. Furthermore, Table 10 shows that XU-6 also displays a high amount of flakes with 76-100% dorsal surface cortex coverage, which is also indicative of early stages of stone reduction. When coupled with the data from Table 2, it appears as though XU-6 was an area that was used for the initial reduction of locally available igneous and quartzite stone.

In addition, Table 11 presents the total weight of debitage within each size grade and excavation area. The weight distributions from all excavations units follow a general pattern: an apex between 21 and 36 mm and with an appreciable increase in debitage larger than 46mm (Figure 1). This parallels Ahler's (1989: 92-93) experimental data, which was produced using hard-hammer freehand or bipolar core reduction and is markedly different from that produced by bifacial tool production. Thus, a mass analysis of these artifacts supports the conclusion derived using Sullivan and Rozen's (1985) formal analysis, which characterized the 76 Draw assemblage as the result of generalized core reduction.

Table 11. Total Weight of Debitage within each Length Group.

Debitage Length (mm)	XU-1	XU-3	XU-4	XU-5	XU-6
1-5.9	0.3	0.2	0	0.2	1
6-10.9	71.1	43.5	6.5	5	58.8
11-15.9	254.7	156.0	19.3	19.8	220.9
16-20.9	286.7	425.9	7.4	12.3	303.7
21-25.9	316.5	348.7	27.2	67.5	342.5
26-30.9	399.6	359.9	21.4	76.3	385.3
31-35.9	341.0	383.0	40.5	45.2	228.8
36-40.9	315.3	204.0	0	3.2	226.8
41-45.9	422.3	123.0	0	27.1	408.9
46-50.9	193.0	350.9	38.6	0	108.6
51+	538.3	401.9	33.1	114.4	355.5

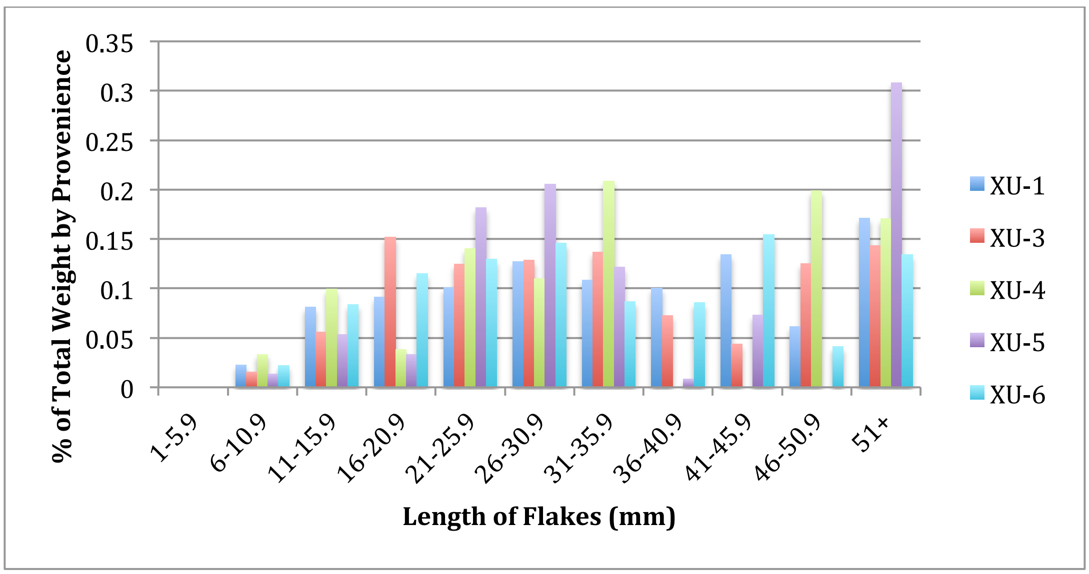

Figure 1. Proportion of the Total Weight of Flakes within each Size Grade

The analysis of flaked stone artifacts across 76 Draw indicates that stone reduction was typified by generalized core reduction, with limited evidence for bifacial flaking and formal tool production. The most evidence for initial core reduction comes from XU-6, which also contains the lowest proportion of "high quality" raw materials. XU-3 and XU-1 both present evidence for mixed reduction strategies, including initial core reduction, intensive core reduction, and formal tool production. This variation, however, is minimal, as all areas surveyed displayed the pattern consistent with generalized core reduction. The overall flaked stone reduction patterns at 76 Draw are similar to those reported at most prehistoric sites in the American Southwest (Di Peso et al. 1974: 342; Parry and Kelly 1987 290-293). Inhabitants of 76 Draw used predominantly locally available stone raw materials to produce flakes for expedient use.

Inter-site Analysis

A comparison between the flaked stone assemblages of 76 Draw and other Medio period sites reveals the degree to which the inhabitants of 76 Draw reduced stone in a manner similar to their neighbors to the south. For the sake of this analysis, detailed information concerning Paquimé's flaked stone assemblage is provided by Di Peso et al. (1974: 336-416). In addition, VanPool et al.'s (2000) analysis of Galeana and Whalen and Minnis' (2009) surveys of Sites 204, 231, 242, and 317 provide insights into the reduction of stone at sites within varying proximity to Paquimé.

In all cases, generalized core reduction with hard-hammer percussors characterizes the technologies that produced each assemblage. Di Peso et al. (1974:339) suggest that direct percussion was used for basic core reduction and for the production of "large tools". They note that there is neither evidence of indirect percussion nor any evidence of pressure flaking except on the production of formal tools such as projectile points. Further, they note that a lack of lipping on flake artifacts with platforms allows them to characterize the assemblage as being the result of hard-hammer percussion (1974:339).

VanPool et al. (2000) note that the flaked-stone assemblage at Galeana employs the same reduction method. These authors point to high counts of complete flakes and flaking debris relative to broken flakes and flake fragments, a lack of faceted platforms on flakes, and a mass analysis similar to Ahler's (1989) data to suggest that the technology employed was expedient generalized core reduction with hard-hammer percussors. Although they employ a slightly different methodology, Whalen and Minnis (2009) characterize all four of their Medio period neighboring sites (204, 231, 242, and 317) in a similar manner.

As mentioned above, several lines of evidence point to generalized core reduction at 76 Draw. As such, the technology employed to reduce stone at 76 Draw is the same as that employed at Paquimé itself, as well as sites within 30km of Paquimé (Sites 204, 231, 242, and 317) and a site within 45km of Paquimé (Galeana). To continue to investigate the degree of similarity between the assemblage from 76 Draw and those of these sites, frequencies of cortical debitage, flake type frequencies and raw material frequencies are analyzed.

Analysis of cortical debitage at 76 Draw revealed that while there was variation in the degree of reduction of stone at 76 Draw, flakes with no dorsal cortex present dominated the assemblage. This is a pattern that Whalen and Minnis (2009) observe for Sites 242, 317, and 231. Di Peso et al. (1974:337) and Whalen and Minnis (2009:188) both employ the "triple-cortex" typology, which classifies debitage as primary, secondary, or tertiary based on the amount of cortex present on the dorsal surface of flakes. However, since the distinction between these categories has been inconsistently defined (Sullivan and Rozen 1985:757), and because differentiating between these categories is prone to measurement error regardless of the definitions employed (Shott 1994:74), Di Peso et al.'s (1974) and Whalen and Minnis' (2009) data cannot be directly compared to my data. Yet, at a more basic level, we can compare the proportions of debitage possessing cortex between the sites without delving into the relative proportions of cortex.

In their inter-site analysis of cortex frequencies, Whalen and Minnis (2009:201) found that Sites 204 and Galeana displayed relatively similar proportions of primary, secondary, and tertiary flakes, while smaller sites such as Sites 231, 317, and 242 displayed significantly fewer primary and secondary flakes. An analysis of cortical and non-cortical debitage at all of these sites plus Paquimé and 76 Draw reveals a similar dichotomy (Table 12).

Table 12. Frequencies of Cortical Debitage and Non-Cortical Debitage at Medio period Sites.

Site	Cortical Debitage	Non-Cortical Debitage	% Cortical Debitage	% Non-Cortical Debitage
76 Draw	903	3259	22	78
Paquimé	969	1462	60	60
Galeana	538	511	51	49
204	2656	2677	50	50
242	226	338	40	60
317	519	1952	21	79
231	283	1291	18	82

Thus, we see that at smaller sites (Site 317, Site 231, and 76 Draw) the percentage of cortical debitage tends to drop rather drastically. The exception to this general rule is Paquimé, which displays a rather low percentage of cortical debitage to non-cortical debitage for being considered large. Regardless, it appears as though smaller Medio period sites in general tend to display fewer pieces of cortical debitage, and that 76 Draw fits in well with this pattern. Whalen and Minnis (2009) argue that the higher amount of tertiary flakes (or non-cortical debitage here) signifies that smaller Medio period sites generally stuck to more intensive reduction strategies than their larger counterparts. An analysis of flake types frequencies at 76 Draw and Galeana confirm this hypothesis. Table 13 presents the results of a Chi-square analysis of the frequencies of flake types at these two sites. Given that Di Peso et al. (1974) and Whalen and Minnis (2009) do not utilize Sullivan and Rozen's (1985) "interpretation free typology", their assemblages cannot be included in this analysis. The null hypothesis is that there are no differences in the frequencies of flake types between the sites, except by those potentially generated as a result of sample size. The alpha level of the test is set at .05, with 3 degrees of freedom. The Chi-square value is 148.8, which exceeds the critical value of 7.8 and signifies that the null hypothesis must be rejected.

Table 13. Chi-square Analysis of Flake Type by Site.

Site	Debitage Type	Observed	Expected	Chi-square	Adjusted Residual
76 Draw	Complete Flakes	2193	2118.7	2.6	5.1
	Broken Flakes	379	484.4	22.9	-11.3
	Flake Fragments	605	630.4	1.0	-2.4
	Debris	971	914.5	3.5	4.7
Galeana	Complete Flakes	462	536.3	10.3	-5.1
	Broken Flakes	228	122.6	90.6	11.3
	Flake Fragments	185	159.6	4.0	2.4
	Debris	175	231.5	13.8	-4.7

Among the many differences between the sites with regard to flake type, we see that 76 Draw displays a significant amount more debris than does Galeana, which supports the pattern reported by Whalen and Minnis (2009) that smaller Medio period sites reduce stone more intensively than their larger counterparts. In addition, 76 Draw displays significantly more complete flakes than Galeana, and significantly fewer broken flakes and flake fragments. VanPool et al. (2000) note that the frequency of broken flakes and flake fragments can be effected by many factors, ranging from characteristics of raw materials to intensity of reduction and degree of post-depositional alteration, and that much of their sample comes from an outdoor plaza area. As such, these particular artifacts could have been exposed to more post-depositional trampling than those excavated in room contexts.

Generally, the inhabitants of 76 Draw utilized a set of stone raw materials that characterizes much of the Casas Grandes culture, as well as the Greater American Southwest (Di Peso et al. 1974: 342; Parry and Kelly 1987:290–293). This includes a preference toward utilizing locally available stone to produce flakes for expedient tools. At 76 Draw we see that igneous stone (andesite, rhyolite, basalts), quartzite and chert are used extensively. This parallels VanPool et al. (2000), who found at Galeana that chert, chalcedony, and igneous stone were heavily exploited. Similarly, at their sites Whalen and Minnis (2009) find that chert, rhyolite, basalt and chalcedony were the most commonly reduced stone raw materials. Finally, at Paquimé chert, chalcedony, igneous, and obsidian dominate the flaked stone assemblage (Di Peso 1974: 336). While the same general types of stone are present at each of these sites, the frequencies of these raw materials vary considerably. Table 14 presents the results of a Chi-square analysis of the frequencies of flake raw materials at 76 Draw, Galeana and Paquimé. The null hypothesis is that there are no differences in the frequencies of raw materials between the sites except by those potentially generated as a result of sample size. The alpha level of the test is set at .05, with 6 degrees of freedom. The Chi-square value is 2139.3, which easily exceeds the critical value of 12.6 and signifies that the null hypothesis must be rejected.

Table 14. Chi-square Analysis of Raw Material by Site.

Site	Raw Material	Observed	Expected	Chi-square	Adjusted Residual
76 Draw	Chalcedony	474	549.9	10.5	-5.2
	Chert	1182	1620.3	118.6	-20.8
	Igneous	1354	1286.7	3.5	3.4
	Quartzite	1049	602.1	331.7	29.2
Galeana	Chalcedony	74	144.6	34.5	-6.8
	Chert	242	425.9	79.4	-12.4
	Igneous	714	338.2	417.6	26.7
	Quartzite	37	158.3	92.9	-11.3
Paquimé	Chalcedony	464	317.6	67.5	10.7
	Chert	1558	935.7	413.9	31.7
	Igneous	300	743.1	264.2	-23.7
	Quartzite	22	347.7	305.1	-22.8

Table 14 illustrates several statistically significant differences in the raw materials recovered from 76 Draw, Galeana and Paquimé. Among these differences is an inordinately high amount of chert and chalcedony at Paquimé, and corresponding with this are low amounts of these materials at 76 Draw and Galeana. Furthermore, Galeana and 76 Draw display higher amounts of porphyritic igneous materials than does Paquimé. Finally, 76 Draw displays a great deal more quartzite in its assemblage than do the other two sites.

The high amount of “high-quality” stone recovered from Paquimé relative to other Medio period sites has been addressed by other researchers, and there are have been varying hypotheses as to why this disparity exists. Whalen and Minnis (2009) suggest that differences in excavation techniques and collection strategies when Paquimé was excavated may have led to a biased representation of the chipped stone present at the site.

However, VanPool et al. (2000) note that the “high-quality” raw materials at Galeana are actually smaller in size than the porphyritic resources, and that differences in recovery methods would therefore have led to an underrepresentation, not an overrepresentation, of these resources at Paquimé.

At the two sites surveyed by Whalen and Minnis (2009:200) that reduced stone as intensively as 76 Draw (Site 317 and Site 231) we also see a higher amount of igneous stone being reduced relative to cryptocrystalline silicates. If differential excavation methods are not the cause of this disparity in raw materials, and that the inhabitants of Paquimé had greater access to “high-quality” stone than did many of their neighbors, it is possible that many of these sites (Sites 317, 231, and 76 Draw) were “stretching” their raw materials as far as possible via intensive reduction to accommodate for the flow of “high-quality” stone out of the periphery and into Paquimé. In other words, it seems as though less access to high-quality stone coincides with a need to more intensively reduce locally available porphyritic stone. This would account for the prevalence of bipolar reduction that we see of chert at 76 Draw, as well as the less intensive reduction of andesite, rhyolite, and quartzite. For this reason, it is not out of the realm of possibility to suggest that “high-quality” raw materials were flowing out of the smaller satellite sites, and into Paquimé itself. If this were the case, we would expect to see: 1) less “high-quality” stone at many smaller neighboring sites, 2) more “high quality” stone at Paquimé, and 3) signs of a loss of raw materials at sites from which the raw materials were leaving. More intensive reduction strategies, then, could signify that these smaller sites were straining to produce expedient flake tools in the face of having lost some of its nearby resources. The particular mechanism that drove this disparity in access to “high quality” stone is not immediately apparent, but a few hypotheses may be proposed. It is possible elite individuals at Paquimé coerced satellite populations to part with their “high quality” raw materials. Another possibility is trade. Finally, the movement of individuals across the landscape could account for the flow of cryptocrystalline silicates out of the periphery and into Paquimé. Paquimé was a site that many local populations considered sacred (Fish and Fish 1999), and other researchers (VanPool et al. 2005) have suggested that traveling pilgrims stockpiled other goods at Paquimé. This too could account for the inconsistency in access to cryptocrystalline silicates that we are seeing at Paquimé, 76 Draw, and many of Paquimé’s neighboring Medio period sites.

Chapter 5

Conclusions

The flaked stone assemblage collected from 76 Draw is characterized by generalized core reduction. The assemblage contained high amounts of locally available igneous and quartzite stone with low relative amounts of cortex. The relative amounts of these raw materials varied considerably, with XU-1 displaying an inordinate amount of cryptocrystalline silicates, and XUs 3 and 6 displaying higher quantities of locally available porphyritic igneous stone. These differences could have been the result of any number of processes, including social inequality, separate occupations of 76 Draw, or production zones within the site. Additional research with other forms of material culture and further excavation may yield a more robust explanation.

In addition, while generalized core reduction does typify the flaked stone assemblage of the site in a general sense, the reduction strategies used at 76 Draw were not uniform, as XUs 1 and 3 produced some evidence of several reduction strategies, including initial core reduction, intensive core reduction, and formal tool production. The relatively high amount of flake fragments and broken flakes at XU-1 also could signify that the area was used as a midden during later occupations of the site. This would explain the proportions of fractured flakes in the area, as well as the higher density of artifacts found in the region in general. Among the excavation units sampled heavily, the unit with the highest proportion of "lower-quality" raw material (XU-6) produced the most evidence for non-intensive reduction patterns, which is to be expected with expedient tool production practices. In sum, inhabitants of 76 Draw used predominantly locally available stone raw materials to produce flakes for expedient use.

Based on the data produced by Di Peso et al. (1974), VanPool et al. (2000), and Whalen and Minnis (2009), flaked stone reduction at 76 Draw follows the pattern typical of sites within the Casas Grandes culture region. More specifically, the assemblage follows the pattern observed at smaller Medio period sites such as Site 317 and Site 231. It mirrors these sites in terms of the mode of production, raw materials utilized, and degree of reduction. These findings fit in well with other aspects of 76 Draw's material record that document a Medio period Casas Grandes influence, including ceramic and architectural evidence (Rakita et al. 2011). As such, the influence of Medio period Casas Grandes sites in the Animas region of southwestern New Mexico is quite evident, and additional research may reflect the degree to which these sites interacted directly with Paquimé.

The high relative amount of cryptocrystalline silicates at Paquimé and corresponding low amounts at 76 Draw and other "small" neighboring sites (Sites 317 and 231) is curious. If the Paquiméans did have greater access to "high-quality" stone, it could have been flowing out of smaller sites in the periphery. The flow of chert out of the periphery and into Paquimé could have been the result of numerous processes, including potential coercion, movement via trade, or migration. Although this suggestion may seem farfetched based on the lithic data alone, it provides a testable hypothesis that can be explored by other researchers carrying out excavations in the Medio periphery, as well as those researching other portions of the material record.

Finally, this study reveals the degree to which the field of lithic analysis can benefit from the use of multiple methodologies. Use of Sullivan and Rozen's (1985) "interpretation-free typology" produces particularly robust results with complementary support from both attribute analysis methods, and mass analysis techniques. The main critique of Sullivan and Rozen's typology was that although it produced replicable types, the simplicity of the typology only allowed for interpretations that were lacking sufficient empirical backing. The use of attribute and mass analyses provides this necessary support. When used together, the researcher benefits from a typology with highly replicable results that produces robust archaeological interpretations.

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