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LITHIC MATERIAL PROCUREMENT AND PROCESSING OF THE ANCESTRAL PUEBLOANS IN MONTEZUMA CANYON
Richae Knudsen

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ABSTRACT

Recent analysis of lithic materials from Ancestral Puebloan sites in Montezuma Canyon demonstrates differences between the northern and southern sites in terms of practices of lithic procurement and processing. Materials from Alkali Ridge and Coal Bed Village had more lithic debitage without cortex, while those from Cave Canyon Village and Three Kiva Ruin had a much higher frequency of debitage with cortex. These data sets suggest that the northern sites performed primary flaking away from home, while those in the south did their primary flaking at home. This distinct behavior may be a result of differential access to lithic material sources as well as the various defensive capabilities of these sites in response to the tense social climate. I use the Field Processing Model in conjunction with data from Montezuma Canyon to demonstrate how the geography may have affected the people’s procurement and processing practices. However, a model is only as good as the circumstances it applies to. It is necessary to consider the actual circumstances of the time and how they nuance the Field Processing Model. The model must adjust to account for other factors. I consider the political upheaval of the time and defensive characteristics of each site analyzed in order to gain a comprehensive understanding of the discrepancy in the data.

INTRODUCTION

The Ancestral Puebloans depended on lithic materials to make weapons, as tools to hunt, to prepare game for cooking, and in crafts. To make use of lithic materials “knappers processed toolstone by systematic reduction” (Shott 2015:548), and it was a very delicate and organized process. My intent is to expand our current knowledge of lithic tool procurement and processing of the Ancestral Puebloans in Montezuma Canyon, Utah, and provide new insights into the socio-political circumstances and field processing habits of the people. I examine the debitage from four sites within and around the canyon; Coal Bed Village, Alkali Ridge, Three Kiva Ruin, and Cave Canyon Village. Analyzing data from four sites within the same region provides a more complete picture of the lithic procurement and processing of the people in that area. After making a comprehensive data set, I show that those who resided at Alkali Ridge and Coal Bed Village performed most primary flaking away from site while those at Three Kiva Ruin and Cave Canyon Village performed most primary flaking on-site. Debitage is defined as “discarded and unused detached pieces of lithic material produced from the reduction of an objective piece”
Cortex is the exterior of the original cobble stone and “can be produced by either chemical or mechanical weathering of the stone surface” (Andrefsky 1998:101). When I use the term on-site, I mean the place where the people lived, or their homes; by off-site, I mean away from home.

Debitage from the Alkali Ridge and Coal Bed Village sites had fewer flakes with cortex than the debitage from Three Kiva Ruin and Cave Canyon Village. This study strives to explain this differential behavior in “the forager’s decision on whether to remove certain aspects of a resource right at the area of procurement (such as the cortex on a lithic nodule) or whether transporting the unprocessed material back to camp is a better use of time and energy” (McElroy 2018:35). Understanding this difference in behavior can open a window into what it was like for the Ancestral Puebloans to acquire and process the lithics needed to survive and what factors influenced this process.

Imperative to the understanding of these data is the process of creating stone tools. First, raw material must be acquired. Next, cores must be prepared, and initial reduction begun. This is followed by primary trimming, then secondary trimming and shaping. Last is maintenance and modification of the finished tool (Swanson 1975:17). Debitage recovered from archaeological sites is an indicator of the people’s use of materials and practices at those sites, “each stage of the process—from quarry to finished tool—produces a distinctive type of waste material, which allows archaeologists to reconstruct the various toolmaking activities that took place at a site” (Smith 2013:84). Types of flakes and shatter found at the site can be used as diagnostics of past activity there.

There are many different reasons the Ancestral Puebloan in Montezuma Canyon performed primary reductions off-site compared to on-site. I consider explanatory models for
what I see in the data—namely, I use the Field Processing Model (FPM) to explain this data differential, for this disparity is the kind of phenomenon that the model addresses. However, this model must be nuanced by local historical circumstances such as increase in violence over time as well as the defensive characteristics of each site. I argue that broad principle-based models that are used to interpret differences in data require consideration of local on-the-ground circumstances to provide more accurate explanations of past behaviors.

Here I review the historical chronology and background of the Ancestral Puebloans, describe the four sites I analyzed debitage from, and review my methods while creating a comprehensive data set. Then I display that data set and present my results. I then suggest that while the Field Processing Model provides a reasonably fitting explanation for the materials, specific, on-the-ground circumstances must also be taken into account to produce a locally nuanced explanation of the data.

**CONTEXT**

The Ancestral Puebloans were a diverse, somewhat spread out, and politically changing people throughout time. Below is a simple chronology of the Ancestral Puebloan currently accepted by archaeologists:

<table>
<thead>
<tr>
<th>Historical Dates</th>
<th>Era</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD 500-700</td>
<td>Basketmaker III</td>
<td>Larger pithouses, storage moved outside residential structures, residencies shaped in arcs. People becoming increasingly sedentary and clustered.</td>
</tr>
<tr>
<td>AD 750-900</td>
<td>Pueblo I</td>
<td>Pithouses, connected apartment-like storage rooms, first villages, proto-great houses. Community is becoming more centralized.</td>
</tr>
<tr>
<td>AD 900-1150</td>
<td>Pueblo II</td>
<td>Chaco as center, population is centralized, many regional connections. Great houses.</td>
</tr>
<tr>
<td>AD 1150-1300</td>
<td>Pueblo III</td>
<td>Mesa Verde as center, drought, people disperse.</td>
</tr>
</tbody>
</table>
Montezuma canyon is located within the West Central Mesa Verde subregion (Figure 1). Those settlements in the lower San Juan and west Central Mesa Verde had stronger connections with those in the Kayenta region and were less influenced by Chaco than those in Mesa Verde Proper (Glowacki 2015: 26). Montezuma Canyon is roughly fifty miles in length and over two thousand feet deep (Figure 3). The fact that there is a difference in lithic procurement and processing within only 50 miles suggests that there were definitely one or more factors influencing the people’s behavior. The canyon lies in the south-east corner of Utah in San Juan County and contains many Ancestral Puebloan sites, many of which include great houses, pit houses, cliff dwellings, granaries, and *herraduras*.\(^1\)

\(^1\) *Herraduras* (a Spanish term meaning “horseshoes”) are defined as “low masonry or rubble enclosures of variable formality. . .occur[ing] occasionally in direct association with. . .roads” in this area (Hurst and Till 2009:67)
SITE DESCRIPTIONS

Coal Bed Village (site 42SA920) (Figure 2) lies in Montezuma Canyon (Figure 3). Ray Matheny was the first to record Coal Bed Village, describing it as a “remarkable ruin complex…built of masonry units covering about a quarter of a mile. . .[with] several visible kivas, many surface rooms, round surface structures, and a series of monoliths standing in a row” (Allison 2018:42). The terrain is very dry and arid. Plant life includes sage brush and greasewood, and most of the canyon resides in the pinyon/juniper zone. Animal life includes deer, rabbits, snakes, eagles, coyote, chipmunks, and lizards. Montezuma Creek runs west and south of the site but was much larger and higher in elevation when Coal Bed was inhabited. The site rests on a butte in the middle of the canyon and has three tiers, with the majority of the
site on the third and lowest tier. The site was occupied intermittently from the Pueblo I to the Pueblo III periods. A Pueblo III great house was built on top of older Pueblo I and Pueblo II pit houses.

It is important to mention how excavations were done at Coal Bed Village in order to compare other excavation and screening methods used at surrounding sites. We excavated using 1-meter x 1-meter grids calibrated to a central datum. Eighth-inch mesh screens were used to sift through the dirt after excavation; lithic, bone, ceramic, and shell were saved for analysis. For the excavations at Alkali Ridge, Three Kiva, and Cave Canyon, quarter-inch screens were used. The different excavation and screening methods of each site likely affected the lithic debitage saved and available for analysis.

Alkali Ridge (42SA13) is the largest known early Pueblo I site (Allison et al. 2012: 44). It has similar plant life to Coal Bed Village. “Brew’s excavations at . . . Alkali Ridge indicated that the flora and climate of Pueblo times were much the same as [they are] today” (Harmon 1977:6). Animal life is similar as well. Alkali Ridge, also called Site 13, rests northwest of Coal Bed Village and is not within Montezuma Canyon, but rather sits on top of the canyon’s mesa. This site was inhabited from the Basketmaker III period to the Pueblo II period.

Three Kiva Ruin (42SA863) rests in the bottom of Montezuma Canyon south of Coal Bed Village. Montezuma Creek flows about two-hundred feet west of the site (Miller 1974:5). Flora and fauna found there are the same as the previously mentioned sites. The site was inhabited between the
Pueblo I and Pueblo III periods and has three distinct kivas as part of a small great house (Figure 4).

Cave Canyon Village (42SA2096) lies along the top of a small ridge at the meeting of Cave Canyon and Montezuma Canyon and is further south of Three Kiva Pueblo. The site reflects continuous occupation from the Basketmaker III period through Pueblo II (Harmon 1977:13) (Figure 5).

**METHODS**

The 373 pieces of lithic debitage analyzed from Coal Bed Village were taken from the last two levels of excavation done within two pit houses found in the summer of 2018 and may date to the early tenth century A.D. (according to pottery found alongside these lithics).

Courtney Ewert (2016) previously analyzed the lithics from Alkali Ridge, including 1210 different pieces of debitage, most of which dates to the Pueblo I period. I use her data to compare with and expand on my own research.

The 285 pieces of debitage analyzed from Three Kiva Ruin I chose somewhat arbitrarily. Because of the limited data available at the Brigham Young University Museum of Peoples and Cultures, relevant context and specific dating were not available.²

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² The only context given for the lithics taken from Three Kiva Ruin was the provenience number TM 150 W 1305. While the significance of this number is unclear to me, I include it for the sake of future research.
The 282 analyzed pieces from Cave Canyon Village came from Pit Structure 1 (Figure 6) and Pit Structure 2 (Figure 7). However, the lithics’ context inside the pit structures is unavailable. Nevertheless, knowing exactly which structures the data come from makes it less arbitrary than the data from Three Kiva. Pit Structure 1 has dendrochronology dates taken from a roof-support post dating to roughly 1016 A.D., as well as a ventilator shaft beam dating roughly to 1113 A.D. Pit Structure 2 had a tree-ring date taken from a roof-support post dating to roughly 1004 A.D. (Harmon 1977:268). These dates, however, are only an estimate because there was no way of assessing how far the last ring was from the true outside of the beam, because the beams used to construct the pit structures may have been modified or shaved down to fit a specific size.

The provenience of the lithics sampled differed from site to site, and this may affect the type and size of materials collected. At Cave Canyon, excavation unites covered middens; at Alkali Ridge, no middens were excavated. Coal Bed Village’s lithics were recovered from the last two levels of excavation above the floors of the pithouses, and there was no midden in these lower levels.

Data examination included the accepted methods and steps in analyzing each site, FS number, and feature number at a time. The lithics were separated according to the lithic materials analysis categories used by the Museum of Peoples and Cultures (Table 2). Each material type was then separated by size as sieved through a 0.5-inch screen. The lithics were separated again
by flake type (Table 3). Once the lot was established, each was weighed, counted, and assigned a lot number according to its feature number.

<table>
<thead>
<tr>
<th>Code</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>OB</td>
<td>Obsidian</td>
</tr>
<tr>
<td>BA</td>
<td>Basalt</td>
</tr>
<tr>
<td>IG</td>
<td>Igneous-not basalt (including diorite, granite, rhyolite, etc.)</td>
</tr>
<tr>
<td>PW</td>
<td>Petrified Wood, various colors</td>
</tr>
<tr>
<td>CH</td>
<td>Chalcedony, clear or transparent material</td>
</tr>
<tr>
<td>CC</td>
<td>Chert, white grading to light gray</td>
</tr>
<tr>
<td>CR</td>
<td>Chert predominantly red to brown with some gold; jasper.</td>
</tr>
<tr>
<td>CD</td>
<td>Chert, dark gray to nearly black</td>
</tr>
<tr>
<td>CO</td>
<td>Chert, any other color that doesn’t fit the previous descriptions</td>
</tr>
<tr>
<td>QC</td>
<td>Quartzite, coarse grained; various colors</td>
</tr>
<tr>
<td>QU</td>
<td>Quartzite, fine grained; various colors; may blend to chert</td>
</tr>
<tr>
<td>ZZ</td>
<td>Unknown material</td>
</tr>
</tbody>
</table>

| Table 3. MUSEUM OF PEOPLES AND CULTURES LITHIC MATERIALS ANALYSIS CATEGORIES |
|---------------------------------|------------------|
| Code   | Material                                   |
| OB     | Obsidian                                  |
| BA     | Basalt                                    |
| IG     | Igneous-not basalt (including diorite, granite, rhyolite, etc.) |
| PW     | Petrified Wood, various colors             |
| CH     | Chalcedony, clear or transparent material  |
| CC     | Chert, white grading to light gray         |
| CR     | Chert predominantly red to brown with some gold; jasper. |
| CD     | Chert, dark gray to nearly black           |
| CO     | Chert, any other color that doesn’t fit the previous descriptions |
| QC     | Quartzite, coarse grained; various colors |
| QU     | Quartzite, fine grained; various colors; may blend to chert |
| ZZ     | Unknown material                           |

<table>
<thead>
<tr>
<th>Table 3. Museum of Peoples and Cultures Flake Type Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Flakes without cortex</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Flakes with cortex</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>
It is important to note here the subjectivity of lithic analysis. I did not use a Munsell color chart or any other standardizing apparatus. I used educated judgement to place lithics in the aforementioned categories. Over the course of examination, a light blue-green chert and a dark green-blue chert turned up frequently, but because they did not fit with any other color description, these colors would be categorized as CO (Chert, any other color that doesn’t fit other, more specific categories) in the material analysis categories. Without a more specific category, these colors of chert would disappear in the data. I concluded that the Museum of Peoples and Cultures Lithic Materials Analysis Categories are not specific enough to account accurately for these materials. Thus, I created two new categories for this analysis. These categories are CB-Chert, light blue-green (Figures 8, 9, 10) and CG-Chert, dark green-blue (Figures 11, 12).

3 The above categories are very broad. What one might consider light gray chert, someone else may consider dark gray, and what one may consider red may be considered brown by another archaeologist. There is also a discrepancy between fine grained and coarse-grained quartzite, where the line lies between fine grained quartzite and chert, and where chert blends to chalcedony. Because I analyzed the lithic material from Coal Bed Village, Three Kiva Ruin, and Cave Canyon Village on my own, it is unlikely that there was much deviation within my own research. But because the lithic materials used in my analysis of Alkali Ridge were studied by another individual a few years ago, this may lead to some nonconformity within the data presented.

4 Ewert (2016) also noticed the light blue-green color and registered each case by indicating “green color” in her comments; she mentions this green color 105 times in her data.
Once the data were collected, I analyzed and compared each site’s lithic material sample to determine and what types of flakes were most common from each site. Results of this comparison and analysis are presented below.

**RESULTS AND COMPARISONS**

Since the analyzed sites have varying sample sizes, I give my results in percentages for the sake of comparison. I determined that chert was the material most used by the Pueblo people to make projectile points and other tools at each site analyzed in Montezuma Canyon. White and light gray chert was the most abundant in each case (Table 4). Second in frequency was CO, or chert that does not fit into other specific color descriptions: 15% of all lithics at Coal Bed Village, 22% at Cave Canyon, 25% at Three Kiva, and 26% at Alkali Ridge were placed in this category.

Table 4. Percentage of White grading to Light Gray Chert (CC) at Each Site

<table>
<thead>
<tr>
<th>Site</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Bed Village</td>
<td>40%</td>
</tr>
<tr>
<td>Cave Canyon Village</td>
<td>27%</td>
</tr>
<tr>
<td>Three Kiva Pueblo</td>
<td>31%</td>
</tr>
<tr>
<td>Alkali Ridge</td>
<td>26%</td>
</tr>
</tbody>
</table>

Quartzite, both coarse and fine grained, was used quite a bit in Cave Canyon Village (13% of all lithic material was coarse-grained quartzite and 16% were fine-grained) and Three Kiva Ruin (14% coarse-grained and 12% fine-grained), but not as frequently at Coal Bed Village (5% coarse-grained and 6% fine-grained) or Alkali Ridge (10% coarse-grained and 2% fine-

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5 It is also important to consider that these data may vary as a result of different field and lab methods used by archaeologists throughout the years.
grained) (Figures 13, 14, 15, 16). This suggests that those sites in the north used quartzite less than those in the south, perhaps indicating that those in the south had better access to quartzite.
The light green-blue chert was found rarely at Cave Canyon Village and Three Kiva (only twice in each case). However, this chert type was documented 11 times at Coal Bed Village. The dark green-blue color was found twice at Cave Canyon, 3 times at Three Kiva, and 11 times at Coal Bed Village (Table 5). This may suggest that CB and CG were easier-accessed by sites in the north.
Table 5. Count of Light Blue-Green Chert (CB) and Dark Green-Blue Chert (CG) at Coal Bed, Three Kiva, and Cave Canyon

<table>
<thead>
<tr>
<th>Location</th>
<th>CB</th>
<th>CG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Bed</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Cave Canyon</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Three Kiva</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Flake type at Coal Bed Village was mostly bifacial thinning flakes (41%), secondary shatter (24%), and internal flakes (17%). Flakes with cortex were not found as often (only 17% of all flakes had cortex) (Figure 17). This means that most flaking performed at Coal Bed Village was internal trimming and shaping rather than primary reductions.

Cave Canyon Village had mostly bifacial thinning flakes (30%), primary shatter (21%), and secondary shatter (18%) (Figure 18). This depicts a good mix of flakes with and without cortex, with a very large percentage of flakes having cortex. This means that a large portion of primary reduction was done on-site.
Three Kiva had mostly bifacial thinning flakes (26%), secondary shatter (24%), and primary shatter (16%) (Figure 19). Similar to Cave Canyon Village, there are a large number of flakes with cortex, especially when compared to the northern sites, and a great deal of primary reductions were also done on-site at Three Kiva Ruin.
Alkali Ridge had mostly flake shatter (33%), and internal flakes (32%). Flakes with cortex were rare (only 21% of all flakes had cortex) (Figure 20), which suggests that the majority of primary flaking was done off-site for Alkali Ridge materials.

![Figure 20](image)

The total weight of each type of flake also varied site to site. At Coal Bed Village, the flake type with the most total weight was secondary shatter (218.5 g). At Cave Canyon Village and Three Kiva ruin the flake type with the most weight was primary shatter (1363.5 g and 758 g). Alkali ridge’s heaviest type was internal flake (1483 g) (Figures 21, 22, 23, 24). This shows that the most common types of flakes were also the heaviest categories, further supporting my argument.

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6 Defined as “was likely the distal end of a flake but lacks a striking platform and bulb of percussion” in an older version of the MPC Lithics Analysis Debitage Key that Ewert used.
After creating a larger data set for the lithic procurement and processing methods of the Ancestral Puebloans in Montezuma Canyon, theories and models help us use this information to tell a story and provide interpretation. These data can give us a glimpse into the socio-political and geographical factors that effected the people’s behavior. I propose that the Field Processing Model explains the difference in procurement and processing behavior between Alkali Ridge and Coal Bed Village compared to Three Kiva Ruin and Cave Canyon Village. However, any model
is only as good as the circumstances it applies to. It is very important to take into account the increase in violence over time, the location and defensive capabilities of each site, and the implications and effects these circumstances have on the overall behavior of the Ancestral Puebloan in this area.

**DISCUSSION**

The data show that the northernmost sites in my analysis—Alkali Ridge and Coal Bed Village—mainly have flakes and shatter without cortex, while the southernmost sites—Three Kiva Ruin and Cave Canyon Village—have a large percentage of lithics with cortex. I argue that the varying data between the northern and the southern sites is explained by differential access to lithic material. Of those lithics that had cortex at Coal Bed Village, 84% were chert. Furthermore, Coal Bed had more flakes of quartzite and chalcedony that did not have cortex than those that did. At Alkali Ridge, 93% of all lithics with cortex were chert. This suggests that chert was closer and easier to access for these two sites than quartzite or chalcedony. The procurement, processing, use, and choice of lithic material helps define the needs, abilities, and preferences of the people. This opens a window into the experience of the culture as a whole, for, according to the FPM, “the longer your round-trip distance, the more processing you do at the quarry” (Shott 2015:549). Based on the Field Processing Model, we can conclude with some surety that this was in fact the case for those living at Alkali Ridge and Coal Bed Village.
Schott’s (2015) Field Processing Model draws from central-place foraging theory. The FPM “assumes that people obtain goods at places distant from their residences, which occur in packages that require processing to separate useful from useless parts. It links return to processing time via a (usually) nonlinear utility function. Degree of processing at the source varies inversely with round-trip travel distance” (Shott 2015:549) (Figure 25). In essence, knappers will seek to optimize transport cost and load utility.

![Diagram](image)
The Field Processing Model has proven its utility and reliability through many studies in which it has been applied (Shott 2015:553) and explains my data very well. The FPM illustrates an exchange between transport and processing costs in an effort to optimize effort exerted and magnify resource utility. The model can be further defined through this mathematical equation:

\[ z_{x-1 \rightarrow x} = p_x \left( u_{x-1} / [u_x - u_{x-1}] \right) \]

\( z_{x-1 \rightarrow x} \) is “critical round-trip travel time for any two successive processing stages \( x-1 \) and \( x \), \( p \) is processing time to stage \( x \), and \( u_x \) and \( u_{x-1} \) are resource utility at stages \( x \) and \( x-1 \), respectively” (Shott 2015:550). Lithic material becomes more and more useful as processing is performed. If the distance between the source and the destination increases, then more field processing at the origin of material should occur (Shott 2015:550). Unfortunately, there is no geologic map that provides the specific location of lithic material sources near Montezuma canyon. However, the UGS map provides the location of specific

<table>
<thead>
<tr>
<th>Color</th>
<th>Geologic Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qe</td>
<td>Eolian deposits</td>
<td></td>
</tr>
<tr>
<td>K1</td>
<td>Cretaceous Dakota Sandstone/Cedar Mountain/Burro Canyon Fms.</td>
<td></td>
</tr>
<tr>
<td>J2</td>
<td>Jurassic Morrison Formation</td>
<td></td>
</tr>
<tr>
<td>Qa</td>
<td>Alluvium and colluvium</td>
<td></td>
</tr>
<tr>
<td>K2</td>
<td>Cretaceous Mancos Shale</td>
<td></td>
</tr>
<tr>
<td>Ti</td>
<td>Tertiary intrusive rocks, quartz diorite porphyry</td>
<td></td>
</tr>
<tr>
<td>Qao</td>
<td>Older alluvial deposits, pediment deposits</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 26. UGS Database Map of Montezuma Canyon](image)
formations, and the FPM can project where we should look (Figure 26, Table 6). Having this
diagnostic map can lead us to possible sources for chert, quartzite, and chalcedony, but does not
provide us with the specific locations. Chert and quartzite can be found in most of these
formations (David Tingey and Scott Ritter, personal communication).

Both fine- and coarse-grained quartzite were used much less often at Alkali Ridge and
Coal Bed than at Three Kiva and Cave Canyon. This may mean that material sources were closer
to these southernmost sites or more easily accessible. Obtaining resources had to be very well
thought out to take best advantage of time and resources because “flintknapping was not a
haphazard art but, rather, a carefully planned process of making stone tools” (Swanson 1975:7).
As the FPM would suggest, performing primary reduction off-site facilitated the transport of
material back to site.

My results demonstrate that heaviest category of lithic material (in grams) was internal
flake at Alkali Ridge, whereas secondary shatter was the heaviest lithic material at Coal Bed
Village, and primary scatter was the heaviest at Three Kiva Ruin and Cave Canyon Village. This
means that the largest mass of flakes at Alkali Ridge and Coal Bed Village were flakes without
cortex, suggesting that the cortex was removed previously elsewhere. Three Kiva Ruin and Cave
Canyon’s largest flake mass were flakes with cortex. This further supports the idea that the
northern sites frequently removed cortex off-site, while the southern sites often removed cortex
on-site.

The FPM suggests inhabitants of Alkali Ridge and Coal Bed village had a harder time
obtaining lithic materials and were more limited in what materials were accessible. They had to
travel on foot to find material sources, and flint-knapping away the cortex lessens the load while
travelling back to site. Three Kiva and Cave Canyon may have had a wider variety of sources
readily accessible and may not have had to travel as far. Reducing the weight of a load has higher priority when a greater length is traveled. It takes more energy to move a heavier load over a longer distance. But when only a short space is traveled, less energy is exerted, and reducing the weight of the load does not seem as crucial.

Though the physical location of lithic sources near Montezuma canyon are unavailable, according to the Field Processing Model, Alkali Ridge and Coal Bed Village did most of their primary knapping off site because lithic material resources were further away. Meanwhile, those living at Cave Canyon Village and Three Kiva Ruin had sources closer to home, thus making processing of lithic material on-site feasible. I argue that “where distance was shorter, less processing at the source was expected and “earlier-stage” products and by-products expected at destinations” (Shott 2015:553). This does not mean that all processing was done on-site for those in the south, but merely that it was more rare for late-stage reduction to happen at the quarry when travel distance was great (Shott 2015:553).

These are the conclusions that I am able to come to just using the raw material and the Field Processing Model. The FPM does support my data, but I am lacking in the specific geological locational data. However, there are much more immediate and crucial factors of life at this time in this area that the FPM does not address that will further explain my data.

In order to obtain a more thorough understanding of the difference in data, it is important to account for variables that effect the FPM. The FPM works perfectly when applied in a vacuum, but we know that no equation is perfect when the human element is applied. It is essential to account for the threat of violence among the Ancestral Puebloan, as well as the defensive capabilities of each site. The archaeological record shows that competition and the threat of violence increased over time and as population grew, “In the Pueblo I period, villages
emerged from a substrate of related groups of households that we can call clans for convenience; and then, in the Pueblo II period, polities composed of many villages appeared” (Kohler and Varien 2010:59). Furthermore, the Pueblo population increased at a very rapid rate, “probably at rates not experienced previously in this region” (Kohler and Varien 2010:56). The threat of local violence made living in close aggregations appealing for safety purposes.

Only two sites in the northern San Juan region have physical evidence of violent deaths during the Basketmaker and Pueblo I periods. The number of violent deaths increases to twenty-one during the Pueblo II period, and twenty-five during the Pueblo III period (Kuckelman et. al 2000:149-150). Although violence was not unknown during the Basketmaker and Pueblo I periods, archaeological data shows that Pueblo II and III were the most violent periods. Especially during the Pueblo I phase, violence appears to have been reserved to nearby communities rather than engaged in on a more regional and interregional scale (Kohler and Varien 2010:38-39). During the Pueblo II period, there was a very substantial amount of violence in the Northern San Juan area (Kuckelman et. al 2000:154). As the people changed, the implications of violence were affected, because “increased social, demographic, and economic competition among equally strong polities may...have promoted warfare” (Lipe 2002:231). Warfare was simply a fact of life in the Four Corners region in general.

The data taken from Alkali Ridge date to the Pueblo I period, and the Coal Bed Village data sets likely date to the early Pueblo II period, while Cave Canyon’s data likely date to the later Pueblo II period (Three Kiva’s data does not have proper context to provide associated dates). If Lipe (2002) is correct about the correlation between demographic density and violence, the smaller population of the earlier phases would imply that violence was not as much of a threat, based on the demographic and violence-related data presented above.
Applying my theory further, the fact that Alkali Ridge and Coal Bed Village show fewer flakes with cortex would support the idea that they did not have to worry as much about an attack. Contrarily, the southern sites performed initial knapping on-site during the Pueblo II period, when the population was larger, supporting the idea that they processed more on-site in response to a greater threat of violence.

Another important adjustment to increased violence in these periods must also nuance the FPM: The difference in defense capacities between each site may also affect why field procurement and processing habits were so different between the two areas. Alkali Ridge rests on the top of a mesa and is not vulnerable to higher-elevation attacks because of the flatness of the surrounding area. Coal Bed Village is located on a butte in the middle of the canyon, giving the people a 360-degree view of the canyon, thus making them less vulnerable to surprise attacks. This defensive capability meant that they had the high ground and an advantage over any inbound war party. However, both Three Kiva Ruin and Cave Canyon Village lie at the bottom of the canyon and are much more vulnerable, as they do not have any high ground. To gain high ground at these sites, the people would have had to climb the sides of the canyon, which would have been very difficult, time consuming, and dangerous.

The people made defensive preparations while constructing their settlements surely because “the occurrence of clearly defensive sites even in low population density areas of southeastern Utah. . . indicated that hostilities were in fact quite widespread” (Lipe 2002:231). Settlements just west of Montezuma canyon (Milk Ranch Point, Cottonwood Wash, and Allen Canyon/Chippean Ridge) were also built with defense in mind as evidenced by elevated observation rooms with “panoramic viewsheds” (Allison et al. 2012:49). Coal Bed Village had a tower on the north side of the butte that may have been built for defensive and signaling
purposes, “the construction of enclosing walls and, perhaps, the proliferation of towers may also be indicators of defensive needs” (Lipe 2002:212). The building of defensive architecture indicates adjustments to the violence that increased as the population grew.

Those in the north (Alkali Ridge and Coal Bed Village) may not have had to worry as much about returning quickly to site or about defending their provisions because of the defensive security afforded them by their geographic placement. Furthermore, attacking these northern sites would have been hazardous for others. The defensive capabilities of the northern sites may have also simply permitted those procuring materials to have peace of mind knowing that their homes were less likely to be raided as a result of their defensive capabilities. The Ancestral Puebloans in the north may have had the ability to do primary flaking off-site for these reasons.

Conversely, those people living in the south may not have had this luxury. It may be suggested that they did not have the ability to do primary flaking off-site because they felt inclined to stay on-site as often as possible in order to be prepared to defend their homes. They may have gone to get their lithic cobbles and just brought them back to site to perform most of the flint-knapping. It is also possible that they did not feel safe to wander away from home for fear of attack or risk of crossing into the territories of other clans (James Allison, personal communication).

There are many circumstances and variables that affect the procurement and processing practices of the Ancestral Puebloans in Montezuma canyon. While the Field Processing Model is a solid explanation for the differential behavior of the Ancestral Puebloans in Montezuma Canyon, we must account for external influences and factors as well in order to obtain a more accurate interpretation of the habits and actions of the people. Furthermore, “if we focus on how individuals respond to hazards and problems and on the ways in which the nature of their
responses (including any patterns of aggregation and disaggregation that these may produce) are related to characteristics of the hazards and problems they face, we may move closer towards” explaining the behavior of the Ancestral Puebloan in regards to their lithic procurement and processing behaviors (Vayda and McCay 1975:300). Consequently, the various behavior between the northern and southern sites may be a mix of both the violent nature of the time and differential access to materials.

After thorough analysis, there still remains steps that can be taken to further solidify the existing data sets and theories. To further support the Field Processing Model of differential access to materials between the northern and southern sites, field survey is needed in order to obtain specific source locations for chert, chalcedony, obsidian, and quartzite in and around Montezuma canyon. Once this is obtained, we can verify whether or not there was truly a divergence in procurement ability. In addition, more specific dating is required for the data sets of Coal Bed Village and Three Kiva Ruin. Once specific dates are discovered, we can further study the implications of violence during each time period and how that would relate to the behavior of the people as a whole.

CONCLUSION

Lithic debitage in Montezuma canyon had never been analyzed and then compared from one site to another. After examining debitage from Alkali Ridge, Coal Bed Village, Three Kiva Ruin, and Cave Canyon Village, a data set was created to represent a comprehensive view of the procurement and processing practices of the Ancestral Puebloans in Montezuma canyon. As the data show, there was a clear difference in procurement and processing behaviors between Alkali Ridge and Coal Bed Village compared to Three Kiva Ruin and Cave Canyon Village. Based on the lithic debitage analyzed, the northern sites performed most primary processing off-site while
those in the south did most of their primary processing on-site. These data sets are supported by
the Field Processing Model, suggesting there was a disparity in access to lithic materials between
the northern and southern sites.

However, models apply perfectly only when other factors are not accounted for. We are
not dealing with a people or time period where all things were equal and neutral. I have found
that the regional violence and general defensive capabilities of each site correspond with how
lithic materials were procured and processed, for the sites in the north were more easily
defensible than those in the south. A model deals with abstract circumstances, whereas my
theory of violence and defensiveness deals with the reality of the situation. The FPM can only be
offered provisionally—no model can account for all circumstances influencing a people’s
behavior, thus additional variables must be considered. The FPM is presented as a plug-in model
meant to be applied without considering other contexts. The Field Processing Model needs to
adjust to account for actual conditions. There are no non-contextual people. People are not a
simulation. The most salient circumstances that archaeologists have seen for this area are
increased violence. The defensive architecture of these sites supports this as well. Furthermore,
my data set shows that the more defensible sites performed most of their primary processing off-
site, while the less defensible sites did their primary flaking at home. This proves that violence
and defensive capabilities of a site affect lithic procurement and processing practices.
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