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Humeri Spatulate Tools Associations and Function in Chaco Canyon, NM

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HUMERI SPATULATE TOOLS
ASSOCIATIONS AND FUNCTION IN CHACO CANYON, NM

by

Sara Anderson

A THESIS

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In the two papers that comprise this thesis, I will be discussing Bone Spatulate Tools (BSTs) specifically those made of artiodactyl humeri found within Chaco Canyon, NM. These archaeological tool types permit the investigation of androcentric biases by way of legacy data acquired using the Chaco Research Archive (CRA). By redressing these archaeological biases, I hope to resuscitate an understudied tool type and highlight their function and importance in Chacoan toolkits. In chapter two, I investigate women and gendered activities by examining Humeri Spatulate Tools (HSTs) that are found at Chacoan great and small house sites. In this study, I specifically evaluate HSTs and their female associations by using a cross-cultural comparison, legacy data, contextual associations, a comparative attribute analysis, and a discussion of use and significance. Several HSTs studied were embellished with turquoise, jet and shell tesserae. These embellishments provide evidence that these tools were cosmologically and ceremonially significant. This investigation allows for the discussion of Chacoan women participating in craft production which may have garnered them elevated status.
In the third chapter, I evaluate Ancestral Puebloan women’s participation in prestige-driven craft production through the use of HSP. I analyzed these bone artifacts at two repository institutions; the Smithsonian’s National Museum of Natural History (NMNH) and the American Museum of Natural History in New York City (AMNH). I traveled to these two repository institutions to compare the embellished HSTs to the more ubiquitous unembellished artifacts. By examining several characteristics including use-wear and polish, I discerned that these HSTs have unique use-wear signatures that suggest their function and significance as utilitarian items as well as their ceremonial significance. To determine HST function, I conducted a five-stage experimental research program to try to create use-wear signatures that I could compare to those seen on the archaeological bone tools. Legacy data from the CRA and the attribute analysis of the HSTs housed at the AMNH and NMNH compared against my experimental research will add evidence to better understand Chacoan HST function.
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Located in southwest New Mexico, Chaco Canyon is a UNESCO World Heritage site and unit within the National Park Service. It is also a sacred ancestral place for numerous Indigenous groups in the region. During the 9th -12th centuries AD, a large social transformation took place in the canyon resulting in the construction of massive masonry buildings called great houses both within the canyon and beyond. This 300-year fluorescence of Chaco produced architecturally unique great houses, elaborate and valuable material goods, and a complex social organization (Crown and Wills 2018; CRA; Lekson 2006; Vivian and Hilpert 2012). Due to the high-desert landscape in which
this culture expanded, the social scale to which the Ancestral Puebloans ascended seems environmentally unlikely.

Archaeological study of Chaco Canyon began in 1895 by Richard Weatherill, a Colorado rancher and explorer who became famous for discovering the cliff dwellings of Mesa Verde. Weatherill made contacts with wealthy New York businessmen Talbot and Fred Hyde Jr. and was able to conduct long-term excavations of the Canyon under the guise of the Hyde Exploring Expedition. In 1896, George Pepper a student of the Peabody Museum at Harvard joined Weatherill to ensure the scientific quality of the archaeological work. Later that spring excavations at Pueblo Bonito began. After several years of work and the removal of thousands of artifacts which were shipped to the AMNH, the Hyde Exploring Expedition ceased. Then, with the passage of the Antiquities Act of 1906, Chaco Canyon became a national monument in 1907 (CRA; Lekson 2006; Vivian and Hilpert 2012).

Due to the development of archaeology as a discipline, new investigations of Chacoan great and small house sites began. In 1920, the National Geographic Society, with the Smithsonian’s Neil Judd as the lead investigator with the help of Edgar Hewett, Earl Morris, Alfred Kidder, and Sylvanus Morley, began investigations at Pueblo Bonito. This project lasted eight seasons, and most of the rooms and kivas were excavated to floor. Judd was able to determine architectural chronology, and, with the help of dendrochronologists was able to establish the age of the pueblos (CRA; Lekson 2006; Vivian and Hilpert 2012). Not only was he able to tease apart much of the archaeological data to answer long-awaited questions but “he amassed an inspiring collection of artifacts
that spoke to the wealth, skill and aesthetics of the ancient Chacoan people” (Vivian and Hilpert 2012:22).

This canyon and its outliers is one of the most well-known and well-studied archaeological sites in North America with over a century of research conducted and published. In the last few decades there has been an immense amount of work done by scholars to reinvestigate Chaco by way of new archaeological projects such as Chaco Project lead by Robert Lister and later by James Judge in Chaco Canyon National Historical Park as well as investigations at Salmon Pueblo and the Bluff Great House, two Chacoan great house outliers (CRA; Lekson 2006; Vivian and Hilpert 2012). The Chaco Research Archive (CRA), an online data repository, was made available in 2009 for the public and scholars to access the immense data that has been produced from the dozens of great house and small house sites from within the Canyon and beyond. This online legacy data repository provides a new and alternative way to access information that once was difficult if not impossible to access for both researchers and the public alike (CRA; Vivian and Hilpert 2012:27-28).

Current research has highlighted the importance of women in Chacoan society both in terms of the scale of their labor and participation in ceremonial and subsistence practices (Heitman 2016) and in terms of matrilineal social organization (Kennett et al. 2017). Bone tool artifacts found in great and small house sites within and beyond Chaco Canyon are a useful artifact to further understand how Ancestral Puebloan women participated in both everyday subsistence and ritual practices. Chacoan Humeri Spatulate Tools (HSTs) are a morphologically distinct artifact found in Chaco sites and their female interment associations provide evidence that they were a part of a female toolkit. Some of
these artifacts are embellished with jet, turquoise and shell inlay and these materials are often found as ritual offerings at various shrines, kivas, or in roofs or dwelling foundations (Plog and Heitman 2010; Heitman 2011, 2015; Whiteley 2012). HSTs depositional contexts and associations provide evidence that Ancestral Puebloan women were using these tools and that some of these tools were embedded with cosmologically and ritually significant materials.

Bone spatulate tools do occur cross-culturally and are in many cultures under the purview of women. These Chacoan HSTs fall under this larger BST category yet are distinct morphologically as well as in their temporal and spatial distribution. They are found in archaeological bone tool assemblages from north of the San Juan River in the Mesa Verde region to the southern edge of the Chaco Canyon area; and are found during the Pueblo II to the Pueblo III periods, AD 900-1300 (LaRue n.d: manuscript). Osborne (2004) suggests a northern or Plains origin for these distinct tools. And yet the earliest they appear in the archaeological record is either in the Red Mesa Valley in Arizona or at Chaco Canyon’s Bc 50/51 (Osborne 2004). They are not seen in Mesa Verde until the Pueblo III period and thus the origin of these distinct tools is unknown; and perhaps were developed by the Ancestral Puebloans for a distinct function or purpose.

How do Bone Spatulate Tools (BSTs) provide information about gender and gendered activities in the archaeological record? Specifically, what can Humeri Spatulate Tools (HSTs) and their associations reveal about Ancestral Puebloan women? What is the significance of the highly embellished HSTs? What can their contexts and associations tell us about the status of their users? What were HSTs used for, if they were used at all especially regarding the embellished HSTs? To help answer these questions, I developed
a four-stage research program: 1) Incorporate direct and cross-cultural ethnographic analyses of BSTs to better inform archaeological interpretations; 2) Use legacy data from the CRA to identify the contextual associations of HSTs; 3) Analyze a sample of these objects in museum collections to examine their morphological variation, the extent of elaboration, and evidence for use-wear; and 4) Utilize experimental techniques to try to replicate the patterns of use-wear on these objects to help interpret their function.

As the archaeological record is being re-examined through new anthropological lenses, new questions can be asked and answered through the use of legacy data. HSTs permit the investigation of androcentric biases by way of legacy data through the Chaco Research Archive (CRA). The contexts and associations within which these tools were discovered, allow interpretations of gendered toolkits and tasks. By redressing the biases that have occurred in the archaeological record, this understudied tool type can be resuscitated, and their function can be reevaluated. By determining a prehistoric function of HSTs and uncovering their contextual association with females as well as their embellished motifs, attention can be brought to the fact that Ancestral Puebloan women “made important and undertheorized contributions to the social transformations that defined emergent Chacoan society” (Heitman 2016:472).

On Mortuary Associated Objects

There are mortuary items that will be displayed and discussed in this paper. Out of respect for the deceased and those that find it offensive I have not included any images of human burials or remains. I have tried to minimize depicting objects that are associated clearly with human burials. However, I have included some images of objects that are from possible mortuary contexts for scientific and educational purposes. When
these items are displayed, I have indicated so in the caption of the figure. There is a potential that some of the artifacts in which I am discussing were left as offerings at Pueblo Bonito or elsewhere in the great and small house sites. Yet, due to the complicated natural and cultural processes of the artifacts after their deposition we cannot be certain of their significance or associations.
Chaco Canyon is located in the San Juan Basin of the American southwest. During the 9th -12th centuries AD a large social transformation took place in the canyon, resulting in the construction of massive masonry buildings called great houses both within the canyon and beyond. The multi-story great house architecture demonstrates the social complexity that arose within the canyon. According to Kidder, “the towns are large, excellently constructed, and lie in close proximity to each other. If all of them had been inhabited at the same time, they might well have housed more than 10,000 people” (Kidder 1924:179).

Since Chaco’s historical discovery in the late 1800s, a significant amount of research has been conducted and published about the past people who called this canyon
home. In the last few decades several new archaeological investigations have been conducted in an attempt to bring current archaeological methods to sites within the Canyon as well as beyond. These physical investigations are not the only new methodological approach that is being applied to reinvestigating the Chaco phenomenon. The Chaco Research Archive (CRA) is an online data repository that makes data from dozens of great and small house sites available for both researchers and the public alike (CRA; Lekson 2006; Vivian and Hilpert 2012). The CRA makes archival photographs and historical documents available and allows for macro and micro scale analyses to be conducted on materials that are often unavailable and/or difficult to assess.

By using legacy data provided by the CRA new questions of past data can be asked and answered, thereby enabling a better understanding of the Chaco phenomenon. Current research has highlighted the importance of women in Chacoan society both in terms of the scale of their labor and participation in ceremonial and subsistence practices (Heitman 2016) as well as matrilineal social organization (Kennett et al. 2017). This examination of Bone Spatulate Tools (BSTs), specifically those made of artiodactyl humeri or Humeri Spatulate Tools (HSTs) that are most commonly known as bone scrapers or fleshers adds to this growing body of research. These bone tools were often adorned with ceremonially significant materials and associated with female burials in Chaco Canyon, which makes them an excellent tool type to examine a gendered activity in the past. Through the use of legacy data, these bone tools and their associations allow historical androcentric biases to be redressed.

Toolkits for hunting, agriculture, and weaponry have long been a subject of study in archaeology. Identifying women’s creation and use of their own toolkits, and therefore
identifying women’s activities, is being redressed through this feminist archaeological movement (Gero 1985; Spector 1984; Hays-Gilpin 2000). A toolkit, as defined by Binford, is “a set of tools used in the execution of a task” (Binford 1980:147). In order to understand gendered activities, the context and form of these toolkits must be examined closely. Women were involved in “all aspects of technological organization, including... selection, transport, manufacture, use, and maintenance” (Ruth 2013: 2). By focusing on bone spatulate tools in the prehistoric toolkit, attention can be drawn to their prevalence cross-culturally and their potential significance for identifying gender and gendered activities.

*Chacoan Humeri Spatulate Tools (HSTs)*

Chacoan Humeri Spatulate Tools (HSTs) are morphologically distinct artifacts recovered from eastern Puebloan sites extending from the Mesa Verde region north of the San Juan River to the southern edge of the Chaco Canyon area during the Pueblo II to the Pueblo III periods, AD 900-1300 (LaRue n.d: manuscript). While bone tools are found cross-culturally, Chacoan HSTs are identifiable in their construction as they are made from artiodactyl humeri with the proximal humeral head removed and the marrow cavity exposed and shaped into a spatulate end towards the
medial side of the bone. These morphologically distinct tools are easily identifiable, yet in the legacy data these tools were classified in various ways with flesher or scraper being the most common functional epithets (CRA).

Morphologically, HSTs are cut at the proximal end to remove the humeral head (humoral ball joint). To remove this cancellous bone, potentially a groove would have been incised around the humeral head. Using hard hammer percussion, a blow to the humeral head could have snapped it off. Upon removing the proximal end, the diaphysis of the bone would then have been cut or sanded on an angle towards the medial side of the bone regardless if left or right, which exposes the marrow cavity tapering toward the worked bit-edge. This medial exposure of the marrow cavity is an identifier of these HSTs artifacts; although the marrow cavity is sometimes exposed anteriorly and very infrequently laterally. The working end of the tool is then worked into a rounded chisel-like bit that is most commonly bifacial [Figure 2.2, Figure 3.16].

The terms flesher and scraper both imply a specific function or use. Rather than using terms that presume a specific function a priori, the goal of chapter three is to analyze their attributes and use-wear to assess tool use. Functional epithets invite confusion when looking at a specific artifact morphology. Consequently, in this paper I will refer to the artifact type in question as bone spatulate tools (BSTs) to both standardize language and reduce confusion. When referring to BSTs that were made from a specific bone, i.e. artiodactyl humeri I will use Humeri Spatulate Tools or (HSTs) or for artiodactyl phalanges, Phalange Spatulate Tools (PSTs). When discussing ethnographic sources, I will use the same terminology as the article, to minimize confusion and to avoid misrepresenting the sources. I will, also, use terms such as flesher, scraper, chisel,
spoon, etc… when specifically citing an artifact from the CRA to allow the reader to better identify the object to which I am referring. To avoid implying a yet-to-be-determined functional use of these tools, morphological nomenclature will be used to better serve this artifact type.

Research Aims

Legacy data can illuminate women’s roles and activities during Chaco Canyon’s fluorescence. In this study, I examine HST to correct androcentric biases through the use of (a) cross cultural ethnographic comparisons, (b) legacy data, (c) comparative attribute analyses, and (d) a discussion of HST significance and use. The CRA provides a new way to reexamine archaeological interpretations. By using this understudied artifact type as a case study, I will examine how these artifacts represent gendered activities in the past and how we can use feminist archaeological theory to reinterpret data from legacy collections. HSTs and their female interment associations as well as the ceremonial significant materials embedded into these tools provide evidence that Ancestral Puebloan women involved in utilitarian and ritual activities.

Ethnographic Comparisons

There are many issues when using ethnohistorical accounts in the interpretation of prehistoric activities and practices. The past becomes “a noncomparative, prehistoric accident without relevance as foundation for those very societies documented in the ethnographic record” by ignoring ethnographic evidence from archaeological interpretations (Gilmore 2005:15; Scheiber 2005:59). While it can be difficult to determine gender through the archaeological record, the careful use of oral testimonies
can provide insight for archaeologists in determining how HSTs may have been used, what role gender played in their manufacture and use, and the significance these items had both as utilitarian and ceremonially significant objects. It is important to acknowledge that these ethnohistorical accounts are not proximate ethnographic comparisons (i.e. from Southwest tribes or groups) but cross-cultural North American comparisons.

In an ethnohistorical study of the Black River Band of Ojibwa, Jack M. Steinbring recorded how defleshing with bone tools was a gendered activity. When this study was conducted in 1963, the Black River Band of Ojibwa lived along the southeastern shore of Lake Winnipeg in Manitoba. Steinbring’s research demonstrates how women were ultimately responsible for the finished product regardless of who conducted the physical labor, which could be an indication of women’s elevated status in regard to this specialized craft. If the women do not ensure the work was crafted properly than the blame falls on her, this clearly demonstrates how status can be achieved and/or elevated through craft goods and the importance of having a proper toolkit. In the 1966 ethnohistorical study of the Black River Band of Ojibwa, Steinbring describes how women were responsible for hide preparation:

The woman's technical role in hide-processing is well-defined at present. All agree that she has responsibility for hide preparation, and there are stories which suggest that in earlier time’s women did all or most of the work associated with hides. One informant insisted that men had always done the hide defleshing. Today, the woman performs the soakings, the applications of curing sub-stances, the smoking process, and, of course, all
product manufacture. In the community, she closely supervises the defleshing and hair-removal operations by men. Sometimes several men are involved in one hide preparation. She is responsible and takes credit for, the quality of the finished product, and she makes sure that proper handling occurs throughout. [Steinbring 1966:580]

Bone Fleshers have continued use from precolonial to modern times in the Black River Band of Ojibwa. Steinbring notes that the highly embellished nature of these bone implements diminished as modern metal tools became available. Great importance lay in the care for fleshers. They were not to be left too close to the fire or outside to freeze. Traditionally they are handed down from mothers to daughters-in-law, a reflection of patrilocal marriage customs. However, these items are now less valuable to the community. Modern fleshers are crudely made and neglected. Steinbring describes watching a flesher carelessly fall into the fire, and if a flesher breaks or dulls often it is thrown away instead of being repaired (Steinbring 1996:581). Steinbring’s observations signify the importance the Black River Band of Ojibwa placed on these specialized tools, clearly if fleshers were to maintain integrity to be passed on, great care must be taken to ensure their longevity.

In an ethnographic analysis of the Omaha O’shea and Ludwhickson (1992:54) identify bone fleshers as implements used for activities by females. The authors stress that burial contexts predominantly contain grave goods that are associated with male activities. Bone fleshers, therefore, would be excluded from burial contexts in the Omaha Indian culture. “Furthermore, a range of implements occurred in the village that was not found in Omaha burials. Many, if not all, are tools that might logically be associated with
female activities—for example, metatarsal fleshers, iron hoes, thick ovate bifaces, and rectangular manos [were absent from grave assemblages]. The implements that regularly occur in graves are predominately (although not exclusively) tools associated with male activities” (O’Shea and Ludwhickson 1992:254). Why are associated female items excluded from burial contexts? Is this statement based on archaeologically/biologically determined fact through excavated and proper determination of skeletal remains or is it an androcentric biased conclusion of the researchers? Potentially, these assessments of female items and toolkits and their exclusion from burial assemblages is a cultural phenomenon. Yet, it is critical to reassess these determinations by applying feminist archaeological theory using legacy data.

An ethnography by George Bird Grinnell on the Cheyenne, describes women using specialized tools for hide-working. This passage demonstrates the significance of a hide-working bone tool through many generations of Cheyenne women and how the decorative elements represent far more than just aesthetics. In an interview conducted by George Bird Grinnell, a Cheyenne woman details the use-life of a single bone tool and its generational span:

One of these fleshers was given me by the wife of White Bull, when she was sixty-five or seventy years of age. Its first known owner was Magpie Woman; when she grew old she gave it to her daughter, Sun Woman; when Sun Woman grew old she gave it to her daughter, Hole In The Nose, but Hole In The Nose fell sick and died, and Sun Woman kept it, and when she died it came to Bull Wool Woman, the wife of Frog, was a distant relation of Spotted Wolf. Form her it passed to her daughter, White
Bull’s wife. Bull Wool Woman had been dead nearly fifty years when the implement came into my hands and was perhaps 140 to 150 years old. In old times they often made a flesher for a little girl, which at first, she played with and later learned to use. The girl might keep count of her age on the flesher, scratching a line across it each year until she married. After this, she recorded the years of her children on it in the same way. [Grinnell 2014:3577-3592]

In this ethnographic example, of bone tools of the Cheyanne, the terms flesher and scraper are interchanged in their morphology. They describe bone fleshers as an L-shaped implement which is more commonly referred to as a bone scraper. To the Cheyanne, scraper was designated as buffalo cannon bone “cut off diagonally from above downward toward the distal end, with a sharp edge notched” (Grinnell 2014:3561). This example demonstrates the complex dynamic of associating specific tool morphology with a specific tool-type nomenclature in artifact classification systems. Not only does this account demonstrate the complex nature of classifying artifact morphologies but it clearly depicts the longevity and significance of one object. These fleshers were used by many different women and were systematically passed through the generations. Their decorative elements convey more meaning than can be purely understood through analysis.

In the cultures of the Plains, gendered division of labor is a central characteristic. “According to ethnographic literature, the hide preparation sequence for Plains groups was remarkably uniform throughout the core of the region and was almost invariably under the purview of women” (Gilmore 2005:16). While hide-working is typically a
female activity that does not mean that all the work fell to women entirely. Men and women both learned the techniques required for preparing the hides within the Pawnee culture (Gilmore 2005:16; Weltfish 1965:369). Gilmore describes the hide preparation sequence for the wider Great Plains stating that “After hides were acquired, women first processed them into rawhide by removing any extra flesh and hair (in the case of deer, elk and pronghorn, and buffalo hides not being processed into robes), and then thinned them by scraping” (Gilmore 2005:17). Fleshers and scrapers are used in the initial hides processing preparations, which Gilmore deems “the most physically demanding and labor-intensive stage of the hide preparation sequence” (2005:18). Fleshers and scrapers are linked in these initial stages as they are both specialized task tools; they have similar features and may have even been used interchangeably during the process. It is easy, therefore, to see how both terms (flesher and scraper) have been used by archaeologists for artifact classification.

These cross-cultural comparisons document that females use bone spatulate tools across other North American cultures. In addition, these ethnographic sources demonstrate a gendered activity associated with particular tools and female’s participation in specialized craft production. There is direct evidence that women were industrious in the economic spheres of their society and even had authority over male participants, as seen in Steinbring’s ethnohistorical study of the Black River Band of Ojibwa (1966). In many of these examples, elevated status is acquired through the use of BSTs specifically for hide production. The embellishment of tools is also notable, demonstrating stylistic attributes with personal associations. In the ethnography of the Cheyanne, provides an example of bone tools as curated heirlooms with their
embellishments conveying individual meaning (Grinnell 2014). Overall, these examples are useful to demonstrate females as industrial specialists that were crafting and curating toolkits that were both utilitarian and ritually significant.

Legacy Data

In Judd’s 1954 publication the commonality of BSTs in Pueblo Bonito material culture is evident as he notes all students of Pueblo prehistory should be familiar with “deer humeri end scrapers or fleshers” (1954:146). He comments on their frequent appearance in eastern pueblos with less evidence for these tools further west. They are commonly seen in the Mesa Verde Region and southward from Chaco to Zuni, with several fleshers/scrapers showing up in Betatakin Pueblo and a fragmented one found at Pecos Pueblo (Judd 1954:146-147). These implements appear in the archaeological record most frequently during the Pueblo II-III periods, AD 900-1300 (LaRue n.d: manuscript).

CRA Legacy Data on HSTs

The Chaco Research Archive contains information on 3,400 worked bone artifacts documented from great house and small house sites in Chaco Canyon (CRA). Of those 3,400 worked bone artifacts, 1,104 come from Pueblo Bonito (CRA). At the time of excavation, BSTs were classified under numerous terms including “flesher” and “scraper”. These terms were used interchangeably in the excavation field notes, artifact lists, photographic captions and museum catalog descriptions.
Table 2.1: CRA data of the Bone Spatulate Tool (BST) counts of various artifact classifications associated with HSTs (flesher, scraper, spatula, spoon, chisel, gorge, bone knife, bone implement). Unspecified worked bone is included as these artifact assemblages could have HSTs included (chacoarchive.org).

### CRA Data for BSTs in Chaco Canyon

<table>
<thead>
<tr>
<th>Chaco Canyon Pueblos</th>
<th>Scraper</th>
<th>Flesher</th>
<th>Spatula</th>
<th>Spoon</th>
<th>Chisel</th>
<th>Gorge/gorge/gorge</th>
<th>Bone Knife</th>
<th>Bone Implement</th>
<th>Total</th>
<th>Unspecified</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>BC 57 (29SJ397)</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>36</td>
<td>41</td>
</tr>
<tr>
<td>Pueblo del Arroyo</td>
<td>16</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>25</td>
<td>64</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>BC 51</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>2</td>
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<td>61</td>
<td>0</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>84</td>
<td>333</td>
<td>417</td>
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<td>Talus Unit #1</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>16</td>
<td>16</td>
<td>113</td>
<td>129</td>
</tr>
<tr>
<td>BC 50 Tseh So</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>29SJ1659, Shabik'eshchee</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>29</td>
<td>34</td>
</tr>
<tr>
<td><strong>Pueblo Bonito</strong></td>
<td><strong>80</strong></td>
<td><strong>5</strong></td>
<td><strong>3</strong></td>
<td><strong>0</strong></td>
<td><strong>1</strong></td>
<td><strong>5</strong></td>
<td><strong>7</strong></td>
<td><strong>79</strong></td>
<td><strong>180</strong></td>
<td><strong>333</strong></td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>16</td>
<td>61</td>
<td>77</td>
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<td>Chetro Ketl</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>34</td>
<td>37</td>
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<tr>
<td>BC 59, Tom Mathews's Site</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>15</td>
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</tr>
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<td>BC 52 - Casa Sombreada</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>23</td>
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</tr>
<tr>
<td>Tsin Kletsin</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>BC 53 - Roberts' Site</td>
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<td>0</td>
<td>1</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>1</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>182</strong></td>
<td><strong>16</strong></td>
<td><strong>28</strong></td>
<td><strong>3</strong></td>
<td><strong>7</strong></td>
<td><strong>7</strong></td>
<td><strong>10</strong></td>
<td><strong>110</strong></td>
<td><strong>363</strong></td>
<td><strong>1249</strong></td>
<td><strong>1612</strong></td>
</tr>
</tbody>
</table>


Using the CRA I was able to locate original field documentation for 1612 possible bone spatulate tools [Table 2.1]. To aggregate a list of possible HST to examine contextual associations, I use the ‘Query the Database’ tab and drilled into the ‘Artifact’ search page. When searching for these tools I began with the terms ‘flesher’ and ‘scraper’ utilizing the ‘Field catalog description’ and the ‘museum catalog description’. Because I was not finding all the data for this tool type, I downloaded an excel table by selecting bone as the ‘material type’ and selecting worked as the ‘modification’ (CRA). In the creation of Pivot Tables to sort, count, and compare the data of the worked bone artifacts in the CRA database, I used the ‘form’ field to get counts on the number of BSTs found within Chaco. Based on the legacy data descriptions it is reasonable to assume that the classifications of scraper, flesher, spatula, spoon, chisel, gouge, bone knife, & bone implement could all be HSTs for a possible total of 363 [Table 2.1]. I also included unspecified bone in Table 2.1 because there could be some HSTs included in these counts. This brings the total count of tools that might qualify as HSTs to 363. The majority of these (339 or 93%) were recovered from great house contexts (Pueblo del Arroyo, Aztec Ruins, Talus Unit no.1, Pueblo Bonito, Peñasco Blanco, and Chetro Ketl).

The legacy data acquired from the CRA only accounts for 180 HSTs total from the Pueblo Bonito [Table 2.1]. Judd notes that most of what he called fleshers are unembellished and that many are heavily used, then discarded in middens or refuse pits. If decoration is present the most common decorative elements are “incised meanders, crosshatching, and animal figures” (Judd 1957:147). Judd states “presumably they are all of the type under consideration” (1954:147); this is a potential pitfall as it is not clear if all the potential BSTs mentioned are of the same artifact morphology or had the same
functional role. As there is the potential error in this data with the varying nomenclature and artifact morphology these numbers may not entirely reflect the complete HST count in which this paper is focused. It is also important to note that four of the embellished HSTs included on Table 2.3 did not mention any design motifs in the legacy data but were notable upon examination. While there are potential errors in this legacy data, its availability makes it possible to conduct this research. By redressing this tool type using the legacy data from the CRA, we can improve our understanding of HSTs while demonstrating the power of legacy data to do so.

Pepper identified 37 BSTs from rooms 2-176 in Pueblo Bonito, which accounts for roughly half of the rooms (1920:366-368). When comparing this to the legacy data of approximately 180 BST from Pueblo Bonito, it seems reasonable that this 180 count could be fairly representative and accurate [Table 2.1]. “It is clear that end scrapers, or fleshers, made from deer humeri were fairly common tools at Pueblo Bonito and that they were lightly tossed aside when broken” (Judd 1957:147). These BSTs represent approximately 10% of the entire worked bone assemblage of Chaco Canyon [Table 2.1]. While 58% of the worked bone assemblage are awls, which I determined by using the ‘Query the Database’ page to search by choosing bone as the ‘CRA material type’ and worked in the ‘modification’ field and then by searching the ‘form’ field for awls which resulted in 1,998 (CRA). When comparing awls and HSTs, there is a notable difference in their occurrence in the archaeological record. HSTs are not as common as awls, yet they are still rather common in the archaeological bone tool assemblage.

AMNH & NMNH HSTs
In the summer of 2018, I traveled to the Smithsonian’s National Museum of Natural History’s (NMNH) Museum Support Center and the American Museum of Natural History (AMNH) to conduct a comparative attribute analysis. These two institutions house many of the artifacts from the two major excavations that were conducted at Chaco Canyon: the Hyde Exploring Expedition and the National Geographic Society’s excavations (CRA, Lekson 2006; Vivian and Hilpert 2012). The Hyde Exploring Expedition under the direction of George Pepper and Richard Weatherill sent a “freight car filled with pottery, turquoise jewelry, and stone tools” (Vivian and Hilpert 2012:19) to the American Museum of Natural History, in New York City, NY. Neil Judd, a southwestern archaeologist who worked for the Smithsonian led the National Geographic Society excavations in 1920 and thus many artifacts are now housed at the Museum Support Center in Suitland, Maryland (Lekson 2006; Vivian and Hilpert 2012:21). A primary goal of this research trip was to conduct an attribute analysis to determine if the embellished HSTs were used comparatively to the more common unembellished HSTs. To accomplish this goal, I took standard artifact photographs, digital microscopic images using a Dino-Lite, as well as photographs to create 3D models of all of the inlaid HSTs. I also took a series of measurements of the inlaid as well as some of the unembellished HST found in burial contexts or for some other reason of interest.

At these two repository institutions I examined 65 HST from a total of approximately 142 bone tools [Appendix C]. The 77 other bone artifacts did not fall into the purview of this research for varying reasons. Approximately 25 of them were Phalange Spatulate Tools (PSTs), which is interesting as they are manufactured like the
HSTs and have an overall similar morphology but on a much smaller scale. Of the 65 HSTs I examined at the two institutions, fourteen were embellished with a variety of motifs including tesserae inlay, incised lines, intentional blackening as well as painting [Table 3.3; Appendix B]. Six of the HSTs examined were inlaid with turquoise, jet, and shell tesserae, each of these inlaid HST had their own specific design motif and therefore are all slightly distinct from one another.

Of the 65 HSTs identified at the NMNH & AMNH, 55 were found in Pueblo Bonito contexts. According to the CRA, nine of these HST were found in association with burials, four were found with burials at Pueblo Bonito in room 326, four were found at small house sites, and one was found with a burial set at Aztec Ruins. Of these nine burial contexts, six of the HST are found with females. In total there are 13 individuals in these nine burial HST contexts, six are females, two are males, and five are undetermined [Table 2.2; Appendix A]. The only HSTs from burial contexts I examined were from

<table>
<thead>
<tr>
<th>HST/Interment Associations from CRA legacy data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pueblo Bonito Room 326</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>4 (All HST found with multiple female burials)</td>
</tr>
<tr>
<td>Aztec Ruin Room 111</td>
</tr>
<tr>
<td>1 (HST found with two undetermined sex individuals)</td>
</tr>
<tr>
<td>Bc 50 - Tseh So</td>
</tr>
<tr>
<td>1 (HST found with 1 female burial in midden btw Bc 50831)</td>
</tr>
<tr>
<td>Bc 51</td>
</tr>
<tr>
<td>1 (HST found with one female)</td>
</tr>
<tr>
<td>Bc 59 - Tom Mathewis Site</td>
</tr>
<tr>
<td>1 (HST found with 2 undetermined sexed individuals)</td>
</tr>
</tbody>
</table>
Pueblo Bonito Room 326 and were all in association with female burials [Appendix A]. One of these, one HST (museum no. 335162), was inlaid with 16 alternating jet and turquoise triangular tesserae [Figure 2.4] (CRA). The other three were all modified in different ways around the distal end of the bone; the epiphyseal ends (handles) of each HST were shaped distinctively (Figure 2.4). The other four HSTs were found in small house sites Bc 50, Bc 51, and Bc 59. One of the HSTs was found with a female burial at Bc 51 (no.30/11) and another HST was found with a female burial in between Bc 50/51 that originally was classified as male but later re-sexed as female (Akins 1986:79).

**HST Associations**

Figure 2.3: Map of Pueblo Bonito (chacoarchive.org), depicting the room distribution of the 55 confirmed HSTs, based on the attribute analysis at the AMNH & NMNH.

Pueblo Bonito is one of the most well-known and largest great houses with roughly 650 rooms [Figure 2.3]. It is one of the earliest constructed and longest occupied
great houses with some of the most elaborate and ornate items. Pueblo Bonito’s artifacts are worthy of study for their significance and implications for social hierarchy (Plog & Heitman 2010). The practice of room burial was not common in the American Southwest. However, at Pueblo Bonito there was a concentration of around 200 burials. Most notable were the northern (32, 33, 53, and 56) and western crypts (320, 326, 329, and 330) [Figure 2.3] (Plog & Heitman 2010).

Pueblo Bonito

Room 326

Almost half of the HST associated with burials were found at Pueblo Bonito, the other half were associated with burials at three small house locations in fairly close proximity across the canyon to the south. With the use of legacy data, I found nine HSTs

Figure 2.4: HSTs museum numbers: 335161, 335162, 335163, and 335164 from Pueblo Bonito room 326 associated with female interments. National Anthropological Archives, Smithsonian Institution [335161; 335162; 335163; 335164]. Photo taken by Anderson 2018.
that are associated with burial contexts, four from Pueblo Bonito room 326 (Figure 2.4; Appendix A). One of these from room 326 (museum no. 335162) inlaid with triangular tesserae; it was found with skeleton 9, a female; skeleton 8 was excavated with 9 and it too is identified as female. The inlaid triangular tesserae of turquoise and jet were laid flush with the bone in an alternating wedge pattern [Figure 2.4]. This inlaid HST was documented by excavators as lying under oblong coiled basket (no.1870) with Skeleton 9 [Figure 2.5] (CRA). Museum catalog number 335161 is an HST that was found with skeletons 5-7, all identified as female. The museum catalog description lists this item as found in basket (no.1563) at the head of Skeleton 6 (CRA). My examination of HSTs revealed a visible pattern of some fibrous material affixed to the back of the tool [Figure 2.4]. This pattern is evidently from adhesive of the stiches from the elliptical basket it was buried within [Figure 2.5]. Its distal epiphyseal end was heavily modified most likely for the users specified hand grip. HST (museum no. 335164), was found between Skeleton 8 and 9 which are identified as females. This HST was also found in an elliptical basket [Figure 2.5] and had a modified distal epiphyseal end for the hand grip although by far the least modified of the four found in PB room 326 [Figure 2.4] (CRA). Museum no. 335163 is identified in the CRA as a bone scraper and is associated with Skeleton 12; Skeletons 11-13 were excavated together and at least two are determined to be female adults while one is listed as an adolescent of unknown sex. This HST was once again contained within an oblong coiled basket (museum no.1869) [Figure 2.5]; its epiphyseal end is the most modified of the group [Figure 2.4] (CRA). Potentially, this modification is added for the comfortability of the user as the epiphyseal end seems to be the handle of the tool (Morris 1919:36-37).
Room 326 is a part of the western burial crypt that includes four contiguous rooms 320, 326, 329, and 330 [Figure 2.3]. These rooms were constructed early in the pueblo’s architectural development at around A.D. 860 (Plog & Heitman 2010). This room contained approximately 13 burials and over 150 objects (CRA). Among these objects was a range of bowls that encompassed the entire span of ceramic history at Pueblo Bonito (CRA-image two). Also found inside this room were pitchers, baskets, hematite cylinders, awls, spearheads, flint knives, arrowheads, bone buttons, flakes, digging sticks, over 20 manos and four metates, mats specifically under the burials, and several stone and sandstone tablets. Bone/stone/turquoise tesserae, jet rings, pigments, turquoise and jet pendants, shell, as well as a turquoise bracelet on the wrist of skeleton 12 and a turquoise pendant found on the neck of skeleton eight, were all found within this one room (CRA). These items range from ordinary everyday goods to ceremonial/high status items. Being buried at all within Pueblo Bonito was rare (Plog & Heitman 2010). This coupled with the shell, jet, and turquoise tesserae inlaid into one of the HST, as well as the items recovered from room 326, could potentially be signals of these individual’s elevated status. The fact that these HSTs were found alongside four female interments in room 326 that also contained 150 artifacts provides support that these tools and their owners may have been significant.

*Oval Basket Bowls*

Not only are these four HST found in association with female burials in room 326 but they also were all found within or under oval baskets [Figure 2.5] (Appendix A). Judd mentions that this is an interesting association especially considering the significance or potential association these HSTs had with other objects:
In all our digging we encountered only four such trays or recognizable portions thereof. All four were in Room 326. Each had been interred with the body of a woman; each was accompanied by an end scraper made from the humerus of a mule deer. The left humerus was utilized in three cases; the right, in one only. In each instance, the basket lay flat and upright. Three of the fleshers had been placed inside their respective trays; the fourth... lay underneath. [Judd 1954:148]

Judd (1954), who discovered and excavated the contents of room 326, referred to these baskets as shallow oval or elliptical trays. Yet Jolie (2018) upon reexamination determined that due to the high wall of these baskets, they should be classified as oval bowls (Jolie 2018: 303-304). These oval bowls have a figure-eight shape created from the middle inward pinching of the walls. This shape is also, seen in Pueblo Bonito’s bifurcated baskets as the mouth or opening is morphologically similar. Jolie suggests that this could represent “a functional if not conceptual relationship” (Jolie 2018:303). The function of these oval bowls is undetermined, yet their contexts within and outside of Chaco proper suggest both a work and medicine basket function (Jolie 2018:304-305). The HSTs, as well as a twined sandal fragment found associated with the four oval basket bowls, imply a utilitarian function. While this HST/basket association with

Figure 2.5: Elliptical/oval basket bowls found with HSTs in Pueblo Bonito room 326 with female burial interments (Judd 1952, Plate 44).
female burials and the rich material good assemblage in room 326, suggest that they are of greater significance (Jolie 2018:304-305).

The oval baskets bowls associated with the female burials in room 326 are not the only co-occurrence of this HST/basket bowl association. One such example of this oval basket bowl and HST association comes from Battle Cave, of southeastern Utah a site found in a tributary of Allen Canyon [Figure 2.6]. This basket bowl contained over 20 different items and several HSTs were included. Among the HSTs, several balls of spun yucca fibers were also discovered inside [Figure 2.6]. These yarn balls were specifically prepared for use in the production of textiles, potentially for woven sandals or tumplines (Laurie Webster, personal communication 2019). This association could be significant in regard to the function of these artifacts. Further discussion of these HSTs and their function is forthcoming in chapter three.

Aztec Ruins & Pueblo del Arroyo (Great House Sites)

According to the CRA, Aztec Ruins has an inlaid bone scraper, (museum no. 29.0/8737), that was found within Grave 25, in the North wing of room 111 (CRA).
Grave 25 contained two adults of unspecified sex (Morris, 1924:163-164; Morris 1928:355-356). While looking through Akin’s (1986:163) data tables there was mention of an adolescent individual buried in room 11A at Pueblo del Arroyo (museum no. 327138) who was buried with a bone scraper. Upon searching the CRA, there was not a clear way to identify this burial or the associated HST (scraper); continued work needs to be done in order to identify this specific burial and HST association.

_Bc 50, 51, 53, & 59 (Small House Sites)_

Of the four remaining HSTs two came from Bc 51, one from Bc 53 and one from Bc 59 [Table 2.2]. Two of the remaining four HSTs were found at Bc 51, one was found in the refuse pit between sites Bc 50 and Bc 51, another was found at Bc 59 or Tom Mathew’s site. The four HST found in room 326 of Pueblo Bonito are associated with female burials specifically, while only two of the HSTs from small house sites are positively associated with female burials [Table 2.2]. At the small house sites, of the four HSTs associated with burial contexts, two are conclusively associated with females, the others are found with two individuals of undetermined sex. Site Bc 51, artifact 30/11, deer bone scraper, was found associated with burial Bc 51 60/4 which is identified as female [Table 2.2; Appendix A] (Akins 1986:154). The midden between sites Bc 50 and Bc 51 contains a bone “chisel” (field no. 30/171) which was associated with burial 60/51; this individual was initially identified as a male but Akin’s reassessment determined it to be an adult female [Table 2.2; Appendix A] (1986:155). An HST (field no. 30/55) was found associated with burials 60/12 & 60/13 at site Bc 51. Akins assessed there to be at least three individuals represented in this burial context, two of which are males, and one unidentified [Table 2.2; Appendix A] (1986:154). At site Bc 59, artifact 30/20 is
described as simply a bone worked tool in the CRA database, however, Akins (1986:157) mentions a scraper fragment associated with Bc 59 burial 2, which is an adult of an undetermined sex and this I believe is Bc 59 60/2 burial listed in CRA database [Table 2.2; Appendix A] (CRA).

**Comparative HST Attribute Analysis**

Described above, one of the four HST found in PB 326 is elaborately embellished (museum no.335162) [Figure 2.4]. Upon searching the CRA for inlaid worked bone, I found eight other inlaid HST that were not associated with burials. I then compiled a list of 15 HSTs which had some mention of embellishment in general including all of the inlaid ones [Table 2.3; Appendix B]. As a result of my attribute analysis at the AMNH & NMNH, I have included four other HSTs (indicated by the asterisk) in Table 2.3 because they were also embellished. This brings the total count of embellished HSTs to nineteen. This combined data of embellished HSTs tells us that thirteen were found in Pueblo Bonito, two from Aztec Ruin, one from Peñasco Blanco, and one each at small house sites Bc 52, 53, and 59.

**AMNH Embellished HSTs**

Three of these inlaid HST from Pueblo Bonito were found in room 244 grouped together in the general fill of the room (CRA). Another inlaid HST (museum no. H/10598) was found broken in the fill of room 170 of Pueblo Bonito; interestingly, the field catalog description states “Humerus of Deer; Broken; Inlaid as are the ones from Room no. 38” (CRA) which is referencing inlaid HST from PB room 38.
Table 2.3: Table of the embellished HSTs and their great and small house contexts using both legacy data (charcoarchive.org) as well as the attribute analysis conducted by Anderson at the AMNH and NMNH.

<table>
<thead>
<tr>
<th>Embellished HSTs from CRA legacy data &amp; AMNH/NMNH Attribute Analysis</th>
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<tbody>
<tr>
<td>I &amp; T (D)</td>
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<td>Pueblo Bonito</td>
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<td>Room 244 - 335155</td>
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<td>Room 244 - 335156</td>
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<td>Room 244 - 335157</td>
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<td>Room 320 - 335160</td>
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<td>Room 326 - 335162</td>
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<td>Kiva L - 335167*</td>
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<td>Room 170 - H/10596</td>
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<td>Room 38 - H/05144</td>
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<td>Room 38 - H/05145*</td>
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<td>Room 54 - H/5645*</td>
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<td>Room 63 - H/07078*</td>
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<tr>
<td>Room 64 - H/08816</td>
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<td>Room 209 - H/28473</td>
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<tr>
<td>Aztec Ruin</td>
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<td>Room 111 - 29.0/8737</td>
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<tr>
<td>Room 51 - 29.0/7158</td>
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<tr>
<td>Penasco Blanco</td>
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<td>H/11727*</td>
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<td>Br 52</td>
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<td>30/154</td>
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<td>Br 59 - Tom Mathews Site</td>
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<td>30/28</td>
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</table>

Key: T = Turquoise; J = Jet; S = Shell; (G) = Dieplosis which is the location of the inlay; (D) = Dendro which is the location of the inlay.
* = Embellished HSTs examined at the AMNH & NMNH but either do not mention embellishment or are not listed in the CRA legacy data.
Figure 2.7: Inlaid HST (A-C) were found in Pueblo Bonito room 244, National Anthropological Archives, Smithsonian Institution [335156; 335157; 335158]; (D) was found in Pueblo Bonito room 326 and National Anthropological Archives, Smithsonian Institution [335162]; (E) H/5145 was found in Pueblo Bonito room 38 and courtesy of the Division of Anthropology, American Museum; and (F) H/10598 was found Pueblo Bonito room 320 and courtesy of the Division of Anthropology, American Museum. Photos taken by Anderson 2018.
Upon searching Pueblo Bonito room 38 in the CRA, I came across two entries (CRA). Field catalog numbers 5144 and 12800 are identified as bone scrapers, no.12800 specifically mentions jet and turquoise inlay while no.5144 only mentions jet. The two scrapers from room 38 did not show up on the same data set as the other worked inlaid bone from Pueblo Bonito, and I had to search for them specifically by entering room number 38 or by their catalog number. They did not show up as the material type is not listed as bone, which is one of the fields I used to search for these tools, and the material type was unspecified and mineral (the latter refers to the decorative mosaic inlay).

When I examined HST artifacts at the AMNH, there were two turquoise and jet inlaid HSTs (museum no. H/05144 and H/05145). Field catalog number 12800, ended up not being a bone tool but was in fact turquoise and jet tesserae perhaps from the mosaic inlay from HSTs H/05144 or H/05145. I was able to examine H/05145 but not H/05144 a result of my attribute analysis at the AMNH & NMNH. I have included four other HSTs (indicated by the asterisk) in Table 2.3 because they were also embellished. H/05144 as it was on display. HST (H/05144) has high quality inlaid jet and turquoise tesserae that are very well preserved and have a unique mosaic design. This HST has six bands encircling the back of the diaphysis of the tool in alternating jet and turquoise tesserae. This mosaic pattern is flush with the bone and includes one band of triangular alternating turquoise and jet tesserae on the band closest to the spatulate end. The inlaid HST that I examined from room 38 (museum no. H/05145) had lost most of the jet and turquoise inlay with only four tesserae remaining [Figure 2.7]. Three turquoise tesserae seem to be encircling a single jet tessera with a different pattern than the more common jet and turquoise alternating bands. This tool seems to be inlaid in a different motif than
the other more standardized HST, which was its original motif confirmed by an illustration by Pepper (1920:193). What do these differences in design mean? We may not know exactly but consideration of the symbolism of turquoise, jet and shell to cosmology and ritual may be able to give us clues.

Room 108 had a HST, museum number H/08473, found in the debris that was blackened entirely, it also has two incised embellishments near the distal end of the bone [Figure 2.8]. The incised lines at the top of the spatulate side made a cross-hatched pattern. An incised zoomorphic figure is adjacent to the crosshatch motif [Figure 2.8; Appendix B].

What these etchings represent is open to interpretation. Another HST from Pueblo Bonito now housed at the AMNH (museum number H/10598) had been incised around the diaphysis and the condyle end for the placement of inlay although no pieces are present [Figure 2.7]. As this tool is broken it is likely that the inlay was recovered for reuse.

**NMNH Embellished HSTs**

Room 244A in Pueblo Bonito also contained three of the most elaborately inlaid HSTs found [Figure 2.7]. All three of these objects are now housed at the NMNH.
Specimen number 335158 is described as an “inlaid bone scraper with turquoise, jet, and halitosis disk in a jet ring on either side at top” (CRA). This HST has the most elaborate inlay that I was able to examine with 9 bands of alternating turquoise, jet, and shell tesserae [Figure 2.8]. This alternating pattern includes a jet tessera band at the top and bottom of the inlay motif, with seven bands of alternating turquoise and shell tesserae bands in between. These mosaics are laid flush with the bone and are affixed on to the incised band around the diaphysis of the bone on the back side of the tool (or the lateral side of the humerus). Not only are there tesserae of (abalone) shell inlaid as tessera bands around the diaphysis, which is the only HST with this design element, but there are abalone shell inlaid into the condyle sides of the distal end (handle) of the tool. These shells are inlaid into a jet ring that was also inlaid into the condyle handles of this tool [Figure 2.8]. The intricacy and unique design of this tool demonstrates the care and work that went into it, and potentially the elevated status that the user may have held in order to apply these exotic and potentially ritually symbolic materials.

The other two HST found in room 244A, were also inlaid with jet and turquoise tesserae with circular shell in the condyles on the handles (distal end of the humeri). Both...
of these HST, (museum no. 335156 & 335157) have the same design motif with five bands of alternating turquoise and jet tessera bands [Figure 2.7]. They both also have the condyles incised for shell inlay, however 335156 no longer has the circular shell disks. These two HST are not as well preserved or as intricately inlaid as 335158, and the shell is only present in the condyle not the actual diaphysis of the tool [Figure 2.7]. This room, 244A, in Pueblo Bonito also had various manos and metates inside the room with these three HST (museum no. 335156, 335157, 335158) (CRA). The excavator notes in the CRA specifies that these three tools were found laid together in the center of the room floor. Could these three highly elaborate, inlaid tools be an offering or was there some other meaning behind their location and elaborate decoration?

My examination of an embellished HST found in room 320A in Pueblo Bonito showed three faint black painted lines encircling the diaphysis of the bone [Appendix C]. This tool was missing the epiphyseal end either because it was removed or the humeri came from a juvenile artiodactyl and the epiphyseal had not yet fused. Several other HSTs from the AMNH also has this missing epiphyseal end, as seen in Figure 2.8, if it was intentional I cannot be sure.

*Embellished HSTs using Legacy Data*

I was not able to examine the two HSTs from Aztec Ruins; however, two drawings from the CRA allowed me to indirectly determine their inlay motifs. Museum number 29.0/7158 (field no. 747), is described as a mammal bone scraper that is incomplete and inlaid probably with turquoise (CRA; Morris 1919:36-37, 41). The image I found indicated that there is a double band of incised circles with a central dot that may have been the location of a turquoise tesserae (Morris 1919: 36-37, 41). The other HST
found in Aztec museum number 2228 was also inlaid (American Museum of Natural History 1918:21 CRA accession no.000616). Yet no more information about the inlay could be gleamed through legacy data, further analysis of the artifact is required.

At Bc 53 (field no. 30/15) a HST with carved decorations and extreme polish was found (CRA). The accession files depict this tool with what appears to be triangular tesserae inlay in a single band around the diaphysis (National Anthropological Archive Smithsonian Institution 1940:163 (CRA accession no.000357); National Anthropological Archive Smithsonian Institution, 1940:12 (CRA accession no.000152). This motif is similar to one of the HST from room 326 with the burial/basket association (museum no. 335162). Some other HSTs that were found at small house sites are described in the excavation notes, provided by the CRA, as: incised lines, decorations, markings, and carved bone. Potentially, these artifacts could have interesting incised motifs that would worth examining in the future.

Discussion of Embellishments

A primary interest when examining the various embellished HSTs at both institutions and through the field notes found in the CRA was to determine and identify similarities and differences in the decorative elements. Were the inlaid motifs, especially between those at Pueblo Bonito and the other great and small house sites, different or similar? And what could these similarities or differences mean? The findings of my analyses at each institution demonstrates that while there is a common decorative theme using jet and turquoise tesserae in an alternating pattern, each inlay motif is distinct unto itself.
The degree to which these objects were incised and inlaid with varying precision and quality is equally distinct and should be noted. All of the tesserae inlaid into the HSTs that I examined were intricately crafted. The rectangle tesserae were anywhere from 2-11 mm and the triangular tesserae were more consistent in size at 4-6 mm; they all had to be relatively the same thickness as they lay flush with the incised bone. Not only were the circular tesserae consistent in their shape on each tool they only varied by 1-2 mm from side to side, this consistency required the incised hole in the condyle to be shaped with equal precision on both sides. According to the Smithsonian’s Bureau of American Ethnology on the Zuni Indians (1901-02), crafting tesserae is a difficult task that involves a significant amount of time. Shells, turquoise, jet or other tesserae are broken and then rubbed against stone slabs until they meet the desired thickness. According to this tradition the more delicate and shaped, the more value they hold (Smithsonian Institution 1901-1902:378-379).

Crafting imported materials such as turquoise, jet, and shell would have been costly. These items have been proven to be highly valuable ritualistically to the Ancestral Puebloans and therefore their inclusion into these tools confirms their importance both economically and symbolically (Bradley 1993 2008; Heitman 2007; Heitman 2015; Mills 2008; Smithsonian Institution 1901-1902:378-379). In the Southwest region, turquoise, jet, and shell materials have a rich economic, political, and religious significance among Puebloan communities and their ancestors. For the Hopi, these colors have directional associations where black or jet is associated with the north while turquoise represents the southwest and white shell is associated with the northeast (Whiteley 2012:146-147).
Turquoise was particularly significant for the Chacoans based on its frequency, ubiquity, and ritual deposition. This blue-green color has religious significance within Pueblo ritual practice and is used, for instance, to call forth deities and cosmological forces (Plog and Heitman 2010; Heitman 2011). Interestingly, turquoise and shell (white in color) mixed with cornmeal are often found associated as ritual offerings at various shrines, kivas, or in roofs or dwelling foundations (Plog and Heitman 2010; Heitman 2011, 2015; Whiteley 2012). Black is associated with the underworld as demonstrated by Zuni tradition black paint is referred to as “From the beginning” (Heitman 2011:132). This paint is used by Rain Chiefs, and is believed to be brought up from the underworld at the time of emergence (Heitman 2011:132).

Olivella and abalone shell is prominently used in Puebloan rituals. In Zuni tradition white shell is associated with a female deity White Shell Woman, while turquoise was associated with a male deity, Turquoise Boy (Heitman 2011:123). Along with the long-distance trade required to obtained shell, as will be discussed in chapter four, they are associated with supernatural deities and are considered objects of adornment for deities and mortals alike (Heitman 2011:123). Therefore, these curated ornaments of turquoise and shell should be expected to be grouped in archaeological deposits. Their value is embedded with cosmology as well as economic status (Heitman 2011:122). The use of these exotic, cosmologically significant exotic materials to embellish HSTs tells us that these items had value beyond mundane, functional objects and were perhaps used in ritual preparation or public ceremonies.

The work that went into just the tesserae themselves that were inlaid into these tools was great, and through ethnographic comparison, rich with meaning. These
decorations however do not imply any function over another. Their implementation into these bone tools therefore most likely represents an elevated status either of the user themselves or of the HST alone for the Ancestral Puebloan people. Perhaps, even among these more ornate tools there was a hierarchy of craftsmanship that determined the quality of the decoration. Overall, the time and energy spent on inlaying these bone tools with these beautifully crafted turquoise, jet, and shell tesserae would have been great and their distinctive motifs are unique. These tools are not just decorative items with little to no use-wear. As I describe in my next chapter, all of these tools are significantly used, and the inlaid HSTs are no exception. The inlaid tools were perhaps used more intensely or for longer than the non-embellished HSTs. The heavy use-wear could provide additional support that the inlaid tools were used by high status women and/or that they were used repeatedly on a specialized craft production which in turn elevated the user’s status.

In summary these HSTs are crafted in a unique way that makes them easily identifiable. They have long been used as representative artifacts from the Chaco culture. Yet, little attention has been paid to the intricate details of these tools which is what makes them an interesting case study. The distinct tool morphology demonstrates that their construction was a part of a learning trajectory among the Ancestral Puebloans. Their association with females buried within Pueblo Bonito specifically room 326 represents their significance. The most ornate forms of HSTs were inlaid with turquoise, jet, and shell tesserae. These embellishments may have reflected that tools could have earned status for the user or feature the status the user already had.
Significance

In Judd’s monograph about the material culture found in Pueblo Bonito, he recounts the finding of 20 humeri artifact during the Nation Geographic Society’s explorations (Judd 1957:148). The three inlaid HSTs found in room 244 “…lay side by side on the floor in the middle of [the] room. Why they were left in that particular spot is not evident, for the room had been vacated and stripped of its furnishings before blown sand sifted in to spread a 1-inch blanket over scrapers and floor” (Judd 1957:148). These three inlaid artifacts were found lying side by side in a room mostly stripped of all other items, except other objects like the manos and a metate, which, as discussed by Heitman were used primarily by females for corn-grinding (2016:471-489). Could these items in this room represent a female space for female activities or an example of offerings left purposely in an otherwise evacuated space?

Judd discusses the claim Pepper makes of the significance of the embellished HSTs found in room 38. Pepper purports that these embellished HSTs along with the jet frog and other items found together in room 38 are alter paraphernalia with a religious significance. Judd disagrees with this claim as he states:

[S]o far as I can judge because they are exceptional, and [Pepper] was loath to believe such exquisite tools were employed in fleshing ordinary deer and coyote hides. The thought is equally distasteful to me, and yet I see no cause for putting the two in a special class. Certainly, there is no justification for stamping the inlaid scrapers “ceremonial” just because they were found on a broken shelf in the same 6-inch layer of blown sand with five turquoise ducks and a turquoise-collared jet frog. If so, then all
the tesserae and pendants intermixed with them, both jet and turquoise, likewise are ceremonial. [Judd 1957:144-148]

Based on the work of Heitman (2011) it is reasonable to believe that the yellow sterile sand was an intentional closure deposit rather than simply blown sand. I disagree with Judd’s uncertainty of these objects’ ceremonial nature. Due to the context explored above as a closure deposit, female burial context, the limited temporal and spatial distribution throughout the Chacoan world, and the intricate embellishment of several of these tools, I believe HST are significant. Ceremonial or religious significance does not exclude items from a simultaneous utilitarian purpose. Fowles (2013:175-176) discusses these ideas of simultaneous ritual and utilitarian significance by asking these questions:

[W]ho is to say that food preparation…is any more basic than prayers or dances? Who is to say which of these practices is any more basic than prayer or dances? Who is to say which of these practices is more fundamental to bodily nourishment? Or which is more deeply enmeshed in larger understandings of the cosmos? Indeed, upon what grounds can we say that an ear of corn is any less a “ceremonial object” than a kiva vessel or a Katina mask? Surely it is unacceptable to immediately locate corn grinding in the profane simply because it was a female practice. [Fowles 2013:175-176]

Social standing and status may have been acquired by contributing to activities that facilitated everyday life, even producing life. Heitman (2016:479) argues that religion does not just play a role in kivas and kachinas, but in every life and the activities that are essential to facilitating that life. As HSTs are not clearly related to corn grinding,
they are tools seemingly used by women to produce some type of material good. These tools can both represent religion and also be tools used by females to accomplish tasks required for everyday life (Heitman 2016). What is more important than that of creating material goods that sustain everyday life?

_Feminist Archaeological Lens_

Akins (1986) re-examined the burials from Chaco Canyon, during these investigations she determined the sex of the individuals which were often in opposition to the legacy data. Her re-assessments are critical for better redressing historical biases or misinterpretations of the archaeological record. To demonstrate the historical androcentric biases, Akins discusses the misidentification of a female burial:

The age and sex of an individual were often recorded, but these frequently do not match the current assessments made for those remains that have survived. These results, in part, from… making the determination or from interpretation based more on interpretation of the burial goods than on the remains. For example, this account concerns an individual (female) from the Talus Unit: ‘The burial itself was an adult man, as far as could be judged from the character of the bones and of the skull, and also from the fact of his having been buried with such care with food jars to carry his spirit, as we presume, to the spirit world. Such care does not commonly seem to be taken of the Soul of Pueblo women at burial’ [Southwestern Monuments 1934]. [Akins 1986:79]
This excerpt is a prime example of how historical biases have affected how the archaeological record has been curated and interpreted. There has been a long-standing androcentric bias of assuming female activities are unimportant, unskilled, and low-status tasks. This examination of HST in Chaco Canyon is useful to counteract and correct the androcentric lens and the modern gender dichotomy being projected onto the past (Spencer-Wood 2005:198-199). An androcentric bias has framed female activities as low-status menial work, yet, these highly embellished turquoise, jet, and Pacific shell inlaid HST say otherwise. It is clear that women are the users in many cases and even the primary owners of these tools, ethnographically and through the burial associations discussed above.

There is a difference between the statuses of the burials at great house versus small house sites. “Prestige and increased access to good are implied by residence at Pueblo Bonito” (Akins 1986:133). Both, women and men at Pueblo Bonito have a greater stature than women and men at small-site burials, each by over 4 centimeters. Stature, as Akins defines, is an indication of better nutrition which could come from a higher degree of status (1986:135-137). Not only is stature higher from the men and women at Pueblo Bonito, but burial goods are of a high value and volume. Akins emphasizes that male burials contain valuable goods more often than female burials (1986:132). However, “overall [the] burial assemblage is dominated by females (46 females, 24 males [Akins 1986: Table B.1])” (Heitman 2016:479). From a colonialist perspective, these burial goods may not seem significant or religious in nature, but it is critical that these perspectives and biases are examined. Male and female burials at Pueblo Bonito clearly indicate a higher status than women and men at small house sites, through grave goods
and mortuary data. Funerary items such as these HST may represent an elevated status for the user which seems to be, through the burial associations, are women.

Akins comments on how “females do occasionally have the ornaments produced from long-distance transport materials; however, these are very few in number” (1986:132). Turquoise, jet, and shell are the materials used in the inlay of the HST artifacts which are all sourced outside of Chaco Canyon, with the turquoise being mined up to 100 miles away (Mathien 2001:103-118) and the abalone shell being procured from the Pacific Ocean. These inlaid implements, I argue, represent women’s participation in the Chacoan trade hub that boomed during its height. Lamphere (2000) discusses the social differences during AD 1050-1130 in Chaco Canyon:

On one hand, one could argue that the production of valuable pottery by women in distant villages and the use of female trade networks to bring pots and/or food into Chaco Canyon might indicate the calling in of economic resources for ritual purposes- the way in which potlatching or feasting in “big man” systems operates. On the other hand, if such rituals served as redistribution systems rather than as systems for appropriating goods, then women involved in craft production and trade might have retained a measure of autonomy and leverage, even prestige. [2000:396]

The latter is perhaps occurring in Chaco during this time. These HST could be examples of women’s participation in the redistribution of specialized craft goods, with the most ornate indicating high-status females within this trade and craft production system. If this is the case more work must be done to locate, identify, and understand HSTs in the greater Chacoan landscape.
This examination of HST provides evidence that these tools were a part of the female toolkit during Chaco’s fluorescence and were prized both as utilitarian items but were also ritualistically and ceremonially important. Not only does this female/tool association give validity to a gendered activity in the past, but the turquoise, jet, and shell embellished implements indicate an elevated level of status also associated with these objects. This provides evidence that women at Chaco were performing important tasks and were valued contributors to their society. Women were able to participate in through utilitarian tasks and were most likely able to participate at the same level as men in trade and distribution at Chaco (Spencer-Wood 2005:208-213).

The past is gendered. Gender is a foundation of human social, economic, political, and ideological organization, issues of concern to archaeologists. Yet, ethnographic studies point to a diversity in gender roles and tasks. If gender is highly variable cross-culturally-then it is presumptuous for us to assume that it would remain stagnant or static through time. Gender roles are not static, though in the ‘ideal’ presentation of a people they may seem just so. The ‘real’ action of gender is fluid. But even with this flexible and active conception of gender, specifically in the division of labor, ethnographically gender roles are patterned. Archaeologists have successfully used gender as an access point to the intricacies of the division of labor, primarily through the collection an analyses of the patterns of tool use, the organization and use of the built environment, and complex suite of activities that women and men contribute in smaller scale
societies and what this means for archaeological patterning. [Frink et al. 2005:3-4]

It is important to remember that the past is variable, and that women and men were active in multiple roles. Acknowledging their participation in past activities is critical when attempting to recreate the past. Using a feminist lens to inspect historical biases in reporting on Chacoan culture is what this research aims to do. By looking closely at Bone Spatulate Tools, specifically the Humeri within from Chaco Canyon, we can determine that the evidence indicates women are most commonly associated with these tools. The ethnographic and archaeological data reflects how women can play a significant role in economic and ritual activities. However, these roles change and vary over time and between cultures. These HSTs may be representative of utilitarian tasks, but the elaborate nature of some of the tools suggests an elevated status as well as a ceremonial or ritual importance concurrently.

Secondary Repositories

“The ethical and scientific imperative for museum collection use and reuse has steadily grown in anthropology over recent decades. But as scholars increasingly (re)turn to historic or legacy collections, we need to continually engage with the complex layers of formation processes, selection, and exclusion that characterize the life histories of these collections in order to better understand their context and biases” (Heitman 2017:128). Returning to legacy data gives researchers the ability to posit new questions and challenge previous assumptions to better engage with the complexity of the prehistoric past. This examination of HST from Chaco illuminates how legacy data can be used to revisit archaeological interpretations and redress historical biases that are
embedded. There are clear discrepancies with the classifications of these artifacts which has much to do with how the items were recorded throughout the various excavations that took place at Chaco Canyon. Issues of nomenclature and classification are also problematic in the archaeological community when identifying tool typology, not to mention the issues with tool morphology and associated activities throughout the ethnographic literature and assumptive interpretations.

“As mentioned, Chaco burials have a long history of removal and a rather poor history of documentation. Problems inherent in the use of archival data are compounded by the diversity of sources from which the information is derived” (Akins 1986:78). Chaco is rich with information, however much of this information was mined before modern excavation methods and standards were in place. Thus, the use of legacy data repositories is essential to examine the information that was recorded to gain a better understanding of the Chaco culture. Historical biases can now be examined using this legacy data, and these HSTs provide another form of evidence of historical gender bias in the processes that formed these collections, including the selection and exclusion of artifacts from the archaeological record.

The various terms used to describe these tools vary from scraper, flesher, spatula, chisel, gouge, spoon, and bone implement, as well as nomenclature regarding the inlaid versions of these tools such as inlaid, mosaic, turquoise, jet, etc., overwhelm and complicate the data. Not only are there issues with artifact nomenclature but upon searching the CRA for inlaid worked bone artifacts, the inlaid HST from Pueblo Bonito room 38 did not appear until specifically searching for them. More work is needed to search the literature and the database to ensure that a comprehensive list of HSTs are
identified. Continued work needs to be done in order to establish exactly how many HSTs exist from Chacoan sites and if their association continues to be connected to female burials and to better understand the significance of the embellished HSTs.

**Conclusion**

Humeri Spatulate Tools are morphologically distinct artifacts found throughout the Chacoan world during its florescence. The ethnographic literature, especially in regard to indigenous cultures of the Plains, demonstrates the importance of bone tools as vital for craft production and female’s participation and use of a specialized toolkit. There is an association between HSTs and female burials at Chaco. This association implies a gendered activity during the Pueblo II-III period. Some of these HSTs were found associated with burials in Pueblo Bonitos room 326. This room contains material goods that suggest high status for the individuals buried within. Turquoise, jet, and shell inlay of several of these HST artifacts indicate a ritual or cosmological association. Therefore, these HSTs could be items of ritual or ceremonial significance that could demonstrate the user’s status or have even earned status for the user. Critically, this examination of HSTs using legacy data acquired from the CRA demonstrates how an understudied tool type can be resuscitated to redress historical archaeological biases.
The Chaco fluorescence occurred between AD 850 and 1250 in the San Juan region of the American Southwest. This arid environment supported the construction of massive ceremonial and public buildings that are architecturally elaborate and unique. The multi-story great house architecture demonstrates the social complexity that arose during these 300 years. Chaco was the center of political, economic, and ceremonial
activities (CRA; Lekson 2006; Vivian and Hilpert 2012). This area of North America is distinctive in its environment and history, which is demonstrated by the massive public and ceremonial architecture as well as the miles of roads (CRA; Lekson 2006; Vivian and Hilpert 2012). Large-scale systems of exchange including the import of turquoise, shell, and raw lithic materials are evident in the archaeological record, as well as the local production of various material goods. Textiles, basketry cordage, rabbit-fur, and turkey feather blankets, and finished hides were all locally produced and are indicators of prestige-driven craft production at Chaco (Watson and Gleason 2016:1).

This area produced some of the most interesting, unique, and beautiful objects in North America. By using the Chaco Research Archive (CRA), where archival documents and historical images are made public, as well as various ethnographic data and other aggregated literature, this paper examines Chacoan Bone Spatulate Tools made from artiodactyl humeri (often referred to in the literature as scrapers/fleshers), their associations, function, and significance (Heitman 2017:130). By examining a sample of the embellished and non-embellished Humeri Spatulate Tools (HST) housed at the National Museum of Natural History (NMNH) in Washington D.C. and the American Museum of Natural History (AMNH) in New York City, NY, I aim to determine their function. To accomplish this research aim I am going to (a) define and distinguish between the terms fleshers and scrapers and demonstrate how HSTs are distinct, (b) explore the historical trajectory of experimental studies in archaeology, (c) use legacy data as well as other examples of HSTs from the Four Corners area to explore their associations, significance, and potential function, and (d) conduct an attribute analysis of the archaeological use-wear, detail my experimental program, and describe the replica
use-wear results. Artifact nomenclature complexities, biases in legacy data, and androcentric issues can all influence and dictate how the record is interpreted and thus a full discussion of these tools is required to better understand the archaeological record in Chaco Canyon.

**Bone Spatulate Tools (BSTs) & their Functions**

*Female Toolkits*

Toolkits for hunting, agriculture, and weaponry have long been a subject of study in archaeology. Identifying women’s manufacture and use of their own toolkits, and therefore identifying women’s activities, has often met resistance and has had a delayed acceptance in the archaeological literature (Gero 1985; Hays-Gilpin 2016; Heitman 2017; Spector 1993). A toolkit, as defined by Binford, is “a set of tools used in the execution of a task” (Binford 1980:147). Much of the archaeological record consists of stone, bone, and ceramic artifacts. In order to understand gendered activities, a closer look at these types of toolkits is critical. Prehistorically, women were involved in “all aspects of technological organization, including quarrying, stone selection, transport, manufacture, use, and maintenance” (Ruth 2012). Tools not only help to create goods but are also signifiers of the tool user’s ability to produce goods and participate in a societal activity (Sundstrom 2017). To better evaluate women’s activities and social roles in the past it is important to understand the tasks they conducted in everyday life. To get at these theoretical understanding archaeologists can use funerary and utilitarian artifacts found in archaeological assemblages. These material goods that are found in association with female burials and other contexts can provide evidence that “women made important and
undertheorized contributions to the social transformations that defined emergent Chacoan society” (Heitman 2016:472).

Toolkits for Hide Processing

Hide-working has a deep archaeological context and the American Southwest, with its dry conditions, is an excellent arena for continued study of hide-production and their associated toolkits (Ruth 2013:185). “In the Revised Ethnographic Atlas, ‘hide-working’ is defined as the dressing of skins” (Ruth 2013:47; Murdock et al. 1962:390). Hide-working is a labor-intensive process that involves many steps such as preliminary preparations, hair removal, defleshing, scrapping/thinning, soaking, working, and smoking (Schultz 1992:334). Many different products can result from hide-working such as materials for shelter, mats, clothing, bags, bedding, blankets, etc. In order to produce these various specialized products, both expert knowledge and toolkits were necessary. As this paper is dedicated to a specific artifact, bone spatulate tools (BST), a larger discussion of all the steps and tools used in hide-processing will not serve this paper.

BSTs are most commonly classified as fleshers or scrapers in the ethnohistorical and archaeological literature. There are however, differing morphologies for these spatulate tools that might have functional significance. As this paper is concerned with a specific tool morphology seen in Chaco Canyon and the greater San Juan region it is important to identify and discriminate between the terms flesher and scraper and their implications as these are the most persistent and common terms for HST. These two terms are used interchangeably, and their use in hide-processing is quite similar and can also be used interchangeably; adding to the confusion, scraper is more commonly
associated with lithic tools. Therefore, the following description aims to disentangle these two terms and to more accurately identify the specific HST morphology.

**Bone Fleshers**

Bone Fleshers, like the Plains example seen in figure 3.2, are used when removing the tissue, fat, and membrane that remain on a hide after the initial skinning process (Ruth 2013:194-195; Schultz 1992:334). As long as the hide does not dry out in the fleshing process, soaking the hide is not a necessary first step. To retain the hair on the hide once fleshing is complete, soaking should not last long and the tanning process should be done as soon as possible. Fleshing is most easily accomplished shortly after killing and butchering the animal, while the hide is still fresh, especially for bison (Ruth 2013:194-195; Schultz 1992:334). The type of implement used for such a process has been described as a ‘serrated bone flesher’ or a ‘bone chisel flesher’ (Ruth 2013:194-199). The most common shape of flesher is “tapered, rounded and serrated at the working edge” (Ruth 2013:196). The serrated edge of the implement serves to strip the tissue, fat, and membranes from the hide (Steinbring 1966:580). In a 2002 experimental archaeological research project examining the tanning process and the effectiveness of the various bone and stone tools, it was noted that “the scraper made from the ulna bone was fairly effective in removing
the flesh, as was the cannon bone flesher. When fleshing, a sharp edge is not needed; a
dulled edge is actually more effective” (Richter et al. 2002:305). Counterarguments claim
that the “bone flesher must be sharpened frequently, and the teeth re-chiseled

Hide processing was primarily done using upright frames as well as the ground
surface (Ruth 2013). In the experimental investigation from Richter et al. (2002:305) as
well as an ethnohistorical account used in Ruth (2013:197), defleshing results from
applied downward pressure against the hide using the serrated or sharpened edge of the
tools. These studies also refer to an attached wrist strap that is added to either “natural or
drilled holes in the proximal end of the tool” (Ruth 2013:197). Wrist straps would
provide leverage and support for firm pressure as defleshing large mammals such as
bison would be fairly difficult due to their thick skin. Fleshers are made of various bones
but most often from the long, tube-shaped cannon bone in the lower leg of a large
quadruped. This preference stems from their leverage and weight that is neither too heavy
nor to light (Steinbring 1966:579). Fleshers, mentioned in the literature, have been
crafted out of moose, horse, bison, elk, bear, deer, caribou, and other mammals using
ulnas, humeri, tibiae, metatarsals, metacarpals, etc. (Ruth 2013:194-199; Steinbring

Bone Scrapers

In contrast, scrapers are defined as an L-shaped implement to scrape the hide in
order to even-out the thickness or reduce thickness overall [Figure 3.3]. These
implements, as seen in Figure 3.3 are handles. A flaked stone tool is then attached to the
handle where it curves into the L-like-shape. Large mammal hides such as elk, bison,
bear, etc. must be thinned through scraping in order to create a soft hide. The hair may also be removed with this L-shaped scraper (Schultz 1992:334). 

“It was also reported as being used to remove flesh from green hides and as a graining tool” (Schultz 1992:338). The shape is ‘adze-like’ in morphology, also being equated to a hoe in structure. How then, was this L-shaped implement crafted and with what material? To create the L-shaped structure of this tool type, a large mammalian bone would be required. Heavy modification would be necessary to shape such a bone and thus it would not be as structurally sound as antler, ivory, or wood. Wood or antler with an attached stone or metal blade is suggested by Schultz (1992:338) as the common form and material used in the production of scrapers.

_Humeri Spatulate Tools (HSTs)_

Bone Spatulate Tools or BSTs are morphologically distinct worked bone artifacts that are found in the greater American southwest and elsewhere. They are crafted from various bones (i.e. humeri, femurs, tibia, and phalanx) of various types of mammals, most often ungulates such as mule deer or bighorn sheep. This paper is specifically concerned with the bone spatulate tools made of humeri of artiodactyls to which I will refer to as Humeri Spatulate Tools (HSTs) [Figure 3.4].
While worked bone spatulate tools show up cross-culturally (i.e. the plains, the subarctic, and elsewhere), the Chacoan HSTs are quite limited in their spatial distribution. Based on archaeological reports the main distribution of these tools extend from north of the San Juan River in the Mesa Verde region to the southern edge of the Chacoan region during the Pueblo II to the Pueblo III phase, AD 900-1300 (LaRue n.d: manuscript; Osborne 2004). There are no known Chacoan HSTs adjacent or further from the Four Corners region of the American Southwest (Osborne 2004). Osborne suggests a northern potentially even Plains origin of this tool morphology although she goes on to report on their earliest first known occurrence in the southern area of the Red Mesa Valley of Arizona during the Pueblo II period, AD 900-1150 (Osborne 2004). Although HSTs found within Chaco Canyon at Tseh So (Bc 50) and Bc 50-51 may be as old, Pueblo II, as those found in the Red Mesa Valley, Arizona (Osborne 2004). These tools are not seen in the archaeological assemblages of Mesa Verde excavations until Pueblo III (Osborne 2004). Thus this assertion of their northern origin does not have archaeological support; further work is required to better understand their distribution and temporal occurrence in the American Southwest.

Morphologically, HSTs are cut at the proximal end to remove the humeral head (humoral ball joint).

Figure 3.4: Humerus Spatulate Tool, museum number H/6169 from Pueblo Bonito. This image demonstrates the typical morphology of HSTs seen throughout the Four Corners area. Courtesy of the Division of Anthropology, American Museum. Photo taken by Anderson 2018.
To remove this cancellous bone, potentially a groove would have been scored around the humeral head. Using hard hammer percussion a blow to the humeral head could have snapped it off. Upon removing the proximal end, the diaphysis of the bone would then have been cut or sanded on the medial side of the bone regardless if left or right, which exposes the marrow cavity tapering toward the worked bit-edge. This medial exposure of the marrow cavity is an identifier of these HSTs artifacts, the marrow cavity is sometimes exposed anteriorly and very infrequently laterally. The worked end of the bone is then shaped to create a spatulate implement [Figure 3.4].

**History of Experimental Archaeology**

It is important to note the difference between fleshing and scraping as they are separate processes and could then require different tools. Many fleshers are also defined as scrapers and vice versa, although it is possible that both scrapers and fleshers were used interchangeably in the hide-working process, archaeologists must have different nomenclature for the two distinct artifact morphologies. Prior to various use-wear analyses like metrology, tribology and microwear, scholars and researchers began to experiment with artifact functions (Stemp et al. 2016:2-3; Watson and Gleason 2016). During the mid-19th and early 20th century, the ‘speculative functional’ approach determined tool function and thus artifact nomenclature. Efficiency studies were commonly used during the 20th century in experimental archaeology studies to assess and determine prehistoric tool use. These studies focused on tools performance and effective performance of specific tasks to understand past tool function (Stemp et al. 2016; Watson and Gleason 2016). These experiments, rather than examining the tool for use-wear patterns, focused on the finished product or produced goods created by using
the implement. Upon assessing the similarities and differences of the produced goods with archaeological materials, researchers classified a tool’s prehistoric function. While this continued well into the development of microscopic and stereo microscopic analyses, bone was not the first material type to be assessed for use and tool function was still primarily assumed based on the various reasons aforementioned (Stemp et al. 2016:2-3; Watson and Gleason 2016).

Understanding the trajectory of bone tool classification and interpretation in regard to anthropological and archaeological inquiry, serves this experimental archaeology research. By understanding artifact classifications and the assumptions of function we can redress tools with morphological nomenclature and thoroughly examine tool functions. Much of the early archaeological assessments of tool function were based on speculation rather than any close examination of use-wear. Stemp et al. (2016:1-2) term this period as the speculative function approach which emphasized the morphological form of a tool in order to predict its function. Not only were current tools and their modern-day functions used as a parallel for excavated artifacts, but ethnographic analogy also influenced past anthropologists and archaeologists and their prehistoric tool use assessments. This is clearly problematic and riddled with Western ethnocentric biases (Stemp et al. 2016:1-2).

**CRA Legacy Data of HSTs**

The legacy data was procured from the CRA by drilling into the ‘Query the Database’ tab and clicking on the ‘Artifact’ tab (CRA). I queried for worked bone by selecting bone from the dropdown menu in the ‘CRA material type’ and from the ‘modification’ dropdown menu I selected the ‘worked’ option. As this results in 3,400
artifacts, I downloaded the excel table to then query the data further. In the downloaded tables, I used the ‘field catalog description’, ‘museum catalog description’, and ‘form’ to search for the various epithets that are associated with these HSTs such as scraper, flesher, spatulate, spoon, chisel, gauge, and inlaid bone implement [Table 3.1]. I included unspecified bone into the Table 3.1, as these work bones should be further examined to assess if any are actually HSTs however I did not include them into my percentage counts as this category is too broad.

Of the 3,400 worked bone artifacts, 32% were found at Pueblo Bonito with only Aztec Ruins having more worked bone artifacts (CRA). By filtering the data into a HST dataset, these tools make up approximately 10% of the worked bone artifacts, 363 HST out of a 3,400 total [Table 3.1]. With roughly half of these (n=180) coming from Pueblo Bonito contexts [Table 3.1], these tools were not overtly abundant. When comparing HST totals to the awl totals recorded in the CRA, awls are significantly more common at 58% of the total worked bone assemblage. What this difference in quantities within Chaco Canyon demonstrates is not clear.

Of the 363 HSTs, nine are found in burial contexts. Four of these were found within Pueblo Bonito which again suggests their significance at this great house site [Table 3.2; Appendix A]. According to the CRA, of these nine HST/burial associations, four were found at small house sites, and one was found with burials at Aztec Ruins [Table 3.2; Appendix A]. Of these nine burial contexts, six of the HST are found with females. In total there are 13 individuals in these nine burial/HST contexts, six are females, two are males, and five are undetermined [Table 3.2].
Table 3.1: List of possible BSTs using the various classifications associated with this tool morphology including: flesher, scraper, spatulate, spoon, chisel, gorge, knife, bone implement. Data aggregated from the CRA (chacoarchive.org).

<table>
<thead>
<tr>
<th>Chaco Canyon Pueblos</th>
<th>Scraper</th>
<th>Flesher</th>
<th>Spatula</th>
<th>Spoon</th>
<th>Chisel</th>
<th>Gorge/grape/goose</th>
<th>Bone</th>
<th>Knife</th>
<th>Bone Implement</th>
<th>Total</th>
<th>Unspecified</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC 57 (295:357)</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>36</td>
<td>41</td>
</tr>
<tr>
<td>Pueblo del Arroyo</td>
<td>15</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>6</td>
<td>25</td>
<td>64</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BC 51</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>17</td>
<td>101</td>
<td>118</td>
<td></td>
</tr>
<tr>
<td>Aztec Ruins</td>
<td>61</td>
<td>0</td>
<td>11</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>84</td>
<td>333</td>
<td>417</td>
<td></td>
</tr>
<tr>
<td>Talus Unit #1</td>
<td>3</td>
<td>7</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>16</td>
<td>113</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td>BC 50 Tseh So</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>10</td>
<td>60</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>295:11659, Shabik'eshchee</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>29</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pueblo Bonito</td>
<td>80</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>79</td>
<td>180</td>
<td>333</td>
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<tr>
<td>Penasco Blanco</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
<td>16</td>
<td>61</td>
<td>77</td>
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<tr>
<td>Chetro Ketl</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
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<td>3</td>
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<td></td>
</tr>
<tr>
<td>Bc 59, Tom Matthews’s Site</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>15</td>
<td>16</td>
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</tr>
<tr>
<td>Bc 52 - Casa Somberada</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Bc 58</td>
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<td>0</td>
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<tr>
<td>Tsin Kletsin</td>
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<td>0</td>
<td>19</td>
<td>19</td>
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</tr>
<tr>
<td>Bc 53 - Roberts’ Site</td>
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<td><strong>110</strong></td>
<td><strong>363</strong></td>
<td><strong>1249</strong></td>
<td><strong>1612</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.2: HST and Interment Associations at great and small house sites. Legacy data acquired from the CRA (chacoarchive.org).

<table>
<thead>
<tr>
<th>Pueblo Bonito</th>
<th>Female</th>
<th>Male</th>
<th>Multiple</th>
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<tbody>
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<td>Room 326</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(All HST found with multiple female burials)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aztec Ruin</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room 111</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(HST found with two undetermined sex individuals)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bc 50 - Tseh So</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(HST found with 1 female burial in midden btw Bc 50 &amp; 51)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bc 51</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(HST found with 2 males and 1 undetermined sex)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bc 59 - Tom Matthews Site</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<td>(HST found with 2 undetermined sexed individuals)</td>
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HST/Basket Associations

The four Pueblo Bonito HSTs & female burial associations were found within room 326 [Table 3.2; Appendix A]. Not only do all of the HSTs show up in association with females but they were all in or underneath elliptical (oval/ hourglass/figure-eight-shaped) trays/baskets [Figure 3.5; Appendix A] (Jolie 2018:302-303). Judd (1954), who discovered and excavated the contents of room 326, referred to these baskets as shallow oval or elliptical trays. Yet Jolie (2018) upon reexamination determined that due to the high wall of these baskets, they should be classified as oval bowls (Jolie 2018:303-304). These oval bowls have a figure-eight shape created from the middle inward pinching of the walls. This shape is also, seen in Pueblo Bonito’s bifurcated baskets as the mouth or opening is morphologically similar. Jolie suggests that this could represent “a functional if not conceptual relationship” (Jolie 2018:303). The function of these oval bowls is undetermined, yet their contexts within and outside of Chaco proper suggest both a work and medicine basket function (Jolie 2018:304-305). The HSTs as well as a twined sandal fragment found associated with the four oval basket bowls imply a utilitarian function. While their association with female burials and the rich material good
assemblage in room 326 suggest that they are of greater significance (Jolie 2018:304-305).

HSTs throughout the Four Corners

HST/Basket Associations at Battle Cave

Another example of these oval bowl baskets and HSTs comes from Battle Cave, of southeastern Utah a site found in a tributary of Allen Canyon [Figure 3.6]. The basket that was discovered in this cave contained over 20 different items including several HSTs. Among the HSTs, several balls of spun yucca fibers were also discovered inside [Figure 3.6]. These yarn balls were specifically prepared for use in the production of textiles, potentially cordage for woven sandals or tumplines (Laurie Webster, personal communication 2019). Potentially, this specific material good association may signify a connected function for both of these artifact types. Perhaps these HSTs were used by specialists in the production of these oval bowl baskets, or these bone tools were used for other plant processing, or potentially there is no functional association at all.
Osborne’s HST Analyses

An experimental archaeology study conducted by Osborne (1965) aimed to recreate ancient *Yucca glauca* plant fibers used in textiles with various tools including these HSTs. Osborne examined six distinct yucca fibers from the Wetherill Mesas sites. When attempting to re-create the various types of yucca fibers made by past southwest peoples, she used these HSTs as well as other tool types such as stone and metal tools (Osborne 1965). Osborne determined that these HSTs were efficient in the reproduction of these ancient fibers as they were successful at scraping the yucca leaves to access the fibrous plant matter. However, this experimental project does not look at the use-wear on the HST utilized, but at the re-produced fibers. Osborne’s intent was to replicate the color, thinness, and texture of the ancient fibers while the ancient tool replications were a matter of successful fiber creation and comfortability of use. While this experiment demonstrates HSTs successful application to produce similar archaeological yucca fibers, further analysis of the tool itself is necessary to compare use-wear signatures to the archaeological HSTs.

In Osborne’s (2004) assessment of HSTs from the Wetherill Collections in Mesa Verde, she purports on an analysis of 57 artiodactyl humeri tools. Of these 57, approximately half were either from mule deer (*Odocoileus hemionus*) or bighorn sheep (*Ovis Canadensis*). There is an equal distribution of both male and female deer humeri, and almost all were mature young adult animals. This suggests that both deer and sheep were equally hunted and were readily available in the Mesa Verde region or the adjacent mountains (Osborne 2004). There was also an even distribution of right and left humeri in this 57 sample, which implies no preference for right or left humeri (Osborne 2004).
Osborne notes that the bones of the mule deer are on average larger, this is a similar observation from the Bernstein-Dierking, UT Site Humeri Spatulate Tools as soon will be discussed.

These tools most commonly have the same beveled bit-edge on the posterior side of the tool, which is what I am referring to as a bifacial bit-edge. This morphology of the working bit is, therefore, ubiquitous in the Chacoan HSTs and these from Mesa Verde. Osborne describes the obvious grinding marks that are seen on most of these tools, which she states are “the stigmata of manufacture” (Osborne 2004:429). The grinding striations are seen running transverse on the posterior side of the tool and mostly running lengthwise up the marrow cavity of the tool (Osborne 2004). These striations are also seen on the HSTs I examined at the NMNH and AMNH. Osborne examined use-wear on these 57 HSTs and found that there is a pattern of heavy use-wear on these artifacts (Osborne 2004).

Seven of the HSTs in Osborne (2004) study sample from the Wetherill Collections are embellished. Three of the seven have incised lines, one (29-42-10) depicts three triangular shapes; another (01221) has straight lines as well as a rectangle and oval incised into the surface. The third HST (04191) had a motif that appears to be a turkey track (Osborne 2004). Four (04181, 04182, 04184, 04196) of the other seven embellished HSTs have a reddish residue; Osborne suggests that it could be dried blood from the color and appearance. This red coloration could be similar to the red pigmentation noticed on the Bernstein-Dierking HSTs; further analysis would be required as Osborne notes that blood residue would not remain distinct through the centuries since their prehistoric deposit (Osborne 2004). Two samples were analyzed from two of these red
pigmented artifacts (04182, 04196), the analysis reported that the samples consisted of mainly cellular plant material potentially the gum or juice. Osborne believes this to be yucca pulp but also states such cellular plant material could originate from flattening rushes or shelling corn (Osborne 2004:430).

_HSTs at Bernstein-Dierking Site_

Five of these HSTs were found at the Bernstein-Dierking site near Blanding, Utah. The five HST, in this archaeological deposit, were found inside a Dolores Corrugated Grey Ware jar which also contained basket fragments (Rood 2000:1). The humeri came from a mule deer (_Odocoileus hemionus_) and a bighorn sheep (_Ovis canadensis_) (Rood 2000:1). These five HSTs were all manufactured analogously to each other (Rood 2000) as well as the other HSTs from the greater Chacoan region. There is variation in the size of these bone tools with the mule deer (_Odocoileus hemionus_) humeri measuring the longest in length and width, as well as the heaviest (Rood 2000). There are differences in the grinding, shape and wear of these five tools. Four (FS-36; FS-38; FS-39; FS-40) of the five demonstrate polishing on the bit-edge with varying degree of use-wear striations and grinding. Three have a beveled bit-edge (bifacial) while one demonstrates such heavy use that the bit-edge has a squared off appearance (Rood 2000:3). One of the tools (FS-38) has red pigmentation on the lateral side and distal end, which is potentially ochre but, is not confirmed (Rood 2000). Could this pigmentation be an embellishment of the tool or something else not yet understood?

The radiocarbon dating allowed two of these tools (FS-36 & FS-37) to be dated to A.D. 875 to 920 +/- 40 (Bernstein-Dierking Discovery Site 2001; Rood 2000). The basket fragments found inside the jar with the five HSTs was dated to A.D. 910 +/- 40,
which puts both into the Pueblo I-II periods (Bernstein-Dierking Discovery Site 2001, Hurst 2000). Potentially, as the five HSTs were found above the basket fragments, these tools may have originally been inside the basket when placed inside the ceramic jar (Bernstein-Dierking Discovery Site 2001). The basket fragment analysis suggests that the basket was cylindrical and would have been small enough to fit within the neck of the corrugated pot (Bernstein-Dierking Discovery Site 2001:4). Could this HST/basket association provide additional support that HSTs were used for plant processing? As all five HSTs are analogous in morphology and use-wear signatures Rood interprets that these HSTs were all likely used for the same tasks. However, there is no evidence for hide processing as the bit-edges are too delicate (Rood 2000:4). He speculates on their effectiveness in plant processing but ultimately does not give a finite determination of function.

Other analyses such as pollen, use-wear, and DNA analysis are in the process of being conducted on these artifacts found at the Bernstein-Dierking site near Blanding, Utah. The sediments inside the jar were collected for pollen residue testing (Bernstein-Dierking Discovery Site 2001:3-4), which could have been from the jar itself, the basket, or from natural geological processes. These artifacts were recovered from an open air surface site and therefore, such residue analyses are often indeterminate (Hurst 2000:11). Information regarding the pollen analysis have not been included in the Cultural Resource report as of yet, but the museum display at the Edge of Cedars State Park Museum purports that there was corn pollen as well as beeweed, grass, cattail, and buffalo berry pollen (Edge of the Cedars State Park Museum 2019). They speculate that this pollen residue could be indicative that these HSTs were used as scoops. The display
also describes that protein residue was found during the DNA analysis of these HSTs (Edge of the Cedars State Park Museum 2019). Overall, as this was an open-air surface site, these analyses would require further investigation with high powered microscopes to determine if the pollen is embedded in the tool or if it is from the other artifacts or air contamination. As the methodology and the results are not included in the report as of yet, it is impossible to determine the validity of these analyses and therefore their inclusion is speculative.

**Current HST Usage in Contemporary Artisan Accounts**

When trying to determine tool function from past cultures, scientific exploration should be utilized in concert with traditional knowledge. To better understand these tools and to explore their possible function I spoke with a Zuni basket weaver, Christopher Lewis. Lewis uses a HST when creating various types of baskets.

Specifically, Lewis uses this tool to thin out yucca leaves to remove sharp edges and remove some of the external plant material. The method Lewis uses to thin the yucca is by placing the spatulate end against his thumb so that the rounder edge thins out the yucca while the sharper edge of the HST removes the sharp external surface and excess fibrous material [Figure 3.8].
When visiting in person with Lewis, I was able to capture both standard artifact photos of his HST as well as dinolite digital images [3.8]. When examining the tool, I noticed it had a bifacial bit-edge. On the center of the bit-edge there was a noticeable chlorophyll stain or something staining the bone in the area in which it is most heavily used [Figure 3.8]. Lewis has been using this one tool for five years and has never had to sharpen or modify the tool. According to Lewis, these tools have not been in use that he knows of, for over 130 years. He is one of the only basket weavers who currently uses this ancestral tool type. His tool is embellished with spiny oyster, jet, turquoise, and other shell tesserae that had been epoxy glued to the surface of the bone [Figure 3.7]. Lewis also discussed the significance of these bone tools “as ceremonial in nature” and mentioned how turquoise was crushed along with shell and added to corn meal for ritual purposes. He also talked about the tesserae inlaid in these Chacoan HSTs and the extent of trade networks to acquire them. Abalone shell according to Zuni tradition is representative of water because it reflects colors similarly as does the ocean. These understandings can help illuminate the importance and potential function of these tools.

Artifact classifications and nomenclature, varying experimental archaeological methodologies and assessments, as well as current usage of prehistoric tools have
influenced the interpretations of HSTs. Identifying and discriminating between the terms scraper/flesher that are most commonly associated with these implements demonstrates assumptions of function. These terms, especially flesher, are often associated with hide production, which in turn imply a function for these Chacoan HSTs. Various other scholars have interpreted these Chacoan HSTs to be tools used in plant processing activities, seen in the above analyses and experimental studies of Osborne (1965; 2004). Other studies of these artifacts such as the five HSTs found at the Bernstein-Dierking Discovery Site provide alternative ideas of these artifacts prehistoric function and significance (Rood 2000). Currently, Christopher Lewis, a Zuni basket weaver is utilizing this ancient tool form to produce specialized baskets. His implementation and usage of this HST allows for an examination of use-wear signatures that have been developed over five years using a specialized sequence. Lewis’s HST along with the analysis and experimental studies of Osborne and Rood with the discussions of nomenclature assumptions provided the framework for my experimental research. To better assess the function of this tool type I designed a research project that addresses their implementation on hides as well as plant processing.

**Cross Cultural BSTs Comparison**

By examining BSTs from other cultural groups and contexts, there is a wider sample for comparison. Although none of the interpretations and understandings of the function of the BSTs from Plains contexts can be used to

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**Figure 3.9:** BSTs from Guilder’s Douglas and Sarpy County, NE excavations (artifact numbers 15, 16, and 18). Courtesy of the Nebraska State Museum, Lincoln, Nebraska. Photo taken by Anderson.
determine the function of the Chaco HSTs, these assessments are an intellectual steppingstone to help me better evaluate bone use-wear. The BST artifacts I evaluated for use-wear signatures are from an early 1900 excavation conducted by an avocational archaeologist Robert Fletcher Gilder (Haack et al. 1975). He primarily worked in Nebraska studying prehistoric earth lodges along the Missouri River in Douglas, Washington, and Sarpy counties. Between the years 1907-1914 Gilder excavated a site near Bellevue, Nebraska named the Child’s Point site, which is now protected within the Fontenelle Forest. Some of the artifacts from this site are housed at Nebraska Hall at the University of Nebraska-Lincoln (Haack et al. 1975). A wide variety of artifacts were excavated from this site including several BSTs. Haack concluded that this site was similar to Ponca Creek sites he had previously excavated and subsequently coined the term Nebraska Culture (Haack et al. 1975).

There are four BSTs from this site, three shown in Figure 3.9. These worked bone tools seem to be made of deer tibia. The distal end of these BSTs was removed and unlike

Figure 3.10: Three BSTs (artifact numbers 15, 16, and 18) from Guilder’s Douglas and Sarpy County, NE excavations; a & b) artifact number 15, c) artifact number 16, d) artifact number 18, each depicting the heavy use-wear signatures. Courtesy the University of Nebraska State Museum. Photo taken by Anderson 2018.
the Chacoan BSTs the entire bone marrow cavity is exposed. Of four BSTs, only three were complete [Figure 3.9]. Number 17 was broken on the distal end where the use-wear signatures would be identifiable. Of three that are suitable for analysis of use-wear patterns only two (no.15 & 16) seem to have been used significantly. I examined all three using a dissecting microscope. These artifacts have rounded deep striations that vary from long to short on the anterior side of the bone and within the marrow cavity. On the posterior side of the tools the striations were rounded and fairly deep but were much shorter in length. The two BSTs that were significantly more used (no.15 and 16) showed heavy use-wear on the posterior side. It appears as though heavy pressure was being applied consistently across posterior distal end of the tool. The pressure seems most heavily applied to the most distal edge and tapers up toward the proximal end becoming less worn moving up the bone. The tapered use ends with a pock mark of pressure which

Figure 3.11: Stemp et al. (2015: 13) publication depicting experimental use-wear patterns on awls. They used a confocal image of the microwear (depicted to the left), a microtopographical elevation map (depicted center), and a roughness profile for experimental tools of (top) animal hides, (middle) plant yucca fiber, (bottom) sandstone.
is demonstrated by a significant circular bone indentation. These patterns of use on the posterior side are evident in Figure 3.10.

Figure 3.11, published by Stemp et al. (2015:13), and cited in research published by Watson and Gleason (2016), demonstrates the leading research in quantifying microwear on bone artifacts. “Watson employed both SEM to document variability in wear and LSCM to quantify variation in wear patterns” (Stemp et al. 2015:12). These studies were conducted on experimental awl replicas that were used on (a) animal hide (b) plant (yucca) fiber (c) sandstone. The analysis was three-fold as seen above where they used “a confocal image of the microwear (depicted to the left), a microtopographic elevation map (depicted center), and a roughness profile for experimental tools” (Stemp et al. 2015:13).

Figure 3.11 depicts deeper rounded clear striations from hide working tasks, while clear patterned striations are not evident from yucca plant processing on these experimental tools. The bottom image also denotes clear thin shallow striations from sandstone processing which add complexity to delineating between plant processing and use against sandstone. There is a general agreement among researchers that “use-wear patterns on bone such as rounded microtopography and short (possibly deeper) striations [are] characteristic of hide-working and planar surfaces interspersed with fine, shallow striations [are] typical of plant fiber working” (Stemp et al. 2015:12; Watson and Gleason 2016:3). The use-wear on the bottom image of bone/sandstone experiments demonstrates plants more commonly, as stated above, are accepted as plant fiber use-patterns. This could add inconsistencies with other researchers’ bone use-wear assessments and interpretations. While the initial test supports the theory that tools used in manufacturing
plant and hide products produce different measurable wear-patterns, continued work needs to be done to address problems with directionality of wear and tool form (Stemp et al. 2015:12). By using HST as a case study for use-wear some of these issues may be resolved as these artifacts have a curved morphology and potentially had a specific directional use. Therefore, further work should be done using similar techniques and these Bone Spatulate Tools.

**Hypothesis of Nebraskan HST Function**

I interpret the BSTs found from the Child’s Point site were used as hide-working tools since the deep visible striations match the experimental awl/hide striations from Watson and Gleason’s (2016) research. These BSTs most likely do represent a fleshing purpose, to remove remaining tissue, fat, and membrane from the hide. The continuous wear across the posterior side and the final pockmarks on these artifacts signals that heavy pressure was being applied against a flat hard surface as illustrated in Figure 3.10. I theorize that these BSTs were being used against the ground, an anvil, or some other specific surface instead of against an upright rack. The thin to thick tapering effect resulting in a final deeply pitted indentation closer to the proximal end of the bone suggests the material these BSTs were used on was anchored against a hard surface [Figure 3.29]. Clearly these interpretations would be further supported by using various other technologies such as a surface metrology, light microscopy and scanning electron microscopy as seen in other researchers in similar use-wear analyses studies.

**HST Comparative Attribute Analysis**
As mentioned earlier in this paper, use-wear analyses and tool function assessments have had an extensive and an often-obscure role in archaeology. From the ‘speculative functional approach’ to efficiency studies, use-wear analyses have also included biases and assumptive nomenclature. There have been considerable efforts made to address these biases. Pioneering work established tribology in the 1960s, which examines friction and wear between materials as a way to redress function assessments (Watson and Gleason 2016:1). Currently there are “[n]umerous experimental applications of microwear analysis [that] have proven that different materials (plant fiber, chipped stone, animal hide, etc.) leave distinct and identifiable traces on bone tools using light microscopy and scanning electron microscopy (SEM)” [Figure 3.11] (Watson and Gleason 2016:1-2). These methods are not without complexities and issues, but they provide scientific methods for judging use-wear patterns left from repeated specific tasks on various materials.

**AMNH & NMNH HSTs**

During my experimental research project, I traveled to two repository institutions, the AMNH and NMNH to analyze a sample of 65 HSTs. To aggregate this list of 65 HSTs, I utilized legacy data from the CRA to identify artifacts from these two institutions that may potentially fall under the Bone Spatulate Tools category. Upon examining approximately 142 bone tools between the NMNH and AMNH, I was able to determine that 65 were HSTs. I took standard artifact photographs, digital microscopic images using a Dino-Lite, as well as photographs to create 3D models of all of the embellished HSTs. I also took a series of measurements of the embellished HSTs as well as some of the unembellished HSTs found in interments. Fourteen of the 65 HSTs were embellished
Five HSTs that I examined were embellished with a varied motif not listed in the legacy data (this is indicated by an asterisk in Table 3.3). I also examined 25 Phalange Spatulate Tools (PST), two of which were embellished. While these phalanges should be considered a part of this overall category of Bone Spatulate Tools due to their identical manufacturing to the HSTs (Morris 1928), I only conducted use-wear analysis on the humeri due to the time limitations. Further work is required to explore their function and connection to HSTs, as Osborne notes there are no Phalange Spatulate Tools found in Mesa Verde assemblages (Osborne 2004).

**Embellished HST Attributes**

![Embellished HST Attributes](image)

Figure 3.12: Inlaid HST (A-C) were found in PB r244, National Anthropological Archives, Smithsonian Institution [335156; 335157; 335158]; (D) was found in PB r326 and National Anthropological Archives, Smithsonian Institution [335162]; (E) H/5145 was found in PB r38 and courtesy of the Division of Anthropology, American Museum; and (F) H/10598 was found PB r320 and courtesy of the Division of Anthropology, American Museum. Photos taken by Anderson 2018.

By examining the tools for their similarities and differences I was able to evaluate whether these embellished artifacts were used at all and whether or not they were used in a similar fashion to the unembellished more abundant versions. To address the function of HSTs, I need to delineate the morphological differences and/or similarities, such as production wear and use-wear, between the embellished and unembellished bone
spatulate tools. These distinctions will inform the use-wear analyses to better define the function of the artifact type as a whole. In order, to make these assessments, I observed properties such as polish, edge wear, design motif, and overall quality to inform my interpretations.

Each of the embellished HSTs had specific qualities unto themselves, with a common theme of alternating jet and turquoise tesserae on all six of the inlaid tools. Yet they were distinct and unique in specific ways suggesting the user and/or manufacturer had personalized each tool individually. There were only five inlaid HSTs (Museum No.: 335162, 335156, 335157, 335158, H/5145) that I was able to examine, as H/4144 was out on display at the AMNH. The other HSTs that I examined had either: incised lines (Museum Specimen No.: H/8815, H/5643), painted black lines (Museum Specimen No.: 335160), or were blackened (Museum Specimen No.: H/8473, H/7078, H/11727, 335167). In addition one had been cut in preparation for attaching tesserae like the others but potentially was broken in production (Museum Specimen No.: H/10598) [Figure 3.12; Table 3.3]. Significantly, all of the embellished tools, in which the use-wear was intact, were used in a manner comparative to the non-embellished HST. Moreover, they all had a distinctive manufacturing pattern as well as a distinctive polish and bit-edge wear related to use. The most elaborate of the inlaid HST with jet, turquoise, and shell inlay on the diaphysis and the condyles looked to be one of the most used tools from the 65 I examined [Figure 3.12]. Three of the inlaid HST from room 244A, had a distinctive polish that appeared to be an intentional component for the design rather than from use; as they were polished evenly over the entire surface, including the unutilized areas [Figure 3.12].
**HST Manufacturing Striations**

On almost all of the 65 HSTs I examined, there were consistent striations on the front of the spatulate opening and on the backside of the spatulate edge. On the front side running from the worked edge into the marrow cavity exposure, there were long vertical striations [Figure 3.13, 3.14]. While on the backside of the tool there were both long vertical striations running up the diaphysis of the bone and also many horizontal striations near the bit-edge [Figure 3.13, 3.14]. These striations were ubiquitous across all the HSTs that I examined at the two institutions including the spatulate ends of these tools that were missing most of the diaphysis and the epiphyseal end (handle). These striations could be from use-wear from a specific task however, they also could be indicative of manufacturing or continued shaping wear. Interestingly, these striations look both smoothed over as well as not smoothed over which could be from continued wear [Figure 3.14, 3.15]. In the case of HST museum number 335158, these striations on the back of the tool ran past the embedded inlay, which indicates the striations resulted prior to making cuts for the embellishments yet many of the striations looked to have been added later [Figure 3.13]. After many discussions with Dr. Phil Geib and Chuck LaRue, a long-time researcher of these types of tools, along with several discussions with various zooarchaeologist, I have concluded that these striations are likely from production/manufacturing techniques. This indicates that the worked edge of the HSTs were given continued care and continued manufacture throughout their use life by grinding.
Table 3.3: Embellished HST and their locations, data aggregated through the CRA (chacoarchive.org) and AMNH & NMNH attribute analysis conducted by Anderson

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<td>Kiva L - 355167*</td>
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<td>Room 170 - H/ 10598</td>
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<td>Room 38 - H/ 05144</td>
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<td>Room 38 - H/ 05145*</td>
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<td>Room 54 - H/ 05648*</td>
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<td>Room 89 - H/ 08815</td>
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<td>Room 108 - H/ 08473</td>
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<td><strong>Aztec Ruin</strong></td>
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<td><strong>Penasco Blanco</strong></td>
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<td><strong>Be 59 - Ton Mathews Site</strong></td>
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* *Embellished HSTs I examined at the AMNH & NMNH but either do not mention embellishment or are not listed in the CRA legacy data.*

**Key:** T = Turquoise; J = Jet; S = Shell; (D) = Diaphysis which is the location of the inlay; (C) = Condyle which is the location of the inlay
Figure 3.13: HST (museum no. 335158), depicting use-wear or manufacturing striations running the length of the diaphysis up to and past the inlaid tesserae. National Anthropological Archives, Smithsonian Institution [335158]. Photos by Anderson 2018.

Figure 3.14: HSTs (a) museum no. H/2722, b) museum no. H/8660), depicting striations that are not smoothed over.Courtesy of the Division of Anthropology, American Museum. Photos taken by Anderson 2018.

Figure 3.15: HST (museum no. H/6170) front and back depicting striations that appear smoothed over. Courtesy of the Division of Anthropology, American Museum. Photos taken by Anderson 2018.
Figure 3.16: HSTs drawings depicting a) a bifacial bit-edge bevel, drawing based on HST museum no. H/6169, Courtesy of the Division of Anthropology, American Museum; and b) a unifacial bit-edge bevel, drawing based on HST museum no. 335167, National Anthropological Archives, Smithsonian Institution [335167]. Illustrations by M. Anderson 2019.

Figure 3.17: HSTs depicting a) a bifacial bit-edge bevel (museum no. 335157), National Anthropological Archives, Smithsonian Institution [335157]; and b) a unifacial bit-edge bevel (museum no. 335167), National Anthropological Archives, Smithsonian Institution [335167]. Photos taken by Anderson 2019.

Figure 3.18: Images of micro-flakes on the bit-edge of HSTs a) museum no. H/8473 and b) museum no. H/7546. Courtesy of the Division of Anthropology, American Museum. Photos taken by Anderson 2019.
If these striations are just from production/manufacturing processes then as these tools were used, one would assume the striations would fade and smooth out. These striations looked both smoothed over [Figure 3.15] and not smoothed over [Figure 3.14]. This could demonstrate repeated maintenance and shaping, or it could be related to use-wear from conceivably plant processing against sandstone slabs. Possibly they needed to maintain the tools bifacial bit-edge, however, further work is required to better assess these striations. In addition to the striation patterns, there are size differences in the HSTs, specifically museum number 335158, which is 123mm long making it roughly 20mm shorter than the other inlaid HSTs [Figure 3.30]. However, these length differences were not overt when comparing these embellished tools against the larger sample, suggesting that sharpening or severe shaping was not occurring on these HSTs. The bit-edge was not worked, sharpened, or shaped to cause a severe size reduction; which is demonstrated by the relatively similar lengths of the HSTs I examined. Although, this could be a byproduct of these tools being repurposed or discarded in a destructive way once they were exhausted.

**HST Bit-Edge Use-Wear**

Of the 65 HST I examined at the two institutions: 50 had a bifacial bit-edge [Figure 3.16a, 3.17a], six were unifacial [Figure 3.16b, 3.17b] and 12 either did not have a spatulate edge to examine or the tool itself had not been utilized. Micro-flakes were present on the front and backside of the spatulate bit-edge on 18 of the HSTs [Figure 3.18 a&b]. This does not verify one function over another per se, but the fact that the majority of the HST analyzed have a bifacial bit-edge and a significant amount contained micro-flakes I am led to believe that these HSTs were used against a hard surface. Sometimes,
the entire HST was polished including areas unassociated with use or handling which is most likely due to intentional polishing as a part of the tool’s aesthetic [Figure 3.12]. While other HSTs just had a polish on the spatulate bit-edge, which is possibly related to the use-wear [Figure 3.17a].

The HSTs I analyzed during my research visits are morphologically analogous yet the motifs of the fourteen embellished HSTs were distinct. There is a pattern of alternating turquoise and jet on the inlaid tools, yet their exact inlaid tesserae designs are unique [3.12]. One (museum number 335158) exhibits abalone shell intermixed with the turquoise and jet in the diaphysis inlay as well as shell inlaid into the condyle. While two (museum number 335157 and 335158) also have abalone shell inlaid into the epiphyseal condyles. Two HSTs (museum numbers 335158 and H/10598) were incised for tesserae inlay in the epiphyseal condyles. These variations in motifs could be indicative of a personalized stylistic attribute added by the manufacturer or the user of the tools, which are not mutually exclusive, or potentially some other reason altogether. Clearly these embellishments are significant in some way as jet, turquoise, and shell are embedded with ritual or ceremonial meaning as discussed in chapter two.

The embellished HSTs demonstrated equal use-wear signatures as the unembellished HSTs. There were striations were ubiquitous on almost all of the HSTs. Vertical striations ran along the marrow cavity of the spatulate opening and horizontal striations were located closer to the bit-edge on the backside of the tool. These striations are likely from the original manufacturing process. However when they appeared to be more distinctive than other striations that were more smoothed over, it may indicate continued shaping or maintenance or from use. The bit-edge of 77% have a bifacial bit-
edge and a third had micro-flakes on the front, back, or both sides. There is also a notable polish on the bit-edge of the HSTs I examined. This polish, bifacial bit-edge, and presence of micro-flakes could all be an indication of use however further examination is necessary to better make these determinations.

**HST Replication Experimentation**

In order to better understand the polish/luster, striations, and morphology of the bit-edge of the HSTs, I created replicas of these artifacts using both Arizona mule deer (*Odocoileus hemionus*) and Iowa white-tail deer (*Odocoileus virginianus*). To make the replica artifacts I used modern tools such as a bone-saw to cut the proximal humeral end (glenohumeral joint) as well as to cut away some of the diaphysis on the medial side of the bone. I then used an electric sander to further open the marrow cavity and to round and taper the spatulate end and the working bit-edge. Later, I used hand-files to shape the bit-edge to more closely match the archaeological specimen. While these techniques are not traditional methods, the effort was informative, nonetheless.

While crafting them I was better able to understand the time and energy that would have been required to create such a tool, as the creation of six replica HSTs with modern tools took a day of work or approximately 8 hours. During HST prehistoric manufacture, the bones would have probably been green when they used a stone saw or similar sharp implement to incise around the humoral head so that it could be snapped off by percussion. To expose the marrow cavity and create the spatulate end they either sanded away the entire medial side of the diaphysis, which would have been difficult and time consuming, or they cut some of it away prior to the abrasive shaping. Either way this
process could have taken a significant amount of time and energy and could have resulted in breaks or tool production failures.

After replicating the archaeological HST, I designed a five-stage experimental research project: (1) use one of the HST Replica 1 on two hides mounted on an upright frame; (2) process two hides against a debarked tree log surface, using HST Replica 2; (3) stake and deflesh two hides with HST Replica 3 against ground surface, in this case on grass; (4) scrape yucca against a sandstone slab, the yucca plants are stationary as the HST Replica 5 moves against it; and (5) pull the yucca plant against the HST Replica 6 using the sandstone slab the sandstone slab as a base.

I acquired six deer hides from Nebraska and four *Yucca glauca* plants, two from the Nebraska Sandhills and two from New Mexico. I acquired a wooden frame and both large and small nails for Stages 1 and 3, a debarked tree stump for Stage 2, and sandstone slabs from New Mexico for Stages 4 and 5. I spent approximately 40-50 hours over the course of several months creating the replica HSTs, acquiring hides and plants to process as well as the materials necessary for each stage, and conducting the 5-Stage experimental research.

*Stage 1:*

I removed the first hide from the fridge and rinsed off the sodium chloride preservative. I attached the hide to the upright frame [Figure 3.19]. As I was not concerned with having a usable hide at the end, I nailed

Figure 3.19: Stage 1, a white tail deer hide stretched on a wooden frame to deflesh using HST Replica 1. Photo taken by Anderson2019.
the hide securely. After several hours attempting to deflesh this hide using HST Replica 1 with little to no results, I began to rethink the ease or feasibly of this approach. Even with more than 20 nails the hide continued to sag and slump in the frame. This prevented a firm enough surface to ever be fully able to make any progress. During Stage 1, I attempted to deflesh two different hides and spent six hours in total attempting to remove flesh, fat, and membrane.

**Stage 2:**

![Image](image1)

![Image](image2)

![Image](image3)

Figure 3.20: Stage 2, a white tail deer hide in the defleshing process using HST Replica 2. A) Image depicting tissue, fat, and membrane at the beginning of Stage 1 with Replica 2; B) Photo demonstrating HST Replica 2 removing layer of tissue from the hide during Stage 2; C) Image of vellum material after Stage 2 was complete. Photos taken by Anderson 2019.

During Stage 2, I removed two hides and placed them in buckets to allow them to soak. After letting the hide soak overnight, I let them dry out for 24 hours. After this process was complete, I began defleshing the hides against a tree log using HST Replica 2 [Figure 3.20]. This process was remarkably easier with a much more successful result. I was able to use the tool to deflesh fat, tissue and membrane from the hide easily. The tool also was useful in ensuring that the hide did not tear while stretching it across the tree stump. While using the replica HSTs in this experiment was much more successful, the
final result of the hide was closer to vellum than it was to a thinned hide for making blankets, clothes, or other goods [Figure 3.20]. I spent approximately six hours processing two different hides using HST Replica 2. While this experiment was much more successful, defleshing and thinning a hide is still quite a bit of work.

Stage 3:

These hides soaked for 24 hours and then dried for the same amount of time. I defleshed the hides while they were staked to the ground surface [Figure 3.21]. I used HST Replica 3 on two hides for approximately five hours to remove tissue, fat, and membrane in order to create a clean hide. Stage 3 was not as successful as the tree-stump defleshing experiment but was more successful than the upright rack experiment. I was not able to get as much of the flesh, fat, and membrane off as I was using the tree-stump for support. However, I was able to remove much of the hair which loosened from the soaking process [Figure 3.21]. During ethnographic research on hide processing, I found mention of a Lakota 1874 Black Hills expedition which described that “when they [the Lakota’s] first found a cave they saw on the flat rock a woman taking the hair off a deer hide with an
oldfashioned scraper” (Sundstrom 2017; Libby 1998:164). Potentially, this could be another prehistoric use for these bone tools.

**Stage 4:**

I then moved on to plant processing with these Replica tools. Per the recommendation of Chuck LaRue, a long time research of these HSTs, I rehydrated the yucca plant, bundled the leaves and used hard hammer percussion to break down the fiber prior to scraping (Chuck LaRue, personal communication 2019). I used HST Replica 5 to scrape the yucca while the yucca was static. I periodically wet the leaves as I was scraping them as rehydration seemed to enhance removal of the leafy plant matter. I tried to scrape a handful of leaves at once as well as a single leaf using sandstone slabs as the base [Figure 3.22]. I tried to cut a trough into the sandstone slab so the yucca would be contained yet I was not able to make a deep enough cut thus keeping the yucca stationary was rather difficult. I spent around eight hours on this stage of the experimental research and used one whole yucca plant. This experiment was successful in scraping the yucca to get at the fiber within the leaf stock [Figure 3.22].

Figure 3.22: Stage 4, using HST Replica 5 to scrape yucca against a sandstone slab. Images a-c depict the process of leaving the yucca leaves stationary sandwiched between the HST and the sandstone slab. Photos taken by Anderson 2019.
Stage 5:

I again, rehydrated the yucca plant and bundled the leaves and used hard hammer percussion to break down the fiber prior to scraping. I used HST Replica 6 to scrape yucca leaves, the tool remained stationary as I moved the yucca leaves between the tool and the sandstone slab [Figure 3.22]. When I held the Replica 6 HST stationary and moved the yucca against the tool, I was not successful. This is in part due to the irregular bit-edge of Replica 6 [Figure 3.28]. The edge was unable to be flush against the sandstone slab which made it virtually impossible to break down the fiber. I spent around one to two hours trying to conduct this stage and attempted to scrape a handful of yucca leaves. Interestingly, this HST Replica 6 developed horizontal striations across the back of the spatulate surface which could have been made either during production or use. Upon assessing the microscopic images from before the experimental research, I could not determine if these striations occurred during the manufacturing process or was, in fact, a result of the little use I attempted with this tool [Figure 3.28]. Another replica HST with a more regular bit-edge may serve this experiment better and should be attempted to better assess the likelihood of this function.

Replica HST Use-Wear

Replica 1

I used Replica 1 during Stage 1 of my experiment in which the hide was nailed to an upright frame [Figure 3.23]. I was not successful at defleshing the fat, tissue and membrane from this hide. Thus, the use-wear on this HST replica is not as visible and/or clear as some of the other replicas. The tool did not perform in a manner in which-
Figure 3.23: HST Replicas 1-6 (not including 4) prior to the use-wear experiments. Replicas 1-3 are from Iowa white tail deer and replicas 5-6 are from Arizona mule deer. Photos taken by Anderson 2019.

Figure 3.24: a & b) Replica HST 1 before use-wear experiments; c & d) Replica HST 1 after use-wear experiments. Photos taken by Anderson 2019.
Figure 3.25: a & b) Replica HST 2 before use-wear experiments; c & d) Replica HST 2 after use-wear experiments. Photos taken by Anderson 2019.

Figure 3.26: a & b) Replica HST 3 before use-wear experiments; c & d) Replica HST 3 after use-wear experiments. Photos taken by Anderson 2019.
Figure 3.27: a & b) Replica HST 5 before use-wear experiments; c & d) Replica HST 5 after use-wear experiments. Photos taken by Anderson 2019.

Figure 3.28: a & b) Replica HST 6 before use-wear experiments; c & d) Replica HST 6 after use-wear experiments. Photos taken by Anderson 2019.
-use-wear striations are clearly visible. Despite limited tool use the bit-edge exhibited a distinctive polish. There is not conclusive evidence that the bit-edge changed from the bifacial bit that I shaped when manufacturing these replica tools [Figure 3.24].

**Replica 2**

Replica 2 had the most identifiable and distinct use-wear and bit-edge of all the experimental tools [Figure 2.23]. During Stage 2, I was able to successfully process the hide against a tree log and produced almost vellum. The replica HST shows a distinctive polish and the most utilized side of the bit-edge became unifacial and fairly sharp [Figure 3.25]. The sharp edge that developed during this experiment in turn was most likely the reason the tool was successful at defleshing the fat, membrane, and tissue. These use-wear signatures while the most distinctive are also the least similar to the artifactual HSTs. The unifacial edges on some of the artifacts were never as sharp as the unifacial edge that was produced. The polish was more pronounced than I observed with most of the archaeological HSTs including the inlaid HSTs, which seem to have the most intensive use-wear [Figure 3.25].

**Replica 3**

I used Replica 3 to deflesh hides against the ground surface during stage 3 [Figure 3.23]. This experiment was more successful than stage one but not as productive as stage two. The tool did remove some of the flesh as well as some of the hair from the external surface of the hide. There is a polish that developed on the edge from tool use, yet little modification occurred to the manufactured bit-edge [Figure 3.26]. The polish and the
manufactured bit-edge looked similar to the archeological HSTs; however, the tool was not fully functional and I could not produce a clean hide.

**Replica 5**

During Stage 4 I used Replica 5 to scrape yucca against a sandstone slab [Figure 2.23]. I was able to extract yucca fiber and the tool worked fairly quickly and easily. The replica developed a polish and extended the bifacial bit-edge of the backside of the tool. Replica 5’s use-wear signatures look much more similar to the archaeological HST. Overall, this experiment/use-wear combination aligned with the archeological HSTs to indicate that plant processing may have been the main purpose or function of this tool type [Figure 2.27].

**Replica 6**

Replica 6 hardly demonstrates any use-wear signatures as Stage 5 was not successful [Figure 3.23]. I attempted to keep the HST replica stationary while pulling the yucca against the tool and the sandstone slab. This process did not work as I had hoped because the spatulate edge was irregularly shaped and didn’t provide enough of a top surface friction area. While this experiment did not result in much use-wear there were horizontal striations on the back of the spatulate side. When going back to my dinolite and standard photographs I could not tell if these were there before the use-wear experiment or resulted from the manufacturing process [Figure 3.28]. Therefore, this experiment should be redone to determine if these horizontal striations developed during the yucca processing or during the manufacturing process. If they are not from production but a result of tool use then potentially the striations that I have deemed manufacturing
wear on the archeological HSTs, are actually from tool use in processing yucca against a sandstone slab or a combination of both.

**Conclusions of the Experimental Research and Use-Wear Signatures**

The archaeological HSTs use-wear and manufacture traces compared against the experimental HSTs replicas gives ambiguous results. It is difficult to fully determine which of these experiments, if any, produced use-wear signatures that align exactly with the archaeological artifacts. A principle weakness of this experiment was the limited time of actual use with the replicas. Overall, the bifacial edge on a majority of the archaeological HSTs and 30% of the HSTs seen at the repository institutions, exhibited distinctive micro-flakes. While Replica 2 was successful at removing the fat, membrane and tissue from the hides, the finish product would not have been useful for blankets, clothes, etc. as it was more like vellum. The polish on the archaeological HSTs is quite different from the extreme polish that occurred on HST Replica 2. The sharp edge that developed on Replica 2 was unifacial and extremely thin which I did not encounter when looking at the archeological HSTs. However, the polish that developed on Replicas 1 and 3, was not much different from the HSTs at NMNH and AMNH. Potentially, this could indicate those HSTs were used in hide production. These replica tools were not extremely adept at removing membrane, fat, and tissue, but they were useful for removing hair as well as stretching the hide without the fear of tearing.

Stage 4 was the overall the most effective and successful experiment of this research. Replica 5 worked efficiently to strip the outer plant material to access the inner fibers. The challenge of this experiment was to keep the yucca leaves corralled so that I may process many at time. Processing a single leaf at time seems unlikely as that would
require too much time. Stage 5 was not effective due to the improper production of the HST Replica 6 irregular bit-edge. Further experimental work is required to determine if the horizontal striations on the back of the HST Replica 6 were created during the little scraping I could attempt or if they were created during the manufacturing processes. This could give insight into the manufacturing striations that were aforementioned on the archeological HSTs. Overall, the effectiveness of the HST Replica 5 at processing the yucca indicates to me that these tools likely could have been utilized to process plant fibers. Still more work is required to better assess function, as there was not obvious use-wear that supported one theory over the other. The yucca processing during Stage 5 did create plant gum that should be detectible on the archeological HSTs if not macroscopically visible; potentially visible through high-powered microcopy or residue analysis. If these tools were used on hides there should be evidence of protein DNA. Thus, there is much more work that could be done to better assess these tools function, but this initial investigation gives insight to the difficulties and variables that effect such a study.

**Themes and Discussion**

Bone Spatulate Tools are represented in the archaeological record not only in the American Southwest but also the Plains and elsewhere. While these artifacts are present cross-culturally the function of these HST artifacts required independent analysis in order to determine their prehistoric function. The Nebraskan BSTs, I argue, were used in hide-production, most likely as fleshers [Figure 3.29]. The Chacoan HSTs should not however be grouped with the Plains BSTs and therefore the nomenclature often associated with these tools (i.e. flesher and scraper) is problematic as these assumptive terms imply a
specific function. However, while use-ware must be applied to morphological categories to truly determine a tools function; I recognized the importance to readdress these tools in the first chapter by deeming that Humeri Spatulate Tools (HSTs), the subject of my experiment, provide use-wear evidence of why archeological nomenclature should be morphological rather than functional, when tools are identified.

The embellished HSTs with their individual design motifs of turquoise, jet and Pacific shell tesserae could be signaling individual life histories, a larger cosmologically connection, both, or something else. These embellished HSTs, as seen in Figure 3.30, were significant not only as utilitarian items but could have also been ritually and ceremonially important. In the Southwest region, turquoise, jet, and shell materials have a rich economic, political, and religious significance among Puebloan communities and their ancestors. For the Hopi, these colors have directional associations where black or jet is associated with the north while turquoise represents the southwest and white shell is associated with the northeast (Whiteley 2012:146-147).
Turquoise was particularly significant for the Chacoans based on its frequency, ubiquity, and ritual deposition. This blue-green color has religious significance within Pueblo ritual practice and is used, for instance, to call forth deities and cosmological forces (Plog and Heitman 2010; Heitman 2011). Interestingly, turquoise and shell (white in color) mixed with cornmeal are often found associated as ritual offerings at various shrines, kivas, or in roofs or dwelling foundations (Plog and Heitman 2010; Heitman 2011, 2015; Whiteley 2012). Black is associated with the underworld as demonstrated by Zuni tradition black paint is referred to as “From the beginning” paint (Heitman 2011:132). This paint is used by Rain Chiefs, and is believed to be brought up from the underworld at the time of emergence (Heitman 2011:132).

Olivella and abalone shell is prominently used in Puebloan rituals. In Zuni tradition white shell is associated with a female deity White Shell Woman, while turquoise was associated with a male deity, Turquoise Boy. Along with the long-distance trade required to obtained shell, as discussed, they are associated with supernatural deities...
and are considered objects of adornment for deities and mortals alike (Heitman 2001:123). Therefore, these curated ornaments of turquoise and shell should be expected to be grouped in archaeological deposits. Their value is embedded with cosmology as well as economic status (Heitman 2011:122).

The CRA provided legacy data that provided contextual evidence that HSTs are primarily found with female burials (6 females of the 9 burial/HST associations). I argue that these items are a part of an Ancestral Puebloan female toolkit [Table 3.2; Appendix A]. This experimental research was an attempt to determine a finite function to better understand their use and significance. While these experiments were not entirely conclusive, this research allowed insight into many variables and challenges using these tools. This five-stage experimental research in concert with contemporary artesian HST usage, previous experimental studies and analyses by Osborne as well as the work done on five HSTs found at the Bernstein-Dierking, UT site, all provided lines of evidence of how these prehistoric tools were used. As the tool seemed most effective as processing plant fibers compared to hide defleshing, I believe that these archeological tools were primarily used in plant processing. Overall, as the use-wear analysis of the replica HSTs requires further work to really understand their function.

Craft production within and outside of Chaco Canyon is believed to be on an individual household scale. This placed production of craft goods and consumption of goods on kin-based units which was dictated by the needs of the household (Jolie 2018:222-223). Intermittent household/community scale craft production of ornaments or other goods which peaked in the Early and Classic Bonito sub-phases, AD 900-1100 is also speculated by scholars (Jolie 2018:222-223). Noted by Watson (2012) there appears
to be an intensification of bone tools and a standardization of awls during this same time period. Watson believes implies an intensification of hide working and basket production. Jolie is uncertain of this assessment as there are a wide variety of tools which could be applicable for a wide variety of activities or products. Ritual needs may have spurred the intensification of craft goods (Jolie 2018:223).

Scholars debate the nature and significance of elites in Chaco. Ritual specialists and craft economies are still not widely understood. This household/community scale production would have allowed leaders to manage not control craft production (Jolie 2018:223). Potentially these HSTs and their association with females in room 326 as well as their ritually significant embellishments signal that they were utilized in some type of craft production in which elevated status could be earned. Although there could other interpretations of their associations and reasons for embellishments, I believe that the inclusion of these HSTs in such a significant burial crypt as well as their embellishment with economically and ceremonially valuable turquoise, jet, and shell tesserae are lines of evidence that Ancestral Puebloan women made ritual and economical contributions to their society.

**Conclusion**

These HSTs artifacts are correlates for addressing questions of gendered activities and tool function related to craft production by Ancestral Puebloans. By using legacy data, archaeologists are able to better understand the historical trajectory of function assessments and biases that persisted in archaeology. Holistic studies of tool function including ethnographic research, examining artifact associations and contexts, methodological development, and experimental archaeology can help illuminate tool
function in the past. We need to examine past biases including artifact nomenclature to ensure that we are not misrepresenting the past specifically in regard to tool function. By using new techniques and technologies archaeologists may be able to get closer to understanding what tools past people used for specific tasks and their significance. These understandings of function not only redress archaeological biases but allow archaeologists to ask different questions about women’s activities and status within and beyond Chaco Canyon.
CHAPTER FOUR

CONCLUSION

This thesis aimed to: 1) examine gender and gendered activities in archaeological bone tool assemblages of Chaco Canyon great and small house sites; 2) use legacy data from the CRA to specifically analyze Chacoan Humeri Spatulate Tools (HSTs) and their associations; 3) assess the attributes of the highly embellished HSTs versus the unembellished ones and determine the significance of these embellished tools through their depositional contexts and associations; 4) conduct direct experimental research using replica HSTs based on other analyses and experimental projects using these tools (Osborne 1965, 2004; Rood 2000) to determine tool function and their role in craft production for the Ancestral Puebloans.

Chapter Two and Three demonstrate how legacy data can be used to mine understudied artifacts, explore their contexts and associations, and better assess their function and significance. The CRA provided the data to redress these bone tools commonly referred to as fleshers and scrapers, and to explore their associations with female interments as well as the significance of the exotic turquoise, jet, and shell inlay applied to several of these tools. The varied classifications associated with HSTs (i.e. flesher and scraper) often imply a specific function which has obscured their prehistoric use. Determining the function of HSTs will provide another line of evidence that these tools were a part of a female toolkit that could have been used in craft production and contributed to the user’s status.
Chapter Two

Burial Associations, Pueblo Bonito room 326

HSTs not only were plagued by misleading and varied classifications but their associations with female interments have been overlooked. As discussed in chapter two, the legacy data demonstrates HSTs clear association with female interments as six out of nine interment/HST associations were sexed female. Not only are they associated with females more often than males in both great and small house sites, their deposition in Pueblo Bonito room 326 communicates their significance. Room 326 is a part of the western burial crypt which was constructed early in Pueblo Bonito's development (Plog & Heitman 2010). This room contained over 150 artifacts that are both common everyday items as well as objects of ceremonial significance (CRA). Scholars debate the nature and significance of elites in Chaco. Yet these burial crypts with multiple interments and the large assemblage of objects that includes ritually significant artifacts such as bone/stone/turquoise tesserae, jet rings, turquoise and jet pendants, and a turquoise bracelet and pendant on two of the female interments, suggest an elevated status of the women buried here (CRA).

Embellished vs Unembellished HSTs

One of the HST found with a female burial in room 326 was inlaid with triangular jet and turquoise tesserae. Using the CRA legacy data in concert with the attribute analysis at the AMNH and NMNH, a total of nineteen HSTs were embellished with either inlaid turquoise, jet, or shell, incised lines, blackened, and/or painted. These embellishments were unique to each of the individual tools. There was an overall theme
of alternating turquoise and jet tesserae in the inlaid HSTs, almost all of them had unique patterns of mosaic inlay. Not only were the embellishments unique to each of the HSTs but as discussed in chapter three, the embellished HSTs were used just as much if not more than their unembellished counterparts.

Significance of Inlaid Materials

Turquoise, jet, and Pacific shell have a rich economic, political, and cosmological/ceremonial significance among the Puebloan indigenous communities and their ancestors. For the Hopi these colors demonstrate a cardinal direction (Whiteley 2012:146-147; Heitman 2011). Turquoise production is a significant component of the Chacoan culture, from mining to production to trade, this commodity was important. It was sourced over 100 miles from Chaco proper, therefore Chacoan people must have exerted some level of control over these turquoise mining locales (Mathien 2001:103-118). Turquoise was considered highly valuable and was a powerful element in the Pueblo religion capable of bringing forth deities and cosmological forces. Interestingly, turquoise and shell, white in color, mixed with cornmeal are often found associated as ritual offerings at various shrines, kivas, or in roofs or dwelling foundations (Plog and Heitman 2010; Whiteley 2012; Heitman 2011, 2015). The turquoise, jet, and shell tesserae embedded into the HSTs may signify a cosmological significance between these tools and Ancestral Puebloans.

Assessing HSTs Significance for Ancestral Puebloans

HSTs are found in female interments and several are inlaid with ritually significant tesserae, these contexts and associations provide evidence that these tools
were a valued component of a female toolkit. Tools not only help to create goods but also signify the tool user’s ability to produce goods and participate in a societal activity (Sundstrom, 2017). HSTs found associated with female burials as well as oval bowl baskets in Pueblo Bonito room 326 along with the many utilitarian items and the ritually significant objects all demonstrate that these tools could have been important. Turquoise, jet and shell are often found in offerings and have cosmological significance. The fact that these materials are then embedded into these tools and that they are found with the interments in the western burial crypt of Pueblo Bonito suggests that HSTs could be associated with elevated status of their users.

*Androcentric Biases through Legacy Data*

Not only did chapter two aim to examine these HSTs, their associations and contexts to better understand gender and gendered activities in Chaco Canyon but also to redress historical biases in the legacy data. Legacy data acquired from the CRA was used to create a case study using HSTs to demonstrate the historical androcentric biases that are embedded into archaeological interpretations. In Atkin’s 1986 re-examination of burials in Chaco, she was able to identify and correct misclassifications of sex. In one particular instance, a female burial was originally assessed as a male due to the elaborate nature of the burial goods and the presumptions and biases of the excavators (1986:79). This burial included a HST and if Atkins had not reassessed the sex of this specific burial, this female/HST associated could not be made. Thus, these understudied HSTs call attention to and help redresses androcentric historical biases, which demonstrates the power of legacy data using online repositories such as the CRA.

*Chapter Three*
Determining the prehistoric function of HSTs helps to better understand gender and gendered activities of the Ancestral Puebloans. It can also provide evidence that these tools: a) could have been used in craft production that earned the user status; b) signal status the user may have already commanded; c) could have been used by ritual specialists or for ritual purposes, and/or; d) are associated with cosmological significance. These various interpretations of significance can only be understood fully through the analysis of these tools and through experimentation to try to determine their prehistoric function.

Examples of Other HST Associations, Experimental Studies, & Analyses

By discussing artifact nomenclature especially in regard to the common epithets of these HSTs (i.e. scraper and flesher), assumptions of tool function can be called into question. These terms scraper and flesher, imply a hide processing function as BSTs seen in cross-cultural comparisons are used in this manner. Yet, these morphological similarities should not impose an analogous use for BSTs and Chacoan HSTs. By examining HSTs and their associations with female interments and oval basket bowls (Jolie 2018; Laurie Webster, personal communication 2019) function assessments as well as significance of these tools may be better understood.

Nomenclature assumptions aside, several analyses including an experimental project have been conducted on these HSTs. Osborne (1965) used replicas of these HSTs to produce yucca fiber that resembles archaeological fibers found in the Chacoan perishable artifact assemblages. This project did not compare use-wear on the bone tool themselves but demonstrated the effectiveness and successful application of these tools to recreate similar archaeological fibers. In 2004, Osborne analyzed a sample
of HSTs from Mesa Verde, the Weatherill collections, and assessed various attributes including use-wear and embellishments. Her analysis demonstrates that these HSTs were well used, and that several of the tools in Mesa Verde also have unique individual embellishments. Several had a red pigmentation that were then sent off to be tested which resulted in a conclusion that the sample consisted of mainly cellular plant material potentially the gum or juice. Osborne believes this to be yucca pulp but also states such cellular plant material could originate from flattening rushes or shelling corn (Osborne 2004:430).

In an analysis of HSTs from the Bernstein-Dierking site of southeast Utah, Rood (2000) conducts an analysis of the attributes of these tools. He concludes that due to their analogous morphological characteristics these tools were mostly likely used for the same function. What that function is, he does not purport. However, he does consider Osborne’s function assessment of a plant processing as plausible. Rood notes one of these HSTs from this context demonstrates red pigmentation (Rood 2000). In the Edge of the Cedar’s State Park museum display of these Bernstein-Dierking site artifacts, pollen residue analyses demonstrated evidence of corn, beeweed, grass, cattail, and buffalo berry pollen (Edge of the Cedar State Park Museum 2019). The museum display speculates that these tools may have been used as scoops. There has not been an official report published on this analysis as of yet. As these artifacts were found in this open-air site, the pollens found could have been contaminants. Thus these results are speculative and would require further investigation.

Experimental Research
These discussions of assumptive nomenclature as well as the various studies of these HSTs from outside Chaco proper provided several theories of HST function that served as the basis of my experimental research design. By comparing the archaeological HST use-wear signatures against replica HSTs that were used in my five-stage experimental program, I aimed to determine a prehistoric function of these bone tools. Chapter three is a function assessment through an analysis of 65 HSTs at the AMNH and NMNH, in concert with my own experimental replication study. I assessed fourteen embellished HSTs that demonstrated use-wear equal to or more than their more ubiquitous unembellished counterparts.

Using five replicas I conducted five experiments, which included hide working and plant processing. I worked six hides on an upright rack, against a debarked log, and against the ground surface. During the plant processing experiments, I scraped yucca leaves against sandstone slabs where I traded keeping the plants stationary and the tool stationary. These experiments while difficult and at times unproductive were informative and ultimately useful for better assessing the prehistoric function of HSTs.

*Archaeological HSTs Use-Wear Signatures*

The comparative attribute analysis of these 65 HST provided evidence that the embellished HSTs were used just as much if not more in some cases as the unembellished HSTs. Bifacial edges are a notable feature of the tools bit-edge with 50 of the HSTs I examined demonstrating this attribute. There were long shallow vertical striations that ran up the diaphysis of the spatulate side as well as short shallow horizontal striations as well as long shallow vertical striations on the backside of tools. These striations are probably
manufacturing wear yet their appearance, being both smoothed over and not, indicate that either these tools were continually shaped or that it is in fact related to use-wear.

*Replica HST Use-Wear Signatures*

The experimental studies and the use-wear signatures on the HSTs described in chapter three provide evidence that these tools could have served a variety of purposes. The polish on Replica 2 did not match the archaeological HSTs as it was too pronounced. The bit-edge of Replica 2 became too sharp which also does not fit the bit-edge attributes on the HSTs I examined at the AMNH and NMNH. The polish on Replica 1 and 3, did however look similar to the polish seen on the archaeological HSTs however these experiments were not successful, as I could not effectively remove tissue, fat, and membrane from the deer hides. The use-wear signatures such as the polish as well as the bifacial bit-edge of Replica 5 most closely matched the archaeological HSTs. Thus, I hypothesize from the use-wear polish, bifacial bit-edge wear, and this replicas effectiveness during Stage 4, that these tools were primarily used in plant processing.

**Themes and Discussion**

As scholars debate the nature and significance of elites and status in Chaco, ritual specialists and craft economies are still not widely understood. Potentially these HSTs and their association with females in room 326 as well as their ritually significant embellishments signal that they were utilized in some type of craft production in which elevated status could be earned. Although there could other interpretations of their associations and reasons for embellishments, I believe that the inclusion of these HSTs in such a significant burial crypt as well as their embellishments with economically and
ceremonially valuable turquoise, jet, and shell tesserae are lines of evidence that Ancestral Puebloan women made ritual and economical contributions to the Chacoan society.

These artifacts were likely utilitarian tools as there is clear evidence they were heavily used. But as demonstrated they are also associated with female interments and other material goods that signal that they could have been ritually/religiously significant tools. The embedded jet, turquoise, shell tesserae suggest that they are cosmologically or ceremonially significant. As they are associated with oval basket bowls in several contexts as well as yucca sandals, and spun yucca fiber perhaps HSTs were used in plant processing. The replication experimental studies as well as contemporary artesian HST usage demonstrate that these tools are effective at processing yucca to thin and access the interior fibers. These lines of evidence suggest that these tools were a part of female toolkits that could have been used in craft production. Legacy data from the Chaco Research Archive in concert with comparative attributes analysis and experimental archaeology allow this understudied tool type to be reassessed and historical androcentric biases to be redressed.

**Future Work**

There is much more work that could be done to better understand these Chacoan HSTs. Conducting a comprehensive analysis of all the worked bone tools found in Chaco Canyon to determine and confirm a list of all the HSTs recovered from small and great house sites, would illuminate a more holistic understanding of these tools. Assessing use-wear signatures as well as embellishments on all the HSTs from these sites and documenting these attributes, is also necessary. While continuing to use legacy data to
then examine associations to continue to grow these lines of evidence for understanding the contexts and associations of these tools to better assess their connection to Ancestral Puebloan women. This work would also benefit from continued research to identify proximate ethnographic examples of morphologically similar tools being used by southwest cultures.

In addition, in order to better determine the true function of these tools, continued use of the replica tools on both hide and plant processing will help determine if further use demonstrates more observable use-wear signatures. Perhaps, if proximate ethnographic comparisons can be found new experiments could be developed and added to the five-stage design implemented in this thesis research. Using high powered microscopy, including SEM imaging of the archeological HSTs and the replica HSTs may also help reveal more conclusive results. Residue analysis, including pollen and phytolith analysis could further add to our understanding of prehistoric use of these tools. It is important to note, that examinations of residue must take into consideration the natural and cultural processes that have occurred since the deposition of these tools over 1000 years ago. If residue is embedded in these artifacts and this can be determined through high resolution microscopes, these residue samples would be helpful in definitively determining tool function. Potentially these tools served many functions and were utilized for many differing tasks and had a more significant role in defining female status. Hence, further work is required to more fully understand prehistoric function in order to make better interpretations of HST significance for Ancestral Puebloan people.
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Wylie, A.
## APPENDIX A: HUMERI SPATULATE TOOLS AND BURIAL ASSOCIATION (CRA LEGACY DATA)

<table>
<thead>
<tr>
<th>Site</th>
<th>field_catalog_no</th>
<th>museum_specimen_no</th>
<th>museum_catalog_description</th>
<th>excavators_location</th>
<th>Physical description</th>
<th>Room</th>
<th>Burial</th>
</tr>
</thead>
<tbody>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>1685</td>
<td>335162</td>
<td>Inlaid bone scraper. Mended. Scraper lay under oblong coiled basket #1870 with Skel. #9. 8</td>
<td>Scraper lay under oblong coiled basket #1870 [referring to card no, but also known as museum catalog no 335313] with Skel. #9.</td>
<td>Mineral^Jet^Jet^Inlay^Worked</td>
<td>Mineral^Turquoise^Turquoise^Inlay^Worked</td>
<td>326</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>1564</td>
<td>335161</td>
<td>Bone flesher (scraper). Found in basket #1563 [referring to card no, but also known as museum catalog no 335306] at head of Skel. #6. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Room 326. Found in basket #1563 [referring to card no, but also known as museum catalog no 335306] at head of Skel. #6.</td>
<td>Bone^Odocoileus hemionus^Artiodactyl - Mule Deer^Scraper^Worked</td>
<td>326</td>
<td>Y (F)</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>1686</td>
<td>335163</td>
<td>Bone scraper. Found in oblong coiled basket #1869 with burial #12. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Found in oblong coiled basket #1869 [referring to card no, but also known as museum catalog no 335307], with burial #12.</td>
<td>Bone^Odocoileus hemionus^Artiodactyl - Mule Deer^Scraper^Worked</td>
<td>326</td>
<td>Y(F)</td>
</tr>
<tr>
<td>Site Code</td>
<td>Grid Code</td>
<td>Reference No</td>
<td>Description</td>
<td>Location</td>
<td>Artifact Type</td>
<td>Notes</td>
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</tr>
<tr>
<td>29SJ38 7, Pueblo Bonito</td>
<td>1687 335164</td>
<td>Bone scraper. Found with oblong (elliptical) basket + burial 8 or 9. Basket fgt only saved; listed with misc. lot under #1681 [referring to card no, but also known as museum catalog no 335313]. Identified by D. H. Johnson as right humerus of mule deer (Odocoileus hemionus).</td>
<td>Room 326. Found with oblong (elliptical) basket + burial 8 or 9. Basket fgt only saved; listed with misc. lot under #1681 [referring to card no, but also known as museum catalog no 335313].</td>
<td>Bone^Odocoileus hemionus^Artiodactyl - Mule Deer^Scraper^Worked</td>
<td>326</td>
<td>Y(F)</td>
<td></td>
</tr>
<tr>
<td>Aztec Ruins</td>
<td>2228 29.0/8737</td>
<td>Mammal bone scraper—inlaid; N wing, had been inlaid, Grave 25, Wing N</td>
<td>Bone</td>
<td>Scraper</td>
<td>111, N wing</td>
<td>Y(2 Unknown)</td>
<td></td>
</tr>
<tr>
<td>29SJ39 4, Bc 50 - Tseh So</td>
<td>BC 51 30/171 BC 51 30/171</td>
<td>&quot;a bone chisel or flesher, Bc51 30/171, 4 1/2 inches long and 3/4 inch wide in good condition&quot;</td>
<td>Bone</td>
<td>Chisel or flesher</td>
<td>Found in the midden between Bc 50 &amp; Bc 51</td>
<td>Y(F)</td>
<td></td>
</tr>
<tr>
<td>29SJ39 5, Bc 51</td>
<td>Bc 51 30/11</td>
<td>Deer bone scraper, end broken off. Sides well smoothed. Grooved. 4 3/4&quot; long. 1 1/2&quot; wide. With burial Bc 51 60/4.</td>
<td>Bone^Deer^Artiodactyl - Deer^Scraper^Worked</td>
<td>Y(F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29SJ39 5, Bc 51</td>
<td>Bc 51 30/55 Bc 51 30/55</td>
<td>Bone scraper. Large strong implement made from animal femur (?), joint being used as a handle. Working end is scoop shaped. Length 6 1/4&quot;, width scraping blade 1&quot;&quot;, width at handle 1 1/2&quot;. Light tan animal bone.</td>
<td>Room 5, 9' S of EW quadrant line. 7' W of NS quadrant line. 2&quot; above floor level.</td>
<td>Bone^Animal^Animal^Scraper^Worked</td>
<td>Floor</td>
<td>Y(2M &amp; 1Unknown)</td>
<td></td>
</tr>
<tr>
<td>29SJ39 9, Bc 59, Tom Mathe ws's Site</td>
<td>Bc 59 30/20</td>
<td>Bc 59 30/20</td>
<td>Worked bone; June 27; 1947; 6.8 x 3.2 x .2cm; Fair; Natural</td>
<td>Bone</td>
<td>Worked bone</td>
<td>Y(2Unknown)</td>
<td></td>
</tr>
</tbody>
</table>
# APPENDIX B: EMBELLISHED HUMERI SPATULATE TOOLS (CRA LEGACY DATA; AMNH & NMNH DATA)

<table>
<thead>
<tr>
<th>Site</th>
<th>museum_specimen_no</th>
<th>field/museum_catalog_description</th>
<th>excavators_location</th>
<th>Embellishments</th>
<th>Burial Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>335162</td>
<td>Inlaid bone scraper. Mended. Scraper lay under oblong coiled basket #1870 with Skel. #9. 8 [triangular shaped drawing] turquoise + 7 of jet. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Room 326. Scraper lay under oblong coiled basket #1870 [referring to card no, but also known as museum catalog no 335313] with Skel. #9.</td>
<td>One band of triangular jet &amp; turquoise inlay</td>
<td>Y(F)</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>H/ 10598</td>
<td>Humerus of Deer; Broken; Inlaid as are the ones from Room #38; Humerus, Deer, Broken, Inlaid</td>
<td>Room 170. From the debris.</td>
<td>broken but incised for inlay in the diaphysis and condyles (saw at AMNH)</td>
<td>N</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>335156</td>
<td>Inlaid bone scraper. Turquoise + jet inlay. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Room 244A. Three (#574-5-6) [referring to the card numbers, also known as museum catalog numbers 335156, 334157, and 334158, respectively] found together on floor in middle of room.</td>
<td>5 bands of turquoise and jet inlay, circular incised condyles but no shell inlay present (saw NMNH, 2nd nicest)</td>
<td>N</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>335157</td>
<td>Inlaid bone scraper. Turquoise + jet (latter decomposed) inlay; halliotis Disk on either side @ top. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Room 244A. Three (#574-5-6) [referring to the card numbers, also known as museum catalog numbers 335156, 334157, and 334158, respectively] found together on floor in middle of room.</td>
<td>5 bands of turquoise and jet inlay, circular incised shell in the condyles (saw at the NMNH, inlay in roughest condition)</td>
<td>N</td>
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<tr>
<td><strong>29SJ387, Pueblo Bonito</strong></td>
<td><strong>335158</strong></td>
<td><strong>Inlaid bone scraper. Turquoise, jet + halliotis inlay; halliotis disk in jet ring on either side @ top. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</strong> Ruppert. Room 244A. Three (#574-5-6) [referring to the card numbers, also known as museum catalog numbers 335156, 334157, and 334158, respectively] found together on floor in middle of room.</td>
<td><strong>9 bands of jet, turquoise, and shell inlay (j-t-s-t-s-t-s-t-); inlaid circular rings of jet and shell in the condyles (saw at the NMNH, best condition of them all).</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>29SJ387, Pueblo Bonito</strong></td>
<td><strong>335160</strong></td>
<td><strong>Bone scraper/ humeri scraper</strong></td>
<td><strong>Room 320A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>H/08815</strong></td>
<td><strong>Bone Scaper; 5&quot; long; Marking on Exterior</strong></td>
<td><strong>Room 60. From the debris.</strong></td>
<td><strong>3 faint black painted lines that encircle the diaphysis.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>29SJ387, Pueblo Bonito</strong></td>
<td><strong>H/08473</strong></td>
<td><strong>Bone Scraper; 4 3/8&quot; long; Blackened on opposite side</strong></td>
<td><strong>Room 108. From debris.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>29SJ387, Pueblo Bonito</strong></td>
<td><strong>H/05144</strong></td>
<td><strong>Inlaid Scraper #9</strong></td>
<td><strong>Room 38. West end. #5136-5154 were found together.</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Inlaid with turquoise and jet tesserae around the diaphysis, most are missing four turquoise tesserae encircling a jet bead.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>H/05145 (Not listed in the CRA)</td>
<td>N/A</td>
<td>Found in room 38 next to H/ 05144</td>
<td>Turquoise, &amp; Jet inlay encircling the diaphysis of the humeri. Six bands of inlay, (j-t-j-t-j-t/j) alternating jet and turquoise with the final band closest to the spatulate end alternating triangular and jet tesserae.</td>
<td>N</td>
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<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>335167</td>
<td>Bone scraper. Ambroided. Identified by D. H. Johnson as left humerus of mule deer, Odocoileus hemionus.</td>
<td>Kiva L</td>
<td>Blackened (intentional?)</td>
<td>N</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>H/ 07078</td>
<td>Bone Scraper</td>
<td>Room 83. From debris.</td>
<td>Blackened (intentional?)</td>
<td>N</td>
</tr>
<tr>
<td>29SJ387, Pueblo Bonito</td>
<td>H/ 05643</td>
<td>Bone Awl; Bone Scraper</td>
<td>Room 54. From debris. Upper floor.</td>
<td>Incised</td>
<td>N</td>
</tr>
<tr>
<td>Site</td>
<td>Catalog No</td>
<td>Description</td>
<td>Room/Location</td>
<td>Notes</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Aztec Ruins</td>
<td>29.0/7158</td>
<td>Mammal bone scraper. Incomplete. Has been inlaid, probably with turquoise. Design double row of circles with central dot around middle.</td>
<td>Room 51, E wing</td>
<td>Circular incised lines with turquoise most likely inlaid into the center of the circles (didn't see in person, saw drawings).</td>
<td></td>
</tr>
<tr>
<td>Aztec Ruins</td>
<td>29.0/8737</td>
<td>Mammal bone scraper--inlaid N wing, had been inlaid, Grave 25, Wing N</td>
<td>Room 111, N wing, Grave No. 25</td>
<td>Inlaid scraper... inlay looks triangular from drawings (didn't see).</td>
<td></td>
</tr>
<tr>
<td>29SJ399, Bc 59, Tom Mathew's Site</td>
<td></td>
<td>Mammal bone; Crudely incised decoration; Flesher (?); July 15, 1947; 96mm x 26mm; Good; None (natural); Preserved with ambroid and acetone; Chip of same in Kiva 2 &quot;sack&quot; 100292 (Koenig)-glued on.</td>
<td>1' below surface</td>
<td>Incised? (didn't see so unsure of embellishments)</td>
<td></td>
</tr>
<tr>
<td>29SJ400, Bc 52 - Casa Sombreada</td>
<td></td>
<td>Bone awl; [drawing of zig-zag line] pattern cut in bone, 60 mm from point on top surface; pattern repeated on underside of bone; 28mm above point on top side design begun [drawing]; 55mm from point; bone point is 10mm, condyle present, smoothed, head worn down; cracked near head; 40mm=width, 30mm=thickness, 122mm=L.; tan; good condition; IA1.a. [Kidder classification?].</td>
<td>Room 19; Horizontal: in niche in cliff; Vertical: locus: 1' above floor level.</td>
<td>Incised? (didn't see and couldn't find any images).</td>
<td></td>
</tr>
<tr>
<td>Site</td>
<td>Bc 53 30/154 (Field Catalog No)</td>
<td>Carved bone, broken. 4.4 x 1.7. &quot;Fragment- deer bone- spoon or awl with decorations, highly polished, 1 3/4 inches long. BM 54&quot;, 10&quot; from S wall, 23&quot; from E wall.&quot;</td>
<td>Room 4, Strat level 5, 10&quot; from S wall, 23&quot; from E wall, 54&quot; deep</td>
<td>Accession note cards depict potentially triangular inlay tesserae.</td>
<td>N</td>
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<td>29SJ396, Bc 53 - Roberts' Site</td>
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<tr>
<td>29SJ410, Penasco Blanco</td>
<td>H/11727</td>
<td>Bone Implement- blackened by fire- 2-7/8&quot; long</td>
<td>Penasco Blanco</td>
<td>Blackened (intentional?)</td>
<td>N</td>
</tr>
</tbody>
</table>
### APPENDIX C: NMNH & AMNH HUMERI SPATULATE TOOLS

<table>
<thead>
<tr>
<th>Museum Cat #</th>
<th>Site</th>
<th>Room #</th>
<th>Description</th>
<th>Form</th>
<th>burial association</th>
<th>Embellished</th>
<th>condyle inlay</th>
<th>Bit Edge</th>
<th>Micro Flakes</th>
</tr>
</thead>
<tbody>
<tr>
<td>334930</td>
<td>Pueblo del Arroyo</td>
<td></td>
<td>Bone knife; Prehistoric; Gift; March 29, 1923; Length 3 1/2&quot; x 3/4&quot;</td>
<td>Knife</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td></td>
</tr>
<tr>
<td>334937</td>
<td>Pueblo del Arroyo</td>
<td>Pueblo del Arroyo</td>
<td>Bone scraper; Prehistoric; Gift; March 29, 1923; Length 6 3/8&quot; x 1 3/16&quot;</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td></td>
</tr>
<tr>
<td>335155</td>
<td>Pueblo Bonito</td>
<td>226A</td>
<td>Fgt. bone scraper. Identified by D. H. Johnson as right humerus of mule deer (Odocoileus hemionus).</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td></td>
</tr>
<tr>
<td>335156</td>
<td>Pueblo Bonito</td>
<td>244</td>
<td>Inlaid bone scraper. Turquoise + jet inlay. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Inlay</td>
<td>N</td>
<td>inlay jet &amp; T</td>
<td>present but missing inlay</td>
<td>bifacial</td>
<td>X</td>
</tr>
<tr>
<td>335157</td>
<td>Pueblo Bonito</td>
<td>Room 244A, Three (57-5-6)</td>
<td>Inlaid bone scraper. Turquoise + jet</td>
<td>Scraper; Disk; Inlay; Inlay</td>
<td>N</td>
<td>inlay jet &amp; T</td>
<td>shell</td>
<td>bifacial</td>
<td>X</td>
</tr>
</tbody>
</table>
[referring to the card numbers, also known as museum catalog numbers 335156, 334157, & 334158, respectively] found together on floor in middle of room.

<table>
<thead>
<tr>
<th>Card Number</th>
<th>Location</th>
<th>Description</th>
<th>Material</th>
<th>Inlay</th>
<th>Equipment</th>
<th>Shape</th>
</tr>
</thead>
<tbody>
<tr>
<td>335158</td>
<td>Pueblo Bonito</td>
<td>Inlaid bone scraper. Turquoise, jet + halliotis inlay; halliotis disk in jet ring on either side @ top. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Scraper</td>
<td>N</td>
<td>inlay J&amp;T&amp; shell</td>
<td>bifacial</td>
</tr>
<tr>
<td>335159</td>
<td>Pueblo Bonito</td>
<td>Bone scraper.</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>unifacial ??</td>
</tr>
<tr>
<td>335160</td>
<td>Pueblo Bonito</td>
<td>None</td>
<td>N</td>
<td>painted - 3 circular lines</td>
<td>none</td>
<td>Bifacial</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>335161</td>
<td>Pueblo Bonito</td>
<td>326</td>
<td>Bone scraper</td>
<td>Scraper</td>
<td>At head of Skel. #6</td>
<td>none</td>
</tr>
<tr>
<td>335162</td>
<td>Pueblo Bonito</td>
<td>326</td>
<td>Inlaid bone scraper. Mended. Scraper lay under oblong coiled basket #1870 with Skel. #9. 8</td>
<td>Inlay Scraper</td>
<td>Skel. #9. 8</td>
<td>inlay jet &amp; T</td>
</tr>
<tr>
<td>335163</td>
<td>Pueblo Bonito</td>
<td>326</td>
<td>Bone scraper. Found in oblong coiled basket #1869 with burial #12. Identified by D. H. Johnson as left humerus of mule deer (Odocoileus hemionus).</td>
<td>Scraper</td>
<td>With burial #12.</td>
<td>none</td>
</tr>
<tr>
<td>335164</td>
<td>Pueblo Bonito</td>
<td>326</td>
<td>Bone scraper. Found with oblong (elliptical) basket + burial 8 or 9. Basket fgt</td>
<td>Scraper</td>
<td>Found with burial 8 or 9.</td>
<td>none</td>
</tr>
</tbody>
</table>
only saved; listed with misc. lot under #1681 [referring to card no, but also known as museum catalog no 335313]. Identified by D. H. Johnson as right humerus of mule deer (Odocoileus hemionus).

<p>| 335165 | Pueblo Bonito | 333 | Bone scraper. Identified by D. H. Johnson as right humerus of mule deer, Odocoileus hemionus. | Scraper | N | none | none | Bifacial |
| 335166 (2.1 a) | Pueblo Bonito | 335 | Bone flesher - 2.1 is a fgt. (cutting edge) only. Identified by D. H. Johnson as right humerus (distal end) &amp; left humerus fgt. of shaft, of mule deer, Odocoileus hemionus. | Flesher | N | none | none | Bifacial |
| 335166 (b) (Not in CRA) | Pueblo Bonito | | | N | none | none | Bifacial |
| 335167 | Pueblo Bonito | Kiva L | Bone scraper. Ambroided. | Scraper | N | blackened - slightly | none | unifacial ?? |</p>
<table>
<thead>
<tr>
<th>Object ID</th>
<th>Site Location</th>
<th>Site Area</th>
<th>Description</th>
<th>Owner</th>
<th>Count</th>
<th>Specimen Type</th>
<th>Material</th>
<th>Date</th>
<th>Technology</th>
<th>Additional Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>335168</td>
<td>Pueblo Bonito</td>
<td>Kiva Q</td>
<td>Bone scraper. Bit broken. Identified by D. H. Johnson as left humerus of mule deer, Odocoileus hemionus.</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>undetermined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>335169</td>
<td>Pueblo Bonito</td>
<td>Unspecified</td>
<td>Bone Scraper - [&quot;&quot;3&quot;&quot; crossed out] 2. [&quot;&quot;2&quot;&quot; crossed out] 1 broken. Two identified by D. H. Johnson as right + left humeri of mule deer, Odocoileus hemionus.</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>undetermined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Catalog No.</td>
<td>Site Name</td>
<td>Location</td>
<td>Description</td>
<td>Artifact Type</td>
<td>Count</td>
<td>Use</td>
<td>Technique</td>
<td>Identification Notes</td>
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</tr>
<tr>
<td>335170 (1050)</td>
<td>Pueblo Bonito</td>
<td>290</td>
<td>Bone flesher - 2. 1 is a fgt. (cutting edge) only. Identified by D. H. Johnson as right humerus (distal end) &amp; left humerus fgt. of shaft, of mule deer, Odocoileus hemionus.</td>
<td>Flesher</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>undetermined (hasn't been used)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>335173</td>
<td>Pueblo Bonito</td>
<td>Sub-floor kiva, R. 286</td>
<td>Fgt. Of bone knife</td>
<td>Knife fragment</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>unifacial (maybe not BST)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>335175</td>
<td>Pueblo Bonito</td>
<td>268A</td>
<td>Bone implement.</td>
<td>Unspecified</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>Bifacial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 00032</td>
<td>Pueblo Bonito</td>
<td>Large Refuse heap. Found in dirt thrown from trench.</td>
<td>Implement, Bone</td>
<td>Unspecified</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial?? (broken so hard to say)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 02978</td>
<td>Pueblo Bonito</td>
<td>Room 25. Found in the refuse.</td>
<td>Knife, Bone</td>
<td>Knife</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>Bifacial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/03024</td>
<td>Pueblo Bonito</td>
<td>Room 25. Found in the refuse</td>
<td>Implement, Bone</td>
<td>Unspecified</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial (not a HST - really rounded bit)</td>
<td></td>
<td></td>
</tr>
<tr>
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</tr>
<tr>
<td>H/04651</td>
<td>?</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/04653</td>
<td>?</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>undetermined</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/04945</td>
<td>Pueblo Bonito</td>
<td>Room 62. General debris Upper Part.</td>
<td>Animal Bones</td>
<td>Not applicable</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>undetermined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/05116</td>
<td>Pueblo Bonito</td>
<td>Room 38. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H/05145</td>
<td>Pueblo Bonito</td>
<td>Room 38. West end. #5136-5154 were found together.</td>
<td>Inlaid Scraper #9</td>
<td>Scraper; Unspecified</td>
<td>N</td>
<td>Turquoise &amp; jet inlay. Six b &amp; s of inlaid tesserae, alternating J &amp; T. The final row of inlay, closest to the spatulated end is alternating triangular jet &amp; turquoise tesserae.</td>
<td>none</td>
<td>bifacial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/05144</td>
<td>Pueblo Bonito</td>
<td>Room 38. West end. #5136-5154 were found together.</td>
<td>N</td>
<td>Turquoise &amp; jet inlay. Missing most of the tesserae.</td>
<td>none</td>
<td>bifacial</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Location</td>
<td>Description</td>
<td>Type</td>
<td>Count</td>
<td>Additional Notes</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>H/ 05267</td>
<td>Room 39. From debris. Lower floor.</td>
<td>Bone Scraper, Broken</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 05481</td>
<td>Room 42. From debris.</td>
<td>Bone Scraper, Broken</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 05528</td>
<td>Room 45. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 05846</td>
<td>Room 60. From debris. Upper floor.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 05933</td>
<td>Room 62. From debris.</td>
<td>Bone Awl</td>
<td>Awl</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 06032</td>
<td>Room 65. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 06169</td>
<td>Room 67. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 06170</td>
<td>Room 67. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 06629</td>
<td>Room 76. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 06705</td>
<td>Room 78. From debris.</td>
<td>Part of Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 07078</td>
<td>Room 83. From debris.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>Backside has been browned (looks intentional)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 07170</td>
<td>Room 64. From debris.</td>
<td>Bone Scraper; Broken</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 07546</td>
<td>Room 89. From debris.</td>
<td>Blade of Bone Scraper, Highly Polished</td>
<td>Scraper</td>
<td>N</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 07933</td>
<td>Pueblo Bonito</td>
<td>Scraper, Bone</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>undetermined</td>
<td></td>
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</tr>
<tr>
<td>H/ 08028</td>
<td>Pueblo Bonito</td>
<td>Room 102. From debris.</td>
<td>Scraper, Deer Bone, Heavily Worked</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>Bifacial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 08234</td>
<td>Pueblo Bonito</td>
<td>Room 105. From the debris.</td>
<td>Scraper, Animal Bone</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>bifacial</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H/ 08473</td>
<td>Pueblo Bonito</td>
<td>Room 108. From the debris.</td>
<td>Scraper, Bone, Blackened Opposite Side</td>
<td>Scraper</td>
<td>N</td>
<td>Blackened &amp; incised with an anthropomorphic figure &amp; a geometric square design.</td>
<td>None</td>
<td>bifacial</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H/ 08659</td>
<td>Pueblo Bonito</td>
<td>Room 109. From debris.</td>
<td>Scraper, Animal Bone</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>bifacial</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H/ 08660</td>
<td>Pueblo Bonito</td>
<td>Room 109. From debris.</td>
<td>Scraper, Animal Bone, Highly Polished</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>bifacial (both ends utilized)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 08662</td>
<td>Pueblo Bonito</td>
<td>Room 109. From debris.</td>
<td>Scraper, Deer Humerus, Blade Broken</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>bifacial</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H/ 08815</td>
<td>Pueblo Bonito</td>
<td>Room 60. From the debris.</td>
<td>Scraper, Bone, Long Markings on Exterior</td>
<td>Scraper</td>
<td>N</td>
<td>Potential incised lines (intentional design?).</td>
<td>None</td>
<td>bifacial (mostly broken away)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H/ 09524</td>
<td>Pueblo Bonito</td>
<td>Room 127. From the debris.</td>
<td>Implement, Bone, Scraper-Form</td>
<td>Unspecified</td>
<td>N</td>
<td>none</td>
<td>None</td>
<td>bifacial</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>H/ 10598</td>
<td>Pueblo Bonito</td>
<td>Room 170. From the debris.</td>
<td>Humerus, Deer, Broken, Inlaid</td>
<td>Humerus</td>
<td>N</td>
<td>Inlay cut, but no tesserae present.</td>
<td>Condyle opening but no</td>
<td>bifacial</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID</td>
<td>Location</td>
<td>Site</td>
<td>Phase</td>
<td>Context</td>
<td>Object Type</td>
<td>Material</td>
<td>Use</td>
<td>Technique</td>
<td>Size</td>
<td>Inlay Tessera</td>
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<tr>
<td>H/10800</td>
<td>Pueblo Bonito</td>
<td>Room 173. From the debris.</td>
<td>Scraper, Bone, Humerus of Deer</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>undetermined</td>
<td></td>
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<tr>
<td>H/11727</td>
<td>Penasco Blanco</td>
<td>Unspecified</td>
<td>Implement</td>
<td>N</td>
<td>Blackened, intentional?</td>
<td>none</td>
<td>bifacial</td>
<td>X</td>
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<td></td>
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<tr>
<td>H/11757</td>
<td>29SJ410, Penasco Blanco</td>
<td>Unspecified</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>H/11758</td>
<td>29SJ410, Penasco Blanco</td>
<td>Unspecified</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td>X</td>
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<tr>
<td>H/11762</td>
<td>29SJ410, Penasco Blanco</td>
<td>Unspecified</td>
<td>Blade</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>bifacial</td>
<td>X</td>
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<tr>
<td>H/12106</td>
<td>Pueblo Bonito</td>
<td>Room 173. Found among bones #H/10753.</td>
<td>Bone Scraper</td>
<td>Scraper</td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>can't tell</td>
<td></td>
<td></td>
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<tr>
<td>H/16363 (not in CRA)</td>
<td>?</td>
<td></td>
<td></td>
<td>N</td>
<td>none</td>
<td>none</td>
<td>unifacial</td>
<td>X</td>
<td></td>
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